

Pulsar® Stackable Valves Series VP, VPL, VPO

Product Ordering Quick Reference

Bulletin HY14-2109/US

Effective: October 1, 2015

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filtration
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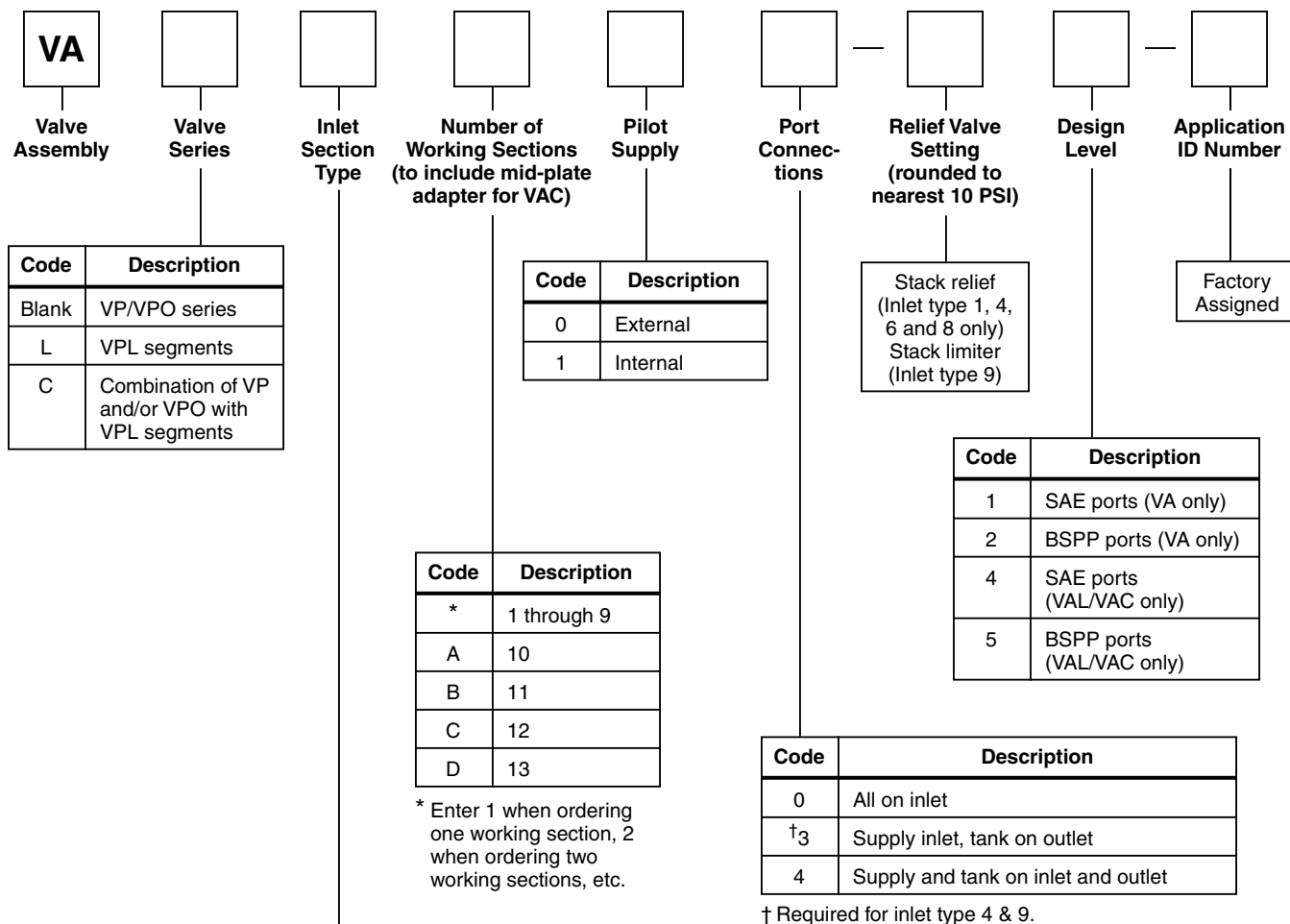
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Pulsar® Stackable Valves

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Valve Assemblies for VP/VPO/VPL Series Valve Stack



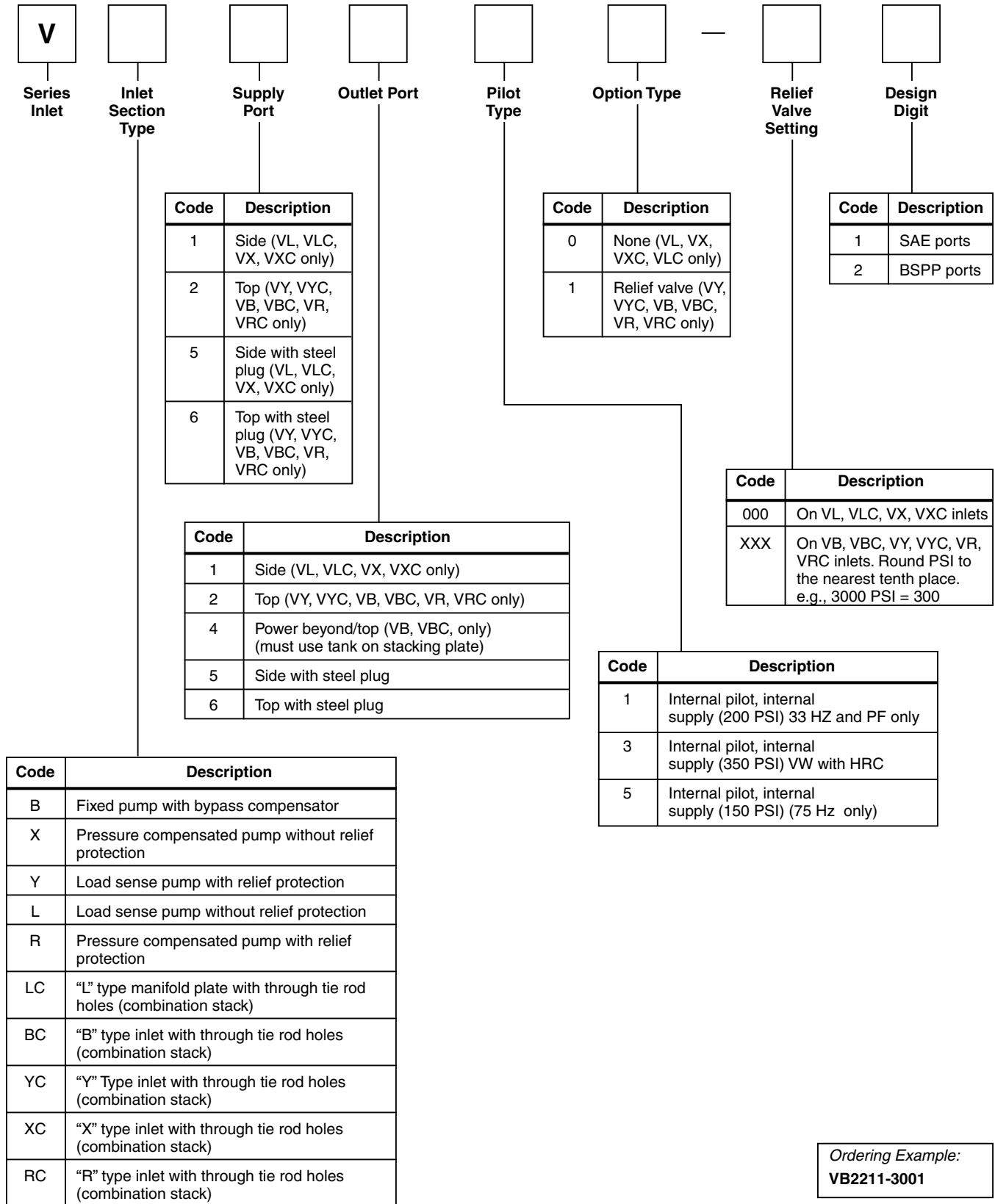
Code	Description
1	Fixed pump with bypass compensator (VB, VBL, VBC)
3	Load sense pump without relief (VL, VLL, VLC)
4	Fixed pump with power beyond port (VB, VBL, VBC)
†5	Pressure compensated pump without relief (VX, VXL, VXC)
6	Load sense pump with relief (VY, VYL, VYC)
†8	Pressure compensated pump with relief (VR, VRL, VRC)
†9	Pressure compensated pump with inlet regulator, only for non-compensated segments (VEL)

† If any segments in the stack are non-compensated, then do not use a “5” or “8” type inlet. Either choose all compensated segments or use “9” type inlet with non-compensated segments.

Ordering Example:
VAL 1410-2504-203

Pulsar® Stackable Valves

VP/VPO Series Inlet



Ordering Example:
VB2211-3001

Pulsar® Stackable Valves**VP/VPO Inlet****Service Parts**

Part No.	Description
VAPPK1	Pilot Reducing Adjustment Screw and Lock Nut Kit
VBCPK3001	Compensator Adjustment Kit (Standard)
VBIFK1	Inlet Pilot Filter Kit - Bypassing (VB, VY, VBC, VYC, VR, VRC)
VBIFK2	Inlet Pilot Filter Kit with External Supply
VBISK1	Bypass Inlet Spool Kit
VBPRK1	Pilot Reducing Kit, 200 PSI
VBPRK2	Pilot Reducing Kit, 350 PSI
VBPRK3	Pilot Reducing Kit, 150 PSI
VBSK1	Compensator O-ring Kit (VB, VBC, VY, VYC, VR, VRC)
VLPFK1	Inlet Pilot Filter - Load Sensing (VL, VLC, VX, VXC)
VPBPK1	Power Beyond Plug Kit
VYISK1	Relief Inlet Spool Kit (VY)

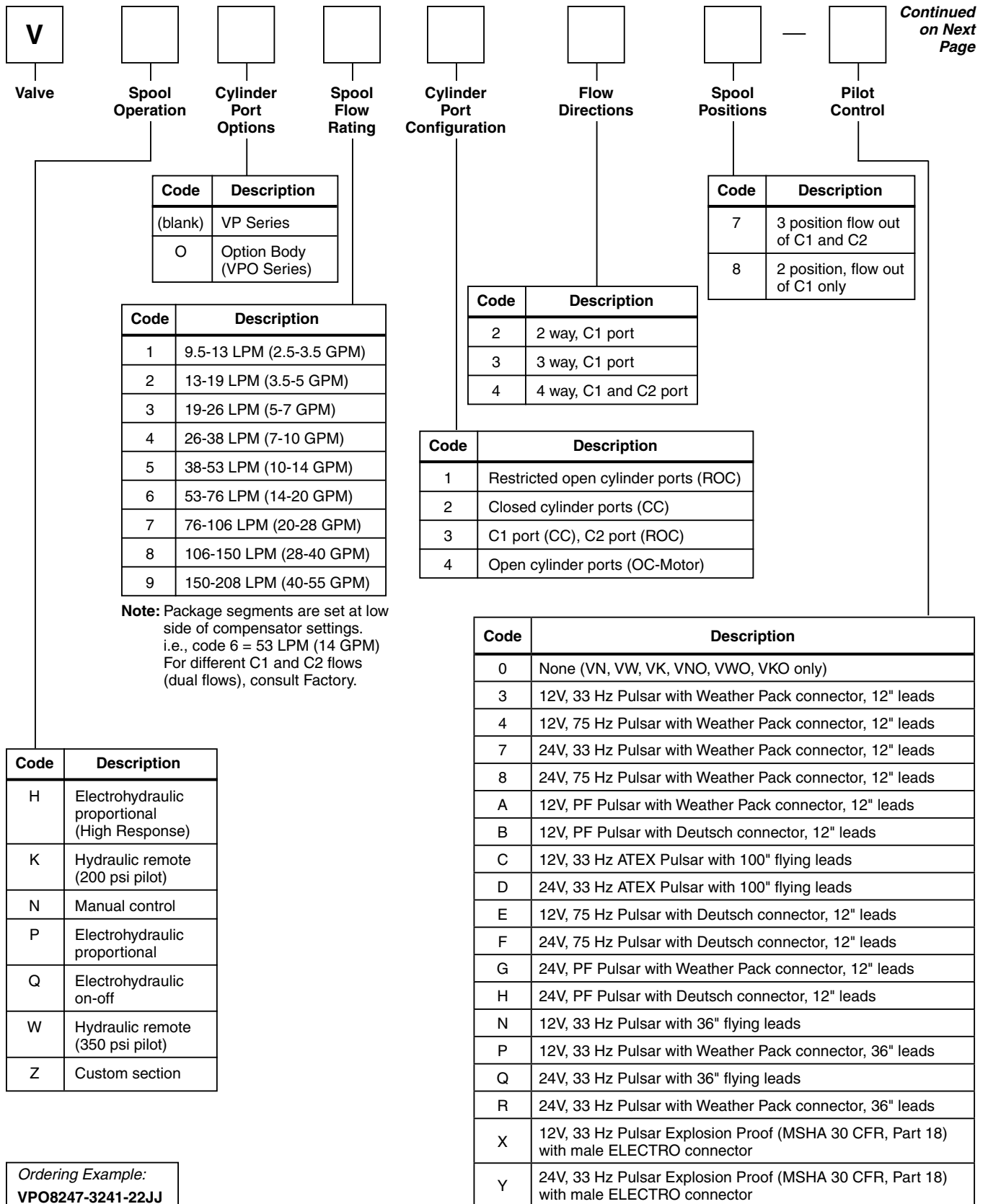
VP/VPO Inlet (Cont.)**Inlet Seal Kit (VB, VY, VBC, VYC, VR, VRC)**

Part No.	Description
VBSK2	SAE Nitrile
VBSK3	BSPP Nitrile

Inlet Seal Kit (VL, VLC, VX, VXC)

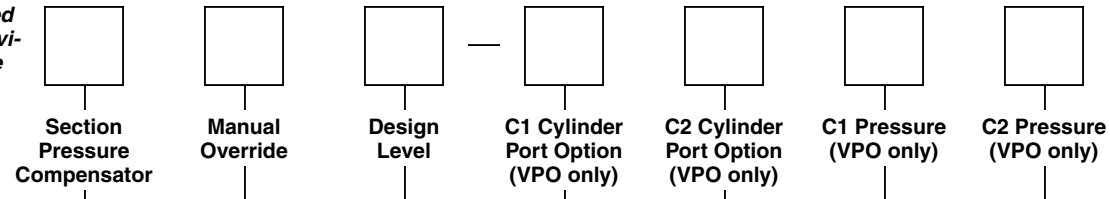
Part No.	Description
VLSK1	SAE Nitrile
VLSK2	BSPP Nitrile

VP/VPO Series Working Segment



Pulsar® Stackable Valves

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Code	Description
1	SAE ports
2	BSPP ports

Code	Description
3	Manual operator shaft only
4	Manual adapter & 6-inch handle rod VP Series VPO Series
5	Manual adapter only VP Series VPO Series
8	Manual adapter and 9" handle rod VP Series VPO Series

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

Code	Description
†1	Non-compensated (for desired flow, select 2 sizes smaller spool min. rating)
2	Individual segment compensator (ISC) shim adjust, low profile design
††3	ISC with external adjust pressure limiter low profile, single segment
††4	ISC with external adjust pressure limiter low profile, multi-segment, first position
††5	ISC with external adjust pressure limiter low profile, multi-segment, intermediate position
††6	ISC with external adjust pressure limiter low profile, multi-segment, final position
A	Externally adjustable ISC, high profile design
E	Individual compensator with ported L.S. plug

† Without compensation, max flow can only be adjusted with flow limiters.

†† For package segments, pressure limiters are set at 1500 PSI.

Code	Description
1	Relief
2	Relief, with anticavitation check
3	Anticavitation check
4	Float, 12 VDC
5	Float, 24 VDC
6	Defeat plug

Code	Description
1	Relief
2	Relief, with anticavitation check
3	Anticavitation check
4	Float, 12 VDC
5	Float, 24 VDC
6	Defeat plug

Pulsar® Stackable Valves**VP/VPO Series Working Segment****Service Parts**

Part No.	Description
VORLSK1	Refurbished Load Sense Kit
VPCSK1	Individual Compensator Shim Kit (100 each 0.025, 0.008, 0.003)
VPEPK1	End Plug Kit
VPFHAK1	Fixed Operator Adapter Kit (VP)
VPFLK1	Flow Limiter Kit
VPFS1K2	Compensator Field Service Kit (Dual springs) (Low Profile)
VPHRK1	High Response Service Kit
VPLFHAK3	Fixed Operator Adapter Kit (VPO)
VPLH6K2	Manual Operator (6 inch) Handle Kit (hex shaft design) (Standard)
VPMOK2	Manual Operator Kit (Multiple Position) (hex shaft design) (Std) (VP Series)
VPOMOK2	Manual Operator Kit (Multiple Position) (hex shaft design) (Std) (VPO Series)
VPPCK2	Pressure Compensator Kit (Externally Adjust)
VPPCK3	Pressure Compensator Kit (Standard) (Low Profile) (Dual Springs) (Supersedes VPPCK1)
VPPCPK1	Ported Compensator Plug Kit SAE #4
VPPCPK2	Ported Compensator Plug Kit BSPP G-1/4
VPPLX1K1501	Low Profile Pressure Limiter Kit, Single Segment
VPPLX2K1501	Low Profile Pressure Limiter Kit, Multi-Segment, First Position
VPPLX3K1501	Low Profile Pressure Limiter Kit, Multi-Segment, Intermediate Position
VPPLX4K1501	Low Profile Pressure Limiter Kit, Multi-Segment, Final Position
VPLH9K1	Manual Operator (9 inch) Handle Kit

VP/VPO Series Working Segment (Cont.)**Service Parts (cont.)**

Part No.	Description
VPPLX1K1502	High Profile Pressure Limiter Kit, Single Segment
VPPLX2K1502	High Profile Pressure Limiter Kit, Multi-Segment, First Position
VPPLX3K1502	High Profile Pressure Limiter Kit, Multi-Segment, Intermediate Position
VPPLX4K1502	High Profile Pressure Limiter Kit, Multi-Segment, Final Position
VPWSSK1	Working Segment Seal Kit (All Segment Seals) SAE, Nitrile
VPWSSK2	Working Segment Seal Kit (All Segment Seals) BSPP, Nitrile

Workport Option Cartridges (VPO Only)

Part No.	Description
VPOAV1K1	Anticavitation Check
VPOFV1K1	Electric Float Valve (2P-2W, N.C.), 12 volt
VPOFV2K1	Electric Float Valve (2P-2W, N.C.), 24 volt
VPORA1K1*	Relief w/Anticavitation Check (3000 PSI)
VPORV1K1*	Standard Relief Valve (3000 PSI)
VPORVSK1	Port Option Seal Kit
VPOSP1K1	Defeat Plug Kit

* Relief valves are adjustable.

Pilot Controls – See Page 19

VP/VPO Series Working Segment Spool Kits**VP/VK/VNV/VQ Segments**

Flow Rating (GPM)	3-POS 3-WAY (C.C.)	3-POS 4-WAY (C.C.)	3-POS 4-WAY (R.O.C.)	3-POS 4-WAY (O.C.M.)
2.5-3.5	VP133K1	VP124K1	VP114K1	VP144K1
3.5-5.0	VP233K1	VP224K1	VP214K1	VP244K1
5.0-7.0	VP333K1	VP324K1	VP314K1	VP344K1
7.0-10.0	VP433K1	VP424K1	VP414K1	VP444K1
10.0-14.0	VP533K1	VP524K1	VP514K1	VP544K1
14.0-20.0	VP633K1	VP624K1	VP614K1	VP644K1
20.0-28.0	VP733K1	VP724K1	VP714K1	VP744K1
28.0-40.0	VP833K1	VP824K1	VP814K1	VP844K1
40.0-55.0	VP933K1	VP924K1	VP914K1	VP944K1

VPO/VKO/VNO/VQO Segments

Flow Rating (GPM)	3-POS 3-WAY (C.C.)	3-POS 4-WAY (C.C.)	3-POS 4-WAY (R.O.C.)	3-POS 4-WAY (O.C.M.)
2.5-3.5	VPO133K1	VPO124K1	VPO114K1	VPO144K1
3.5-5.0	VPO233K1	VPO224K1	VPO214K1	VPO244K1
5.0-7.0	VPO333K1	VPO324K1	VPO314K1	VPO344K1
7.0-10.0	VPO433K1	VPO424K1	VPO414K1	VPO444K1
10.0-14.0	VPO533K1	VPO524K1	VPO514K1	VPO544K1
14.0-20.0	VPO633K1	VPO624K1	VPO614K1	VPO644K1
20.0-28.0	VPO733K1	VPO724K1	VPO714K1	VPO744K1
28.0-40.0	VPO833K1	VPO824K1	VPO814K1	VPO844K1
40.0-55.0	VPO933K1	VPO924K1	VPO914K1	VPO944K1

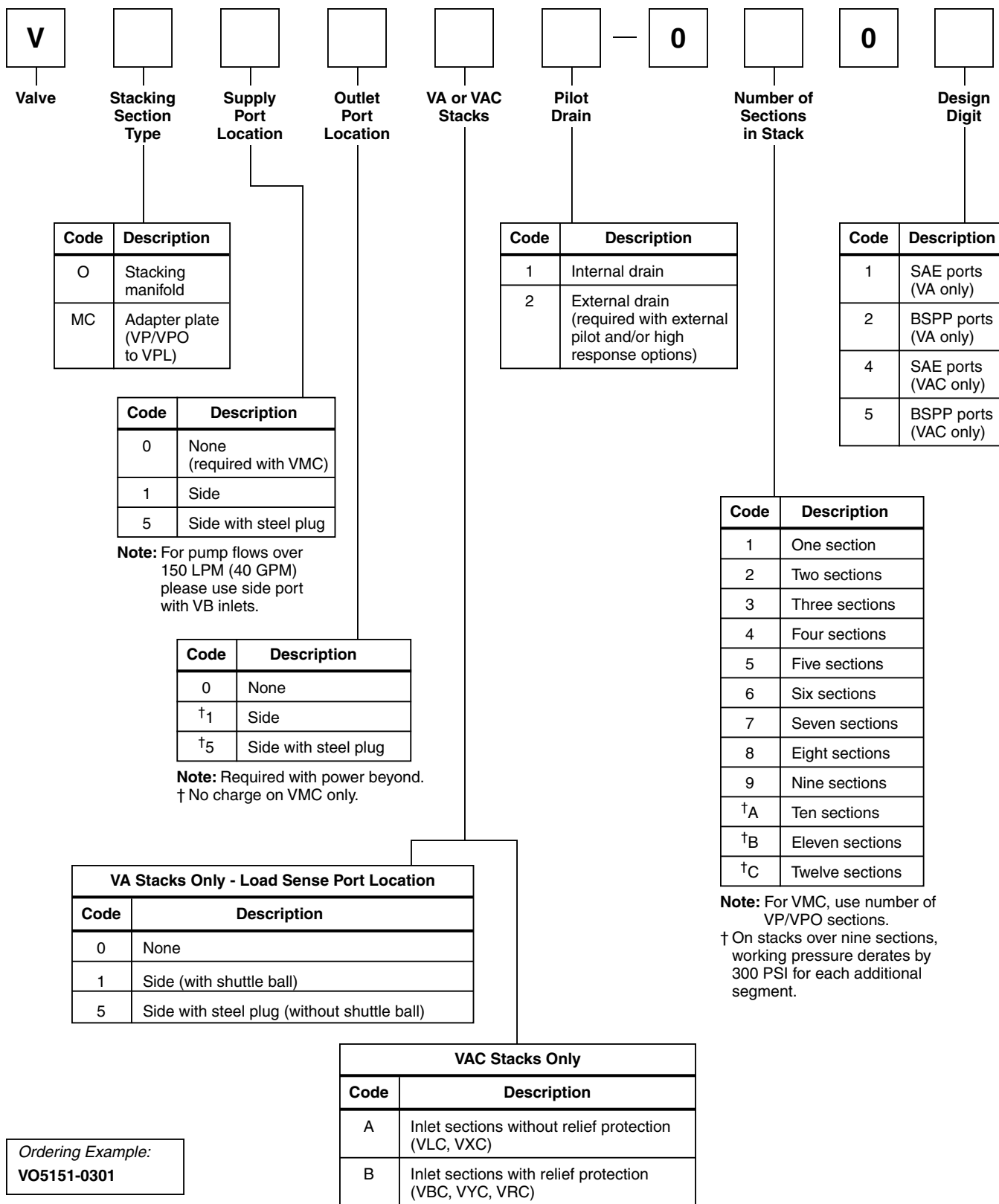
VW Segments

Flow Rating (GPM)	3-POS 3-WAY (C.C.)	3-POS 4-WAY (C.C.)	3-POS 4-WAY (R.O.C.)	3-POS 4-WAY (O.C.M.)
2.5-3.5	VW133K1	VW124K1	VW114K1	VW144K1
3.5-5.0	VW233K1	VW224K1	VW214K1	VW244K1
5.0-7.0	VW333K1	VW324K1	VW314K1	VW344K1
7.0-10.0	VW433K1	VW424K1	VW414K1	VW444K1
10.0-14.0	VW533K1	VW524K1	VW514K1	VW544K1
14.0-20.0	VW633K1	VW624K1	VW614K1	VW644K1
20.0-28.0	VW733K1	VW724K1	VW714K1	VW744K1
28.0-40.0	VW833K1	VW824K1	VW814K1	VW844K1
40.0-55.0	VW933K1	VW924K1	VW914K1	VW944K1

VWO Segments

Flow Rating (GPM)	3-POS 3-WAY (C.C.)	3-POS 4-WAY (C.C.)	3-POS 4-WAY (R.O.C.)	3-POS 4-WAY (O.C.M.)
2.5-3.5	VWO133K1	VWO124K1	VWO114K1	VWO144K1
3.5-5.0	VWO233K1	VWO224K1	VWO214K1	VWO244K1
5.0-7.0	VWO333K1	VWO324K1	VWO314K1	VWO344K1
7.0-10.0	VWO433K1	VWO424K1	VWO414K1	VWO444K1
10.0-14.0	VWO533K1	VWO524K1	VWO514K1	VWO544K1
14.0-20.0	VWO633K1	VWO624K1	VWO614K1	VWO644K1
20.0-28.0	VWO733K1	VWO724K1	VWO714K1	VWO744K1
28.0-40.0	VWO833K1	VWO824K1	VWO814K1	VWO844K1
40.0-55.0	VWO933K1	VWO924K1	VWO914K1	VWO944K1

VP/VPO Series Stacking Plate (for factory assembly only)



Pulsar® Stackable Valves**VP/VPO Series Stacking Plate (for kits only)****Service Parts**

Part No.	Description
VO0K1	Stacking Plate Kit (No Ports) SAE
VO1K1	Stacking Plate Kit (Ports) SAE
VO5K1	Stacking Plate Kit (Ports & Plugs) SAE
VO0K2	Stacking Plate Kit (No Ports) BSPP
VO1K2	Stacking Plate Kit (Ports) BSPP
VO5K2	Stacking Plate Kit (Ports & Plugs) BSPP

Mid-Adapter Plate: Joining VP/VPO to VPL Series

Part No.	Description
VMCK4	(SAE, Design 4)
VMCK5	(BSPP, Design 5)

VP/VPO Stacking Plate**Assembly Kits
(Tie Rods, Seal Plates, O-Rings, Shuttle Balls)**

Part No.	Description
VA1K1	1 Section
VA2K1	2 Section
VA3K1	3 Section
VA4K1	4 Section
VA5K1	5 Section
VA6K1	6 Section
VA7K1	7 Section
VA8K1	8 Section
VA9K1	9 Section
VAAK1	10 Section
VABK1	11 Section
VACK1	12 Section

Assembly Kits — Combination Stacks VPL Side

Part No.	Description
VALMC2K1	2 Section
VALMC3K1	3 Section
VALMC4K1	4 Section
VALMC5K1	5 Section
VALMC6K1	6 Section
VALMC7K1	7 Section
VALMC8K1	8 Section
VALMC9K1	9 Section
VALMCAK1	10 Section
VALMCBK1	11 Section

VP/VPO Stacking Plate (Cont.)**Assembly Kits — Combination Stacks VP Side With VBC, VYC & VRC Inlet**

Part No.	Description
VAMCB1K1	1 Section
VAMCB2K1	2 Section
VAMCB3K1	3 Section
VAMCB4K1	4 Section
VAMCB5K1	5 Section
VAMCB6K1	6 Section
VAMCB7K1	7 Section
VAMCB8K1	8 Section
VAMCB9K1	9 Section

Assembly Kits — Combination Stacks VP Side With VLC & VXC Inlet

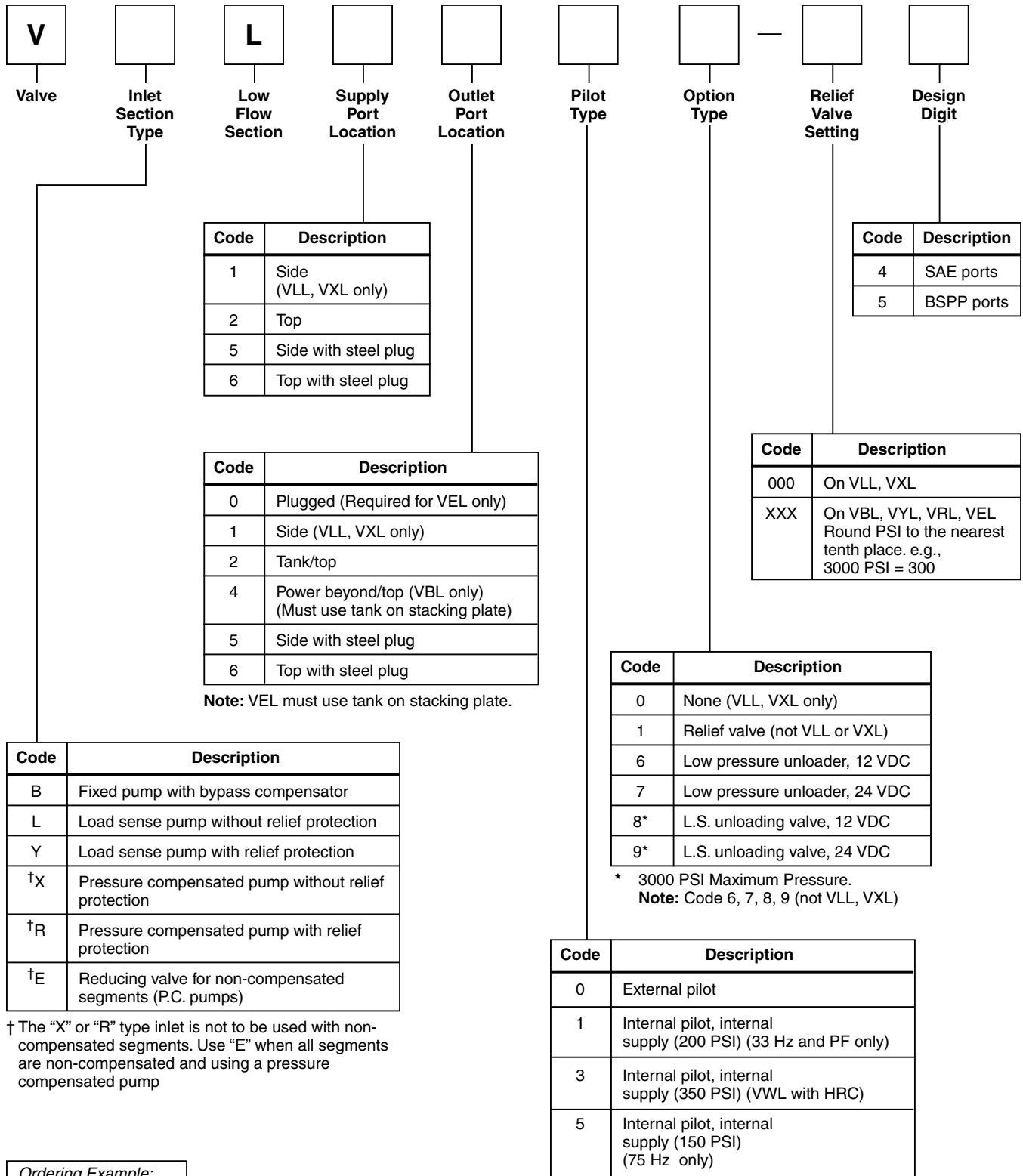
Part No.	Description
VAMCA1K1	1 Section
VAMCA2K1	2 Section
VAMCA3K1	3 Section
VAMCA4K1	4 Section
VAMCA5K1	5 Section
VAMCA6K1	6 Section
VAMCA7K1	7 Section
VAMCA8K1	8 Section
VAMCA9K1	9 Section

Service Parts

Part No.	Description
VOSPK2	Seal Plate with loose O-rings and shuttle ball
VOOSK2	Seal Plate Seal Kit (O-rings only)
VTAGK1	Name Tag Labels (50 Pcs)
B1005016	3/16" Shuttle Ball

Pulsar® Stackable Valves

VPL Series Inlet



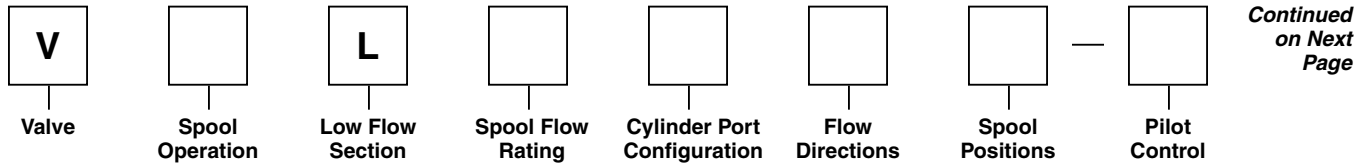
VPL Inlet

Service Parts

Part No.	Description
VALPCK1	Pilot Reducing Cartridge (200 PSI)
VALPCK2	Pilot Reducing Cartridge (350 PSI)
VALPCK3	Pilot Reducing Cartridge (150 PSI)
VALPPK1	Pilot Defeat Plug Kit for Non-Electric
VALPPK2	Pilot Defeat Plug Kit for Electric Operation
VALPRSK1	Pilot Reducing Seal Kit
VBLSBK1	Bypass Inlet Spool Kit
VBLSK2	Inlet Seal Kit (Nitrile)
VPLRVK1	Relief Valve Cartridge
VYLSRK1	Relief Inlet Spool Kit
VBLFSSK1	Spool Stop and Spring for Power Beyond Inlet

Pulsar® Stackable Valves

VPL Series Working Segment (Compensated)



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Code	Description
A	3-5 LPM (0.7-1.3 GPM)
1	5-10 LPM (1.3-2.5 GPM)
2	10-15 LPM (2.5-4 GPM)
3	15-27 LPM (4-7 GPM)
4	27-42 LPM (7-11 GPM)
5	42-64 LPM (11-17 GPM)
6	64-91 LPM (17-24 GPM)
7	91-114 LPM (24-30 GPM)

Note: For different C1 and C2 flows Consult Factory.

Code	Description
2	2 way, C1 port
3	3 way, C1 port
4	4 way, C1 & C2 port

Code	Description
1	2 pos., H.D. flow adj. on C1
2	2 pos., no adj., flow out C1 only
3	3 pos., no adj., flow out C1 & C2
4	3 pos., H.D. flow adj. on C1 & C2
5	3 pos., H.D. flow adj. on C1 only
6	3 pos., H.D. flow adj. on C2 only
7	3 pos., S.D. flow adj. on C1 and C2
8	2 pos., S.D. flow adj. on C1
A	3 pos., Detented C1, C2 & Center (Manual control only) (No adj.)
B	3 pos., Infinite pos. friction lock w/ctr detent (Manual control only) (S.D.)

Note: S.D. (Standard Duty) adjustment screws are defeated when H.D. (Heavy Duty) adjustment screws are used.

Code	Description
2	Closed cylinder ports (CC)
3	C1 port (CC), C2 port (VOC)
4	Open cylinder ports (OC-Motor)
5	Special closed cylinder port (low leak) **
6	Special 3-way closed cylinder ports (low leak) **
7	Vented open cylinder ports (VOC)

** Leakage: 7-17 cc/min @ 1000 PSI with 150 SUS oil @ 100°F.

Code	Description
K	Hydraulic remote (200 psi pilot)
N	Manual control
P	Electrohydraulic proportional
Q	Electrohydraulic on-off
W	Hydraulic remote (350 psi pilot)
Z	Custom section

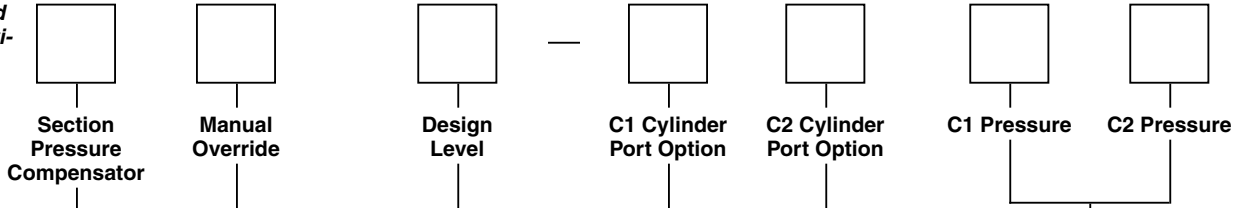
Code	Description
0	None (VNL, VWL, VKL only)
3	12V, 33 Hz Pulsar with Weather Pack connector, 12" leads
4	12V, 75 Hz Pulsar with Weather Pack connector, 12" leads
7	24V, 33 Hz Pulsar with Weather Pack connector, 12" leads
8	24V, 75 Hz Pulsar with Weather Pack connector, 12" leads
A	12V, PF Pulsar with Weather Pack connector, 12" leads
B	12V, PF Pulsar with Deutsch connector, 12" leads
C	12V, 33 Hz ATEX Pulsar with 100" flying leads
D	24V, 33 Hz ATEX Pulsar with 100" flying leads
E	12V, 75 Hz Pulsar with Deutsch connector, 12" leads
F	24V, 75 Hz Pulsar with Deutsch connector, 12" leads
G	24V, PF Pulsar with Weather Pack connector, 12" leads
H	24V, PF Pulsar with Deutsch connector, 12" leads
N	12V, 33 Hz Pulsar with 36" flying leads
P	12V, 33 Hz Pulsar with Weather Pack connector, 36" leads
Q	24V, 33 Hz Pulsar with 36" flying leads
R	24V, 33 Hz Pulsar with Weather Pack connector, 36" leads
X	12V, 33 Hz Pulsar Explosion Proof (MSHA 30 CFR, Part 18) with male ELECTRO connector
Y	24V, 33 Hz Pulsar Explosion Proof (MSHA 30 CFR, Part 18) with male ELECTRO connector

Note: Consult factory regarding Hirschmann Connectors.

Ordering Example:
VPL5247-3244-22MN

Pulsar® Stackable Valves

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Section Pressure Compensator

Manual Override

Design Level

C1 Cylinder Port Option

C2 Cylinder Port Option

C1 Pressure

C2 Pressure

Code	Description
4	SAE #8 ports
5	BSPP G-1/2 ports
7 *	SAE #10 ports

* Hard LS seats included

Code	Description
3	Manual operator shaft only
4	Manual adapter and 6-inch handle rod
5	Manual adapter only
6	Marine handle adapter
7	Marine handle adapter with 6-inch handle
8	Manual adapter and 9-inch handle rod

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

Code	Description
2	Individual spool compensator
3	Individual spool compensator with common pressure limiter
4	Individual spool compensator with individual port pressure limiters C1 and C2
5	Individual spool compensator with pressure limiter C1 only
6	Load drop check (non-compensated)
A	External adj. individual spool compensator
B	External adj. spool compensator with common pressure limiter
C	External adj. individual spool compensator with individual port limiters, C1 and C2
D	External adj. individual spool compensator with pressure limiter C1 only
E	Individual compensator w/ported L.S. plug
F	Individual compensator with common P.L. and L.S. port in bottom of casting
G	Individual compensator with individual P.L. and L. S. port in bottom of casting
H	Individual compensator with C1 P.L. only and L.S. port in bottom of casting
*	Two Stage Compensator

Code	Description
0	No port cavity
2	Relief, with anticavitation check
3	Anticavitation check
4*	Float, 12 VDC (3000 PSI Max)
5*	Float, 24 VDC (3000 PSI Max)
6	Defeat plug (Relief Option)

* SAE #10 Ports not available.

Code	Description
0	No port cavity
2	Relief, with anticavitation check
3	Anticavitation check
4*	Float, 12 VDC (3000 PSI Max)
5*	Float, 24 VDC (3000 PSI Max)
6	Defeat plug (Relief Option)

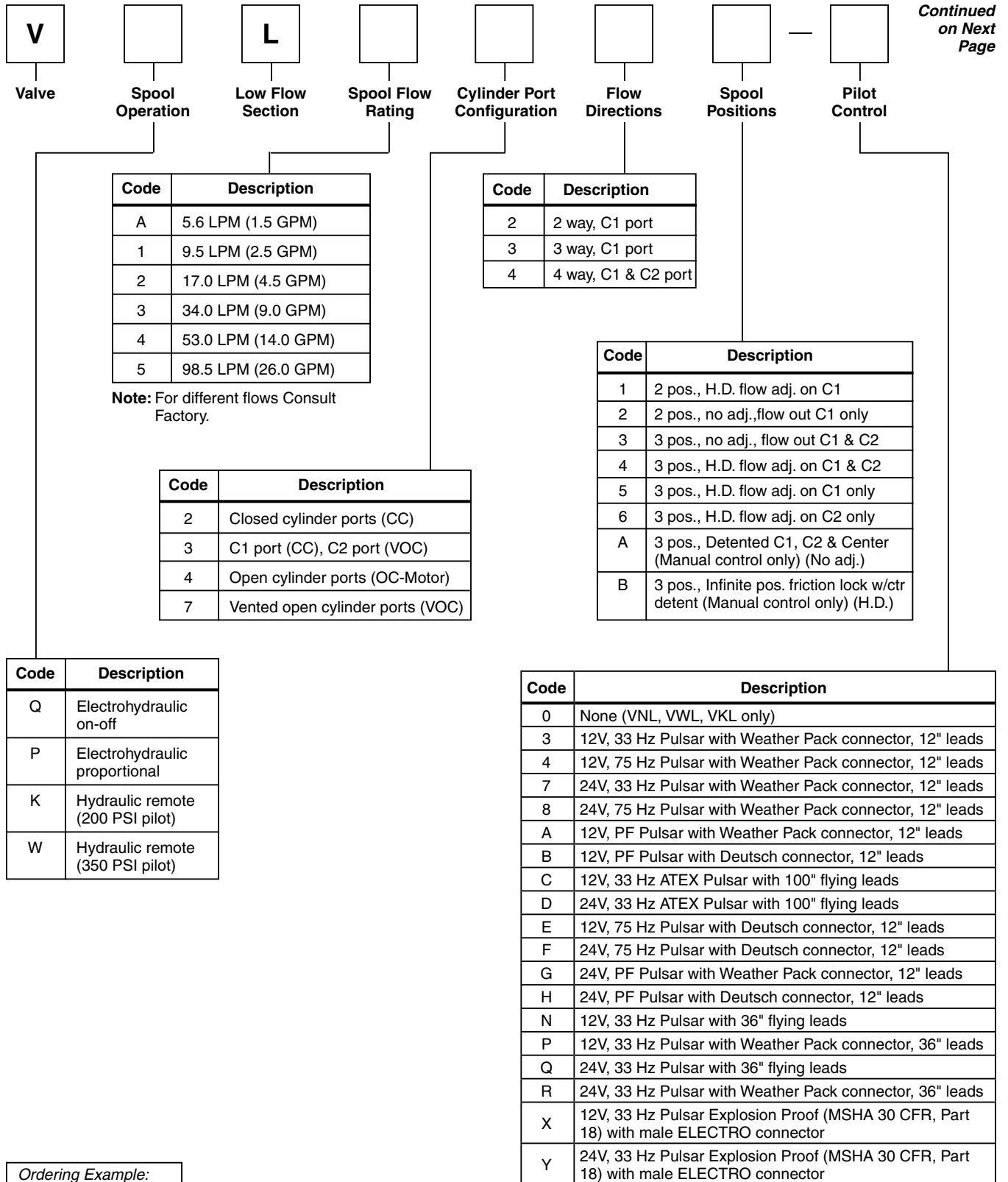
* SAE #10 Ports not available.

Note: For package segments, pressure limiters are set at 1500 PSI.



Pulsar® Stackable Valves

VPL Series Working Segment (Non-compensated)



Ordering Example:
VQL5444-3035-26JO

Note: Consult factory regarding Hirschmann Connectors.

Pulsar® Stackable Valves

Continued from Previous Page



Section Pressure Compensator

Code	Description
0	Non-compensated



Manual Override

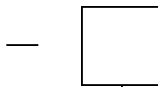
Code	Description
3	Manual operator shaft only
4	Manual operator with adapter and 6-inch handle
5	Manual adapter only
6	Marine handle adapter
7	Marine handle adapter with 6-inch handle
8	Manual adapter and 9-inch handle rod



Design Level

Code	Description
4	SAE #8 ports
5	BSPP G-1/2 ports
7 *	SAE #10 ports

* Hard LS seats included



C1 Cylinder Port Option

Code	Description
0	No port cavity
2	Relief, with anticavitation check
3	Anticavitation check
4*	Float, 12 VDC (3000 PSI Max)
5*	Float, 24 VDC (3000 PSI Max)
6	Defeat plug (Relief Option)

* SAE #10 Ports not available.



C2 Cylinder Port Option

Code	Description
0	No port cavity
2	Relief, with anticavitation check
3	Anticavitation check
4*	Float, 12 VDC (3000 PSI Max)
5*	Float, 24 VDC (3000 PSI Max)
6	Defeat plug (Relief Option)

* SAE #10 Ports not available.



C1 Pressure

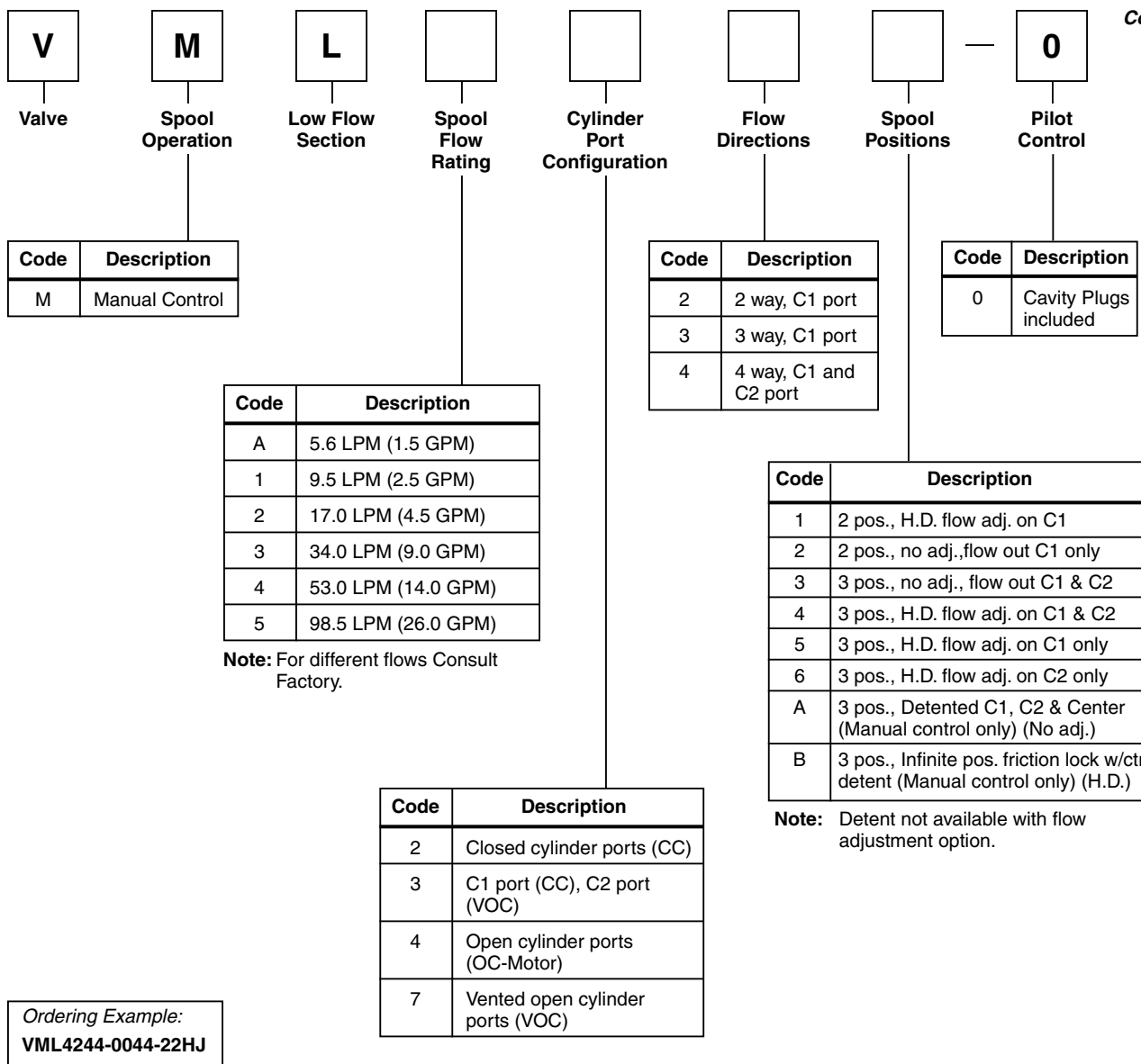


C2 Pressure

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

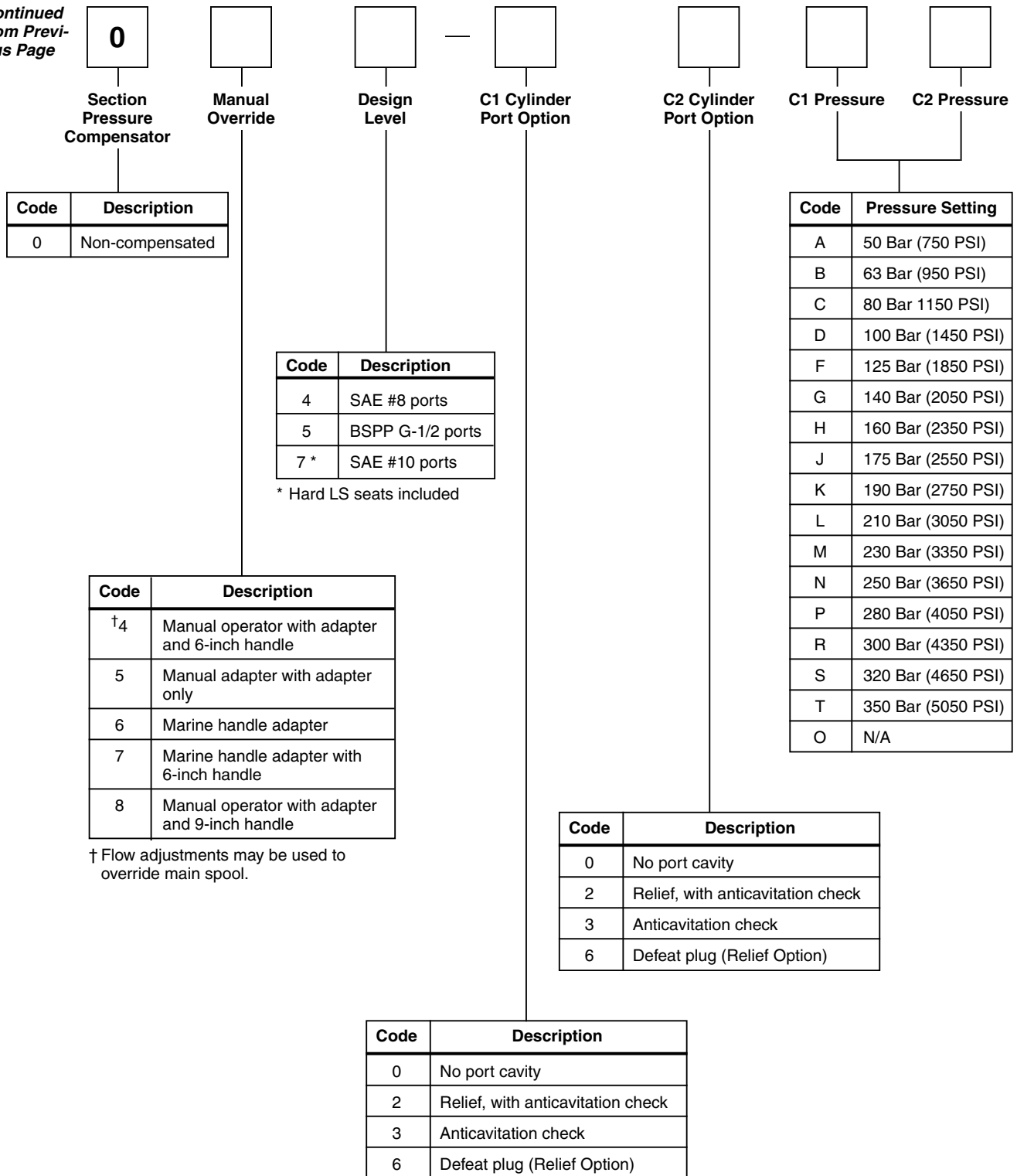
VML Series Manual Working Segment (Non-compensated)

Continued on Next Page



Pulsar® Stackable Valves

Continued from Previous Page



Pulsar® Stackable Valves**VPL Series Working Segment****Service Parts**

Part No.	Description
DB1545021	Seal Nut for Flow Limiter
DB1659147	Manual Operator Handle Knob
DB1851268	Shim Insertion Kit
DB1905950	Symmetry Adjustment Kit
DB5319027	Set Screw for Flow Limiter
DB5341734	Float Coil, 12V
DB5342734	Float Coil, 24V
DB5343950	Float Cartridge Kit, 12V
DB5344950	Float Cartridge Kit, 24V
VNLDK1	3 Position Detent Kit (w/o Spool)
VNLFLK1	Friction Lock Kit (w/o spool)
VPLAV1K1	Anticavitation Valve Kit for option ports
VPLCPK1	Compensator Plug Kit, Shim Adjustable
VPLCPK2	Compensator Plug Kit, Externally Adjustable
VPLCSK1	Individual Compensator Shim Kit (100 each 0.025, 0.008, 0.003)
VPLFHAK3	Fixed Operator Linkage Kit (handle adapter and set screw) (4, 5, 6 design)
VPLFHMK1	Fixed Operator Linkage Kit (Marine) (Handle adapter and set screw) (4, 5, 6 Design)
VPLFLK1	Flow Adjustment Kit (Replacement end plugs on spool cavity)
VPLH6K2	Manual Operator (6 inch) Handle Kit (hex shaft design)

VPL Series Working Segment (Cont.)**Service Parts**

Part No.	Description
VPLH9K1	Manual Operator (9 inch) Handle Kit
VPLHWK2	Manual Operator (6 inch) Weighted
VPLLDCK1	Load Drop Check Kit
VPLMHK2	Handle Shaft Kit (no adapter)
VPLPK2	Work Port Option Plug Kit
VPLPCPK1	Ported Compensator Plug Kit (#4 SAE)
VPLPCPK2	Ported Compensator Plug Kit (BSPP G-1/4)
VPLRA*K1	Relief w/Anticavitation Valve Kit (See table on Page 17 for pressure setting)
VPLRVK1	Compensator Plug Kit, Shim Adjustable w/C1 Pressure Limiter or Common Press Limiter
VPLRVK2	C2 Pressure Limiter Kit
VPLRVK3	Compensator Plug Kit, Externally Adjustable with C1 Pressure Limiter
VPLSCK2	Segment Compensator Spool Kit
VPLSK2	Working Segment O-ring Kit, Nitrile (complete)
VPLSP1K1	Defeat Plug Kit for option ports
VPLWSK2	Individual Segment O-ring Kit (Face Seals)

Pilot Controls – See Page 19

Pulsar® Stackable Valves**Pulsar® Pilot Controls****Service Parts**

Part No.	Description
VNPK1	Solenoid Plug Kit (2)
VS1320-0001-001	Solenoid Cartridge, Marine 12V (Old Nemko Approved)
VS1320-0005-001A	Solenoid Cartridge, 12V, 12" leads ATEX Certified
VS1320-0005-001B	Solenoid Cartridge, 12V, 36" leads ATEX Certified
VS1320-0005-001C	Solenoid Cartridge, 12V, 100" leads ATEX Certified
VS1320-0011	Solenoid Cartridge, 12V, Proportional with Weather Pack, 33Hz
VS1320-0012-003	Solenoid Cartridge, MSHA, 11.2V Intrinsic with Weather Pack Connector (proportional), 33Hz
VS1320-0022-003	Solenoid Cartridge, MSHA, 33Hz 11.2V Intrinsic w/ELECTRO Male Connector (submersible) (proportional)
VS1320-0024-002	Solenoid Cartridge, MSHA, 33Hz 12V Proportional XP with ELECTRO Male Connector
VS1320-0024-006	Solenoid Cartridge, MSHA, 33Hz 24V Proportional XP with ELECTRO Male Connector
VS1320-0051-001	Solenoid Cartridge, Marine 24V (Old Nemko Approved), 33Hz
VS1320-0055-001A	Solenoid Cartridge, 24V, 12" leads ATEX Certified, 33Hz
VS1320-0055-001B	Solenoid Cartridge, 24V, 36" leads ATEX Certified, 33Hz
VS1320-0055-001C	Solenoid Cartridge, 24V, 100" leads ATEX Certified, 33Hz
VS1320-0061	Solenoid Cartridge, 24V, Proportional with Weather Pack, 33Hz
VS1320-0111	Solenoid Cartridge, 12V ON/OFF with Weather Pack, 33Hz
VS1320-0161	Solenoid Cartridge, 24V ON/OFF with Weather Pack, 33Hz
VS1320-00J1	Solenoid Cartridge, 12V w/Large Hirschmann Connector (DIN 43) GDM Series, 33Hz
VS1320-00K1	Solenoid Cartridge 24V w/Large Hirschmann Connector (DIN 43) GDM Series, 33Hz
VS1320-00L1	Solenoid Cartridge, 12V w/Small Hirschmann Connector G Series, 33Hz
VS1320-00M1	Solenoid Cartridge, 24V w/Small Hirschmann Connector G Series, 33Hz

Pulsar® Pilot Controls (Cont.)**Service Parts**

Part No.	Description
VS1320-00N1	Solenoid Cartridge, 12V, Proportional with 36" flying leads, 33Hz
VS1320-00P1	Solenoid Cartridge, 12V, Proportional with 36" Weather Pack, 33Hz
VS1320-00Q1	Solenoid Cartridge, 24V, Proportional with 36" flying leads, 33Hz
VS1320-00R1	Solenoid Cartridge, 24V, Proportional with 36" Weather Pack, 33Hz
VS1515-0001	Solenoid Cartridge, 12V, 75Hz with 12" flying leads (High Response), No Groove
VS1515-0011	Solenoid Cartridge, 12V, 75Hz with Weather Pack Connector (High Response), No Groove
VS1515-0041	Solenoid Cartridge, 12V, 75Hz with Deutsch Connector (High Response), No Groove
VS1515-0051	Solenoid Cartridge, 24V, 75Hz with 12" flying leads, (High Response), No Groove
VS1515-0061	Solenoid Cartridge, 24V, 75Hz with Weather Pack Connector (High Response), No Groove
VS1515-0091	Solenoid Cartridge, 24V, 75Hz with Deutsch Connector (High Response), No Groove
VS1515-3001	Solenoid Cartridge, 12V, 75 Hz with 12" flying leads
VS1515-3011	Solenoid Cartridge, 12V, 75 Hz with Weather Pack Connector
VS1515-3041	Solenoid Cartridge, 12V, 75Hz with Deutsch Connector
VS1515-3051	Solenoid Cartridge, 24V, 75Hz with 12" flying leads
VS1515-3061	Solenoid Cartridge, 24V 75Hz with Weather Pack Connector
VS1515-3091	Solenoid Cartridge, 24V, 75Hz with Deutsch Connector
VS1619-0011	Solenoid Cartridge, 12 V PF with Weather Pack Connector
VS1619-0041	Solenoid Cartridge, 12 V PF with Deutsch Connector
VS1619-0061	Solenoid Cartridge, 24 V PF with Weather Pack Connector
VS1619-0091	Solenoid Cartridge, 24 V PF with Deutsch Connector
VWFK4	Pilot Oil Fitting Kit (2) (#4 SAE)
VWFK5	Pilot Oil Fitting Kit (2) (BSPP G-1/4)

Pulsar® Stackable Valves**VPL Series Working Segment Spool Kits****SPOOL KITS**

Part No.	Description
See Table	VPL, VWL, VQL, VML
VNL***AK2	Three Position Detent
VNL***BK2	Infinite Position Friction Lock

VPL/VKL/VNL/VQL Segments (Compensated)

Flow Rating (GPM)	3-POS. 3-WAY (C.C.)	3-POS. 4-WAY (C.C.)	3-POS. 4-WAY (C ₁ =CC, C ₂ =VOC)	3-POS. 4-WAY (O.C.M.)	3-POS. 4-WAY (V.O.C.)
0.7-1.3	VPLA33K2	VPLA24K2	VPLA34K2	VPLA44K2	VPLA74K2
1.3-2.5	VPL133K2	VPL124K2	VPL134K2	VPL144K2	VPL174K2
2.5-4.0	VPL233K2	VPL224K2	VPL234K2	VPL244K2	VPL274K2
4.0-7.0	VPL333K2	VPL324K2	VPL334K2	VPL344K2	VPL374K2
7.0-11.0	VPL433K2	VPL424K2	VPL434K2	VPL444K2	VPL474K2
11.0-17.0	VPL533K2	VPL524K2	VPL534K2	VPL544K2	VPL574K2
17.0-24.0	VPL633K2	VPL624K2	VPL634K2	VPL644K2	VPL674K2
24.0-30.0	VPL733K2	VPL724K2	VPL734K2	VPL744K2	VPL774K2

VWL Segments (Compensated)

Flow Rating (GPM)	3-POS. 3-WAY (C.C.)	3-POS. 4-WAY (C.C.)	3-POS. 4-WAY (C ₁ =CC, C ₂ =VOC)	3-POS. 4-WAY (O.C.M.)	3-POS. 4-WAY (V.O.C.)
0.7-1.3	VWLA33K2	VWLA24K2	VWLA34K2	VWLA44K2	VWLA74K2
1.3-2.5	VWL133K2	VWL124K2	VWL134K2	VWL144K2	VWL174K2V
2.5-4.0	VWL233K2	VWL224K2	VWL234K2	VWL244K2	VWL274K2
4.0-7.0	VWL333K2	VWL324K2	VWL334K2	VWL344K2	VWL374K2
7.0-11.0	VWL433K2	VWL424K2	VWL434K2	VWL444K2	VWL474K2
11.0-17.0	VWL533K2	VWL524K2	VWL534K2	VWL544K2	VWL574K2
17.0-24.0	VWL633K2	VWL624K2	VWL634K2	VWL644K2	VWL674K2
24.0-30.0	VWL733K2	VWL724K2	VWL734K2	VWL744K2	VWL774K2

VML/VQL Segments (Non-Compensated)

Flow Rating (GPM)	3-POS. 3-WAY (C.C.)	3-POS. 4-WAY (C.C.)	3-POS. 4-WAY (C ₁ =CC, C ₂ =VOC)	3-POS. 4-WAY (O.C.M.)	3-POS. 4-WAY (V.O.C.)
1.5	VMLA33K3	VMLA24K3	VMLA34K3	VMLA44K3	VMLA74K3
2.5	VML133K3	VML124K3	VML134K3	VML144K3	VML174K3
4.5	VML233K3	VML224K3	VML234K3	VML244K3	VML274K3
9.0	VML333K3	VML324K3	VML334K3	VML344K3	VML374K3
14.0	VML433K3	VML424K3	VML434K3	VML444K3	VML474K3
26.0	VML533K3	VML524K3	VML534K3	VML544K3	VML574K3

VPL/VKL Segments (Non-Compensated)

Flow Rating (GPM)	3-POS. 3-WAY (C.C.)	3-POS. 4-WAY (C.C.)	3-POS. 4-WAY (C ₁ =CC, C ₂ =VOC)	3-POS. 4-WAY (O.C.M.)	3-POS. 4-WAY (V.O.C.)
1.5	VPLA33K3	VPLA24K3	VPLA34K3	VPLA44K3	VPLA74K3
2.5	VPL133K3	VPL124K3	VPL134K3	VPL144K3	VPL174K3
4.5	VPL233K3	VPL224K3	VPL234K3	VPL244K3	VPL274K3
9.0	VPL333K3	VPL324K3	VPL334K3	VPL344K3	VPL374K3
14.0	VPL433K3	VPL424K3	VPL434K3	VPL444K3	VPL474K3
26.0	VPL533K3	VPL524K3	VPL534K3	VPL544K3	VPL574K3

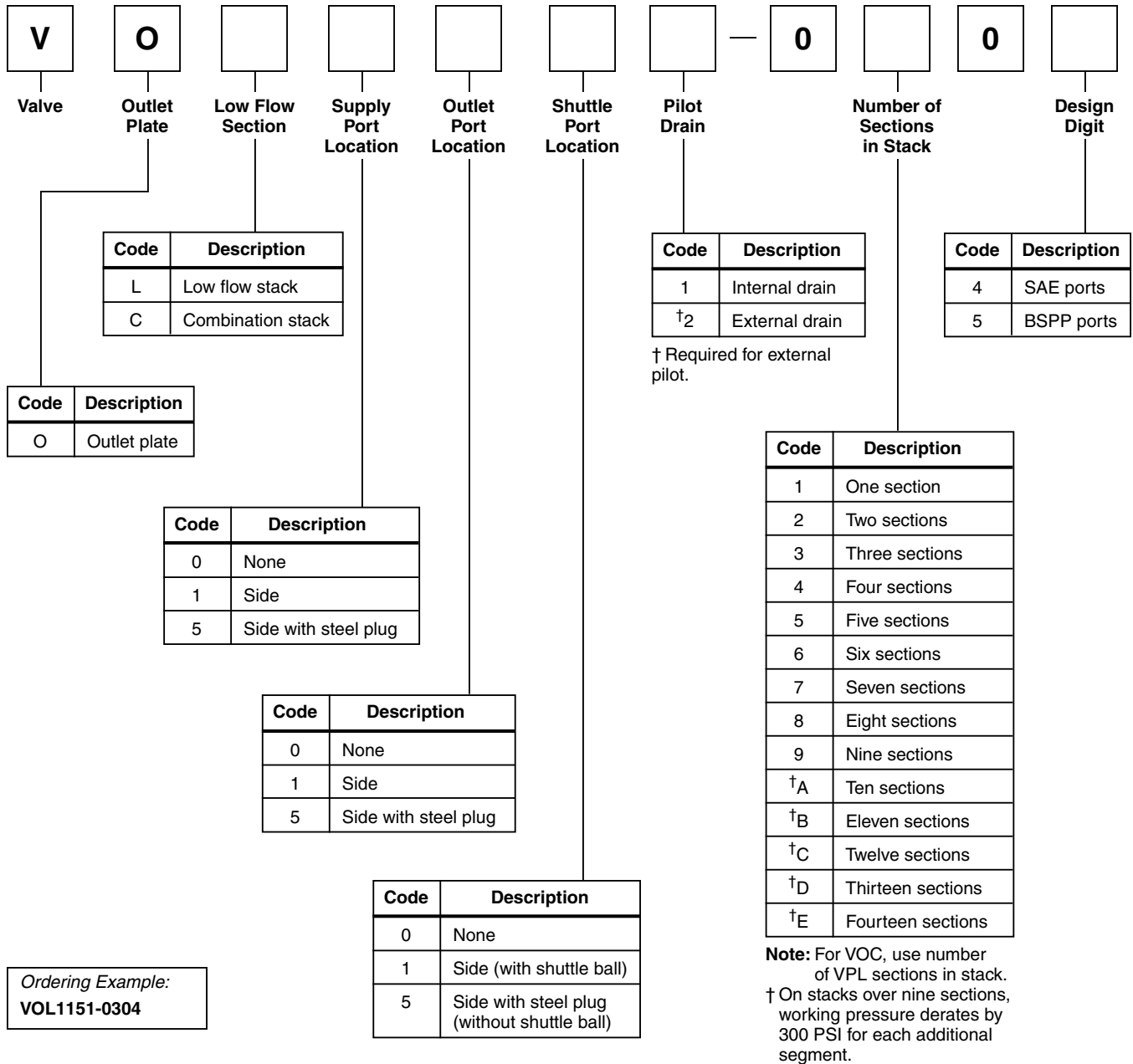
VWL Segments (Non-Compensated)

Flow Rating (GPM)	3-POS. 3-WAY (C.C.)	3-POS. 4-WAY (C.C.)	3-POS. 4-WAY (C ₁ =CC, C ₂ =VOC)	3-POS. 4-WAY (O.C.M.)	3-POS. 4-WAY (V.O.C.)
1.5	VWLA33K3	VWLA24K3	VWLA34K3	VWLA44K3	VWLA74K3
2.5	VWL133K3	VWL124K3	VWL134K3	VWL144K3	VWL174K3
4.5	VWL233K3	VWL224K3	VWL234K3	VWL244K3	VWL274K3
9.0	VWL333K3	VWL324K3	VWL334K3	VWL344K3	VWL374K3
14.0	VWL433K3	VWL424K3	VWL434K3	VWL444K3	VWL474K3
26.0	VWL533K3	VWL524K3	VWL534K3	VWL544K3	VWL574K3

Note: Centering spring is different between compensated and non-compensated valves. DO NOT INTERMIX.

Pulsar® Stackable Valves

VPL Series Stacking Plate (for factory assemblies only)



VPL, Series Stacking Plate (for kits only)**Service Parts**

Part No.	Description
VOL0K4	Stacking Plate (No Ports) SAE
VOL0K5	Stacking Plate (No Ports) BSPP
VOL1K4	Stacking Plate (Ports) SAE
VOL1K5	Stacking Plate (Ports) BSPP
VOL5K4	Stacking Plate (Ports & Plugs) SAE
VOL5K5	Stacking Plate (Ports & Plugs) BSPP

Assembly Kits (Tie Rods and Mountings)

Part No.	Description
VAL1K1	1 Section
VAL2K1	2 Section
VAL3K1	3 Section
VAL4K1	4 Section
VAL5K1	5 Section
VAL6K1	6 Section
VAL7K1	7 Section
VAL8K1	8 Section
VAL9K1	9 Section
VALAK1	10 Section
VALBK1	11 Section
VALCK1	12 Section
VALDK1	13 Section
VALEK1	14 Section

Service Parts

Part No.	Description
VTAGK1	Name Tag Labels (50 pcs)

Notes:

- Stacking plate is convertible between internal and external drain.
- When ordering kits for combination stacks, order a VOL series stacking plate, but be sure to order the correct VALMC*K1 assembly kit (page 9).

Terms of Sale with Warranty Limitations

Offer of Sale

The goods, services or work (referred to as the "Products") offered by Parker-Hannifin Corporation, its subsidiaries, groups, divisions, and authorized distributors ("Seller") are offered for sale at prices indicated in the offer, or as may be established by Seller. The offer to sell the Products and acceptance of Seller's offer by any customer ("Buyer") is contingent upon, and will be governed by all of the terms and conditions contained in this Offer of Sale. Buyer's order for any Products specified in Buyer's purchase document or Seller's offer, proposal or quote ("Quote") attached to the purchase order, when communicated to Seller verbally, or in writing, shall constitute acceptance of this offer. 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 or work described will be referred to as "Products".

1. Terms and Conditions. Seller's willingness to offer Products for sale or accept an order for Products is subject to the terms and conditions contained in this Offer of Sale or any newer version of the same, published by Seller electronically at www.parker.com/saleterms/. Seller objects to any contrary or additional terms or conditions of Buyer's order or any other document or other communication issued by Buyer.

2. Price; Payment. Prices stated on Seller's Quote are valid for thirty (30) days, except as explicitly otherwise stated therein, and do not include any sales, use, or other taxes or duties unless specifically stated. Seller reserves the right to modify prices to adjust for any raw material price fluctuations. Unless otherwise specified by Seller, all prices are F.C.A. Seller's facility (INCOTERMS 2010). Payment is subject to credit approval and payment for all purchases is due thirty (30) days from the date of invoice (or such date as may be specified by Seller's Credit Department). Unpaid invoices beyond the specified payment date incur interest at the rate of 1.5% per month or the maximum allowable rate under applicable law.

3. Shipment; Delivery; Title and Risk of Loss. All delivery dates are approximate. Seller is not responsible for damages resulting from any delay. Regardless of the manner of shipment, delivery occurs and title and risk of loss or damage 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 Buyer's 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 (18) months from the date of delivery. All prices are based upon the exclusive limited warranty stated above, and upon the following disclaimer: **DISCLAIMER OF WARRANTY: THIS WARRANTY IS THE SOLE AND ENTIRE WARRANTY PERTAINING TO PRODUCTS PROVIDED. 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 receipt. No claims for shortages will be allowed unless reported to the Seller within ten (10) days of delivery. No other claims against Seller will be allowed unless asserted in writing within thirty (30) days after delivery. Buyer shall notify Seller of any alleged breach of warranty within thirty (30) days after the date the defect is or should have been discovered by Buyer. Any claim or action against Seller based upon breach of contract or any other theory, including tort, negligence, or otherwise must be commenced within twelve (12) months from the date of the alleged breach or other alleged event, without regard to the date of discovery.

6. LIMITATION OF LIABILITY. IN THE EVENT OF A BREACH OF WARRANTY, SELLER WILL, AT ITS OPTION, REPAIR OR REPLACE A DEFECTIVE PRODUCT, OR REFUND THE PURCHASE PRICE WITHIN A REASONABLE PERIOD OF TIME. IN NO EVENT IS SELLER LIABLE 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, WHETHER BASED 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 based upon data or specifications provided by the user, 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 (2) 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 has 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 retains a security interest in all Products delivered to Buyer and this agreement is deemed to be 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 losses, claims, liabilities, damages, lawsuits, judgments and costs (including attorney fees and defense costs), 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, application, design, specification 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 Products; 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. Buyer may not cancel or modify or cancel any order 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.

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 is not liable for delay or failure to perform any of Seller's obligations by reason of events or circumstances beyond its reasonable control (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 invalidate 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 prior written notice. Seller may immediately terminate this agreement, in writing, if Buyer: (a) breaches any provision of this agreement (b) appoints 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 one if filed by a third party (d) makes an assignment for the benefit of creditors; or (e) dissolves its business or liquidates all or a majority of its assets.

17. Governing Law. This agreement and the sale and delivery of all Products are 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 is not liable 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 refund the purchase price less a reasonable allowance for depreciation. Notwithstanding the foregoing, Seller is not liable 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 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. The terms contained herein may not be modified unless in writing and signed by an authorized representative of Seller.

20. Compliance with Laws. Buyer agrees to comply with all applicable laws, regulations, and industry and professional standards of care, including those of the United Kingdom, the United States of America, and the country or countries in which Buyer may operate, including without limitation the U. K. Bribery Act, the U.S. Foreign Corrupt Practices Act ("FCPA"), the U.S. Anti-Kickback Act ("Anti-Kickback Act") and the U.S. Food Drug and Cosmetic Act ("FDCA"), each as currently amended, and the rules and regulations promulgated by the U.S. Food and Drug Administration ("FDA"), 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 it is familiar with the provisions of the U. K. Bribery Act, the FCPA, the FDA, and the Anti-Kickback Act, and certifies that Buyer will adhere to the requirements thereof. In particular, Buyer represents and agrees that Buyer will 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.

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Parker's Motion & Control Technologies

At Parker, we're guided by a relentless drive to help our customers become more productive and achieve higher levels of profitability by engineering the best systems for their requirements. It means looking at customer applications from many angles to find new ways to create value. Whatever the motion and control technology need, Parker has the experience, breadth of product and global reach to consistently deliver. No company knows more about motion and control technology than Parker. For further info call 1 800 C-Parker (1 800 272 7537)



Aerospace

Key Markets

Aftermarket services
Commercial transports
Engines
General & business aviation
Helicopters
Launch vehicles
Military aircraft
Missiles
Power generation
Regional transports
Unmanned aerial vehicles

Key Products

Control systems & actuation products
Engine systems & components
Fluid conveyance systems & components
Fluid metering, delivery & atomization devices
Fuel systems & components
Fuel tank inerting systems
Hydraulic systems & components
Thermal management
Wheels & brakes



Climate Control

Key Markets

Agriculture
Air conditioning
Construction Machinery
Food & beverage
Industrial machinery
Life sciences
Oil & gas
Precision cooling
Process
Refrigeration
Transportation

Key Products

Accumulators
Advanced actuators
CO₂ controls
Electronic controllers
Filter driers
Hand shut-off valves
Heat exchangers
Hose & fittings
Pressure regulating valves
Refrigerant distributors
Safety relief valves
Smart pumps
Solenoid valves
Thermostatic expansion valves



Electromechanical

Key Markets

Aerospace
Factory automation
Life science & medical
Machine tools
Packaging machinery
Paper machinery
Plastics machinery & converting
Primary metals
Semiconductor & electronics
Textile
Wire & cable

Key Products

AC/DC drives & systems
Electric actuators, gantry robots & slides
Electrohydraulic actuation systems
Electromechanical actuation systems
Human machine interface
Linear motors
Stepper motors, servo motors, drives & controls
Structural extrusions



Filtration

Key Markets

Aerospace
Food & beverage
Industrial plant & equipment
Life sciences
Marine
Mobile equipment
Oil & gas
Power generation & renewable energy
Process
Transportation
Water Purification

Key Products

Analytical gas generators
Compressed air filters & dryers
Engine air, coolant, fuel & oil filtration systems
Fluid condition monitoring systems
Hydraulic & lubrication filters
Hydrogen, nitrogen & zero air generators
Instrumentation filters
Membrane & fiber filters
Microfiltration
Sterile air filtration
Water desalination & purification filters & systems



Fluid & Gas Handling

Key Markets

Aerial lift
Agriculture
Bulk chemical handling
Construction machinery
Food & beverage
Fuel & gas delivery
Industrial machinery
Life sciences
Marine
Mining
Mobile
Oil & gas
Renewable energy
Transportation

Key Products

Check valves
Connectors for low pressure fluid conveyance
Deep sea umbilicals
Diagnostic equipment
Hose couplings
Industrial hose
Mooring systems & power cables
PTFE hose & tubing
Quick couplings
Rubber & thermoplastic hose
Tube fittings & adapters
Tubing & plastic fittings



Hydraulics

Key Markets

Aerial lift
Agriculture
Alternative energy
Construction machinery
Forestry
Industrial machinery
Machine tools
Marine
Material handling
Mining
Oil & gas
Power generation
Refuse vehicles
Renewable energy
Truck hydraulics
Turf equipment

Key Products

Accumulators
Cartridge valves
Electrohydraulic actuators
Human machine interfaces
Hybrid drives
Hydraulic cylinders
Hydraulic motors & pumps
Hydraulic systems
Hydraulic valves & controls
Hydrostatic steering
Integrated hydraulic circuits
Power take-offs
Power units
Rotary actuators
Sensors



Pneumatics

Key Markets

Aerospace
Conveyor & material handling
Factory automation
Life science & medical
Machine tools
Packaging machinery
Transportation & automotive

Key Products

Air preparation
Brass fittings & valves
Manifolds
Pneumatic accessories
Pneumatic actuators & grippers
Pneumatic valves & controls
Quick disconnects
Rotary actuators
Rubber & thermoplastic hose & couplings
Structural extrusions
Thermoplastic tubing & fittings
Vacuum generators, cups & sensors



Process Control

Key Markets

Alternative fuels
Biopharmaceuticals
Chemical & refining
Food & beverage
Marine & shipbuilding
Medical & dental
Microelectronics
Nuclear Power
Offshore oil exploration
Oil & gas
Pharmaceuticals
Power generation
Pulp & paper
Steel
Water/wastewater

Key Products

Analytical Instruments
Analytical sample conditioning products & systems
Chemical injection fittings & valves
Fluoropolymer chemical delivery fittings, valves & pumps
High purity gas delivery fittings, valves, regulators & digital flow controllers
Industrial mass flow meters/controllers
Permanent no-weld tube fittings
Precision industrial regulators & flow controllers
Process control double block & bleeds
Process control fittings, valves, regulators & manifold valves



Sealing & Shielding

Key Markets

Aerospace
Chemical processing
Consumer
Fluid power
General industrial
Information technology
Life sciences
Microelectronics
Military
Oil & gas
Power generation
Renewable energy
Telecommunications
Transportation

Key Products

Dynamic seals
Elastomeric o-rings
Electro-medical instrument design & assembly
EMI shielding
Extruded & precision-cut, fabricated elastomeric seals
High temperature metal seals
Homogeneous & inserted elastomeric shapes
Medical device fabrication & assembly
Metal & plastic retained composite seals
Shielded optical windows
Silicone tubing & extrusions
Thermal management
Vibration dampening

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Parker Hannifin Corporation
Hydraulic Valve Division
520 Ternes Avenue
Elyria, Ohio 44035 USA
Tel: 440-366-5100
Fax: 440-366-5253
www.parker.com/hydraulicvalve

