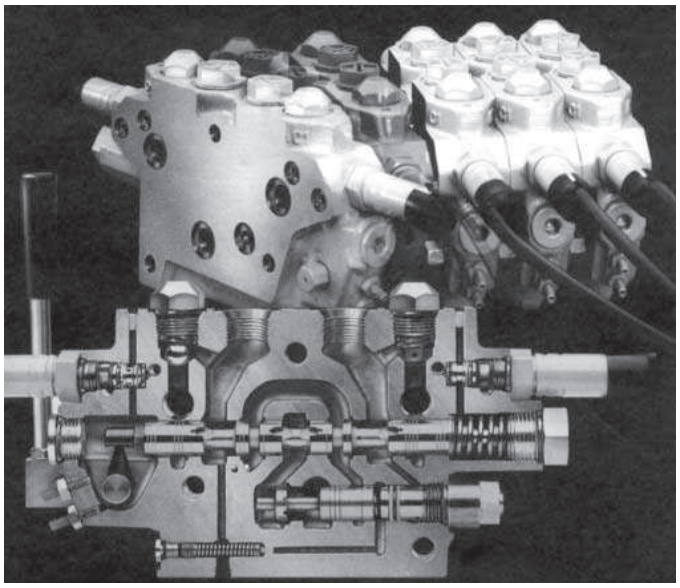
Bulletin HY14-2101-B2/US

Series VPL Proportional Valves

Effective: February 1, 2004
Supersedes: Cat. No. PMF-1030 dated 3/98



⚠ WARNING

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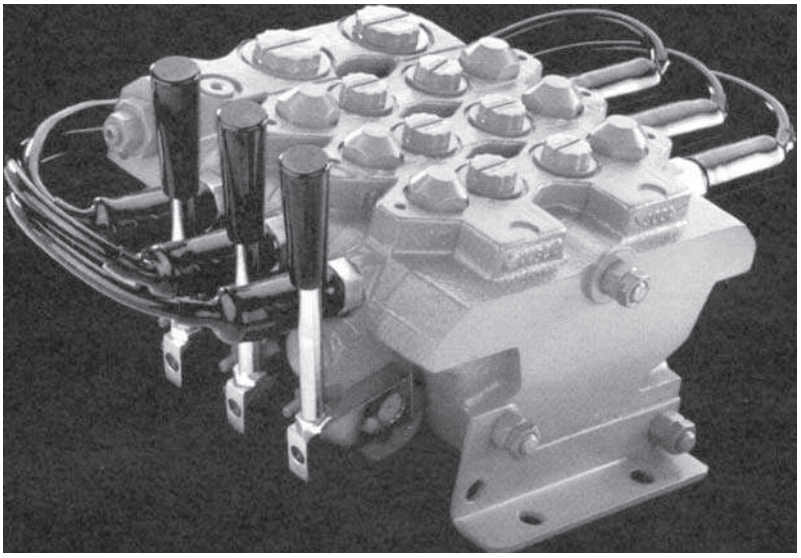


A combination of practicality and valve design expertise has been combined to give you and your customers a control valve package equaled by none.

The **VPL** series valve can:

- Fit into any type of pumping system
- Control the direction of flow
- Regulate flow precisely and repeatedly
- Flow compensates as the function's parameters vary
- Control pressures on inlet and cylinder ports
- Offer dual operating stations with a positive manual lever and remote control, hydraulic or electrical
- Be controlled manually, remote hydraulically or electrohydraulically
- Be stacked to provide the required number of control segments
- Combine all of your functions requirement into one valve segment
- Be stacked with a VP series valve segment for higher flows

The **VPL** series valve provides efficiency to you by:

- Having available the proper style inlet; bypassing, load sensing etc., for your circuit
- Letting you tailor the C_1 or C_2 port flows to meet the function's flow requirements
- Limiting the function pressure to exactly that which is required for either cylinder port
- Using pressure compensation to give predictable and repeatable flow output

The **VPL** inlet can be:

- Bypassing with relief for fixed pumps
- Bypassing with relief for multiple stacks
- Bypassing with power beyond to other valves for fixed pumps
- Closed center for variable pumps
- Closed center with relief for variable pumps
- Has an integral pilot supply which can be used for both hydraulic and electrical control

The **VPL** directional section will:

- Control direction in 3 ways or 4 ways
- Allow various proportional maximum output flows to the cylinder ports
- Allow different maximum output flows to C_1 port and C_2 port
- Allow shock and suction valves in the cylinder ports
- Limit output pressures to both ports, one port or two ports selectively to less than pump or main relief
- Has interchangeable directional spools
- Provide positive flow stops as a standard feature
- Incorporates an internal sense network for use in load sensing systems
- Can be controlled by direct lever input or by a remote hydraulic or electrical signal

The **VPL** stacking plate provides:

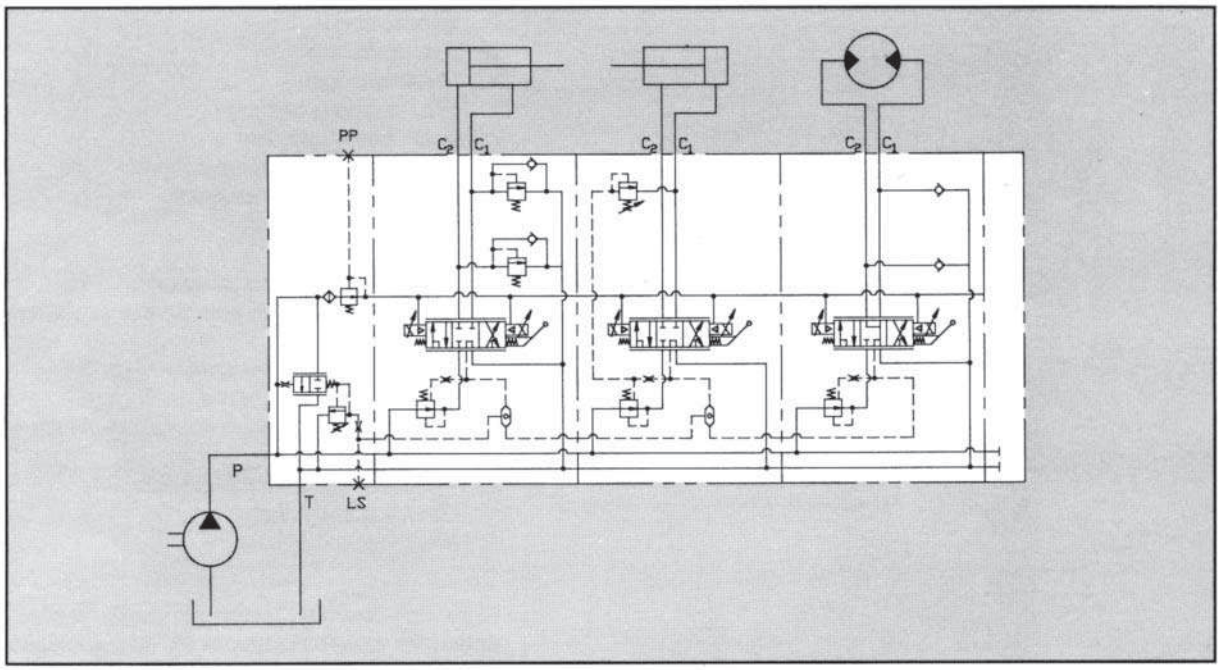
- Additional P & T ports for circuit simplification
- Simplifies the load sense circuit by eliminating external shuttles
- Closes off the stack in a positive yet efficient fashion
- Optional external pilot drain

The **VPL** utilizes the Pulsar® for electrohydraulic control. The Pulsar® is:

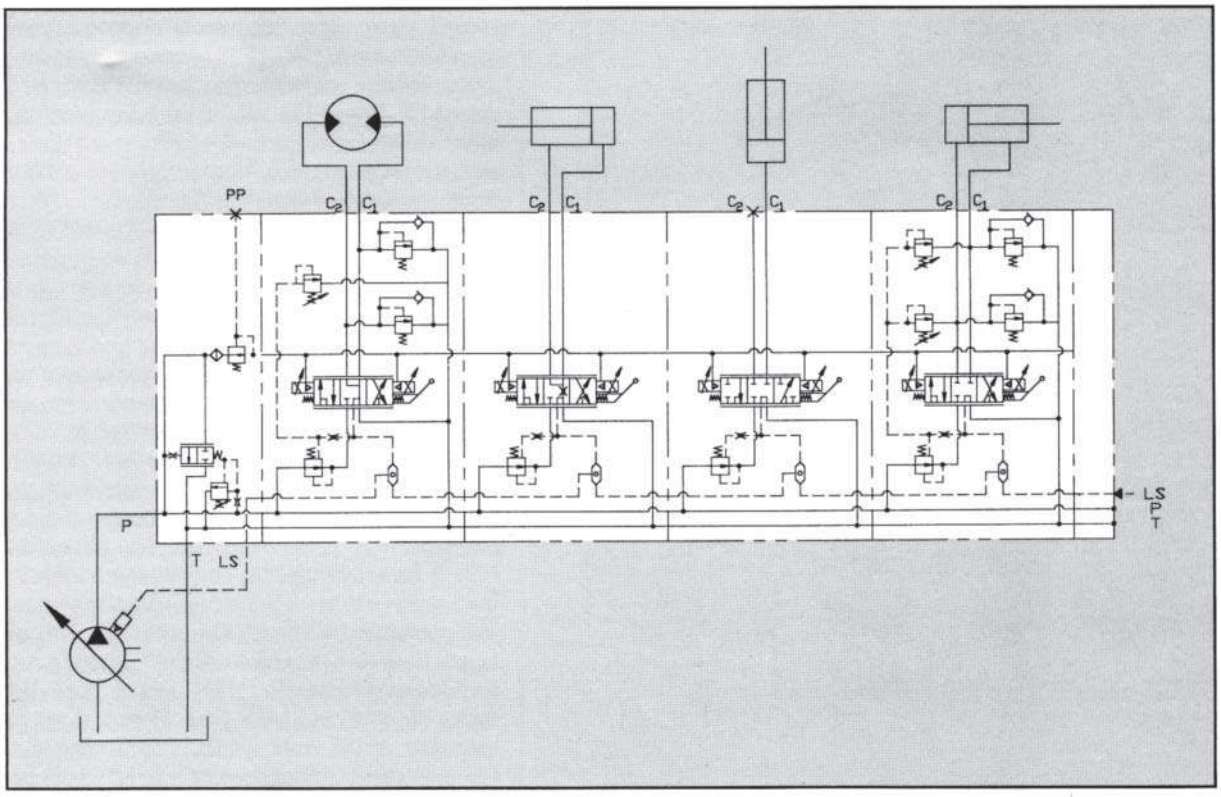
- Available in 12 or 24 VDC configuration
- Intrinsically safe as an option
- Available for marine applications as an option
- Can be microprocessor driven because of its low power requirements (less than 500 mA)
- Is available in an ON/OFF as an option

Examples

1. Sample fixed displacement circuit



2. Sample load sensing circuit



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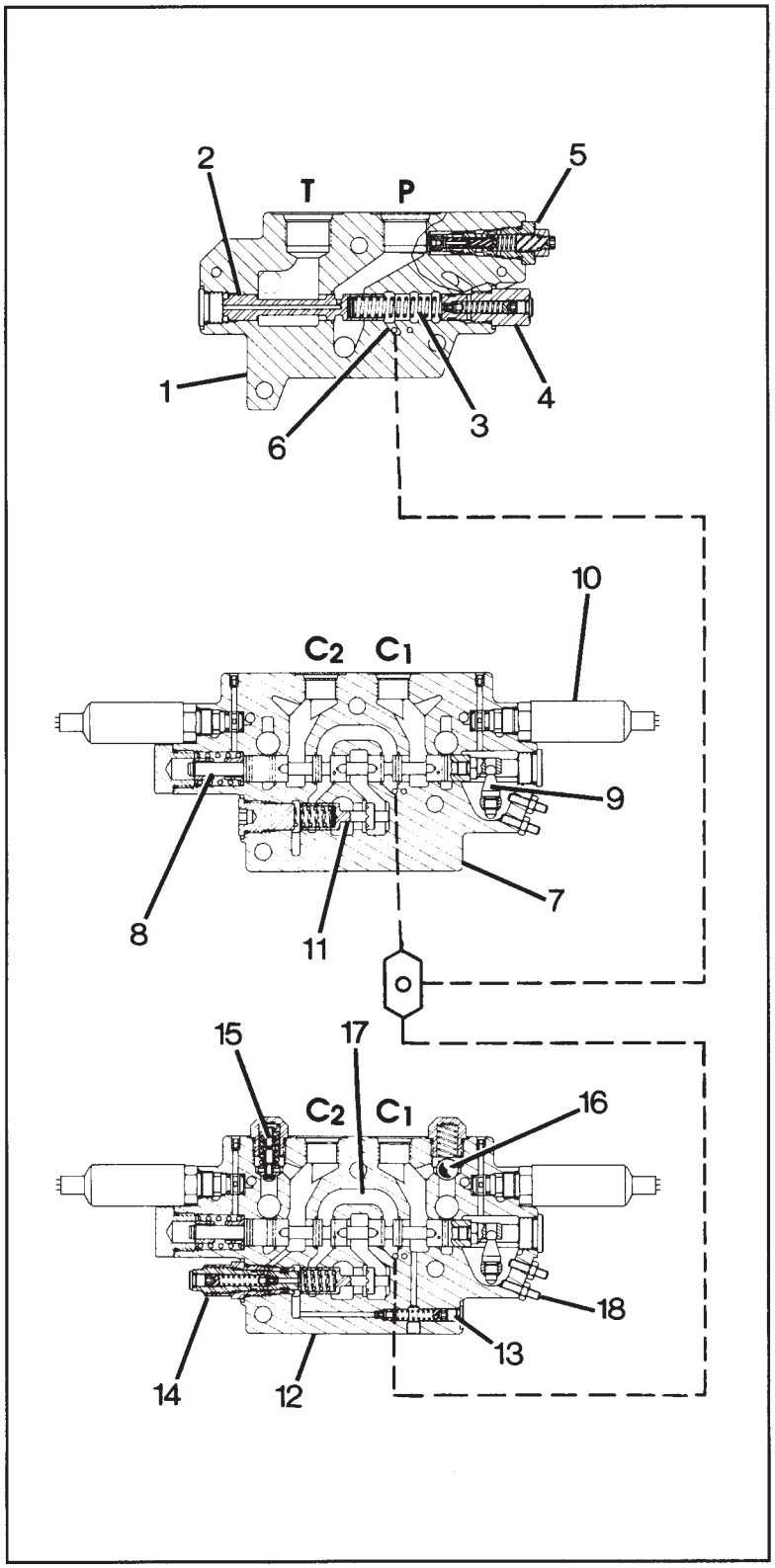
VPL - sectional drawing



1. Bypass inlet body
2. Bypass spool
3. Bypass spring
4. Relief cartridge
5. Pilot reducing cartridge
6. Load sense passage
7. VPL body standard, no options
8. Flow control spool assembly
9. Mechanical override
10. Pulsar solenoid
11. Segment compensation spool
12. VPL body with work port options and pressure limiters
13. Pressure limiter adjustment, C_2 port
14. Pressure limiter adjustment, C_1 port
15. Work port relief with anticavitation check cartridge
16. Work port anticavitation check
17. Load sense passage
18. Mechanical flow limiters

When the fixed displacement pump is started, oil enters the valve assembly at "P" on the inlet body (1). The load sense passage (6) is vented to tank whenever the flow control spools are centered in the work sections. The pump's flow is bypassed at the bypass spring (3) pressure of 200 psi to the "T" port. A load sense signal causes the bypass spool (2) to close until the supply of oil reaches a pressure equal to load sense pressure plus 200 psi from the bypass spring (3). When the load sense pressure rises to the main relief cartridge's (4) setting, the load sense signal is relieved, allowing the bypass spool (2) to shift open, unloading the pump. The standard VPL section (7) is actuated by energizing the Pulsar (10). The flow control spool (8) shifts, allowing proportional control. The individual compensation spool (11) maintains a constant pressure drop across the meter-in land, independent of supply or load pressure variations. The direct acting mechanical override linkage (9) can provide pressure compensated directional proportional flow control for a manual control station or emergency override. The VPL body with work port options and dual individual pressure limiters (12) provides these features in a compact package. The pressure of the load sense passage (17) is limited by the C_2 port pressure limiter (13) or the C_1 port pressure limiter (14), depending on which work port is pressurized. The relief with anticavitation check cartridge (15) protects the C_2 work port and an anticavitation check (16), which also provides make-up oil to the work port. Flow limiters (18) are standard on all work sections, providing maximum flow limitation, independently for each work port.

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VPL Valve General Specifications

Operating Pressure:

Pressure supply port	5000 psi (350.0 bar)
Cylinder ports	5000 psi (350.0)
Tank ports	200 psi (14.0 bar)
Inlet relief valve settings	500-4000 psi (35. 0 - 280. 0 bar)
Maximum inlet flow	50 gpm (189 L/min)
Spool flow ratings*	1.3, 2.5, 4, 7, 11, 17, 24, 30 gpm (5, 10, 15, 25, 40, 65, 90, 114 L/min)
Spool/cylindar port configuration	Closed, restricted open, open (motor)
Spool deadband	25% of stroke
C_1 C_2 leakage (per section)	0.006 gpm (20 ml/min) at 1000 psi (69.0 bar), 150 SUS (30 cSt)
Recommended filtration	SAE Class 5 (17/14-ISO 4406)
Fluid temperature range	-40°F to 195°F (-40°C to 90°C)
Maximum fluid temperature	250°F (121°C)
Ambient temperature range	-40°F to 190°F (-40°C to 88°C)
Fluid viscosity range	1500 to 30 SUS (323 to 1.1 cSt)
Seal material	Buna-N
Mounting attitude	Unrestricted
Weight (approx.)	7.0 lbs. (3.2 kg) stacking plate 10.0 lbs. (4.5 kg) work segment 10.0 lbs. (4.5 kg) inlet valve

*** Additional flow ratings available, consult factory**

VPL Manual Control

Handle torque	5-31 lb/in (0,6 - 3,5 Nm)
Angle for full spool shift	+/- 20°

Four handle adapter positions from horizontal +30° to -90° in 15° increments. Horizontal adapter position standard.

VPL Hydraulic Control

Pressure required for standard spools:

Deadband	80 psi (5,5 bar)
Fullstroke	220 psi (15,2 bar)

Reduced 350 psi (24 bar) pilot supply available from inlet

VPL Electrohydraulic Control

Step response:

0% to 100%	300 milliseconds
100 to 0%	150 milliseconds

Standard and Marine Solenoids

Coil resistance (12 VDC)	28.0 OHMS at 70°F (21°C)
(24 VDC)	65.0 OHMS at 70°F (21°C)
Operating voltage range	12 +/- 3 VDC 24 +/- 3 VDC
Current draw	430 mA at 12VDC and 70°F (21°C) 370 mA at 24 VDC and 70°F (21°C)
PWM frequency	33 Hz
Connectors	Weather Pac, Hirschmann, Flying Leads (standard solenoid); Flying leads (marine solenoid)

Intrinsically Safe Solenoids

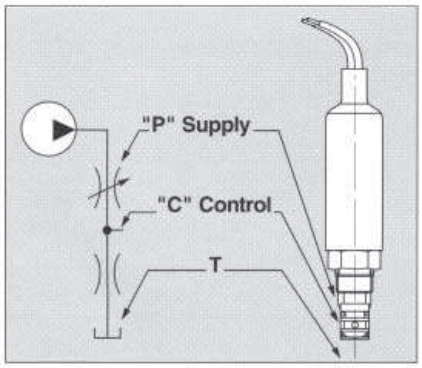
Coil resistance	28.0 OHMS at 70°F (21°C)
Rated Operating Voltage	12.0 VDC Max.
Current Draw	430 mA at 12 VDC and 70°F (21°C)
PWM frequency	33 Hz
Connectors	Weather Pac, Electro Brand Immersible Waterproof Connector

Pulsar products comply with the following standards for use in hazardous environments:

US Code of Federal Regulations Title 30 - Mineral Resources	MSHA Evaluations IA-627-0, IA-14328-0
CENELEC European Norms EN50014 - 1977 and EN 50020-1977	NEMKO Evaluation 90.114 EEx ib IIA T4, I_{max} = 300mA, 12VDC, L_{eq} = 2.25mH, C_{eq}=0 EEx ib IIB T4, I_{max} = 250mA, 9VDC, L_{eq} = 2.25mH, C_{eq}=0
EN 50014 - 1977 and EN 50028 - 1987	NEMKO Evaluation 90.277X, EEx m II T4

All values typical

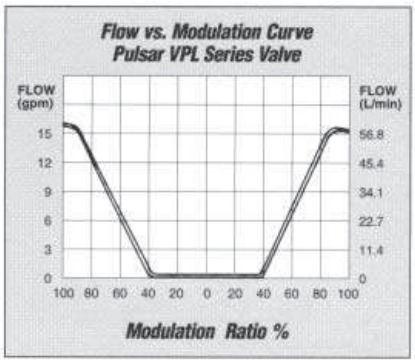
THE VPL VALVE



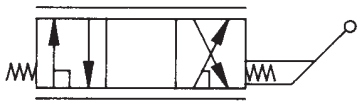
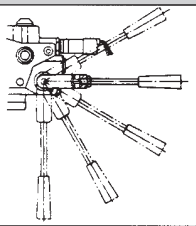
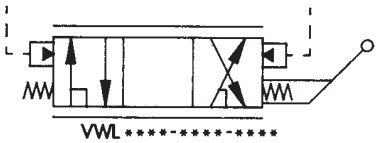
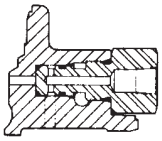
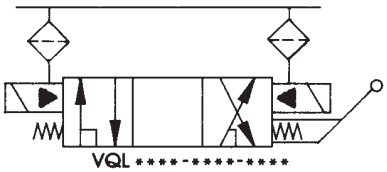
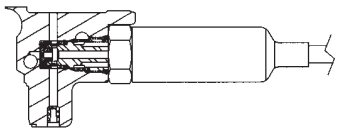
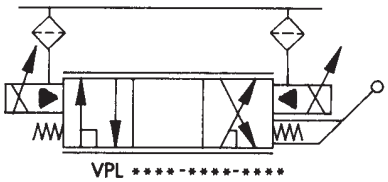
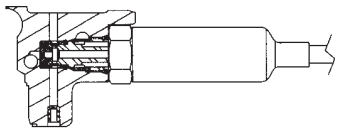
THE UNIQUE PULSAR PROPORTIONAL SOLENOID FOR PILOT PRESSURE CONTROL

Electrical control of the **VPL** Series valve is achieved with the patented Pulsar electrohydraulic pilot valve. This pilot pressure control uses digital electronics to provide a pressure control which is linear and repeatable. Being a truly digital device means that the valve is either open or closed. This results in a device in which the current draw (less than 500 mA) is controllable in the simpler electronic circuits. These electronics use PWM type drive to vary the modulation ratio, on time versus off time to provide smooth valve operation. Valve resolution is optimized and gives a valve output of low hysteresis which results in predictable machine performance.

This Pulsar digital technology does not have the same sensitivity to viscosity and contamination as servo valves or other pilot sources. Since it is manufactured in cartridge form, serviceability is easy and there are no null or center adjustments.



Work Segment Operators:

SYMBOL	DESCRIPTION	
 VNL ****-****-****	**MANUAL CONTROL** • Spring centered • Handle mounting in line or 90° to adapter • Adapter mounting +30° to -90° in 15° increments • Conversion capability to electrohydraulic proportional	
 VWL ****-****-****	**HYDRAULIC REMOTE CONTROL** • Spring centered • Pilot supply available from valve stack inlet • Conversion capability to electrohydraulic proportional	
 VQL ****-****-****	**ELECTROHYDRAULIC ON/OFF CONTROL** • Spring centered • Available in 12 or 24-volt coils • PWM Signal not required • Internal pilot supply available from valve stack inlet	
 VPL ****-****-****	**ELECTROHYDRAULIC PROPORTIONAL CONTROL** • Spring centered • Available in 12 or 24-volt coils • Pulse width modulation control • Internal pilot supply available from valve stack inlet	

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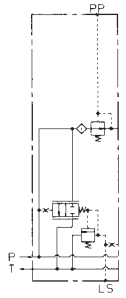
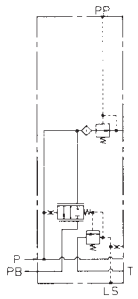
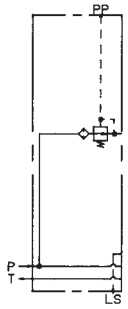
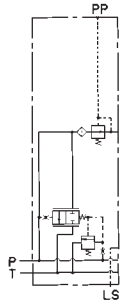
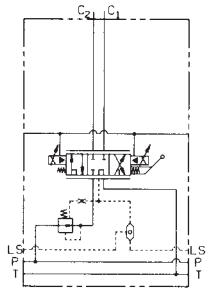
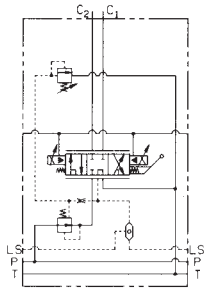
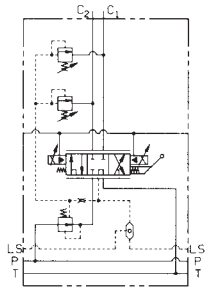
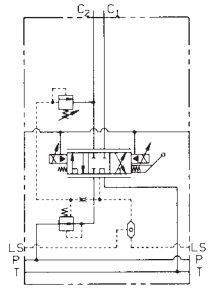
VPL Product Code Number

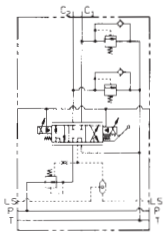
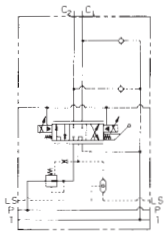
A *Inlet Types:*

SYMBOL	DESCRIPTION
 **VBL 2211-******	**Bypass type inlet with adjustable relief valve feature** • For use with fixed displacement pumps • Integral pilot reducing valve cartridge with 40 micron screen
 **VBL 2411-******	**Bypass type inlet with Power-Beyond Feature and adjustable relief valve** • For use with fixed displacement pumps • Power-Beyond feature provides priority to working segments in this valve assembly and allows for excess oil to be used by downstream valve assemblies to full system pressure • External relief valve required to protect valve stacks • Integral pilot reducing valve cartridge with 40 micron screen
 **VLL 2210-******	**Load sensing type inlet** • For use with variable displacement pumps • Load sensing port is plugged for use with pressure compensated pump • Integral pilot reducing valve with 40 micron screen
 **VYL 2211-******	**Load sensing type inlet with adjustable relief valve feature** • For use with variable displacement pumps • Load sensing port is plugged for use with pressure compensated pump • Integral pilot reducing valve with 40 micron screen

B *Work Segments*

SYMBOL	DESCRIPTION
 **VPL* 247-*23*-0000**	**Work segment with individual compensator** • Pressure compensated for constant flow at any load/supply pressure condition • Manual operator linkage standard • Load sense shuttle logic standard • Mechanical flowstop standard
 **VPL* 247-*33*-0000**	**Work segment with individual compensator and common C_1 and C_2 pressure limiter** • Pressure compensated for constant flow at any load/supply pressure condition • Manual operator linkage standard • Load sense shuttle logic standard • Mechanical flowstop standard • Common cylinder port pressure limitation for same reduced maximum pressure at C_1 and C_2 ports
 **VPL*247-*43*-0000**	**Work segment with individual compensator and individual C_1 and C_2 pressure limiter** • Pressure compensated for constant flow at any load/supply pressure condition • Manual operator linkage standard • Load sense shuttle logic standard • Mechanical flowstop standard • Dual individual cylinder port pressure limitation for separate reduced maximum pressures at C_1 and C_2 ports
 **VPL*247-*53*-0000**	**Work segment with individual compensator and C_1 pressure limiter** • Pressure compensated for constant flow at any load/supply pressure condition • Manual operator linkage standard • Load sense shuttle logic standard • Mechanical flowstop standard • Single cylinder port pressure limitation for reduced maximum pressure on only the C_1 port

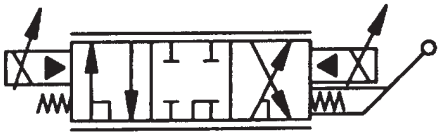
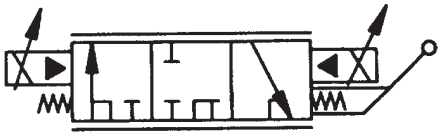
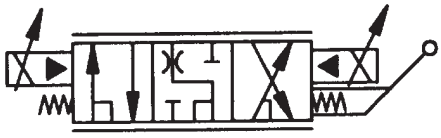
C *Work Segment Work Port Options*

SYMBOL	DESCRIPTION
 VPL* 247-*23*-22**	**Relief with anticavitation valve** • Pressure compensated for constant flow at any load/supply pressure condition • Manual operator linkage standard • Load sense shuttle logic standard • Mechanical flowstop standard • Direct-acting relief valve with anticavitation check valve • Available for either work port or both
 VPL* 247-*23*-3300	**Anticavitation valve** • Pressure compensated for constant flow at any load/supply pressure condition • Manual operator linkage standard • Load sense shuttle logic standard • Mechanical flowstop standard • Anticavitation check valve • Available for either work port or both

D *Stacking Plate*

SYMBOL	DESCRIPTION
 VOL 0001-0*0*	**Stacking plate** • No ports included • External pilot drain available (VOL 0002-0*0*)
 VOL 1111-0*0*	**Stacking plate with ports** • Pressure tank & shuttle (load sense) ports included • Shuttle port for consolidating plumbing of load sense circuits (includes shuttle ball) • Tank port required when stack has a power-beyond inlet • Shuttle port must be connected to auxiliary load sense • External pilot drain available (VOL 1112-0*0*)
 VOL 5551-0*0*	**Stacking plate with plugged ports** • Pressure and tank load ports included • Tank port required when stack has a power-beyond inlet • All ports fitted with steel plugs • Shuttle port not useable • External pilot drain available (VOL 5552-0*0*)

E *Work Segment Spools*

SYMBOL	DESCRIPTION
 VPL*14	**VENTED OPEN** • 4 way, 3 position • Cylinder ports open to tank in neutral for venting valves • Flow restricted 0.5 gpm at 100 psi (2 L/min at 7,0 bar)
 VPL*24	**CLOSED** • 4 way, 3 position • Cylinder ports closed to tank in neutral • Low leakage version available
 VPL*33	**CLOSED** • 3 way, 3 position • Cylinder port closed to tank in neutral • C_2 port plugged • Flow metering out is flow compensated with remote hydraulic and electrohydraulic actuated • Low leakage version available
 VPL*34	**CLOSED/VENTED OPEN** • 4 way, 3 position • C_1 port closed, C_2 port open to tank in neutral for venting valves • Flow restricted 0.5 gpm at 100 psi (2 L/min at 7,0 bar) • Low leakage version available
 VPL*44	**OPEN (MOTOR)** • 4 way, 3 position • Cylinder ports open to tank in neutral for motors • Open flow 15 gpm at 50 psi (57 L/min at 3,5 bar)

SPOOL FLOW TABLE

Spool I.D. Code	GPM	L/min
A	1.3	5
1	2.5	10
2	4	15
3	7	25
4	11	40
5	17	65
6	24	90
7	30	114

NOTES

1) Intermediate flow rates available.

2) Dual flows C_1/C_2 available, consult factory.

3) Additional flow ratings available, consult factory.

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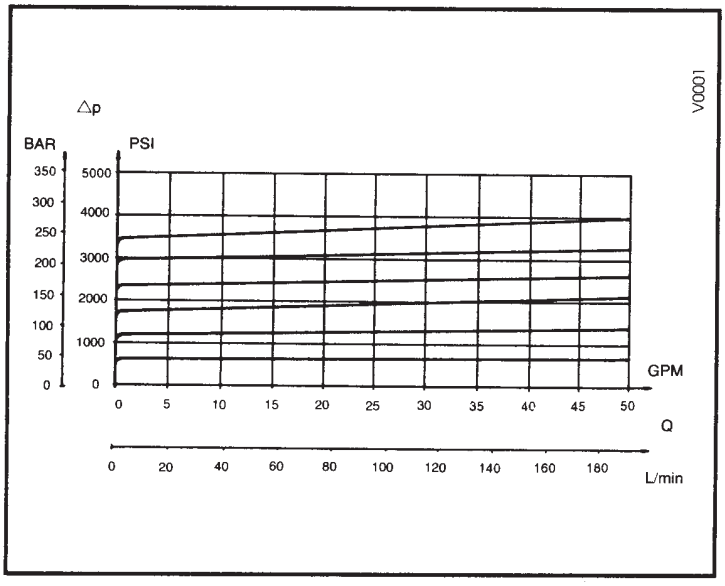
INLET

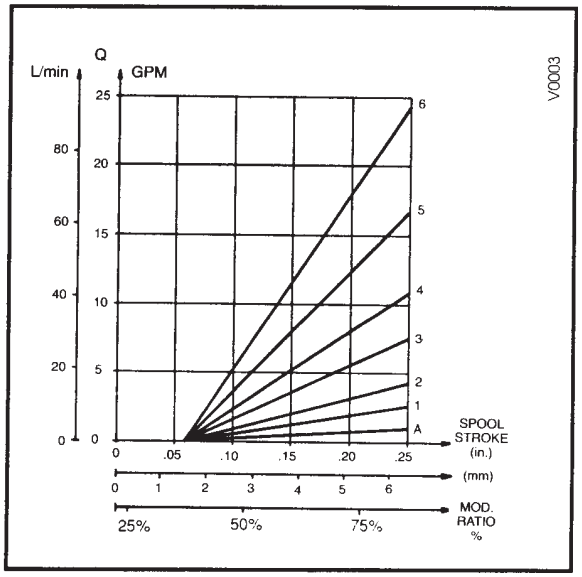
Inlet pressure relief valve characteristic



Pressure setting made at 1 gpm (4 L/min)

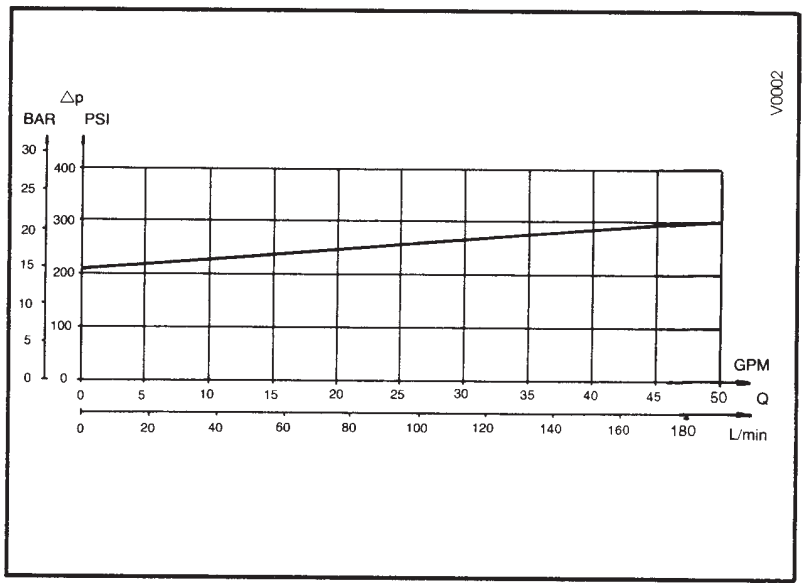
WORK SEGMENT

Pressure-compensated flow gain characteristic



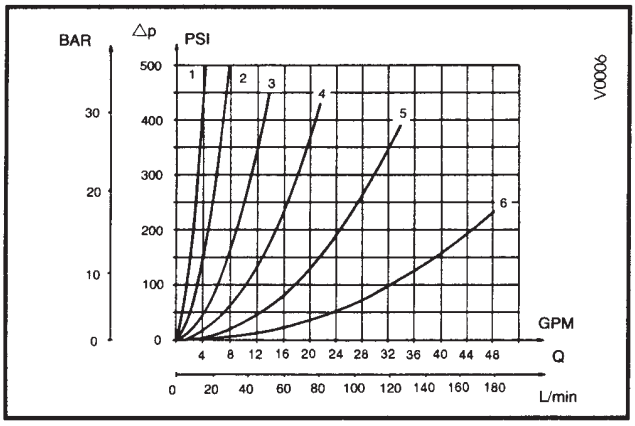
The curves are shown for spool I.D. numbers 1 through 6

Neutral flow pressure drop on VBL inlet, open center

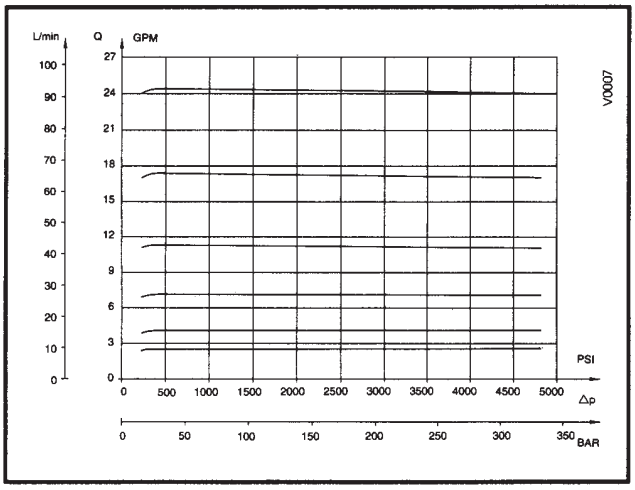


Work Segment (continued)

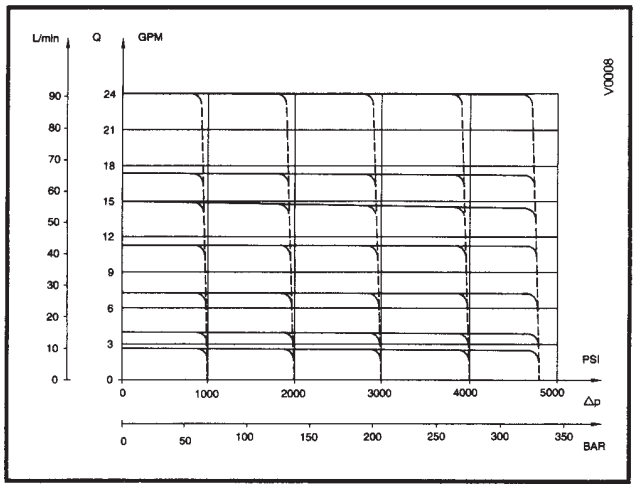
Pressure drop $C_1/C_2 \rightarrow T$



Individual segment compensator characteristic

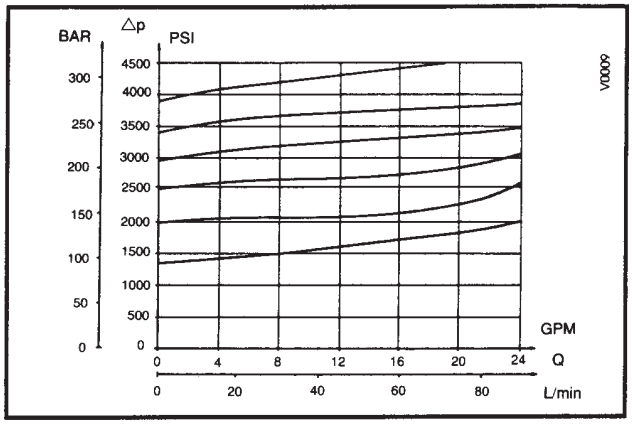


Pressure limiter characteristic

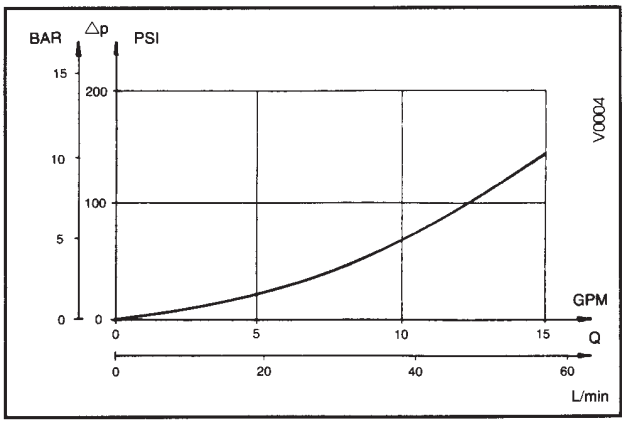


WORK PORT OPTIONS

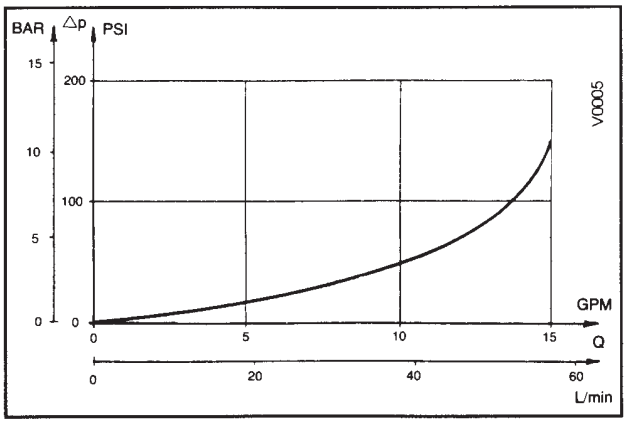
Relief with anticavitation valve
Relief characteristics

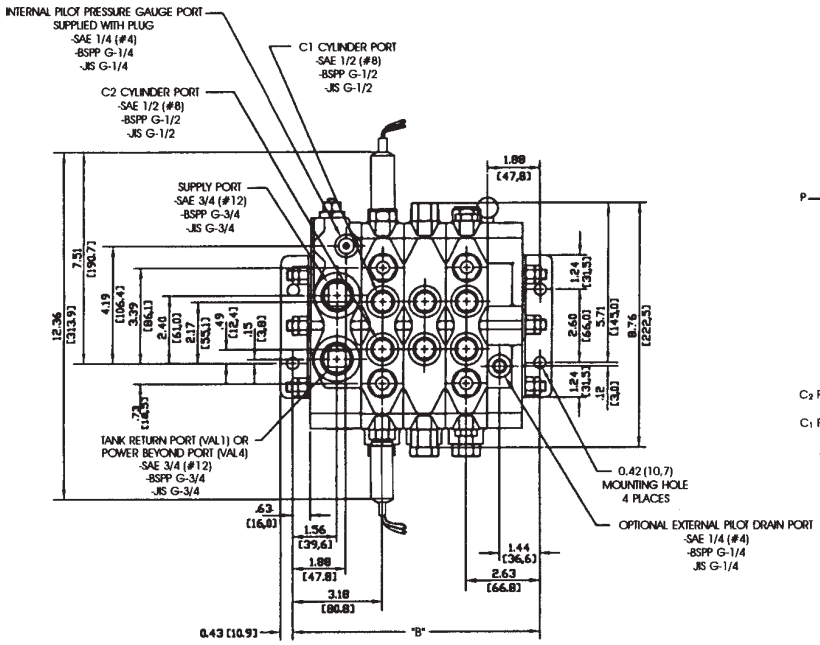


Relief with anticavitation valve
Anticavitation characteristic

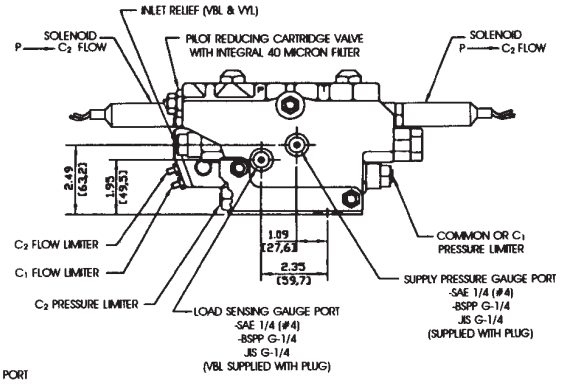


Anticavitation valve
Anticavitation characteristic

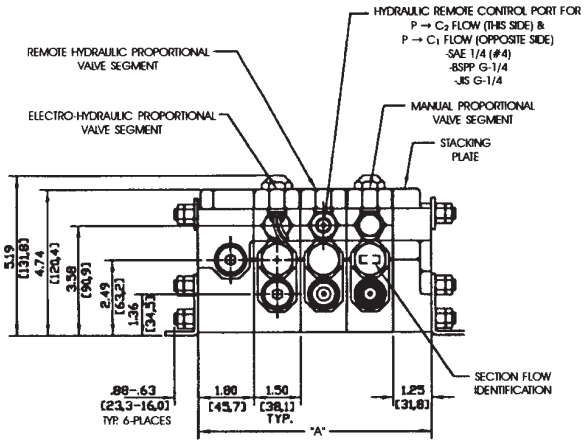




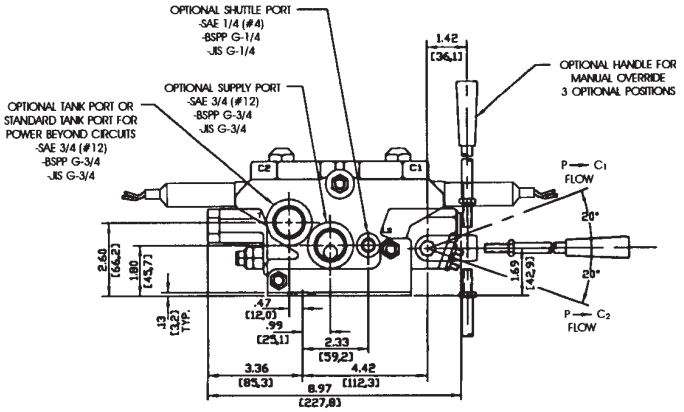
Top View



Inlet View



Side View



Stacking Plate View

WEIGHTS (APPROX)
STACKING PLATE....7.0 LBS. (3,2 KG)
WORK SEGMENT....10.0 LBS. (4,5 KG)
INLET VALVE.....10.0 LBS. (4,5 KG)

DIMENSIONS ARE IN INCHES (mm)

NUMBERS OF SEGMENTS	A (in/mm)	B (in/mm)
1	4.55 (115,5)	5.80 (147,3)
2	6.05 (153,6)	7.30 (185,4)
3	7.55 (191,7)	8.80 (223,5)
4	9.05 (229,8)	10.30 (261,6)
5	10.55 (267,9)	11.80 (299,7)
6	12.05 (306,0)	13.30 (337,8)
7	13.55 (344,1)	14.80 (375,9)
8	15.05 (382,2)	16.30 (414,0)
9	16.55 (420,3)	17.80 (452,1)

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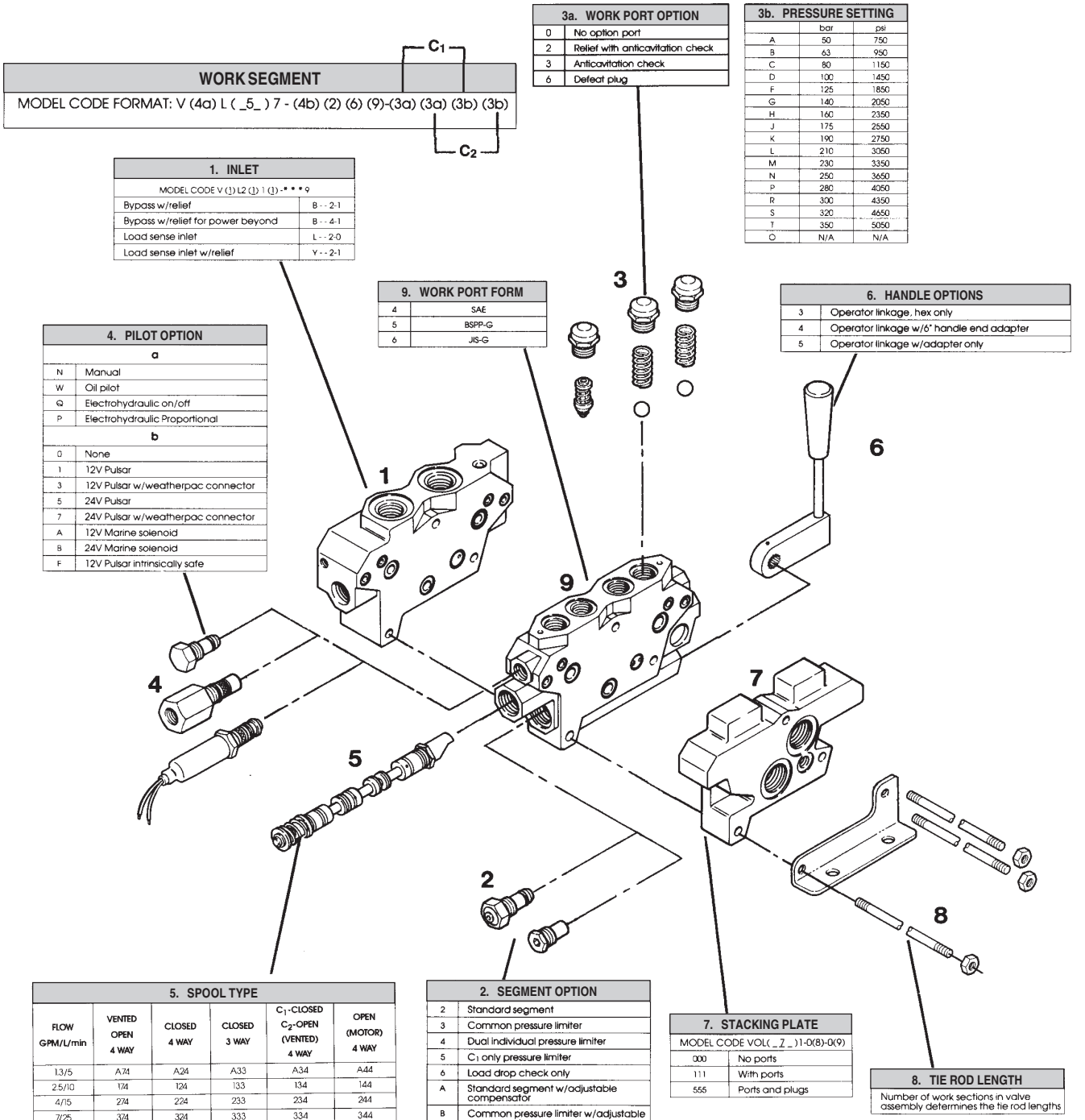
Elyria, Ohio, USA



3a. WORK PORT OPTION	
0	No option port
2	Relief with anticavitation check
3	Anticavitation check
6	Defeat plug

3b. PRESSURE SETTING	bar	psi
A	50	750
B	63	950
C	80	1150
D	100	1450
F	125	1850
G	140	2050
H	160	2350
J	175	2550
K	190	2750
L	210	3050
M	230	3350
N	250	3650
P	280	4050
R	300	4350
S	320	4650
T	350	5050
O	N/A	N/A

1. INLET	
MODEL CODE V (1) L2 (1) 1 (1) -* * * 9	
Bypass w/relief	B - - 2-1
Bypass w/relief for power beyond	B - - 4-1
Load sense inlet	L - - 2-0
Load sense inlet w/relief	Y - - 2-1

9. WORK PORT FORM	
4	SAE
5	BSPP-G
6	JIS-G

6. HANDLE OPTIONS	
3	Operator linkage, hex only
4	Operator linkage w/6" handle end adapter
5	Operator linkage w/adapter only

4. PILOT OPTION	
a	
N	Manual
W	Oil pilot
Q	Electrohydraulic on/off
P	Electrohydraulic Proportional
b	
0	None
1	12V Pulsar
3	12V Pulsar w/weatherpac connector
5	24V Pulsar
7	24V Pulsar w/weatherpac connector
A	12V Marine solenoid
B	24V Marine solenoid
F	12V Pulsar intrinsically safe

5. SPOOL TYPE					
FLOW GPM/L/min	VENTED OPEN 4 WAY	CLOSED 4 WAY	CLOSED 3 WAY	C_1-CLOSED C_2-OPEN (VENTED) 4 WAY	OPEN (MOTOR) 4 WAY
1.3/5	A74	A24	A33	A34	A44
2.5/10	174	124	133	134	144
4/15	274	224	233	234	244
7/25	374	324	333	334	344
11/40	474	424	433	434	444
17/65	574	524	533	534	544
24/90	674	624	633	634	644
30/114	774	724	733	734	744

2. SEGMENT OPTION	
2	Standard segment
3	Common pressure limiter
4	Dual individual pressure limiter
5	C_1 only pressure limiter
6	Load drop check only
A	Standard segment w/adjustable compensator
B	Common pressure limiter w/adjustable compensator
C	Dual individual pressure limiter w/adjustable compensator
D	C_1 only pressure limiter w/adjustable compensator

7. STACKING PLATE	
MODEL CODE VOL(_ Z _)1-0(8)-0(9)	
000	No ports
111	With ports
555	Ports and plugs

8. TIE ROD LENGTH
Number of work sections in valve assembly determines the tie rod lengths

Note: Beyond 9 segments, the valve assembly maximum allowable pressure is reduced.

EXAMPLE: A 10 GPM, closed cylinder port, 3 position, 4 way, proportional, 12V Pulsar w/weatherpac connector, individually compensated valve, dual individual pressure limiter (C_1 at 1300 psi and C_2 at 2500 psi), 6" nonremovable handle, SAE ports, C_1 port anticavitation and C_2 port relief with anticavitation at 2750 psi is: VPL5247-3444-320K

ASSEMBLY KITS: Assembly kits include tierods, nuts, jam nuts, shuttleballs and mounting feet.
VAL*K1---Number of work segments (1-9)

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Elyria, Ohio, USA

Distributor _____

Phone _____

Customer _____

Application _____

Customer P/N _____

Author _____ **Date** _____

VPL Series

Valve Assembly Code: VAL _____

INLET

Pump type: ❑ fixed ❑ variable ❑ load sensing

Relief/Comp setting _____ psi

Pump flow _____ GPM (min.)

_____ GPM (max.)

Power Beyond: ❑ yes ❑ no

Ports

P ❑ open T ❑ open
❑ plugged ❑ plugged

STACKING PLATE ❑ with ports ❑ without ports

Ports

P ❑ open T ❑ open
❑ plugged ❑ plugged

LS

❑ Plugged (no shuttle ball)
❑ Shuttle ball (required for LS input)

Number Of Work Segments _____

Electrical Control (Pulsar)

Voltage _____ ❑ Marine Other_____

Connector type _____ ❑ Intrinsically Safe

WORK SEGMENT INFORMATION

SEGMENT POSITION	SEGMENT FUNCTION	SPOOL TYPE (5)	FLOW (5)		PRES. LIMITER (2)		C_1 PORT OPTION (3)			C_2 PORT OPTION (3)		
			C_1	C_2	C_1	C_2	Relief	Anticav	Defeat	Relief	Anticav	Defeat
Example*	Boom Lift	524	10	10	1300	2500		3		K		
1st												
2nd												
3rd												
4th												
5th												
6th												
7th												
8th												
9th												

SEGMENT POSITION	VALVE ACTUATOR				NOTES AND / OR SPECIAL INSTRUCTIONS
	MANUAL	REMOTE	ELECTRIC		
			ON/OFF	PROP	
Example				X	
1st					
2nd					
3rd					
4th					
5th					
6th					
7th					
8th					
9th					

* Model Code VPL5247-3444-320K

V * L * * * * - * * * * - * * * * *

Spool Operation
P - electrohydraulic proportional
Q - electrohydraulic (on-off)
W - hydraulic remote
N - manual control
Z - custom section

Spool Flow Rating
0 - on/off operation
A - 1.3GPM/5 LPM
1 - 2.5GPM/10 LPM
2 - 4GPM/15 LPM
3 - 7GPM/25 LPM
4 - 11GPM/40 LPM
5 - 17GPM/65 LPM
6 - 24GPM/90 LPM
7 - 30GPM/114 LPM
For different C_1/C_2 flows consult factory

Cylinder Port Configuration
7 - vented open cylinder ports (VOC)
2 - closed cylinder ports (CC)
3 - C_1 port closed, C_2 port open
4 - open cylinder port (OC-Motor)
5 - special closed cylinder port (low leak)

Flow Directions
2 - 2 way, C_1 flow
3 - 3 way, C_1 flow
4 - 4 way, C_1 and C_2 flow

Spool Positions
7 - 3 pos flow limiters C_1 and C_2
8 - 2 pos flow limiters C_1 and C_2
A - 3 pos, detented C_1, C_2, and center (VNL only)
B - Infinite pos, friction lock (VNL only)

Pilot Control
0 - none
1 - 12 V Pulsar
3 - 12 V Pulsar w/Weather Pack connector
5 - 24 V Pulsar
7 - 24 V Pulsar w/Weather Pack connector
A - 12 V Marine
B - 24 V Marine
J - 12 V Hirschmann, Large
K - 24 V Hirschmann, Large
L - 12 V Hirschmann, Small
M - 24 V Hirschmann, Small
N - 12 V Pulsar w/36" leads
Q - 24 V Pulsar w/36" leads
S - 11.2 V, 5 amp supply intrinsically safe w/Male Electro Connector
T - 11.2 V, 5 amp supply intrinsically safe w/Weather Pack Connector

Section Pressure Compensator
1 - uncompensated
2 - individual spool compensator
3 - individual spool compensator w/common pressure limiter
4 - individual spool compensator w/individual port pressure limiters C_1 and C_2
5 - individual spool compensator w/pressure limiter C_1 only
6 - load drop check

Manual Override
3 - manual operator shaft only
4 - manual operator with non-removable adaptor & removable 6 inch handle rod
5 - manual operator with non-removable adaptor
6 - Marine Handle Adaptor
7 - Marine Handle Adaptor w/6" handle

Design Level
4 - SAE ports
5 - BSPP ports
6 - JIS-G ports

C_1 Cylander Port Option
0 - none, no port cavity
2 - relief w/anticavitation
3 - anticavitation check
5 - float
6 - defeat plug

C_2 Cylinder Port Option
0 - none, no port cavity
2 - relief w/anticavitation
3 - anticavitation check
5 - float
6 - defeat plug

C_1 Pressure (see table)

C_2 Pressure (see table)

Packaging
(blank) - segment subassembly
P - packaged

Pressure Settings

CODE	PSI	BAR
A	750	50
B	950	63
C	1150	80
D	1450	100
F	1850	125
G	2050	140
H	2350	160
J	2550	175
K	2750	190
L	3050	210
M	3350	230
N	3650	250
P	4050	280
R	4350	300
S	4650	320
T	5050	350
O	N/A	N/A

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9/91-P

Parker Hannifin Corporation
Hydraulic Valve Division
Elyria, Ohio, USA

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