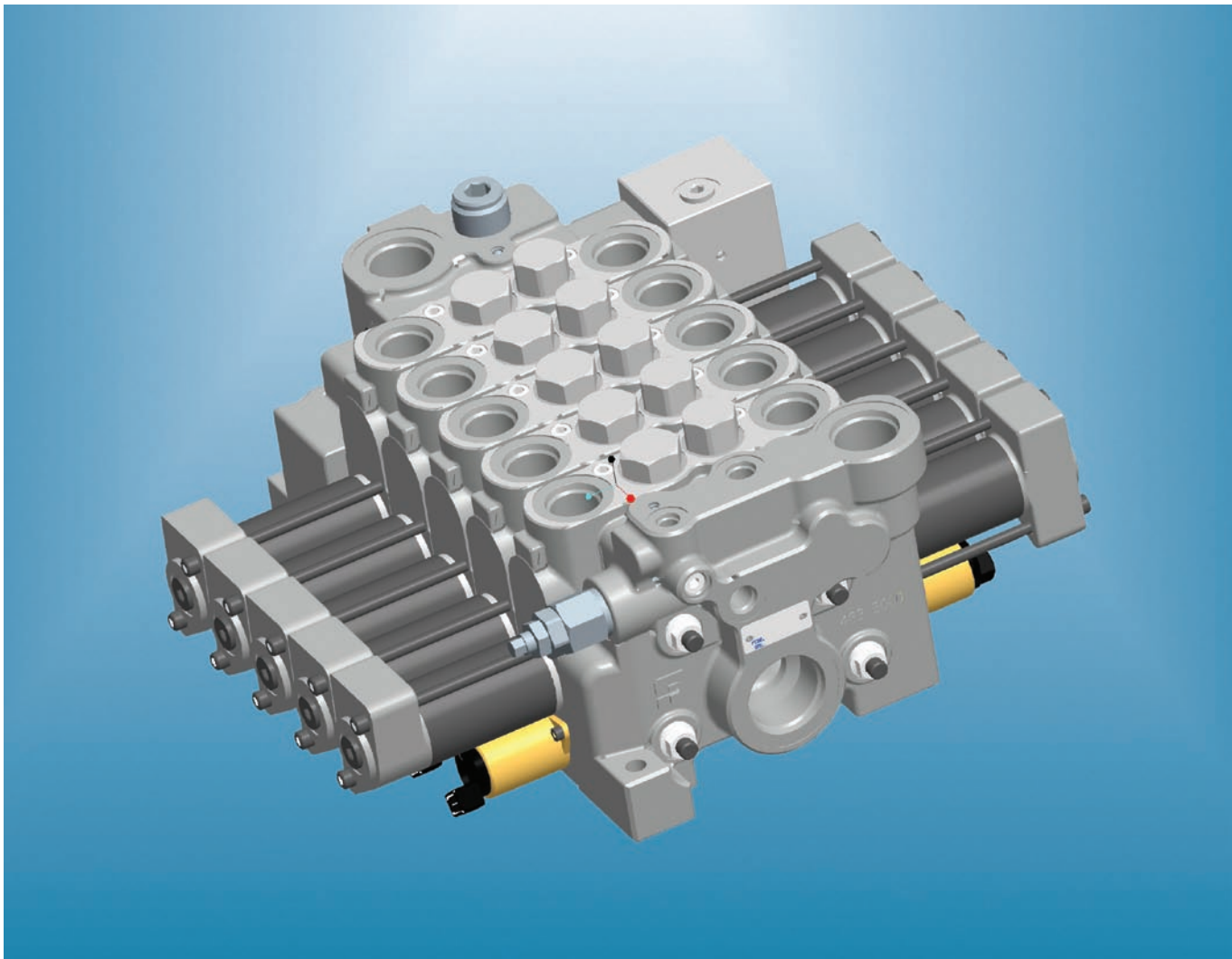




Directional Control Valve VP170

***Proportional, Load-Sensing,
Pressure Compensated***

Catalog HY14-2006/US



 **WARNING**

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Breadth of Line

Parker Hannifin is a Fortune 300 company with sales of \$8 billion and over 400,000 customers in 46 countries. Parker is the world's leading supplier of motion control components and system solutions serving the mobile, industrial and aerospace markets.

Parker is your single source for any hydraulic valve requirement. We provide a wide selection of open-center and load-sense directional control valves for any construction, off-highway, or on-highway application. Many of our open-center valves can be adapted and used as closed-center, constant-pressure, and constant-pressure unloaded valves. Each of these technologies offers unique features for improved machine performance over traditional, open-center control valves.



When remote control is required, Parker provides a broad line of pilot controllers that are compact and pressure-matched with our control valves to provide consistent and optimized machine control. There are a variety of electric-switch handle options available for additional function control by the operator.

Parker's premier IQAN electronics packages range from simple stand-alone controllers to large, multiple CAN bus systems with color displays. For example, IQAN interfaces with new electronic diesel engines over the SAE J1939 CAN bus.

Package components are designed and tested for mobile applications to help increase machine uptime. The IQAN valve drivers offer superior control of proportional hydraulic functions resulting in increased machine productivity.

Non-programmers find IQAN's programming interface easy to use, reducing development time. Furthermore, excellent diagnostic tools and remote modem connection help cut field service time.

Total Machine Motion Control

You can turn to us for all your mobile motion control solutions. We offer stand-alone valves, as well as custom-designed manifolds with integrated directional control valves.

No matter what type of system you choose, Parker solutions provide top-notch performance and reliability. Our systems are optimized to reduce complexity, size, cost, and fluid leakage. Therefore, working with Parker can significantly cut your machine-build time.



State-of-the-Art Manufacturing

Parker is committed to using lean manufacturing to eliminate waste while streamlining processes. Lean technology helps us meet customer request dates quickly and cost-effectively. We also rely on state-of-the-art equipment and technology, such as computer-aided machining, to ensure product quality.

We regularly invest in our ISO 9001 certified manufacturing facilities because we are committed to meeting all international standards for safety and quality. The hydraulic valves we manufacture comply with relevant ISO, CSA, CE, and AMEX standards.

In addition, Parker hydraulic valves and valve manifolds are fully tested and certified before being released to the customer. You can expect Parker hydraulic valves to work the first time, every time.

Customer Service with a Global Reach

Parker's worldwide network of field sales engineers and Mobile Systems Engineers (MSEs) are the best in the business. A field sales engineer works closely with you, acting as a single point of contact to evaluate applications and design solutions. MSEs support field sales efforts by

managing difficult design problems and complex circuit design.

You also benefit from Parker Mobile Technology Centers (MTCs) that are staffed by specially trained distributors who provide only the highest levels of customer service. These one-stop shops offer complete hydraulic systems design for mobile applications, as well as technology services such as diagnostics, troubleshooting, computer design, testing, and integration of electronic controls.

Finally, our thousands of dependable distributors are strategically located in your markets. They carry inventory to meet specific, local market needs, and they ensure that products arrive when and where they are needed. You can count on Parker distributors to minimize downtime.

To locate your nearest distributor for the latest information on the VP170 Directional Control Valve, or our entire mobile valve line-up, visit us at www.parker.com.



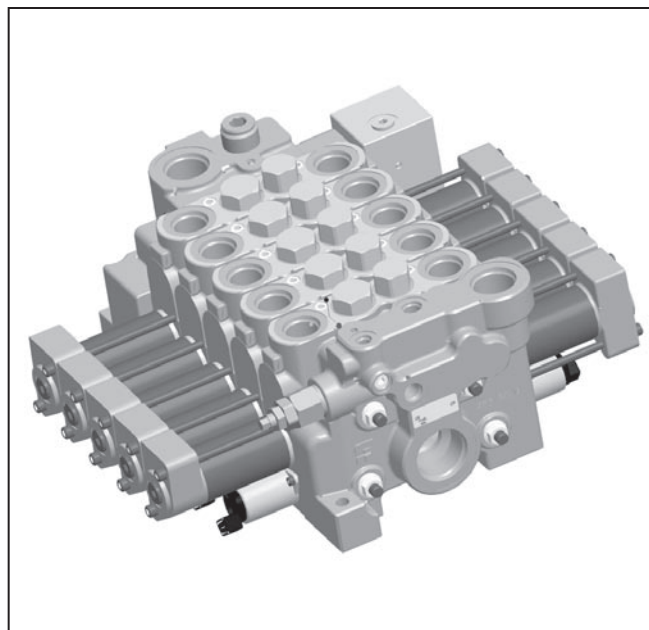
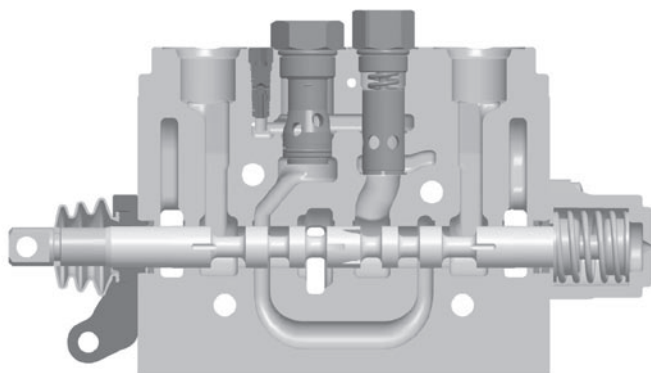
General Description

The VP170 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 rpms. The key technology integrated into the VP170 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.

The design of the VP170 is modular, allowing for content to be added or taken out of the valve to better match its value to varying machine requirements. For example, it is available as a load-sense pressure compensated, load-sense only, and with and without induced-load protection.

The valve can be operated manually, pneumatically, hydraulic remote or with solenoids. The same solenoid is used for on/off and proportional control. A bypass unloader is available for use with fixed-displacement pumps. Also, a new, low-pressure regeneration feature has been designed to overcome the damaging affects of cavitation – premature component wear and spongy operation.

The VP170 uses the same spool positioners and port accessories as its open-center counterpart – VA/VG20. The standard spool types are 3-way, 4-way and 4-position float. The standard flow limited spools are |8, 16, 24, 32 and 45 GPM based upon a margin pressure of 250 PSI. There is also a standard spool that is not flow limited.

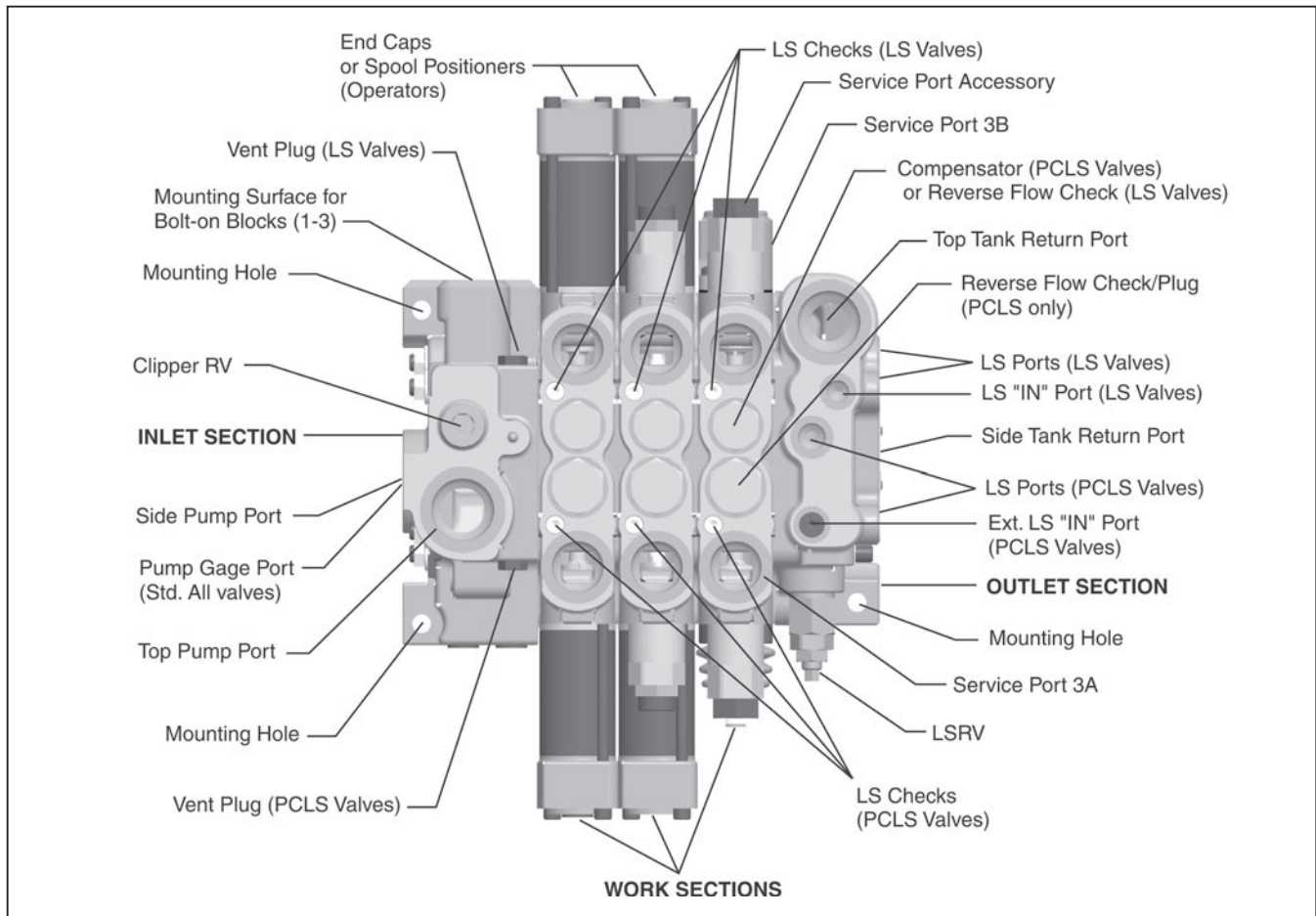


Operation

The VP170 (PCLS) is an individually compensated load-sense directional control valve. For optimum horsepower utilization and heat generation, 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 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 changes in pressure or input flow. This enhances machine control, improves productivity and helps to make every operator an “expert” operator -- all of which saves money. Also, this valve type lends itself to closed-loop control.
- **Improved system efficiency** – optimized horsepower utilization and heat management are inherent with load-sense pressure compensated valves. This is because of a closer match between horsepower consumption and horsepower demand. Fuel savings between 30-50% can be achieved vs. open-center type systems. Also, better horsepower utilization may enable the use of a smaller, less costly engine.
- **Enhanced machine productivity** – the VP170 incorporates flow-sharing technology. This means that during a pump over-demand condition the valve will automatically apportion the available pump flow to the selected functions, based upon control spool area openings. 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.
- **Flexible design** – the modular design of the VP170 enables the machine designer to add or remove content to achieve a better “value match” with the machine requirements. For example, the VP170 is available as load-sense pressure compensated, load-sense only, and with or without induced-load protection. Also, a full line of spool positioners and port accessories is available.
- **Wide flow range** – offers application potential across a family of machines. The VP170 can handle a pump input of 230 LPM (60 GPM) and work sections flows from 30-190 LPM (8-50 GPM).
- **Induced-load protection** – is available for machines whose duty cycles might generate induced loads greater than the load-sense relief valve setting. This is an important option for valves with flow-sharing technology and has the benefit of maintaining machine productivity.
- **Addresses cavitation and maintains system responsiveness** – a unique, optional low-pressure regeneration feature combats cavitation and the damage it causes to hydraulic components -- reducing warranty costs as much as 15%. This device assures there is hydraulic oil in the loop at all times.
- **Ease of service** – the load-sense check, compensator and transition check are located on top of each work section making it a “service friendly” design.

Definitions

PCLS = Pressure Compensated Load-Sense, or load-sensing with individual pressure compensation. Individual pressure compensation means each circuit (work section) has a pressure compensator. These pressure compensators reduce pressure to individual circuit needs resulting in flows for each circuit being proportional to spool stroke.

LS = Load-Sensing (no individual pressure compensators). Flow is proportional to spool stroke in the highest loaded function only.

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

Clipper RV = “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 0.045" 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.

PRRV = Pressure Reducing and Relieving Valve.

Q = Flow or Flow rate.

LS vent = A small connection (0.014"/0.017" diameter) of the LS gallery to tank to “bleed down” the LS pressure to the tank level when LS pressure is not required.

LS check = Helps decide which circuit has the highest LS pressure.

Flow sharing = A valve arranged so available flow is shared between active circuits – also known as “post compensated”.

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

Specifications

Pressures	Pump inlets: 350 Bar (5000 PSI) Service Ports: 350 Bar (5000 PSI) Pilot (input or internal supply): 35 Bar (508 PSI) Tank Return: 15 Bar (220 PSI) Solenoid Drain: 2 Bar (29 PSI)
Flow Rates	Maximum Input: 227 LPM (60 US GPM) Maximum Flow out of Service Ports: 190 LPM (50 US GPM) Max. Return to Service Port: 280 LPM (75 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. Workport w/RV or RV+AC: 24 cc/min max. Thru Reverse Flow Check: 180 cc/min max. Thru Compensator Only (no Reverse Flow Check): 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

Inlet w/o Bolt-on Block	9.53 kg (21 lb)
Inlet with Bolt-on Block	12.25 kg (27 lb)
Work Sections	
Manual	9.10 kg (20 lb)
Hydraulic Remote	9.53 kg (21 lb)
EH	9.98 kg (22 lb)
Outlets	
Standard	8.62 kg (19 lb)
LP Regen	10.43 kg (23 lb)
LS Unloader	10.43 kg (23 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

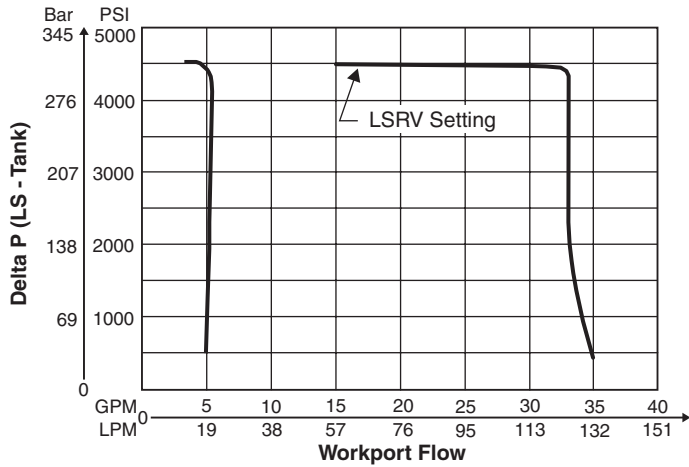
O-ring boss ports SAE-J1926-1
 BSPP ports ISO 1179-1
 Pump gage port standard
 o-ring boss 9/16"-18 UNF , BSPP ports 1/4"-19

Description	SAE #	Thread Size	
		O-ring Boss (UNF)	BSPP
inlet, top	16	1 ⁵ / ₁₆ -12	1"-11
inlet, top	12	1 ¹ / ₁₆ -12	3/4"-14
inlet, side	16	1 ⁵ / ₁₆ -12	1"-11
inlet, side	12	1 ¹ / ₁₆ -12	3/4"-14
EH inlet, pilot	6	9/16-18	1/4"-19
All block ports	6	9/16-18	1/4"-19
outlet, top	16	1 ⁵ / ₁₆ -12	1"-11
outlet, top	12	1 ¹ / ₁₆ -12	3/4"-14
outlet, side	16	1 ⁵ / ₁₆ -12	1"-11
outlet, side	12	1 ¹ / ₁₆ -12	3/4"-14
outlet, side	20	1 ⁵ / ₈ -12	1 ¹ / ₄ "-11
work section	8	3/4-16	(none)
work section	10	7/8-14	1/2"-14
work section	12	1 ¹ / ₁₆ -12	3/4"-14

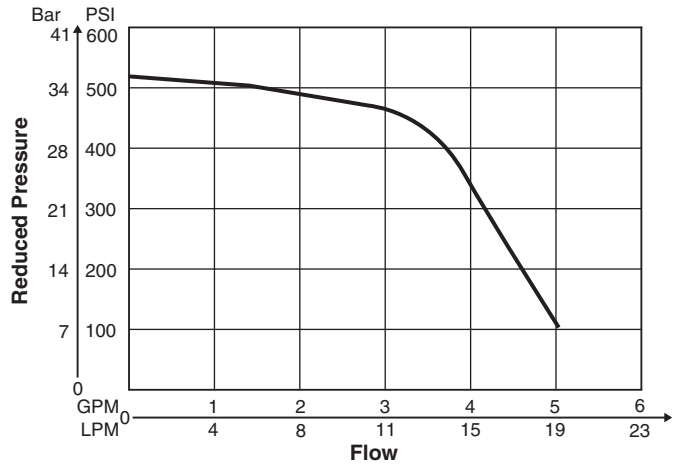
Solenoid Specifications

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)		

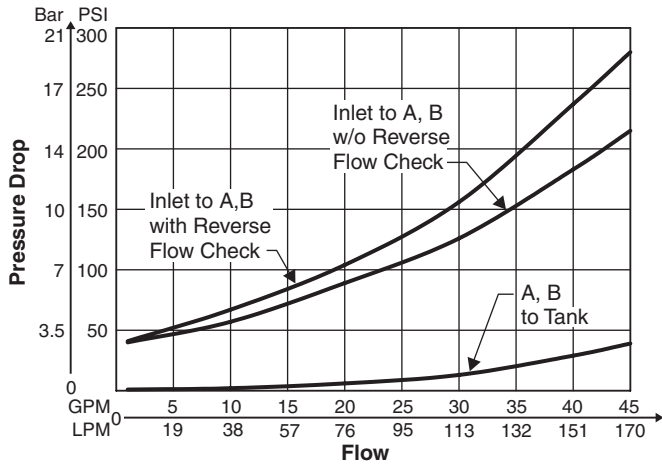
Compensator Performance



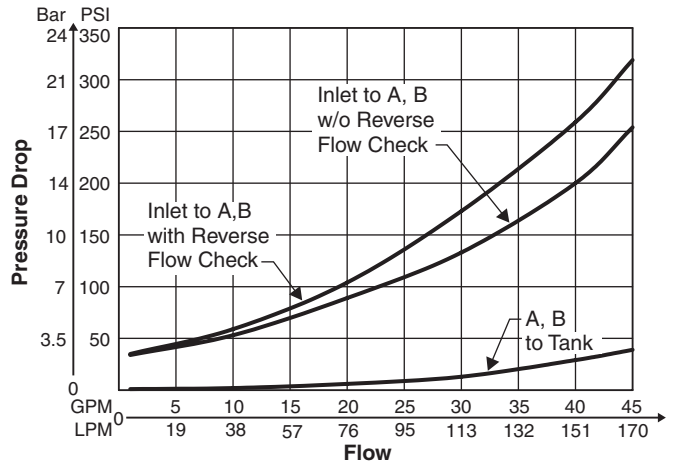
PRRV Pressure vs. Flow



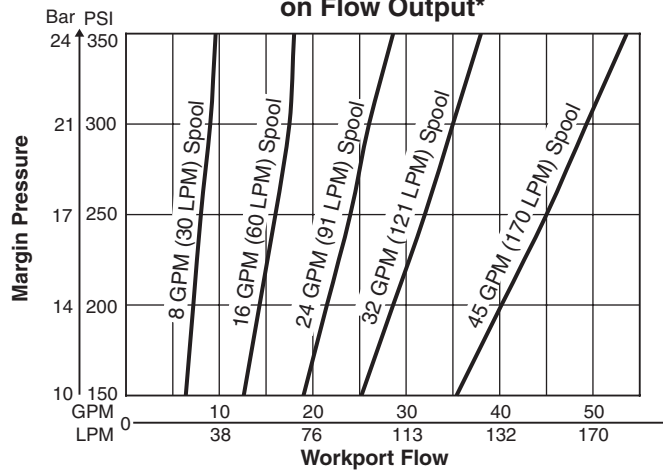
1 Spool Pressure Drop vs. Flow



7 Spool Pressure Drop vs. Flow

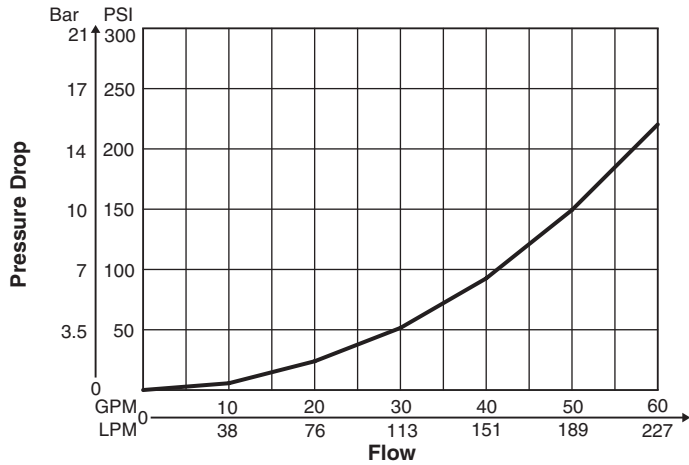


Effects of Margin Pressure on Flow Output*

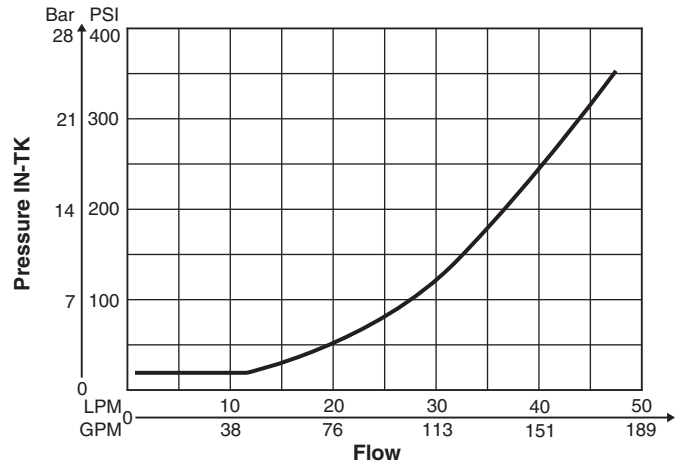


* assumes no Delta P from pump to valve

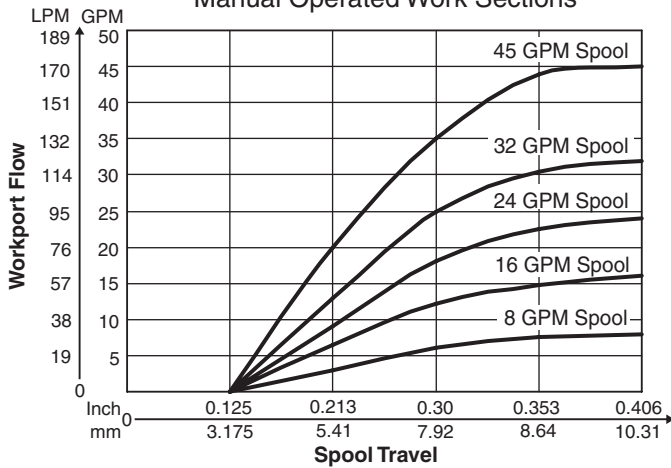
A/C Curve 355 9001 164



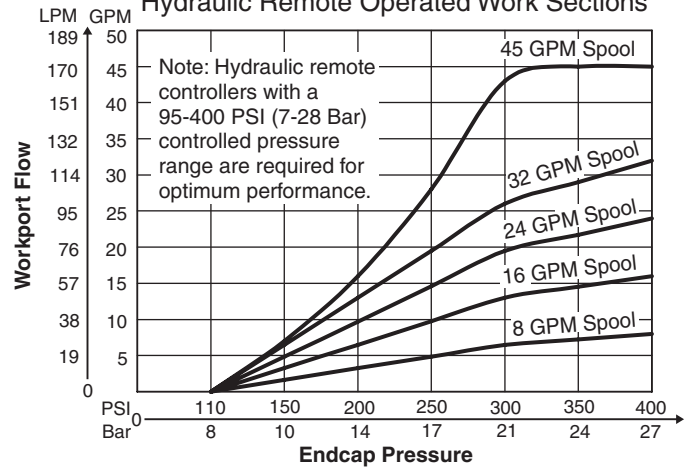
A/C Curve 355 9001 278



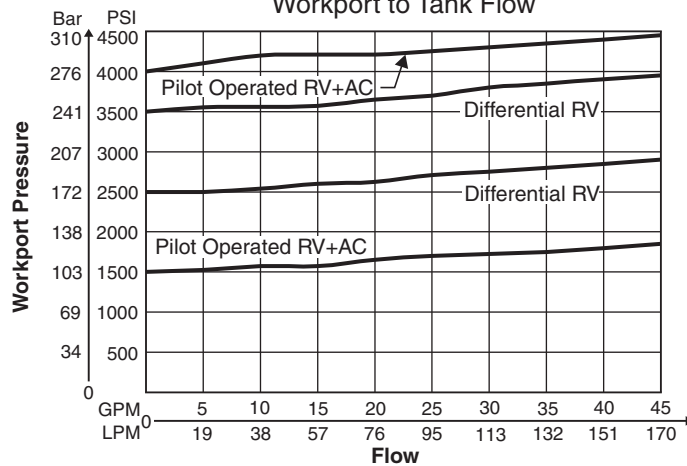
**Meter-In Flow to Workport
 Manual Operated Work Sections**



**Meter-In Flow to Workport
 Hydraulic Remote Operated Work Sections**



**Port Relief Valve Curves
 Workport to Tank Flow**



Major Valve Options

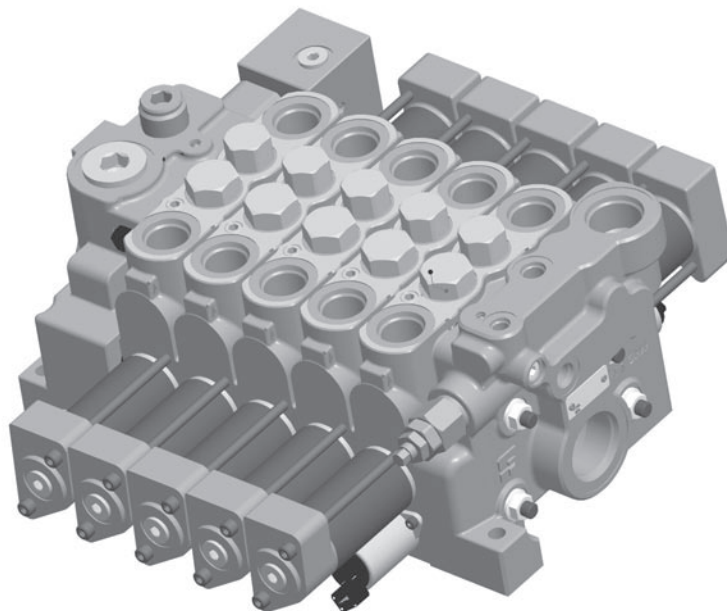
I Circuits:

- A) LS – when individual pressure compensation isn't needed.
- B) PCLS without reverse flow check – when “induced loads”* are not anticipated. Also, the check may be eliminated when load drift is not required.
- C) PCLS with reverse flow check – when “induced loads”* are anticipated. Also, the check serves as a low leak transition check.

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

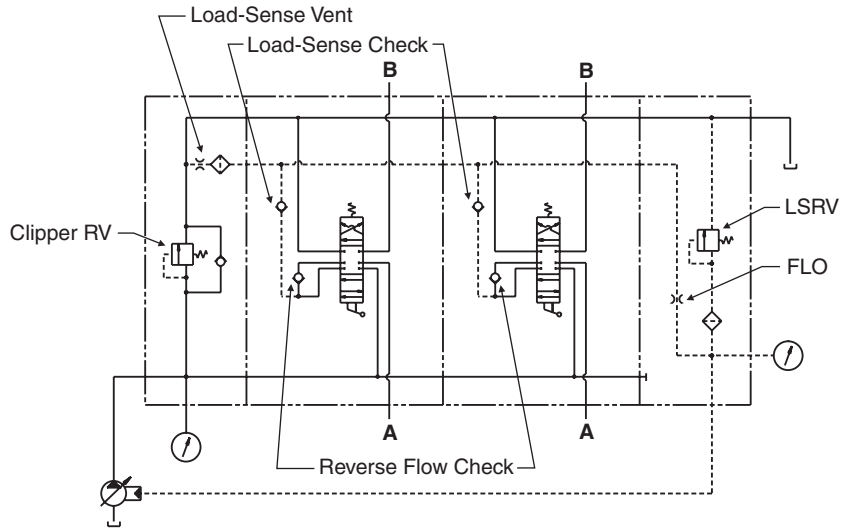
II Inlets:

- A) Standard - all spool operators except solenoid
 - B) “EH” - “external supply” to solenoids – port for connecting external supply to solenoids and drain port – 1.7 Bar (25 PSI) max
 - C) Inlet + block 1, 2, 3
 - Block 1: “Internal supply” – reduced PSI to solenoids via internal pilot gallery
Internal supply to solenoid operators.
 - Block 2: “Joystick supply” – reduced PSI to external port to supply joystick(s)
No internal pilot supply.
 - Block 3: “Kidney loop” – reduced PSI to an external pilot port. The signal 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 blocks 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 – 1.7 Bar (25 PSI) max

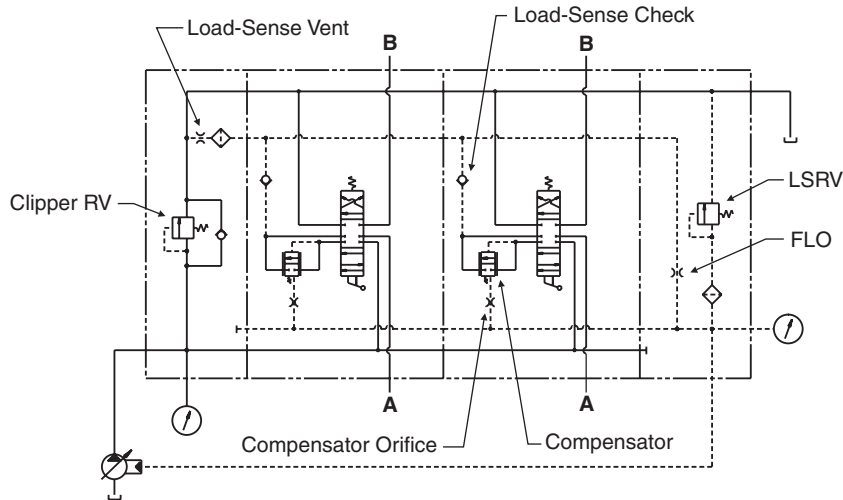


How VP170 May Be Arranged

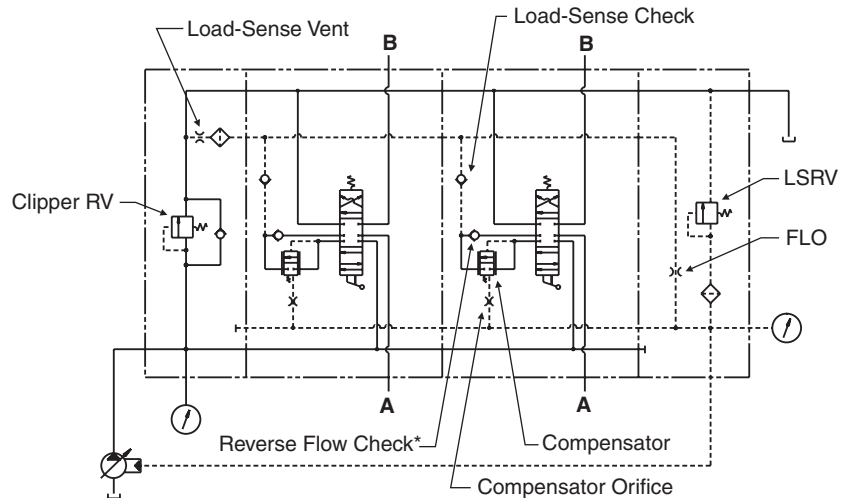
Load-Sense Valve



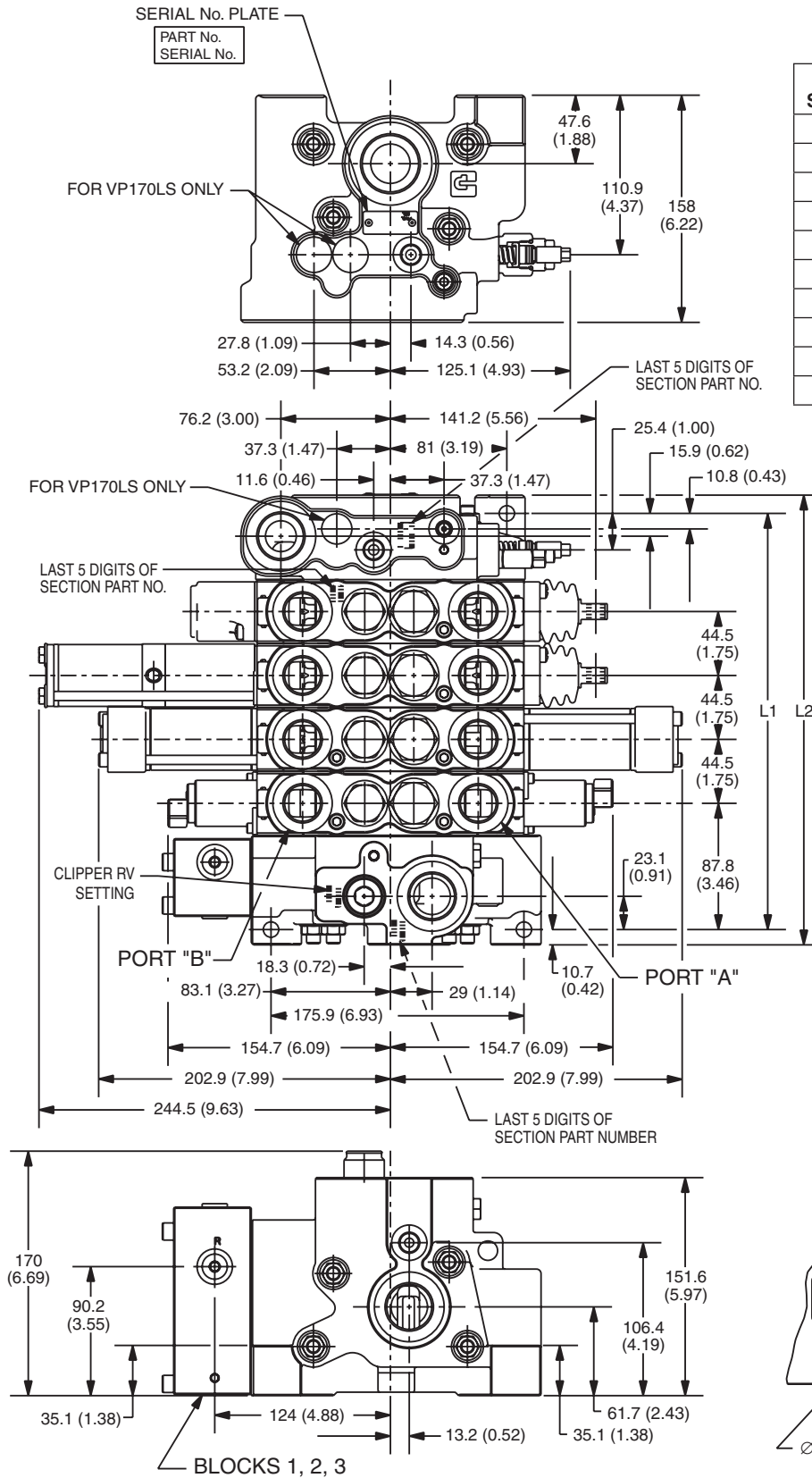
**Pressure Compensated Load-Sense (PCLS)
 without Reverse Flow check**



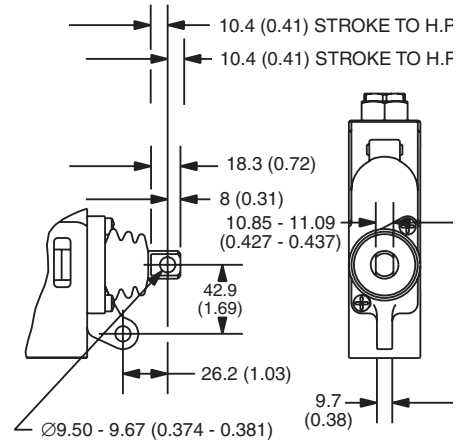
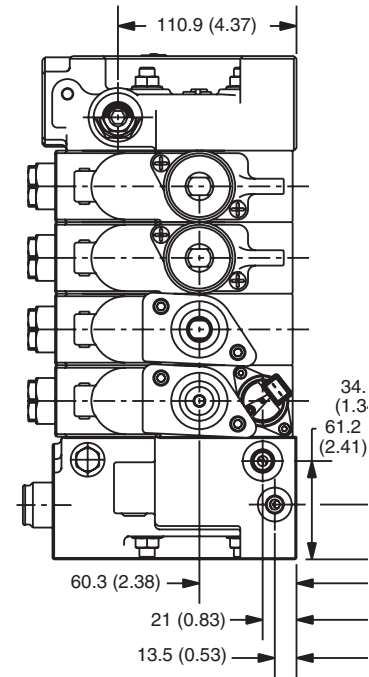
**Pressure Compensated Load-Sense (PCLS)
 with Reverse Flow Check*
 (Protects against Induced Loads)**



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



No. of Sections	L1	L2
1	156 (6.14)	179.3 (7.06)
2	200.4 (7.89)	223.8 (8.81)
3	244.9 (9.64)	269.2 (10.6)
4	289.3 (11.39)	313.7 (12.35)
5	333.8 (13.14)	358.1 (14.1)
6	378.2 (14.89)	402.6 (15.85)
7	422.7 (16.64)	447.0 (17.6)
8	467.1 (18.39)	491.5 (19.35)
9	511.6 (20.14)	535.9 (21.1)
10	556 (21.89)	580.4 (22.85)



TYPE 1 END

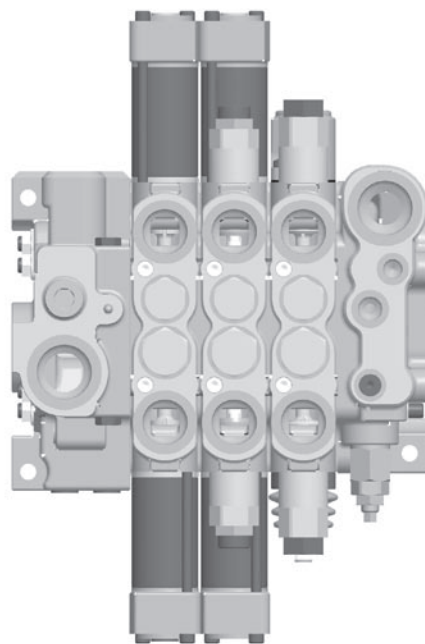
How to Configure a Valve Assembly

There are three choices available to configure a valve assembly: a hard copy specification sheet that is shown on page 25, 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	BSPP
[05]	System Voltage
12	12 VDC
24	24 VDC
[06]	Connector Type
D	Deutsch
A	Amp
W	Weatherpack (see below)
[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

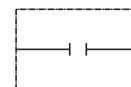
The standard inlet has high pressure ports available on the top and side, and a gage port is also located on the side. An optional clipper relief valve is positioned on the top and set @ 20 LPM (5.3 GPM).

- **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.
- **Inlet + block 1, 2 or 3** - all three blocks have a screen upstream of the PRRV, an accumulator port and check valve, a PRRV and a dedicated solenoid drain port.

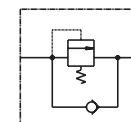
[15]	Inlet Section Type (See next page)
I	Standard
IEH	EH
I1 (block 1)	Internal pilot supply to ports A&B. It also has an optional port that provides a regulated signal out (with a steel plug).
I2 (block 2)	Supplies a regulated external signal to a hydraulic remote controller.
I3 (block 3)	Provides external pilot supply that can be routed thru an external filter and then back into the inlet, for internal supply to the work sections.
[16]	Clipper RV Cavity
Y	Steel plug
PA	RV+AC (non-adjustable)
Z	Plastic closure
[17]	Clipper RV setting (bar)
80	80 Bar (1160 PSI)
100	100 Bar (1450 PSI)
125	125 Bar (1813 PSI)
140	140 Bar (2030 PSI)
160	160 Bar (2320 PSI)
175	175 Bar (2540 PSI)
190	190 Bar (2755 PSI)
210	210 Bar (3045 PSI)
230	230 Bar (3335 PSI)
250	250 Bar (3625 PSI)
280	280 Bar (4060 PSI)
300	300 Bar (4350 PSI)
330	330 Bar (4785 PSI)
350	350 Bar (5075 PSI)
380	380 Bar (5510 PSI)
400	400 Bar (5800 PSI)
[26]	Top Inlet HP Port
1TOPB	SAE 16 or 1" BSPP with a steel plug
1TOP	SAE 16 or 1" BSPP open
[27]	Side Inlet HP Port
1SB	SAE 16 or 1" BSPP with a steel plug
1S	SAE 16 or 1" BSPP open

[16] Clipper RV Cavity

Code Y

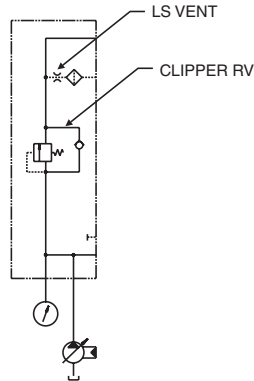
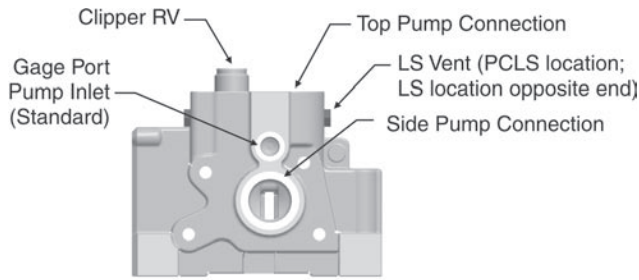


Code PA

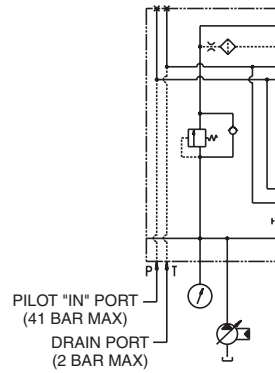
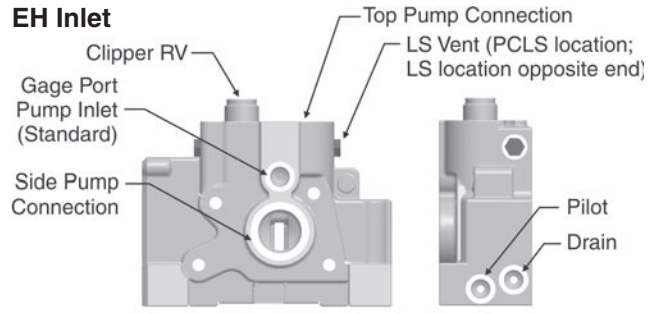


[15] Inlet Section Type

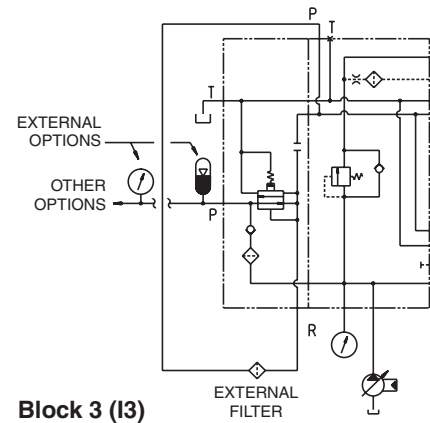
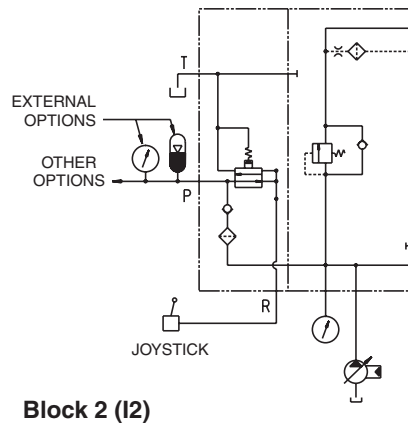
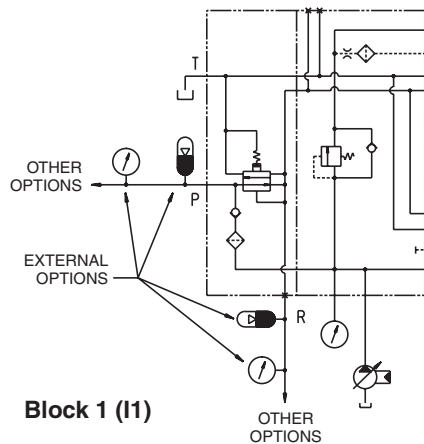
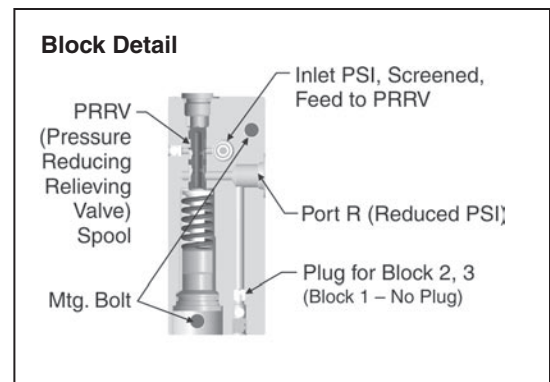
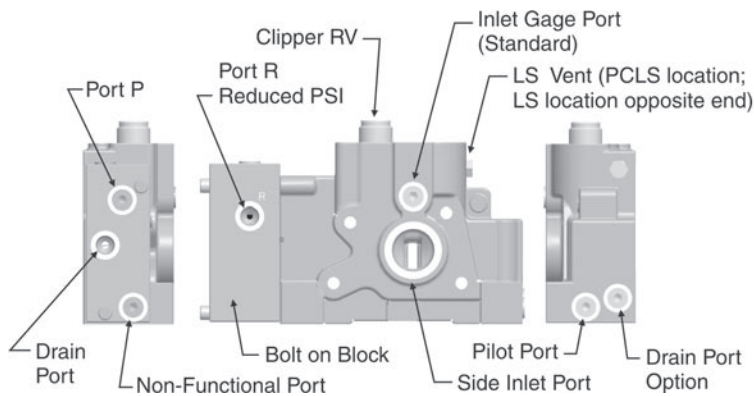
Standard Inlet



EH Inlet



Inlet with Bolt on Block



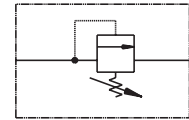
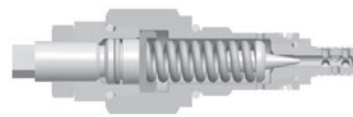
Outlet Attributes

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.

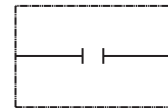
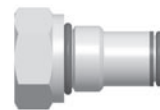
[31]	Top load-sense IN port
LSP	Yes
LSPB	No
[34]	Top tank return port
1 TOPTB	SAE 16 or 1" BSPP with a steel plug
1TOPT	SAE 16 or 1" BSPP open
[33]	Side tank return port
1STB	SAE 16 or 1" BSPP with a steel plug
1ST	SAE 16 or 1" BSPP open
2 STB	SAE 20 or 1 ¼" BSPP with a steel plug
2 ST	SAE 20 or 1 ¼" BSPP open
[41]	LSRV Cavity
LSRV	Load-sense relief valve
Y	Steel plug
[43]	Load-sense RV setting (Bar)
Bar	Enter setting. If none, omit

[41] LSRV Cavity

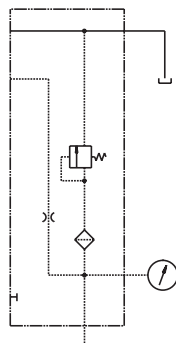
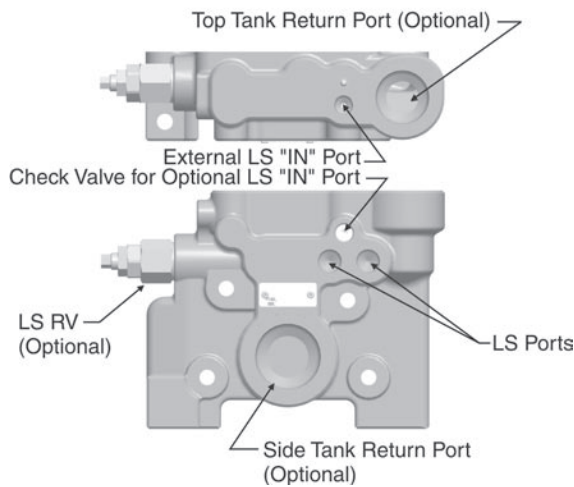
Code LSRV



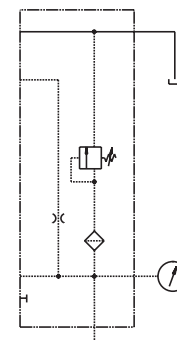
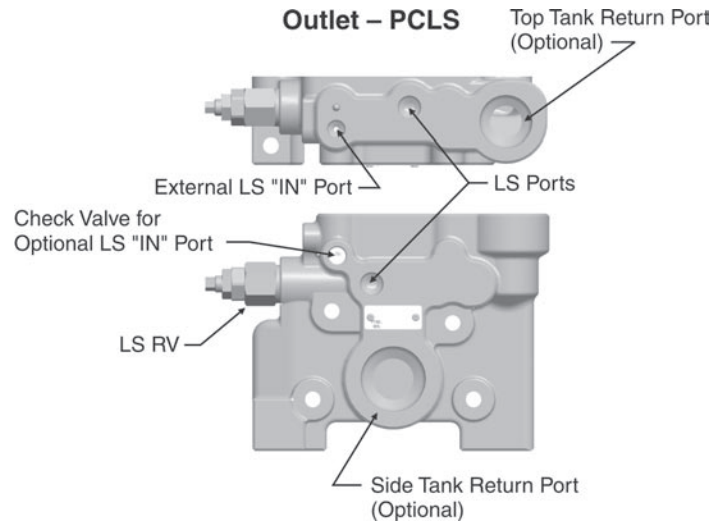
Code Y



Outlet – Load Sense



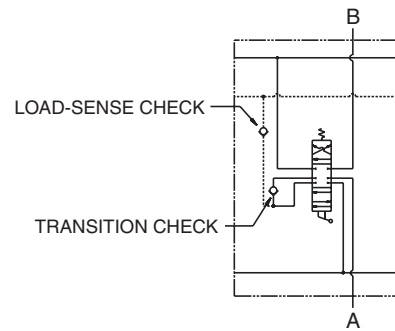
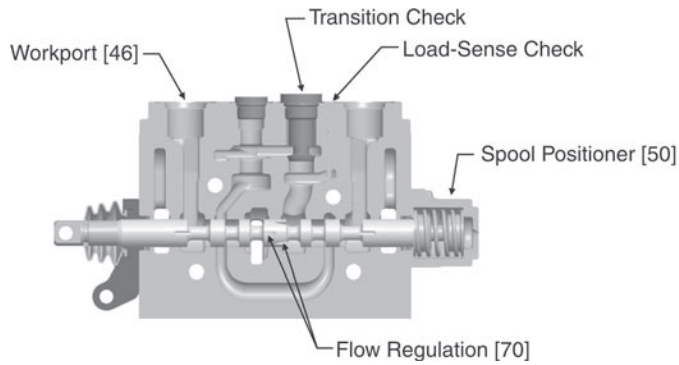
Outlet – PCLS



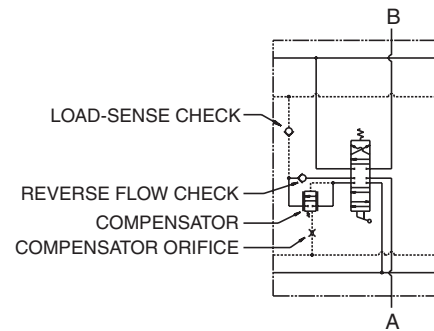
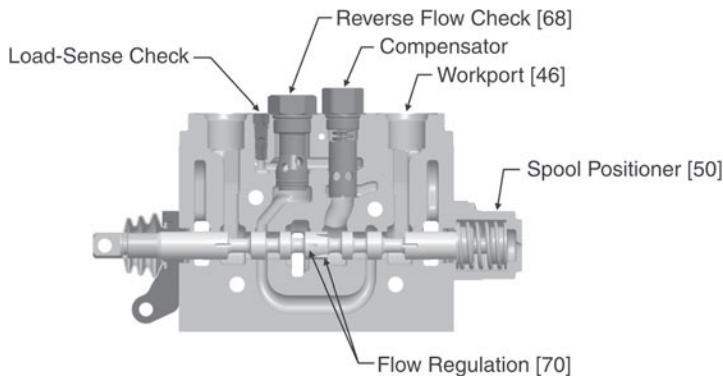
Work Section Attributes

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, pneumatic, hydraulic remote and solenoid.

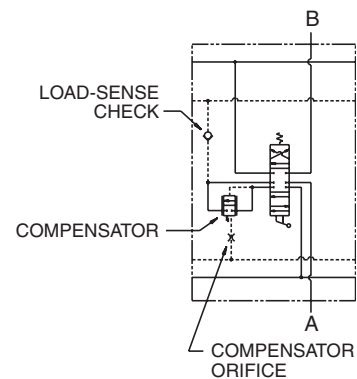
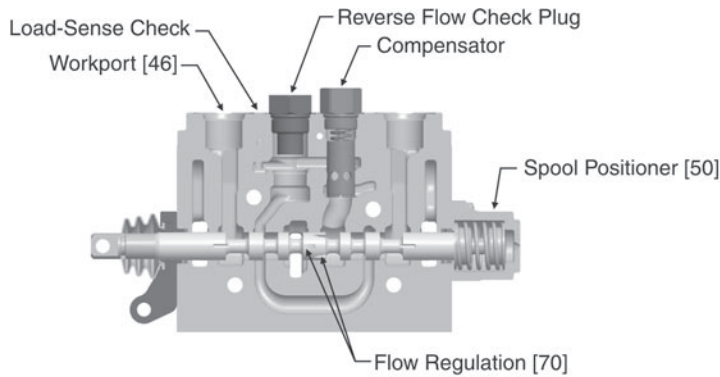
Load-Sensing Work Section



PCLS Work Section with Reverse Flow Check



PCLS Work Section w/o Reverse Flow Check



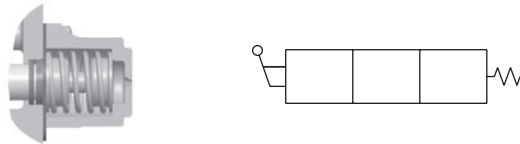
Work-Section Attributes

[46]	Size of work ports
WP2001	SAE 10 or 1/2" BSPP
WP2002	SAE 12 or 3/4" BSPP
[50]	Spool Positioner (See below and next page)
C1	Manual, 3-position
CB	Manual, 4-position, detent in 4th position float
B3	Manual, 3-position detent
3SD	Manual, 3-position, detent IN, spring-return OUT
ACP	Pneumatic, 3-position
PC	Hydraulic-remote, 3-position
PCA	Hydraulic-remote, 3-position, adjusted spool stroke
PCF	Hydraulic-remote, 4-position float
EC	Solenoid, 3-position
ECA	Solenoid, 3-position, adjusted spool stroke
ECF	Solenoid, 4-position float

[50] Work Section Spool Positioner

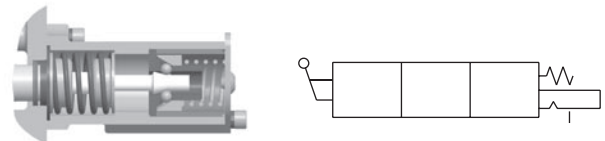
Code C1 = Spring Return

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



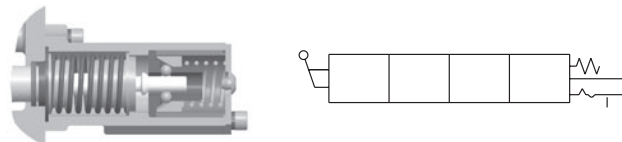
Code 3SD = Spring Return Out, Detent In

Basic Function:
Spool is detented when pushed IN. Spool is returned to neutral via spring when pulled OUT.



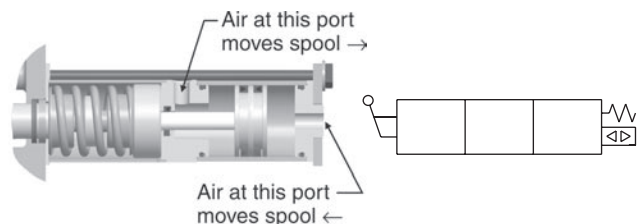
Code CB = Spring Return w/4th Position Detent

Basic Function:
Spring return from either work position. Detent in 4th position. Manual handle operation.



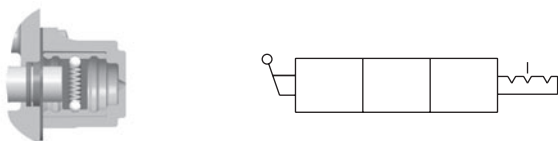
Code ACP = Single Ended Pneumatic

Basic Function:
Proportional air pilot PSI, admitted at either port, balances against spring.



Code B3 = 3-Position Detent

Basic Function:
Hold spool in neutral position or in either work position. Manual handle operation.



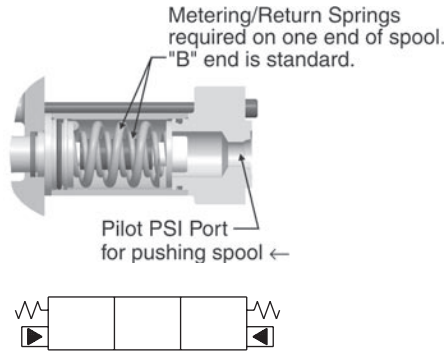
Continued on next page

[50] Work Section Spool Positioner (cont.)

Code PC = Hydraulic Remote (Proportional)

Basic Function:

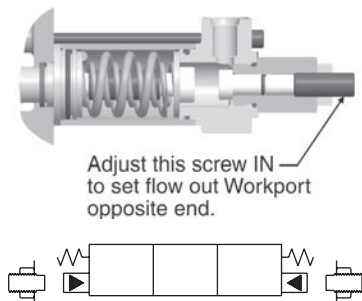
Proportional hydraulic pilot PSI is admitted to port (PCL4) and balances against metering/return springs. Use metering band of PCL4 for best match.



Code PCA = Hydraulic Remote, Adj. Spool Stroke

Basic Function:

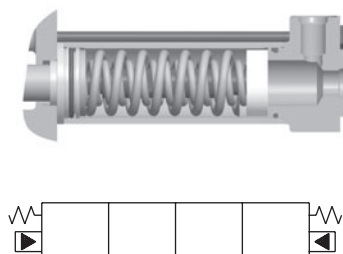
Reduce spool stroke thus reducing flow to service ports. Can reduce spool stroke from 0.406 to 0.094. Flow (Q) set at "A", "B" [61]



Code PCF = Hydraulic Remote, 4-Position Float

Basic Function:

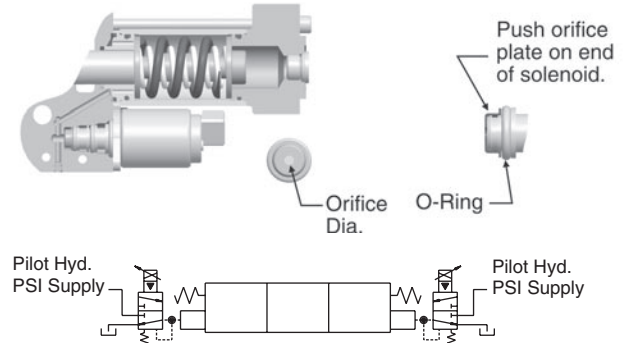
Proportional hydraulic pilot PSI admitted to ports from PCL4 moves spool proportionally to HP @ A, B or 4th position float.



Code EC = Proportional Solenoid, 3-Position

Basic Function:

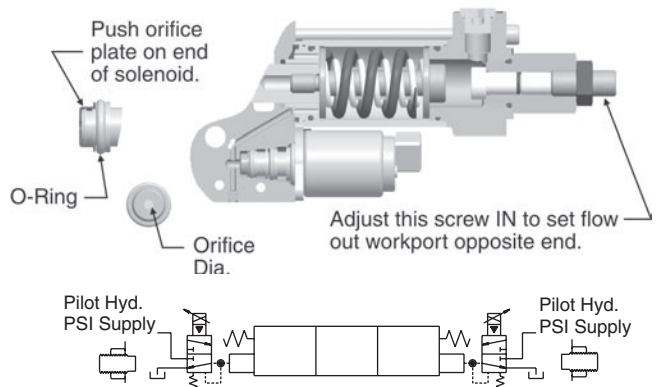
Proportional spool movement via proportional current to solenoid (ref. IQAN).



Code ECA = Proportional Solenoid, Adj. Spool Stroke

Basic Function:

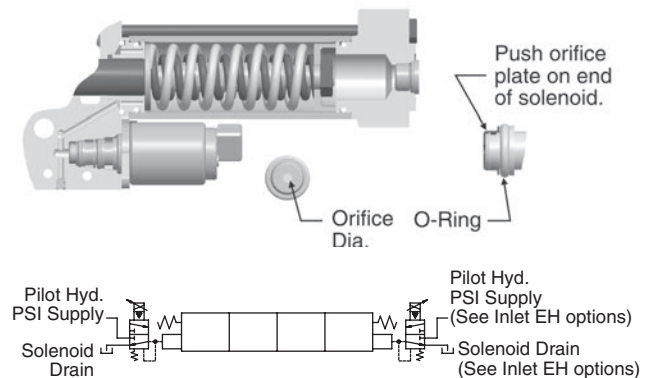
Reduce spool stroke thus reducing flow to service ports. Can reduce spool stroke from 0.406 to 0.094. Flow (Q) set at "A", "B" [61]

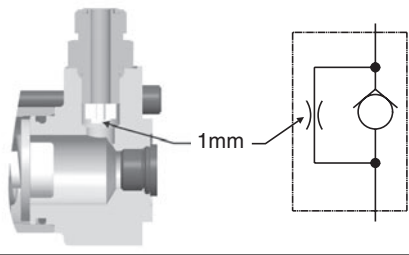
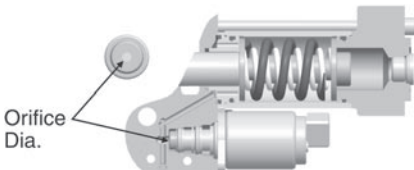
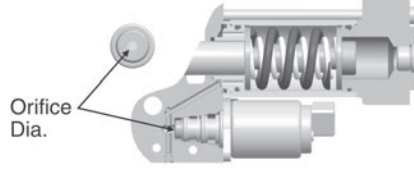


Code ECF = Proportional Solenoid, 4-Position Float

Basic Function:

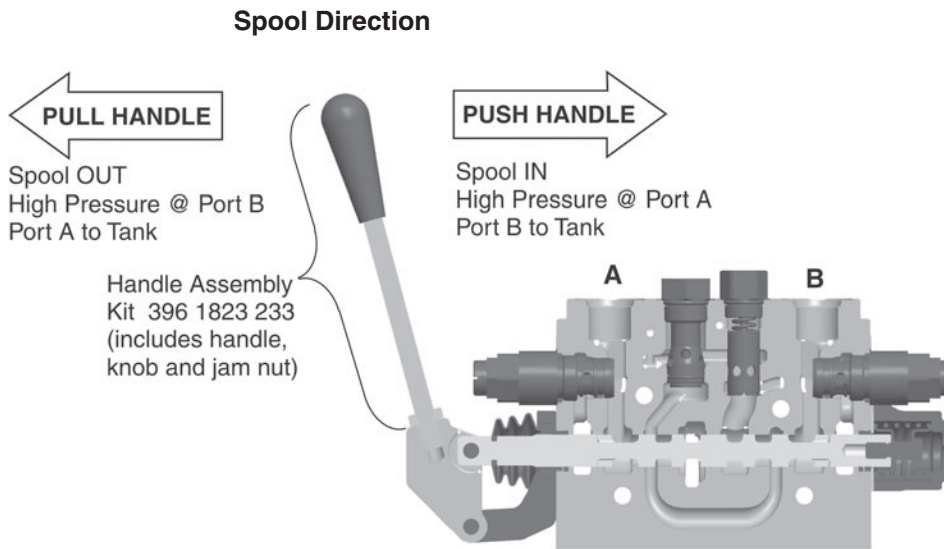
Solenoids use current proportioning to proportion hydraulic pilot PSI and balance it against metering/return springs for proportional spool movement.



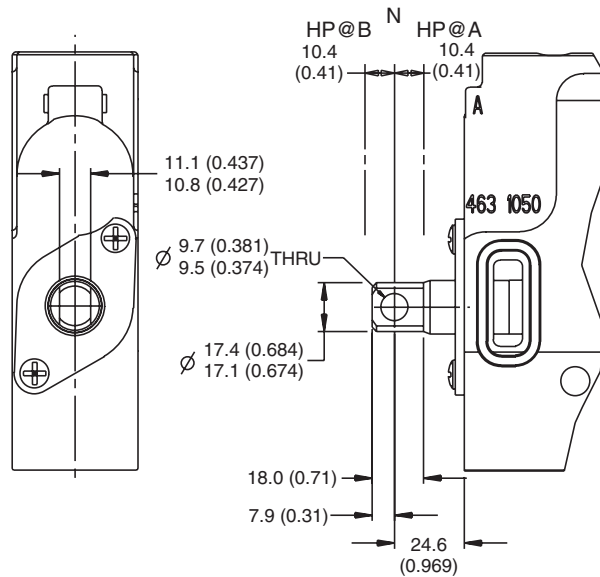
[51]	Manual Operator (See next page)	
L1	Type 1 Handle	
L2	Type 2 Lug End	
[55A]	Pilot orifice diameter for hydraulic remote. Controls shift to 'A' port – mm. This option is utilized, when dampening is needed.	
1	1 mm (0.039")	
0	None	
[55B]	Pilot orifice diameter. Controls shift to 'B' port – mm. This option is utilized, when dampening is needed.	
1	1 mm (0.039")	
0	None	
[56A]	Solenoid pilot orifice. Controls shift to 'A' port – mm. This option is utilized, when dampening is needed. The standard size is 3mm.	
.45	0.45	
.6	0.6	
.7	0.7	
0.8	0.8	
0.9	0.9	
1	1	
1.1	1.1	
1.2	1.2	
1.3	1.3	
1.4	1.4	
1.5	1.5	
2	2	
3	3	
[56B]	Solenoid pilot orifice. Controls shift to 'B' port - mm. This option is utilized, when dampening is needed. The standard size is 3mm.	
.45	0.45	
.6	0.6	
.7	0.7	
0.8	0.8	
0.9	0.9	
1	1	
1.1	1.1	
1.2	1.2	
1.3	1.3	
1.4	1.4	
1.5	1.5	
2	2	
3	3	






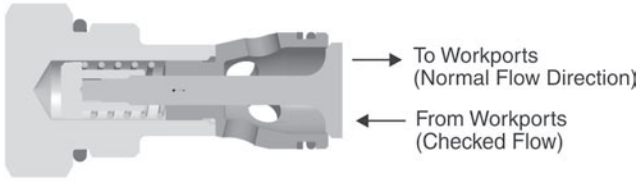
[51] Manual Operators

Type 1 Handle End



Type 2 Lug End



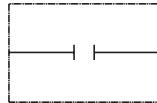
[57]	Diode (ports A and B)	
D1	Yes	
/	No	
[60]	Spool Function	
D	Double-Acting Cylinder	
M	Double-Acting Motor	
DEB	Single-Acting Cylinder @ port B	
MEB	Single-Acting Motor @ port B	
F	4th Position Float	
[61A]	Flow setting out of port 'A' with stroke limiter. For hydraulic remote or solenoid operation.	
LPM	Enter setting	
[61B]	Flow setting out of port 'B' with stroke limiter. For hydraulic remote or solenoid operation.	
LPM	Enter setting	
[68]	<p>Reverse Flow Check (applies to VP170 (PCLS) only. This feature addresses induced loads and also serves as a transition check. It is not needed if induced loads are not applicable OR the function has pilot-operated checks or counterbalance valves.</p>	
CV	Yes	
Y2	No	
[70]	Spool Flow at Full Stroke – Ports 'A & B'. This is based upon a margin pressure of 17 Bar (250 PSI)	
30/8	30 LPM/8 GPM	
61/16	61 LPM/16 GPM	
91/24	91 LPM/24 GPM	
121/32	121 LPM/32 GPM	
170/45	170 LPM/45 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

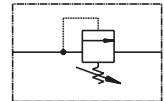
Port A	Accessory (See below for details)	Port B
[76A]	Accessory (See below for details)	[76B]
Y2	Steel Plug	Y2
C	Plastic Closure	C
PS	RV/AC, screw adjustable, 35-345 Bar (500-5000 PSI)	PS
RV1	RV, screw adjustable, 35-86 Bar (500-1250 PSI)	RV1
RV2	RV, screw adjustable, 86-183 Bar (1251-2650 PSI)	RV2
RV3	RV, screw adjustable, 183-269 Bar (2651-3900 PSI)	RV3
RV4	RV, shim adjustable, 35-69 Bar (500-1000 PSI)	RV5
RV5	RV, shim adjustable, 69-172 Bar (1001-2500 PSI)	RV6
RV6	RV, shim adjustable, 172-241 Bar (2501-3500 PSI)	RV7
N2	Anti-Cav	N2
Bars	R/V Setting – enter in Bars	Bars

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

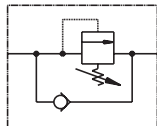
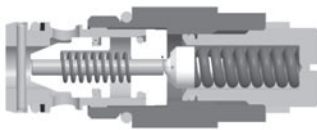
Code Y2



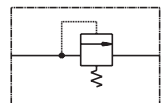
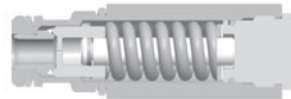
Code RV1, RV2, RV3



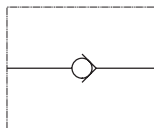
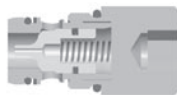
Code PS



Code RV4, RV5, RV6



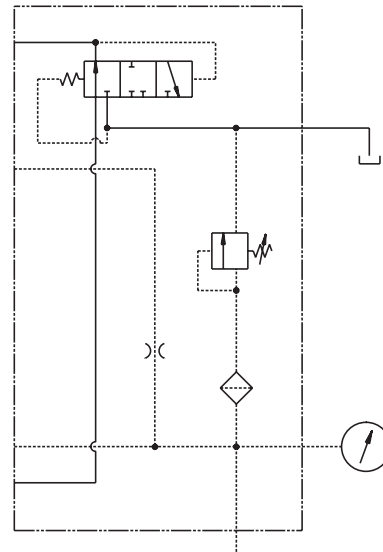
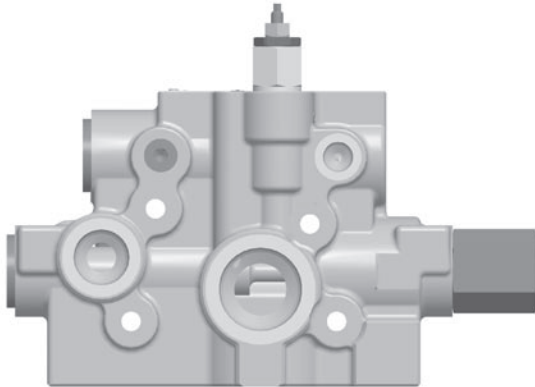
Code N2



Low Pressure Regeneration

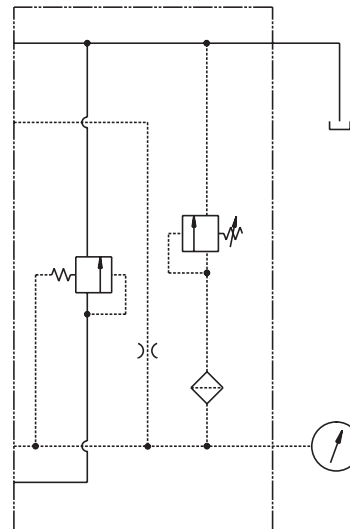
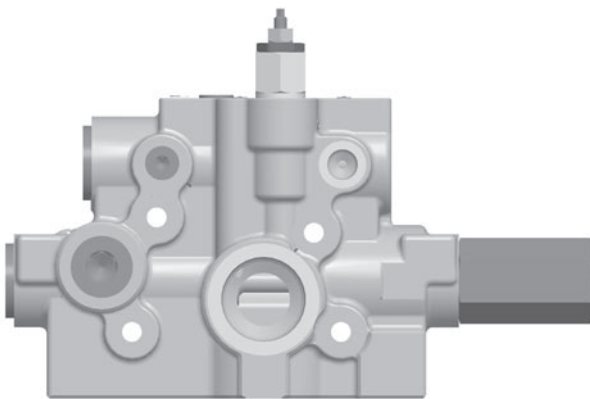
For combatting cavitation

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 stroke until that void is eliminated.

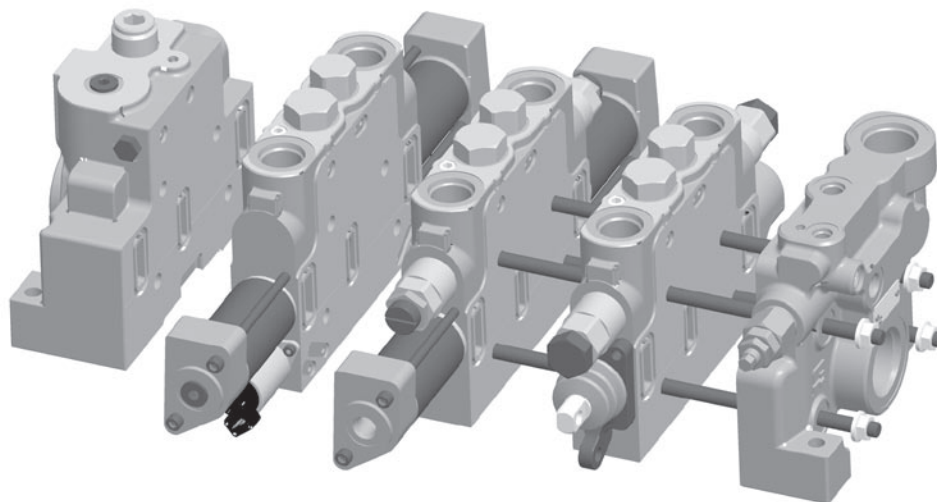


LS Unloader

Operates with fixed displacement pumps



Stud Assemblies



# Sections	Stud assembly	Stud	Length (in)
1	391 9425 108	391 1425 378	6.75
2	391 9425 107	391 1425 377	8.50
3	391 9425 085	391 1425 425	10.25
4	391 9425 109	391 1425 382	12.00
5	391 9425 111	391 1425 388	13.75
6	391 9425 121	391 1425 404	15.50
7	391 9425 122	391 1425 405	17.25
8	391 9425 123	391 1425 406	19.00
9	391 9425 124	391 1425 407	20.75

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1. Terms and Conditions of Sale: All descriptions, quotations, proposals, offers, acknowledgments, acceptances and sales of Seller's products are subject to and shall be governed exclusively by the terms and conditions stated herein. Buyer's acceptance of any offer to sell is limited to these terms and conditions. Any terms or conditions in addition to, or inconsistent with those stated herein, proposed by Buyer in any acceptance of an offer by Seller, are hereby objected to. No such additional, different or inconsistent terms and conditions shall become part of the contract between Buyer and Seller unless expressly accepted in writing by Seller. Seller's acceptance of any offer to purchase by Buyer is expressly conditional upon Buyer's assent to all the terms and conditions stated herein, including any terms in addition to, or inconsistent with those contained in Buyer's offer. Acceptance of Seller's products shall in all events constitute such assent.

2. Payment: Payment shall be made by Buyer net 30 days from the date of delivery of the items purchased hereunder. Amounts not timely paid shall bear interest at the maximum rate permitted by law for each month or portion thereof that the Buyer is late in making payment. Any claims by Buyer for omissions or shortages in a shipment shall be waived unless Seller receives notice thereof within 30 days after Buyer's receipt of the shipment.

3. Delivery: Unless otherwise provided on the face hereof, delivery shall be made F.O.B. Seller's plant. Regardless of the method of delivery, however, risk of loss shall pass to Buyer upon Seller's delivery to a carrier. Any delivery dates shown are approximate only and Seller shall have no liability for any delays in delivery.

4. Warranty: Seller warrants that the items sold hereunder shall be free from defects in material or workmanship for a period of 18 months from date of shipment from Parker Hannifin Corporation. **THIS WARRANTY COMPRISES THE SOLE AND ENTIRE WARRANTY PERTAINING TO ITEMS PROVIDED HEREUNDER. SELLER MAKES NO OTHER WARRANTY, GUARANTEE, OR REPRESENTATION OF ANY KIND WHATSOEVER. ALL OTHER WARRANTIES, INCLUDING BUT NOT LIMITED TO, MERCHANTABILITY AND FITNESS FOR PURPOSE, WHETHER EXPRESS, IMPLIED, OR ARISING BY OPERATION OF LAW, TRADE USAGE, OR COURSE OF DEALING ARE HEREBY DISCLAIMED. NOTWITHSTANDING THE FOREGOING, THERE ARE NO WARRANTIES WHATSOEVER ON ITEMS BUILT OR ACQUIRED WHOLLY OR PARTIALLY, TO BUYER'S DESIGNS OR SPECIFICATIONS.**

5. Limitation Of Remedy: SELLER'S LIABILITY ARISING FROM OR IN ANY WAY CONNECTED WITH THE ITEMS SOLD OR THIS CONTRACT SHALL BE LIMITED EXCLUSIVELY TO REPAIR OR REPLACEMENT OF THE ITEMS SOLD OR REFUND OF THE PURCHASE PRICE PAID BY BUYER, AT SELLER'S SOLE OPTION. IN NO EVENT SHALL SELLER BE LIABLE FOR ANY INCIDENTAL, CONSEQUENTIAL OR SPECIAL DAMAGES OF ANY KIND OR NATURE WHATSOEVER, INCLUDING BUT NOT LIMITED TO LOST PROFITS ARISING FROM OR IN ANY WAY CONNECTED WITH THIS AGREEMENT OR ITEMS SOLD HEREUNDER, WHETHER ALLEGED TO ARISE FROM BREACH OF CONTRACT, EXPRESS OR IMPLIED WARRANTY, OR IN TORT, INCLUDING WITHOUT LIMITATION, NEGLIGENCE, FAILURE TO WARN OR STRICT LIABILITY.

6. Changes, Reschedules and Cancellations: Buyer may request to modify the designs or specifications for the items sold hereunder as well as the quantities and delivery dates thereof, or may request to cancel all or part of this order, however, no such requested modification or cancellation shall become part of the contract between Buyer and Seller unless accepted by Seller in a written amendment to this Agreement. Acceptance of any such requested modification or cancellation shall be at Seller's discretion, and shall be upon such terms and conditions as Seller may require.

7. Special Tooling: A tooling charge may be imposed for any special tooling, including without limitation, dies, fixtures, molds and patterns, acquired to manufacture items sold pursuant to this contract. 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 items sold hereunder, 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.

8. 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, may be considered obsolete and may be destroyed by Seller after two (2) consecutive years have elapsed without Buyer placing an order for the items which are 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. Taxes: Unless otherwise indicated on the face hereof, all prices and charges are exclusive of excise, sales, use, property, occupational or like taxes which may be imposed by any taxing authority upon the manufacture, sale or delivery of the items sold hereunder. If any such taxes must be paid by Seller or if Seller is liable for the collection of such tax, the amount thereof shall be in addition to the amounts for the items sold. Buyer agrees to pay all such taxes or to reimburse Seller therefore upon receipt of its invoice. If Buyer claims exemption from any sales, use or other tax imposed by any taxing authority, Buyer shall save Seller harmless from and against any such tax, together with any interest or penalties thereon which may be assessed if the items are held to be taxable.

10. 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 Part 10. Seller will defend and indemnify Buyer against allegations of infringement of U.S. Patents, U.S. Trademarks, copyrights, trade dress and trade secrets (hereinafter '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 an item sold pursuant to this contract 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 an item sold hereunder 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 said item, replace or modify said item so as to make it noninfringing, or offer to accept return of said item 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 items 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 item sold hereunder. The foregoing provisions of this Part 10 shall constitute Seller's sole and exclusive liability and Buyer's sole and exclusive remedy for infringement of Intellectual Property Rights.

If a claim is based on information provided by Buyer or if the design for an item delivered hereunder is specified in whole or in part by Buyer, Buyer shall defend and indemnify Seller for all costs, expenses or judgments resulting from any claim that such item infringes any patent, trademark, copyright, trade dress, trade secret or any similar right.

11. Force Majeure: Seller does not assume the risk of 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, acts of God, strikes or labor disputes, acts, laws, rules or regulations of any government or government authority, fires, floods, delays or failures in delivery of carriers or suppliers, shortages of materials and any other cause beyond Seller's control.

12. Entire Agreement/Governing Law: The terms and conditions set forth herein, together with any amendments, modifications and any different terms or conditions expressly accepted by Seller in writing, shall constitute the entire Agreement concerning the items sold, and there are no oral or other representations or agreements which pertain thereto. This Agreement shall be governed in all respects by the law of the State of Ohio. No actions arising out of the sale of the items sold hereunder or this Agreement may be brought by either party more than two (2) years after the cause of action accrues.

9/91-P

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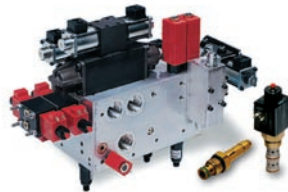
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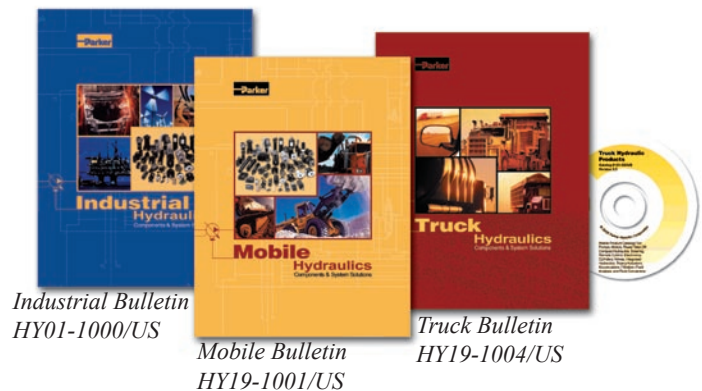
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