Applications

Regenerative circuits allow a cylinder to be advanced more rapidly than it could be with pump flow alone. To achieve this, oil from the rod end of a cylinder is added to the pump flow to the blind end, increasing the rate of advance.

NOTE: Regeneration circuits apply only to single rod cylinders in the extended direction.

SUN Hydraulics offers two types of regenerative valve assemblies, pressure sensitive and continuous regeneration.

Determination of the type of regenerative circuit to be used is dependent upon the system requirements. In making this determination, several areas need careful consideration.

Pressure sensitive regenerative valves will provide regenerative flow to the blind end of the cylinder until the load induced pressure reaches the setting of the counter–balance valve, at which time rod end oil is automatically diverted to tank. The circuit then becomes non–regenerative and full system pressure is applied to the full blind area, allowing it to develop maximum force.

Continuous (or full time) regenerative valves will provide regenerative flow to the blind end of the cylinder during the complete extension cycle.

Hydraulic cylinders are manufactured with an almost unlimited combination of cylinder–to–rod ratios. These ratios can have a dramatic effect on the speed of extension and retraction of the cylinders.

A 2:1 cylinder (i.e. The blind end piston area is twice the rod end area.) will extend and retract at the same speed if regeneration is used. Without regeneration, the extend speed would be 50% of the retract speed.

Cylinders with large rod diameters typically offer small amounts of oil for use in cylinder extension in regenerative circuits. Rod extension speed therefore may not be increased substantially. In contrast, when retracting a large rod diameter cylinder in a regenerative circuit, the speed may be so great, due the small volume of oil required, that the system may become unstable and generate shock. Conversely, cylinders with small rod diameters may produce shock on rod extension, and retract slowly.

When applying pressure sensitive regenerative valve assemblies, several factors must be considered:

- The pressure required to move a cylinder.
- Rod–to–diameter ratio.
- Pressure adjustment methods required to control the setting of the SUN counterbalance valve.

Losses due to high flows and seal friction may prevent a circuit from staying in regeneration. *Be conservative in system design.*

NOTE: In applications where the load tends to extend the cylinder, a vented pilot to open check valve or a vented counterbalance valve may be installed in the cylinder rod port to positively lock the cylinder.

Formulae to calculate flow in regenerative circuits include:

Regenerative Flow (flow out the rod end)
$$= \frac{Db^2 - Dr^2}{Dr^2} \times Pump\ Flow$$

Combined Flow (pump flow plus regenerative flow)
$$= \frac{Db^2}{Dr^2} \times Pump\ Flow$$

Retraction Flow (flow out of the blind end during retraction)
$$= \frac{Db^2}{Db^2 - Dr^2} \times Pump\ Flow$$

Db = Bore Diameter
Dr = Rod Diameter

Design Concepts and Features

SUN's pressure sensitive regenerative valve assembly incorporates a pressure adjustable counterbalance valve that provides a smooth transition when the work is engaged and pressure in the blind end rises to approximately 25% of the set point of the counterbalance valve, at which time the regenerative flow decreases smoothly until rod end flow is fully diverted to tank. Full pump pressure is then applied to the blind end area developing maximum force.

SUN's full time regenerative valve assembly utilizes a standard check valve in place of the counterbalance valve. This allows flow from the rod end to be supplied to the blind end continuously during the complete extension cycle.

SUN's regenerative valve assemblies are available in various flow rates and packaged as inline, ISO sandwich assemblies, and subplate versions.

REGENERATION ASSEMBLY
PRESSURE SENSITIVE

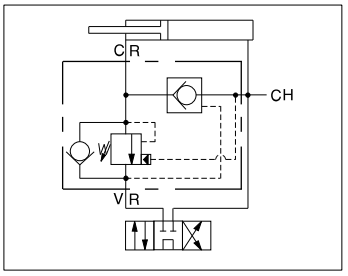
Refer to page 13.42 for further technical information.

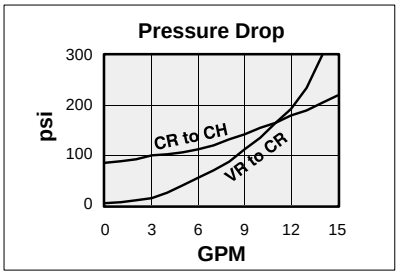
- Aluminum rated to 3000 psi and Ductile Iron rated to 5000 psi.

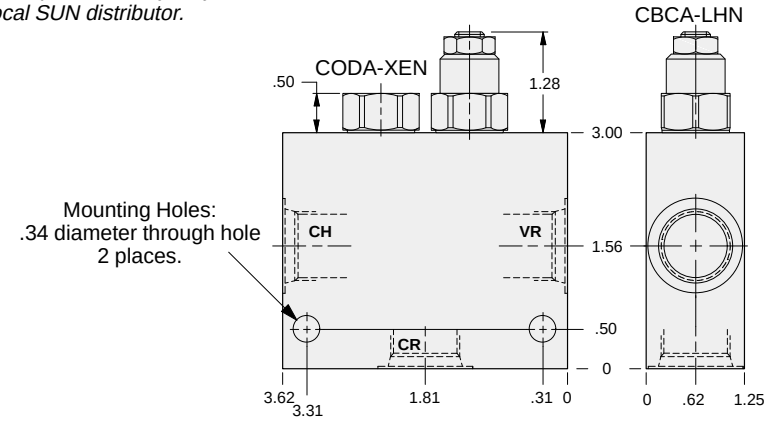
YDCC: 15 GPM maximum regenerative flow. Regeneration diminishes progressively above setting of CBCA.

Ports CH CR & VR	ALUMINUM Port Code	ALUMINUM List Price*	DUCTILE IRON Port Code	DUCTILE IRON List Price*
.50 NPTF	C		C/S	
SAE-10	K		K/S	
.50 BSPP	V		V/S	

NOTE: Refer to page 13.42 if load causes cylinder to extend.
**For part number and price for body only contact your local SUN distributor.*



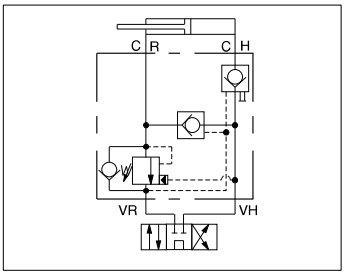


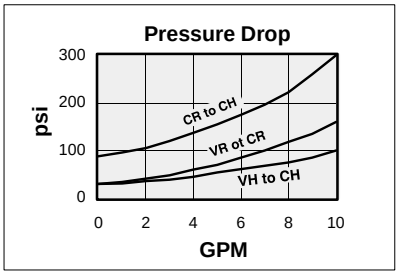


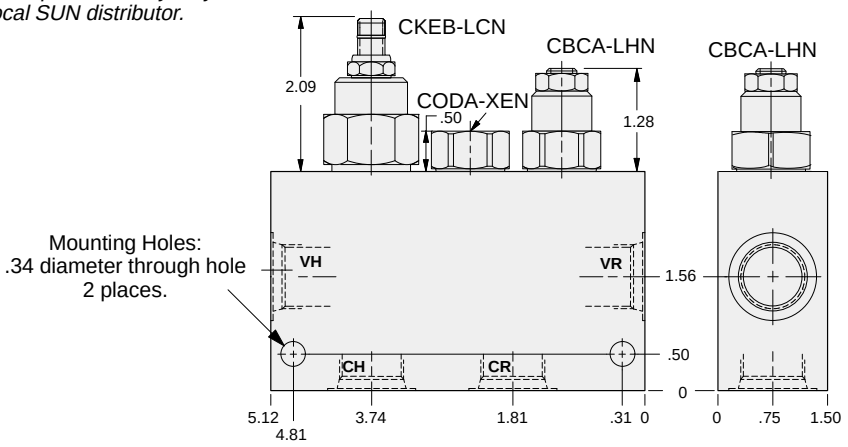
YDCD: 10 GPM maximum regenerative flow, with load holding check valve. Regeneration diminishes progressively above setting of CBCA.

Ports CH CR & VR	ALUMINUM Port Code	ALUMINUM List Price*	DUCTILE IRON Port Code	DUCTILE IRON List Price*
.50 NPTF	C		C/S	
SAE-10	K		K/S	
.50 BSPP	V		V/S	

NOTE: Refer to page 13.42 if load causes cylinder to extend.
**For part number and price for body only contact your local SUN distributor.*







OPTIONS

YDC* – LHN – A*

FUNCTION

- **C** Less CKEB Load Holding Check
- **D** Includes CKEB Load Holding Check See Pg 4.16

For Viton Seals Change LHN to LHV.

For Viton Seals Change LHN to LHV.

Customer Specified Setting Stamped on Hex

PORTS

See Chart above

REGENERATION ASSEMBLY
PRESSURE SENSITIVE

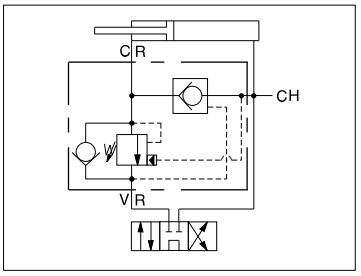
Refer to page 13.42 for further technical information.

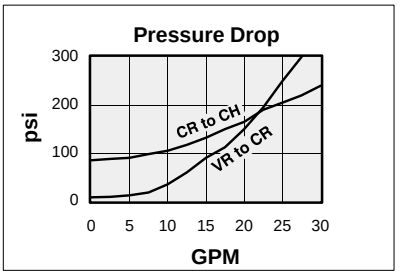
- Aluminum rated to 3000 psi and Ductile Iron rated to 5000 psi.

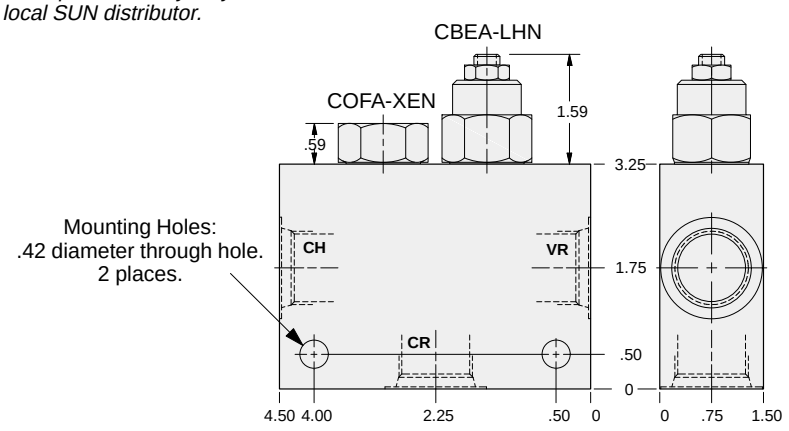
YDEC: 30 GPM maximum regeneration flow. Regeneration diminishes progressively above setting of CBEA.

Ports CH CR & VR	ALUMINUM Port Code	ALUMINUM List Price*	DUCTILE IRON Port Code	DUCTILE IRON List Price*
.75 NPTF	D		D/S	
SAE-12	L		L/S	
.75 BSPP	W		W/S	

NOTE: Refer to page 13.42 if load causes cylinder to extend.
**For part number and price for body only contact your local SUN distributor.*



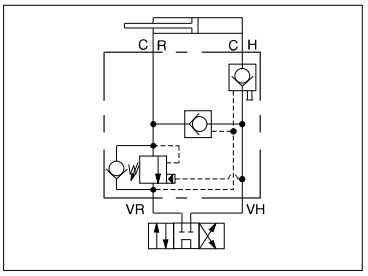


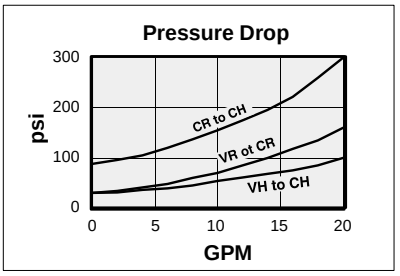


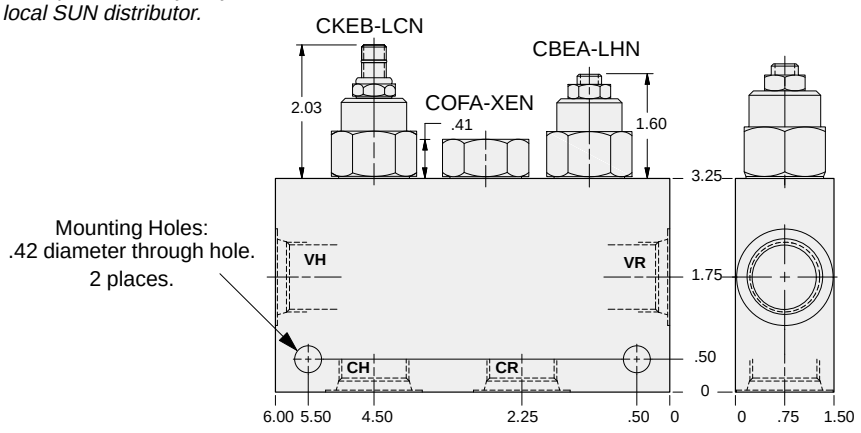
YDED: 20 GPM maximum total flow, with load holding check valve. Regeneration diminishes progressively above setting of CBEA.

Ports CH CR & VR	ALUMINUM Port Code	ALUMINUM List Price*	DUCTILE IRON Port Code	DUCTILE IRON List Price*
.75 NPTF	D		D/S	
SAE-12	L		L/S	
.75 BSPP	W		W/S	

NOTE: Refer to page 13.42 if load causes cylinder to extend.
**For part number and price for body only contact your local SUN distributor.*







OPTIONS

YDE* – LHN – A*

FUNCTION

- **C** Less CKEB Load Holding Check
- **D** Includes CKEB Load Holding Check See Pg 4.16

For Viton Seals Change LHN to LHV.

For Viton Seals Change LHN to LHV.

Customer Specified Setting Stamped on Hex

PORTS

See Chart above

REGENERATION ASSEMBLY
PRESSURE SENSITIVE

Refer to page 13.42 for further technical information.

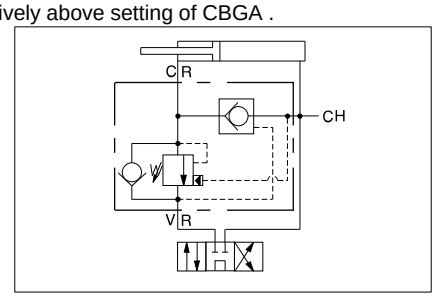
- Aluminum rated to 3000 psi and Ductile Iron rated to 5000 psi.

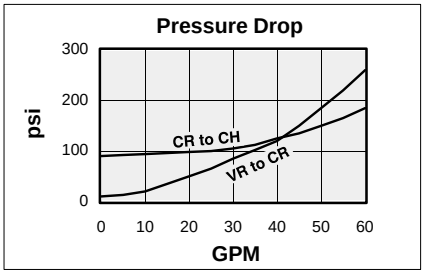
YDGC: 60 GPM maximum regeneration flow. Regeneration diminishes progressively above setting of CBGA .

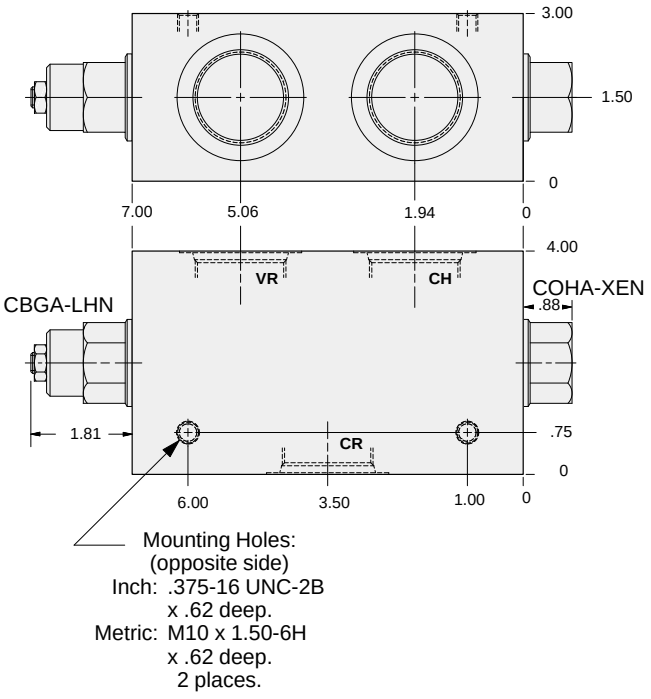
Mounting Hole Dimensions	*Ports CR, CH & VR*	ALUMINUM		DUCTILE IRON	
		Port Code	*List Price**	*Port Code*	*List Price**
Inch	.75 NPTF	**D**		**D/S**	
Inch	1.00 NPTF	**E**		**E/S**	
Inch	1.25 NPTF	**F**		**F/S**	
Inch	SAE-12	**L**		**L/S**	
Inch	SAE-16	**M**		**M/S**	
Inch	SAE-20	**N**		**N/S**	
Metric	.75 BSPP	**W**		**W/S**	
Metric	1.00 BSPP	**X**		**X/S**	
Metric	1.25 BSPP	**Y**		**Y/S**	
Inch	1.00" SAE Code 61	**P**		**P/S**	
Metric		**P/M**		**P/T**	

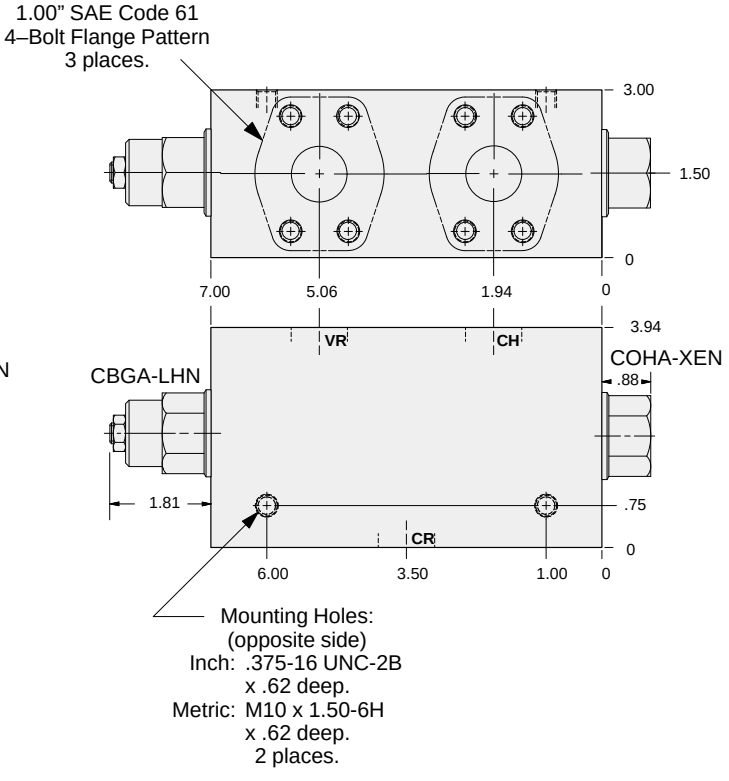
NOTE: Refer to page 13.42 if load causes cylinder to extend.

**For part number and price for body only contact your local SUN distributor.*









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OPTIONS

YDGC – LHN – A*

For Viton Seals Change LHN to LHV.

Customer Specified Setting Stamped on Hex

PORTS
See Chart above

REGENERATION ASSEMBLY
PRESSURE SENSITIVE

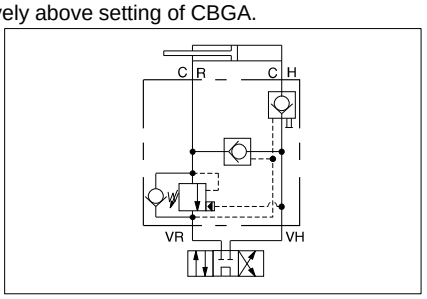
Refer to page 13.42 for further technical information.

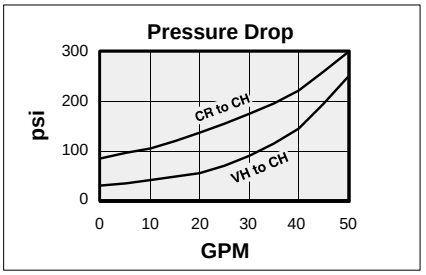
- Aluminum rated to 3000 psi and Ductile Iron rated to 5000 psi.

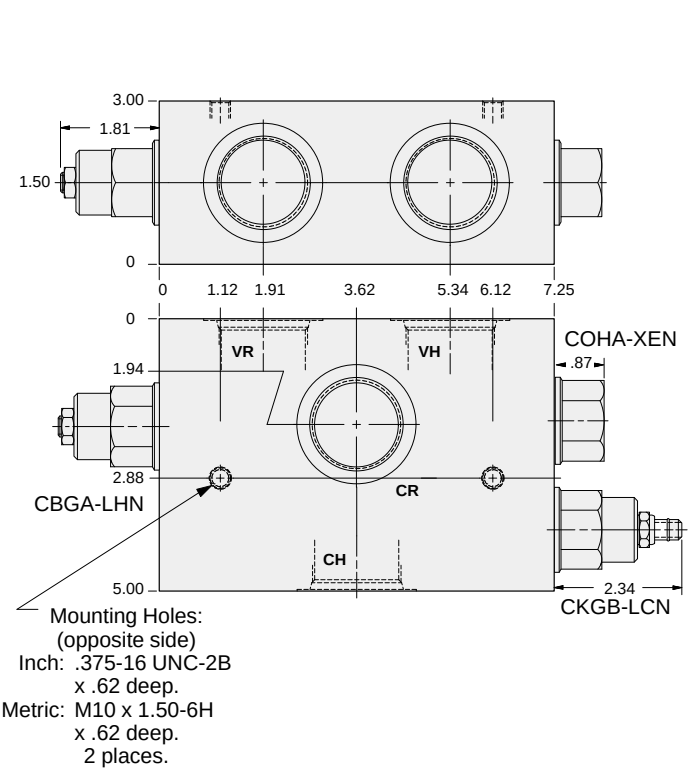
YDGD: 50 GPM maximum regeneration flow. Regeneration diminishes progressively above setting of CBGA.

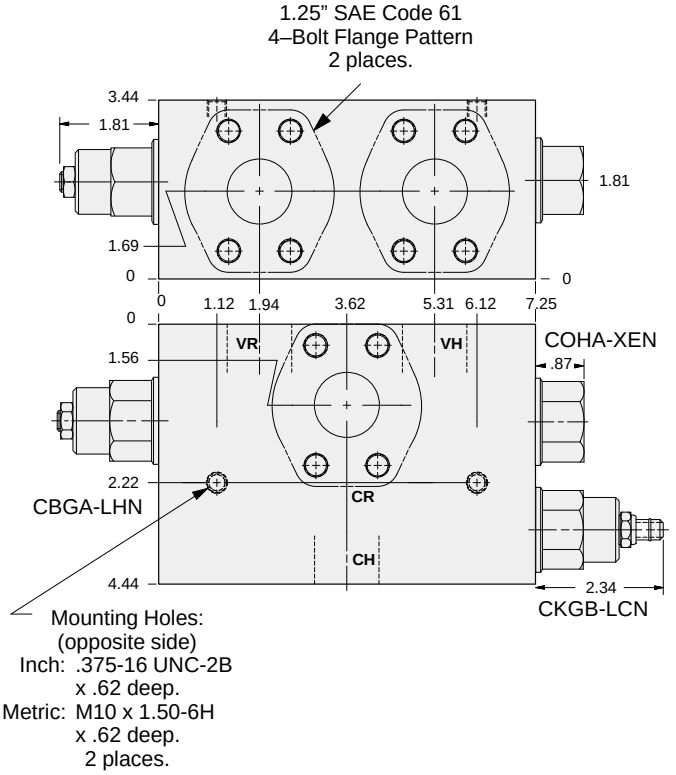
Mounting Hole Dimensions	*Ports CH, CR & VR*	ALUMINUM		DUCTILE IRON	
		Port Code	*List Price**	*Port Code*	*List Price**
Inch	.75 NPTF	**D**		**D/S**	
Inch	1.00 NPTF	**E**		**E/S**	
Inch	1.25 NPTF	**F**		**F/S**	
Inch	SAE-12	**L**		**L/S**	
Inch	SAE-16	**M**		**M/S**	
Inch	SAE-20	**N**		**N/S**	
Metric	.75 BSPP	**W**		**W/S**	
Metric	1.00 BSPP	**X**		**X/S**	
Metric	1.25 BSPP	**Y**		**Y/S**	
Inch	1.25" SAE Code 61	**Q**		**Q/S**	
Metric		**Q/M**		**Q/T**	

NOTE: Refer to page 13.42 if load causes cylinder to extend.
**For part number and price for body only contact your local SUN distributor.*









OPTIONS

YDGD – LHN – A*

For Viton Seals Change LHN to LHV.

Customer Specified Setting Stamped on Hex

PORTS
See Chart above

REGENERATION ASSEMBLY
PRESSURE SENSITIVE

Refer to page 13.42 for further technical information.

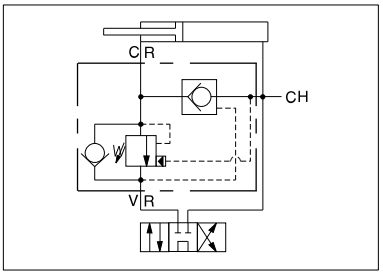
- Aluminum rated to 3000 psi and Ductile Iron rated to 5000 psi.

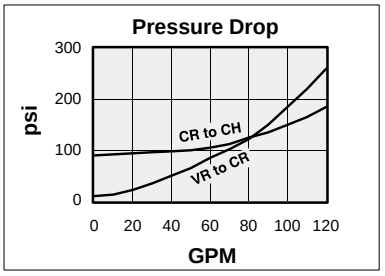
YDHC: 120 GPM maximum regeneration flow. Regeneration diminishes progressively above setting of CBGA.

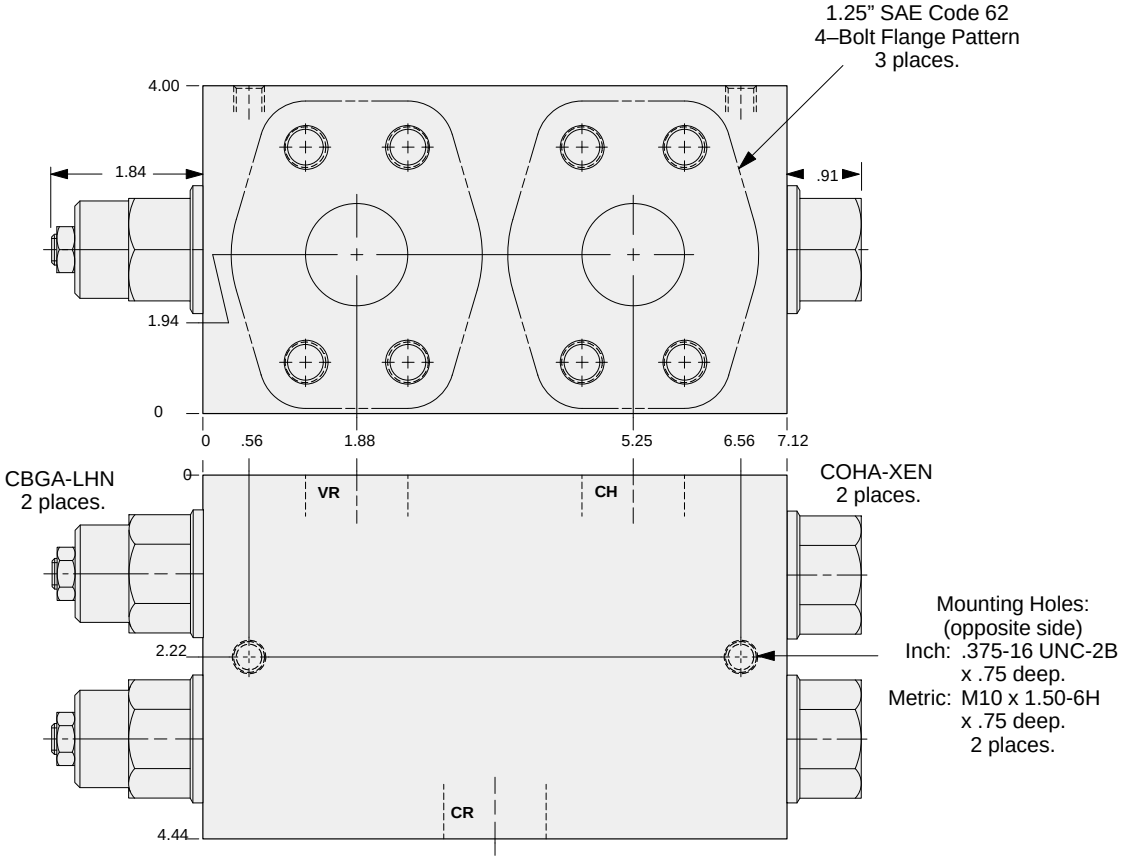
Mounting Hole Dimensions	ALUMINUM		DUCTILE IRON	
	Port Code	*List Price**	*Port Code*	*List Price**
Inch	**5**		**5/S**	
Metric	**5/M**		**5/T**	

NOTE: Refer to page 13.42 if load causes cylinder to extend.

**For part number and price for body only contact your local SUN distributor.*







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OPTIONS

YDHC – LHN – A*

For Viton Seals Change LHN to LHV.

Customer Specified Setting Stamped on Hex

PORTS
See Chart above

REGENERATION ASSEMBLY
PRESSURE SENSITIVE

Refer to page 13.42 for further technical information.

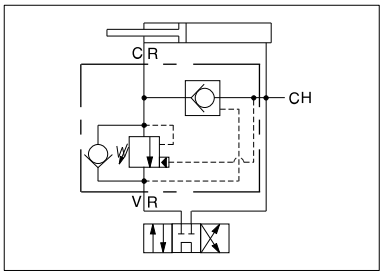
- Aluminum rated to 3000 psi and Ductile Iron rated to 5000 psi.

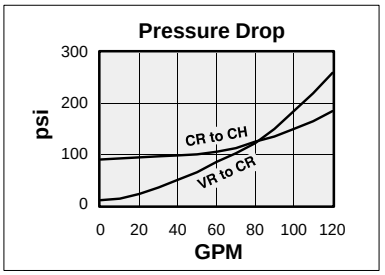
YDJC: 120 GPM maximum regeneration flow. Regeneration diminishes progressively above setting of CBIA.

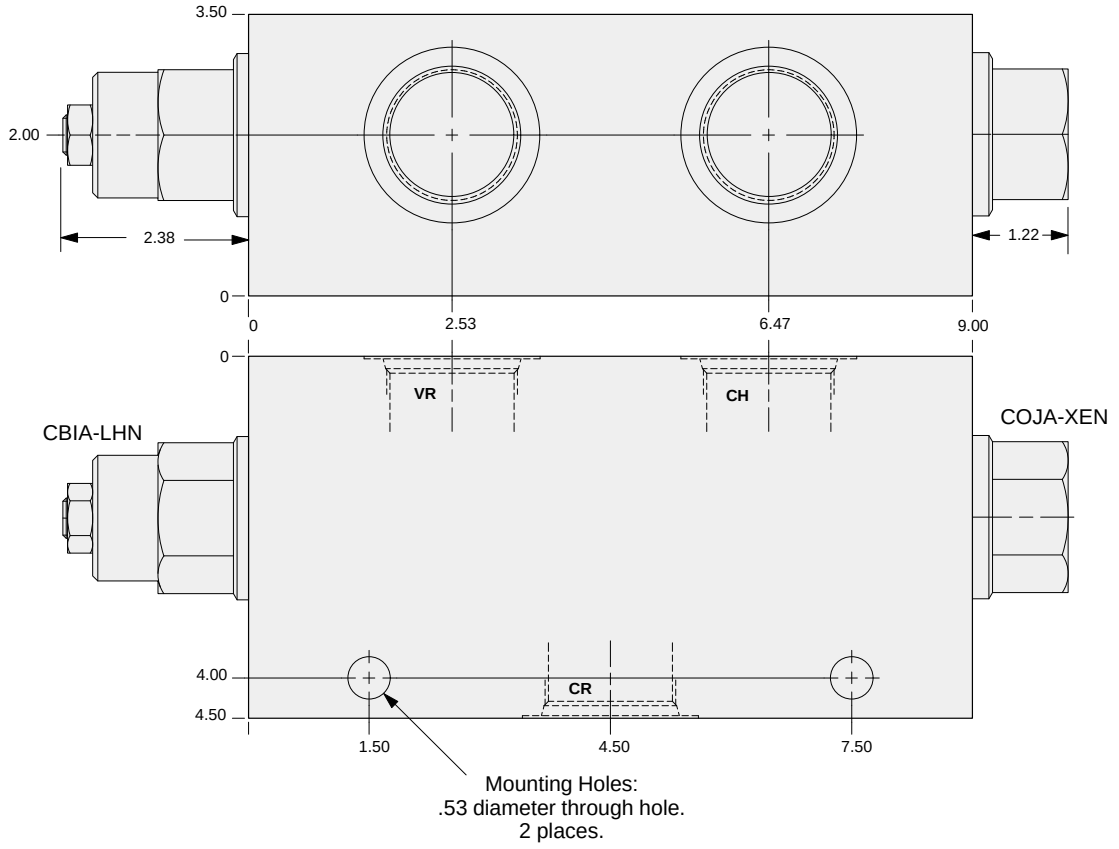
Ports CH CR & VR	ALUMINUM		DUCTILE IRON	
	Port Code	*List Price**	*Port Code*	*List Price**
SAE-20	**N**		**N/S**	

NOTE: Refer to page 13.42 if load causes cylinder to extend.

**For part number and price for body only contact your local SUN distributor.*







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OPTIONS

YDJC – LHN – A*

For Viton Seals Change LHN to LHV.

Customer Specified Setting Stamped on Hex

PORTS
See Chart above

REGENERATION ASSEMBLY
PRESSURE SENSITIVE

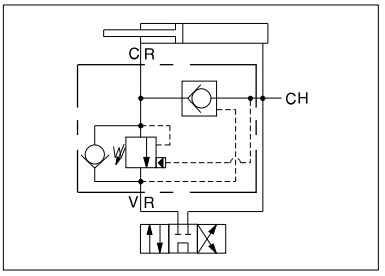
Refer to page 13.42 for further technical information.

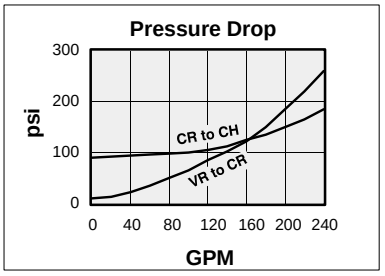
- Aluminum rated to 3000 psi and Ductile Iron rated to 5000 psi.

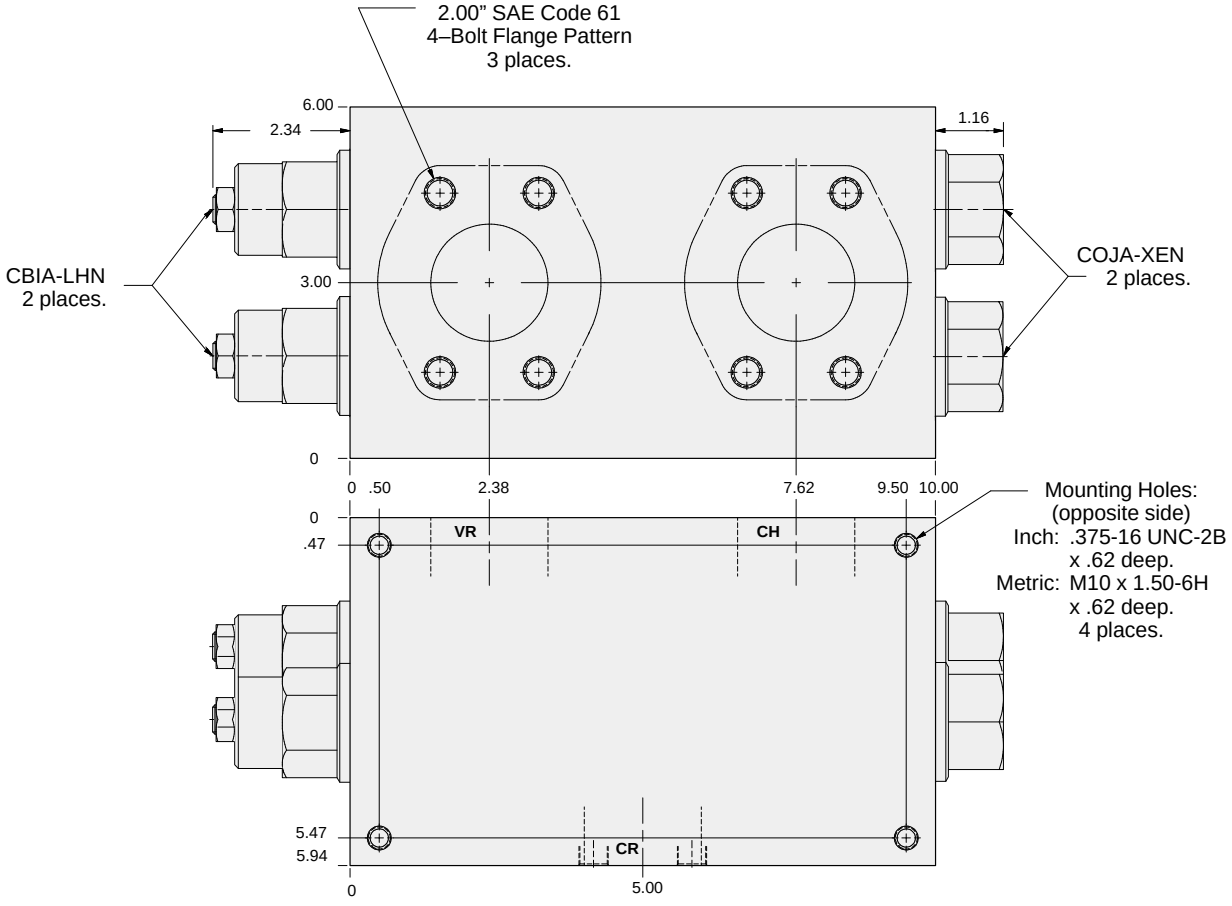
YDJC: 240 GPM maximum regeneration flow. Regeneration diminishes progressively above setting of CBIA.

Mounting Hole Dimensions	ALUMINUM		DUCTILE IRON	
	Port Code	*List Price**	*Port Code*	*List Price**
Inch	**S**		**S/S**	
Metric	**S/M**		**S/T**	

NOTE: Refer to page 13.42 if load causes cylinder to extend.
**For part number and price for body only contact your local SUN distributor.*







Refer to page 13.42 if load causes cylinder to extend.

OPTIONS

YDJC – LHN – A*

For Viton Seals Change LHN to LHV.

Customer Specified Setting Stamped on Hex

PORTS
See Chart above