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**MODEL CODES PRINTED IN RED  
IN THIS CATALOGUE  
ARE PREFERRED PRODUCTS  
AND ARE READILY AVAILABLE.**

Specifications, descriptions and illustrative material contained herein were as accurate as known at the time this publication was approved for printing.

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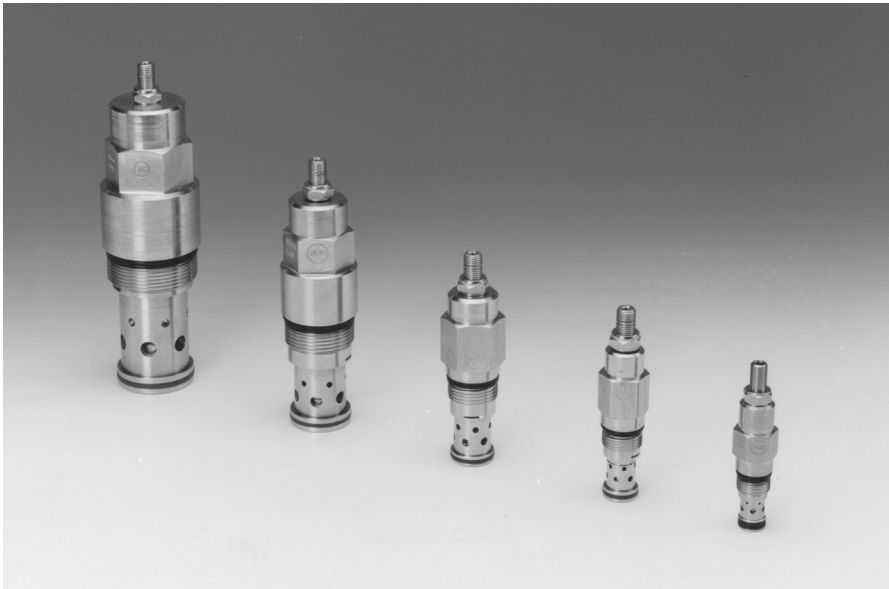
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*Sun screw-in cartridges, available in five sizes, are suitable for both mobile and industrial applications.*



*A wide range of standard bodies are available to simplify the installation of Sun cartridges in new and existing circuits.*

### **Five Cartridge Sizes**

*Flows to 760 L/min.  
(1600 L/min. for some applications).*

Sun screw-in cartridge type hydraulic valves for industrial and mobile applications are basic building blocks. Each cartridge contains the active elements needed for hydraulic control functions in a convenient and reliable lightweight envelope. Cartridges are available in standard pressure ranges up to 350 bar (420 bar in some models). Every cartridge receives a complete functional test prior to shipment.

The use of cartridge valves in hydraulic systems will:

- Improve system reliability
- Simplify circuits
- Reduce leakage points
- Reduce piping costs
- Save space and weight
- Simplify service
- Reduce assembly time
- Reduce spare parts inventory

A significant advantage in the design of Sun cartridges is that the working parts “float” in the body, so they are not susceptible to binding caused by overtightening, during installation in the cavity. (See illustration on inside front cover.)

Sun utilizes relatively few cartridge cavities throughout its entire range of cartridge products. Many valve functions and ranges can be interchanged in the same cavity. The result is greatly increased flexibility, and the capability to modify circuits without disturbing any piping, breaking unions or unplumbing any valves.

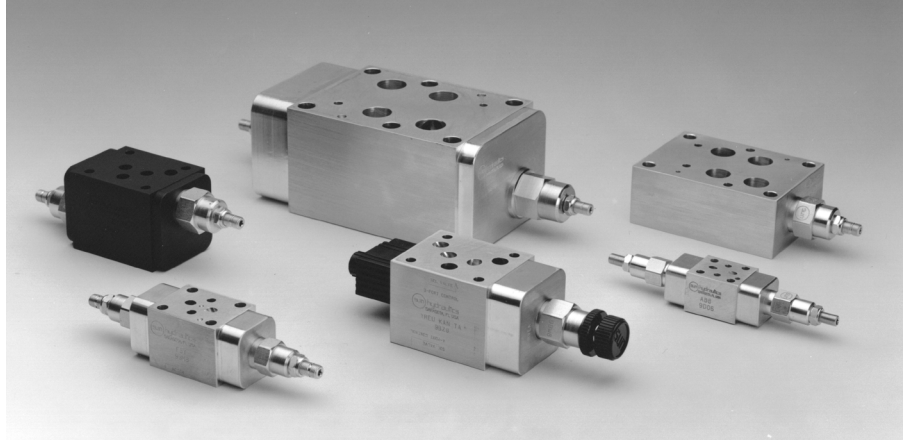
### **Line Mounted Bodies**

Sun manufactures a wide range of standard bodies to simplify the installation of cartridges in new and existing circuits. SAE O-ring straight thread, NPTF, BSPP, SAE Code 61 and 62 split flange, and other ports are available. Two hydraulic functions are frequently combined in a single body to simplify piping. All bodies are available in aluminium or SG iron.

# THE SUN PRODUCT

### *Sandwich Bodies and Subplates*

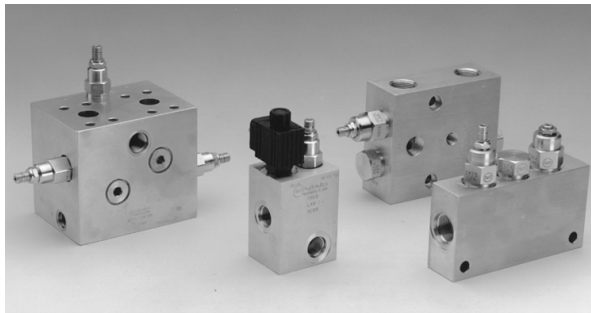
Sun's sandwich valves and subplates are complete circuit elements which mount directly under the solenoid valve. Most hydraulic functions are available in sandwich bodies and subplates. They are available in aluminium or SG iron and provide a simple method of incorporating circuit controlling components right at the solenoid valve. Sandwich valves and subplates can be easily assembled with studrods and studnuts. The result is a clean, neat assembly with a minimum of external piping that is easily accessible for modification.



*Sandwich bodies and subplates provide a simple method of incorporating controlling components right at the solenoid valve.*

### *Pre-packaged Valve Assemblies*

A wide variety of pre-packaged valve assemblies are available to perform many of the more common hydraulic circuit functions. These assemblies incorporate two or more different cartridges in a manifold body with a choice of porting options and are available in aluminium or SG iron.



*Pre-packaged valve assemblies for common hydraulic circuit functions.*



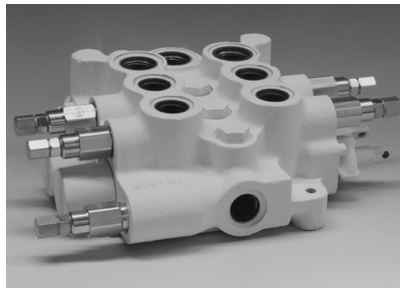
*Direct Motor Mount bodies for commercial hydraulic motors.*

### *Direct Motor Mount Bodies*

Mounting configurations offered by Sun match the mounting patterns of selected Char-Lynn, Danfoss, Staffa, HPI, Parker Ross, and White motors. These valve assemblies provide relief, counterbalance, and flow control functions for mounting directly to a motor, and are available in aluminium or SG iron.

### *Integration into Hydraulic Components*

Directly integrating cartridge valves into the housing of other components is a very cost effective and compact method of packaging multiple hydraulic functions. Cavity form tools for machining the cartridge cavity are readily available from Sun.



*Direct integration is cost-effective and compact.*



*Custom valve packages for specific applications.*

### *Custom Valve Packages*

It is often desirable and economical to incorporate several cartridges into a special, application specific manifold body to simplify a circuit, reduce piping costs, fit into a confined space, or solve a mounting problem.

Sun Hydraulics and its network of Authorised Distributors (see inside back cover) will work with you to develop customised solutions to your particular application problems.

## TECHNICAL PRODUCT INFORMATION

### Cartridge Installation

Sun cartridge valves are manufactured from carbon steel with all external parts zinc plated to protect against corrosion. Critical internal working parts (sliding spool valves often have a clearance between fixed and working parts of 5 microns or less) are heat treated and precision ground or lapped, to ensure repeatable, reliable performance.

Sun cartridge valves are available in five different sizes with capacities doubling from one size to the next. These cartridges can only be used in a Sun cavity that matches the external configuration of the cartridge. When installing cartridges in their cavities, they should be torqued to the recommended value.

All cartridges have Buna-N seals as standard, with Viton optional. Buna-N seals have an operating range of -45° C to 90° C. Viton seals have an operating range of -15° C to 120° C.

### Filtration

As with any precision hydraulic component, clean oil contributes to long life and reliable performance. The most common cause of failure of a cartridge is dirt in the hydraulic fluid, which can then lodge in the working parts of the cartridge and interfere with operation.

Most Sun pilot operated valves feature a 150 micron stainless steel screen or equivalent, to protect the control orifice from contamination. This filter is produced from electrochemically etched stainless steel sheets to provide a consistent screening material.

It is recommended that hydraulic fluid used in systems with Sun valves have an ISO 4406 contamination level of 18/15 or better at all times. Consult your Authorised Distributor for filtration requirements to meet this cleanliness level.

### Pressure and Flow Rating – Performance Data

Unless otherwise specified, Sun cartridges are rated to 350 bar (420 bar intermittent). All Sun cartridges are designed with a 4:1 safety factor. This means the minimum burst pressure is at least four times the maximum rated operating pressure.

All performance data in this catalogue is derived using Castrol 32 centistokes petroleum based hydraulic fluid having a specific gravity of 0.85 at 20° C. All tests are conducted at 40° C.

Leakage is often specified in units of drops per minute in this catalogue. For reference, 250 drops equal 15 cubic centimeters.

All performance data provided is developed in our laboratory.

### Materials

All manifolds and bodies are available in aluminium or SG iron. Aluminium bodies are made of wrought 6061-T6 grade aluminium and have a maximum pressure rating of 210 bar, a proof rating of 420 bar, and a burst rating of 840 bar.

SG iron bodies are made of continuous cast, grade 65-45-12 iron. SG iron bodies have a maximum pressure rating of 350 bar, with a proof rating of 700 bar, and burst rating of 1400 bar.

### Porting Options

Sun offers many porting options in its mounting configurations, including, but not limited to: SAE Code 61 and 62 split flanges, NPTF dry seal threads, SAE O-ring threaded ports, and BSPP (Whitworth) threads.

Please note that some bodies with SAE O-ring threaded ports utilize a modified spot face diameter for conservation of materials.

### Sandwich Interface Patterns

Most sandwich and subplate bodies are available in the following interface configurations:

ISO 02	NFPA D02	NG 4
ISO 03	NFPA D03	NG 6
ISO 05*	NFPA D05	NG 10
ISO 07	NFPA D07	NG 16
ISO 08	NFPA D08	NG 25

\* Available with X and Y ports

### Testing

All cartridge valves go through functional testing before shipment. Tests are performed using petroleum based hydraulic fluid (ISO Grade 32) at a temperature of 40° C (cSt = 28). Test stand cleanliness is maintained at ISO 17/14 or better.

Standard and special set pressure controls are set at the following flow rates:

- Load Control Valves - 35 cc/min.
- Pressure Reducing Valves - 0 flow (blocked control port).
- All Other Valves - 15 L/min.

### Sun Service Instructions

Cartridge valves are basic service items and they are easily removed in the field. See **Caution** below and the Sun Service Bulletin for details.

A non-functioning cartridge should be returned to Sun through your local Authorised Distributor for evaluation. A full report of our findings will be issued upon request.

**Caution!** – Prior to removing any cartridge:

1. **Refer to the equipment manufacturer's documentation for recommendations relating to precautions for securing any moving elements associated with the hydraulic system or equipment. (If documentation does not exist, ensure that all loads are adequately supported.)**
2. **Ensure that the hydraulic system is de-pressurised.**

## TECHNICAL PRODUCT INFORMATION

### *Solenoid Cartridge Valves*

Sun Hydraulics offers a variety of pilot solenoid cartridges and direct acting full flow solenoid cartridges to suit most application requirements.

#### *Full Flow Valves Rated for Reliability*

- Direct acting full flow solenoid cartridges will operate reliably at their maximum pressure (250 bar) and flow ratings (40 L/min.).
- All pressure and flow ratings are conservative to ensure that the final circuit will function as the designer intended.
- These solenoid cartridge valves will operate at rated conditions with a life expectancy in excess of 20 million cycles.

### *Multiple Versions*

Two port, 2 position / 2-way solenoids are available in either spool or poppet versions, each offered in both normally open and normally closed configurations.

- Spool version exhibit maximum leakage rates of 80 cc/min. at 250 bar and are recommended for high flow requirements where leakage is not critical.
- Poppet version exhibit maximum leakage rates of 10 drops/min. at 250 bar.
- Three port, 2 position / 3-way spool type cartridges exhibit all of the features of the two position / 2-way spool cartridges.
- Solenoid cartridges feature a standard push-type manual override.

### *Designed for Application Flexibility*

These direct acting valves require no minimum pressure for their operation.

- An efficient coil and tube design generates maximum force output with only 22 watts of power, so the valves exhibit consistent and reliable operation.
- The high force output of the solenoid ensures that there is enough power to overcome flow forces that may otherwise prevent the valve from shifting.

- Within each cartridge version, the normally open and normally closed configurations have virtually identical performance, allowing them to be used interchangeably.
- Together these features afford the circuit designer greatly increased flexibility.

### *Connector and Voltage Options*

- All solenoids are DC type devices.
- An internal bridge rectifier is used in the coil for AC applications.
- Coils will operate reliably from 80% to 120% of the rated voltage with a maximum ambient temperature of 50°C.
- DC coils are offered in 12 and 24-volt versions with twin lead, DIN or AMP® Junior Timer connectors.
- AC coils are available in both 115 or 230-volt options and feature DIN connectors.
- All coils employ internal transient voltage suppression protection to protect externally connected electrical switching.

#### *High Pressure Solenoid Pilot Controls*

- These small spool-type cartridges handle flows up to approximately 1,0 L/min. and will accommodate pressure up to 350 bar at all ports.
- All pilot solenoid cartridges are rated for a fatigue life of greater than 20 million cycles at their maximum working pressure and flow ratings.

### *Low Power Consumption*

The highly efficient tube design of the pilot solenoids requires only 12 watts to shift the valve.

- Voltage and temperature tolerances of the pilot solenoids are identical to those of the full flow valves.
- All coils employ internal transient voltage suppression protection to protect externally connected electrical switching.
- Both AC and DC coils are offered with AC coils employing an internal bridge rectifier.
- DC coils are offered in various voltage options from 6 to 48-volts.
- Connector options include DIN, SAE twin spade and twin leads.

- AC coils are offered in 115- and 230-volt options and feature DIN connectors.

### *Integrated Pilot Control*

While all of the pilot control solenoid cartridges can be used individually in manifolds to control other devices, the 2-way cartridges offer the added benefit of being able to be directly installed into other Sun cartridges to provide electrically operated high flow and high pressure control.

- The T-8A cavity is offered as a control option on many of Sun's ventable and pilot operated cartridges to offer high performance, 350 bar electrically controlled products at a competitive price.
- Directly integrating the electrical control in the main stage function results in a product that offers improved control characteristics; separate pilot lines are eliminated and only a single cavity needs to be machined to accommodate both the control and primary function.
- Sun also offers a range of cartridges that incorporate solenoid pilot controls to provide directional control for flow ranges from 60 to 480 L/min.

### *2-way or 3-way*

Pilot control solenoid cartridges are available in either a two port, 2 position / 2-way (DAAA), or a three port, 2 position / 3-way (DBAA), each of which exhibits internal leakage rates of 10 drop/min. maximum at 350 bar.

- The 2-way versions fit into Sun's existing T-8A cavity.
- The 3-way versions fit the T-9A cavity.
- Both are offered in normally open and normally closed configurations with a variety of voltage and connector options.
- The pilot control solenoid valves include a push-type manual override as a standard feature.

TECHNICAL PRODUCT INFORMATION

Line Mounted Bodies

Sun Hydraulics offers many different line mount bodies for its screw-in cartridges, all available in a choice of either aluminium or SG iron. These passive mounting configurations greatly simplify the installation of cartridges in both new and existing circuits. Because oil flow is confined within the body, leakage points are minimized. The result is a reliable hydraulic circuit with a high degree of stiffness.

Line mount bodies feature one or more cavities with various porting options for oil distribution. Sun offers ports in the following configurations:

- NPTF – National Pipe Tapered for Fuels (1/4” to 1 1/4”)
- BSPP – British Standard Pipe Parallel (1/4” to 1 1/4”)
- SAE – Modified (see table below) Straight Thread with O-ring Boss (4 through 20)
- SAE Code 61 and Code 62 Four-Bolt Split Flange (1/2” through 2”)

Material Properties

Grade 6061-T6 Aluminium — Material Pressure Rating 210 bar

For its aluminium bodies, Sun uses a 6000 series aluminium alloy that offers high strength characteristics and good corrosion resistance in the finished product. The mechanical properties of grade 6061-T6 aluminium are:

Ultimate Strength (Tension)	3060 bar
Yield Strength (Tension)	2720 bar
Elongation	12%
Brinell Hardness	95
Ultimate Shear Strength	2040 bar
Fatigue Endurance Limit	950 bar
Elasticity	0,7 X 10 <sup>6</sup> bar

Grade 65-45-12 SG Iron — Material Pressure Rating 350 bar

Sun uses a SG iron that offers high tensile strength and good ductility for its iron bodies. All SG iron bodies use iron produced by the continuous cast method which provides a body that possesses a dense, homogeneous structure with minimal inclusions for high pressure integrity. After machining, all SG iron bodies go through a surface impregnation process in which the material is chemically blackened. The mechanical

properties of grade 65-45-12 SG iron are:

Ultimate Strength (Tension)	4420 bar
Yield Strength (Tension)	3060 bar
Elongation	12%
Brinell Hardness	170 - 207
Ultimate Shear Strength	3950 bar
Fatigue Endurance Limit	2070 bar
Elasticity	1,66 X 10 <sup>6</sup> bar

Sun’s Modified SAE Straight Thread with O-ring Boss

To conserve material, Sun modifies the SAE standard counterbore diameter on its SAE straight threads. The modification uses a smaller spotface than the standard SAE diameter which may result in certain fittings not seating correctly. The table below compares Sun’s SAE counterbore diameters with the standard SAE specification. Swivel and ORS fittings do not present interference problems with the Sun modified counterbore diameter. However, the across corner dimension of certain hex fittings will interfere with the spotface and therefore may not seat correctly. A column of comparative specifications is shown in the table and hex fittings that present interference problems are identified with an asterisk.

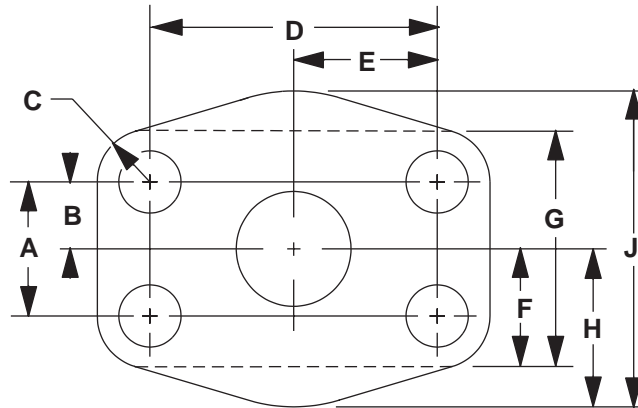
SAE Counterbore Diameters

SAE Size	SUN Counterbore Diameter	SAE Recommended Counterbore Diameter	Standard Fittings Hex Size		
			12,7	14,3	17,5 (*)
-4	17,1	21,0	12,7	14,3	17,5 (*)
-6	20,6	24,6	17,5	19,1 (*)	23,8 (*)
-8	26,2	30,2	20,6	22,2	25,4 (*)
-10	30,2	34,1	25,4	28,6 (*)	
-12	37,3	41,3	28,6	31,8	34,9 (*)
-16	44,5	48,5	34,9	38,1	41,3 (*)
-20	55,6	57,7	42,9	47,6	

(\*) Hex fittings that present interference problems.

TECHNICAL PRODUCT INFORMATION

SAE Flange Pattern Specifications



SAE Code 61	
Nominal SAE Flange	SAE Maximum Recommended Working Pressure
3/4"	350 bar
1"	350 bar
1 1/4"	280 bar
1 1/2"	210 bar
2"	210 bar

SAE Code 62	
Nominal SAE Flange	SAE Maximum Recommended Working Pressure
1/2"	420 bar
3/4"	420 bar
1"	420 bar
1 1/4"	420 bar
1 1/2"	420 bar
2"	420 bar

SAE Code 61									
Four-Bolt Flange Pattern									
SAE Flange	A	B	C	D	E	F	G	H	J
3/4"	22,2	11,1	8,7	47,6	23,8	20,6	41,3	26,2	52,4
1"	26,2	13,1	8,7	52,4	26,2	23,8	47,6	29,4	58,7
1 1/4"	30,2	15,1	10,3	58,7	29,4	27,0	54,0	36,5	73,0
1 1/2"	35,7	17,9	11,9	69,9	34,9	31,8	63,8	41,3	82,6
2"	42,9	21,4	11,9	77,8	38,9	38,1	76,2	48,4	96,8

SAE Code 62									
Four-Bolt Flange Pattern									
SAE Flange	A	B	C	D	E	F	G	H	J
1/2"	18,3	9,1	7,9	40,5	20,2	19,1	38,1	23,8	47,6
3/4"	23,8	11,9	10,3	50,8	25,4	23,8	47,6	30,2	60,3
1"	27,8	13,9	11,9	57,2	28,6	27,0	54,0	34,9	69,9
1 1/4"	31,8	15,9	14,3	66,7	33,3	30,2	60,3	38,9	77,8
1 1/2"	36,5	18,3	16,7	79,4	39,7	34,9	69,9	47,6	95,3
2"	44,5	22,2	18,3	96,8	48,4	42,9	85,7	57,2	114,3

Inch Mounting Dimensions				
SAE Flange	Hole Diameter	Hole Thread	Hole Thread Depth	Hole Counterbore Diameter
3/4"	10,4	.375-16 UNC	22,2	15,1
1"	10,4	.375-16 UNC	22,2	15,1
1 1/4"	11,9	.438-14 UNC	28,6	17,5
1 1/2"	13,5	.500-13 UNC	27,0	19,8
2"	13,5	.500-13 UNC	27,0	19,8

Inch Mounting Dimensions				
SAE Flange	Hole Diameter	Hole Thread	Hole Thread Depth	Hole Counterbore Diameter
1/2"	8,6	.312-18 UNC	20,6	12,7
3/4"	10,4	.375-16 UNC	23,8	15,0
1"	11,9	.438-14 UNC	27,0	17,5
1 1/4"	13,5	.500-13 UNC	25,4	19,8
1 1/2"	16,8	.625-11 UNC	34,9	24,6
2"	19,8	.750-10 UNC	38,1	29,4

Reference: J518 4-Bolt Flange

Reference: J518 4-Bolt Flange

Metric Mounting Dimensions				
SAE Flange	Hole Diameter	Hole Thread	Hole Thread Depth	Hole Counterbore Diameter
3/4"	10,7	M10 x 1.5-6H	22,2	17,5
1"	10,7	M10 x 1.5-6H	22,2	17,5
1 1/4"	10,7	M10 x 1.5-6H	28,6	17,5
1 1/2"	12,7	M12 x 1.75-6H	27,0	19,1
2"	12,7	M12 x 1.75-6H	27,0	19,1

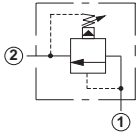
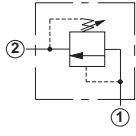
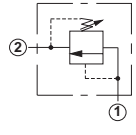
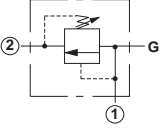
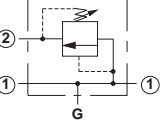
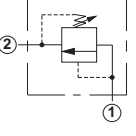
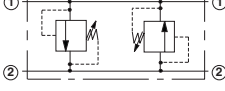
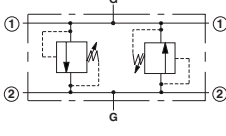
Metric Mounting Dimensions				
SAE Flange	Hole Diameter	Hole Thread	Hole Thread Depth	Hole Counterbore Diameter
1/2"	8,6	M8 x 1.25-6H	20,6	14,3
3/4"	10,7	M10 x 1.5-6H	23,8	17,5
1"	12,7	M12 x 1.75-6H	27,0	19,1
1 1/4"	15,0	M14 x 2.0-6H	28,4	22,2
1 1/2"	16,8	M16 x 2.0-6H	34,9	25,4
2"	20,6	M20 x 2.5-6H	38,1	31,8

Reference: DIN 20066 4-Bolt Flange

Reference: DIN 20066 4-Bolt Flange

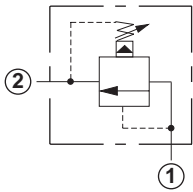


# Two Port Relief Assemblies

	<i>Cartridge Type</i>	<i>Page</i>
	Pilot Operated	2
	Direct Acting	2
<b><i>Line Mounted Assemblies (Body Type)</i></b>		
	90 Degree	4
	90 Degree with Gauge Port 90 Degree 1.50" SAE C62 Flange Port	5 5
	Through Port	6
	2.00" SAE C61/62 Flange Port, 2 Cavities	8
	Cross-Port, 2 Cavities	9-10
	Cross-Port, 2 Cavities with 2 Gauge Ports Cross-Port, 1.50" SAE C61/C62 Flange Port, 2 Cavities	10 10

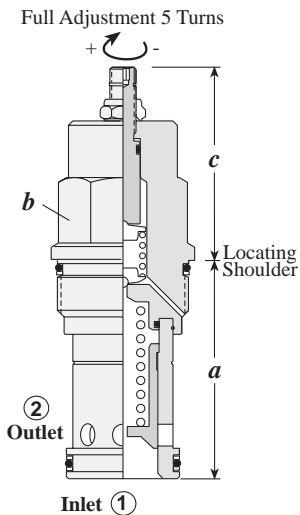
## Relief Valves

## PILOT OPERATED



Capacity	Typical Cartridge Model Code	Cavity	Cartridge Dimensions					Installation Torque (Nm)
			a	b	c			
					L	C	K	
45 L/min.	RPCC - LAN	T - 162A	31	19,1	54	56	59	35/40
95 L/min.	RPEC - LAN	T - 10A	39,7	22,2	51	53	58	40/50
200 L/min.	RPGC - LAN	T - 3A	47,8	28,6	54	56	61	60/70
380 L/min.	RPIC - LAN	T - 16A	61,9	31,8	62	64	69	200/215
760 L/min.	RPKC - LAN	T - 18A	79,4	41,3	72	74	78	465/500

## OPTION ORDERING INFORMATION

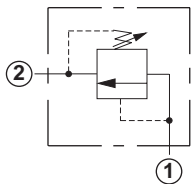


**RP \* C - \* \* \***

Nominal Capacity	Control**	Adjustment Range	Seal
<b>C</b> 45 L/min.*	<b>L</b> Standard Screw	<b>A</b> 7 - 210 bar	<b>N</b> Buna-N
<b>E</b> 95 L/min.	<b>C</b> Tamper Resistant	<b>W</b> 10 - 315 bar	<b>V</b> Viton
<b>G</b> 200 L/min.	<b>K</b> Handknob	<b>B</b> 3,5 - 105 bar	
<b>I</b> 380 L/min.		<b>C</b> 10 - 420 bar	
<b>K</b> 760 L/min.		<b>N</b> 4 - 55 bar	
		<b>Q</b> 4 - 25 bar	

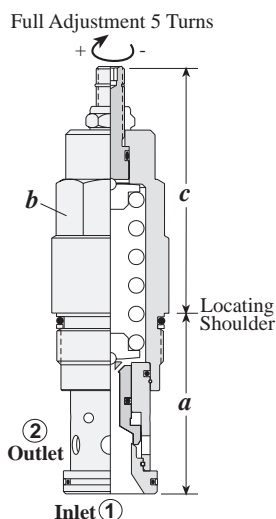
Adjustment Range Options:  
 A, B, C, and W are standard set at 70 bar.  
 N Option is standard set at 25 bar.  
 Q Option is standard set at 14 bar.  
 \* Minimum setting 5 bar on all ranges.  
 \*\* See page 244 for information on Control Options  
 Customer may specify pressure setting.

## DIRECT ACTING



Capacity	Typical Cartridge Model Code	Cavity	Cartridge Dimensions				Installation Torque (Nm)
			a	b	c		
					L	C	
45 L/min.	RDBA - LAN	T - 162A	31	19,1	54	56	35/40
95 L/min.	RDDA - LAN	T - 10A	39,7	22,2	61	53	40/50
200 L/min.	RDFA - LAN	T - 3A	47,8	28,6	64	66	60/70
380 L/min.	RDHA - LAN	T - 16A	61,9	31,8	83	85	200/215
760 L/min.	RDJA - LAN	T - 18A	79,4	41,3	100	104	465/500

## OPTION ORDERING INFORMATION



**RD \* A - \* \* \***

Nominal Capacity	Control**	Adjustment Range	Seal
<b>B</b> 45 L/min.	<b>L</b> Standard Screw	<b>A</b> 35 - 210 bar	<b>N</b> Buna-N
<b>D</b> 95 L/min.	<b>C</b> Tamper Resistant	<b>W</b> 70 - 315 bar	<b>V</b> Viton
<b>F</b> 200 L/min.		<b>B</b> 20 - 105 bar	
<b>H</b> 380 L/min.		<b>C</b> 70 - 420 bar	
<b>J</b> 760 L/min.		<b>D</b> 14 - 55 bar	
		<b>E</b> 7 - 25 bar	
		<b>S</b> 3,5 - 14 bar	

Adjustment Range Options:  
 A, B, C, and W are standard set at 70 bar.  
 D Option is standard set at 25 bar.  
 E Option is standard set at 14 bar.  
 S Option is standard set at 7 bar.  
 \*\* See page 244 for information on Control Options  
 Customer may specify pressure setting.

U.S. Patent #4,742,846  
 European Patent Pending

## TECHNICAL TIPS / PERFORMANCE CURVES

### Relief Valves, Pilot Operated

#### Applications

These relief cartridges are normally closed, pressure control elements that are fully adjustable over a wide range of operating pressures up to 350 bar. They are typically used when accurate pressure regulation is required and spool leakage is not critical.

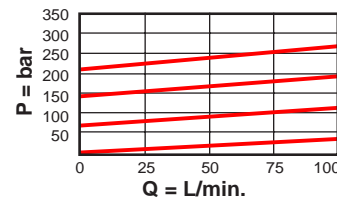
#### Design Concepts and Features

- Incorporates 150 micron stainless steel screen to protect the main stage control orifice.
- Low leakage, 50 to 115 cc/min./100 bar, dependent on frame size.
- Low hysteresis, less than  $\pm 1\%$
- Selection of spring adjustment ranges with low adjustment effort.

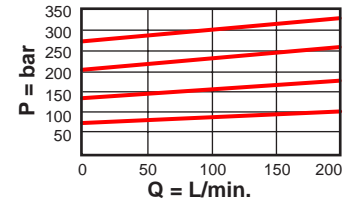
#### Performance Curves

##### Typical Pressure Rise

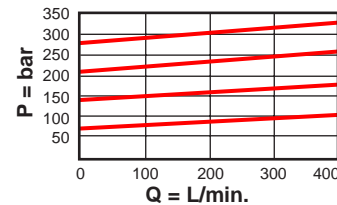
#### RPCC-L\*N



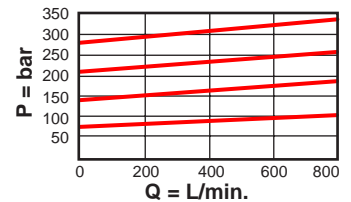
#### RPEC-L\*N



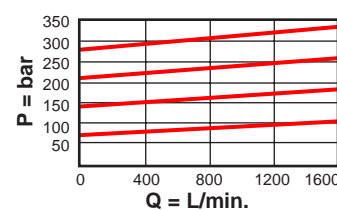
#### RPGC-L\*N



#### RPIC-L\*N



#### RPKC-L\*N



### Relief Valves, Direct Acting

#### Applications

This patented, direct acting, differential area valve with broad operating characteristics is adjustable to 350 bar. Because of its exceptional performance, this relief cartridge should be considered for applications where fast response, dirt tolerance and leakage are critical. Examples of this type of application would include overshoot protection of fixed and variable volume pumps and shock protection of actuators (cylinders and motors).

#### Design Concepts and Features

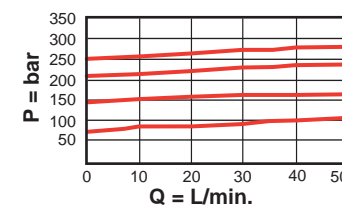
- Maximum leakage is 10 drops/min. at reseal.
- Reseat equals 90% of cracking pressure for all five frame sizes.
- Not recommended for repeated adjustment because of high adjustment effort.

**Note:** For both types of relief cartridge, any pressure at port 2 is directly additive to the valve settings. In situations where absolute pressure at port 1 is required; use **RS\*C-\*\*\*** sequence cartridge or **RV\*D**, four port relief cartridge.

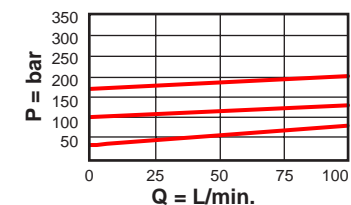
#### Performance Curves

##### Typical Pressure Rise

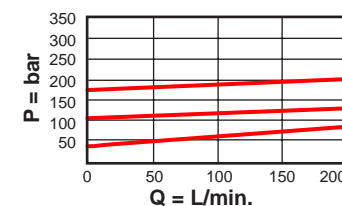
#### RDBA-L\*N



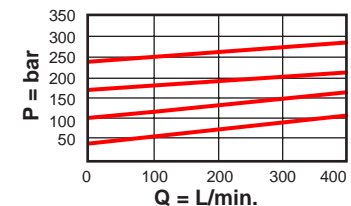
#### RDDA-L\*N



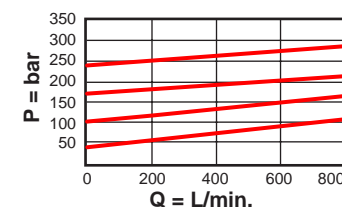
#### RDFA-L\*N



#### RDHA-L\*N



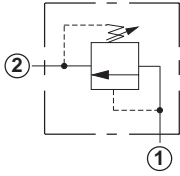
#### RDJA-L\*N



### General Application Requirements

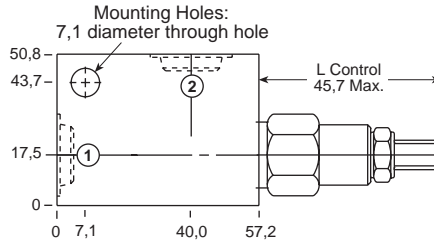
- Operating Temperature Range: Buna-N seals  $-45^{\circ}\text{C}$  to  $90^{\circ}\text{C}$ , Viton seals  $-15^{\circ}\text{C}$  to  $120^{\circ}\text{C}$ .
- Viscosity Range: 10-600 centistokes.
- Fluid Contamination Level: ISO 4406 18/15 or better; Recommend  $\beta_{10} \geq 75$  to achieve ISO 18/15 or better in most systems.
- Factory Pressure Setting for cartridge is established at a 15 L/min. flow rate.

## Line Mounted Assemblies

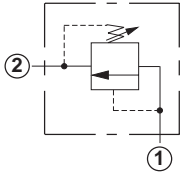
TWO PORT PRESSURE REGULATING RELIEF APPLICATIONS  
(90 DEGREE BODIES)PILOT OPERATED  
ASSEMBLIESGo to [www.sunhydraulics.com](http://www.sunhydraulics.com)  
for more product information.DIRECT ACTING  
ASSEMBLIES

Ports 1 and 2	Assembly Model Code*
1/4" BSPP	<b>RPCC-LAN-AAT</b>
3/8" BSPP	<b>RPCC-LAN-AAU</b>

## 0-45 L/min. Cavity T-162A

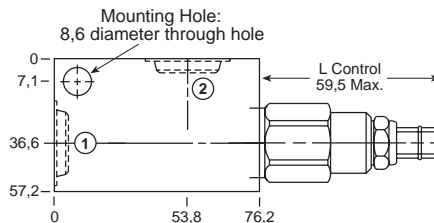


Ports 1 and 2	Assembly Model Code*
1/4" BSPP	<b>RDBA-LAN-AAT</b>
3/8" BSPP	<b>RDBA-LAN-AAU</b>

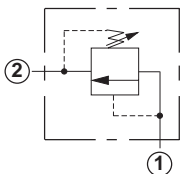
\*Add modifier /S to order SG Iron for pressure rating  
over 210 bar.\*Add modifier /S to order SG Iron for pressure rating  
over 210 bar.

Ports 1 and 2	Assembly Model Code*
3/8" BSPP	<b>RPEC-LAN-FAU</b>
1/2" BSPP	<b>RPEC-LAN-FAV</b>
3/4" BSPP	<b>RPEC-LAN-FAW</b>

## 0-95 L/min. Cavity T-10A

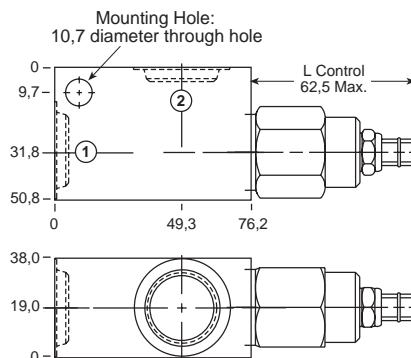


Ports 1 and 2	Assembly Model Code*
3/8" BSPP	<b>RDDA-LAN-FAU</b>
1/2" BSPP	<b>RDDA-LAN-FAV</b>
3/4" BSPP	<b>RDDA-LAN-FAW</b>

\*Add modifier /S to order SG Iron for pressure rating  
over 210 bar.\*Add modifier /S to order SG Iron for pressure rating  
over 210 bar.

Ports 1 and 2	Assembly Model Code*
1/2" BSPP	<b>RPGC-LAN-CAV</b>
3/4" BSPP	<b>RPGC-LAN-CAW</b>

## 0-200 L/min. Cavity T-3A



Ports 1 and 2	Assembly Model Code*
1/2" BSPP	<b>RDFA-LAN-CAV</b>
3/4" BSPP	<b>RDFA-LAN-CAW</b>

\*Add modifier /S to order SG Iron for pressure rating  
over 210 bar.\*Add modifier /S to order SG Iron for pressure rating  
over 210 bar.

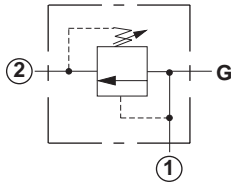
NOTES: Page 2 for cartridge models RP\*C-\*\*\* and RD\*A-\*\*\* shows performance curves, technical tips, and options.  
See page vii for technical information about line mount bodies including SAE flange pattern specifications.  
Consult the Sun Factory for other port sizes available in the bodies shown above.  
Model Codes printed in red are Preferred Products and are readily available.

**TWO PORT PRESSURE REGULATING RELIEF APPLICATIONS  
(90 DEGREE/90 DEGREE 1.50" SAE C62 FLANGE PORT BODIES)**

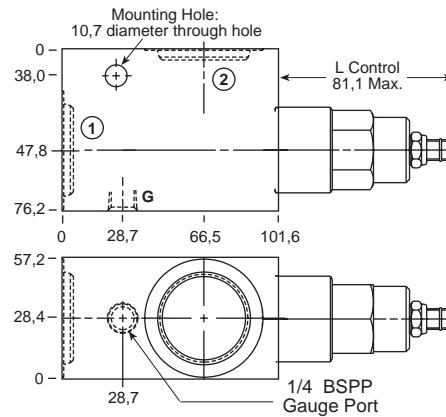
**PILOT OPERATED ASSEMBLIES**

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**DIRECT ACTING ASSEMBLIES**



**0-380 L/min. Cavity T-16A**

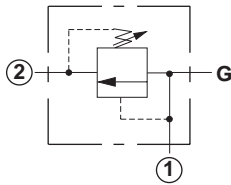


Ports 1 and 2	Assembly Model Code*
3/4" BSPP	<b>RPIC-LAN-IAW</b>
1" BSPP	<b>RPIC-LAN-IAX</b>
1 1/4" BSPP	<b>RPIC-LAN-IAY</b>

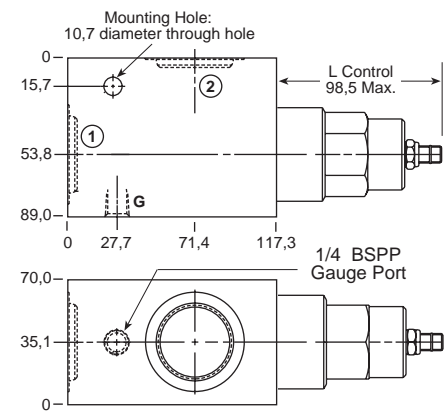
Ports 1 and 2	Assembly Model Code*
3/4" BSPP	<b>RDHA-LAN-IAW</b>
1" BSPP	<b>RDHA-LAN-IAX</b>
1 1/4" BSPP	<b>RDHA-LAN-IAY</b>

\*Add modifier /S to order SG Iron for pressure rating over 210 bar.

\*Add modifier /S to order SG Iron for pressure rating over 210 bar.



**0-760 L/min. Cavity T-18A**

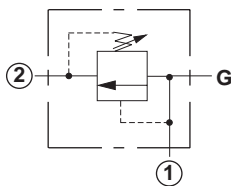


Ports 1 and 2	Assembly Model Code*
3/4" BSPP	<b>RPKC-LAN-LAW</b>
1" BSPP	<b>RPKC-LAN-LAX</b>
1 1/4" BSPP	<b>RPKC-LAN-LAY</b>

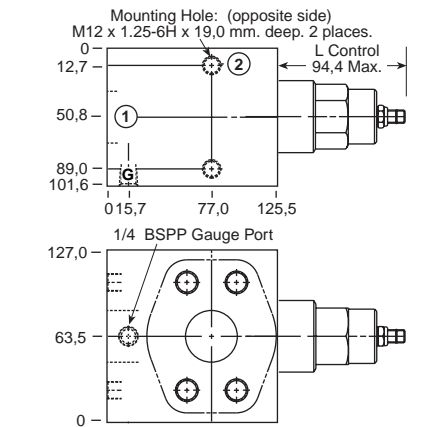
Ports 1 and 2	Assembly Model Code*
3/4" BSPP	<b>RDJA-LAN-LAW</b>
1" BSPP	<b>RDJA-LAN-LAX</b>
1 1/4" BSPP	<b>RDJA-LAN-LAY</b>

\*Add modifier /S to order SG Iron for pressure rating over 210 bar.

\*Add modifier /S to order SG Iron for pressure rating over 210 bar.



**0-760 L/min. Cavity T-18A**



Ports 1 and 2	Assembly Model Code*
1 1/2" SAE C62	<b>RPKC-LAN-LA6/M</b>

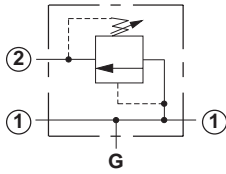
Ports 1 and 2	Assembly Model Code*
1 1/2" SAE C62	<b>RDJA-LAN-LA6/M</b>

\*Add modifier /T to order SG Iron for pressure rating over 210 bar.

\*Add modifier /T to order SG Iron for pressure rating over 210 bar.

NOTES: Page 2 for cartridge models RP\*C-\*\*\* and RD\*A-\*\*\* shows performance curves, technical tips, and options. See page vii for technical information about line mount bodies including SAE flange pattern specifications. Consult the Sun Factory for other port sizes available in the bodies shown above. Model Codes printed in red are Preferred Products and are readily available.

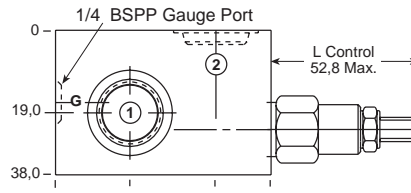
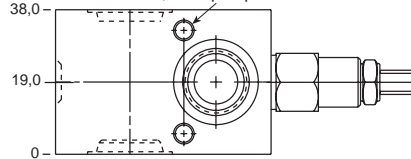
## Line Mounted Assemblies

TWO PORT PRESSURE REGULATING RELIEF APPLICATIONS  
(THROUGH PORT BODIES)PILOT OPERATED  
ASSEMBLIESGo to [www.sunhydraulics.com](http://www.sunhydraulics.com)  
for more product information.DIRECT ACTING  
ASSEMBLIES

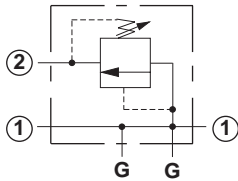
Ports 1 and 2	Assembly Model Code*
1/4" BSPP	<b>RPCC-LAN-AET</b>
3/8" BSPP	<b>RPCC-LAN-AEU</b>

\*Add modifier /S to order SG Iron for pressure rating  
over 210 bar.

## 0-45 L/min. Cavity T-162A

Mounting Holes: (opposite side)  
M6 x 1.0-6H x 12,7 deep. 2 places.

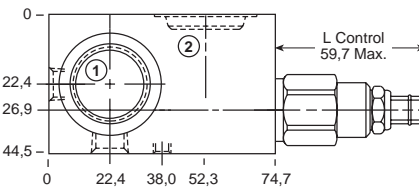
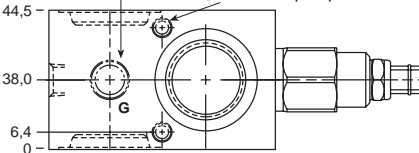
Ports 1 and 2	Assembly Model Code*
1/4" BSPP	<b>RDBA-LAN-AET</b>
3/8" BSPP	<b>RDBA-LAN-AEU</b>

\*Add modifier /S to order SG Iron for pressure rating  
over 210 bar.

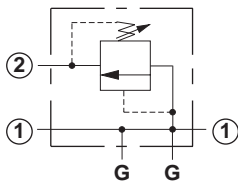
Ports 1 and 2	Assembly Model Code*
3/8" BSPP	<b>RPEC-LAN-FEU</b>
1/2" BSPP	<b>RPEC-LAN-FEV</b>

\*Add modifier /S to order SG Iron for pressure rating  
over 210 bar.

## 0-95 L/min. Cavity T-10A

Mounting Holes: (opposite side)  
M6 x 1.00-6H x 12,7 mm. deep. 2 places.

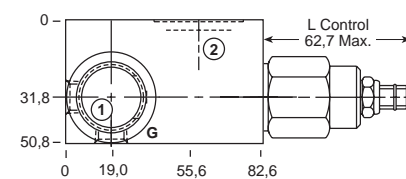
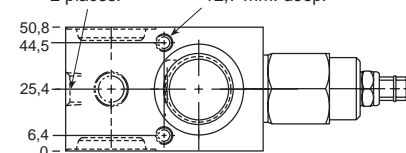
Ports 1 and 2	Assembly Model Code*
3/8" BSPP	<b>RDDA-LAN-FEU</b>
1/2" BSPP	<b>RDDA-LAN-FEV</b>

\*Add modifier /S to order SG Iron for pressure rating  
over 210 bar.

Ports 1 and 2	Assembly Model Code*
1/2" BSPP	<b>RPGC-LAN-CEV</b>
3/4" BSPP	<b>RPGC-LAN-CEW</b>

\*Add modifier /S to order SG Iron for pressure rating  
over 210 bar.

## 0-200 L/min. Cavity T-3A

Mounting Hole: (opposite side)  
M6 x 1.00-6H x 12,7 mm. deep.

Ports 1 and 2	Assembly Model Code*
1/2" BSPP	<b>RDFA-LAN-CEV</b>
3/4" BSPP	<b>RDFA-LAN-CEW</b>

\*Add modifier /S to order SG Iron for pressure rating  
over 210 bar.

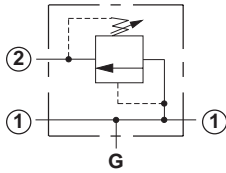
NOTES: Page 2 for cartridge models RP\*C-\*\*\* and RD\*A-\*\*\* shows performance curves, technical tips, and options.  
See page vii for technical information about line mount bodies including SAE flange pattern specifications.  
Consult the Sun Factory for other port sizes available in the bodies shown above.  
Model Codes printed in red are Preferred Products and are readily available.

# TWO PORT PRESSURE REGULATING RELIEF APPLICATIONS (THROUGH PORT BODIES)

## PILOT OPERATED ASSEMBLIES

Go to [www.sunhydraulics.com](http://www.sunhydraulics.com) for more product information.

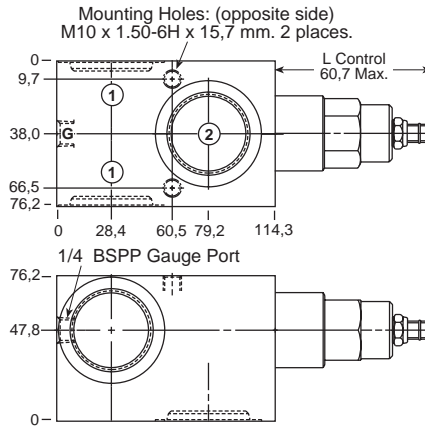
## DIRECT ACTING ASSEMBLIES



Ports 1 and 2	Assembly Model Code*
1" BSPP	<b>RPIC-LAN-IEX</b>
1 1/4" BSPP	<b>RPIC-LAN-IEY</b>

\*Add modifier /S to order SG Iron for pressure rating over 210 bar.

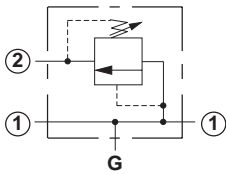
### 0-380 L/min. Cavity T-16A



Ports 1 and 2	Assembly Model Code*
1" BSPP	<b>RDHA-LAN-IEX</b>
1 1/4" BSPP	<b>RDHA-LAN-IEY</b>

\*Add modifier /S to order SG Iron for pressure rating over 210 bar.

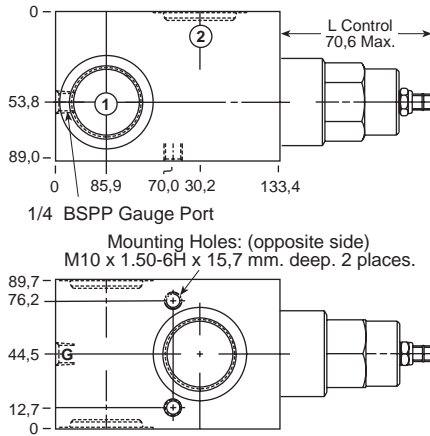
## PILOT OPERATED ASSEMBLIES



Ports 1 and 2	Assembly Model Code*
1" BSPP	<b>RPKC-LAN-LEX</b>
1 1/4" BSPP	<b>RPKC-LAN-LEY</b>

\*Add modifier /S to order SG Iron for pressure rating over 210 bar.

### 0-760 L/min. Cavity T-18A



Ports 1 and 2	Assembly Model Code*
1" BSPP	<b>RDJA-LAN-LEX</b>
1 1/4" BSPP	<b>RDJA-LAN-LEY</b>

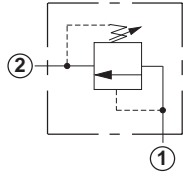
\*Add modifier /S to order SG Iron for pressure rating over 210 bar.

NOTES: Page 2 for cartridge models RP\*C-\*\*\* and RD\*A-\*\*\* shows performance curves, technical tips, and options. See page vii for technical information about line mount bodies including SAE flange pattern specifications. Consult the Sun Factory for other port sizes available in the bodies shown above. Model Codes printed in red are Preferred Products and are readily available.

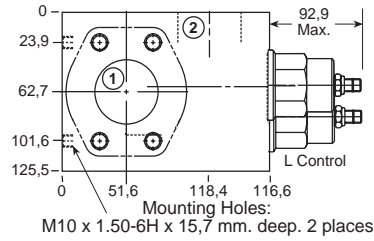
## Line Mounted Assemblies

# TWO PORT PRESSURE REGULATING RELIEF APPLICATIONS (2.00" SAE C61/C62 FLANGE PORT BODIES 2 CAVITIES)

**PILOT OPERATED  
ASSEMBLIES**

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for more product information.


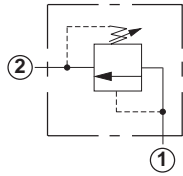
Ports 1 and 2	Assembly Model Code*
2" SAE C61	<b>RPKC-LAN-XZY/M</b>

**0-1600 L/min. Cavity T-18A**


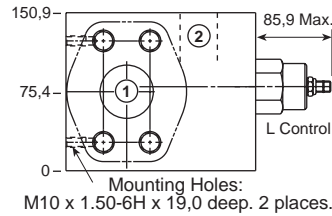
Ports 1 and 2	Assembly Model Code*
2" SAE C61	<b>RDJA-LAN-XZY/M</b>

\*Add modifier **/T** to order SG Iron for pressure rating over 210 bar.

\*Add modifier **/T** to order SG Iron for pressure rating over 210 bar.

**0-1600 L/min. Cavity T-18A**


Ports 1 and 2	Assembly Model Code*
2" SAE C62	<b>RPKC-LAN-VTN/M</b>



Ports 1 and 2	Assembly Model Code*
2" SAE C62	<b>RDJA-LAN-VTN/M</b>

\*Add modifier **/T** to order SG Iron for pressure rating over 210 bar.

\*Add modifier **/T** to order SG Iron for pressure rating over 210 bar.

NOTES: Page 2 for cartridge models RP\*C-\*\*\* and RD\*A-\*\*\* shows performance curves, technical tips, and options.  
See page vii for technical information about line mount bodies including SAE flange pattern specifications.  
Consult the Sun Factory for other port sizes available in the bodies shown above.



# TWO PORT PRESSURE REGULATING RELIEF APPLICATIONS (CROSS-PORT BODIES, 2 CAVITIES)

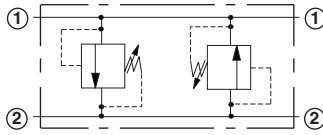
Cross-port relief assemblies are used to protect system components against hydraulic and structural damage which can be caused by the sudden stopping of an inertial load. These assemblies also protect "swing" circuits and other bi-directional installations against possible surges and cavitation.

Sun offers a series of cross-port relief assemblies for line mounting which are shown below, as well as a variety of single and dual models in sandwich bodies to simplify circuitry when using ISO 02, ISO 03, ISO 05, ISO 07 and ISO 08 solenoid valves.

## PILOT OPERATED ASSEMBLIES

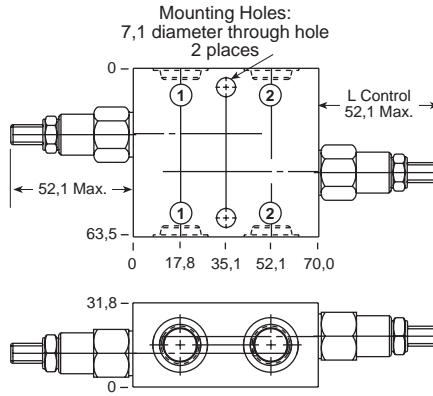
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## DIRECT ACTING ASSEMBLIES



Ports 1 and 2	Assembly Model Code*
1/4" BSPP	<b>RPCC-LAN-AYT</b>
3/8" BSPP	<b>RPCC-LAN-AYU</b>

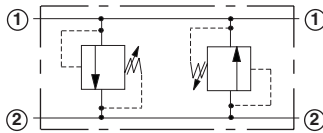
### 0-45 L/min. Cavity T-162A



Ports 1 and 2	Assembly Model Code*
1/4" BSPP	<b>RDDB-LAN-AYT</b>
3/8" BSPP	<b>RDDB-LAN-AYU</b>

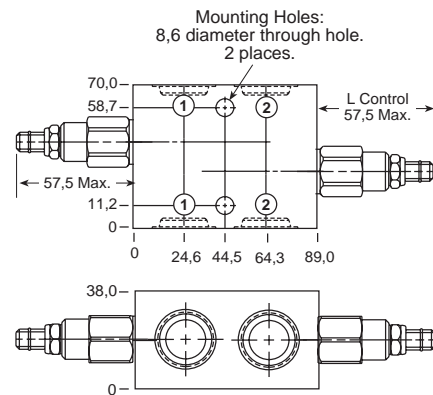
\*Add modifier /S to order SG Iron for pressure rating over 210 bar.

\*Add modifier /S to order SG Iron for pressure rating over 210 bar.



Ports 1 and 2	Assembly Model Code*
3/8" BSPP	<b>RPEC-LAN-YFU</b>
1/2" BSPP	<b>RPEC-LAN-YFV</b>

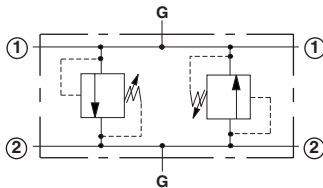
### 0-95 L/min. Cavity T-10A



Ports 1 and 2	Assembly Model Code*
3/8" BSPP	<b>RDDA-LAN-YFU</b>
1/2" BSPP	<b>RDDA-LAN-YFV</b>

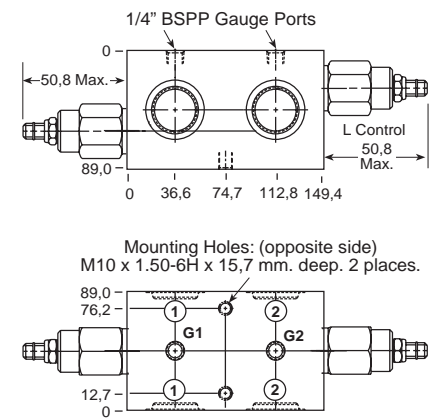
\*Add modifier /S to order SG Iron for pressure rating over 210 bar.

\*Add modifier /S to order SG Iron for pressure rating over 210 bar.



Ports 1 and 2	Assembly Model Code*
3/4" BSPP	<b>RPGC-LAN-YCW</b>
1" BSPP	<b>RPGC-LAN-YCX</b>

### 0-200 L/min. Cavity T-3A



Ports 1 and 2	Assembly Model Code*
3/4" BSPP	<b>RDFA-LAN-YCW</b>
1" BSPP	<b>RDFA-LAN-YCX</b>

\*Add modifier /S to order SG Iron for pressure rating over 210 bar.

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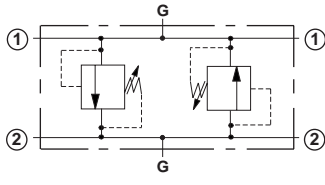
NOTES: Page 2 for cartridge models RP\*C-\*\*\* and RD\*A-\*\*\* shows performance curves, technical tips, and options. See page vii for technical information about line mount bodies including SAE flange pattern specifications. Consult the Sun Factory for other port sizes available in the bodies shown above. Model Codes printed in red are Preferred Products and are readily available.

## Line Mounted Assemblies

# TWO PORT PRESSURE REGULATING RELIEF APPLICATIONS (CROSS-PORT/CROSS-PORT, 1.50" SAE C61/C62 FLANGE PORT BODIES, 2 CAVITIES)

**PILOT OPERATED  
ASSEMBLIES**

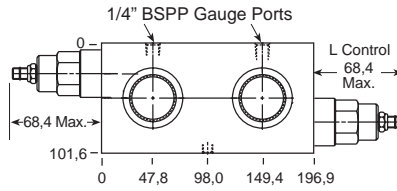
 Go to [www.sunhydraulics.com](http://www.sunhydraulics.com)  
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**DIRECT ACTING  
ASSEMBLIES**


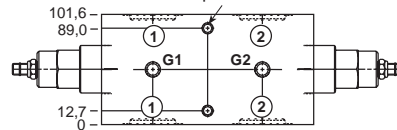
Ports  
1 and 2

Assembly  
Model Code\*

1 1/4" BSPP **RPIC-LAN-YIY**

**0-380 L/min. Cavity T-16A**


Mounting Holes: (opposite side)  
M10 x 1.50-6H x 15.7 mm. deep.  
2 places.



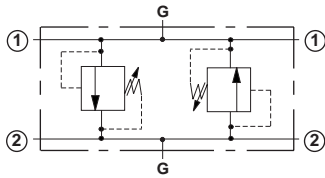
Ports  
1 and 2

Assembly  
Model Code\*

1 1/4" BSPP **RDHA-LAN-YIY**

\*Add modifier /S to order SG Iron for pressure rating  
over 210 bar.

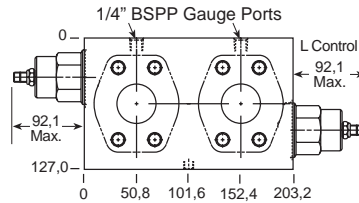
\*Add modifier /S to order SG Iron for pressure rating  
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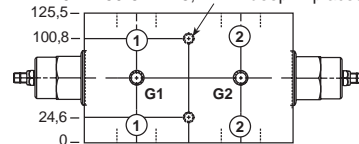
Ports  
1 and 2

Assembly  
Model Code\*

1 1/2" SAE C61 **RPKC-LAN-YLR/M**

**0-760 L/min. Cavity T-18A**


Mounting Holes: (opposite side)  
M10 x 1.50-6H x 15.7 mm. deep. 2 places.



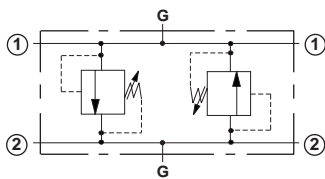
Ports  
1 and 2

Assembly  
Model Code\*

1 1/2" SAE C61 **RDJA-LAN-YLR/M**

\*Add modifier /T to order SG Iron for pressure rating  
over 210 bar.

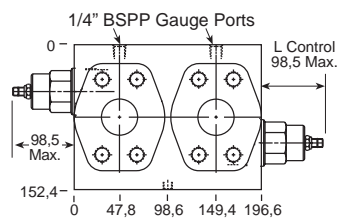
\*Add modifier /T to order SG Iron for pressure rating  
over 210 bar.



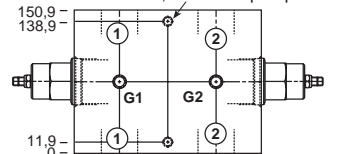
Ports  
1 and 2

Assembly  
Model Code\*

1 1/2" SAE C62 **RPKC-LAN-YL6/M**

**0-760 L/min. Cavity T-18A**


Mounting Holes: (opposite side)  
M10 x 1.50-6H x 15.7 mm. deep. 2 places.



Ports  
1 and 2

Assembly  
Model Code\*

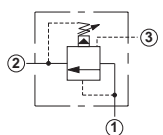
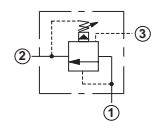
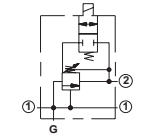
1 1/2" SAE C62 **RDJA-LAN-YL6/M**

\*Add modifier /T to order SG Iron for pressure rating  
over 210 bar.

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over 210 bar.

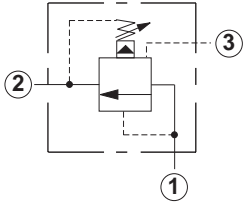
NOTES: Page 2 for cartridge models RP\*C-\*\*\* and RD\*A-\*\*\* shows performance curves, technical tips, and options.  
See page vii for technical information about line mount bodies including SAE flange pattern specifications.  
Consult the Sun Factory for other port sizes available in the bodies shown above.  
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# Three Port Relief Assemblies

	<i>Cartridge Type</i>	<i>Page</i>
	Pilot Operated with Vent	12
<b><i>Line Mounted Assemblies (Body Type)</i></b>		
	90 Degree	14
	90 Degree 1.50" SAE C62 Flange Port	15
	90 Degree 2.00" SAE C61/C62 Flange Port, 2 Cavities	16
	Solenoid Operated with Vented Relief	17
	Solenoid Operated, Flange Mounted with Vented Relief	18

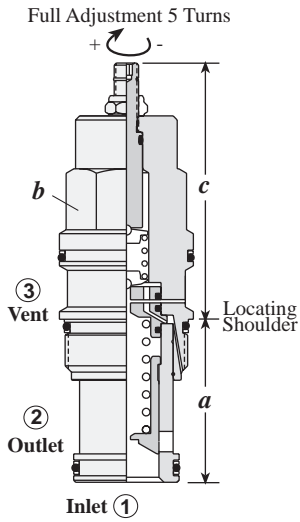
## Relief Valves

## PILOT OPERATED WITH VENT



Capacity	Typical Cartridge Model Code	Cavity	Cartridge Dimensions					Installation Torque (Nm)
			a	b	c			
					L	C	K	
30 L/min.	RVBA – LAN	T - 163A	31	19,1	65	67	71	35/40
60 L/min.	RVCA – LAN	T - 11A	34,9	22,2	64	66	70	40/50
120 L/min.	RVEA – LAN	T - 2A	34,9	28,6	72	74	78	60/70
240 L/min.	RVGA – LAN	T - 17A	46	31,8	84	86	90	200/215
480 L/min.	RVIA – LAN	T - 19A	63,5	41,3	100	104	107	465/500

## OPTION ORDERING INFORMATION



**RV \* A - \* \* \***

Nominal Capacity	Control**	Adjustment Range	Seal
<b>B</b> 30 L/min.*	<b>L</b> Standard Screw	<b>A</b> 7 - 210 bar	<b>N</b> Buna-N
<b>C</b> 60 L/min.	<b>C</b> Tamper Resistant	<b>W</b> 10 - 315 bar	<b>V</b> Viton
<b>E</b> 120 L/min.	<b>K</b> Handknob	<b>B</b> 3,5 - 105 bar	
<b>G</b> 240 L/min.		<b>C</b> 10 - 420 bar	
<b>I</b> 480 L/min.		<b>N</b> 4 - 55 bar	
		<b>Q</b> 4 - 25 bar	

Adjustment Range Options:  
 A, B, C, and W are standard set at 70 bar.  
 N Option is standard set at 25 bar.  
 Q Option is standard set at 14 bar.  
 \* Minimum setting 5 bar on all ranges.  
 Customer may specify pressure setting.

\*\* See page 244 for information on Control Options

## TECHNICAL TIPS / PERFORMANCE CURVES

### Relief Valves, Pilot Operated with Vent

#### Applications

Ventable, pilot operated relief valves incorporate an additional port for remote control.

- To provide remote adjustment of the main cartridge through the use of the **RBAC-\*\*\*** pilot cartridge or other suitable device.
- To unload the main relief valve by opening the vent port with a 2-way solenoid valve (**DAAA-\*\*\***). Normal relief operation is activated by blocking the bypass pilot flow.

#### Design Concepts and Features

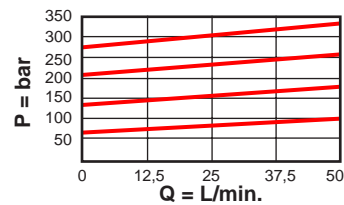
- Incorporates 150 micron stainless steel screen to protect the main stage control orifice.
- Low leakage, 50 to 115 cc/min./100 bar, dependent on frame size.
- Control pilot flow 0,15 to 0,35 L/min., dependent on frame size.
- Low hysteresis, less than  $\pm 1\%$
- Low pressure drop when unloaded.

**Note:** Any pressure at port 2 is additive to the pressure setting of the valve. If absolute system pressure must be regulated at port 1 and variable pressure is present at port 2, consider using the 4 port **RV\*D-\*\*\*** series where an independent drain port is provided.

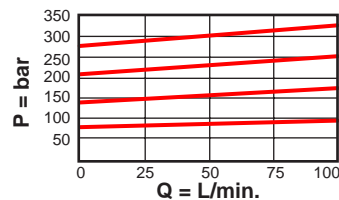
#### Performance Curves

##### Typical Pressure Rise

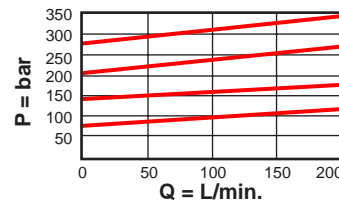
##### RVBA-L\*N



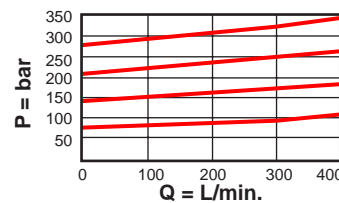
##### RVCA-L\*N



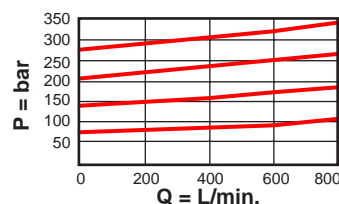
##### RVEA-L\*N



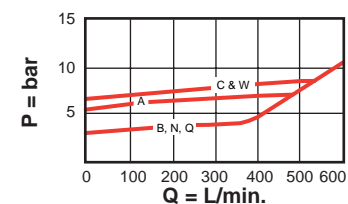
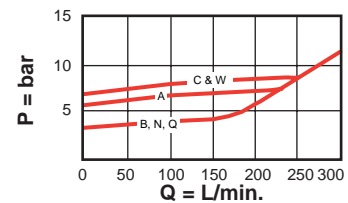
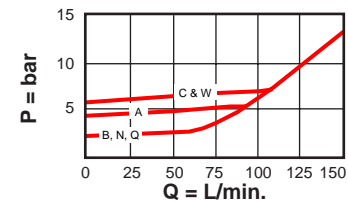
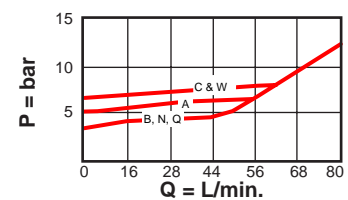
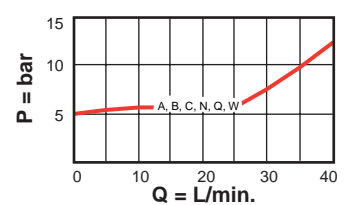
##### RVGA-L\*N



##### RVIA-L\*N



##### Vented Pressure



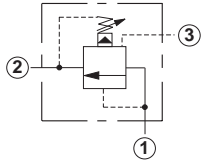
### General Application Requirements

- Operating Temperature Range: Buna-N seals  $-45^{\circ}\text{C}$  to  $90^{\circ}\text{C}$ , Viton seals  $-15^{\circ}\text{C}$  to  $120^{\circ}\text{C}$ .
- Viscosity Range: 10-600 centistokes.
- Fluid Contamination Level: ISO 4406 18/15 or better; Recommend  $\beta_{10} \geq 75$  to achieve ISO 18/15 or better in most systems.
- Factory Pressure Setting for cartridge is established at a 15 L/min. flow rate.

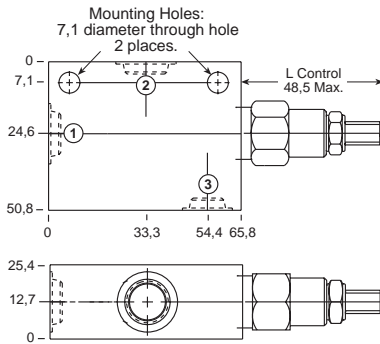
## Line Mounted Assemblies

THREE PORT PRESSURE REGULATING RELIEF APPLICATIONS  
(90 DEGREE BODIES)PILOT OPERATED  
ASSEMBLIESGo to [www.sunhydraulics.com](http://www.sunhydraulics.com)  
for more product information.

## 0-30 L/min. Cavity T-163A

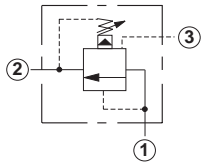


Ports 1 and 2	Port 3	Assembly Model Code*
1/4" BSPP	1/4" BSPP	<b>RVBA-LAN-JCT</b>
3/8" BSPP	1/4" BSPP	<b>RVBA-LAN-JCU</b>

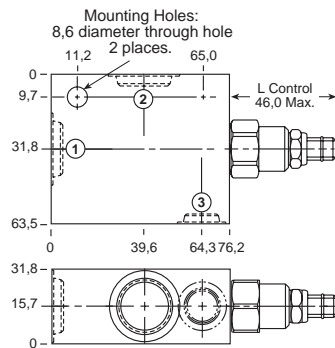


\*Add modifier /S to order SG Iron for pressure rating over 210 bar.

## 0-60 L/min. Cavity T-11A

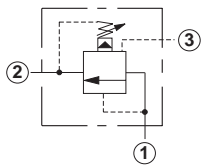


Ports 1 and 2	Port 3	Assembly Model Code*
3/8" BSPP	1/4" BSPP	<b>RVCA-LAN-ECU</b>
1/2" BSPP	1/4" BSPP	<b>RVCA-LAN-ECV</b>

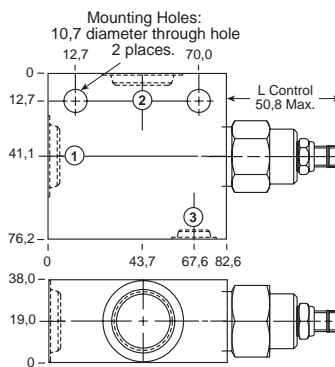


\*Add modifier /S to order SG Iron for pressure rating over 210 bar.

## 0-120 L/min. Cavity T-2A



Ports 1 and 2	Port 3	Assembly Model Code*
1/2" BSPP	1/4" BSPP	<b>RVEA-LAN-BCV</b>
3/4" BSPP	1/4" BSPP	<b>RVEA-LAN-BCW</b>



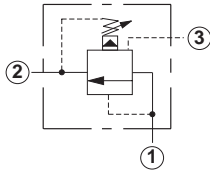
\*Add modifier /S to order SG Iron for pressure rating over 210 bar.

NOTES: Page 12 for cartridge model RV\*A-\*\*\* shows performance curves, technical tips, and options.  
See page viii for technical information about line mount bodies including SAE flange pattern specifications.  
Consult the Sun Factory for other port sizes available in the bodies shown above.  
Model Codes printed in red are Preferred Products and are readily available.

# THREE PORT PRESSURE REGULATING RELIEF APPLICATIONS (90 DEGREE/90 DEGREE 1.50" SAE C62 FLANGE PORT BODIES)

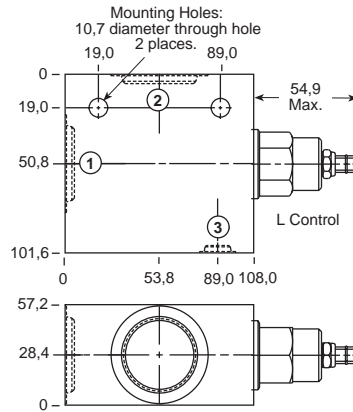
## PILOT OPERATED ASSEMBLIES

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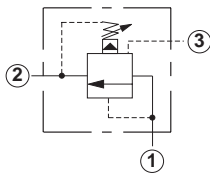


### 0-240 L/min. Cavity T-17A

Ports 1 and 2	Port 3	Assembly Model Code*
3/4" BSPP	1/4" BSPP	<b>RVGA-LAN-HCW</b>
1" BSPP	1/4" BSPP	<b>RVGA-LAN-HCX</b>
1 1/4" BSPP	1/4" BSPP	<b>RVGA-LAN-HCY</b>

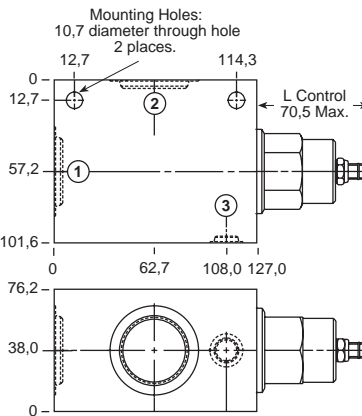


\*Add modifier /S to order SG Iron for pressure rating over 210 bar.

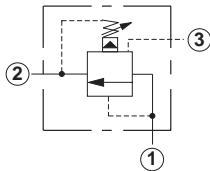


### 0-480 L/min. Cavity T-19A

Ports 1 and 2	Port 3	Assembly Model Code*
1" BSPP	1/4" BSPP	<b>RVIA-LAN-KCX</b>
1 1/4" BSPP	1/4" BSPP	<b>RVIA-LAN-KCY</b>

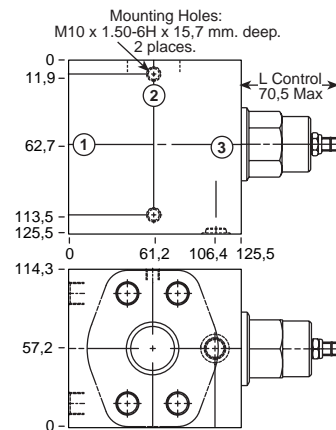


\*Add modifier /S to order SG Iron for pressure rating over 210 bar.



### 0-480 L/min. Cavity T-19A

Ports 1 and 2	Port 3	Assembly Model Code*
1 1/2" SAE C62	1/4" BSPP	<b>RVIA-LAN-KC6/M</b>



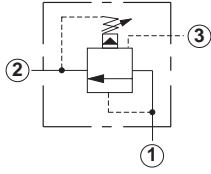
\*Add modifier /T to order SG Iron for pressure rating over 210 bar.

NOTES: Page 12 for cartridge model RV\*A-\*\*\* shows performance curves, technical tips, and options.  
See page vii for technical information about line mount bodies including SAE flange pattern specifications.  
Consult the Sun Factory for other port sizes available in the bodies shown above.  
Model Codes printed in red are Preferred Products and are readily available.

## Line Mounted Assemblies

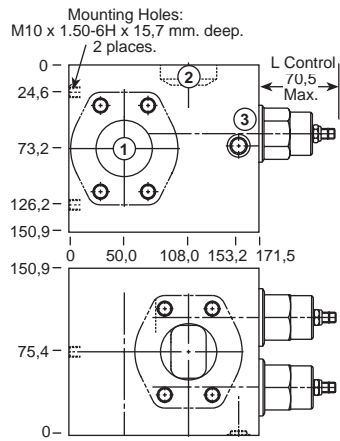
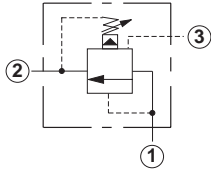
# THREE PORT PRESSURE REGULATING RELIEF APPLICATIONS (90 DEGREE 2.00" SAE C61/C62 FLANGE PORT BODIES, 2 CAVITIES)

**PILOT OPERATED  
ASSEMBLIES**

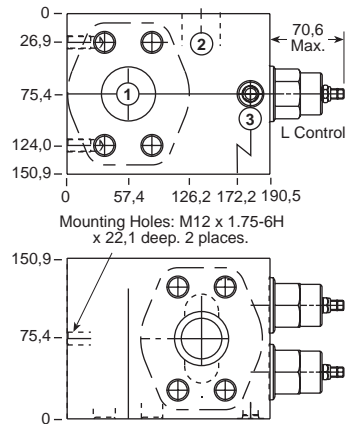
 Go to [www.sunhydraulics.com](http://www.sunhydraulics.com)  
for more product information.


Ports 1 and 2	Port 3	Assembly Model Code*
2" SAE C61	1/4" BSPP	<b>RVIA-LAN-XZZ/M</b>

 \*Add modifier **/T** to order SG Iron for pressure rating over 210 bar.

**0-960 L/min. Cavity T-19A**

**0-960 L/min. Cavity T-19A**


Ports 1 and 2	Port 3	Assembly Model Code*
2" SAE C62	1/4" BSPP	<b>RVIA-LAN-Z8Z/M</b>

 \*Add modifier **/T** to order SG Iron for pressure rating over 210 bar.


NOTES: Page 12 for cartridge model RV\*A-\*\*\* shows performance curves, technical tips, and options.  
See page vii for technical information about line mount bodies including SAE flange pattern specifications.  
Consult the Sun Factory for other port sizes available in the bodies shown above.

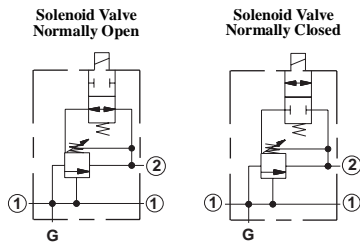


# THREE PORT PRESSURE REGULATING RELIEF APPLICATIONS (SOLENOID OPERATED BODIES WITH VENTED RELIEF)

## PILOT OPERATED ASSEMBLIES

Suitable for operation up to 350 bar

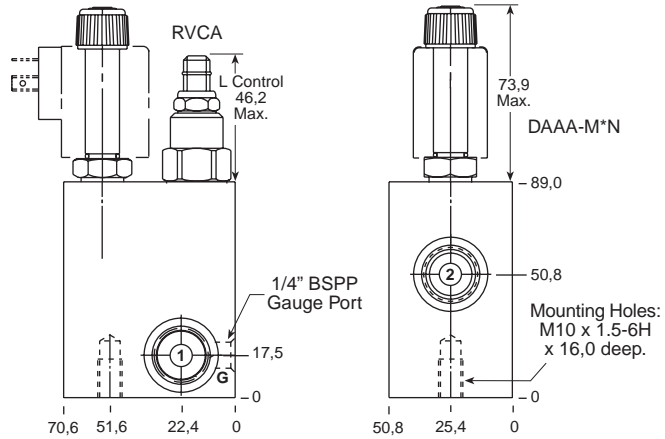
Go to [www.sunhydraulics.com](http://www.sunhydraulics.com) for more product information.



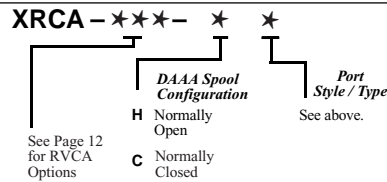
Ports 1 and 2	Assembly Model Code*
1/4" BSPP	<b>XRCA-LAN-T</b>
3/8" BSPP	<b>XRCA-LAN-U</b>
1/2" BSPP	<b>XRCA-LAN-V</b>

\*Add modifier /S to order SG Iron for pressure rating over 210 bar.

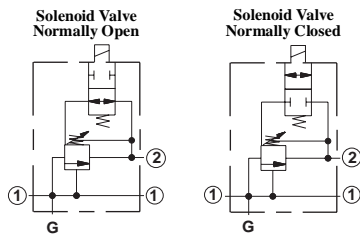
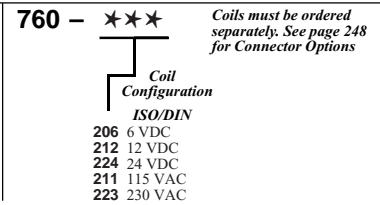
### 0-60 L/min. Cavity T-11A



Assembly Order:



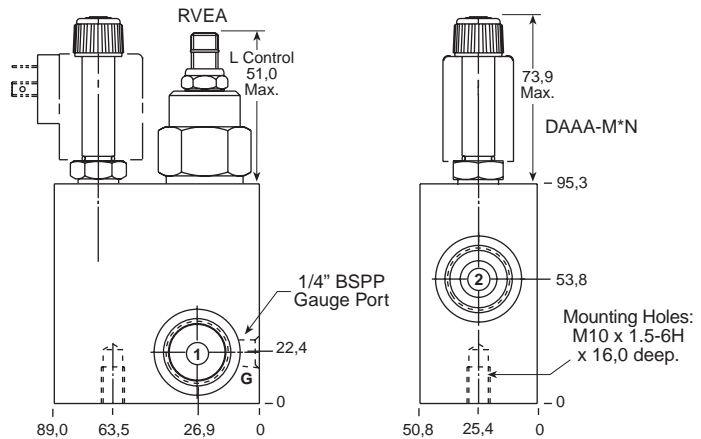
Solenoid Coil Order:



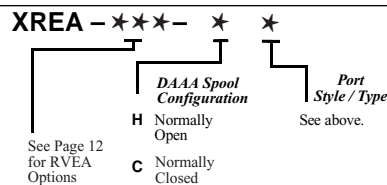
Ports 1 and 2	Assembly Model Code*
3/8" BSPP	<b>XREA-LAN-U</b>
1/2" BSPP	<b>XREA-LAN-V</b>
3/4" BSPP	<b>XREA-LAN-W</b>

\*Add modifier /S to order SG Iron for pressure rating over 210 bar.

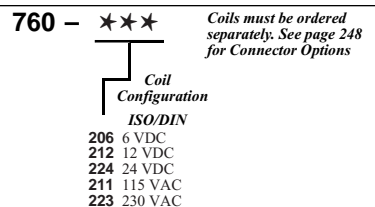
### 0-120 L/min. Cavity T-2A



Assembly Order:



Solenoid Coil Order:



NOTES: Page 12 for cartridge model RV\*A-\*\*\* shows performance curves, technical tips, and options. See page vii for technical information about line mount bodies including SAE flange pattern specifications. Consult the Sun Factory for other port sizes available in the bodies shown above. Model Codes printed in red are Preferred Products and are readily available.

## Line Mounted Assemblies

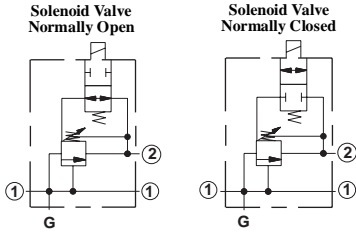
# THREE PORT PRESSURE REGULATING RELIEF APPLICATIONS (SOLENOID OPERATED, FLANGE MOUNTED BODIES WITH VENTED RELIEF)

### PILOT OPERATED ASSEMBLIES

Suitable for operation  
up to 350 bar

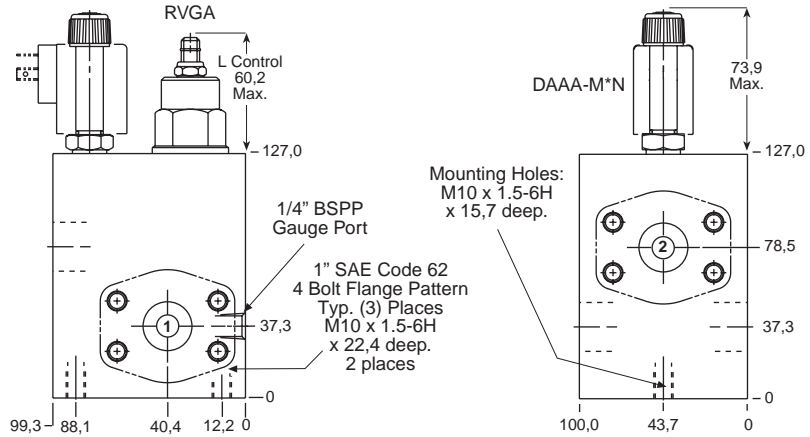
Go to [www.sunhydraulics.com](http://www.sunhydraulics.com)  
for more product information.

### 0-240 L/min. Cavity T-17A

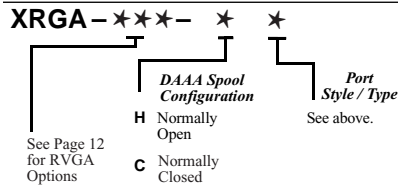


Ports 1 and 2	Assembly Model Code*
3/4" BSPP	<b>XRGA-LAN-W</b>
1" BSPP	<b>XRGA-LAN-X</b>
1 1/4" BSPP	<b>XRGA-LAN-Y</b>

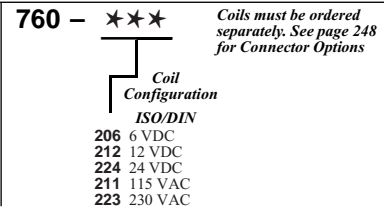
\*Add modifier **T** to order SG Iron for pressure rating over 210 bar.



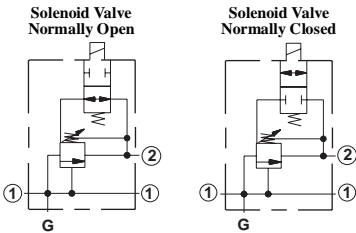
**Assembly Order:**



**Solenoid Coil Order:**

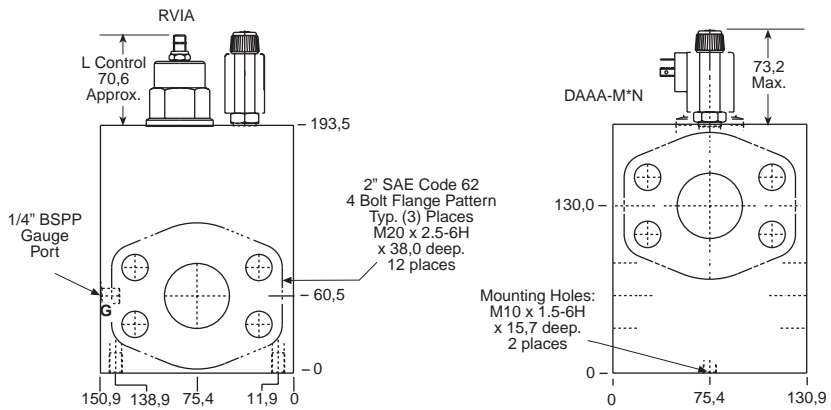


### 0-480 L/min. Cavity T-19A

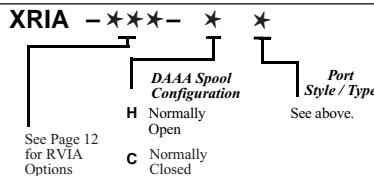


Ports 1 and 2	Assembly Model Code*
2" SAE C62	<b>XRIA-LAN-8/M</b>

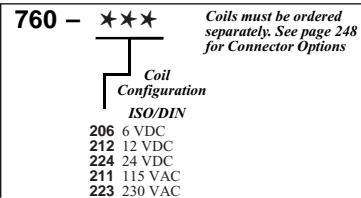
\*Add modifier **T** to order SG Iron for pressure rating over 210 bar.



**Assembly Order:**

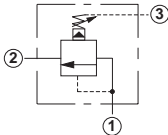
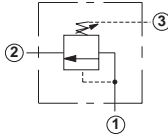
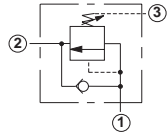
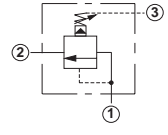
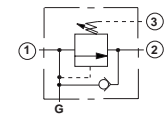
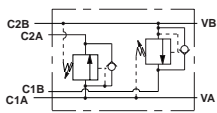
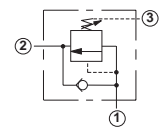


**Solenoid Coil Order:**



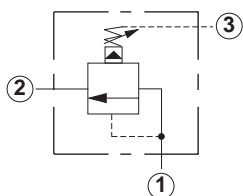
NOTES: Page 12 for cartridge model RV\*A-\*\*\* shows performance curves, technical tips, and options.  
See page vii for technical information about line mount bodies including SAE flange pattern specifications.  
Consult the Sun Factory for other port sizes available in the bodies shown above.

# Sequence Assemblies

	<i>Cartridge Type</i>	<i>Page</i>
	Pilot Operated	20
	Direct Acting	20
	Direct Acting with Reverse Free Flow Check	28
<b><i>Line Mounted Assemblies (Body Type)</i></b>		
	90 Degree	22
	90 Degree with Reverse Free Flow Check	24
	90 Degree with Reverse Free Flow Check, 2 Cavities	26
	90 Degree	30

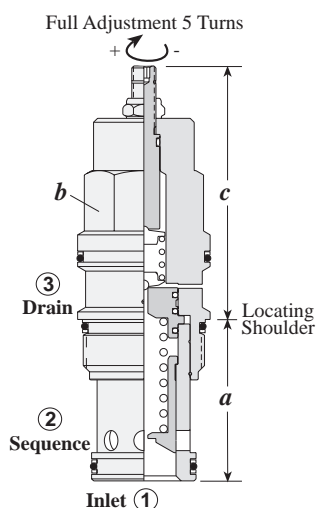
# Sequence Valves

## PILOT OPERATED



Capacity	Typical Cartridge Model Code	Cavity	Cartridge Dimensions					Installation Torque (Nm)
			a	b	c		K	
30 L/min.	<b>RSBC – LAN</b>	T - 163A	31	19,1	65	67	71	35/40
60 L/min.	<b>RSDC – LAN</b>	T - 11A	34,9	22,2	64	66	70	40/50
120 L/min.	<b>RSFC – LAN</b>	T - 2A	34,9	28,6	72	74	78	60/70
240 L/min.	<b>RSHC – LAN</b>	T - 17A	46	31,8	84	86	90	200/215
480 L/min.	<b>RSJC – LAN</b>	T - 19A	63,5	41,3	100	104	107	465/500

### OPTION ORDERING INFORMATION



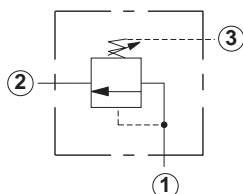
**RS \* C - \* \* \***

Nominal Capacity	Control**	Adjustment Range	Seal
<b>B</b> 30 L/min.*	<b>L</b> Standard Screw	<b>A</b> 7 - 210 bar	<b>N</b> Buna-N
<b>D</b> 60 L/min.	<b>C</b> Tamper Resistant	<b>W</b> 10 - 315 bar	<b>V</b> Viton
<b>F</b> 120 L/min.	<b>K</b> Handknob	<b>B</b> 3,5 - 105 bar	
<b>H</b> 240 L/min.		<b>C</b> 10 - 420 bar	
<b>J</b> 480 L/min.		<b>N</b> 4 - 55 bar	
		<b>Q</b> 4 - 25 bar	

Adjustment Range Options:  
 A, B, C, and W are standard set at 70 bar.  
 N Option is standard set at 25 bar.  
 Q Option is standard set at 14 bar.  
 \* Minimum setting 5 bar on all ranges.  
**Customer may specify pressure setting.**

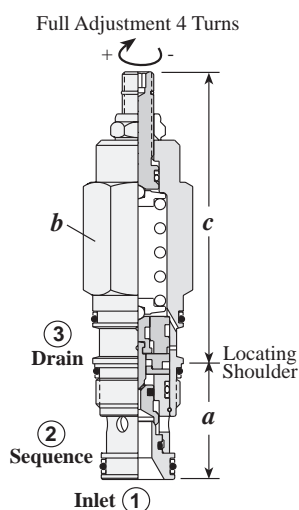
\*\* See page 244 for information on Control Options

## DIRECT ACTING



Capacity	Typical Cartridge Model Code	Cavity	Cartridge Dimensions				Installation Torque (Nm)
			a	b	c		
60 L/min.	<b>SXCA – LAN</b>	T - 11A	34,9	22,2	79	81	40/50
120 L/min.	<b>SXEA – LAN</b>	T - 2A	34,9	28,6	89	91	60/70

### OPTION ORDERING INFORMATION



**SX \* A - \* \* \***

Nominal Capacity	Control**	Adjustment Range	Seal
<b>C</b> 60 L/min.	<b>L</b> Standard Screw	<b>A</b> 35 - 210 bar	<b>N</b> Buna-N
<b>E</b> 120 L/min.	<b>C</b> Tamper Resistant	<b>W</b> 55 - 315 bar	<b>V</b> Viton
		<b>B</b> 20 - 105 bar	
		<b>C</b> 140 - 420 bar	
		<b>D</b> 14 - 55 bar	

Adjustment Range Options:  
 A, B, and W are standard set at 70 bar.  
 C Option is standard set at 140 bar.  
 D Option is standard set at 25 bar.  
**Customer may specify pressure setting.**

\*\* See page 244 for information on Control Options

## TECHNICAL TIPS / PERFORMANCE CURVES

### Sequence Valves, Pilot Operated

#### Applications

Pilot operated sequence cartridges are similar to relief valves, but with an additional third port, to drain the spring chamber.

- May be used to regulate pressure more accurately than relief valve, as pressure is regulated on an absolute basis.
- To control the sequence of two or more cylinders or motors while maintaining the pressure on the actuator that moves first.

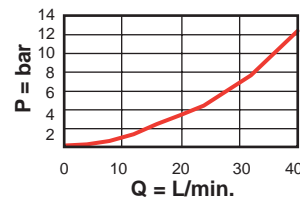
#### Design Concepts and Features

- Exceptionally flat pressure control over a wide range of settings.
- Low hysteresis and spool leakage: 50 to 115 cc/min./100 bar dependent on frame size.
- Wide selection of spring ranges to optimize adjustment sensitivity.
- Pilot flow will continue to increase when pilot section opens as pressure at port 1 increases above setting. *Maximum Pilot Flow May be 1 L/min.*

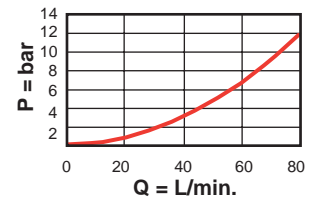
#### Performance Curves

##### Pressure Drop-full Sequence

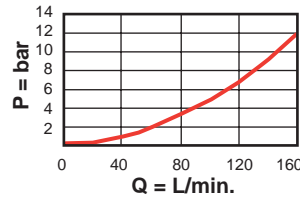
#### RSBC-L\*N



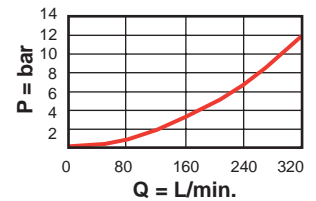
#### RSDC-L\*N



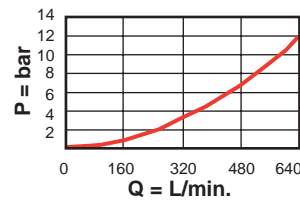
#### RSFC-L\*N



#### RSHC-L\*N



#### RSJC-L\*N



### Sequence Valves, Direct Acting

#### Applications

The direct acting sequence cartridges are interchangeable with the pilot operated models and may be used as an alternative to the pilot operated version.

#### Design Concepts and Features

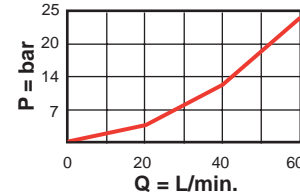
- Low hysteresis and low leakage on closing. Valve reseats with leakage less than 5 drops./min.
- Reseat at 85% of cracking pressure.
- Direct acting design provides fast opening and closing.
- Zero pilot flow (however, the spring chamber drain must not be plugged). See Note.

**Note:** For both types of sequence cartridge, any pressure at port 3 is directly additive to the valve setting.

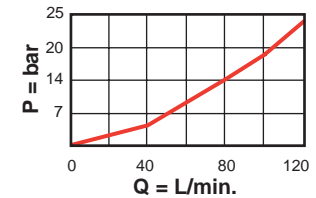
#### Performance Curves

##### Pressure Drop-full Sequence

#### SXCA-L\*N



#### SXEA-L\*N



### General Application Requirements

- Operating Temperature Range: Buna-N seals -45° C to 90° C, Viton seals -15° C to 120° C.
- Viscosity Range: 10-600 centistokes.
- Fluid Contamination Level: ISO 4406 18/15 or better; Recommend  $\beta_{10} \geq 75$  to achieve ISO 18/15 or better in most systems.
- Factory Pressure Setting for cartridge is established at a 15 L/min. flow rate.

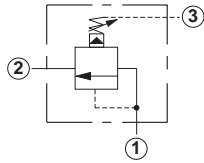
## Line Mounted Assemblies

# THREE PORT PRESSURE SEQUENCING APPLICATIONS (90 DEGREE BODIES)

### PILOT OPERATED ASSEMBLIES

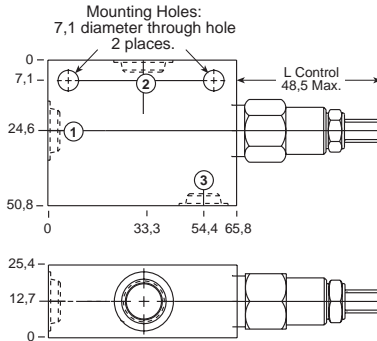
Go to [www.sunhydraulics.com](http://www.sunhydraulics.com)  
for more product information.

### DIRECT ACTING ASSEMBLIES

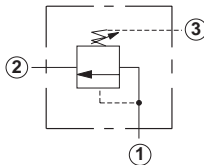


#### 0-30 L/min. Cavity T-163A

Ports 1 and 2	Port 3	Assembly Model Code*
1/4" BSPP	1/4" BSPP	<b>RSBC-LAN-JCT</b>
3/8" BSPP	1/4" BSPP	<b>RSBC-LAN-JCU</b>

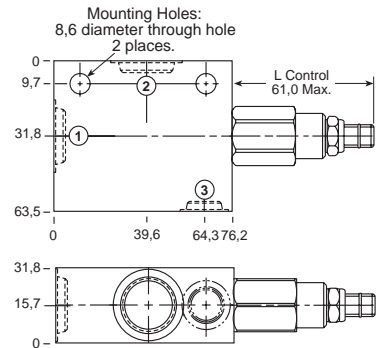


\*Add modifier /S to order SG Iron for pressure rating over 210 bar.



#### 0-60 L/min. Cavity T-11A

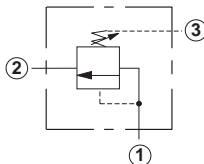
Ports 1 and 2	Port 3	Assembly Model Code*
3/8" BSPP	1/4" BSPP	<b>RSDC-LAN-ECU</b>
1/2" BSPP	1/4" BSPP	<b>RSDC-LAN-ECV</b>



\*Add modifier /S to order SG Iron for pressure rating over 210 bar.

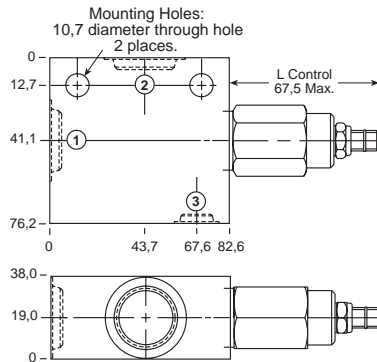
Ports 1 and 2	Port 3	Assembly Model Code*
3/8" BSPP	1/4" BSPP	<b>SXCA-LAN-ECU</b>
1/2" BSPP	1/4" BSPP	<b>SXCA-LAN-ECV</b>

\*Add modifier /S to order SG Iron for pressure rating over 210 bar.



#### 0-120 L/min. Cavity T-2A

Ports 1 and 2	Port 3	Assembly Model Code*
1/2" BSPP	1/4" BSPP	<b>RSFC-LAN-BCV</b>
3/4" BSPP	1/4" BSPP	<b>RSFC-LAN-BCW</b>



\*Add modifier /S to order SG Iron for pressure rating over 210 bar.

Ports 1 and 2	Port 3	Assembly Model Code*
1/2" BSPP	1/4" BSPP	<b>SXEA-LAN-BCV</b>
3/4" BSPP	1/4" BSPP	<b>SXEA-LAN-BCW</b>

\*Add modifier /S to order SG Iron for pressure rating over 210 bar.

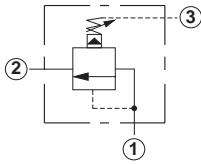
NOTES: Page 20 for cartridge models RS\*C-\*\*\* and SX\*A-\*\*\* shows performance curves, technical tips, and options. See page vii for technical information about line mount bodies including SAE flange pattern specifications. Consult the Sun Factory for other port sizes available in the bodies shown above.

Model Codes printed in red are Preferred Products and are readily available.

# THREE PORT PRESSURE SEQUENCING APPLICATIONS (90 DEGREE BODIES)

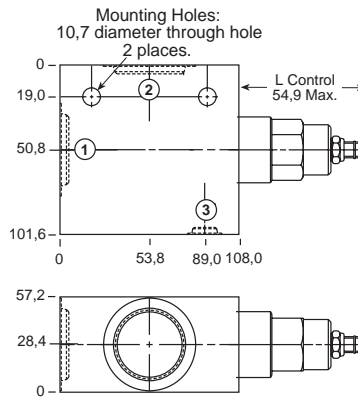
## PILOT OPERATED ASSEMBLIES

Go to [www.sunhydraulics.com](http://www.sunhydraulics.com) for more product information.



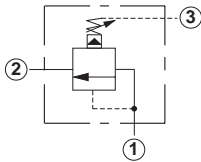
### 0-240 L/min. Cavity T-17A

Ports 1 and 2	Port 3	Assembly Model Code*
1" BSPP	1/4" BSPP	<b>RSHC-LAN-HCX</b>
1 1/4" BSPP	1/4" BSPP	<b>RSHC-LAN-HCY</b>

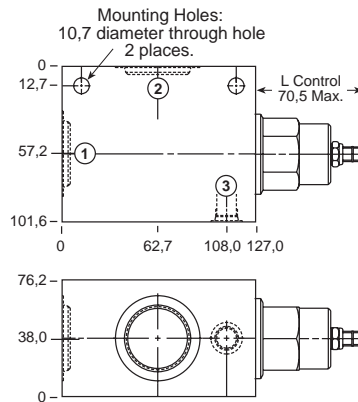


\*Add modifier /S to order SG Iron for pressure rating over 210 bar.

### 0-480 L/min. Cavity T-19A



Ports 1 and 2	Port 3	Assembly Model Code*
1" BSPP	1/4" BSPP	<b>RSJC-LAN-KCX</b>
1 1/4" BSPP	1/4" BSPP	<b>RSJC-LAN-KCY</b>



\*Add modifier /S to order SG Iron for pressure rating over 210 bar.

NOTES: Page 20 for cartridge model RS\*C-\*\*\* shows performance curves, technical tips, and options.  
See page vii for technical information about line mount bodies including SAE flange pattern specifications.  
Consult the Sun Factory for other port sizes available in the bodies shown above.  
Model Codes printed in red are Preferred Products and are readily available.

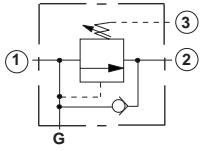
## Line Mounted Assemblies

# THREE PORT PRESSURE SEQUENCING APPLICATIONS (BODIES WITH REVERSE FREE FLOW CHECK)

### PILOT OPERATED ASSEMBLIES

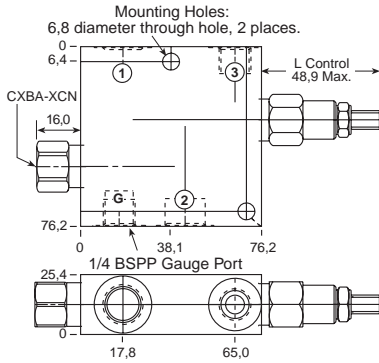
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for more product information.

### DIRECT ACTING ASSEMBLIES



### 0-30 L/min. Cavity T-163A

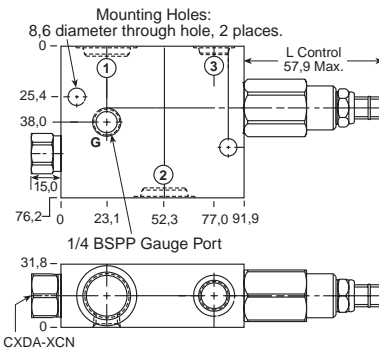
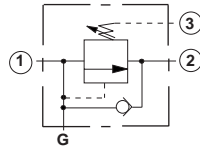
Ports 1 and 2	Port 3	Assembly Model Code*
1/4" BSPP	1/4" BSPP	<b>RSBC-LAN-J6T</b>
3/8" BSPP	1/4" BSPP	<b>RSBC-LAN-J6U</b>



\*Add modifier /S to order SG Iron for pressure rating over 210 bar.

### 0-60 L/min. Cavity T-11A

Ports 1 and 2	Port 3	Assembly Model Code*
3/8" BSPP	1/4" BSPP	<b>RSDC-LAN-E6U</b>
1/2" BSPP	1/4" BSPP	<b>RSDC-LAN-E6V</b>



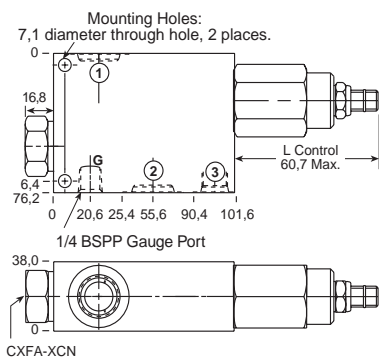
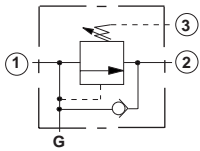
\*Add modifier /S to order SG Iron for pressure rating over 210 bar.

Ports 1 and 2	Port 3	Assembly Model Code*
3/8" BSPP	1/4" BSPP	<b>SXCA-LAN-E6U</b>
1/2" BSPP	1/4" BSPP	<b>SXCA-LAN-E6V</b>

\*Add modifier /S to order SG Iron for pressure rating over 210 bar.

### 0-120 L/min. Cavity T-2A

Ports 1 and 2	Port 3	Assembly Model Code*
1/2" BSPP	1/4" BSPP	<b>RSFC-LAN-B6V</b>
3/4" BSPP	1/4" BSPP	<b>RSFC-LAN-B6W</b>



\*Add modifier /S to order SG Iron for pressure rating over 210 bar.

Ports 1 and 2	Port 3	Assembly Model Code*
1/2" BSPP	1/4" BSPP	<b>SXEA-LAN-B6V</b>
3/4" BSPP	1/4" BSPP	<b>SXEA-LAN-B6W</b>

\*Add modifier /S to order SG Iron for pressure rating over 210 bar.

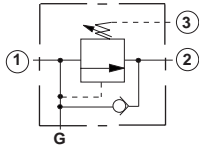
NOTES: Page 20 for cartridge models RS\*C-\*\*\* and SX\*A-\*\*\* shows performance curves, technical tips, and options.  
See page vii for technical information about line mount bodies including SAE flange pattern specifications.



# THREE PORT PRESSURE SEQUENCING APPLICATIONS (BODIES WITH REVERSE FREE FLOW CHECK)

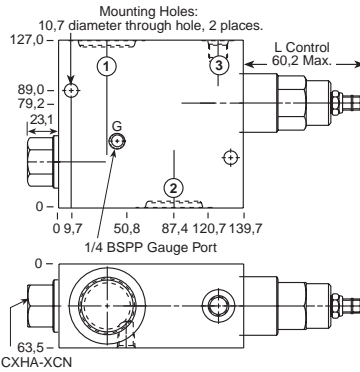
## PILOT OPERATED ASSEMBLIES

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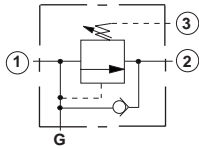
### 0-240 L/min. Cavity T-17A

Ports 1 and 2	Port 3	Assembly Model Code*
1" BSPP	1/4" BSPP	<b>RSHC-LAN-H6X</b>
1 1/4" BSPP	1/4" BSPP	<b>RSHC-LAN-H6Y</b>

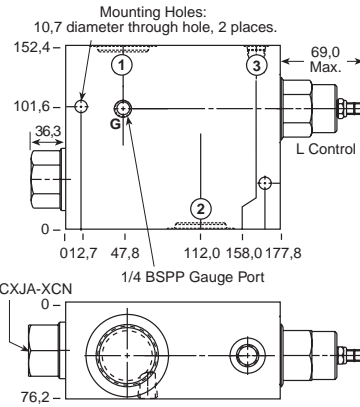


\*Add modifier /S to order SG Iron for pressure rating over 210 bar.

### 0-480 L/min. Cavity T-19A



Ports 1 and 2	Port 3	Assembly Model Code*
1" BSPP	1/4" BSPP	<b>RSJC-LAN-K6X</b>
1 1/4" BSPP	1/4" BSPP	<b>RSJC-LAN-K6Y</b>



\*Add modifier /S to order SG Iron for pressure rating over 210 bar.

NOTES: Page 20 for cartridge model RS\*C-\*\*\* shows performance curves, technical tips, and options.  
See page vii for technical information about line mount bodies including SAE flange pattern specifications.  
Consult the Sun Factory for other port sizes available in the bodies shown above.

## Line Mounted Assemblies

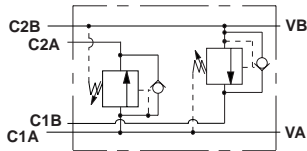
# THREE PORT DUAL PRESSURE SEQUENCING APPLICATIONS (2 CAVITY BODIES WITH REVERSE FREE FLOW CHECKS)

The line-mounted dual sequencing assembly can be used in applications where two hydraulic cylinders are to be operated in a particular sequence when both extending and retracting. The block eliminates a great deal of pipework when compared to using conventional line mounted valves.

### PILOT OPERATED ASSEMBLIES

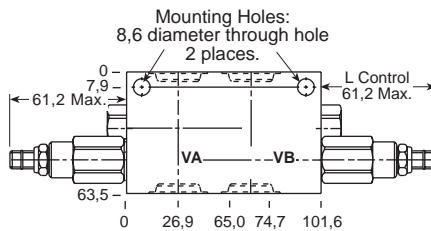
Go to [www.sunhydraulics.com](http://www.sunhydraulics.com) for more product information.

### DIRECT ACTING ASSEMBLIES

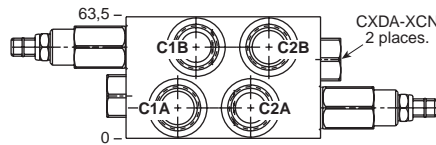


All Ports	Assembly Model Code*
3/8" BSPP	<b>RSDC-LAN-E8U</b>
1/2" BSPP	<b>RSDC-LAN-E8V</b>

### 0-60 L/min Cavity T-11A

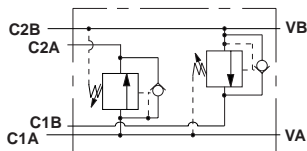


All Ports	Assembly Model Code*
3/8" BSPP	<b>SXCA-LAN-E8U</b>
1/2" BSPP	<b>SXCA-LAN-E8V</b>



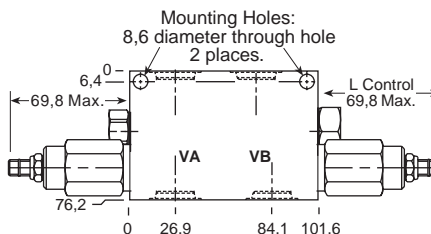
\*Add modifier /S to order SG Iron for pressure rating over 210 bar.

\*Add modifier /S to order SG Iron for pressure rating over 210 bar.

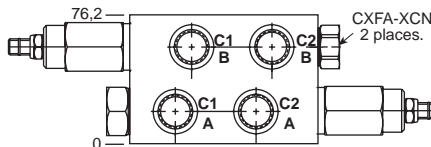


All Ports	Assembly Model Code*
1/2" BSPP	<b>RSFC-LAN-B8V</b>
3/4" BSPP	<b>RSFC-LAN-B8W</b>

### 0-120 L/min Cavity T-2A

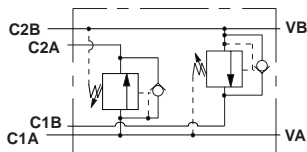


All Ports	Assembly Model Code*
1/2" BSPP	<b>SXEA-LAN-B8V</b>
3/4" BSPP	<b>SXEA-LAN-B8W</b>



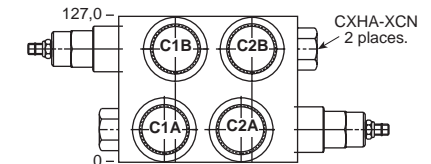
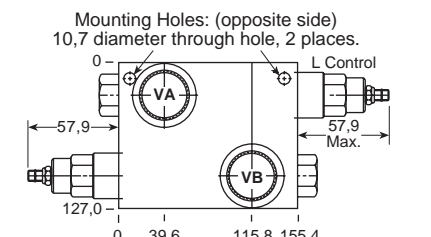
\*Add modifier /S to order SG Iron for pressure rating over 210 bar.

\*Add modifier /S to order SG Iron for pressure rating over 210 bar.



All Ports	Assembly Model Code*
1" BSPP	<b>RSHC-LAN-H8X</b>
1 1/4" BSPP	<b>RSHC-LAN-H8Y</b>

### 0-240 L/min Cavity T-17A



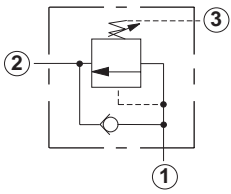
\*Add modifier /S to order SG Iron for pressure rating over 210 bar.

NOTES: Page 20 for cartridge models RS\*C-\*\*\* and SX\*A-\*\*\* show performance curves, technical tips, and options. See page vii for technical information about line mount bodies including SAE flange pattern specifications. Consult the Sun Factory for other port sizes available in the bodies shown above.

# NOTES

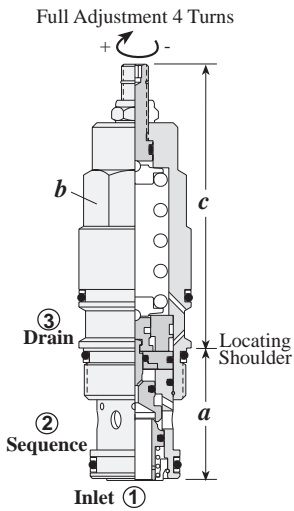
## Sequence Valves

### DIRECT ACTING WITH REVERSE FREE FLOW CHECK



Capacity	Typical Cartridge Model Code	Cavity	Cartridge Dimensions				Installation Torque (Nm)
			a	b	L	C	
60 L/min.	SCCA - LAN	T - 11A	34,9	22,2	79	81	40/50
120 L/min.	SCEA - LAN	T - 2A	34,9	28,6	89	91	60/70
240 L/min.	SCGA - LAN	T - 17A	46	31,8	100	102	200/215
480 L/min.	SCIA - LAN	T - 19A	63,5	41,3	120	124	465/500

### OPTION ORDERING INFORMATION



**SC \* A - \* \* \***

Nominal Capacity	Control**	Adjustment Range	Seal
<b>C</b> 60 L/min.	<b>L</b> Standard Screw	<b>A</b> 35 - 210 bar	<b>N</b> Buna-N
<b>E</b> 120 L/min.	<b>C</b> Tamper Resistant	<b>W</b> 55 - 315 bar	<b>V</b> Viton
<b>G</b> 240 L/min.		<b>B</b> 20 - 105 bar	
<b>I</b> 480 L/min.		<b>D</b> 14 - 55 bar	
		<b>C</b> 140 - 420 bar	

*Adjustment Range Options:*  
 A, B and W are standard set at 70 bar.  
 C Option is standard set at 140 bar.  
 D Option is standard set at 25 bar.  
**Customer may specify pressure setting.**

\*\* See page 244 for information on Control Options

# TECHNICAL TIPS / PERFORMANCE CURVES

## Sequence Valves, Reverse Free Flow Check

### Applications

SC\*A series of sequence valves have an integral reverse free flow check and may be used in a similar manner to the cartridges without the check.

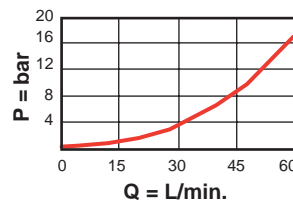
### Design Concepts and Features

- This is a zero pilot flow valve. Port 3 must not be plugged.
- Pressure at Port 3 is directly additive to valve setting.
- Typical response time is 2 ms.
- Maximum leakage is 10 drops/min. at reseal.
- Reseat exceeds 85% of set pressure.
- Reverse free flow check cracking pressure is 1,4 bar to 3,0 bar, depending on frame size.

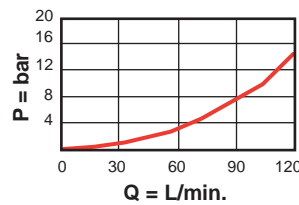
### Performance Curves

#### Pressure Drop-full Sequence

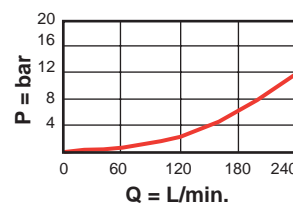
##### SCCA-L\*N



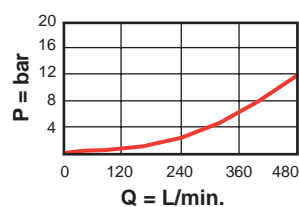
##### SCEA-L\*N



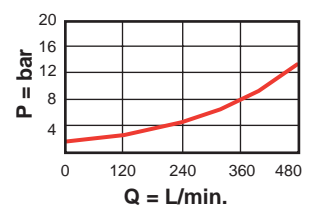
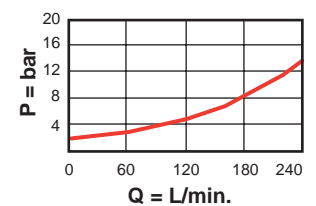
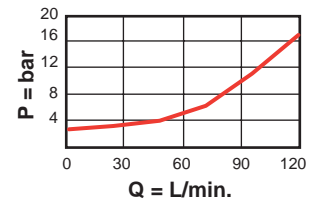
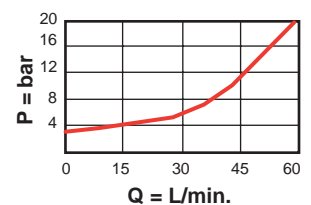
##### SCGA-L\*N



##### SCIA-L\*N



#### Reverse Free Flow



## General Application Requirements

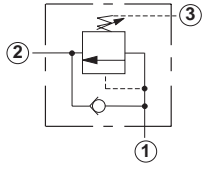
- Operating Temperature Range: Buna-N seals -45° C to 90° C, Viton seals -15° C to 120° C.
- Viscosity Range: 10-600 centistokes.
- Fluid Contamination Level: ISO 4406 18/15 or better; Recommend  $\beta_{10} \geq 75$  to achieve ISO 18/15 or better in most systems.
- Factory Pressure Setting for cartridge is established at a 15 L/min. flow rate.

## Line Mounted Assemblies

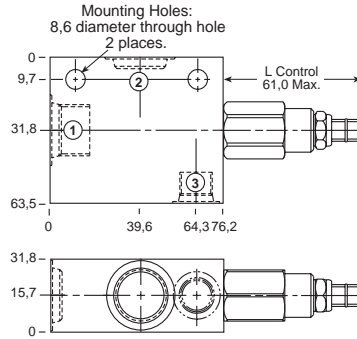
# THREE PORT PRESSURE SEQUENCING APPLICATIONS (90 DEGREE BODIES)

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for more product information.

**DIRECT ACTING  
ASSEMBLIES**

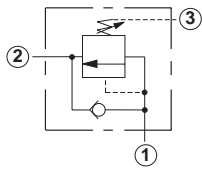


### 0-60 L/min. Cavity T-11A

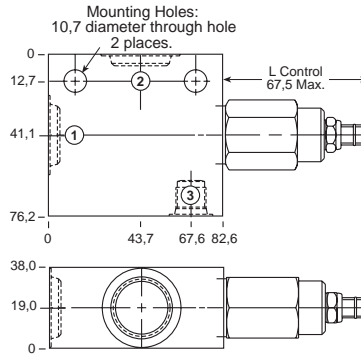


Ports 1 and 2	Port 3	Assembly Model Code*
3/8" BSPP	1/4" BSPP	<b>SCCA-LAN-ECU</b>
1/2" BSPP	1/4" BSPP	<b>SCCA-LAN-ECV</b>

\*Add modifier /S to order SG Iron for pressure rating over 210 bar.



### 0-120 L/min. Cavity T-2A



Ports 1 and 2	Port 3	Assembly Model Code*
3/8" BSPP	1/4" BSPP	<b>SCEA-LAN-BCU</b>
1/2" BSPP	1/4" BSPP	<b>SCEA-LAN-BCV</b>
3/4" BSPP	1/4" BSPP	<b>SCEA-LAN-BCW</b>

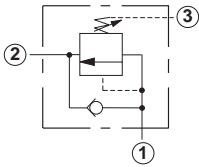
\*Add modifier /S to order SG Iron for pressure rating over 210 bar.

NOTES: Page 28 for cartridge model SC\*A-\*\*\* shows performance curves, technical tips, and options.  
See page vii for technical information about line mount bodies including SAE flange pattern specifications.  
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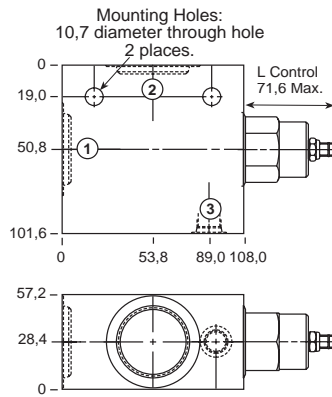
# THREE PORT PRESSURE SEQUENCING APPLICATIONS (90 DEGREE BODIES)

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**DIRECT ACTING  
ASSEMBLIES**

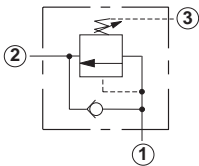


## 0-240 L/min. Cavity T-17A

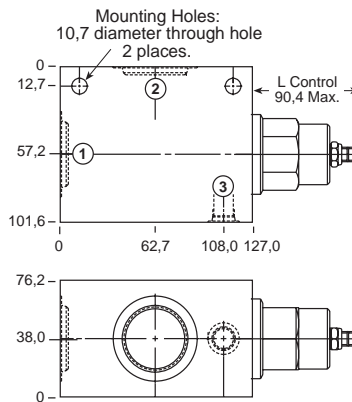


Ports 1 and 2	Port 3	Assembly Model Code*
1" BSPP	1/4" BSPP	<b>SCGA-LAN-HCX</b>
1 1/4" BSPP	1/4" BSPP	<b>SCGA-LAN-HCY</b>

\*Add modifier **/S** to order SG Iron for pressure rating over 210 bar.



## 0-480 L/min. Cavity T-19A



Ports 1 and 2	Port 3	Assembly Model Code*
1" BSPP	1/4" BSPP	<b>SCIA-LAN-KCX</b>
1 1/4" BSPP	1/4" BSPP	<b>SCIA-LAN-KCY</b>

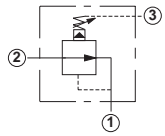
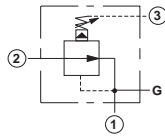
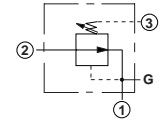
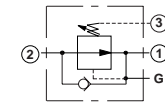
\*Add modifier **/S** to order SG Iron for pressure rating over 210 bar.

NOTES: Page 28 for cartridge model SC\*A-\*\*\* shows performance curves, technical tips, and options.  
See page vii for technical information about line mount bodies including SAE flange pattern specifications.  
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NOTES

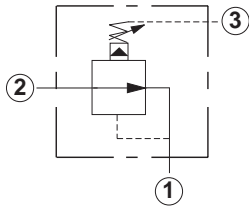


# Pressure Reducing Assemblies

	<i>Cartridge Type</i>	<i>Page</i>
	Pilot Operated	34
<i>Line Mounted Assemblies (Body Type)</i>		
	90 Degree	36
	90 Degree 1.50" SAE C61/C62 Flange Port	38
	90 Degree with Reverse Free Flow Check	39

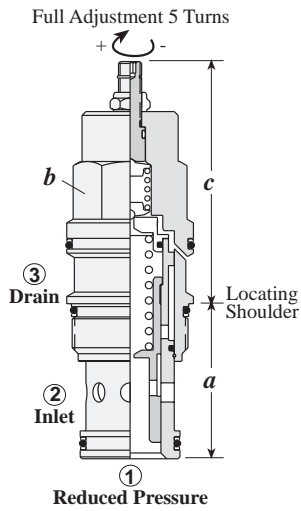
## Pressure Reducing Valves

### PILOT OPERATED REDUCING



Capacity	Typical Cartridge Model Code	Cavity	Cartridge Dimensions					Installation Torque (Nm)
			a	b	c			
					L	C	K	
20 L/min.	PBBB – LAN	T - 163A	31	19,1	65	67	71	35/40
40 L/min.	PBDB – LAN	T - 11A	34,9	22,2	64	66	70	40/50
80 L/min.	PBFB – LAN	T - 2A	34,9	28,6	72	74	78	60/70
160 L/min.	PBHB – LAN	T - 17A	46	31,8	84	86	90	200/215
320 L/min.	PBJB – LAN	T - 19A	63,5	41,3	100	104	107	465/500

### OPTION ORDERING INFORMATION



## PB \* B - \* \* \*

Nominal Capacity	Control**	Adjustment Range	Seal
<b>B</b> 20 L/min.*	<b>L</b> Standard Screw	<b>A</b> 7 - 210 bar	<b>N</b> Buna-N
<b>D</b> 40 L/min.	<b>C</b> Tamper Resistant	<b>W</b> 10 - 315 bar	<b>V</b> Viton
<b>F</b> 80 L/min.	<b>K</b> Handknob	<b>B</b> 3,5 - 105 bar	
<b>H</b> 160 L/min.		<b>N</b> 4 - 55 bar	
<b>J</b> 320 L/min.		<b>Q</b> 4 - 25 bar	

Adjustment Range Options:  
 All are standard set at 14 bar.  
 Maximum pressure differentials for spring ranges:  
 A and B are 210 bar.  
 N and Q are 140 bar.  
 W is 350 bar inlet pressure.

\*\* See page 244 for information on Control Options

\* Minimum setting 5 bar on all ranges.  
 Customer may specify pressure setting.

## TECHNICAL TIPS / PERFORMANCE CURVES

### Pressure Reducing Valves, Pilot Operated

#### Applications

Pilot operated reducing cartridges reduce high primary pressure at port 2 (inlet) to a controlled lower pressure at port 1. Port 3 is the pilot drain connection and pressure in this port is directly additive to the reduced pressure setting.

- Provide a controlled lower pressure to a secondary circuit function.
- Provide accurate reduced pressure control for clamp and hold down circuits.

#### Design Concepts and Features

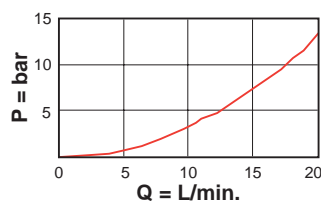
- Low hysteresis for accurate pressure regulation.
- High flow capacity relative to physical size.
- Low pilot flow (from .15 to .35 L/min.) dependent on frame size.
- Incorporates a 150 micron screen to protect main stage control orifice from contamination.
- Multiple spring ranges for optimum adjustment control.
- See page 34 for maximum operating pressure differentials for individual spring ranges.

**Note:** Sun also offers reducing/relieving cartridges (PP\*B) that are functionally interchangeable with reducing cartridges. However, with the reducing/relieving valves it is necessary to have a full flow capacity return passage from port 3. See page 42 for further details.

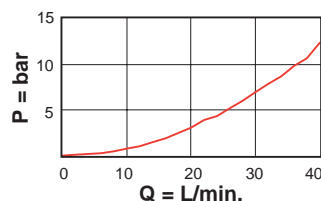
#### Performance Curves

##### No Load Pressure Drop with Valve Full Open

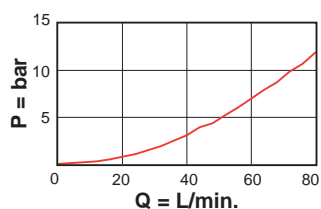
##### PBBB-L\*N



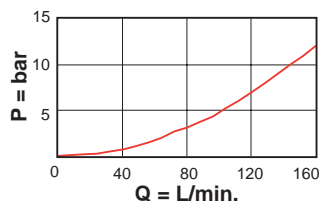
##### PBDB-L\*N



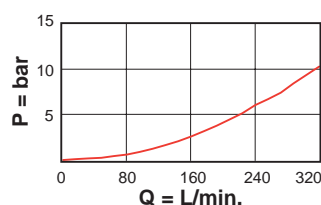
##### PBFB-L\*N



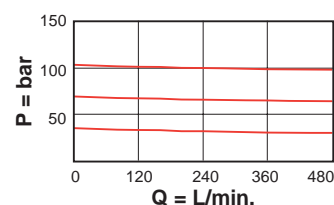
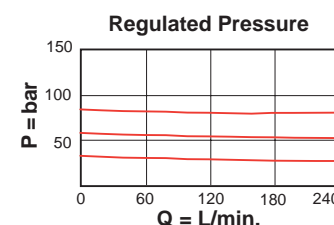
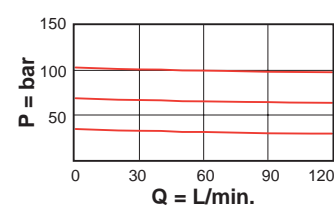
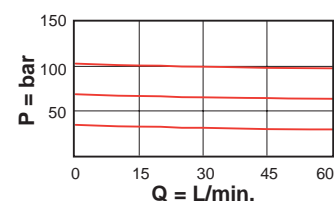
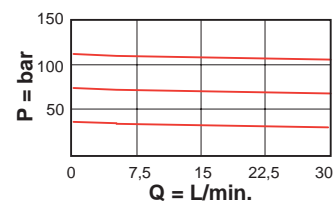
##### PBHB-L\*N



##### PBJB-L\*N



##### Regulated Pressure



### General Application Requirements

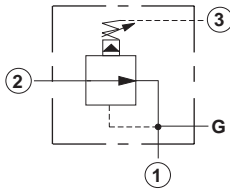
- Operating Temperature Range: Buna-N seals -45° C to 90° C, Viton seals -15° C to 120° C.
- Viscosity Range: 10-600 centistokes.
- Fluid Contamination Level: ISO 4406 18/15 or better; Recommend  $\beta_{10} \geq 75$  to achieve ISO 18/15 or better in most systems.
- Factory Pressure Setting for cartridge is established at zero flow rate.

## Line Mounted Assemblies

# THREE PORT PRESSURE REDUCING APPLICATIONS (90 DEGREE BODIES)

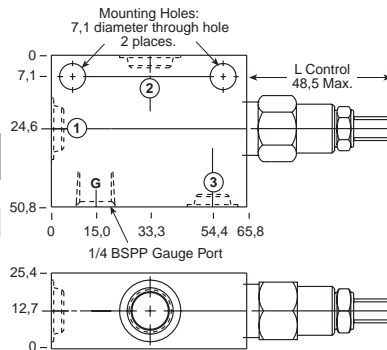
### PILOT OPERATED ASSEMBLIES

Go to [www.sunhydraulics.com](http://www.sunhydraulics.com)  
for more product information.

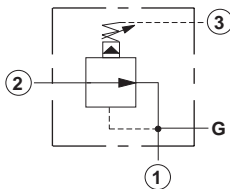


### 0-20 L/min. Cavity T-163A

Ports 1 and 2	Port 3	Assembly Model Code*
1/4" BSPP	1/4" BSPP	<b>PBBB-LAN-JFT</b>
3/8" BSPP	1/4" BSPP	<b>PBBB-LAN-JFU</b>

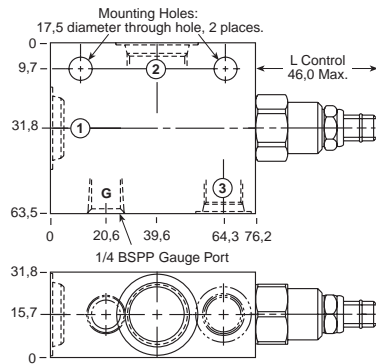


\*Add modifier /S to order SG Iron for pressure rating over 210 bar.

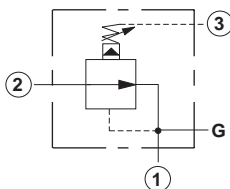


### 0-40 L/min. Cavity T-11A

Ports 1 and 2	Port 3	Assembly Model Code*
3/8" BSPP	1/4" BSPP	<b>PBDB-LAN-EFU</b>
1/2" BSPP	1/4" BSPP	<b>PBDB-LAN-EFV</b>

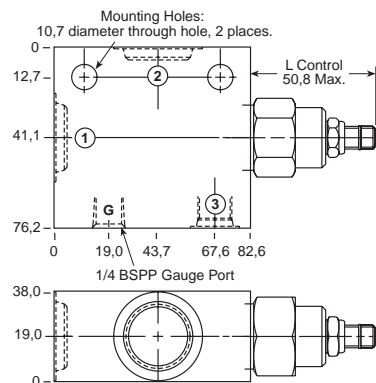


\*Add modifier /S to order SG Iron for pressure rating over 210 bar.



### 0-80 L/min. Cavity T-2A

Ports 1 and 2	Port 3	Assembly Model Code*
1/2" BSPP	1/4" BSPP	<b>PBFB-LAN-BFV</b>
3/4" BSPP	1/4" BSPP	<b>PBFB-LAN-BFW</b>



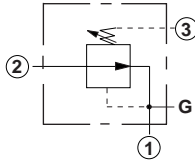
\*Add modifier /S to order SG Iron for pressure rating over 210 bar.

NOTES: Page 34 for cartridge model PB\*B-\*\*\* shows performance curves, technical tips, and options.  
See page vii for technical information about line mount bodies including SAE flange pattern specifications.  
Consult the Sun Factory for other port sizes available in the bodies shown above.  
Model Codes printed in red are Preferred Products and are readily available.

# THREE PORT PRESSURE REDUCING APPLICATIONS (90 DEGREE BODIES)

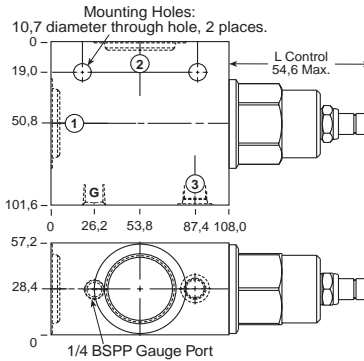
## PILOT OPERATED ASSEMBLIES

Go to [www.sunhydraulics.com](http://www.sunhydraulics.com) for more product information.



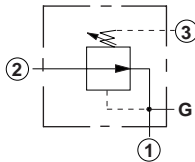
### 0-160 L/min. Cavity T-17A

Ports 1 and 2	Port 3	Assembly Model Code*
1" BSPP	1/4" BSPP	<b>PBHB-LAN-HFX</b>
1 1/4" BSPP	1/4" BSPP	<b>PBHB-LAN-HFY</b>

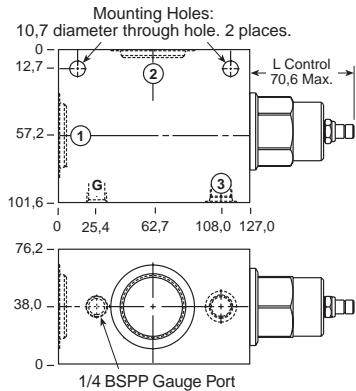


\*Add modifier /S to order SG Iron for pressure rating over 210 bar.

### 0-320 L/min. Cavity T-19A



Ports 1 and 2	Port 3	Assembly Model Code*
1" BSPP	1/4" BSPP	<b>PBJB-LAN-KFX</b>
1 1/4" BSPP	1/4" BSPP	<b>PBJB-LAN-KFY</b>



\*Add modifier /S to order SG Iron for pressure rating over 210 bar.

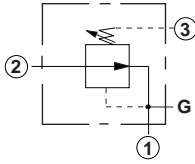
NOTES: Page 34 for cartridge model PB\*B-\*\*\* shows performance curves, technical tips, and options.  
See page vii for technical information about line mount bodies including SAE flange pattern specifications.  
Consult the Sun Factory for other port sizes available in the bodies shown above.  
Model Codes printed in red are Preferred Products and are readily available.

## Line Mounted Assemblies

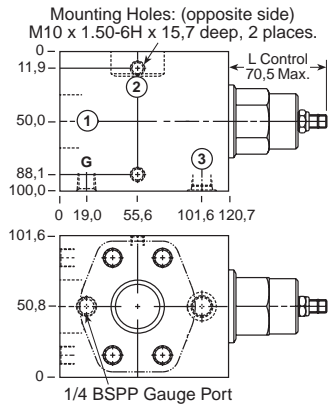
# THREE PORT PRESSURE REDUCING APPLICATIONS (90 DEGREE, 1.50" SAE C61/C62 FLANGE PORT BODIES)

### PILOT OPERATED ASSEMBLIES

Go to [www.sunhydraulics.com](http://www.sunhydraulics.com)  
for more product information.

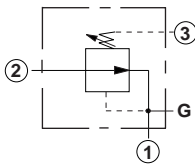


### 0-320 L/min. Cavity T-19A

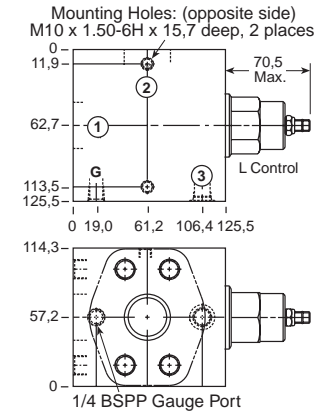


Ports 1 and 2	Port 3	Assembly Model Code*
1 1/2" SAE C61	1/4" BSPP	PBJB-LAN-KFR/M

\*Add modifier **T** to order SG Iron for pressure rating over 210 bar.



### 0-320 L/min. Cavity T-19A



Ports 1 and 2	Port 3	Assembly Model Code*
1 1/2" SAE C62	1/4" BSPP	PBJB-LAN-KF6/M

\*Add modifier **T** to order SG Iron for pressure rating over 210 bar.

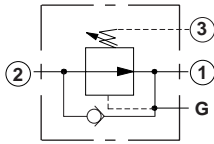
NOTES: Page 34 for cartridge model PB\*B-\*\*\* shows performance curves, technical tips, and options.  
See page vii for technical information about line mount bodies including SAE flange pattern specifications.  
Consult the Sun Factory for other port sizes available in the bodies shown above.

# THREE PORT PRESSURE REDUCING APPLICATIONS (BODIES WITH REVERSE FREE FLOW CHECK)

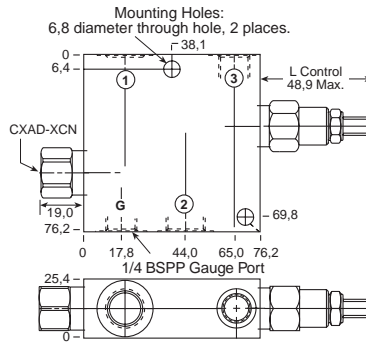
## PILOT OPERATED ASSEMBLIES

Go to [www.sunhydraulics.com](http://www.sunhydraulics.com) for more product information.

### 0-20 L/min. Cavity T-163A

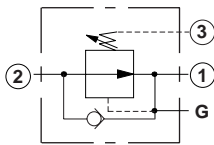


Ports 1 and 2	Port 3	Assembly Model Code*
1/4" BSPP	1/4" BSPP	PBBB-LAN-J2T
3/8" BSPP	1/4" BSPP	PBBB-LAN-J2U

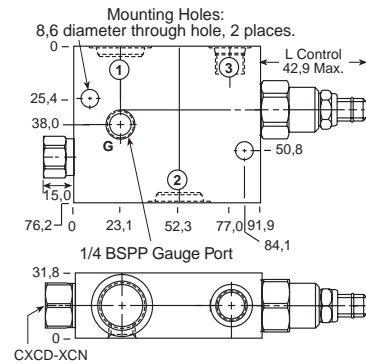


\*Add modifier /S to order SG Iron for pressure rating over 210 bar.

### 0-40 L/min. Cavity T-11A

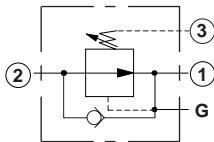


Ports 1 and 2	Port 3	Assembly Model Code*
3/8" BSPP	1/4" BSPP	PBDB-LAN-E2U
1/2" BSPP	1/4" BSPP	PBDB-LAN-E2V

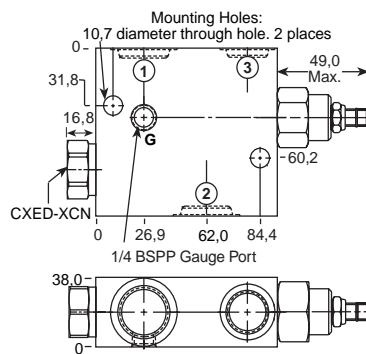


\*Add modifier /S to order SG Iron for pressure rating over 210 bar.

### 0-80 L/min. Cavity T-2A



Ports 1 and 2	Port 3	Assembly Model Code*
1/2" BSPP	1/4" BSPP	PBFB-LAN-B2V
3/4" BSPP	1/4" BSPP	PBFB-LAN-B2W



\*Add modifier /S to order SG Iron for pressure rating over 210 bar.

NOTES: Page 34 for cartridge model PB\*B-\*\*\* shows performance curves, technical tips, and options.  
See page vii for technical information about line mount bodies including SAE flange pattern specifications.  
Consult the Sun Factory for other port sizes available in the bodies shown above.

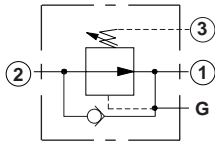
## Line Mounted Assemblies

# THREE PORT PRESSURE REDUCING APPLICATIONS (BODIES WITH REVERSE FREE FLOW CHECK)

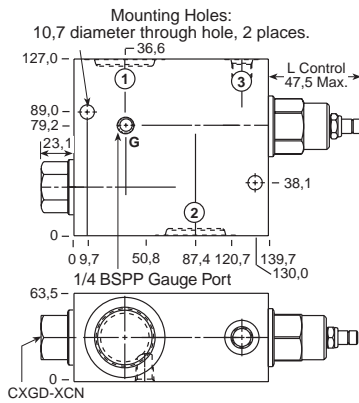
### PILOT OPERATED ASSEMBLIES

Go to [www.sunhydraulics.com](http://www.sunhydraulics.com)  
for more product information.

### 0-160 L/min. Cavity T-17A

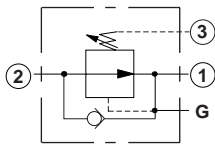


Ports 1 and 2	Port 3	Assembly Model Code*
1" BSPP	1/4" BSPP	<b>PBHB-LAN-H2X</b>
1 1/4" BSPP	1/4" BSPP	<b>PBHB-LAN-H2Y</b>

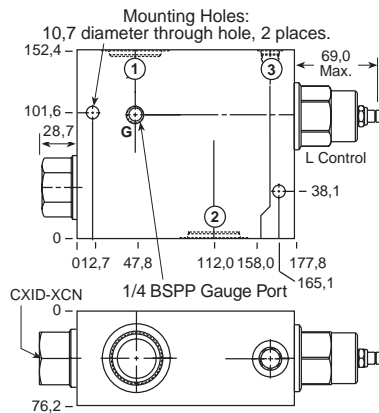


\*Add modifier **/S** to order SG Iron for pressure rating over 210 bar.

### 0-320 L/min. Cavity T-19A



Ports 1 and 2	Port 3	Assembly Model Code*
1" BSPP	1/4" BSPP	<b>PBJB-LAN-K2X</b>
1 1/4" BSPP	1/4" BSPP	<b>PBJB-LAN-K2Y</b>

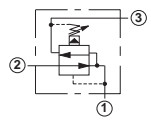
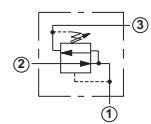
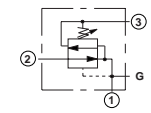
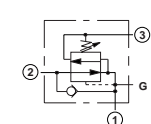
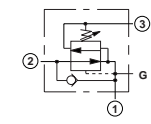
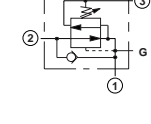


\*Add modifier **/S** to order SG Iron for pressure rating over 210 bar.

NOTES: Page 34 for cartridge model PB\*B-\*\*\* shows performance curves, technical tips, and options.  
See page vii for technical information about line mount bodies including SAE flange pattern specifications.  
Consult the Sun Factory for other port sizes available in the bodies shown above.

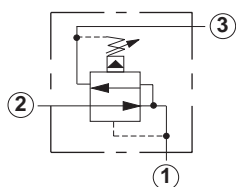


# Reducing/Relieving Assemblies

	<i>Cartridge Type</i>	<i>Page</i>
	Pilot Operated	42
	Direct Acting	42
<b><i>Line Mounted Assemblies (Body Type)</i></b>		
	90 Degree, High Capacity Port 3	44
	90 Degree, 1.50 SAE C61/C62 Flange Port, High Capacity Port 3	46
	90 Degree with Reverse Free Flow Check	47
	90 Degree with Reverse Free Flow Check, High Capacity Port 3	48

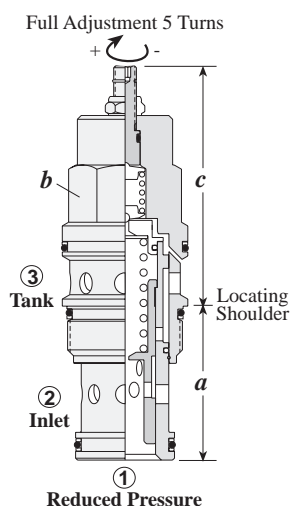
## Reducing/Relieving Valves

### PILOT OPERATED REDUCING/RELIEVING



Capacity	Typical Cartridge Model Code	Cavity	Cartridge Dimensions					Installation Torque (Nm)
			a	b	c			
					L	C	K	
40 L/min.	PPDB – LAN	T - 11A	34,9	22,2	64	66	70	40/50
80 L/min.	PPFB – LAN	T - 2A	34,9	28,6	72	74	78	60/70
160 L/min.	PPHB – LAN	T - 17A	46	31,8	89	86	90	200/215
320 L/min.	PPJB – LAN	T - 19A	63,5	41,3	100	104	107	465/500

### OPTION ORDERING INFORMATION



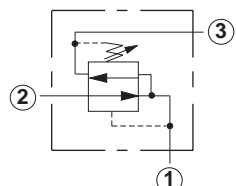
**PP \* B - \* \* \***

Nominal Capacity	Control**	Adjustment Range	Seal
D 40 L/min.	L Standard Screw	A 7 - 210 bar	N Buna-N
F 80 L/min.	C Tamper Resistant	W 10 - 315 bar	V Viton
H 160 L/min.	K Handknob	B 3,5 - 105 bar	
J 320 L/min.		N 4 - 55 bar	
		Q 4 - 25 bar	

*Adjustment Range Options:*  
 All are standard set at 14 bar.  
 Maximum pressure differentials for spring ranges:  
 A and B are 210 bar.  
 N and Q are 140 bar.  
 W is 350 bar inlet pressure.  
**Customer may specify pressure setting.**

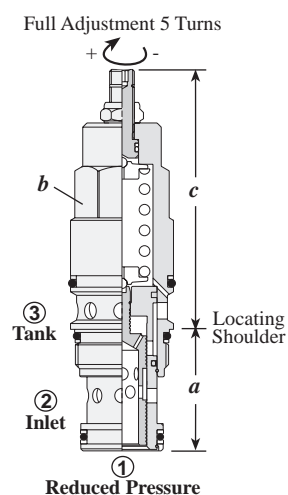
\*\* See page 244 for information on Control Options

### DIRECT ACTING REDUCING/RELIEVING



Capacity	Typical Cartridge Model Code	Cavity	Cartridge Dimensions					Installation Torque (Nm)
			a	b	c			
					L	C	K	
40 L/min.	PRDB – LAN	T - 11A	34,9	22,2	79	81	85	40/50
80 L/min.	PRFB – LAN	T - 2A	34,9	28,6	89	91	96	60/70
160 L/min.	PRHB – LAN	T - 17A	46	31,8	100	102	107	200/215
320 L/min.	PRJB – LAN	T - 19A	63,5	41,11	123,8	127,8	130,2	465/500

### OPTION ORDERING INFORMATION



**PR \* B - \* \* \***

Nominal Capacity	Control**	Adjustment Range	Seal
D 40 L/min.	L Standard Screw	A 35 - 210 bar	N Buna-N
F 80 L/min.	C Tamper Resistant	W 50 - 315 bar	V Viton
H 160 L/min.	K Handknob	B 3,5 - 105 bar	
J 320 L/min.		D 1,5 - 55 bar	
		E 1,5 - 25 bar	
		S 1,5 - 14 bar	

*Adjustment Range Options:*  
**PRDB Only:**  
 A, W are standard set at 70 bar.  
 B, D, E, S are standard set at 14 bar.  
**PRFB, PRHB, PRJB:**  
 A, W are standard set at 70 bar.  
 B is standard set at 38 bar.  
 D is standard set at 25 bar.  
 E is standard set at 14 bar.  
 S is standard set at 7 bar.

\*\* See page 244 for information on Control Options

**Maximum Inlet Pressure: 350 bar**  
**Customer may specify pressure setting.**

## TECHNICAL TIPS / PERFORMANCE CURVES

### Reducing/Relieving Valves, Pilot Operated

#### Applications

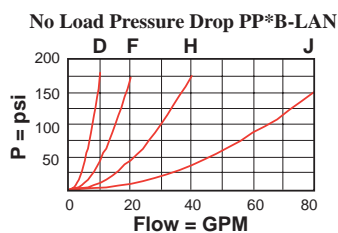
Pilot operated reducing/relieving cartridges may be used interchangeably with reducing valve, however, they have one additional function; they will maintain a constant pressure at port 1 during reverse flow conditions to port three.

#### Design Concepts and Features

- Low hysteresis for accurate pressure regulation.
- Minimal dead-band provides low transition pressure between reducing and relieving modes.
- Low pilot control flow, 0,15 to 0,35 L/min. dependent on frame size.
- Pressure at port 3 is directly additive to valve setting and should not exceed 210 bar.

**Note:** Maximum pressure differentials, inlet to outlet, see adjustment ranges on page 42.

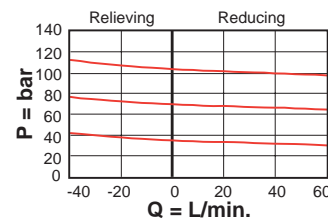
**Note:** Reducing/relieving valves require a body with a high capacity third port.



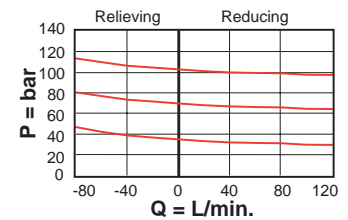
#### Performance Curves

##### Regulated Pressure

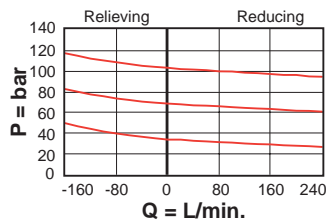
#### PPDB-L\*N



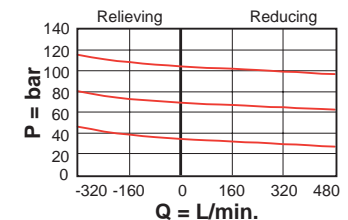
#### PPFB-L\*N



#### PPHB-L\*N



#### PPJB-L\*N



### Reducing/Relieving Valves, Direct Acting

#### Applications

Direct acting reducing/relieving cartridges may be used interchangeably with pilot operated units. These valves offer low internal leakage and increased reliability in contaminated systems, this makes them ideal choices in accumulator and brake circuits. They exhibit lower overshoot characteristics than pilot operated valves and should therefore be considered in clamping circuits.

#### Design Concepts and Features

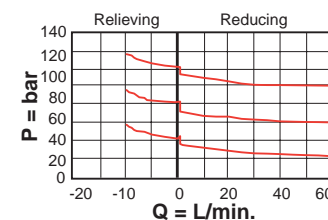
- Damped differential construction for stable operation.
- Low internal leakage in both no flow and control flow modes; 30 to 80 cc/min @ 210 bar.
- Multiple spring ranges for optimum control

**Note:** Maximum pressure differentials, inlet to outlet, see adjustment ranges on page 42.

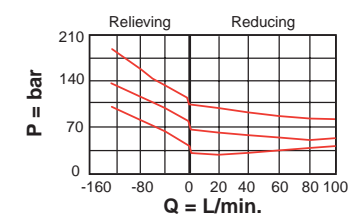
#### Performance Curves

##### Regulated Pressure

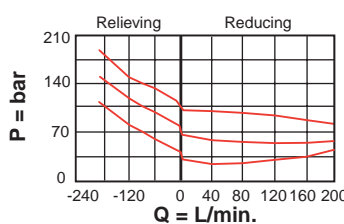
#### PRDB-L\*N



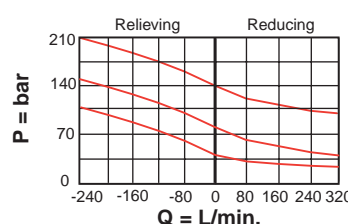
#### PRFB-L\*N



#### PRHB-L\*N



#### PRJB-L\*N



### General Application Requirements

- Operating Temperature Range: Buna-N seals -45° C to 90° C, Viton seals -15° C to 120° C.
- Viscosity Range: 10-600 centistokes.
- Fluid Contamination Level: ISO 4406 18/15 or better; Recommend  $\beta_{10} \geq 75$  to achieve ISO 18/15 or better in most systems.
- Factory Pressure Setting for cartridge is established at zero flow rate.

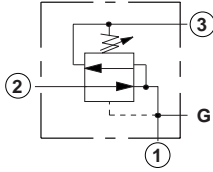
## Line Mounted Assemblies

# THREE PORT PRESSURE REDUCING/RELIEVING APPLICATIONS (90 DEGREE, HIGH CAPACITY PORT 3 BODIES)

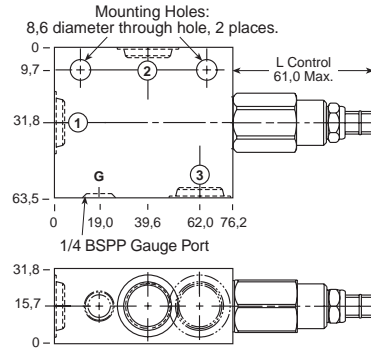
### PILOT OPERATED ASSEMBLIES

Go to [www.sunhydraulics.com](http://www.sunhydraulics.com) for more product information.

### DIRECT ACTING ASSEMBLIES



### 0-40 L/min. Cavity T-11A

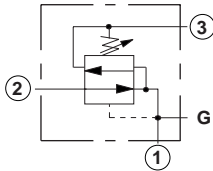


Ports 1 and 2	Port 3	Assembly Model Code*
3/8 BSPP	3/8 BSPP	<b>PRDB-LAN-ELU</b>
1/2" BSPP	3/8" BSPP	<b>PPDB-LAN-ELV</b>

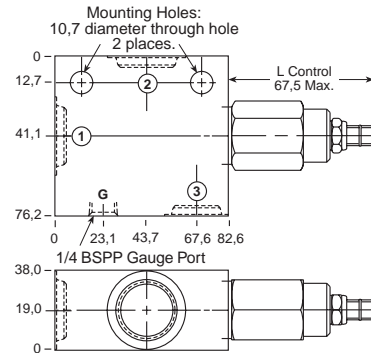
Ports 1 and 2	Port 3	Assembly Model Code*
3/8" BSPP	3/8" BSPP	<b>PRDB-LAN-ELU</b>
1/2" BSPP	3/8" BSPP	<b>PRDB-LAN-ELV</b>

\*Add modifier /S to order SG Iron for pressure rating over 210 bar.

\*Add modifier /S to order SG Iron for pressure rating over 210 bar.



### 0-80 L/min. Cavity T-2A



Ports 1 and 2	Port 3	Assembly Model Code*
1/2" BSPP	1/2" BSPP	<b>PPFB-LAN-BLV</b>
3/4" BSPP	1/2" BSPP	<b>PPFB-LAN-BLW</b>

Ports 1 and 2	Port 3	Assembly Model Code*
1/2" BSPP	1/2" BSPP	<b>PRFB-LAN-BLV</b>
3/4" BSPP	1/2" BSPP	<b>PRFB-LAN-BLW</b>

\*Add modifier /S to order SG Iron for pressure rating over 210 bar.

\*Add modifier /S to order SG Iron for pressure rating over 210 bar.

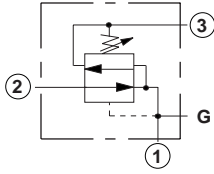
NOTES: Page 42 for cartridge models PP\*B-\*\*\* and PR\*B-\*\*\* show performance curves, technical tips, and options. See page vii for technical information about line mount bodies including SAE flange pattern specifications. Consult the Sun Factory for other port sizes available in the bodies shown above. Model Codes printed in red are Preferred Products and are readily available.

# THREE PORT PRESSURE REDUCING/RELIEVING APPLICATIONS (90 DEGREE, HIGH CAPACITY PORT 3 BODIES)

## PILOT OPERATED ASSEMBLIES

Go to [www.sunhydraulics.com](http://www.sunhydraulics.com) for more product information.

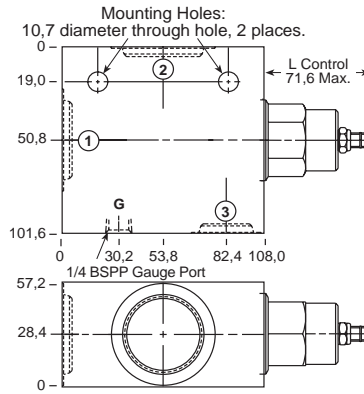
## DIRECT ACTING ASSEMBLIES



Ports 1 and 2	Port 3	Assembly Model Code*
1" BSPP	3/4" BSPP	<b>PPHB-LAN-HEX</b>
1 1/4" BSPP	3/4" BSPP	<b>PPHB-LAN-HEY</b>

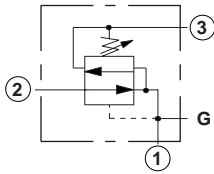
\*Add modifier /S to order SG Iron for pressure rating over 210 bar.

### 0-160 L/min. Cavity T-17A



Ports 1 and 2	Port 3	Assembly Model Code*
1" BSPP	3/4" BSPP	<b>PRHB-LAN-HEX</b>
1 1/4" BSPP	3/4" BSPP	<b>PRHB-LAN-HEY</b>

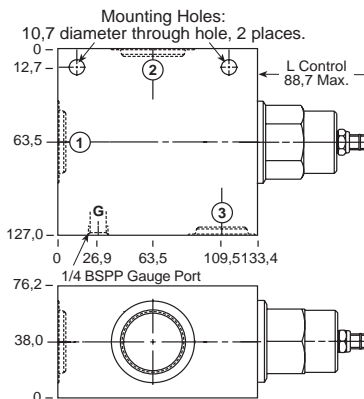
\*Add modifier /S to order SG Iron for pressure rating over 210 bar.



Ports 1 and 2	Port 3	Assembly Model Code*
1" BSPP	1" BSPP	<b>PPJB-LAN-KEX</b>
1 1/4" BSPP	1" BSPP	<b>PPJB-LAN-KEY</b>

\*Add modifier /S to order SG Iron for pressure rating over 210 bar.

### 0-320 L/min. Cavity T-19A



Ports 1 and 2	Port 3	Assembly Model Code*
1" BSPP	1" BSPP	<b>PRJB-LAN-KEX</b>
1 1/4" BSPP	1" BSPP	<b>PRJB-LAN-KEY</b>

\*Add modifier /S to order SG Iron for pressure rating over 210 bar.

NOTES: Page 42 for cartridge models PP\*B-\*\*\* and PR\*B-\*\*\* show performance curves, technical tips, and options. See page vii for technical information about line mount bodies including SAE flange pattern specifications. Consult the Sun Factory for other port sizes available in the bodies shown above. Model Codes printed in red are Preferred Products and are readily available.

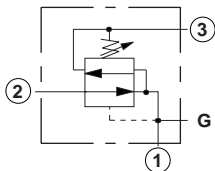
## Line Mounted Assemblies

# THREE PORT PRESSURE REDUCING/RELIEVING APPLICATIONS (90 DEGREE, 1.50" SAE C61/C62 FLANGE PORT BODIES, HIGH CAPACITY PORT 3)

### PILOT OPERATED ASSEMBLIES

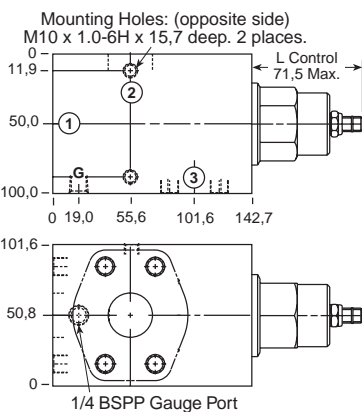
Go to [www.sunhydraulics.com](http://www.sunhydraulics.com) for more product information.

### DIRECT ACTING ASSEMBLIES



Ports  
1, 2, and 3  
1 1/2" SAE C61  
Assembly  
Model Code\*  
**PPJB-LAN-KER/M**

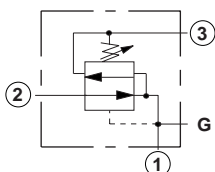
### 0-320 L/min. Cavity T-19A



Ports  
1, 2, and 3  
1 1/2" SAE C61  
Assembly  
Model Code\*  
**PRJB-LAN-KER/M**

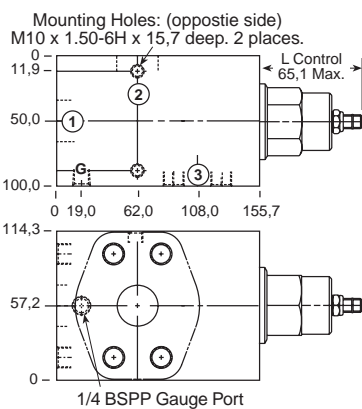
\*Add modifier **/T** to order SG Iron for pressure rating over 210 bar.

\*Add modifier **/T** to order SG Iron for pressure rating over 210 bar.



Ports  
1, 2, and 3  
1 1/2" SAE C62  
Assembly  
Model Code\*  
**PPJB-LAN-KE6/M**

### 0-320 L/min. Cavity T-19A



Ports  
1, 2, and 3  
1 1/2" SAE C62  
Assembly  
Model Code\*  
**PRJB-LAN-KE6/M**

\*Add modifier **/T** to order SG Iron for pressure rating over 210 bar.

\*Add modifier **/T** to order SG Iron for pressure rating over 210 bar.

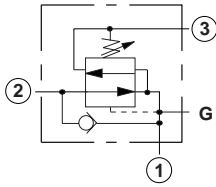
NOTES: Page 42 for cartridge model PP\*B-\*\*\* show performance curves, technical tips, and options.  
See page vii for technical information about line mount bodies including SAE flange information and port specifications.  
Consult the Sun Factory for other port sizes available in the bodies shown above.

# THREE PORT PRESSURE REDUCING/RELIEVING APPLICATIONS (BODIES WITH REVERSE FREE FLOW CHECK)

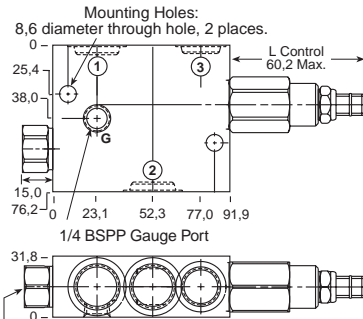
## PILOT OPERATED ASSEMBLIES

Go to [www.sunhydraulics.com](http://www.sunhydraulics.com) for more product information.

## DIRECT ACTING ASSEMBLIES



### 0-40 L/min. Cavity T-11A

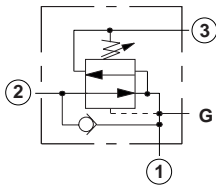


Ports 1 and 2	Port 3	Assembly Model Code*
3/8" BSPP	3/8" BSPP	PPDB-LAN-E4U
1/2" BSPP	3/8" BSPP	PPDB-LAN-E4V

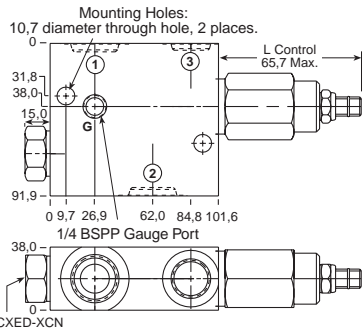
Ports 1 and 2	Port 3	Assembly Model Code*
3/8" BSPP	3/8" BSPP	PRDB-LAN-E4U
1/2" BSPP	3/8" BSPP	PRDB-LAN-E4V

\*Add modifier /S to order SG Iron for pressure rating over 210 bar.

\*Add modifier /S to order SG Iron for pressure rating over 210 bar.



### 0-80 L/min. Cavity T-2A



Ports 1 and 2	Port 3	Assembly Model Code*
1/2" BSPP	1/2" BSPP	PPFB-LAN-B4V
3/4" BSPP	1/2" BSPP	PPFB-LAN-B4W

Ports 1 and 2	Port 3	Assembly Model Code*
1/2" BSPP	1/2" BSPP	PRFB-LAN-B4V
3/4" BSPP	1/2" BSPP	PRFB-LAN-B4W

\*Add modifier /S to order SG Iron for pressure rating over 210 bar.

\*Add modifier /S to order SG Iron for pressure rating over 210 bar.

NOTES: Page 42 for cartridge models PP\*B-\*\*\* and PR\*B-\*\*\* show performance curves, technical tips, and options. See page vii for technical information about line mount bodies including SAE flange pattern specifications. Consult the Sun Factory for other port sizes available in the bodies shown above.

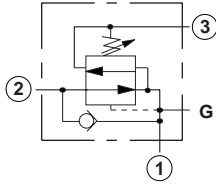
## Line Mounted Assemblies

# THREE PORT PRESSURE REDUCING/RELIEVING APPLICATIONS (BODIES WITH REVERSE FREE FLOW CHECK, HIGH CAPACITY PORT 3)

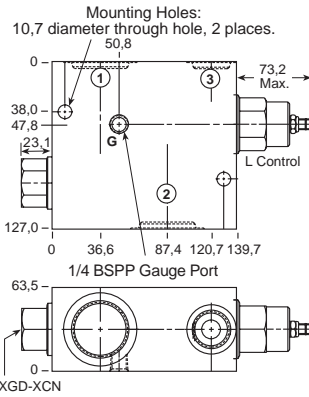
### PILOT OPERATED ASSEMBLIES

Go to [www.sunhydraulics.com](http://www.sunhydraulics.com)  
for more product information.

### DIRECT ACTING ASSEMBLIES



### 0-160 L/min. Cavity T-17A

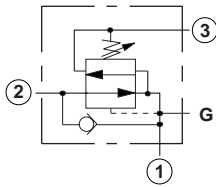


Ports 1 and 2	Port 3	Assembly Model Code*
1" BSPP	3/4" BSPP	PPHB-LAN-H4X
1 1/4" BSPP	3/4" BSPP	PPHB-LAN-H4Y

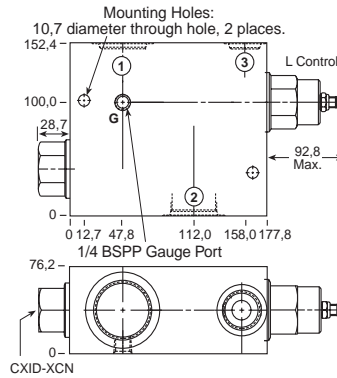
Ports 1 and 2	Port 3	Assembly Model Code*
1" BSPP	3/4" BSPP	PRHB-LAN-H4X
1 1/4" BSPP	3/4" BSPP	PRHB-LAN-H4Y

\*Add modifier /S to order SG Iron for pressure rating over 210 bar.

\*Add modifier /S to order SG Iron for pressure rating over 210 bar.



### 0-320 L/min. Cavity T-19A



Ports 1 and 2	Port 3	Assembly Model Code*
1" BSPP	3/4" BSPP	PPJB-LAN-K4X
1 1/4" BSPP	3/4" BSPP	PPJB-LAN-K4Y

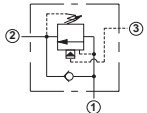
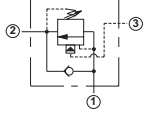
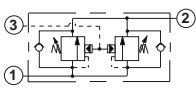
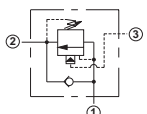
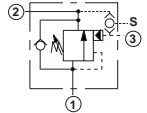
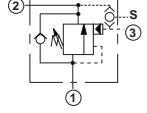
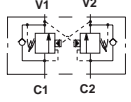
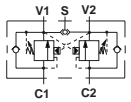
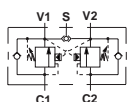
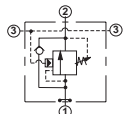
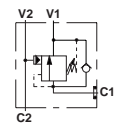
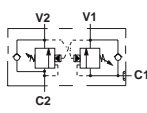
Ports 1 and 2	Port 3	Assembly Model Code*
1" BSPP	3/4" BSPP	PRJB-LAN-K4X
1 1/4" BSPP	3/4" BSPP	PRJB-LAN-K4Y

\*Add modifier /S to order SG Iron for pressure rating over 210 bar.

NOTES: Page 42 for cartridge models PP\*B-\*\*\* and PR\*B-\*\*\* show performance curves, technical tips, and options.  
See page vii for technical information about line mount bodies including SAE flange pattern specifications.  
Consult the Sun Factory for other port sizes available in the bodies shown above.

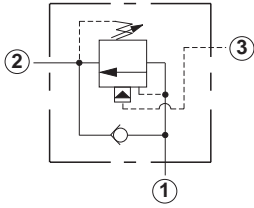


# Three Port Counterbalance Assemblies

	<i>Cartridge Type</i>	<i>Page</i>
	Standard, 280 bar Maximum Setting	50
	Standard, 350 bar Maximum Setting	50
<b><i>Line Mounted Assemblies (Body Type)</i></b>		
	90 Degree	52
	90 Degree 2.00" C61/C62 Flange Port, 2 Cavities	54
	Inline	55
	90 Degree with Shuttle	56
	90 Degree 1.50" C61/C62 SAE Flange Port with Shuttle, 2 Cavities	57
	90 Degree Cross-Piloted, 2 Cavities	58
	90 Degree Cross-Piloted, 1.50" SAE C61/C62 Flange Port, 2 Cavities	59
	Inline/Inline Cross-Piloted, 1.50" SAE C61 Flange Port, 2 Cavities	60
	90 Degree Cross-Piloted with Shuttle, 2 Cavities	61
	Cross-Piloted, 1.50" SAE C61/C62 Flange Port with Shuttle, 2 Cavities	62
	Inline Cross-Piloted with Shuttle, 2 Cavities	63
	Direct Mount .75"/1.00"/1.25" SAE C61 Flange Port, Through Pilot	64
	Gasket Mount	66
	Gasket Mount, 2 Cavities	67

## Counterbalance Valves

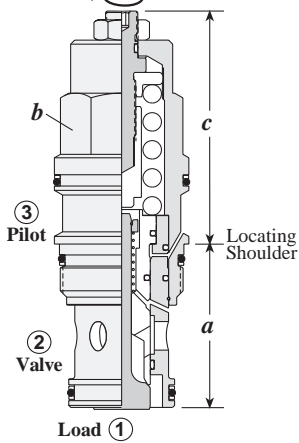
### STANDARD, 280 BAR MAXIMUM SETTING



Capacity	Typical Cartridge Model Code	Cavity	Cartridge Dimensions				Installation Torque (Nm)
			a	b	L	C	
60 L/min.	<b>CBCA – LHN</b>	T - 11A	34,9	22,2	50	56	40/50
120 L/min.	<b>CBEA – LHN</b>	T - 2A	34,9	28,6	61	64	60/70
240 L/min.	<b>CBGA – LHN</b>	T - 17A	46	31,8	70	84	200/215
480 L/min.	<b>CBIA – LHN</b>	T - 19A	63,5	41,3	90	104	465/500

### OPTION ORDERING INFORMATION

Turn screw clockwise to reduce setting and release load. Complete Adjustment 3 Turns

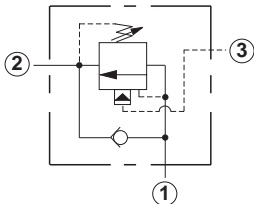


Nominal Capacity	Control**		Cracking Pressure		Seal
	Control**	Version	Cracking Pressure	Cracking Pressure	
<b>C</b> 60 L/min.	<b>L</b> Standard Screw		<b>2 Bar Check Spring</b>	<b>N</b> Buna-N	
<b>E</b> 120 L/min.	<b>C</b> Tamper Resistant		<b>H</b> 70 - 280 bar	<b>V</b> Viton	
<b>G</b> 240 L/min.			<b>I</b> 25 - 105 bar		
<b>I</b> 480 L/min.			<b>0,3 Bar Check Spring</b>		
	<b>A</b> 3:1 Pilot Ratio		<b>A</b> 70 - 280 bar		
	<b>B</b> 1.5:1 Pilot Ratio (with sealed pilot)		<b>B</b> 25 - 105 bar		
	<b>Y</b> 2:1 Pilot Ratio (with bleed through pilot)				

Adjustment Range Options:  
A and H are standard set at 210 bar.  
I and B are standard set at 70 bar.  
Customer may specify setting.

\*\* See page 244 for information on Control Options

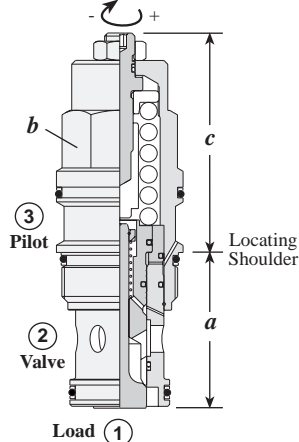
### STANDARD, 350 BAR MAXIMUM SETTING



Capacity	Typical Cartridge Model Code	Cavity	Cartridge Dimensions				Installation Torque (Nm)
			a	b	L	C	
60 L/min.	<b>CBCG – LJN</b>	T - 11A	34,9	22,2	50	56	40/50
120 L/min.	<b>CBEG – LJN</b>	T - 2A	34,9	28,6	61	64	60/70
240 L/min.	<b>CBGG – LJN</b>	T - 17A	46	31,8	70	84	200/215
480 L/min.	<b>CBIG – LJN</b>	T - 19A	63,5	41,3	90	104	465/500

### OPTION ORDERING INFORMATION

Turn screw clockwise to reduce setting and release load. Complete Adjustment 3 Turns



Nominal Capacity	Control**		Cracking Pressure		Seal
	Control**	Version	Cracking Pressure	Cracking Pressure	
<b>C</b> 60 L/min.	<b>L</b> Standard Screw		<b>2 Bar Check Spring</b>	<b>N</b> Buna-N	
<b>E</b> 120 L/min.	<b>C</b> Tamper Resistant		<b>J</b> 140 - 350 bar	<b>V</b> Viton	
<b>G</b> 240 L/min.			<b>K</b> 70 - 175 bar		
<b>I</b> 480 L/min.			<b>0,3 Bar Check Spring</b>		
	<b>G</b> 4.5:1 Pilot Ratio		<b>C</b> 140 - 350 bar		
	<b>H</b> 10:1 Pilot Ratio		<b>D</b> 70 - 175 bar		
	<b>L</b> 2.3:1 Pilot Ratio (with sealed pilot)				

Adjustment Range Options:  
J and C are standard set at 210 bar.  
K and D are standard set at 140 bar.  
Customer may specify setting.

\*\* See page 244 for information on Control Options

## TECHNICAL TIPS / PERFORMANCE CURVES

### Counterbalance Valves, 3:1, 1.5:1 and 2:1 Pilot Ratio, External Pilot, Non-vented

#### Applications

The Sun three port counterbalance cartridges (with pilot to open assist) are modulating devices that allow free flow from port 2 (inlet) to port 1 (load) and then block reverse flow until a pilot pressure inversely proportional to the load pressure is sensed at port 3 (pilot) or load pressure exceeds relief setting. These valves improve the motion control of most control valve systems by ensuring that the actuator always sees a positive load pressure, even under overrunning load situations.

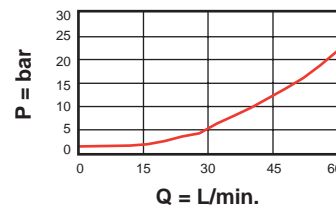
#### Design Concepts and Features

- Recommended minimum setting should be 1.3 times maximum load induced pressure.
- 3:1, 1.5:1, 2:1 pilot ratio, load holding to 210 bar (with 280 bar setting).
- Load reactive pilot assist for overcentre load control applications.
- 5 drops/min. maximum leakage at reseal.
- Reseat exceeds 85% of set pressure at standard setting.
- Back pressure at Port 2 may adversely affect operation of valve. For circuits with back pressure Sun recommends vented counterbalance valves CW\*\* (vented valves).

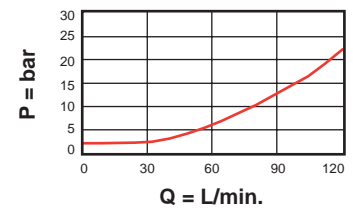
#### Performance Curves

##### Free Flow and Pilot Open Pressure Drop

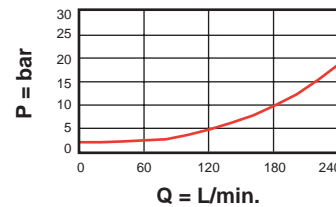
CBC\*-L\*N



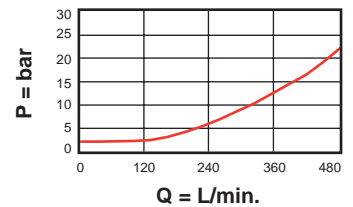
CBE\*-L\*N



CBG\*-L\*N



CBI\*-L\*N



### Counterbalance Valves, 4.5:1, 10:1 and 2.3:1 Pilot Ratio, External Pilot, Non-vented

#### Applications

The Sun three port counterbalance cartridges (with pilot to open assist) are modulating devices that allow free flow from port 2 (inlet) to port 1 (load) and then block reverse flow until a pilot pressure inversely proportional to the load pressure is sensed at port 3 (pilot) or load pressure exceeds relief setting. These valves improve the motion control of most control valve systems by ensuring that the actuator always sees a positive load pressure, even under overrunning load situations.

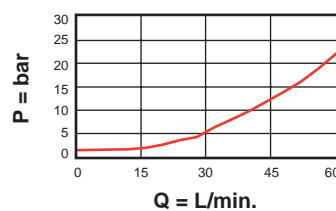
#### Design Concepts and Features

- Recommended minimum setting should be 1.3 times maximum load induced pressure.
- 4.5:1 10:1, 2.3:1 pilot ratio, load holding to 280 bar (with 350 bar setting).
- Load reactive pilot assist for overcentre load control applications.
- 5 drops/min. maximum leakage at reseal.
- Reseat exceeds 85% of set pressure at standard setting.
- Back pressure at Port 2 may adversely affect operation of valve. For circuits with back pressure Sun recommends vented counterbalance valves CW\*\* (vented valves).

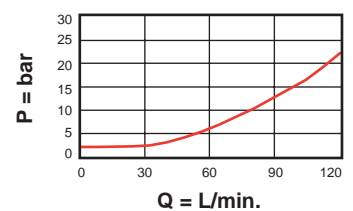
#### Performance Curves

##### Free Flow and Pilot Open Pressure Drop

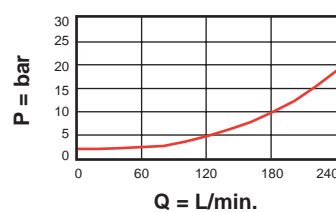
CBC\*-L\*N



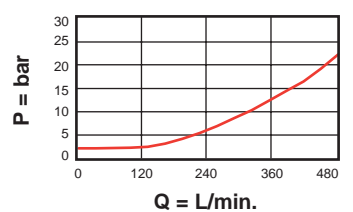
CBE\*-L\*N



CBG\*-L\*N



CBI\*-L\*N



### General Application Requirements

- Operating Temperature Range: Buna-N seals -45° C to 90° C, Viton seals -15° C to 120° C.
- Viscosity Range: 10-600 centistokes.
- Fluid Contamination Level: ISO 4406 18/15 or better; Recommend  $\beta_{10} \geq 75$  to achieve ISO 18/15 or better in most systems.
- Factory Pressure Setting for cartridge is established at cracking flow 35 cc/min.

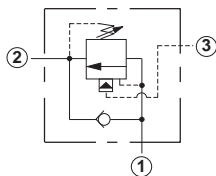
## Line Mounted Assemblies

# THREE PORT LOAD CONTROL APPLICATIONS (90 DEGREE BODIES)

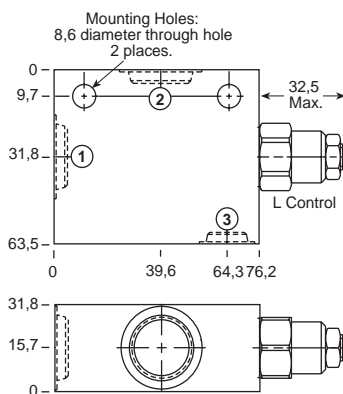
**PILOT RATIO**  
3:1, 1.5:1, 2:1

Go to [www.sunhydraulics.com](http://www.sunhydraulics.com)  
for more product information.

**PILOT RATIO**  
2.3:1, 4.5:1, 10:1



### 0-60 L/min. Cavity T-11A

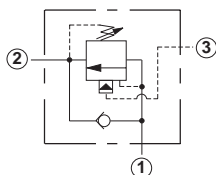


Ports 1 and 2	Port 3	Assembly Model Code*
3/8" BSPP	1/4" BSPP	<b>CBC*-LHN-ECU</b>
1/2" BSPP	1/4" BSPP	<b>CBC*-LHN-ECV</b>

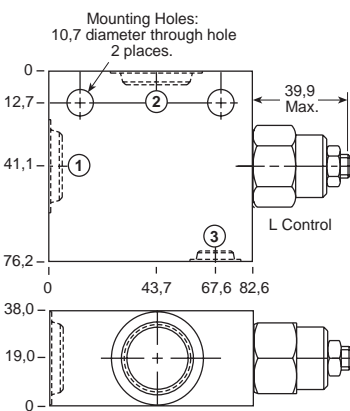
Ports 1 and 2	Port 3	Assembly Model Code*
3/8" BSPP	1/4" BSPP	<b>CBC*-LJN-ECU</b>
1/2" BSPP	1/4" BSPP	<b>CBC*-LJN-ECV</b>

\*The asterisk (\*) shown in the fourth digit of the model code indicates the counterbalance pilot ratio of the cartridge and must be specified by customer. See page 50. Add modifier /S to order SG Iron for pressure rating over 210 bar.

\*The asterisk (\*) shown in the fourth digit of the model code indicates the counterbalance pilot ratio of the cartridge and must be specified by customer. See page 50. Add modifier /S to order SG Iron for pressure rating over 210 bar.



### 0-120 L/min. Cavity T-2A



Ports 1 and 2	Port 3	Assembly Model Code*
1/2" BSPP	1/4" BSPP	<b>CBE*-LHN-BCV</b>
3/4" BSPP	1/4" BSPP	<b>CBE*-LHN-BCW</b>

Ports 1 and 2	Port 3	Assembly Model Code*
1/2" BSPP	1/4" BSPP	<b>CBE*-LJN-BCV</b>
3/4" BSPP	1/4" BSPP	<b>CBE*-LJN-BCW</b>

\*The asterisk (\*) shown in the fourth digit of the model code indicates the counterbalance pilot ratio of the cartridge and must be specified by customer. See page 50. Add modifier /S to order SG Iron for pressure rating over 210 bar.

\*The asterisk (\*) shown in the fourth digit of the model code indicates the counterbalance pilot ratio of the cartridge and must be specified by customer. See page 50. Add modifier /S to order SG Iron for pressure rating over 210 bar.

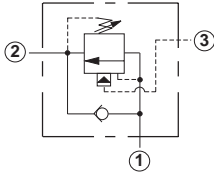
NOTES: Page 50 for cartridge models CB\*\*-\* shows performance curves, technical tips, and options.  
See page vii for technical information about line mount bodies including SAE flange pattern specifications.  
Consult the Sun Factory for other port sizes available in the bodies shown above.  
Model Codes printed in red are Preferred Products and are readily available.

# THREE PORT LOAD CONTROL APPLICATIONS (90 DEGREE BODIES)

**PILOT RATIO**  
3:1, 1.5:1, 2:1

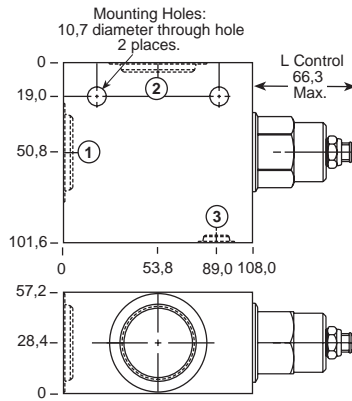
Go to [www.sunhydraulics.com](http://www.sunhydraulics.com)  
for more product information.

**PILOT RATIO**  
2.3:1, 4.5:1, 10:1



Ports 1 and 2	Port 3	Assembly Model Code*
1" BSPP	1/4" BSPP	<b>CBG*-LHN-HCX</b>
1 1/4" BSPP	1/4" BSPP	<b>CBG*-LHN-HCY</b>

## 0-240 L/min. Cavity T-17A



Ports 1 and 2	Port 3	Assembly Model Code*
1" BSPP	1/4" BSPP	<b>CBG*-LJN-HCX</b>
1 1/4" BSPP	1/4" BSPP	<b>CBG*-LJN-HCY</b>

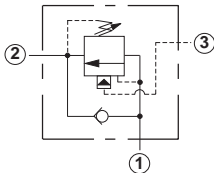
\*The asterisk (\*) shown in the fourth digit of the model code indicates the counterbalance pilot ratio of the cartridge and must be specified by customer. See page 50. Add modifier /S to order SG Iron for pressure rating over 210 bar.

\*The asterisk (\*) shown in the fourth digit of the model code indicates the counterbalance pilot ratio of the cartridge and must be specified by customer. See page 50. Add modifier /S to order SG Iron for pressure rating over 210 bar.

**PILOT RATIO**  
3:1, 1.5:1, 2:1

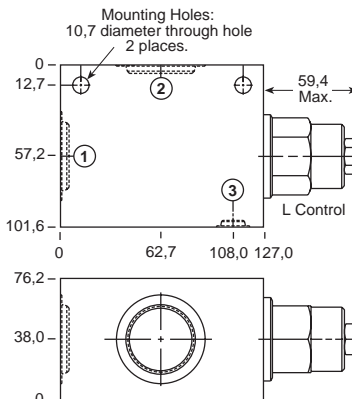
Go to [www.sunhydraulics.com](http://www.sunhydraulics.com)  
for more product information.

**PILOT RATIO**  
2.3:1, 4.5:1, 10:1



Ports 1 and 2	Port 3	Assembly Model Code*
1" BSPP	1/4" BSPP	<b>CBI*-LHN-KCX</b>
1 1/4" BSPP	1/4" BSPP	<b>CBI*-LHN-KCY</b>

## 0-480 L/min. Cavity T-19A



Ports 1 and 2	Port 3	Assembly Model Code*
1" BSPP	1/4" BSPP	<b>CBI*-LJN-KCX</b>
1 1/4" BSPP	1/4" BSPP	<b>CBI*-LJN-KCY</b>

\*The asterisk (\*) shown in the fourth digit of the model code indicates the counterbalance pilot ratio of the cartridge and must be specified by customer. See page 50. Add modifier /S to order SG Iron for pressure rating over 210 bar.

\*The asterisk (\*) shown in the fourth digit of the model code indicates the counterbalance pilot ratio of the cartridge and must be specified by customer. See page 50. Add modifier /S to order SG Iron for pressure rating over 210 bar.

NOTES: Page 50 for cartridge models CB\*\*-\* shows performance curves, technical tips, and options.  
See page vii for technical information about line mount bodies including SAE flange pattern specifications.  
Consult the Sun Factory for other port sizes available in the bodies shown above.  
Model Codes printed in red are Preferred Products and are readily available.

## Line Mounted Assemblies

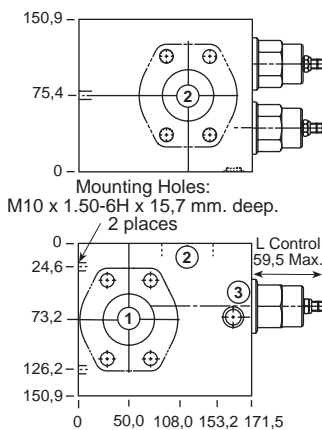
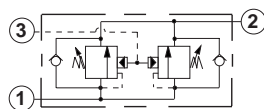
# THREE PORT LOAD CONTROL APPLICATIONS (90 DEGREE 2.00" C61/C62 FLANGE PORT BODIES, 2 CAVITIES)

**PILOT RATIO**  
3:1, 1.5:1, 2:1

Go to [www.sunhydraulics.com](http://www.sunhydraulics.com)  
for more product information.

**PILOT RATIO**  
2.3:1, 4.5:1, 10:1

### 0-960 L/min. Cavity T-19A



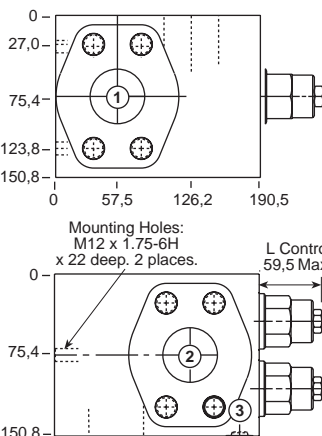
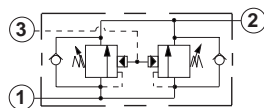
Ports 1 and 2	Port 3	Assembly Model Code*
2" SAE C61	1/4" BSPP	<b>CBI*-LHN-XZZ/M</b>

Ports 1 and 2	Port 3	Assembly Model Code*
2" SAE C61	1/4" BSPP	<b>CBI*-LJN-XZZ/M</b>

\*Add modifier **/T** to order SG Iron for pressure rating over 210 bar.

\*Add modifier **/T** to order SG Iron for pressure rating over 210 bar.

### 0-960 L/min. Cavity T-19A



Ports 1 and 2	Port 3	Assembly Model Code*
2" SAE C62	1/4" BSPP	<b>CBI*-LHN-Z8Z/M</b>

Ports 1 and 2	Port 3	Assembly Model Code*
2" SAE C62	1/4" BSPP	<b>CBI*-LJN-Z8Z/M</b>

\*Add modifier **/T** to order SG Iron for pressure rating over 210 bar.

\*Add modifier **/T** to order SG Iron for pressure rating over 210 bar.

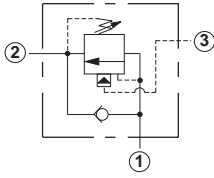
NOTES: Page 50 for cartridge models CB\*\*-\* shows performance curves, technical tips, and options.  
See page vii for technical information about line mount bodies including SAE flange pattern specifications.  
Consult the Sun Factory for other port sizes available in the bodies shown above.

# THREE PORT LOAD CONTROL APPLICATIONS (INLINE BODIES)

**PILOT RATIO**  
3:1, 1.5:1, 2:1

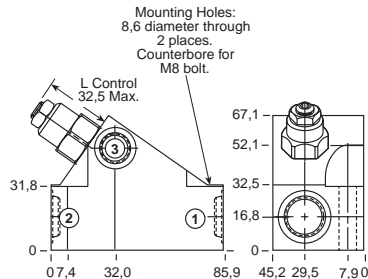
Go to [www.sunhydraulics.com](http://www.sunhydraulics.com)  
for more product information.

**PILOT RATIO**  
2.3:1, 4.5:1, 10:1



## 0-60 L/min. Cavity T-11A

Ports 1 and 2	Port 3	Assembly Model Code*
3/8" BSPP	1/4" BSPP	<b>CBC*-LHN-EJU</b>
1/2" BSPP	1/4" BSPP	<b>CBC*-LHN-EJV</b>

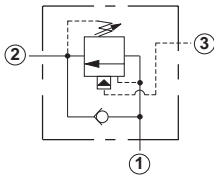


Ports 1 and 2	Port 3	Assembly Model Code*
3/8" BSPP	1/4" BSPP	<b>CBC*-LJN-EJU</b>
1/2" BSPP	1/4" BSPP	<b>CBC*-LJN-EJV</b>

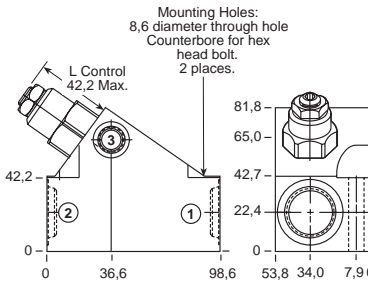
\*The asterisk (\*) shown in the fourth digit of the model code indicates the counterbalance pilot ratio of the cartridge and must be specified by customer. See page 50. Add modifier /S to order SG Iron for pressure rating over 210 bar.

\*The asterisk (\*) shown in the fourth digit of the model code indicates the counterbalance pilot ratio of the cartridge and must be specified by customer. See page 50. Add modifier /S to order SG Iron for pressure rating over 210 bar.

## 0-120 L/min. Cavity T-2A



Ports 1 and 2	Port 3	Assembly Model Code*
1/2" BSPP	1/4" BSPP	<b>CBE*-LHN-BVV</b>
3/4" BSPP	1/4" BSPP	<b>CBE*-LHN-BVW</b>

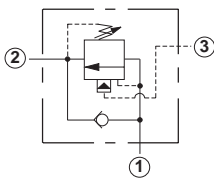


Ports 1 and 2	Port 3	Assembly Model Code*
1/2" BSPP	1/4" BSPP	<b>CBE*-LJN-BVV</b>
3/4" BSPP	1/4" BSPP	<b>CBE*-LJN-BVW</b>

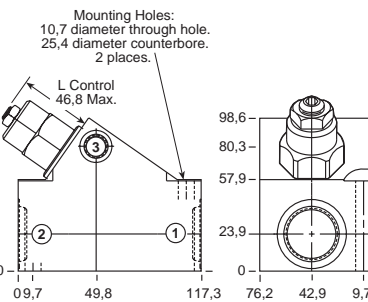
\*The asterisk (\*) shown in the fourth digit of the model code indicates the counterbalance pilot ratio of the cartridge and must be specified by customer. See page 50. Add modifier /S to order SG Iron for pressure rating over 210 bar.

\*The asterisk (\*) shown in the fourth digit of the model code indicates the counterbalance pilot ratio of the cartridge and must be specified by customer. See page 50. Add modifier /S to order SG Iron for pressure rating over 210 bar.

## 0-240 L/min. Cavity T-17A



Ports 1 and 2	Port 3	Assembly Model Code*
3/4" BSPP	1/4" BSPP	<b>CBG*-LHN-HDW</b>
1" BSPP	1/4" BSPP	<b>CBG*-LHN-HDX</b>



Ports 1 and 2	Port 3	Assembly Model Code*
3/4" BSPP	1/4" BSPP	<b>CBG*-LJN-HDW</b>
1" BSPP	1/4" BSPP	<b>CBG*-LJN-HDX</b>

\*The asterisk (\*) shown in the fourth digit of the model code indicates the counterbalance pilot ratio of the cartridge and must be specified by customer. See page 50. Add modifier /S to order SG Iron for pressure rating over 210 bar.

\*The asterisk (\*) shown in the fourth digit of the model code indicates the counterbalance pilot ratio of the cartridge and must be specified by customer. See page 50. Add modifier /S to order SG Iron for pressure rating over 210 bar.

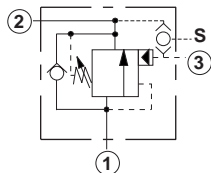
NOTES: Page 50 for cartridge models CB\*\*\_\*\*\* shows performance curves, technical tips, and options.  
See page vii for technical information about line mount bodies including SAE flange pattern specifications.  
Consult the Sun Factory for other port sizes available in the bodies shown above.  
**Model Codes printed in red are Preferred Products and are readily available.**

# THREE PORT LOAD CONTROL APPLICATIONS (90 DEGREE BODIES WITH SHUTTLE)

**PILOT RATIO**  
3:1, 1.5:1, 2:1

Go to [www.sunhydraulics.com](http://www.sunhydraulics.com)  
for more product information.

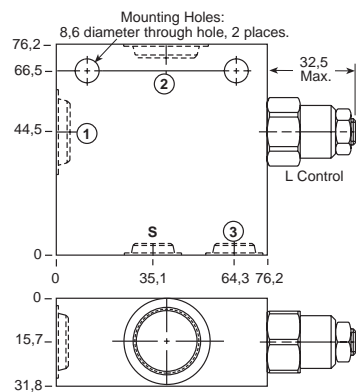
**PILOT RATIO**  
2.3:1, 4.5:1, 10:1



Ports 1 and 2	Port Shuttle and 3	Assembly Model Code*
3/8" BSPP	1/4" BSPP	<b>CBC*-LHN-EGU</b>
1/2" BSPP	1/4" BSPP	<b>CBC*-LHN-EGV</b>

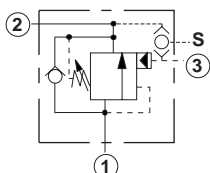
\*The asterisk (\*) shown in the fourth digit of the model code indicates the counterbalance pilot ratio of the cartridge and must be specified by customer. See page 50. Add modifier /S to order SG Iron for pressure rating over 210 bar.

## 0-60 L/min. Cavity T-11A



Ports 1 and 2	Port Shuttle and 3	Assembly Model Code*
3/8" BSPP	1/4" BSPP	<b>CBC*-LJN-EGU</b>
1/2" BSPP	1/4" BSPP	<b>CBC*-LJN-EGV</b>

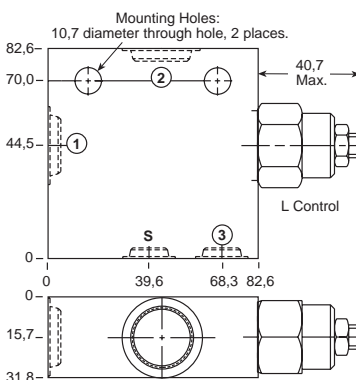
\*The asterisk (\*) shown in the fourth digit of the model code indicates the counterbalance pilot ratio of the cartridge and must be specified by customer. See page 50. Add modifier /S to order SG Iron for pressure rating over 210 bar.



Ports 1 and 2	Port Shuttle and 3	Assembly Model Code*
1/2" BSPP	1/4" BSPP	<b>CBE*-LHN-BGV</b>
3/4" BSPP	1/4" BSPP	<b>CBE*-LHN-BGV</b>

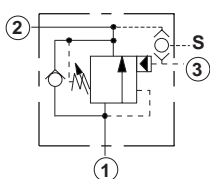
\*The asterisk (\*) shown in the fourth digit of the model code indicates the counterbalance pilot ratio of the cartridge and must be specified by customer. See page 50. Add modifier /S to order SG Iron for pressure rating over 210 bar.

## 0-120 L/min. Cavity T-2A



Ports 1 and 2	Port Shuttle and 3	Assembly Model Code*
1/2" BSPP	1/4" BSPP	<b>CBE*-LJN-BGV</b>
3/4" BSPP	1/4" BSPP	<b>CBE*-LJN-BGV</b>

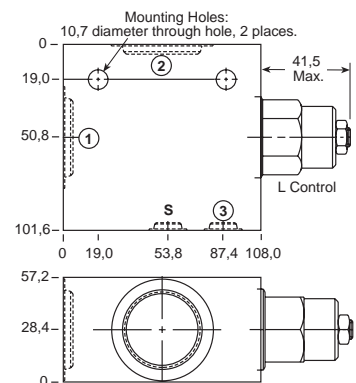
\*The asterisk (\*) shown in the fourth digit of the model code indicates the counterbalance pilot ratio of the cartridge and must be specified by customer. See page 50. Add modifier /S to order SG Iron for pressure rating over 210 bar.



Ports 1 and 2	Port Shuttle and 3	Assembly Model Code*
1" BSPP	1/4" BSPP	<b>CBG*-LHN-HGX</b>
1 1/4" BSPP	1/4" BSPP	<b>CBG*-LHN-HGY</b>

\*The asterisk (\*) shown in the fourth digit of the model code indicates the counterbalance pilot ratio of the cartridge and must be specified by customer. See page 50. Add modifier /S to order SG Iron for pressure rating over 210 bar.

## 0-240 L/min. Cavity T-17A



Ports 1 and 2	Port Shuttle and 3	Assembly Model Code*
1" BSPP	1/4" BSPP	<b>CBG*-LJN-HGX</b>
1 1/4" BSPP	1/4" BSPP	<b>CBG*-LJN-HGY</b>

\*The asterisk (\*) shown in the fourth digit of the model code indicates the counterbalance pilot ratio of the cartridge and must be specified by customer. See page 50. Add modifier /S to order SG Iron for pressure rating over 210 bar.

NOTES: Page 50 for cartridge models CB\*\*-\* shows performance curves, technical tips, and options.  
See page vii for technical information about line mount bodies including SAE flange pattern specifications.  
Consult the Sun Factory for other port sizes available in the bodies shown above.

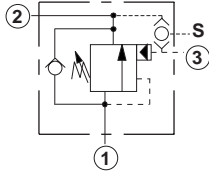


# THREE PORT LOAD CONTROL APPLICATIONS (90 DEGREE 1.50" SAE FLANGE PORT C61/C62 BODIES WITH SHUTTLE)

**PILOT RATIO**  
3:1, 1.5:1, 2:1

Go to [www.sunhydraulics.com](http://www.sunhydraulics.com)  
for more product information.

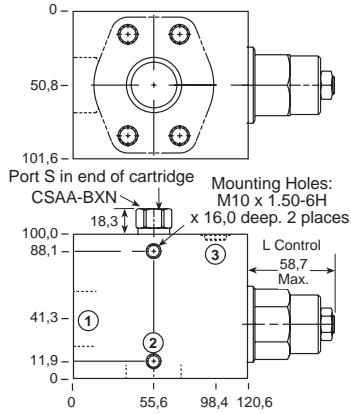
**PILOT RATIO**  
2.3:1, 4.5:1, 10:1



Ports 1 and 2	Port Shuttle and 3	Assembly Model Code*
1 1/2" SAE C61	1/4" BSPP	<b>CBI*-LHN-KGR/M</b>

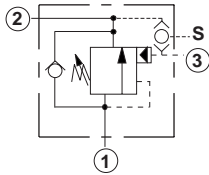
\*Add modifier **/T** to order SG Iron for pressure rating over 210 bar.

## 0-480 L/min. Cavity T-19A



Ports 1 and 2	Port Shuttle and 3	Assembly Model Code*
1 1/2" SAE C61	1/4" BSPP	<b>CBI*-LJN-KGR/M</b>

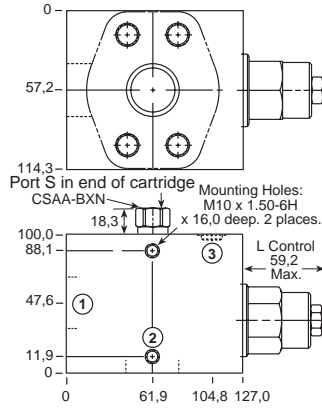
\*Add modifier **/T** to order SG Iron for pressure rating over 210 bar.



Ports 1 and 2	Port Shuttle and 3	Assembly Model Code*
1 1/2" SAE C62	1/4" BSPP	<b>CBI*-LHN-KG6/M</b>

\*Add modifier **/T** to order SG Iron for pressure rating over 210 bar.

## 0-480 L/min. Cavity T-19A



Ports 1 and 2	Port Shuttle and 3	Assembly Model Code*
1 1/2" SAE C62	1/4" BSPP	<b>CBI*-LJN-KG6/M</b>

\*Add modifier **/T** to order SG Iron for pressure rating over 210 bar.

NOTES: Page 50 for cartridge models CB\*\*-\* shows performance curves, technical tips, and options.  
See page vii for technical information about line mount bodies including SAE flange pattern specifications.  
Consult the Sun Factory for other port sizes available in the bodies shown above.

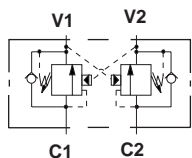
## Line Mounted Assemblies

# THREE PORT LOAD CONTROL APPLICATIONS (90 DEGREE CROSS-PILOTED BODIES, 2 CAVITIES)

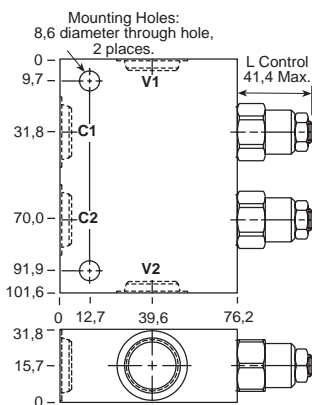
**PILOT RATIO**  
3:1, 1.5:1, 2:1

Go to [www.sunhydraulics.com](http://www.sunhydraulics.com)  
for more product information.

**PILOT RATIO**  
2.3:1, 4.5:1, 10:1



### 0-60 L/min. Cavity T-11A

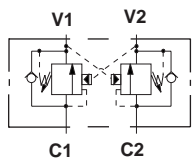


Ports C1, C2, V1 & V2	Assembly Model Code*
3/8" BSPP	<b>CBC*-LHN-YEU</b>
1/2" BSPP	<b>CBC*-LHN-YEV</b>

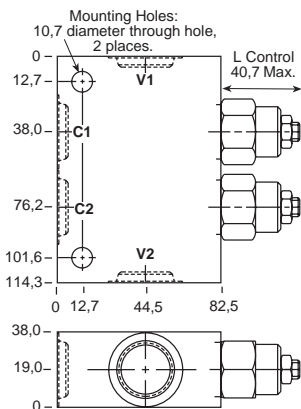
Ports C1, C2, V1 & V2	Assembly Model Code*
3/8" BSPP	<b>CBC*-LJN-YEU</b>
1/2" BSPP	<b>CBC*-LJN-YEV</b>

\*The asterisk (\*) shown in the fourth digit of the model code indicates the counterbalance pilot ratio of the cartridge and must be specified by customer. See page 50. Add modifier /S to order SG Iron for pressure rating over 210 bar.

\*The asterisk (\*) shown in the fourth digit of the model code indicates the counterbalance pilot ratio of the cartridge and must be specified by customer. See page 50. Add modifier /S to order SG Iron for pressure rating over 210 bar.



### 0-120 L/min. Cavity T-2A

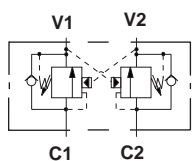


Ports C1, C2, V1 & V2	Assembly Model Code*
3/8" BSPP	<b>CBE*-LHN-YAU</b>
1/2" BSPP	<b>CBE*-LHN-YAV</b>

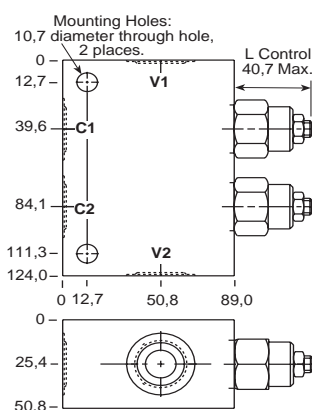
Ports C1, C2, V1 & V2	Assembly Model Code*
3/8" BSPP	<b>CBE*-LJN-YAU</b>
1/2" BSPP	<b>CBE*-LJN-YAV</b>

\*The asterisk (\*) shown in the fourth digit of the model code indicates the counterbalance pilot ratio of the cartridge and must be specified by customer. See page 50. Add modifier /S to order SG Iron for pressure rating over 210 bar.

\*The asterisk (\*) shown in the fourth digit of the model code indicates the counterbalance pilot ratio of the cartridge and must be specified by customer. See page 50. Add modifier /S to order SG Iron for pressure rating over 210 bar.



### 0-120 L/min. Cavity T-2A



Ports C1, C2, V1 & V2	Assembly Model Code*
3/4" BSPP	<b>CBE*-LHN-YAW</b>

Ports C1, C2, V1 & V2	Assembly Model Code*
3/4" BSPP	<b>CBE*-LJN-YAW</b>

\*The asterisk (\*) shown in the fourth digit of the model code indicates the counterbalance pilot ratio of the cartridge and must be specified by customer. See page 50. Add modifier /S to order SG Iron for pressure rating over 210 bar.

\*The asterisk (\*) shown in the fourth digit of the model code indicates the counterbalance pilot ratio of the cartridge and must be specified by customer. See page 50. Add modifier /S to order SG Iron for pressure rating over 210 bar.

NOTES: Page 50 for cartridge model CB\*-\*\*\* shows performance curves, technical tips, and options.  
See page vii for technical information about line mount bodies including SAE flange pattern specifications.  
Consult the Sun Factory for other port sizes available in the bodies shown above.  
**Model Codes printed in red are Preferred Products and are readily available.**

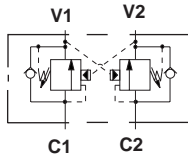
**THREE PORT LOAD CONTROL APPLICATIONS  
(90 DEGREE CROSS-PILOTED, 1.50" SAE C61/C62 FLANGE PORT BODIES, 2 CAVITIES)**

**PILOT RATIO  
3:1, 1.5:1, 2:1**

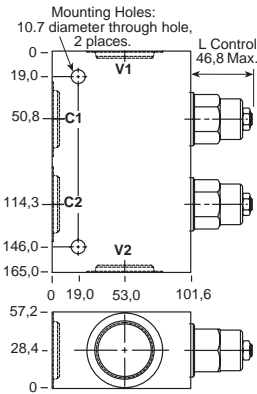
Go to [www.sunhydraulics.com](http://www.sunhydraulics.com)  
for more product information.

**PILOT RATIO  
2.3:1, 4.5:1, 10:1**

**0-240 L/min. Cavity T-17A**



Ports	Assembly Model Code*
C1, C2, V1 & V2	
1" BSPP	<b>CBG*-LHN-YJX</b>
1 1/4" BSPP	<b>CBG*-LHN-YJY</b>

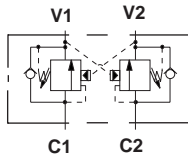


Ports	Assembly Model Code*
C1, C2, V1 & V2	
1" BSPP	<b>CBG*-LJN-YJX</b>
1 1/4" BSPP	<b>CBG*-LJN-YJY</b>

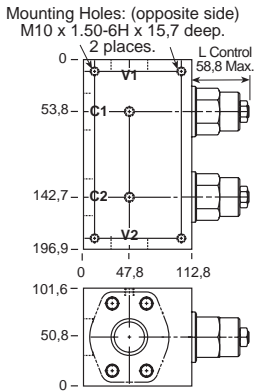
\*The asterisk (\*) shown in the fourth digit of the model code indicates the counterbalance pilot ratio of the cartridge and must be specified by customer. See page 50. Add modifier /S to order SG Iron for pressure rating over 210 bar.

\*The asterisk (\*) shown in the fourth digit of the model code indicates the counterbalance pilot ratio of the cartridge and must be specified by customer. See page 50. Add modifier /S to order SG Iron for pressure rating over 210 bar.

**0-480 L/min. Cavity T-19A**



Ports	Assembly Model Code*
C1, C2, V1 & V2	
1 1/2" SAE C61	<b>CBI*-LHN-YMR/M</b>

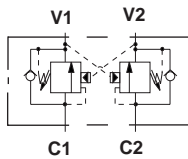


Ports	Assembly Model Code*
C1, C2, V1 & V2	
1 1/2" SAE C61	<b>CBI*-LJN-YMR/M</b>

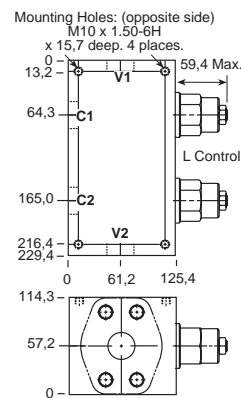
\*Add modifier /T to order SG Iron for pressure rating over 210 bar.

\*Add modifier /T to order SG Iron for pressure rating over 210 bar.

**0-480 L/min. Cavity T-19A**



Ports	Assembly Model Code*
C1, C2, V1 & V2	
1 1/2" SAE C62	<b>CBI*-LHN-YM6/M</b>



Ports	Assembly Model Code*
C1, C2, V1 & V2	
1 1/2" SAE C62	<b>CBI*-LJN-YM6/M</b>

\*Add modifier /T to order SG Iron for pressure rating over 210 bar.

\*Add modifier /T to order SG Iron for pressure rating over 210 bar.

NOTES: Page 50 for cartridge model CB\*\*.\* shows performance curves, technical tips, and options. See page vii for technical information about line mount bodies including SAE flange pattern specifications. Consult the Sun Factory for other port sizes available in the bodies shown above.  
Model Codes printed in red are Preferred Products and are readily available.

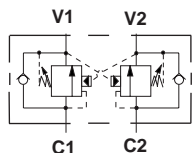
## Line Mounted Assemblies

# THREE PORT LOAD CONTROL APPLICATIONS (INLINE/INLINE CROSS-PILOTED, 1.50" SAE C61 FLANGE PORT BODIES, 2 CAVITIES)

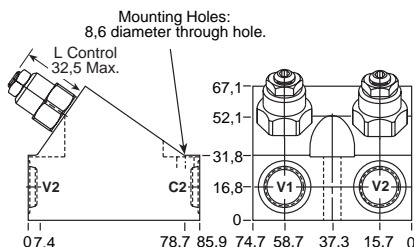
**PILOT RATIO**  
3:1, 1.5:1, 2:1

Go to [www.sunhydraulics.com](http://www.sunhydraulics.com)  
for more product information.

**PILOT RATIO**  
2.3:1, 4.5:1, 10:1



### 0-60 L/min. Cavity T-11A

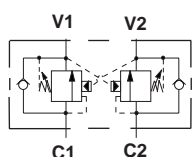


Ports C1, C2, V1 & V2	Assembly Model Code*
3/8" BSPP	<b>CBC*-LHN-XEU</b>
1/2" BSPP	<b>CBC*-LHN-XEV</b>

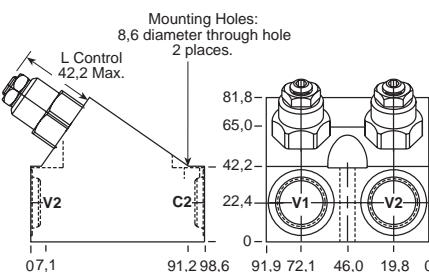
\*The asterisk (\*) shown in the fourth digit of the model code indicates the counterbalance pilot ratio of the cartridge and must be specified by customer. See page 50. Add modifier /S to order SG Iron for pressure rating over 210 bar.

Ports C1, C2, V1 & V2	Assembly Model Code*
3/8" BSPP	<b>CBC*-LJN-XEU</b>
1/2" BSPP	<b>CBC*-LJN-XEV</b>

\*The asterisk (\*) shown in the fourth digit of the model code indicates the counterbalance pilot ratio of the cartridge and must be specified by customer. See page 50. Add modifier /S to order SG Iron for pressure rating over 210 bar.



### 0-120 L/min. Cavity T-2A

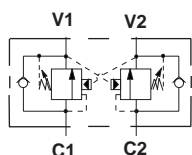


Ports C1, C2, V1 & V2	Assembly Model Code*
1/2" BSPP	<b>CBE*-LHN-XAV</b>
3/4" BSPP	<b>CBE*-LHN-XAW</b>

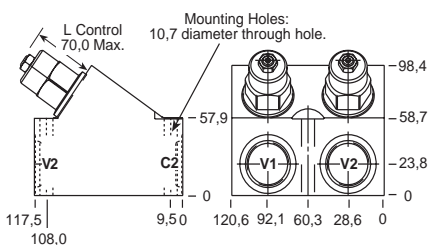
\*The asterisk (\*) shown in the fourth digit of the model code indicates the counterbalance pilot ratio of the cartridge and must be specified by customer. See page 50. Add modifier /S to order SG Iron for pressure rating over 210 bar.

Ports C1, C2, V1 & V2	Assembly Model Code*
1/2" BSPP	<b>CBE*-LJN-XAV</b>
3/4" BSPP	<b>CBE*-LJN-XAW</b>

\*The asterisk (\*) shown in the fourth digit of the model code indicates the counterbalance pilot ratio of the cartridge and must be specified by customer. See page 50. Add modifier /S to order SG Iron for pressure rating over 210 bar.



### 0-240 L/min. Cavity T-17A

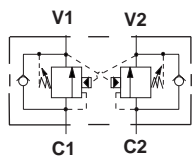


Ports C1, C2, V1 & V2	Assembly Model Code*
3/4" BSPP	<b>CBG*-LHN-XJW</b>
1" BSPP	<b>CBG*-LHN-XJX</b>

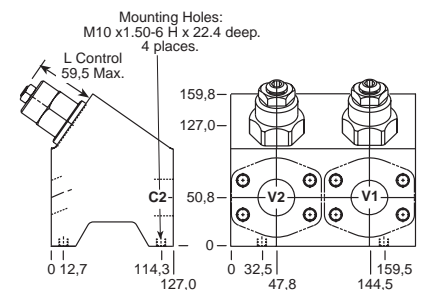
\*The asterisk (\*) shown in the fourth digit of the model code indicates the counterbalance pilot ratio of the cartridge and must be specified by customer. See page 50. Add modifier /S to order SG Iron for pressure rating over 210 bar.

Ports C1, C2, V1 & V2	Assembly Model Code*
3/4" BSPP	<b>CBG*-LJN-XJW</b>
1" BSPP	<b>CBG*-LJN-XJX</b>

\*The asterisk (\*) shown in the fourth digit of the model code indicates the counterbalance pilot ratio of the cartridge and must be specified by customer. See page 50. Add modifier /S to order SG Iron for pressure rating over 210 bar.



### 0-480 L/min. Cavity T-19A



Ports C1, C2, V1 & V2	Assembly Model Code*
1 1/2" SAE C61	<b>CBI*-LHN-XZP/M</b>

\*Add modifier /T to order SG Iron for pressure rating over 210 bar.

Ports C1, C2, V1 & V2	Assembly Model Code*
1 1/2" SAE C61	<b>CBI*-LJN-XZP/M</b>

\*Add modifier /T to order SG Iron for pressure rating over 210 bar.

NOTES: Page 50 for cartridge model CB\*-\*-\* shows performance curves, technical tips, and options.  
See page vii for technical information about line mount bodies including SAE flange pattern specifications.  
Consult the Sun Factory for other port sizes available in the bodies shown above.  
Model Codes printed in red are Preferred Products and are readily available.

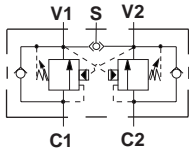
# THREE PORT LOAD CONTROL APPLICATIONS (90 DEGREE CROSS-PILOTED BODIES WITH SHUTTLE, 2 CAVITIES)

**PILOT RATIO**  
3:1, 1.5:1, 2:1

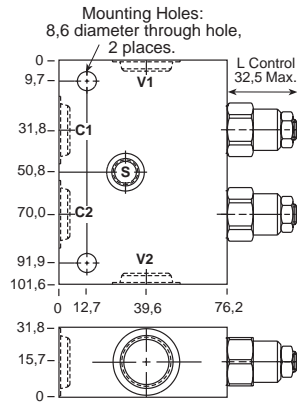
Go to [www.sunhydraulics.com](http://www.sunhydraulics.com)  
for more product information.

**PILOT RATIO**  
2.3:1, 4.5:1, 10:1

## 0-60 L/min. Cavity T-11A



Ports C1, C2, V1, V2	Shuttle Port	Assembly Model Code*
3/8" BSPP	1/4" BSPP	<b>CBC*-LHN-YGU</b>
1/2" BSPP	1/4" BSPP	<b>CBC*-LHN-YGV</b>

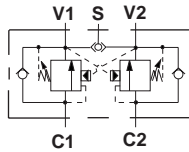


Ports C1, C2, V1, V2	Shuttle Port	Assembly Model Code*
3/8" BSPP	1/4" BSPP	<b>CBC*-LJN-YGU</b>
1/2" BSPP	1/4" BSPP	<b>CBC*-LJN-YGV</b>

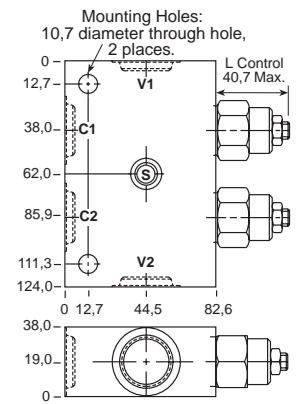
\*The asterisk (\*) shown in the fourth digit of the model code indicates the counterbalance pilot ratio of the cartridge and must be specified by customer. See page 50. Add modifier /S to order SG Iron for pressure rating over 210 bar.

\*The asterisk (\*) shown in the fourth digit of the model code indicates the counterbalance pilot ratio of the cartridge and must be specified by customer. See page 50. Add modifier /S to order SG Iron for pressure rating over 210 bar.

## 0-120 L/min. Cavity T-2A



Ports C1, C2, V1, V2	Shuttle Port	Assembly Model Code*
1/2" BSPP	1/4" BSPP	<b>CBE*-LHN-YHV</b>
3/4" BSPP	1/4" BSPP	<b>CBE*-LHN-YHW</b>

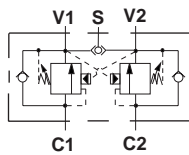


Ports C1, C2, V1, V2	Shuttle Port	Assembly Model Code*
1/2" BSPP	1/4" BSPP	<b>CBE*-LJN-YHV</b>
3/4" BSPP	1/4" BSPP	<b>CBE*-LJN-YHW</b>

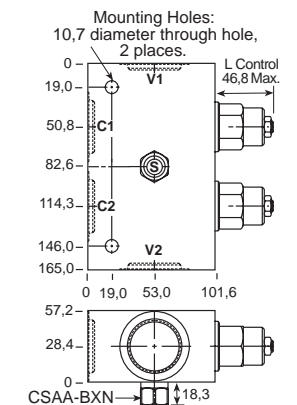
\*The asterisk (\*) shown in the fourth digit of the model code indicates the counterbalance pilot ratio of the cartridge and must be specified by customer. See page 50. Add modifier /S to order SG Iron for pressure rating over 210 bar.

\*The asterisk (\*) shown in the fourth digit of the model code indicates the counterbalance pilot ratio of the cartridge and must be specified by customer. See page 50. Add modifier /S to order SG Iron for pressure rating over 210 bar.

## 0-240 L/min. Cavity T-17A



Ports C1, C2, V1, V2	Shuttle Port	Assembly Model Code*
1" BSPP	1/4" BSPP	<b>CBG*-LHN-YKX</b>
1 1/4" BSPP	1/4" BSPP	<b>CBG*-LHN-YKY</b>



Ports C1, C2, V1, V2	Shuttle Port	Assembly Model Code*
1" BSPP	1/4" BSPP	<b>CBG*-LJN-YKX</b>
1 1/4" BSPP	1/4" BSPP	<b>CBG*-LJN-YKY</b>

\*The asterisk (\*) shown in the fourth digit of the model code indicates the counterbalance pilot ratio of the cartridge and must be specified by customer. See page 50. Add modifier /S to order SG Iron for pressure rating over 210 bar.

\*The asterisk (\*) shown in the fourth digit of the model code indicates the counterbalance pilot ratio of the cartridge and must be specified by customer. See page 50. Add modifier /S to order SG Iron for pressure rating over 210 bar.

NOTES: Page 50 for cartridge models CB\*\*-\* shows performance curves, technical tips, and options. See page vii for technical information about line mount bodies including SAE flange information and specifications. Consult the Sun Factory for other port sizes available in the bodies shown above.

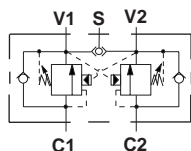
## Line Mounted Assemblies

# THREE PORT LOAD CONTROL APPLICATIONS (CROSS-PILOTED 1.50" SAE C61/C62 FLANGE PORT BODIES WITH SHUTTLE, 2 CAVITIES)

**PILOT RATIO**  
3:1, 1.5:1, 2:1

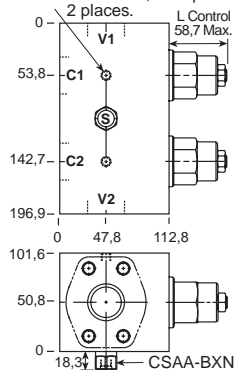
Go to [www.sunhydraulics.com](http://www.sunhydraulics.com)  
for more product information.

**PILOT RATIO**  
2.3:1, 4.5:1, 10:1



### 0-480 L/min. Cavity T-19A

Mounting Holes: (opposite side)  
M10 x 1.50-6H x 15,7 deep.



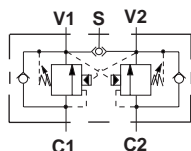
Ports C1, C2, V1, V2	Shuttle Port	Assembly Model Code*
1 1/2" SAE C61	1/4" BSPP	<b>CBI*-LHN-YNR/M</b>

Ports C1, C2, V1, V2	Shuttle Port	Assembly Model Code*
1 1/2" SAE C61	1/4" BSPP	<b>CBI*-LJN-YNR/M</b>

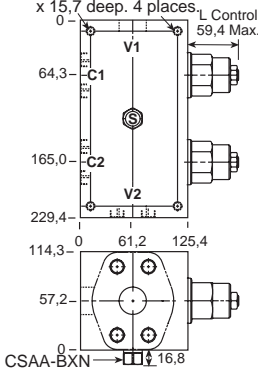
\*Add modifier **/T** to order SG Iron for pressure rating over 210 bar.

\*Add modifier **/T** to order SG Iron for pressure rating over 210 bar.

### 0-480 L/min. Cavity T-19A



Mounting Holes:  
(opposite side) M10 x 1.50-6H  
x 15,7 deep. 4 places.



Ports C1, C2, V1, V2	Shuttle Port	Assembly Model Code*
1 1/2" SAE C62	1/4" BSPP	<b>CBI*-LHN-YN6/M</b>

Ports C1, C2, V1, V2	Shuttle Port	Assembly Model Code*
1 1/2" SAE C62	1/4" BSPP	<b>CBI*-LJN-YN6/M</b>

\*Add modifier **/T** to order SG Iron for pressure rating over 210 bar.

\*Add modifier **/T** to order SG Iron for pressure rating over 210 bar.

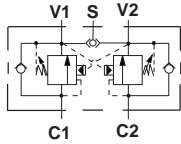
NOTES: Page 50 for cartridge models CB\*\*-\* shows performance curves, technical tips, and options.  
See page vii for technical information about line mount bodies including SAE flange information and port specifications.  
Consult the Sun Factory for other port sizes available in the bodies shown above.

# THREE PORT LOAD CONTROL APPLICATIONS (INLINE CROSS-PILOTED BODIES WITH SHUTTLE, 2 CAVITIES)

**PILOT RATIO**  
3:1, 1.5:1, 2:1

Go to [www.sunhydraulics.com](http://www.sunhydraulics.com)  
for more product information.

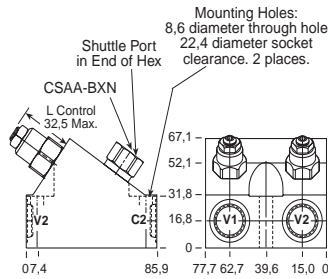
**PILOT RATIO**  
2.3:1, 4.5:1, 10:1



Ports C1, C2, V1, V2	Shuttle Port	Assembly Model Code*
3/8" BSPP	1/4" BSPP	<b>CBC*-LHN-XGU</b>

\*The asterisk (\*) shown in the fourth digit of the model code indicates the counterbalance pilot ratio of the cartridge and must be specified by customer. See page 50. Add modifier /S to order SG Iron for pressure rating over 210 bar.

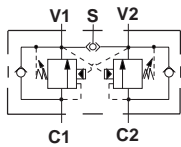
## 0-60 L/min. Cavity T-11A



Ports C1, C2, V1, V2	Shuttle Port	Assembly Model Code*
3/8" BSPP	1/4" BSPP	<b>CBC*-LJN-XGU</b>

\*The asterisk (\*) shown in the fourth digit of the model code indicates the counterbalance pilot ratio of the cartridge and must be specified by customer. See page 50. Add modifier /S to order SG Iron for pressure rating over 210 bar.

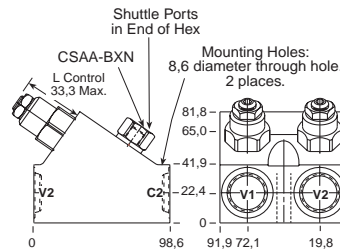
## 0-120 L/min. Cavity T-2A



Ports C1, C2, V1, V2	Shuttle Port	Assembly Model Code*
1/2" BSPP	1/4" BSPP	<b>CBE*-LHN-XHV</b>
3/4" BSPP	1/4" BSPP	<b>CBE*-LHN-XHW</b>

\*The asterisk (\*) shown in the fourth digit of the model code indicates the counterbalance pilot ratio of the cartridge and must be specified by customer. See page 50. Add modifier /S to order SG Iron for pressure rating over 210 bar.

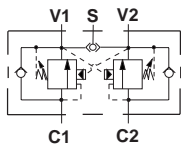
## 0-120 L/min. Cavity T-2A



Ports C1, C2, V1, V2	Shuttle Port	Assembly Model Code*
1/2" BSPP	1/4" BSPP	<b>CBE*-LJN-XHV</b>
3/4" BSPP	1/4" BSPP	<b>CBE*-LJN-XHW</b>

\*The asterisk (\*) shown in the fourth digit of the model code indicates the counterbalance pilot ratio of the cartridge and must be specified by customer. See page 50. Add modifier /S to order SG Iron for pressure rating over 210 bar.

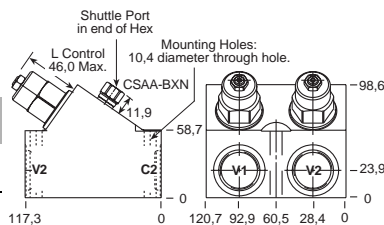
## 0-240 L/min. Cavity T-17A



Ports C1, C2, V1, V2	Shuttle Port	Assembly Model Code*
3/4" BSPP	1/4" BSPP	<b>CBE*-LHN-XKW</b>
1" BSPP	1/4" BSPP	<b>CBE*-LHN-XKY</b>

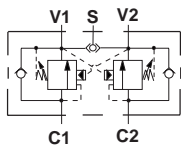
\*The asterisk (\*) shown in the fourth digit of the model code indicates the counterbalance pilot ratio of the cartridge and must be specified by customer. See page 50. Add modifier /S to order SG Iron for pressure rating over 210 bar.

## 0-240 L/min. Cavity T-17A



Ports C1, C2, V1, V2	Shuttle Port	Assembly Model Code*
3/4" BSPP	1/4" BSPP	<b>CBE*-LJN-XKW</b>
1" BSPP	1/4" BSPP	<b>CBE*-LJN-XKY</b>

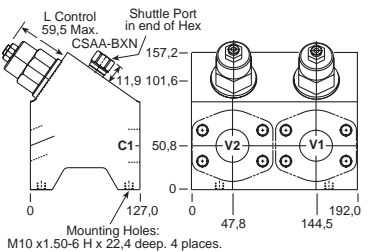
## 0-480 L/min. Cavity T-19A



Ports 1 and 2	Shuttle Port	Assembly Model Code*
1 1/2" SAE C61	1/4" BSPP	<b>CBI*-LHN-XZQ/M</b>

\*Add modifier /T to order SG Iron for pressure rating over 210 bar.

## 0-480 L/min. Cavity T-19A



Ports C1, C2, V1, V2	Shuttle Port	Assembly Model Code*
1 1/2" SAE C61	1/4" BSPP	<b>CBI*-LJN-XZQ/M</b>

NOTES: Page 50 for cartridge models CB\*\*-\* shows performance curves, technical tips, and options. See page vii for technical information about line mount bodies including SAE flange pattern specifications. Consult the Sun Factory for other port sizes available in the bodies shown above.

## Line Mounted Assemblies

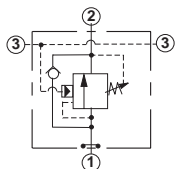
# THREE PORT LOAD CONTROL APPLICATIONS (DIRECT MOUNT .75"/1.00"/1.25" SAE C61 FLANGE PORT BODIES, THROUGH PILOT)

The direct mounted SAE flange port bodies provide the opportunity to mount load control valves directly onto the ports of an actuator.

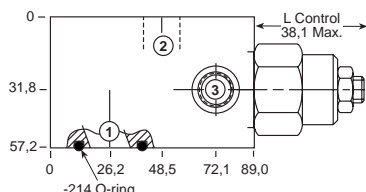
**PILOT RATIO**  
3:1, 1.5:1, 2:1

Go to [www.sunhydraulics.com](http://www.sunhydraulics.com)  
for more product information.

**PILOT RATIO**  
2.3:1, 4.5:1, 10:1



## 0-120 L/min. Cavity T-2A

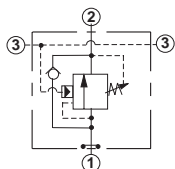


Ports 1 and 2	Port 3	Assembly Model Code*
3/4" SAE C61	1/4" BSPP	<b>CBE*-LHN-ZNV/M</b>

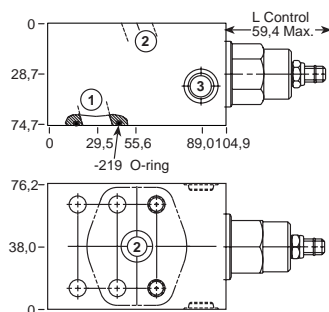
Ports 1 and 2	Port 3	Assembly Model Code*
3/4" SAE C61	1/4" BSPP	<b>CBE*-LJN-ZNV/M</b>

\*Add modifier **/T** to order SG Iron for pressure rating over 210 bar.

\*Add modifier **/T** to order SG Iron for pressure rating over 210 bar.



## 0-240 L/min. Cavity T-17A

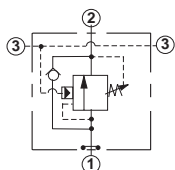


Ports 1 and 2	Port 3	Assembly Model Code*
1" SAE C61	1/4" BSPP	<b>CBG*-LHN-ZNV/M</b>

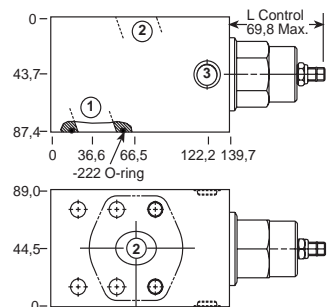
Ports 1 and 2	Port 3	Assembly Model Code*
1" SAE C61	1/4" BSPP	<b>CBG*-LJN-ZNV/M</b>

\*Add modifier **/T** to order SG Iron for pressure rating over 210 bar.

\*Add modifier **/T** to order SG Iron for pressure rating over 210 bar.



## 0-480 L/min. Cavity T-19A



Ports 1 and 2	Port 3	Assembly Model Code*
1 1/4" SAE C61	1/4" BSPP	<b>CBI*-LHN-ZNX/M</b>

Ports 1 and 2	Port 3	Assembly Model Code*
1 1/4" SAE C61	1/4" BSPP	<b>CBI*-LJN-ZNX/M</b>

\*Add modifier **/T** to order SG Iron for pressure rating over 210 bar.

\*Add modifier **/T** to order SG Iron for pressure rating over 210 bar.

NOTES: Page 50 for cartridge models CB\*\*-\* shows performance curves, technical tips, and options.  
See page vii for technical information about line mount bodies including SAE flange pattern specifications.  
Consult the Sun Factory for other port sizes available in the bodies shown above.



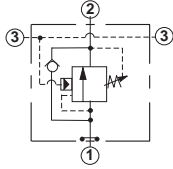
# THREE PORT LOAD CONTROL APPLICATIONS (DIRECT MOUNT .75"/1.00"/1.25" SAE C62 FLANGE BODIES, THROUGH PILOT)

The direct mounted SAE flange port bodies provide the opportunity to mount load control valves directly onto the ports of an actuator.

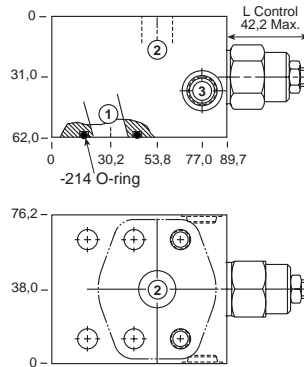
Go to [www.sunhydraulics.com](http://www.sunhydraulics.com) for more product information.

**PILOT RATIO**  
3:1, 1.5:1; 2:1

**PILOT RATIO**  
2.3:1, 4.5:1, 10:1



### 0-120 L/min. Cavity T-2A



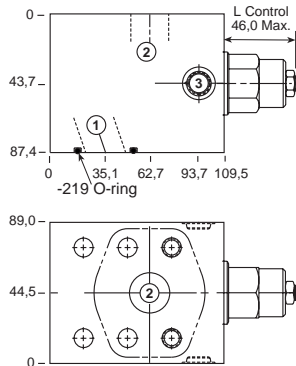
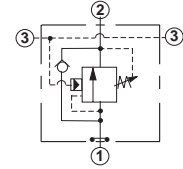
Ports 1 and 2	Port 3	Assembly Model Code*
3/4" SAE C62	1/4" BSPP	<b>CBE*-LHN-ZDS/M</b>

Ports 1 and 2	Port 3	Assembly Model Code*
3/4" SAE C62	1/4" BSPP	<b>CBE*-LJN-ZDS/M</b>

\*Add modifier **/T** to order SG Iron for pressure rating over 210 bar.

\*Add modifier **/T** to order SG Iron for pressure rating over 210 bar.

### 0-240 L/min. Cavity T-17A



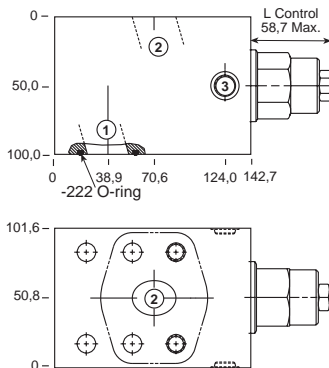
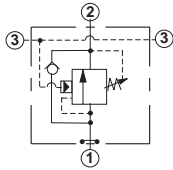
Ports 1 and 2	Port 3	Assembly Model Code*
1" SAE C62	1/4" BSPP	<b>CBG*-LHN-ZDR/M</b>

Ports 1 and 2	Port 3	Assembly Model Code*
1" SAE C62	1/4" BSPP	<b>CBG*-LJN-ZDR/M</b>

\*Add modifier **/T** to order SG Iron for pressure rating over 210 bar.

\*Add modifier **/T** to order SG Iron for pressure rating over 210 bar.

### 0-480 L/min. Cavity T-19A



Ports 1 and 2	Port 3	Assembly Model Code*
1 1/4" SAE C62	1/4" BSPP	<b>CBI*-LHN-ZFD/M</b>

Ports 1 and 2	Port 3	Assembly Model Code*
1 1/4" SAE C62	1/4" BSPP	<b>CBI*-LJN-ZFD/M</b>

\*Add modifier **/T** to order SG Iron for pressure rating over 210 bar.

\*Add modifier **/T** to order SG Iron for pressure rating over 210 bar.

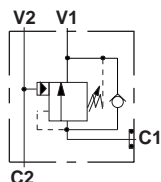
NOTES: Page 50 for cartridge models CB\*\*-\* shows performance curves, technical tips, and options. See page vii for technical information about line mount bodies including SAE flange pattern specifications. Consult the Sun Factory for other port sizes available in the bodies shown above.

## Line Mounted Assemblies

THREE PORT LOAD CONTROL APPLICATIONS  
(GASKET MOUNT BODIES)

These compact gasket-mounted bodies provide the opportunity to mount load control valves directly onto the ports of an actuator.

**PILOT RATIO**  
3:1, 1.5:1, 2:1



Ports  
C2, V1 & V2

3/8" BSPP

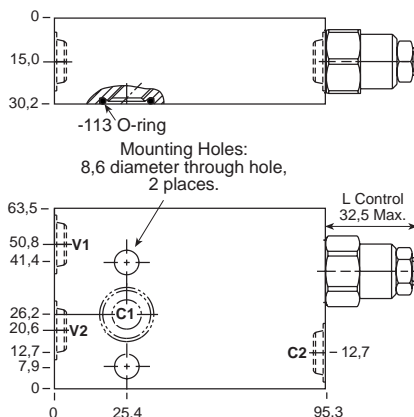
Assembly  
Model Code\*

**CBC\*-LHN-ZTD**

\*The asterisk (\*) shown in the fourth digit of the model code indicates the counterbalance pilot ratio of the cartridge and must be specified by customer. See page 50. Add modifier /S to order SG Iron for pressure rating over 210 bar.

Go to [www.sunhydraulics.com](http://www.sunhydraulics.com)  
for more product information.

## 0-60 L/min. Cavity T-11A



**PILOT RATIO**  
2.3:1, 4.5:1, 10:1

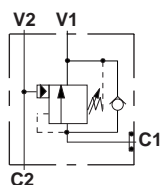
Ports  
C2, V1 & V2

3/8" BSPP

Assembly  
Model Code\*

**CBC\*-LJN-ZTD**

\*The asterisk (\*) shown in the fourth digit of the model code indicates the counterbalance pilot ratio of the cartridge and must be specified by customer. See page 50. Add modifier /S to order SG Iron for pressure rating over 210 bar.



Ports  
C2, V1 & V2

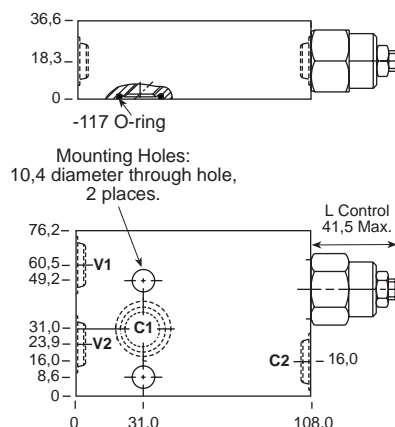
1/2" BSPP

Assembly  
Model Code\*

**CBE\*-LHN-ZTH**

\*The asterisk (\*) shown in the fourth digit of the model code indicates the counterbalance pilot ratio of the cartridge and must be specified by customer. See page 50. Add modifier /S to order SG Iron for pressure rating over 210 bar.

## 0-120 L/min. Cavity T-2A



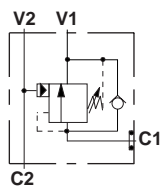
Ports  
C2, V1 & V2

1/2" BSPP

Assembly  
Model Code\*

**CBE\*-LJN-ZTH**

\*The asterisk (\*) shown in the fourth digit of the model code indicates the counterbalance pilot ratio of the cartridge and must be specified by customer. See page 50. Add modifier /S to order SG Iron for pressure rating over 210 bar.



Ports  
C2, V1 & V2

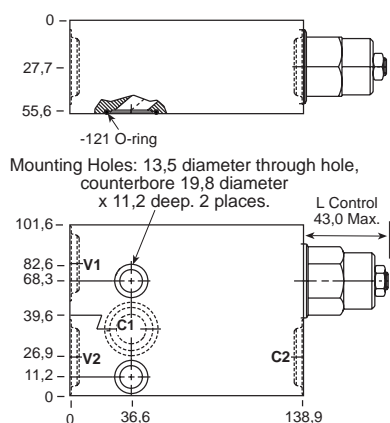
3/4" BSPP

Assembly  
Model Code\*

**CBG\*-LHN-ZTL**

\*The asterisk (\*) shown in the fourth digit of the model code indicates the counterbalance pilot ratio of the cartridge and must be specified by customer. See page 50. Add modifier /S to order SG Iron for pressure rating over 210 bar.

## 0-240 L/min. Cavity T-17A



Ports  
C2, V1 & V2

3/4" BSPP

Assembly  
Model Code\*

**CBG\*-LJN-ZTL**

\*The asterisk (\*) shown in the fourth digit of the model code indicates the counterbalance pilot ratio of the cartridge and must be specified by customer. See page 50. Add modifier /S to order SG Iron for pressure rating over 210 bar.

NOTES: Page 50 for cartridge model CB\*\*-\* shows performance curves, technical tips, and options. See page vii for technical information about line mount bodies including SAE flange pattern specifications. Consult the Sun Factory for other port sizes available in the bodies shown above.

Model Codes printed in red are Preferred Products and are readily available.

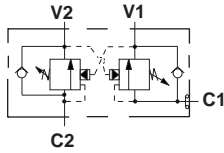
# THREE PORT LOAD CONTROL APPLICATIONS (GASKET MOUNT BODIES, 2 CAVITIES)

These compact gasket-mounted bodies provide the opportunity to mount load control valves directly onto the ports of an actuator.

**PILOT RATIO**  
3:1, 1.5:1

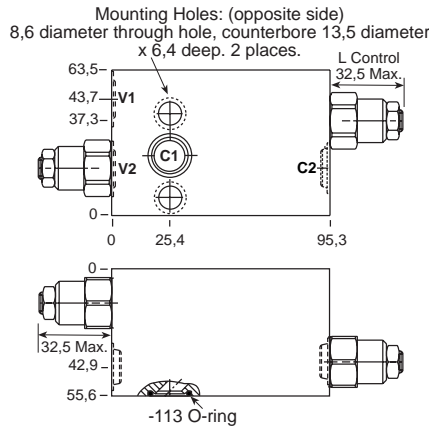
Go to [www.sunhydraulics.com](http://www.sunhydraulics.com)  
for more product information.

**PILOT RATIO**  
2.3:1, 4.5:1, 10:1



**Ports**  
C2, V1 & V2  
**Assembly Model Code\***  
3/8" BSPP **CBC\*-LHN-YVX**

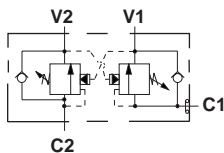
**0-60 L/min. Cavity T-11A**



**Ports**  
C2, V1 & V2  
**Assembly Model Code\***  
3/8" BSPP **CBC\*-LJN-YVX**

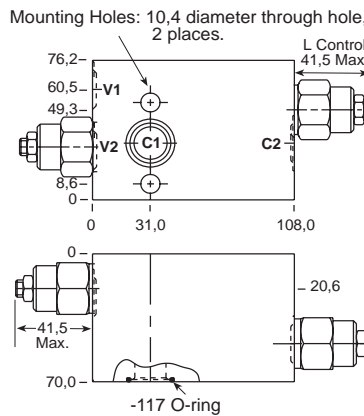
\*The asterisk (\*) shown in the fourth digit of the model code indicates the counterbalance pilot ratio of the cartridge and must be specified by customer. See page 50. Add modifier /S to order SG Iron for pressure rating over 210 bar.

\*The asterisk (\*) shown in the fourth digit of the model code indicates the counterbalance pilot ratio of the cartridge and must be specified by customer. See page 50. Add modifier /S to order SG Iron for pressure rating over 210 bar.



**Ports**  
C2, V1 & V2  
**Assembly Model Code\***  
1/2" BSPP **CBE\*-LHN-YVU**

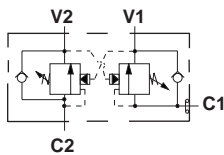
**0-120 L/min. Cavity T-2A**



**Ports**  
C2, V1 & V2  
**Assembly Model Code\***  
1/2" BSPP **CBE\*-LJN-YVU**

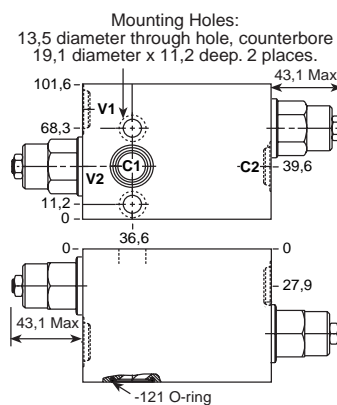
\*The asterisk (\*) shown in the fourth digit of the model code indicates the counterbalance pilot ratio of the cartridge and must be specified by customer. See page 50. Add modifier /S to order SG Iron for pressure rating over 210 bar.

\*The asterisk (\*) shown in the fourth digit of the model code indicates the counterbalance pilot ratio of the cartridge and must be specified by customer. See page 50. Add modifier /S to order SG Iron for pressure rating over 210 bar.



**Ports**  
C2, V1 & V2  
**Assembly Model Code\***  
3/4" BSPP **CBG\*-LHN-YVR**

**0-240 L/min. Cavity T-17A**



**Ports**  
C2, V1 & V2  
**Assembly Model Code\***  
3/4" BSPP **CBG\*-LJN-YVR**

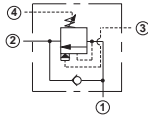
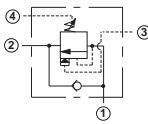
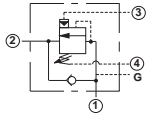
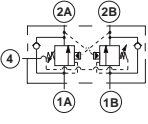
\*The asterisk (\*) shown in the fourth digit of the model code indicates the counterbalance pilot ratio of the cartridge and must be specified by customer. See page 50. Add modifier /S to order SG Iron for pressure rating over 210 bar.

\*The asterisk (\*) shown in the fourth digit of the model code indicates the counterbalance pilot ratio of the cartridge and must be specified by customer. See page 50. Add modifier /S to order SG Iron for pressure rating over 210 bar.

NOTES: Page 50 for cartridge model CB\*\*.\* shows performance curves, technical tips, and options. See page vii for technical information about line mount bodies including SAE flange pattern specifications. Consult the Sun Factory for other port sizes available in the bodies shown above.

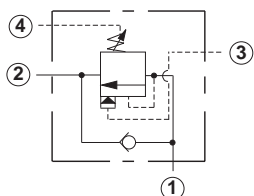
**NOTES**

# Four Port Counterbalance Assemblies

	<i>Cartridge Type</i>	<i>Page</i>
	Vented, 280 bar Maximum Setting	70
	Vented, 420 bar Maximum Setting	70
<b><i>Line Mounted Assemblies (Body Type)</i></b>		
	90 Degree	72
	90 Degree with Gauge Port	73
	2.00" SAE C62 Flange Port, 2 Cavities	74
	90 Degree Cross-Piloted, 2 Cavities, Common Port 4	75

## Counterbalance Valves

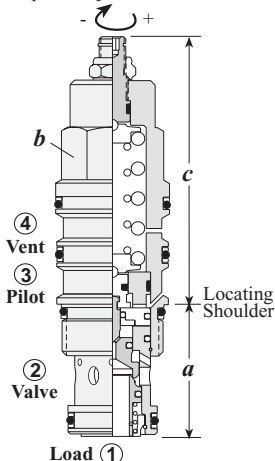
### VENTED, 280 BAR MAXIMUM SETTING



Capacity	Typical Cartridge Model Code	Cavity	Cartridge Dimensions				Installation Torque (Nm)
			a	b	L	C	
60 L/min.	<b>CWCA- LHN</b>	T - 21A	34,9	22,2	74	81	40/50
120 L/min.	<b>CWEA- LHN</b>	T - 22A	34,9	28,6	84	90	60/70
240 L/min.	<b>CWGA- LHN</b>	T - 23A	46	31,8	96	101	200/215
480 L/min.	<b>CWIA - LHN</b>	T - 24A	63,5	41,3	117	126	465/500

### OPTION ORDERING INFORMATION

Turn screw clockwise to reduce setting and release load. Complete Adjustment 5 Turns



**CW** \* \* - \* \* \*

Nominal Capacity	Control**	Cracking Pressure	Seal
<b>C</b> 60 L/min.	<b>L</b> Standard Screw	<b>A and K Pilot Ratios</b>	<b>N</b> Buna-N
<b>E</b> 120 L/min.	<b>C</b> Tamper Resistant	<b>H</b> 70 - 280 bar	<b>V</b> Viton
<b>G</b> 240 L/min.		<b>I</b> 25 - 105 bar	
<b>I</b> 480 L/min.			

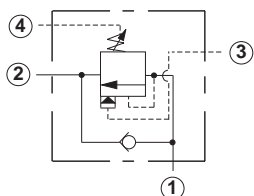
**Version**

**A** 3:1 Pilot Ratio  
**K** 1:1 Pilot Ratio

Adjustment Range Options:  
H is standard set at 210 bar.  
I is standard set at 70 bar.  
**Customer may specify setting.**

\*\* See page 244 for information on Control Options

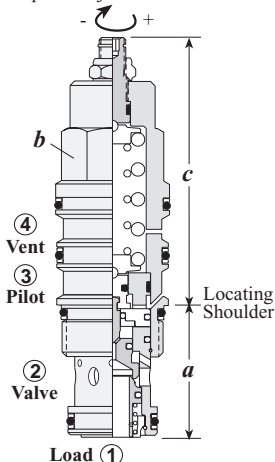
### VENTED, 420 BAR MAXIMUM SETTING



Capacity	Typical Cartridge Model Code	Cavity	Cartridge Dimensions				Installation Torque (Nm)
			a	b	L	C	
60 L/min.	<b>CWCG- LFN</b>	T - 21A	34,9	22,2	74	81	40/50
120 L/min.	<b>CWEG- LFN</b>	T - 22A	34,9	28,6	84	90	60/70
240 L/min.	<b>CWGG- LFN</b>	T - 23A	46	31,8	96	101	200/215
480 L/min.	<b>CWIG - LFN</b>	T - 24A	63,5	41,3	117	126	465/500

### OPTION ORDERING INFORMATION

Turn screw clockwise to reduce setting and release load. Complete Adjustment 5 Turns



**CW** \* \* - \* \* \*

Nominal Capacity	Control**	Cracking Pressure	Seal
<b>C</b> 60 L/min.	<b>L</b> Standard Screw	<b>G and L Pilot Ratios</b>	<b>N</b> Buna-N
<b>E</b> 120 L/min.	<b>C</b> Tamper Resistant	<b>F</b> 70 - 175 bar	<b>V</b> Viton
<b>G</b> 240 L/min.		<b>G</b> 140 - 420 bar	
<b>I</b> 480 L/min.			

**Version**

**G** 5:1 Pilot Ratio  
**L** 2:1 Pilot Ratio

Adjustment Range Options:  
F is standard set at 140 bar.  
G is standard set at 280 bar.  
**Customer may specify setting.**

\*\* See page 244 for information on Control Options

## TECHNICAL TIPS / PERFORMANCE CURVES

### Counterbalance Valves, 3:1, 5:1, 1:1 and 2:1 Pilot Ratios, Vented

#### Applications

Sun counterbalance valves with pilot assist are used for load holding and to provide smooth motion control. When used with vertical actuators they help to ensure control of the load during lowering. With horizontal rotary motion, such as slewing, they can help provide good control of acceleration and deceleration.

The vented type are used to provide load control on applications where there is a variable back-pressure downstream of the valve which could cause instability in a standard valve. The spring chamber is vented externally to tank through a fourth port making it insensitive to back pressure. Any pressure generated on the drain port will be additive to the setting.

Counterbalance valves are load control valves and not speed control valves. Separate meter-in flow control valves should be included to provide speed control. It is always better to undersize rather than oversize the valve used and mount it as close to the actuator as possible. It is always advisable to set the pressure setting of a counterbalance valve before fitting it to the application as it is difficult to set up on a machine.

It is always advisable to select a low pilot ratio to provide the best stability, particularly on cylinder applications. High pilot ratios should only be used on stable motor applications.

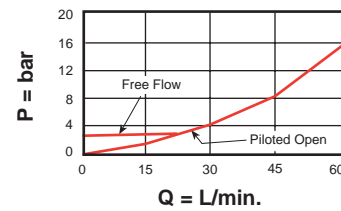
#### Design Concepts and Features

- All cartridges are fully tested and supplied at a standard setting. The setting of a counterbalance valve is always the cracking pressure.
- The valve reseats after opening at 85% of the cracking pressure.
- Maximum leakage on reseat is 5 drops/min.
- The standard free reverse flow check varies between 1,4 bar and 3,0 bar depending on the frame size.
- Recommended setting for counterbalance valves is 1.3 times the maximum load induced pressure.
- Increase setting by turning adjust screw anti-clockwise.
- The valve is opened by a combination of the load induced pressure on the main seat area and the pilot pressure on the pilot area.
- The cartridge has a sealed pilot.
- All cartridges have 3 nominal adjustment turns from minimum to maximum pressure setting.
- A press fit tamper resistant cap is available to fit over the screw adjustment.
- Valves are unaffected by back pressure at Port 2.
- Vent port should not be blocked.

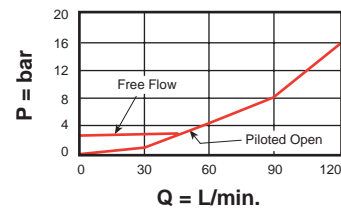
#### Performance Curves

##### Free Flow and Pilot Open Pressure Drop

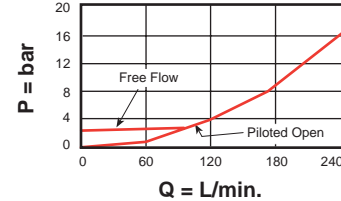
##### CWC\*-L\*N



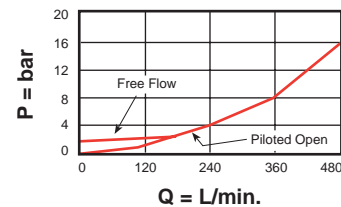
##### CWE\*-L



##### CWG\*-L\*N



##### CWI\*-L\*N



#### General Application Requirements

- Operating Temperature Range: Buna-N seals -45° C to 90° C, Viton seals -15° C to 120° C.
- Viscosity Range: 10-600 centistokes.
- Fluid Contamination Level: ISO 4406 18/15 or better; Recommend  $\beta_{10} \geq 75$  to achieve ISO 18/15 or better in most systems.
- Factory Pressure Setting for cartridge is established at cracking flow.

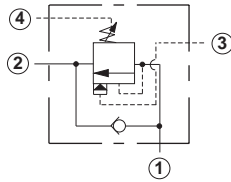
Line Mounted Assemblies

FOUR PORT LOAD CONTROL APPLICATIONS  
(90 DEGREE BODIES)

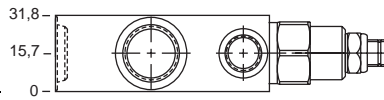
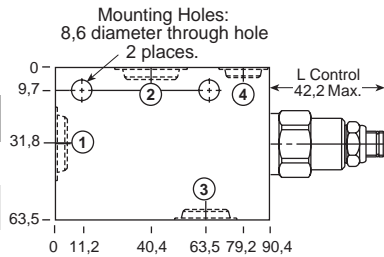
PILOT RATIO  
3:1, 1:1

Go to [www.sunhydraulics.com](http://www.sunhydraulics.com)  
for more product information.

PILOT RATIO  
5:1, 2:1



0-60 L/min. Cavity T-21A

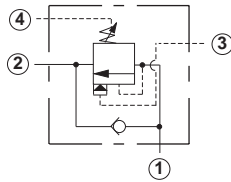


Ports 1 and 2	Ports 3 and 4	Assembly Model Code*
3/8" BSPP	3: 3/8" BSPP 4: 1/4" BSPP	<b>CWC*-LHN-MAU</b>
1/2" BSPP	3: 3/8" BSPP 4: 1/4" BSPP	<b>CWC*-LHN-MAV</b>

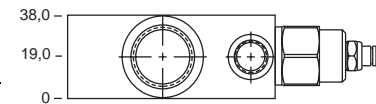
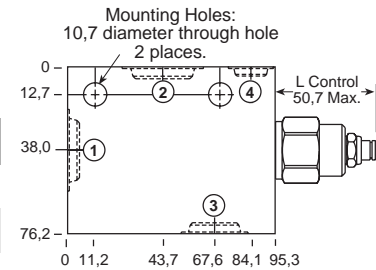
Ports 1 and 2	Ports 3 and 4	Assembly Model Code*
3/8" BSPP	3: 3/8" BSPP 4: 1/4" BSPP	<b>CWC*-LGN-MAU</b>
1/2" BSPP	3: 3/8" BSPP 4: 1/4" BSPP	<b>CWC*-LGN-MAV</b>

\*The asterisk (\*) shown in the fourth digit of the model code indicates the counterbalance pilot ratio of the cartridge and must be specified by customer. See page 70. Add modifier /S to order SG Iron for pressure rating over 210 bar.

\*The asterisk (\*) shown in the fourth digit of the model code indicates the counterbalance pilot ratio of the cartridge and must be specified by customer. See page 70. Add modifier /S to order SG Iron for pressure rating over 210 bar.



0-120 L/min. Cavity T-22A



Ports 1 and 2	Ports 3 and 4	Assembly Model Code*
1/2" BSPP	3: 1/2" BSPP 4: 1/4" BSPP	<b>CWE*-LHN-NAV</b>
3/4" BSPP	3: 1/2" BSPP 4: 1/4" BSPP	<b>CWE*-LHN-NAW</b>

Ports 1 and 2	Ports 3 and 4	Assembly Model Code*
1/2" BSPP	3: 1/2" BSPP 4: 1/4" BSPP	<b>CWE*-LGN-NAV</b>
3/4" BSPP	3: 1/2" BSPP 4: 1/4" BSPP	<b>CWE*-LGN-NAW</b>

\*The asterisk (\*) shown in the fourth digit of the model code indicates the counterbalance pilot ratio of the cartridge and must be specified by customer. See page 70. Add modifier /S to order SG Iron for pressure rating over 210 bar.

\*The asterisk (\*) shown in the fourth digit of the model code indicates the counterbalance pilot ratio of the cartridge and must be specified by customer. See page 70. Add modifier /S to order SG Iron for pressure rating over 210 bar.

NOTES: Page 70 for cartridge models CW\*\*-.\*\*\* shows performance curves, technical tips, and options. See page vii for technical information about line mount bodies including SAE flange pattern specifications. Consult the Sun Factory for other port sizes available in the bodies shown above. Model Codes printed in red are Preferred Products and are readily available.

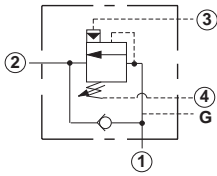


# FOUR PORT LOAD CONTROL APPLICATIONS (90 DEGREE BODIES)

**PILOT RATIO  
3:1, 1:1**

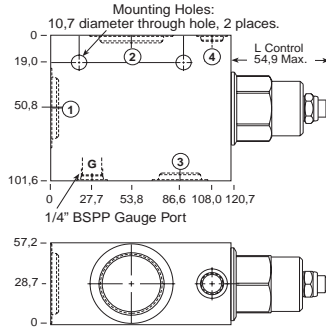
Go to [www.sunhydraulics.com](http://www.sunhydraulics.com)  
for more product information.

**PILOT RATIO  
5:1, 2:1**



## 0-240 L/min. Cavity T-23A

Ports 1 and 2	Ports 3 and 4	Assembly Model Code*
1" BSPP	1/4" BSPP	<b>CWG*-LHN-PCX</b>
1 1/4" BSPP	1/4" BSPP	<b>CWG*-LHN-PCY</b>

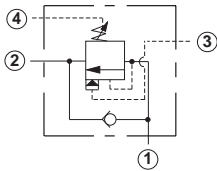


Ports 1 and 2	Ports 3 and 4	Assembly Model Code*
1" BSPP	1/4" BSPP	<b>CWG*-LGN-PCX</b>
1 1/4" BSPP	1/4" BSPP	<b>CWG*-LGN-PCY</b>

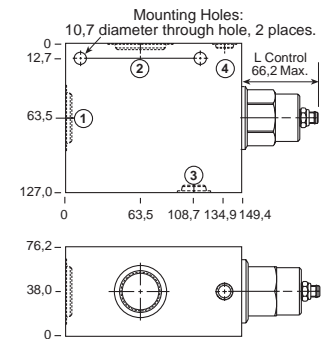
\*The asterisk (\*) shown in the fourth digit of the model code indicates the counterbalance pilot ratio of the cartridge and must be specified by customer. See page 70. Add modifier /S to order SG Iron for pressure rating over 210 bar.

\*The asterisk (\*) shown in the fourth digit of the model code indicates the counterbalance pilot ratio of the cartridge and must be specified by customer. See page 70. Add modifier /S to order SG Iron for pressure rating over 210 bar.

## 0-480 L/min. Cavity T-24A



Ports 1 and 2	Ports 3 and 4	Assembly Model Code*
1" BSPP	1/4" BSPP	<b>CWI*-LHN-QCX</b>
1 1/4" BSPP	1/4" BSPP	<b>CWI*-LHN-QCY</b>



Ports 1 and 2	Ports 3 and 4	Assembly Model Code*
1" BSPP	1/4" BSPP	<b>CWI*-LGN-QCX</b>
1 1/4" BSPP	1/4" BSPP	<b>CWI*-LGN-QCY</b>

\*The asterisk (\*) shown in the fourth digit of the model code indicates the counterbalance pilot ratio of the cartridge and must be specified by customer. See page 70. Add modifier /S to order SG Iron for pressure rating over 210 bar.

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NOTES: Page 70 for cartridge models CW\*\*.\* shows performance curves, technical tips, and options.  
See page vii for technical information about line mount bodies including SAE flange pattern specifications.  
Consult the Sun Factory for other port sizes available in the bodies shown above.  
Model Codes printed in red are Preferred Products and are readily available.

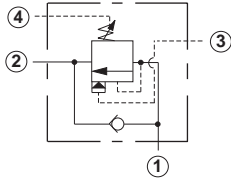
**Line Mounted Assemblies**

**FOUR PORT LOAD CONTROL APPLICATIONS  
(2.00" SAE C62 FLANGE PORT BODY, 2 CAVITIES)**

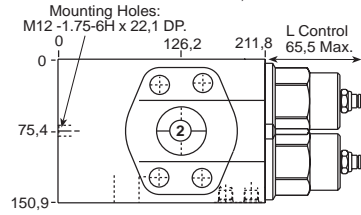
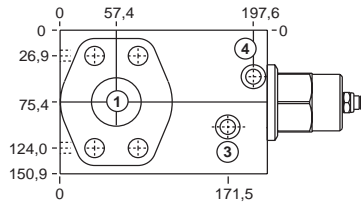
**PILOT RATIO  
3:1, 1:1**

Go to [www.sunhydraulics.com](http://www.sunhydraulics.com)  
for more product information.

**PILOT RATIO  
4.5:1, 2:1**



**0-960 L/min. Cavity T-24A**



Ports 1 and 2	Ports 3 and 4	Assembly Model Code*
2" SAE C62	1/4" BSPP	<b>CWI*-LHN-Z9T/M</b>

Ports 1 and 2	Ports 3 and 4	Assembly Model Code*
2" SAE C62	1/4" BSPP	<b>CWI*-LGN-Z9T/M</b>

\*Add modifier **IT** to order SG Iron for pressure rating over 210 bar.

\*Add modifier **IT** to order SG Iron for pressure rating over 210 bar.

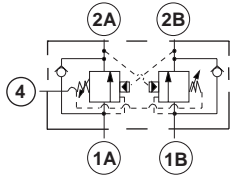
NOTES: Page 70 for cartridge models CW\*\*-\* shows performance curves, technical tips, and options.  
See page vii for technical information about line mount bodies including SAE flange pattern specifications.  
Consult the Sun Factory for other port sizes available in the bodies shown above.

**FOUR PORT LOAD CONTROL APPLICATIONS  
(90 DEGREE CROSS-PILOTED BODIES, 2 CAVITIES, COMMON PORT 4)**

**PILOT RATIO  
3:1, 1:1**

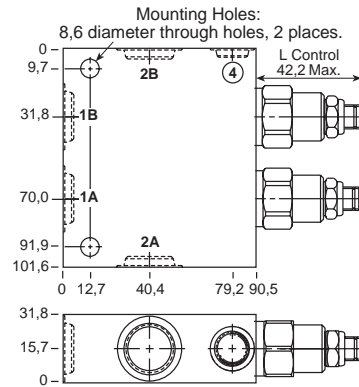
Go to [www.sunhydraulics.com](http://www.sunhydraulics.com)  
for more product information.

**PILOT RATIO  
5:1, 2:1**



**0-60 L/min. Cavity T-21A**

Ports 1A, 1B, 2A & 2B	Port 4	Assembly Model Code*
3/8" BSPP	1/4" BSPP	<b>CWC*-LHN-XPU</b>
1/2" BSPP	1/4" BSPP	<b>CWC*-LHN-XPV</b>



Ports 1A, 1B, 2A & 2B	Port 4	Assembly Model Code*
3/8" BSPP	1/4" BSPP	<b>CWC*-LGN-XPU</b>
1/2" BSPP	1/4" BSPP	<b>CWC*-LGN-XPV</b>

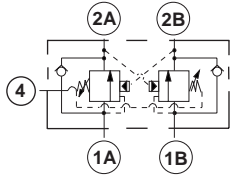
\*The asterisk (\*) shown in the fourth digit of the model code indicates the counterbalance pilot ratio of the cartridge and must be specified by customer. See page 70. Add modifier /S to order SG Iron for pressure rating over 210 bar.

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**PILOT RATIO  
3:1, 1:1**

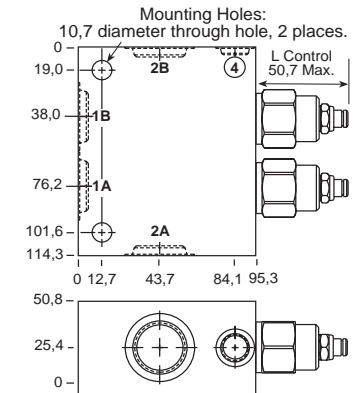
Go to [www.sunhydraulics.com](http://www.sunhydraulics.com)  
for more product information.

**PILOT RATIO  
5:1, 2:1**



**0-120 L/min. Cavity T-22A**

Ports 1A, 1B, 2A & 2B	Port 4	Assembly Model Code*
1/2" BSPP	1/4" BSPP	<b>CWE*-LHN-XIV</b>
3/4" BSPP	1/4" BSPP	<b>CWE*-LHN-XIW</b>



Ports 1A, 1B, 2A & 2B	Port 4	Assembly Model Code*
1/2" BSPP	1/4" BSPP	<b>CWE*-LGN-XIV</b>
3/4" BSPP	1/4" BSPP	<b>CWE*-LGN-XIW</b>

\*The asterisk (\*) shown in the fourth digit of the model code indicates the counterbalance pilot ratio of the cartridge and must be specified by customer. See page 70. Add modifier /S to order SG Iron for pressure rating over 210 bar.

\*The asterisk (\*) shown in the fourth digit of the model code indicates the counterbalance pilot ratio of the cartridge and must be specified by customer. See page 70. Add modifier /S to order SG Iron for pressure rating over 210 bar.

NOTES: Page 70 for cartridge model CW\*\*\_\*\*\* shows performance curves, technical tips, and options.  
See page vii for technical information about line mount bodies including SAE flange pattern specifications.  
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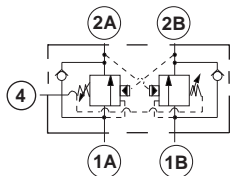
## Line Mounted Assemblies

# FOUR PORT LOAD CONTROL APPLICATIONS (90 DEGREE CROSS-PILOTED BODIES, 2 CAVITIES, COMMON PORT 4)

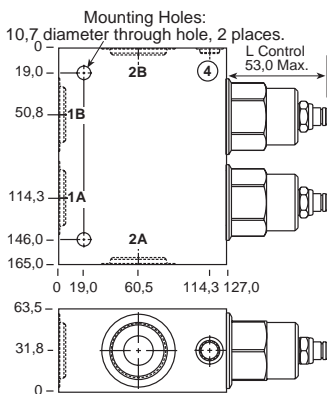
**PILOT RATIO**  
3:1, 1:1

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for more product information.

**PILOT RATIO**  
5:1, 2:1



### 0-240 L/min. Cavity T-23A



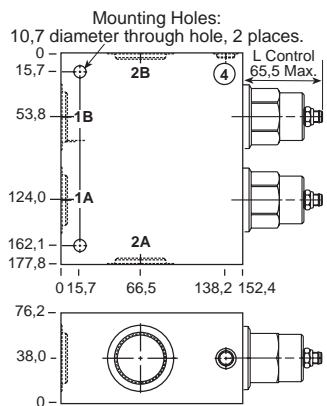
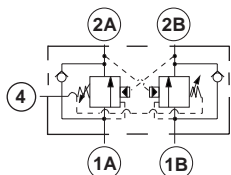
Ports 1A, 1B, 2A & 2B	Port 4	Assembly Model Code*
1" BSPP	1/4" BSPP	<b>CWG*-LHN-XXM</b>
1 1/4" BSPP	1/4" BSPP	<b>CWG*-LHN-XY</b>

Ports 1A, 1B, 2A & 2B	Port 4	Assembly Model Code*
1" BSPP	1/4" BSPP	<b>CWG*-LGN-XXM</b>
1 1/4" BSPP	1/4" BSPP	<b>CWG*-LGN-XY</b>

\*The asterisk (\*) shown in the fourth digit of the model code indicates the counterbalance pilot ratio of the cartridge and must be specified by customer. See page 70. Add modifier /S to order SG Iron for pressure rating over 210 bar.

\*The asterisk (\*) shown in the fourth digit of the model code indicates the counterbalance pilot ratio of the cartridge and must be specified by customer. See page 70. Add modifier /S to order SG Iron for pressure rating over 210 bar.

### 0-480 L/min. Cavity T-24A



Ports 1A, 1B, 2A & 2B	Port 4	Assembly Model Code*
1" BSPP	1/4" BSPP	<b>CWI*-LHN-XLX</b>
1 1/4" BSPP	1/4" BSPP	<b>CXI*-LHN-XLY</b>

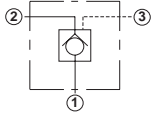
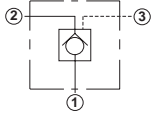
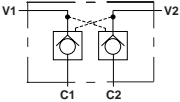
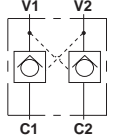
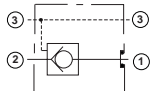
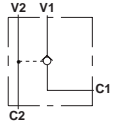
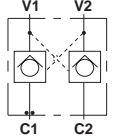
Ports 1A, 1B, 2A & 2B	Port 4	Assembly Model Code*
1" BSPP	1/4" BSPP	<b>CWI*-LGN-XLX</b>
1 1/4" BSPP	1/4" BSPP	<b>CWI*-LGN-XLY</b>

\*The asterisk (\*) shown in the fourth digit of the model code indicates the counterbalance pilot ratio of the cartridge and must be specified by customer. See page 70. Add modifier /S to order SG Iron for pressure rating over 210 bar.

\*The asterisk (\*) shown in the fourth digit of the model code indicates the counterbalance pilot ratio of the cartridge and must be specified by customer. See page 70. Add modifier /S to order SG Iron for pressure rating over 210 bar.

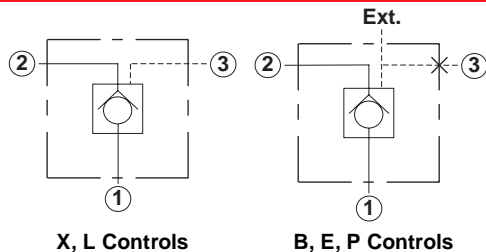
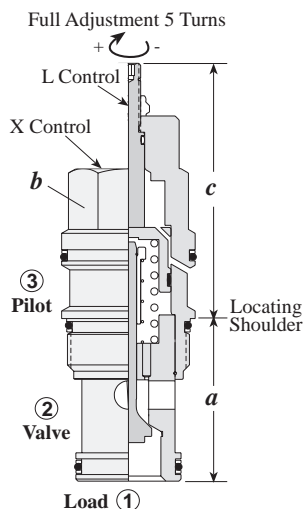
NOTES: Page 70 for cartridge model CW\*\*.\* shows performance curves, technical tips, and options.  
See page vii for technical information about line mount bodies including SAE flange pattern specifications.  
Consult the Sun Factory for other port sizes available in the bodies shown above.

# Three Port Pilot-to-Open Check Assemblies

	<i>Cartridge Type</i>	<i>Page</i>
	Pilot Operated	78
<b><i>Line Mounted Assemblies (Body Type)</i></b>		
	90 Degree Inline	80 82
	90 Degree 2" SAE C61/C62 Flange Port, 2 Cavities	84
	90 Degree Cross-Piloted, 2 Cavities	85
	Inline Cross-Piloted, 2 Cavities	88
	Direct Mount .75"/1.00"/1.25" SAE C61 Flange Port/ Gasket Mount, Through Pilot Port	89
	Direct Mount .75"/1.00"/1.25" SAE C62 Flange Port/ Gasket Mount, Through Pilot Port	90
	Gasket Mount	91
	Gasket Mount, 2 Cavities	92

# Pilot-to-Open Check Valves

## PILOT OPERATED



Capacity	Typical Cartridge Model Code	Cavity	Cartridge Dimensions				Installation Torque (Nm)
			a	b	c		
					X, B, E, P	L	
30 L/min.	CKBB - XCN	T - 163A	31	19,1	32	43	35/40
60 L/min.	CKCB - XCN	T - 11A	34,9	22,2	31	62	40/50
120 L/min.	CKEB - XCN	T - 2A	34,9	28,6	35	72	60/70
240 L/min.	CKGB - XCN	T - 17A	46	31,8	46	84	200/215
480 L/min.	CKIB - XCN	T - 19A	63,5	41,3	59	100	465/500

## OPTION ORDERING INFORMATION

Nominal Capacity	Version	Control**	Cracking Pressure	Seal
<b>B</b> *30 L/min.	<b>B</b> Bleed through Pilot	<b>X</b> Standard Pilot	<b>A</b> 0,3 bar	<b>N</b> Buna-N
<b>C</b> 60 L/min.	<b>D</b> Sealed Pilot Piston	<b>L</b> Manual Load Release	<b>B</b> 1,0 bar	<b>V</b> Viton
<b>E</b> 120 L/min.		<b>B</b> 1/4" BSPP External Pilot Port 3 blocked	<b>C</b> 2,0 bar	
<b>G</b> 240 L/min.		<b>E</b> SAE-4 External Pilot Port 3 blocked	<b>D</b> 3,5 bar	
<b>I</b> 480 L/min.		<b>P</b> 1/4" NPTF External Pilot Port 3 blocked	<b>E</b> 5,0 bar	
			<b>F</b> 7,0 bar	

\*\* See page 244 for information on Control Options

\*CKBB, CKBD available with C and E Cracking Pressure Only.

## TECHNICAL TIPS / PERFORMANCE CURVES

### Pilot-to-Open Check Valves, External Pilot, Non-vented

#### Applications

Pilot operated checks are used to hold loads in position and for that reason should be mounted as close to the actuator as possible. Pilot-to-open checks are non-modulating, on/off devices that allow free flow through the check valve from port 2 (valve) to port 1 (load). Reverse flow is blocked until a pilot pressure directly proportional to the load pressure is sensed at port 3 (pilot), so that a pilot piston displaces the check from its seat.

#### Design Concepts and Features

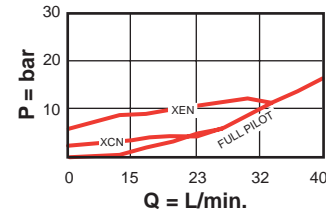
- 3:1 pilot ratio is suitable for most applications.
- Low leakage when closed, less than 1 drop/min.
- Optional, emergency manual release screw, in case pilot pressure is not available.
- Pilot piston leakage is present on **CK\*B** models between port 3 and port 2 in order to purge trapped air in the pilot line. Optional models (**CK\*D**) feature a sealed pilot piston for applications where cross-port leakage is undesirable.

**Note:** Pressure at port 2 is directly additive to the pilot pressure required at port 3 (pilot). For applications where this occurs, a 4 port vented pilot operated check cartridge (**CV\*V-\*\*\***) should be considered.

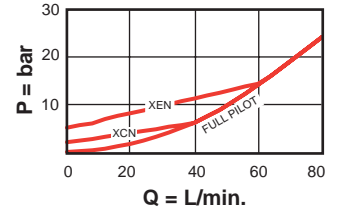
#### Performance Curves

##### Typical Pressure Drop

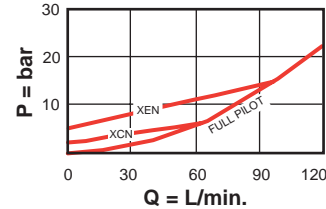
#### CKBB-X\*N



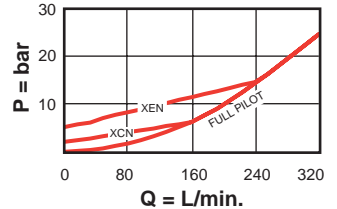
#### CKCB-X\*N



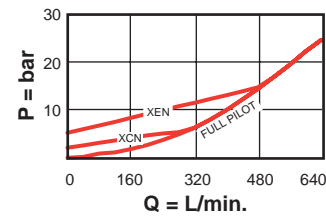
#### CKEB-X\*N



#### CKGB-X\*N



#### CKIB-X\*N



### General Application Requirements

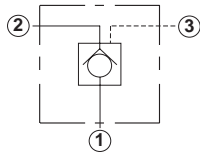
- Operating Temperature Range: Buna-N seals -45° C to 90° C, Viton seals -15° C to 120° C.
- Viscosity Range: 10-600 centistokes.
- Fluid Contamination Level: ISO 4406 18/15 or better; Recommend  $\beta_{10} \geq 75$  to achieve ISO 18/15 or better in most systems.
- Factory Pressure Setting for cartridge is established at cracking flow.

## Line Mounted Assemblies

# THREE PORT PILOT-TO-OPEN CHECK APPLICATIONS (90 DEGREE BODIES)

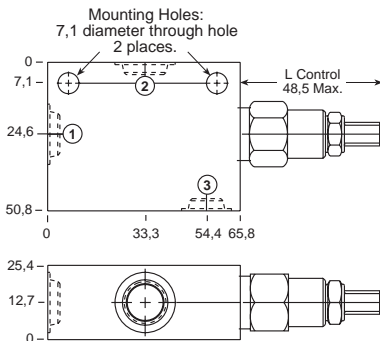
### PILOT OPERATED ASSEMBLIES

Go to [www.sunhydraulics.com](http://www.sunhydraulics.com)  
for more product information.

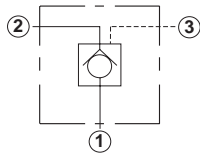


### 0-30 L/min. Cavity T-163A

Ports 1 and 2	Port 3	Assembly Model Code*
1/4" BSPP	1/4" BSPP	<b>CKBB-XCN-JCT</b>
3/8" BSPP	1/4" BSPP	<b>CKBB-XCN-JCU</b>

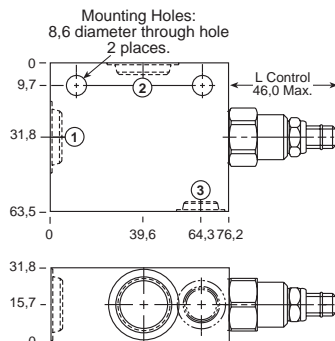


\*Add modifier **/S** to order SG Iron for pressure rating over 210 bar.

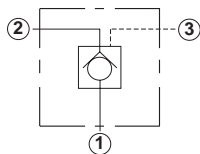


### 0-60 L/min. Cavity T-11A

Ports 1 and 2	Port 3	Assembly Model Code*
3/8" BSPP	1/4" BSPP	<b>CKCB-XCN-ECU</b>
1/2" BSPP	1/4" BSPP	<b>CKCB-XCN-ECV</b>

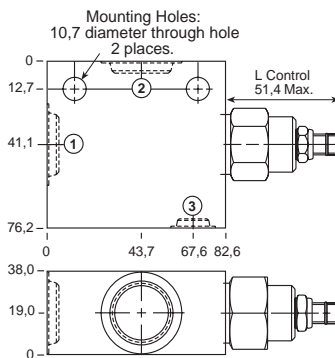


\*Add modifier **/S** to order SG Iron for pressure rating over 210 bar.



### 0-120 L/min. Cavity T-2A

Ports 1 and 2	Port 3	Assembly Model Code*
1/2" BSPP	1/4" BSPP	<b>CKEB-XCN-BCV</b>
3/4" BSPP	1/4" BSPP	<b>CKEB-XCN-BCW</b>



\*Add modifier **/S** to order SG Iron for pressure rating over 210 bar.

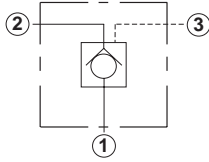
NOTES: Page 78 for cartridge model CK\*B-\*\*\* shows performance curves, technical tips, and options.  
See page vii for technical information about line mount bodies including SAE flange pattern specifications.  
Consult the Sun Factory for other port sizes available in the bodies shown above.  
Model Codes printed in red are Preferred Products and are readily available.



# THREE PORT PILOT-TO-OPEN CHECK APPLICATIONS (90 DEGREE BODIES)

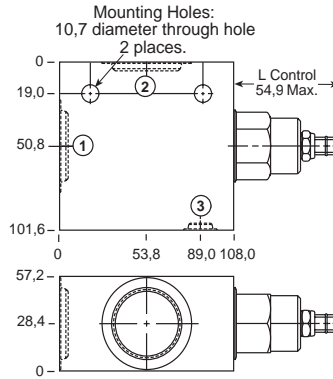
## PILOT OPERATED ASSEMBLIES

Go to [www.sunhydraulics.com](http://www.sunhydraulics.com) for more product information.



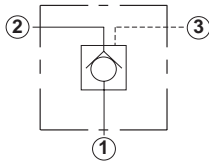
### 0-240 L/min. Cavity T-17A

Ports 1 and 2	Port 3	Assembly Model Code*
1" BSPP	1/4" BSPP	<b>CKGB-XCN-HCX</b>
1 1/4" BSPP	1/4" BSPP	<b>CKGB-XCN-HCY</b>

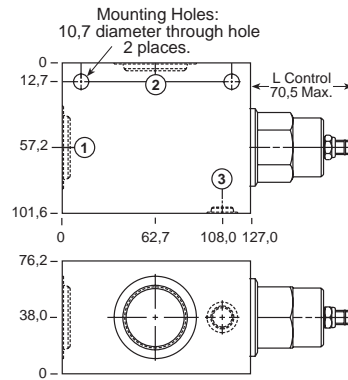


\*Add modifier /S to order SG Iron for pressure rating over 210 bar.

### 0-480 L/min. Cavity T-19A



Ports 1 and 2	Port 3	Assembly Model Code*
1" BSPP	1/4" BSPP	<b>CKIB-XCN-KCX</b>
1 1/4" BSPP	1/4" BSPP	<b>CKIB-XCN-KCY</b>



\*Add modifier /S to order SG Iron for pressure rating over 210 bar.

NOTES: Page 78 for cartridge model CK\*B-\*\*\* shows performance curves, technical tips, and options.  
See page vii for technical information about line mount bodies including SAE flange pattern specifications.  
Consult the Sun Factory for other port sizes available in the bodies shown above.  
Model Codes printed in red are Preferred Products and are readily available.

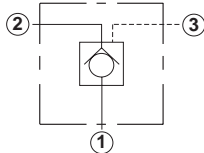
## Line Mounted Assemblies

# THREE PORT PILOT-TO-OPEN CHECK APPLICATIONS (INLINE BODIES)

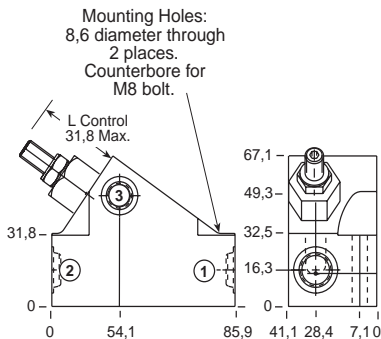
### PILOT OPERATED ASSEMBLIES

Go to [www.sunhydraulics.com](http://www.sunhydraulics.com)  
for more product information.

### 0-30 L/min. Cavity T-163A

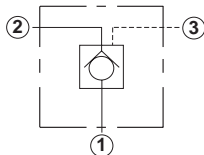


Ports 1 and 2	Port 3	Assembly Model Code*
1/4" BSPP	1/4" BSPP	<b>CKBB-XCN-JJT</b>
3/8" BSPP	1/4" BSPP	<b>CKBB-XCN-JJU</b>

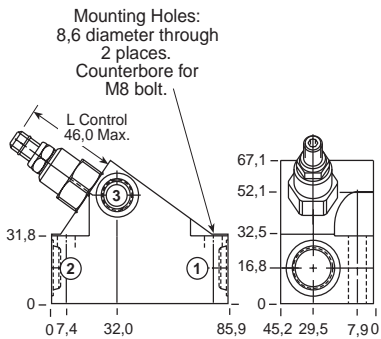


\*Add modifier **/S** to order SG Iron for pressure rating over 210 bar.

### 0-60 L/min. Cavity T-11A



Ports 1 and 2	Port 3	Assembly Model Code*
3/8" BSPP	1/4" BSPP	<b>CKCB-XCN-EJU</b>
1/2" BSPP	1/4" BSPP	<b>CKCB-XCN-EJV</b>



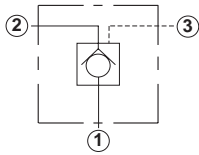
\*Add modifier **/S** to order SG Iron for pressure rating over 210 bar.

NOTES: Page 78 for cartridge model CK\*B-\*\*\* shows performance curves, technical tips, and options.  
See page vii for technical information about line mount bodies including SAE flange pattern specifications.  
Consult the Sun Factory for other port sizes available in the bodies shown above.  
Model Codes printed in red are Preferred Products and are readily available.

# THREE PORT PILOT-TO-OPEN CHECK APPLICATIONS (INLINE BODIES)

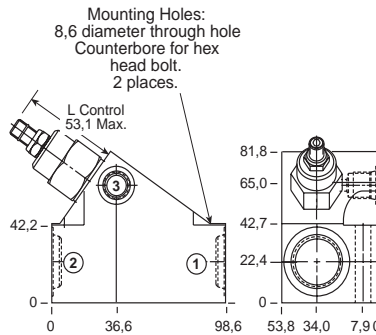
## PILOT OPERATED ASSEMBLIES

Go to [www.sunhydraulics.com](http://www.sunhydraulics.com) for more product information.

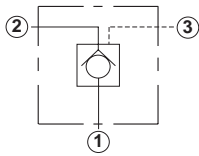


**0-120 L/min. Cavity T-2A**

Ports 1 and 2	Port 3	Assembly Model Code*
1/2" BSPP	1/4" BSPP	<b>CKEB-XCN-BVV</b>
3/4" BSPP	1/4" BSPP	<b>CKEB-XCN-BVW</b>

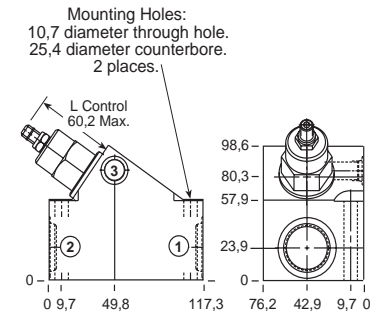


\*Add modifier /S to order SG Iron for pressure rating over 210 bar.



**0-240 L/min. Cavity T-17A**

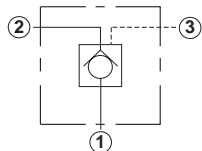
Ports 1 and 2	Port 3	Assembly Model Code*
3/4" BSPP	1/4" BSPP	<b>CKGB-XCN-HDW</b>
1" BSPP	1/4" BSPP	<b>CKGB-XCN-HDX</b>



\*Add modifier /S to order SG Iron for pressure rating over 210 bar.

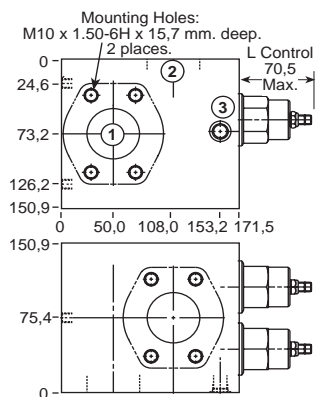
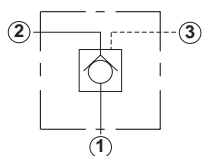
NOTES: Page 78 for cartridge model CK\*B-\*\*\* shows performance curves, technical tips, and options. See page vii for technical information about line mount bodies including SAE flange pattern specifications. Consult the Sun Factory for other port sizes available in the bodies shown above. Model Codes printed in red are Preferred Products and are readily available.

## Line Mounted Assemblies

THREE PORT PILOT-TO-OPEN CHECK APPLICATIONS  
(90 DEGREE 2.00" SAE C61/C62 FLANGE PORT BODIES, 2 CAVITIES)PILOT OPERATED  
ASSEMBLIESGo to [www.sunhydraulics.com](http://www.sunhydraulics.com)  
for more product information.

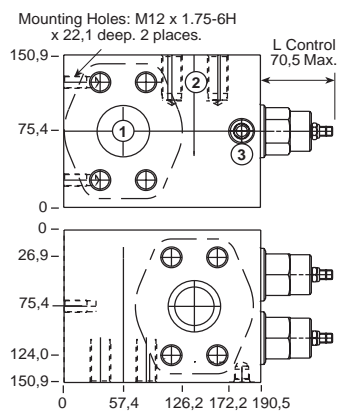
Ports 1 and 2	Port 3	Assembly Model Code*
2" SAE C61	1/4" BSPP	<b>CKIB-XCN-XZZ/M</b>

## 0-960 L/min. Cavity T-19A

\*Add modifier **T** to order SG Iron for pressure rating over 210 bar.

Ports 1 and 2	Port 3	Assembly Model Code*
2" SAE C62	1/4" BSPP	<b>CKIB-XCN-Z8Z/M</b>

## 0-960 L/min. Cavity T-19A

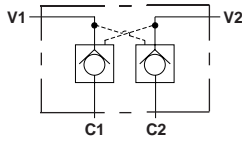
\*Add modifier **T** to order SG Iron for pressure rating over 210 bar.

NOTES: Page 78 for cartridge model CK\*B-\*\*\* shows performance curves, technical tips, and options.  
 See page vii for technical information about line mount bodies including SAE flange pattern specifications.  
 Consult the Sun Factory for other port sizes available in the bodies shown above.

**THREE PORT PILOT-TO-OPEN CHECK APPLICATIONS  
(90 DEGREE CROSS-PILOTED BODIES, 2 CAVITIES)**

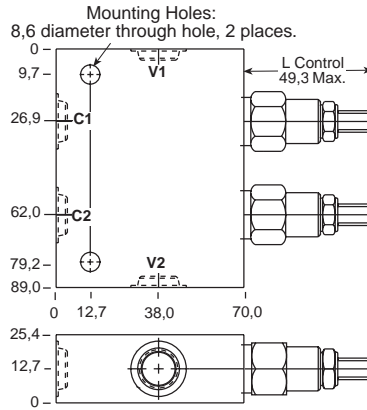
**PILOT OPERATED  
ASSEMBLIES**

Go to [www.sunhydraulics.com](http://www.sunhydraulics.com)  
for more product information.

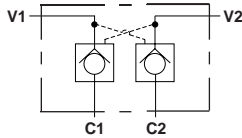


Ports C1, C2, V1 & V2	Assembly Model Code*
1/4" BSPP	<b>CKBB-XCN-JYT</b>
3/8" BSPP	<b>CKBB-XCN-JYU</b>

**0-30 L/min. Cavity T-163A**

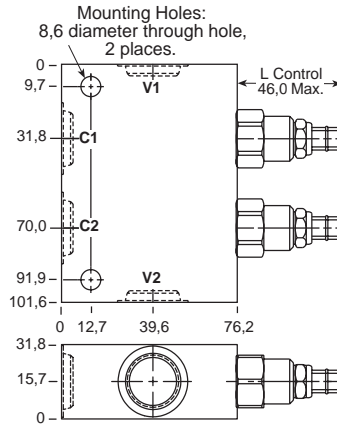


\*Add modifier /S to order SG Iron for pressure rating over 210 bar.



Ports C1, C2, V1 & V2	Assembly Model Code*
3/8" BSPP	<b>CKCB-XCN-YEU</b>
1/2" BSPP	<b>CKCB-XCN-YEV</b>

**0-60 L/min. Cavity T-11A**



\*Add modifier /S to order SG Iron for pressure rating over 210 bar.

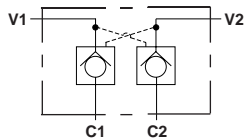
NOTES: Page 78 for cartridge model CK\*B-\*\*\* shows performance curves, technical tips, and options.  
See page vii for technical information about line mount bodies including SAE flange pattern specifications.  
Consult the Sun Factory for other port sizes available in the bodies shown above.  
Model Codes printed in red are Preferred Products and are readily available.

## Line Mounted Assemblies

# THREE PORT PILOT-TO-OPEN CHECK APPLICATIONS (90 DEGREE CROSS-PILOTED BODIES, 2 CAVITIES)

### PILOT OPERATED ASSEMBLIES

Go to [www.sunhydraulics.com](http://www.sunhydraulics.com)  
for more product information.

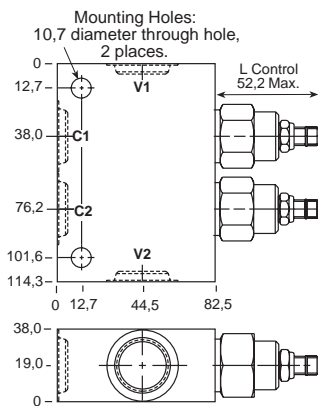


0-120 L/min.

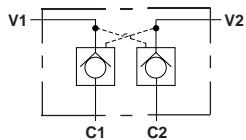
Cavity T-2A

**Ports**  
C1, C2, V1 & V2  
1/2" BSPP

**Assembly  
Model Code\***  
**CKEB-XCN-YAV**



\*Add modifier **/S** to order SG Iron for pressure rating over 210 bar.

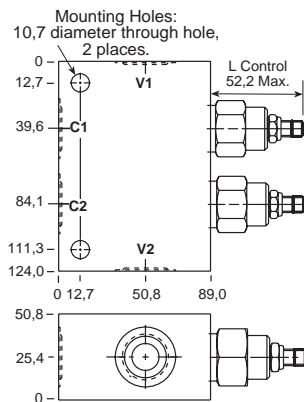


0-120 L/min.

Cavity T-2A

**Ports**  
C1, C2, V1 & V2  
3/4" BSPP

**Assembly  
Model Code\***  
**CKEB-XCN-YAW**



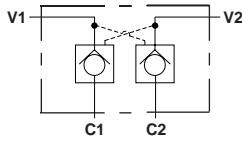
\*Add modifier **/S** to order SG Iron for pressure rating over 210 bar.

NOTES: Page 78 for cartridge model CK\*B-\*\*\* shows performance curves, technical tips, and options.  
See page vii for technical information about line mount bodies including SAE flange pattern specifications.  
Consult the Sun Factory for other port sizes available in the bodies shown above.  
**Model Codes printed in red are Preferred Products and are readily available.**

**THREE PORT PILOT-TO-OPEN CHECK APPLICATIONS  
(90 DEGREE CROSS-PILOTED BODIES, 2 CAVITIES)**

**PILOT OPERATED  
ASSEMBLIES**

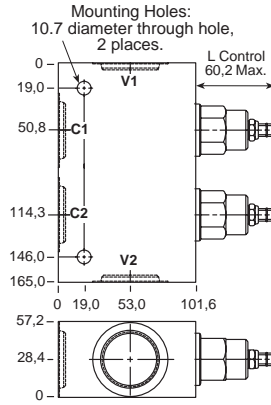
Go to [www.sunhydraulics.com](http://www.sunhydraulics.com)  
for more product information.



**0-240 L/min.**

**Cavity T-17A**

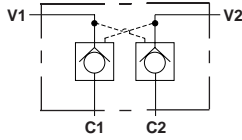
Ports C1, C2, V1 & V2	Assembly Model Code*
1" BSPP	<b>CKGB-XCN-YJX</b>
1 1/4" BSPP	<b>CKGB-XCN-YJY</b>



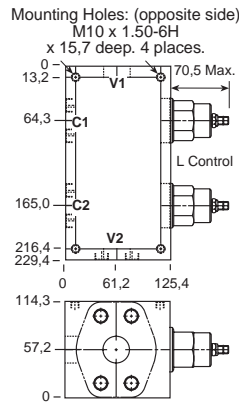
\*Add modifier /S to order SG Iron for pressure rating over 210 bar.

**0-480 L/min.**

**Cavity T-19A**



Ports C1, C2, V1 & V2	Assembly Model Code*
1 1/2" SAE C62	<b>CKIB-XCN-YM6/M</b>



\*Add modifier /T to order SG Iron for pressure rating over 210 bar.

NOTES: Page 78 for cartridge model CK\*B-\*\*\* shows performance curves, technical tips, and options.  
See page vii for technical information about line mount bodies including SAE flange pattern specifications.  
Consult the Sun Factory for other port sizes available in the bodies shown above.  
Model Codes printed in red are Preferred Products and are readily available.

## Line Mounted Assemblies

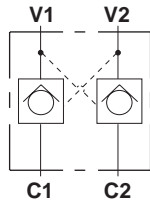
# THREE PORT PILOT-TO-OPEN CHECK APPLICATIONS (INLINE CROSS-PILOTED BODIES, 2 CAVITIES)

### PILOT OPERATED ASSEMBLIES

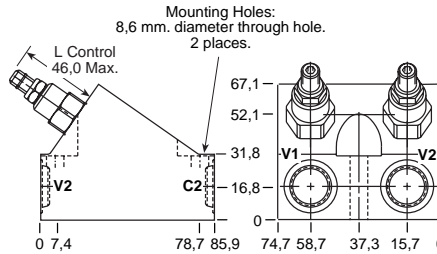
Go to [www.sunhydraulics.com](http://www.sunhydraulics.com)  
for more product information.

0-60 L/min.

Cavity T-11A



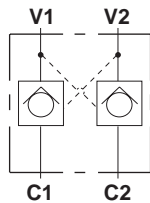
Ports C1, C2, V1 & V2	Assembly Model Code*
3/8" BSPP	<b>CKCB-XCN-XEU</b>
1/2" BSPP	<b>CKCB-XCN-XEV</b>



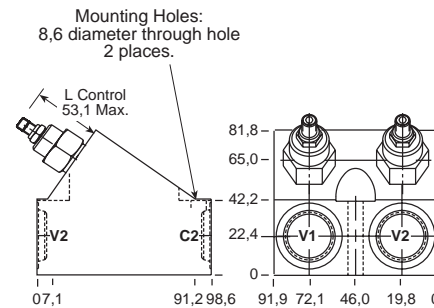
\*Add modifier /S to order SG Iron for pressure rating  
over 210 bar.

0-120 L/min.

Cavity T-2A



Ports C1, C2, V1 & V2	Assembly Model Code*
1/2" BSPP	<b>CKEB-XCN-XAV</b>
3/4" BSPP	<b>CKEB-XCN-XAW</b>



\*Add modifier /S to order SG Iron for pressure rating  
over 210 bar.

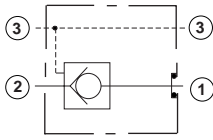
NOTES: Page 78 for cartridge model CK\*B-\*\*\* shows performance curves, technical tips, and options.  
See page vii for technical information about line mount bodies including SAE flange pattern specifications.  
Consult the Sun Factory for other port sizes available in the bodies shown above.  
Model Codes printed in red are Preferred Products and are readily available.



**THREE PORT PILOT-TO-OPEN CHECK APPLICATIONS  
(DIRECT MOUNT .75"/1.00"/1.25" SAE C61 FLANGE PORT/GASKET MOUNT BODIES,  
THROUGH PILOT PORT)**

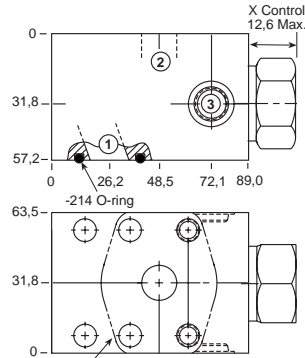
**PILOT OPERATED  
ASSEMBLIES**

Go to [www.sunhydraulics.com](http://www.sunhydraulics.com)  
for more product information.



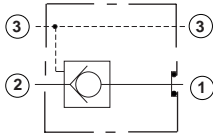
**0-120 L/min. Cavity T-2A**

Ports 1 and 2	Port 3	Assembly Model Code*
3/4" SAE C61	1/4" BSPP	<b>CKEB-XCN-ZNV/M</b>

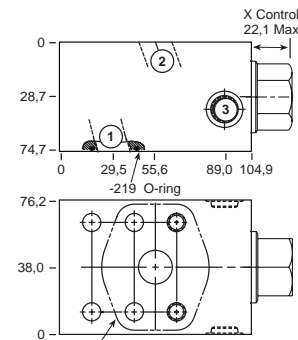


\*Add modifier **T** to order SG Iron for pressure rating over 210 bar.

**0-240 L/min. Cavity T-17A**

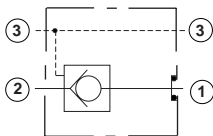


Ports 1 and 2	Port 3	Assembly Model Code*
1" SAE C61	1/4" BSPP	<b>CKGB-XCN-ZNW/M</b>

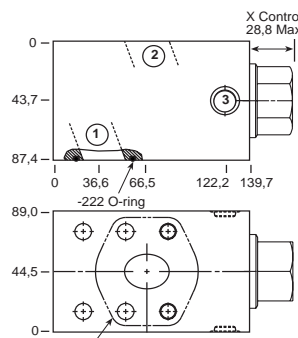


\*Add modifier **T** to order SG Iron for pressure rating over 210 bar.

**0-480 L/min. Cavity T-19A**



Ports 1 and 2	Port 3	Assembly Model Code*
1 1/4" SAE C61	1/4" BSPP	<b>CKIB-XCN-ZNX/M</b>



\*Add modifier **T** to order SG Iron for pressure rating over 210 bar.

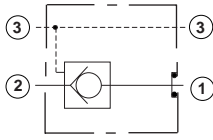
NOTES: Page 78 for cartridge model CK\*B-\*\*\* shows performance curves, technical tips, and options.  
See page vii for technical information about line mount bodies including SAE flange pattern specifications.  
Consult the Sun Factory for other port sizes available in the bodies shown above.

## Line Mounted Assemblies

# THREE PORT PILOT-TO-OPEN CHECK APPLICATIONS (DIRECT MOUNT .75"/1.00"/1.25" C62 FLANGE PORT/GASKET MOUNT BODIES, THROUGH PILOT/DRAIN PORT)

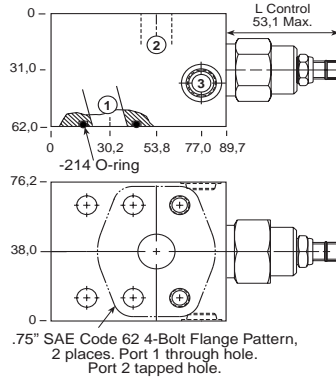
### PILOT OPERATED ASSEMBLIES

Go to [www.sunhydraulics.com](http://www.sunhydraulics.com)  
for more product information.



### 0-120 L/min. Cavity T-2A

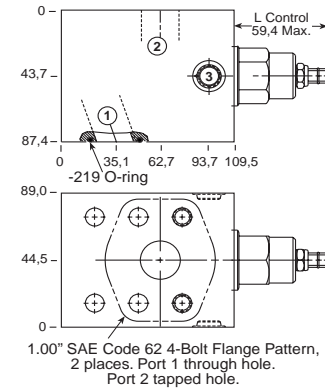
Ports 1 and 2	Port 3	Assembly Model Code*
3/4" SAE C62	1/4" BSPP	CKEB-XCN-ZDS/M



\*Add modifier **T** to order SG Iron for pressure rating over 210 bar.

### 0-240 L/min. Cavity T-17A

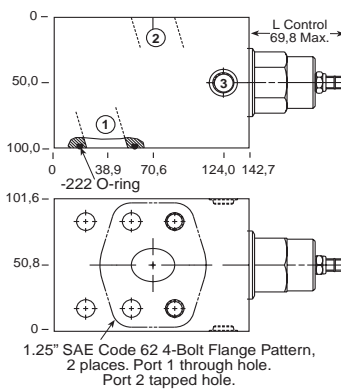
Ports 1 and 2	Port 3	Assembly Model Code*
1" SAE C62	1/4" BSPP	CKGB-XCN-ZDR/M



\*Add modifier **T** to order SG Iron for pressure rating over 210 bar.

### 0-480 L/min. Cavity T-19A

Ports 1 and 2	Port 3	Assembly Model Code*
1 1/4" SAE C62	1/4" BSPP	CKIB-XCN-ZFD/M



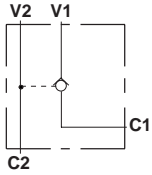
\*Add modifier **T** to order SG Iron for pressure rating over 210 bar.

NOTES: Page 78 for cartridge model CK\*B-\*\*\* shows performance curves, technical tips, and options.  
See page vii for technical information about line mount bodies including SAE flange information and specifications.  
Consult the Sun Factory for other port sizes available in the bodies shown above.

# THREE PORT PILOT-TO-OPEN CHECK APPLICATIONS (GASKET MOUNT BODIES)

## PILOT OPERATED ASSEMBLIES

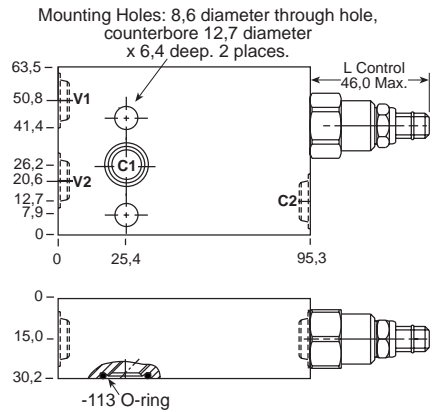
Go to [www.sunhydraulics.com](http://www.sunhydraulics.com) for more product information.



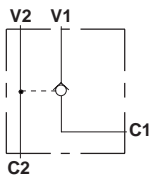
Ports  
C1, C2, V1 & V2  
3/8" BSPP

Assembly  
Model Code\*  
**CKCB-XCN-ZTD**

### 0-60 L/min. Cavity T-11A



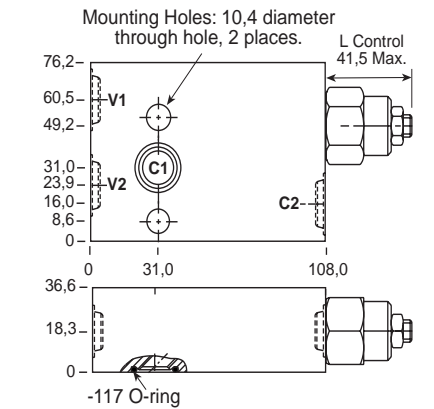
\*Add modifier /S to order SG Iron for pressure rating over 210 bar.



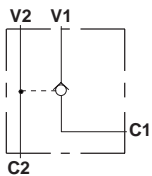
Ports  
C1, C2, V1 & V2  
1/2" BSPP

Assembly  
Model Code\*  
**CKEB-XCN-ZTH**

### 0-120 L/min. Cavity T-2A



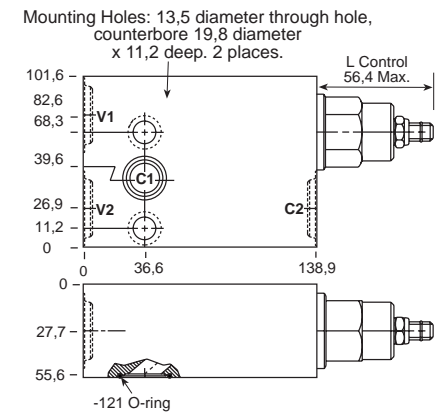
\*Add modifier /S to order SG Iron for pressure rating over 210 bar.



Ports  
C1, C2, V1 & V2  
3/4" BSPP

Assembly  
Model Code\*  
**CKGB-XCN-ZTL**

### 0-240 L/min. Cavity T-17A



\*Add modifier /S to order SG Iron for pressure rating over 210 bar.

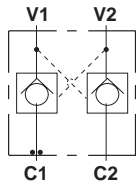
NOTES: Page 78 for cartridge model CK\*B-\*\*\* shows performance curves, technical tips, and options.  
See page vii for technical information about line mount bodies including SAE flange pattern specifications.  
Consult the Sun Factory for other port sizes available in the bodies shown above.  
Model Codes printed in red are Preferred Products and are readily available.

## Line Mounted Assemblies

# THREE PORT PILOT-TO-OPEN CHECK APPLICATIONS (GASKET MOUNT BODIES, 2 CAVITIES)

### PILOT OPERATED ASSEMBLIES

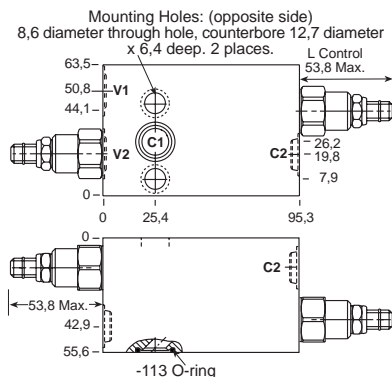
Go to [www.sunhydraulics.com](http://www.sunhydraulics.com)  
for more product information.



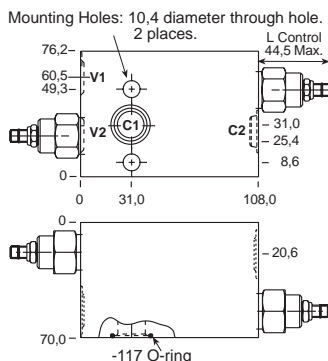
Ports C2, V1 & V2	Assembly Model Code*
3/8 BSPP	CKCB-XCN-YVX

\*Add modifier /S to order SG Iron for pressure rating over 210 bar.

### 0-60 L/min. Cavity T-11A

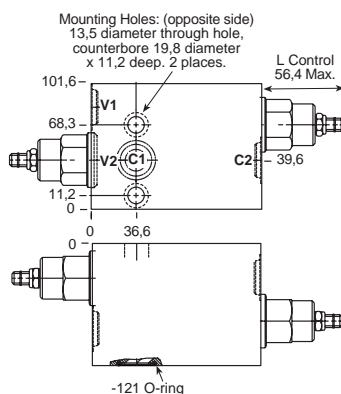


### 0-120 L/min. Cavity T-2A



\*Add modifier /S to order SG Iron for pressure rating over 210 bar.

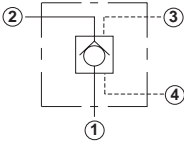
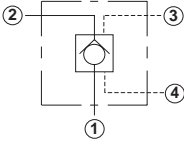
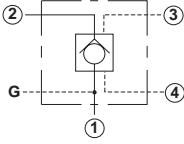
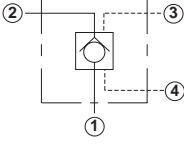
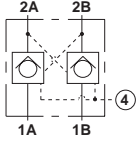
### 0-240 L/min. Cavity T-17A



\*Add modifier /S to order SG Iron for pressure rating over 210 bar.

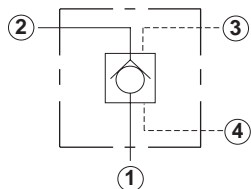
NOTES: Page 78 for cartridge model CK\*B-\*\*\* shows performance curves, technical tips, and options.  
See page vii for technical information about line mount bodies including SAE flange pattern specifications.  
Consult for other port sizes available in the bodies shown above.

# Four Port Pilot-to-Open Check Assemblies

	<i>Cartridge Type</i>	<i>Page</i>
	Vented, 4 Port Cavity	94
<b><i>Line Mounted Assemblies (Body Type)</i></b>		
	90 Degree	96
	90 Degree with Gauge Port	97
	2.00" SAE C62 Flange Port, 2 Cavities	98
	90 Degree Cross-Piloted, 2 Cavities, Common Port 4	99

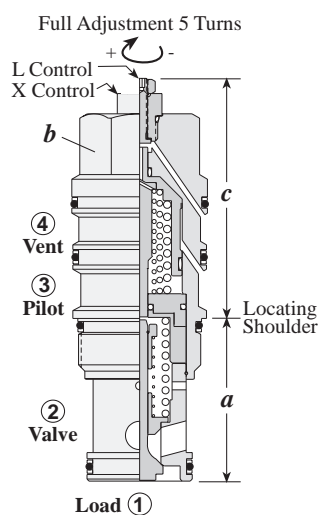
## Pilot-to-Open Check Valves

### VENTED, 4 PORT CAVITY



Capacity	Typical Cartridge Model Code	Cavity	Cartridge Dimensions				Installation Torque (Nm)
			a	b	c		
					X	L	
60 L/min.	<b>CVCV - XCN</b>	T - 21A	34,9	22,2	59	60	40/50
120 L/min.	<b>CVEV - XCN</b>	T - 22A	34,9	28,6	60	65	60/70
240 L/min.	<b>CVGV - XCN</b>	T - 23A	46	31,8	72	77	200/215
480 L/min.	<b>CVIV - XCN</b>	T - 24A	63,5	41,3	89	96	465/500

### OPTION ORDERING INFORMATION



Nominal Capacity	CV * V - * * *		
	Control**	Cracking Pressure	Seal
<b>C</b> 60 L/min.	<b>X</b> Standard Pilot	<b>A</b> 0,3 bar	<b>N</b> Buna-N
<b>E</b> 120 L/min.	<b>L</b> Manual Load Release	<b>B</b> 1,0 bar	<b>V</b> Viton
<b>G</b> 240 L/min.		<b>C</b> 2,0 bar	
<b>I</b> 480 L/min.		<b>D</b> 3,5 bar	
		<b>E</b> 5,0 bar	
		<b>F</b> 7,0 bar	

\*\* See page 244 for information on Control Options

## Pilot-to-Open Check Valves, Vented

### Applications

Sun pilot-to-open check valves are non-modulating, *on/off* valves used for load locking only, therefore *do not* provide smooth motion control. They allow free flow through check valve from port 2 to port 1, then block reverse flow until a pilot pressure directly proportional to the load pressure is sensed at port 3 so that a pilot piston can push the check poppet off of its seat.

Because of the on/off action of the pilot-to-open check valve it makes them unsuitable for use with overrunning loads that will cause a loss of pilot pressure. Without pilot pressure the check valve will close until adequate pilot pressure is again restored, causing a ratcheting motion.

*Pilot-to-open check valves should never be used with paired cylinders.* Pilot pressure will open the valve with the least load first, transferring the combined load to the second valve at double the pressure.

The *vented* type is used on applications where there is variable back-pressure downstream of the valve which could cause instability in a standard valve. The pilot spring chamber is vented externally to tank through a fourth port making it insensitive to back pressure. Any pressure generated on the drain port will be additive to the pilot pressure required.

**NOTE:** The vent port should never be plugged, as seal weepage will eventually cause valves to malfunction.

It is preferable that the pilot-to-open check valve is mounted as close as possible to the actuator to provide maximum protection in the event of a hydraulic line failure. This can be achieved by incorporating them directly into the actuator, or, Sun offers a range of gasket mounted bodies that bolt directly onto the mounting face of a cylinder or motor.

### Design Concepts and Features

- Pilot-to-open check valves have a pilot ratio of 3:1, which is suitable for most applications.
- Operating pressures up to 350 bar. Flow capacities up to 480 L/min.
- Low leakage when closed, less than 1 drop/min. *This leakage figure is checked at both low and high pressure during test.*
- Optional free flow check springs available, from 0.3 bar to avoid cavitation up to 7 bar for severe applications.
- These cartridges have a sealed pilot piston.
- Valve with emergency manual release screw available, in case pilot pressure is not available.
- Hardened poppet and seat provides long life and better resistance to contamination.

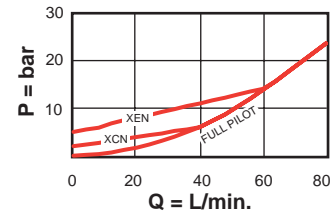
### General Application Requirements

- Operating Temperature Range: Buna-N seals -45° C to 90° C, Viton seals -15° C to 120° C.
- Viscosity Range: 10-600 centistokes.
- Fluid Contamination Level: ISO 4406 18/15 or better; Recommend  $\beta_{10} \geq 75$  to achieve ISO 18/15 or better in most systems.
- Factory Pressure Setting for cartridge is established at cracking flow.

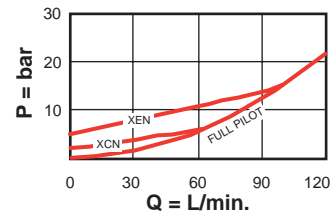
### Performance Curves

#### Typical Pressure Drop

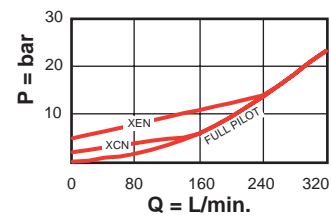
#### CVCV-X\*N



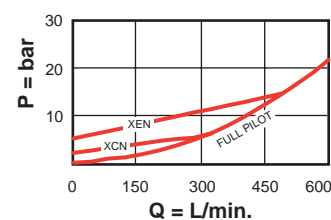
#### CVEV-X\*N



#### CVGV-X\*N



#### CVIV-X\*N



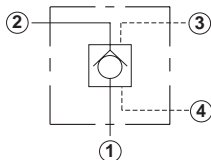
## Line Mounted Assemblies

# FOUR PORT PILOT-TO-OPEN CHECK APPLICATIONS (90 DEGREE BODIES)

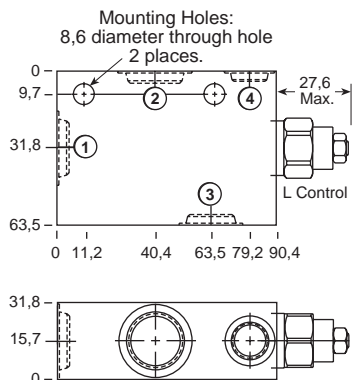
### VENTED

Go to [www.sunhydraulics.com](http://www.sunhydraulics.com)  
for more product information.

### 0-60 L/min. Cavity T-21A

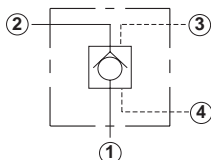


Ports 1 and 2	Ports 3 and 4	Assembly Model Code*
1/4" BSPP	3: 1/4" BSPP 4: 1/4" BSPP	<b>CVCV-XCN-MAT</b>
3/8" BSPP	3: 3/8" BSPP 4: 1/4" BSPP	<b>CVCV-XCN-MAU</b>
1/2" BSPP	3: 3/8" BSPP 4: 1/4" BSPP	<b>CVCV-XCN-MAV</b>

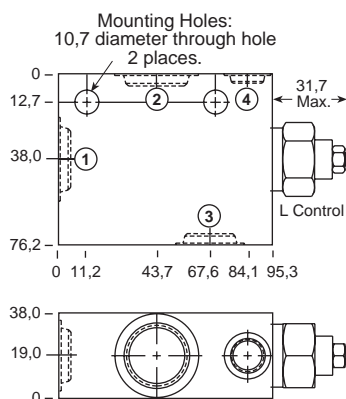


\*Add modifier /S to order SG Iron for pressure rating over 210 bar.

### 0-120 L/min. Cavity T-22A



Ports 1 and 2	Ports 3 and 4	Assembly Model Code*
3/8" BSPP	3: 3/8" BSPP 4: 1/4" BSPP	<b>CVEV-XCN-NAU</b>
1/2" BSPP	3: 1/2" BSPP 4: 1/4" BSPP	<b>CVEV-XCN-NAV</b>
3/4" BSPP	3: 1/2" BSPP 4: 1/4" BSPP	<b>CVEV-XCN-NAW</b>



\*Add modifier /S to order SG Iron for pressure rating over 210 bar.

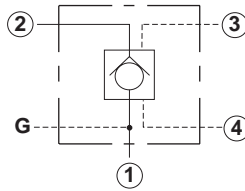
NOTES: Page 94 for cartridge model CV\*V-\*\*\* shows performance curves, technical tips, and options.  
See page vii for technical information about line mount bodies including SAE flange pattern specifications.  
Consult the Sun Factory for other port sizes available in the bodies shown above.  
Model Codes printed in red are Preferred Products and are readily available.



# FOUR PORT PILOT-TO-OPEN CHECK APPLICATIONS (90 DEGREE BODIES)

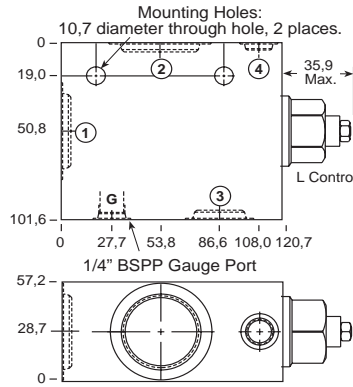
## VENTED

Go to [www.sunhydraulics.com](http://www.sunhydraulics.com) for more product information.

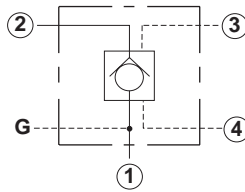


### 0-240 L/min. Cavity T-23A

Ports 1 and 2	Ports 3 and 4	Assembly Model Code*
3/4" BSPP	1/4" BSPP	<b>CVGV-XCN-PCW</b>
1" BSPP	1/4" BSPP	<b>CVGV-XCN-PCX</b>
1 1/4" BSPP	1/4" BSPP	<b>CVGV-XCN-PCY</b>

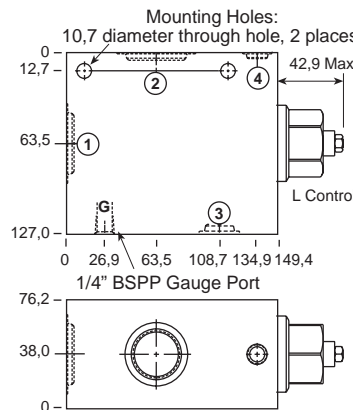


\*Add modifier /S to order SG Iron for pressure rating over 210 bar.



### 0-480 L/min. Cavity T-24A

Ports 1 and 2	Ports 3 and 4	Assembly Model Code*
1" BSPP	1/4" BSPP	<b>CVIV-XCN-QCX</b>
1 1/4" BSPP	1/4" BSPP	<b>CVIV-XCN-QCY</b>



\*Add modifier /S to order SG Iron for pressure rating over 210 bar.

NOTES: Page 94 for cartridge model CV\*V-\*\*\* shows performance curves, technical tips, and options.  
See page vii for technical information about line mount bodies including SAE flange pattern specifications.  
Consult the Sun Factory for other port sizes available in the bodies shown above.  
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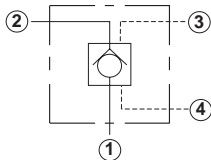
## Line Mounted Assemblies

# FOUR PORT PILOT-TO-OPEN CHECK APPLICATIONS (2.00" SAE C62 FLANGE PORT BODY, 2 CAVITIES)

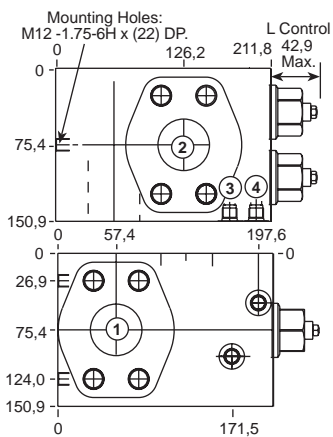
VENTED

Go to [www.sunhydraulics.com](http://www.sunhydraulics.com)  
for more product information.

**0-960 L/min. Cavity T-24A**



Ports 1 and 2	Ports 3 and 4	Assembly Model Code*
2" SAE C62	3: 1/4" BSPP 4: 1/4" BSPP	<b>CVIV-XCN-Z9T/M</b>



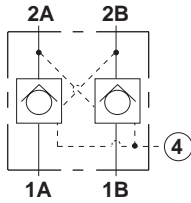
\*Add modifier **T** to order SG Iron for pressure rating over 210 bar.

NOTES: Page 94 for cartridge model CV\*V-\*\*\* shows performance curves, technical tips, and options.  
See page vii for technical information about line mount bodies including SAE flange pattern specifications.  
Consult the Sun Factory for other port sizes available in the bodies shown above.

**FOUR PORT PILOT-TO-OPEN CHECK APPLICATIONS  
(90 DEGREE CROSS-PILOTED BODIES, 2 CAVITIES, COMMON PORT 4)**

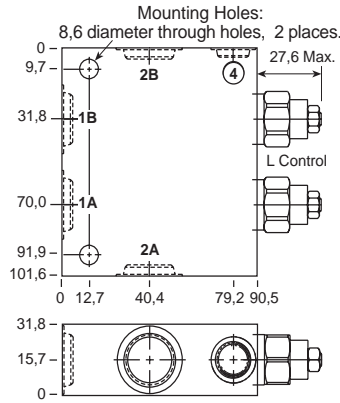
**VENTED**

Go to [www.sunhydraulics.com](http://www.sunhydraulics.com) for more product information.

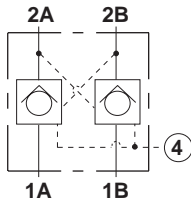


**0-60 L/min. Cavity T-21A**

Ports 1A, 1B, 2A & 2B	Port 4	Assembly Model Code*
3/8" BSPP	1/4" BSPP	<b>CVCV-XCN-XPU</b>
1/2" BSPP	1/4" BSPP	<b>CVCV-XCN-XPV</b>

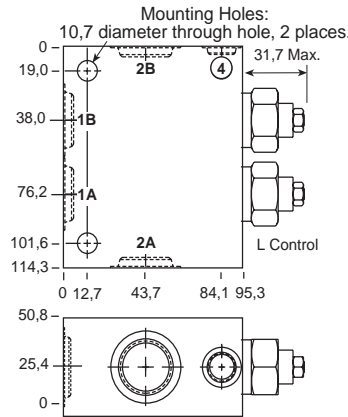


\*Add modifier **/S** to order SG Iron for pressure rating over 210 bar.



**0-120 L/min. Cavity T-22A**

Ports 1A, 1B, 2A & 2B	Port 4	Assembly Model Code*
1/2" BSPP	1/4" BSPP	<b>CVEV-XCN-XIV</b>
3/4" BSPP	1/4" BSPP	<b>CVEV-XCN-XIW</b>



\*Add modifier **/S** to order SG Iron for pressure rating over 210 bar.

NOTES: Page 94 for cartridge model CV\*V-\*\*\* shows performance curves, technical tips, and options.  
See page vii for technical information about line mount bodies including SAE flange pattern specifications.  
Consult the Sun Factory for other port sizes available in the bodies shown above.

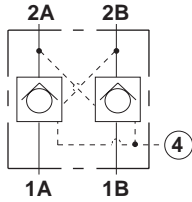
## Line Mounted Assemblies

# FOUR PORT PILOT-TO-OPEN CHECK APPLICATIONS (90 DEGREE CROSS-PILOTED BODIES, 2 CAVITIES, COMMON PORT 4)

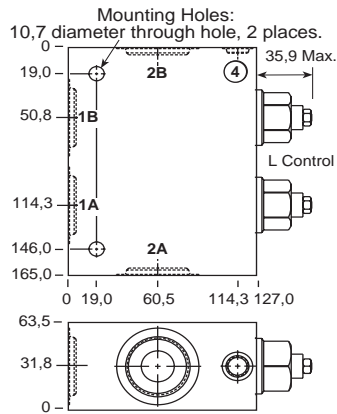
### VENTED

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for more product information.

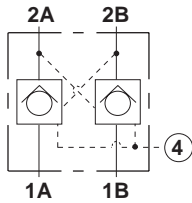
### 0-240 L/min. Cavity T-23A



Ports 1A, 1B, 2A & 2B	Port 4	Assembly Model Code*
1" BSPP	1/4" BSPP	CVGV-XCN-XMU
1 1/4" BSPP	1/4" BSPP	CVGV-XCN-XMV

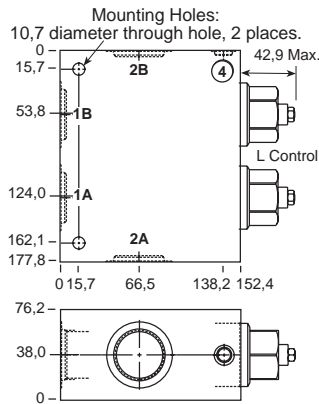


\*Add modifier /S to order SG Iron for pressure rating over 210 bar.



Ports 1A, 1B, 2A & 2B	Port 4	Assembly Model Code*
1" BSPP	1/4" BSPP	CVIV-XCN-XLX
1 1/4" BSPP	1/4" BSPP	CVIV-XCN-XLY

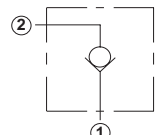
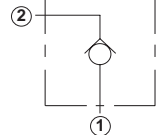
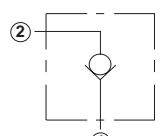
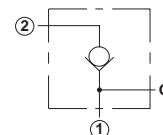
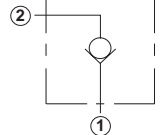
### 0-480 L/min. Cavity T-24A



\*Add modifier /S to order SG Iron for pressure rating over 210 bar.

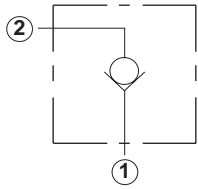
NOTES: Page 94 for cartridge model CV\*V-\*\*\* shows performance curves, technical tips, and options.  
See page vii for technical information about line mount bodies including SAE flange pattern specifications.  
Consult the Sun Factory for other port sizes available in the bodies shown above.

# Check Assemblies

	<i>Cartridge Type</i>	<i>Page</i>
	1 to 2 Free Flow	102
	2 to 1 Free Flow	102
<b><i>Line Mounted Assemblies (Body Type)</i></b>		
	90 Degree	104
	90 Degree with Gauge Port	105
	Inline Inline/Inline 1.50"/2.00" SAE C61 Flange Port 2.00" SAE C61/C62 Flange Port, 2 Port Cavity in Parallel	106 107 108

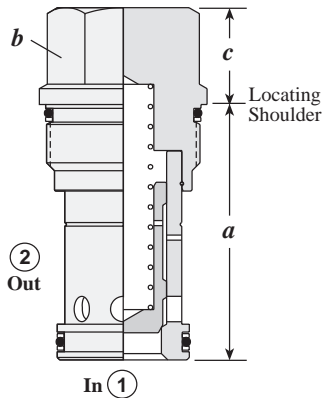
## Check Valves

### 1 TO 2 FREE FLOW



Capacity	Typical Cartridge Model Code	Cavity	Cartridge Dimensions			Installation Torque (Nm)
			a	b	c X	
40 L/min.	CXBA – XCN	T - 162A	31	19,1	21	35/40
80 L/min.	CXDA – XCN	T - 13A	34,9	22,2	19	40/50
160 L/min.	CXFA – XCN	T - 5A	41,1	28,6	18	60/70
320 L/min.	CXHA – XCN	T - 16A	61,9	31,8	25	200/215
640 L/min.	CXJA – XCN	T - 18A	79,9	41,3	31	465/500

### OPTION ORDERING INFORMATION

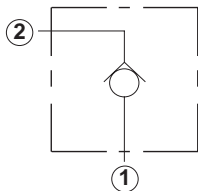


**CX \* A - \* \* \***

Nominal Capacity	Control**	Cracking Pressure	Seal
<b>B</b> 40 L/min.	<b>X</b> Non-adjustable	<b>A</b> 0,3 bar	<b>N</b> Buna-N
<b>D</b> 80 L/min.		<b>B</b> 1,0 bar	<b>V</b> Viton
<b>F</b> 160 L/min.		<b>C</b> 2,0 bar	
<b>H</b> 320 L/min.		<b>D</b> 3,5 bar	
<b>J</b> 640 L/min.		<b>E</b> 5,0 bar	
		<b>F</b> 7,0 bar	

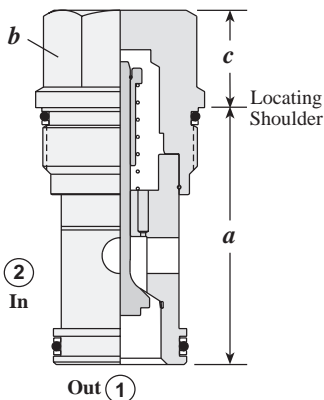
\*\* See page 244 for information on Control Options

### 2 TO 1 FREE FLOW



Capacity	Typical Cartridge Model Code	Cavity	Cartridge Dimensions			Installation Torque (Nm)
			a	b	c X	
30 L/min.	CXAD – XCN	T - 162A	31	19,1	21	35/40
60 L/min.	CXCD – XCN	T - 13A	34,9	22,2	19	40/50
120 L/min.	CXED – XCN	T - 5A	41,1	28,6	18	60/70
240 L/min.	CXGD – XCN	T - 16A	61,9	31,8	25	200/215
480 L/min.	CXID – XCN	T - 18A	79,9	41,3	31	465/500

### OPTION ORDERING INFORMATION



**CX \* D - \* \* \***

Nominal Capacity	Control**	Cracking Pressure	Seal
<b>A*</b> 30 L/min.	<b>X</b> Non-adjustable	<b>A</b> 0,3 bar	<b>N</b> Buna-N
<b>C</b> 60 L/min.		<b>B</b> 1,0 bar	<b>V</b> Viton
<b>E</b> 120 L/min.		<b>C</b> 2,0 bar	
<b>G</b> 240 L/min.		<b>D</b> 3,5 bar	
<b>I</b> 480 L/min.		<b>E</b> 5,0 bar	
		<b>F</b> 7,0 bar	

\*\* See page 244 for information on Control Options

\*CXAD available with A,C,E Cracking Pressures Only.

# TECHNICAL TIPS / PERFORMANCE CURVES

## Check Valves, Free Flow, Port 1 to 2

### Applications

Check valves are used to provide free flow in one direction and blocked flow in the opposite direction. The preferred check CX\*A-X\*N (free flow 1 to 2) should be used wherever possible.

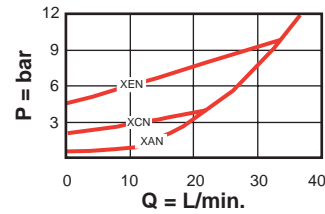
### Design Concepts and Features

- Hardened and lapped sealing surfaces provide low leakage (less than 1 drop / min.) and long life.
- Extensive range of spring options.
- Available in five frame sizes with operating pressures to 350 bar.

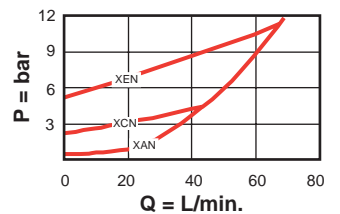
### Performance Curves

#### Typical Pressure Rise

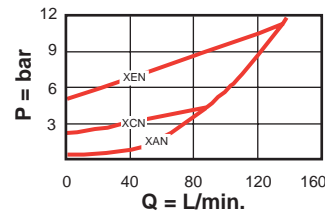
#### CXBA-X\*N



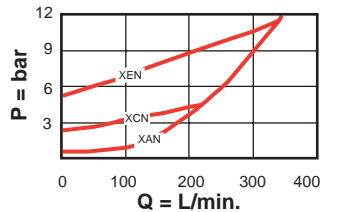
#### CXDA-X\*N



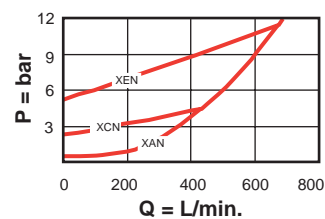
#### CXFA-X\*N



#### CXHA-X\*N



#### CXJA-X\*N



## Check Valves, Free Flow, Port 2 to 1

### Applications

The CX\*D-X\*N non-preferred check (free flow 2 to 1) should only be used to simplify complex manifold designs.

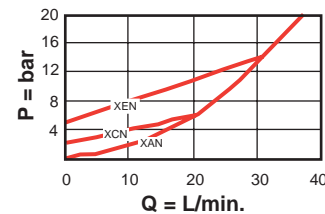
### Design Concepts and Features

- Hardened and lapped sealing surfaces provide low leakage (less than 1 drop / min.) and long life.
- Extensive range of spring options.
- Available in five frame sizes with operating pressures to 350 bar.

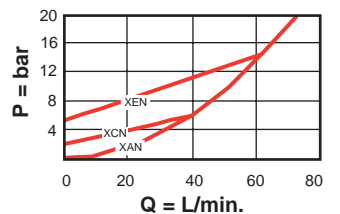
### Performance Curves

#### Typical Pressure Rise

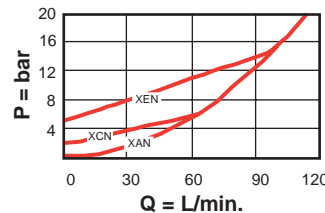
#### CXAD-X\*N



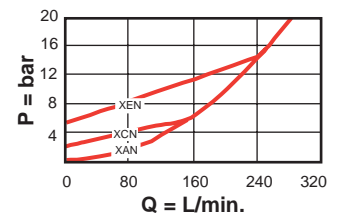
#### CXCD-X\*N



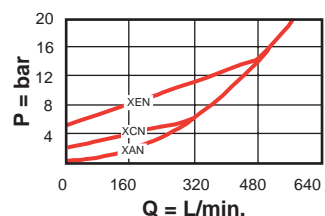
#### CXED-X\*N



#### CXGD-X\*N



#### CXID-X\*N



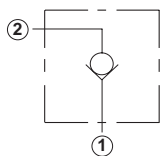
## General Application Requirements

- Operating Temperature Range: Buna-N seals -45° C to 90° C, Viton seals -15° C to 120° C.
- Viscosity Range: 10-600 centistokes.
- Fluid Contamination Level: ISO 4406 18/15 or better; Recommend  $\beta_{10} \geq 75$  to achieve ISO 18/15 or better in most systems.
- Factory Pressure Setting for cartridge is established at a crack flow rate.

## Line Mounted Assemblies

TWO PORT FLOW CONTROL APPLICATIONS  
(90 DEGREE BODIES)FREE FLOW  
Port 1 to Port 2

0-40 L/min.

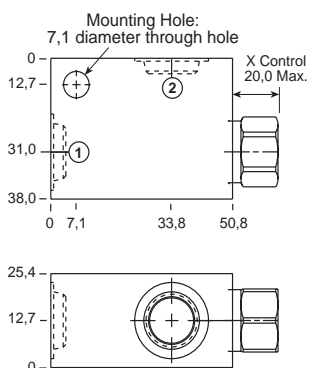


Ports 1 and 2	Assembly Model Code*
1/4" BSPP	<b>CXBA-X*N-AAT</b>
3/8" BSPP	<b>CXBA-X*N-AAU</b>

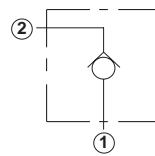
\*Add modifier /S to order SG Iron for pressure rating over 210 bar.

Go to [www.sunhydraulics.com](http://www.sunhydraulics.com)  
for more product information.

Cavity T-162A

FREE FLOW  
Port 2 to Port 1

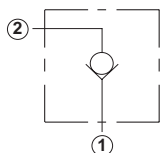
0-30 L/min.



Ports 1 and 2	Assembly Model Code*
1/4" BSPP	<b>CXAD-X*N-AAT</b>
3/8" BSPP	<b>CXAD-X*N-AAU</b>

\*Add modifier /S to order SG Iron for pressure rating over 210 bar.

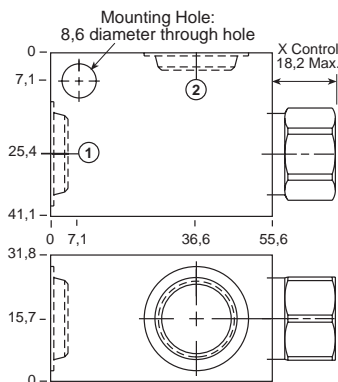
0-80 L/min.



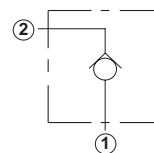
Ports 1 and 2	Assembly Model Code*
1/4" BSPP	<b>CXDA-X*N-GAT</b>
3/8" BSPP	<b>CXDA-X*N-GAU</b>

\*Add modifier /S to order SG Iron for pressure rating over 210 bar.

Cavity T-13A



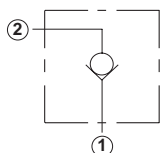
0-60 L/min.



Ports 1 and 2	Assembly Model Code*
1/4" BSPP	<b>CXCD-X*N-GAT</b>
3/8" BSPP	<b>CXCD-X*N-GAU</b>

\*Add modifier /S to order SG Iron for pressure rating over 210 bar.

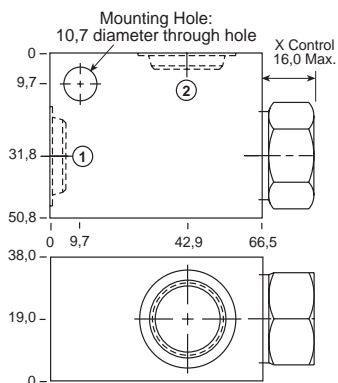
0-160 L/min.



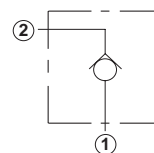
Ports 1 and 2	Assembly Model Code*
3/8" BSPP	<b>CXFA-X*N-DAU</b>
1/2" BSPP	<b>CXFA-X*N-DAV</b>

\*Add modifier /S to order SG Iron for pressure rating over 210 bar.

Cavity T-5A



0-120 L/min.



Ports 1 and 2	Assembly Model Code*
3/8" BSPP	<b>CXED-X*N-DAU</b>
1/2" BSPP	<b>CXED-X*N-DAV</b>

\*Add modifier /S to order SG Iron for pressure rating over 210 bar.

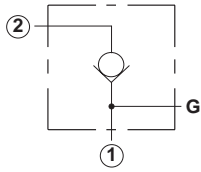
NOTES: Page 102 for cartridge models CX\*A-\*\*\* and CX\*D-\*\*\* shows performance curves, technical tips, and options.  
See page vii for technical information about line mount bodies including SAE flange pattern specifications.  
Consult the Sun Factory for other port sizes available in the bodies shown above.  
Model Codes printed in red are Preferred Products and are readily available.



**TWO PORT FLOW CONTROL APPLICATIONS  
(90 DEGREE BODIES)**

**FREE FLOW  
Port 1 to Port 2**

**0-320 L/min.**

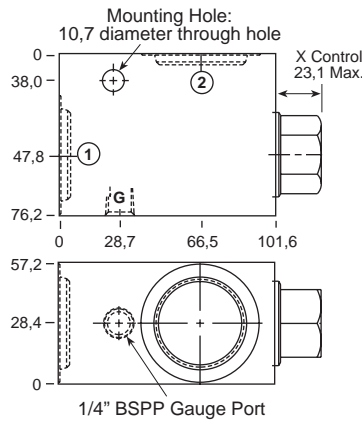


Ports 1 and 2	Assembly Model Code*
3/4" BSPP	<b>CXHA-X*N-IAW</b>
1" BSPP	<b>CXHA-X*N-IAX</b>
1 1/4" BSPP	<b>CXHA-X*N-IAY</b>

\*Add modifier /S to order SG Iron for pressure rating over 210 bar.

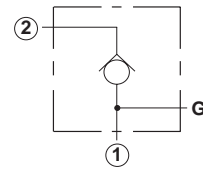
Go to [www.sunhydraulics.com](http://www.sunhydraulics.com) for more product information.

**Cavity T-16A**



**FREE FLOW  
Port 2 to Port 1**

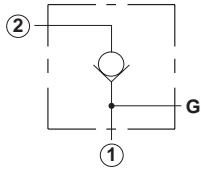
**0-240 L/Min**



Ports 1 and 2	Assembly Model Code*
3/4" BSPP	<b>CXGD-X*N-IAW</b>
1" BSPP	<b>CXGD-X*N-IAX</b>
1 1/4" BSPP	<b>CXGD-X*N-IAY</b>

\*Add modifier /S to order SG Iron for pressure rating over 210 bar.

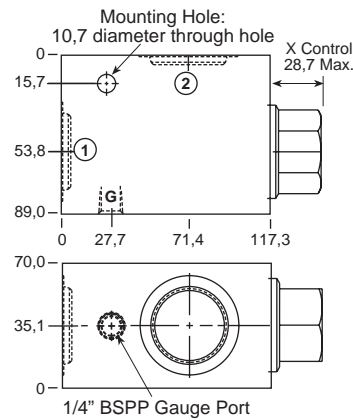
**0-640 L/min.**



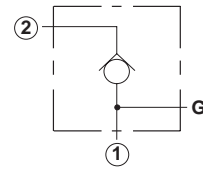
Ports 1 and 2	Assembly Model Code*
3/4" BSPP	<b>CXJA-X*N-LAW</b>
1" BSPP	<b>CXJA-X*N-LAX</b>
1 1/4" BSPP	<b>CXJA-X*N-LAY</b>

\*Add modifier /S to order SG Iron for pressure rating over 210 bar.

**Cavity T-18A**



**0-480 L/Min**



Ports 1 and 2	Assembly Model Code*
3/4" BSPP	<b>CXID-X*N-LAW</b>
1" BSPP	<b>CXID-X*N-LAX</b>
1 1/4" BSPP	<b>CXID-X*N-LAY</b>

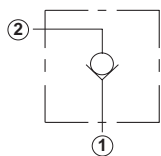
\*Add modifier /S to order SG Iron for pressure rating over 210 bar.

NOTES: Page 102 for cartridge models CX\*A-\*\*\* and CX\*D-\*\*\* shows performance curves, technical tips, and options. See page vii for technical information about line mount bodies including SAE flange pattern specifications. Consult the Sun Factory for other port sizes available in the bodies shown above. Model Codes printed in red are Preferred Products and are readily available.

## Line Mounted Assemblies

TWO PORT FLOW CONTROL APPLICATIONS  
(INLINE BODIES)FREE FLOW  
Port 1 to Port 2

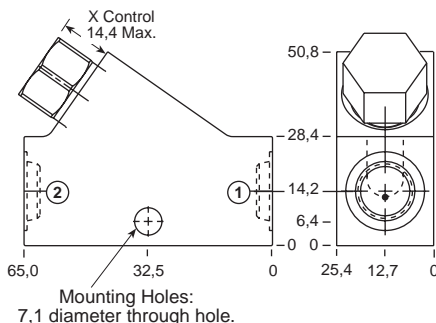
0-40 L/min.



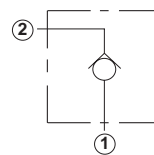
Ports 1 and 2	Assembly Model Code*
1/4" BSPP	<b>CXBA-X*N-ACT</b>
3/8" BSPP	<b>CXBA-X*N-ACU</b>

Go to [www.sunhydraulics.com](http://www.sunhydraulics.com)  
for more product information.

Cavity T-162A

FREE FLOW  
Port 2 to Port 1

0-30 L/min.

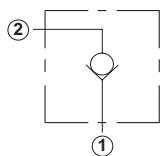


Ports 1 and 2	Assembly Model Code*
1/4" BSPP	<b>CXAD-X*N-ACT</b>
3/8" BSPP	<b>CXAD-X*N-ACU</b>

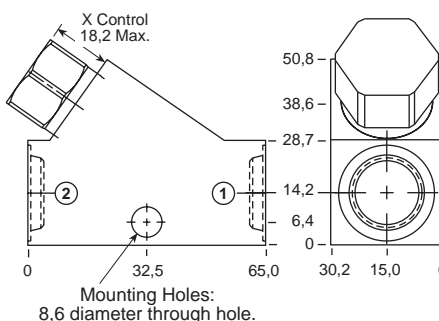
\*Add modifier /S to order SG Iron for pressure rating  
over 210 bar.\*Add modifier /S to order SG Iron for pressure rating  
over 210 bar.

0-80 L/min.

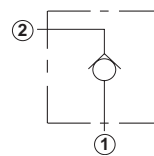
Cavity T-13A



Ports 1 and 2	Assembly Model Code*
1/4" BSPP	<b>CXDA-X*N-GCT</b>
3/8" BSPP	<b>CXDA-X*N-GCU</b>



0-60 L/min.

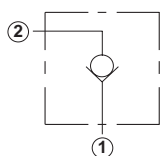


Ports 1 and 2	Assembly Model Code*
1/4" BSPP	<b>CXCD-X*N-GCT</b>
3/8" BSPP	<b>CXCD-X*N-GCU</b>

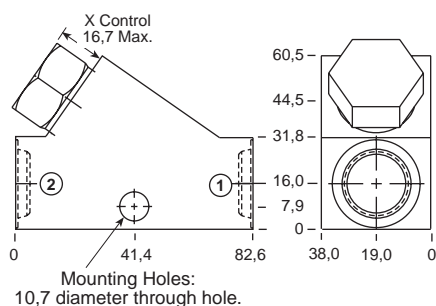
\*Add modifier /S to order SG Iron for pressure rating  
over 210 bar.\*Add modifier /S to order SG Iron for pressure rating  
over 210 bar.

0-160 L/min.

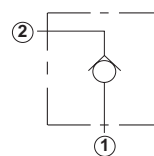
Cavity T-5A



Ports 1 and 2	Assembly Model Code*
3/8" BSPP	<b>CXFA-X*N-DCU</b>
1/2" BSPP	<b>CXFA-X*N-DCV</b>



0-120 L/min.



Ports 1 and 2	Assembly Model Code*
3/8" BSPP	<b>CXED-X*N-DCU</b>
1/2" BSPP	<b>CXED-X*N-DCV</b>

\*Add modifier /S to order SG Iron for pressure rating  
over 210 bar.\*Add modifier /S to order SG Iron for pressure rating  
over 210 bar.

NOTES: Page 102 for cartridge models CX\*A-\*\*\* and CX\*D-\*\*\* shows performance curves, technical tips, and options.  
See page vii for technical information about line mount bodies including SAE flange pattern specifications.  
Consult the Sun Factory for other port sizes available in the bodies shown above.  
Model Codes printed in red are Preferred Products and are readily available.

**TWO PORT FLOW CONTROL APPLICATIONS  
(INLINE/INLINE 1.50"/2.00" SAE C61 FLANGE PORT BODIES)**

**FREE FLOW  
Port 1 to Port 2**

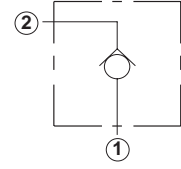
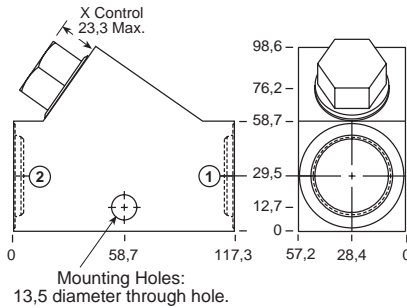
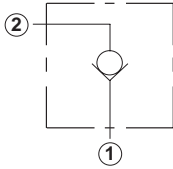
Go to [www.sunhydraulics.com](http://www.sunhydraulics.com)  
for more product information.

**FREE FLOW  
Port 2 to Port 1**

**0-320 L/min.**

**Cavity T-16A**

**0-240 L/min.**



Ports 1 and 2	Assembly Model Code*
3/4" BSPP	<b>CXHA-X*N-ICW</b>
1" BSPP	<b>CXHA-X*N-ICX</b>
1 1/4" BSPP	<b>CXHA-X*N-ICY</b>

Ports 1 and 2	Assembly Model Code*
3/4" BSPP	<b>CXGD-X*N-ICW</b>
1" BSPP	<b>CXGD-X*N-ICX</b>
1 1/4" BSPP	<b>CXGD-X*N-ICY</b>

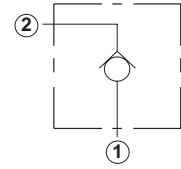
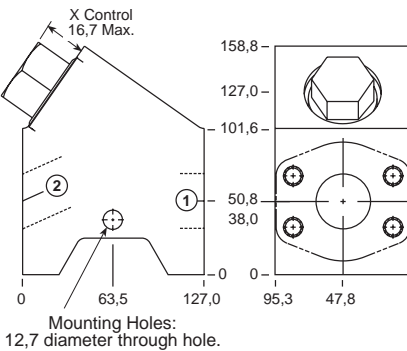
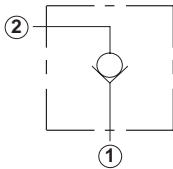
\*Add modifier /S to order SG Iron for pressure rating over 210 bar.

\*Add modifier /S to order SG Iron for pressure rating over 210 bar.

**0-640 L/min.**

**Cavity T-18A**

**0-480 L/min.**



Ports 1 and 2	Assembly Model Code*
1 1/2" SAE C61	<b>CXJA-X*N-ZLS/M</b>

Ports 1 and 2	Assembly Model Code*
1 1/2" SAE C61	<b>CXID-X*N-ZLS/M</b>

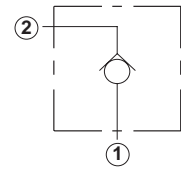
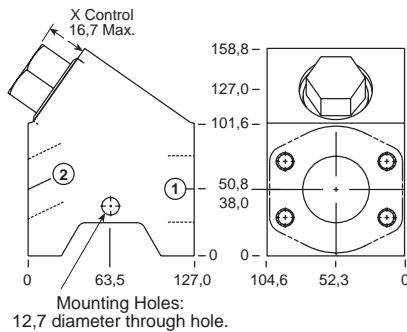
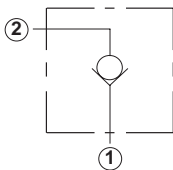
\*Add modifier /T to order SG Iron for pressure rating over 210 bar.

\*Add modifier /T to order SG Iron for pressure rating over 210 bar.

**0-640 L/min.**

**Cavity T-18A**

**0-480 L/min.**



Ports 1 and 2	Assembly Model Code*
2" SAE C61	<b>CXJA-X*N-ZLR/M</b>

Ports 1 and 2	Assembly Model Code*
2" SAE C61	<b>CXID-X*N-ZLR/M</b>

\*Add modifier /T to order SG Iron for pressure rating over 210 bar.

\*Add modifier /T to order SG Iron for pressure rating over 210 bar.

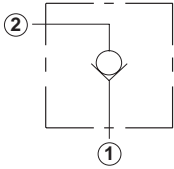
NOTES: Page 102 for cartridge models CX\*A-\*\*\* and CX\*D-\*\*\* shows performance curves, technical tips, and options. See page vii for technical information about line mount bodies including SAE flange pattern specifications. Consult the Sun Factory for other port sizes available in the bodies shown above. Model Codes printed in red are Preferred Products and are readily available.

## Line Mounted Assemblies

## TWO PORT FLOW CONTROL APPLICATIONS (2.00" SAE C61/C62 FLANGE PORT BODIES, 2 PORT CAVITY IN PARALLEL)

FREE FLOW  
Port 1 to Port 2

0-1280 L/min.



Ports  
1 and 2

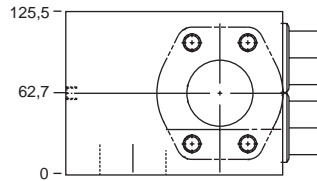
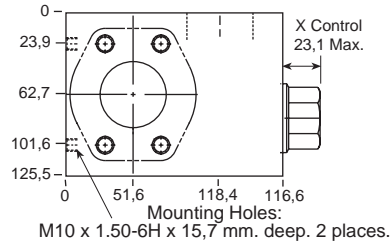
2" SAE C61

Assembly  
Model Code\*

**CXJA-X\*N-XZY/M**

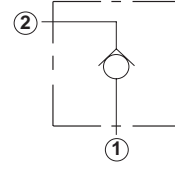
Go to [www.sunhydraulics.com](http://www.sunhydraulics.com)  
for more product information.

Cavity T-18A



FREE FLOW  
Port 2 to Port 1

0-960 L/min.



Ports  
1 and 2

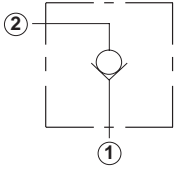
2" SAE C61

Assembly  
Model Code\*

**CXID-X\*N-XZY/M**

\*Add modifier **T** to order SG Iron for pressure rating  
over 210 bar.

0-1280 L/min.



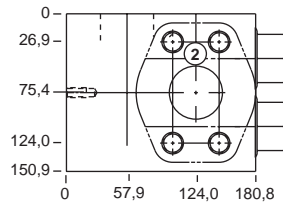
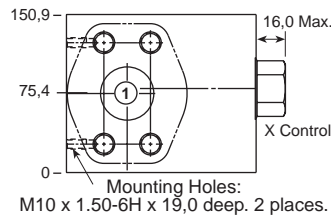
Ports  
1 and 2

2" SAE C62

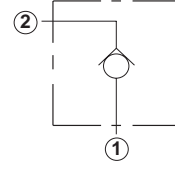
Assembly  
Model Code\*

**CXJA-X\*N-VTN/M**

Cavity T-18A



0-960 L/min.



Ports  
1 and 2

2" SAE C62

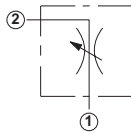
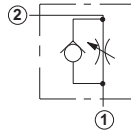
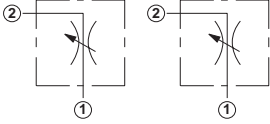
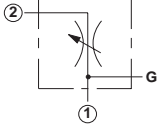
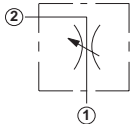
Assembly  
Model Code\*

**CXID-X\*N-VTN/M**

\*Add modifier **T** to order SG Iron for pressure rating  
over 210 bar.

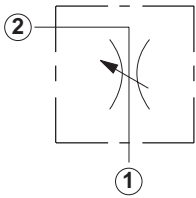
NOTES: Page 102 for cartridge model CX\*A-\*\*\* shows performance curves, technical tips, and options.  
See page vii for technical information about line mount bodies including SAE flange pattern specifications.  
Consult the Sun Factory for other port sizes available in the bodies shown above.

# Needle Assemblies

	<i>Cartridge Type</i>	<i>Page</i>
	Fully Adjustable Needle	110
	Fully Adjustable Needle with Reverse Free Flow Check	110
<b><i>Line Mounted Assemblies (Body Type)</i></b>		
	90 Degree	112
	90 Degree with Gauge Port	113
	Inline Inline/Inline 1.50"/2.00" SAE C61 Flange Port 2.00" SAE C61/C62 Flange Port, 2 Port Cavity in Parallel	114 115 116

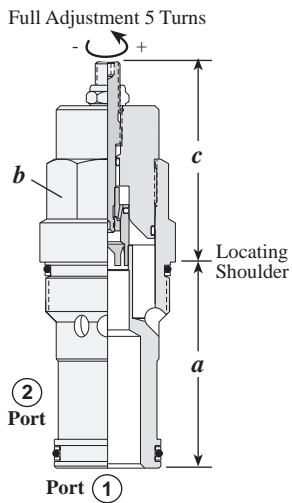
## Needle Valves

### FULLY ADJUSTABLE NEEDLE



Capacity	Typical Cartridge Model Code	Cavity	Cartridge Dimensions					Installation Torque (Nm)
			a	b	c			
					L	H	K	
0-4,0 mm	NFBC - LCN	T - 162A	31	19,1	41	-	45	35/40
0-4,8 mm	NFCC - LCN	T - 13A	34,9	22,2	58	64	64	40/50
0-6,3 mm	NFDC - LAN	T - 5A	41,1	28,6	67	72	73	60/70
0-9,6 mm	NFEC - LEN	T - 16A	61,9	31,8	73	79	79	200/215
0-14,2 mm	NFFC - LGN	T - 18A	79,4	41,3	84	90	90	465/500

#### OPTION ORDERING INFORMATION

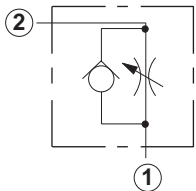


**NF \* C - \* \* \***

Nominal Capacity	Control**	Maximum Diameter Orifice	Seal
<b>B</b> 0-4,0 mm	<b>L</b> Standard Screw	<b>C</b> 4 mm	<b>N</b> Buna-N
<b>C</b> 0-4,8 mm	<b>H</b> Calibrated Handknob with Detent Lock	<b>C</b> 4,8 mm	<b>V</b> Viton
<b>D</b> 0-6,3 mm	<b>K</b> Handknob	<b>D</b> 2,3 mm	
<b>E</b> 0-9,6 mm		<b>A</b> 6,3 mm	
<b>F</b> 0-14,2 mm		<b>B</b> 3,2 mm	
		<b>E</b> 9,6 mm	
		<b>F</b> 7,1 mm	
		<b>G</b> 14,2 mm	
		<b>H</b> 9,6 mm	

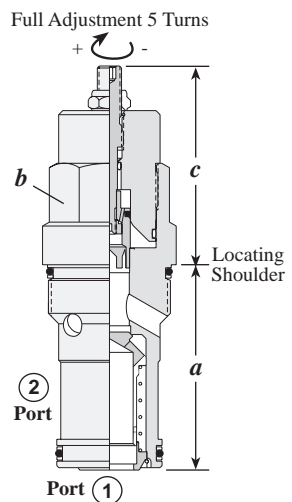
\*\* See page 244 for information on Control Options

### FULLY ADJUSTABLE NEEDLE WITH REVERSE FREE FLOW CHECK



Capacity	Typical Cartridge Model Code	Cavity	Cartridge Dimensions					Installation Torque (Nm)
			a	b	c			
					L	H	K	
0-4,0 mm	NCBB - LCN	T - 162A	31	19,1	41	-	45	35/40
0-4,8 mm	NCCB - LCN	T - 13A	34,9	22,2	58	64	64	40/50
0-6,3 mm	NCEB - LCN	T - 5A	41,1	28,6	67	72	73	60/70
0-9,6 mm	NCFB - LCN	T - 16A	61,9	31,8	73	79	79	200/215
0-14,2 mm	NCGB - LCN	T - 18A	79,4	41,3	84	90	90	465/500

#### OPTION ORDERING INFORMATION



**NC \* B - \* \* \***

Nominal Capacity	Control**	Cracking Pressure*	Seal
<b>NCBB*</b> 0-4,0 mm	<b>L</b> Standard Screw	<b>A</b> 0,3 bar	<b>N</b> Buna-N
<b>NCCB</b> 0-4,0 mm	<b>H</b> Calibrated Handknob with Detent Lock	<b>C</b> 2,0 bar	<b>V</b> Viton
<b>NCCC</b> 0-2,3 mm	<b>K</b> Handknob	<b>E</b> 5,0 bar	
<b>NCEB</b> 0-6,3 mm			
<b>NCEC</b> 0-3,2 mm			
<b>NCFB</b> 0-9,6 mm			
<b>NCFC</b> 0-7,1 mm			
<b>NCGB</b> 0-14,2 mm			
<b>NCGC</b> 0-9,6 mm			

\*\* See page 244 for information on Control Options

\*Cracking Pressure Ranges:  
A and E ranges are not available in T-162A cavity

## TECHNICAL TIPS / PERFORMANCE CURVES

### Needle Valves, Fully Adjustable

#### Applications

These adjustable needle valves offer accurate and precise flow control because of their balanced adjustment design. They may be used for bi-directional operation.

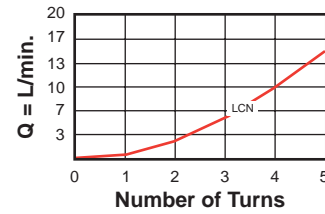
#### Design Concepts and Features

- Sharp-edge orifice minimizes flow variation with viscosity changes.
- Optional needle orifice ranges. See page 110.
- Positive shut-off of flow when closed.

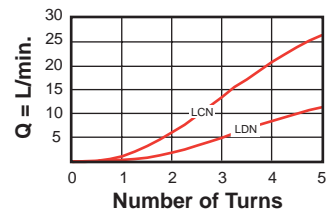
#### Performance Curves

##### Adjustment Sensitivity at 7 bar Differential

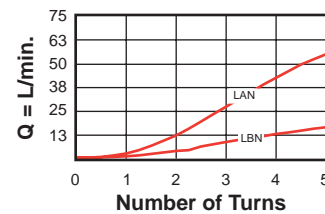
#### NFBC-L\*N



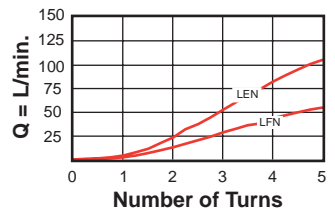
#### NFCC-L\*N



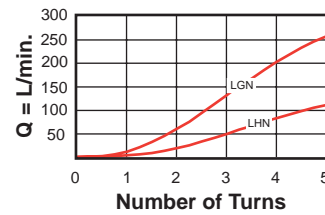
#### NFDC-L\*N



#### NFEC-L\*N



#### NFFC-L\*N



### Needle Valves, Fully Adjustable with Reverse Free Flow Check

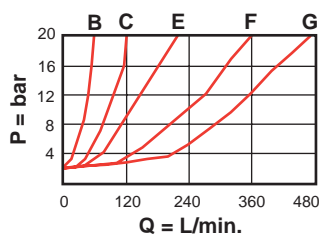
#### Applications

These adjustable needle valves with integral reverse free flow check fit the same cavity as the needle valve without check.

#### Design Concepts and Features

- Performance parameters of the adjustable needle cartridge with check are similar to the NF\*C.
- However, the leakage rate when closed is approximately 5 drops / min. or less.

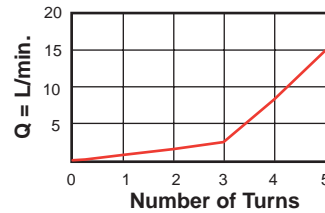
Reverse Flow Pressure Drop with Needle Closed



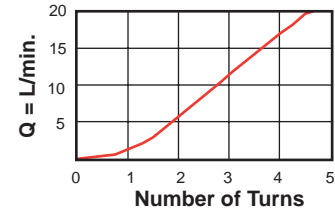
#### Performance Curves

##### Adjustment Sensitivity at 7 bar Differential

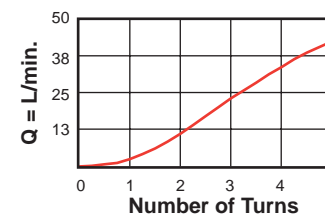
#### NCBB-L\*N



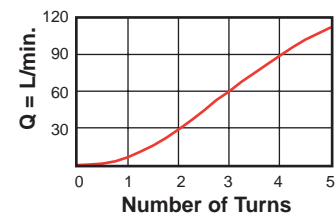
#### NCCB-L\*N



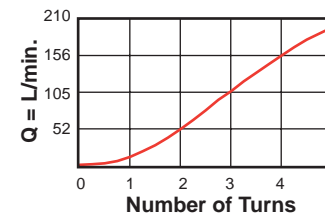
#### NCEB-L\*N



#### NCFB-L\*N



#### NCGB-L\*N



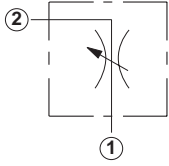
### General Application Requirements

- Operating Temperature Range: Buna-N seals -45° C to 90° C, Viton seals -15° C to 120° C.
- Viscosity Range: 10-600 centistokes.
- Fluid Contamination Level: ISO 4406 18/15 or better; Recommend  $\beta_{10} \geq 75$  to achieve ISO 18/15 or better in most systems.
- Factory Pressure Setting for cartridge is established at a 15 L/min. flow rate.

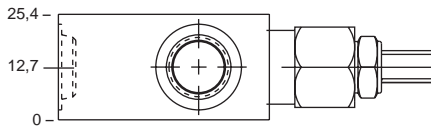
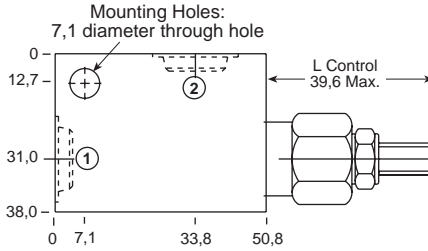
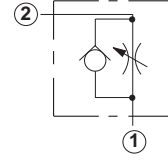
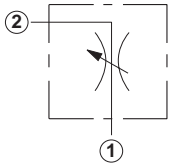
## Line Mounted Assemblies

TWO PORT FLOW CONTROL APPLICATIONS  
(90 DEGREE BODIES)

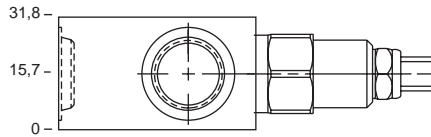
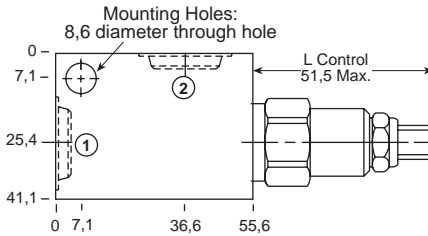
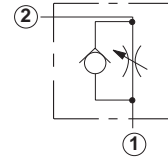
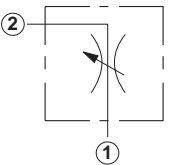
## FULLY ADJUSTABLE NEEDLE

Ports  
1 and 21/4" BSPP  
3/8" BSPPAssembly  
Model Code\*  
**NFBC-L\*N-AAT**  
**NFBC-L\*N-AAU**Go to [www.sunhydraulics.com](http://www.sunhydraulics.com)  
for more product information.

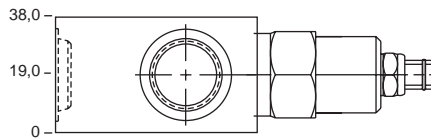
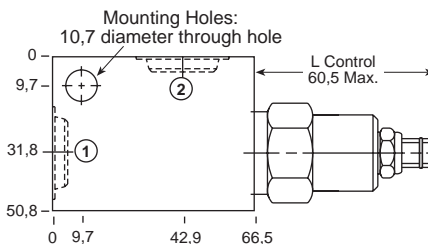
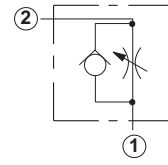
## 0-4,0 mm Cavity T-162A

\*Add modifier /S to order SG Iron for pressure rating  
over 210 bar.FULLY ADJUSTABLE NEEDLE WITH  
REVERSE FREE FLOW CHECKPorts  
1 and 21/4" BSPP  
3/8" BSPPAssembly  
Model Code\*  
**NCCB-L\*N-AAT**  
**NCCB-L\*N-AAU**\*Add modifier /S to order SG Iron for pressure rating  
over 210 bar.Ports  
1 and 21/4" BSPP  
3/8" BSPPAssembly  
Model Code\*  
**NFCC-L\*N-GAT**  
**NFCC-L\*N-GAU**

## 0-4,8 mm Cavity T-13A

\*Add modifier /S to order SG Iron for pressure rating  
over 210 bar.Ports  
1 and 21/4" BSPP  
3/8" BSPPAssembly  
Model Code\*  
**NCCB-L\*N-GAT**  
**NCCB-L\*N-GAU**\*Add modifier /S to order SG Iron for pressure rating  
over 210 bar.Ports  
1 and 23/8" BSPP  
1/2" BSPPAssembly  
Model Code\*  
**NFDC-L\*N-DAU**  
**NFDC-L\*N-DAV**

## 0-6,3 mm Cavity T-5A

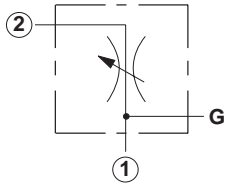
\*Add modifier /S to order SG Iron for pressure rating  
over 210 bar.Ports  
1 and 23/8" BSPP  
1/2" BSPPAssembly  
Model Code\*  
**NCEB-L\*N-DAU**  
**NCEB-L\*N-DAV**\*Add modifier /S to order SG Iron for pressure rating  
over 210 bar.

NOTES: Page 110 for cartridge models NF\*C-\*\*\* and NC\*B-\*\*\* shows performance curves, technical tips, and options.  
See page vii for technical information about line mount bodies including SAE flange pattern specifications.  
Consult the Sun Factory for other port sizes available in the bodies shown above.  
Model Codes printed in red are Preferred Products and are readily available.



**TWO PORT FLOW CONTROL APPLICATIONS  
(90 DEGREE BODIES)**

**FULLY ADJUSTABLE**

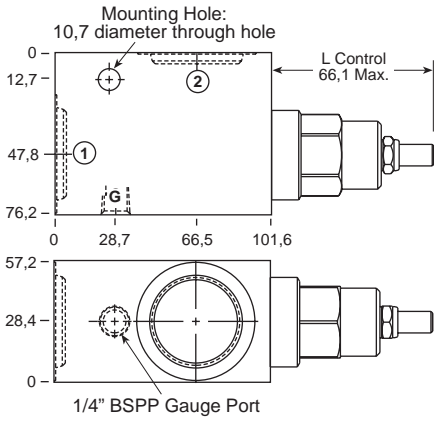


Ports 1 and 2	Assembly Model Code*
3/4" BSPP	<b>NFEC-L*N-IAW</b>
1" BSPP	<b>NFEC-L*N-IAX</b>
1 1/4" BSPP	<b>NFEC-L*N-IAZ</b>

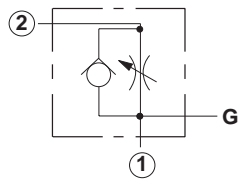
\*Add modifier /S to order SG Iron for pressure rating over 210 bar.

Go to [www.sunhydraulics.com](http://www.sunhydraulics.com) for more product information.

**0-9,6 mm Cavity T-16A**



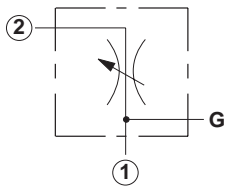
**FULLY ADJUSTABLE WITH REVERSE FREE FLOW CHECK**



Ports 1 and 2	Assembly Model Code*
3/4" BSPP	<b>NCFB-L*N-IAW</b>
1" BSPP	<b>NCFB-L*N-IAZ</b>
1 1/4" BSPP	<b>NCFB-L*N-IAY</b>

\*Add modifier /S to order SG Iron for pressure rating over 210 bar.

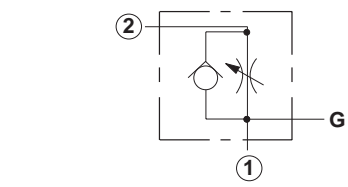
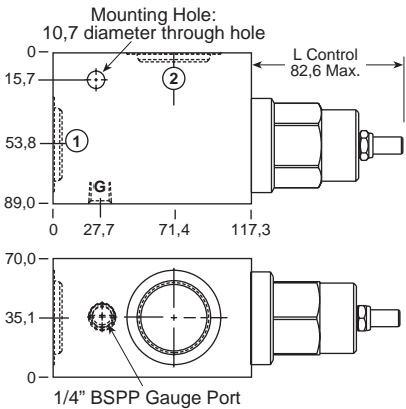
**FULLY ADJUSTABLE**



Ports 1 and 2	Assembly Model Code*
1" BSPP	<b>NFFC-L*N-LAX</b>
1 1/4" BSPP	<b>NFFC-L*N-LAY</b>

\*Add modifier /S to order SG Iron for pressure rating over 210 bar.

**0-14,2 mm Cavity T-18A**



Ports 1 and 2	Assembly Model Code*
1" BSPP	<b>NCGB-L*N-LAX</b>
1 1/4" BSPP	<b>NCGB-L*N-LAY</b>

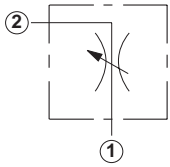
\*Add modifier /S to order SG Iron for pressure rating over 210 bar.

NOTES: Page 110 for cartridge models NF\*C-\*\*\* and NC\*B-\*\*\* shows performance curves, technical tips, and options. See page vii for technical information about line mount bodies including SAE flange pattern specifications. Consult the Sun Factory for other port sizes available in the bodies shown above. Model Codes printed in red are Preferred Products and are readily available.

## Line Mounted Assemblies

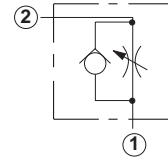
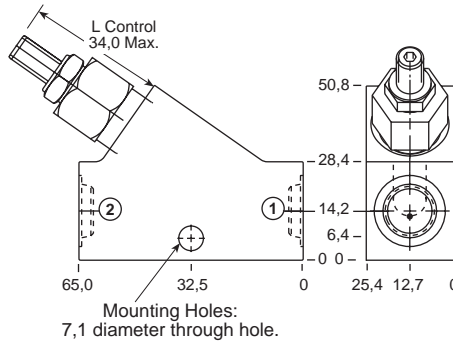
TWO PORT FLOW CONTROL APPLICATIONS  
(INLINE BODIES)

## FULLY ADJUSTABLE NEEDLE

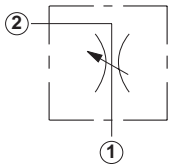
Go to [www.sunhydraulics.com](http://www.sunhydraulics.com)  
for more product information.FULLY ADJUSTABLE NEEDLE WITH  
REVERSE FREE FLOW CHECK

Ports 1 and 2	Assembly Model Code*
1/4" BSPP	<b>NFBC-L*N-ACT</b>
3/8" BSPP	<b>NFBC-L*N-ACU</b>

## 0-4,0 mm Cavity T-162A

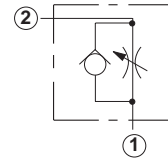
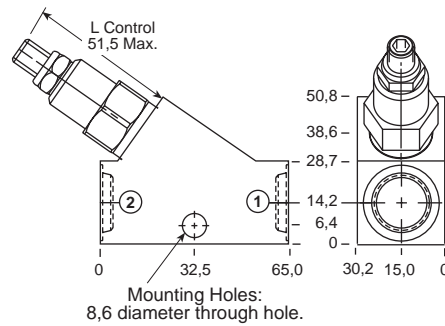


Ports 1 and 2	Assembly Model Code*
1/4" BSPP	<b>NCBB-L*N-ACT</b>
3/8" BSPP	<b>NCBB-L*N-ACU</b>

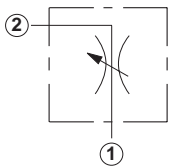
\*Add modifier /S to order SG Iron for pressure rating  
over 210 bar.\*Add modifier /S to order SG Iron for pressure rating  
over 210 bar.

Ports 1 and 2	Assembly Model Code*
1/4" BSPP	<b>NFCC-L*N-GCT</b>
3/8" BSPP	<b>NFCC-L*N-GCU</b>

## 0-4,8 mm Cavity T-13A

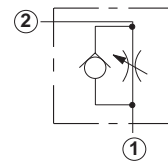
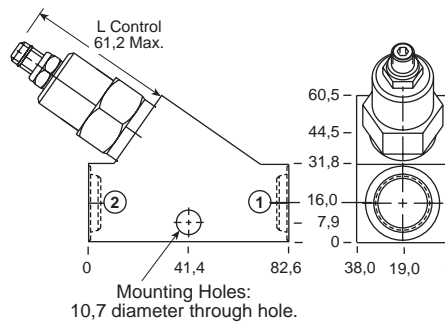


Ports 1 and 2	Assembly Model Code*
1/4" BSPP	<b>NCCB-L*N-GCT</b>
3/8" BSPP	<b>NCCB-L*N-GCU</b>

\*Add modifier /S to order SG Iron for pressure rating  
over 210 bar.\*Add modifier /S to order SG Iron for pressure rating  
over 210 bar.

Ports 1 and 2	Assembly Model Code*
3/8" BSPP	<b>NFDC-L*N-DCU</b>
1/2" BSPP	<b>NFDC-L*N-DCV</b>

## 0-6,3 mm Cavity T-5A



Ports 1 and 2	Assembly Model Code*
3/8" BSPP	<b>NCEB-L*N-DCU</b>
1/2" BSPP	<b>NCEB-L*N-DCV</b>

\*Add modifier /S to order SG Iron for pressure rating  
over 210 bar.\*Add modifier /S to order SG Iron for pressure rating  
over 210 bar.

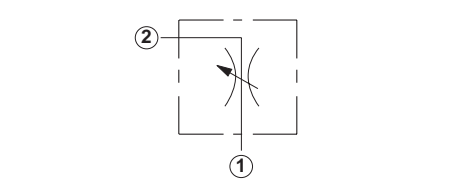
NOTES: Page 110 for cartridge models NF\*C-\*\*\* and NC\*B-\*\*\* shows performance curves, technical tips, and options.  
See page vii for technical information about line mount bodies including SAE flange pattern specifications.  
Consult the Sun Factory for other port sizes available in the bodies shown above.  
Model Codes printed in red are Preferred Products and are readily available.

**TWO PORT FLOW CONTROL APPLICATIONS  
(INLINE/INLINE 1.50"/2.00" SAE C61 FLANGE PORT BODIES)**

**FULLY ADJUSTABLE NEEDLE**

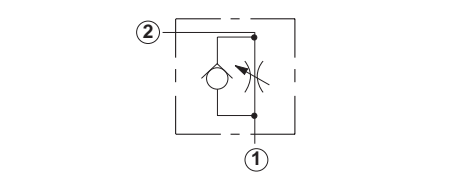
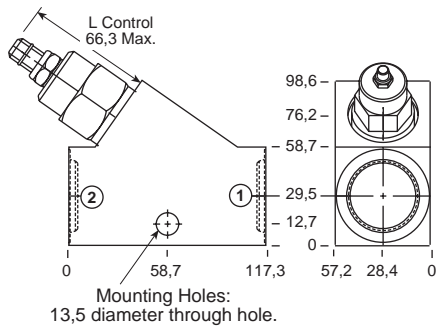
Go to [www.sunhydraulics.com](http://www.sunhydraulics.com) for more product information.

**FULLY ADJUSTABLE NEEDLE WITH REVERSE FREE FLOW CHECK**



Ports 1 and 2	Assembly Model Code*
3/4" BSPP	<b>NFEC-L*N-ICW</b>
<b>1" BSPP</b>	<b>NFEC-L*N-ICX</b>
1 1/4" BSPP	<b>NFEC-L*N-ICY</b>

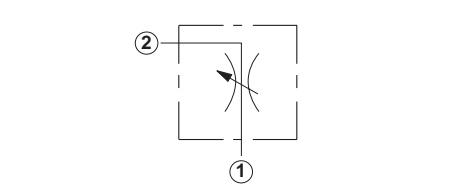
**0-9,6 mm Cavity T-16A**



Ports 1 and 2	Assembly Model Code*
3/4" BSPP	<b>NCFB-L*N-ICW</b>
<b>1" BSPP</b>	<b>NCFB-L*N-ICX</b>
1 1/4" BSPP	<b>NCFB-L*N-ICY</b>

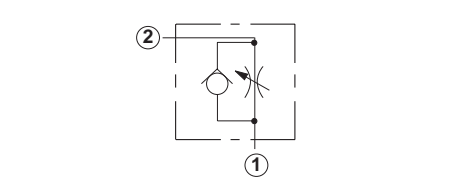
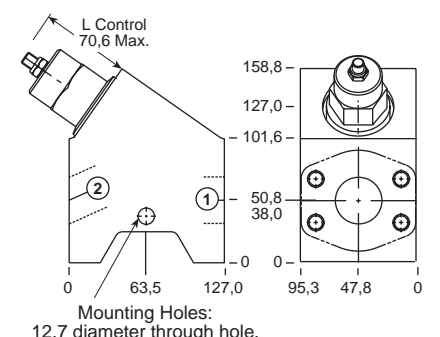
\*Add modifier /S to order SG Iron for pressure rating over 210 bar.

\*Add modifier /S to order SG Iron for pressure rating over 210 bar.



Ports 1 and 2	Assembly Model Code*
1 1/2" SAE C61	<b>NFFC-L*N-ZLS/M</b>

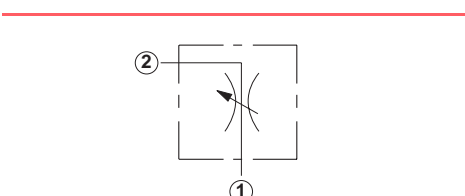
**0-14,2 mm Cavity T-18A**



Ports 1 and 2	Assembly Model Code*
1 1/2" SAE C61	<b>NCGB-L*N-ZLS/M</b>

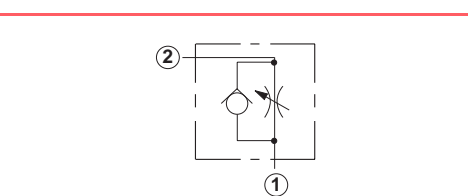
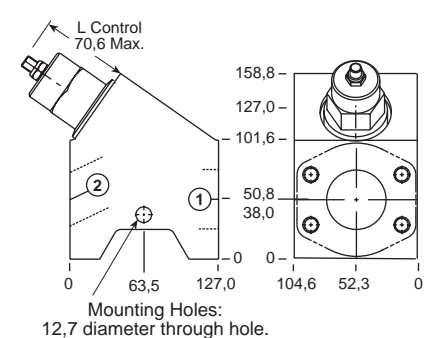
\*Add modifier /T to order SG Iron for pressure rating over 210 bar.

\*Add modifier /T to order SG Iron for pressure rating over 210 bar.



Ports 1 and 2	Assembly Model Code*
2" SAE C61	<b>NFFC-L*N-ZLR/M</b>

**0-14,2 mm Cavity T-18A**



Ports 1 and 2	Assembly Model Code*
2" SAE C61	<b>NCGB-L*N-ZLR/M</b>

\*Add modifier /T to order SG Iron for pressure rating over 210 bar.

\*Add modifier /T to order SG Iron for pressure rating over 210 bar.

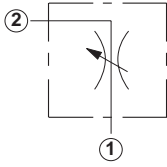
NOTES: Page 110 for cartridge models NF\*C-\*\*\* and NC\*B-\*\*\* shows performance curves, technical tips, and options. See page vii for technical information about line mount bodies including SAE flange pattern specifications. Consult the Sun Factory for other port sizes available in the bodies shown above. **Model Codes printed in red are Preferred Products and are readily available.**



## Line Mounted Assemblies

## TWO PORT FLOW CONTROL APPLICATIONS (2.00" SAE C61/C62 FLANGE PORT BODIES, 2 PORT CAVITY IN PARALLEL)

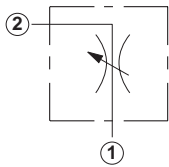
## FULLY ADJUSTABLE NEEDLE



Ports  
1 and 2  
2" SAE C61

Assembly  
Model Code\*  
NFFC-L\*N-XZY/M

\*Add modifier /T to order SG Iron for pressure rating over 210 bar.



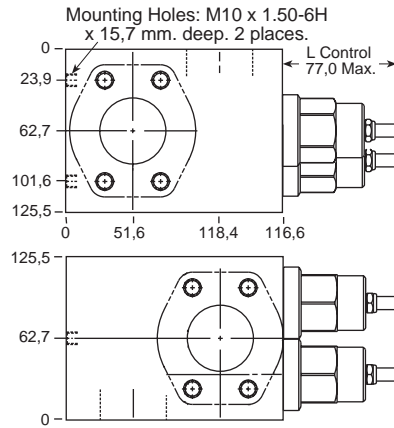
Ports  
1 and 2  
2" SAE C62

Assembly  
Model Code\*  
NFFC-L\*N-VTN/M

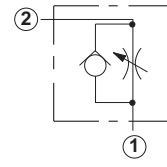
\*Add modifier /T to order SG Iron for pressure rating over 210 bar.

Go to [www.sunhydraulics.com](http://www.sunhydraulics.com)  
for more product information.

## 0-28 mm Cavity T-18A



## FULLY ADJUSTABLE NEEDLE WITH REVERSE FREE FLOW CHECK

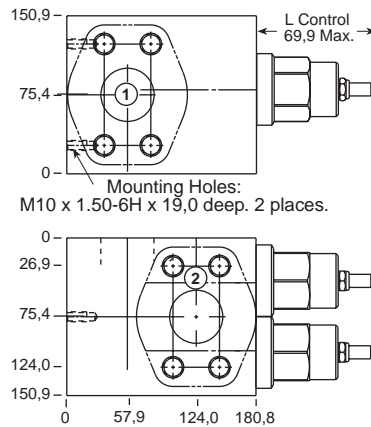


Ports  
1 and 2  
2" SAE C61

Assembly  
Model Code\*  
NCGB-L\*N-XZY/M

\*Add modifier /T to order SG Iron for pressure rating over 210 bar.

## 0-28 mm Cavity T-18A



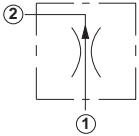
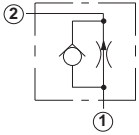
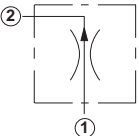
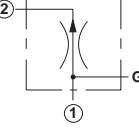
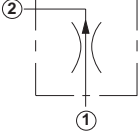
Ports  
1 and 2  
2" SAE C62

Assembly  
Model Code\*  
NCGB-L\*N-VTN/M

\*Add modifier /T to order SG Iron for pressure rating over 210 bar.

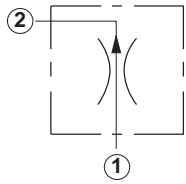
NOTES: Page 110 for cartridge model NF\*C-\*\*\* shows performance curves, technical tips, and options.  
See page vii for technical information about line mount bodies including SAE flange pattern specifications.  
Consult the Sun Factory for other port sizes available in the bodies shown above.

# Fixed Orifice Pressure Compensated Flow Control Assemblies

	<i>Cartridge Type</i>	<i>Page</i>
	Fixed Orifice, Pressure Compensated	118
	Fixed Orifice, Pressure Compensated with Free Flow Check	118
<i>Line Mounted Assemblies (Body Type)</i>		
	90 Degree	120
	90 Degree with Gauge Port	121
	Inline Inline/Inline 1.50"/2.00" SAE C61 Flange Port 2.00" SAE C61/ C62 Flange Port, 2 Port Cavity in Parallel	122 123 124

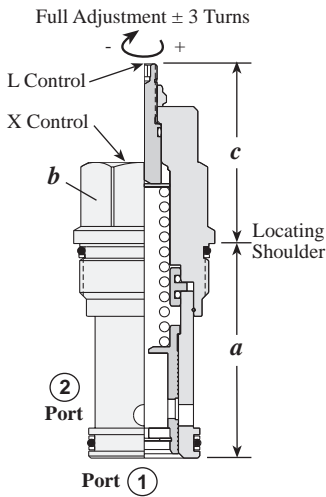
## Flow Control Valves

### FIXED ORIFICE, PRESSURE COMPENSATED



Capacity	Typical Cartridge Model Code	Cavity	Cartridge Dimensions					Installation Torque (Nm)
			a	b	c			
					X	L	K	
0,4-12 L/min.	<b>FXBA</b> – LAN	T - 162A	31	19,1	21	54	58	35/40
0,4-23 L/min.	<b>FXCA</b> – LAN	T - 13A	34,9	22,2	19	51	58	40/50
0,4-45 L/min.	<b>FXDA</b> – LAN	T - 5A	41,1	28,6	18	54	61	60/70
0,8-95 L/min.	<b>FXEA</b> – LAN	T - 16A	61,9	31,8	25	62	69	200/215
0,8-200 L/min.	<b>FXFA</b> – LAN	T - 18A	79,4	41,3	31	72	78	465/500

#### OPTION ORDERING INFORMATION



**FX \* A - \* A \***

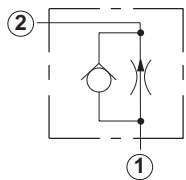
Nominal Capacity	Control**	Adjustment Range	Seal
<b>B</b> 0,4-12 L/min.	<b>X</b> Non-adjustable Factory set at customer specified flow	<b>A</b> Fixed Orifice	<b>N</b> Buna-N
<b>C</b> 0,4-23 L/min.		<b>L</b> Tuning Adjustment ±25% of customer specified flow	<b>V</b> Viton
<b>D</b> 0,4-45 L/min.		<b>K</b> Handknob for L control	
<b>E</b> 0,8-95 L/min.			
<b>F</b> 0,8-200 L/min.			

Customer must specify flow

Flow Ranges by Frame Size:  
 FXBA: 0,4 - 12 L/min.  
 FXCA: 0,4 - 23 L/min.  
 FXDA: 0,4 - 45 L/min.  
 FXEA: 0,8 - 95 L/min.  
 FXFA: 0,8 - 200 L/min.

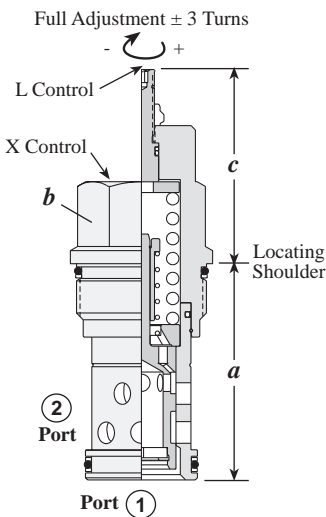
\*\* See page 244 for information on Control Options

### FIXED ORIFICE, PRESSURE COMPENSATED WITH FREE FLOW CHECK



Capacity	Typical Cartridge Model Code	Cavity	Cartridge Dimensions					Installation Torque (Nm)
			a	b	c			
					X	L	K	
0,4-12 L/min.	<b>FCBB</b> – LAN	T - 162A	31	19,1	21	54	58	35/40
0,4-23 L/min.	<b>FCCB</b> – LAN	T - 13A	34,9	22,2	19	51	58	40/50
0,4-45 L/min.	<b>FCDB</b> – LAN	T - 5A	41,1	28,6	18	54	61	60/70
0,8-95 L/min.	<b>FCEB</b> – LAN	T - 16A	61,9	31,8	25	62	69	200/215
0,8-200 L/min.	<b>FCFB</b> – LAN	T - 18A	79,4	41,3	31	72	78	465/500

#### OPTION ORDERING INFORMATION



**FC \* B - \* A \***

Nominal Capacity	Control**	Adjustment Range	Seal
<b>B</b> 0,4-12 L/min.	<b>X</b> Non-adjustable Factory set at customer specified flow	<b>A</b> Fixed Orifice	<b>N</b> Buna-N
<b>C</b> 0,4-23 L/min.		<b>L</b> Tuning Adjustment ±25% of customer specified flow	<b>V</b> Viton
<b>D</b> 0,4-45 L/min.		<b>K</b> Handknob for L control	
<b>E</b> 0,8-95 L/min.			
<b>F</b> 0,8-200 L/min.			

Customer must specify flow

Flow Ranges by Frame Size:  
 FCBB: 0,4 - 12 L/min.  
 FCCB: 0,4 - 23 L/min.  
 FCDB: 0,4 - 45 L/min.  
 FCEB: 0,8 - 95 L/min.  
 FCFB: 0,8 - 200 L/min.

\*\* See page 244 for information on Control Options

## TECHNICAL TIPS / PERFORMANCE CURVES

### Flow Control Valves, Fixed Orifice, Pressure Compensated

#### Applications

These pressure-compensated cartridges provide precise flow regulation for meter-in and meter-out applications. They also offer accurate control in bleed-off circuits where the load pressure and inlet flow are relatively constant.

**NOTE:** Accurate pressure-compensated control requires a 14 bar minimum pressure differential be maintained across the valve

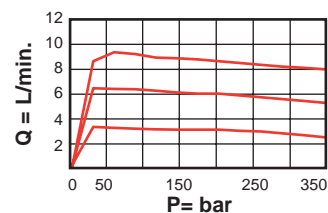
#### Design Concepts and Features

- Minimum flow change over widely varying load pressure changes (less than  $\pm 5\%$  over 315 bar load change).
- Selectable fixed orifice size (flow capacity 0,4 to 200 L/min., dependent on frame size).
- Tunable control option to provide  $\pm 25\%$  variation of the nominal factory set flow.

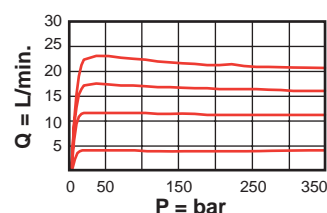
#### Performance Curves

##### Typical Performance

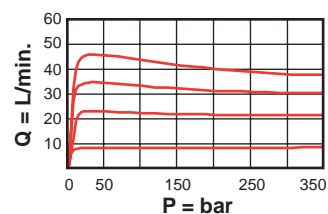
**FXBA-\*A\***



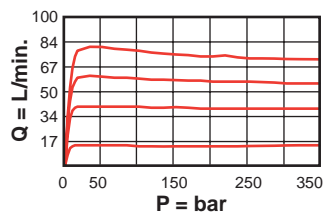
**FXCA-\*A\***



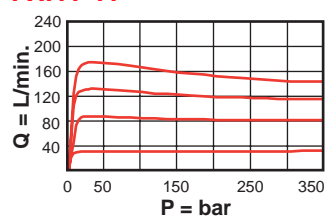
**FXDA-\*A\***



**FXEA-\*A\***



**FXFA-\*A\***



### Flow Control Valves, Fixed Orifice, Pressure Compensated with Free Flow Check

#### Applications

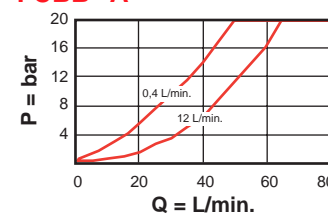
The performance parameters of the FC\*B pressure compensated flow control with free flow check are identical to the FX\*A, but with the addition of a high capacity free flow check.

**Note:** Accurate pressure-compensated control requires a 14 bar minimum pressure differential be maintained across the valve

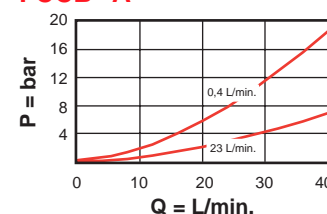
#### Performance Curves

##### Reverse Free Flow Pressure Drop

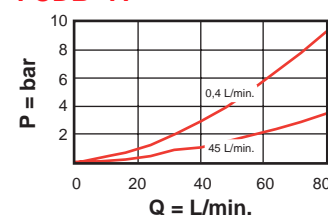
**FCBB-\*A\***



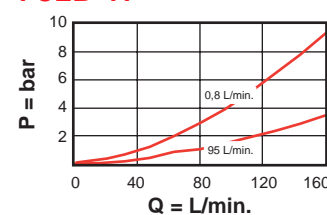
**FCCB-\*A\***



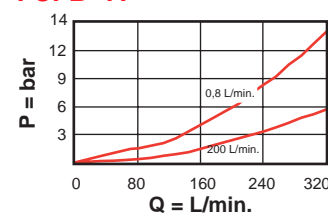
**FCDB-\*A\***



**FCEB-\*A\***



**FCFB-\*A\***



### General Application Requirements

- Operating Temperature Range: Buna-N seals  $-45^{\circ}\text{C}$  to  $90^{\circ}\text{C}$ , Viton seals  $-15^{\circ}\text{C}$  to  $120^{\circ}\text{C}$ .
- Viscosity Range: 10-600 centistokes.
- Fluid Contamination Level: ISO 4406 18/15 or better; Recommend  $\beta_{10} \geq 75$  to achieve ISO 18/15 or better in most systems.
- Factory Pressure Setting for cartridge is established at a 15 L/min. flow rate.

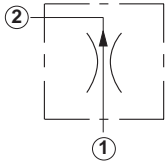
## Line Mounted Assemblies

# TWO PORT FLOW CONTROL APPLICATIONS (90 DEGREE BODIES)

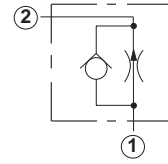
### FIXED ORIFICE

Go to [www.sunhydraulics.com](http://www.sunhydraulics.com)  
for more product information.

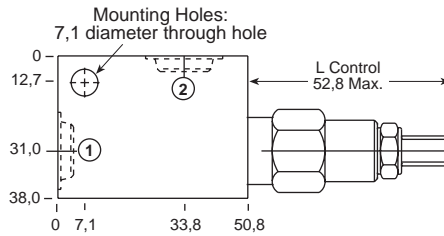
### FIXED ORIFICE WITH REVERSE FREE FLOW CHECK



**0,4-12 L/min. Cavity T-162A**



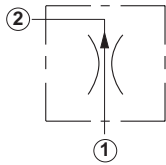
Ports 1 and 2	Assembly Model Code*
1/4" BSPP	<b>FXBA-LAN-AAT</b>
3/8" BSPP	<b>FXBA-LAN-AAU</b>



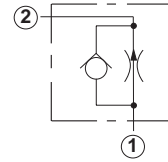
Ports 1 and 2	Assembly Model Code*
1/4" BSPP	<b>FCBB-LAN-AAT</b>
3/8" BSPP	<b>FCBB-LAN-AAU</b>

\*Add modifier /S to order SG Iron for pressure rating over 210 bar.

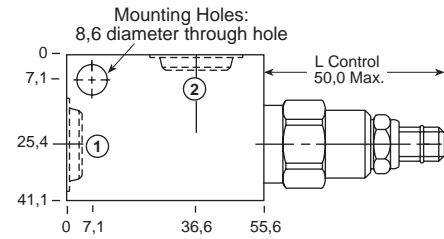
\*Add modifier /S to order SG Iron for pressure rating over 210 bar.



**0,4-23 L/min. Cavity T-13A**



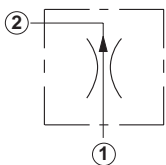
Ports 1 and 2	Assembly Model Code*
1/4" BSPP	<b>FXCA-LAN-GAT</b>
3/8" BSPP	<b>FXCA-LAN-GAU</b>



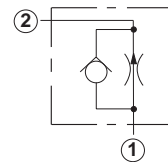
Ports 1 and 2	Assembly Model Code*
1/4" BSPP	<b>FCCB-LAN-GAT</b>
3/8" BSPP	<b>FCCB-LAN-GAU</b>

\*Add modifier /S to order SG Iron for pressure rating over 210 bar.

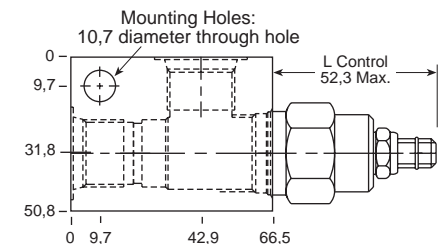
\*Add modifier /S to order SG Iron for pressure rating over 210 bar.



**0,4-45 L/min. Cavity T-5A**



Ports 1 and 2	Assembly Model Code*
3/8" BSPP	<b>FXDA-LAN-DAU</b>
1/2" BSPP	<b>FXDA-LAN-DAV</b>



Ports 1 and 2	Assembly Model Code*
3/8" BSPP	<b>FCDB-LAN-DAU</b>
1/2" BSPP	<b>FCDB-LAN-DAV</b>

\*Add modifier /S to order SG Iron for pressure rating over 210 bar.

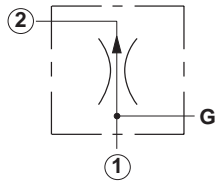
\*Add modifier /S to order SG Iron for pressure rating over 210 bar.

NOTES: Page 118 for cartridge models FX\*A-\*\*\* and FC\*B-\*\*\* shows performance curves, technical tips, and options. See page vii for technical information about line mount bodies including SAE flange pattern specifications. Consult the Sun Factory for other port sizes available in the bodies shown above.  
Model Codes printed in red are Preferred Products and are readily available.



**TWO PORT FLOW CONTROL APPLICATIONS  
(90 DEGREE BODIES)**

**FIXED ORIFICE**

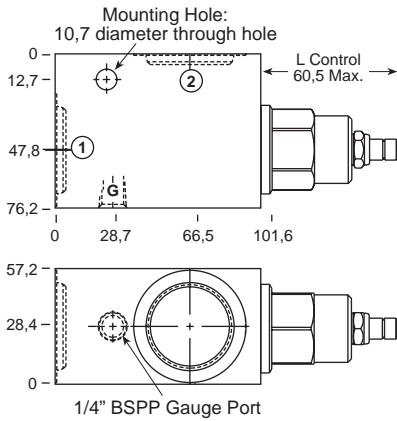


Ports 1 and 2	Assembly Model Code*
3/4" BSPP	<b>FXEA-LAN-IAW</b>
1" BSPP	<b>FXEA-LAN-IAX</b>
1 1/4" BSPP	<b>FXEA-LAN-IAY</b>

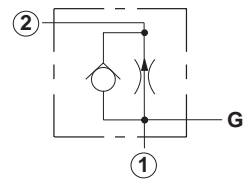
\*Add modifier /S to order SG Iron for pressure rating over 210 bar.

Go to [www.sunhydraulics.com](http://www.sunhydraulics.com) for more product information.

**0,8-95 L/min. Cavity T-16A**



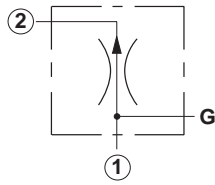
**FIXED ORIFICE WITH REVERSE FREE FLOW CHECK**



Ports 1 and 2	Assembly Model Code*
3/4" BSPP	<b>FCFB-LAN-IAW</b>
1" BSPP	<b>FCFB-LAN-IAX</b>
1 1/4" BSPP	<b>FCFB-LAN-IAY</b>

\*Add modifier /S to order SG Iron for pressure rating over 210 bar.

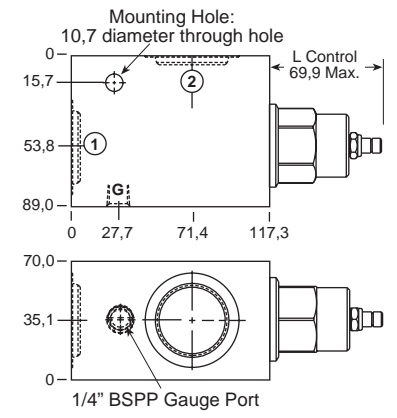
**0,8-200 L/min. Cavity T-18A**



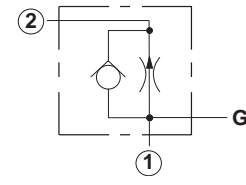
Ports 1 and 2	Assembly Model Code*
3/4" BSPP	<b>FXFA-LAN-LAW</b>
1" BSPP	<b>FXFA-LAN-LAX</b>
1 1/4" BSPP	<b>FXFA-LAN-LAY</b>

\*Add modifier /S to order SG Iron for pressure rating over 210 bar.

**0,8-200 L/min. Cavity T-18A**



**FIXED ORIFICE WITH REVERSE FREE FLOW CHECK**



Ports 1 and 2	Assembly Model Code*
3/4" BSPP	<b>FCFB-LAN-LAW</b>
1" BSPP	<b>FCFB-LAN-LAX</b>
1 1/4" BSPP	<b>FCFB-LAN-LAY</b>

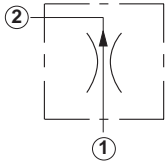
\*Add modifier /S to order SG Iron for pressure rating over 210 bar.

NOTES: Page 118 for cartridge models FX\*A-\*\*\* and FC\*B-\*\*\* shows performance curves, technical tips, and options. See page vii for technical information about line mount bodies including SAE flange pattern specifications. Consult the Sun Factory for other port sizes available in the bodies shown above. Model Codes printed in red are Preferred Products and are readily available.

## Line Mounted Assemblies

# TWO PORT FLOW CONTROL APPLICATIONS (INLINE BODIES)

### FIXED ORIFICE

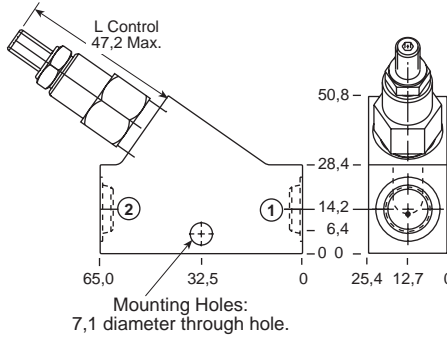


Ports 1 and 2	Assembly Model Code*
1/4" BSPP	<b>FXBA-LAN-ACT</b>
3/8" BSPP	<b>FXBA-LAN-ACU</b>

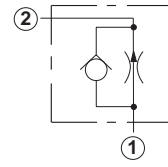
\*Add modifier /S to order SG Iron for pressure rating over 210 bar.

Go to [www.sunhydraulics.com](http://www.sunhydraulics.com) for more product information.

### 0,4-12 L/min. Cavity T-162A

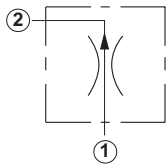


### FIXED ORIFICE WITH REVERSE FREE FLOW CHECK



Ports 1 and 2	Assembly Model Code*
1/4" BSPP	<b>FCBB-LAN-ACT</b>
3/8" BSPP	<b>FCBB-LAN-ACU</b>

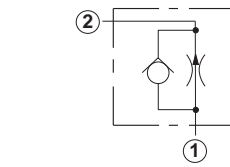
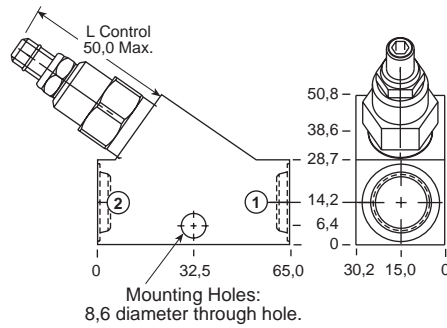
\*Add modifier /S to order SG Iron for pressure rating over 210 bar.



Ports 1 and 2	Assembly Model Code*
1/4" BSPP	<b>FXCA-LAN-GCT</b>
3/8" BSPP	<b>FXCA-LAN-GCU</b>

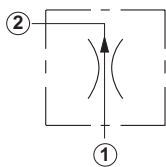
\*Add modifier /S to order SG Iron for pressure rating over 210 bar.

### 0,4-23 L/min. Cavity T-13A



Ports 1 and 2	Assembly Model Code*
1/4" BSPP	<b>FCCB-LAN-GCT</b>
3/8" BSPP	<b>FCCB-LAN-GCU</b>

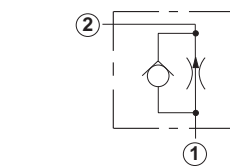
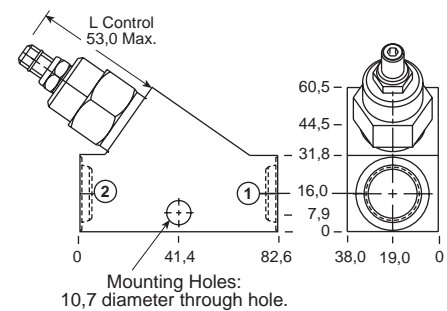
\*Add modifier /S to order SG Iron for pressure rating over 210 bar.



Ports 1 and 2	Assembly Model Code*
3/8" BSPP	<b>FXDA-LAN-DCU</b>
1/2" BSPP	<b>FXDA-LAN-DCV</b>

\*Add modifier /S to order SG Iron for pressure rating over 210 bar.

### 0,4-45 L/min. Cavity T-5A



Ports 1 and 2	Assembly Model Code*
3/8" BSPP	<b>FCDB-LAN-DCU</b>
1/2" BSPP	<b>FCDB-LAN-DCV</b>

\*Add modifier /S to order SG Iron for pressure rating over 210 bar.

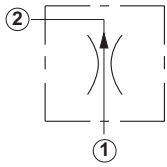
NOTES: Page 118 for cartridge models FX\*A-\*\*\* and FC\*B-\*\*\* shows performance curves, technical tips, and options.  
See page vii for technical information about line mount bodies including SAE flange pattern specifications.  
Consult the Sun Factory for other port sizes available in the bodies shown above.  
Model Codes printed in red are Preferred Products and are readily available.

**TWO PORT FLOW CONTROL APPLICATIONS  
(INLINE/INLINE 1.50"/2.00" SAE C61 FLANGE PORT BODIES)**

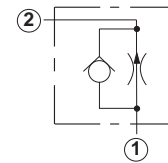
**FIXED ORIFICE**

Go to [www.sunhydraulics.com](http://www.sunhydraulics.com) for more product information.

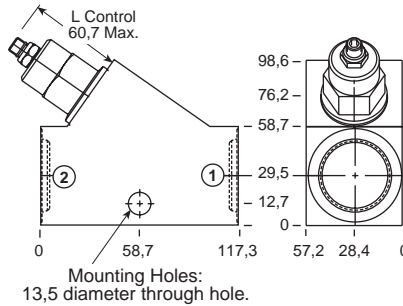
**FIXED ORIFICE WITH REVERSE FREE FLOW CHECK**



**0,8-95 L/min. Cavity T-16A**



Ports 1 and 2	Assembly Model Code*
3/4" BSPP	<b>FXEA-LAN-ICW</b>
1" BSPP	<b>FXEA-LAN-ICX</b>
1 1/4" BSPP	<b>FXEA-LAN-ICY</b>

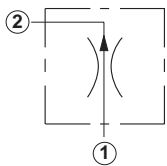


Ports 1 and 2	Assembly Model Code*
3/4" BSPP	<b>FCEB-LAN-ICW</b>
1" BSPP	<b>FCEB-LAN-ICX</b>
1 1/4" BSPP	<b>FCEB-LAN-ICY</b>

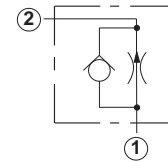
\*Add modifier **/S** to order SG Iron for pressure rating over 210 bar.

\*Add modifier **/S** to order SG Iron for pressure rating over 210 bar.

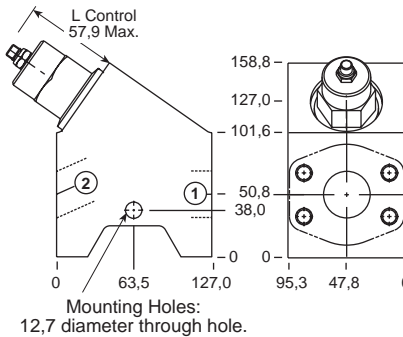
**0,8-200 L/min. Cavity T-18A**



**0,8-200 L/min. Cavity T-18A**



Ports 1 and 2	Assembly Model Code*
1 1/2" SAE C61	<b>FXFA-LAN-ZLS/M</b>

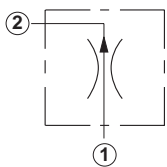


Ports 1 and 2	Assembly Model Code*
1 1/2" SAE C61	<b>FCFB-LAN-ZLS/M</b>

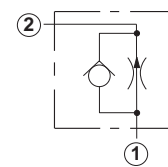
\*Add modifier **/T** to order SG Iron for pressure rating over 210 bar.

\*Add modifier **/T** to order SG Iron for pressure rating over 210 bar.

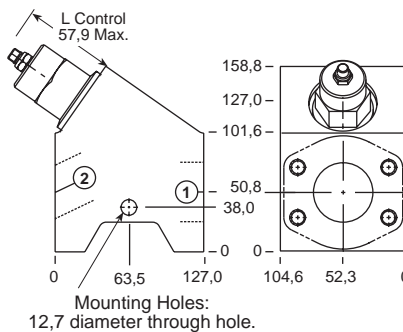
**0,8-200 L/min. Cavity T-18A**



**0,8-200 L/min. Cavity T-18A**



Ports 1 and 2	Assembly Model Code*
2" SAE C61	<b>FXFA-LAN-ZLR/M</b>



Ports 1 and 2	Assembly Model Code*
2" SAE C61	<b>FCFB-LAN-ZLR/M</b>

\*Add modifier **/T** to order SG Iron for pressure rating over 210 bar.

\*Add modifier **/T** to order SG Iron for pressure rating over 210 bar.

NOTES: Page 118 for cartridge models FX\*A-\*\*\* and FC\*B-\*\*\* shows performance curves, technical tips, and options. See page vii for technical information about line mount bodies including SAE flange pattern specifications. Consult the Sun Factory for other port sizes available in the bodies shown above. Model Codes printed in red are Preferred Products and are readily available.

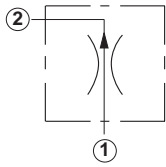
**Line Mounted Assemblies**

**TWO PORT FLOW CONTROL APPLICATIONS  
(2.00" SAE C61/C62 FLANGE PORT BODIES, 2 PORT CAVITY IN PARALLEL)**

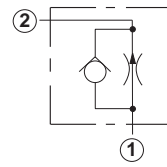
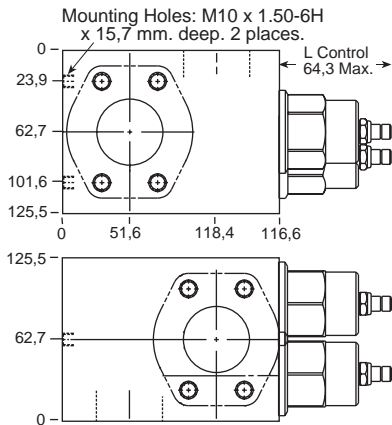
**FIXED ORIFICE**

Go to [www.sunhydraulics.com](http://www.sunhydraulics.com)  
for more product information.

**1,6-400 L/min. Cavity T-18A**



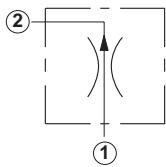
Ports 1 and 2	Assembly Model Code*
2" SAE C61	<b>FXFA-LAN-XZY/M</b>



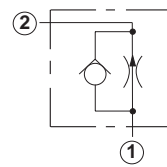
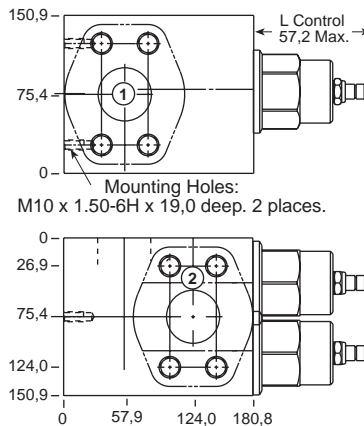
Ports 1 and 2	Assembly Model Code*
2" SAE C61	<b>FCFB-LAN-XZY/M</b>

\*Add modifier **T** to order SG Iron for pressure rating over 210 bar.

**1,6-400 L/min. Cavity T-18A**



Ports 1 and 2	Assembly Model Code*
2" SAE C62	<b>FXFA-LAN-VTN/M</b>

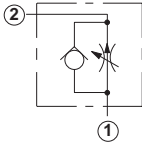
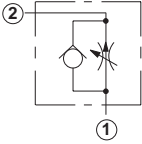
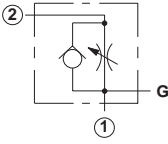
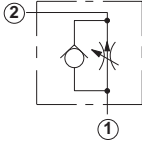


Ports 1 and 2	Assembly Model Code*
2" SAE C62	<b>FCFB-LAN-VTN/M</b>

\*Add modifier **T** to order SG Iron for pressure rating over 210 bar.

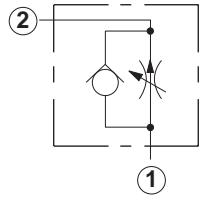
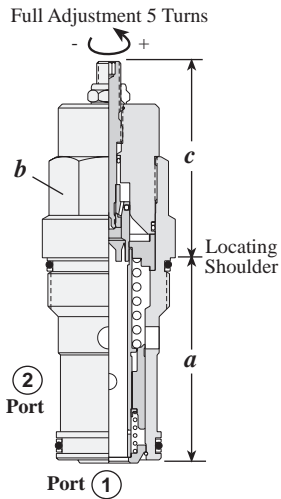
NOTES: Page 118 for cartridge model FX\*A-\*\*\* shows performance curves, technical tips, and options.  
See page vii for technical information about line mount bodies including SAE flange pattern specifications.  
Consult the Sun Factory for other port sizes available in the bodies shown above.

# Fully Adjustable Pressure Compensated Flow Control Assemblies

	<i>Cartridge Type</i>	<i>Page</i>
	Fully Adjustable Pressure Compensated with Free Flow Check	126
<b><i>Line Mounted Assemblies (Body Type)</i></b>		
	90 Degree	128
	90 Degree with Gauge Port	129
	Inline	130
	Inline/Inline 1.50"/2.00" SAE C61 Flange Port	131
	2.00" SAE C61/C62 Flange Port, 2 Port Cavities	132

## Flow Control Valves

# FULLY ADJUSTABLE PRESSURE COMPENSATED WITH FREE FLOW CHECK



Capacity	Typical Cartridge Model Code	Cavity	Cartridge Dimensions					Installation Torque (Nm)
			a	b	c			
					L	H	K	
0,4-23 L/min.	<b>FD</b> BA – LAN	T - 13A	34,9	22,2	58	64	64	40/50
0,4-45 L/min.	<b>FD</b> CB – LAN	T - 5A	41,1	28,6	67	72	73	60/70
1-95 L/min.	<b>FD</b> EA – LAN	T - 16A	61,9	31,8	73	79	79	200/215
1-200 L/min.	<b>FD</b> FA – LAN	T - 18A	79,4	41,3	84	90	90	465/500

## OPTION ORDERING INFORMATION

FD ** - ** A **		Seal
Nominal Capacity	Control**	Adjustment Range
<b>BA</b> 0,4-23 L/min.	<b>L</b> Standard Screw	<b>FD</b> BA <b>A</b> 0,4 - 23 L/min.
<b>CB</b> 0,4-45 L/min.	<b>H</b> Calibrated Handknob with Detent Lock	<b>FD</b> CB <b>A</b> 0,4 - 45 L/min.
<b>EA</b> 1-95 L/min.	<b>K</b> Handknob	<b>FD</b> EA <b>A</b> 1 - 95 L/min.
<b>FA</b> 1-200 L/min.		<b>FD</b> FA <b>A</b> 1 - 200 L/min.
		<b>N</b> Buna-N <b>V</b> Viton

\*\* See page 244 for information on Control Options

# TECHNICAL TIPS / PERFORMANCE CURVES

## Flow Control Valves, Fully Adjustable, Pressure Compensated with Free Flow Check

### Applications

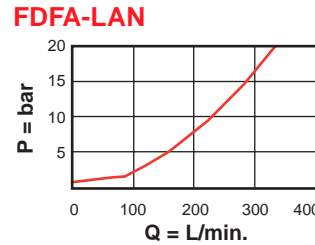
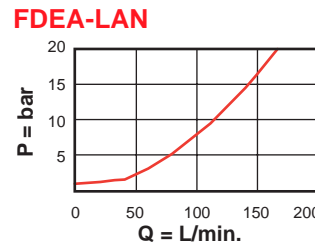
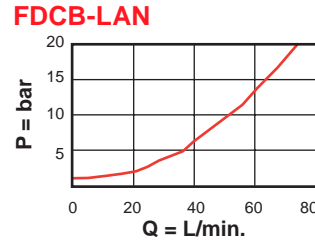
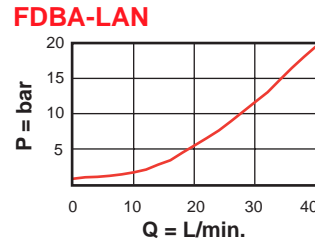
The fully adjustable pressure compensated flow control (FD\*\* series) is similar in function to the (FC\*B) fixed orifice model with check. However, the FD\*\* series offers full adjustment over the entire flow range of the cartridge.

### Design Concepts and Features

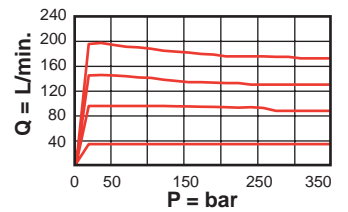
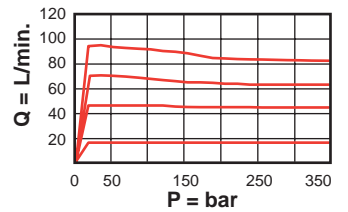
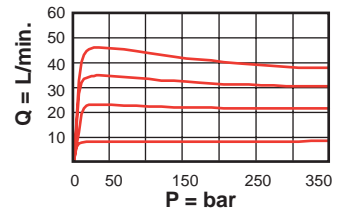
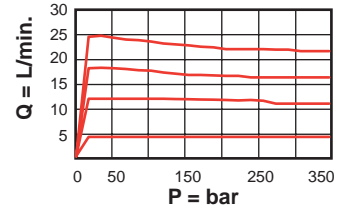
- Sharp edge orifice design to minimize flow variation with viscosity change.
- Five turns of adjustment with low operating effort at high pressure.
- Optional needle ranges to provide different flow capacity. See page 110.
- Leakage at shutoff:
  - FDBA and FDCB 0,3 L/min.
  - FDEA and FDFA 0,4 L/min.
- Optional adjustment control options are as follows:
  - Standard screw adjustment
  - Handknob with locking ring
  - Calibrated handknob with detent lock

### Performance Curves

Reverse Free Flow with Needle Closed



Typical Performance



### General Application Requirements

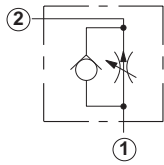
- Operating Temperature Range: Buna-N seals -45° C to 90° C, Viton seals -15° C to 120° C.
- Viscosity Range: 10-600 centistokes.
- Fluid Contamination Level: ISO 4406 18/15 or better; Recommend  $\beta_{10} \geq 75$  to achieve ISO 18/15 or better in most systems.
- Factory Pressure Setting for cartridge is established at a 15 L/min. flow rate.

## Line Mounted Assemblies

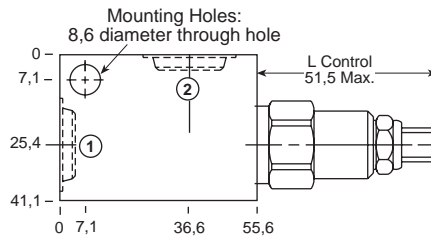
# TWO PORT FLOW CONTROL APPLICATIONS (90 DEGREE BODIES)

FULLY ADJUSTABLE WITH  
REVERSE FREE FLOW CHECK

Go to [www.sunhydraulics.com](http://www.sunhydraulics.com)  
for more product information.

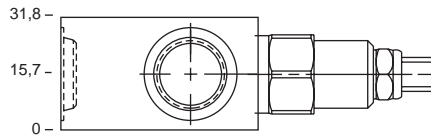


**0,4-23 L/min. Cavity T-13A**

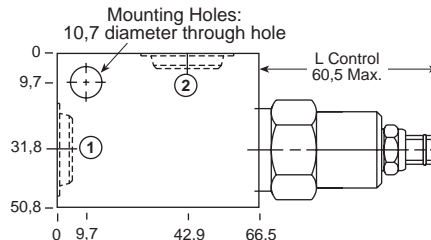
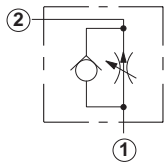


Ports 1 and 2	Assembly Model Code*
1/4" BSPP	<b>FDBA-LAN-GAT</b>
3/8" BSPP	<b>FDBA-LAN-GAU</b>

\*Add modifier /S to order SG Iron for pressure rating over 210 bar.

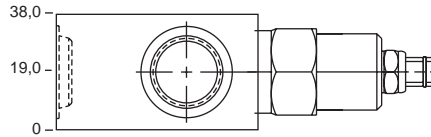


**0,4-45 L/min. Cavity T-5A**

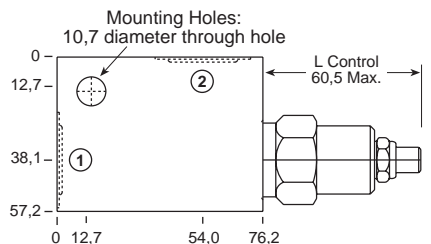
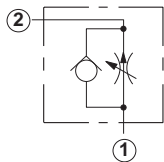


Ports 1 and 2	Assembly Model Code*
3/8" BSPP	<b>FDCB-LAN-DAU</b>
1/2" BSPP	<b>FDCB-LAN-DAV</b>

\*Add modifier /S to order SG Iron for pressure rating over 210 bar.

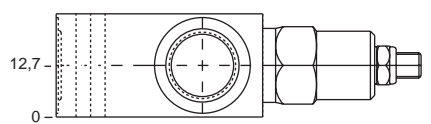


**0,4-45 L/min. Cavity T-5A**



Ports 1 and 2	Assembly Model Code*
3/4" BSPP	<b>FDCB-LAN-DAW</b>

\*Add modifier /S to order SG Iron for pressure rating over 210 bar.



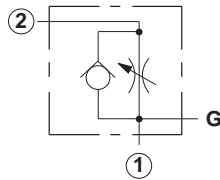
NOTES: Page 126 for cartridge model FD\*\*\_\*\*\* shows performance curves, technical tips, and options.  
See page vii for technical information about line mount bodies including SAE flange pattern specifications.  
Consult the Sun Factory for other port sizes available in the bodies shown above.  
Model Codes printed in red are Preferred Products and are readily available.



# TWO PORT FLOW CONTROL APPLICATIONS (90 DEGREE BODIES)

FULLY ADJUSTABLE WITH REVERSE FREE FLOW CHECK

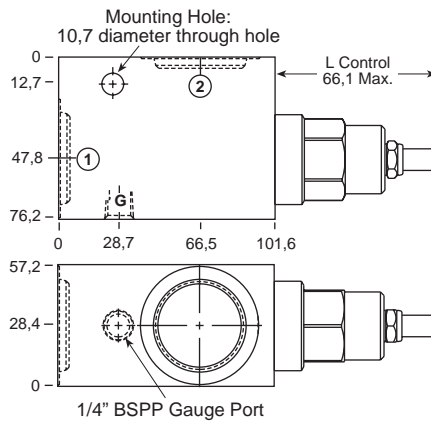
Go to [www.sunhydraulics.com](http://www.sunhydraulics.com) for more product information.



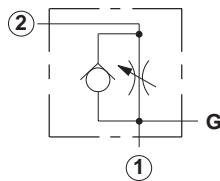
Ports 1 and 2	Assembly Model Code*
3/4" BSPP	<b>FDEA-LAN-IAW</b>
<b>1" BSPP</b>	<b>FDEA-LAN-IAX</b>
1 1/4" BSPP	<b>FDEA-LAN-IAZ</b>

\*Add modifier /S to order SG Iron for pressure rating over 210 bar.

## 1-95 L/min. Cavity T-16A



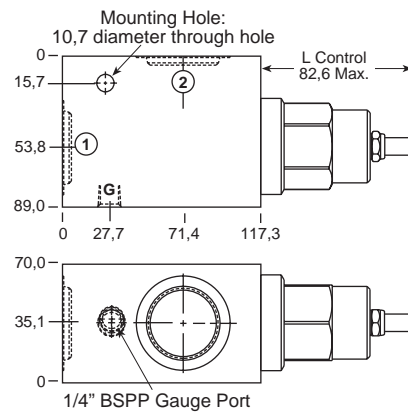
\*Add modifier /S to order SG Iron for pressure rating over 210 bar.



Ports 1 and 2	Assembly Model Code*
1" BSPP	<b>FDFA-LAN-LAX</b>
1 1/4" BSPP	<b>FDFA-LAN-LAY</b>

\*Add modifier /S to order SG Iron for pressure rating over 210 bar.

## 1-200 L/min. Cavity T-18A



\*Add modifier /S to order SG Iron for pressure rating over 210 bar.

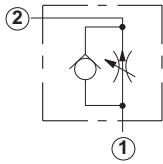
NOTES: Page 126 for cartridge model FD\*\*-\*\*\* shows performance curves, technical tips, and options.  
See page vii for technical information about line mount bodies including SAE flange pattern specifications.  
Consult the Sun Factory for other port sizes available in the bodies shown above.  
Model Codes printed in red are Preferred Products and are readily available.

## Line Mounted Assemblies

# TWO PORT FLOW CONTROL APPLICATIONS (INLINE BODIES)

FULLY ADJUSTABLE WITH  
REVERSE FREE FLOW CHECK

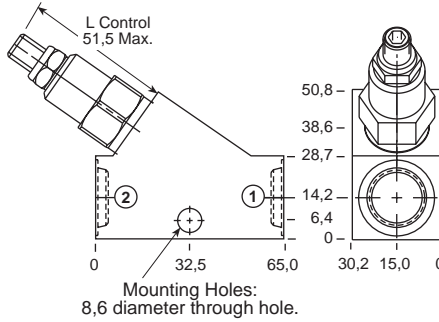
Go to [www.sunhydraulics.com](http://www.sunhydraulics.com)  
for more product information.



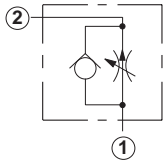
0,4-23 L/min.

Cavity T-13A

Ports 1 and 2	Assembly Model Code*
1/4" BSPP	<b>FDBA-LAN-GCT</b>
3/8" BSPP	<b>FDBA-LAN-GCU</b>



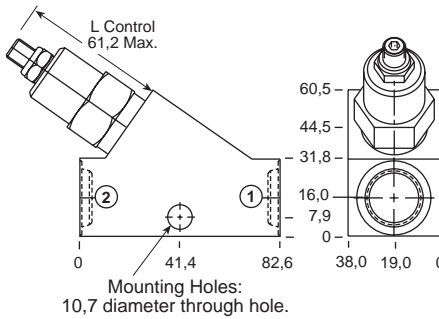
\*Add modifier /S to order SG Iron for pressure rating  
over 210 bar.



0,4-45 L/min.

Cavity T-5A

Ports 1 and 2	Assembly Model Code*
3/8" BSPP	<b>FDCB-LAN-DCU</b>
1/2" BSPP	<b>FDCB-LAN-DCV</b>



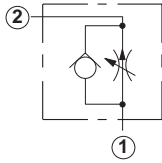
\*Add modifier /S to order SG Iron for pressure rating  
over 210 bar.

NOTES: Page 126 for cartridge model FD\*\*-\* shows performance curves, technical tips, and options.  
See page vii for technical information about line mount bodies including SAE flange pattern specifications.  
Consult the Sun Factory for other port sizes available in the bodies shown above.  
Model Codes printed in red are Preferred Products and are readily available.

**TWO PORT FLOW CONTROL APPLICATIONS  
(INLINE/INLINE 1.50"/2.00" SAE C61 FLANGE PORT BODIES)**

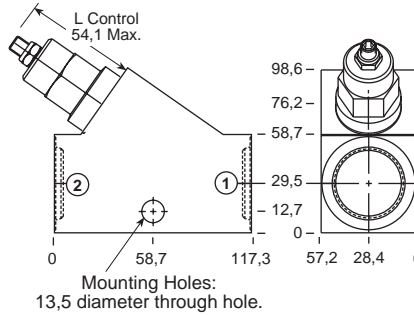
FULLY ADJUSTABLE WITH REVERSE FREE FLOW CHECK

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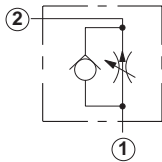
**1-95 L/min. Cavity T-16A**

Ports 1 and 2	Assembly Model Code*
3/4" BSPP	<b>FDEA-LAN-ICW</b>
1" BSPP	<b>FDEA-LAN-ICX</b>
1 1/4" BSPP	<b>FDEA-LAN-ICY</b>

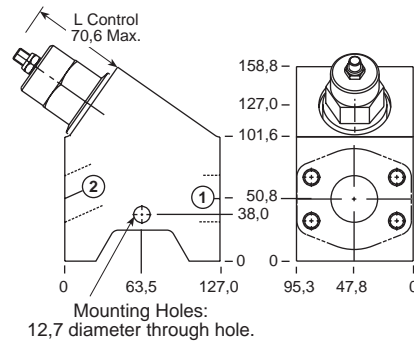


\*Add modifier /S to order SG Iron for pressure rating over 210 bar.

**1-200 L/min. Cavity T-18A**

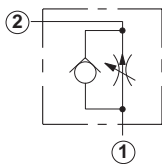


Ports 1 and 2	Assembly Model Code*
1 1/2" SAE C61	<b>FDFA-LAN-ZLS/M</b>

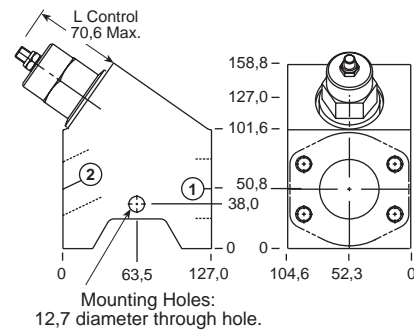


\*Add modifier /T to order SG Iron for pressure rating over 210 bar.

**1-200 L/min. Cavity T-18A**



Ports 1 and 2	Assembly Model Code*
2" SAE C61	<b>FDFA-LAN-ZLR/M</b>



\*Add modifier /T to order SG Iron for pressure rating over 210 bar.

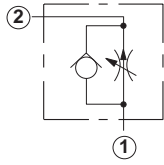
NOTES: Page 126 for cartridge model FD\*\*-\* shows performance curves, technical tips, and options. See page vii for technical information about line mount bodies including SAE flange pattern specifications. Consult the Sun Factory for other port sizes available in the bodies shown above. Model Codes printed in red are Preferred Products and are readily available.

**Line Mounted Assemblies**

**TWO PORT FLOW CONTROL APPLICATIONS  
(2.00" SAE C61/C62 FLANGE PORT BODIES, 2 CAVITIES)**

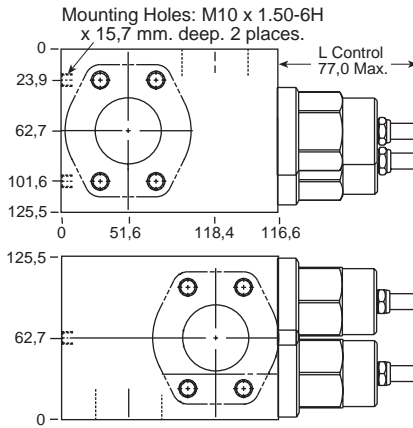
**FULLY ADJUSTABLE WITH REVERSE FREE FLOW CHECK**

Go to [www.sunhydraulics.com](http://www.sunhydraulics.com) for more product information.

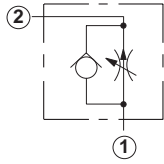


Ports 1 and 2	Assembly Model Code*
2" SAE C61	<b>FDFA-LAN-XZY/M</b>

**1,6-400 L/min. Cavity T-18A**

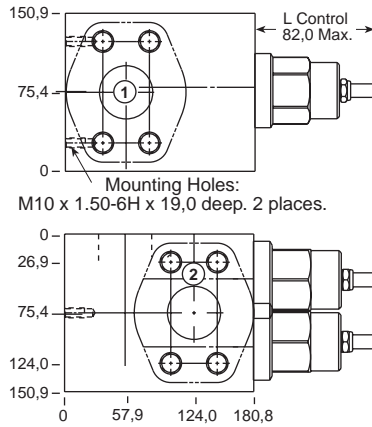


\*Add modifier **/T** to order SG Iron for pressure rating over 210 bar.



Ports 1 and 2	Assembly Model Code*
2" SAE C62	<b>FDFA-LAN-VTN/M</b>

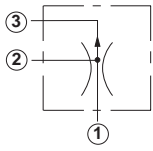
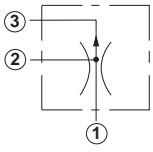
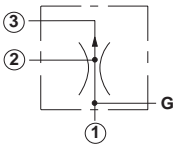
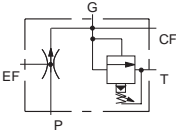
**1,6-400 L/min. Cavity T-18A**



\*Add modifier **/T** to order SG Iron for pressure rating over 210 bar.

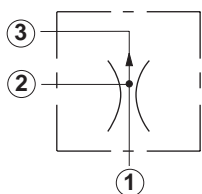
NOTES: Page 126 for cartridge model FD\*\*\_\*\*\* shows performance curves, technical tips, and options.  
See page vii for technical information about line mount bodies including SAE flange pattern specifications.  
Consult the Sun Factory for other port sizes available in the bodies shown above.

# Fixed Orifice Priority Flow Control Assemblies

	<i>Cartridge Type</i>	<i>Page</i>
	Bypass/Restrictive, Fixed Orifice	134
<b><i>Line Mounted Assemblies (Body Type)</i></b>		
	90 Degree High Capacity Port 3	136
	90 Degree High Capacity with Gauge Port	137
	Relief on Controlled Port	138

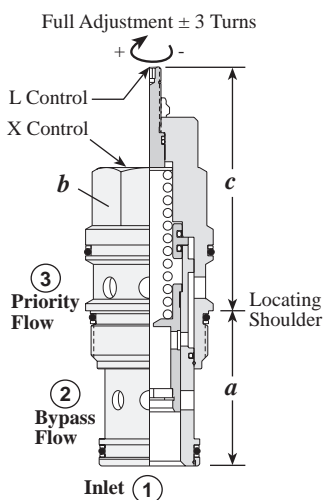
# Priority Flow Control Valves

## BYPASS / RESTRICTIVE, FIXED ORIFICE



Capacity	Typical Cartridge Model Code	Cavity	Cartridge Dimensions					Installation Torque (Nm)
			a	b	c			
					X	L	K	
0,4-11 L/min.	FRBA – LAN	T - 163A	31	19,1	32	43	47	35/40
0,4-23 L/min.	FRCA – LAN	T - 11A	34,9	22,2	31	64	71	40/50
0,4-45 L/min.	FRDA – LAN	T - 2A	34,9	28,6	35	72	78	60/70
1-95 L/min.	FREA – LAN	T - 17A	46	31,8	46	84	91	200/215
1-200 L/min.	FRFA – LAN	T - 19A	63,5	41,3	60	100	107	465/500

### OPTION ORDERING INFORMATION



**FR \* A - \* A \***

<p><b>Nominal Capacity</b></p> <p><b>B</b> 0,4-11 L/min.</p> <p><b>C</b> 0,4-23 L/min.</p> <p><b>D</b> 0,4-45 L/min.</p> <p><b>E</b> 1-95 L/min.</p> <p><b>F</b> 1-200 L/min.</p>	<p><b>Control**</b></p> <p><b>X</b> Non-adjustable Factory set at customer specified flow</p> <p><b>L</b> Tuning Adjustment ±25% of customer specified flow</p> <p><b>K</b> Handknob for <b>L</b> control</p>	<p><b>Adjustment Range</b></p> <p><b>A</b> Fixed Orifice</p> <p><b>Customer must specify flow</b></p>	<p><b>Seal</b></p> <p><b>N</b> Buna-N</p> <p><b>V</b> Viton</p>
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*Maximum Inlet Flow:*  
FRBA: 30 L/min.  
FRCA: 60 L/min.  
FRDA: 120 L/min.  
FREA: 240 L/min.  
FRFA: 480 L/min.

*Priority Flow ranges:*  
FRBA: 0,4 - 12 L/min.  
FRCA: 0,4 - 23 L/min.  
FRDA: 0,4 - 45 L/min.  
FREA: 0,8 - 95 L/min.  
FRFA: 0,8 - 200 L/min.

*\*\* See page 244 for information on Control Options*

# TECHNICAL TIPS / PERFORMANCE CURVES

## Priority Flow Control Valves, Fixed Orifice, Bypass / Restrictive

### Applications

These combination priority and bypass flow control valves may be used to establish the flow to the priority or controlled flow circuit, and either bypass the remaining flow to tank at the load induced pressure of the system or use it in a secondary system.

### Application Notes

- Valve will not bypass unless priority flow is satisfied.
- Bypass pressure may exceed priority pressure.
- Blocking the controlled flow path will also block the bypass flow path.**
- Note factory set point conditions.

### Design Concepts and Features

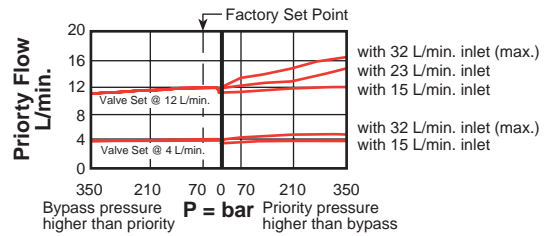
- Customer specified, fixed orifice for priority flow. (Flow setting accuracy  $\pm 10\%$ .)
- Tunable control option to provide  $\pm 25\%$  variation of the customer specified flow at factory preset conditions.

**Note:** Tunable adjustment range follows performance curve profile.

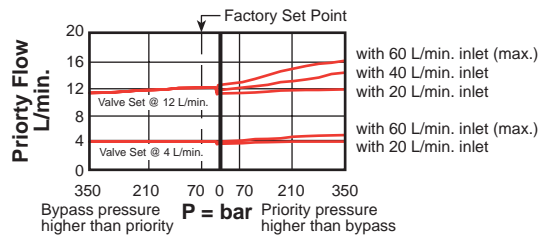
### Performance Curves

#### Typical Performance

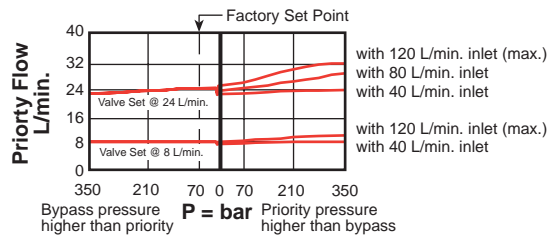
#### FRBA-LAN



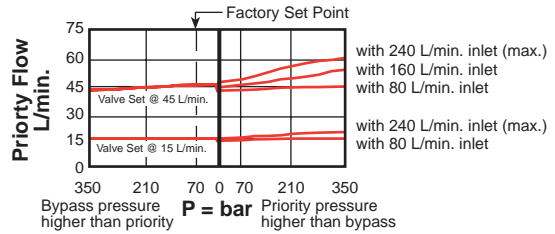
#### FRCA-LAN



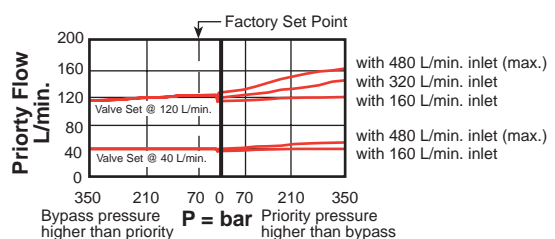
#### FRDA-LAN



#### FREA-LAN



#### FRFA-LAN



## General Application Requirements

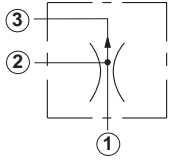
- Operating Temperature Range: Buna-N seals  $-45^{\circ}\text{C}$  to  $90^{\circ}\text{C}$ , Viton seals  $-15^{\circ}\text{C}$  to  $120^{\circ}\text{C}$ .
- Viscosity Range: 10-600 centistokes.
- Fluid Contamination Level: ISO 4406 18/15 or better; Recommend  $\beta_{10} \geq 75$  to achieve ISO 18/15 or better in most systems.

Line Mounted Assemblies

THREE PORT PRIORITY FLOW CONTROL APPLICATIONS  
(90 DEGREE HIGH CAPACITY PORT 3 BODIES)

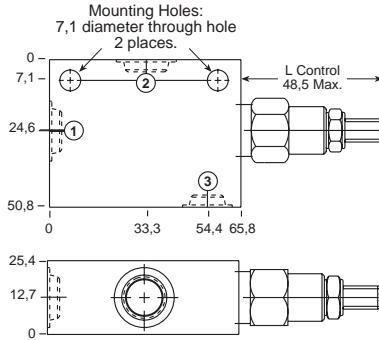
BYPASS / RESTRICTIVE  
FIXED ORIFICE

Go to [www.sunhydraulics.com](http://www.sunhydraulics.com)  
for more product information.

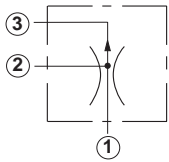


0,4-11 L/min. Cavity T-163A

Ports 1 and 2	Port 3	Assembly Model Code*
1/4" BSPP	1/4" BSPP	<b>FRBA-LAN-JCT</b>
3/8" BSPP	1/4" BSPP	<b>FRBA-LAN-JCU</b>

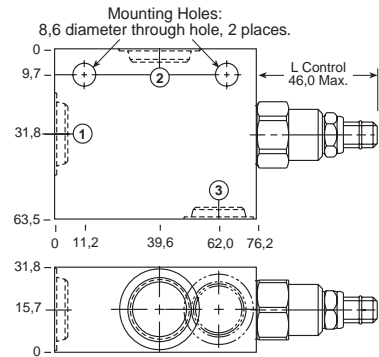


\*Add modifier /S to order SG Iron for pressure rating over 210 bar.

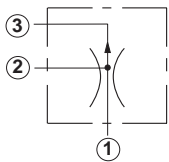


0,4-23 L/min. Cavity T-11A

Ports 1 and 2	Port 3	Assembly Model Code*
3/8" BSPP	3/8" BSPP	<b>FRCA-LAN-EAU</b>
1/2" BSPP	3/8" BSPP	<b>FRCA-LAN-EAV</b>

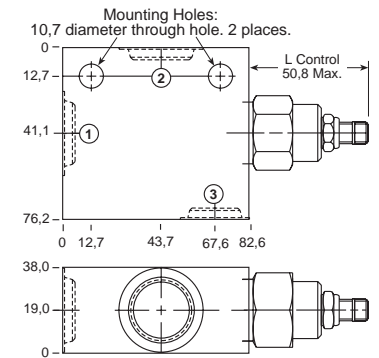


\*Add modifier /S to order SG Iron for pressure rating over 210 bar.



0,4-45 L/min. Cavity T-2A

Ports 1 and 2	Port 3	Assembly Model Code*
3/8" BSPP	3/8" BSPP	<b>FRDA-LAN-BAU</b>
1/2" BSPP	1/2" BSPP	<b>FRDA-LAN-BAV</b>
3/4" BSPP	1/2" BSPP	<b>FRDA-LAN-BAW</b>



\*Add modifier /S to order SG Iron for pressure rating over 210 bar.

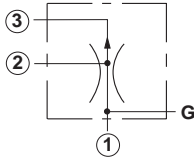
NOTES: Page 134 for cartridge model FR\*A-\*\*\* shows performance curves, technical tips, and options.  
See page vii for technical information about line mount bodies including SAE flange pattern specifications.  
Consult the Sun Factory for other port sizes available in the bodies shown above.  
Model Codes printed in red are Preferred Products and are readily available.



**THREE PORT PRIORITY FLOW CONTROL APPLICATIONS  
(90 DEGREE, HIGH CAPACITY PORT 3 BODIES)**

**BYPASS / RESTRICTIVE  
FIXED ORIFICE**

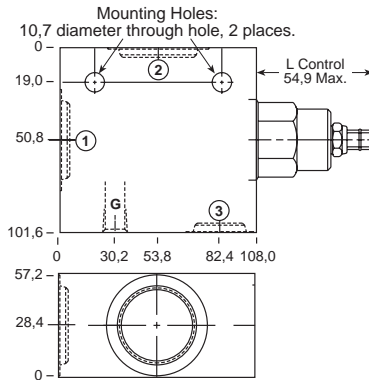
Go to [www.sunhydraulics.com](http://www.sunhydraulics.com)  
for more product information.



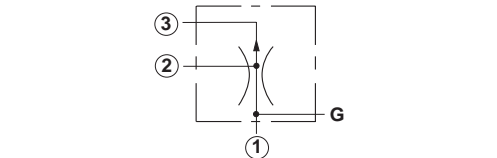
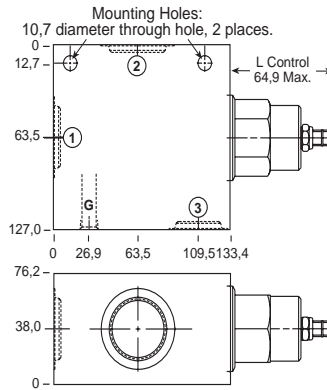
Ports 1 and 2	Port 3	Assembly Model Code*
3/4" BSPP	3/4" BSPP	<b>FREA-LAN-HEW</b>
1" BSPP	3/4" BSPP	<b>FREA-LAN-HEX</b>
1 1/4" BSPP	3/4" BSPP	<b>FREA-LAN-HEY</b>

\*Add modifier /S to order SG Iron for pressure rating over 210 bar.

**1-95 L/min. Cavity T-17A**



**1-200 L/min. Cavity T-19A**



Ports 1 and 2	Port 3	Assembly Model Code*
1" BSPP	1" BSPP	<b>FRFA-LAN-KEX</b>
1 1/4" BSPP	1" BSPP	<b>FRFA-LAN-KEY</b>

\*Add modifier /S to order SG Iron for pressure rating over 210 bar.

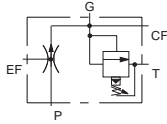
NOTES: Page 134 for cartridge model FR\*A-\*\*\* show performance curves, technical tips, and options.  
See page vii for technical information about line mount bodies including SAE flange pattern specifications.  
Consult the Sun Factory for other port sizes available in the bodies shown above.  
Model Codes printed in red are Preferred Products and are readily available.

Line Mounted Assemblies

THREE PORT PRESSURE-COMPENSATED PRIORITY FLOW CONTROL APPLICATIONS (RELIEF ON CONTROLLED PORT BODIES)

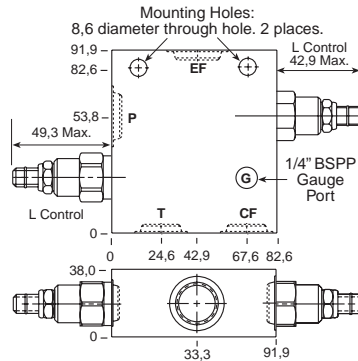
UP TO 25 L/min.  
PRIORITY FLOW

Go to [www.sunhydraulics.com](http://www.sunhydraulics.com)  
for more product information.



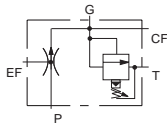
0,4-23 L/min. Cavity T-11A

Ports (EF) Excess Flow & (P) Pump	Ports (CF) Control Flow & (T) Tank	Assembly Model Code*
1/4" BSPP	1/4" BSPP	YRDR-LAN-LT
3/8" BSPP	3/8" BSPP	YRDR-LAN-LU
1/2" BSPP	3/8" BSPP	YRDR-LAN-LV



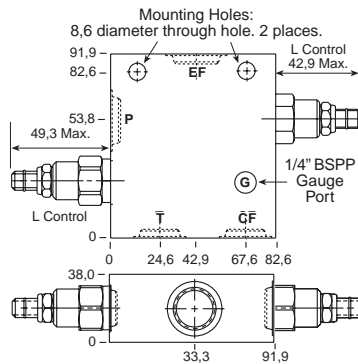
\*Add modifier /S to order SG Iron for pressure rating over 210 bar.

UP TO 50 L/min.  
PRIORITY FLOW



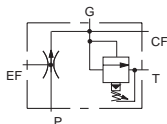
0,4-45 L/min. Cavity T-2A

Ports (EF) Excess Flow & (P) Pump	Ports (CF) Control Flow & (T) Tank	Assembly Model Code*
1/2" BSPP	1/2" BSPP	YREM-LAN-LV
3/4" BSPP	1/2" BSPP	YREM-LAN-LW



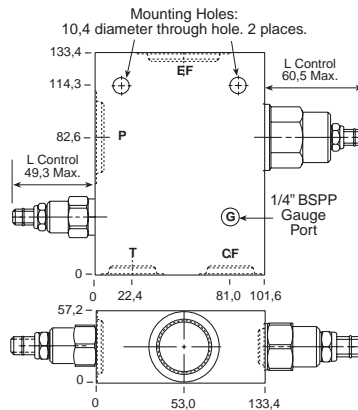
\*Add modifier /S to order SG Iron for pressure rating over 210 bar.

UP TO 100 L/min.  
PRIORITY FLOW



1-95 L/min. Cavity T-17A

Ports (EF) Excess Flow & (P) Pump	Ports (CF) Control Flow & (T) Tank	Assembly Model Code*
3/4" BSPP	3/4" BSPP	YRFF-LAN-LW
1" BSPP	3/4" BSPP	YRFF-LAN-LX
1 1/4" BSPP	3/4" BSPP	YRFF-LAN-LY



\*Add modifier /S to order SG Iron for pressure rating over 210 bar.

NOTES: Page 134 for cartridge model FR\*A-\*\*\* shows performance curves, technical tips, and options.  
See page vii for technical information about line mount bodies including SAE flange pattern specifications.  
Consult the Sun Factory for other port sizes available in the bodies shown above.

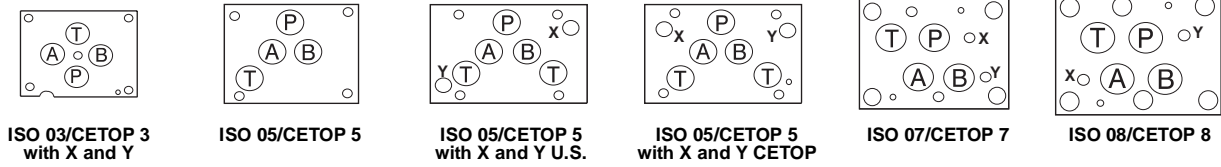
	<i>Page</i>
Technical Product Information	140
Studkits	142
Studrod Length Determination Chart	143

## *Sandwich Assemblies*

<i>Body Type</i>	<i>Page</i>	<i>Body Type</i>	<i>Page</i>
<i>ISO 03/CETOP 3 Valves</i>		<i>ISO 07/CETOP 7 Valves</i>	
Relief	145	Relief	183
Relief, Vented	147	Sequence	185
Sequence	148	Reducing	186
Reducing	149	Reducing/Relieving	187
Reducing/Relieving	150	Counterbalance	188
Counterbalance and Vented Counterbalance	151	Pilot-to-Open Check	189
Pilot-to-Open Check	152	Check	190
Check	153	Flow Control	191
Flow Control and Priority Flow Control	154	Circuit Saver	192
Flow Control	155		
Circuit Saver	158		
<i>ISO 05/CETOP 5 Valves</i>		<i>ISO 08/CETOP 8 Valves</i>	
Relief	161	Relief	193
Relief, Vented	163	Sequence	195
Sequence	164	Reducing	196
Reducing	165	Reducing/Relieving	197
Reducing/Relieving	166	Counterbalance	198
Counterbalance	167	Pilot-to-Open Check	199
Pilot-to-Open Check	168	Check	200
Check	169	Flow Control	201
Flow Control	170	Circuit Saver	202
<i>ISO 05 with X and Y Valves</i>			
Relief	173		
Sequence	175		
Reducing	176		
Reducing/Relieving	177		
Counterbalance	178		
Pilot-to-Open Check	179		
Check	180		
Flow Control	181		

TECHNICAL PRODUCT INFORMATION

Sun offers sandwich and subplate mounted bodies for most of its cartridge functions. These mounting configurations are complete circuit elements that mount under directional control valves. Similar to other Sun mounting configurations, the sandwich and subplate bodies are available in aluminium and SG iron material. The sandwich and subplate bodies are available in five different interface patterns as shown below:



**Mounting of ISO 03 Sandwiches**

Sun’s ISO 03 sandwich bodies are designed for multi-functional use to permit maximum circuit flexibility. Due to this versatility, the ISO 03 sandwich bodies do not have a counterbore for installing O-ring seals. Instead, Sun uses a special seal plate with a raised “NIB” and a locating “NOTCH”. Sun bodies incorporate oversize, symmetrical mounting holes to allow the bodies to be rotated about the “NIB” axis and the longitudinal axis as shown in Figure 1.

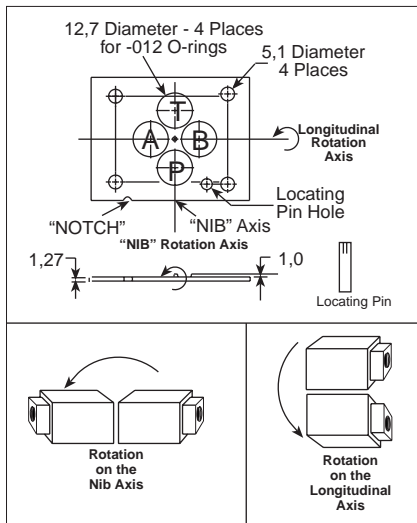


Figure 1: Body Rotation Reference

Rotation about the “NIB” axis enables the “A” and “B” port connections to be interchanged and rotation about the longitudinal axis enables the “P” and “T” ports to be interchanged.

All Sun seal plates are manufactured to current industry standards regarding port and mounting bolt locations. Each Sun D03 sandwich body is supplied with a “NIB” locating hole which is drilled on each mounting face to position the body in the correct relationship to the ports and mounting holes. To further ensure that all

bodies are located properly, all ISO 03 sandwich bodies are stamped with an arrow (or arrows) to show the relationship to the notch in the seal plate (see Figure 2). Multi-function bodies are “NOTCH” stamped for all possible mounting positions and all positions should be carefully inspected to be sure the intended function is correctly installed.

**ISO 03 Sandwich Bodies stamped with numbers to orient body for desired function**

The function symbols on the data pages for Sun’s ISO 03 sandwich bodies are shown with numbers (1,2,3,4) in the upper right and lower left hand corners. These numbers correspond to numbers stamped on the face of the bodies and designate the functionality of the product. Because many of these bodies can be used for different functions, the bodies are stamped to help the user orient the body for the function desired.

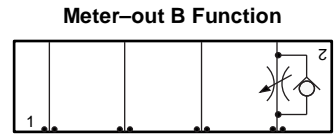
Some bodies can be mounted in four different orientations, as shown in Figure 1A on the facing page. The example below shows GBA. As demonstrated by the function symbols, this single body can be used to achieve four different functions: Meter-in A, Meter-out A, Meter-in B, and Meter-out B. The body drawing only indicates the Meter-out B and Meter-in A orientations because only one face of the body is shown. The Meter-out A and Meter-in B functions are shown in the symbols with the numbers 3 and 4, which correspond to the numbers stamped on the opposite face of the body.

**Rotation Example for ISO 03 bodies using subplate GBA.**

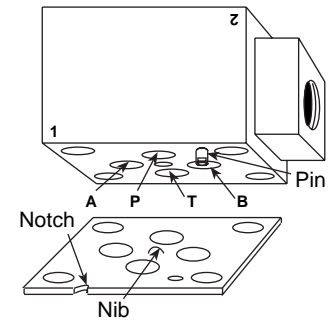
**STEP 1**

Begin with body view showing stamped number 1 in lower left corner. Note the location of P, T, A, and B ports and the

position of the cavity. This position places the P port of the sandwich nearest to the viewer. The sandwich is now oriented for the meter-out B function.

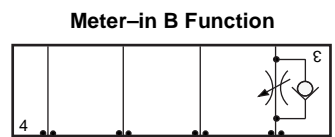


Note that the numbers on the function symbol for GBA correspond to the numbers stamped on the body.

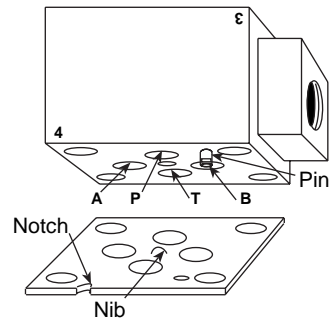


**STEP 2**

Rotate the sandwich on the **longitudinal axis** to orient body for meter-in B function.



Note that the numbers on the function symbol for GBA correspond to the numbers stamped on the body.



Sandwich Assemblies

ISO 03 / CETOP 3 FLOW CONTROL VALVES

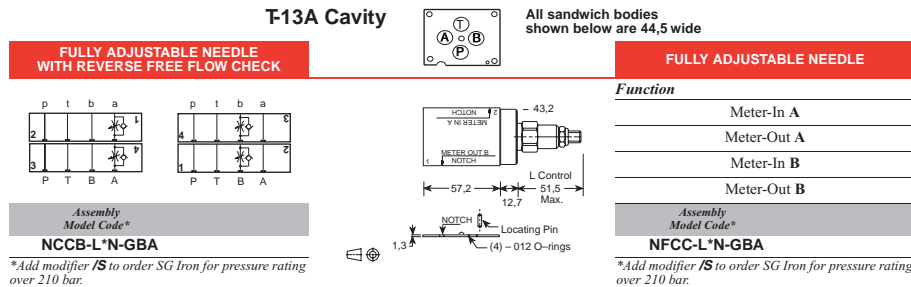
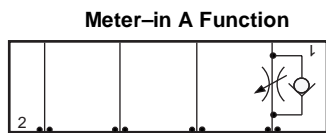


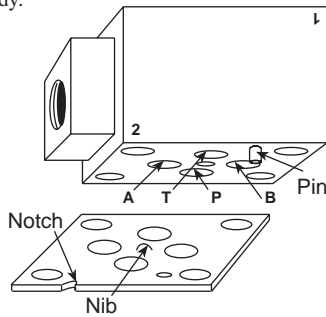
Figure 1A

STEP 3

Rotate the sandwich on the **nib** axis to orient body for meter-in A function.

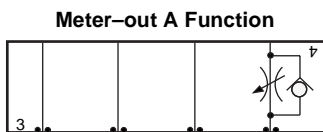


Note that the numbers on the function symbol for GBA correspond to the numbers stamped on the body.

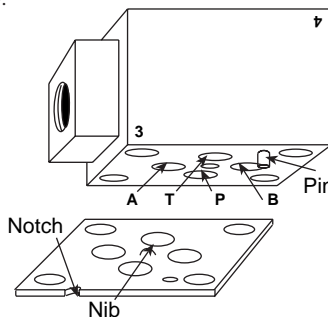


STEP 4

Rotate the sandwich on the **longitudinal axis** to orient body for meter-out A function.



Note that the numbers on the function symbol for GBA correspond to the numbers stamped on the body.



Assembly of ISO 03 Sandwiches

1. Place the Sun seal plate, with the “NIB” facing upward, in the proper position to correctly align the mounting holes and fluid ports. At this time, the “NOTCH” in the seal plate must be adjacent to the “P” port of the valve interface. See Figure 1.
2. Position the Sun sandwich body so that the control “NOTCH” arrow for the required function points to the “NOTCH” in the seal plate. See Figure 2.
3. Move the sandwich body as required to engage the “NIB” on the seal plate with the clearance hole in the body.

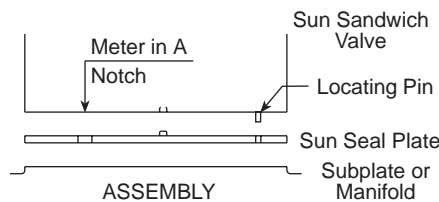


Figure 2: Assembly

**NOTE:** In every installation, the seal plate nib must be oriented toward the directional control valve and away from the subplate or manifold. All locating “NIBS” in the sandwich valve stack must point in the same direction.

4. After determining the correct alignment of the sandwich body to the seal plate, lift the body and plate together, turn the assembly over and locate the correct hole in which to press the locating pin. The locating pin is shipped separately. Press the pin, serrated end first, into the body until it stops. The pin must protrude below the seal plate to positively align with the mounting surface. If a valve

stack requires disassembly at anytime, the pin should not be removed. It will simplify the reassembly of the valve stack.

5. After all the body alignments have been determined and all pins installed, assemble the valve stack in the required functional order. Make sure all the O-rings are properly positioned. Install the directional control valve on top of the stack and tighten the stud nuts alternately to the proper torque of 5.5–6 Nm.

Mounting ISO 05 Sandwich Bodies

Sun ISO 05 sandwich bodies are available for many mounting configurations. The standard ISO 05/NFPA D05 is offered with two methods of sealing the fluid interface. The sealing method depends on the ability of the body to be rotated about its axis. Sandwich bodies that can be rotated will use a Sun seal plate supplied with the body. Non-rotating bodies will have counterbores machined into the body sealing surface for O-ring placement. The ISO 05 sandwich body can only be rotated about the “NIB” axis referred to in the ISO 03 sandwich section. There is no “NIB” on the ISO 05 subplate, it is used only for axis reference. Longitudinal axis rotation is not possible due to the lack of symmetry of the fluid ports.

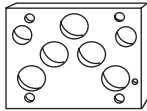
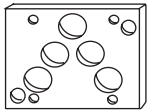
Mounting ISO 05 X,Y Sandwich Bodies

Sun ISO 05 X, Y sandwich bodies are furnished with pilot and drain connections. **Due to the differences in the European and U.S. seal plates, none are supplied with these bodies. They**

**TECHNICAL PRODUCT INFORMATION**

**must be ordered separately to correctly match the other valve bodies in the stack.** See the chart below for various product brands and part number information.

U.S. for use with		European (CETOP) for use with	
Double A	Q*-02	Rexroth	WEH 10
Parker-Hannifin	D31W	Bosch	
Racine	FD4-**HS-02		
Dynex Rivett	6600-02H		
Snap-Tite	DG02		



**Kit #990-120-009**

**Kit #990-120-012**

- Includes:
- 1 - 911-008 seal plate
  - 5 - 500-001-014 Buna-N O-rings
  - 2 - 500-001-010 Buna-N O-rings

- Includes:
- 1 - 991-009 seal plate
  - 5 - 500-001-014 Buna-N O-rings
  - 2 - 500-001-012 Buna-N O-rings

1. Verify that the correct seal plates have been selected (if required) and position the sandwich body so that the fluid ports are correctly aligned and the correct port (A or B) is being controlled.
2. After determining the proper alignment of all the sandwich bodies, assemble the valve stack in the required functional order. Make sure all the O-rings are properly positioned. Install the directional valve and tighten the studnuts alternately to the proper torque of 14-15 Nm.

**Studkits for ISO 03 and ISO 05 Sandwich Bodies**

To simplify the installation of ISO 03 and ISO 05 sandwiches, Sun offers uncut (can be cut to length in the field) or precut studkits in both inch and metric standard threaded rod. Once the rods are installed in a subplate or manifold, they act as a guide in assembling the sandwich body stack. After the directional control valve is assembled on top of a stack, Sun studnuts are used to retain the assembled stack.

The inch and metric studrods are both made of high tensile, fully threaded ASTM-A-193 Grade B material with the following mechanical properties:

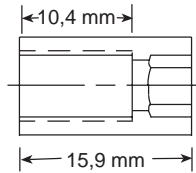
- 8780 Kg/cm<sup>2</sup> minimum tensile strength.
- 7380 Kg/cm<sup>2</sup> minimum yield point.
- 26 -32 Rc hardness.

The studnuts are special hex socket nuts with the following features:

- An outside diameter equivalent to a standard socket head cap screw.
- Full thread engagement as shown below.
- Mechanical stop between the internal hex and the thread to prevent the hex wrench from being pushed out of its socket.

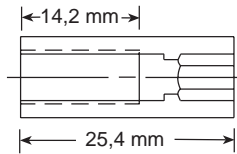
**ISO 03**

Internal Hex Size  
5/32" U.S. 4 mm metric  
**10-24 (Part #350005) and M5 (Part #350009) Studnuts**



**ISO 05**

Internal Hex Size  
3/16" U.S. 5 mm metric  
**1/4-20 (Part #350004) and M6 (Part #350008) Studnuts**



**ISO 03 Studkits (recommended torque - 5.5-6 Nm)**

**Inch Standards**

- (4) 10-24 Studnuts and (4) approximately 178 mm long 10-24 studrods **Kit # 992011**
- (4) 10-24 Studnuts and (4) approximately 305 mm long 10-24 studrods **Kit # 992012**
- (50) 10-24 Studnuts and (10) approximately 914 mm long 10-24 studrods **Kit # 992013**
- (50) 10-24 Studnuts only **Kit # 992550**
- (4) 10-24 Studnuts and (4) 10-24 studrods cut to customer specified length (± 1,5 mm) **Kit # 992650**

**Metric Standards**

- (4) M5 Studnuts and (4) approximately 178 mm long M5 studrods **Kit # 992111**
- (4) M5 Studnuts and (4) approximately 305 mm long M5 studrods **Kit # 992112**
- (50) M5 Studnuts and (10) approximately 914 mm long M5 studrods **Kit # 992113**
- (50) M5 Studnuts only **Kit # 992750**
- (4) M5 Studnuts and (4) M5 studrods cut to customer specified length (± 1,5 mm) **Kit # 992850**

**ISO 05 Studkits (recommended torque - 14-15 Nm)**

**Inch Standards**

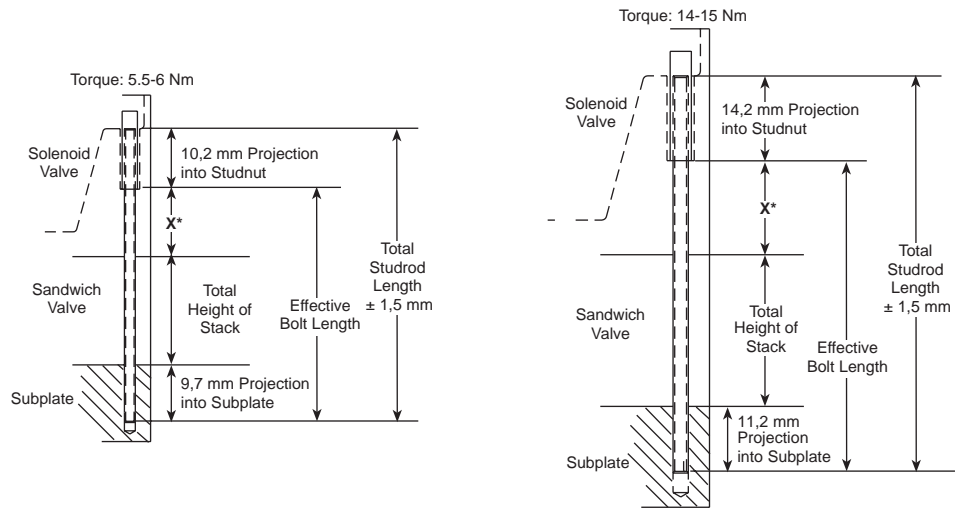
- (4) 1/4-20 Studnuts and (4) approximately 178 mm long 1/4-20 studrods **Kit # 992001**
- (4) 1/4-20 Studnuts and (4) approximately 305 mm long 1/4-20 studrods **Kit # 992002**
- (50) 1/4-20 Studnuts and (10) approximately 914 mm long 1/4-20 studrods **Kit # 992500**
- (50) 1/4-20 Studnuts only **Kit # 992500**
- (4) 1/4-20 Studnuts and (4) 1/4-20 studrods cut to customer specified length (± 1,5 mm) **Kit # 992600**

**Metric Standards**

- (4) M6 Studnuts and (4) approximately 178 mm long M6 studrods **Kit # 992101**
- (4) M6 Studnuts and (4) approximately 305 mm long M6 studrods **Kit # 992102**
- (50) M6 Studnuts and (10) approximately 914 mm long M6 Studrods **Kit # 992103**
- (50) M6 Studnuts only **Kit # 992700**
- (4) M6 Studnuts and (4) M6 studrods cut to customer specified length (± 1,5 mm) **Kit # 992800**

**TECHNICAL PRODUCT INFORMATION**

**STUDROD LENGTH DETERMINATION CHART**



ISO 03				ISO 05 and ISO 05 X,Y		
	Model	"X" mm	"X" inches*	Model	"X" mm*	"X" inches*
Continental	EP03M	15,9	.625	VS12M	33,3	1.31
Continental	VS5M	15,9	.625	EP05M	33,3	1.31
Double A (Vickers)	Q*-3	39,6	1.56	Q*-5	26,7	1.05
Parker-Hannifin	D1VW	38,1	1.50	D3W	48,5	1.91
Racine Bosch	.25NG6	22,1	.87	1/4"	35,1	1.38
Rexroth	4WRA6	32,0	1.26	4WE10, 4WEH10	30,0	1.18
Dynex/Rivett	6500 Series 03	11,2	.44	6500-02	9,7	.38
Vickers/40	DG4V	39,6	1.56	DG4S4	26,7	1.05
Vickers/60	DG4V	21,1	.83	DG4V5	30,0	1.18
Nachi 1	SSG01	36,6	1.44	SSG03,E10,E20	60,5	2.38

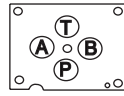
\* The X dimension was accurate as of the publication date of this catalogue. Verify in the applicable manufacturers literature.

**NOTES**



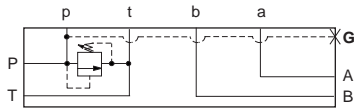
**ISO 03 / CETOP 3 RELIEF VALVES**  
**(SIDE PORTED SUBPLATE / REAR PORTED SUBPLATE / SIDE PORTED SUBPLATE WITH P AND T IN BASE)**

**T-10A Cavity**



First two subplates shown below are 89,0 mm wide.  
 Third subplate shown below is 76,2 mm wide

**PILOT OPERATED**



Ports	Assembly Model Code*
A, B, P, T	RPEC-LAN-FSU

\*Add modifier /S to order SG Iron for pressure rating over 210 bar.

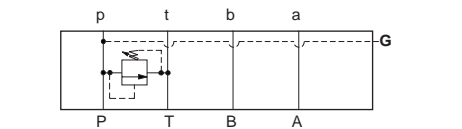
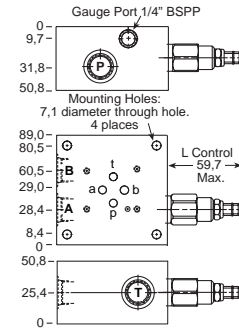
**DIRECT ACTING**

**Function**

**P to T**

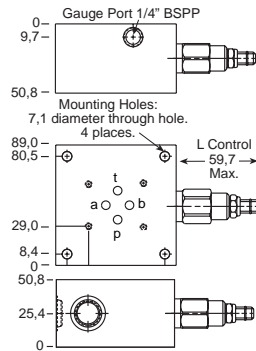
Ports	Assembly Model Code*
A, B, P, T	RDDA-LAN-FSU

\*Add modifier /S to order SG Iron for pressure rating over 210 bar.



Ports	Assembly Model Code*
A, B, P, T	RPEC-LAN-FRU

\*Add modifier /S to order SG Iron for pressure rating over 210 bar.

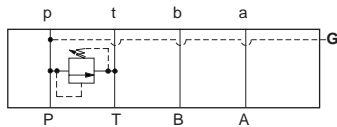


**Function**

**P to T**

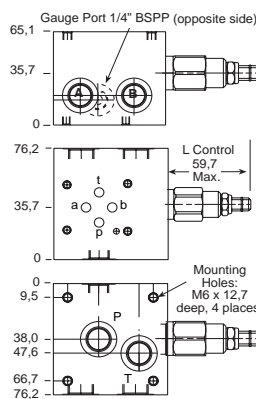
Ports	Assembly Model Code*
A, B, P, T	RDDA-LAN-FRU

\*Add modifier /S to order SG Iron for pressure rating over 210 bar.



Ports	Assembly Model Code*
A, B, P, T	RPEC-LAN-FVU

\*Add modifier /S to order SG Iron for pressure rating over 210 bar.



**Function**

**P to T**

Ports	Assembly Model Code*
A, B, P, T	RDDA-LAN-FVU

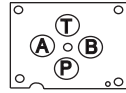
\*Add modifier /S to order SG Iron for pressure rating over 210 bar.

NOTES: Page 2 for cartridge models RP\*C-\*\*\* and RD\*A-\*\*\* show performance curves, technical tips, and options.  
 See Page 140 for technical information about sandwich bodies including ISO interface patterns, mounting instructions, studrods, and studkits.  
 Go to [www.sunhydraulics.com](http://www.sunhydraulics.com) for more product information.  
 Model Codes printed in red are Preferred Products and are readily available.

**Sandwich Assemblies**

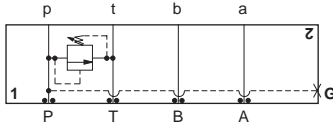
**ISO 03 / CETOP 3 RELIEF VALVES**

**T-10A Cavity**



All sandwich bodies shown below are 44,5 mm wide

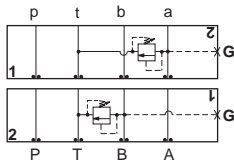
**PILOT OPERATED**



Assembly Model Code\*

**RPEC-LAN-FBP/M**

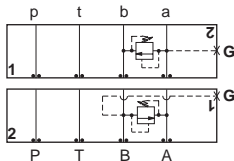
\*Add modifier **/T** to order SG Iron for pressure rating over 210 bar.



Assembly Model Code\*

**RPEC-LAN-FBA/M**

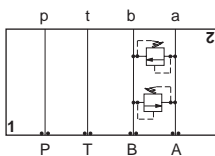
\*Add modifier **/T** to order SG Iron for pressure rating over 210 bar.



Assembly Model Code\*

**RPEC-LAN-FBC/M**

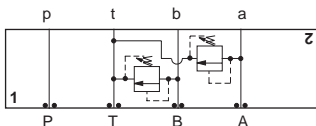
\*Add modifier **/T** to order SG Iron for pressure rating over 210 bar.



Assembly Model Code\*

**RPEC-LAN-FBY**

\*Add modifier **/S** to order SG Iron for pressure rating over 210 bar.



Assembly Model Code\*

**RPEC-LAN-FBX**

\*Add modifier **/S** to order SG Iron for pressure rating over 210 bar.

**DIRECT ACTING**

**Function**

**P to T**

Assembly Model Code\*

**RDDA-LAN-FBP/M**

\*Add modifier **/T** to order SG Iron for pressure rating over 210 bar.

**Function**

**A to T (High Capacity)**

**B to T (High Capacity)**

Assembly Model Code\*

**RDDA-LAN-FBA/M**

\*Add modifier **/T** to order SG Iron for pressure rating over 210 bar.

**Function**

**A to B (High Capacity)**

**B to A (High Capacity)**

Assembly Model Code\*

**RDDA-LAN-FBC/M**

\*Add modifier **/T** to order SG Iron for pressure rating over 210 bar.

**Function**

**A to B and B to A (High Capacity) (Cross-Port)**

Assembly Model Code\*

**RDDA-LAN-FBY**

\*Add modifier **/S** to order SG Iron for pressure rating over 210 bar.

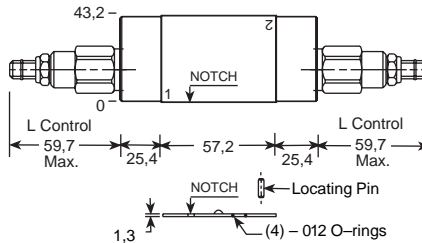
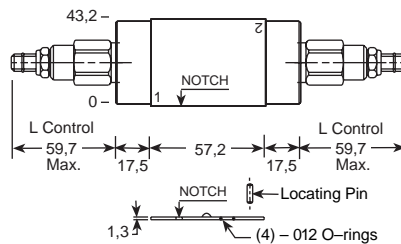
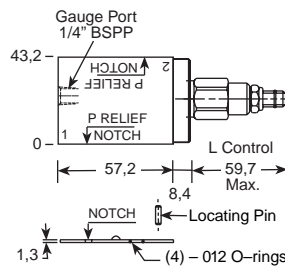
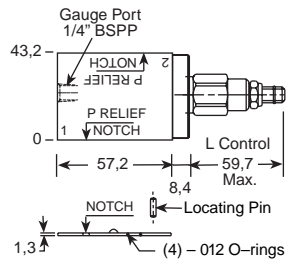
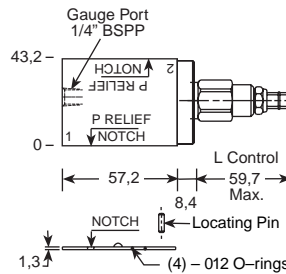
**Function**

**A and B to T (High Capacity)**

Assembly Model Code\*

**RDDA-LAN-FBX**

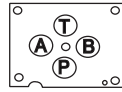
\*Add modifier **/S** to order SG Iron for pressure rating over 210 bar.



NOTES: Page 2 for cartridge models RP\*C-\*\*\* and RD\*A-\*\*\* show performance curves, technical tips, and options. See page 140 for technical information about sandwich bodies including ISO interface patterns, mounting instructions, studrods, and studkits. Go to [www.sunhydraulics.com](http://www.sunhydraulics.com) for more product information. Model Codes printed in red are Preferred Products and are readily available.

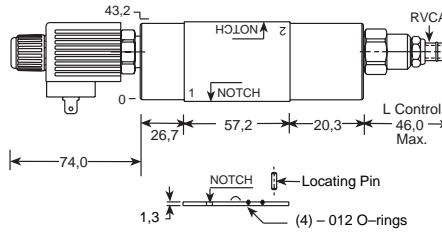
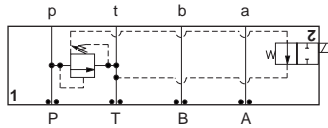
ISO 03 / CETOP 3 RELIEF VALVES, VENTED

T-11A Cavity



All sandwich bodies shown below are 44,5 mm wide

PILOT OPERATED



Function

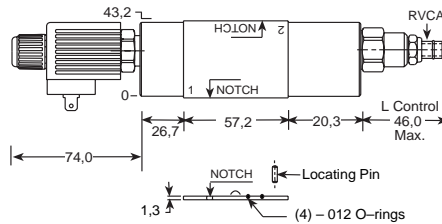
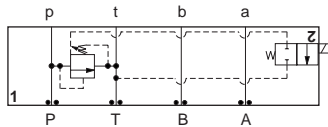
**P to T**  
(Normally Open, Solenoid Vented)

Assembly Model Code\*

**XRCO-LAN-HA**

\*Add modifier /S to order SG Iron for pressure rating over 210 bar.

Operating pressure is limited to 350 bar.  
Coil must be selected separately. See page 248.



Function

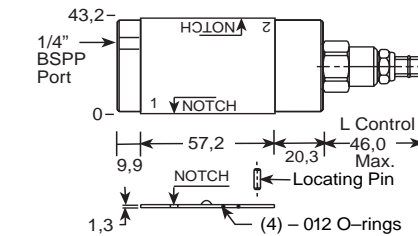
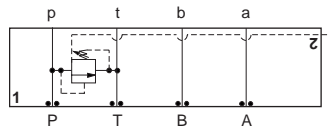
**P to T**  
(Normally Closed, Solenoid Vented)

Assembly Model Code\*

**XRCO-LAN-CA**

\*Add modifier /S to order SG Iron for pressure rating over 210 bar.

Operating pressure is limited to 350 bar.  
Coil must be selected separately. See page 248.



Function

**P to T** (Externally Vented)

Vent Port

Assembly Model Code\*

1/4" BSPP

**RVCA-LAN-EBC/M**

\*Add modifier /T to order SG Iron for pressure rating over 210 bar.

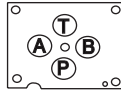
NOTES: Page 12 for cartridge model RV\*A-\*\*\* show performance curves, technical tips, and options.  
Select Solenoid Connector Option from Page 248.

See Page 140 for technical information about sandwich bodies including ISO interface patterns, mounting instructions, studrods, and studkits.  
Go to [www.sunhydraulics.com](http://www.sunhydraulics.com) for more product information.

**Sandwich Assemblies**

**ISO 03 / CETOP 3 SEQUENCE VALVES**

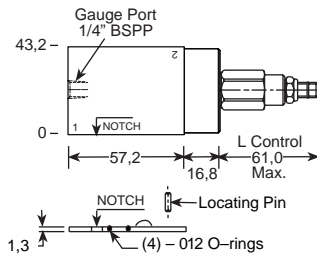
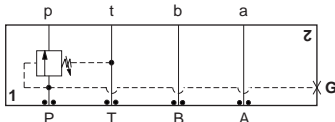
**T-11A Cavity**



All sandwich bodies shown below are 44,5 mm wide

**PILOT OPERATED**

**DIRECT ACTING**



**Function**

In to **P**

Assembly Model Code\*

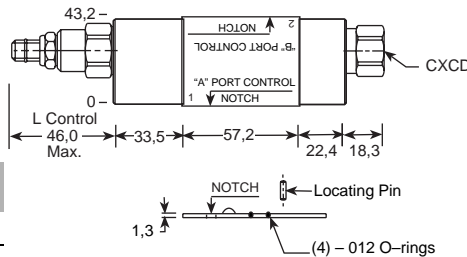
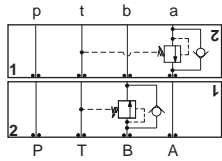
**RSDC-LAN-EBW/M**

\*Add modifier /S to order SG Iron for pressure rating over 210 bar.

Assembly Model Code\*

**SXCA-LAN-EBW/M**

\*Add modifier /T to order SG Iron for pressure rating over 210 bar.



**Function**

In to **A** (Reverse Free Flow Check)

Out of **B** (Reverse Free Flow Check)

Assembly Model Code\*

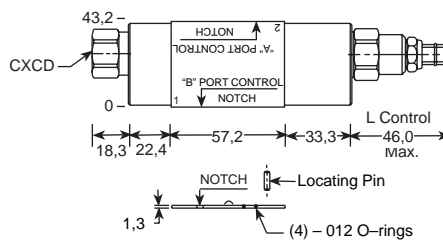
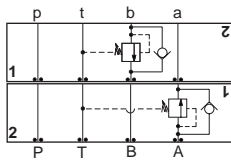
**RSDC-LAN-EB4**

\*Add modifier /S to order SG Iron for pressure rating over 210 bar.

Assembly Model Code\*

**SXCA-LAN-EB4**

\*Add modifier /S to order SG Iron for pressure rating over 210 bar.



**Function**

In to **B** (Reverse Free Flow Check)

Out of **A** (Reverse Free Flow Check)

Assembly Model Code\*

**RSDC-LAN-EB5**

\*Add modifier /S to order SG Iron for pressure rating over 210 bar.

Assembly Model Code\*

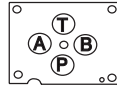
**SXCA-LAN-EB5**

\*Add modifier /S to order SG Iron for pressure rating over 210 bar.

NOTES: Pages 20 a 28 for cartridge models RS\*C-\*\*\*, SX\*A-\*\*\* and S C\*A-\*\*\* show performance curves, technical tips, and options. See Page 140 for technical information about sandwich bodies including ISO interface patterns, mounting instructions, studrods, and studkits. Go to [www.sunhydraulics.com](http://www.sunhydraulics.com) for more product information. Model Codes printed in red are Preferred Products and are readily available.

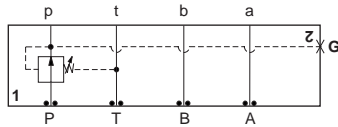
ISO 03 / CETOP 3 REDUCING VALVES

T-11A Cavity



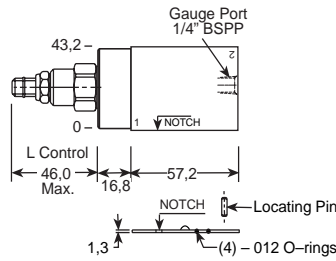
All sandwich bodies shown below are 44,5 mm wide

PILOT OPERATED

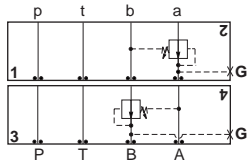


Assembly Model Code\*  
**PBDB-LAN-EBP/M**

\*Add modifier /T to order SG Iron for pressure rating over 210 bar.

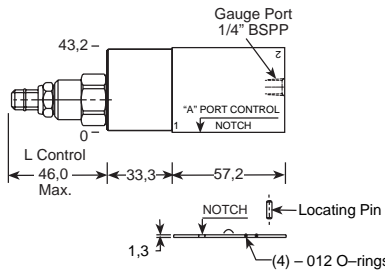


Function  
On P Drained to T

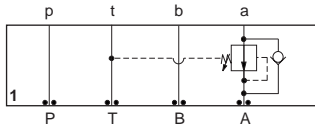


Assembly Model Code\*  
**PBDB-LAN-EBA/M**

\*Add modifier /T to order SG Iron for pressure rating over 210 bar.

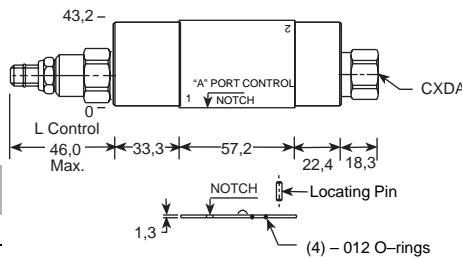


Function  
On A Drained to B  
On B Drained to A

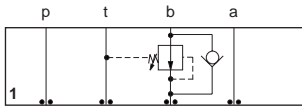


Assembly Model Code\*  
**PBDB-LAN-EB2**

\*Add modifier /S to order SG Iron for pressure rating over 210 bar.

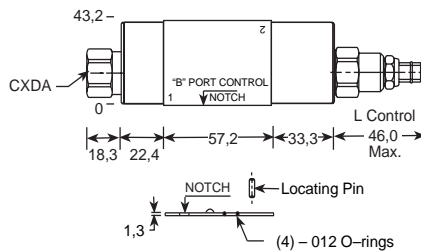


Function  
On A Drain to T  
(Reverse Free Flow Check)

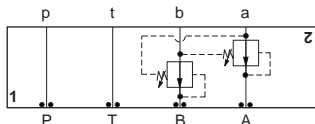


Assembly Model Code\*  
**PBDB-LAN-EB3**

\*Add modifier /S to order SG Iron for pressure rating over 210 bar.

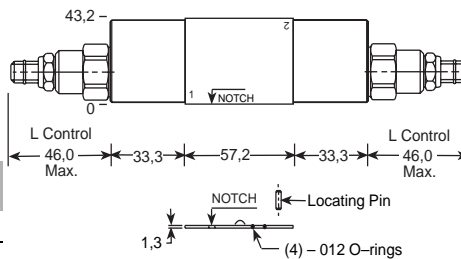


Function  
On B Drain to T  
(Reverse Free Flow Check)



Assembly Model Code\*  
**PBDB-LAN-EBY**

\*Add modifier /S to order SG Iron for pressure rating over 210 bar.



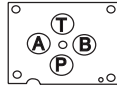
Function  
On A and B  
(Drains to Opposite Port)

NOTES: Page 34 for cartridge model PB\*B-\*\*\* show performance curves, technical tips, and options.  
See Page 140 for technical information about sandwich bodies including ISO interface patterns, mounting instructions, studrods, and studkits.  
Go to [www.sunhydraulics.com](http://www.sunhydraulics.com) for more product information.  
Model Codes printed in red are Preferred Products and are readily available.

**Sandwich Assemblies**

**ISO 03 / CETOP 3 REDUCING / RELIEF VALVES**

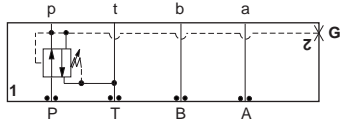
**T-11A Cavity**



All sandwich bodies shown below are 44,5 mm wide

**PILOT OPERATED**

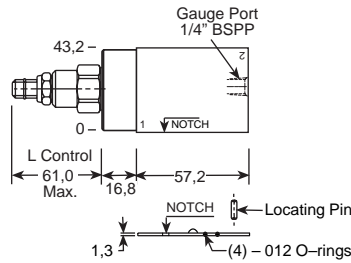
**DIRECT ACTING**



Assembly Model Code\*

**PPDB-LAN-EBP/M**

\*Add modifier /T to order SG Iron for pressure rating over 210 bar.



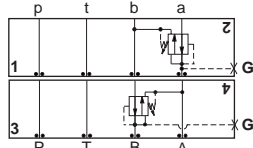
**Function**

On P Tank to T, Drained at T

Assembly Model Code\*

**PRDB-LAN-EBP/M**

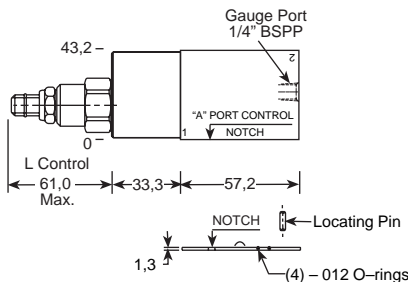
\*Add modifier /T to order SG Iron for pressure rating over 210 bar.



Assembly Model Code\*

**PPDB-LAN-EBA/M**

\*Add modifier /T to order SG Iron for pressure rating over 210 bar.



**Function**

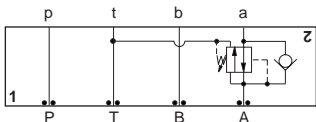
On A Tank to B

On B Tank to A

Assembly Model Code\*

**PRDB-LAN-EBA/M**

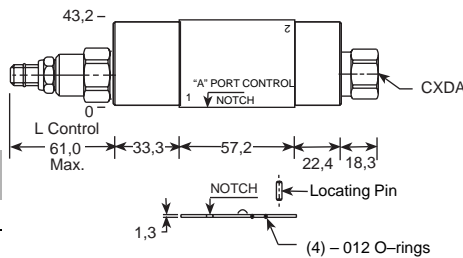
\*Add modifier /T to order SG Iron for pressure rating over 210 bar.



Assembly Model Code\*

**PPDB-LAN-EB2**

\*Add modifier /S to order SG Iron for pressure rating over 210 bar.



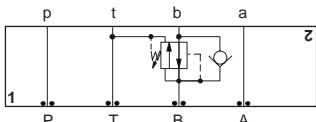
**Function**

On A Tank to T  
(Reverse Free Flow Check)

Assembly Model Code\*

**PRDB-LAN-EB2**

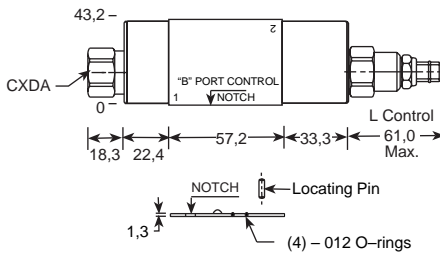
\*Add modifier /S to order SG Iron for pressure rating over 210 bar.



Assembly Model Code\*

**PPDB-LAN-EB3**

\*Add modifier /S to order SG Iron for pressure rating over 210 bar.



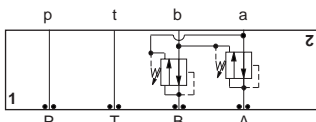
**Function**

On B Tank to T, Drained to T  
(Reverse Free Flow Check)

Assembly Model Code\*

**PRDB-LAN-EB3**

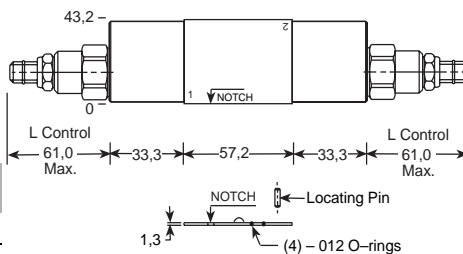
\*Add modifier /S to order SG Iron for pressure rating over 210 bar.



Assembly Model Code\*

**PPDB-LAN-EBY**

\*Add modifier /S to order SG Iron for pressure rating over 210 bar.



**Function**

On A and B Tanks and Drains to Opposite Port

Assembly Model Code\*

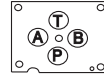
**PRDB-LAN-EBY**

\*Add modifier /S to order SG Iron for pressure rating over 210 bar.

NOTES: Page 42 for cartridge models PP\*B-\*\*\* and PR\*B-\*\*\* show performance curves, technical tips, and options.  
See Page 140 for technical information about sandwich bodies including ISO interface patterns, mounting instructions, studrods, and studkits.  
Go to [www.sunhydraulics.com](http://www.sunhydraulics.com) for more product information.  
Model Codes printed in red are Preferred Products and are readily available.

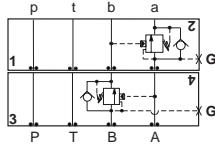
ISO 03 / CETOP 3 COUNTERBALANCE / VENTED COUNTERBALANCE VALVES

T-11A / T21A Cavity



All sandwich bodies shown below are 44,5 mm wide

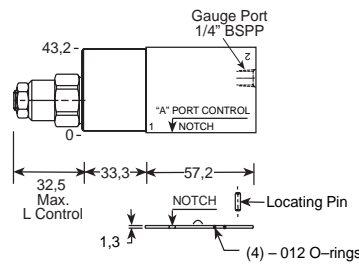
**PILOT RATIOS**  
3:1 and 1.5:1 (CB\*\*) and 3:1 and 1:1 (CW\*\*)



Assembly Model Code\*  
**CBC\*-LHN-EBA/M**

\*The 4th digit of the Model Code must be entered to specify counterbalance pilot ratio. Add modifier /T to order SG Iron for pressure rating over 210 bar.

STANDARD

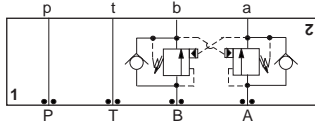


Function

On A Pilot from B  
On B Pilot from A

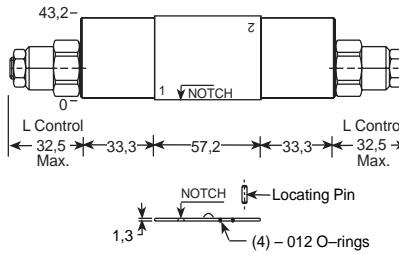
Assembly Model Code\*  
**CBC\*-LJN-EBA/M**

\*The 4th digit of the Model Code must be entered to specify counterbalance pilot ratio. Add modifier /T to order SG Iron for pressure rating over 210 bar.



Assembly Model Code\*  
**CBC\*-LHN-EBY**

\*The 4th digit of the Model Code must be entered to specify counterbalance pilot ratio. Add modifier /S to order SG Iron for pressure rating over 210 bar.

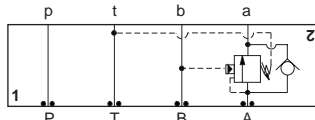


Function

On A and B (Cross-Piloted)

Assembly Model Code\*  
**CBC\*-LJN-EBY**

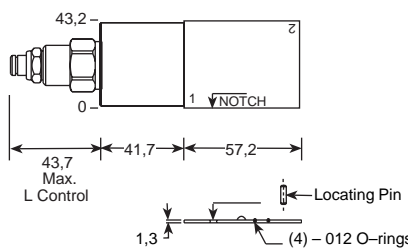
\*The 4th digit of the Model Code must be entered to specify counterbalance pilot ratio. Add modifier /S to order SG Iron for pressure rating over 210 bar.



Assembly Model Code\*  
**CWC\*-LHN-MBA**

\*The 4th digit of the Model Code must be entered to specify counterbalance pilot ratio. Add modifier /S to order SG Iron for pressure rating over 210 bar.

VENTED

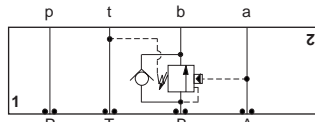


Function

On A Pilot from B, Vent to T

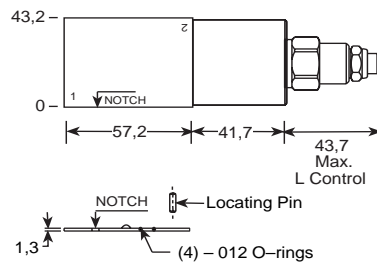
Assembly Model Code\*  
**CWC\*-LGN-MBA**

\*The 4th digit of the Model Code must be entered to specify counterbalance pilot ratio. Add modifier /S to order SG Iron for pressure rating over 210 bar.



Assembly Model Code\*  
**CWC\*-LHN-MBB**

\*The 4th digit of the Model Code must be entered to specify counterbalance pilot ratio. Add modifier /S to order SG Iron for pressure rating over 210 bar.

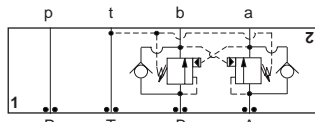


Function

On B Pilot from A, Vent to T

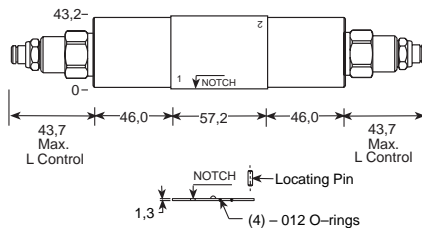
Assembly Model Code\*  
**CWC\*-LGN-MBB**

\*The 4th digit of the Model Code must be entered to specify counterbalance pilot ratio. Add modifier /S to order SG Iron for pressure rating over 210 bar.



Assembly Model Code\*  
**CWC\*-LHN-MBY**

\*The 4th digit of the Model Code must be entered to specify counterbalance pilot ratio. Add modifier /S to order SG Iron for pressure rating over 210 bar.



Function

On A and B (Cross-Piloted, vents to T)

Assembly Model Code\*  
**CWC\*-LGN-MBY**

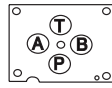
\*The 4th digit of the Model Code must be entered to specify counterbalance pilot ratio. Add modifier /S to order SG Iron for pressure rating over 210 bar.

NOTES: Page 50 for cartridge model CB\*\*\_\*\*\* and page 70 for cartridge model CW\*\*\_\*\*\* show performance curves, technical tips, and options. See Page 140 for technical information about sandwich bodies including ISO interface patterns, mounting instructions, studrods, and studkits. Go to [www.sunhydraulics.com](http://www.sunhydraulics.com) for more product information. Model Codes printed in red are Preferred Products and are readily available.

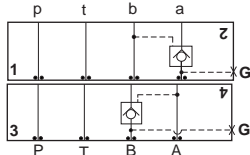
ISO 03 / CETOP 3 PILOT-TO-OPEN CHECK VALVES

T-11A / T-21A Cavity

All sandwich bodies shown below are 44,5 mm wide



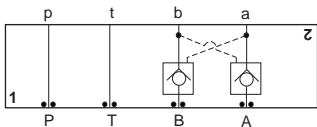
PILOT OPERATED



Assembly Model Code\*

**CKCB-XCN-EBA/M**

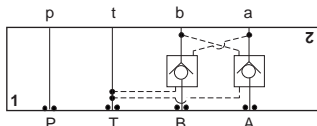
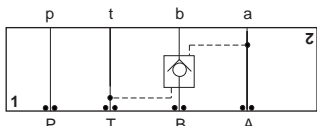
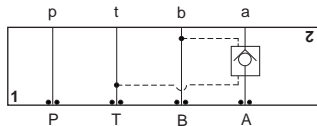
\*Add modifier /T to order SG Iron for pressure rating over 210 bar.



Assembly Model Code\*

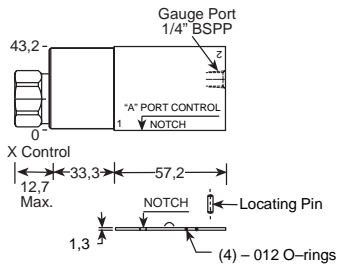
**CKCB-XCN-EBY**

\*Add modifier /S to order SG Iron for pressure rating over 210 bar.



VENTED

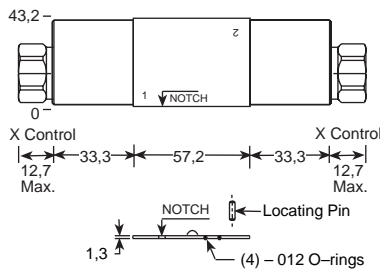
STANDARD



Function

On A Pilot from B

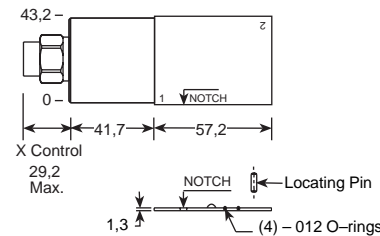
On B Pilot from A



Function

On A and B (Cross-Piloted)

VENTED



Function

On A Pilot from B Vent to T

Assembly Model Code\*

**CVCV-XCN-MBA**

\*Add modifier /S to order SG Iron for pressure rating over 210 bar.

Function

On B Pilot from A, Vent to T

Assembly Model Code\*

**CVCV-XCN-MBB**

\*Add modifier /S to order SG Iron for pressure rating over 210 bar.

Function

On A and B Cross-Piloted, Vents to T

Assembly Model Code\*

**CVCV-XCN-MBY**

\*Add modifier /S to order SG Iron for pressure rating over 210 bar.

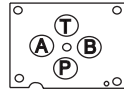
NOTES: Page 78 for cartridge models CK\*\*\_\*\*\* and page 94 for cartridge model CV\*V\_\*\*\* show performance curves, technical tips, and options. See Page 140 for technical information about sandwich bodies including ISO interface patterns, mounting instructions, studrods, and studkits. Go to [www.sunhydraulics.com](http://www.sunhydraulics.com) for more product information.

Model Codes printed in red are Preferred Products and are readily available.



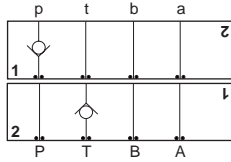
ISO 03 / CETOP 3 CHECK VALVES

T-13A / T-5A Cavity



All sandwich bodies shown below are 44,5 mm wide

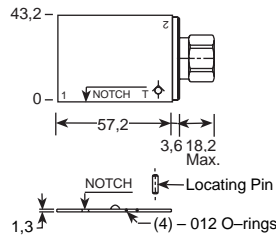
FREE FLOW PORT 1 TO 2



Assembly Model Code\*

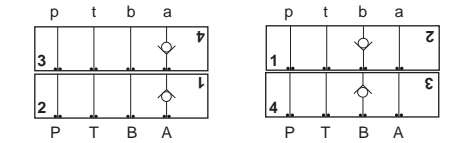
**CXDA-XCN-GDP**

\*Add modifier /S to order SG Iron for pressure rating over 210 bar.



Function

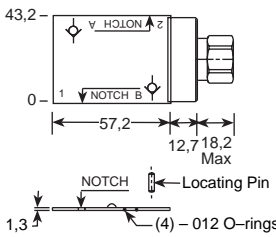
On P
On T



Assembly Model Code\*

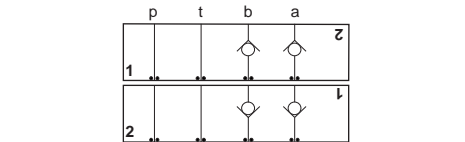
**CXDA-XCN-GDA**

\*Add modifier /S to order SG Iron for pressure rating over 210 bar.



Function

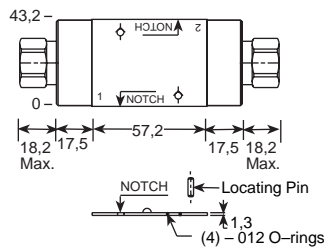
On A Free Flow Into Valve
On A Free Flow Out Valve
On B Free Flow Into Valve
On B Free Flow Out Valve



Assembly Model Code\*

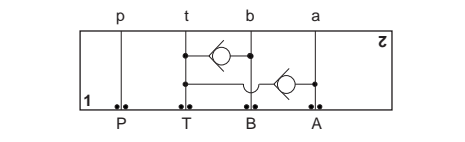
**CXDA-XCN-GDY**

\*Add modifier /S to order SG Iron for pressure rating over 210 bar.



Function

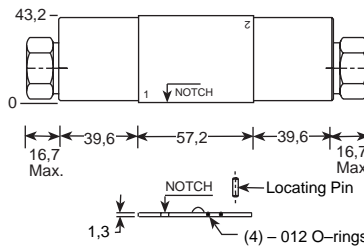
On A and B, Free Flow Out of Valve
On A and B, Free Flow Into Valve



Assembly Model Code\*

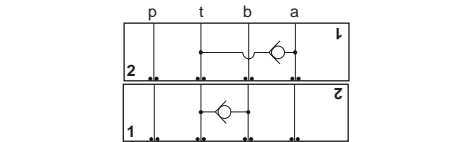
**CXFA-XAN-GDF**

\*Add modifier /S to order SG Iron for pressure rating over 210 bar.



Function

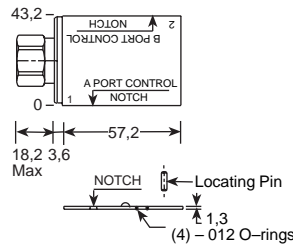
T to A and B (High Capacity)
------------------------------



Assembly Model Code\*

**CXDA-XAN-GDW**

\*Add modifier /S to order SG Iron for pressure rating over 210 bar.



Function

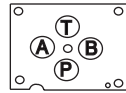
T to A
T to B

NOTES: Page 102 for cartridge models CX\*A-\*\*\* and CX\*D-\*\*\* show performance curves, technical tips, and options. See Page 140 for technical information about sandwich bodies including ISO interface patterns, mounting instructions, studrods, and studkits. Go to [www.sunhydraulics.com](http://www.sunhydraulics.com) for more product information. Model Codes printed in red are Preferred Products and are readily available.

**Sandwich Assemblies**

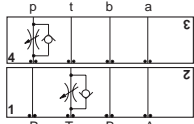
**ISO 03 / CETOP 3 FLOW CONTROL / PRIORITY FLOW CONTROL VALVES**

**T-13A / T-11A Cavity**



All sandwich bodies shown below are 44,5 mm wide

**FULLY ADJUSTABLE NEEDLE**

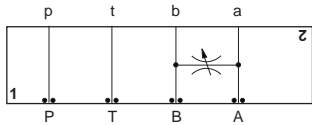


Note: Reverse Checks on FDBA-LAN-GBP Only

Assembly Model Code\*

**NFCC-LCN-GBP**

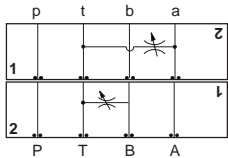
\*Add modifier /S to order SG Iron for pressure rating over 210 bar.



Assembly Model Code\*

**NFCC-LCN-GBS**

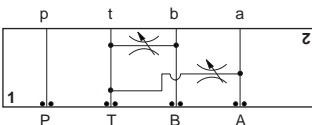
\*Add modifier /S to order SG Iron for pressure rating over 210 bar.



Assembly Model Code\*

**NFCC-LCN-GBW**

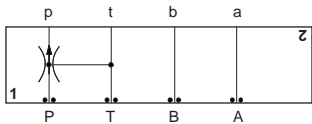
\*Add modifier /S to order SG Iron for pressure rating over 210 bar.



Assembly Model Code\*

**NFCC-LCN-GBX**

\*Add modifier /S to order SG Iron for pressure rating over 210 bar.



Assembly Model Code\*

**FRCA-LAN-WBN\*\***

\*Add modifier /S to order SG Iron for pressure rating over 210 bar.

\*\*Customer must specify priority flow.

NOTES: Page 110 for cartridge model NF\*C-\*\*\*, page 126 for FD\*A-\*\*\*, and page 134 for FR\*A-\*\*\* show performance curves, technical tips, and options. See Page 140 for technical information about sandwich bodies including ISO interface patterns, mounting instructions, studrods, and studkits. Go to [www.sunhydraulics.com](http://www.sunhydraulics.com) for more product information. Model Codes printed in red are Preferred Products and are readily available.

**FULLY ADJUSTABLE NEEDLE PRESSURE COMPENSATED WITH REVERSE FREE FLOW CHECK**

**Function**

Meter-In **P**

Meter-Out **T**

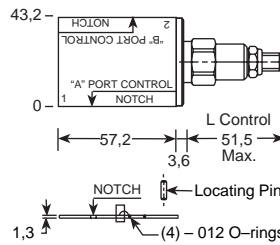
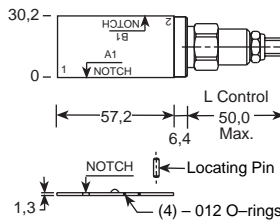
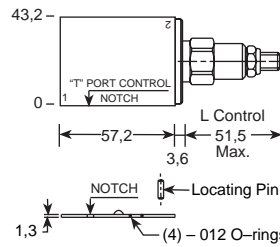
Assembly Model Code\*

**FDBA-LAN-GBP**

\*Add modifier /S to order SG Iron for pressure rating over 210 bar.

**Function**

Bleed-Off **A** to **B** and **B** to **A**



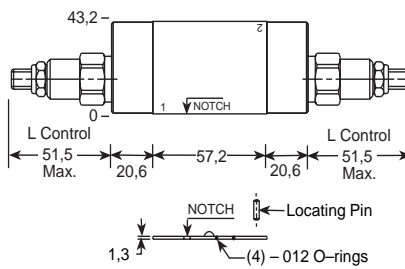
**Function**

Bleed-Off **A** to **T**

Bleed-Off **B** to **T**

**Function**

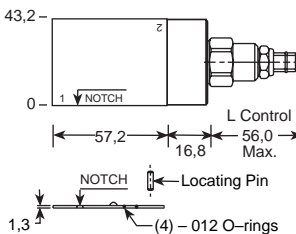
Bleed-Off **A** and **B** to **T**



**PRIORITY FLOW CONTROL FIXED ORIFICE**

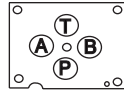
**Function**

Priority Flow on **P**, Bypass to **T**



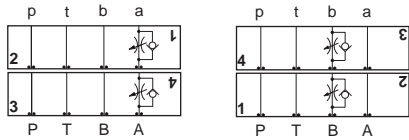
ISO 03 / CETOP 3 FLOW CONTROL VALVES

T-13A Cavity



All sandwich bodies shown below are 44,5 mm wide

FULLY ADJUSTABLE NEEDLE WITH REVERSE FREE FLOW CHECK



Assembly Model Code\*  
**NCCB-LCN-GBA**

\*Add modifier /S to order SG Iron for pressure rating over 210 bar.

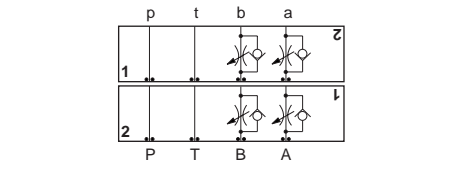
FULLY ADJUSTABLE, PRESSURE COMPENSATED WITH FREE FLOW CHECK

Function

Meter-In A
Meter-Out A
Meter-In B
Meter-Out B

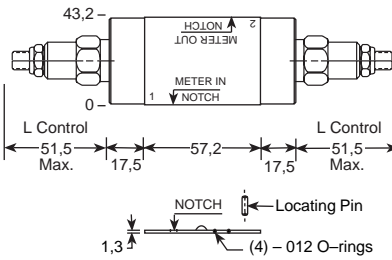
Assembly Model Code\*  
**FDBA-LAN-GBA**

\*Add modifier /S to order SG Iron for pressure rating over 210 bar.



Assembly Model Code\*  
**NCCB-LCN-GBY**

\*Add modifier /S to order SG Iron for pressure rating over 210 bar.

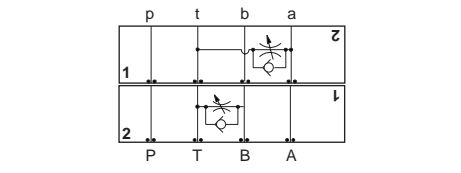


Function

Meter-In A and B
Meter-Out A and B

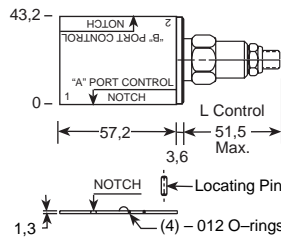
Assembly Model Code\*  
**FDBA-LAN-GBY**

\*Add modifier /S to order SG Iron for pressure rating over 210 bar.



Assembly Model Code\*  
**NCCB-LAN-GBW**

\*Add modifier /S to order SG Iron for pressure rating over 210 bar.

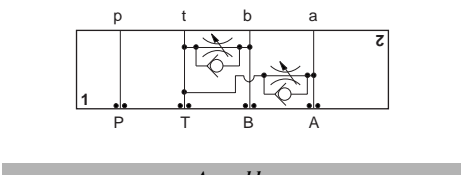


Function

Bleed-Off A to T
Bleed-Off B to T

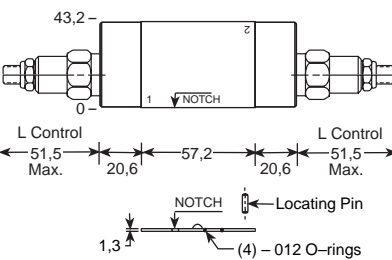
Assembly Model Code\*  
**FDBA-LAN-GBW**

\*Add modifier /S to order SG Iron for pressure rating over 210 bar.



Assembly Model Code\*  
**NCCB-LAN-GBX**

\*Add modifier /S to order SG Iron for pressure rating over 210 bar.



Function

Bleed-Off A and B to T
------------------------

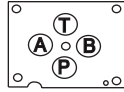
Assembly Model Code\*  
**FDBA-LAN-GBX**

\*Add modifier /S to order SG Iron for pressure rating over 210 bar.

NOTES: Page 110 for cartridge model NC\*B-\*\*\* and page 126 for FD\*A-\*\*\* show performance curves, technical tips, and options. See Page 140 for technical information about sandwich bodies including ISO interface patterns, mounting instructions, studrods, and studkits. Go to [www.sunhydraulics.com](http://www.sunhydraulics.com) for more product information. Model Codes printed in red are Preferred Products and are readily available.

# ISO 03 / CETOP 3 FLOW CONTROL VALVES (RAPID ADVANCE - FINE FEED)

## T-13A Cavity



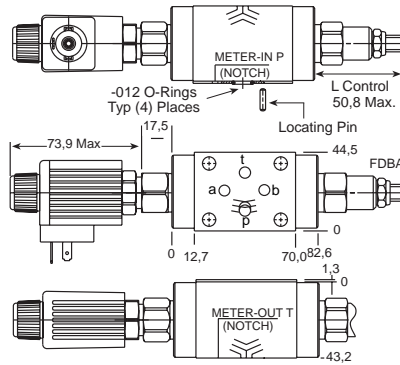
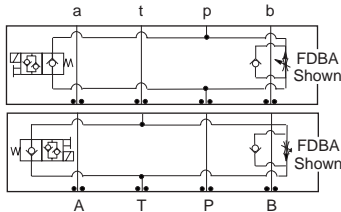
All sandwich bodies shown below are 44,5 mm wide

**FULLY ADJUSTABLE, PRESSURE COMPENSATED WITH FREE FLOW CHECK**

### Function

Meter-In **P**, Solenoid Normally Closed

Meter-Out **T**, Solenoid Normally Closed



Coil must be selected separately. See page 248.

Assembly  
Model Code\*

**X2CD-LAN-CA**

\*Add modifier **/S** to order SG Iron for pressure rating over 210 bar.

Assembly  
Model Code\*

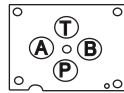
**X2CD-LAN-CA**

\*Add modifier **/S** to order SG Iron for pressure rating over 210 bar.

NOTES: Page 126 for cartridge model FD\*A-\*\*\* shows performance curves, technical tips, and options.  
See Page 140 for technical information about sandwich bodies including ISO interface patterns, mounting instructions, studrods, and studkits.  
Go to [www.sunhydraulics.com](http://www.sunhydraulics.com) for more product information.

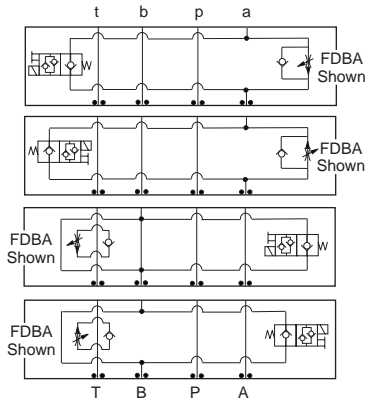
**ISO 03 / CETOP 3 FLOW CONTROL VALVES  
(RAPID ADVANCE - FINE FEED)**

**T-13A Cavity**



All sandwich bodies shown below are 44,5 mm wide

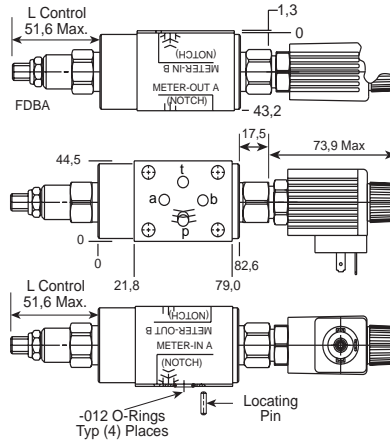
**FULLY ADJUSTABLE, PRESSURE COMPENSATED WITH FREE FLOW CHECK**



Assembly Model Code\*

**X4CD-LAN-CA**

\*Add modifier /S to order SG Iron for pressure rating over 210 bar.



Coil must be selected separately. See page 248.

Assembly Model Code\*

**X4CD-LAN-CA**

\*Add modifier /S to order SG Iron for pressure rating over 210 bar.

**Function**

Meter-In **A**, Solenoid Normally Closed

Meter-Out **A**, Solenoid Normally Closed

Meter-In **B**, Solenoid Normally Closed

Meter-Out **B**, Solenoid Normally Closed

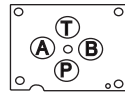
NOTES: Page 126 for FDDBA\*\*\* to show performance curves, technical tips, and options.  
See Page 140 for technical information about sandwich bodies including ISO interface patterns, mounting instructions, studs, and studkits.  
Go to [www.sunhydraulics.com](http://www.sunhydraulics.com) for more product information.

**Sandwich Assemblies**

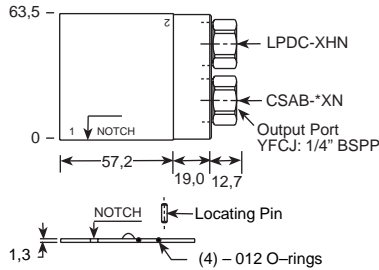
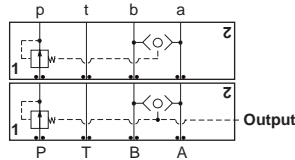
**ISO 03 / CETOP 3 CIRCUIT SAVERS**

**(PRESSURE COMPENSATOR / REGENERATIVE / LOAD SENSING / PILOT CHOKE PACK)**

**T-11A / T-13A Cavity**



All sandwich bodies shown below are 44,5 mm wide

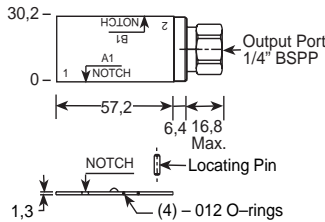
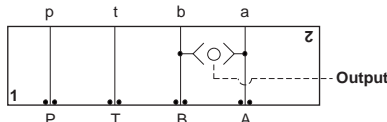


**Function**

YFCG: Pressure Compensator (Restrictive), 14 bar  
 YFCJ: Pressure Compensator (Restrictive), 14 bar with external Load-Sensing Port

External Shuttle Port	Assembly Model Code*
None	<b>YFCG-XHN-AA/M</b>
1/4" BSPP	<b>YFCJ-XHN-AA/M</b>

\*Add modifier /**T** to order SG Iron for pressure rating over 210 bar.



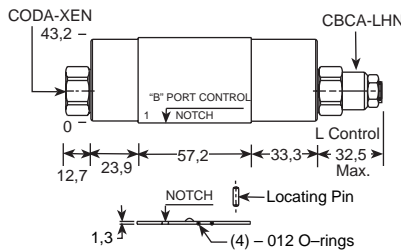
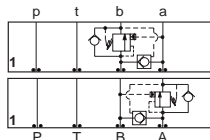
**Function**

Shuttle A and B (Output External)

Assembly Model Code\*

**CSAA-BXN-GBS**

\*Add modifier /**S** to order SG Iron for pressure rating over 210 bar.



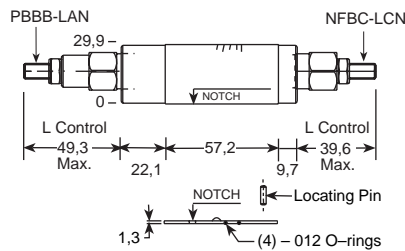
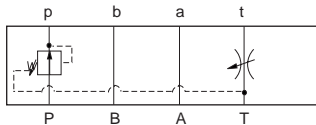
**Function**

B to A Pressure Sensing Regenerative Circuit  
 A to B Pressure Sensing Regenerative Circuit

Assembly Model Code\*

**YDCA-LHN-AA**

\*Add modifier /**S** to order SG Iron for pressure rating over 210 bar.



**Function**

Pilot Choke Pack

(Used typically to control main stage shift time on pilot operated ISO/CETOP directional valves.)

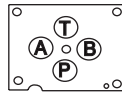
Assembly Model Code\*

**YNAA-LDN-AA**

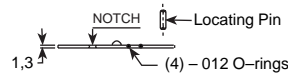
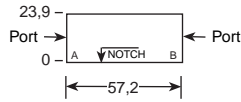
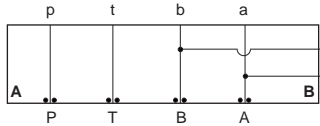
\*Add modifier /**S** to order SG Iron for pressure rating over 210 bar.

NOTES: See Page 140 for technical information about sandwich bodies including ISO interface patterns, mounting instructions, studrods, and studkits. Go to [www.sunhydraulics.com](http://www.sunhydraulics.com) for more product information. Model Codes printed in red are Preferred Products and are readily available.

**ISO 03 / CETOP 3 CIRCUIT SAVERS  
(TAP IN MANIFOLD / ADAPTOR PLATE / COVER PLATE)**



All sandwich bodies shown below are 44,5 mm wide

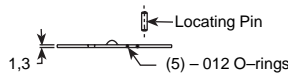
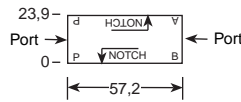
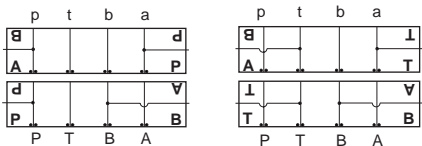


**Function**

A and B Tap in Manifold

Ports A, B  
1/4" BSPP  
Assembly Model Code\*  
**ZVB**

\*Add modifier /S to order SG Iron for pressure rating over 210 bar.

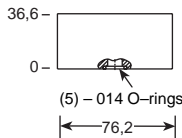
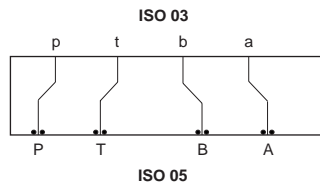


**Function**

P and A Tap in Manifold  
P and B Tap in Manifold  
T and A Tap in Manifold  
T and B Tap in Manifold

External Port  
1/4" BSPP  
Assembly Model Code\*  
**ZVC**

\*Add modifier /S to order SG Iron for pressure rating over 210 bar.

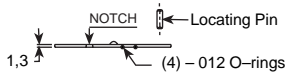
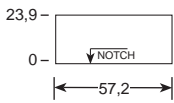
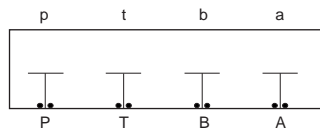


**Function**

Adaptor from ISO 05 to ISO 03.

Assembly Model Code\*  
**ZVT**

\*Add modifier /S to order SG Iron for pressure rating over 210 bar.



**Function**

Cover Plate with All Ports Blocked

Assembly Model Code\*  
**ZJR**

\*Add modifier /S to order SG Iron for pressure rating over 210 bar.

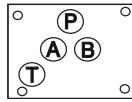
NOTE: See Page 140 for technical information about sandwich bodies including ISO interface patterns, mounting instructions, studrods, and studkits. Go to [www.sunhydraulics.com](http://www.sunhydraulics.com) for more product information. Model Codes printed in red are Preferred Products and are readily available.

**NOTES**



**ISO 05 / CETOP 5 RELIEF VALVES**  
**(SIDE PORTED SUBPLATE / REAR PORTED SUBPLATE / SIDE PORTED SUBPLATE WITH GASKET MOUNTED TANK PORT)**

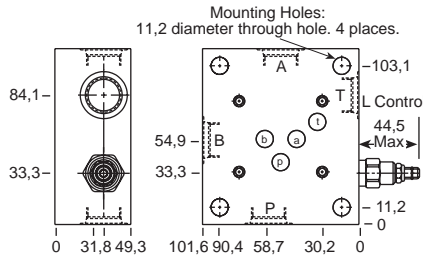
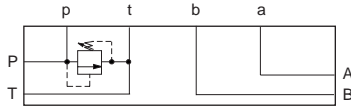
**T-10A Cavity**



All subplates shown below are 114,3 mm wide

**PILOT OPERATED**

**DIRECT ACTING**



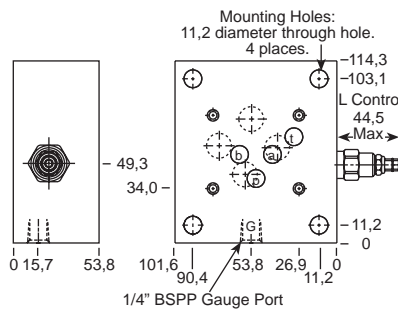
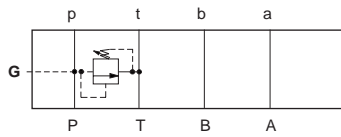
**Function**  
**P to T**

Ports **A, B, P, T**  
 Assembly Model Code\*  
**1/2" BSPP RPEC-LAN-FSV**

Ports **A, B, P, T**  
 Assembly Model Code\*  
**1/2" BSPP RDDA-LAN-FSV**

\*Add modifier /S to order SG Iron for pressure rating over 210 bar.

\*Add modifier /S to order SG Iron for pressure rating over 210 bar.



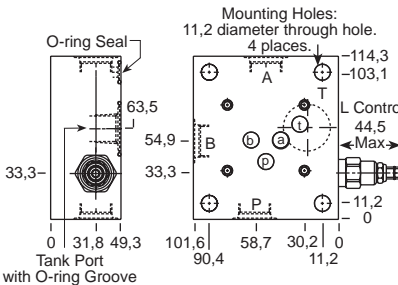
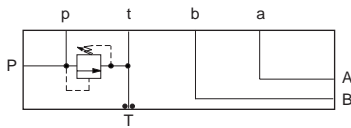
**Function**  
**P to T**

Ports **A, B, P, T**  
 Assembly Model Code\*  
**1/2" BSPP RPEC-LAN-FRV**

Ports **A, B, P, T**  
 Assembly Model Code\*  
**1/2" BSPP RDDA-LAN-FRV**

\*Add modifier /S to order SG Iron for pressure rating over 210 bar.

\*Add modifier /S to order SG Iron for pressure rating over 210 bar.



**Function**  
**P to T**

Ports **A, B, P, T**  
 Assembly Model Code\*  
**1/2" BSPP RPEC-LAN-FTV**

Ports **A, B, P, T**  
 Assembly Model Code\*  
**1/2" BSPP RDDA-LAN-FTV**

\*Add modifier /S to order SG Iron for pressure rating over 210 bar.

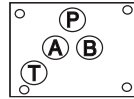
\*Add modifier /S to order SG Iron for pressure rating over 210 bar.

NOTES: Page 2 for cartridge models RP\*C-\*\*\* and RD\*A-\*\*\* show performance curves, technical tips, and options.  
 See page 140 for technical information about sandwich bodies including ISO interface patterns, mounting instructions, studrods, and studkits.  
 Go to [www.sunhydraulics.com](http://www.sunhydraulics.com) for more product information.  
 Model Codes printed in red are Preferred Products and are readily available.

**Sandwich Assemblies**

**ISO 05 / CETOP 5 RELIEF VALVES**

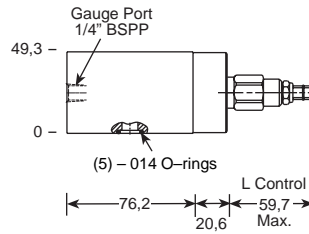
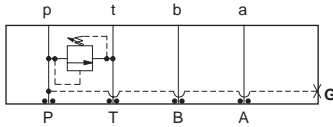
**T-10A Cavity**



All sandwich bodies shown below are 63,5 mm wide

**PILOT OPERATED**

**DIRECT ACTING**



**Function**

**P to T**

Assembly Model Code\*

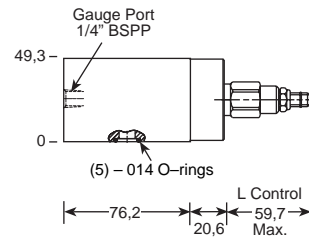
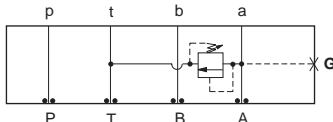
**RPEC-LAN-CBE/M**

\*Add modifier /T to order SG Iron for pressure rating over 210 bar.

Assembly Model Code\*

**RDDA-LAN-CBE/M**

\*Add modifier /T to order SG Iron for pressure rating over 210 bar.



**Function**

**A to T**

Assembly Model Code\*

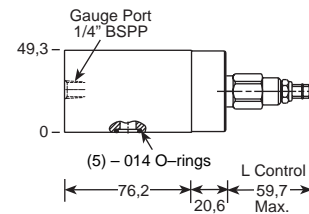
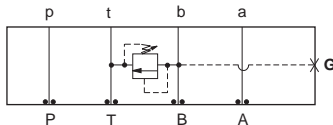
**RPEC-LAN-CBF/M**

\*Add modifier /T to order SG Iron for pressure rating over 210 bar.

Assembly Model Code\*

**RDDA-LAN-CBF/M**

\*Add modifier /T to order SG Iron for pressure rating over 210 bar.



**Function**

**B to T**

Assembly Model Code\*

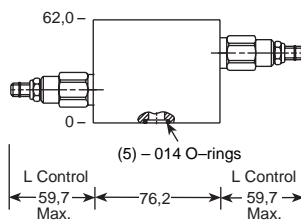
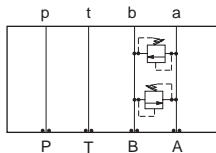
**RPEC-LAN-CBG/M**

\*Add modifier /T to order SG Iron for pressure rating over 210 bar.

Assembly Model Code\*

**RDDA-LAN-CBG/M**

\*Add modifier /T to order SG Iron for pressure rating over 210 bar.



**Function**

**A to B and B to A  
(Cross-port)**

Assembly Model Code\*

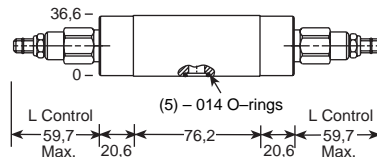
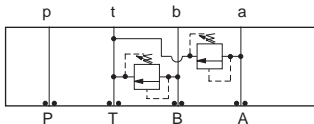
**RPEC-LAN-CBI**

\*Add modifier /S to order SG Iron for pressure rating over 210 bar.

Assembly Model Code\*

**RDDA-LAN-CBI**

\*Add modifier /S to order SG Iron for pressure rating over 210 bar.



**Function**

**A and B to T**

Assembly Model Code\*

**RPEC-LAN-CBD**

\*Add modifier /S to order SG Iron for pressure rating over 210 bar.

Assembly Model Code\*

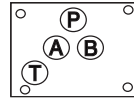
**RDDA-LAN-CBD**

\*Add modifier /S to order SG Iron for pressure rating over 210 bar.

NOTES: Page 2 for cartridge models RP\*C-\*\*\* and RD\*A-\*\*\* show performance curves, technical tips, and options. See page 140 for technical information about sandwich bodies including ISO interface patterns, mounting instructions, studrods, and studkits. Go to [www.sunhydraulics.com](http://www.sunhydraulics.com) for more product information. Model Codes printed in red are Preferred Products and are readily available.

ISO 05 / CETOP 5 RELIEF VALVES

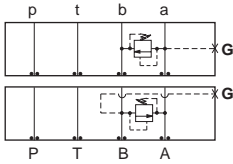
T-10A Cavity/T-2A Cavity



All sandwich bodies shown below are 63,5 mm wide

PILOT OPERATED

DIRECT ACTING



Function

A to B

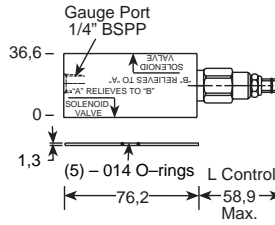
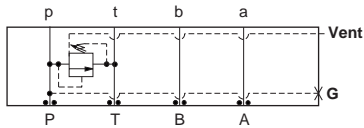
B to A

Assembly Model Code\*  
**RPEC-LAN-CBH/M**

Assembly Model Code\*  
**RDDA-LAN-CBH/M**

\*Add modifier /T to order SG Iron for pressure rating over 210 bar.

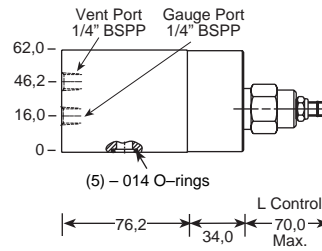
\*Add modifier /T to order SG Iron for pressure rating over 210 bar.



Function

P to T (Externally Vented)

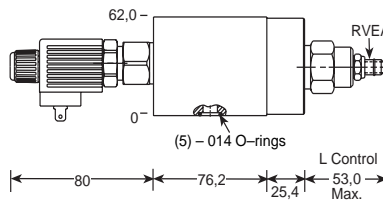
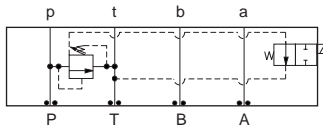
Vent Port Assembly Model Code\*  
1/4" BSPP **RVEA-LAN-BBC/M**



\*Add modifier /T to order SG Iron for pressure rating over 210 bar.

Function

P to T  
(Normally Open, Solenoid Vented)



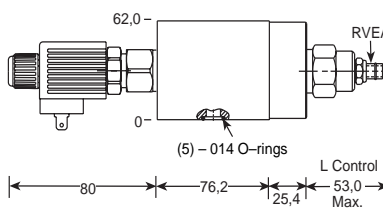
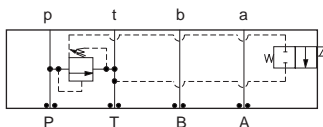
Assembly Model Code\*  
**XRED-LAN-HA**

Coil must be selected separately. See page 248.

\*Add modifier /S to order SG Iron for pressure rating over 210 bar.

Function

P to T  
(Normally Closed, Solenoid Vented)



Assembly Model Code\*  
**XRED-LAN-CA**

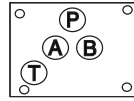
Coil must be selected separately. See page 248.

\*Add modifier /S to order SG Iron for pressure rating over 210 bar.

NOTES: Page 2 for cartridge models RP\*C-\*\*\*, RD\*A-\*\*\* and page 12 for cartridge model RV\*A-\*\*\* show performance curves, technical tips, and options. See page 140 for technical information about sandwich bodies including ISO interface patterns, mounting instructions, studrods, and studkits. Go to [www.sunhydraulics.com](http://www.sunhydraulics.com) for more product information.

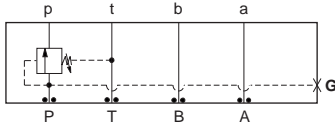
## ISO 05 / CETOP 5 SEQUENCE VALVES

## T-2A Cavity



All sandwich bodies shown below are 63,5 mm wide

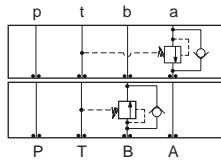
## PILOT OPERATED



Assembly Model Code\*

**RSFC-LAN-BBW/M**

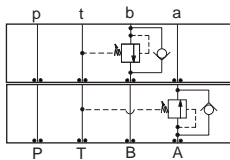
\*Add modifier **/T** to order SG Iron for pressure rating over 210 bar.



Assembly Model Code\*

**RSFC-LAN-BB4**

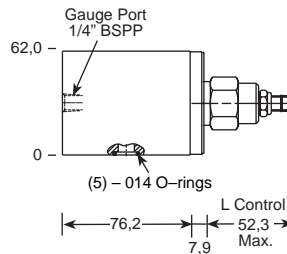
\*Add modifier **/S** to order SG Iron for pressure rating over 210 bar.



Assembly Model Code\*

**RSFC-LAN-BB5**

\*Add modifier **/S** to order SG Iron for pressure rating over 210 bar.



## DIRECT ACTING

## Function

In to **P**

Assembly Model Code\*

**SXEA-LAN-BBW/M**

\*Add modifier **/T** to order SG Iron for pressure rating over 210 bar.

## Function

Into **A** (Reverse Free Flow Check)

Out of **B** (Reverse Free Flow Check)

Assembly Model Code\*

**SXEA-LAN-BB4**

\*Add modifier **/S** to order SG Iron for pressure rating over 210 bar.

## Function

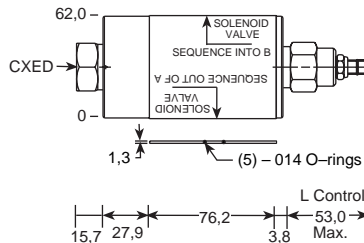
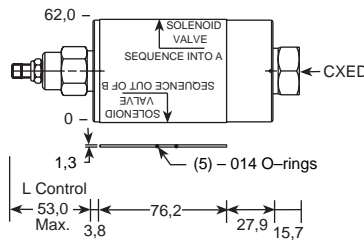
Into **B** (Reverse Free Flow Check)

Out of **A** (Reverse Free Flow Check)

Assembly Model Code\*

**SXEA-LAN-BB5**

\*Add modifier **/S** to order SG Iron for pressure rating over 210 bar.

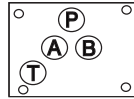


NOTES: Page 20 for cartridge model RS\*C-\*\*\* and SX\*A-\*\*\* and page 102 for CX\*D-\*\*\* show performance curves, technical tips, and options. See page 140 for technical information about sandwich bodies including ISO interface patterns, mounting instructions, studrods, and studkits. Go to [www.sunhydraulics.com](http://www.sunhydraulics.com) for more product information.

Model Codes printed in red are Preferred Products and are readily available.

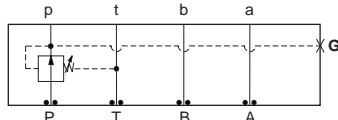
ISO 05 / CETOP 5 REDUCING VALVES

T-2A Cavity



All sandwich bodies shown below are 63,5 mm wide

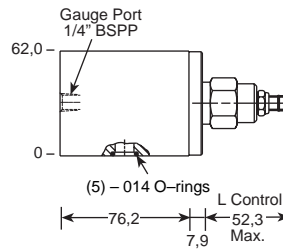
PILOT OPERATED



Assembly Model Code\*

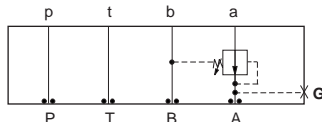
**PBFB-LAN-BBP/M**

\*Add modifier **T** to order SG Iron for pressure rating over 210 bar.



Function

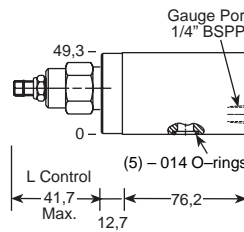
On P Drained to T



Assembly Model Code\*

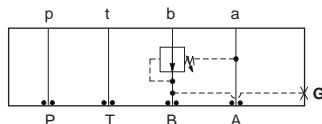
**PBFB-LAN-BBA/M**

\*Add modifier **T** to order SG Iron for pressure rating over 210 bar.



Function

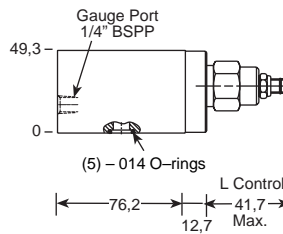
On A Drained to B



Assembly Model Code\*

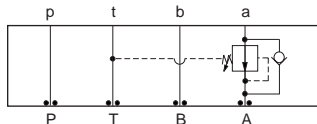
**PBFB-LAN-BBB/M**

\*Add modifier **T** to order SG Iron for pressure rating over 210 bar.



Function

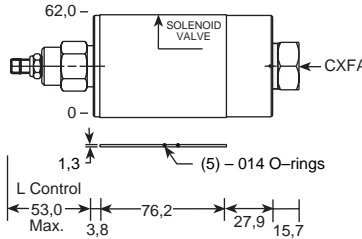
On B Drained to A



Assembly Model Code\*

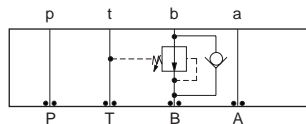
**PBFB-LAN-BB2**

\*Add modifier **S** to order SG Iron for pressure rating over 210 bar.



Function

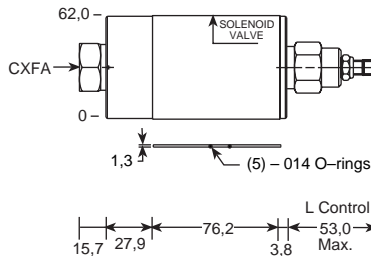
On A Drain to T  
(Reverse Free Flow Check)



Assembly Model Code\*

**PBFB-LAN-BB3**

\*Add modifier **S** to order SG Iron for pressure rating over 210 bar.



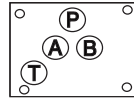
Function

On B Drain to T  
(Reverse Free Flow Check)

NOTES: Page 34 for cartridge model PB\*B-\*\*\* and page 102 for cartridge model CX\*A-\*\*\* show performance curves, technical tips, and options. See page 140 for technical information about sandwich bodies including ISO interface patterns, mounting instructions, studrods, and studkits. Go to [www.sunhydraulics.com](http://www.sunhydraulics.com) for more product information. Model Codes printed in red are Preferred Products and are readily available.

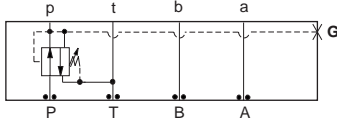
## ISO 05 / CETOP 5 REDUCING / RELIEVING VALVES

## T-2A Cavity



All sandwich bodies shown below are 63,5 mm wide

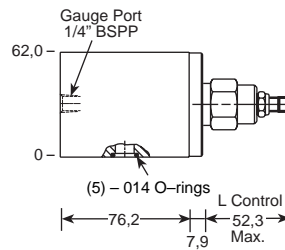
## PILOT OPERATED



Assembly  
Model Code\*

**PPFB-LAN-BBP/M**

\*Add modifier **/T** to order SG Iron for pressure rating over 210 bar.



## DIRECT ACTING

## Function

On **P**, Tank to **T**

Assembly  
Model Code\*

**PRFB-LAN-BBP/M**

\*Add modifier **/T** to order SG Iron for pressure rating over 210 bar.

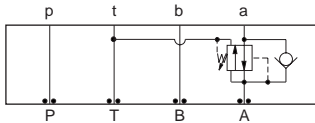
## Function

On **A**, Tank to **T**  
(Reverse Free Flow Check)

Assembly  
Model Code\*

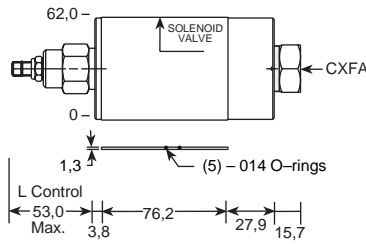
**PRFB-LAN-BB2**

\*Add modifier **/S** to order SG Iron for pressure rating over 210 bar.



Assembly  
Model Code\*

**PPFB-LAN-BB2**



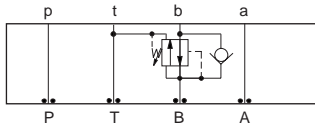
## Function

On **B**, Tank to **T**  
(Reverse Free Flow Check)

Assembly  
Model Code\*

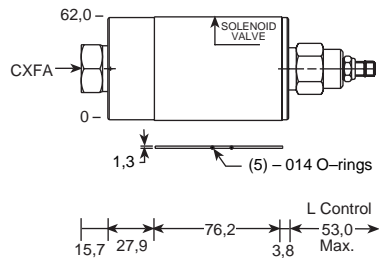
**PRFB-LAN-BB3**

\*Add modifier **/S** to order SG Iron for pressure rating over 210 bar.



Assembly  
Model Code\*

**PPFB-LAN-BB3**

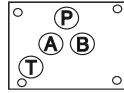


NOTES: Page 42 for cartridge models PP\*B-\*\*\* and PR\*B-\*\*\* show performance curves, technical tips, and options.  
See page 140 for technical information about sandwich bodies including ISO interface patterns, mounting instructions, studrods, and studkits.  
Go to [www.sunhydraulics.com](http://www.sunhydraulics.com) for more product information.

Model Codes printed in red are Preferred Products and are readily available.

ISO 05 / CETOP 5 COUNTERBALANCE VALVES

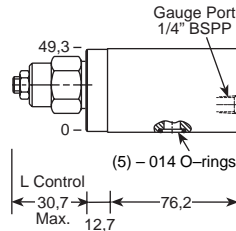
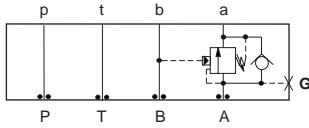
T-2A Cavity



All sandwich bodies shown below are 63,5 mm wide

**PILOT RATIOS**  
3:1 (CBEA), 1.5:1 (CBEB), 2:1 (CBEY)

**PILOT RATIOS**  
2.3:1 (CBEL), 4.5:1 (CBEG), 10:1 (CBEH)



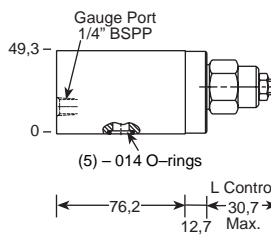
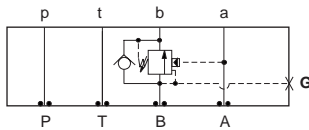
Assembly Model Code\*  
**CBE\*-LHN-BBA/M**

\*The 4th digit of the Model Code must be entered to specify counterbalance pilot ratio. Add modifier /T to order SG Iron for pressure rating over 210 bar.

**Function**  
On A, Pilot from B

Assembly Model Code\*  
**CBE\*-LJN-BBA/M**

\*The 4th digit of the Model Code must be entered to specify counterbalance pilot ratio. Add modifier /T to order SG Iron for pressure rating over 210 bar.



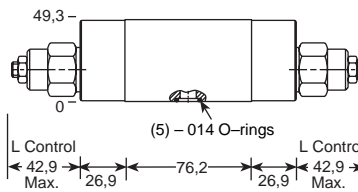
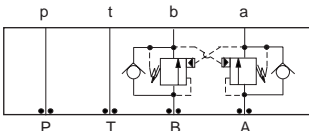
Assembly Model Code\*  
**CBE\*-LHN-BBB/M**

\*The 4th digit of the Model Code must be entered to specify counterbalance pilot ratio. Add modifier /T to order SG Iron for pressure rating over 210 bar.

**Function**  
On B, Pilot from A

Assembly Model Code\*  
**CBE\*-LJN-BBB/M**

\*The 4th digit of the Model Code must be entered to specify counterbalance pilot ratio. Add modifier /T to order SG Iron for pressure rating over 210 bar.



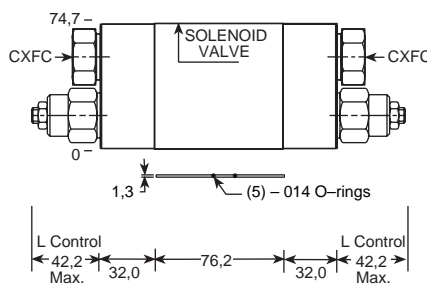
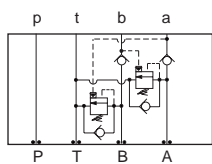
Assembly Model Code\*  
**CBE\*-LHN-BBY**

\*The 4th digit of the Model Code must be entered to specify counterbalance pilot ratio. Add modifier /S to order SG Iron for pressure rating over 210 bar.

**Function**  
On A and B (Cross-Piloted)

Assembly Model Code\*  
**CBE\*-LJN-BBY**

\*The 4th digit of the Model Code must be entered to specify counterbalance pilot ratio. Add modifier /S to order SG Iron for pressure rating over 210 bar.



Assembly Model Code\*  
**CBE\*-LHN-BB8**

\*The 4th digit of the Model Code must be entered to specify counterbalance pilot ratio. Add modifier /S to order SG Iron for pressure rating over 210 bar.

**Function**  
Cushion Lock Circuit  
On A and B

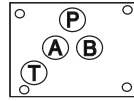
Assembly Model Code\*  
**CBE\*-LJN-BB8**

\*The 4th digit of the Model Code must be entered to specify counterbalance pilot ratio. Add modifier /S to order SG Iron for pressure rating over 210 bar.

NOTES: Page 50 for cartridge model CB\*\*.\* show performance curves, technical tips, and options.  
See page 140 for technical information about sandwich bodies including ISO interface patterns, mounting instructions, studrods, and studkits.  
Go to [www.sunhydraulics.com](http://www.sunhydraulics.com) for more product information.  
Model Codes printed in red are Preferred Products and are readily available.

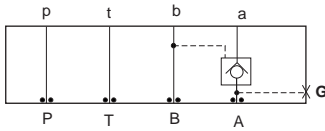
## ISO 05 / CETOP 5 PILOT-TO-OPEN CHECK VALVES

## T-2A Cavity



All sandwich bodies shown below are 63,5 mm wide

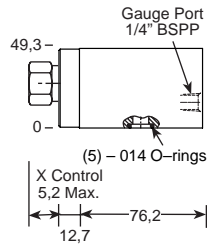
## PILOT OPERATED



Assembly  
Model Code\*

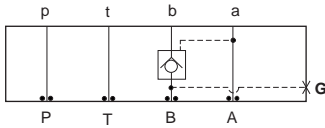
**CKEB-XCN-BBA/M**

\*Add modifier **T** to order SG Iron for pressure rating over 210 bar.



## Function

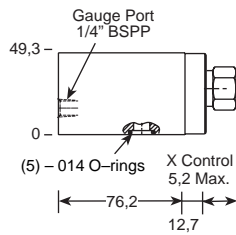
On A, Pilot from B



Assembly  
Model Code\*

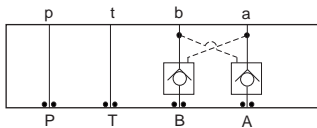
**CKEB-XCN-BBB/M**

\*Add modifier **T** to order SG Iron for pressure rating over 210 bar.



## Function

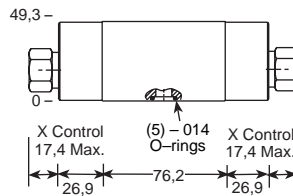
On B, Pilot from A



Assembly  
Model Code\*

**CKEB-XCN-BBY**

\*Add modifier **S** to order SG Iron for pressure rating over 210 bar.



## Function

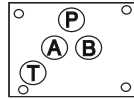
On A and B (Cross-piloted)

NOTES: Page 78 for cartridge model CK\*\*.\* show performance curves, technical tips, and options.  
See page 140 for technical information about sandwich bodies including ISO interface patterns, mounting instructions, studrods, and studkits.  
Go to [www.sunhydraulics.com](http://www.sunhydraulics.com) for more product information.  
Model Codes printed in red are Preferred Products and are readily available.



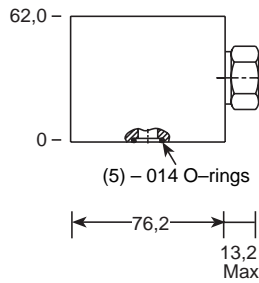
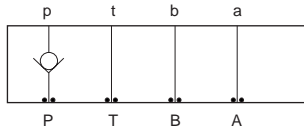
ISO 05 / CETOP 5 CHECK VALVES

T-5A Cavity



All sandwich bodies shown below are 63,5 mm wide

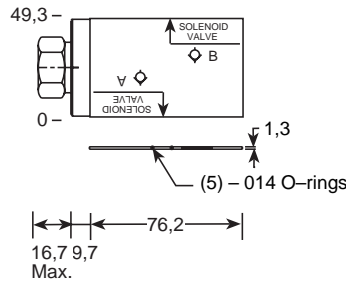
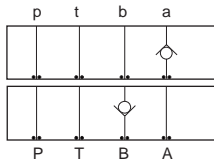
**FREE FLOW  
PORT 1 TO 2**



**Function**  
On P

Assembly Model Code\*  
**CXFA-XCN-DBP**

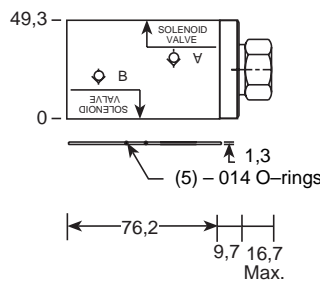
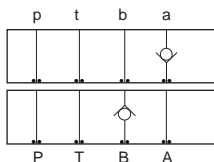
\*Add modifier /S to order SG Iron for pressure rating over 210 bar.



**Function**  
On A, Free Flow Out of Valve  
On B, Free Flow Into Valve

Assembly Model Code\*  
**CXFA-XCN-DBK**

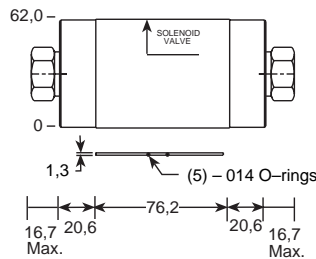
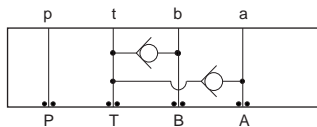
\*Add modifier /S to order SG Iron for pressure rating over 210 bar.



**Function**  
On A, Free Flow Into Valve  
On B, Free Flow Out of Valve

Assembly Model Code\*  
**CXFA-XCN-DBJ**

\*Add modifier /S to order SG Iron for pressure rating over 210 bar.



**Function**  
T to A and B

Assembly Model Code\*  
**CXFA-XAN-DBW**

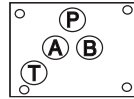
\*Add modifier /S to order SG Iron for pressure rating over 210 bar.

NOTES: Page 102 for cartridge models CX\*A-\*\*\* and CX\*D-\*\*\* show performance curves, technical tips, and options. See page 140 for technical information about sandwich bodies including ISO interface patterns, mounting instructions, studrods, and studkits. Go to [www.sunhydraulics.com](http://www.sunhydraulics.com) for more product information. Model Codes printed in red are Preferred Products and are readily available.

**Sandwich Assemblies**

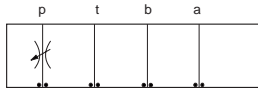
**ISO 05 / CETOP 5 FLOW CONTROL VALVES**

**T-5A Cavity**



All sandwich bodies shown below are 63,5 mm wide

**FULLY ADJUSTABLE NEEDLE WITH REVERSE FREE FLOW CHECK**



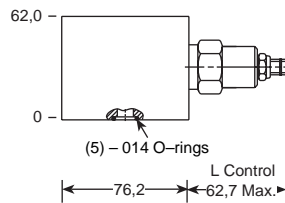
Note: No Check with NFDC Model

Assembly Model Code\*

**NFDC-LAN-DBP**

\*Add modifier /S to order SG Iron for pressure rating over 210 bar.

**FULLY ADJUSTABLE PRESSURE COMPENSATED WITH FREE FLOW CHECK**



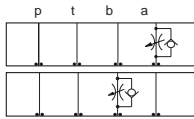
Function

Meter-In P

Assembly Model Code\*

**FDCB-LAN-DBP**

\*Add modifier /S to order SG Iron for pressure rating over 210 bar.

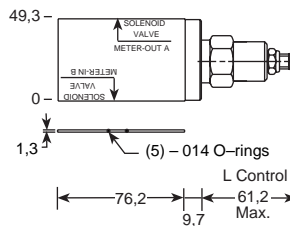


Note: Pressure Compensated Symbol Not Shown

Assembly Model Code\*

**NCEB-LAN-DBA**

\*Add modifier /S to order SG Iron for pressure rating over 210 bar.



Function

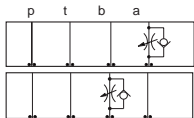
Meter-Out A

Meter-In B

Assembly Model Code\*

**FDCB-LAN-DBA**

\*Add modifier /S to order SG Iron for pressure rating over 210 bar.

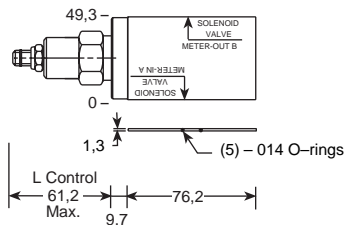


Note: Pressure Compensated Symbol Not Shown

Assembly Model Code\*

**NCEB-LAN-DBB**

\*Add modifier /S to order SG Iron for pressure rating over 210 bar.



Function

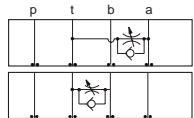
Meter-In A

Meter-Out B

Assembly Model Code\*

**FDCB-LAN-DBB**

\*Add modifier /S to order SG Iron for pressure rating over 210 bar.

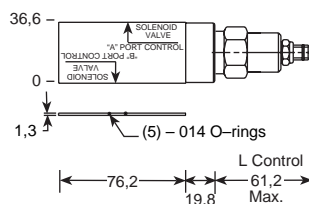


Note: Pressure Compensated Symbol Not Shown

Assembly Model Code\*

**NCEB-LAN-DBC**

\*Add modifier /S to order SG Iron for pressure rating over 210 bar.



Function

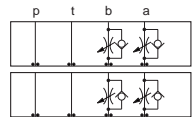
Bleed-Off A to T

Bleed-Off B to T

Assembly Model Code\*

**FDCB-LAN-DBC**

\*Add modifier /S to order SG Iron for pressure rating over 210 bar.

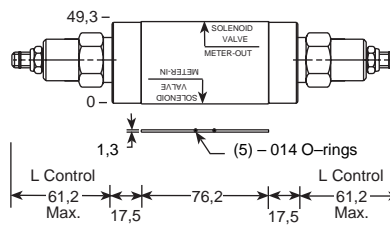


Note: Pressure Compensated Symbol Not Shown

Assembly Model Code\*

**NCEB-LAN-DBY**

\*Add modifier /S to order SG Iron for pressure rating over 210 bar.



Function

Meter-In A and B

Meter-Out A and B

Assembly Model Code\*

**FDCB-LAN-DBY**

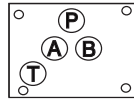
\*Add modifier /S to order SG Iron for pressure rating over 210 bar.

NOTES: Page 110 for cartridge models NF\*C-\*\*\* and NC\*B-\*\*\* and page 126 for FD\*B\*\*\* show performance curves, technical tips, and options. See page 140 for technical information about sandwich bodies including ISO interface patterns, mounting instructions, studrods, and studkits. Go to [www.sunhydraulics.com](http://www.sunhydraulics.com) for more product information. Model Codes printed in red are Preferred Products and are readily available.

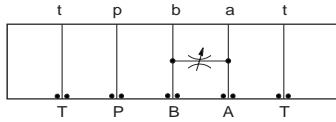
ISO 05 / CETOP 5 FLOW CONTROL VALVES

T-13A Cavity

All sandwich bodies shown below are 63,5 mm wide

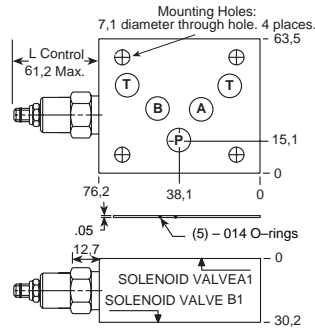


FULLY ADJUSTABLE NEEDLE



Assembly Model Code\*  
**NFCC-LCN-DBS**

\*Add modifier /S to order SG Iron for pressure rating over 210 bar.



Function

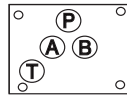
Meter A to B
Meter B to A

NOTES: Page 110 for cartridge models NF\*C-\*\*\* show performance curves, technical tips, and options. See page 140 for technical information about sandwich bodies including ISO interface patterns, mounting instructions, studrods, and studkits. Go to [www.sunhydraulics.com](http://www.sunhydraulics.com) for more product information.

**Sandwich Assemblies**

**ISO 05 / CETOP 5 FLOW CONTROL VALVES  
(RAPID ADVANCE AND FEED ASSEMBLIES)**

**T-5A Cavity**



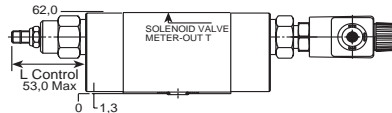
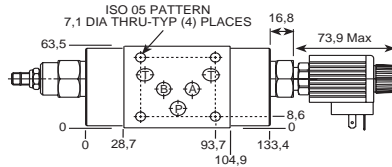
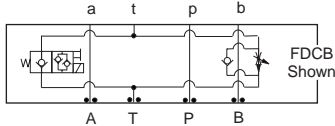
All sandwich bodies shown below are 63,5 mm wide

**FIXED ORIFICE TUNABLE,  
PRESSURE COMPENSATED**

**FULLY ADJUSTABLE, PRESSURE  
COMPENSATED WITH FREE FLOW CHECK**

**Function**

Meter-Out T, Solenoid Normally Closed



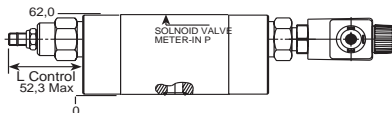
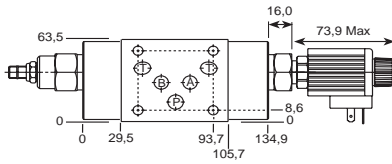
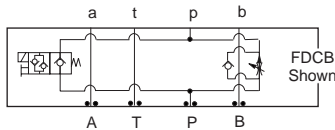
Coil must be selected separately. See page 248.

Assembly  
Model Code\*  
**X3DD-LAN-CA**

\*Add modifier /S to order SG Iron for pressure rating over 210 bar.

**Function**

Meter in P, Solenoid Normally Closed



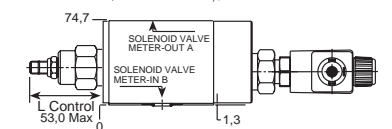
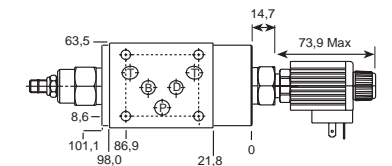
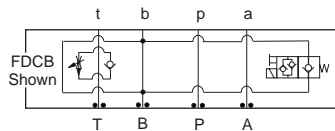
Coil must be selected separately. See page 248.

Assembly  
Model Code\*  
**X2DD-LAN-CA**

\*Add modifier /S to order SG Iron for pressure rating over 210 bar.

**Function**

Meter-Out A, Solenoid Normally Closed  
Meter-In B, Solenoid Normally Closed



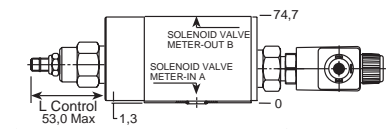
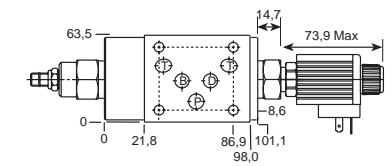
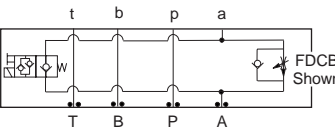
Coil must be selected separately. See page 248.

Assembly  
Model Code\*  
**X6DD-LAN-CA**

\*Add modifier /S to order SG Iron for pressure rating over 210 bar.

**Function**

Meter-In A, Solenoid Normally Closed  
Meter-Out B, Solenoid Normally Closed



Coil must be selected separately. See page 248.

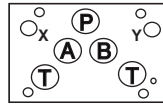
Assembly  
Model Code\*  
**X4DD-LAN-CA**

\*Add modifier /S to order SG Iron for pressure rating over 210 bar.

NOTES: Page 118 for FCDB and 126 for FDCB performance curves, technical tips, and options.  
See page 140 for technical information about sandwich bodies including ISO interface patterns, mounting instructions, studrods, and studkits.  
Go to [www.sunhydraulics.com](http://www.sunhydraulics.com) for more product information.

**ISO 05 / CETOP 5 WITH X AND Y RELIEF VALVES  
(SIDE PORTED SUBPLATE)**

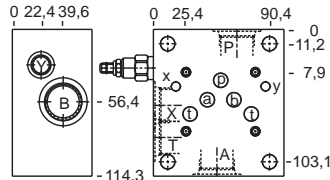
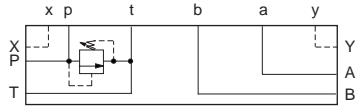
**T-10A Cavity**



All subplates shown below are 114,3 mm wide

**PILOT OPERATED**

**DIRECT ACTING**



Order Retainer and Seal Kits separately. (See page 141)

**Function**

**P to T**

Ports A, B, P, T	Ports X, Y	Assembly Model Code*
1/2" BSPP	1/4" BSPP	<b>RPEC-LAN-ZHT</b>
3/4" BSPP	1/4" BSPP	<b>RPEC-LAN-ZHV</b>

\*Add modifier **/S** to order SG Iron for pressure rating over 210 bar.

Ports A, B, P, T	Ports X, Y	Assembly Model Code*
1/2" BSPP	1/4" BSPP	<b>RDDA-LAN-ZHT</b>
3/4" BSPP	1/4" BSPP	<b>RDDA-LAN-ZHV</b>

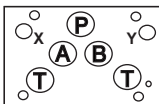
\*Add modifier **/S** to order SG Iron for pressure rating over 210 bar.

NOTES: Page 2 for cartridge models RP\*C-\*\*\* and RD\*A-\*\*\* show performance curves, technical tips, and options. See page 140 for technical information about sandwich bodies including ISO interface patterns, mounting instructions, studrods, and studkits. Sun ISO 05 X, Y, sandwich bodies are furnished with pilot and drain connections. Seal plates are NOT supplied with these bodies, due to the differences in the European and U.S. seal plates. To order seal plates separately see page 141-142. Go to [www.sunhydraulics.com](http://www.sunhydraulics.com) for more product information.

## Sandwich Assemblies

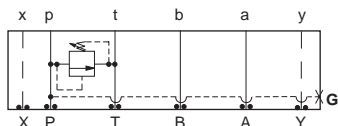
# ISO 05 / CETOP 5 WITH X AND Y RELIEF VALVES

### T-3A / T-10A Cavities



All sandwich bodies shown below are 63,5 mm wide

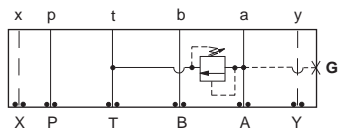
#### PILOT OPERATED



Assembly Model Code\*

**RPGC-LAN-CJP/M**

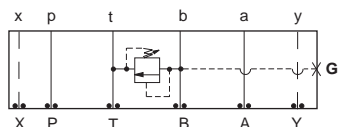
\*Add modifier **/T** to order SG Iron for pressure rating over 210 bar.



Assembly Model Code\*

**RPGC-LAN-CJA/M**

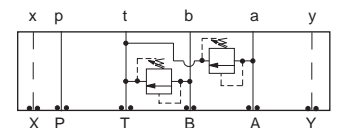
\*Add modifier **/T** to order SG Iron for pressure rating over 210 bar.



Assembly Model Code\*

**RPGC-LAN-CJB/M**

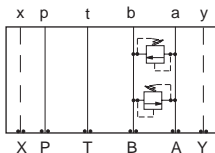
\*Add modifier **/T** to order SG Iron for pressure rating over 210 bar.



Assembly Model Code\*

**RPGC-LAN-CJX**

\*Add modifier **/S** to order SG Iron for pressure rating over 210 bar.



Assembly Model Code\*

**RPEC-LAN-CJY**

\*Add modifier **/S** to order SG Iron for pressure rating over 210 bar.

#### DIRECT ACTING

#### Function

**P to T** (High Capacity)

Assembly Model Code\*

**RDFA-LAN-CJP/M**

\*Add modifier **/T** to order SG Iron for pressure rating over 210 bar.

#### Function

**A to T** (High Capacity)

Assembly Model Code\*

**RDFA-LAN-CJA/M**

\*Add modifier **/T** to order SG Iron for pressure rating over 210 bar.

#### Function

**B to T** (High Capacity)

Assembly Model Code\*

**RDFA-LAN-CJB/M**

\*Add modifier **/T** to order SG Iron for pressure rating over 210 bar.

#### Function

**A and B to T** (High Capacity)

Assembly Model Code\*

**RDFA-LAN-CJX**

\*Add modifier **/S** to order SG Iron for pressure rating over 210 bar.

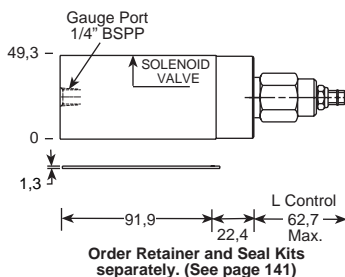
#### Function

**A to B and B to A**  
(Cross-port)

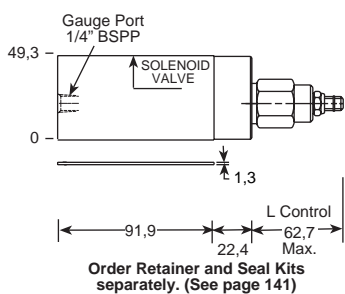
Assembly Model Code\*

**RDDA-LAN-CJY**

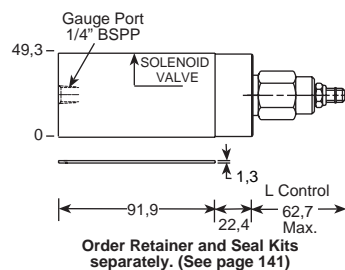
\*Add modifier **/S** to order SG Iron for pressure rating over 210 bar.



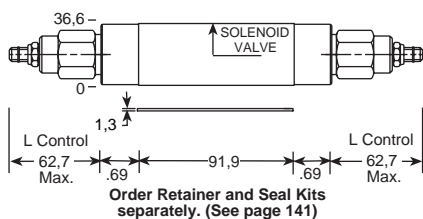
Order Retainer and Seal Kits separately. (See page 141)



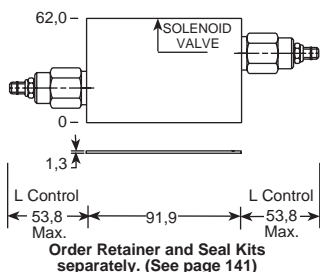
Order Retainer and Seal Kits separately. (See page 141)



Order Retainer and Seal Kits separately. (See page 141)



Order Retainer and Seal Kits separately. (See page 141)



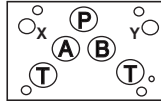
Order Retainer and Seal Kits separately. (See page 141)

NOTES: Page 2 for cartridge models RP\*C-\*\*\* and RD\*A-\*\*\* show performance curves, technical tips, and options. See page 140 for technical information about sandwich bodies including ISO interface patterns, mounting instructions, studrods, and studkits. Sun ISO 05 X, Y, sandwich bodies are furnished with pilot and drain connections. Seal plates are NOT supplied with these bodies, due to the differences in the European and U.S. seal plates. To order seal plates separately see page 141-142.

Go to [www.sunhydraulics.com](http://www.sunhydraulics.com) for more product information.  
Model Codes printed in red are Preferred Products and are readily available.

ISO 05 / CETOP 5 WITH X AND Y SEQUENCE VALVES

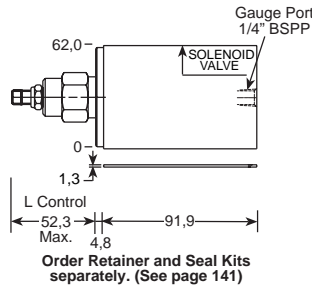
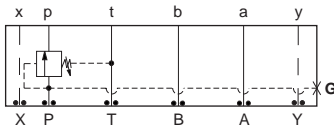
T-2A Cavity



All sandwich bodies shown below are 63,5 mm wide

PILOT OPERATED

DIRECT ACTING



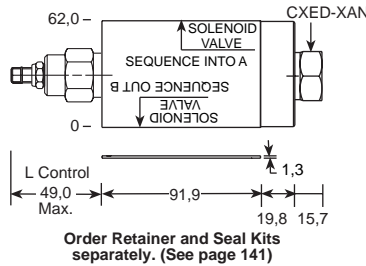
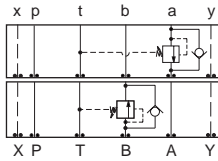
**Function**  
In to **P**

Assembly Model Code\*  
**RSFC-LAN-BJW/M**

Assembly Model Code\*  
**SXEA-LAN-BJW/M**

\*Add modifier **/T** to order SG Iron for pressure rating over 210 bar.

\*Add modifier **/T** to order SG Iron for pressure rating over 210 bar.



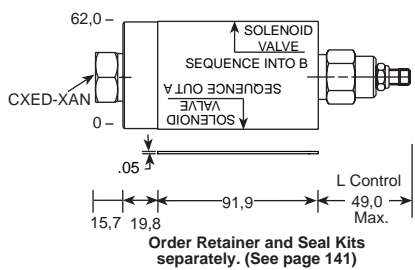
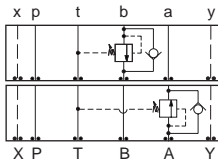
**Function**  
In to **A** (Reverse Free Flow Check)  
Out of **B** (Reverse Free Flow Check)

Assembly Model Code\*  
**RSFC-LAN-BJ4**

Assembly Model Code\*  
**SXEA-LAN-BJ4**

\*Add modifier **/S** to order SG Iron for pressure rating over 210 bar.

\*Add modifier **/S** to order SG Iron for pressure rating over 210 bar.



**Function**  
In to **B** (Reverse Free Flow Check)  
Out of **A** (Reverse Free Flow Check)

Assembly Model Code\*  
**RSFC-LAN-BJ5**

Assembly Model Code\*  
**SXEA-LAN-BJ5**

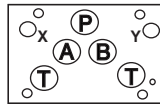
\*Add modifier **/S** to order SG Iron for pressure rating over 210 bar.

\*Add modifier **/S** to order SG Iron for pressure rating over 210 bar.

NOTES: Page 20 for cartridge models RS\*C-\*\*\* and SX\*A-\*\*\* show performance curves, technical tips, and options. See page 140 for technical information about sandwich bodies including ISO interface patterns, mounting instructions, studrods, and studkits. Sun ISO 05 X, Y, sandwich bodies are furnished with pilot and drain connections. Seal plates are NOT supplied with these bodies, due to the differences in the European and U.S. seal plates. To order seal plates separately see page 141-142. Go to [www.sunhydraulics.com](http://www.sunhydraulics.com) for more product information.

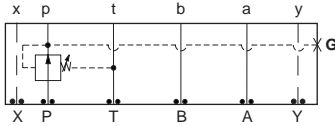
ISO 05 / CETOP 5 WITH X AND Y REDUCING VALVES

T-2A Cavity



All sandwich bodies shown below are 63,5 mm wide

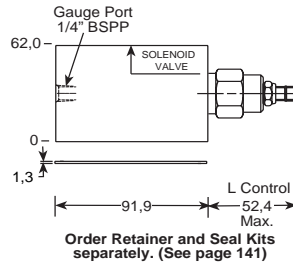
PILOT OPERATED



Assembly Model Code\*

**PBFB-LAN-BJP/M**

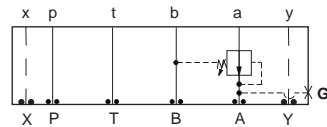
\*Add modifier **T** to order SG Iron for pressure rating over 210 bar.



Order Retainer and Seal Kits separately. (See page 141)

Function

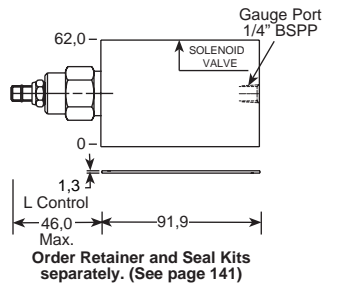
On P Drained to T



Assembly Model Code\*

**PBFB-LAN-BJA/M**

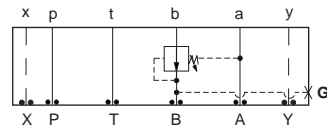
\*Add modifier **T** to order SG Iron for pressure rating over 210 bar.



Order Retainer and Seal Kits separately. (See page 141)

Function

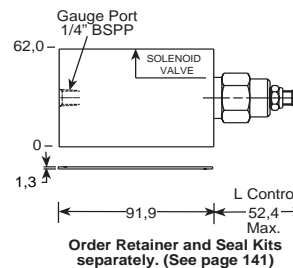
On A Drained to B



Assembly Model Code\*

**PBFB-LAN-BJB/M**

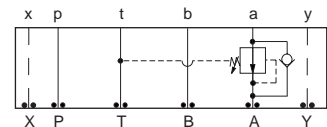
\*Add modifier **T** to order SG Iron for pressure rating over 210 bar.



Order Retainer and Seal Kits separately. (See page 141)

Function

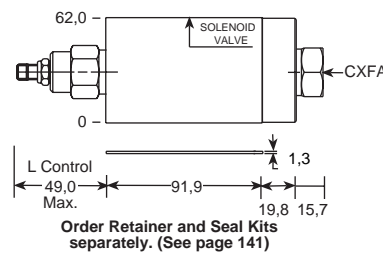
On B Drained to A



Assembly Model Code\*

**PBFB-LAN-BJ2**

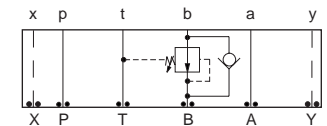
\*Add modifier **S** to order SG Iron for pressure rating over 210 bar.



Order Retainer and Seal Kits separately. (See page 141)

Function

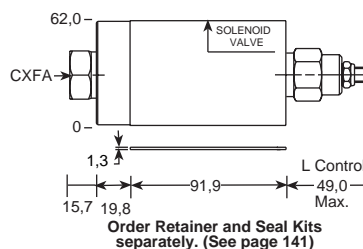
On A Drain to T  
(Reverse Free Flow Check)



Assembly Model Code\*

**PBFB-LAN-BJ3**

\*Add modifier **S** to order SG Iron for pressure rating over 210 bar.



Order Retainer and Seal Kits separately. (See page 141)

Function

On B Drain to T  
(Reverse Free Flow Check)

NOTES: Page 34 for cartridge models PB\*B-\*\*\* and page 102 for CX\*A-\*\*\* show performance curves, technical tips, and options.

See page 140 for technical information about sandwich bodies including ISO interface patterns, mounting instructions, studrods, and studkits.

Sun ISO 05 X, Y, sandwich bodies are furnished with pilot and drain connections. Seal plates are NOT supplied with these bodies, due to the differences in the European and U.S. seal plates. To order seal plates separately see page 141-142

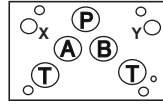
Go to [www.sunhydraulics.com](http://www.sunhydraulics.com) for more product information.

Model Codes printed in red are Preferred Products and are readily available.



ISO 05 / CETOP 5 WITH X AND Y REDUCING / RELIEVING VALVES

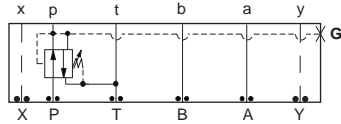
T-2A Cavity



All sandwich bodies shown below are 63,5 mm wide

PILOT OPERATED

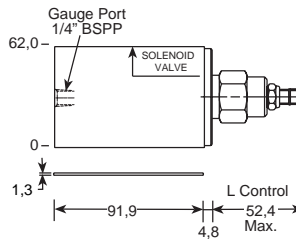
DIRECT ACTING



Assembly Model Code\*

**PPFB-LAN-BJP/M**

\*Add modifier /T to order SG Iron for pressure rating over 210 bar.



Order Retainer and Seal Kits separately. (See page 141)

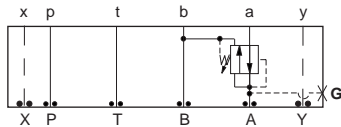
Function

On P Tank to T Drained to T

Assembly Model Code\*

**PRFB-LAN-BJP/M**

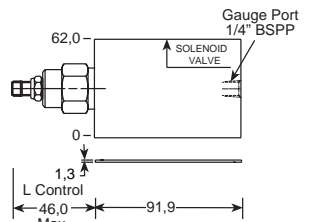
\*Add modifier /T to order SG Iron for pressure rating over 210 bar.



Assembly Model Code\*

**PPFB-LAN-BJA/M**

\*Add modifier /T to order SG Iron for pressure rating over 210 bar.



Order Retainer and Seal Kits separately. (See page 141)

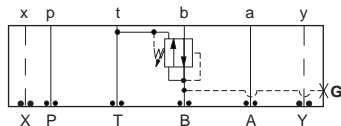
Function

On A Tank to B

Assembly Model Code\*

**PRFB-LAN-BJA/M**

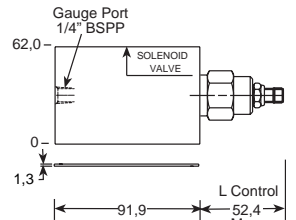
\*Add modifier /T to order SG Iron for pressure rating over 210 bar.



Assembly Model Code\*

**PPFB-LAN-BJB/M**

\*Add modifier /T to order SG Iron for pressure rating over 210 bar.



Order Retainer and Seal Kits separately. (See page 141)

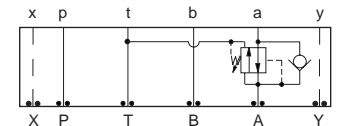
Function

On B Tank to A

Assembly Model Code\*

**PRFB-LAN-BJB/M**

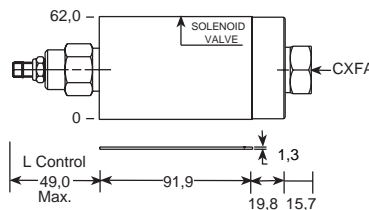
\*Add modifier /T to order SG Iron for pressure rating over 210 bar.



Assembly Model Code\*

**PPFB-LAN-BJ2**

\*Add modifier /S to order SG Iron for pressure rating over 210 bar.



Order Retainer and Seal Kits separately. (See page 141)

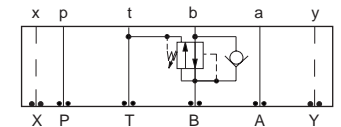
Function

On A Tank to T  
(Reverse Free Flow Check)

Assembly Model Code\*

**PRFB-LAN-BJ2**

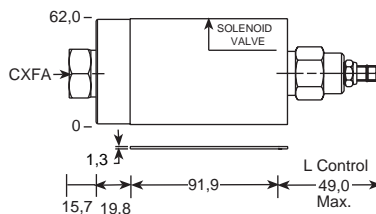
\*Add modifier /S to order SG Iron for pressure rating over 210 bar.



Assembly Model Code\*

**PPFB-LAN-BJ3**

\*Add modifier /S to order SG Iron for pressure rating over 210 bar.



Order Retainer and Seal Kits separately. (See page 141)

Function

On B Tank to T  
(Reverse Free Flow Check)

Assembly Model Code\*

**PRFB-LAN-BJ3**

\*Add modifier /S to order SG Iron for pressure rating over 210 bar.

NOTES: Page 34 for cartridge models PPFB-\*\*\* and PRFB-\*\*\*, and page 102 for C\*FA-\*\*\* show performance curves, technical tips, and options.

See page 140 for technical information about sandwich bodies including ISO interface patterns, mounting instructions, studrods, and studkits.

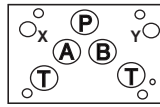
Sun ISO 05 X, Y, sandwich bodies are furnished with pilot and drain connections. Seal plates are NOT supplied with these bodies, due to the differences in the European and U.S. seal plates. To order seal plates separately see page 141-142.

Go to [www.sunhydraulics.com](http://www.sunhydraulics.com) for more product information.

Model Codes printed in red are Preferred Products and are readily available.

**ISO 05 / CETOP 5 WITH X AND Y COUNTERBALANCE VALVES**

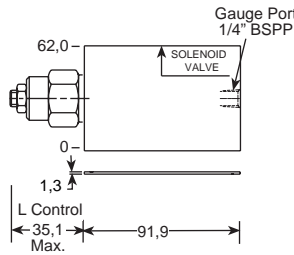
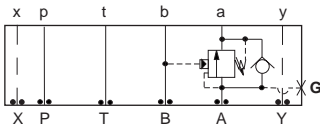
**T-2A Cavity**



All sandwich bodies shown below are 63,5 mm wide

**PILOT RATIOS**  
3:1, 1.5:1 and 2:1

**PILOT RATIOS**  
2.3:1, 4.5:1 and 10:1



**Function**

On A Pilot from B

Assembly Model Code\*

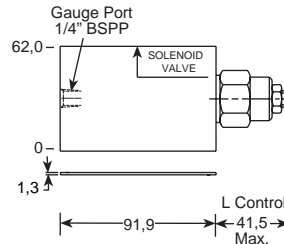
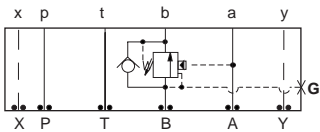
**CBE\*-LHN-BJA/M**

\*The 4th digit of the Model Code must be entered to specify counterbalance pilot ratio. Add modifier /T to order SG Iron for pressure rating over 210 bar.

Assembly Model Code\*

**CBE\*-LJN-BJA/M**

\*Add modifier /T to order SG Iron for pressure rating over 210 bar.



**Function**

On B Pilot from A

Assembly Model Code\*

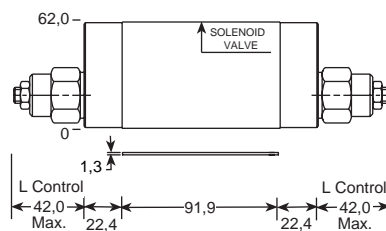
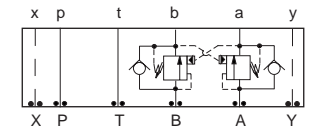
**CBE\*-LHN-BJB/M**

\*The 4th digit of the Model Code must be entered to specify counterbalance pilot ratio. Add modifier /T to order SG Iron for pressure rating over 210 bar.

Assembly Model Code\*

**CBE\*-LJN-BJB/M**

\*Add modifier /T to order SG Iron for pressure rating over 210 bar.



**Function**

On A and B (Cross-Piloted)

Assembly Model Code\*

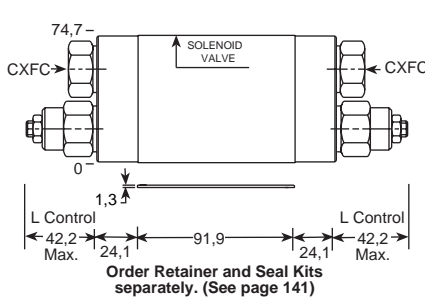
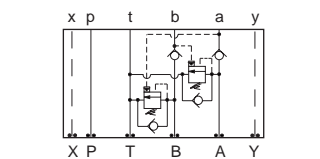
**CBE\*-LHN-BJY**

\*The 4th digit of the Model Code must be entered to specify counterbalance pilot ratio. Add modifier /S to order SG Iron for pressure rating over 210 bar.

Assembly Model Code\*

**CBE\*-LJN-BJY**

\*Add modifier /S to order SG Iron for pressure rating over 210 bar.



**Function**

Cushion Lock Circuit  
On A and B

Assembly Model Code\*

**CBE\*-LHN-BJ8**

\*The 4th digit of the Model Code must be entered to specify counterbalance pilot ratio. Add modifier /S to order SG Iron for pressure rating over 210 bar.

Assembly Model Code\*

**CBE\*-LJN-BJ8**

\*Add modifier /S to order SG Iron for pressure rating over 210 bar.

NOTES: Page 50 for cartridge model CBE\*.-\*\*\* show performance curves, technical tips, and options.

See page 140 for technical information about sandwich bodies including ISO interface patterns, mounting instructions, studrods, and studkits.

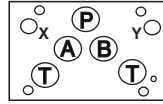
Sun ISO 05 X, Y, sandwich bodies are furnished with pilot and drain connections. Seal plates are NOT supplied with these bodies, due to the differences in the European and U.S. seal plates. To order seal plates separately see page 141-142.

Go to [www.sunhydraulics.com](http://www.sunhydraulics.com) for more product information.

Model Codes printed in red are Preferred Products and are readily available.

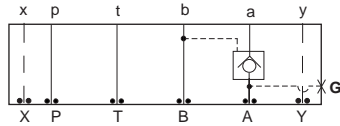
ISO 05 / CETOP 5 WITH X AND Y PILOT-TO-OPEN CHECK VALVES

T-2A Cavity



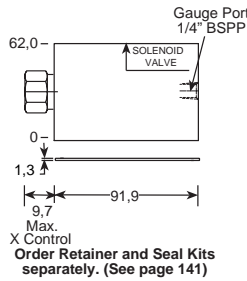
All sandwich bodies shown below are 63,5 mm wide

PILOT OPERATED



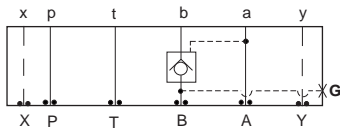
Assembly Model Code\*  
**CKEB-XCN-BJA/M**

\*Add modifier **T** to order SG Iron for pressure rating over 210 bar.



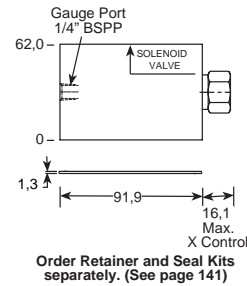
Function

On A Pilot from B



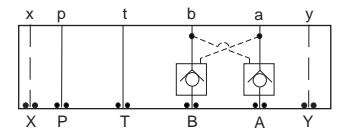
Assembly Model Code\*  
**CKEB-XCN-BJB/M**

\*Add modifier **T** to order SG Iron for pressure rating over 210 bar.



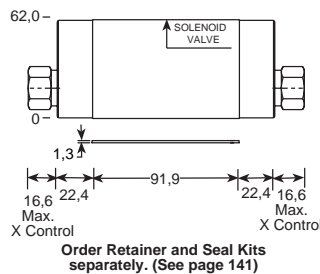
Function

On B Pilot from A



Assembly Model Code\*  
**CKEB-XCN-BJY**

\*Add modifier **S** to order SG Iron for pressure rating over 210 bar.



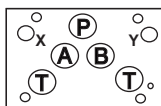
Function

On A and B (Cross-Piloted)

NOTES: Page 78 for cartridge models CK\*\*-\*\*\* show performance curves, technical tips, and options.  
See page 140 for technical information about sandwich bodies including ISO interface patterns, mounting instructions, studrods, and studkits.  
**Sun ISO 05 X, Y, sandwich bodies are furnished with pilot and drain connections. Seal plates are NOT supplied with these bodies, due to the differences in the European and U.S. seal plates. To order seal plates separately see page 141-142.**  
Go to [www.sunhydraulics.com](http://www.sunhydraulics.com) for more product information.  
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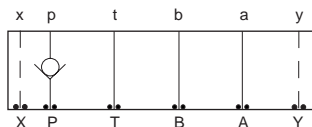
**ISO 05 / CETOP 5 WITH X AND Y CHECK VALVES**

**T-5A Cavity**



All sandwich bodies shown below are 63,5 mm wide

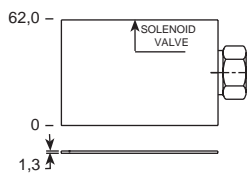
**CHECK VALVES**



Assembly Model Code\*

**CXFA-XCN-DJP**

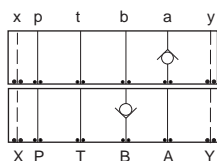
\*Add modifier /S to order SG Iron for pressure rating over 210 bar.



Order Retainer and Seal Kits separately. (See page 141)

**Function**

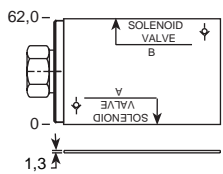
On P



Assembly Model Code\*

**CXFA-XCN-DJK**

\*Add modifier /S to order SG Iron for pressure rating over 210 bar.

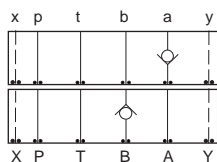


Order Retainer and Seal Kits separately. (See page 141)

**Function**

On A Free Flow Out of Valve

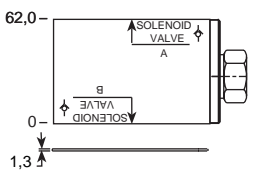
On B Free Flow Into Valve



Assembly Model Code\*

**CXFA-XCN-DJJ**

\*Add modifier /S to order SG Iron for pressure rating over 210 bar.

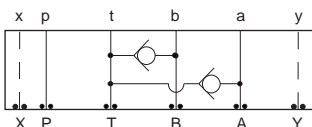


Order Retainer and Seal Kits separately. (See page 141)

**Function**

On A Free Flow Into Valve

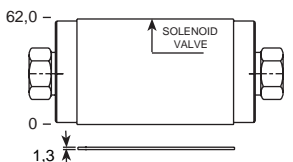
On B Free Flow Out of Valve



Assembly Model Code\*

**CXFA-XAN-DJW**

\*Add modifier /S to order SG Iron for pressure rating over 210 bar.



Order Retainer and Seal Kits separately. (See page 141)

**Function**

T to A and B

NOTES: Page 102 for cartridge models CX\*A-\*\*\* show performance curves, technical tips, and options.

See page 140 for technical information about sandwich bodies including ISO interface patterns, mounting instructions, studrods, and studkits.

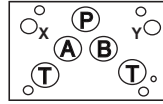
Sun ISO 05 X, Y, sandwich bodies are furnished with pilot and drain connections. Seal plates are NOT supplied with these bodies, due to the differences in the European and U.S. seal plates. To order seal plates separately see page 141-142.

Go to [www.sunhydraulics.com](http://www.sunhydraulics.com) for more product information.

Model Codes printed in red are Preferred Products and are readily available.

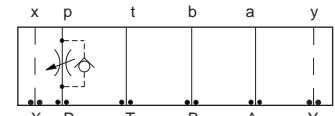
ISO 05 / CETOP 5 WITH X AND Y FLOW CONTROL VALVES

T-5A Cavity



All sandwich bodies shown below are 63,5 mm wide

FULLY ADJUSTABLE NEEDLE



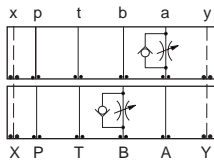
Note: Free Flow Check with Model FDCB Only

Assembly Model Code\*

NFDC-LAN-DJP

\*Add modifier /S to order SG Iron for pressure rating over 210 bar.

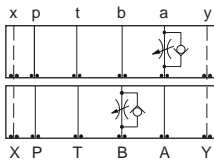
FULLY ADJUSTABLE NEEDLE WITH FREE FLOW CHECK



Assembly Model Code\*

NCEB-LCN-DJA

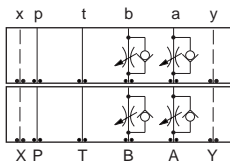
\*Add modifier /S to order SG Iron for pressure rating over 210 bar.



Assembly Model Code\*

NCEB-LCN-DJB

\*Add modifier /S to order SG Iron for pressure rating over 210 bar.

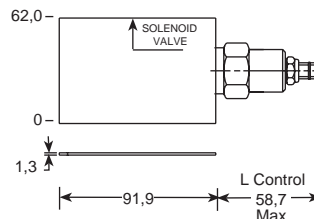


Assembly Model Code\*

NCEB-LCN-DJP

\*Add modifier /S to order SG Iron for pressure rating over 210 bar.

FULLY ADJUSTABLE PRESSURE COMPENSATED WITH FREE FLOW CHECK



Function

Meter-In P

Assembly Model Code\*

FDCB-LAN-DJP

\*Add modifier /S to order SG Iron for pressure rating over 210 bar.

Function

Meter-Out A

Meter-In B

Assembly Model Code\*

FDCB-LAN-DJA

\*Add modifier /S to order SG Iron for pressure rating over 210 bar.

Function

Meter-In A

Meter-Out B

Assembly Model Code\*

FDCB-LAN-DJB

\*Add modifier /S to order SG Iron for pressure rating over 210 bar.

Function

Meter-In A and B

Meter-Out A and B

Assembly Model Code\*

FDCB-LAN-DJP

\*Add modifier /S to order SG Iron for pressure rating over 210 bar.

NOTES: Page 110 for cartridge models NF\*C-\*\*\* and NC\*B-\*\*\*, and page 126 for FD\*\*.\* show performance curves, technical tips, and options. See page 140 for technical information about sandwich bodies including ISO interface patterns, mounting instructions, studrods, and studkits.

Sun ISO 05 X, Y, sandwich bodies are furnished with pilot and drain connections. Seal plates are NOT supplied with these bodies, due to the differences in the European and U.S. seal plates. To order seal plates separately see page 141-142.

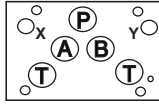
Go to [www.sunhydraulics.com](http://www.sunhydraulics.com) for more product information.

Model Codes printed in red are Preferred Products and are readily available.

**Sandwich Assemblies**

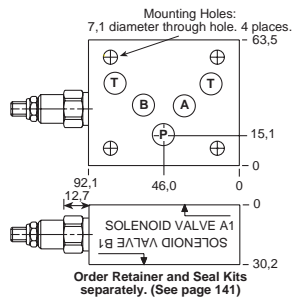
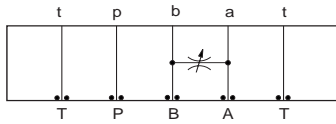
**ISO 05 / CETOP 5 WITH X AND Y FLOW CONTROL VALVES**

**T-13A Cavity**



**FULLY ADJUSTABLE NEEDLE**

**Function**



**Meter A to B and B to A**

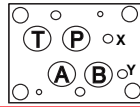
Assembly Model Code\*  
**NFCC-LCN-DJS**

\*Add modifier /S to order SG Iron for pressure rating over 210 bar.

NOTES: Page 110 for cartridge model NF\*C-\*\*\* show performance curves, technical tips, and options. See page 140 for technical information about sandwich bodies including ISO interface patterns, mounting instructions, studrods, and studkits. Sun ISO 05 X, Y, sandwich bodies are furnished with pilot and drain connections. Seal plates are NOT supplied with these bodies, due to the differences in the European and U.S. seal plates. To order seal plates separately see page 141-142. Go to [www.sunhydraulics.com](http://www.sunhydraulics.com) for more product information.

**ISO 07 / CETOP 7 RELIEF VALVES  
(SIDE PORTED SUBPLATE / SIDE PORTED SUBPLATE WITH GASKET MOUNTED TANK PORT)**

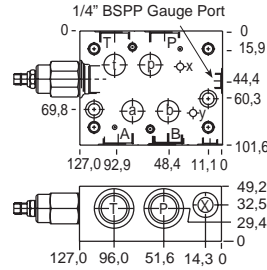
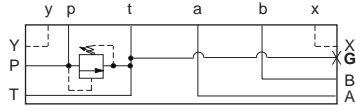
**T-3A Cavity**



All subplates shown below are 127,0 mm wide

**PILOT OPERATED**

**DIRECT ACTING**



**Function**

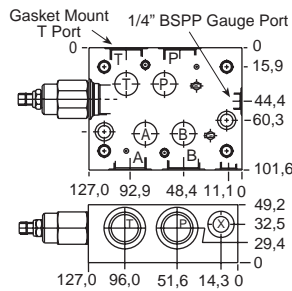
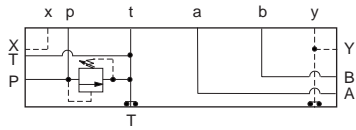
**P to T**

Ports A, B, P, T	Ports X, Y	Assembly Model Code*
3/4" BSPP	1/4" BSPP	<b>RPGC-LAN-ZLZ</b>

\*Add modifier /S to order SG Iron for pressure rating over 210 bar.

Ports A, B, P, T	Ports X, Y	Assembly Model Code*
3/4" BSPP	1/4" BSPP	<b>RDFA-LAN-ZLZ</b>

\*Add modifier /S to order SG Iron for pressure rating over 210 bar.



**Function**

**P to T**

Ports A, B, P, T	Ports X, Y	Assembly Model Code*
3/4" BSPP	1/4" BSPP	<b>RPGC-LAN-VTG</b>

\*Add modifier /S to order SG Iron for pressure rating over 210 bar.

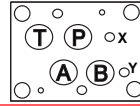
Ports A, B, P, T	Ports X, Y	Assembly Model Code*
3/4" BSPP	1/4" BSPP	<b>RDFA-LAN-VTG</b>

\*Add modifier /S to order SG Iron for pressure rating over 210 bar.

NOTES: Page 2 for cartridge models RP\*C-\*\*\* and RD\*A-\*\*\* show performance curves, technical tips, and options.  
See page 140 for technical information about sandwich bodies including ISO interface patterns, mounting instructions, studrods, and studkits.  
Go to [www.sunhydraulics.com/](http://www.sunhydraulics.com/) for more product information.  
Model Codes printed in red are Preferred Products and are readily available.

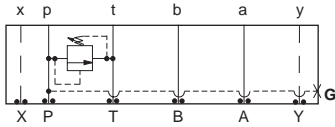
## ISO 07 / CETOP 7 RELIEF VALVES

## T-3A / T-10A Cavities



All sandwich bodies shown below are 89,0 mm wide

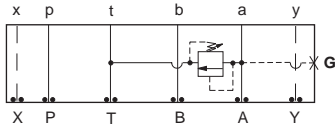
## PILOT OPERATED



Assembly  
Model Code\*

**RPGC-LAN-CKP/M**

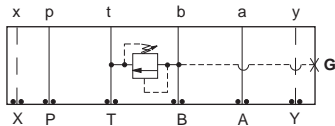
\*Add modifier **/T** to order SG Iron for pressure rating over 210 bar.



Assembly  
Model Code\*

**RPGC-LAN-CKA/M**

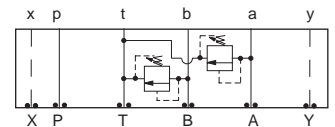
\*Add modifier **/T** to order SG Iron for pressure rating over 210 bar.



Assembly  
Model Code\*

**RPGC-LAN-CKB/M**

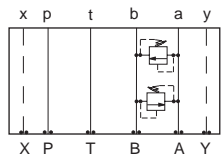
\*Add modifier **/T** to order SG Iron for pressure rating over 210 bar.



Assembly  
Model Code\*

**RPGC-LAN-CKX**

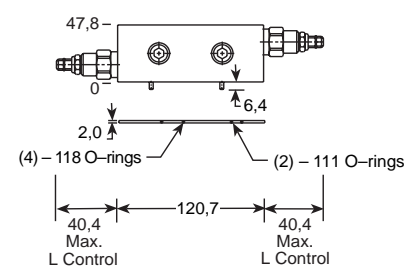
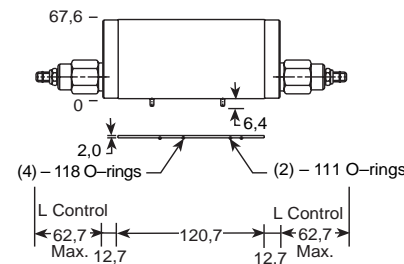
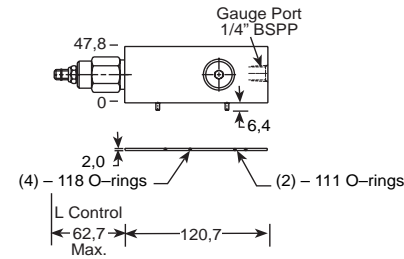
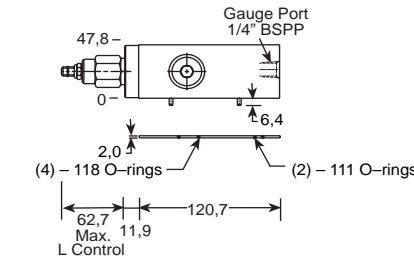
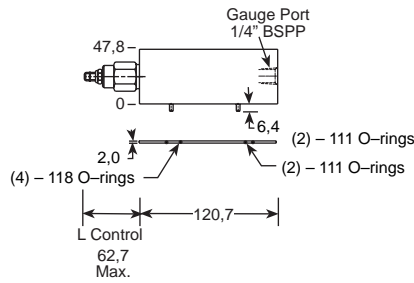
\*Add modifier **/S** to order SG Iron for pressure rating over 210 bar.



Assembly  
Model Code\*

**RPEC-LAN-CKY**

\*Add modifier **/S** to order SG Iron for pressure rating over 210 bar.



## DIRECT ACTING

## Function

**P to T**

Assembly  
Model Code\*

**RDFA-LAN-CKP/M**

\*Add modifier **/T** to order SG Iron for pressure rating over 210 bar.

## Function

**A to T**

Assembly  
Model Code\*

**RDFA-LAN-CKA/M**

\*Add modifier **/T** to order SG Iron for pressure rating over 210 bar.

## Function

**B to T**

Assembly  
Model Code\*

**RDFA-LAN-CKB/M**

\*Add modifier **/T** to order SG Iron for pressure rating over 210 bar.

## Function

**A and B to T (High Capacity)**

Assembly  
Model Code\*

**RDFA-LAN-CKX**

\*Add modifier **/S** to order SG Iron for pressure rating over 210 bar.

## Function

**A to B and B to A  
(Cross-port)**

Assembly  
Model Code\*

**RDDA-LAN-CKY**

\*Add modifier **/S** to order SG Iron for pressure rating over 210 bar.

NOTES: Page 2 for cartridge models RP\*C-\*\*\* and RD\*A-\*\*\* show performance curves, technical tips, and options.

See page 140 for technical information about sandwich bodies including ISO interface patterns, mounting instructions, studrods, and studkits.

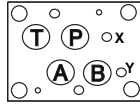
Go to [www.sunhydraulics.com](http://www.sunhydraulics.com) for more product information.

Model Codes printed in red are Preferred Products and are readily available.



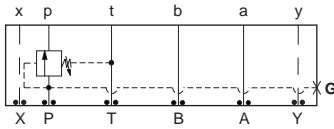
ISO 07 / CETOP 7 SEQUENCE VALVES

T-17A Cavity



All sandwich bodies shown below are 89,0 mm wide

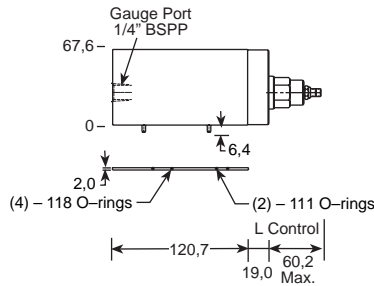
PILOT OPERATED



Assembly Model Code\*

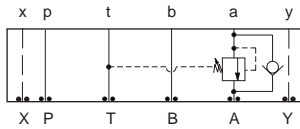
RSHC-LAN-BKW/M

\*Add modifier /T to order SG Iron for pressure rating over 210 bar.



Function

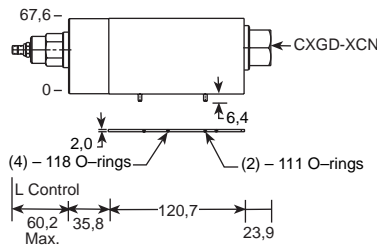
In to P



Assembly Model Code\*

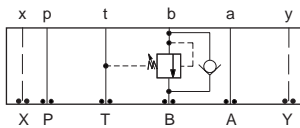
RSHC-LAN-BK4

\*Add modifier /S to order SG Iron for pressure rating over 210 bar.



Function

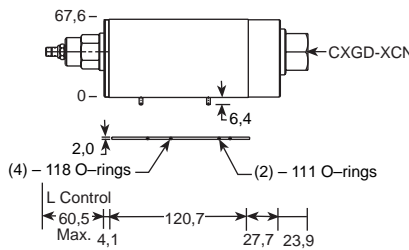
In to A (Reverse Free Flow Check)



Assembly Model Code\*

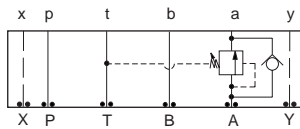
RSHC-LAN-BK5

\*Add modifier /S to order SG Iron for pressure rating over 210 bar.



Function

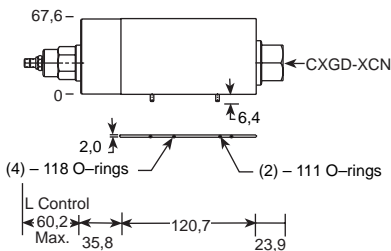
In to B (Reverse Free Flow Check)



Assembly Model Code\*

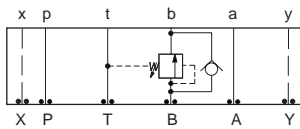
RSHC-LAN-BK6

\*Add modifier /S to order SG Iron for pressure rating over 210 bar.



Function

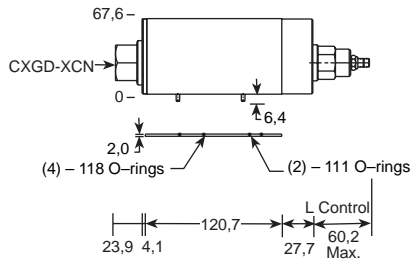
Out of A (Reverse Free Flow Check)



Assembly Model Code\*

RSHC-LAN-BK7

\*Add modifier /S to order SG Iron for pressure rating over 210 bar.



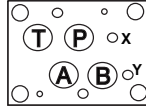
Function

Out of B (Reverse Free Flow Check)

NOTES: Page 20 for cartridge model RS\*C-\*\*\* show performance curves, technical tips, and options. See page 140 for technical information about sandwich bodies including ISO interface patterns, mounting instructions, studrods, and studkits. Go to [www.sunhydraulics.com](http://www.sunhydraulics.com) for more product information. Model Codes printed in red are Preferred Products and are readily available.

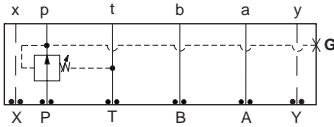
## ISO 07 / CETOP 7 REDUCING VALVES

## T-17A Cavity



All sandwich bodies shown below are 89,0 mm wide

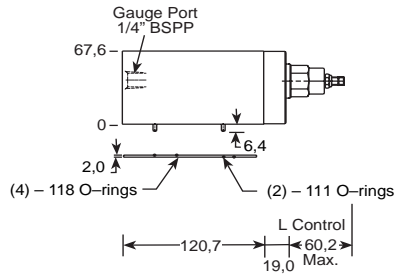
## PILOT OPERATED



Assembly Model Code\*

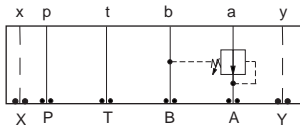
**PBHB-LAN-BKP/M**

\*Add modifier **/T** to order SG Iron for pressure rating over 210 bar.



## Function

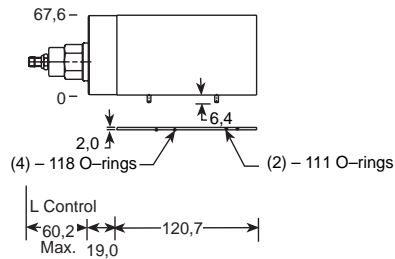
On **P** Drained to **T**



Assembly Model Code\*

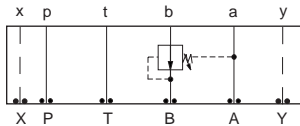
**PBHB-LAN-BKA**

\*Add modifier **/S** to order SG Iron for pressure rating over 210 bar.



## Function

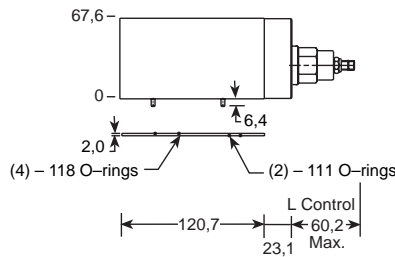
On **A** Drained to **B**



Assembly Model Code\*

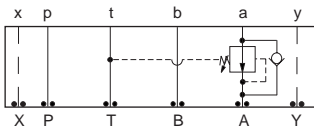
**PBHB-LAN-BKB**

\*Add modifier **/S** to order SG Iron for pressure rating over 210 bar.



## Function

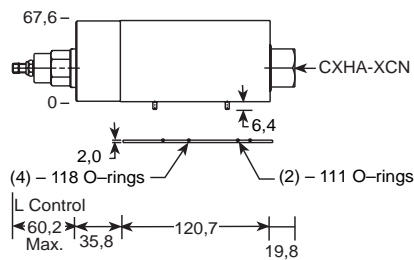
On **B** Drained to **A**



Assembly Model Code\*

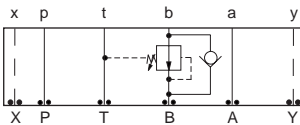
**PBHB-LAN-BK2**

\*Add modifier **/S** to order SG Iron for pressure rating over 210 bar.



## Function

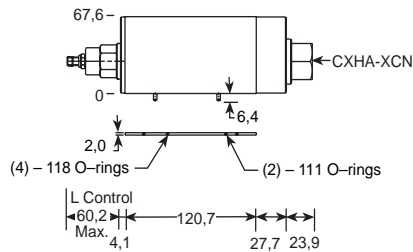
On **A** Drain to **T**  
(Reverse Free Flow Check)



Assembly Model Code\*

**PBHB-LAN-BKJ**

\*Add modifier **/S** to order SG Iron for pressure rating over 210 bar.



## Function

On **B** Drain to **T**  
(Reverse Free Flow Check)

NOTES: Page 34 for cartridge model PB\*B-\*\*\* and page 102 for CX\*A-\*\*\* shows performance curves, technical tips, and options.

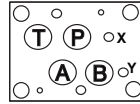
See page 140 for technical information about sandwich bodies including ISO interface patterns, mounting instructions, studrods, and studkits.

Go to [www.sunhydraulics.com](http://www.sunhydraulics.com) for more product information.

Model Codes printed in red are Preferred Products and are readily available.

**ISO 07 / CETOP 7 REDUCING / RELIEF VALVES**

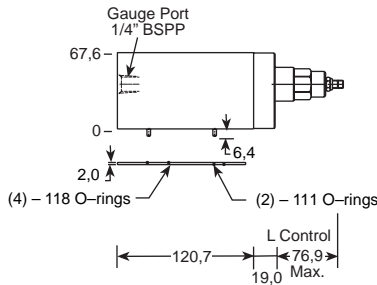
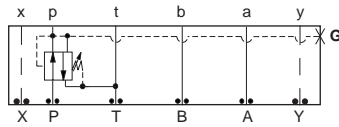
**T-17A Cavity**



All sandwich bodies shown below are 89,0 mm wide

**PILOT OPERATED**

**DIRECT ACTING**



**Function**

On **P** Tank to **T** Drained to **T**

Assembly Model Code\*

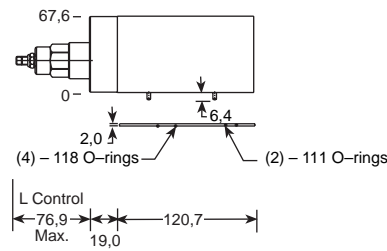
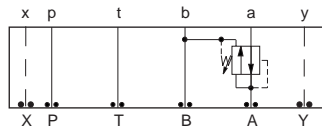
**PPHB-LAN-BKP/M**

\*Add modifier **/T** to order SG Iron for pressure rating over 210 bar.

Assembly Model Code\*

**PRHB-LAN-BKP/M**

\*Add modifier **/T** to order SG Iron for pressure rating over 210 bar.



**Function**

On **A** Tank to **B** Drained to **B**

Assembly Model Code\*

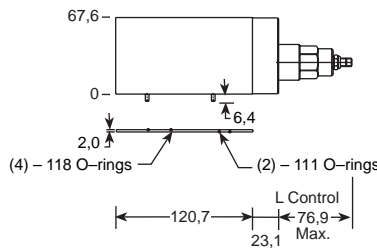
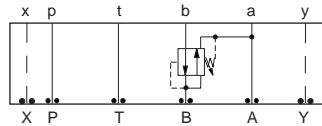
**PPHB-LAN-BKA**

\*Add modifier **/S** to order SG Iron for pressure rating over 210 bar.

Assembly Model Code\*

**PRHB-LAN-BKA**

\*Add modifier **/S** to order SG Iron for pressure rating over 210 bar.



**Function**

On **B** Tank to **A** Drained to **A**

Assembly Model Code\*

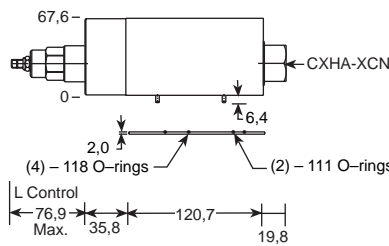
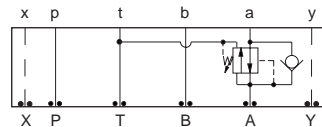
**PPHB-LAN-BKB**

\*Add modifier **/S** to order SG Iron for pressure rating over 210 bar.

Assembly Model Code\*

**PRHB-LAN-BKB**

\*Add modifier **/S** to order SG Iron for pressure rating over 210 bar.



**Function**

On **A** Tank to **T** Drained to **T**  
(Reverse Free Flow Check)

Assembly Model Code\*

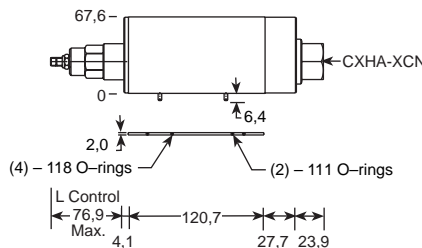
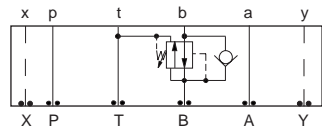
**PPHB-LAN-BK2**

\*Add modifier **/S** to order SG Iron for pressure rating over 210 bar.

Assembly Model Code\*

**PRHB-LAN-BK2**

\*Add modifier **/S** to order SG Iron for pressure rating over 210 bar.



**Function**

On **B** Tank to **T** Drained to **T**  
(Reverse Free Flow Check)

Assembly Model Code\*

**PPHB-LAN-BKJ**

\*Add modifier **/S** to order SG Iron for pressure rating over 210 bar.

Assembly Model Code\*

**PRHB-LAN-BKJ**

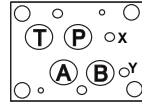
\*Add modifier **/S** to order SG Iron for pressure rating over 210 bar.

NOTES: Page 42 for cartridge models PP\*B-\*\*\* and PR\*B-\*\*\*, and page 102 for CX\*A-\*\*\* show performance curves, technical tips, and options. See page 140 for technical information about sandwich bodies including ISO interface patterns, mounting instructions, studrods, and studkits. Go to [www.sunhydraulics.com](http://www.sunhydraulics.com) for more product information.

Model Codes printed in red are Preferred Products and are readily available.

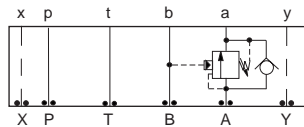
## ISO 07 / CETOP 7 COUNTERBALANCE VALVES

## T-17A Cavity



All sandwich bodies shown below are 89,0 mm wide

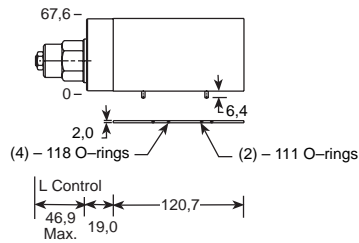
**PILOT RATIOS**  
3:1, 2:1 and 1.5:1



Assembly  
Model Code\*

**CBG\*-LHN-BKA**

\*Add modifier /S to order SG Iron for pressure rating over 210 bar.



**PILOT RATIOS**  
2.3:1, 4.5:1 and 10:1

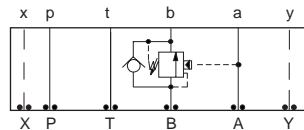
## Function

On A Pilot from B

Assembly  
Model Code\*

**CBG\*-LJN-BKA**

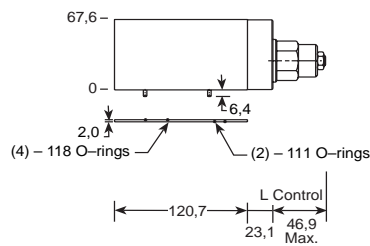
\*Add modifier /S to order SG Iron for pressure rating over 210 bar.



Assembly  
Model Code\*

**CBG\*-LHN-BKB**

\*Add modifier /S to order SG Iron for pressure rating over 210 bar.



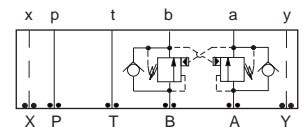
## Function

On B Pilot from A

Assembly  
Model Code\*

**CBG\*-LJN-BKB**

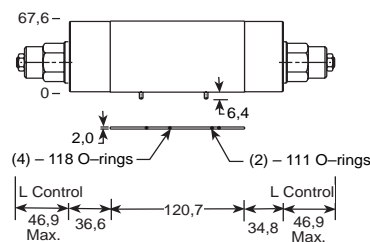
\*Add modifier /S to order SG Iron for pressure rating over 210 bar.



Assembly  
Model Code\*

**CBG\*-LHN-BKY**

\*Add modifier /S to order SG Iron for pressure rating over 210 bar.



## Function

On A and B (Cross-piloted)

Assembly  
Model Code\*

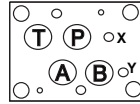
**CBG\*-LJN-BKY**

\*Add modifier /S to order SG Iron for pressure rating over 210 bar.

NOTES: Page 50 for cartridge model CB\*\*-\* show performance curves, technical tips, and options.  
See page 140 for technical information about sandwich bodies including ISO interface patterns, mounting instructions, studrods, and studkits.  
Go to [www.sunhydraulics.com](http://www.sunhydraulics.com) for more product information.  
Model Codes printed in red are Preferred Products and are readily available.

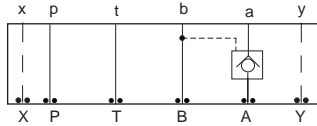
ISO 07 / CETOP 7 PILOT-TO-OPEN CHECK VALVES

T-17A Cavity



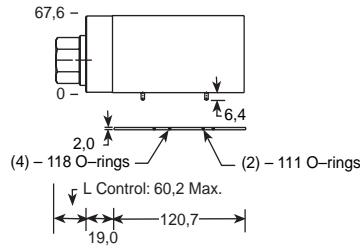
All sandwich bodies shown below are 89,0 mm wide

PILOT OPERATED

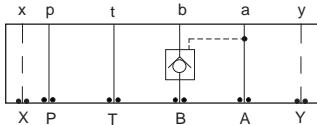


Assembly Model Code\*  
**CKGB-XCN-BKA**

\*Add modifier /S to order SG Iron for pressure rating over 210 bar.

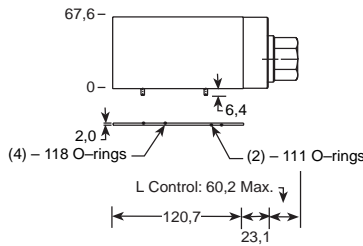


Function  
On A Pilot from B

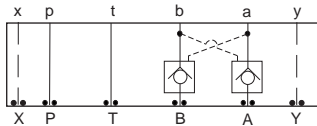


Assembly Model Code\*  
**CKGB-XCN-BKB**

\*Add modifier /S to order SG Iron for pressure rating over 210 bar.

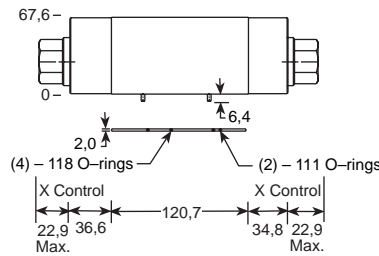


Function  
On B Pilot from A



Assembly Model Code\*  
**CKGB-XCN-BKY**

\*Add modifier /S to order SG Iron for pressure rating over 210 bar.



Function  
On A and B (Cross-piloted)

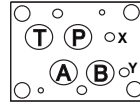
NOTES: Page 78 for cartridge model CK\*\*.\* show performance curves, technical tips, and options.  
See page 140 for technical information about sandwich bodies including ISO interface patterns, mounting instructions, studrods, and studkits.  
Go to [www.sunhydraulics.com](http://www.sunhydraulics.com) for more product information.  
Model Codes printed in red are Preferred Products and are readily available.

**Sandwich Assemblies**

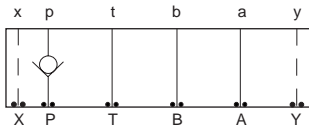
**ISO 07 / CETOP 7 CHECK VALVES**

**T-5A/T-16A Cavity**

All sandwich bodies shown below are 89,0 mm wide



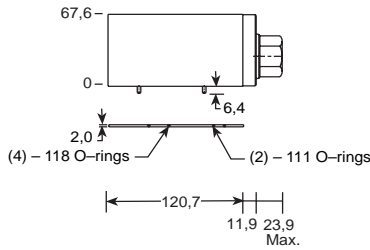
**CHECK VALVE**



Assembly Model Code\*

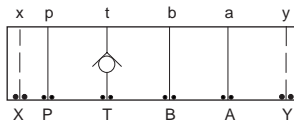
**CXHA-XCN-DKP**

\*Add modifier /S to order SG Iron for pressure rating over 210 bar.



**Function**

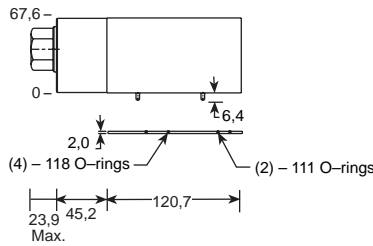
On P



Assembly Model Code\*

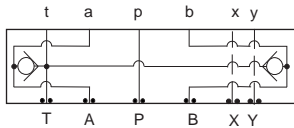
**CXHA-XCN-DKT**

\*Add modifier /S to order SG Iron for pressure rating over 210 bar.



**Function**

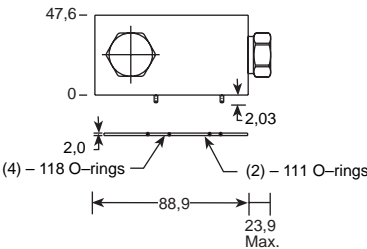
On T Free Flow Out of Valve



Assembly Model Code\*

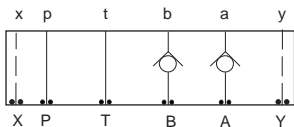
**CXFA-XAN-DKX**

\*Add modifier /S to order SG Iron for pressure rating over 210 bar.



**Function**

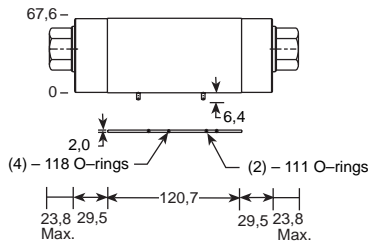
T to A and B



Assembly Model Code\*

**CXHA-XCN-DKZ**

\*Add modifier /S to order SG Iron for pressure rating over 210 bar.



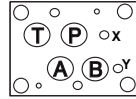
**Function**

On A and B, Free Flow Out of Valve

NOTES: Page 102 for cartridge models CX\*A-\*\*\* show performance curves, technical tips, and options. See page 140 for technical information about sandwich bodies including ISO interface patterns, mounting instructions, studrods, and studkits. Go to [www.sunhydraulics.com](http://www.sunhydraulics.com) for more product information. Model Codes printed in red are Preferred Products and are readily available.

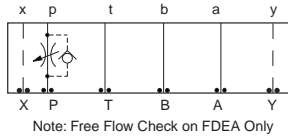
ISO 07 / CETOP 7 FLOW CONTROL VALVES

T-16A Cavity



All sandwich bodies shown below are 89,0 mm wide

FULLY ADJUSTABLE NEEDLE

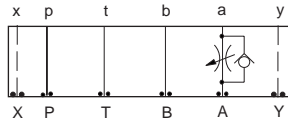


Note: Free Flow Check on FDEA Only

Assembly Model Code\*  
**NFEC-LEN-DKP**

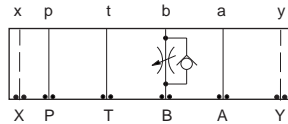
\*Add modifier /S to order SG Iron for pressure rating over 210 bar.

FULLY ADJUSTABLE NEEDLE WITH FREE FLOW CHECK



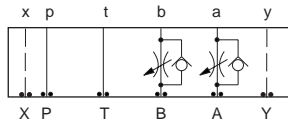
Assembly Model Code\*  
**NCFB-L\*N-DKA**

\*Add modifier /S to order SG Iron for pressure rating over 210 bar.



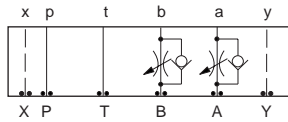
Assembly Model Code\*  
**NCFB-L\*N-DKB**

\*Add modifier /S to order SG Iron for pressure rating over 210 bar.



Assembly Model Code\*  
**NCFB-L\*N-DKY**

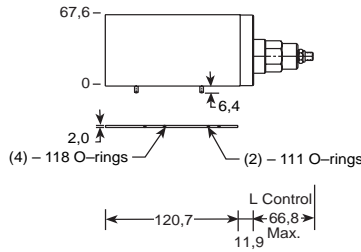
\*Add modifier /S to order SG Iron for pressure rating over 210 bar.



Assembly Model Code\*  
**NCFB-L\*N-DKZ**

\*Add modifier /S to order SG Iron for pressure rating over 210 bar.

FULLY ADJUSTABLE PRESSURE COMPENSATED WITH FREE FLOW CHECK

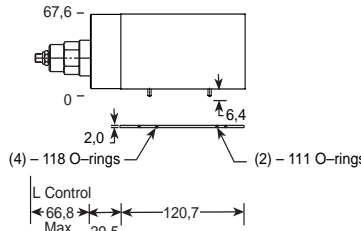


Function  
Meter-In P

Assembly Model Code\*  
**FDEA-LAN-DKP**

\*Add modifier /S to order SG Iron for pressure rating over 210 bar.

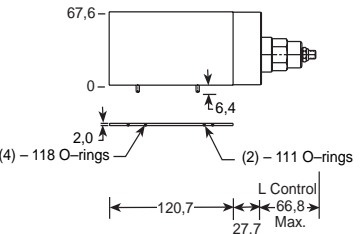
Function  
Meter-Out A



Assembly Model Code\*  
**FDEA-LAN-DKA**

\*Add modifier /S to order SG Iron for pressure rating over 210 bar.

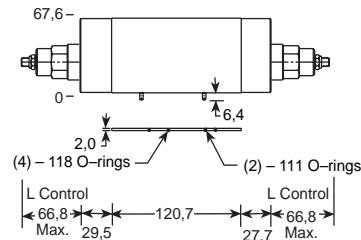
Function  
Meter-Out B



Assembly Model Code\*  
**FDEA-LAN-DKB**

\*Add modifier /S to order SG Iron for pressure rating over 210 bar.

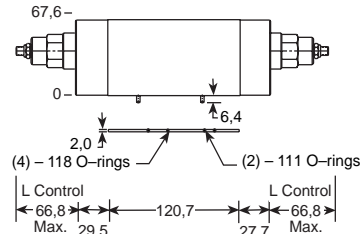
Function  
Meter-Out A and B



Assembly Model Code\*  
**FDEA-LAN-DKY**

\*Add modifier /S to order SG Iron for pressure rating over 210 bar.

Function  
Meter-In A and B



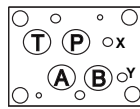
Assembly Model Code\*  
**FDEA-LAN-DKZ**

\*Add modifier /S to order SG Iron for pressure rating over 210 bar.

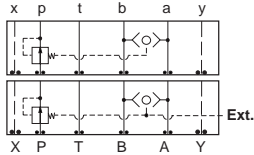
NOTES: Page 110 for cartridge models NF\*C-\*\*\* and NC\*B-\*\*\*, and page 126 for FD\*A show performance curves, technical tips, and options. See page 140 for technical information about sandwich bodies including ISO interface patterns, mounting instructions, studrods, and studkits. Go to [www.sunhydraulics.com](http://www.sunhydraulics.com) for more product information. Model Codes printed in red are Preferred Products and are readily available.

# ISO 07 / CETOP 7 CIRCUIT SAVER VALVES (PRESSURE COMPENSATOR / REGENERATIVE)

## T-13A Cavity/T-17A Cavity



All sandwich bodies shown below are 89,0 mm wide



External Shuttle Port

Assembly Model Code\*

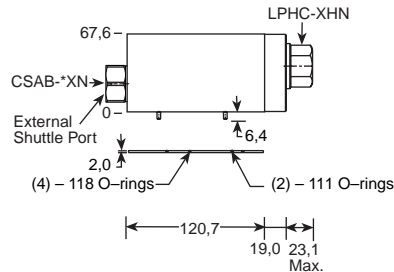
None

**YFFE-XHN-AB**

1/4 BSPP

**YFFF-XHN-AB/M**

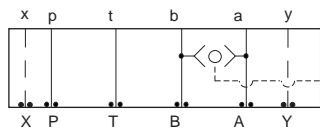
\*Add modifier **/T** to order SG Iron for pressure rating over 210 bar. Add modifier **/S** to order SG Iron for YFFE.



### Function

YFFE: Pressure Compensator (Restrictive)

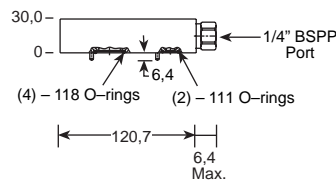
YFFF: With Load Sensing Pressure Compensator (Restrictive)



Assembly Model Code\*

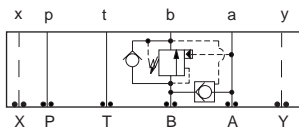
**CSAA-BXN-DKS**

\*Add modifier **/S** to order SG Iron for pressure rating over 210 bar.



### Function

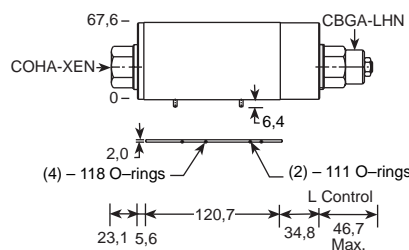
Shuttle A and B (Output External)



Assembly Model Code\*

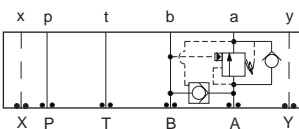
**YDFG-LHN-AB**

\*Add modifier **/S** to order SG Iron for pressure rating over 210 bar.



### Function

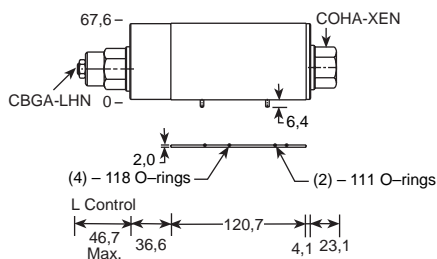
B to A Regenerative



Assembly Model Code\*

**YDFE-LHN-AB**

\*Add modifier **/S** to order SG Iron for pressure rating over 210 bar.



### Function

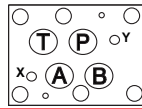
A to B Regenerative

NOTES: Page 50 for cartridge model CB\*A-\*\*\* shows performance curves, technical tips, and options.  
See page 140 for technical information about sandwich bodies including ISO interface patterns, mounting instructions, studrods, and studkits.  
Go to [www.sunhydraulics.com](http://www.sunhydraulics.com) for more product information.



**ISO 08 / CETOP 8 RELIEF VALVES**  
**(SIDE PORTED SUBPLATE / REAR PORTED SUBPLATE / SIDE PORTED SUBPLATE WITH GASKET MOUNTED TANK PORT)**

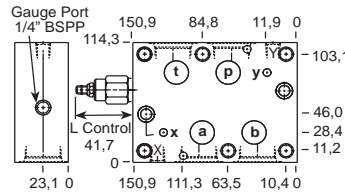
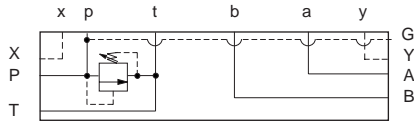
**T-3A Cavity**



All subplates shown below are 150,9 mm wide

**PILOT OPERATED**

**DIRECT ACTING**



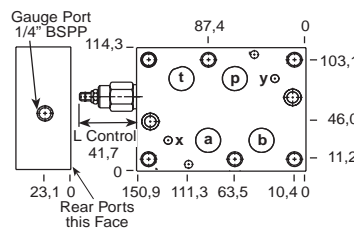
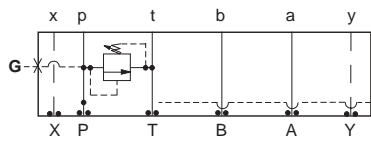
**Function**  
**P to T (Side Ports)**

Ports A, B, P, T	Ports X, Y	Assembly Model Code*
1" BSPP	1/4" BSPP	<b>RPGC-LAN-CSX</b>

Ports A, B, P, T	Ports X, Y	Assembly Model Code*
1" BSPP	1/4" BSPP	<b>RDFA-LAN-CSX</b>

\*Add modifier /S to order SG Iron for pressure rating over 210 bar.

\*Add modifier /S to order SG Iron for pressure rating over 210 bar.



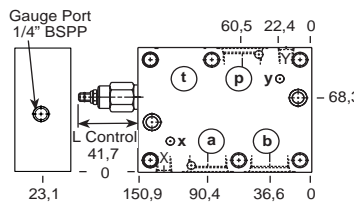
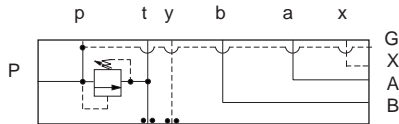
**Function**  
**P to T (Rear Ports)**

Ports A, B, P, T	Ports X, Y	Assembly Model Code*
1" BSPP	1/4" BSPP	<b>RPGC-LAN-CRX</b>

Ports A, B, P, T	Ports X, Y	Assembly Model Code*
1" BSPP	1/4" BSPP	<b>RDFA-LAN-CRX</b>

\*Add modifier /S to order SG Iron for pressure rating over 210 bar.

\*Add modifier /S to order SG Iron for pressure rating over 210 bar.



**Function**  
**P to T**  
**(Gasket Mounted T and Y Port, other Ports on side)**

Ports A, B, P	Ports X, Y	Assembly Model Code*
1" BSPP	1/4" BSPP	<b>RPGC-LAN-CTS</b>

Ports A, B, P, T	Ports X, Y	Assembly Model Code*
1" BSPP	1/4" BSPP	<b>RDFA-LAN-CTS</b>

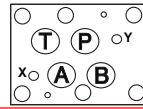
\*Add modifier /S to order SG Iron for pressure rating over 210 bar.

\*Add modifier /S to order SG Iron for pressure rating over 210 bar.

NOTES: Page 2 for cartridge models RP\*C-\*\*\* and RD\*A-\*\*\* show performance curves, technical tips, and options.  
 See page 140 for technical information about sandwich bodies including ISO interface patterns, mounting instructions, studrods, and studkits.  
 Go to [www.sunhydraulics.com](http://www.sunhydraulics.com) for more product information.  
 Model Codes printed in red are Preferred Products and are readily available.

ISO 08 / CETOP 8 RELIEF VALVES

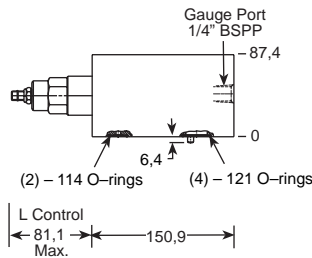
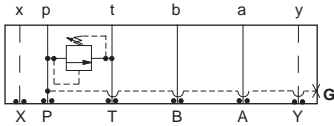
T-16A Cavity



All sandwich bodies shown below are 114,3 mm wide

PILOT OPERATED

DIRECT ACTING



Function

P to T (High Capacity)

Assembly Model Code\*

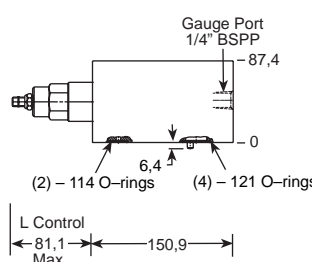
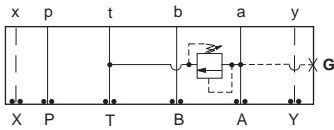
**RPIC-LAN-CDO/M**

\*Add modifier **/T** to order SG Iron for pressure rating over 210 bar.

Assembly Model Code\*

**RDHA-LAN-CDO/M**

\*Add modifier **/T** to order SG Iron for pressure rating over 210 bar.



Function

A to T (High Capacity)

Assembly Model Code\*

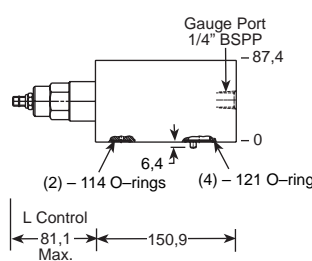
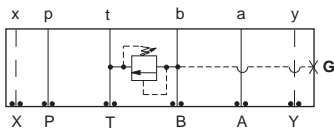
**RPIC-LAN-CDC/M**

\*Add modifier **/T** to order SG Iron for pressure rating over 210 bar.

Assembly Model Code\*

**RDHA-LAN-CDC/M**

\*Add modifier **/T** to order SG Iron for pressure rating over 210 bar.



Function

B to T (High Capacity)

Assembly Model Code\*

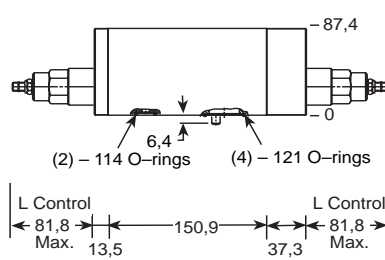
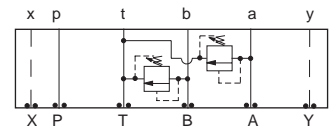
**RPIC-LAN-CDD/M**

\*Add modifier **/T** to order SG Iron for pressure rating over 210 bar.

Assembly Model Code\*

**RDHA-LAN-CDD/M**

\*Add modifier **/T** to order SG Iron for pressure rating over 210 bar.



Function

A and B to T (High Capacity)

Assembly Model Code\*

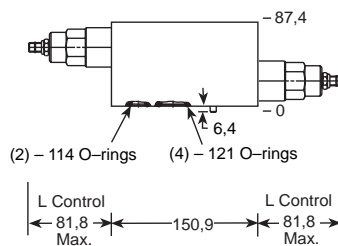
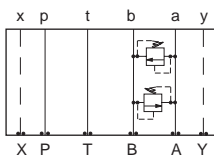
**RPIC-LAN-CDZ**

\*Add modifier **/S** to order SG Iron for pressure rating over 210 bar.

Assembly Model Code\*

**RDHA-LAN-CDZ**

\*Add modifier **/S** to order SG Iron for pressure rating over 210 bar.



Function

A to B and B to A (High Capacity) (Cross-port)

Assembly Model Code\*

**RPIC-LAN-CDW**

\*Add modifier **/S** to order SG Iron for pressure rating over 210 bar.

Assembly Model Code\*

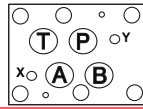
**RDHA-LAN-CDW**

\*Add modifier **/S** to order SG Iron for pressure rating over 210 bar.

NOTES: Page 2 for cartridge models RP\*C-\*\*\* and RD\*A-\*\*\* show performance curves, technical tips, and options.  
 See page 140 for technical information about sandwich bodies including ISO interface patterns, mounting instructions, studrods, and studkits.  
 Go to [www.sunhydraulics.com](http://www.sunhydraulics.com) for more product information.  
 Model Codes printed in red are Preferred Products and are readily available.

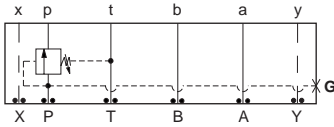
ISO 08 / CETOP 8 SEQUENCE VALVES

T-17A Cavity



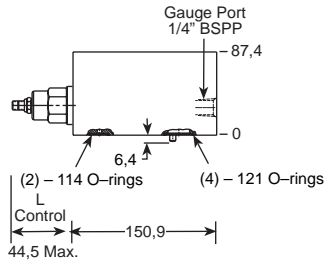
All sandwich bodies shown below are 114,3 mm wide

PILOT OPERATED

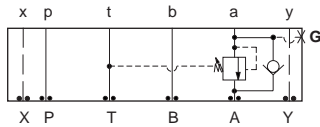


Assembly Model Code\*  
**RSHC-LAN-HBW/M**

\*Add modifier **T** to order SG Iron for pressure rating over 210 bar.

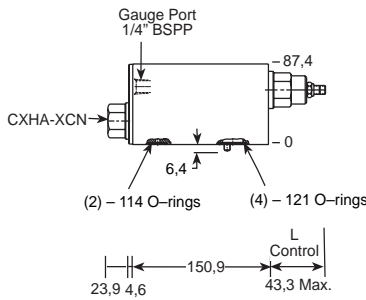


Function  
In to **P**

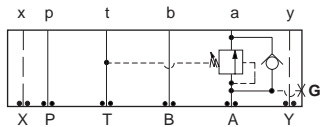


Assembly Model Code\*  
**RSHC-LAN-HB4/M**

\*Add modifier **T** to order SG Iron for pressure rating over 210 bar.

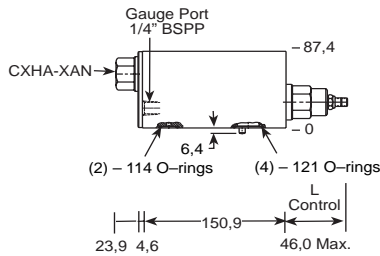


Function  
In to **A** (Reverse Free Flow Check)

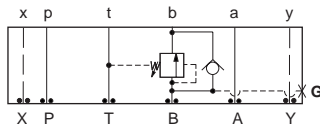


Assembly Model Code\*  
**RSHC-LAN-HB6/M**

\*Add modifier **T** to order SG Iron for pressure rating over 210 bar.

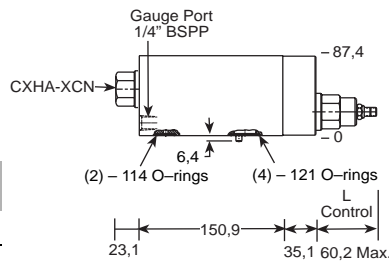


Function  
Out of **A** (Reverse Free Flow Check)



Assembly Model Code\*  
**RSHC-LAN-HB7/M**

\*Add modifier **T** to order SG Iron for pressure rating over 210 bar.



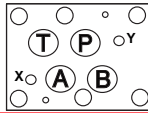
Function  
Out of **B** (Reverse Free Flow Check)

NOTES: Pages 20 for cartridge models RS\*C-\*\*\* and page 102 for CX\*A-A-\*\*\* show performance curves, technical tips, and options. See page 140 for technical information about sandwich bodies including ISO interface patterns, mounting instructions, studrods, and studkits. Go to [www.sunhydraulics.com](http://www.sunhydraulics.com) for more product information. Model Codes printed in red are Preferred Products and are readily available.

**Sandwich Assemblies**

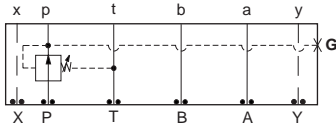
**ISO 08 / CETOP 8 REDUCING VALVES**

**T-19A Cavity/T-17A Cavity**



All sandwich bodies shown below are 114,3 mm wide

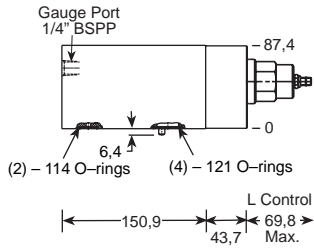
**PILOT OPERATED**



Assembly Model Code\*

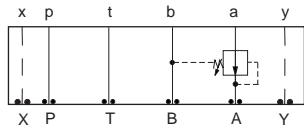
**PBJB-LAN-HBO/M**

\*Add modifier **T** to order SG Iron for pressure rating over 210 bar.



**Function**

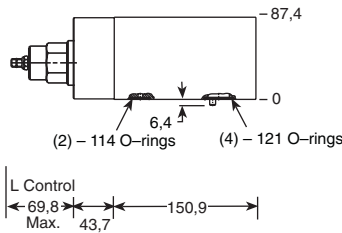
On P Drained to T (High Capacity)



Assembly Model Code\*

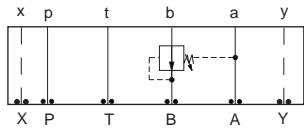
**PBJB-LAN-HBA**

\*Add modifier **S** to order SG Iron for pressure rating over 210 bar.



**Function**

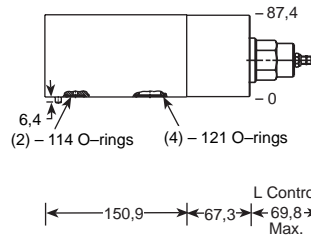
On A Drained to B (High Capacity)



Assembly Model Code\*

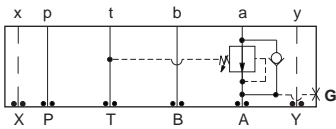
**PBJB-LAN-HBB**

\*Add modifier **S** to order SG Iron for pressure rating over 210 bar.



**Function**

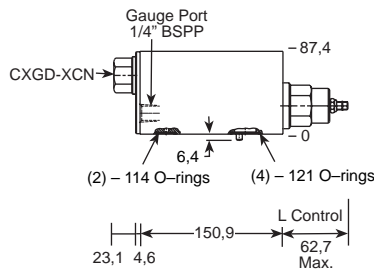
On B Drained to A (High Capacity)



Assembly Model Code\*

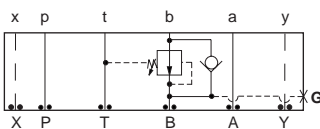
**PBHB-LAN-HBK/M**

\*Add modifier **T** to order SG Iron for pressure rating over 210 bar.



**Function**

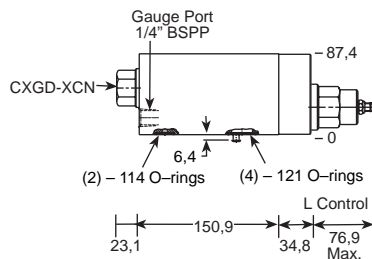
On A Drain to T (Reverse Free Flow Check)



Assembly Model Code\*

**PBHB-LAN-HBJ/M**

\*Add modifier **T** to order SG Iron for pressure rating over 210 bar.



**Function**

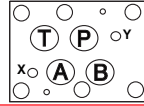
On B Drain to T (Reverse Free Flow Check)

NOTES: Page 34 for cartridge model PBJB-\*\*\* and page 102 for CX\*D-\*\*\* show performance curves, technical tips, and options. See page 140 for technical information about sandwich bodies including ISO interface patterns, mounting instructions, studrods, and studkits. Go to [www.sunhydraulics.com](http://www.sunhydraulics.com) for more product information.

Model Codes printed in red are Preferred Products and are readily available.

ISO 08 / CETOP 8 REDUCING / RELIEF VALVES

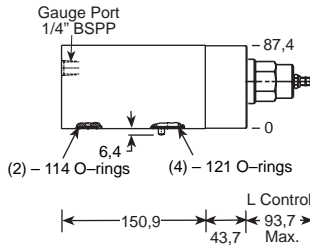
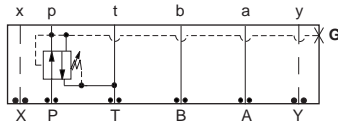
T-19A Cavity/T-17A Cavity



All sandwich bodies shown below are 114,3 mm wide

PILOT OPERATED

DIRECT ACTING



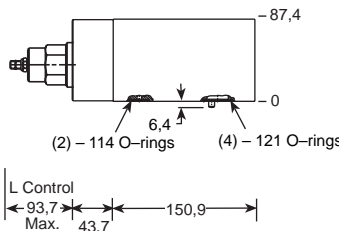
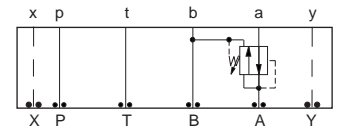
**Function**  
On P Tank to T Drained to T (High Capacity)

Assembly Model Code\*  
**PPJB-LAN-HBO/M**

Assembly Model Code\*  
**PRJB-LAN-HBO/M**

\*Add modifier /T to order SG Iron for pressure rating over 210 bar.

\*Add modifier /S to order SG Iron for pressure rating over 210 bar.



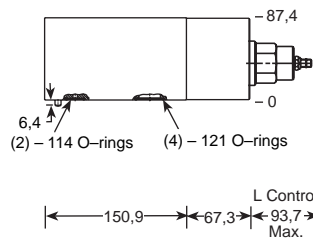
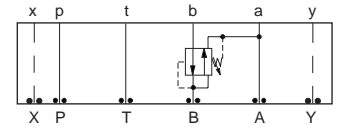
**Function**  
On A Tank to B Drained to B (High Capacity)

Assembly Model Code\*  
**PPJB-LAN-HBA**

Assembly Model Code\*  
**PRJB-LAN-HBA**

\*Add modifier /S to order SG Iron for pressure rating over 210 bar.

\*Add modifier /S to order SG Iron for pressure rating over 210 bar.



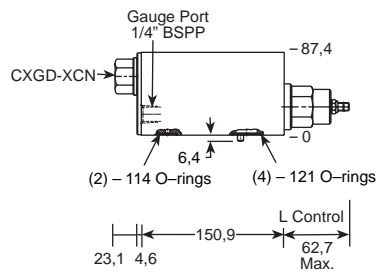
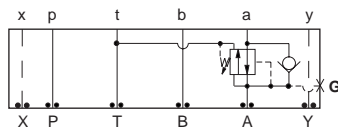
**Function**  
On B Tank to A Drained to A (High Capacity)

Assembly Model Code\*  
**PPJB-LAN-HBB**

Assembly Model Code\*  
**PRJB-LAN-HBB**

\*Add modifier /S to order SG Iron for pressure rating over 210 bar.

\*Add modifier /S to order SG Iron for pressure rating over 210 bar.



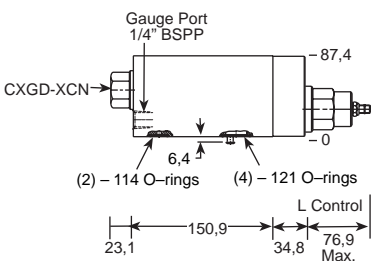
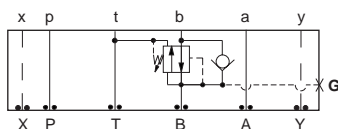
**Function**  
On A Tank to T Drained to T (Reverse Free Flow Check)

Assembly Model Code\*  
**PPHB-LAN-HBK/M**

Assembly Model Code\*  
**PRHB-LAN-HBK/M**

\*Add modifier /T to order SG Iron for pressure rating over 210 bar.

\*Add modifier /T to order SG Iron for pressure rating over 210 bar.



**Function**  
On B Tank to T Drained to T (Reverse Free Flow Check)

Assembly Model Code\*  
**PPHB-LAN-HBJ/M**

Assembly Model Code\*  
**PRHB-LAN-HBJ/M**

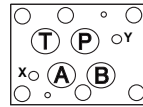
\*Add modifier /T to order SG Iron for pressure rating over 210 bar.

\*Add modifier /T to order SG Iron for pressure rating over 210 bar.

NOTES: Page 42 for cartridge model PP\*B-\*\*\* and PR\*B-\*\*\*, and page 102 for CX\*D-\*\*\* shows performance curves, technical tips, and options. See page 140 for technical information about sandwich bodies including ISO interface patterns, mounting instructions, studrods, and studkits. Go to [www.sunhydraulics.com](http://www.sunhydraulics.com) for more product information. Model Codes printed in red are Preferred Products and are readily available.

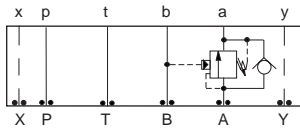
## ISO 08 / CETOP 8 COUNTERBALANCE VALVES

## T-19A Cavity



All sandwich bodies shown below are 114,3 mm wide

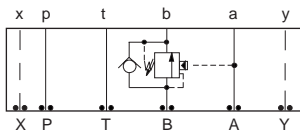
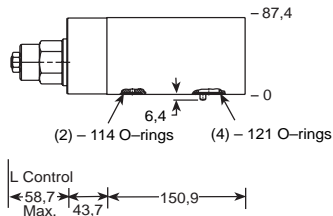
**PILOT RATIOS**  
3:1, 1.5:1 and 2:1



Assembly  
Model Code\*

**CBI\*-LHN-HBA**

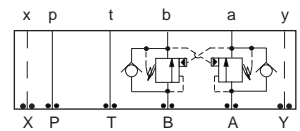
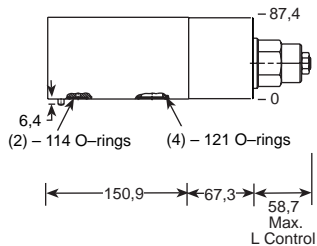
\*Add modifier /S to order SG Iron for pressure rating over 210 bar.



Assembly  
Model Code\*

**CBI\*-LHN-HBB**

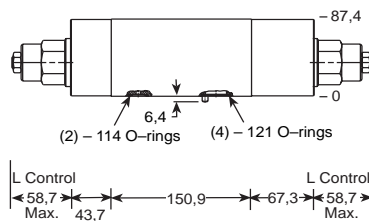
\*Add modifier /S to order SG Iron for pressure rating over 210 bar.



Assembly  
Model Code\*

**CBI\*-LHN-HBY**

\*Add modifier /S to order SG Iron for pressure rating over 210 bar.



**PILOT RATIOS**  
2.3:1, 4.5:1 and 10:1

## Function

On A Pilot from B (High Capacity)

Assembly  
Model Code\*

**CBI\*-LJN-HBA**

\*Add modifier /S to order SG Iron for pressure rating over 210 bar.

## Function

On B Pilot from A (High Capacity)

Assembly  
Model Code\*

**CBI\*-LJN-HBB**

\*Add modifier /S to order SG Iron for pressure rating over 210 bar.

## Function

On A and B  
(Cross-Piloted) (High Capacity)

Assembly  
Model Code\*

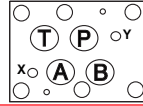
**CBI\*-LJN-HBY**

\*Add modifier /S to order SG Iron for pressure rating over 210 bar.

NOTES: Page 50 for cartridge model CB\*\*-\* show performance curves, technical tips, and options.  
See page 140 for technical information about sandwich bodies including ISO interface patterns, mounting instructions, studrods, and studkits.  
Go to [www.sunhydraulics.com](http://www.sunhydraulics.com) for more product information.  
Model Codes printed in red are Preferred Products and are readily available.

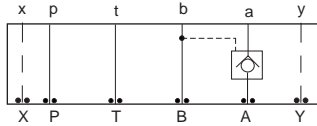
ISO 08 / CETOP 8 PILOT-TO-OPEN CHECK VALVES

T-19A Cavity



All sandwich bodies shown below are 114,3 mm wide

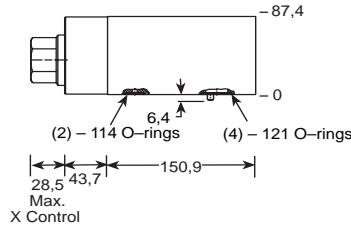
PILOT OPERATED



Assembly Model Code\*

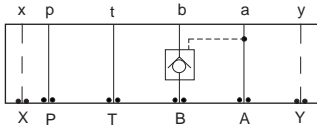
**CKIB-XCN-HBA**

\*Add modifier /S to order SG Iron for pressure rating over 210 bar.



Function

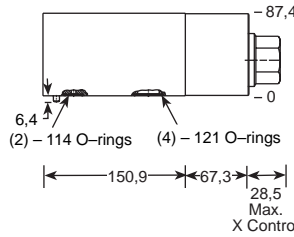
On A Pilot from B (High Capacity)



Assembly Model Code\*

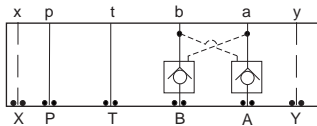
**CKIB-XCN-HBB**

\*Add modifier /S to order SG Iron for pressure rating over 210 bar.



Function

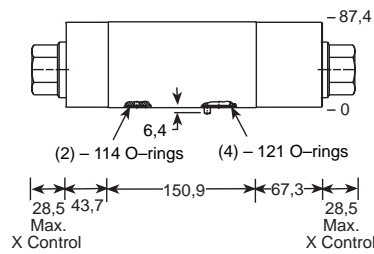
On B Pilot from A (High Capacity)



Assembly Model Code\*

**CKIB-XCN-HBY**

\*Add modifier /S to order SG Iron for pressure rating over 210 bar.



Function

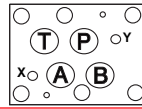
On A and B Cross-Piloted (High Capacity)

NOTES: Page 78 for cartridge model CK\*\*-\*\*\* show performance curves, technical tips, and options. See page 140 for technical information about sandwich bodies including ISO interface patterns, mounting instructions, studrods, and studkits. Go to [www.sunhydraulics.com](http://www.sunhydraulics.com) for more product information. Model Codes printed in red are Preferred Products and are readily available.

**Sandwich Assemblies**

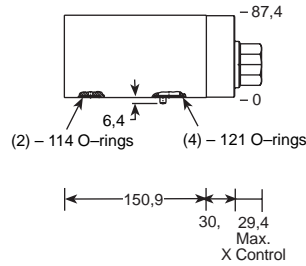
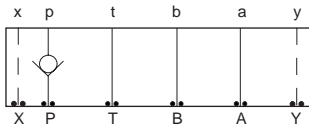
**ISO 08 / CETOP 8 CHECK VALVES**

**T-18A Cavity/T-16A Cavity**



All sandwich bodies shown below are 114,3 mm wide

**CHECK VALVE**



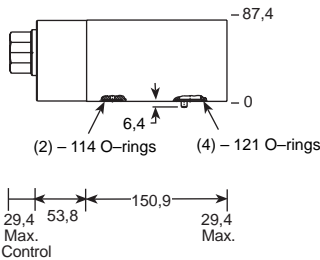
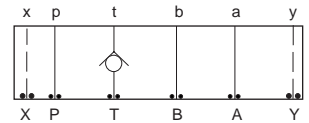
**Function**

On **P** (High Capacity)

Assembly Model Code\*

**CXJA-XCN-IBO**

\*Add modifier **/S** to order SG Iron for pressure rating over 210 bar.



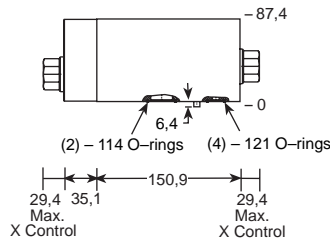
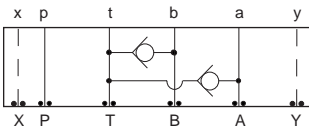
**Function**

On **T** (High Capacity)

Assembly Model Code\*

**CXJA-XCN-IBV**

\*Add modifier **/S** to order SG Iron for pressure rating over 210 bar.



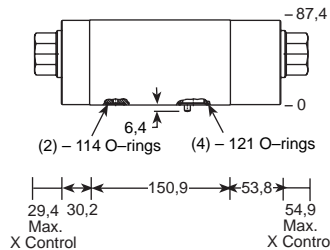
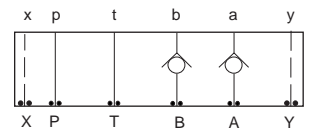
**Function**

**T to A and B**

Assembly Model Code\*

**CXHA-XAN-CDV**

\*Add modifier **/S** to order SG Iron for pressure rating over 210 bar.



**Function**

On **A** and **B** Free Flow Out of Valve (High Capacity)

Assembly Model Code\*

**CXJA-XCN-IBZ**

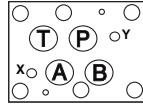
\*Add modifier **/S** to order SG Iron for pressure rating over 210 bar.

NOTES: Page 102 for cartridge model CX\*A-\*\*\* shows performance curves, technical tips, and options. See page 140 for technical information about sandwich bodies including ISO interface patterns, mounting instructions, studrods, and studkits. Go to [www.sunhydraulics.com](http://www.sunhydraulics.com) for more product information. Model Codes printed in red are Preferred Products and are readily available.



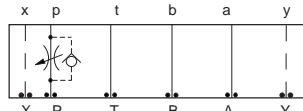
**ISO 08 / CETOP 8 FLOW CONTROL VALVES**

**T-18A Cavity**



All sandwich bodies shown below are 114,3 mm wide

**FULLY ADJUSTABLE NEEDLE**

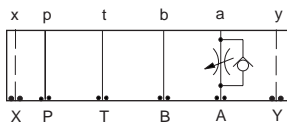


Note: Free Flow Check on FDFA Only

Assembly Model Code\*  
**NFFC-LGN-IBO**

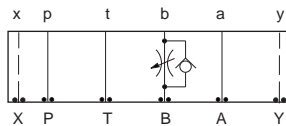
\*Add modifier /S to order SG Iron for pressure rating over 210 bar.

**FULLY ADJUSTABLE NEEDLE WITH FREE FLOW CHECK**



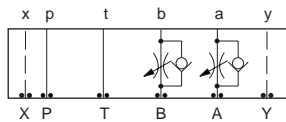
Assembly Model Code\*  
**NCGB-LCN-IBE**

\*Add modifier /S to order SG Iron for pressure rating over 210 bar.



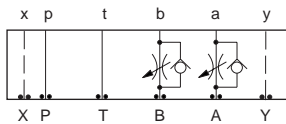
Assembly Model Code\*  
**NCGB-LCN-IBF**

\*Add modifier /S to order SG Iron for pressure rating over 210 bar.



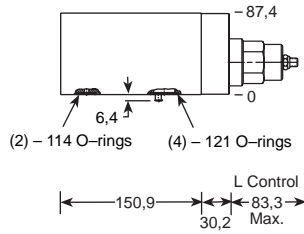
Assembly Model Code\*  
**NCGB-LCN-IBZ**

\*Add modifier /S to order SG Iron for pressure rating over 210 bar.



Assembly Model Code\*  
**NCGB-LCN-IBY**

\*Add modifier /S to order SG Iron for pressure rating over 210 bar.



**FULLY ADJUSTABLE PRESSURE COMPENSATED WITH FREE FLOW CHECK**

**Function**  
Meter-In **P** (High Capacity)

Assembly Model Code\*  
**FDFA-LAN-IBO**

\*Add modifier /S to order SG Iron for pressure rating over 210 bar.

**Function**  
Meter-Out **A** (High Capacity)

Assembly Model Code\*  
**FDFA-LAN-IBE**

\*Add modifier /S to order SG Iron for pressure rating over 210 bar.

**Function**  
Meter-Out **B** (High Capacity)

Assembly Model Code\*  
**FDFA-LAN-IBF**

\*Add modifier /S to order SG Iron for pressure rating over 210 bar.

**Function**  
Meter-In **A and B** (High Capacity)

Assembly Model Code\*  
**FDFA-LAN-IBZ**

\*Add modifier /S to order SG Iron for pressure rating over 210 bar.

**Function**  
Meter-Out **A and B** (High Capacity)

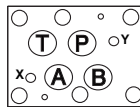
Assembly Model Code\*  
**FDFA-LAN-IBY**

\*Add modifier /S to order SG Iron for pressure rating over 210 bar.

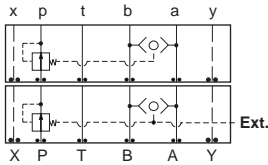
NOTES: Page 110 for cartridge model NC\*B-\*\*\* and page 126 for FD\*A-\*\*\* show performance curves, technical tips, and options. See page 140 for technical information about sandwich bodies including ISO interface patterns, mounting instructions, studrods, and studkits. Go to [www.sunhydraulics.com](http://www.sunhydraulics.com) for more product information. Model Codes printed in red are Preferred Products and are readily available.

# ISO 08 / CETOP 8 CIRCUIT SAVER VALVES (PRESSURE COMPENSATOR / LOAD SENSING / REGENERATIVE)

## T-13A Cavity/T-19A Cavity



All sandwich bodies shown below are 114,3 mm wide



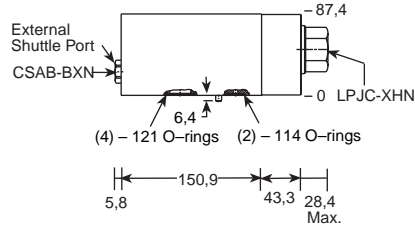
External Shuttle Port

Assembly Model Code\*

1/4" BSPP

YFIB-XHN-CA/M

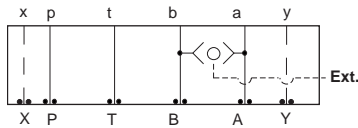
\*Add modifier **T** to order SG Iron for pressure rating on YFIB over 210 bar. Add **/S** for YFIA.



### Function

YFIA: Pressure Compensator (Restrictive)

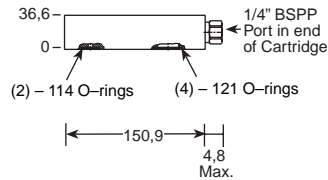
YFIB: Pressure Compensator (Restrictive) with Load-Sensing Port



Assembly Model Code\*

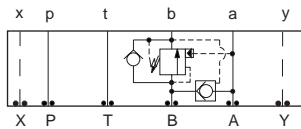
CSAA-BXN-IBS

\*Add modifier **/S** to order SG Iron for pressure rating over 210 bar.



### Function

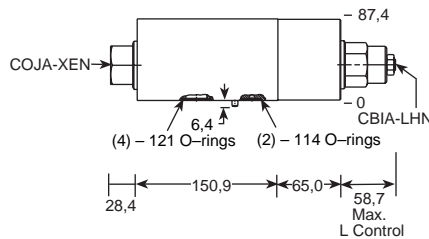
Shuttle A and B (Output External)



Assembly Model Code\*

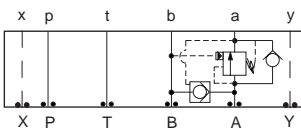
YDGF-LHN-CA

\*Add modifier **/S** to order SG Iron for pressure rating over 210 bar.



### Function

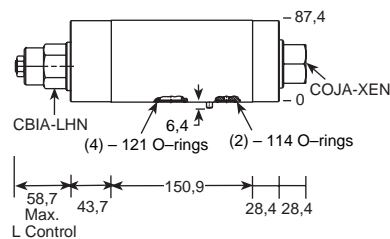
B to A Regenerative (High Capacity)



Assembly Model Code\*

YDGE-LHN-CA

\*Add modifier **/S** to order SG Iron for pressure rating over 210 bar.



### Function

A to B Regenerative (High Capacity)

NOTES: Page 50 for cartridge model CB\*A-\*\*\* shows performance curves, technical tips, and options.

See page 140 for technical information about sandwich bodies including ISO interface patterns, mounting instructions, studrods, and studkits.

Go to [www.sunhydraulics.com](http://www.sunhydraulics.com) for more product information.

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## TECHNICAL PRODUCT INFORMATION

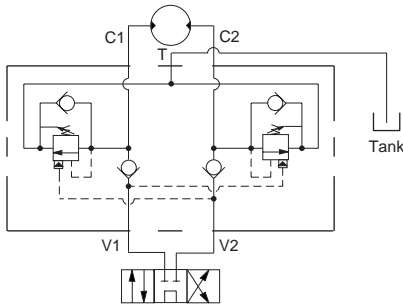
### CUSHION LOCK VALVES

#### Applications

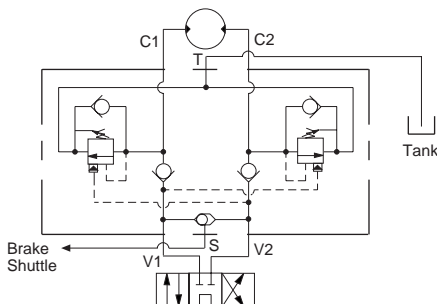
The cushion lock circuit is used to control the acceleration, and deceleration of reciprocating or rotary reversing circuits. Most slewing type circuits have inertia loads and it is important that there is a facility to ensure that during operation there is good control of the motion. The cushion lock provides this type of control using counterbalance valves as both a relief for acceleration and providing a braking resistance during deceleration.

Sun offers four basic types of cushion lock valves:

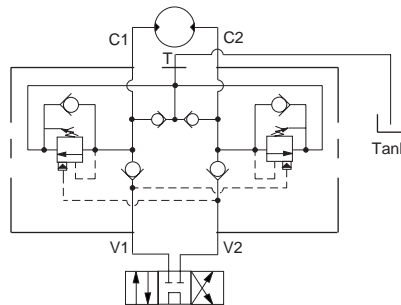
1. The basic dual counterbalance valve assembly with the check valves in supply lines and separate tank return line.



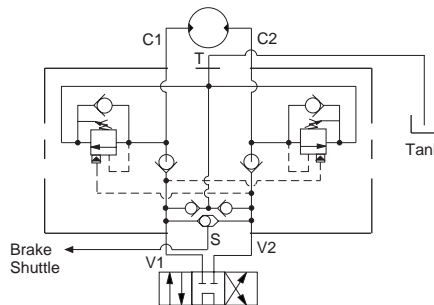
2. The basic assembly as above but with a shuttle valve to release a spring-applied mechanical brake.



3. The assembly that incorporates the same features as version 1. but with additional anti-cavitation check valves from the external tank line to the service lines.



4. The assembly as in version 3. but with a shuttle valve to release a spring-applied mechanical brake.



#### Design Concepts and Features

The use of counterbalance valves provides smooth control of the motion because the valves are modulating load control valves.

The valves are also seated so provide good load locking capability, although on most motor applications a mechanical brake supplements this because there is always leakage across the motor.

A wide range of pilot ratios and pressure ratings are available for the counterbalance valves to enable the most suitable valves to be selected for the application.

The check valves used for anti-cavitation have low cracking pressure of 0,4 bar to create the least resistance.

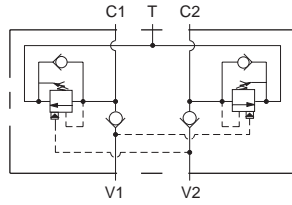
The valves are also available in CETOP sandwiches or could be made in custom manifolds to suit a particular application.

Standard Assemblies: Cushion Lock Valves

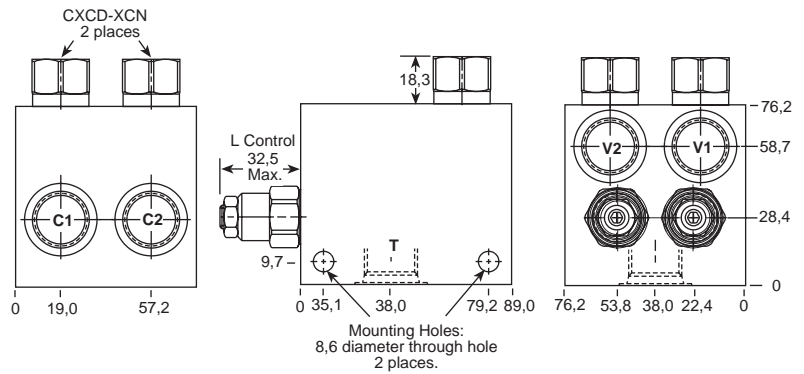
**DUAL LOAD CONTROL APPLICATIONS  
(TWO CAVITY WITH CHECKS)**

**PILOT RATIOS  
1.5:1, 2:1, 2.3:1, 3:1, 4.5:1, 10:1**

**0-60 L/min. Cavity T-11A**

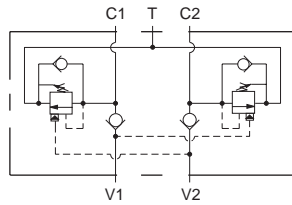


Ports C1, C2, V1, V2	Port T	Assembly Model Code*
3/8" BSPP	1/2" BSPP	<b>CBC*-L*N-EMU</b>
1/2" BSPP	1/2" BSPP	<b>CBC*-L*N-EMV</b>

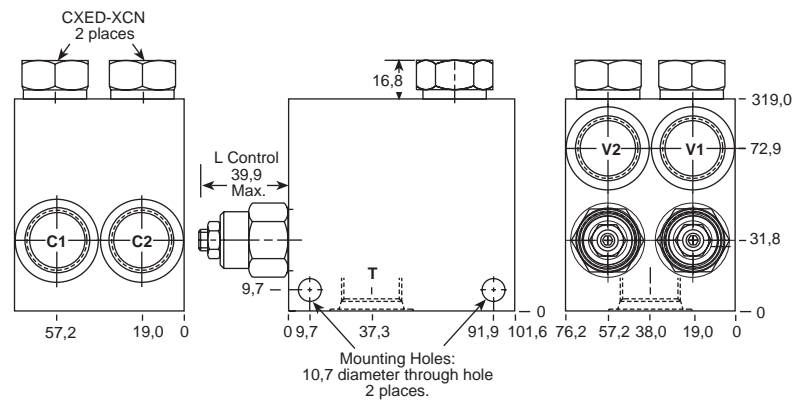


\*Add modifier /S to order SG Iron for pressure rating over 210 bar.

**0-120 L/min. Cavity T-2A**



Ports C1, C2, V1, V2	Port T	Assembly Model Code*
1/2" BSPP	3/4" BSPP	<b>CBE*-L*N-BMV</b>
3/4" BSPP	3/4" BSPP	<b>CBE*-L*N-BMW</b>



\*Add modifier /S to order SG Iron for pressure rating over 210 bar.

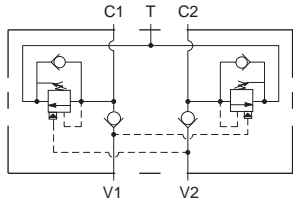
NOTES: Page 50 for cartridge model CB\*\*.\* and page 102 for CX\*D-\*\*\* shows performance curves, technical tips, and options. See page vii for technical information about line mount bodies including SAE flange pattern specifications. Consult the Sun Factory for other port sizes available in the bodies shown above. Go to [www.sunhydraulics.com](http://www.sunhydraulics.com) for more product information.

**Standard Assemblies: Cushion Lock Valves**

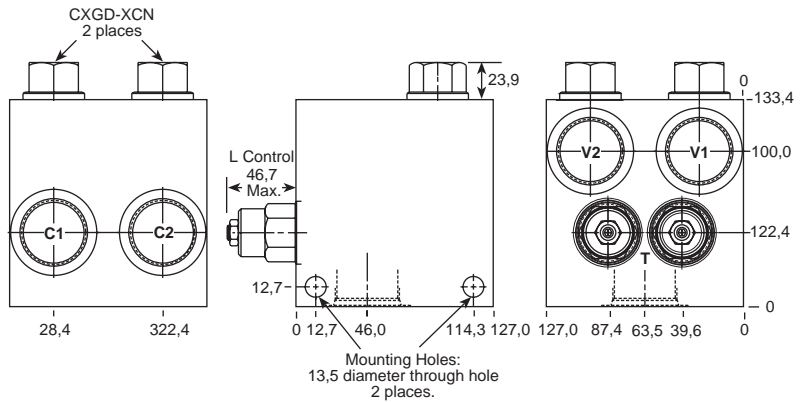
**DUAL LOAD CONTROL APPLICATIONS  
(TWO CAVITY WITH CHECKS)**

**PILOT RATIOS**  
1.5:1, 2:1, 2.3:1, 3:1, 4.5:1, 10:1

**0-240 L/min. Cavity T-17A**

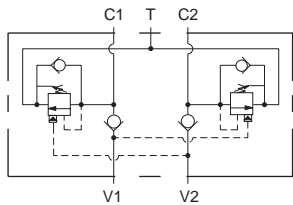


Ports C1, C2, V1, V2	Port T	Assembly Model Code*
1" BSPP	1 1/4" BSPP	<b>CBG*-L*N-HMX</b>
1 1/4" BSPP	1 1/4" BSPP	<b>CBG*-L*N-HMY</b>

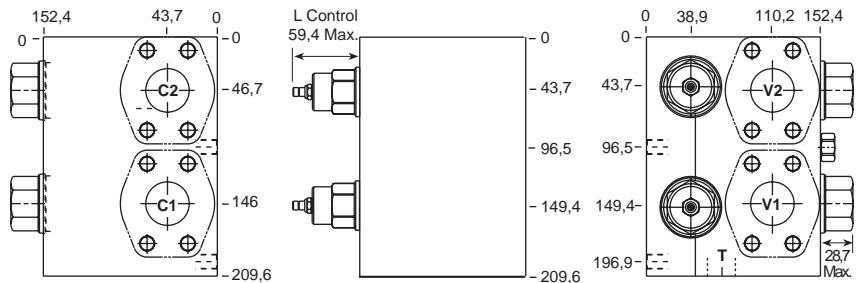


\*Add modifier /S to order  
Ductile Iron for pressure rating  
over.

**0-480 L/min. Cavity T-19A**



Ports C1, C2, V1, V2	Port T	Assembly Model Code*
1 1/2" SAE C61 1 1/2" SAE C61	1 1/2" SAE C61	<b>YCJD-L*N-AR/M</b>
1 1/2" SAE C61 1 1/2" SAE C61	1 1/2" SAE C61	<b>YCJD-L*N-GR/M</b>
1 1/2" SAE C61 1 1/2" SAE C61	1 1/2" SAE C61	<b>YCJD-L*N-HR/M</b>



Model Code	Pilot Ratio
YCJD-L*N-AR/M	3:1
YCJD-L*N-GR/M	4.5:1
YCJD-L*N-HR/M	10:1

\*Add modifier /T to order SG Iron for pressure rating over  
210 bar.

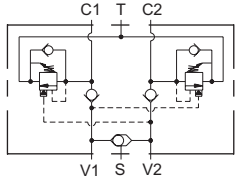
NOTES: Page 50 for cartridge model CB\*\*-\* and page 102 for CX\*D-\* shows performance curves, technical tips, and options.  
See page vii for technical information about line mount bodies including SAE flange pattern specifications.  
Consult the Sun Factory for other port sizes available in the bodies shown above.  
Go to [www.sunhydraulics.com](http://www.sunhydraulics.com) for more product information.

**Standard Assemblies: Cushion Lock Valves**

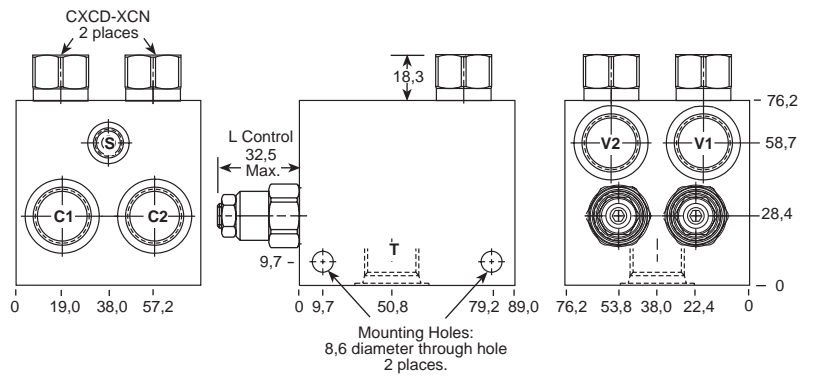
**DUAL LOAD CONTROL APPLICATIONS  
(TWO CAVITY WITH CHECKS AND SHUTTLE)**

**PILOT RATIOS**  
1.5:1, 2:1, 2.3:1, 3:1, 4.5:1, 10:1

**0-60 L/min. Cavity T-11A**

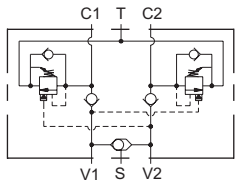


Ports C1, C2, V1, V2	Port T	Port S	Assembly Model Code*
3/8" BSPP	1/2" BSPP	1/4" BSPP	<b>CBC*-L*N-ENU</b>
1/2" BSPP	1/2" BSPP	1/4" BSPP	<b>CBC*-L*N-ENV</b>

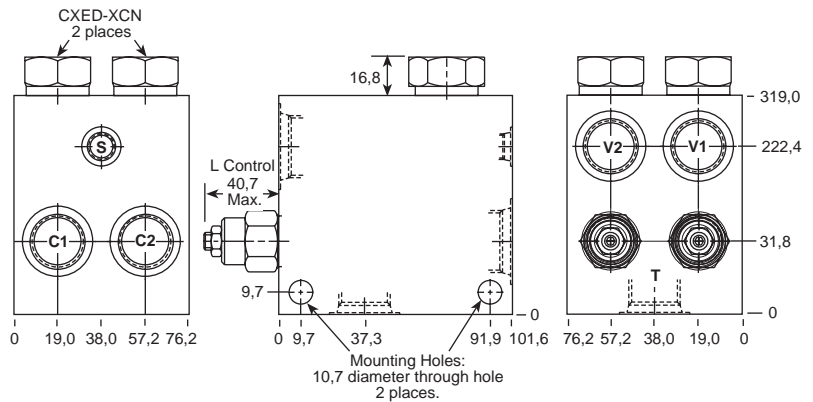


\*Add modifier /S to order SG Iron for pressure rating over 210 bar.

**0-120 L/min. Cavity T-2A**



Ports C1, C2, V1, V2	Port T	Port S	Assembly Model Code*
1/2" BSPP	3/4" BSPP	1/4" BSPP	<b>CBE*-L*N-BNV</b>
3/4" BSPP	3/4" BSPP	1/4" BSPP	<b>CBE*-L*N-BNW</b>



\*Add modifier /S to order SG Iron for pressure rating over 210 bar.

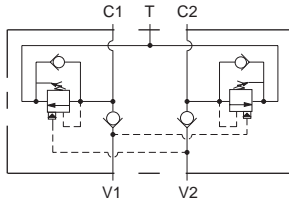
NOTES: Page 50 for cartridge model CB\*\*-\* and page 102 for CX\*D-\* shows performance curves, technical tips, and options. See page vii for technical information about line mount bodies including SAE flange pattern specifications. Consult the Sun Factory for other port sizes available in the bodies shown above. Go to [www.sunhydraulics.com](http://www.sunhydraulics.com) for more product information.

Standard Assemblies: Cushion Lock Valves

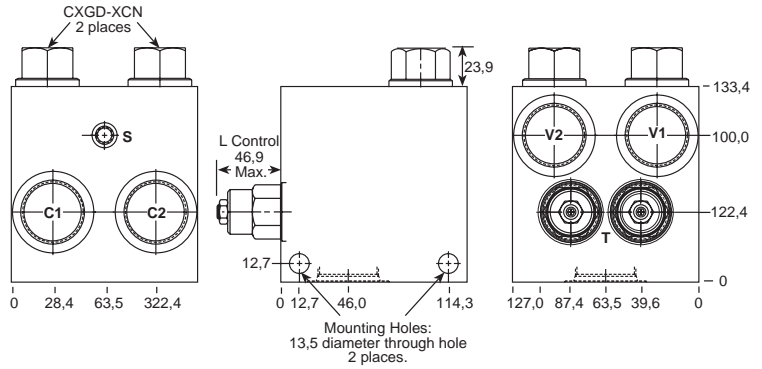
**DUAL LOAD CONTROL APPLICATIONS  
(TWO CAVITY WITH CHECKS WITH SHUTTLE)**

**PILOT RATIOS**  
1.5:1, 2:1, 2.3:1, 3:1, 4.5:1, 10:1

**0-240 L/min. Cavity T-17A**

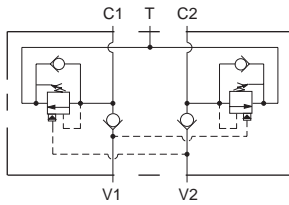


Ports C1, C2, V1, V2	Port T	Port S	Assembly Model Code*
1" BSPP	1 1/4" BSPP	1/4" BSPP	<b>CBG*-L*N-HNX</b>
1 1/4" BSPP	1 1/4" BSPP	1/4" BSPP	<b>CBG*-L*N-HNY</b>

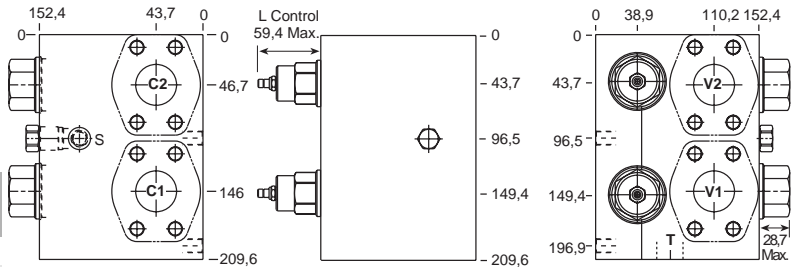


\*Add modifier **/S** to order Ductile Iron for pressure rating over .

**0-480 L/min. Cavity T-19A**



Ports C1, C2, V1, V2	Port T	Port S	Assembly Model Code*
1 1/2" SAE C61	1 1/2" SAE C61	1/4" BSPP	<b>YCJH-L*N-AR/M</b>
1 1/2" SAE C61	1 1/2" SAE C61	1/4" BSPP	<b>YCJH-L*N-GR/M</b>
1 1/2" SAE C61	1 1/2" SAE C61	1/4" BSPP	<b>YCJH-L*N-HR/M</b>



Model Code	Pilot Ratio
YCJH-L*N-AR/M	3:1
YCJH-L*N-GR/M	4.5:1
YCJH-L*N-HR/M	10:1

\*Add modifier **/T** to order SG Iron for pressure rating over 210 bar.

NOTES: Page 50 for cartridge model CB\*\*.\* and page 102 for CX\*D-\*\*\* shows performance curves, technical tips, and options. See page vii for technical information about line mount bodies including SAE flange pattern specifications. Consult the Sun Factory for other port sizes available in the bodies shown above. Go to [www.sunhydraulics.com](http://www.sunhydraulics.com) for more product information.

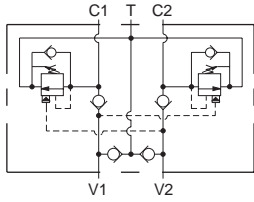


Standard Assemblies: Cushion Lock Valves

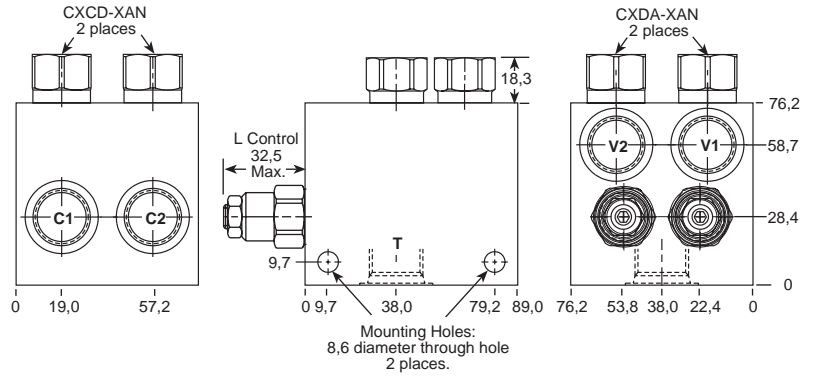
**DUAL LOAD CONTROL APPLICATIONS  
(TWO CAVITY WITH ANTI-CAVITATION CHECKS)**

**PILOT RATIOS**  
1.5:1, 2:1, 2.3:1, 3:1, 4.5:1, 10:1

**0-60 L/min. Cavity T-11A**

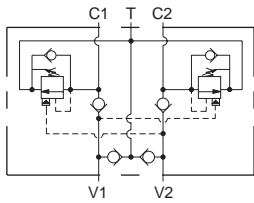


Ports C1, C2, V1, V2	Port T	Assembly Model Code*
3/8" BSPP	1/2" BSPP	<b>CBC*-L*N-EPU</b>
1/2" BSPP	1/2" BSPP	<b>CBC*-L*N-EPV</b>

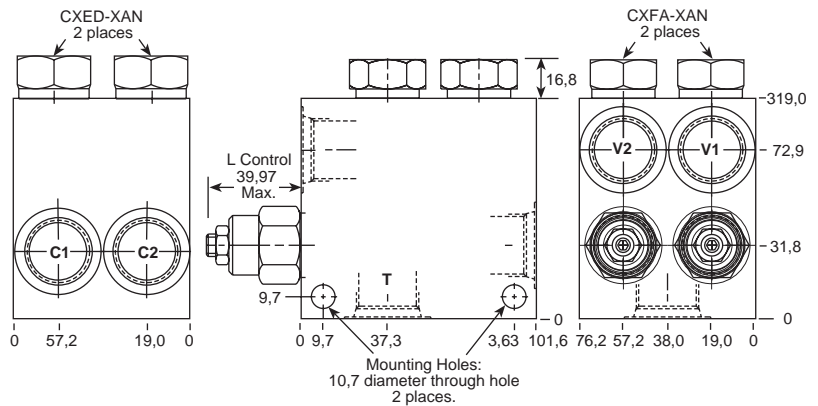


\*Add modifier /S to order SG Iron for pressure rating over 210 bar.

**0-120 L/min. Cavity T-2A**



Ports C1, C2, V1, V2	Port T	Assembly Model Code*
1/2" BSPP	3/4" BSPP	<b>CBE*-L*N-BPV</b>
3/4" BSPP	3/4" BSPP	<b>CBE*-L*N-BPW</b>



\*Add modifier /S to order SG Iron for pressure rating over 210 bar.

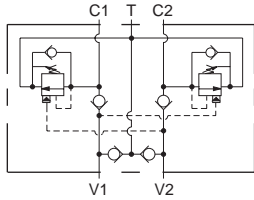
NOTES: Page 50 for cartridge model CB\*\*-\* and page 102 for CX\*D-\* shows performance curves, technical tips, and options. See page vii for technical information about line mount bodies including SAE flange pattern specifications. Consult the Sun Factory for other port sizes available in the bodies shown above. Go to [www.sunhydraulics.com](http://www.sunhydraulics.com) for more product information.

Standard Assemblies: Cushion Lock Valves

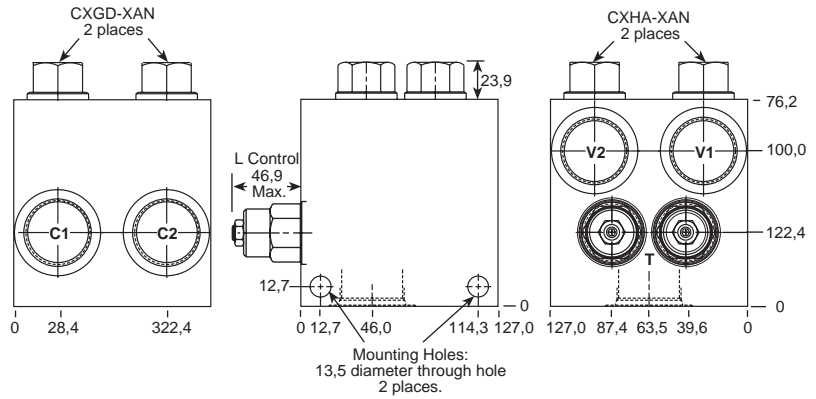
**DUAL LOAD CONTROL APPLICATIONS  
(TWO CAVITY WITH ANTI-CAVITATION CHECKS)**

**PILOT RATIOS**  
1.5:1, 2:1, 2.3:1, 3:1, 4.5:1, 10:1

**0-240 L/min. Cavity T-17A**

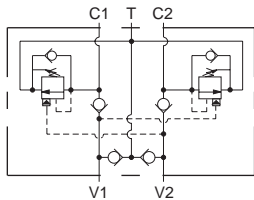


Ports C1, C2, V1, V2	Port T	Assembly Model Code*
1" BSPP	1 1/4" BSPP	<b>CBG*-L*N-HPX</b>
1 1/4" BSPP	1 1/4" BSPP	<b>CBG*-L*N-HPY</b>

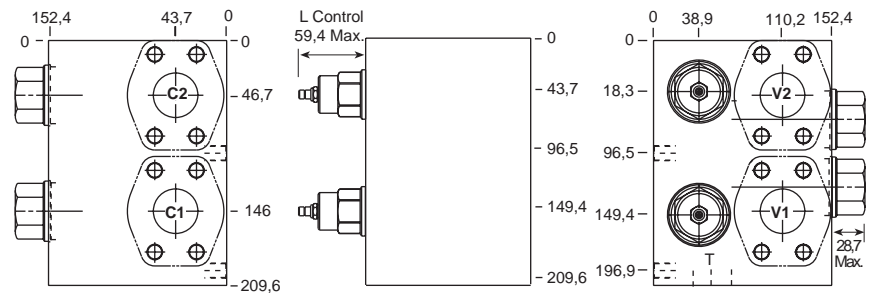


\*Add modifier /S to order  
Ductile Iron for pressure rating  
over.

**0-480 L/min. Cavity T-19A**



Ports C1, C2, V1, V2	Port T	Assembly Model Code*
1 1/2" SAE C61	1 1/2" SAE C61	<b>YCJE-L*N-AR/M</b>
1 1/2" SAE C61	1 1/2" SAE C61	<b>YCJE-L*N-GR/M</b>
1 1/2" SAE C61	1 1/2" SAE C61	<b>YCJE-L*N-HR/M</b>



Model Code	Pilot Ratio
YCJE-L*N-AR/M	3:1
YCJE-L*N-GR/M	4.5:1
YCJE-L*N-HR/M	10:1

\*Add modifier /T to order SG Iron for pressure rating over  
210 bar.

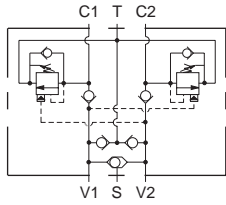
NOTES: Page 50 for cartridge model CB\*\*-\* and page 102 for CX\*D-\* shows performance curves, technical tips, and options.  
See page vii for technical information about line mount bodies including SAE flange pattern specifications.  
Consult the Sun Factory for other port sizes available in the bodies shown above.  
Go to [www.sunhydraulics.com](http://www.sunhydraulics.com) for more product information.

Standard Assemblies: Cushion Lock Valves

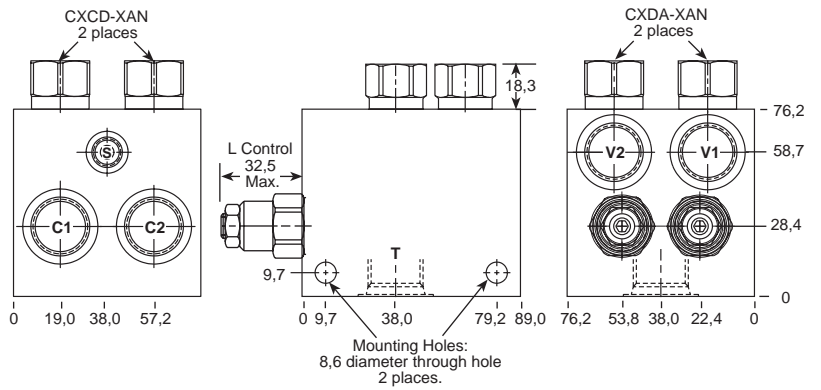
**DUAL LOAD CONTROL APPLICATIONS  
(TWO CAVITY WITH ANTI-CAVITATION CHECKS AND SHUTTLE)**

**PILOT RATIOS**  
1.5:1, 2:1, 2.3:1, 3:1, 4.5:1, 10:1

**0-60 L/min. Cavity T-11A**

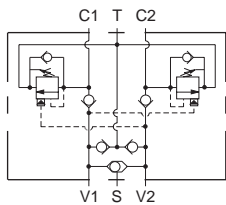


Ports C1, C2, V1, V2	Port T	Port S	Assembly Model Code*
3/8" BSPP	1/2" BSPP	1/4" BSPP	<b>CBC*-L*N-EQU</b>
1/2" BSPP	1/2" BSPP	1/4" BSPP	<b>CBC*-L*N-EQV</b>

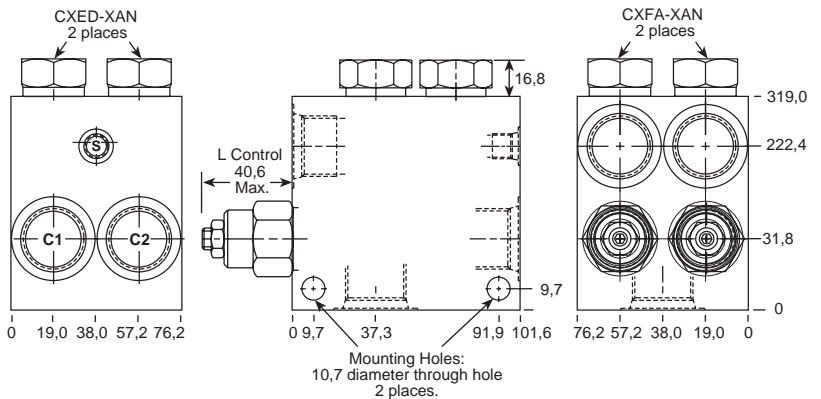


\*Add modifier /S to order SG Iron for pressure rating over 210 bar.

**0-120 L/min. Cavity T-2A**



Ports C1, C2, V1, V2	Port T	Port S	Assembly Model Code*
1/2" BSPP	3/4" BSPP	1/4" BSPP	<b>CBE*-L*N-BQV</b>
3/4" BSPP	3/4" BSPP	1/4" BSPP	<b>CBE*-L*N-BQW</b>



\*Add modifier /S to order SG Iron for pressure rating over 210 bar.

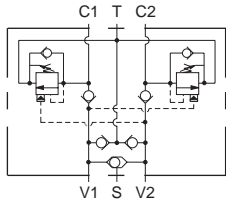
NOTES: Page 50 for cartridge model CB\*\*.\* and page 102 for CX\*D-\*\*\* shows performance curves, technical tips, and options. See page vii for technical information about line mount bodies including SAE flange pattern specifications. Consult the Sun Factory for other port sizes available in the bodies shown above. Go to [www.sunhydraulics.com](http://www.sunhydraulics.com) for more product information.

Standard Assemblies: Cushion Lock Valves

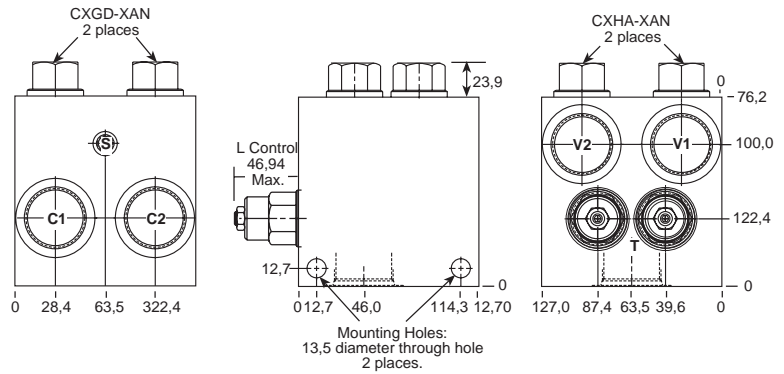
**DUAL LOAD CONTROL APPLICATIONS  
(TWO CAVITY WITH ANTI-CAVITATION CHECKS AND SHUTTLE)**

**PILOT RATIOS**  
1.5:1, 2:1, 2.3:1, 3:1, 4.5:1, 10:1

**0-240 L/min. Cavity T-17A**

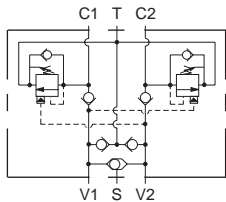


Ports C1, C2, V1, V2	Port T	Port S	Assembly Model Code*
1" BSPP	1 1/4" BSPP	1/4" BSPP	<b>CBG*-L*N-HQX</b>
1 1/4" BSPP	1 1/4" BSPP	1/4" BSPP	<b>CBG*-L*N-HQY</b>

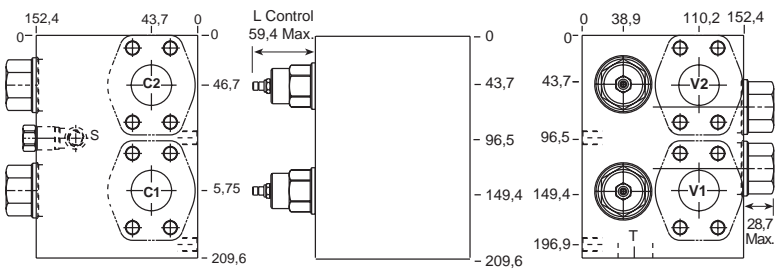


\*Add modifier /S to order Ductile Iron for pressure rating over .

**0-480 L/min. Cavity T-19A**



Ports C1, C2, V1, V2	Port T	Port S	Assembly Model Code*
1 1/2" SAE C61	1 1/2" SAE C61	1/4" BSPP	<b>YCJG-L*N-AR/M</b>
1 1/2" SAE C61	1 1/2" SAE C61	1/4" BSPP	<b>YCJG-L*N-GR/M</b>
1 1/2" SAE C61	1 1/2" SAE C61	1/4" BSPP	<b>YCJG-L*N-HR/M</b>



Model Code	Pilot Ratio
YCJG-L*N-AR/M	3:1
YCJG-L*N-GR/M	4.5:1
YCJG-L*N-HR/M	10:1

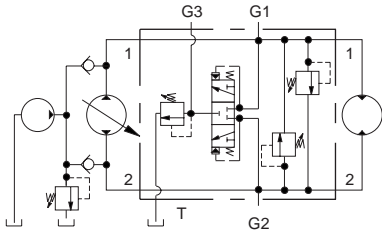
\*Add modifier /T to order SG Iron for pressure rating over 210 bar.

NOTES: Page 50 for cartridge model CB\*\*.\* and page 102 for CX\*D-\*\*\* shows performance curves, technical tips, and options. See page vii for technical information about line mount bodies including SAE flange pattern specifications. Consult the Sun Factory for other port sizes available in the bodies shown above. Go to [www.sunhydraulics.com](http://www.sunhydraulics.com) for more product information.

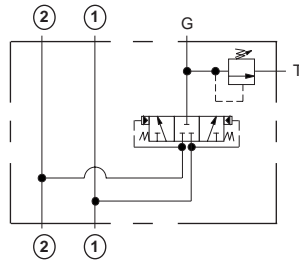
**TECHNICAL PRODUCT INFORMATION**  
**HYDROSTATIC TRANSMISSION VALVES AND HOT OIL SHUTTLES**

**Applications**

In all closed loop hydrostatic transmission circuits it is necessary to remove and replace some of the oil from the circuit to provide cooling and filtration. The normal rule of thumb is to continuously take out 10-15% of the pump flow. This is achieved using a hot oil shuttle valve with low-pressure relief.



The hot oil shuttle valve senses pressure from the high-pressure side and opens to bleed off oil from the return low-pressure side of the circuit. A low-pressure charge pump into the inlet of the transmission pump makes up this oil.



The oil passed through the hot oil shuttle valve goes across a low-pressure relief valve set at a slightly lower pressure than the charge pump. This oil is taken through an offline filtration and cooling unit before being returned to the oil reservoir. Often this oil is also passed through the casing drain of the transmission motor to help keep the motor cool.

The other main requirement for close loop circuits is cross line relief valves to provide protection from over pressurization to the pump and motor.

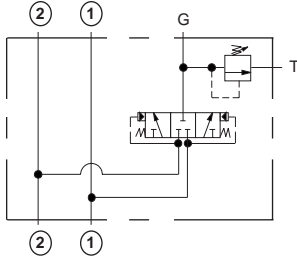
**Design Concepts and Features**

Sun offers a complete range of hot oil shuttle valves and hydrostatic transmission valves incorporating four through ports for easy installation into the circuit. The use of cartridge valves in these packages means an elimination of pipe work and provides easy maintenance. In the event of a problem, it simply means replacing a cartridge rather than the complete valve assembly. This reduces cost and eliminates down time. The cross line relief valves used are fast acting with limited overshoot to provide excellent protection from over pressurization.

Sun can provide packages to handle transmission flows from 40 L/min. right up to 960 L/min. and pressures up to 350 bar. As well as the standard packages shown in the catalogue, Sun can also design a custom package to suit the exact requirement for a customer's application.

## HOT OIL SHUTTLE AND RELIEF APPLICATIONS (INLINE / 1.00" SAE FLANGE PORT BODIES)

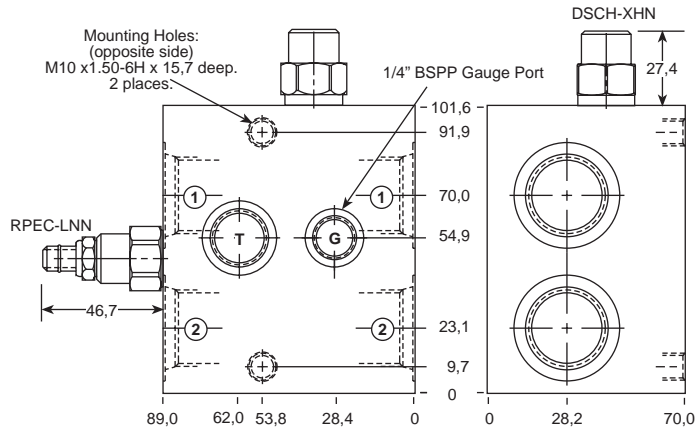
### PILOT OPERATED



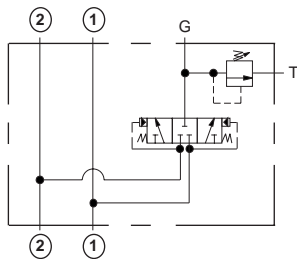
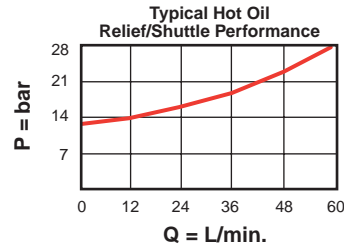
Ports 1 and 2	Port T	Assembly Model Code*
1/2" BSPP	3/8" BSPP	XRDC-LNN-AV
3/4" BSPP	3/8" BSPP	XRDC-LNN-AW

\*Add modifier /S to order SG Iron for pressure rating over 210 bar.

### 0-50 L/min. Cavity T-10A



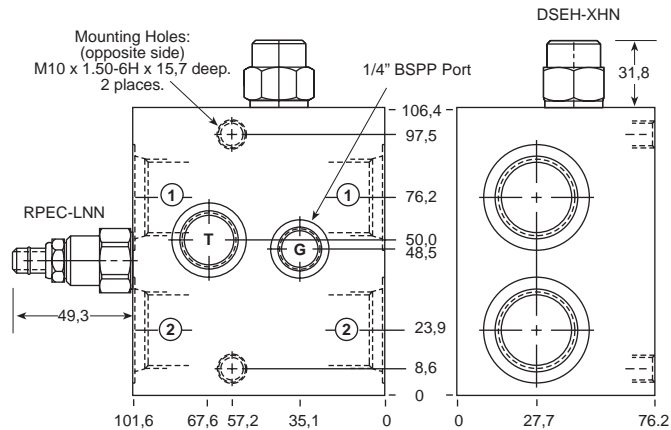
These Sun valve assemblies are for use in bleeding hot oil from the low pressure side of a hydrostatic transmission circuit. The hot oil can be cooled, filtered, or used as a source of oil for flushing other pump and motor cases. The hot oil is removed from the loop when the Sun RPEC cartridge is set below the hydrostatic charge pressure relief valve.



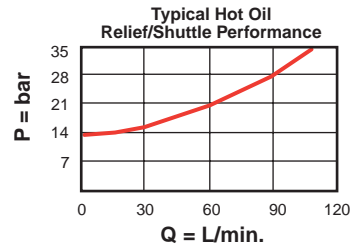
Ports 1 and 2	Port T	Assembly Model Code*
3/4" BSPP	1/2" BSPP	XRFC-LNN-AW

\*Add modifier /T to order SG Iron for pressure rating over 210 bar.

### 0-95 L/min. Cavity T-10A



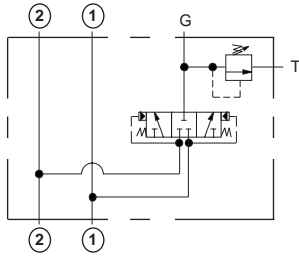
These Sun valve assemblies are for use in bleeding hot oil from the low pressure side of a hydrostatic transmission circuit. The hot oil can be cooled, filtered, or used as a source of oil for flushing other pump and motor cases. The hot oil is removed from the loop when the Sun RPEC cartridge is set below the hydrostatic charge pressure relief valve.



NOTES: Page 2 for cartridge model RP\*C-\*\*\* shows performance curves, technical tips, and options.  
See page vii for technical information about line mount bodies including SAE flange pattern specifications.  
Consult the Sun Factory for other port sizes available in the bodies shown above.  
Go to [www.sunhydraulics.com](http://www.sunhydraulics.com) for more product information.

**HOT OIL SHUTTLE AND RELIEF APPLICATIONS (INLINE BODIES)**

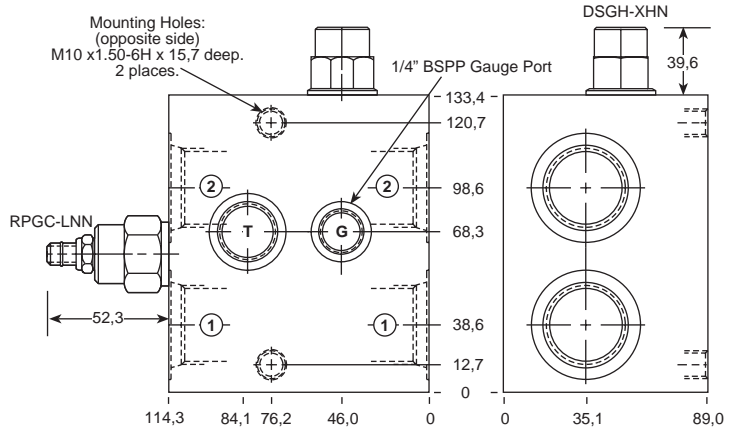
**PILOT OPERATED**



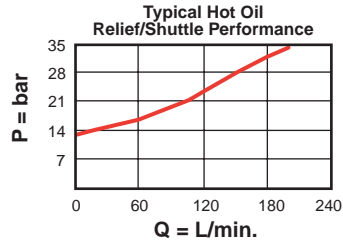
Ports 1 and 2	Port T	Assembly Model Code*
1" BSPP	3/4" BSPP	XRHC-LNN-AX

\*Add modifier /S to order SG Iron for pressure rating over 210 bar.

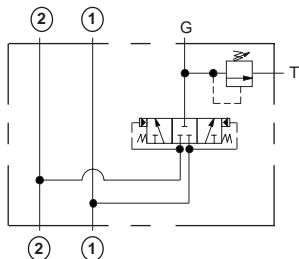
**0-200 L/min. Cavity T-3A**



These Sun valve assemblies are for use in bleeding hot oil from the low pressure side of a hydrostatic transmission circuit. The hot oil can be cooled, filtered, or used as a source of oil for flushing other pump and motor cases. The hot oil is removed from the loop when the Sun RPGC cartridge is set below the hydrostatic charge pressure relief valve.



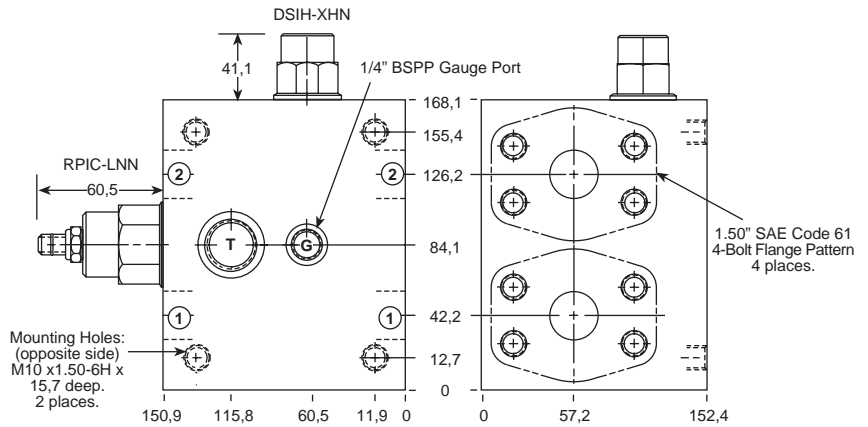
**0-380 L/min. Cavity T-16A**



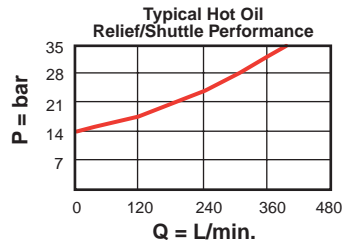
Ports 1 and 2	Port T	Assembly Model Code*
1 1/4" BSPP	1" BSPP	XRJC-LNN-AX

\*Add modifier /S to order SG Iron for pressure rating over 210 bar.

**0-380 L/min. Cavity T-16A**



These Sun valve assemblies are for use in bleeding hot oil from the low pressure side of a hydrostatic transmission circuit. The hot oil can be cooled, filtered, or used as a source of oil for flushing other pump and motor cases. The hot oil is removed from the loop when the Sun RPIC cartridge is set below the hydrostatic charge pressure relief valve.

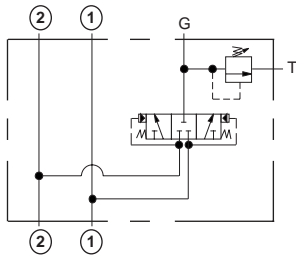


NOTES: Page 2 for cartridge model RP\*C-\*\*\* shows performance curves, technical tips, and options. See page vii for technical information about line mount bodies including SAE flange pattern specifications. Consult the Sun Factory for other port sizes available in the bodies shown above. Go to [www.sunhydraulics.com](http://www.sunhydraulics.com) for more product information.

**Standard Assemblies: Hydrostatic Transmission Valves and Hot Oil Shuttles**

**HOT OIL SHUTTLE AND RELIEF APPLICATIONS  
(1.50" SAE FLANGE PORT BODIES)**

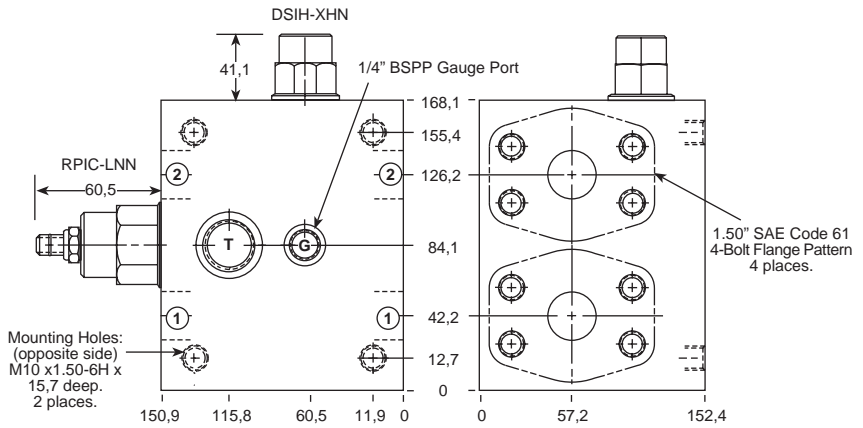
**PILOT OPERATED**



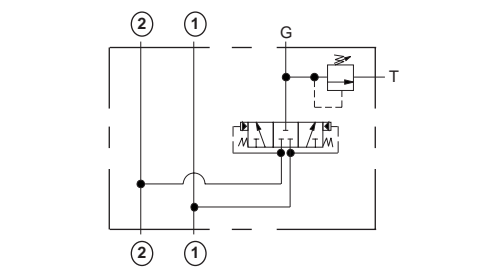
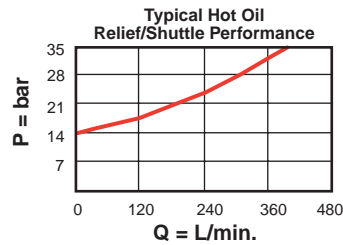
Ports 1 and 2	Port T	Assembly Model Code*
1 1/2" SAE C61	1" BSPP	<b>XRJC-LNN-AR/M</b>

\*Add modifier **/T** to order SG Iron for pressure rating over 210 bar.

**0-380 L/min. Cavity T-16A**



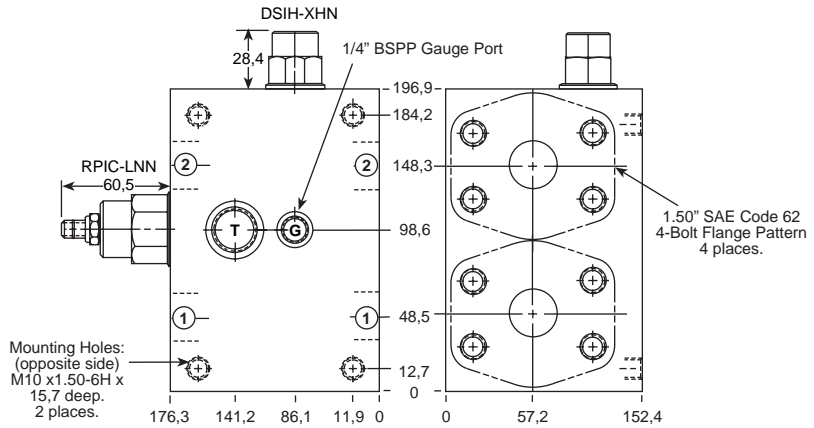
These Sun valve assemblies are for use in bleeding hot oil from the low pressure side of a hydrostatic transmission circuit. The hot oil can be cooled, filtered, or used as a source of oil for flushing other pump and motor cases. The hot oil is removed from the loop when the Sun RPIC cartridge is set below the hydrostatic charge pressure relief valve.



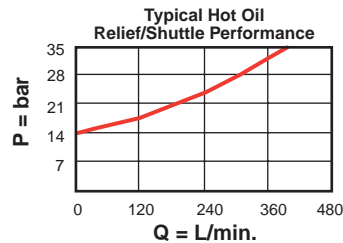
Ports 1 and 2	Port T	Assembly Model Code*
1 1/2" SAE C62	1" BSPP	<b>XRJC-LNN-A6/M</b>

\*Add modifier **/T** to order SG Iron for pressure rating over 210 bar.

**0-380 L/min. Cavity T-16A**



These Sun valve assemblies are for use in bleeding hot oil from the low pressure side of a hydrostatic transmission circuit. The hot oil can be cooled, filtered, or used as a source of oil for flushing other pump and motor cases. The hot oil is removed from the loop when the Sun RPIC cartridge is set below the hydrostatic charge pressure relief valve.

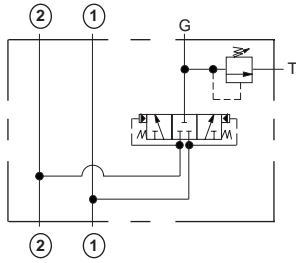


NOTES: Page 2 for cartridge model RP\*C-\*\*\* shows performance curves, technical tips, and options. See page vii for technical information about line mount bodies including SAE flange pattern specifications. Consult the Sun Factory for other port sizes available in the bodies shown above. Go to [www.sunhydraulics.com](http://www.sunhydraulics.com) for more product information.



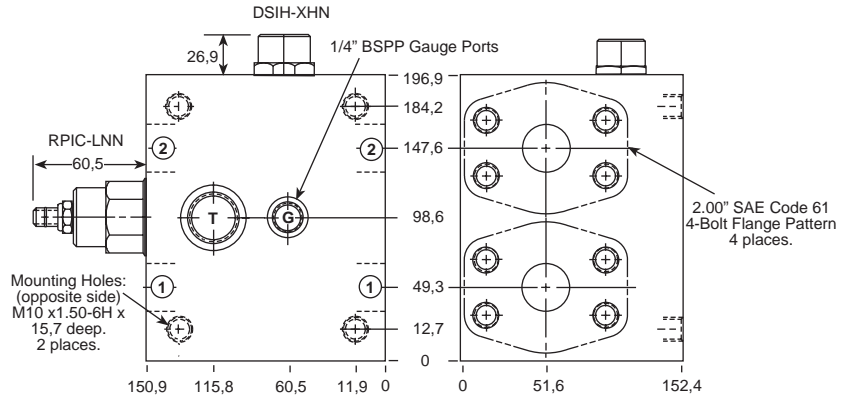
**HOT OIL SHUTTLE AND RELIEF APPLICATIONS  
(2.00" SAE FLANGE PORT BODY)**

**PILOT OPERATED**



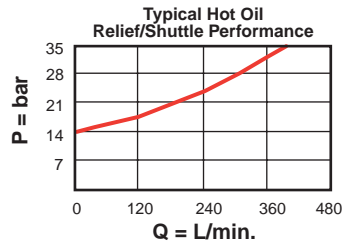
**0-380 L/min. Cavity T-16A**

Ports 1 and 2	Port T	Assembly Model Code*
2" SAE C61	1" BSPP	<b>XRJC-LNN-AS/M</b>



\*Add modifier **T** to order SG Iron for pressure rating over 210 bar.

These Sun valve assemblies are for use in bleeding hot oil from the low pressure side of a hydrostatic transmission circuit. The hot oil can be cooled, filtered, or used as a source of oil for flushing other pump and motor cases. The hot oil is removed from the loop when the Sun RPIC cartridge is set below the hydrostatic charge pressure relief valve.

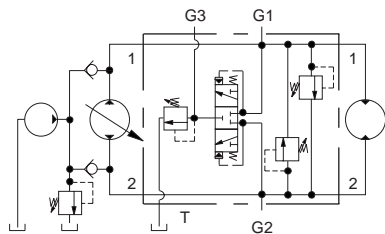


NOTES: Page 2 for cartridge model RP\*C-\*\*\* shows performance curves, technical tips, and options. See page vii for technical information about line mount bodies including SAE flange pattern specifications. Consult the Sun Factory for other port sizes available in the bodies shown above. Go to [www.sunhydraulics.com](http://www.sunhydraulics.com) for more product information.

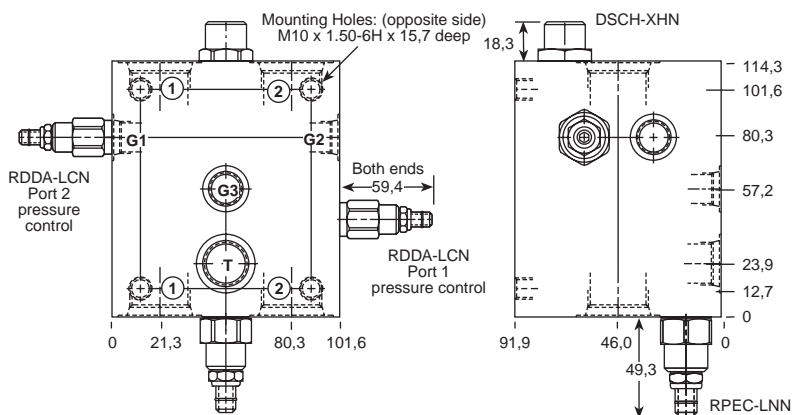
**HYDROSTATIC TRANSMISSION APPLICATIONS (INLINE BODY)**

**DIRECT ACTING**

**0-95 L/min. Cavity T-10A**



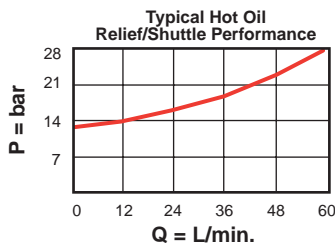
Ports 1 and 2	Port T	Ports G1, G2 & G3	Assembly Model Code*
3/4" BSPP	3/8" BSPP	1/4" BSPP	<b>XRDB-LCN-AW</b>



\*Add modifier **/S** to order SG Iron for pressure rating over 210 bar.

These Sun valve assemblies are for use with hydrostatic transmissions to provide overload relief valve protection for the main circuit in both directions. Additionally, an auxiliary shuttle valve allows bleeding of hot oil from the low pressure side. Hot oil can be cooled, filtered, or used as a source of oil for flushing other pump and motor cases. Hot oil is removed from the loop when the Sun RPEC cartridge is set below the hydrostatic charge pressure relief valve.

**NOTE: A mechanical brake is recommended to positively lock any static live load.**

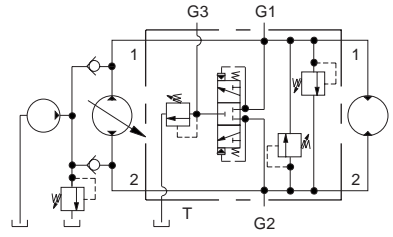


NOTES: Page 2 for cartridge models RP\*C-\*\*\* and RD\*A-\*\*\* shows performance curves, technical tips, and options. See page vii for technical information about line mount bodies including SAE flange pattern specifications. Consult the Sun Factory for other port sizes available in the bodies shown above. Go to [www.sunhydraulics.com](http://www.sunhydraulics.com) for more product information.

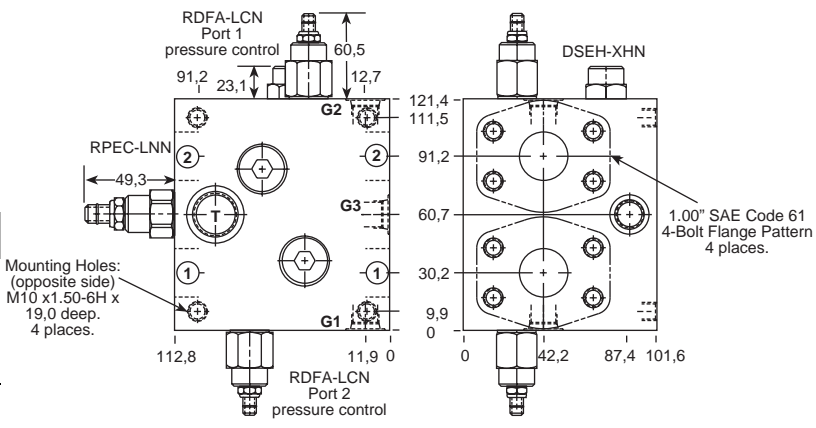
**HYDROSTATIC TRANSMISSION APPLICATIONS (1.00" SAE FLANGE PORT BODIES)**

**DIRECT ACTING**

0-200 L/min. Cavity T-3A

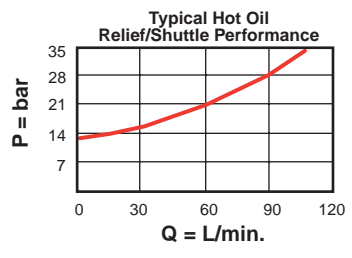


Ports 1 and 2	Port T	Ports G1, G2 & G3	Assembly Model Code*
1" SAE C61	1/2" BSPP	1/4" BSPP	<b>XRFB-LCN-AP/M</b>

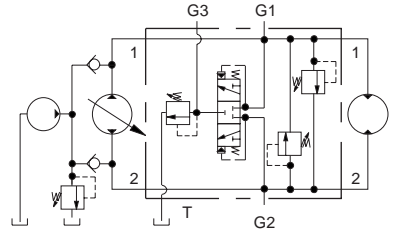


\*Add modifier **/T** to order SG Iron for pressure rating over 210 bar.

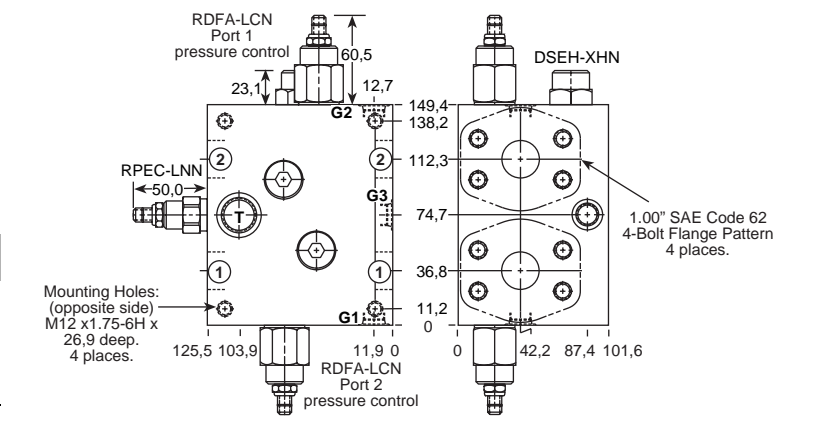
These Sun valve assemblies are for use with hydrostatic transmissions to provide overload relief valve protection for the main circuit in both directions. Additionally, an auxiliary shuttle valve allows bleeding of hot oil from the low pressure side. Hot oil can be cooled, filtered, or used as a source of oil for flushing other pump and motor cases. Hot oil is removed from the loop when the Sun RPEC cartridge is set below the hydrostatic charge pressure relief valve. **NOTE: A mechanical brake is recommended to positively lock any static live load.**



0-200 L/min. Cavity T-3A

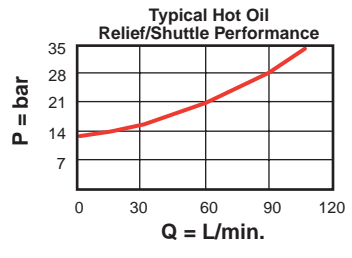


Ports 1 and 2	Port T	Ports G1, G2 & G3	Assembly Model Code*
1" SAE C62	1/2" BSPP	1/4" BSPP	<b>XRFB-LCN-A4/M</b>



\*Add modifier **/T** to order SG Iron for pressure rating over 210 bar.

These Sun valve assemblies are for use with hydrostatic transmissions to provide overload relief valve protection for the main circuit in both directions. Additionally, an auxiliary shuttle valve allows bleeding of hot oil from the low pressure side. Hot oil can be cooled, filtered, or used as a source of oil for flushing other pump and motor cases. Hot oil is removed from the loop when the Sun RPEC cartridge is set below the hydrostatic charge pressure relief valve. **NOTE: A mechanical brake is recommended to positively lock any static live load.**



NOTES: Page 2 for cartridge models RP\*C-\*\*\* and RD\*A-\*\*\* shows performance curves, technical tips, and options. See page vii for technical information about line mount bodies including SAE flange pattern specifications. Consult the Sun Factory for other port sizes available in the bodies shown above. Go to [www.sunhydraulics.com](http://www.sunhydraulics.com) for more product information.

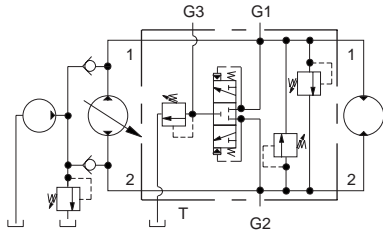


## Standard Assemblies: Hydrostatic Transmission Valves and Hot Oil Shuttles

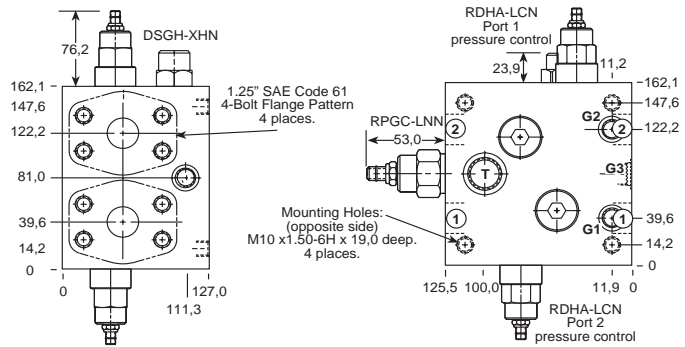
# HYDROSTATIC TRANSMISSION APPLICATIONS (1.25" SAE FLANGE PORT BODIES)

### DIRECT ACTING

**0-380 L/min. Cavity T-16A**



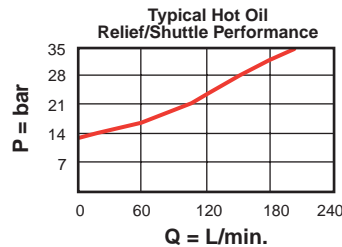
Ports 1 and 2	Port T	Ports G1, G2 & G3	Assembly Model Code*
1 1/4" SAE C61	1/4" BSPP	1/4" BSPP	<b>XRHB-LCN-AQ/M</b>



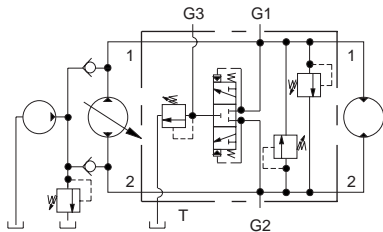
\*Add modifier **T** to order SG Iron for pressure rating over 210 bar.

These Sun valve assemblies are for use with hydrostatic transmissions to provide overload relief valve protection for the main circuit in both directions. Additionally, an auxiliary shuttle valve allows bleeding of hot oil from the low pressure side. Hot oil can be cooled, filtered, or used as a source of oil for flushing other pump and motor cases. Hot oil is removed from the loop when the Sun RPGC cartridge is set below the hydrostatic charge pressure relief valve.

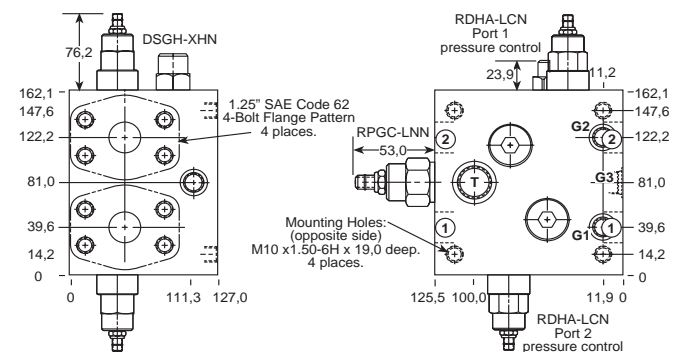
**NOTE: A mechanical brake is recommended to positively lock any static live load.**



**0-380 L/min. Cavity T-16A**



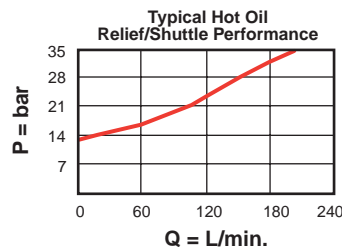
Ports 1 and 2	Port T	Ports G1, G2 & G3	Assembly Model Code*
1 1/4" SAE C62	1/4" BSPP	1/4" BSPP	<b>XRHB-LCN-A5/M</b>



\*Add modifier **T** to order SG Iron for pressure rating over 210 bar.

These Sun valve assemblies are for use with hydrostatic transmissions to provide overload relief valve protection for the main circuit in both directions. Additionally, an auxiliary shuttle valve allows bleeding of hot oil from the low pressure side. Hot oil can be cooled, filtered, or used as a source of oil for flushing other pump and motor cases. Hot oil is removed from the loop when the Sun RPGC cartridge is set below the hydrostatic charge pressure relief valve.

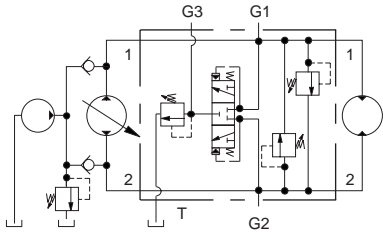
**NOTE: A mechanical brake is recommended to positively lock any static live load.**



**NOTES:** Page 2 for cartridge models RP\*C-\*\*\* and RD\*A-\*\*\* shows performance curves, technical tips, and options. See page vii for technical information about line mount bodies including SAE flange pattern specifications. Consult the Sun Factory for other port sizes available in the bodies shown above. Go to [www.sunhydraulics.com](http://www.sunhydraulics.com) for more product information.

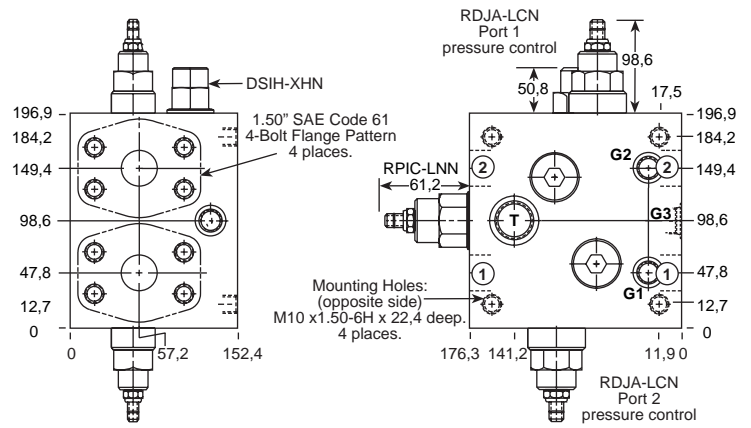
**HYDROSTATIC TRANSMISSION APPLICATIONS  
(1.50" / 2.00" SAE FLANGE PORT BODIES)**

**DIRECT ACTING**



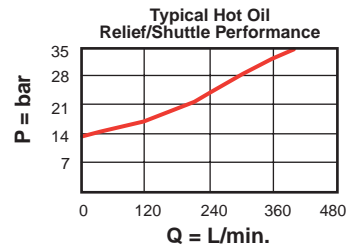
Ports 1 and 2	Port T	Ports G1, G2 & G3	Assembly Model Code*
1 1/2" SAE C61	1" BSPP	1/4" BSPP	<b>XRJB-LCN-AR/M</b>

**0-760 L/min. Cavity T-18A**

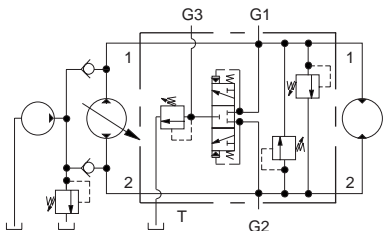


\*Add modifier **T** to order SG Iron for pressure rating over 210 bar.

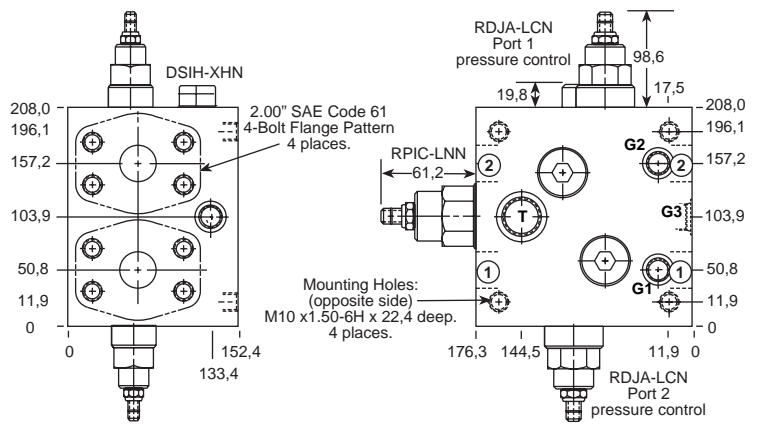
These Sun valve assemblies are for use with hydrostatic transmissions to provide overload relief valve protection for the main circuit in both directions. Additionally, an auxiliary shuttle valve allows bleeding of hot oil from the low pressure side. Hot oil can be cooled, filtered, or used as a source of oil for flushing other pump and motor cases. Hot oil is removed from the loop when the Sun RPIC cartridge is set below the hydrostatic charge pressure relief valve.  
**NOTE: A mechanical brake is recommended to positively lock any static live load.**



**0-760 L/min. Cavity T-18A**

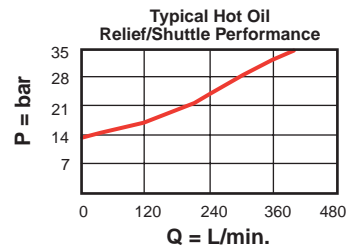


Ports 1 and 2	Port T	Ports G1, G2 & G3	Assembly Model Code*
2" SAE C61	1" BSPP	1/4" BSPP	<b>XRJB-LCN-AS/M</b>



\*Add modifier **T** to order SG Iron for pressure rating over 210 bar.

These Sun valve assemblies are for use with hydrostatic transmissions to provide overload relief valve protection for the main circuit in both directions. Additionally, an auxiliary shuttle valve allows bleeding of hot oil from the low pressure side. Hot oil can be cooled, filtered, or used as a source of oil for flushing other pump and motor cases. Hot oil is removed from the loop when the Sun RPIC cartridge is set below the hydrostatic charge pressure relief valve.  
**NOTE: A mechanical brake is recommended to positively lock any static live load.**



NOTES: Page 2 for cartridge models RP\*C-\*\*\* and RD\*A-\*\*\* shows performance curves, technical tips, and options. See page vii for technical information about line mount bodies including SAE flange pattern specifications. Consult the Sun Factory for other port sizes available in the bodies shown above. Go to [www.sunhydraulics.com](http://www.sunhydraulics.com) for more product information.

**NOTES**

**TECHNICAL PRODUCT INFORMATION**  
**LINE MOUNTED REGENERATIVE ASSEMBLIES**

**Applications**

Regenerative circuits are used to provide faster cylinder extension speeds by taking the oil from the rod end and diverting it to the head end of the cylinder. This means that the effective area during extension is only the rod area that gives a faster speed **but also a reduced force**. This means using a cylinder with a 2:1 area ratio between piston and rod, equal speeds and forces can be obtained in both directions without using a double rod.

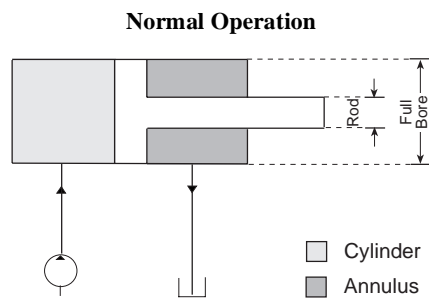
Sun offers two types of regenerative valve assemblies. One provides full time regeneration and the other is a pressure sensitive regenerative circuit. The full time regeneration has only a limited number of applications and is most commonly used for providing fast extension speeds with low force.

The pressure sensitive regenerative circuit is used in many applications such as compacting machines. The first part of the cylinder extension occurs when there is very little load (for example during initial compaction) and regeneration provides a faster speed. When the load resistance increases, the pressure on the full bore side starts to increase and will pilot open a counterbalance valve connecting the rod side to tank and take the circuit out of regeneration. This then provides a slower speed, as it is now operating on the full bore area, but also a corresponding increase in force. Regenerative circuits **do not** affect the retraction of the cylinder.

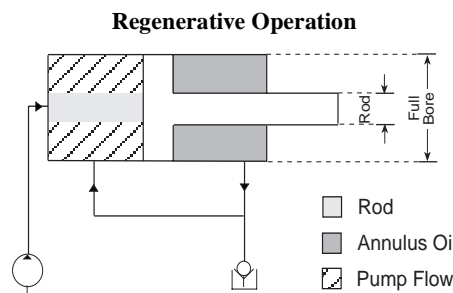
It is important to remember to size pipe work correctly to allow for the increased flow going into the full bore side of the cylinder.

The circuit Sun uses for all types of regeneration includes a pilot to close check valve connecting from the rod side to the full bore side. If this circuit is used in applications where the load can extend the cylinder it will be necessary to incorporate a vented load control valve on the rod side to prevent the load running away.

The illustration shows the appropriate calculations for regenerative circuits.



Oil from the pump fills the full bore of a cylinder. With a cylinder ratio of 2:1 and the annulus connected to tank the flow out of the annulus is half of the flow into the full bore.



During regen, pump flow into the full bore end fills only the effective area of the rod. The area not filled by the pump flow is made up by the annulus oil feeding back into the full bore. Hence, the reason why during regen, the cylinder extends at a faster rate.

**Design Concepts and Features**

The first main feature of all Sun regenerative packages is that they are installed after the directional valve controlling the actuator. This means that the higher flows generated are not passed through the directional valve, which can be the same size as for normal circuits. This also means that this package can more easily be added to an existing circuit with the minimum of disruption.

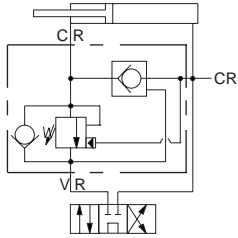
The main feature for the pressure sensitive regenerative circuit is that Sun uses a counterbalance valve to transfer from regeneration to normal operation. This type of valve opens gradually as the pilot pressure increases and gives a much smoother transition compared to the more commonly used sequence valve. It therefore eliminates a great deal of the shock, which can occur during this transition.

The assemblies can be supplied for various flow rates and packages such as line mounted, CETOP sandwich assemblies and gasket-mounted subplates. It is also possible to mount the cartridges directly into the cylinder head.

**Standard Assemblies: Line Mounted Regenerative Assemblies**

**PRESSURE SENSITIVE REGENERATION APPLICATIONS**

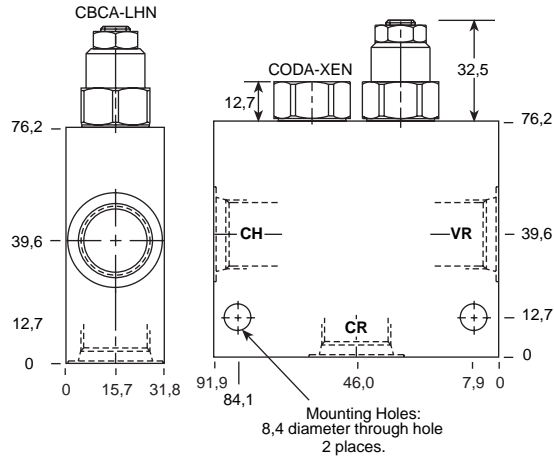
**REGENERATION**



Ports CH,  
CR & VR  
1/2" BSPP

Assembly  
Model Code\*  
**YDCC-LHN-AV**

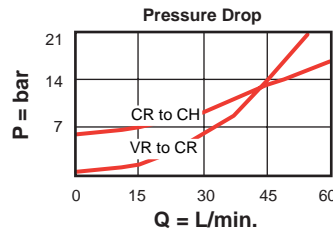
**60 L/min. Maximum Regenerative Flow**



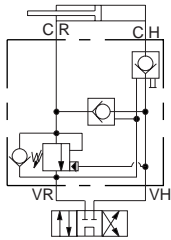
\*Add modifier /S to order SG Iron for pressure rating over 210 bar.

**Regeneration diminishes progressively above setting of CBCA.**

**NOTE:** Refer to page 223 if load causes cylinder to extend.  
\*For part number and price for body only contact the Sun factory.

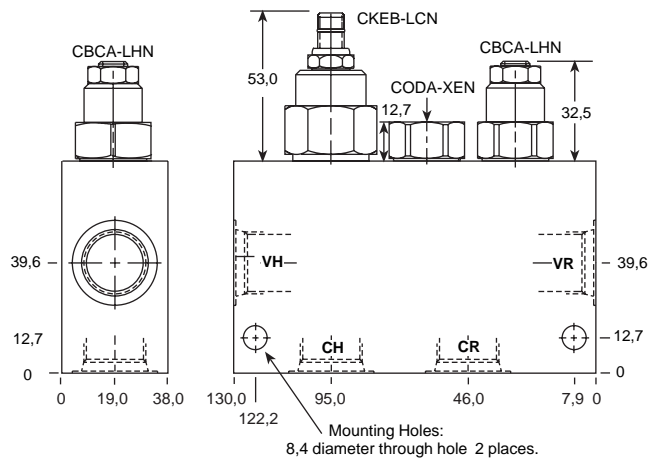


**40 L/min. Maximum Regenerative Flow**



Ports CH,  
CR & VR  
1/2" BSPP

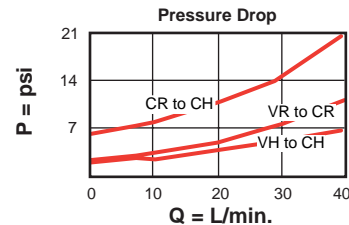
Assembly  
Model Code\*  
**YDCD-LHN-AV**



\*Add modifier /S to order SG Iron for pressure rating over 210 bar.

**Includes CKEB load holding check valve. Regeneration diminishes progressively above setting of CBCA.**

**NOTE:** Refer to page 223 if load causes cylinder to extend.  
\*For part number and price for body only contact the Sun factory.



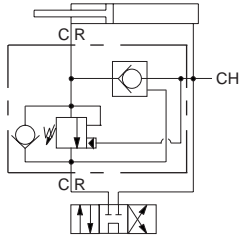
NOTES: Pages 50 for cartridge model CB\*\*\_\*\*\* and page 78 for CK\*B\_\*\*\* shows performance curves, technical tips, and options. See page vii for technical information about line mount bodies including SAE flange pattern specifications. Consult the Sun Factory for other port sizes available in the bodies shown above. Go to [www.sunhydraulics.com](http://www.sunhydraulics.com) for more product information.



**PRESSURE SENSITIVE REGENERATION APPLICATIONS**

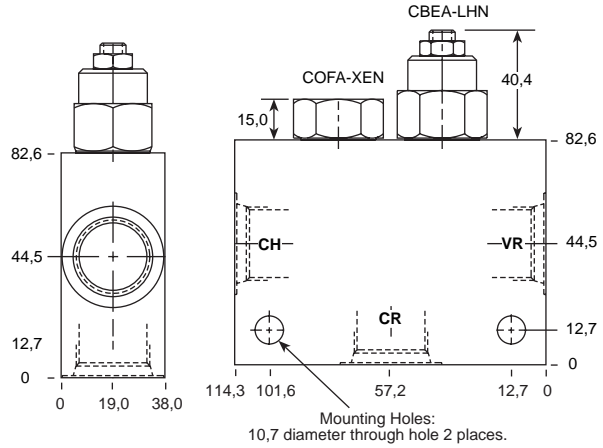
**REGENERATION**

**120 L/min. Maximum Regenerative Flow**

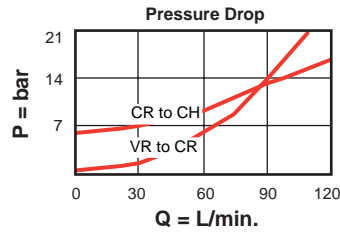


Ports CH, CR & VR	Assembly Model Code*
3/4" BSPP	<b>YDEC-LHN-AW</b>

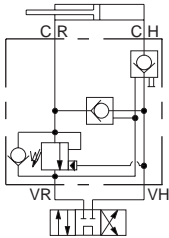
\*Add modifier /S to order SG Iron for pressure rating over 210 bar.



**Regeneration diminishes progressively above setting of CBEA.**  
**NOTE:** Refer to page 223 if load causes cylinder to extend.  
 \*For part number and price for body only contact the Sun factory.

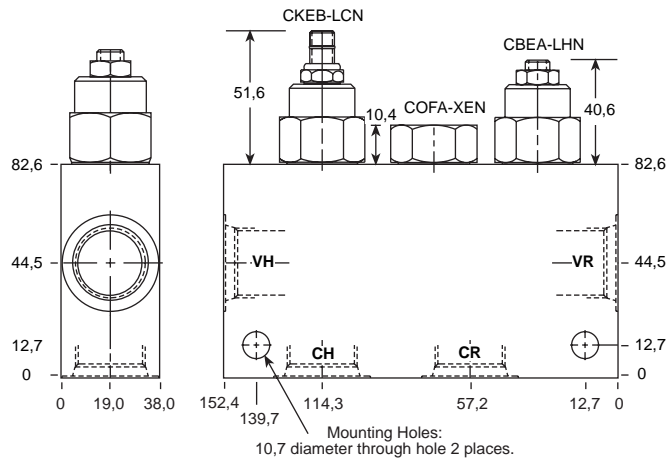


**80 L/min. Maximum Total Flow with Load Holding Check Valve**

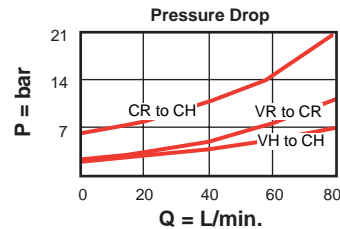


Ports CH, CR & VR	Assembly Model Code*
3/4" BSPP	<b>YDED-LHN-AW</b>

\*Add modifier /S to order SG Iron for pressure rating over 210 bar.



**Regeneration diminishes progressively above setting of CBEA.**  
**NOTE:** Refer to page 223 if load causes cylinder to extend.  
 \*For part number and price for body only contact the Sun factory.

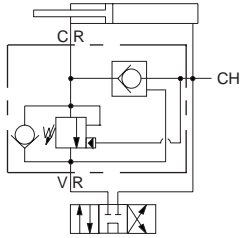


NOTES: Pages 50 for cartridge model CB\*\*.\* and page 78 for CK\*B-\*\*\* shows performance curves, technical tips, and options. See page vii for technical information about line mount bodies including SAE flange pattern specifications. Consult the Sun Factory for other port sizes available in the bodies shown above. Go to [www.sunhydraulics.com](http://www.sunhydraulics.com) for more product information.

# Standard Assemblies: Line Mounted Regenerative Assemblies

## PRESSURE SENSITIVE REGENERATION APPLICATIONS

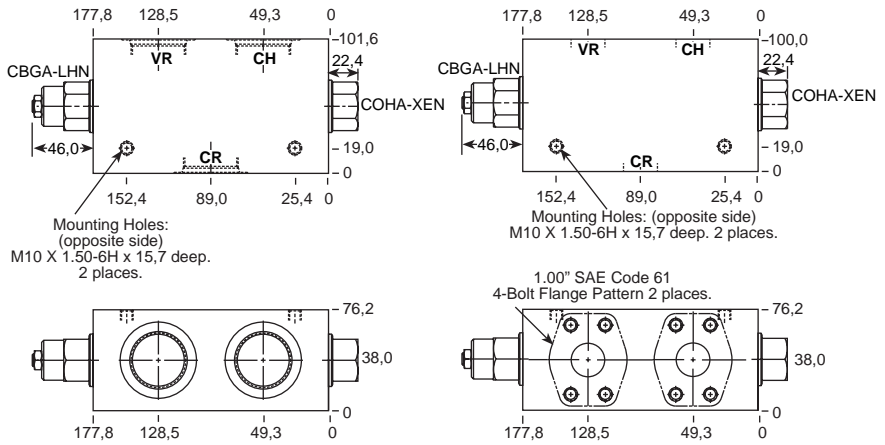
### REGENERATION



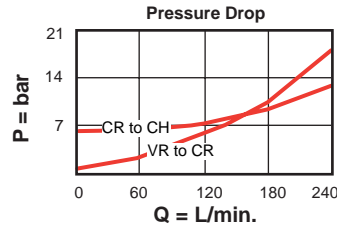
Ports CH, CR & VR	Assembly Model Code*
3/4" BSPP	YDGC-LHN-AW
1" BSPP	YDGC-LHN-AX
1 1/4" BSPP	YDGC-LHN-AY
1" SAE C61	YDGC-LHN-AP/M

\*Add modifier /S or /T to order SG Iron for pressure rating over 210 bar.

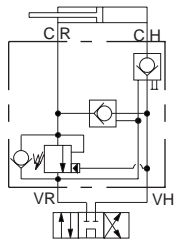
### 240 L/min. Maximum Regenerative Flow



**Regeneration diminishes progressively above setting of CBGA.**  
**NOTE:** Refer to page 223 if load causes cylinder to extend.  
 \*For part number and price for body only contact the Sun factory.

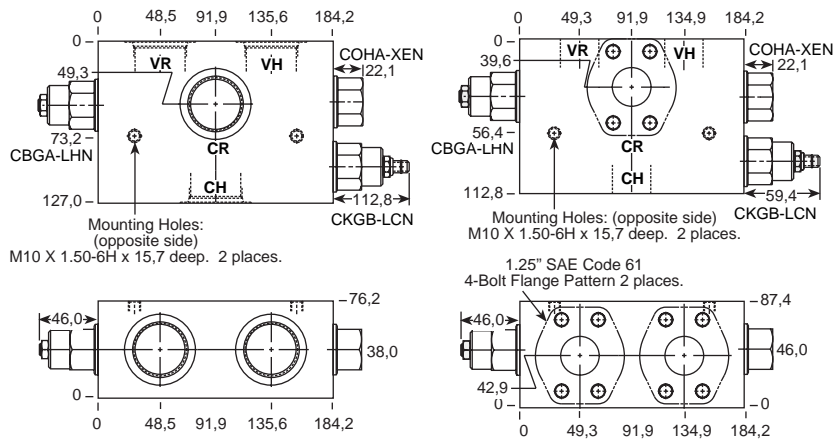


### 200 L/min. Maximum Regenerative Flow

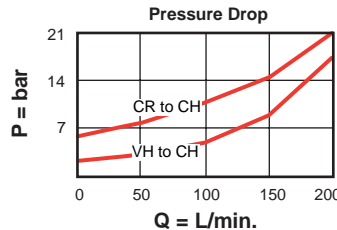


Ports CH, CR & VR	Assembly Model Code*
3/4" BSPP	YDGD-LHN-AW
1" BSPP	YDGD-LHN-AX
1 1/4" BSPP	YDGD-LHN-AY
1 1/4" SAE C61	YDGD-LHN-AQ/M

\*Add modifier /S or /T to order SG Iron for pressure rating over 210 bar.



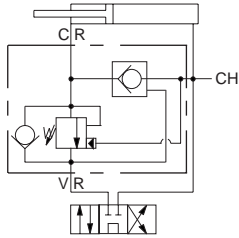
**Regeneration diminishes progressively above setting of CBGA.**  
**NOTE:** Refer to page 223 if load causes cylinder to extend.  
 \*For part number and price for body only contact the Sun factory.



**NOTES:** Pages 50 for cartridge model CB\*\*-\* and page 78 for CK\*B-\* shows performance curves, technical tips, and options. See page vii for technical information about line mount bodies including SAE flange pattern specifications. Consult the Sun Factory for other port sizes available in the bodies shown above. Go to [www.sunhydraulics.com](http://www.sunhydraulics.com) for more product information.

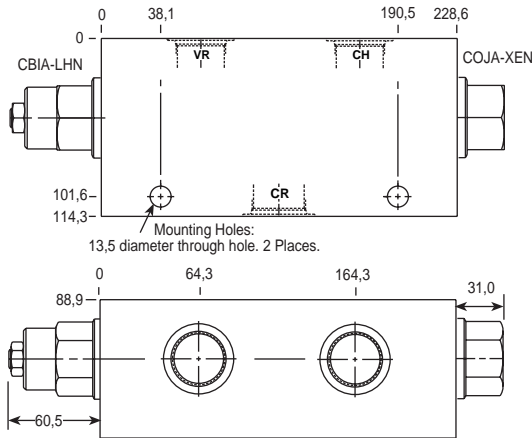
**PRESSURE SENSITIVE REGENERATION APPLICATIONS**

**REGENERATION**



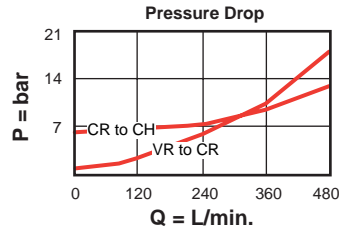
Ports CH, CR & VR	Assembly Model Code*
1" BSPP	YDJC-LHN-AX

**480 L/min. Maximum Regenerative Flow**

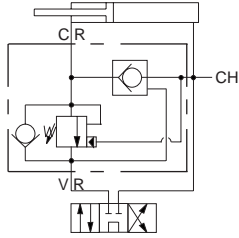


\*Add modifier /S to order SG Iron for pressure rating over 210 bar.

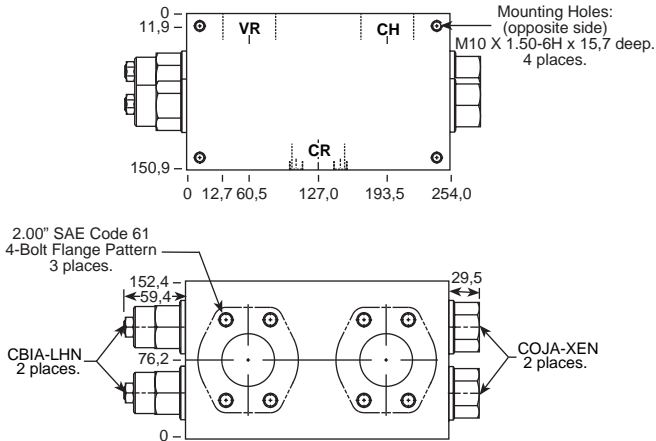
Regeneration diminishes progressively above setting of CBIA.  
 NOTE: Refer to page 223 if load causes cylinder to extend.  
 \*For part number and price for body only contact the Sun factory.



**960 L/min. Maximum Regenerative Flow**

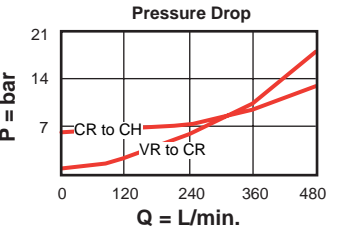


Ports CH, CR, VR	Assembly Model Code*
2" SAE C61	YDJC-LHN-AS/M



\*Add modifier /T to order SG Iron for pressure rating over 210 bar.

Regeneration diminishes progressively above setting of CBIA.  
 NOTE: Refer to page 223 if load causes cylinder to extend.  
 \*For part number and price for body only contact the Sun factory.



NOTES: Pages 50 for cartridge model CB\*\*\_\*\*\* and shows performance curves, technical tips, and options.  
 See page vii for technical information about line mount bodies including SAE flange pattern specifications.  
 Consult the Sun Factory for other port sizes available in the bodies shown above.  
 Go to [www.sunhydraulics.com](http://www.sunhydraulics.com) for more product information.

**NOTES**

**TECHNICAL PRODUCT INFORMATION**  
**DIRECT MOTOR MOUNTED ASSEMBLIES**  
**Char-Lynn S Series**

*Applications*

The gerotor type gear motor is used on a large number of mobile and industrial applications. It is often necessary to incorporate valves in the circuit with the motor to control the flow and pressure. It may also be necessary to incorporate load control valves in the circuit.

It is possible to mount line mounted valves into the pipework feeding the motor, but Sun offers a large range of valves that can be bolted directly onto the motor interface. This eliminates pipework and provides the control directly at the motor.

The use of Sun cartridge valves in these assemblies means that in the event of a problem, it is a simple task to replace the cartridge rather than have to replace the complete valve.

On the smaller size motors the same gasket mounted face is used by at least four different manufacturers of this type of motor. The list below provides a quick cross-reference.

***Manufacturer (general motor type with gasket mounted interface)***

Eaton (S Type)  
White (RS 06 and RS 46)  
Parker/Ross/Nichols/Prince (TA, TB, TD, NE, 110A, 130S, 400S)

**On the specification in this catalogue for the smaller size of motor, we are using the Eaton reference number type as they are probably the largest manufacturer.**

For the larger size of motors we are only showing the Eaton reference of 2000 series and 4000 series.

*Design Concepts and Features*

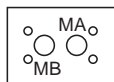
The valve assemblies shown for all sizes of motor are counterbalance valves and cross line relief valves. The counterbalance valves provide load holding and load control while the cross line relief valves provide over pressure protection. The Sun counterbalance valves provide excellent control with low hysteresis and minimum leakage. The relief valves are fast acting with minimum overshoot for excellent protection.

On the smaller sizes of motor, Sun also offers flow control, which can accurately control the motor speed. The type of valve offered is a pressure compensated flow control valve but for more basic flow control a simple restrictor valve can also be used. Sun also has a further expanded range of bolt on valve assemblies. Consult the Sun factory or your local distributor for further information.

# Standard Assemblies: Direct Motor Mounted Assemblies: Char-Lynn S Series Motors

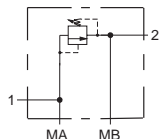
## SINGLE / DUAL CROSS-PORT RELIEF AND SINGLE COUNTERBALANCE APPLICATIONS

### T-10A / T-11A Cavities



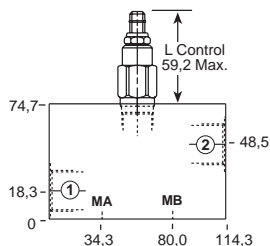
Go to [www.sunhydraulics.com](http://www.sunhydraulics.com) for more product information.

#### DIRECT ACTING



<b>Ports</b> 1, 2	<b>Assembly Model Code*</b>
3/4" BSPP	<b>RDDA-L*N-ZFL</b>

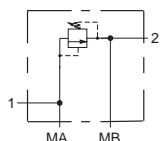
\*Add modifier /S to order SG Iron for pressure rating over 210 bar.



#### PILOT RATIO 3:1

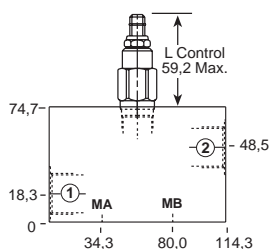
#### Function

Single Cross-Port Relief A to B



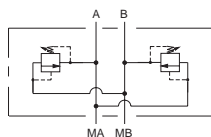
<b>Ports</b> 1, 2	<b>Assembly Model Code*</b>
3/4" BSPP	<b>RDDA-L*N-ZFL</b>

\*Add modifier /S to order SG Iron for pressure rating over 210 bar.



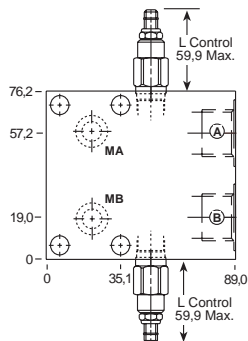
#### Function

Single Cross-Port Relief B to A



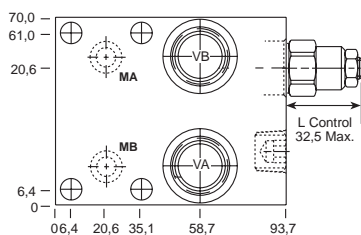
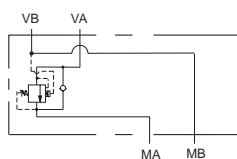
<b>Ports</b> A, B	<b>Assembly Model Code*</b>
1/2 BSPP	<b>RDDA-L*N-YVB</b>

\*Add modifier /S to order SG Iron for pressure rating over 210 bar.



#### Function

Dual Cross-Port Relief

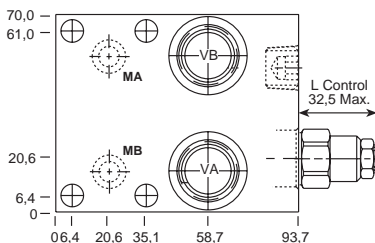
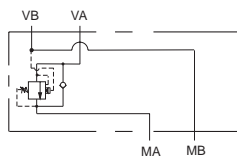


#### Function

Single Counterbalance on A

<b>Ports</b> VA, VB	<b>Assembly Model Code*</b>
1/2 BSPP	<b>CBCA-LAN-ZDL</b>

\*Add modifier /S to order SG Iron for pressure rating over 210 bar.



#### Function

Single Counterbalance on B

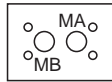
<b>Ports</b> VA, VB	<b>Assembly Model Code*</b>
1/2 BSPP	<b>CBCA-LAN-ZDM</b>

\*Add modifier /S to order SG Iron for pressure rating over 210 bar.

NOTES: Pages 2 for cartridge models RD\*A-\*\*\* and page 50 for CB\*-\*\*\* show performance curves, technical tips, and options. See page 229 for technical information about bolt-on packages.

SINGLE / DUAL COUNTERBALANCE AND DUAL FLOW CONTROL APPLICATIONS

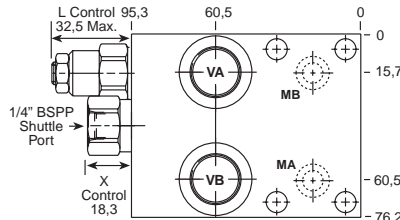
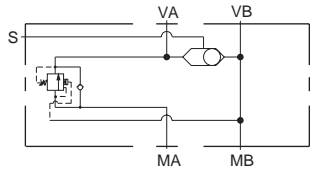
T-11A / T-13A Cavities



Go to [www.sunhydraulics.com](http://www.sunhydraulics.com) for more product information.

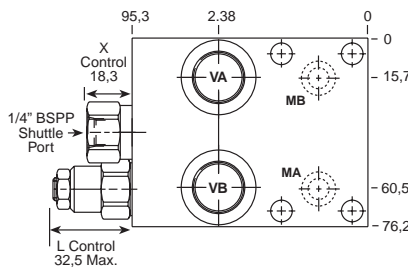
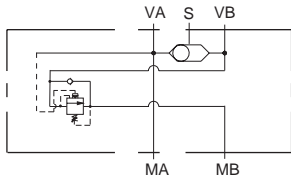
FULLY ADJUSTABLE PRESSURE COMPENSATED WITH FREE FLOW CHECK

PILOT RATIO 3:1



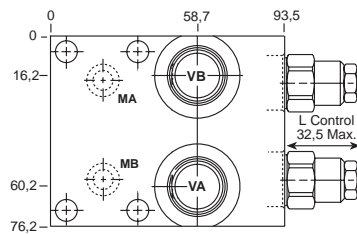
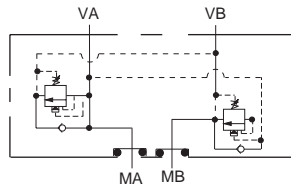
Function	
Single Counterbalance on A with Shuttle	
Ports VA, VB	Assembly Model Code*
1/2" BSPP	<b>CBCA-LAN-ZDW</b>

\*Add modifier /S to order SG Iron for pressure rating over 210 bar.



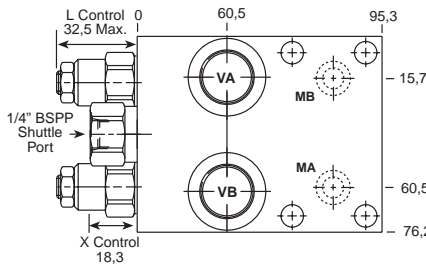
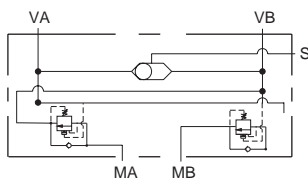
Function	
Single Counterbalance on B with Shuttle	
Ports VA, VB	Assembly Model Code*
1/2" BSPP	<b>CBCA-LAN-ZDZ</b>

\*Add modifier /S to order SG Iron for pressure rating over 210 bar.



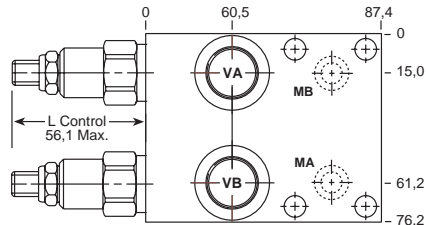
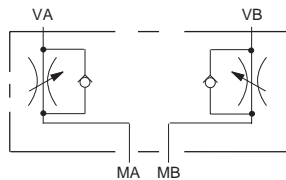
Function	
Dual Counterbalance	
Ports VA, VB	Assembly Model Code*
1/2" BSPP	<b>CBCA-LAN-YTV</b>

\*Add modifier /S to order SG Iron for pressure rating over 210 bar.



Function	
Dual Counterbalance with Shuttle	
Ports VA, VB	Assembly Model Code*
1/2" BSPP	<b>CBCA-LAN-XTT</b>

\*Add modifier /S to order SG Iron for pressure rating over 210 bar.



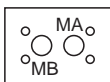
Ports VA, VB	Assembly Model Code*
1/2" BSPP	<b>FDBA-LAN-XWV</b>

\*Add modifier /S to order SG Iron for pressure rating over 210 bar.

NOTES: Page 126 for cartridge model FD\*\*\_\*\*\* and page 50 for CB\*\*\_\*\*\* show performance curves, technical tips, and options. See page 229 for technical information about bolt-on packages.

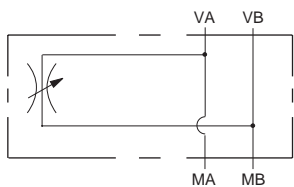
SINGLE FLOW CONTROL APPLICATIONS

T-13A Cavity



Go to [www.sunhydraulics.com](http://www.sunhydraulics.com) for more product information.

FULLY ADJUSTABLE



Function

Single Flow Control Bleed-Off

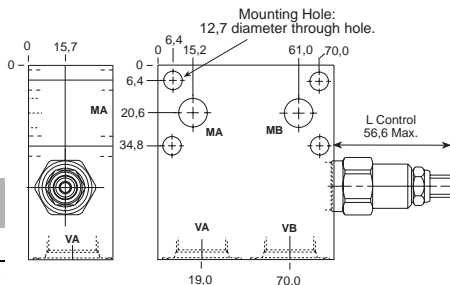
Ports  
VA, VB

Assembly  
Model Code\*

1/2" BSPP

NFCC-LCN-ZGB

\*Add modifier /S to order SG Iron for pressure rating over 210 bar.

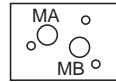


NOTES: Page 110 for cartridge models NF\*\*.\* show performance curves, technical tips, and options. See page 229 for technical information about bolt-on packages.



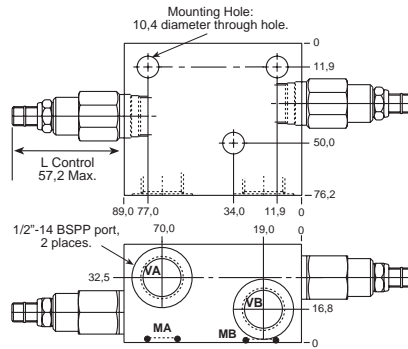
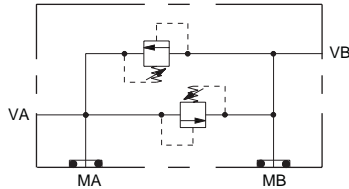
DUAL CROSS-PORT RELIEF AND SINGLE COUNTERBALANCE APPLICATIONS

T-10A / T-2A Cavities



Go to [www.sunhydraulics.com](http://www.sunhydraulics.com) for more product information.

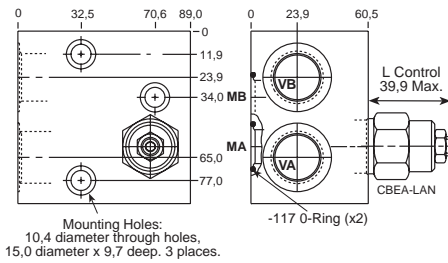
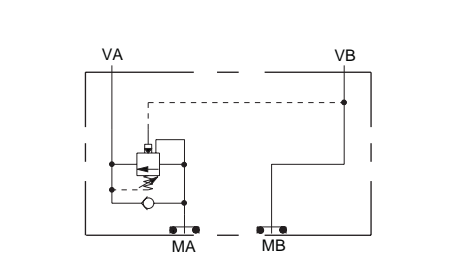
DIRECT ACTING



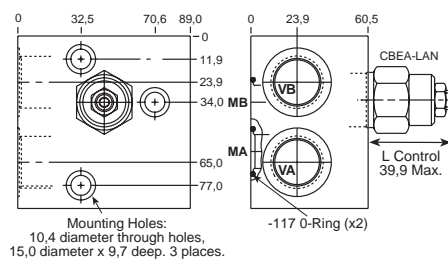
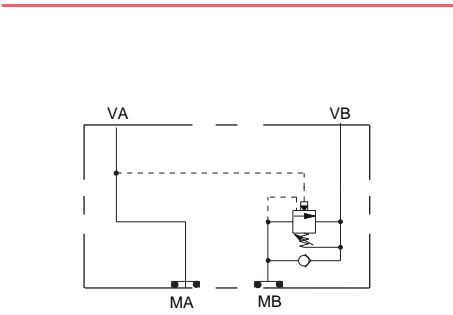
Ports VA, VB  
1/2" BSPP  
Assembly Model Code\*  
**RDDA-L\*N-VZM**  
\*Add modifier /S to order SG Iron for pressure rating over 210 bar.

PILOT RATIO 3:1

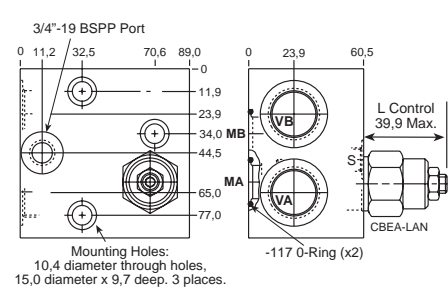
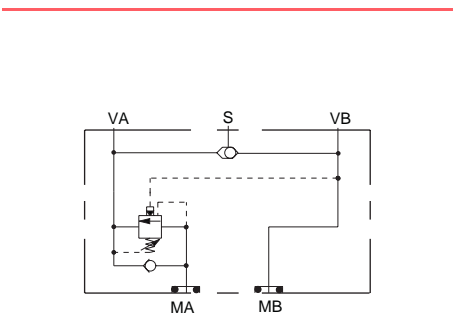
Function  
Dual Cross-Port Relief



Function  
Single Counterbalance on A  
Ports VA, VB  
3/4" BSPP  
Assembly Model Code\*  
**CBEA-LAN-ZNM**  
\*Add modifier /S to order SG Iron for pressure rating over 210 bar.



Function  
Single Counterbalance on B  
Ports VA, VB  
3/4" BSPP  
Assembly Model Code\*  
**CBEA-LAN-ZNN**  
\*Add modifier /S to order SG Iron for pressure rating over 210 bar.

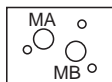


Function  
Single Counterbalance on A with Shuttle  
Ports VA, VB  
3/4" BSPP  
Assembly Model Code\*  
**CBEA-LAN-ZNQ**  
\*Add modifier /S to order SG Iron for pressure rating over 210 bar.

NOTES: Page 2 for cartridge model RD\*A-\*\*\* and page 50 for CB\*-\*-\*\*\* show performance curves, technical tips, and options. See page 229 for technical information about bolt-on packages.

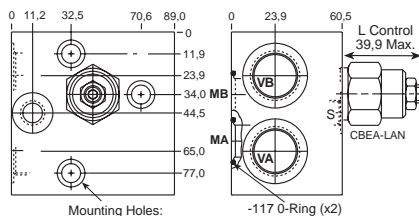
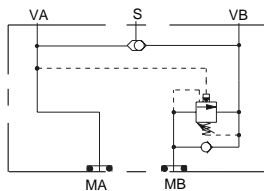
**SINGLE / DUAL COUNTERBALANCE APPLICATIONS**

**T-2A Cavity**



Go to [www.sunhydraulics.com](http://www.sunhydraulics.com) for more product information.

**PILOT RATIO 3:1**



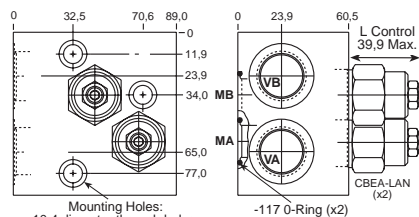
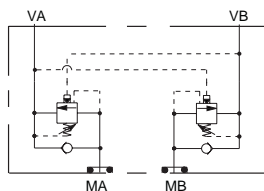
Mounting Holes:  
10,4 diameter through holes,  
15,0 diameter x 9,7 deep. 3 places.

**Function**

Single Counterbalance on **B**  
with Shuttle

Ports VA, VB	Assembly Model Code*
3/4" BSPP	<b>CBEA-LAN-ZNR</b>

\*Add modifier /S to order SG Iron for pressure rating over 210 bar.



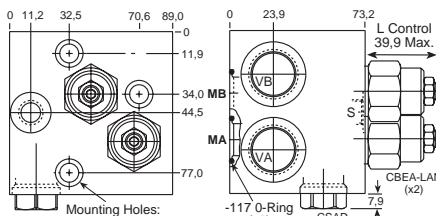
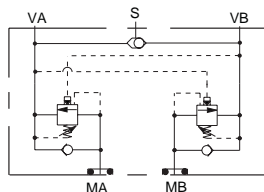
Mounting Holes:  
10,4 diameter through holes,  
15,0 diameter x 9,7 deep. 3 places.

**Function**

Dual Counterbalance

Ports VA, VB	Assembly Model Code*
3/4" BSPP	<b>CBEA-LAN-YTF</b>

\*Add modifier /S to order SG Iron for pressure rating over 210 bar.



Mounting Holes:  
10,4 diameter through holes,  
15,0 diameter x 9,7 deep. 3 places.

**Function**

Dual Counterbalance with Shuttle

Ports VA, VB	Assembly Model Code*
3/4" BSPP	<b>CBEA-LAN-XYT</b>

\*Add modifier /S to order SG Iron for pressure rating over 210 bar.

NOTES: Page 50 for cartridge model CB\*\*.\* show performance curves, technical tips, and options.  
See page 229 for technical information about bolt-on packages.

DUAL CROSS-PORT RELIEF AND DUAL COUNTERBALANCE APPLICATIONS

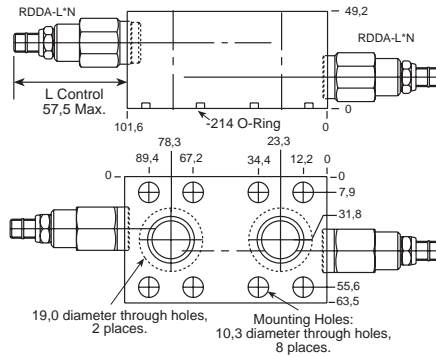
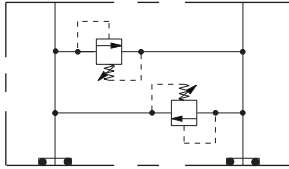
T-10A / T-2A Cavities



Go to [www.sunhydraulics.com](http://www.sunhydraulics.com) for more product information.

DIRECT ACTING

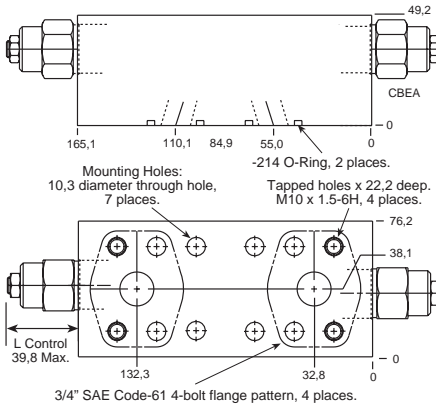
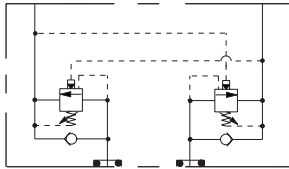
PILOT RATIOS 3:1



Assembly Model Code\*  
**RDDA-L\*N-YVP/M**

\*Add modifier /T to order SG Iron for pressure rating over 210 bar.

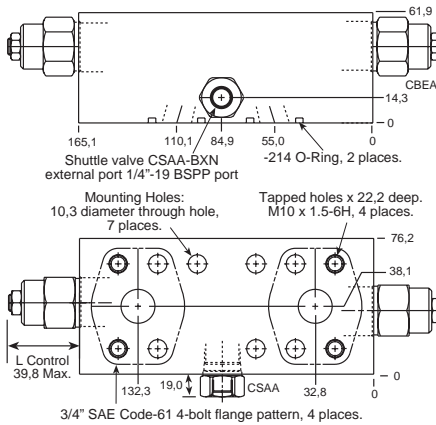
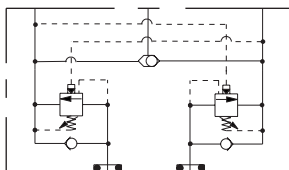
**Function**  
Dual Cross-Port Relief



**Function**  
Dual Counterbalance on A and B

Ports  
3/4" SAE C61  
Assembly Model Code\*  
**CBEA-LAN-VZX/M**

Add modifier /T to order SG Iron for pressure rating over 210 bar.



**Function**  
Dual Counterbalance on A and B with Shuttle

Ports  
3/4" SAE C61  
Assembly Model Code\*  
**CBEA-LAN-VWZ/M**

\*Add modifier /T to order SG Iron for pressure rating over 210 bar.

NOTES: Page 2 for cartridge model RD\*A-\*\*\* and page 50 for CB\*\*-\* show performance curves, technical tips, and options. See page 229 for technical information about bolt-on packages.

**NOTES**

## TECHNICAL PRODUCT INFORMATION

### DIRECT MOTOR MOUNTED ASSEMBLIES

#### Danfoss (OMP/OMR Series and OMT Series)

#### *Applications*

The Danfoss gerotor type gear motor is used on a large number of mobile and industrial applications. It is often necessary to incorporate valves in the circuit with the motor to control the flow and pressure. It is also sometimes necessary to incorporate load control valves in the circuit.

It is possible to mount line-mounted valves into the pipework feeding the motor but Sun offers a large range of valves that can be bolted directly onto the motor interface. This eliminates pipework and provides the control directly at the motor.

The use of Sun cartridge valves in these valve assemblies means that in the event of a problem it is a simple task to replace the cartridge rather than have to replace the complete valve.

We are showing a range of bolt-on valve assemblies for the two most common ranges of Danfoss motors, the OMP/OMR range and the OMT range.

#### *Design Concepts and Features*

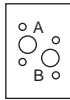
The valve assemblies shown for all sizes of motor are counterbalance valves and cross line relief valves. The counterbalance valves provide load holding and load control while the cross line relief valves provide protection from over pressurisation. The Sun counterbalance valves provide excellent control with low hysteresis and minimum leakage. The relief valves are fast acting with minimum overshoot for excellent protection.

On the smaller sizes of motor, Sun also offers flow control, which can accurately control the motor speed. The type of valve offered is a restrictor type control valve but for more accurate flow control a pressure compensated valve can also be used. Sun also has a further expanded range of bolt on valve assemblies. Consult your local Sun company or distributor for further information.

# Standard Assemblies: Direct Motor Mounted: Danfoss (OMP/OMR Series)

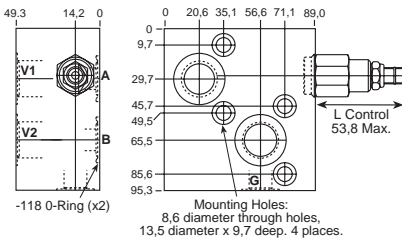
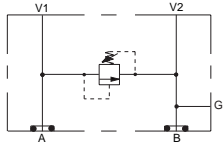
## SINGLE / DUAL CROSS-PORT RELIEF AND SINGLE COUNTERBALANCE APPLICATIONS

### T-10A / T-11A Cavities



Go to [www.sunhydraulics.com](http://www.sunhydraulics.com) for more product information.

#### DIRECT ACTING



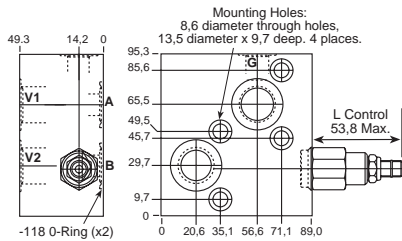
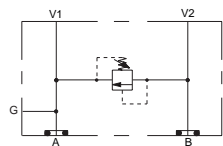
#### PILOT RATIO 3:1

#### Function

Single Cross-Port Relief A to B

Ports V1, V2	Gauge Port	Assembly Model Code*
1/2" BSPP	1/4" BSPP	<b>RDDA-L*N-WVW</b>

\*Add modifier /S to order SG Iron for pressure rating over 210 bar.

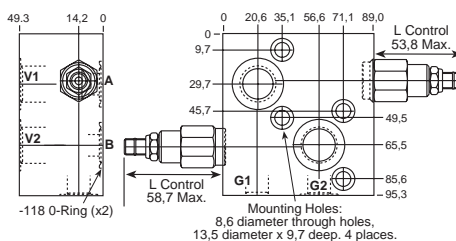
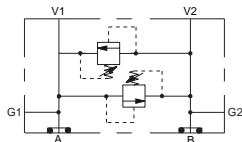


#### Function

Single Cross-Port Relief B to A

Ports V1, V2	Gauge Port	Assembly Model Code*
1/2" BSPP	1/4" BSPP	<b>RDDA-L*N-WVT</b>

\*Add modifier /S to order SG Iron for pressure rating over 210 bar.

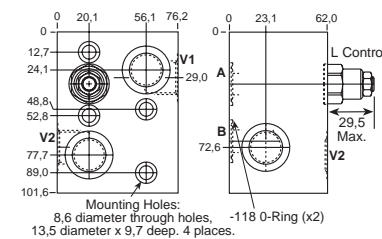
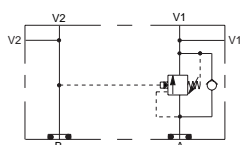


#### Function

Dual Cross-Port Relief

Ports V1, V2	Gauge Port	Assembly Model Code*
1/2" BSPP	1/4" BSPP	<b>RDDA-L*N-WVQ</b>

\*Add modifier /S to order SG Iron for pressure rating over 210 bar.

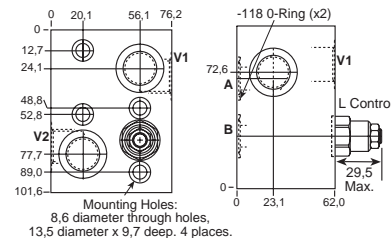
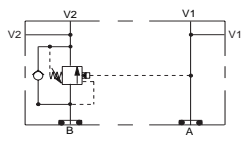


#### Function

Single Counterbalance on A

Ports V1, V2	Assembly Model Code*
1/2" BSPP	<b>CBCA-LAN-WZG</b>

\*Add modifier /S to order SG Iron for pressure rating over 210 bar.



#### Function

Single Counterbalance on B

Ports V1, V2	Assembly Model Code*
1/2" BSPP	<b>CBCA-LAN-WZD</b>

\*Add modifier /S to order SG Iron for pressure rating over 210 bar.

NOTES: Page 2 for cartridge models RD\*A-\*\*\* and page 50 for CB\*\*-\* show performance curves, technical tips, and options. See page 229 for technical information about bolt-on packages.

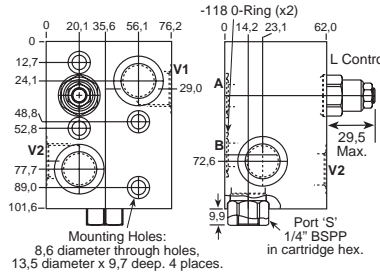
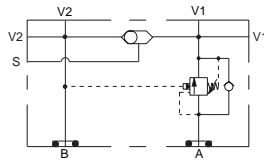
SINGLE / DUAL COUNTERBALANCE APPLICATIONS (SHUTTLES)

T-11A Cavity



Go to [www.sunhydraulics.com](http://www.sunhydraulics.com) for more product information.

PILOT RATIO 3:1

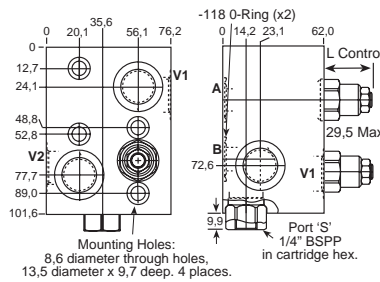
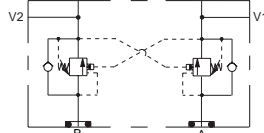


Function

Single Counterbalance on A with Shuttle

Ports V1, V2	Assembly Model Code*
1/2" BSPP	<b>CBCA-LAN-WZR</b>

\*Add modifier /S to order SG Iron for pressure rating over 210 bar.

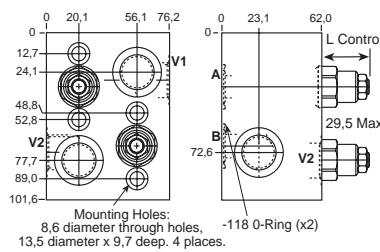
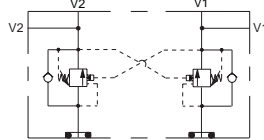


Function

Single Counterbalance on B with Shuttle

Ports V1, V2	Assembly Model Code*
1/2" BSPP	<b>CBCA-LAN-WZN</b>

\*Add modifier /S to order SG Iron for pressure rating over 210 bar.

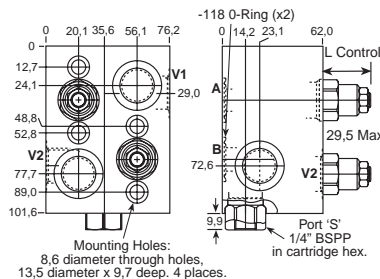
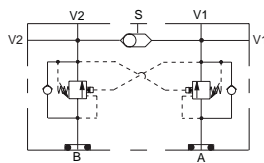


Function

Dual Counterbalance

Ports V1, V2	Assembly Model Code*
1/2" BSPP	<b>CBCA-LAN-WZK</b>

\*Add modifier /S to order SG Iron for pressure rating over 210 bar.

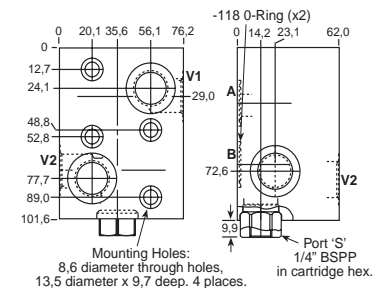
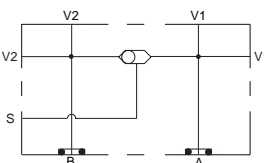


Function

Dual Counterbalance with Shuttle

Ports V1, V2	Assembly Model Code*
1/2" BSPP	<b>CBCA-LAN-WZU</b>

\*Add modifier /S to order SG Iron for pressure rating over 210 bar.



Function

Shuttle Only

Ports V1, V2	Assembly Model Code*
1/2" BSPP	<b>CSAA-BXN-WZX</b>

\*Add modifier /S to order SG Iron for pressure rating over 210 bar.

NOTES: Page 50 for cartridge models CB\*\*\_\*\*\* show performance curves, technical tips, and options. See page 229 for technical information about bolt-on packages.

Standard Assemblies: Direct Motor Mounted: Danfoss (OMP/OMR Series)

DUAL FLOW CONTROL APPLICATIONS

T-5A Cavity

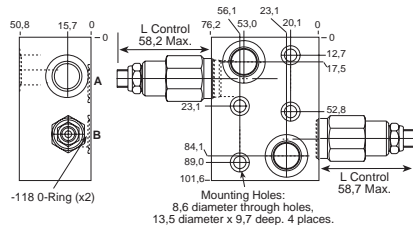
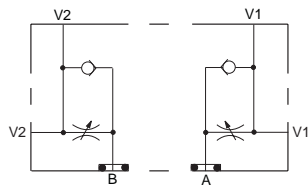


Go to [www.sunhydraulics.com](http://www.sunhydraulics.com) for more product information.

FULLY ADJUSTABLE PRESSURE COMPENSATED FLOW CONTROL WITH REVERSE FREE FLOW CHECK

Function

Dual Flow Control  
Meter-in on A and B

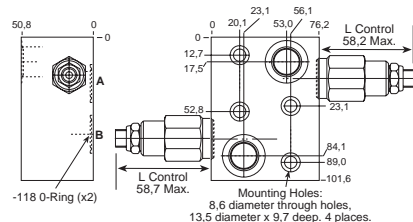
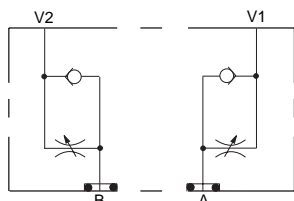


<b>Ports</b> V1, V2	<b>Assembly</b> <b>Model Code*</b>
1/2" BSPP	<b>FDCB-LAN-WZC</b>

\*Add modifier /S to order SG Iron for pressure rating over 210 bar.

Function

Dual Flow Control  
Meter-out on A and B



<b>Ports</b> V1, V2	<b>Assembly</b> <b>Model Code*</b>
1/2" BSPP	<b>FDCB-LAN-WXI</b>

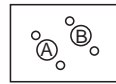
\*Add modifier /S to order SG Iron for pressure rating over 210 bar.

NOTES: Page 126 for cartridge models FD\*B-\*\*\* show performance curves, technical tips, and options. See page 229 for technical information about bolt-on packages.



**SINGLE / DUAL CROSS-PORT RELIEF AND SINGLE COUNTERBALANCE APPLICATIONS**

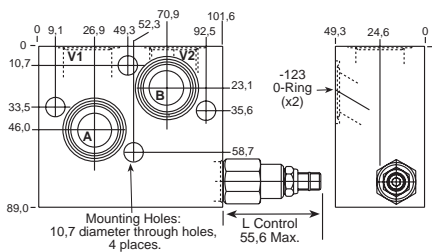
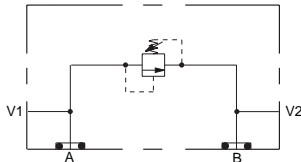
**T-10A / T-2A Cavities**



Go to [www.sunhydraulics.com](http://www.sunhydraulics.com) for more product information.

**DIRECT ACTING**

**PILOT RATIO 3:1**

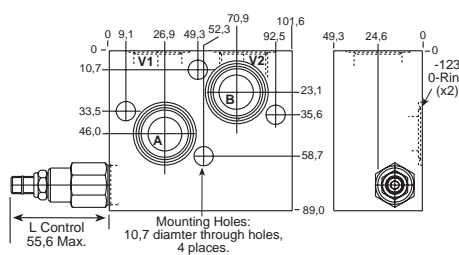
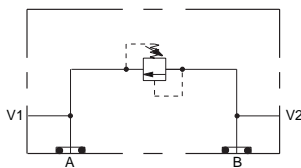


**Function**

Single Cross-Port Relief A to B

Ports V1, V2  
3/4" BSPP  
Assembly Model Code\*  
**RDDA-L\*N-WLW**

\*Add modifier /S to order SG Iron for pressure rating over 210 bar.

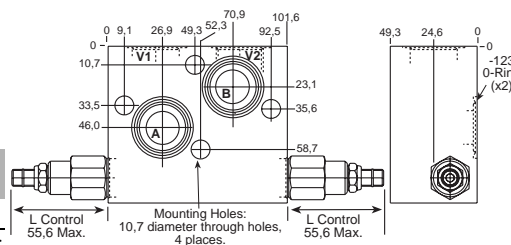
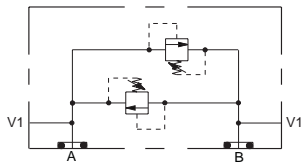


**Function**

Single Cross-Port Relief B to A

Ports V1, V2  
3/4" BSPP  
Assembly Model Code\*  
**RDDA-L\*N-WMW**

\*Add modifier /S to order SG Iron for pressure rating over 210 bar.

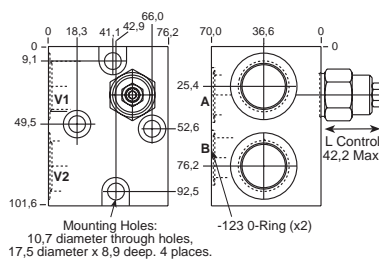
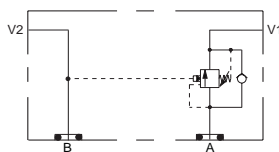


**Function**

Dual Cross-Port Relief

Ports V1, V2  
3/4" BSPP  
Assembly Model Code\*  
**RDDA-L\*N-WLZ**

\*Add modifier /S to order SG Iron for pressure rating over 210 bar.

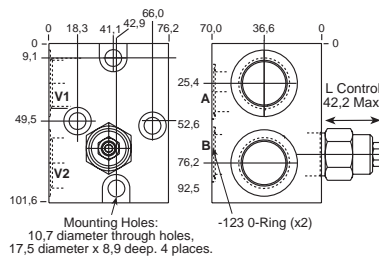
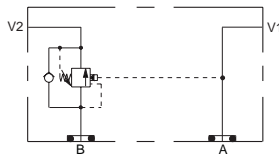


**Function**

Single Counterbalance on A

Ports V1, V2  
3/4" BSPP  
Assembly Model Code\*  
**CBEA-LAN-WKJ**

\*Add modifier /S to order SG Iron for pressure rating over 210 bar.



**Function**

Single Counterbalance on B

Ports V1, V2  
3/4" BSPP  
Assembly Model Code\*  
**CBEA-LAN-WKL**

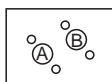
\*Add modifier /S to order SG Iron for pressure rating over 210 bar.

NOTES: Pages 2 for cartridge models RD\*A-\*\*\* and page 50 for CB\*-\*\*\* show performance curves, technical tips, and options. See page 229 for technical information about bolt-on packages.

Standard Assemblies: Direct Motor Mounted: Danfoss (OMT Series)

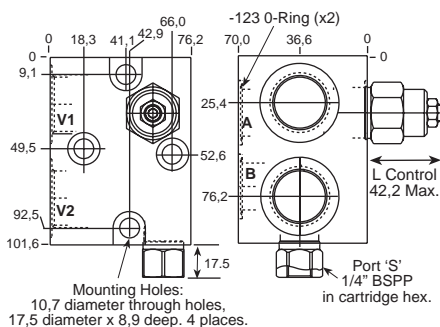
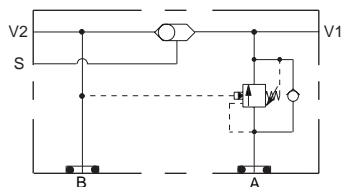
SINGLE / DUAL COUNTERBALANCE APPLICATIONS (SHUTTLES)

T-2A Cavity



Go to [www.sunhydraulics.com](http://www.sunhydraulics.com) for more product information.

PILOT RATIO 3:1



Function

Single Counterbalance on A with Shuttle

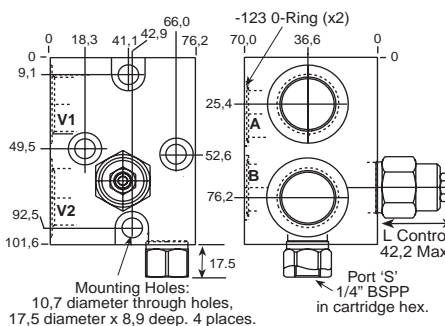
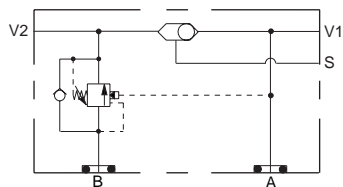
Ports V1, V2

Assembly Model Code\*

3/4" BSPP

**CBEA-LAN-WKQ**

\*Add modifier /S to order SG Iron for pressure rating over 210 bar.



Function

Single Counterbalance on B with Shuttle

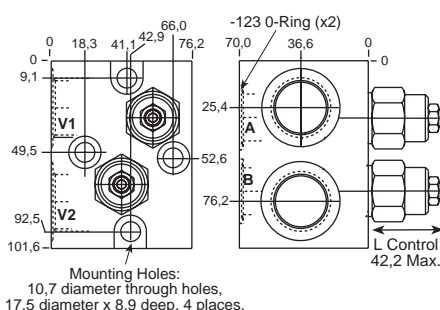
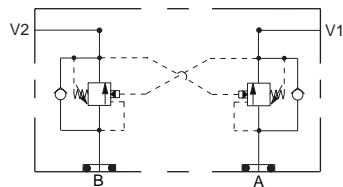
Ports V1, V2

Assembly Model Code\*

3/4" BSPP

**CBEA-LAN-WKT**

\*Add modifier /S to order SG Iron for pressure rating over 210 bar.



Function

Dual Counterbalance

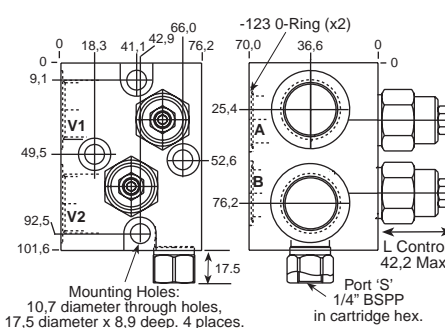
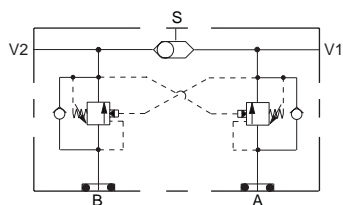
Ports V1, V2

Assembly Model Code\*

3/4" BSPP

**CBEA-LAN-WKW**

\*Add modifier /S to order SG Iron for pressure rating over 210 bar.



Function

Dual Counterbalance with Shuttle

Ports V1, V2

Assembly Model Code\*

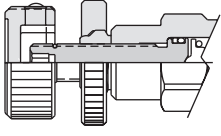
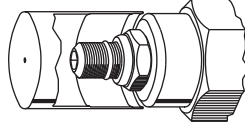
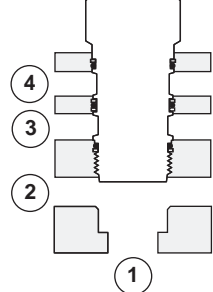
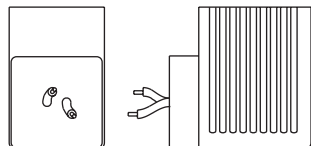
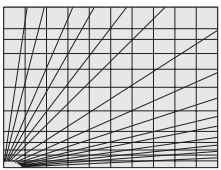
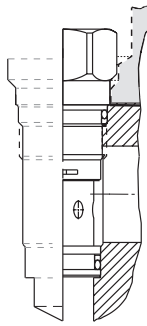
3/4" BSPP

**CBEA-LAN-WKZ**

\*Add modifier /S to order SG Iron for pressure rating over 210 bar.

NOTES: Page 50 for cartridge model CB\*\*.\* show performance curves, technical tips, and options. See page 229 for technical information about bolt-on packages.

# General Information

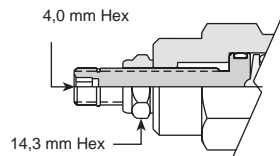
	<i>Page</i>	
Cartridge Control Options	244	
Cartridge Control Kits	245	
Cavity Plugs	246	
Solenoid Electrical Connector Options	248	
Pressure Drop Data Chart	249	
Cartridge Cavities and Cavity Tools	250	

**CARTRIDGE CONTROL OPTIONS**

**General Purpose Controls**

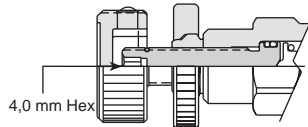
**L Standard Screw Adjustment**

O-ring seal on adjust screw. Adjust screw positively retained. Overset protection-pilot spring cannot go solid.



**K Handknob with Lock Knob**

Handknob and lock knob added to L control. Sun handknob kits for field conversion are available. See cartridge control kits.

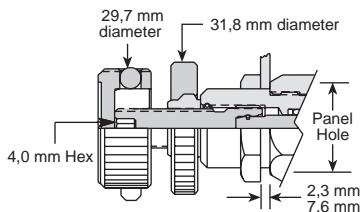


**O Handknob with Panel Mount**

Special threaded cartridge hex body with panel nut for mounting cartridge through access hole in control panel. Handknob and lock knob included.

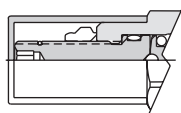
Panel Hole:

Series 1 cartridges 19,0 mm dia.  
Series 2 cartridges 25,4 mm dia.



**C Tamper Resistant Factory Set**

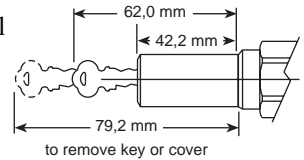
Steel cover press-fits onto L control cartridge shoulder. Valves may be ordered in this configuration. *Specify pressure setting on order.* Setting stamped on cartridge hex. Kits for field conversion are available. See cartridge control kits.



**Key Lock Kit**

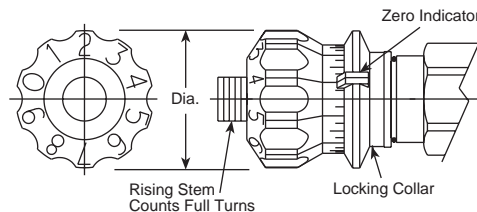
Optional adjustment Key Lock Cover Kit for L controls allows adjustment to be locked with a key to prevent changes in valve setting. Adjustment easily accessible when lock assembly is removed.

Requires replacement of standard locknut with special locknut which accepts assembly, and new wire stop ring for overset protection.



**H Calibrated Handknob with Detent Lock**

Fully calibrated handknob for flow control cartridges. 40 radial calibrations per turn. Moveable zero indicator. (Minor disassembly required.) Rising detented locking collar positively locks adjustment knob against vibration or accidental tampering. Any desired setting may be recorded and repeated. U.S. Patent #4,577,831

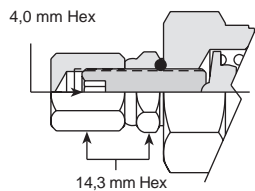


Diameter	28,7 mm	35,1 mm	41,1 mm	41,1 mm
Series	1	2	3	4
	NCCB	NCEB	NCFB	NCGB
	NCCC	NCEC	NCFC	NCGC
	NFCC	NFDC	NFEC	NFFC
	NFCD	NFDD	NFED	NFFD
	FDBA	FDCB	FDEA	FDFA

**Special Purpose Controls** (for use in systems where adjustment is seldom changed after installation)

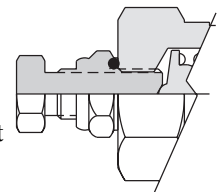
**J Socket Head Set Screw with Cap**

Stem seal O-ring under locknut. Adjusting screw is not retained. No overset protection.



**F Wrench Adjustment**

Stem seal O-ring under locknut. Adjusting screw is not retained. Overset protection-pilot spring cannot go solid.

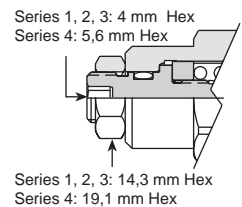


**Counterbalance Valves**

All Sun counterbalance cartridges are built with a leakproof adjustment (O-ring seals on the adjusting screw) but are not designed for frequent adjustment in the field. Cartridges that are factory pre-set by Sun to a customer specified pressure setting are available and can be installed directly on a machine without the need for further adjustment.

**L Standard Leakproof Screw Adjustment.**

O-ring seal on adjust screw.



**C Tamper Resistant Factory Set**

See C Control description above.

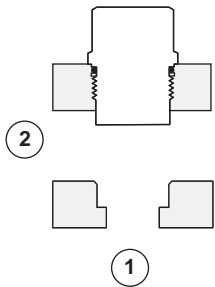


## General Information

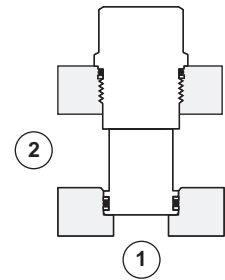
### CAVITY PLUGS

It is sometimes desirable to remove a Sun cartridge valve and still maintain the integrity of the hydraulic system. This may be necessitated by the need to flush a system after repairs or a piping change, or to change an operating function in the circuit. For these requirements, Sun offers two styles of cavity plugs - all ports blocked and main ports open to flow.

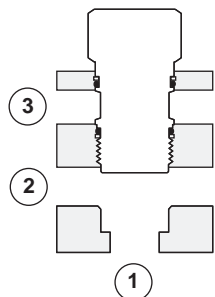
#### Plugs for Two Port Cavities:



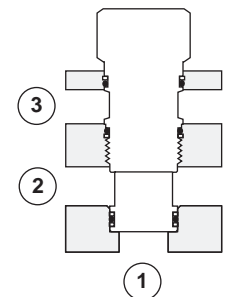
Series	Cavity	All Ports Open	All Ports Blocked
		Cavity Plug Model Code	Cavity Plug Model Code
P	T-8A	XAOA-XX*	XACA-XX*
0	T-162A	XZOA-XX*	XZCA-XX*
1	T-10A	XFOA-XX*	XFCA-XX*
	T-13A	XGOA-XX*	XGCA-XX*
2	T-3A	XCOA-XX*	XCCA-XX*
	T-5A	XDOA-XX*	XDCA-XX*
3	T-16A	XIOA-XX*	XICA-XX*
4	T-18A	XKOA-XX*	XKCA-XX*



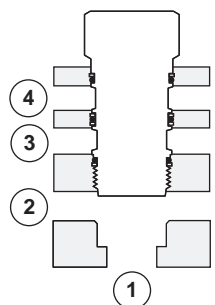
#### Plugs for Three Port Cavities



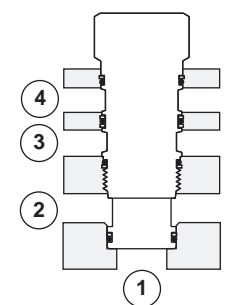
Series	Cavity	Ports 1 to 2 Open Port 3 Blocked	All Ports Blocked
		Cavity Plug Model Code	Cavity Plug Model Code
P	T-9A	XAOB-XX*	XACB-XX*
0	T-163A	XZOB-XX*	XZCB-XX*
1	T-11A	XEOA-XX*	XECA-XX*
2	T-2A	XBOA-XX*	XBCA-XX*
3	T-17A	XHOA-XX*	XHCA-XX*
4	T-19A	XJOA-XX*	XJCA-XX*



#### Plugs for Four Port Cavities (Internal Locating Shoulder)



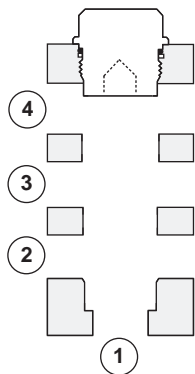
Series	Cavity	Ports 1 to 2 Open Port 3 and 4 Blocked	All Ports Blocked
		Cavity Plug Model Code	Cavity Plug Model Code
1	T-21A	XMOA-XX*	XMCA-XX*
2	T-22A	XNOA-XX*	XNCA-XX*
3	T-23A	XPOA-XX*	XPCA-XX*
4	T-24A	XQOA-XX*	XQCA-XX*



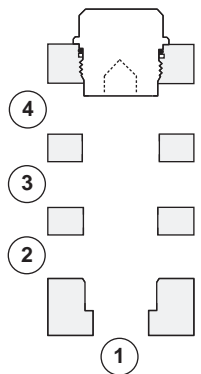
\*Insert in the seventh position model code digit N to order Buna-N seals or V to order Viton seals.

**CAVITY PLUGS**

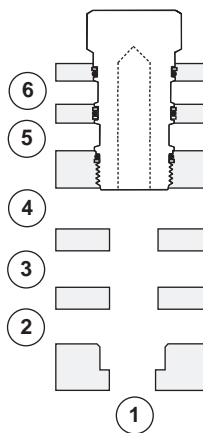
**Plugs for Four Port Cavities (External Locating Shoulder)**



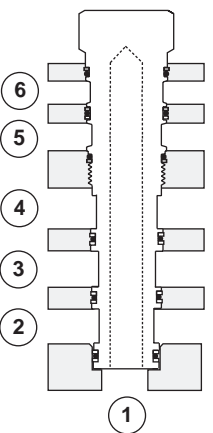
		All Ports Open	All Ports Blocked
Series	Cavity	Cavity Plug Model Code*	Cavity Plug Model Code*
1	T-31A	XFOA-XX*	XRCA-XX*
2	T-32A	XCOA-XX*	XSCA-XX*
3	T-33A	XIOA-XX*	XTCA-XX*
4	T-34A	XKOA-XX*	XVCA-XX*



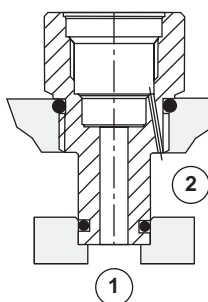
**Plugs for Six Port Cavities**



		Ports 1, 2, 3 and 4 Open Ports 5 and 6 Blocked	All Ports Blocked
Series	Cavity	Cavity Plug Model Code*	Cavity Plug Model Code*
1	T-61A	XMOA-XX*	XRCC-XX*
2	T-62A	XNOA-XX*	XSCC-XX*
3	T-63A	XPOA-XX*	XTCC-XX*
4	T-64A	XQOA-XX*	XVCC-XX*



**Cavity Adaptor (Adapts Waterman 12-2 Cavity to the Sun T-8A Cavity)**

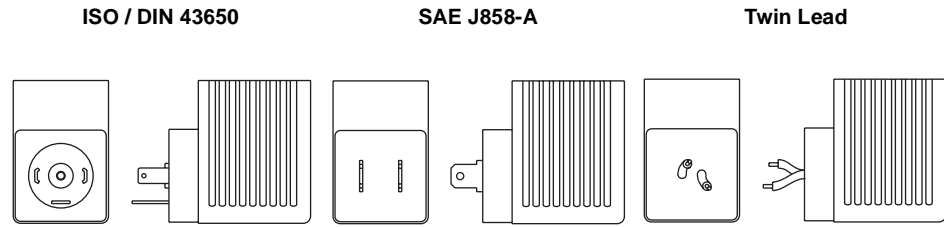


		All Ports Open
Cavity	Cavity Plug Model Code*	
12-2	XAAA-8X*	

\*Insert in the seventh position model code digit N to order Buna-N seals or V to order Viton seals.

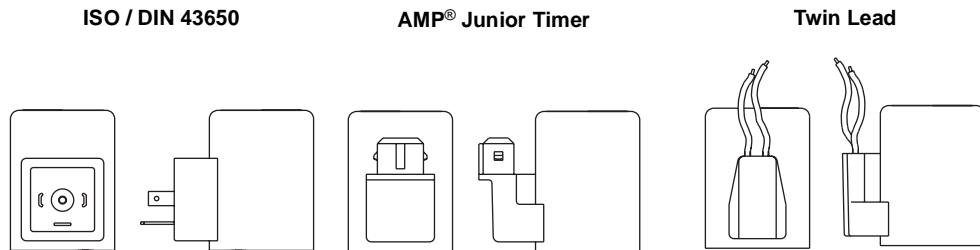
**SOLENOID ELECTRICAL CONNECTOR OPTIONS**

**Pilot Flow Solenoid Valves: DAAA, DBAA**



Description	Coil only part number		Coil only part number		Coil only part number	
115 V AC 50/60 Hz	760-211		N/A		N/A	
230 V AC 50/60 Hz	760-223		N/A		N/A	
6 V DC	760-206		760-506		N/A	
12 V DC	760-212		760-512		760-712	
24 V DC	760-224		760-524		760-724	
36 V DC	760-236		N/A		N/A	
48 V DC	760-248		N/A		N/A	

**Full Flow Solenoid Valves: DLDA, DTDA, DMDA, DNDA**



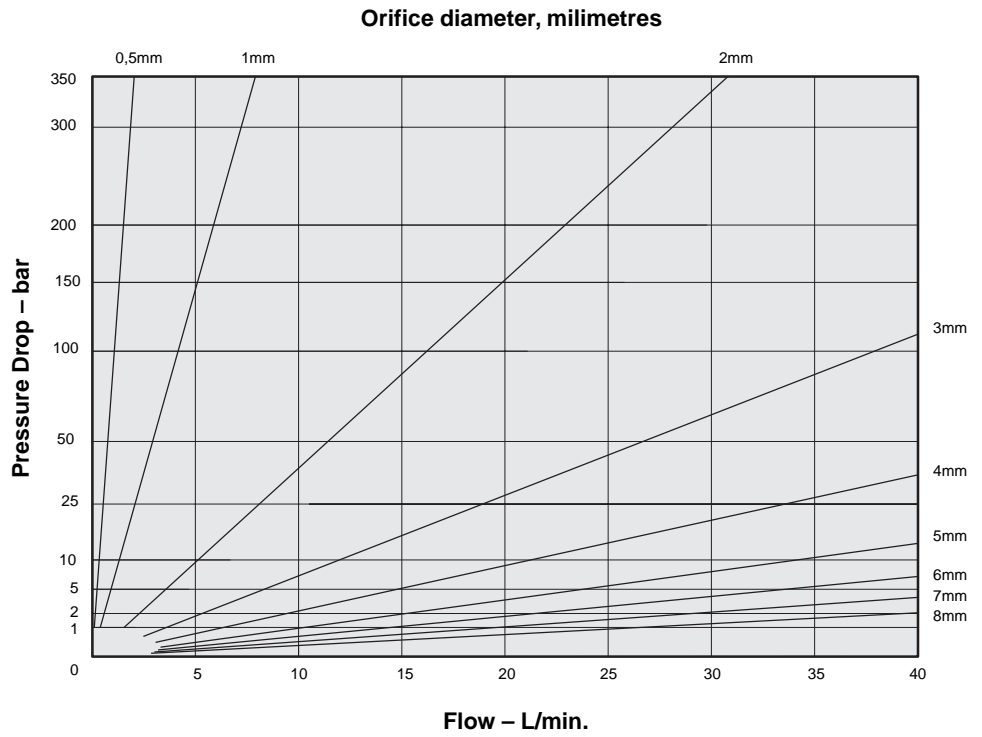
Description	Coil only part number		Coil only part number		Coil only part number	
115 V AC 50/60 Hz	770-211		N/A		N/A	
230 V AC 50/60 Hz	770-223		N/A		N/A	
12 V DC	770-212		770-612		770-712	
24 V DC	770-224		770-624		770-724	
48 V DC	770-248		770-648		770-748	

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ORIFICE PRESSURE DROP DATA

No allowance has been made for viscosity effects, or regain of pressure downstream.



These charts are based on the formula:

$$Q = \alpha A \sqrt{\frac{2\Delta P}{\rho}}$$

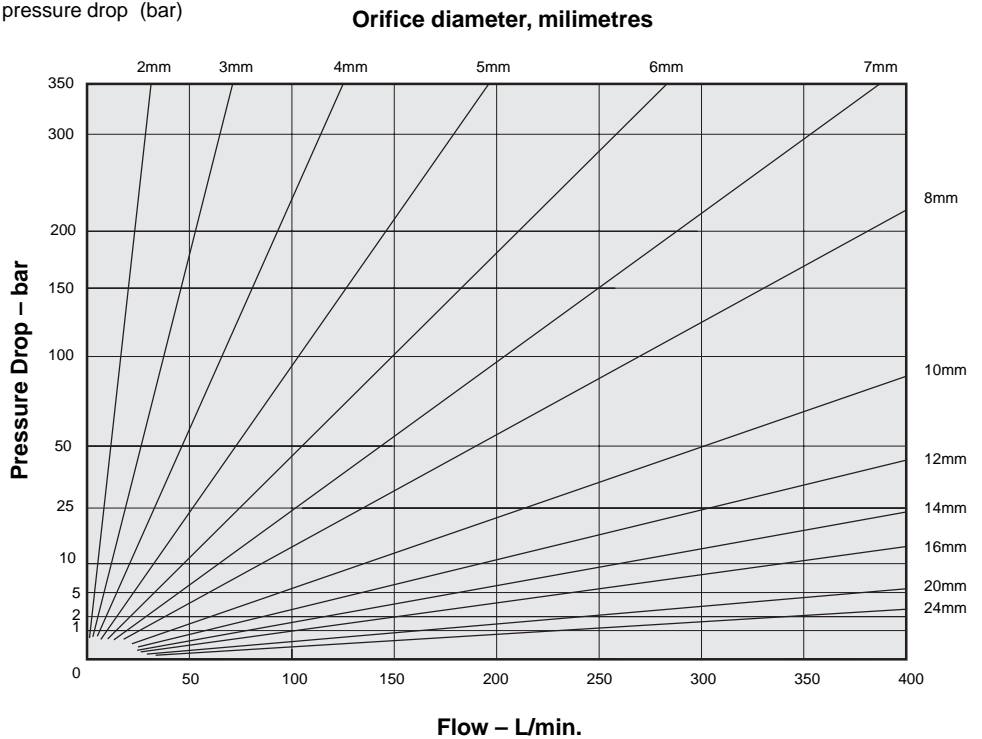
Where:

- Q = Flow m<sup>3</sup>/sec.
- α = orifice coefficient
- A = orifice dia. cm<sup>2</sup>
- Δ P = pressure drop N/m<sup>2</sup>
- ρ = density Ns<sup>2</sup>/m<sup>4</sup>

This equation becomes:

$$Q \text{ (l,min)} = 0.4212 \times d^2 \text{ (mm)} \sqrt{\text{pressure drop (bar)}}$$

when c = 0.6  
ρ = 0.9 g/cm<sup>3</sup>

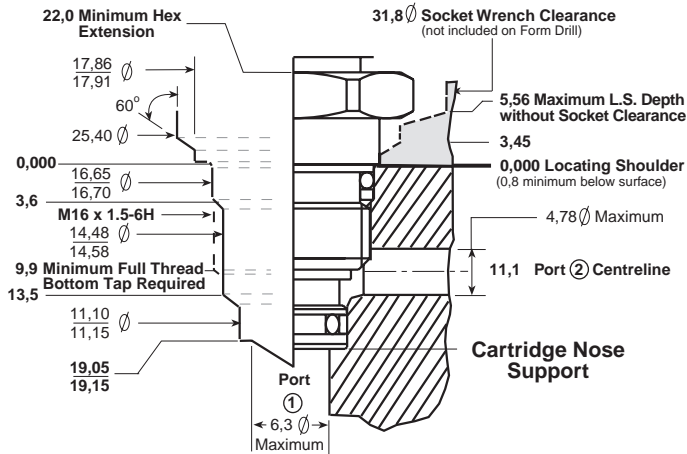


## General Information: Cartridge Cavities and Cavity Tools

**NOTES:** Thin wall deep hex sockets, preferred for installing Sun cartridges, are available from Sun or Snap-On Tools Corporation. Complete cavity machining dimensions are provided with form tools or supplied upon request. Dimensions shown below are simplified for manifold design purposes.

### SERIES P

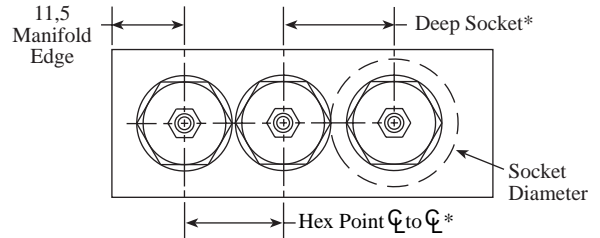
#### T-8A 2 Port Sun Cavity



Cavity Diameters to be concentric to threads within 0,05.

© SUN Hydraulics Corporation

#### Minimum Clearance Distances:



\* See respective Pilot Stage Cartridge Outline Drawing for Deep Socket and Hex Point clearance centreline dimensions

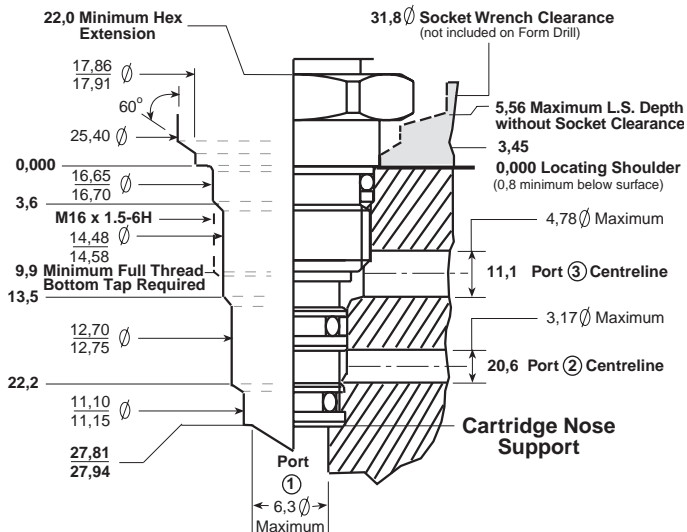
Description	High Speed Steel	Titanium Coated
	Model Code	Model Code
Form Drill TD-8A	994-008-001	994-008-101
Form Reamer TR-8A	995-008-001	995-008-101
Metric Tap M16x1.5-6H	998-991	998-991-101

Note: Drill and Reamer have a #3 Morse taper. Tap has straight shank.

#### 7/8" Hex Deep Socket:

Sun P/N: 998-100-006, Snap-On P/N: SIML280

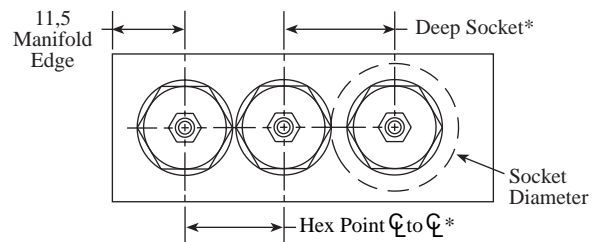
#### T-9A 3 Port Sun Cavity



Cavity Diameters to be concentric to threads within 0,05.

© SUN Hydraulics Corporation

#### Minimum Clearance Distances:



\* See respective Pilot Stage Cartridge Outline Drawing for Deep Socket and Hex Point clearance centreline dimensions.

Description	High Speed Steel	Titanium Coated
	Model Code	Model Code
Form Drill TD-9A	994-009-001	994-009-101
Form Reamer TR-9A	995-009-001	995-009-101
Metric Tap M16x1.5-6H	998-991	998-991-101

Note: Drill and Reamer have a #3 Morse taper. Tap has straight shank.

#### 7/8" Hex Deep Socket:

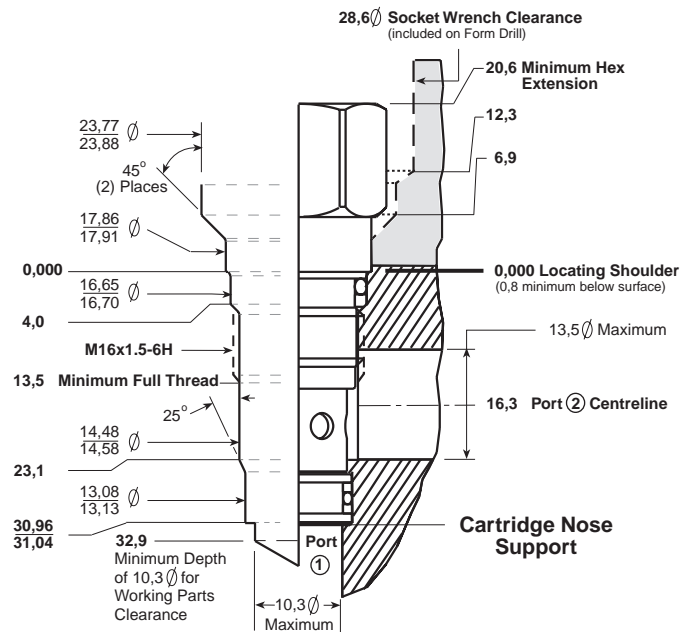
Sun P/N: 998-100-006, Snap-On P/N: SIML280

## General Information: Cartridge Cavities and Cavity Tools

**NOTES:** Thin wall deep hex sockets, preferred for installing Sun cartridges, are available from Sun or Snap-On Tools Corporation. Complete cavity machining dimensions are provided with form tools or supplied upon request. Dimensions shown below are simplified for manifold design purposes.

### SERIES 0

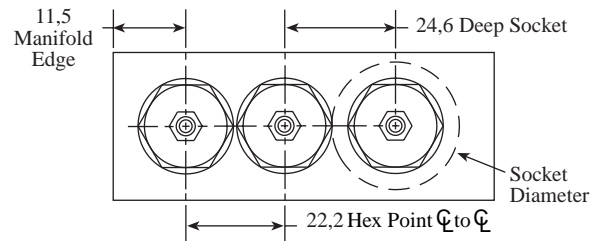
#### T-162A 2 Port Sun Cavity



Cavity Diameters to be concentric to threads within 0,05.

© SUN Hydraulics Corporation

#### Minimum Clearance Distances:



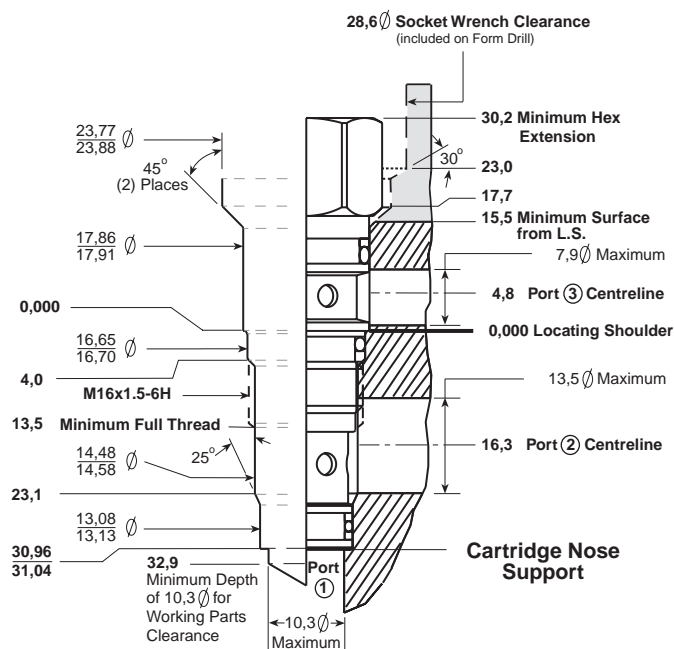
Description	High Speed Steel	Titanium Coated
	Model Code	Model Code
Form Drill TD-162A	994-162-001	994-162-101
Form Reamer TR-162A	995-162-001	995-162-101
Metric Tap M16x1.5-6H	998-991	998-991-101

Note: Drill and Reamer have a #3 Morse taper. Tap has straight shank.

#### 3/4" Hex Deep Socket:

Sun P/N: 998-100-005, Snap-On P/N: S241

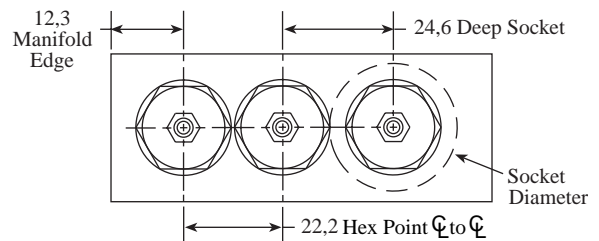
#### T-163A 3 Port Sun Cavity



Cavity Diameters to be concentric to threads within 0,05.

© SUN Hydraulics Corporation

#### Minimum Clearance Distances:



Description	High Speed Steel	Titanium Coated
	Model Code	Model Code
Form Drill TD-163A	994-163-001	994-163-101
Form Reamer TR-163A	995-163-001	995-163-101
Metric Tap M16x1.5-6H	998-991	998-991-101

Note: Drill and Reamer have a #3 Morse taper. Tap has straight shank.

#### 3/4" Hex Deep Socket:

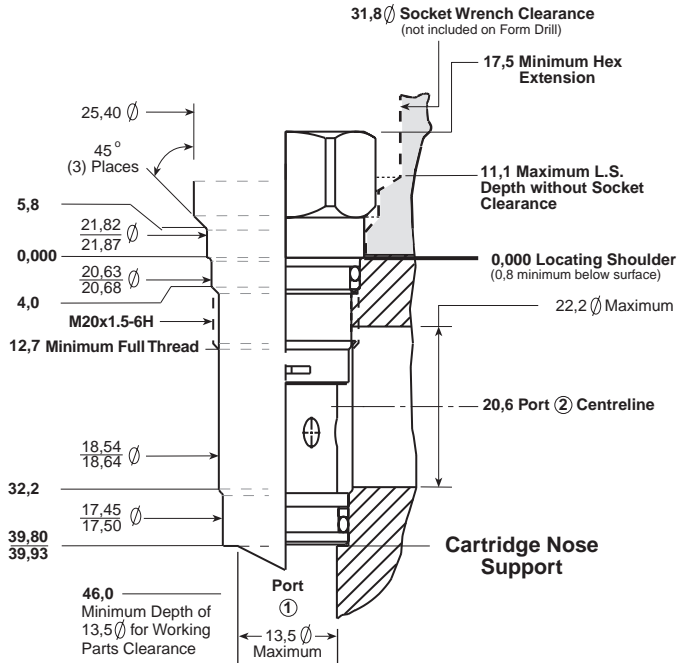
Sun P/N: 998-100-005, Snap-On P/N: S241

## General Information: Cartridge Cavities and Cavity Tools

**NOTES:** Thin wall deep hex sockets, preferred for installing Sun cartridges, are available from Sun or Snap-On Tools Corporation. Complete cavity machining dimensions are provided with form tools or supplied upon request. Dimensions shown below are simplified for manifold design purposes.

### SERIES 1

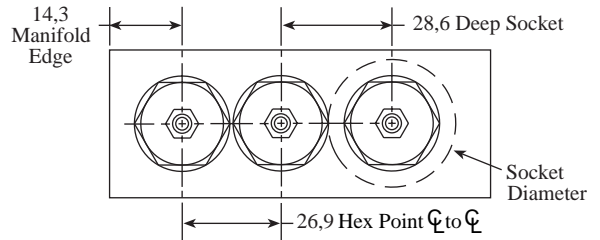
#### T-10A 2 Port Sun Cavity



Cavity Diameters to be concentric to threads within 0,05.

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#### Minimum Clearance Distances:



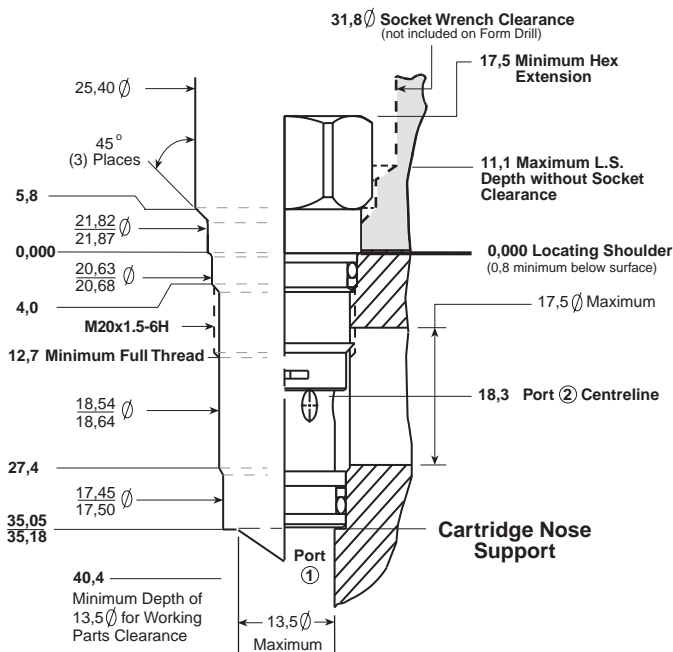
Description	High Speed Steel	Titanium Coated
	Model Code	Model Code
Form Drill TD-10A	994-010-001	994-010-101
Form Reamer TR-10A	995-010-001	995-010-101
Metric Tap M20x1.5-6H	998-998	998-998-101

Note: Drill and Reamer have a #3 Morse taper. Tap has straight shank.

#### 7/8" Hex Deep Socket:

Sun P/N: 998-100-001, Snap-On P/N: S281

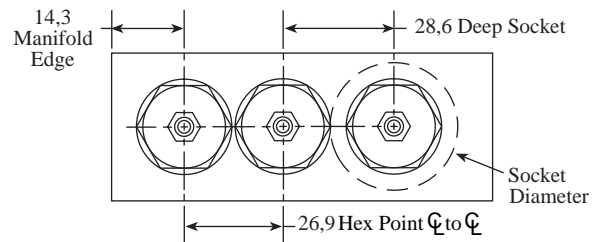
#### T-13A 2 Port Sun Cavity



Cavity Diameters to be concentric to threads within 0,05.

© SUN Hydraulics Corporation

#### Minimum Clearance Distances:



Description	High Speed Steel	Titanium Coated
	Model Code	Model Code
Form Drill TD-13A	994-013-001	994-013-101
Form Reamer TR-13A	995-013-001	995-013-101
Metric Tap M20x1.5-6H	998-998	998-998-101

Note: Drill and Reamer have a #3 Morse taper. Tap has straight shank.

#### 7/8" Hex Deep Socket:

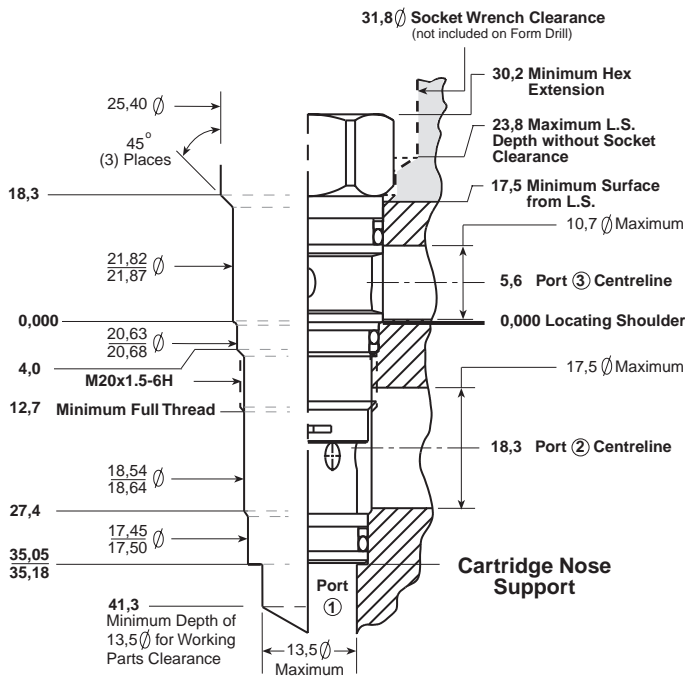
Sun P/N: 998-100-001, Snap-On P/N: S281

## General Information: Cartridge Cavities and Cavity Tools

**NOTES:** Thin wall deep hex sockets, preferred for installing Sun cartridges, are available from Sun or Snap-On Tools Corporation. Complete cavity machining dimensions are provided with form tools or supplied upon request. Dimensions shown below are simplified for manifold design purposes.

### SERIES 1

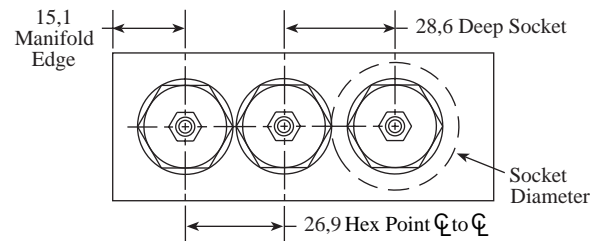
#### T-11A 3 Port Sun Cavity



Cavity Diameters to be concentric to threads within 0,05.

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#### Minimum Clearance Distances:



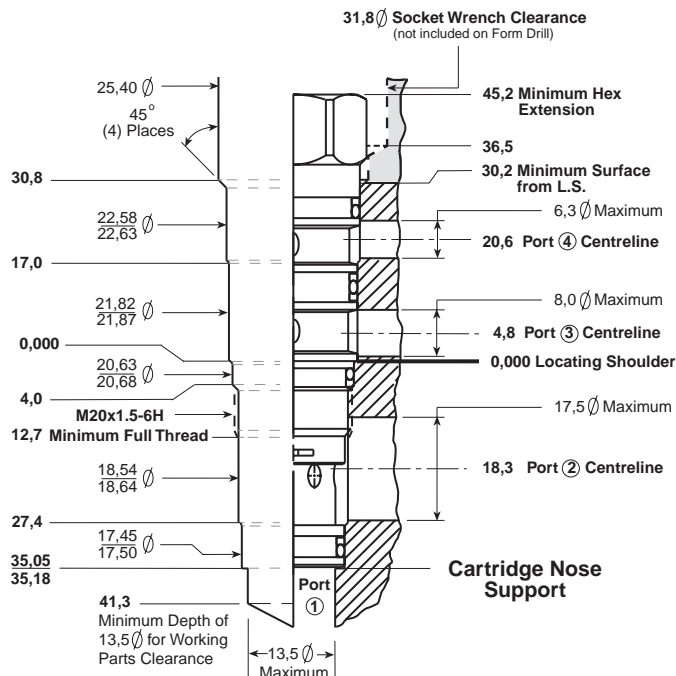
Description	High Speed Steel	Titanium Coated
	Model Code	Model Code
Form Drill TD-11A	994-011-001	994-011-101
Form Reamer TR-11A	995-011-001	995-011-101
Metric Tap M20x1.5-6H	998-998	998-998-101

Note: Drill and Reamer have a #3 Morse taper. Tap has straight shank.

#### 7/8" Hex Deep Socket:

Sun P/N: 998-100-001, Snap-On P/N: S281

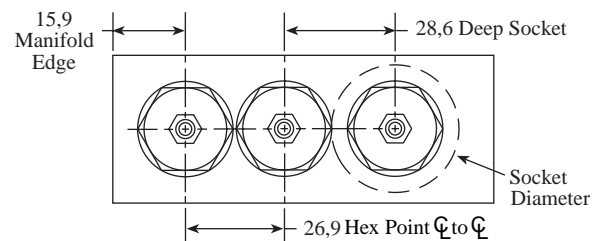
#### T-21A 4 Port Sun Cavity



Cavity Diameters to be concentric to threads within 0,05.

© SUN Hydraulics Corporation

#### Minimum Clearance Distances:



Description	High Speed Steel	Titanium Coated
	Model Code	Model Code
Form Drill TD-21A	994-021-001	994-021-101
Form Reamer TR-21A	995-021-001	995-021-101
Metric Tap M20x1.5-6H	998-998	998-998-101

Note: Drill and Reamer have a #3 Morse taper. Tap has straight shank.

#### 7/8" Hex Deep Socket:

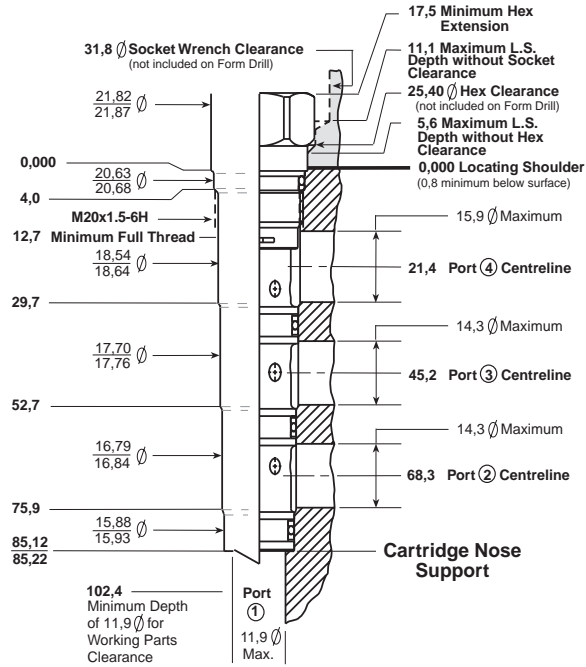
Sun P/N: 998-100-001, Snap-On P/N: S281

## General Information: Cartridge Cavities and Cavity Tools

**NOTES:** Thin wall deep hex sockets, preferred for installing Sun cartridges, are available from Sun or Snap-On Tools Corporation. Complete cavity machining dimensions are provided with form tools or supplied upon request. Dimensions shown below are simplified for manifold design purposes.

### SERIES 1

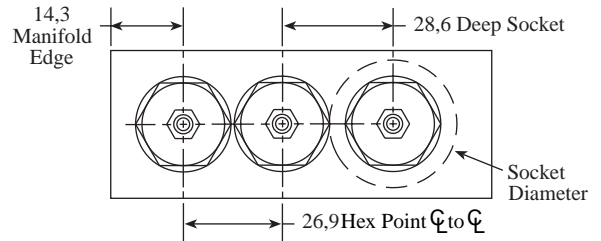
#### T-31A 4 Port Sun Cavity



Cavity Diameters to be concentric to threads within 0,05.

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#### Minimum Clearance Distances:



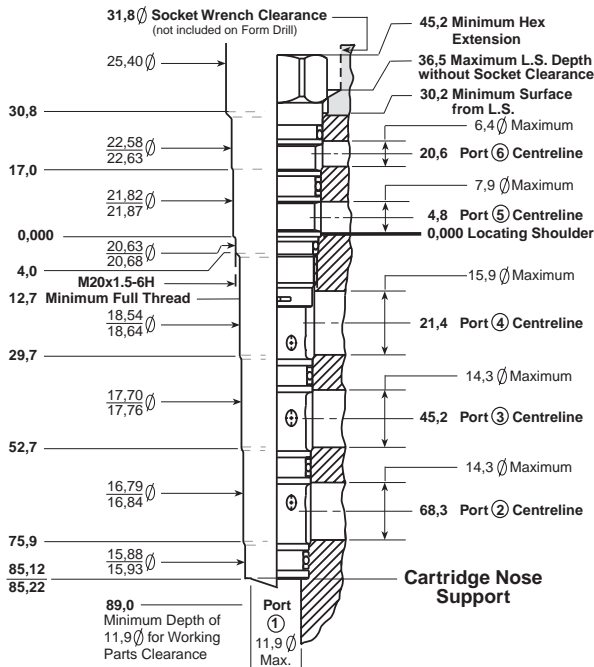
Description	High Speed Steel	Titanium Coated
	Model Code	Model Code
Form Drill TD-31A	994-031-001	994-031-101
Form Reamer TR-31A	995-031-001	995-031-101
Metric Tap M20x1.5-6H	998-998	998-998-101

Note: Drill and Reamer have a #3 Morse taper. Tap has straight shank.

#### 7/8" Hex Deep Socket:

Sun P/N: 998-100-001, Snap-On P/N: S281

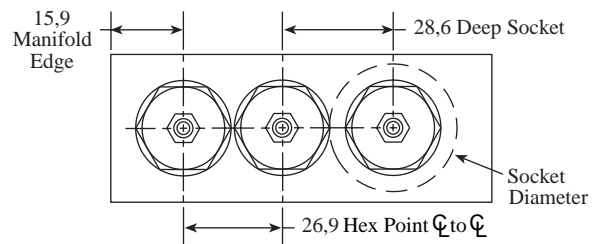
#### T-61A 6 Port Sun Cavity



Cavity Diameters to be concentric to threads within 0,05.

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#### Minimum Clearance Distances:



Description	High Speed Steel	Titanium Coated
	Model Code	Model Code
Form Drill TD-61A	994-061-001	994-061-101
Form Reamer TR-61A	995-061-001	995-061-101
Metric Tap M20x1.5-6H	998-998	998-998-101

Note: Drill and Reamer have a #3 Morse taper. Tap has straight shank.

#### 7/8" Hex Deep Socket:

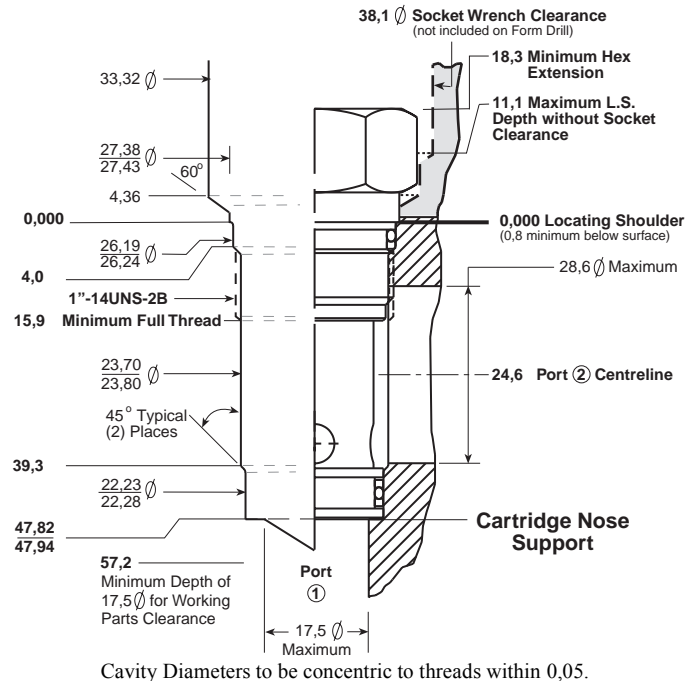
Sun P/N: 998-100-001, Snap-On P/N: S281

## General Information: Cartridge Cavities and Cavity Tools

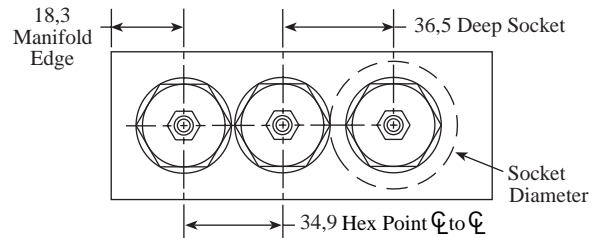
**NOTES:** Thin wall deep hex sockets, preferred for installing Sun cartridges, are available from Sun or Snap-On Tools Corporation. Complete cavity machining dimensions are provided with form tools or supplied upon request. Dimensions shown below are simplified for manifold design purposes.

### SERIES 2

#### T-3A 2 Port Sun Cavity



#### Minimum Clearance Distances:



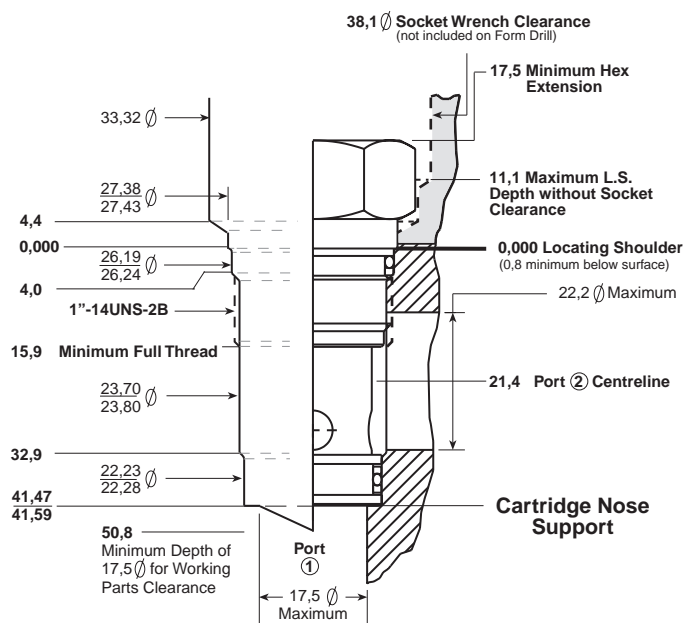
Description	High Speed Steel	Titanium Coated
	Model Code	Model Code
Form Drill TD-3A	994-003-001	994-003-101
Form Reamer TR-3A	995-003-001	995-003-101
UNS Tap 1"-14	998-999	998-999-101

Note: Drill and Reamer have a #3 Morse taper. Tap has straight shank.

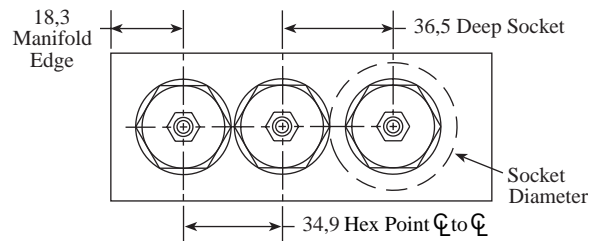
#### 1 1/8" Hex Deep Socket:

Sun P/N: 998-100-002, Snap-On P/N: S361

#### T-5A 2 Port Sun Cavity



#### Minimum Clearance Distances:



Description	High Speed Steel	Titanium Coated
	Model Code	Model Code
Form Drill TD-5A	994-005-001	994-005-101
Form Reamer TR-5A	995-005-001	995-005-101
UNS Tap 1"-14	998-999	998-999-101

Note: Drill and Reamer have a #3 Morse taper. Tap has straight shank.

#### 1 1/8" Hex Deep Socket:

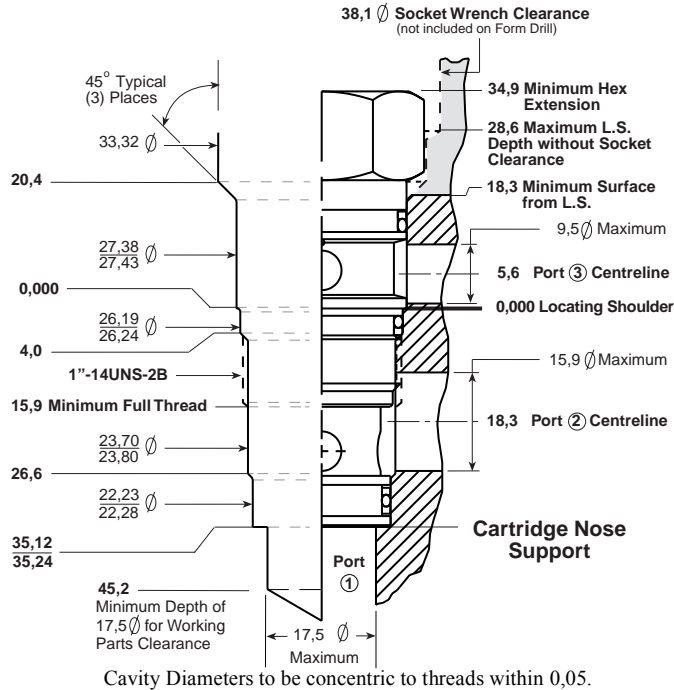
Sun P/N: 998-100-002, Snap-On P/N: S361

## General Information: Cartridge Cavities and Cavity Tools

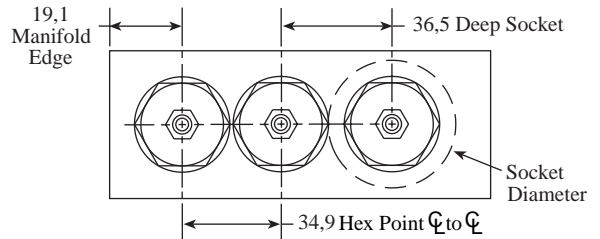
**NOTES:** Thin wall deep hex sockets, preferred for installing Sun cartridges, are available from Sun or Snap-On Tools Corporation. Complete cavity machining dimensions are provided with form tools or supplied upon request. Dimensions shown below are simplified for manifold design purposes.

### SERIES 2

#### T-2A 3 Port Sun Cavity



#### Minimum Clearance Distances:



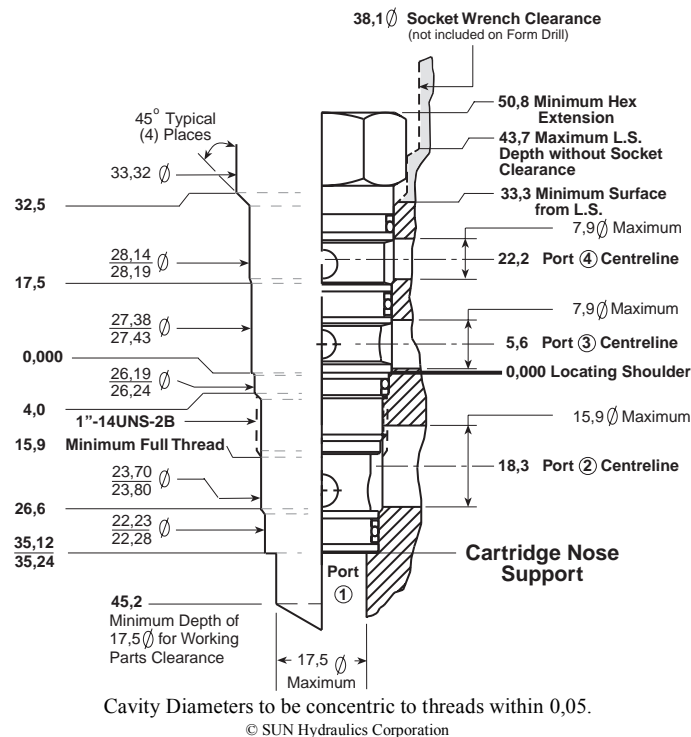
Description	High Speed Steel	Titanium Coated
	Model Code	Model Code
Form Drill TD-2A	994-002-001	994-002-101
Form Reamer TR-2A	995-002-001	995-002-101
UNS Tap 1"-14	998-999	998-999-101

Note: Drill and Reamer have a #3 Morse taper. Tap has straight shank.

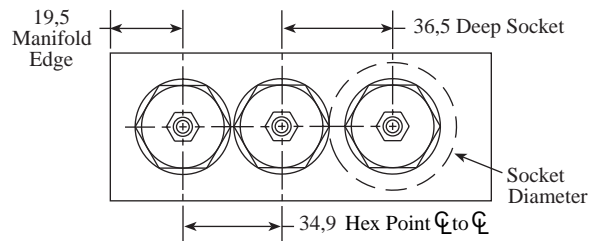
#### 1 1/8" Hex Deep Socket:

Sun P/N: 998-100-002, Snap-On P/N: S361

#### T-22A 4 Port Sun Cavity



#### Minimum Clearance Distances:



Description	High Speed Steel	Titanium Coated
	Model Code	Model Code
Form Drill TD-22A	994-022-001	994-022-101
Form Reamer TR-22A	995-022-001	995-022-101
UNS Tap 1"-14	998-999	998-999-101

Note: Drill and Reamer have a #3 Morse taper. Tap has straight shank.

#### 1 1/8" Hex Deep Socket:

Sun P/N: 998-100-002, Snap-On P/N: S361

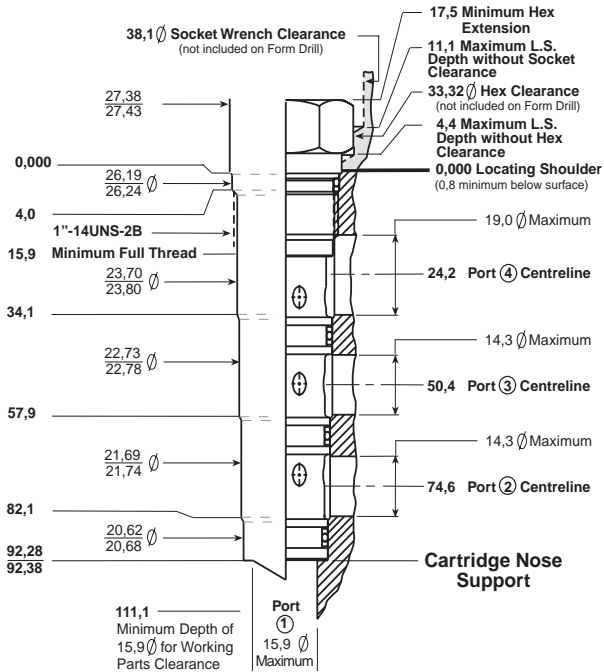


## General Information: Cartridge Cavities and Cavity Tools

**NOTES:** Thin wall deep hex sockets, preferred for installing Sun cartridges, are available from Sun or Snap-On Tools Corporation. Complete cavity machining dimensions are provided with form tools or supplied upon request. Dimensions shown below are simplified for manifold design purposes.

### SERIES 2

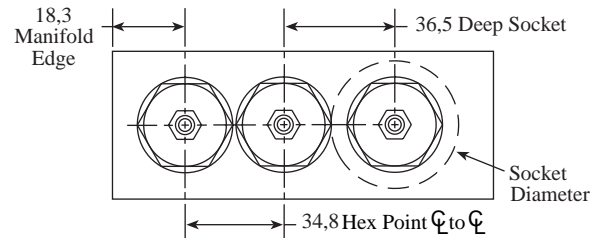
#### T-32A 4 Port Sun Cavity



Cavity Diameters to be concentric to threads within 0,05.

© SUN Hydraulics Corporation

#### Minimum Clearance Distances:



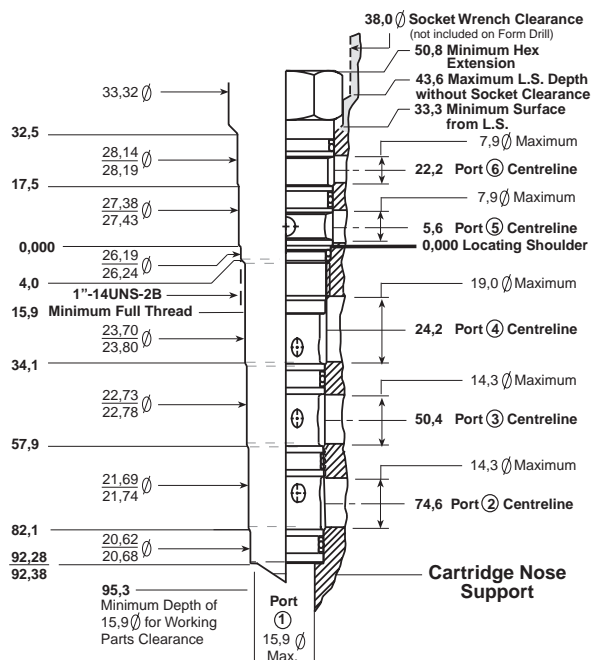
Description	High Speed Steel	Titanium Coated
	Model Code	Model Code
Form Drill TD-32A	994-032-001	994-032-101
Form Reamer TR-32A	995-032-001	995-032-101
UNS Tap 1" - 14UNS-2B	998-999	998-999-101

Note: Drill and Reamer have a #3 Morse taper. Tap has straight shank.

#### 1 1/8" Hex Deep Socket:

Sun P/N: 998-100-002, Snap-On P/N: S361

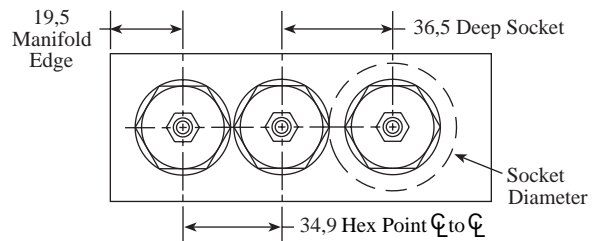
#### T-62A 6 Port Sun Cavity



Cavity Diameters to be concentric to threads within 0,05.

© SUN Hydraulics Corporation

#### Minimum Clearance Distances:



Description	High Speed Steel	Titanium Coated
	Model Code	Model Code
Form Drill TD-62A	994-062-001	994-062-101
Form Reamer TR-62A	995-062-001	995-062-101
UNS Tap 1" - 14UNS-2B	998-999	998-999-101

Note: Drill and Reamer have a #3 Morse taper. Tap has straight shank.

#### 1 1/8" Hex Deep Socket:

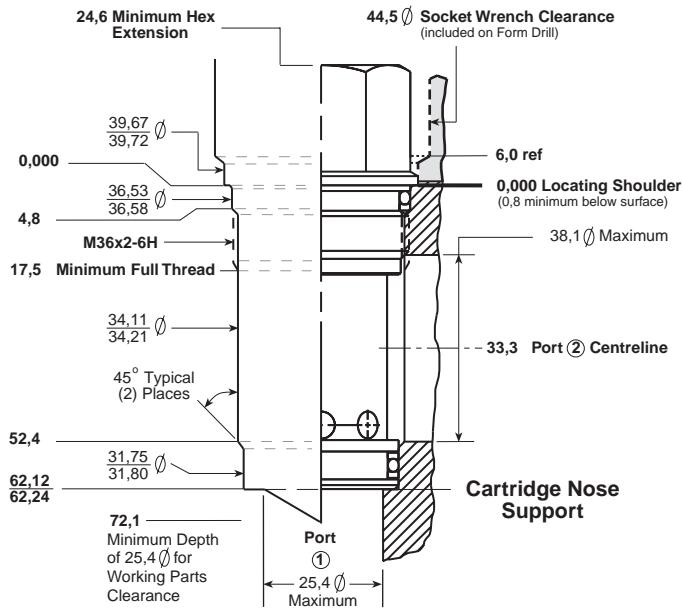
Sun P/N: 998-100-002, Snap-On P/N: S361

## General Information: Cartridge Cavities and Cavity Tools

**NOTES:** Thin wall deep hex sockets, preferred for installing Sun cartridges, are available from Sun or Snap-On Tools Corporation. Complete cavity machining dimensions are provided with form tools or supplied upon request. Dimensions shown below are simplified for manifold design purposes.

### SERIES 3

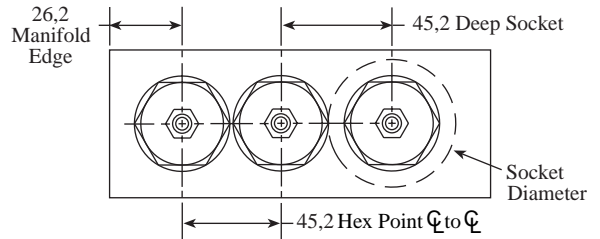
#### T-16A 2 Port Sun Cavity



Cavity Diameters to be concentric to threads within 0,05.

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#### Minimum Clearance Distances:



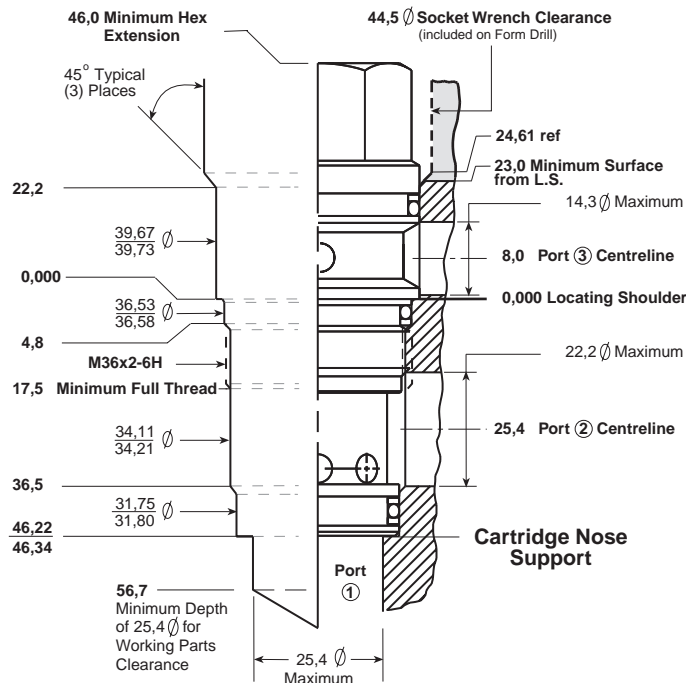
Description	High Speed Steel	Titanium Coated
	Model Code	Model Code
Form Drill TD-16A	994-016-001	994-016-101
Form Reamer TR-16A	995-016-001	995-016-101
Metric Tap M36x2-6H	998-996	998-996-101

Note: Drill and Reamer have a #3 Morse taper. Tap has straight shank.

#### 1 1/4" Hex Deep Socket:

Sun P/N: 998-100-003, Snap-On P/N: S401

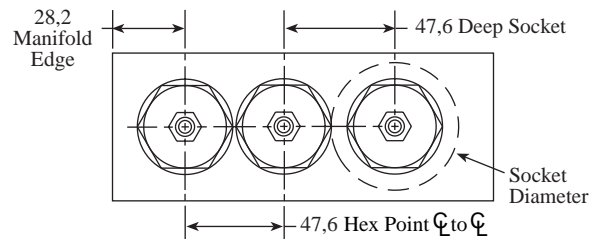
#### T-17A 3 Port Sun Cavity



Cavity Diameters to be concentric to threads within 0,05.

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#### Minimum Clearance Distances:



Description	High Speed Steel	Titanium Coated
	Model Code	Model Code
Form Drill TD-17A	994-017-001	994-017-101
Form Reamer TR-17A	995-017-001	995-017-101
Metric Tap M36x2-6H	998-996	998-996-101

Note: Drill and Reamer have a #3 Morse taper. Tap has straight shank.

#### 1 1/4" Hex Deep Socket:

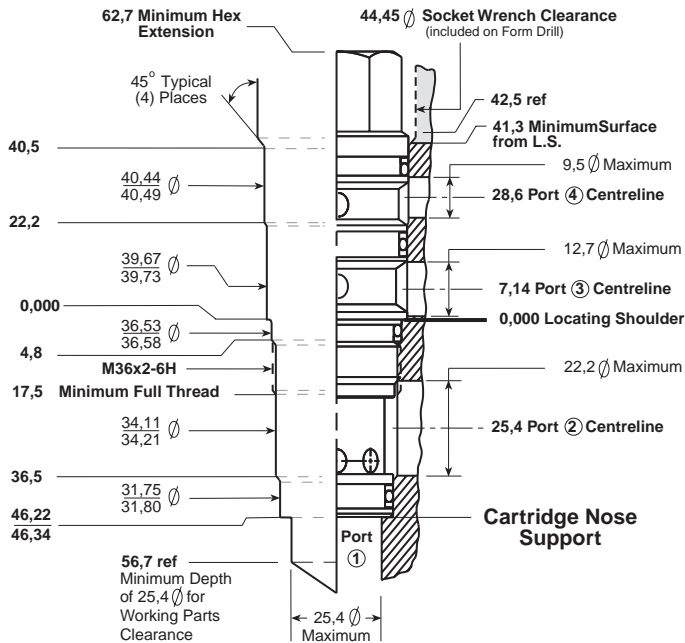
Sun P/N: 998-100-003, Snap-On P/N: S401

## General Information: Cartridge Cavities and Cavity Tools

**NOTES:** Thin wall deep hex sockets, preferred for installing Sun cartridges, are available from Sun or Snap-On Tools Corporation. Complete cavity machining dimensions are provided with form tools or supplied upon request. Dimensions shown below are simplified for manifold design purposes.

### SERIES 3

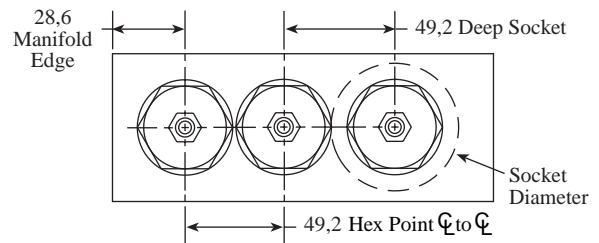
#### T-23A 4 Port Sun Cavity



Cavity Diameters to be concentric to threads within 0,05.

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#### Minimum Clearance Distances:



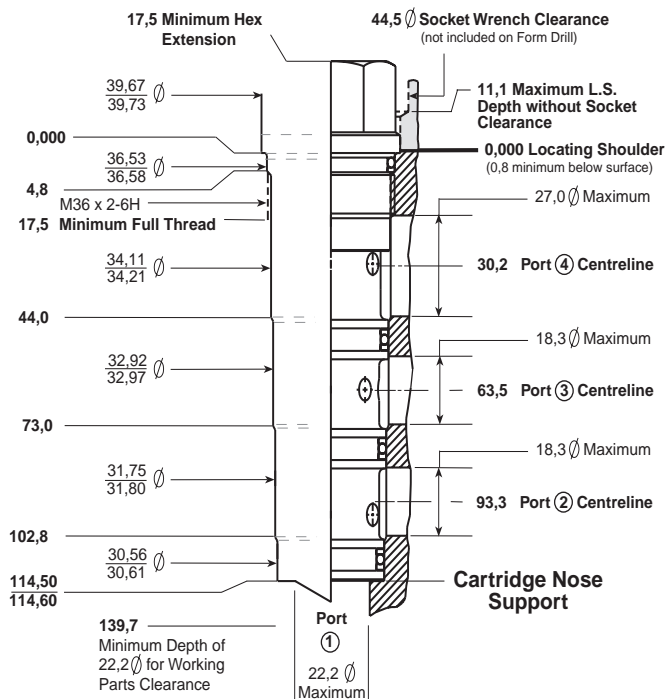
Description	High Speed Steel	Titanium Coated
	Model Code	Model Code
Form Drill TD-23A	994-023-001	994-023-101
Form Reamer TR-23A	995-023-001	995-023-101
Metric Tap M36x2-6H	998-996	998-996-101

Note: Drill and Reamer have a #3 Morse taper. Tap has straight shank.

#### 1 1/4" Hex Deep Socket:

Sun P/N: 998-100-003, Snap-On P/N: S401

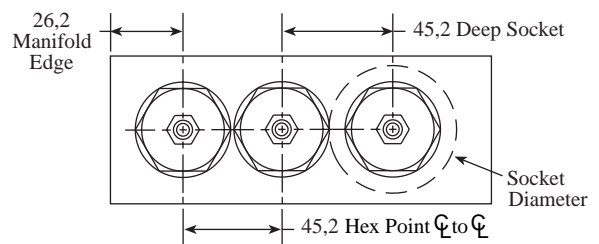
#### T-33A 4 Port Sun Cavity



Cavity Diameters to be concentric to threads within 0,05.

© SUN Hydraulics Corporation

#### Minimum Clearance Distances:



Description	High Speed Steel	Titanium Coated
	Model Code	Model Code
Form Drill TD-33A	994-033-001	994-033-101
Form Reamer TR-33A	995-033-001	995-033-101
Metric Tap M36x2-6H	998-996	998-996-101

Note: Drill and Reamer have a #3 Morse taper. Tap has straight shank.

#### 1 1/4" Hex Deep Socket:

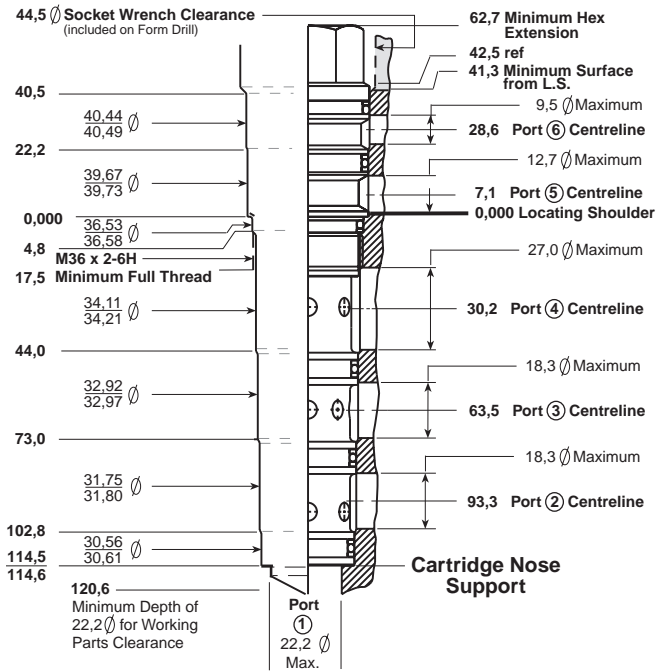
Sun P/N: 998-100-003, Snap-On P/N: S401

## General Information: Cartridge Cavities and Cavity Tools

**NOTES:** Thin wall deep hex sockets, preferred for installing Sun cartridges, are available from Sun or Snap-On Tools Corporation. Complete cavity machining dimensions are provided with form tools or supplied upon request. Dimensions shown below are simplified for manifold design purposes.

### SERIES 3

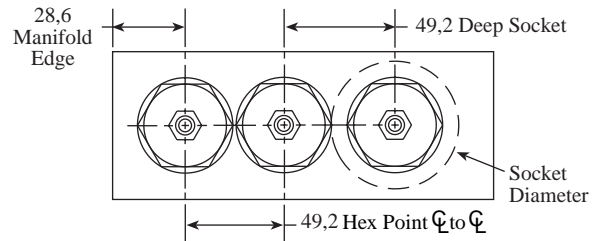
#### T-63A 6 Port Sun Cavity



Cavity Diameters to be concentric to threads within 0,05.

© SUN Hydraulics Corporation

#### Minimum Clearance Distances:



Description	High Speed Steel	Titanium Coated
	Model Code	Model Code
Form Drill TD-63A	994-063-001	994-063-101
Form Reamer TR-63A	995-063-001	995-063-101
Metric Tap M36x2-6H	998-996	998-996-101

Note: Drill and Reamer have a #3 Morse taper. Tap has straight shank.

#### 1 1/4" Hex Deep Socket:

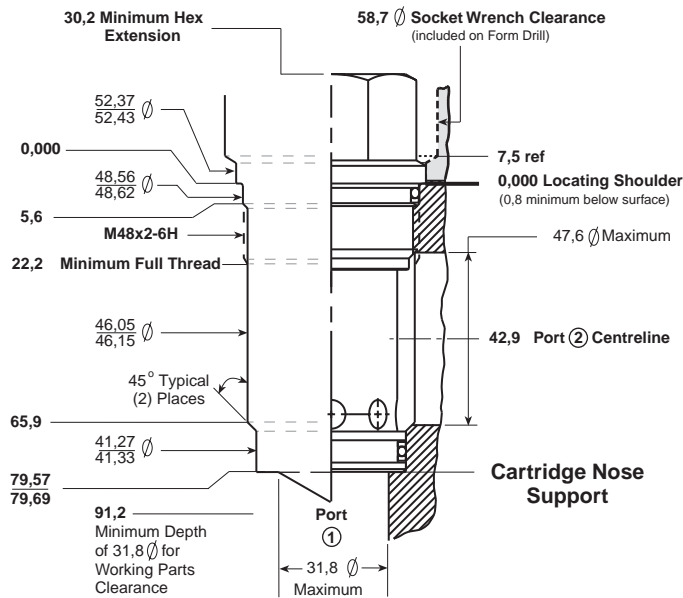
Sun P/N: 998-100-003, Snap-On P/N: S401

## General Information: Cartridge Cavities and Cavity Tools

**NOTES:** Thin wall deep hex sockets, preferred for installing Sun cartridges, are available from Sun or Snap-On Tools Corporation. Complete cavity machining dimensions are provided with form tools or supplied upon request. Dimensions shown below are simplified for manifold design purposes.

### SERIES 4

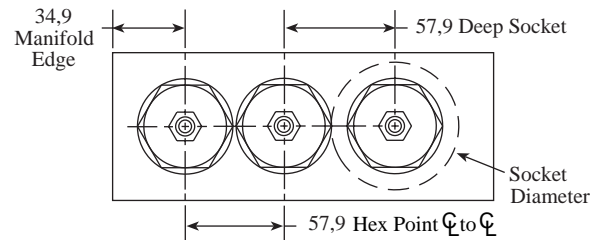
#### T-18A 2 Port Sun Cavity



Cavity Diameters to be concentric to threads within 0,05.

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#### Minimum Clearance Distances:



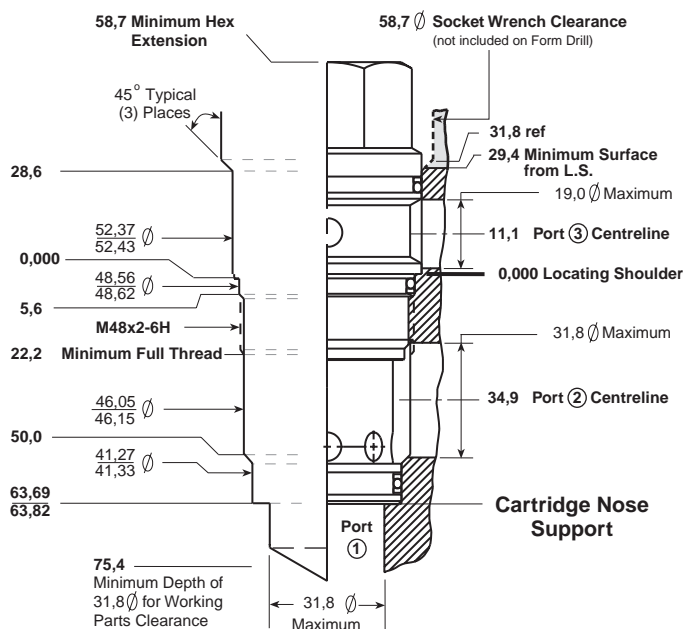
Description	High Speed Steel	Titanium Coated
	Model Code	Model Code
Form Drill TD-18A	994-018-001	994-018-101
Form Reamer TR-18A	995-018-001	995-018-101
Metric Tap M48x2-6H	998-992	998-992-101

Note: Drill and Reamer have a #3 Morse taper. Tap has straight shank.

#### 1 5/8" Hex Deep Socket:

Sun P/N: 998-100-004, Snap-On P/N: LS522

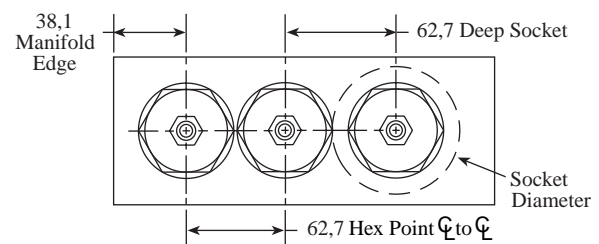
#### T-19A 3 Port Sun Cavity



Cavity Diameters to be concentric to threads within 0,05.

© SUN Hydraulics Corporation

#### Minimum Clearance Distances:



Description	High Speed Steel	Titanium Coated
	Model Code	Model Code
Form Drill TD-19A	994-019-001	994-019-101
Form Reamer TR-19A	995-019-001	995-019-101
Metric Tap M48x2-6H	998-992	998-992-101

Note: Drill and Reamer have a #3 Morse taper. Tap has straight shank.

#### 1 5/8" Hex Deep Socket:

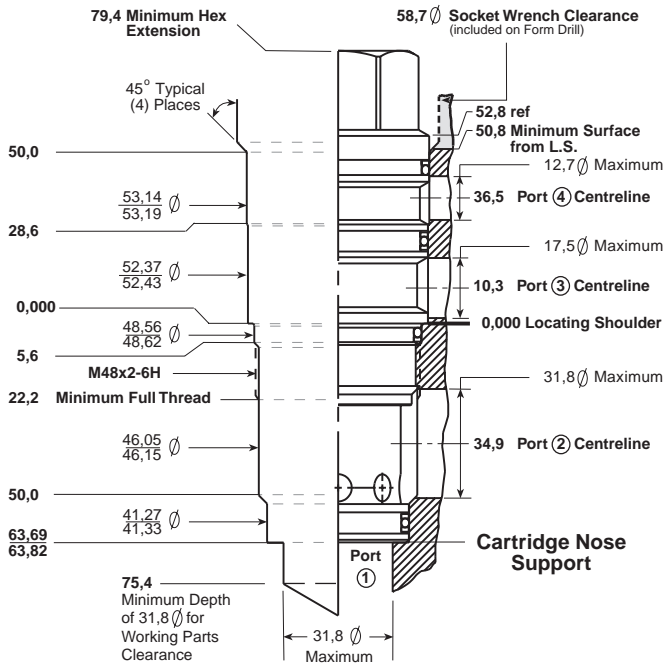
Sun P/N: 998-100-004, Snap-On P/N: LS522

## General Information: Cartridge Cavities and Cavity Tools

**NOTES:** Thin wall deep hex sockets, preferred for installing Sun cartridges, are available from Sun or Snap-On Tools Corporation. Complete cavity machining dimensions are provided with form tools or supplied upon request. Dimensions shown below are simplified for manifold design purposes.

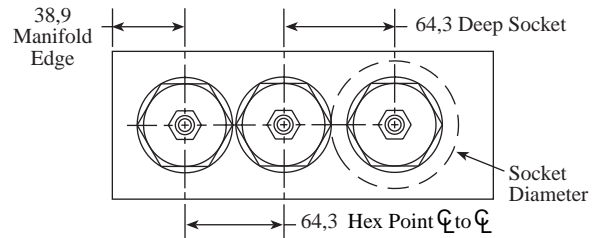
### SERIES 4

#### T-24A 4 Port Sun Cavity



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#### Minimum Clearance Distances:



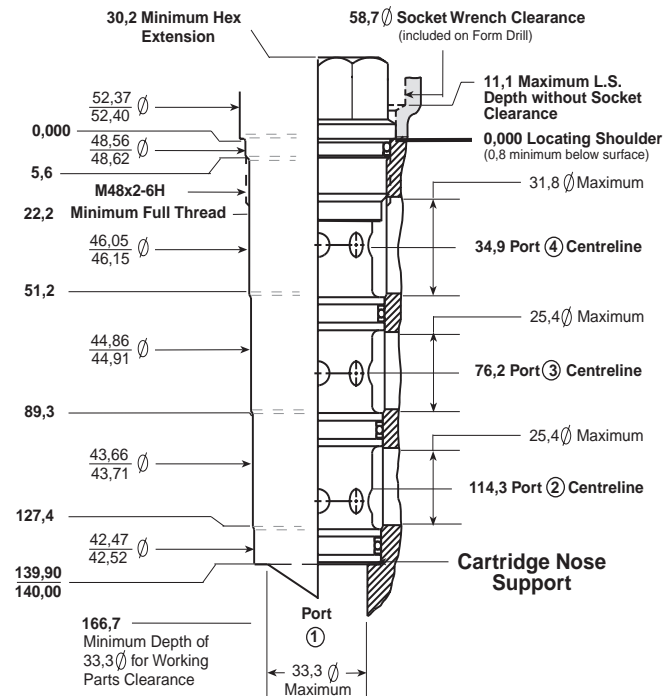
Description	High Speed Steel	Titanium Coated
	Model Code	Model Code
Form Drill TD-24A	994-024-001	994-024-101
Form Reamer TR-24A	995-024-001	995-024-101
Metric Tap M48x2-6H	998-992	998-992-101

Note: Drill and Reamer have a #3 Morse taper. Tap has straight shank.

#### 1 5/8" Hex Deep Socket:

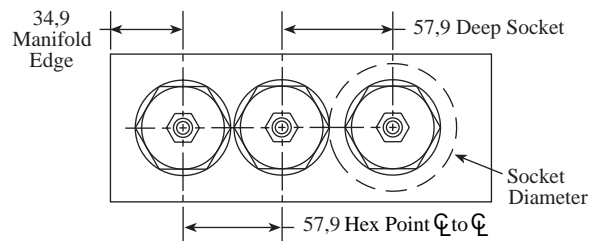
Sun P/N: 998-100-004, Snap-On P/N: LS522

#### T-34A 4 Port Sun Cavity



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#### Minimum Clearance Distances:



Description	High Speed Steel	Titanium Coated
	Model Code	Model Code
Form Drill TD-34A	994-034-001	994-034-101
Form Reamer TR-34A	995-034-001	995-034-101
Metric Tap M48x2-6H	998-992	998-992-101

Note: Drill and Reamer have a #3 Morse taper. Tap has straight shank.

#### 1 5/8" Hex Deep Socket:

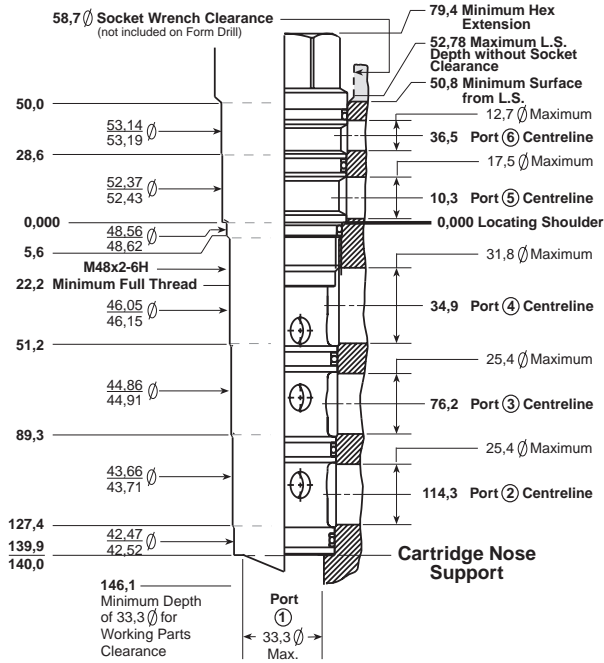
Sun P/N: 998-100-004, Snap-On P/N: LS522

## General Information: Cartridge Cavities and Cavity Tools

**NOTES:** Thin wall deep hex sockets, preferred for installing Sun cartridges, are available from Sun or Snap-On Tools Corporation. Complete cavity machining dimensions are provided with form tools or supplied upon request. Dimensions shown below are simplified for manifold design purposes.

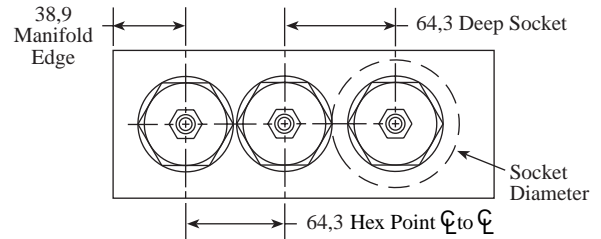
### SERIES 4

#### T-64A 6 Port Sun Cavity



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#### Minimum Clearance Distances:



Description	High Speed Steel	Titanium Coated
	Model Code	Model Code
Form Drill TD-64A	994-064-001	994-064-101
Form Reamer TR-64A	995-064-001	995-064-101
Metric Tap M48x2-6H	998-992	998-992-101

Note: Drill and Reamer have a #3 Morse taper. Tap has straight shank.

#### 1 5/8" Hex Deep Socket:

Sun P/N: 999-100-004, Snap-On P/N: LS522

# Model Code Index

## CARTRIDGES

<i>Model Code</i>	<i>Cavity</i>	<i>Page</i>	<i>Model Code</i>	<i>Cavity</i>	<i>Page</i>	<i>Model Code</i>	<i>Cavity</i>	<i>Page</i>
<b>CBCA - ***</b>	T-11A	50	<b>CWIA - ***</b>	T-24A	70	<b>PBJB - ***</b>	T-19A	34
<b>CBCB - ***</b>	T-11A	50	<b>CWIG - ***</b>	T-24A	70	<b>PPDB - ***</b>	T-11A	42
<b>CBCG - ***</b>	T-11A	50	<b>CWIK - ***</b>	T-24A	70	<b>PPFB - ***</b>	T-2A	42
<b>CBCH - ***</b>	T-11A	50	<b>CWIL - ***</b>	T-24A	70	<b>PPHB - ***</b>	T-17A	42
<b>CBCL - ***</b>	T-11A	50	<b>CXAD - ***</b>	T-162A	102	<b>PPJB - ***</b>	T-19A	42
<b>CBCY - ***</b>	T-11A	50	<b>CXBA - ***</b>	T-162A	102	<b>PRDB - ***</b>	T-11A	42
<b>CBEA - ***</b>	T-2A	50	<b>CXCD - ***</b>	T-13A	102	<b>PRFB - ***</b>	T-2A	42
<b>CBEB - ***</b>	T-2A	50	<b>CXDA - ***</b>	T-13A	102	<b>PRHB - ***</b>	T-17A	42
<b>CBEG - ***</b>	T-2A	50	<b>CXED - ***</b>	T-5A	102	<b>PRJB - ***</b>	T-19A	42
<b>CBEH - ***</b>	T-2A	50	<b>CXFA - ***</b>	T-5A	102	<b>RDBA - ***</b>	T-162A	2
<b>CBEL - ***</b>	T-2A	50	<b>CXGD - ***</b>	T-16A	102	<b>RDDA - ***</b>	T-10A	2
<b>CBEY - ***</b>	T-2A	50	<b>CXHA - ***</b>	T-16A	102	<b>RDFA - ***</b>	T-3A	2
<b>CBGA - ***</b>	T-17A	50	<b>CXID - ***</b>	T-18A	102	<b>RDHA - ***</b>	T-16A	2
<b>CBGB - ***</b>	T-17A	50	<b>CXJA - ***</b>	T-18A	102	<b>RDJA - ***</b>	T-18A	2
<b>CBGG - ***</b>	T-17A	50	<b>FCBB - ***</b>	T-162A	118	<b>RPCC - ***</b>	T-162A	2
<b>CBGH - ***</b>	T-17A	50	<b>FCCB - ***</b>	T-13A	118	<b>RPEC - ***</b>	T-10A	2
<b>CBGL - ***</b>	T-17A	50	<b>FCDB - ***</b>	T-5A	118	<b>RPGC - ***</b>	T-3A	2
<b>CBGY - ***</b>	T-17A	50	<b>FCEB - ***</b>	T-16A	118	<b>RPIC - ***</b>	T-16A	2
<b>CBIA - ***</b>	T-19A	50	<b>FCFB - ***</b>	T-18A	118	<b>RPKC - ***</b>	T-18A	2
<b>CBIB - ***</b>	T-19A	50	<b>FDBA - ***</b>	T-13A	126	<b>RSBC - ***</b>	T-163A	20
<b>CBIG - ***</b>	T-19A	50	<b>FDCB - ***</b>	T-5A	126	<b>RSDC - ***</b>	T-11A	20
<b>CBIH - ***</b>	T-19A	50	<b>FDEA - ***</b>	T-16A	126	<b>RSFC - ***</b>	T-2A	20
<b>CBIL - ***</b>	T-19A	50	<b>FDFA - ***</b>	T-18A	126	<b>RSHC - ***</b>	T-17A	20
<b>CBII - ***</b>	T-19A	50	<b>FRBA - ***</b>	T-163A	134	<b>RSJC - ***</b>	T-19A	20
<b>CKBB - ***</b>	T-163A	78	<b>FRCA - ***</b>	T-11A	134	<b>RVBA - ***</b>	T-163A	12
<b>CKBD - ***</b>	T-163A	78	<b>FRDA - ***</b>	T-2A	134	<b>RVCA - ***</b>	T-11A	12
<b>CKCB - ***</b>	T-11A	78	<b>FREA - ***</b>	T-17A	134	<b>RVEA - ***</b>	T-2A	12
<b>CKCD - ***</b>	T-11A	78	<b>FRFA - ***</b>	T-19A	134	<b>RVGA - ***</b>	T-17A	12
<b>CKEB - ***</b>	T-2A	78	<b>FXBA - ***</b>	T-162A	118	<b>RVIA - ***</b>	T-19A	12
<b>CKED - ***</b>	T-2A	78	<b>FXCA - ***</b>	T-13A	118	<b>SCCA - ***</b>	T-11A	28
<b>CKGB - ***</b>	T-17A	78	<b>FXDA - ***</b>	T-5A	118	<b>SCEA - ***</b>	T-2A	28
<b>CKGD - ***</b>	T-17A	78	<b>FXEA - ***</b>	T-16A	118	<b>SCGA - ***</b>	T-17A	28
<b>CKIB - ***</b>	T-19A	78	<b>FXFA - ***</b>	T-18A	118	<b>SCIA - ***</b>	T-19A	28
<b>CKID - ***</b>	T-19A	78	<b>NCBB - ***</b>	T-162A	110	<b>SXCA - ***</b>	T-11A	20
<b>CVCV - ***</b>	T-21A	94	<b>NCCB - ***</b>	T-13A	110	<b>SXEA - ***</b>	T-2A	20
<b>CVEV - ***</b>	T-22A	94	<b>NCCC - ***</b>	T-13A	110			
<b>CVGV - ***</b>	T-23A	94	<b>NCEB - ***</b>	T-5A	110			
<b>CVIV - ***</b>	T-24A	94	<b>NCEC - ***</b>	T-5A	110			
<b>CWCA - ***</b>	T-21A	70	<b>NCFB - ***</b>	T-16A	110			
<b>CWCG - ***</b>	T-21A	70	<b>NCGB - ***</b>	T-18A	110			
<b>CWCK - ***</b>	T-21A	70	<b>NCGC - ***</b>	T-18A	110			
<b>CWCL - ***</b>	T-21A	70	<b>NFBC - ***</b>	T-162A	110			
<b>CWEA - ***</b>	T-22A	70	<b>NFCC - ***</b>	T-13A	110			
<b>CWEG - ***</b>	T-22A	70	<b>NFDC - ***</b>	T-5A	110			
<b>CWEK - ***</b>	T-22A	70	<b>NFEC - ***</b>	T-16A	110			
<b>CWEL - ***</b>	T-22A	70	<b>NFFC - ***</b>	T-18A	110			
<b>CWGA - ***</b>	T-23A	70	<b>PBBB - ***</b>	T-163A	34			
<b>CWGG - ***</b>	T-23A	70	<b>PBDB - ***</b>	T-11A	34			
<b>CWGK - ***</b>	T-23A	70	<b>PBFB - ***</b>	T-2A	34			
<b>CWGL - ***</b>	T-23A	70	<b>PBHB - ***</b>	T-17A	34			



**ASSEMBLIES**

<i>Model Code</i>	<i>Cavity</i>	<i>Page</i>	<i>Model Code</i>	<i>Cavity</i>	<i>Page</i>	<i>Model Code</i>	<i>Cavity</i>	<i>Page</i>
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CBE*-L*N-BPV	T-2A	209	CBC*-LJN-YGV	T-11A	61	CBE*-LJN-BJA/M	T-2A	178
CBE*-L*N-BPW	T-2A	209	CBC*-LJN-YVX	T-11A	67	CBE*-LJN-BJB/M	T-2A	178
CBE*-L*N-BQV	T-2A	211	CBC*-LJN-ZTD	T-11A	66	CBE*-LJN-BJY	T-2A	178
CBE*-L*N-BQW	T-2A	211	CBCA-LAN-WZD	T-11A	238	CBE*-LJN-BVV	T-2A	55
CBC*-L*N-EMU	T-11A	205	CBCA-LAN-WZG	T-11A	238	CBE*-LJN-BVW	T-2A	55
CBC*-L*N-EMV	T-11A	205	CBCA-LAN-WZK	T-11A	239	CBE*-LJN-XAV	T-2A	60
CBC*-L*N-ENU	T-11A	207	CBCA-LAN-WZN	T-11A	239	CBE*-LJN-XAW	T-2A	60
CBC*-L*N-ENV	T-11A	207	CBCA-LAN-WZR	T-11A	239	CBE*-LJN-XHV	T-2A	63
CBC*-L*N-EPU	T-11A	209	CBCA-LAN-WZU	T-11A	239	CBE*-LJN-XHW	T-2A	63
CBC*-L*N-EPV	T-11A	209	CBCA-LAN-XTT	T-11A	231	CBE*-LJN-YAU	T-2A	58
CBC*-L*N-EQU	T-11A	211	CBCA-LAN-YTV	T-11A	231	CBE*-LJN-YAV	T-2A	58
CBC*-L*N-EQV	T-11A	211	CBCA-LAN-ZDW	T-11A	231	CBE*-LJN-YAW	T-2A	58
CBG*-L*N-HMX	T-17A	206	CBCA-LAN-ZDZ	T-11A	231	CBE*-LJN-YHV	T-2A	61
CBG*-L*N-HMY	T-17A	206	CBCA-LAN-ZDL	T-11A	230	CBE*-LJN-YHW	T-2A	61
CBG*-L*N-HNX	T-17A	208	CBCA-LAN-ZDM	T-11A	230	CBE*-LJN-YVU	T-2A	67
CBG*-L*N-HNY	T-17A	208	CBE*-LHN-BB8	T-2A	167	CBE*-LJN-ZDS/M	T-2A	65
CBG*-L*N-HPX	T-17A	210	CBE*-LHN-BBA/M	T-2A	167	CBE*-LJN-ZNV/M	T-2A	64
CBG*-L*N-HPY	T-17A	210	CBE*-LHN-BBB/M	T-2A	167	CBE*-LJN-ZTH	T-2A	66
CBG*-L*N-HQX	T-17A	212	CBE*-LHN-BBY	T-2A	167	CBEA-LAN-VWZ/M	T-2A	235
CBG*-L*N-HQY	T-17A	212	CBE*-LHN-BCV	T-2A	52	CBEA-LAN-VZX/M	T-2A	235
CBC*-LHN-EBA/M	T-11A	151	CBE*-LHN-BCW	T-2A	52	CBEA-LAN-WKJ	T-2A	241
CBC*-LHN-EBY	T-11A	151	CBE*-LHN-BGV	T-2A	56	CBEA-LAN-WKM	T-2A	241
CBC*-LHN-ECU	T-11A	52	CBE*-LHN-BGW	T-2A	56	CBEA-LAN-WKQ	T-2A	242
CBC*-LHN-ECV	T-11A	52	CBE*-LHN-BJ8	T-2A	178	CBEA-LAN-WKT	T-2A	242
CBC*-LHN-EGU	T-11A	56	CBE*-LHN-BJA/M	T-2A	178	CBEA-LAN-WKW	T-2A	242
CBC*-LHN-EGV	T-11A	56	CBE*-LHN-BJB/M	T-2A	178	CBEA-LAN-WKZ	T-2A	242
CBC*-LHN-EJU	T-11A	55	CBE*-LHN-BJY	T-2A	178	CBEA-LAN-XYT	T-2A	234
CBC*-LHN-EJV	T-11A	55	CBE*-LHN-BVV	T-2A	55	CBEA-LAN-YTF	T-2A	234
CBC*-LHN-XEU	T-11A	60	CBE*-LHN-BVW	T-2A	55	CBEA-LAN-ZNM	T-2A	233
CBC*-LHN-XEV	T-11A	60	CBE*-LHN-XAV	T-2A	60	CBEA-LAN-ZNN	T-2A	233
CBC*-LHN-XGU	T-11A	63	CBE*-LHN-XAW	T-2A	60	CBEA-LAN-ZNQ	T-2A	233
CBC*-LHN-YEU	T-11A	58	CBE*-LHN-XHV	T-2A	63	CBEA-LAN-ZNR	T-2A	234
CBC*-LHN-YEV	T-11A	58	CBE*-LHN-XHW	T-2A	63	CBG*-LHN-BKA	T-17A	188
CBC*-LHN-YGU	T-11A	61	CBE*-LHN-YAU	T-2A	58	CBG*-LHN-BKB	T-17A	188
CBC*-LHN-YGV	T-11A	61	CBE*-LHN-YAV	T-2A	58	CBG*-LHN-BKY	T-17A	188
CBC*-LHN-YVX	T-11A	67	CBE*-LHN-YAW	T-2A	58	CBG*-LHN-HCX	T-17A	53
CBC*-LHN-ZTD	T-11A	66	CBE*-LHN-YHV	T-2A	61	CBG*-LHN-HCY	T-17A	53
CBC*-LJN-EBA/M	T-11A	151	CBE*-LHN-YHW	T-2A	61	CBG*-LHN-HDW	T-17A	55
CBC*-LJN-EBY	T-11A	151	CBE*-LHN-YVU	T-2A	67	CBG*-LHN-HDX	T-17A	55
CBC*LJN-ECU	T-11A	52	CBE*-LHN-ZDS/M	T-2A	65	CBG*-LHN-HGX	T-17A	56
CBC*LJN-ECV	T-11A	52	CBE*-LHN-ZNV/M	T-2A	64	CBG*-LHN-HGY	T-17A	56
CBC*LJN-EGU	T-11A	56	CBE*-LHN-ZTH	T-2A	66	CBG*-LHN-XJW	T-17A	60
CBC*LJN-EGV	T-11A	56	CBE*-LJN-BB8	T-2A	167	CBG*-LHN-XJX	T-17A	60
CBC*LJN-EJU	T-11A	55	CBE*-LJN-BBA/M	T-2A	167	CBG*-LHN-XKW	T-17A	63
CBC*LJN-EJV	T-11A	55	CBE*-LJN-BBB/M	T-2A	167	CBG*-LHN-XKX	T-17A	63
CBC*LJN-XEU	T-11A	60	CBE*-LJN-BBY	T-2A	167	CBG*-LHN-YJX	T-17A	59
CBC*LJN-XEV	T-11A	60	CBE*-LJN-BCV	T-2A	52	CBG*-LHN-YJY	T-17A	59

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CBG*-LHN-YKX	T-17A	61	CBI*-LJN-XZP/M	T-19A	60	CKGB-XCN-HDW	T-17A	83
CBG*-LHN-YKY	T-17A	61	CBI*-LJN-XZQ/M	T-19A	63	CKGB-XCN-HDX	T-17A	83
CBG*-LHN-YVR	T-17A	67	CBI*-LJN-XZZ/M	T-19A	54	CKGB-XCN-YJX	T-17A	87
CBG*-LHN-ZDR/M	T-17A	65	CBI*-LJN-YM6/M	T-19A	59	CKGB-XCN-YJY	T-17A	87
CBG*-LHN-ZNW/M	T-17A	64	CBI*-LJN-YMR/M	T-19A	59	CKGB-XCN-YVR	T-17A	92
CBG*-LHN-ZTL	T-17A	66	CBI*-LJN-YN6/M	T-19A	62	CKGB-XCN-ZDR/M	T-17A	90
CBG*LJN-BKA	T-17A	188	CBI*-LJN-YNR/M	T-19A	62	CKGB-XCN-ZNW/M	T-17A	89
CBG*-LJN-BKB	T-17A	188	CBI*-LJN-Z8Z/M	T-19A	54	CKGB-XCN-ZTL	T-17A	91
CBG*-LJN-BKY	T-17A	188	CBI*-LJN-ZFD/M	T-19A	65	CKIB-XCN-HBA	T-19A	199
CBG*-LJN-HCX	T-17A	53	CBI*-LJN-ZNX/M	T-19A	64	CKIB-XCN-HBB	T-19A	199
CBG*-LJN-HCY	T-17A	53	CKBB-XCN-JYT	T-163A	85	CKIB-XCN-HBY	T-19A	199
CBG*-LJN-HDW	T-17A	55	CKBB-XCN-JCT	T-163A	80	CKIB-XCN-KCX	T-19A	81
CBG*-LJN-HDX	T-17A	55	CKBB-XCN-JCU	T-163A	80	CKIB-XCN-KCY	T-19A	81
CBG*-LJN-HGX	T-17A	56	CKBB-XCN-JJT	T-163A	82	CKIB-XCN-XZZ/M	T-19A	84
CBG*-LJN-HGY	T-17A	56	CKBB-XCN-JJU	T-163A	82	CKIB-XCN-YM6/M	T-19A	87
CBG*-LJN-XJW	T-17A	60	CKBB-XCN-JJU	T-163A	82	CKIB-XCN-Z8Z/M	T-19A	84
CBG*-LJN-XJX	T-17A	60	CKBB-XCN-JJU	T-163A	85	CKIB-XCN-ZFD/M	T-19A	90
CBG*-LJN-XKW	T-17A	63	CKCB-XCN-EBA/M	T-11A	152	CKIB-XCN-ZNX/M	T-19A	89
CBG*-LJN-XKX	T-17A	63	CKCB-XCN-EBY	T-11A	152	CSAA-BXN-DKS	T-13A	192
CBG*-LJN-YJX	T-17A	59	CKCB-XCN-ECU	T-11A	80	CSAA-BXN-GBS	T-13A	158
CBG*-LJN-YJY	T-17A	59	CKCB-XCN-ECV	T-11A	80	CSAA-BXN-IBS	T-13A	202
CBG*-LJN-YJY	T-17A	59	CKCB-XCN-EJU	T-11A	82	CSAA-BXN-IBS	T-13A	202
CBG*-LJN-YKX	T-17A	61	CKCB-XCN-EJV	T-11A	82	CSAA-BXN-WZX	T-11A	239
CBG*-LJN-YKY	T-17A	61	CKCB-XCN-EJU	T-11A	82	CVCV-XCN-MAT	T-21A	96
CBG*-LJN-YKY	T-17A	61	CKCB-XCN-XEU	T-11A	88	CVCV-XCN-MAT	T-21A	96
CBG*-LJN-YVR	T-17A	67	CKCB-XCN-XEV	T-11A	88	CVCV-XCN-MAU	T-21A	96
CBG*-LJN-ZDR/M	T-17A	65	CKCB-XCN-XEV	T-11A	88	CVCV-XCN-MAU	T-21A	96
CBG*-LJN-ZDR/M	T-17A	65	CKCB-XCN-YEU	T-11A	85	CVCV-XCN-MAV	T-21A	96
CBG*-LJN-ZNW/M	T-17A	64	CKCB-XCN-YEV	T-11A	85	CVCV-XCN-MAV	T-21A	96
CBG*-LJN-ZTL	T-17A	66	CKCB-XCN-YEV	T-11A	85	CVCV-XCN-MBA	T-21A	152
CBG*-LJN-ZTL	T-17A	66	CKCB-XCN-YVX	T-11A	92	CVCV-XCN-MBA	T-21A	152
CBG*-LJN-ZTL	T-17A	66	CKCB-XCN-YVX	T-11A	92	CVCV-XCN-MBB	T-21A	152
CBI*-LHN-HBA	T-19A	198	CKCB-XCN-ZTD	T-11A	91	CVCV-XCN-MBB	T-21A	152
CBI*-LHN-HBB	T-19A	198	CKCB-XCN-ZTD	T-11A	91	CVCV-XCN-MBY	T-21A	152
CBI*-LHN-HBB	T-19A	198	CKEB-XCN-BBA/M	T-2A	168	CVCV-XCN-MBY	T-21A	152
CBI*-LHN-HBY	T-19A	198	CKEB-XCN-BBA/M	T-2A	168	CVCV-XCN-XPT	T-21A	99
CBI*-LHN-HBY	T-19A	198	CKEB-XCN-BBB/M	T-2A	168	CVCV-XCN-XPT	T-21A	99
CBI*-LHN-KCX	T-19A	53	CKEB-XCN-BBY	T-2A	168	CVCV-XCN-XPV	T-21A	99
CBI*-LHN-KCY	T-19A	53	CKEB-XCN-BBY	T-2A	168	CVCV-XCN-XPV	T-21A	99
CBI*-LHN-KCY	T-19A	53	CKEB-XCN-BCV	T-2A	80	CVEV-XCN-NAU	T-22A	96
CBI*-LHN-KG6/M	T-19A	57	CKEB-XCN-BCV	T-2A	80	CVEV-XCN-NAU	T-22A	96
CBI*-LHN-KG6/M	T-19A	57	CKEB-XCN-BCW	T-2A	80	CVEV-XCN-NAV	T-22A	96
CBI*-LHN-KGR/M	T-19A	57	CKEB-XCN-BCW	T-2A	80	CVEV-XCN-NAV	T-22A	96
CBI*-LHN-KGR/M	T-19A	57	CKEB-XCN-BJA/M	T-2A	179	CVEV-XCN-NAV	T-22A	96
CBI*-LHN-XZP/M	T-19A	60	CKEB-XCN-BJA/M	T-2A	179	CVEV-XCN-NAW	T-22A	96
CBI*-LHN-XZP/M	T-19A	60	CKEB-XCN-BJB/M	T-2A	179	CVEV-XCN-NAW	T-22A	96
CBI*-LHN-XZQ/M	T-19A	63	CKEB-XCN-BJB/M	T-2A	179	CVEV-XCN-XIT	T-22A	99
CBI*-LHN-XZQ/M	T-19A	63	CKEB-XCN-BJY	T-2A	179	CVEV-XCN-XIT	T-22A	99
CBI*-LHN-XZQ/M	T-19A	63	CKEB-XCN-BJY	T-2A	179	CVEV-XCN-XIU	T-22A	99
CBI*-LHN-XZZ/M	T-19A	54	CKEB-XCN-BJV	T-2A	83	CVEV-XCN-XIU	T-22A	99
CBI*-LHN-XZZ/M	T-19A	54	CKEB-XCN-BVJ	T-2A	83	CVEV-XCN-XIU	T-22A	99
CBI*-LHN-XZZ/M	T-19A	54	CKEB-XCN-BVJ	T-2A	83	CVEV-XCN-XIV	T-22A	99
CBI*-LHN-YM6/M	T-19A	59	CKEB-XCN-BVV	T-2A	83	CVEV-XCN-XIV	T-22A	99
CBI*-LHN-YM6/M	T-19A	59	CKEB-XCN-BVV	T-2A	83	CVEV-XCN-XIW	T-22A	99
CBI*-LHN-YM6/M	T-19A	59	CKEB-XCN-BVV	T-2A	83	CVEV-XCN-XIW	T-22A	99
CBI*-LHN-YMR/M	T-19A	59	CKEB-XCN-XAV	T-2A	88	CVGV-XCN-PCW	T-23A	97
CBI*-LHN-YMR/M	T-19A	59	CKEB-XCN-XAV	T-2A	88	CVGV-XCN-PCW	T-23A	97
CBI*-LHN-YN6/M	T-19A	62	CKEB-XCN-XAV	T-2A	88	CVGV-XCN-PCX	T-23A	97
CBI*-LHN-YN6/M	T-19A	62	CKEB-XCN-XAW	T-2A	88	CVGV-XCN-PCX	T-23A	97
CBI*-LHN-YN6/M	T-19A	62	CKEB-XCN-XAW	T-2A	88	CVGV-XCN-PCY	T-23A	97
CBI*-LHN-YNR/M	T-19A	62	CKEB-XCN-XAV	T-2A	86	CVGV-XCN-PCY	T-23A	97
CBI*-LHN-YNR/M	T-19A	62	CKEB-XCN-XAV	T-2A	86	CVGV-XCN-PCY	T-23A	97
CBI*-LHN-YNR/M	T-19A	62	CKEB-XCN-XAV	T-2A	86	CVGV-XCN-PCY	T-23A	97
CBI*-LHN-Z8Z/M	T-19A	54	CKEB-XCN-XAW	T-2A	86	CVGV-XCN-XMT	T-23A	100
CBI*-LHN-Z8Z/M	T-19A	54	CKEB-XCN-XAW	T-2A	86	CVGV-XCN-XMT	T-23A	100
CBI*-LHN-Z8Z/M	T-19A	54	CKEB-XCN-XAW	T-2A	86	CVGV-XCN-XMT	T-23A	100
CBI*-LHN-ZFD/M	T-19A	65	CKEB-XCN-YAV	T-2A	86	CVGV-XCN-XMU	T-23A	100
CBI*-LHN-ZFD/M	T-19A	65	CKEB-XCN-YAV	T-2A	86	CVGV-XCN-XMU	T-23A	100
CBI*-LHN-ZFD/M	T-19A	65	CKEB-XCN-YAV	T-2A	86	CVGV-XCN-XMU	T-23A	100
CBI*-LHN-ZNX/M	T-19A	64	CKEB-XCN-YVU	T-2A	92	CVGV-XCN-XMU	T-23A	100
CBI*-LHN-ZNX/M	T-19A	64	CKEB-XCN-YVU	T-2A	92	CVGV-XCN-XMV	T-23A	100
CBI*-LHN-ZNX/M	T-19A	64	CKEB-XCN-ZDS/M	T-2A	90	CVIV-XCN-QCX	T-24A	97
CBI*-LJN-HBA	T-19A	198	CKEB-XCN-ZDS/M	T-2A	90	CVIV-XCN-QCX	T-24A	97
CBI*-LJN-HBA	T-19A	198	CKEB-XCN-ZNV/M	T-2A	89	CVIV-XCN-QCY	T-24A	97
CBI*-LJN-HBA	T-19A	198	CKEB-XCN-ZNV/M	T-2A	89	CVIV-XCN-QCY	T-24A	97
CBI*-LJN-HBB	T-19A	198	CKEB-XCN-ZTH	T-2A	91	CVIV-XCN-XLX	T-24A	100
CBI*-LJN-HBB	T-19A	198	CKEB-XCN-ZTH	T-2A	91	CVIV-XCN-XLX	T-24A	100
CBI*-LJN-HBB	T-19A	198	CKEB-XCN-ZTH	T-2A	91	CVIV-XCN-XLX	T-24A	100
CBI*-LJN-HBY	T-19A	198	CKGB-XCN-BKA	T-17A	189	CVIV-XCN-XLY	T-24A	100
CBI*-LJN-HBY	T-19A	198	CKGB-XCN-BKA	T-17A	189	CVIV-XCN-XLY	T-24A	100
CBI*-LJN-HBY	T-19A	198	CKGB-XCN-BKA	T-17A	189	CVIV-XCN-XLY	T-24A	100
CBI*-LJN-KCX	T-19A	53	CKGB-XCN-BKB	T-17A	189	CVIV-XCN-XLY	T-24A	100
CBI*-LJN-KCX	T-19A	53	CKGB-XCN-BKB	T-17A	189	CVIV-XCN-XLY	T-24A	100
CBI*-LJN-KCX	T-19A	53	CKGB-XCN-BKB	T-17A	189	CVIV-XCN-XLY	T-24A	100
CBI*-LJN-KCY	T-19A	53	CKGB-XCN-BKY	T-17A	189	CVIV-XCN-Z9T/M	T-24A	98
CBI*-LJN-KCY	T-19A	53	CKGB-XCN-BKY	T-17A	189	CVIV-XCN-Z9T/M	T-24A	98
CBI*-LJN-KCY	T-19A	53	CKGB-XCN-BKY	T-17A	189	CVIV-XCN-Z9T/M	T-24A	98
CBI*-LJN-KG6/M	T-19A	56	CKGB-XCN-HCX	T-17A	81	CWC*-LGN-MAU	T-21A	72
CBI*-LJN-KG6/M	T-19A	56	CKGB-XCN-HCX	T-17A	81	CWC*-LGN-MAU	T-21A	72
CBI*-LJN-KG6/M	T-19A	56	CKGB-XCN-HCX	T-17A	81	CWC*-LGN-MAU	T-21A	72
CBI*-LJN-KGR/M	T-19A	56	CKGB-XCN-HCY	T-17A	81	CWC*-LGN-MAV	T-21A	72
CBI*-LJN-KGR/M	T-19A	56	CKGB-XCN-HCY	T-17A	81	CWC*-LGN-MAV	T-21A	72
CBI*-LJN-KGR/M	T-19A	56	CKGB-XCN-HCY	T-17A	81	CWC*-LGN-MAV	T-21A	72



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CWC*-LGN-MBA	T-21A	151	CXDA-X*N-GCT	T-13A	106	CXJA-X*N-LAX	T-18A	105
CWC*-LGN-MBB	T-21A	151	CXDA-X*N-GCU	T-13A	106	CXJA-X*N-LAY	T-18A	105
CWC*-LGN-MBY	T-21A	151	CXDA-XAN-GDW	T-13A	153	CXJA-X*N-VTN/M	T-18A	108
CWC*-LGN-XPU	T-21A	75	CXDA-XCN-GDA	T-13A	153	CXJA-X*N-XZY/M	T-18A	108
CWC*-LGN-XPV	T-21A	75	CXDA-XCN-GDP	T-13A	153	CXJA-X*N-ZLR/M	T-18A	107
CWC*-LHN-MAU	T-21A	72	CXDA-XCN-GDY	T-13A	153	CXJA-X*N-ZLS/M	T-18A	107
CWC*-LHN-MAV	T-21A	72	CXED-X*N-DAT	T-5A	104	CXJA-XCN-IBO	T-18A	200
CWC*-LHN-MBA	T-21A	151	CXED-X*N-DAU	T-5A	104	CXJA-XCN-IBV	T-18A	200
CWC*-LHN-MBB	T-21A	151	CXED-X*N-DAV	T-5A	104	CXJA-XCN-IBZ	T-18A	200
CWC*-LHN-MBY	T-21A	151	CXED-X*N-DCU	T-5A	106	FCBB-LAN-AAT	T-162A	120
CWC*-LHN-XPU	T-21A	75	CXED-X*N-DCV	T-5A	106	FCBB-LAN-AAU	T-162A	120
CWC*-LHN-XPV	T-21A	75	CXFA-X*N-DAT	T-5A	104	FCBB-LAN-ACT	T-162A	122
CWE*-LGN-NAV	T-22A	72	CXFA-X*N-DAU	T-5A	104	FCBB-LAN-ACU	T-162A	122
CWE*-LGN-NAW	T-22A	72	CXFA-X*N-DAV	T-5A	104	FCCB-LAN-GAT	T-13A	120
CWE*-LGN-XIV	T-22A	75	CXFA-X*N-DCU	T-5A	106	FCCB-LAN-GAU	T-13A	120
CWE*-LGN-XIW	T-22A	75	CXFA-X*N-DCV	T-5A	106	FCCB-LAN-GCT	T-13A	122
CWE*-LHN-NAV	T-22A	72	CXFA-XAN-DBW	T-5A	169	FCCB-LAN-GCU	T-13A	122
CWE*-LHN-NAW	T-22A	72	CXFA-XAN-DJW	T-5A	180	FCDB-LAN-DAT	T-5A	120
CWE*-LHN-XIV	T-22A	75	CXFA-XAN-DKX	T-5A	190	FCDB-LAN-DAU	T-5A	120
CWE*-LHN-XIW	T-22A	75	CXFA-XAN-GDF	T-5A	153	FCDB-LAN-DAV	T-5A	120
CWG*-LGN-PCX	T-23A	73	CXFA-XCN-DBJ	T-5A	169	FCDB-LAN-DCU	T-5A	122
CWG*-LGN-PCY	T-23A	73	CXFA-XCN-DBK	T-5A	169	FCDB-LAN-DCV	T-5A	122
CWG*-LGN-XXM	T-23A	76	CXFA-XCN-DBP	T-5A	169	FCEB-LAN-IAW	T-16A	121
CWG*-LGN-XXY	T-23A	76	CXFA-XCN-DJJ	T-5A	180	FCEB-LAN-IAX	T-16A	121
CWG*-LHN-PCX	T-23A	73	CXFA-XCN-DJK	T-5A	180	FCEB-LAN-IAY	T-16A	121
CWG*-LHN-PCY	T-23A	73	CXFA-XCN-DJP	T-5A	180	FCEB-LAN-ICW	T-16A	123
CWG*-LHN-XXM	T-23A	76	CXGD-X*N-ICW	T-16A	107	FCEB-LAN-ICX	T-16A	123
CWG*-LHN-XXY	T-23A	76	CXGD-X*N-IAW	T-16A	105	FCEB-LAN-ICY	T-16A	123
CWI*-LGN-QCX	T-24A	73	CXGD-X*N-IAX	T-16A	105	FCFB-LAN-LAW	T-18A	121
CWI*-LGN-QCY	T-24A	73	CXGD-X*N-IAY	T-16A	105	FCFB-LAN-LAX	T-18A	121
CWI*-LGN-XLX	T-24A	76	CXGD-X*N-ICX	T-16A	107	FCFB-LAN-LAY	T-18A	121
CWI*-LGN-XLY	T-24A	76	CXGD-X*N-ICY	T-16A	107	FCFB-LAN-VTN/M	T-18A	124
CWI*-LGN-Z9T/M	T-24A	74	CXHA-X*N-IAW	T-16A	105	FCFB-LAN-XZY/M	T-18A	124
CWI*-LHN-QGX	T-24A	73	CXHA-X*N-IAX	T-16A	105	FCFB-LAN-ZLR/M	T-18A	123
CWI*-LHN-QGY	T-24A	73	CXHA-X*N-IAY	T-16A	105	FCFB-LAN-ZLS/M	T-18A	123
CWI*-LHN-XLX	T-24A	76	CXHA-X*N-ICW	T-16A	107	FDBA-LAN-XWV	T-13A	231
CWI*-LHN-Z9T/M	T-24A	74	CXHA-X*N-ICX	T-16A	107	FDBA-LAN-GAT	T-13A	128
CXAD-X*N-AAT	T-162A	104	CXHA-X*N-ICY	T-16A	107	FDBA-LAN-GAU	T-13A	128
CXAD-X*N-AAU	T-162A	104	CXHA-XAN-CDV	T-16A	200	FDBA-LAN-GBA	T-13A	155
CXAD-X*N-ACT	T-162A	106	CXHA-XCN-DKP	T-16A	190	FDBA-LAN-GBP	T-13A	154
CXAD-X*N-ACU	T-162A	106	CXHA-XCN-DKT	T-16A	190	FDBA-LAN-GBW	T-13A	155
CXBA-X*N-AAT	T-162A	104	CXHA-XCN-DKZ	T-16A	190	FDBA-LAN-GBX	T-13A	155
CXBA-X*N-AAU	T-162A	104	CWI*-LHN-XLY	T-24A	76	FDBA-LAN-GBY	T-13A	155
CXBA-X*N-ACT	T-162A	106	CXID-X*N-VTN/M	T-18A	108	FDBA-LAN-GCT	T-13A	130
CXBA-X*N-ACU	T-162A	106	CXID-X*N-LAW	T-18A	105	FDBA-LAN-GCU	T-13A	130
CXCD-X*N-GAT	T-13A	104	CXID-X*N-LAX	T-18A	105	FDCB-LAN-DAT	T-5A	128
CXCD-X*N-GAU	T-13A	104	CXID-X*N-LAY	T-18A	105	FDCB-LAN-DAU	T-5A	128
CXCD-X*N-GCT	T-13A	106	CXID-X*N-ZLR/M	T-18A	107	FDCB-LAN-DAV	T-5A	128
CXCD-X*N-GCU	T-13A	106	CXID-X*N-ZLS/M	T-18A	107	FDCB-LAN-DAW	T-5A	128
CXDA-X*N-GAT	T-13A	104	CXID-X*N-XZY/M	T-18A	108	FDCB-LAN-DBA	T-5A	170
CXDA-X*N-GAU	T-13A	104	CXJA-X*N-LAW	T-18A	105	FDCB-LAN-DBB	T-5A	170

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FDCB-LAN-DBP	T-5A	170	FXCA-LAN-GAT	T-13A	120	NCFB-L*N-IAX	T-16A	113
FDCB-LAN-DBY	T-5A	170	FXCA-LAN-GAU	T-13A	120	NCFB-L*N-IAY	T-16A	113
FDCB-LAN-DCU	T-5A	130	FXCA-LAN-GCT	T-13A	122	NCFB-L*N-ICW	T-16A	115
FDCB-LAN-DCV	T-5A	130	FXCA-LAN-GCU	T-13A	122	NCFB-L*N-ICX	T-16A	115
FDCB-LAN-DJA	T-5A	181	FXDA-LAN-DAT	T-5A	120	NCFB-L*N-ICY	T-16A	115
FDCB-LAN-DJB	T-5A	181	FXDA-LAN-DAU	T-5A	120	NCGB-L*N-LAW	T-18A	113
FDCB-LAN-DJP	T-5A	181	FXDA-LAN-DAV	T-5A	120	NCGB-L*N-LAX	T-18A	113
FDCB-LAN-DJY	T-5A	181	FXDA-LAN-DCU	T-5A	122	NCGB-L*N-LAY	T-18A	113
FDCB-LAN-WVC	T-5A	240	FXDA-LAN-DCV	T-5A	122	NCGB-L*N-VTN/M	T-18A	116
FDCB-LAN-WXI	T-5A	240	FXEA-LAN-IAW	T-16A	121	NCGB-L*N-XZY/M	T-18A	116
FDCB-LAN-WZC	T-5A	240	FXEA-LAN-IAX	T-16A	121	NCGB-L*N-ZLR/M	T-18A	115
FDEA-LAN-DKA	T-16A	191	FXEA-LAN-IAY	T-16A	121	NCGB-L*N-ZLS/M	T-18A	115
FDEA-LAN-DKB	T-16A	191	FXEA-LAN-ICW	T-16A	123	NCGB-LCN-IBE	T-18A	201
FDEA-LAN-DKP	T-16A	191	FXEA-LAN-ICX	T-16A	123	NCGB-LCN-IBF	T-18A	201
FDEA-LAN-DKY	T-16A	191	FXEA-LAN-ICY	T-16A	123	NCGB-LCN-IBY	T-18A	201
FDEA-LAN-DKZ	T-16A	191	FXFA-LAN-LAW	T-18A	121	NCGB-LCN-IBZ	T-18A	201
FDEA-LAN-IAW	T-16A	129	FXFA-LAN-LAX	T-18A	121	NFBC-L*N-AAT	T-162A	112
FDEA-LAN-IAX	T-16A	129	FXFA-LAN-LAY	T-18A	121	NFBC-L*N-AAU	T-162A	112
FDEA-LAN-IAY	T-16A	129	FXFA-LAN-VTN/M	T-18A	124	NFBC-L*N-ACT	T-162A	114
FDEA-LAN-ICW	T-16A	131	FXFA-LAN-XZY/M	T-18A	124	NFBC-L*N-ACU	T-162A	114
FDEA-LAN-ICX	T-16A	131	FXFA-LAN-ZLR/M	T-18A	123	NFCC-L*N-GAT	T-13A	112
FDEA-LAN-ICY	T-16A	131	FXFA-LAN-ZLS/M	T-18A	123	NFCC-L*N-GAU	T-13A	112
FDFA-LAN-IBE	T-18A	201	NCBB-L*N-AAT	T-162A	112	NFCC-L*N-GCT	T-13A	114
FDFA-LAN-IBF	T-18A	201	NCBB-L*N-AAU	T-162A	112	NFCC-L*N-GCU	T-13A	114
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FDFA-LAN-IBY	T-18A	201	NCBB-L*N-ACU	T-162A	114	NFCC-LCN-GBP	T-13A	154
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FDFA-LAN-LAW	T-18A	129	NCCB-L*N-GAU	T-13A	112	NFCC-LCN-GBW	T-13A	154
FDFA-LAN-LAX	T-18A	129	NCCB-L*N-GCT	T-13A	114	NFCC-LCN-GBX	T-13A	154
FDFA-LAN-LAY	T-18A	129	NCCB-L*N-GCU	T-13A	114	NFCC-LCN-ZGB	T-13A	232
FDFA-LAN-VTN/M	T-18A	132	NCCB-LAN-GBW	T-13A	155	NFCC-LCN-DBS	T-13A	171
FDFA-LAN-XZY/M	T-18A	132	NCCB-LAN-GBX	T-13A	155	NFCC-L*N-DAT	T-5A	112
FDFA-LAN-ZLR/M	T-18A	131	NCCB-LCN-GBY	T-13A	155	NFDC-L*N-DAU	T-5A	112
FDFA-LAN-ZLS/M	T-18A	131	NCCB-LCN-GBA	T-13A	155	NFDC-L*N-DAV	T-5A	112
FRBA-LAN-JCT	T-163A	136	NCEB-L*N-DAT	T-5A	112	NFDC-L*N-DCU	T-5A	114
FRBA-LAN-JCU	T-163A	136	NCEB-L*N-DAU	T-5A	112	NFDC-L*N-DCV	T-5A	114
FRCA-LAN-EAU	T-11A	136	NCEB-L*N-DAV	T-5A	112	NFDC-LAN-DBP	T-5A	170
FRCA-LAN-EAV	T-11A	136	NCEB-L*N-DCU	T-5A	114	NFDC-LAN-DJP	T-5A	181
FRCA-LAN-WBN	T-11A	154	NCEB-L*N-DCV	T-5A	114	NFEC-L*N-IAW	T-16A	113
FRDA-LAN-BAU	T-2A	136	NCEB-LAN-DBA	T-5A	170	NFEC-L*N-IAX	T-16A	113
FRDA-LAN-BAV	T-2A	136	NCEB-LAN-DBB	T-5A	170	NFEC-L*N-IAY	T-16A	113
FRDA-LAN-BAW	T-2A	136	NCEB-LAN-DBC	T-5A	170	NFEC-L*N-ICW	T-16A	115
FREA-LAN-HEW	T-17A	137	NCEB-LAN-DBY	T-5A	170	NFEC-L*N-ICX	T-16A	115
FREA-LAN-HEX	T-17A	137	NCEB-LCN-DJA	T-5A	181	NFEC-L*N-ICY	T-16A	115
FREA-LAN-HEY	T-17A	137	NCEB-LCN-DJB	T-5A	181	NFEC-LAN-DKP	T-16A	191
FRFA-LAN-KEX	T-19A	137	NCEB-LCN-DJY	T-5A	181	NFFC-L*N-LAW	T-18A	113
FRFA-LAN-KEY	T-19A	137	NCFB-L*N-DKA	T-16A	191	NFFC-L*N-LAX	T-18A	113
FXBA-LAN-AAT	T-162A	120	NCFB-L*N-DKB	T-16A	191	NFFC-L*N-LAY	T-18A	113
FXBA-LAN-AAU	T-162A	120	NCFB-L*N-DKY	T-16A	191	NFFC-L*N-VTN/M	T-18A	116
FXBA-LAN-ACT	T-162A	122	NCFB-L*N-DKZ	T-16A	191	NFFC-L*N-XZY/M	T-18A	116



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NFFC-L*N-ZLS/M	T-18A	115	PPDB-LAN-EB2	T-11A	150	PRFB-LAN-BB3	T-2A	166
NFFC-LGN-IBO	T-18A	201	PPDB-LAN-EB3	T-11A	150	PRFB-LAN-BBP/M	T-2A	166
PBBB-LAN-J2T	T-163A	39	PPDB-LAN-EBA/M	T-11A	150	PRFB-LAN-BJ2	T-2A	177
PBBB-LAN-J2U	T-163A	39	PPDB-LAN-EBP/M	T-11A	150	PRFB-LAN-BJ2	T-2A	177
PBBB-LAN-JFT	T-163A	36	PPDB-LAN-EBY	T-11A	150	PRFB-LAN-BJ3	T-2A	177
PBBB-LAN-JFU	T-163A	36	PPDB-LAN-ELU	T-11A	44	PRFB-LAN-BJA/M	T-2A	177
PBDB-LAN-E2U	T-11A	39	PPDB-LAN-ELV	T-11A	44	PRFB-LAN-BJB/M	T-2A	177
PBDB-LAN-E2V	T-11A	39	PPFB-LAN-B4V	T-2A	47	PRFB-LAN-BJP/M	T-2A	177
PBDB-LAN-EB2	T-11A	149	PPFB-LAN-B4W	T-2A	47	PRFB-LAN-BLV	T-2A	44
PBDB-LAN-EB3	T-11A	149	PPFB-LAN-BB2	T-2A	166	PRFB-LAN-BLW	T-2A	44
PBDB-LAN-EBA/M	T-11A	149	PPFB-LAN-BB3	T-2A	166	PRHB-LAN-BK2	T-17A	187
PBDB-LAN-EBP/M	T-11A	149	PPFB-LAN-BBP/M	T-2A	166	PRHB-LAN-BKA/M	T-17A	187
PBDB-LAN-EBY	T-11A	149	PPFB-LAN-BJ2	T-2A	177	PRHB-LAN-BKB/M	T-17A	187
PBDB-LAN-EFU	T-11A	36	PPFB-LAN-BJ3	T-2A	177	PRHB-LAN-BKJ	T-17A	187
PBDB-LAN-EFV	T-11A	36	PPFB-LAN-BJA/M	T-2A	177	PRHB-LAN-BKP/M	T-17A	187
PBFB-LAN-B2V	T-2A	39	PPFB-LAN-BJB/M	T-2A	177	PRHB-LAN-H4X	T-17A	48
PBFB-LAN-B2W	T-2A	39	PPFB-LAN-BJP/M	T-2A	177	PRHB-LAN-H4Y	T-17A	48
PBFB-LAN-BB2	T-2A	165	PPFB-LAN-BLV	T-2A	44	PRHB-LAN-HBJ/M	T-17A	197
PBFB-LAN-BB3	T-2A	165	PPFB-LAN-BLW	T-2A	44	PRHB-LAN-HBK/M	T-17A	197
PBFB-LAN-BBA/M	T-2A	165	PPHB-LAN-BK2	T-17A	187	PRHB-LAN-HEX	T-17A	45
PBFB-LAN-BBB/M	T-2A	165	PPHB-LAN-BKA	T-17A	187	PRHB-LAN-HEY	T-17A	45
PBFB-LAN-BBP/M	T-2A	165	PPHB-LAN-BKB	T-17A	187	PRJB-LAN-HBA	T-19A	197
PBFB-LAN-BFV	T-2A	36	PPHB-LAN-BKJ	T-17A	187	PRJB-LAN-HBB	T-19A	197
PBFB-LAN-BFW	T-2A	36	PPHB-LAN-BKP/M	T-17A	187	PRJB-LAN-HBO/M	T-19A	197
PBFB-LAN-BJ2	T-2A	176	PPHB-LAN-H4X	T-17A	48	PRJB-LAN-K4X	T-19A	48
PBFB-LAN-BJ3	T-2A	176	PPHB-LAN-H4Y	T-17A	48	PRJB-LAN-K4Y	T-19A	48
PBFB-LAN-BJA/M	T-2A	176	PPHB-LAN-HBJ/M	T-17A	197	PRJB-LAN-KE6/M	T-19A	46
PBFB-LAN-BJB/M	T-2A	176	PPHB-LAN-HBK/M	T-17A	197	PRJB-LAN-KER/M	T-19A	46
PBFB-LAN-BJP/M	T-2A	176	PPHB-LAN-HEX	T-17A	45	PRJB-LAN-KEX	T-19A	45
PBHB-LAN-BK2	T-17A	186	PPHB-LAN-HEY	T-17A	45	PRJB-LAN-KEY	T-19A	45
PBHB-LAN-BKA/M	T-17A	186	PPJB-LAN-HBA	T-19A	197	RDBA-LAN-AET	T-162A	6
PBHB-LAN-BKB/M	T-17A	186	PPJB-LAN-HBB	T-19A	197	RDBA-LAN-AAT	T-162A	4
PBHB-LAN-BKJ	T-17A	186	PPJB-LAN-HBO/M	T-19A	197	RDBA-LAN-AAU	T-162A	4
PBHB-LAN-BKP/M	T-17A	186	PPJB-LAN-K4X	T-19A	48	RDBA-LAN-AEU	T-162A	6
PBHB-LAN-H2X	T-17A	40	PPJB-LAN-K4Y	T-19A	48	RDBA-LAN-AYT	T-162A	9
PBHB-LAN-H2Y	T-17A	40	PPJB-LAN-KE6/M	T-19A	46	RDBA-LAN-AYU	T-162A	9
PBHB-LAN-HBJ/M	T-17A	196	PPJB-LAN-KER/M	T-19A	46	RDDA-L*N-VZM	T-10A	233
PBHB-LAN-HBK/M	T-17A	196	PPJB-LAN-KEX	T-19A	45	RDDA-L*N-WLW	T-10A	241
PBHB-LAN-HFX	T-17A	37	PPJB-LAN-KEY	T-19A	45	RDDA-L*N-WLZ	T-10A	241
PBHB-LAN-HFY	T-17A	37	PRDB-LAN-E4U	T-11A	47	RDDA-L*N-WMW	T-10A	241
PBJB-LAN-HBA	T-19A	196	PRDB-LAN-E4V	T-11A	47	RDDA-L*N-WVQ	T-10A	238
PBJB-LAN-HBB	T-19A	196	PRDB-LAN-EB2	T-11A	150	RDDA-L*N-WVT	T-10A	238
PBJB-LAN-HBO/M	T-19A	196	PRDB-LAN-EB3	T-11A	150	RDDA-L*N-WVW	T-10A	238
PBJB-LAN-K2X	T-19A	40	PRDB-LAN-EBA/M	T-11A	150	RDDA-L*N-YVB	T-10A	230
PBJB-LAN-K2Y	T-19A	40	PRDB-LAN-EBP/M	T-11A	150	RDDA-L*N-YVP/M	T-10A	235
PBJB-LAN-KF6/M	T-19A	38	PRDB-LAN-EBY	T-11A	150	RDDA-L*N-ZFL	T-10A	230
PBJB-LAN-KFR/M	T-19A	38	PRDB-LAN-ELU	T-11A	44	RDDA-L*N-ZFL	T-10A	230
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RDDA-LAN-CBI	T-10A	162	RDHA-LAN-IEX	T-16A	7	RPGC-LAN-CEW	T-3A	6
RDDA-LAN-CJY	T-10A	174	RDHA-LAN-IEY	T-16A	7	RPGC-LAN-CJA/M	T-3A	174
RDDA-LAN-CKY	T-10A	184	RDHA-LAN-YIY	T-16A	10	RPGC-LAN-CJB/M	T-3A	174
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RDDA-LAN-FAV	T-10A	4	RDJA-LAN-LAW	T-18A	5	RPGC-LAN-CJX	T-3A	174
RDDA-LAN-FAW	T-10A	4	RDJA-LAN-LAX	T-18A	5	RPGC-LAN-CKA/M	T-3A	184
RDDA-LAN-FBA/M	T-10A	146	RDJA-LAN-LAY	T-18A	5	RPGC-LAN-CKB/M	T-3A	184
RDDA-LAN-FBC/M	T-10A	146	RDJA-LAN-LEX	T-18A	7	RPGC-LAN-CKP/M	T-3A	184
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RDDA-LAN-FBY	T-10A	146	RDJA-LAN-XZY/M	T-18A	8	RPGC-LAN-CSX	T-3A	193
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RDDA-LAN-FRV	T-10A	161	RPCC-LAN-AAU	T-162A	4	RPGC-LAN-YCX	T-3A	9
RDDA-LAN-FSU	T-10A	145	RPCC-LAN-AET	T-162A	6	RPGC-LAN-ZLZ	T-3A	183
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RDDA-LAN-YFV	T-10A	9	RPEC-LAN-CBE/M	T-10A	162	RPIC-LAN-CDZ	T-16A	194
RDDA-LAN-ZHT	T-10A	173	RPEC-LAN-CBF/M	T-10A	162	RPIC-LAN-IAW	T-16A	5
RDDA-LAN-ZHV	T-10A	173	RPEC-LAN-CBG/M	T-10A	162	RPIC-LAN-IAX	T-16A	5
RDFA-LAN-CAV	T-3A	4	RPEC-LAN-CBH/M	T-10A	163	RPIC-LAN-IAY	T-16A	5
RDFA-LAN-CAW	T-3A	4	RPEC-LAN-CBI	T-10A	162	RPIC-LAN-IEX	T-16A	7
RDFA-LAN-CAX	T-3A	4	RPEC-LAN-CJY	T-10A	174	RPIC-LAN-IEY	T-16A	7
RDFA-LAN-CEV	T-3A	6	RPEC-LAN-CKY	T-10A	184	RPIC-LAN-YIY	T-16A	10
RDFA-LAN-CEW	T-3A	6	RPEC-LAN-FAU	T-10A	4	RPKC-LAN-LA6/M	T-18A	5
RDFA-LAN-CJA/M	T-3A	174	RPEC-LAN-FAV	T-10A	4	RPKC-LAN-LAW	T-18A	5
RDFA-LAN-CJB/M	T-3A	174	RPEC-LAN-FAW	T-10A	4	RPKC-LAN-LAX	T-18A	5
RDFA-LAN-CJP/M	T-3A	174	RPEC-LAN-FBA/M	T-10A	146	RPKC-LAN-LAY	T-18A	5
RDFA-LAN-CJX	T-3A	174	RPEC-LAN-FBC/M	T-10A	146	RPKC-LAN-LEX	T-18A	7
RDFA-LAN-CKA/M	T-3A	184	RPEC-LAN-FBP/M	T-10A	146	RPKC-LAN-LEY	T-18A	7
RDFA-LAN-CKB/M	T-3A	184	RPEC-LAN-FBX	T-10A	146	RPKC-LAN-VTN/M	T-18A	8
RDFA-LAN-CKP/M	T-3A	184	RPEC-LAN-FBY	T-10A	146	RPKC-LAN-XZY/M	T-18A	8
RDFA-LAN-CKX	T-3A	184	RPEC-LAN-FEU	T-10A	6	RPKC-LAN-YL6/M	T-18A	10
RDFA-LAN-CRX	T-3A	193	RPEC-LAN-FEV	T-10A	6	RPKC-LAN-YLR/M	T-18A	10
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RDFA-LAN-VTG	T-3A	183	RPEC-LAN-FSU	T-10A	145	RSBC-LAN-JCT	T-163A	22
RDFA-LAN-YCW	T-3A	9	RPEC-LAN-FSV	T-10A	161	RSBC-LAN-JCU	T-163A	22
RDFA-LAN-YCX	T-3A	9	RPEC-LAN-FTV	T-10A	161	RSDC-LAN-E6U	T-11A	24
RDFA-LAN-ZLZ	T-3A	183	RPEC-LAN-FVU	T-10A	145	RSDC-LAN-E6V	T-11A	24
RDHA-LAN-CDC/M	T-16A	194	RPEC-LAN-YFU	T-10A	9	RSDC-LAN-E8U	T-11A	26
RDHA-LAN-CDD/M	T-16A	194	RPEC-LAN-YFV	T-10A	9	RSDC-LAN-E8V	T-11A	26
RDHA-LAN-CDO/M	T-16A	194	RPEC-LAN-ZHT	T-10A	173	RSDC-LAN-EB4	T-11A	148
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RSFC-LAN-B8V	T-2A	26	SCGA-LAN-HCY	T-17A	31	XRGA-LAN-*X		18
RSFC-LAN-B8W	T-2A	26	SCIA-LAN-KCX	T-19A	31	XRGA-LAN-*Y		18
RSFC-LAN-BB4	T-2A	164	SCIA-LAN-KCY	T-19A	31	XRHB-LCN-A5/M		220
RSFC-LAN-BB5	T-2A	164	SXCA-LAN-E6U	T-11A	24	XRHB-LCN-AQ/M		220
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RSFC-LAN-BCV	T-2A	22	SXCA-LAN-E8U	T-11A	26	XRIA-LAN-*8/M		18
RSFC-LAN-BCW	T-2A	22	SXCA-LAN-E8V	T-11A	26	XRJB-LCN-AR/M		221
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RSHC-LAN-BK4	T-17A	185	SXCA-LAN-ECU	T-11A	22	XRJC-LNN-AS/M		217
RSHC-LAN-BK5	T-17A	185	SXCA-LAN-ECV	T-11A	22	XRJC-LNN-AX		215
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RSHC-LAN-BKW/M	T-17A	185	SXEA-LAN-B8V	T-2A	26	YCJD-L*N-HR		206
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RSHC-LAN-H8X	T-17A	26	SXEA-LAN-BB5	T-2A	164	YCJE-L*N-HR		210
RSHC-LAN-H8Y	T-17A	26	SXEA-LAN-BBW/M	T-2A	164	YCJG-L*N-AR		212
RSHC-LAN-HB4/M	T-17A	195	SXEA-LAN-BCV	T-2A	22	YCJG-L*N-GR		212
RSHC-LAN-HB6/M	T-17A	195	SXEA-LAN-BCW	T-2A	22	YCJG-L*N-HR		212
RSHC-LAN-HB7/M	T-17A	195	SXEA-LAN-BJ4	T-2A	175	YCJH-L*N-AR		208
RSHC-LAN-HBW/M	T-17A	195	SXEA-LAN-BJ5	T-2A	175	YCJH-L*N-GR		208
RSHC-LAN-HCX	T-17A	23	SXEA-LAN-BJW/M	T-2A	175	YCJH-L*N-HR		208
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RSJC-LAN-K6X	T-19A	25	X2DD-LAN-CA		172	YDCC-LHN-AV		224
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## NOTES

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## NOTES

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## NOTES

## WARRANTY INFORMATION, PERFORMANCE ASSURANCE, AND APPLICATION LIMITATIONS

### Caution

Sun Hydraulics Limited manufactures a variety of cartridge valves that will fit into the same Sun cavity. Each cartridge is marked with a seven-digit part identification code and a four-digit date code, stamped on the hex surfaces. Designers and users of Sun components are advised that **physical interchangeability of cartridges does not necessarily mean functional interchangeability.** When

replacing any Sun cartridges, users should first check with the manufacturer's service literature, their local Sun distributor, or the Sun factory before making any part substitutions.

**NOTE: To avoid serious injury, the manufacturer's service manual must be consulted before working on any hydraulic system.**

### Limited Warranty

Sun Hydraulics Limited warrants its products free from defects in material, workmanship, and design for a period of three years after installation, provided the installation date is less than one year after manufacture. **“O-rings” and seals are specifically exempted from this warranty.** In no instance is there any warranty of fitness for a particular use and Sun Hydraulics Limited cannot and does not accept responsibility of any type for any of its products that have been subjected to improper installation, improper application, negligence, tampering, or abuse, or which have been repaired or altered

outside of the Sun Hydraulics factory. Sun Hydraulics Limited's liability under this warranty shall extend only to replacement or correction, f.o.b. our factory, of any defective part or product determined by inspection as not conforming to this warranty. We make no other warranties, expressed or implied, and are not responsible for any consequential damages resulting from use by any buyer or user, our liability being limited to the value of product sold or obligation to replace a defective part.

### Performance Assurance

All Sun cartridges are individually tested at the factory and preset to specific pressure or flow settings where indicated in this catalogue. However, as the actual performance of buyers' equipment cannot be reproduced in Sun's testing laboratory,

assurance of suitability of all Sun products in the buyer's application is the responsibility of the buyer. This is typically accomplished by the manufacture of a prototype followed by a test or qualification program on the part of the buyer.

### Application Limitations

Sun's product designs and manufacturing facilities have been specifically developed to provide products for commercial, industrial and mobile hydraulic applications and Sun's products are only warranted for this type of use. **Sun's distributors are not authorised to approve the use of Sun products in any of the following applications:**

- Any steering or braking systems for passenger-carrying vehicles or on-highway trucks.
- Aircraft or space vehicles.

- Ordnance equipment.
- Life support equipment.
- Any end product which is used in a nuclear power plant application.

Specific written approval for any application of Sun products in any of the above named applications should be obtained from Sun Hydraulics Limited. Consultation with Sun distributors or factory engineers is advised in unusual situations where applicability is questionable.