



VP120 Load-Sense Directional Control Valve

Motion Hydraulic Valves
Catalog HY14-2008/US

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climate control
electromechanical
filtration
fluid & gas handling
hydraulics
pneumatics
process control
sealing & shielding



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SAFETY GUIDE

For safety information, see Safety Guide SG HY14-1000 at www.parker.com/safety or call 1-800-CParker.

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Cat HY14-2008-frtcvr.indd, m&a



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General Description

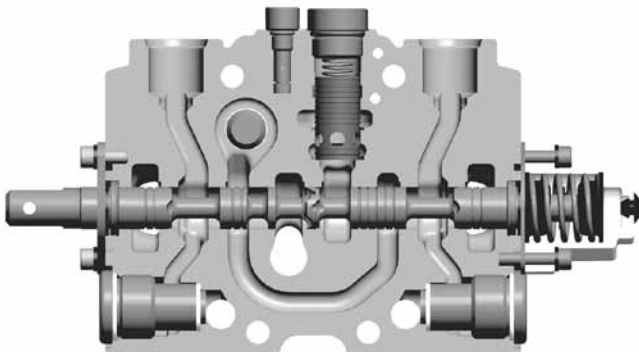
The VP120 can be configured either as pressure-compensated load-sense (PCLS) or as load-sense (LS). Both have the flexibility of sectional construction. The PCLS work section has its own compensator, so that speed control of multiple functions is achieved, regardless of changes in pressure or engine rpm's. The key technology integrated into the VP120 is flow-sharing. In pump over-demand conditions, flow-sharing benefits machine productivity by maintaining the speed relationship of the selected functions, but at a reduced speed. Thus, the operator can maintain the rhythm of the machine.

A new technology available in the VP120 is pressure-limiting. This feature allows for selected functions to operate at pressures lower than load-sense relief-valve setting. The advantage of using pressure limiters to accomplish this vs. port relief-valves is that less flow is lost – which means less heat generation.

Another new technology developed for the VP120 is margin control, which can be used to selectively boost or reduce the flow out of a work-section.

The combination inlet/outlet can be installed on both ends of the valve, facilitating the routing of pump flow to both ends of the valve.

The valve can be operated manually, hydraulic-remote and with solenoids. The same solenoid is used for on/off and proportional control. A bypass compensator is available for use with fixed displacement pumps. Also, priority flow control is an option for steering requirements. In addition, low pressure regeneration is an option designed to overcome the damaging affects of cavitation – namely premature component wear and spongy operation.



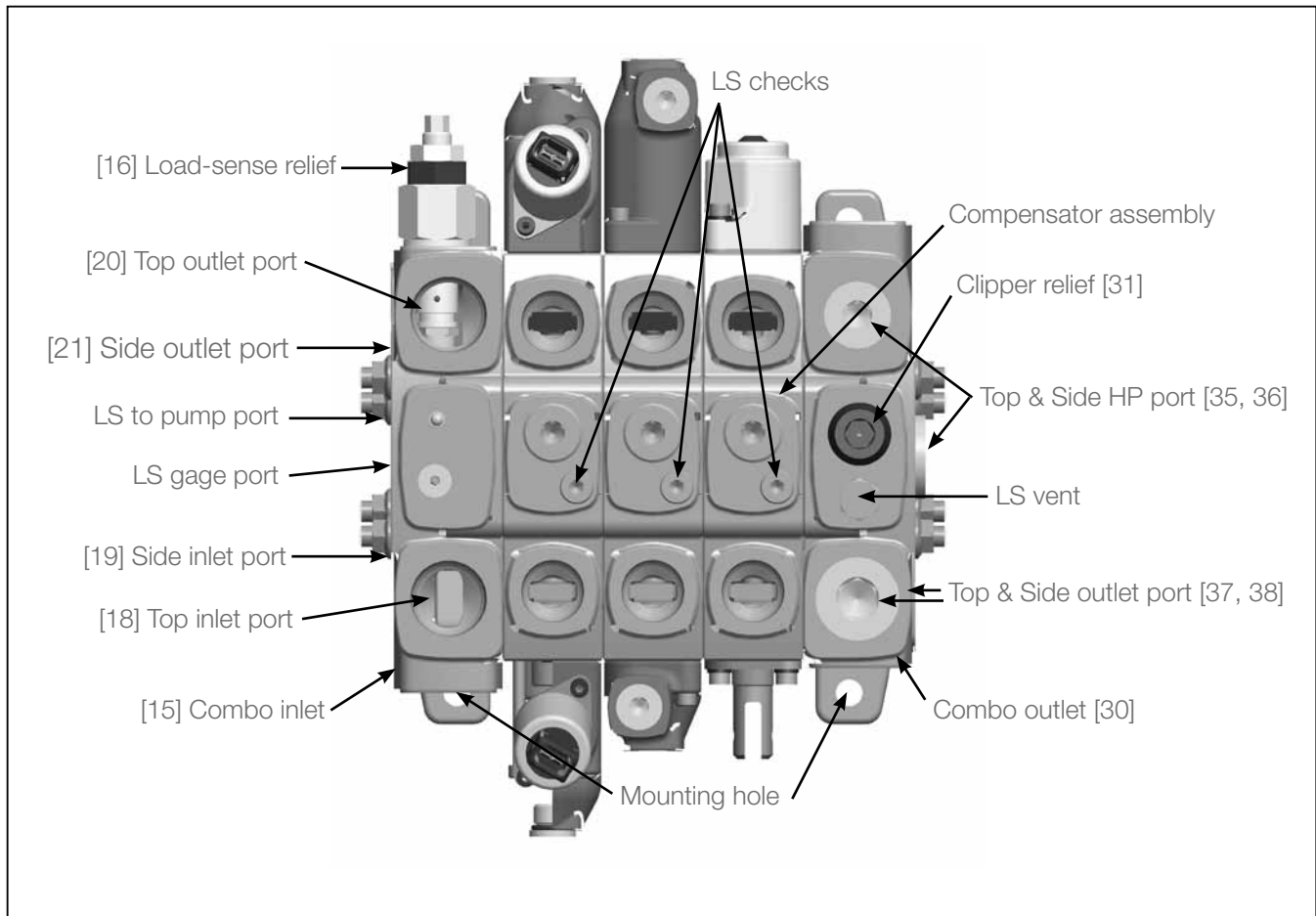
The VP120 uses the same port accessories, load-sense relief valve and pressure-reducing valve that are used in our other valves. The standard spool types are 3-way, 4-way and 4-position float. A full range of flow limited spools are available.

Operation

The VP120 (PCLS) is an individually pressure-compensated load-sense valve. For optimum horsepower utilization, it is normally used with a piston pump. However, it does have the flexibility to be interfaced with a fixed (gear or vane) displacement pump.

During single function use, the pump control will determine the flow to the valve, based upon the area opening of the spool notch and the load-sense signal being sent back to the pump.

During multi-function operation, the pump control will determine the flow for the highest loaded function, while the work-section compensator will control the flow for the lighter loaded function.



Benefits

- **Excellent machine controllability** – individual pressure compensation in each work section delivers predictable metering with single and multi-function operation; regardless of changed in pressure and input flow. This enhances machine control, improves productivity and helps to make every operator an “expert” operator – all of which saves money. This valve type also lends itself to closed-loop control.
- **Improved system efficiency** – optimized horsepower utilization and heat management are features that are inherent with load-sense pressure-compensated valves due to a closer match between horsepower consumption and horsepower demand. Fuel savings of up to 30% can be achieved vs. open-center type systems. Also, better horsepower utilization may enable the use of a smaller engine or elimination of a heat exchanger.
- **Enhanced machine productivity** – the VP120 incorporates flow-sharing technology. This means that during a pump over-demand condition the valve will automatically apportion the available flow to the selected functions, based upon the area openings of the spool notches. The selected functions will maintain their speed relationship, but at a lower overall speed. This automatic adjusting by the valve can improve machine productivity as much as 20% and reduce operator fatigue.
- **Enhanced speed control** – the optional margin control boosts or reduces flow of the selected work sections. This enables the hydraulic circuit designer to better utilize the available pump flow and possibly reduce the size of the engine.
- **Reduced heat generation** – pressure limiting is a feature not common on valves with flow sharing technology. This feature allows for selected functions to operate at a pressure less than the setting of the load-sense relief-valve, while only passing a few liters of oil to tank. The alternative method for achieving this is with a port relief-valve. But they can pass anywhere from 75 LPM (20 GPM) to full flow to tank.
- **Flexible design** – the VP120 is available as a pressure-compensated load-sense valve (PCLS) or just as a load-sense (LS) valve. The combination inlet/outlet casting can be installed on both ends of the valve, which means that pump flows can be routed to both ends of the valve.
- **Ease of service** – the load-sense check and the compensator are located on the top of the work section, making them accessible for trouble-shooting without having to disassemble the valve bank.

Definitions

PCLS = Pressure Compensated Load-Sense, or load-sensing with pressure compensation.

LS = Load-Sensing.

LSRV/PLM = Load-Sense Relief Valve – normally a small RV that sets maximum LS pressure.

Clipper RV/PA = “Clips” or reduces pressure spikes normally caused when flow demand decreases faster than the pump flow output can decrease.

Margin_{valve} = Pressure at valve inlet – pressure at valve LS port = M_v .

Margin_{pump} = Pressure at pump outlet – pressure at pump LS port = M_p .

Margin_{neutral} = M_v or M_p when all valve spools are in neutral.

Margin_{stall} = M_v or M_p when one valve function is deadheaded and the LSRV relieves.

FLO = Flow Limit Orifice, limits flow over LSRV. Normally it is .045" diameter.

Over-Demand = When functions demand flow in excess of pump capacity.

EH = Electrohydraulic or solenoid controlled spool positioning.

Induced Load = Occurs when an actuator tries to force fluid into a valve workport.

Pressure Limiting = Port pressure is limited to a value less than the normal operating pressure. Flow loss during flow limiting is <2 LPM (.53 GPM).

PBL = Special Option - priority flow, bypass unloader, low pressure regen.

Conversion Factors:

1 kg = 2.2 lbs.

1 N = 0.225 lbs. force

1 Bar = 14.5 PSI

1 liter = 0.22 UK gallon

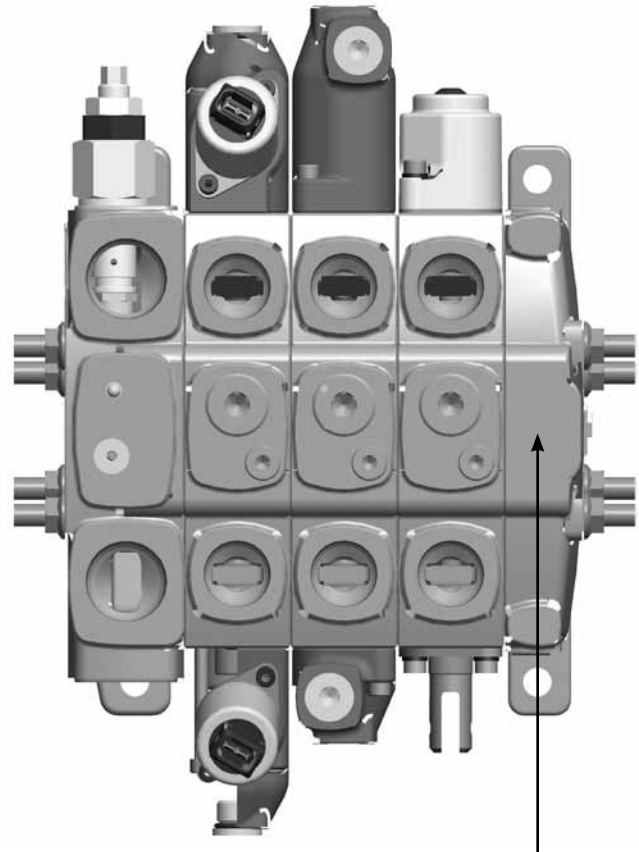
1 liter = 0.264 US gallon

1 cm³ = 0.061 in³

1 m = 3.28 feet

1 mm = 0.039 inches

9/5 °C + 32 = °F



Simple outlet

Specifications

Pressures	Pump inlets: 280 Bar (4060 PSI) Service Ports: 320 Bar (4640 PSI) Pilot-EH (input or internal supply): 35 Bar (508 PSI) Tank Return: 15 Bar (220 PSI) Solenoid Drain: 2 Bar (29 PSI) Pilot-Hydraulic Remote: 7-28 Bar (100-400 PSI)
Flow Rates	Maximum Input: 160 LPM (42 US GPM) Maximum Flow out of Service Ports: 120 LPM (32 US GPM)
Leakage Performance With mineral oil, 100 SUS @ 120°F at 1100 PSI differential	Workport w/Steel Plug or no Accessory: 20 cc/min max. Thru Compensator Only: 1100 cc/min max.
Hydraulic Fluid	Mineral base oil. For other fluids consult factory. Viscosity, working range: 15-380mm ² /s (15-380 cSt).
Hydraulic Oil Temperature	Recommended Operating Range without Solenoid Operation: -30° to 90°C (-22° to 194°F) Recommended Operating Range with Solenoid Operation: -20° to 80°C (-4° to 176°F)
Filtration (ISO 4406)	20/18/14 in Main Flow Paths 18/16/13 Pilot Supply

Weights

Inlets/Outlets

Std. Combination Inlet/Outlet	4.58 kg (10.1 lb)
EH Combination Inlet/Outlet	15.81 kg (12.8 lb)
Combination Inlet/Outlet with priority flow divider	6.89 kg (15.2 lb)
Combination Inlet/Outlet with bypass compensator	6.94 kg (15.3 lb)
Combination Inlet/Outlet with low pressure regeneration	6.85 kg (15.1 lb)
Simple turnaround cover	3.1 kg (6.8 lb)
Work Sections	
Manual with 2 port access.	4.17 kg (9.2 lb)
Hydraulic Remote with 2 port access.	4.58 kg (10.1 lb)
EH with 2 port access.	6.03 kg (13.3 lb)

Mounting Surface

There is no restriction on orientation.
 Flatness should be at least 0.5 mm (0.020")
 Surface must be stable and not put stress on valve.

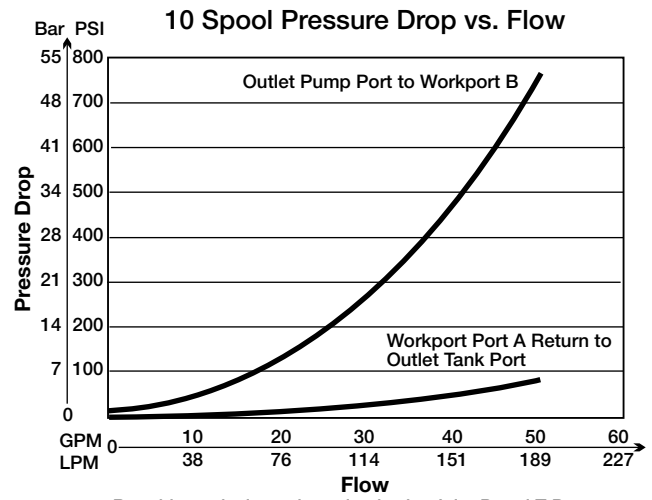
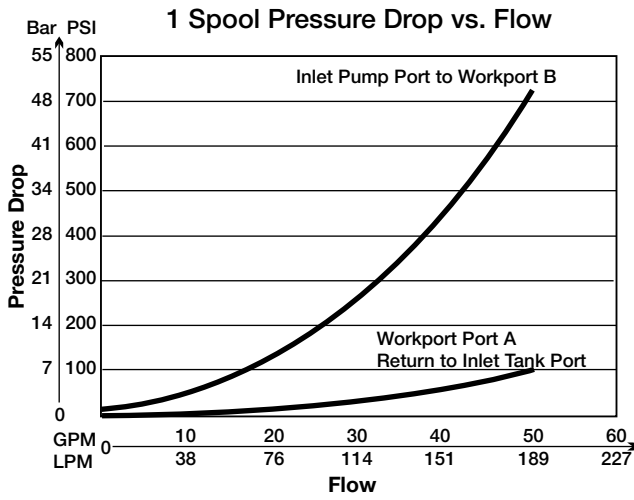
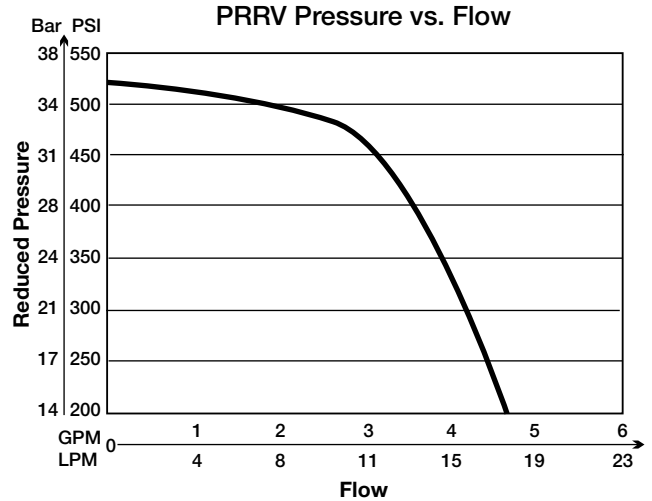
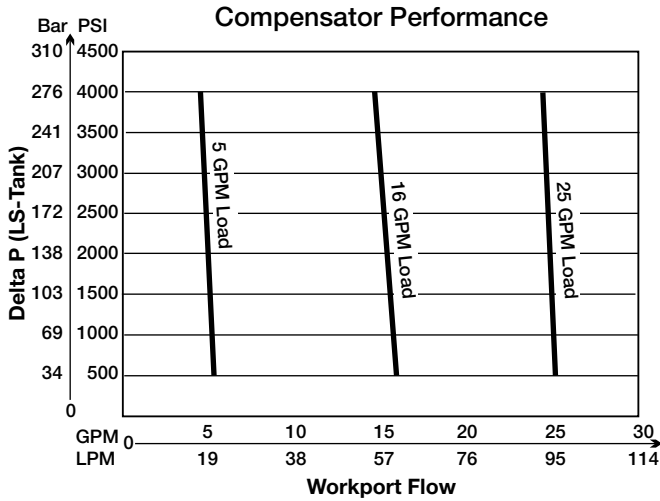
Connections

O-ring boss ports SAE-J1926-1
 BSPP ports ISO 1179-1
 Pump gage port standard
 O-ring boss 9/16"-18 UNF, BSPP ports 1/4"-19

Description	SAE #	Thread Size	
		O-ring Boss (UNF)	BSPP
inlet, top	12	1 ¹ / ₁₆ -12	3/4"-14
inlet, side	12	1 ¹ / ₁₆ -12	3/4"-14
EH inlet, pilot	6	9/16-18	1/4"-19
outlet, top	12	1 ¹ / ₁₆ -12	3/4"-14
outlet, side	16	1 ⁵ / ₁₆ -12	1"-11
work section	8	3/4-12	(none)
work section	10	7/8-14	1/2"-14

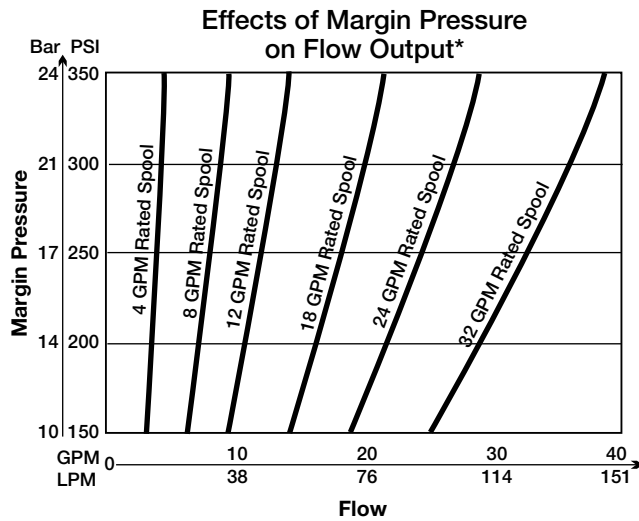
Solenoid Specifications

Voltage	12 or 24 VDC		
Pilot	35 Bar (508 PSI), 15-23 LPM (4-6 GPM)		
Current Input (I)	1.5A for 12 VDC 0.75A for 24 VDC		
Current (mA) for Spool Shift	Start Shift	12V 500	24V 250
	Full Shift	1250	625
Insulation Material	Class H		
Duty Cycle	100%		
R20 Ohm	5.3 (±5%) for 12 VDC 21.2 (±5%) for 24 VDC		
Fluid Cleanliness	17/14 per ISO 4406		
Ambient Temperature	-30° to 80°C (-22° to 176°F)		
Fluid Temperature	-20° to 80°C (-4° to 176°F)		

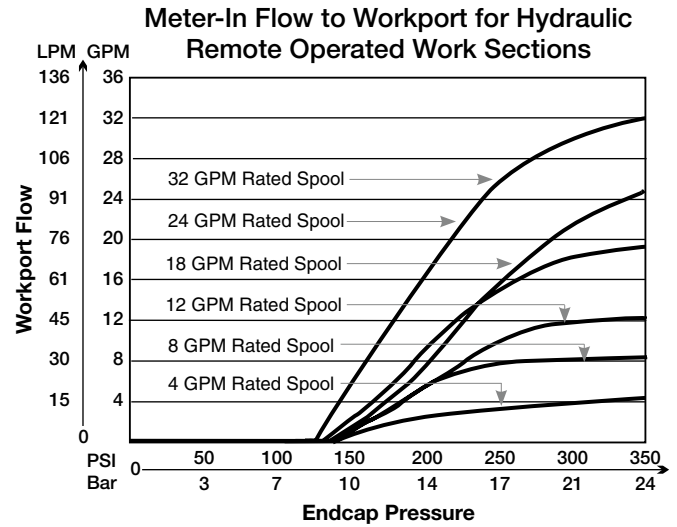
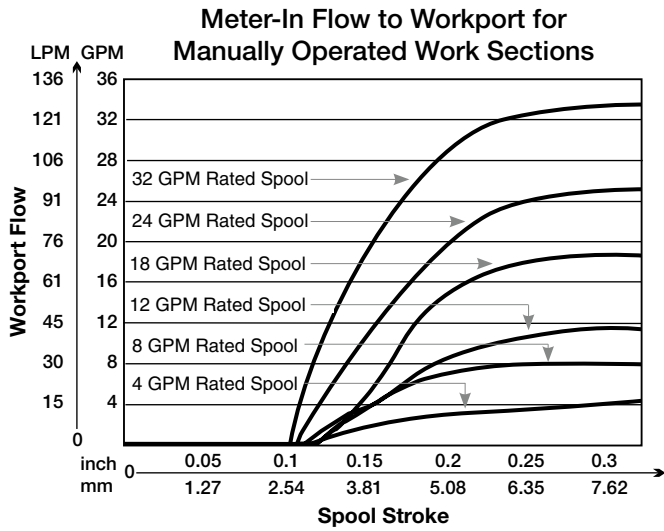
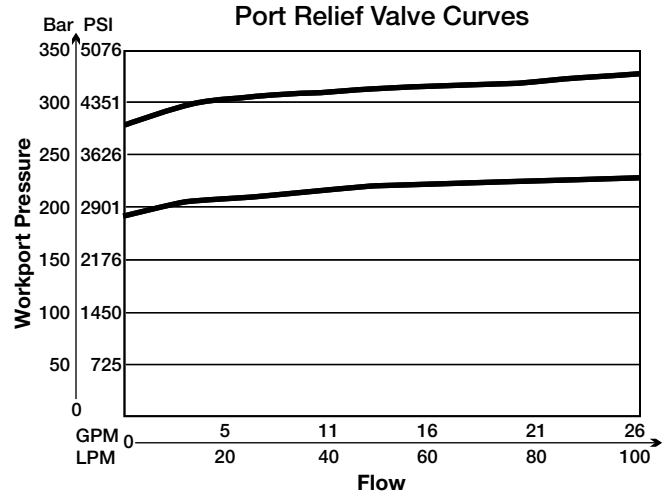
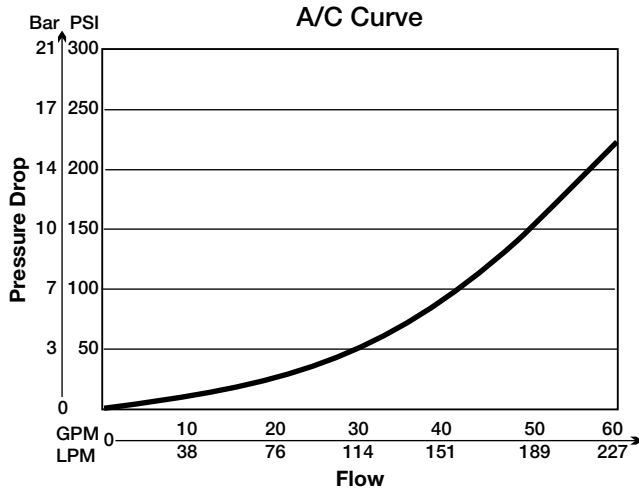


Roughly equivalent when plumbed to Outlet P and T Ports

Roughly equivalent when plumbed to Inlet P and T Ports



* assumes no Delta P from pump to valve



Major Valve Options

I Circuits:

- A) LS – when individual pressure compensation isn't needed.
- B) PCLS with compensator. Also, both types of valves contain the load check which serves as a low leak transition check or when "induced loads"* are anticipated.

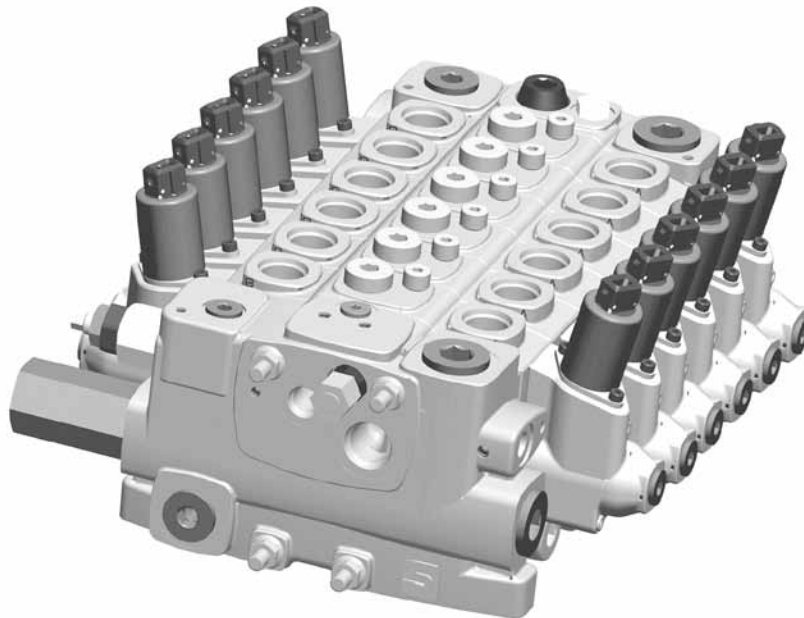
* Induced loads are actuators trying to force fluid back into valve.

II Inlets:

- A) Combo – all spool operators. This also has the option for an external pilot supply in port if there is pilot supply available external to the valve for the solenoids.
- B) "EH" – "external supply" to solenoids – port for connecting external supply to solenoids and drain port.
 - Internal supply – reduced PSI to solenoids via internal pilot gallery
 - internal supply to solenoid operators.
 - Joystick supply – reduced PSI to external port to supply joystick(s)
 - No internal pilot supply.
 - Kidney loop – reduced PSI to an external pilot port. The pilot flow can then be routed to a filter and back into the valve. The signal is then routed to the solenoids via internal pilot gallery.

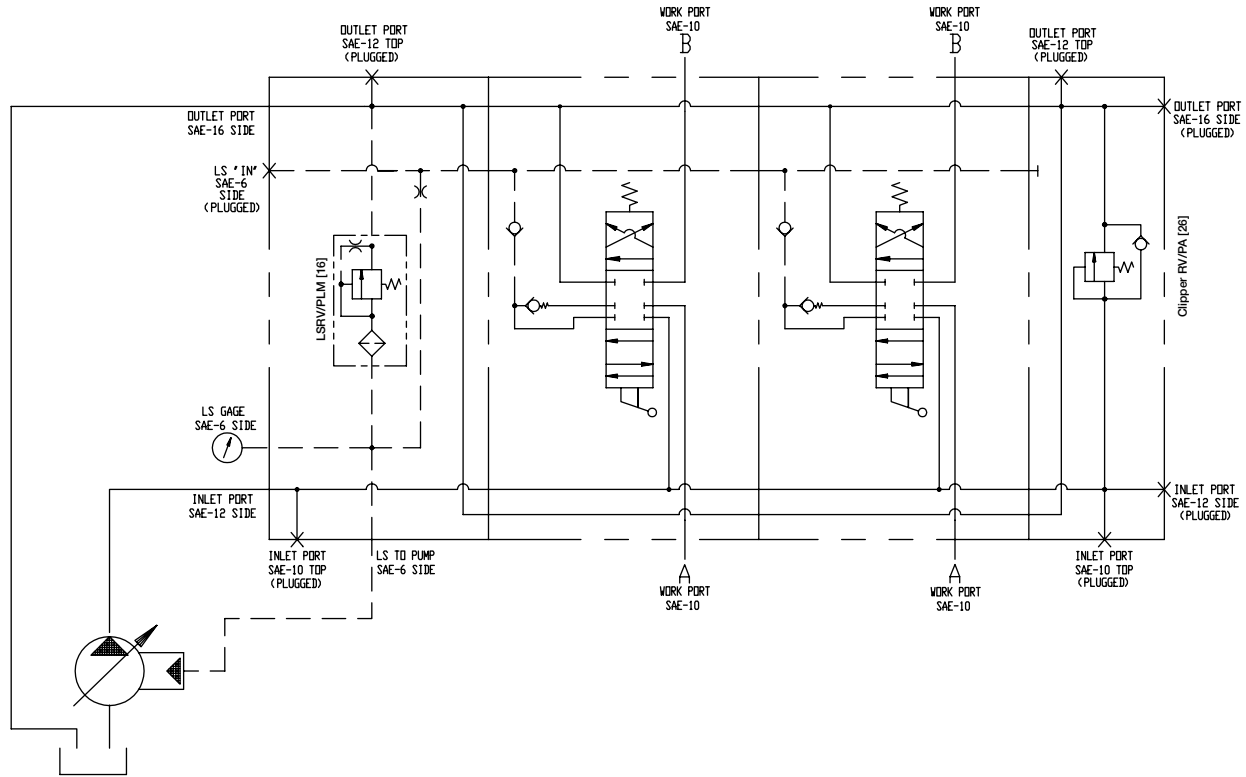
All 3 options have:

- a) PRRV and screen upstream of it
- b) Accumulator port and check valve
- c) Drain port for connection of solenoid drains and PRRV spring to tank – 2 Bar (29 PSI) max

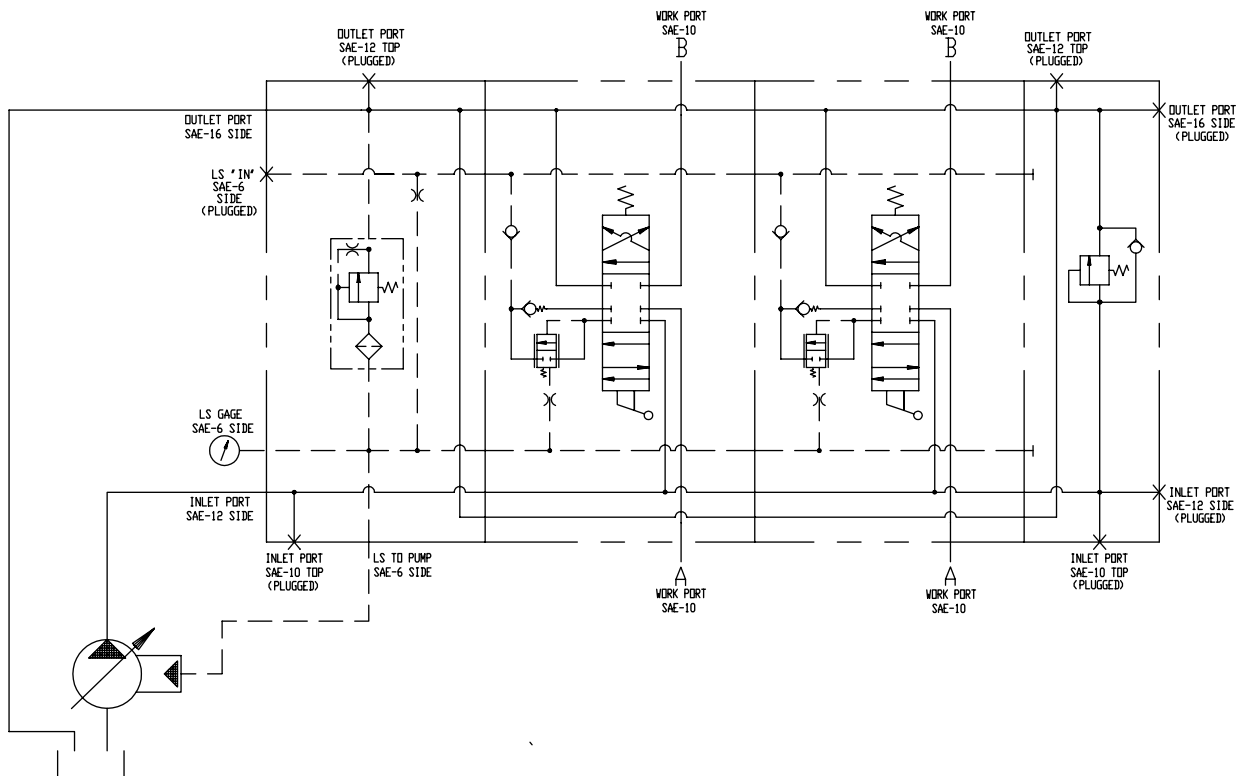


How VP120 May Be Arranged

Load-Sense Valve

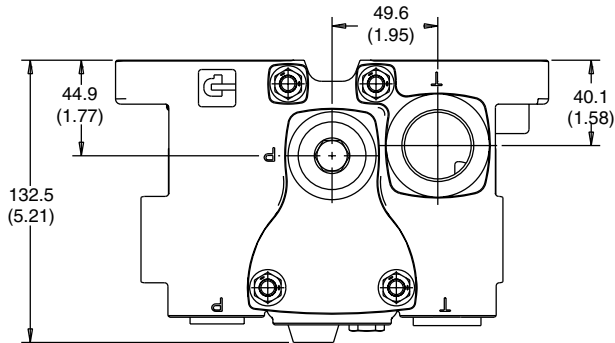


Pressure Compensated Load-Sense (PCLS)

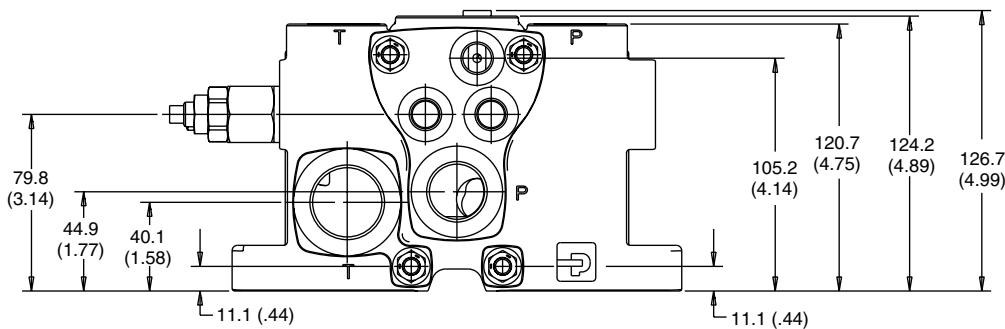
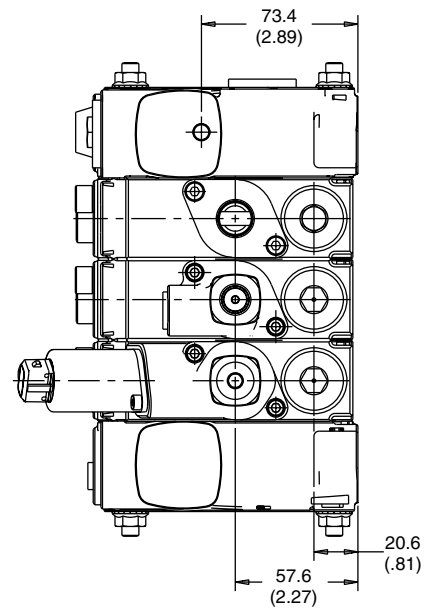
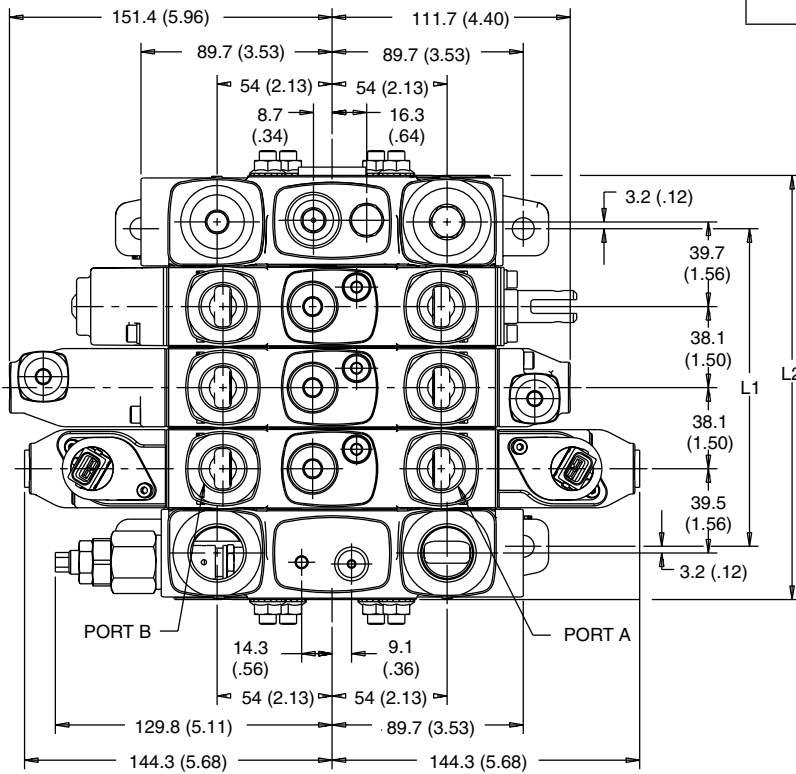


VP120 with Combination Inlet / Combination Outlet

Inch equivalents for millimeter dimensions are shown in (**)

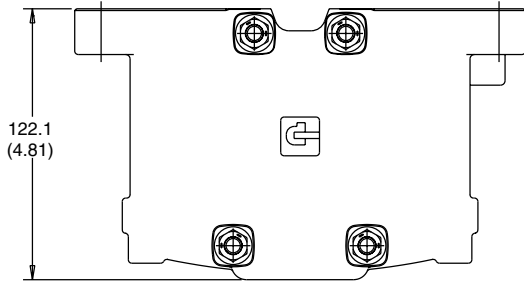


No. Of Sections	L1 mm [inch]	L2 mm [inch]
1	72.8 [2.87]	122.8 [4.83]
2	110.9 [4.37]	160.9 [6.33]
3	149 [5.87]	199.0 [7.83]
4	187.1 [7.37]	237.1 [9.33]
5	225.2 [8.87]	275.2 [10.83]
6	263.3 [10.37]	313.3 [12.33]
7	301.4 [11.87]	351.4 [13.83]
8	339.5 [13.37]	389.5 [15.33]
9	377.6 [14.87]	427.6 [16.83]
10	415.3 [16.37]	465.7 [18.33]

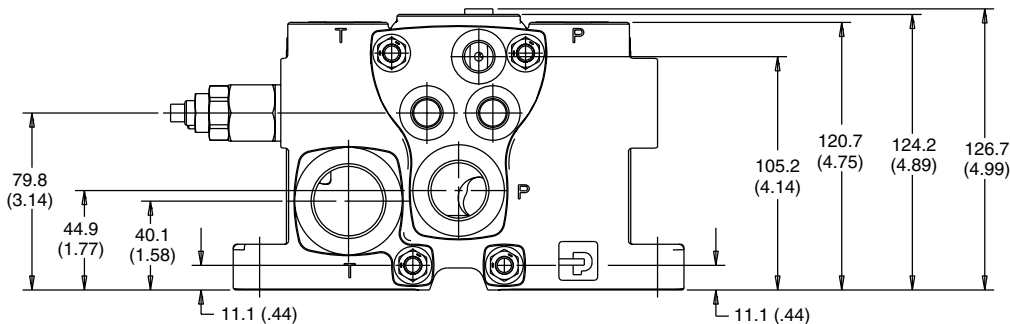
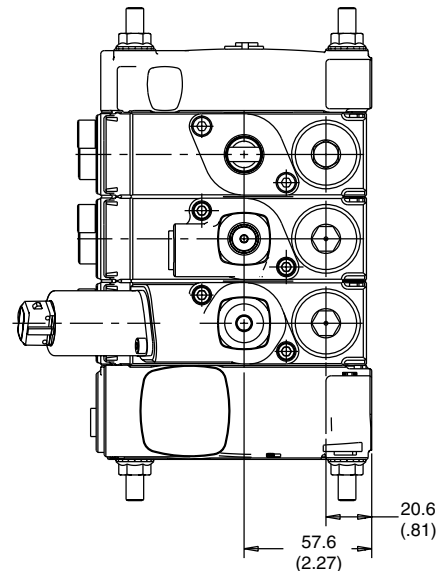
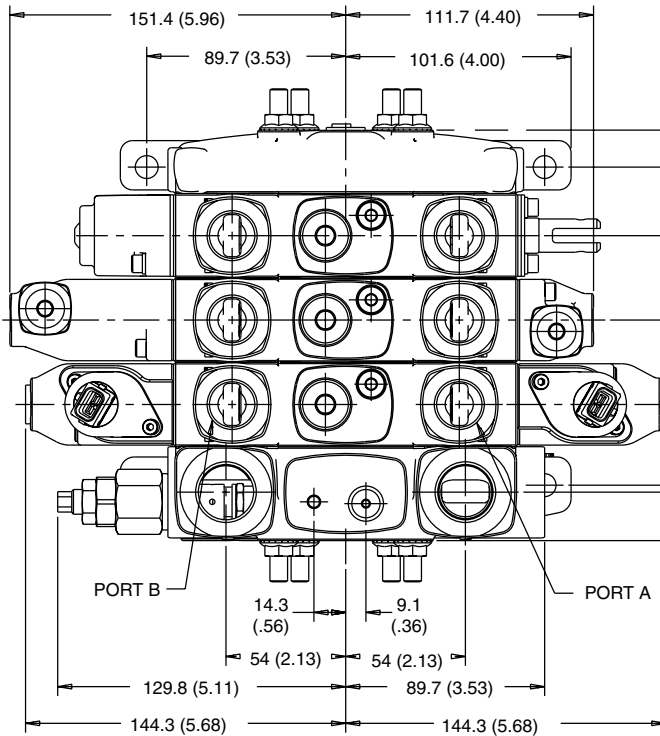


VP120 with Combination Inlet / Simple Outlet

Inch equivalents for millimeter dimensions are shown in (**)



No. Of Sections	L1 mm [inch]	L2 mm [inch]
1	70.4 [2.77]	108.9 [4.29]
2	108.5 [4.27]	147.0 [5.79]
3	146.6 [5.77]	185.1 [7.29]
4	184.7 [7.27]	223.2 [8.79]
5	222.8 [8.77]	261.3 [10.29]
6	260.9 [10.27]	299.4 [11.79]
7	299.0 [11.77]	337.5 [13.29]
8	337.1 [13.27]	375.6 [14.79]
9	375.2 [14.77]	413.7 [16.29]
10	413.3 [16.27]	451.8 [17.79]



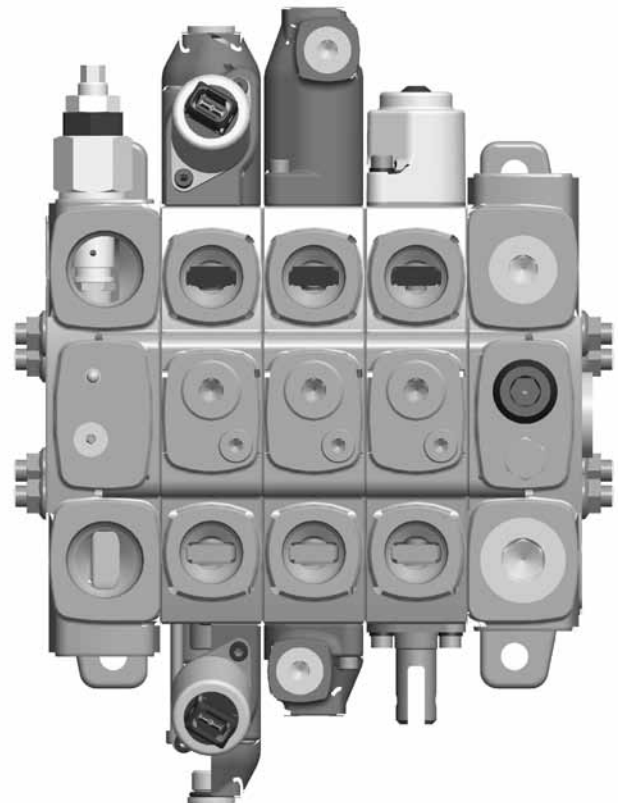
How to Configure a Valve Assembly

There are three choices available to configure a valve assembly: a hard copy specification sheet that is shown on page 23, an MS Excel spreadsheet version of this specification sheet and an eConfigurator that is web based. Please contact your Parker representative or local distributor for additional information regarding these options.

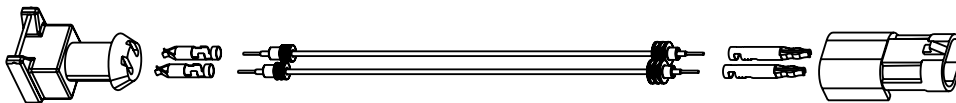
All of these choices involve selecting attributes or features for the system – inlet, work section and outlet. Each of the attributes is associated with a number or position that is shown in brackets [].

System Related Attributes

[Position] Codes	Description
[01]	Valve Type
PCLS	Pressure-compensated load-sense
LS	Load-sense
[04]	Port Type
U	UNF
G	BSPB
[05]	System Voltage
12	12 VDC
24	24 VDC
[06]	Connector Type
D	Deutsch
A	Amp
W	Weatherpack
[07]	Surface Treatment
X	No Paint
P	Black
[08]	Customer Designated ID (pt no)
ID	Enter part number



Note: A jumper is available, Part 391 1823 417, that will connect a solenoid with an AMP connector to a Weatherpack connector on a machine.



Inlet Attributes

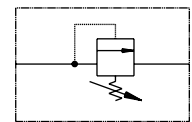
The standard inlet has high pressure P pump ports available on the top and side, low pressure T tank ports on the top and side. There are also external LS in port, LS out port and a gage port located on the side. An optional load-sense relief valve is positioned on the end and set @ 8 LPM (2 GPM).

- **Standard** – used with all spool operators, except solenoid.
- **EH** – this is the standard inlet and has machining for external pilot/drain. It also supplies internal pilot pressure to the work-sections. This also has a screen upstream of the PRRV, an accumulator port and check valve, a PRRV and a dedicated solenoid drain port.

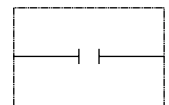
[15]	Inlet Section Type
IC	Combo Inlet
IEH	EH Combo Inlet
ICF	Bypass Inlet
IPR	Priority Inlet
ILP	Low Pressure Regeneration Inlet
[16]	Load-Sense RV Cavity
Y	Steel plug
PA	RV+AC (non-adjustable)
[17]	Load-Sense RV Setting (2600-4060 PSI)
[18]	Top Inlet HP Port
1TOPB	SAE 12 or 3/4" BSPP with a steel plug
1TOP	SAE 12 or 3/4" BSPP open
[19]	Side Inlet HP Port
1SB	SAE 12 or 3/4" BSPP with a steel plug
1S	SAE 12 or 3/4" BSPP open
[20]	Top Outlet LP Port
1 TOPTB	SAE 12 or 3/4" BSPP with a steel plug
1 TOPT	SAE 12 or 3/4" BSPP open
[21]	Side Outlet LP Port
1STB	SAE 16 or 1" BSPP with a steel plug
1ST	SAE 16 or 1" BSPP open
[22]	External LS in Cavity
LSP	SAE 6 LS in port
LSPCK	SAE 6 LS in port with Check
LSPB	No LS in port
[23]	External Pilot in Cavity
PSP	SAE 6 External Pilot Supply in port
PSPB	No Pilot Supply in port

[16] LSRV Cavity

Code LSRV

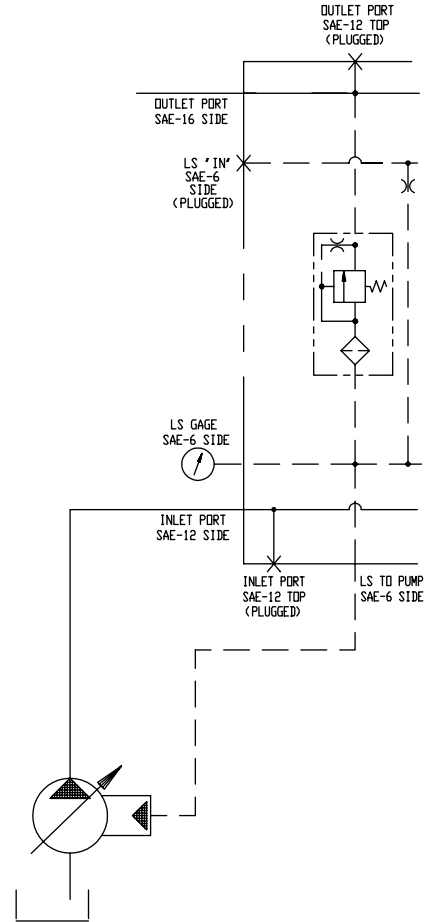
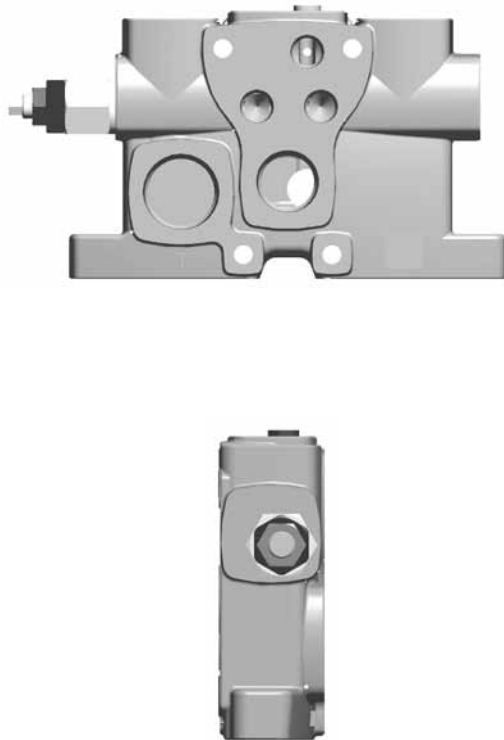


Code Y

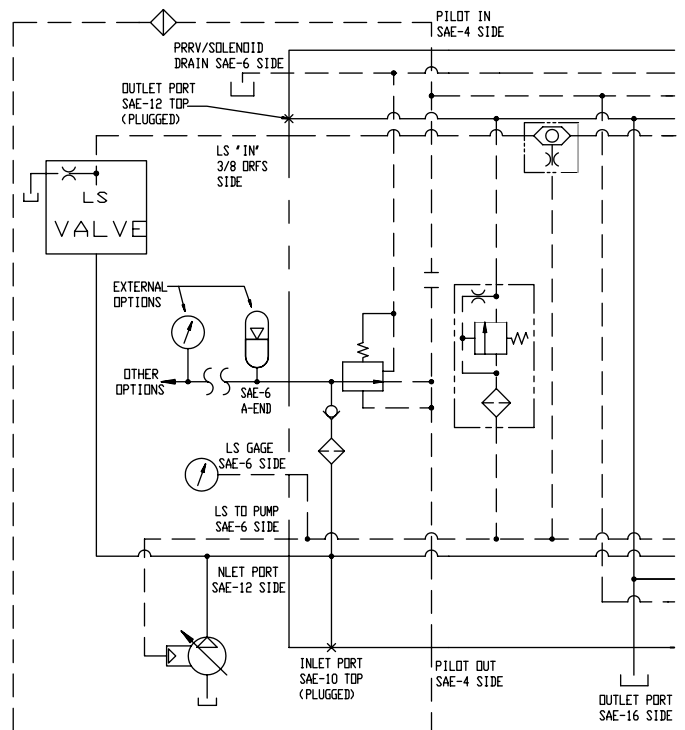
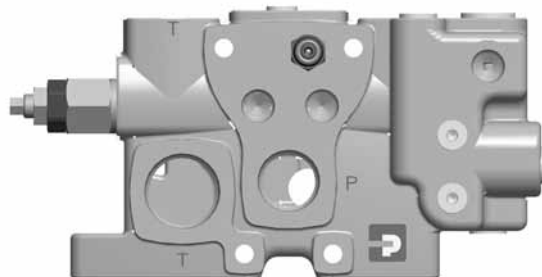


[15] Inlet Section Type

Standard Inlet



EH Inlet / Outlet



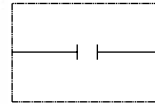
Outlet Attributes

The outlet is available with low pressure ports (top & side), a load-sense relief valve, load-sense and gage ports and an optional port to accept a load-sense signal from an external load-sense valve.

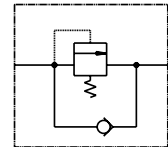
[30]	Outlet Section Type
O	Simple Outlet
OC	Combo Outlet
OEH	EH Combo Outlet
OCF	Bypass Outlet
OPR	Priority Outlet
OLP	Low Pressure Regeneration Outlet
[31]	Clipper RV Cavity
Y	Steel plug
PA	RV+AC (non-adjustable)
[32]	Clipper RV Setting
[35]	Top Inlet HP Port
1TOPB	SAE 12 or 3/4" BSPP with a steel plug
1TOP	SAE 12 or 3/4" BSPP open
[36]	Side Inlet HP Port
1SB	SAE 12 or 3/4" BSPP with a steel plug
1S	SAE 12 or 3/4" BSPP open
[37]	Top Outlet LP Port
1TOPTB	SAE 12 or 3/4" BSPP with a steel plug
1TOPT	SAE 12 or 3/4" BSPP open
[38]	Side Outlet LP Port
1STB	SAE 16 or 1" BSPP with a steel plug
1ST	SAE 16 or 1" BSPP open

[31] Clipper RV Cavity

Code Y

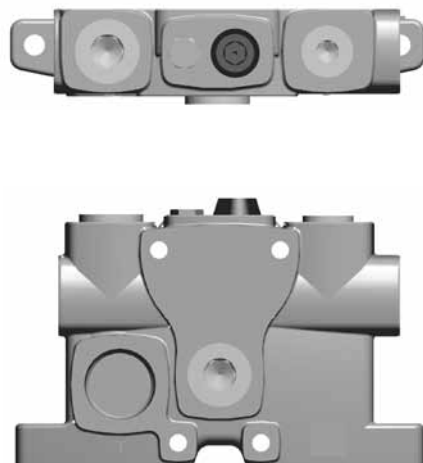
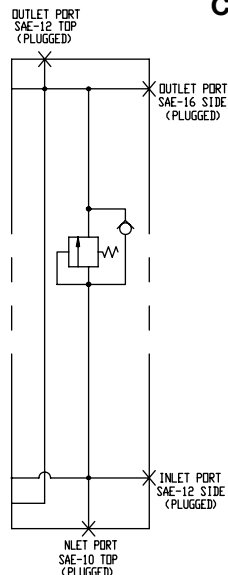


Code PA

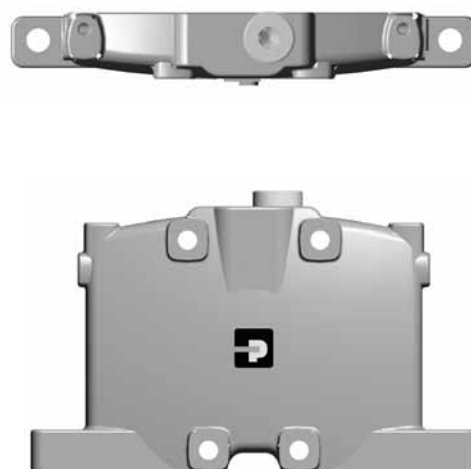


PRESSURE SETTING Bar (PSI)	
25	(363)
32	(464)
40	(580)
50	(725)
63	(914)
80	(1160)
100	(1450)
125	(1813)
140	(2030)
160	(2320)
175	(2538)
190	(2755)
210	(3045)
230	(3335)
250	(3625)
280	(4060)
300	(4350)
330	(4785)
350	(5075)
380	(5510)
400	(5800)
420	(6090)
260	(3770)
270	(3915)
225	(3263)

Combination Outlet



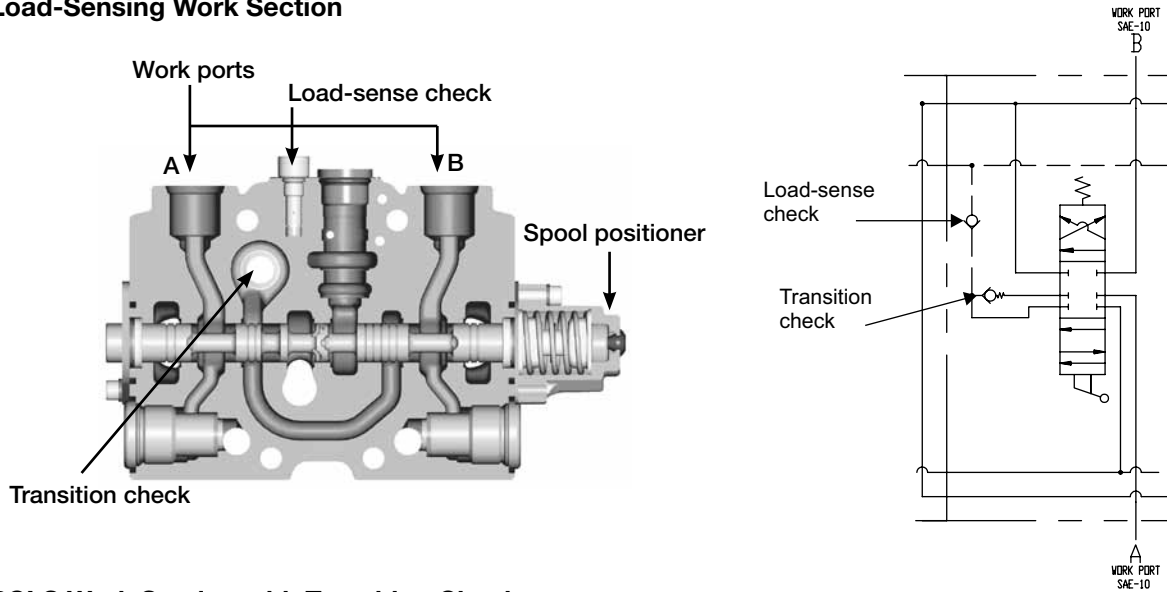
Outlet Simple



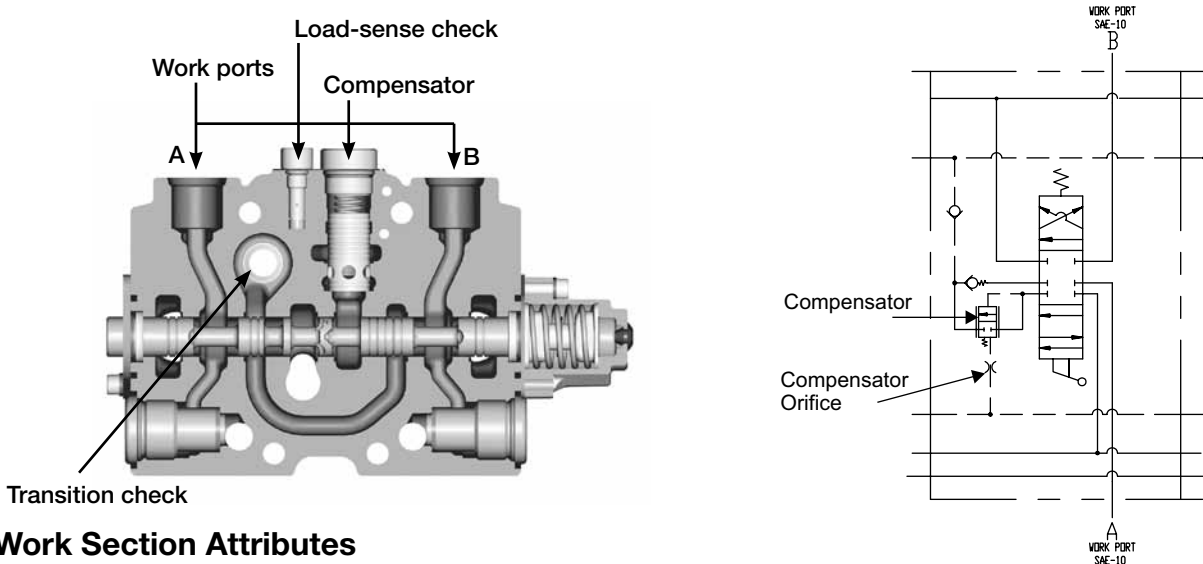
Work Section Attributes

Work sections are available in 3-way, 3-position (cylinder & motor), a 4-way, 3-position (cylinder & motor), and a 4-position float. There are six flow ranges available for each spool type. These spools are based upon a valve margin pressure of 17 Bar (250 PSI). Spool positioners are manual, hydraulic remote and solenoid.

Load-Sensing Work Section



PCLS Work Section with Transition Check



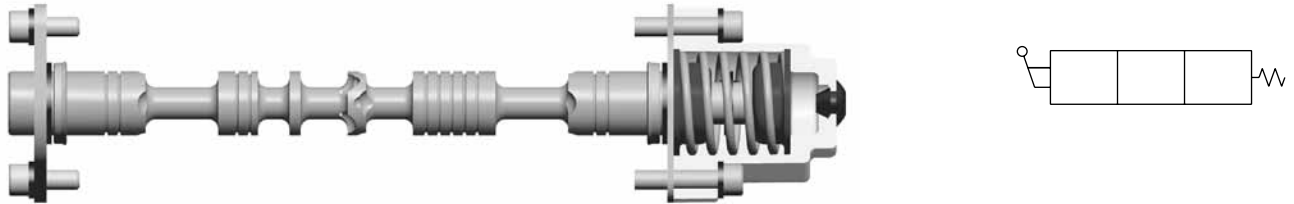
Work Section Attributes

[47]	Size of Work Ports
WP2001	SAE 10 or 1/2" BSPP
[50]	Spool Positioner (See below and next page)
C1	Manual, 3 position
PC	Hydraulic-remote, 3 position
EC	Solenoid, 3 position
ECS	Electrohydraulic without override
ECH/ECFH	Electrohydraulic with handle option
PCF	Hydraulic-remote, 4 th position float
ECF	EH 4 th position float

[50] Work Section Spool Positioner

Code C1 = Spring Return

Basic Function:
 Return spool to neutral position from either work position when handle is released. Manual handle operation.



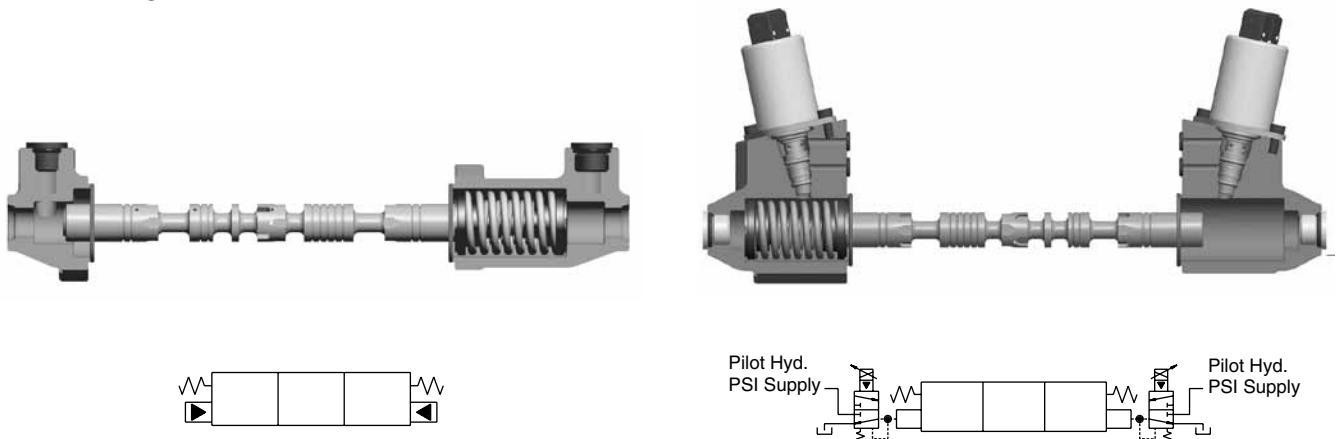
[50] Work Section Spool Positioner

Code PC = Hydraulic Remote (Proportional)

Basic Function:
 Proportional hydraulic pilot PSI is admitted to port (PCL4) and balances against metering/return springs. Use metering band of PCL4 for best match.

Code EC = Proportional Solenoid, 3-Position

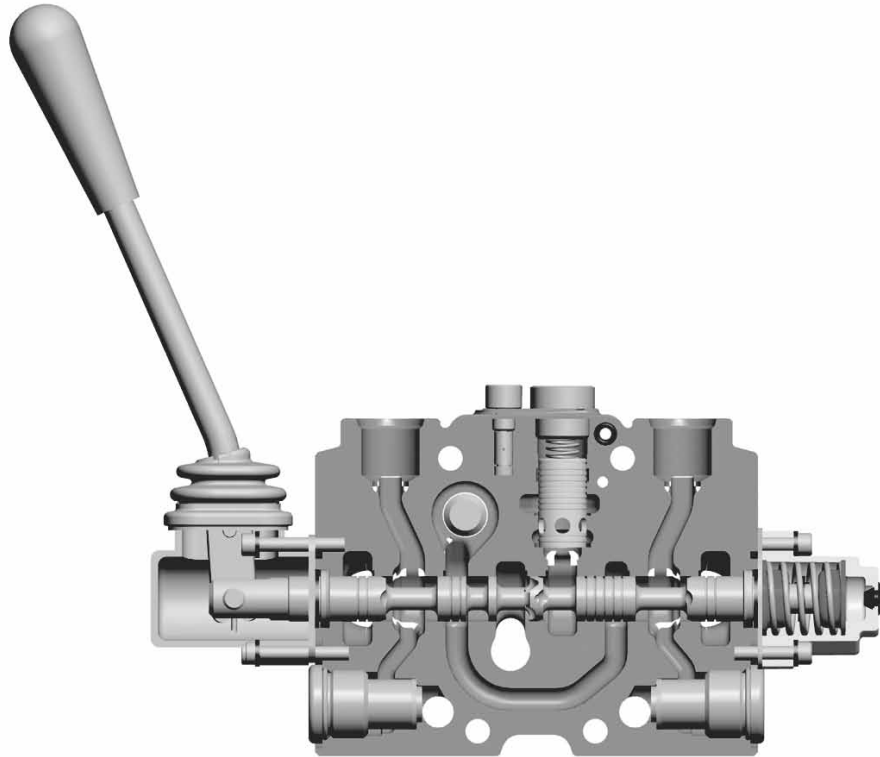
Basic Function:
 Proportional spool movement via proportional current to solenoid (ref. IQAN).



[51]	Manual Operator (See next page)	
L1	Type 1 with Handle Bracket	
L2	Type 2 Lug End Only	
[55A]	Solenoid pilot orifice. Controls shift to 'A' port – mm. This option is utilized when dampening is needed. The standard size is 2mm.	
[55B]	Solenoid pilot orifice. Controls shift to 'B' port – mm. This option is utilized when dampening is needed. The standard size is 2mm.	

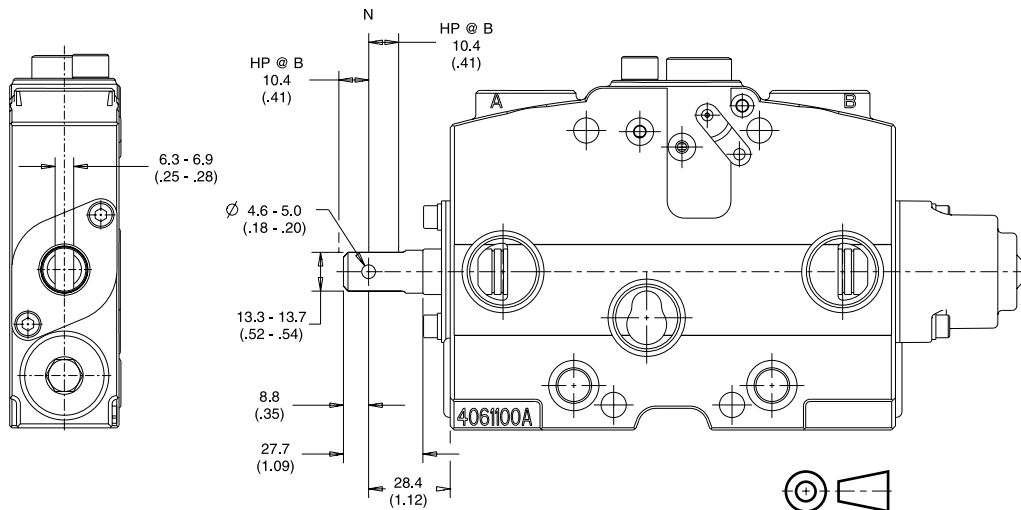
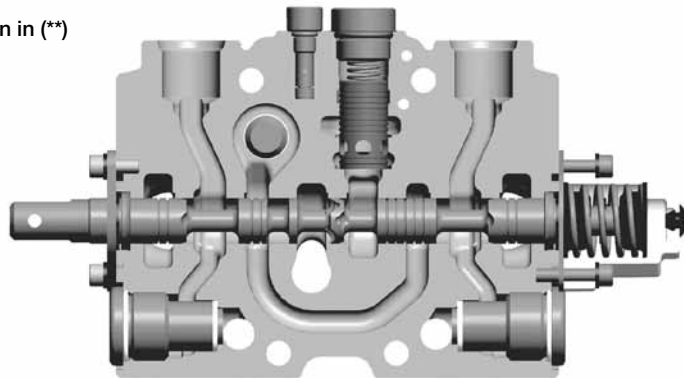
Manual Operators

Type 1 Handle End



Type 2 Lug End

Inch equivalents for millimeter dimensions are shown in (**)



cat hy14-2008/US.indd, m&a



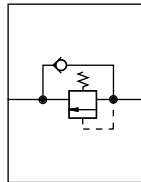
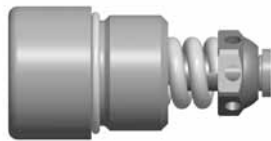
[60]	Spool Function	
D	Double-Acting Cylinder	
M	Double-Acting Motor	
DEB	Single-Acting Cylinder @ port B	
MEB	Single-Acting Motor @ port B	
F	4th Position Float Please consult factory for availability	
[72A]	Flow setting out of port 'A' with stroke limiter. For hydraulic remote or solenoid operation.	
LPM	Enter setting	
[72B]	Flow setting out of port 'B' with stroke limiter. For hydraulic remote or solenoid operation.	
LPM	Enter setting	
[69]	Spool Flow at Full Stroke – Ports 'A & B'. This is based upon a margin pressure of 17 Bar (250 PSI)	
15/4	15 LPM (4 GPM)	
30/8	30 LPM (8 GPM)	
45/12	45 LPM (12 GPM)	
68/18	68 LPM (18 GPM)	
90/24	90 LPM (24 GPM)	
120/32	120 LPM (32 GPM)	
Full	This spool will meter to approximately 75% of stroke. With further spool movement, the spool will come off the notch.	

Workport Accessories – Select one for each port

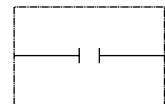
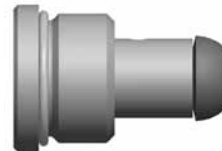
Port A	Description	Port B
[76A]		[76B]
N2	Anticavitation check	N2
Y2	Steel Plug	Y2
25	25 Bar (363 PSI)	25
32	32 Bar (464 PSI)	32
40	40 Bar (580 PSI)	40
50	50 Bar (725 PSI)	50
63	63 Bar (914 PSI)	63
80	80 Bar (1160 PSI)	80
100	100 Bar (1450 PSI)	100
125	125 Bar (1813 PSI)	125
140	140 Bar (2030 PSI)	140
160	160 Bar (2320 PSI)	160
175	175 Bar (2538 PSI)	175
190	190 Bar (2755 PSI)	190
210	210 Bar (3045 PSI)	210
225	225 Bar (3263 PSI)	225
230	230 Bar (3335 PSI)	230
250	250 Bar (3625 PSI)	250
265	265 Bar (3843 PSI)	265
270	270 Bar (3915 PSI)	270
280	280 Bar (4060 PSI)	280
300	300 Bar (4350 PSI)	300
330	330 Bar (4785 PSI)	330
350	350 Bar (5075 PSI)	350
380	380 Bar (5510 PSI)	380
400	400 Bar (5800 PSI)	400
420	420 Bar (6090 PSI)	420

[76A] and [76B] – Workport Accessories

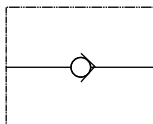
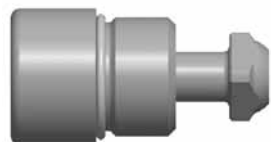
Relief with Anticavitation Check



Code Y2 – Relief Cavity Plug



Code N2 – Anticavitation Check



Margin Control

Please consult factory for availability

Flow Boost or Reduction

Fast winch up or slow track traverse speed

- Flow boost facilitates quickly raising an unloaded winch hook to a higher elevation
- Slowing track speed to make more flow available to boom, arm, and bucket functions is a benefit of flow reduction

Novice vs. Expert Control

Mini-excavator operation

- Pressure gain control + margin control work together to assist a novice operator with more forgiving operation. For the novice, margin control will limit the machine's maximum function speed while pressure gain control cushions the fast reaction of machine controls. As a result, the mini-excavator is suitable for either the novice or expert operator.

Deactivation

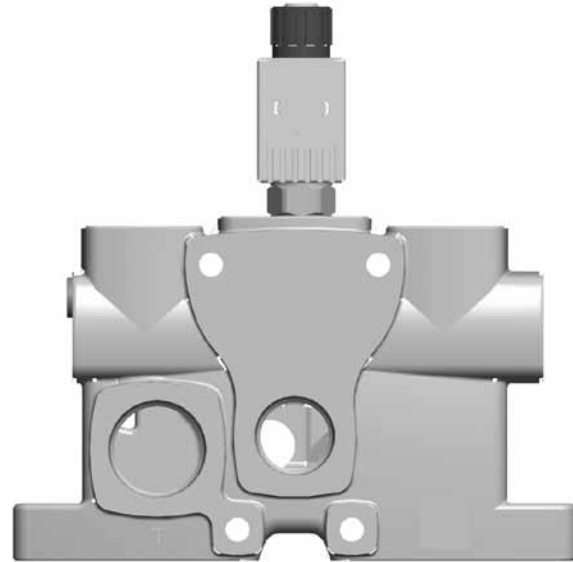
Disabling a machine function

- A machine may need one or more functions disabled for safety during a certain sequence of operations.

Priority

Wheel loader operation

- Margin control can automatically give boom raise priority over bucket rollback.



Speed Sensing Power Control

Horsepower limitation

- Horsepower can be managed by reducing flow to certain or all functions during a machine cycle.

Hydraulic Cylinder Damping

Programmed damping mode

- Automatic cylinder speed ramp down near the end of stroke extends the component and overall machine life.

Pressure Flow Limitation (PLQ)

Please consult factory for availability

General Application Concept

Constant force or torque

- Any application that requires a constant force or torque via deadheading a workport can use PLQ. This assumes the PLQ regulated workport pressure is less than maximum system pressure. The PLQ work section only consumes a very insignificant flow of less than 0.75 gpm. Working at only the essential pressure and minimum flow maximizes energy efficiency.

Snow Plow Salt Spreader Truck

Plow blade elevation

- Regulated pressure is required to generate upward force to counter gravity acting on the blade in order to maintain elevation.

Scraping with plow

- Regulated pressure is required to control the force of the plow blade against the ground.

Forestry - Log Skidder and Log Loader

Clamping and retaining logs

- Regulated pressure is required to control the clamping force of the tongs against the logs while they are being moved.

Stamping, Molding Machines

Maximum press

- Regulated pressure is required to control the force of a ram against the part being made.

Swing Stability

Please consult factory for availability

Load-Sense Signal Conditioning

Winch stability

- Encourages the actuator to maintain a velocity which minimizes instability during initial function movement by creating an artificial load-sense signal greater than the actual load pressure.
- Specially applicable to high inertial loads

Force Feedback

Swing control

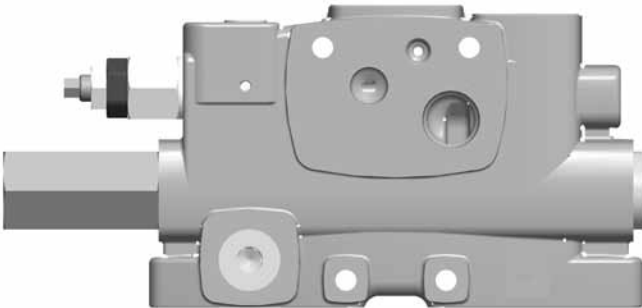
- Provides more control during swing acceleration to minimize lurching by routing the work port pressure thru an orifice to the opposite pilot cap.

Priority Flow Divider (Available as Inlet or Outlet Section)

Please consult factory for availability

Priority Flow for Steering

This feature always provides a regulated output flow for a steering function. This can be used with a simple, Bypass unloading or a Low pressure regeneration type of outlet.



Low Pressure Regeneration (Available as Inlet or Outlet Section)

Please consult factory for availability

Cavitation

To combat cavitation, this outlet is designed to always keep oil in the loop between the valve and the actuator. When a function is cavitating, it will force oil across any anti-cavitation checks in the valve. If there is still a void in the hydraulic loop (valve to actuator) after the spools are returned to neutral, it will keep the piston pump on

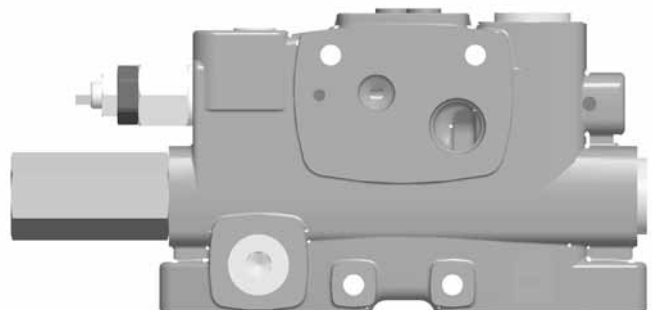


Bypass Compensator (Available as Inlet or Outlet Section)

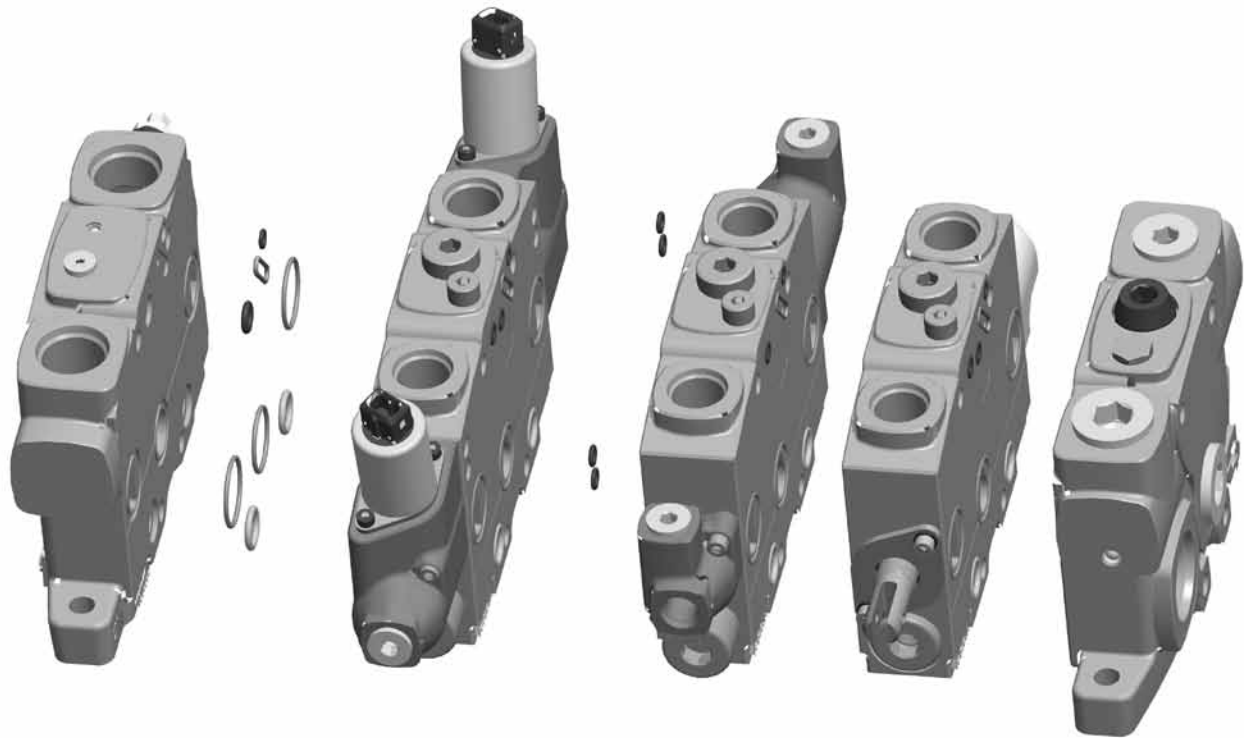
Please consult factory for availability

Fixed Displacement Pumps

This feature allows for the VP120 to operate with fixed displacement pumps. Please consult factory for availability.



Stud Assemblies



**For use with Combo-In + Combo-Out OR
 Combo-In + Simple-Out OR
 PBL-In + Simple-Out**

NUMBER OF WORK SECTIONS	LENGTH "L" (±.030)
1	5.75
2	7.25
3	8.75
4	10.25
5	11.75
6	13.25
7	14.75
8	16.25
9	17.75
10	19.25
11	20.75
12	22.25

**For use with PBL-In + PBL-Out OR
 PBL-In + Combo-Out OR
 Combo-In + PBL-Out**

NUMBER OF WORK SECTIONS	LENGTH "L" (±.030)
1	6.50
2	8.00
3	9.50
4	11.00
5	12.50
6	14.00
7	15.50
8	17.00
9	18.50
10	20.00
11	21.50
12	23.00

Terms of Sale with Warranty Limitations

Offer of Sale

The items described in this document and other documents and descriptions provided by Parker Hannifin Corporation, its subsidiaries and its authorized distributors ("Seller") are hereby offered for sale at prices to be established by Seller. This offer and its acceptance by any customer ("Buyer") shall be governed by all of the following Terms and Conditions. Buyer's order for any item described in its document, when communicated to Seller verbally, or in writing, shall constitute acceptance of this offer. All goods, services or work described will be referred to as "Products".

1. **Terms and Conditions.** Seller's willingness to offer Products, or accept an order for Products, to or from Buyer is subject to these Terms and Conditions or any newer version of the terms and conditions found on-line at www.parker.com/saleterms/. Seller objects to any contrary or additional terms or conditions of Buyer's order or any other document issued by Buyer.

2. **Price Adjustments; Payments.** Prices stated on Seller's quote or other documentation offered by Seller are valid for 30 days, and do not include any sales, use, or other taxes unless specifically stated. Unless otherwise specified by Seller, all prices are F.C.A. Seller's facility (INCOTERMS 2010). Payment is subject to credit approval and is due 30 days from the date of invoice or such other term as required by Seller's Credit Department, after which Buyer shall pay interest on any unpaid invoices at the rate of 1.5% per month or the maximum allowable rate under applicable law.

3. **Delivery Dates; Title and Risk; Shipment.** All delivery dates are approximate and Seller shall not be responsible for any damages resulting from any delay. Regardless of the manner of shipment, title to any products and risk of loss or damage shall pass to Buyer upon placement of the products with the shipment carrier at Seller's facility. Unless otherwise stated, Seller may exercise its judgment in choosing the carrier and means of delivery. No deferment of shipment at Buyers' request beyond the respective dates indicated will be made except on terms that will indemnify, defend and hold Seller harmless against all loss and additional expense. Buyer shall be responsible for any additional shipping charges incurred by Seller due to Buyer's acts or omissions.

4. **Warranty.** Seller warrants that the Products sold hereunder shall be free from defects in material or workmanship for a period of eighteen months from the date of delivery to Buyer. The prices charged for Seller's products are based upon the exclusive limited warranty stated above, and upon the following disclaimer: **DISCLAIMER OF WARRANTY: THIS WARRANTY COMPRISES THE SOLE AND ENTIRE WARRANTY PERTAINING TO PRODUCTS PROVIDED HEREUNDER. SELLER DISCLAIMS ALL OTHER WARRANTIES, EXPRESS AND IMPLIED, INCLUDING DESIGN, MERCHANTABILITY AND FITNESS FOR A PARTICULAR PURPOSE.**

5. **Claims; Commencement of Actions.** Buyer shall promptly inspect all Products upon delivery. No claims for shortages will be allowed unless reported to the Seller within 10 days of delivery. No other claims against Seller will be allowed unless asserted in writing within 30 days after delivery. Buyer shall notify Seller of any alleged breach of warranty within 30 days after the date the defect is or should have been discovered by Buyer. Any action based upon breach of this agreement or upon any other claim arising out of this sale (other than an action by Seller for an amount due on any invoice) must be commenced within 12 months from the date of the breach without regard to the date breach is discovered.

6. **LIMITATION OF LIABILITY, UPON NOTIFICATION, SELLER WILL, AT ITS OPTION, REPAIR OR REPLACE A DEFECTIVE PRODUCT, OR REFUND THE PURCHASE PRICE. IN NO EVENT SHALL SELLER BE LIABLE TO BUYER FOR ANY SPECIAL, INDIRECT, INCIDENTAL OR CONSEQUENTIAL DAMAGES ARISING OUT OF, OR AS THE RESULT OF, THE SALE, DELIVERY, NON-DELIVERY, SERVICING, USE OR LOSS OF USE OF THE PRODUCTS OR ANY PART THEREOF, OR FOR ANY CHARGES OR EXPENSES OF ANY NATURE INCURRED WITHOUT SELLER'S WRITTEN CONSENT, EVEN IF SELLER HAS BEEN NEGLIGENT, WHETHER IN CONTRACT, TORT OR OTHER LEGAL THEORY. IN NO EVENT SHALL SELLER'S LIABILITY UNDER ANY CLAIM MADE BY BUYER EXCEED THE PURCHASE PRICE OF THE PRODUCTS.**

7. **User Responsibility.** The user, through its own analysis and testing, is solely responsible for making the final selection of the system and Product and assuring that all performance, endurance, maintenance, safety and warning requirements of the application are met. The user must analyze all aspects of the application and follow applicable industry standards and Product information. If Seller provides Product or system options, the user is responsible for determining that such data and specifications are suitable and sufficient for all applications and reasonably foreseeable uses of the Products or systems.

8. **Loss to Buyer's Property.** Any designs, tools, patterns, materials, drawings, confidential information or equipment furnished by Buyer or any other items which become Buyer's property, will be considered obsolete and may be destroyed by Seller after two consecutive years have elapsed without Buyer ordering the items manufactured using such property. Seller shall not be responsible for any loss or damage to such property while it is in Seller's possession or control.

9. **Special Tooling.** A tooling charge may be imposed for any special tooling, including without limitation, dies, fixtures, molds and patterns, acquired to manufacture Products. Such special tooling shall be and remain Seller's property notwithstanding payment of any charges by Buyer. In no event will Buyer acquire any interest in apparatus belonging to Seller which is utilized in the manufacture of the Products, even if such apparatus has been specially converted or adapted for such manufacture and notwithstanding any charges paid by Buyer. Unless otherwise agreed, Seller shall have the right to alter, discard or otherwise dispose of any special tooling or other property in its sole discretion at any time.

10. **Buyer's Obligation; Rights of Seller.** To secure payment of all sums due or otherwise, Seller shall retain a security interest in the goods delivered and this agreement shall be deemed a Security Agreement under the Uniform Commercial Code. Buyer authorizes Seller as its attorney to execute and file on Buyer's behalf all documents Seller deems necessary to perfect its security interest.

11. **Improper Use and Indemnity.** Buyer shall indemnify, defend, and hold Seller harmless from any claim, liability, damages, lawsuits, and costs (including attorney fees), whether for personal injury, property damage, patent, trademark or copyright

infringement or any other claim, brought by or incurred by Buyer, Buyer's employees, or any other person, arising out of: (a) improper selection, improper application or other misuse of Products purchased by Buyer from Seller; (b) any act or omission, negligent or otherwise, of Buyer; (c) Seller's use of patterns, plans, drawings, or specifications furnished by Buyer to manufacture Product; or (d) Buyer's failure to comply with these terms and conditions. Seller shall not indemnify Buyer under any circumstance except as otherwise provided.

12. **Cancellations and Changes.** Orders shall not be subject to cancellation or change by Buyer for any reason, except with Seller's written consent and upon terms that will indemnify, defend and hold Seller harmless against all direct, incidental and consequential loss or damage. Seller may change product features, specifications, designs and availability with notice to Buyer.

13. **Limitation on Assignment.** Buyer may not assign its rights or obligations under this agreement without the prior written consent of Seller.

14. **Force Majeure.** Seller does not assume the risk and shall not be liable for delay or failure to perform any of Seller's obligations by reason of circumstances beyond the reasonable control of Seller (hereinafter "Events of Force Majeure"). Events of Force Majeure shall include without limitation: accidents, strikes or labor disputes, acts of any government or government agency, acts of nature, delays or failures in delivery from carriers or suppliers, shortages of materials, or any other cause beyond Seller's reasonable control.

15. **Waiver and Severability.** Failure to enforce any provision of this agreement will not waive that provision nor will any such failure prejudice Seller's right to enforce that provision in the future. Invalidation of any provision of this agreement by legislation or other rule of law shall not invalidate any other provision herein. The remaining provisions of this agreement will remain in full force and effect.

16. **Termination.** Seller may terminate this agreement for any reason and at any time by giving Buyer thirty (30) days written notice of termination. Seller may immediately terminate this agreement, in writing, if Buyer: (a) commits a breach of any provision of this agreement (b) appointments a trustee, receiver or custodian for all or any part of Buyer's property (c) files a petition for relief in bankruptcy on its own behalf, or by a third party (d) makes an assignment for the benefit of creditors, or (e) dissolves or liquidates all or a majority of its assets.

17. **Governing Law.** This agreement and the sale and delivery of all Products hereunder shall be deemed to have taken place in and shall be governed and construed in accordance with the laws of the State of Ohio, as applicable to contracts executed and wholly performed therein and without regard to conflicts of laws principles. Buyer irrevocably agrees and consents to the exclusive jurisdiction and venue of the courts of Cuyahoga County, Ohio with respect to any dispute, controversy or claim arising out of or relating to this agreement.

18. **Indemnity for Infringement of Intellectual Property Rights.** Seller shall have no liability for infringement of any patents, trademarks, copyrights, trade dress, trade secrets or similar rights except as provided in this Section. Seller will defend and indemnify Buyer against allegations of infringement of U.S. patents, U.S. trademarks, copyrights, trade dress and trade secrets ("Intellectual Property Rights"). Seller will defend at its expense and will pay the cost of any settlement or damages awarded in an action brought against Buyer based on an allegation that a Product sold pursuant to this Agreement infringes the Intellectual Property Rights of a third party. Seller's obligation to defend and indemnify Buyer is contingent on Buyer notifying Seller within ten (10) days after Buyer becomes aware of such allegations of infringement, and Seller having sole control over the defense of any allegations or actions including all negotiations for settlement or compromise. If a Product is subject to a claim that it infringes the Intellectual Property Rights of a third party, Seller may, at its sole expense and option, procure for Buyer the right to continue using the Product, replace or modify the Product so as to make it noninfringing, or offer to accept return of the Product and return the purchase price less a reasonable allowance for depreciation. Notwithstanding the foregoing, Seller shall have no liability for claims of infringement based on information provided by Buyer, or directed to Products delivered hereunder for which the designs are specified in whole or part by Buyer, or infringements resulting from the modification, combination or use in a system of any Product sold hereunder. The foregoing provisions of this Section shall constitute Seller's sole and exclusive liability and Buyer's sole and exclusive remedy for infringement of Intellectual Property Rights.

19. **Entire Agreement.** This agreement contains the entire agreement between the Buyer and Seller and constitutes the final, complete and exclusive expression of the terms of sale. All prior or contemporaneous written or oral agreements or negotiations with respect to the subject matter are herein merged.

20. **Compliance with Law, U. K. Bribery Act and U.S. Foreign Corrupt Practices Act.** Buyer agrees to comply with all applicable laws and regulations, including both those of the United Kingdom and the United States of America, and of the country or countries of the Territory in which Buyer may operate, including without limitation the U. K. Bribery Act, the U.S. Foreign Corrupt Practices Act ("FCPA") and the U.S. Anti-Kickback Act (the "Anti-Kickback Act"), and agrees to indemnify and hold harmless Seller from the consequences of any violation of such provisions by Buyer, its employees or agents. Buyer acknowledges that they are familiar with the provisions of the U. K. Bribery Act, the FCPA and the Anti-Kickback Act, and certifies that Buyer will adhere to the requirements thereof. In particular, Buyer represents and agrees that Buyer shall not make any payment or give anything of value, directly or indirectly to any governmental official, any foreign political party or official thereof, any candidate for foreign political office, or any commercial entity or person, for the purpose of influencing such person to purchase products or otherwise benefit the business of Seller.



Parker Safety Guide for Selecting and Using Hydraulic Valves and Related Accessories

WARNING: Failure or improper selection or improper use of Parker Hydraulic Valve Division (HVD) Valves or related accessories (“Products”) can cause death, personal injury and property damage. Possible consequences of failure or improper use of these Products include but are not limited to:

- Valves or parts thereof thrown off at high speed
- High velocity fluid discharge
- Explosion or burning of the conveyed fluid
- Contact with suddenly moving or falling objects controlled by the Valve
- Injections by high-pressure fluid discharge
- Contact with fluid that may be hot, cold, toxic or otherwise injurious
- Injuries resulting from injection, inhalation or exposure to fluids
- Injury from handling a heavy item (dropped, awkward lift)
- Electric shock from improper handling of solenoid connections
- Injury from slip or fall on spilled or leaked fluid

Before selecting or using any of these Products, it is important that you read and follow the instructions below. In general, the Products are not approved for in-flight aerospace applications. Consult the factory for the few that are FAA approved.

1.0 GENERAL INSTRUCTIONS

- 1.1 **Scope:** This safety guide provides instructions for selecting and using (including assembling, installing and maintaining) these Products. For convenience all items in this guide are called “Valves”. This safety guide is a supplement to and is to be used in conjunction with the specific Parker catalogs for the specific Valves and/or accessories being considered for use. See item 1.6 below for obtaining those catalogs.
- 1.2 **Fail-Safe:** Valves can and do fail without warning for many reasons. Design all systems and equipment in a fail-safe mode, so that failure of the Valve or Valve Assembly will not endanger persons or property.
- 1.3 **Safety Devices:** Never disconnect, override, circumvent or otherwise disable any safety lockout on any system whether powered by HVD Valves or any motion control system of any manufacturer. (e.g. Automatic shut-off on a riding lawn mower should the operator get out of the seat).
- 1.4 **Distribution:** Provide a copy of this safety guide to each person that is responsible for selecting or using HVD Valve Products. Do not select HVD Valves without thoroughly reading and understanding this safety guide as well as the specific Parker catalogs for the Products considered or selected.
- 1.5 **User Responsibility:** Due the wide variety of operating conditions and applications for Valves, HVD and its distributors do not represent or warrant that any particular Valve is suitable for any specific system. This safety guide does not analyze all technical parameters that must be considered in selecting a product. The user, through its own analysis and testing is solely responsible for:
 - Making the final selection of the Valve
 - Assuring that the user’s requirements are met and that the application presents no health or safety hazards.
 - Providing all appropriate health and safety warnings on the equipment on which the Valves are used.
 - Assuring compliance with all applicable government and industry standards.
- 1.6 **Additional Questions:** Call the appropriate Parker technical service department if you have any questions or require any additional information. See the Parker publication for the product being considered or used, or call 1-800-CPARKER, or go to www.parker.com, for the telephone numbers of the appropriate technical service department. For additional copies of this or any other Parker Safety Guide go to www.parker.com and click on the safety button on the opening page. Catalogs and/or catalog numbers for the various HVD Valve Products can be obtained by calling HVD at 440-366-5100. Phone numbers and catalog information is also available on the Parker website, www.parker.com.

2.0 VALVE SELECTION INSTRUCTIONS

- 2.1 **Pressure:** Valve selection must be made so that the maximum working pressure of the Valve is equal to or greater than the maximum system pressure. Surge, impulse or peak transient pressures in the system must be below the maximum working pressure of the Valve. Surge, impulse and peak pressures can usually be determined by sensitive electrical instrumentation that measures and indicates pressures at millisecond intervals. Mechanical pressure gauges indicate only average pressure and cannot be used to determine surge, impulse or peak transient pressures. Burst pressure ratings if given or known are for manufacturing purposes only and are not an indication that the Product can be used in applications at the burst pressure or otherwise above the maximum working pressure.
- 2.2 **Temperature:** The fluid temperature must be regulated or controlled so that the operating viscosity of the fluid is maintained at a level specified for the particular Valve product. Such ranges are given in the product catalogs or can be obtained from the appropriate customer service department for the particular Valve product.
- 2.3 **Fluid Compatibility:** The fluid conveyed in Valves has direct implications on the Valve selection. The fluid must be chemically compatible with the Valve component materials. Elastomer seals, brass, cast iron, aluminum for example all are potentially affected by certain fluids. Additionally, fluid selection affects the performance of various Valves. Considerations relative to fluid selection are outlined in the specific HVD Valve product catalog. Of particular importance is that the fluid be for hydraulic use, contain the proper additives and wear inhibitors. See 1.6 “Additional Questions” above for information to obtain such HVD catalogs.
- 2.4 **Changing Fluids:** If a system requires a different fluid, it should be done with the guidance in number 2.3 above. Additionally, it may be necessary to flush the system (including the Valves) to remove any of the previous fluid. Consult the Parker Valve Division for guidance.
- 2.5 **Size:** Transmission of power by means of pressurized fluid varies with pressure and rate of flow. The size of the components must be adequate to keep pressure losses to a minimum and avoid damage due to heat generation or excessive fluid velocity.
- 2.6 **Placement:** Installation of Valves must take into account the orientation of the Valve and the proximity of the Valve to other parts of the system. This includes but is not limited to closeness to hot and cold areas, access for servicing and operation as well as orientation for proper connectors.
- 2.7 **Ports:** Connection of Valves in systems can be by threaded ports, sub-base surfaces, flanges and manifolds. In all cases, the proper fitting, surface or mounting hardware must be selected to properly seal and contain the system fluid so as to avoid the adverse conditions listed in the initial warning box above. Specifically, if using threaded ports, the designer must make sure that the mating fitting is of the compatible thread. Also, the instructions provided by the connector hardware supplier must be read and understood so as to properly assemble the connector. The Parker Safety Guide for using Hose, Tubing and Fittings and Related Accessories is but one reference to this end.
- 2.8 **Environment:** Care must be taken to insure that the Valve and Valve Assemblies are either compatible with or protected from the environment (that is, surrounding conditions) to which they are exposed. Environmental conditions including but not limited to ultraviolet radiation, sunlight, heat, ozone, moisture, water, salt water, chemicals and air pollutants can cause degradation and premature failure.
- 2.9 **Electric Power:** For Valves requiring electric power for control, it is imperative that the electricity be delivered at the proper voltage, current and wattage requirements. To obtain the proper control requirements please refer to the respective Parker product catalog for the specific Valve that is intended for use. If further guidance is required, call the appropriate technical service department identified in the respective Parker product catalog.
- 2.10 **Specifications and Standards:** When selecting Valves, government, industry and Parker specifications and recommendations must be reviewed and followed as applicable.
- 2.11 **Accessories:** All accessories used in conjunction with any Parker Valve product must be rated to the same requirements of the Valve including but not limited to pressure, flow, material compatibility, power requirements. All of these items must be examined as stated in the “VALVE INSTALLATION INSTRUCTIONS” paragraph 3.0.

3.0 **VALVE INSTALLATION INSTRUCTIONS**

- 3.1 **Component Inspection:** Prior to use, a careful examination of the Valve(s) must be performed. The Valve intended for use must be checked for correct style, size, catalog number and external condition. The Valve must be examined for cleanliness, absence of external defects or gouges, cracked or otherwise deformed parts or missing items. The mounting surface or port connections must be protected and free of burrs, scratches, corrosion or other imperfections. Do NOT use any item that displays any signs of nonconformance. In addition, any accessory including but not limited to fittings, bolt kits, hoses, sub bases, manifolds, and electrical connectors must be subjected to the same examination.
- 3.2 **Handling Valves:** Many Valves whether HVD Valves or of another manufacturer can be large, bulky or otherwise difficult to handle. Care must be taken to use proper lifting techniques, tools, braces, lifting belts or other aids so as not to cause injury to the user, any other person or to property.
- 3.3 **Filtration:** Fluid cleanliness is a necessity in any hydraulic system. Fluid filters must be installed and maintained in the system to provide the required level of fluid cleanliness. Filters can be placed in the inlets, pressure lines and return lines. The level of cleanliness required is specified in the HVD product catalog for the specific Valve(s) selected or intended for use. For additional information on Filter selection contact Parker Filter Division at 800-253-1258 or 419-644-4311.
- 3.4 **Servo Valves:** Application of Servo Valves in general requires knowledge and awareness of “closed loop control theory” and the use of electronic controls for successful and safe operation. Individuals who do not have such experience or knowledge must gain training before use of such Products. Parker offers both classroom training as well as manuals to assist in gaining this knowledge. These aids can be obtained by contacting Hydraulic Valve Division at 440-366-5100, calling the general Parker help line 800-CPARKER or going to the Parker web site at www.parker.com.
- 3.5 **Accessory Ratings:** All accessories used in combination with the selected or intended Valve product must be rated and compatible with the selected Valve. Specifically, the items must be of equal or greater rating including but not limited to pressure, flow, power, size, port style, thread connectors and material.
- 3.6 **Connection Styles:** It is the responsibility of the user of the Parker product to properly select connectors and accessories that match the connections on the sub plate, Valve, flange or threaded connection or manifold. It is also the responsibility of the installer to possess adequate skill and knowledge including but not limited to thread preparation, torque technique, hose assembly and inspection, tube preparation and assembly, and fitting installation. Parker Tube Fitting Division (www.parker.com/tfd) catalog 4300 and Parker Hose Products (www.parkerhose.com) catalog 4400 describe some basic technical information relative to proper fitting assembly.
- 3.7 **Electrical Connections:** All electrical connections must be made to the applicable codes and local safety requirements.
- 3.8 **Gauges and Sensors:** The user must install sufficient gauges and sensors in the system so as to be able to determine the condition of the system. This includes but is not limited to pressure gauges, flow meters, temperature sensors and site gauges. These are of utmost importance should removal or disassembly of a Valve, portion of a Valve or portion of the system become necessary. Refer to “VALVE MAINTENANCE AND REPLACEMENT INSTRUCTIONS” for details and especially item 4.8.
- 3.9 **System Checkout:** Once installed, the Valve installation must be tested to insure proper operation and that no external leakage exists. All safety equipment must be in place including but not limited to safety glasses, helmets, ear protection, splash guards, gloves, coveralls and any shields on the equipment. All air entrapment must be eliminated and the system pressurized to the maximum system pressure (at or below the Valve maximum working pressure) and checked for proper function and freedom from leaks. Personnel must stay out of potentially hazardous areas while testing and using.

4.0 **VALVE MAINTENANCE AND REPLACEMENT INSTRUCTIONS**

- 4.1 **Maintenance Program:** Even with proper installation, Valves and Valve System life may be significantly reduced without a continuing maintenance program. The severity of the application and risk potential must determine the frequency of the inspection and the replacement of the Products so that Products are replaced before any failure occurs. A maintenance program must be established and followed by the user and, at a minimum, must include instructions 4.2 through 4.10. An FMEA (Failure Mode and Effects Analysis) is recommended in determining maintenance requirements.
- 4.2 **Visual Inspection-Valves:** Any of the following conditions require immediate shut down and replacement of the Valve.
- Evidence that the Valve is in partial dis-assembly.
 - Visible crack or suspicion of a crack in the Valve housing or bent, cracked or otherwise damaged solenoid.
 - Missing or partially extending drive pin on a flow control knob.
 - Missing, loose components, obstructions or other condition impeding the motion or function of the manual knob, lever, foot pedal or other mechanical operator of a hydraulic Valve.
 - Any evidence of burning or heat induced discoloration.
 - Blistered, soft, degraded or loose cover of any kind.
 - Loose wire or electrical connector.
- 4.3 **Visual Inspection-Other:** The following conditions must be tightened, repaired, corrected or replaced as required.
1. Fluid on the ground must be cleaned immediately. Also, the source of the fluid must be determined prior to running the equipment again.
 2. Leaking port or excessive external dirt build-up.
 3. System fluid level is too low or air is entrapped or visible in the reservoir.
 4. Equipment controlled by the Valve or Valve assembly has been losing power, speed, efficiency
- 4.4 **Filter Maintenance:** System filters must be maintained and kept in proper working order. The main service requirement is periodic replacement of the filter element or screen. Contact Parker Filter Division at 800-253-1258 or 419-644-4311 for further filter maintenance details.
- 4.5 **Functional Test:** See “System Checkout” number 3.9 above in “VALVE INSTALLATION INSTRUCTIONS”.
- 4.6 **Replacement Intervals:** Valves and Valve Systems will eventually age and require replacement. Seals especially should be inspected and replaced at specific replacement intervals based on previous experience, government or industry recommendations, or when failures could result in unacceptable downtime, damage or injury risk. At a minimum seals must be replaced whenever service is rendered to a Valve product.
- 4.7 **Adjustments, Control Knobs, and Other Manual Controls:** System Pressure and Flow are typically adjusted by knobs and/or handles. A set-screw or lock-nut secures the adjustment device so as to maintain the desired setting. This set-screw or lock-nut must first be loosened prior to making any adjustments and re-tightened after adjustment on the HVD Valve. All adjustments must be made in conjunction with pressure gauges and/or flow meters (or by watching the speed of the actuator in the case of setting flow only). See paragraph “Gauges and Sensors” above in the section “VALVE INSTALLATION INSTRUCTIONS”. Under no circumstances should any control knob, adjustment stem, handle, foot pedal or other actuating device be forced beyond the mechanical stop(s) on the Valve. For example, the Parker Safety Notice Bulletin **HY14-3310-B1/US** for HVD Colorflow Valves specifically restricts the adjustment torque to “hand adjust” or “less than 10 ft/lbs” if it cannot be adjusted by hand. Failure to adhere to this may force the knob beyond the stop point allowing it to be ejected at high speed resulting in death, personal injury and property damage. For complete safety instructions on HVD Colorflow Valves, copies of Safety Notice **Bulletin HY14-3310-B1/US** can be obtained directly from the Hydraulic Valve Division at 440-366-5100 or from the Parker web site at www.parker.com by selecting the “Safety” button. Parker help line 800-CPARKER is on call 24/7 as well should there be any question about the use of a HVD Valve. Additionally, when making adjustments, always adjust the Valve with all parts of your body to the side of the Valve (that is, the knob is not pointing toward you or anyone else).
- 4.8 **High pressure Warning:** Hydraulic power is transmitted by high-pressure fluids through hoses, fittings and valves, pumps and actuators. This condition can be dangerous and potentially lethal and, therefore, extreme caution must be exercised when working with fluids under pressure. From time to time, hoses, Valves, tubes or fittings fail if they are not replaced at proper time intervals. Typically these failures are the result of some form of misapplication, abuse, wear, or failure to perform proper maintenance. When such failure occurs, generally the high pressure fluid inside escapes in a stream which may or may not be visible to the user. Under no circumstances should the user attempt to locate the leak by “feeling” with their hands or any other part of their body. High-pressure fluids can and will penetrate the skin and cause severe tissue damage and possible loss of limb or life. Even seemingly minor hydraulic fluid injection injuries must be treated immediately by a physician with knowledge of the tissue damaging properties of hydraulic fluid.
- If a hose, tube, fitting or Valve failure occurs, immediately shut down the equipment and leave the area until pressure has been completely released from the system. Simply shutting down the pump may or may not eliminate the pressure in the system. It may take several minutes or even hours for the pressure to be relieved so that the leak area can be examined safely. Once the pressure has been reduced to zero, the suspected leaking item can be taken off the equipment and examined. It must always be replaced if a failure has occurred. Never attempt to patch or repair a connector (especially a hose) or Valve that has failed. Consult the nearest Parker distributor or the appropriate Parker division for component replacement information. Never touch or examine a failed hydraulic component unless it is obvious that the item no longer contains fluid under pressure.

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