

ENGINEERING
TOMORROW



Technical Information

Proportional Valve Group

PVG 16



Revision history

Table of revisions

Date	Changed	Rev
January 2018	Major update.	0601
July 2017	Major update.	0501
February 2017	Major update.	0401
March 2016	Minor update in PVHC technical characteristics	0303
March 2016	Updated to Engineering Tomorrow design.	0302
February 2016	Drawing was updated in topic: How to select the correct spool	0301
September 2015	PVG 16 Step II	0200
Feb. 2013-Mar. 2015	Major layout revision, drawings change	BA-BF
October 2012	New Edition	AA

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General Information

General Description

PVG is a hydraulic, load-sensing proportional valve, designed for optimal machine performance and maximum design flexibility. The PVG valve design is based on a modular concept that enables machine designers to specify a valve solution suitable for multiple market segments across multiple applications.

The PVG 16 is a member of the PVG product platform.

PVG 16 controls work port flow up to 65 l/min and up to 420 bar work port pressure.

The load independent proportional control valve and high performance actuator technology combined with a low pressure drop design improves the machine performance and efficiency – increasing productivity and reducing energy consumption.

PVG 16 Features

PVG load-sensing proportional valves features and benefits summarized in a few bullets.

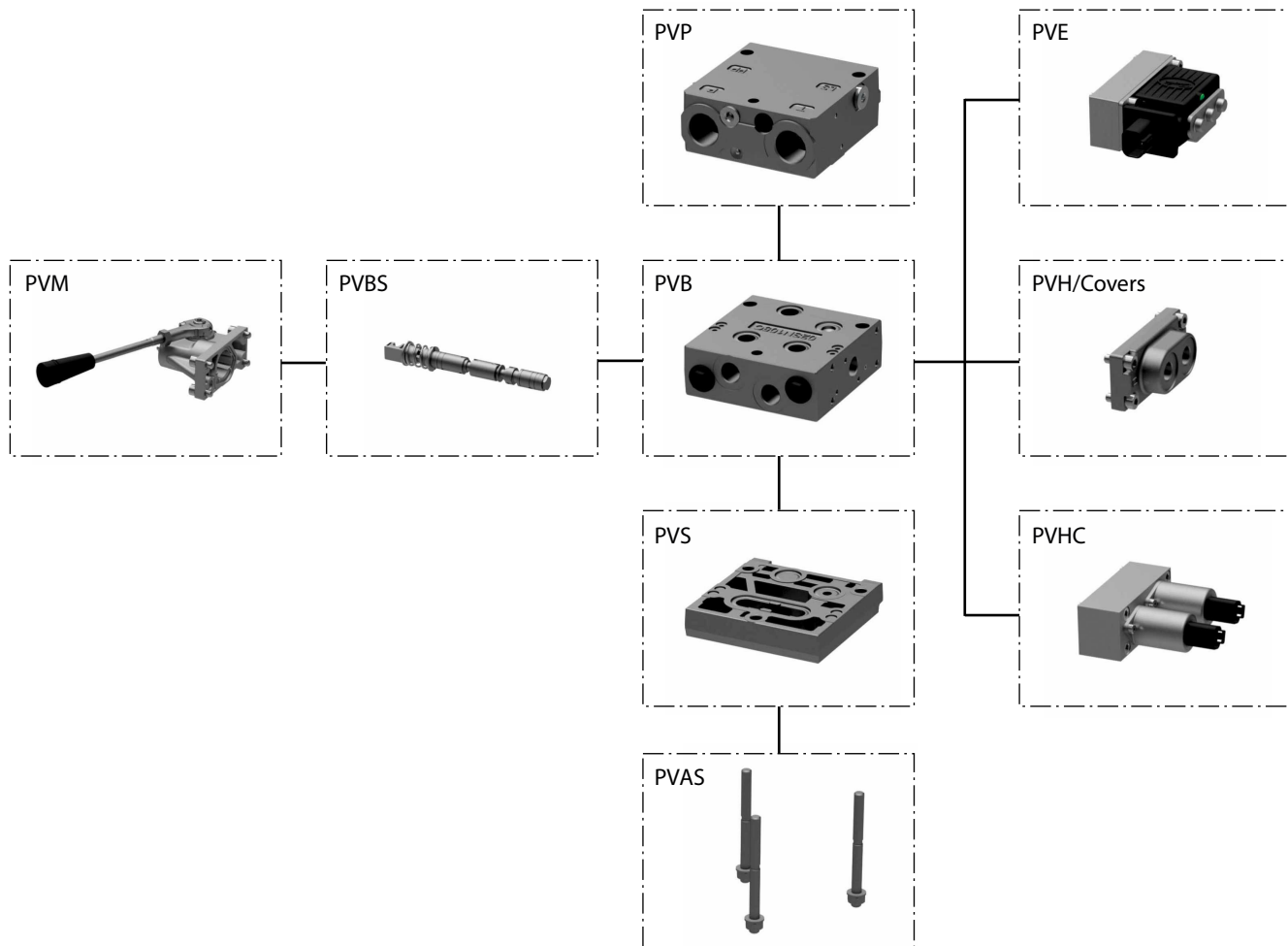
- Inlet flow up to 140 l/min [37 US gal/min] 230 l/min [61 US gal/min] when used with mid-inlet
- Easy integration with PVG 32
- Possible combination with the rest of the PVG family: PVG 100, PVG 120 or PVG 128/256 when using an interface module
- Up to 12 basic modules per PVG 16 valve group
- Load-independent flow control:
 - Oil flow to an individual function is independent of the load pressure of this function
 - Oil flow to one function is independent of the load pressure of other functions
- Reliable regulation characteristics across the entire flow range
- Load sense relief valves for A and B port enables reduced energy loss at target pressure
- Several options for connection threads and flange mount
- Compact design, easy installation and serviceability

General Information

PVG 16 Modules Overview

PVG proportional valve group shown in the exploded view illustration for a quick modules navigation.

PVG 16 Modules Assembly Overview



PVG Modules Navigation:

- [PVP Inlet Modules](#) on page 7
- [PVB Basic Modules](#) on page 22
- [PVBS Main Spools](#) on page 42
- [PVM Manual Actuation](#) on page 54
- [PVE Electrical Actuation](#) on page 61
- [PVH Hydraulic Actuation](#) on page 57
- [PVHC Electro-Hydraulic Actuation](#) on page 59
- [PVS End Plates](#) on page 72
- [PVAS Stay Bolts](#) on page 81

PVP Inlet Modules

The PVG 16 PVP inlet modules, also referred to as pump side modules, act as an interface between the PVG 16 proportional valve group and the hydraulic pump and tank reservoir.

PVP Inlet Module



The PVP inlet module variants are based on a generic platform with a selection of additional features, enabling you to tailor the PVP to suit the demands of any hydraulic system.

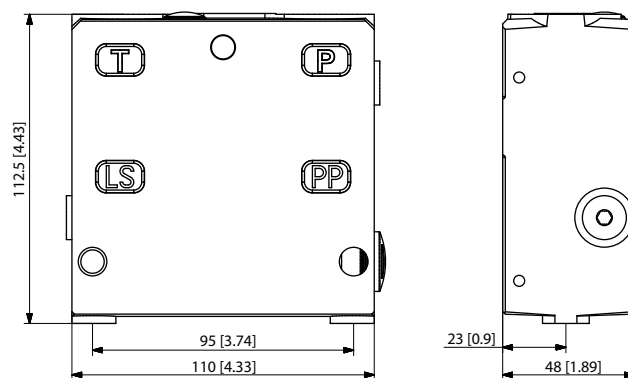
Symbols

Fixed displacement pump	Variable displacement pump

The generic PVP inlet module platform includes the following main variants:

- Open center PVP for fixed displacement pumps; [Open Center PVP](#) on page 8
- Open center PVP with PPRV for fixed displacement pumps, [Open Center PVP with PPRV](#) on page 10
- Open center PVP with PPRV and damped pressure adjustment spool for fixed displacement pumps; [Open center PVP with PPRV and adjustment spool](#) on page 13
- Closed center PVP for variable displacement pumps; [Closed Center PVP](#) on page 16
- Closed center PVP with PPRV for fixed displacement pumps; [Closed Center PVP with PPRV](#) on page 18

PVP inlet module dimensions



Weight: 3.1 kg [6.9 lb]

PVP Inlet Modules

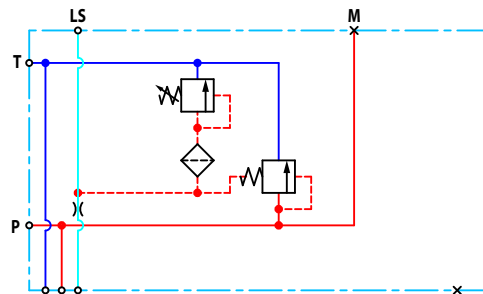
Open Center PVP

The basic Open Center PVP inlet module is intended for use with fixed displacement pumps in applications, where a valve group with mechanically controlled work sections is desired, or where the pilot pressure to the valve group is supplied externally.

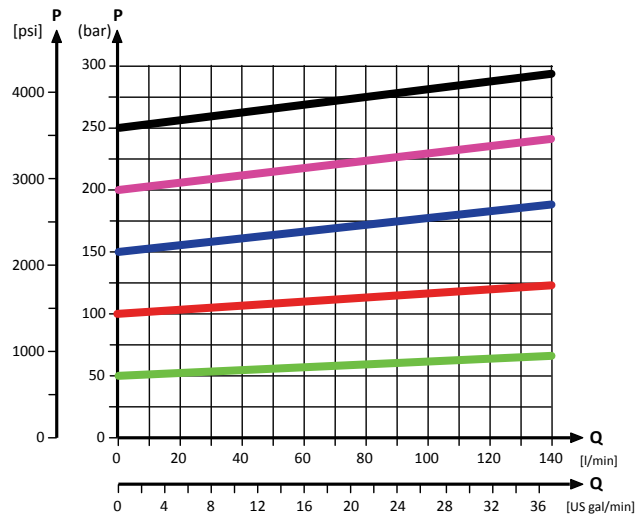
The Open Center PVP features:

- Integrated LS pressure relief valve
- Threaded ports for P/T/LS and M measuring gauge
- Optional LS unloading valve, PVPX

Open center PVP schematic

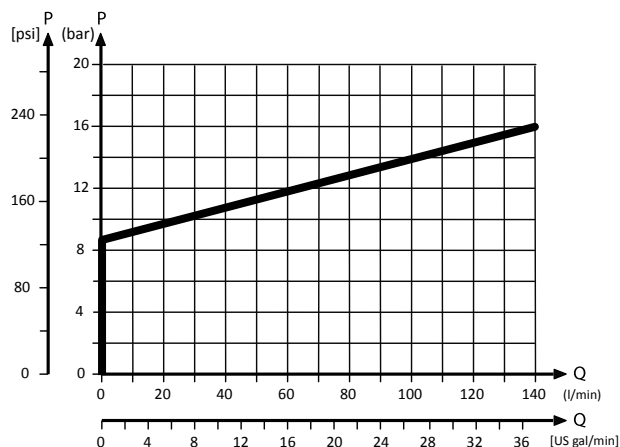


Integrated LS pressure relief valve characteristic (Theoretical)



PVP Inlet Modules

PVP Neutral By-pass pressure drop characteristics



Technical Data

Maximum rated pressure	P-port continuous	350 bar [5076 psi]
	P-port intermittent	400 bar [5800 psi]
	T-port static/dynamic	25/40 bar [363/580 psi]
Maximum rated flow	P-port	140 l/min [37 US gal/min]
Fluid temperature	Recommended	30 to 60°C [86 to 140°F]
	Minimum	-30°C [-22°F]
	Maximum	90° [194°F]
Ambient temperature	Recommended	-30 to 60°C [-22 to 140°F]
Fluid viscosity	Operating range	12 to 75 mm ² /s [65 to 347 SUS]
	Minimum	4 mm ² /s [39 SUS]
	Maximum	460 mm ² /s [2128 SUS]
Fluid cleanliness	Minimum	23/19/16 (according to ISO 4406)

Part numbers for Open Center PVP

Part number	P-port	T-port	LS-port	M-port	Mounting	PVPX*
157B5000	G1/2"	G3/4"	G1/4"	G1/4"	M8	-
157B5100	G3/4"	G3/4"	G1/4"	G1/4"	M8	-
157B5102	G3/4"	G3/4"	G1/4"	G1/4"	M8	Yes
157B5200	7/8-14 UNF	1-1/16 UN	1/2-20 UNF	1/2-20 UNF	5/16-18 UNC	-
157B5300	1-1/16 UN	1-1/16 UN	1/2-20 UNF	1/2-20 UNF	5/16-18 UNC	-

*For more information see [PVPX, Electrical LS Pressure Unloading Valve](#) on page 20

PVP Inlet Modules

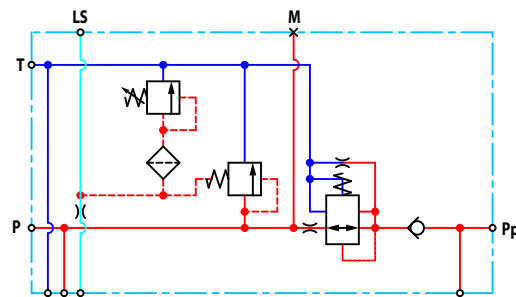
Open Center PVP with PPRV

The Open Center PVP inlet with integrated pilot pressure reduction valve (PPRV) is intended for use with fixed displacement pumps in applications, where a valve group with electro-hydraulically or hydraulically controlled work sections is desired (PVE or PVH/PVHC).

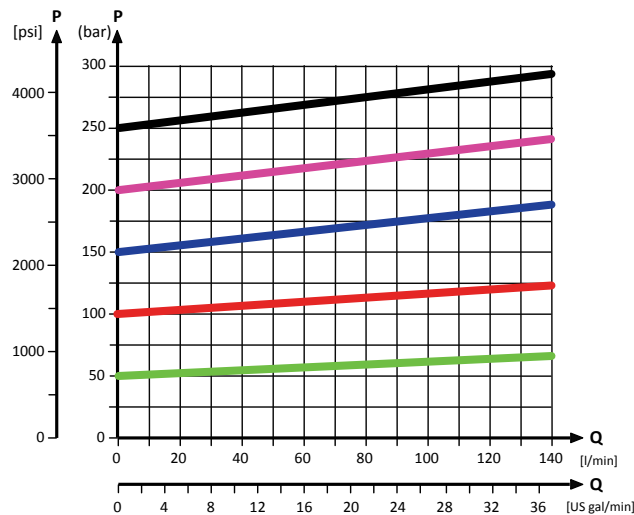
The Open Center PVP features:

- Integrated LS pressure relief valve
- Threaded ports for P/T/LS and M measuring gauge
- Integrated pilot pressure reducing valve (PPRV) for PVE or PVH/PVHC
- Optional external pilot pressure port (Pp)
- Optional LS unloading valve, PVPX

Open center PVP with PPRV schematic

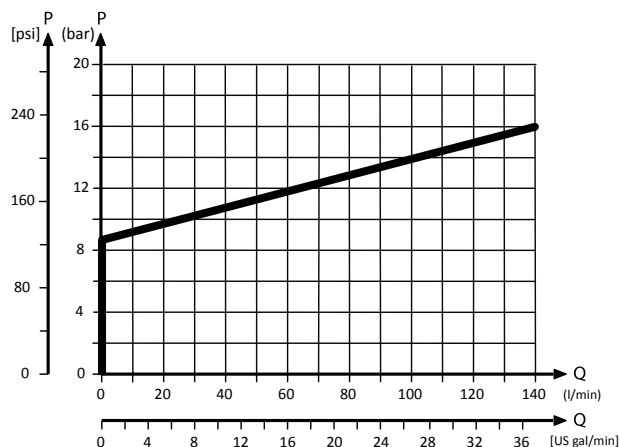


Integrated LS pressure relief valve characteristic (Theoretical)

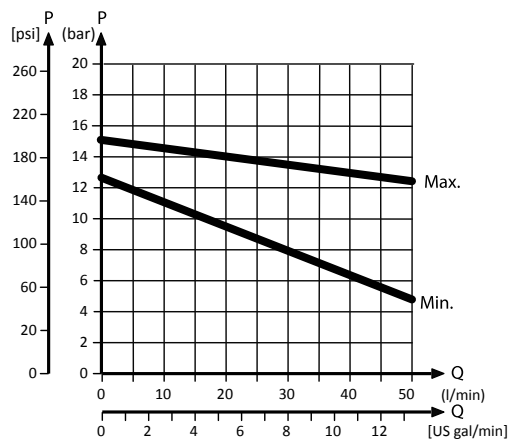


PVP Inlet Modules

PVP Neutral By-pass pressure drop characteristics



PVP pilot pressure characteristics



Technical Data

Maximum rated pressure	P-port continuous	350 bar [5076 psi]
	P-port intermittent	400 bar [5800 psi]
	T-port static/dynamic	25/40 bar [363/580 psi]
Maximum rated flow	P-port	140 l/min [37 US gal/min]
Fluid temperature	Recommended	30 to 60°C [86 to 140°F]
	Minimum	-30°C [-22°F]
	Maximum	90° [194°F]
Ambient temperature	Recommended	-30 to 60°C [-22 to 140°F]
Fluid viscosity	Operating range	12 to 75 mm ² /s [65 to 347 SUS]
	Minimum	4 mm ² /s [39 SUS]
	Maximum	460 mm ² /s [2128 SUS]
Fluid cleanliness	Minimum	23/19/16 (according to ISO 4406)

Part numbers for Open Center PVP with PPRV

Part number	Actuation	P-port	T-port	LS-port	M-port	Pp-port	Mounting	PVPX*
157B5010	PVE	G1/2"	G3/4"	G1/4"	G1/4"	-	M8	-
157B5012	PVE	G1/2"	G3/4"	G1/4"	G1/4"	-	M8	Yes

PVP Inlet Modules

Part numbers for Open Center PVP with PPRV (continued)

Part number	Actuation	P-port	T-port	LS-port	M-port	Pp-port	Mounting	PVPX*
157B5110	PVE	G3/4"	G3/4"	G1/4"	G1/4"	–	M8	–
157B5112	PVE	G3/4"	G3/4"	G1/4"	G1/4"	–	M8	Yes
157B5180	PVE	G3/4"	G3/4"	G1/4"	G1/4"	G1/4"	M8	–
157B5190	PVH/PVHC	G3/4"	G3/4"	G1/4"	G1/4"	G1/4"	M8	–
157B5210	PVE	7/8-14 UNF	1-1/16 UN	1/2-20 UNF	1/2-20 UNF	–	5/16-18 UNC	–
157B5212	PVE	7/8-14 UNF	1-1/16 UN	1/2-20 UNF	1/2-20 UNF	–	5/16-18 UNC	Yes
157B5310	PVE	1-1/16 UN	1-1/16 UN	1/2-20 UNF	1/2-20 UNF	–	5/16-18 UNC	–
157B5312	PVE	1-1/16 UN	1-1/16 UN	1/2-20 UNF	1/2-20 UNF	–	5/16-18 UNC	Yes
157B5380	PVE	1 1/16 UN	1 1/16 UN	1/2-20 UNF	1/2-20 UNF	9/16-18 UNF	5/16-18 UNC	–
157B5390	PVH/PVHC	1-1/16 UN	1-1/16 UN	9/16-18 UNF	9/16-18 UNF	9/16-18 UNF	5/16-18 UNC	–

* For more information please see [PVPX, Electrical LS Pressure Unloading Valve](#) on page 20

All modules can be manually activated with the PVM. For more information please see [PVM Manual Actuation](#) on page 54.

PVP Inlet Modules

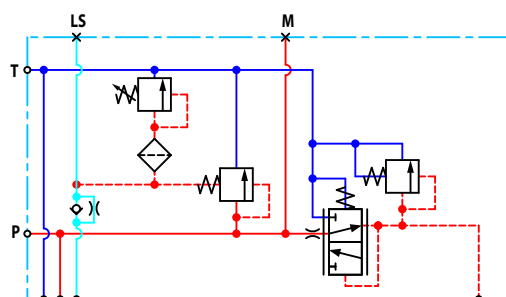
Open center PVP with PPRV and adjustment spool

The Open Center PVP inlet with integrated pilot pressure reduction valve (PPRV) is intended for use with fixed displacement pumps in applications where a valve group with electro-hydraulic or hydraulically controlled work sections is desired.

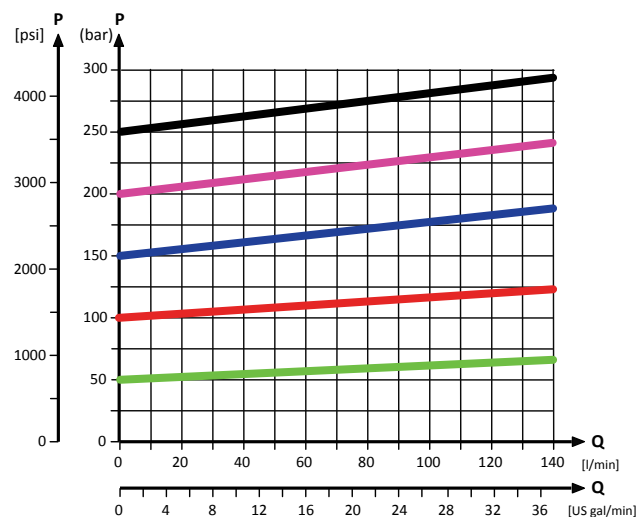
The Open Center PVP features:

- Integrated LS pressure relief valve
- Threaded ports for P/T/LS and M measuring gauge
- Integrated pilot pressure reducing valve (PPRV) for PVE or PVH/PVHC
- Optional external pilot pressure port (Pp)

Open center PVP with PPRV, adjustment spool schematic

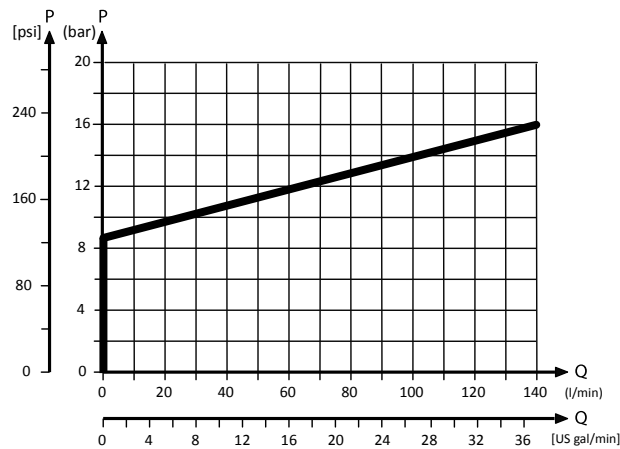


Integrated LS pressure relief valve characteristic (Theoretical)

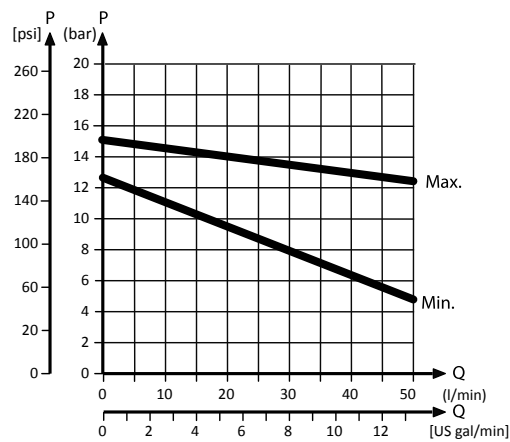


PVP Inlet Modules

PVP Neutral By-pass pressure drop characteristics



PVP pilot pressure characteristics



Technical Data

Maximum rated pressure	P-port continuous	350 bar [5076 psi]
	P-port intermittent	400 bar [5800 psi]
	T-port static/dynamic	25/40 bar [363/580 psi]
Maximum rated flow	P-port	140 l/min [37 US gal/min]
Fluid temperature	Recommended	30 to 60°C [86 to 140°F]
	Minimum	-30°C [-22°F]
	Maximum	90° [194°F]
Ambient temperature	Recommended	-30 to 60°C [-22 to 140°F]
Fluid viscosity	Operating range	12 to 75 mm ² /s [65 to 347 SUS]
	Minimum	4 mm ² /s [39 SUS]
	Maximum	460 mm ² /s [2128 SUS]
Fluid cleanliness	Minimum	23/19/16 (according to ISO 4406)

PVP Inlet Modules

Part numbers OC PVP with PPRV, adjustment spool

Part number	Actuation	P-port	T-port	LS-port	M-port	Pp-port	Mounting	PVPX*
11008849	PVE	G3/4"	G3/4"	G1/4"	G1/4"	G1/4"	M8	-
11008851	PVH	G3/4"	G3/4"	G1/4"	G1/4"	G1/4"	M8	-

* For more information please see [PVPX, Electrical LS Pressure Unloading Valve](#) on page 20

All modules can be manually activated with the PVM. For more information please see [PVM Manual Actuation](#) on page 54.

PVP Inlet Modules

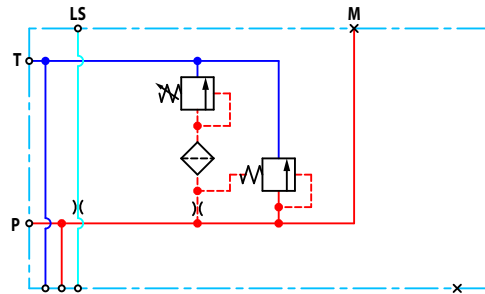
Closed Center PVP

The basic Closed Center PVP inlet is intended for use with variable displacement pumps in applications where a valve group with mechanically controlled work sections is desired, or where the pilot pressure to the valve group is supplied externally.

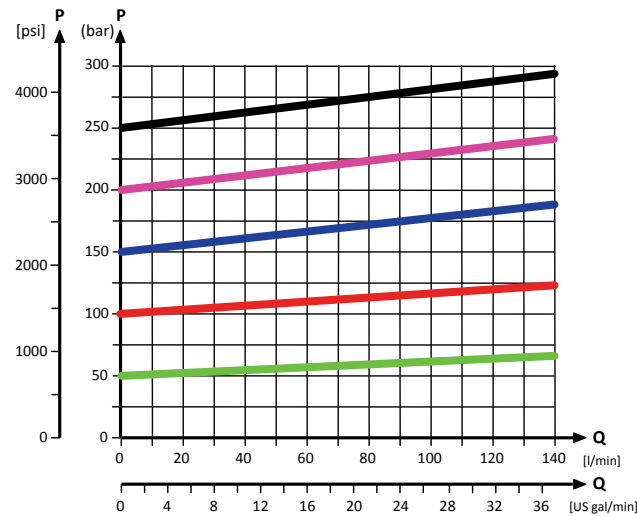
The Closed Center PVP features:

- Integrated LS pressure relief valve
- Threaded ports for P/T/LS and M measuring gauge
- Optional LS unloading valve, PVPX

Closed center PVP schematic



Integrated LS pressure relief valve characteristic (Theoretical)



Technical Data

Maximum rated pressure	P-port continuous	350 bar [5076 psi]
	P-port intermittent	400 bar [5800 psi]
	T-port static/dynamic	25/40 bar [363/580 psi]
Maximum rated flow	P-port	140 l/min [37 US gal/min]
Fluid temperature	Recommended	30 to 60°C [86 to 140°F]
	Minimum	-30°C [-22°F]
	Maximum	90° [194°F]
Ambient temperature	Recommended	-30 to 60°C [-22 to 140°F]

PVP Inlet Modules

Technical Data (continued)

Fluid viscosity	Operating range	12 to 75 mm ² /s [65 to 347 SUS]
	Minimum	4 mm ² /s [39 SUS]
	Maximum	460 mm ² /s [2128 SUS]
Fluid cleanliness	Minimum	23/19/16 (according to ISO 4406)

Part numbers for Closed Center PVP

Part number	P-port	T-port	LS-port	M-port	Mounting	PVPX*
157B5001	G1/2"	G3/4"	G1/4"	G1/4"	M8	-
157B5101	G3/4"	G3/4"	G1/4"	G1/4"	M8	-
157B5103	G3/4"	G3/4"	G1/4"	G1/4"	M8	Yes
157B5201	7/8-14 UNF	1-1/16 UN	1/2-20 UNF	1/2-20 UNF	5/16-18 UNC	-
157B5301	1-1/16 UN	1-1/16 UN	1/2-20 UNF	1/2-20 UNF	5/16-18 UNC	-

* For more information please see [PVPX, Electrical LS Pressure Unloading Valve](#) on page 20

PVP Inlet Modules

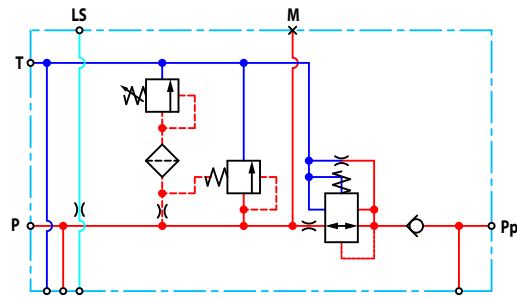
Closed Center PVP with PPRV

The Closed Center PVP inlet with integrated pilot pressure reduction valve (PPRV) is intended for use with variable displacement pumps in applications where a valve group with electro-hydraulic or hydraulically controlled work sections is desired.

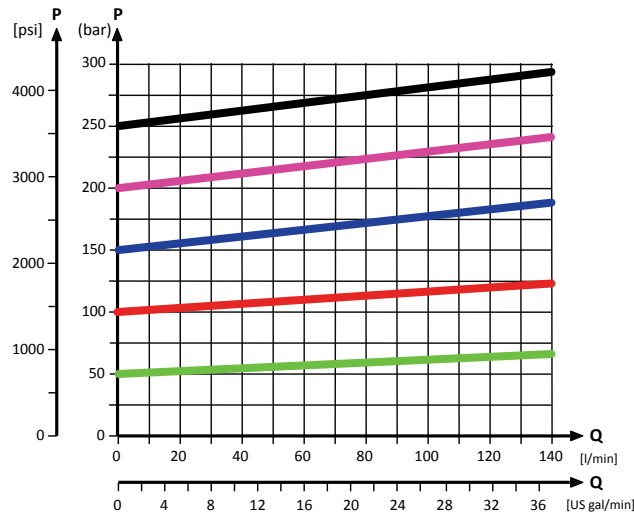
The Closed Center PVP features:

- Integrated LS pressure relief valve
- Threaded ports for P/T/LS and M measuring gauge
- Integrated pilot pressure reducing valve (PPRV) for PVE or PVH/PVHC
- Optional external pilot pressure port (Pp)
- Optional LS unloading valve, PVPX

Closed center PVP with PPRV schematic

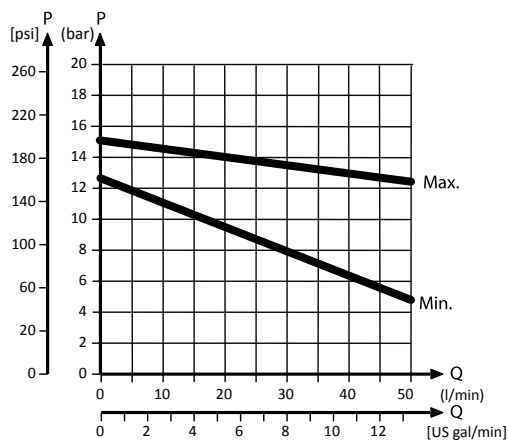


Integrated LS pressure relief valve characteristic (Theoretical)



PVP Inlet Modules

PVP pilot pressure characteristics



All modules can be manually activated with the PVM. For more information please see [PVM Manual Actuation](#) on page 54.

Technical Data

Maximum rated pressure	P-port continuous	350 bar [5076 psi]
	P-port intermittent	400 bar [5800 psi]
	T-port static/dynamic	25/40 bar [363/580 psi]
Maximum rated flow	P-port	140 l/min [37 US gal/min]
Fluid temperature	Recommended	30 to 60°C [86 to 140°F]
	Minimum	-30°C [-22°F]
	Maximum	90° [194°F]
Ambient temperature	Recommended	-30 to 60°C [-22 to 140°F]
Fluid viscosity	Operating range	12 to 75 mm ² /s [65 to 347 SUS]
	Minimum	4 mm ² /s [39 SUS]
	Maximum	460 mm ² /s [2128 SUS]
Fluid cleanliness	Minimum	23/19/16 (according to ISO 4406)

Part numbers for Closed Center PVP with PPRV

Part number	Actuation	P-port	T-port	LS-port	M-port	Pp-port	Mounting	PVPX*
157B5011	PVE	G1/2"	G3/4"	G1/4"	G1/4"	-	M8	-
157B5013	PVE	G1/2"	G3/4"	G1/4"	G1/4"	-	M8	Yes
157B5111	PVE	G3/4"	G3/4"	G1/4"	G1/4"	-	M8	-
157B5113	PVE	G3/4"	G3/4"	G1/4"	G1/4"	-	M8	Yes
157B5181	PVE	G3/4"	G3/4"	G1/4"	G1/4"	G1/4"	M8	-
157B5191	PVH/PVHC	G3/4"	G3/4"	G1/4"	G1/4"	G1/4"	M8	-
157B5211	PVE	7/8-14 UNF	1-1/16 UN	1/2-20 UNF	1/2-20 UNF	-	5/16-18 UNC	-
157B5213	PVE	7/8-14 UNF	1-1/16 UN	1/2-20 UNF	1/2-20 UNF	-	5/16-18 UNC	Yes
157B5311	PVE	1-1/16 UN	1-1/16 UN	1/2-20 UNF	1/2-20 UNF	-	5/16-18 UNC	-
157B5313	PVE	1-1/16 UN	1-1/16 UN	1/2-20 UNF	1/2-20 UNF	-	5/16-18 UNC	Yes
157B5381	PVE	1-1/16 UN	1-1/16 UN	9/16-18 UNF	9/16-18 UNF	9/16-18 UNF	5/16-18 UNC	-
157B5391	PVH/PVHC	1-1/16 UN	1-1/16 UN	9/16-18 UNF	9/16-18 UNF	9/16-18 UNF	5/16-18 UNC	

* For more information please see [PVPX, Electrical LS Pressure Unloading Valve](#) on page 20

PVP Inlet Modules

PVPX, Electrical LS Pressure Unloading Valve

The PVPX, electrical LS pressure unloading valve is an accessory available for PVP inlet modules used for PVG 16.

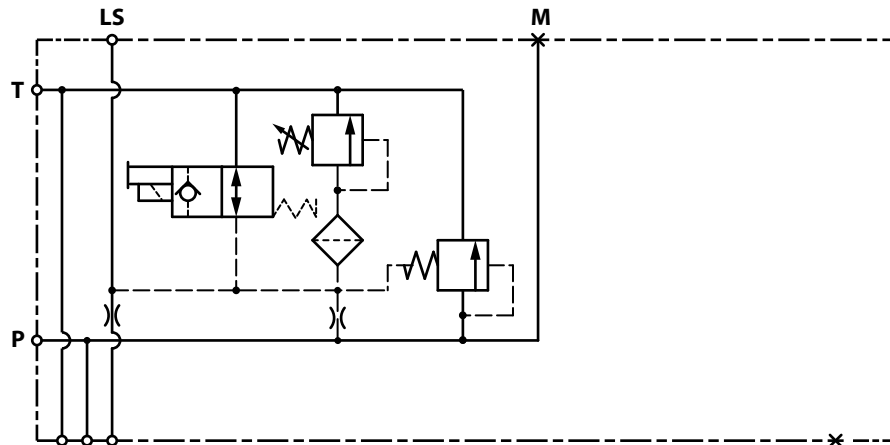
The PVPX consist of a solenoid valve and a magnetic coil package, allowing the operator to relieve the LS pressure to tank electrically. Variants also feature a manual override functionality to activate the PVPX manually. Relieving the LS pressure to tank results in a reduced system pressure.

- In an **Open Center** configuration PVP the reduced system pressure level is determined by the sum of the tank pressure and the neutral by-pass pressure drop.
- In a **Closed Center** configuration PVP the reduced system pressure level is determined by the sum of the tank pressure and the standby-pressure.

Configuration variants

Normally Open (NO)	Normally Open with Manual Override (NOMO)	Normally Closed (NC)

PVPX with NOMO schematic



Technical Data

Max. pressure drop @ 0.1 l/min [2.6 US gal/min]		2 bar [30 psi]
Max. coil surface temperature		155°C [311°F]
Oil temperature	Recommended range	30 to 60°C [86 to 140°F]
	Minimum	-30°C [-22°F]
	Maximum	90°C [194°F] 300 ms
Ambient recommended temperature range		-30 to 60°C [-22 to 140°F]
Oil viscosity	Operating range	12 to 75 mm ² /s [65 to 347 SUS]
	Minimum	4 mm ² /s [39 SUS]
	Maximum	460 mm ² /s [2128 SUS]
Oil cleanliness according to ISO 4406		23/19/16

PVP Inlet Modules

PVPX electrical data

Voltage supply	12 V_{DC} ± 10%	24 V_{DC} ± 10%
Resistance	7.2 Ω ± 7%	28.2 Ω ± 7%
Power consumption	20 W	
Max. LS pressure relief response time		

Part numbers for PVPX

Part number	Configuration	Manual Override	Voltage Supply	Connector	Thread Size	IP Rating
157B4236	NO	-	12 V _{DC}	1x2 DIN	3/4-16 UNF	IP65
157B4238	NO	-	24 V _{DC}	1x2 DIN	3/4-16 UNF	IP65
157B4246	NC	-	12 V _{DC}	1x2 DIN	3/4-16 UNF	IP65
157B4248	NC	-	24 V _{DC}	1x2 DIN	3/4-16 UNF	IP65
157B4256	NOMO	PUSH	12 V _{DC}	1x2 DIN	3/4-16 UNF	IP65
157B4257	NOMO	PUSH & TURN	24 V _{DC}	1x2 DIN	3/4-16 UNF	IP65
157B4258	NOMO	PUSH	12 V _{DC}	1x2 DIN	3/4-16 UNF	IP65
157B4259	NOMO	PUSH & TURN	24 V _{DC}	1x2 DIN	3/4-16 UNF	IP65
157B4260	NOMO	PUSH	26 V _{DC}	1x2 DIN	3/4-16 UNF	IP65
157B4976	NC	-	26 V _{DC}	1x2 DIN	3/4-16 UNF	IP65
157B4981	NO	-	12 V _{DC}	1x2 AMP	3/4-16 UNF	IP66
157B4982	NO	-	24 V _{DC}	1x2 AMP	3/4-16 UNF	IP66
157B4983	NC	-	12 V _{DC}	1x2 AMP	3/4-16 UNF	IP66
157B4984	NC	-	24 V _{DC}	1x2 AMP	3/4-16 UNF	IP66
157B4985	NOMO	PUSH	12 V _{DC}	1x2 AMP	3/4-16 UNF	IP66
157B4986	NOMO	PUSH	24 V _{DC}	1x2 AMP	3/4-16 UNF	IP66
11180766	NO	-	12 V _{DC}	1x2 DEU	3/4-16 UNF	IP65
11180767	NO	-	24 V _{DC}	1x2 DEU	3/4-16 UNF	IP65
11180768	NC	-	12 V _{DC}	1x2 DEU	3/4-16 UNF	IP65
11180769	NC	-	24 V _{DC}	1x2 DEU	3/4-16 UNF	IP65

PVB Basic Modules

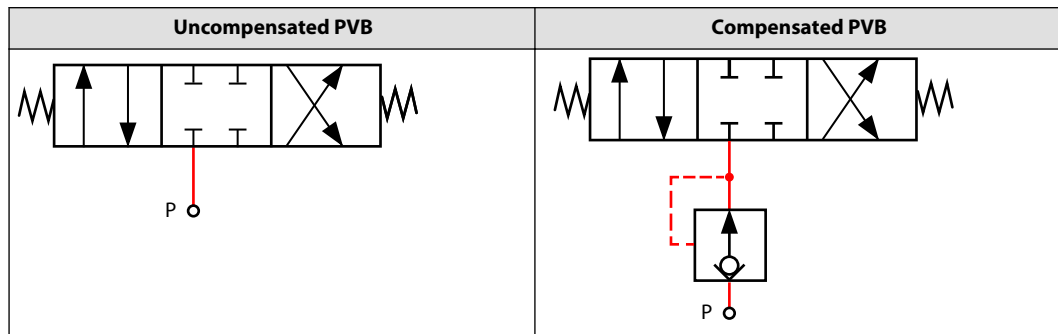
The PVB basic modules, also referred to as work sections, is the interface between the proportional valve group and the work function such as a cylinder or a motor.

PVB basic module



The PVB basic module variants are based on a generic platform with a selection of additional features, enabling you to tailor the PVB to suit the demands of any hydraulic system. The generic PVB basic module platform includes the following main variants:

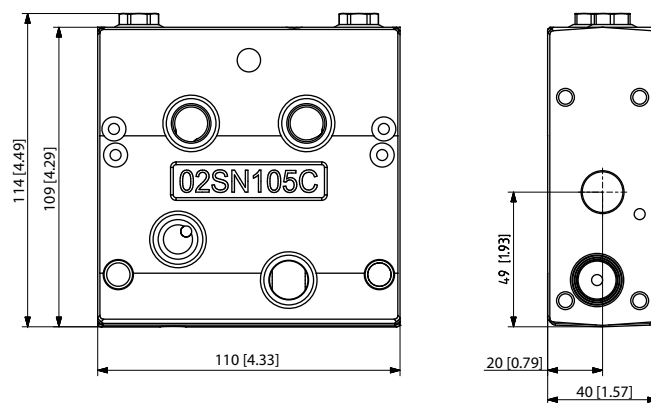
Symbols



- Compensated basic module; [Compensated PVB](#) on page 24
- Compensated basic module with facilities for shock and anti-cavitation valves (PVLP/PVLA); [Compensated PVB with PVLP/PVLA](#) on page 27
- Compensated basic module with one common adjustable LS valve for port A and port B; [Compensated PVB with LS A/B](#) on page 31
- Uncompensated basic module with optional integrated load drop check valve; [Uncompensated PVB](#) on page 34
- Uncompensated basic module with facilities for shock valves (PVLP) and optional integrated load drop check valve; [Uncompensated PVB with PVLP](#) on page 36

PVB Basic Modules

PVB dimensions



Weight: 2,6 kg [5,7 lb]

PVB Basic Modules

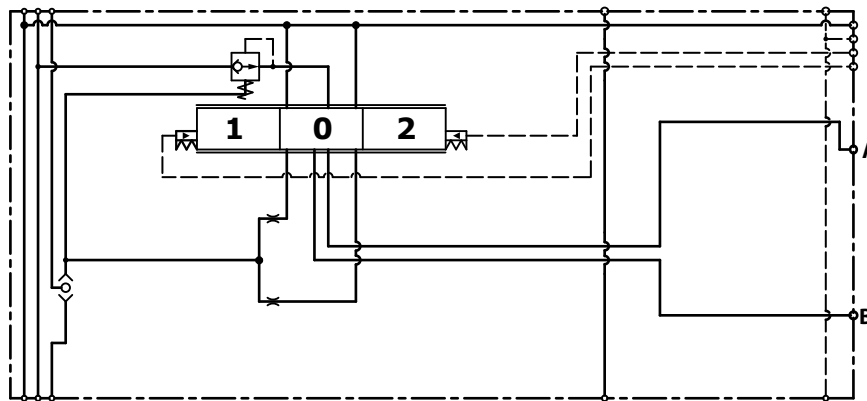
Compensated PVB

The compensated PVB is intended for controlling a work function where the function behavior in terms of flow and pressures requires independence on the load pressure of other functions used simultaneously.

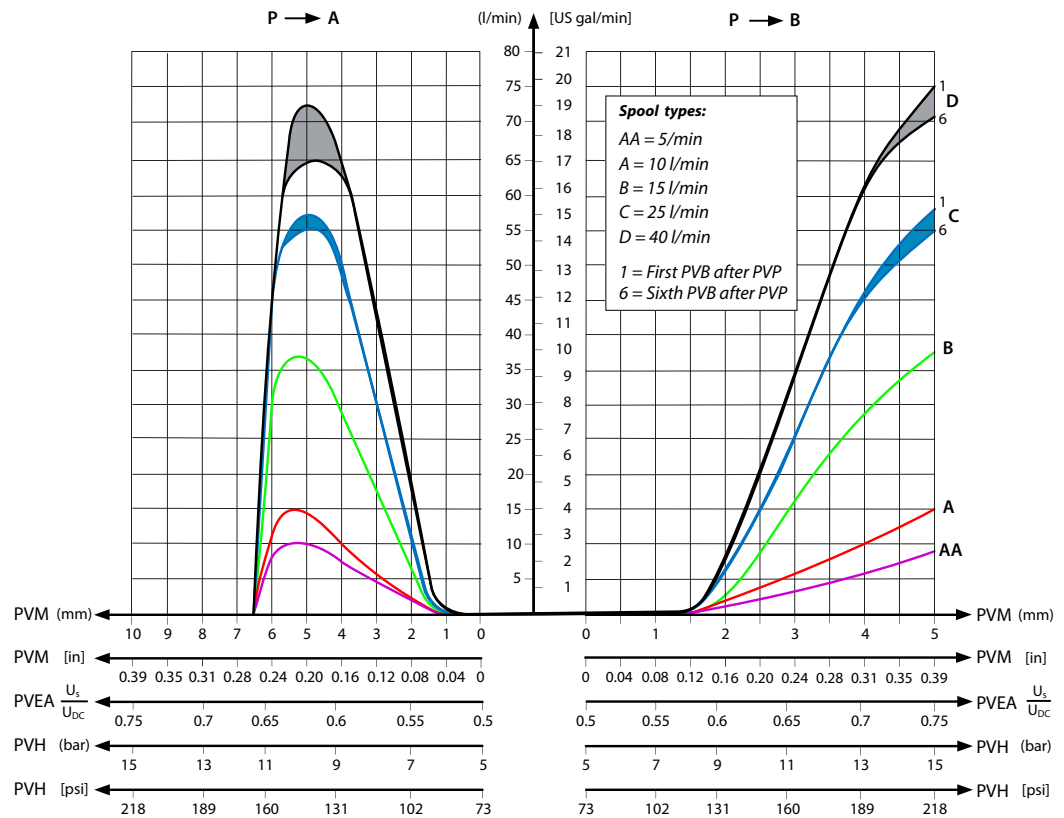
The Compensated PVB features:

- Integrated LS shuttle network
- Integrated compensator

Compensated PVB schematic

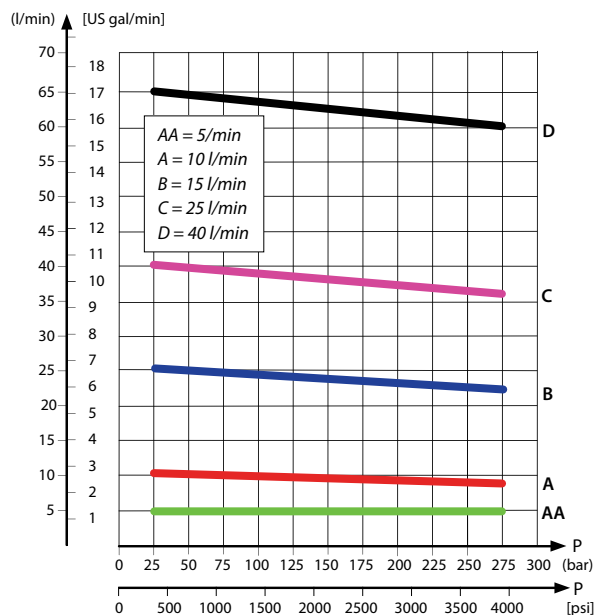


Fluid flow as a function of spool travel

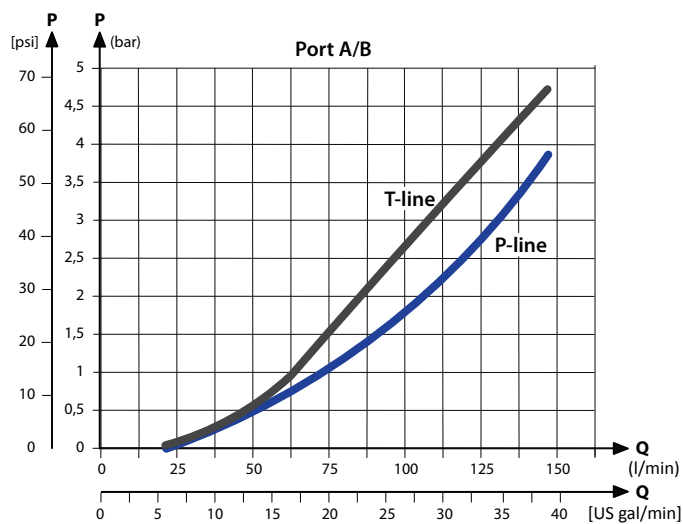


PVB Basic Modules

PVB pressure compensated fluid flow characteristics



PVB pressure compensated P-line and T-line characteristics



Technical data

Maximum rated pressure	A/B-port continuous	380 bar [5510 psi]
	A/B-port intermittent	420 bar [6090 psi]
Maximum rated flow	A/B-port	65 l/min [17 US gal/min]
Fluid temperature	Recommended	30 to 60°C [86 to 140°F]
	Ambient	-30 to 60°C [-22 to 140°F]
	Minimum	-30°C [-22°F]
	Maximum	90° [194°F]

PVB Basic Modules

Technical data (continued)

Fluid viscosity	Operating range	12 to 75 mm ² /s [65 to 347 SUS]
	Minimum	4 mm ² /s [39 SUS]
	Maximum	460 mm ² /s [2128 SUS]
Fluid cleanliness	Minimum	23/19/16 (according to ISO 4406)

Part numbers for Compensated PVB

Part number	A/B-port
11130976	3/8" BSP
11130977	3/4" - 16 UNF

PVB Basic Modules

Compensated PVB with PVLP/PVLA

The compensated PVB featuring an optional PVLP/PVLA shock and anti-cavitation valves on each work port for pressure peak protection and anti-cavitation prevention, is intended for controlling a work function where the function behavior in terms of flow and pressures requires independence on the load pressure of other functions used simultaneously.

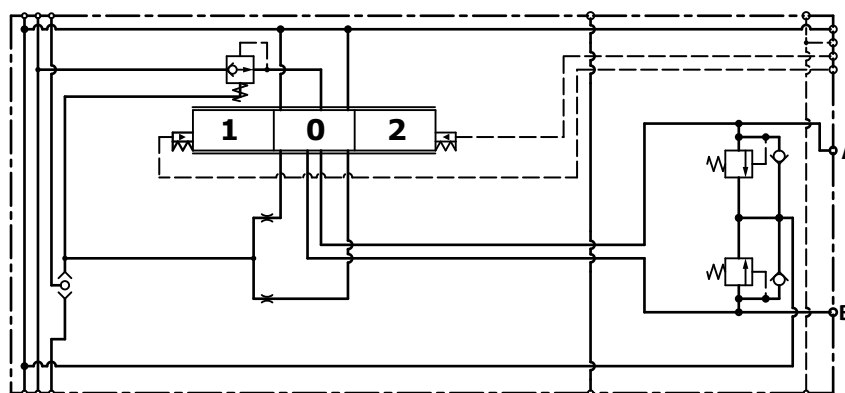
The compensated PVB is intended for controlling a work function where the function behavior in terms of flow and pressures requires independence on the load pressure of other functions used simultaneously.

Optional shock and featuring an optional PVLP/PVLA shock and anti-cavitation valves on each work port for pressure peak protection and anti-cavitation prevention.

The Compensated PVB with PVLP/PVLA features:

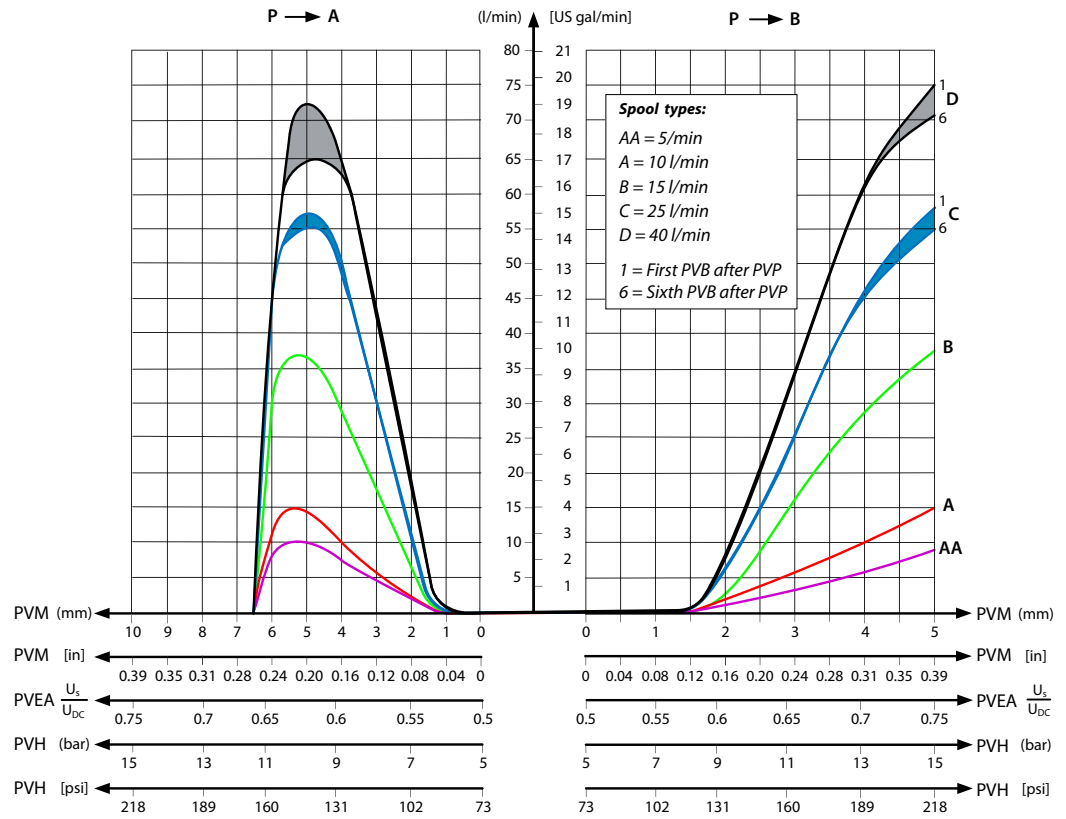
- Integrated LS shuttle network
- Integrated compensator
- Optional shock and anti-cavitation valve facility (PVLP/PVLA)

Compensated PVB with PVLP/PVLA schematic

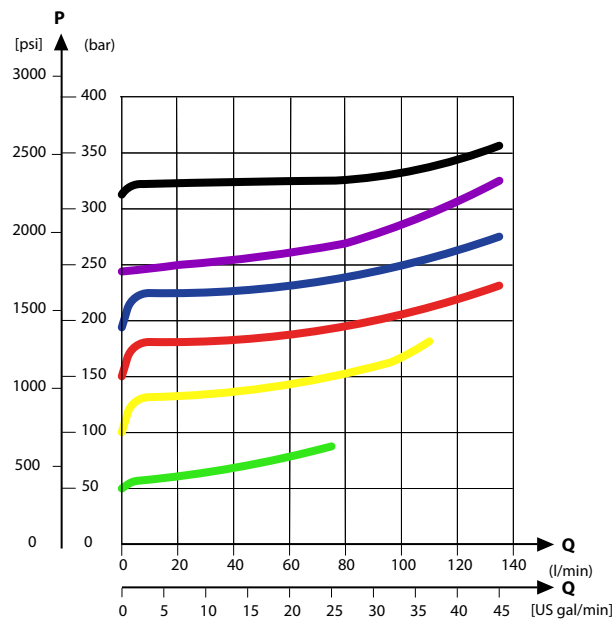


PVB Basic Modules

Fluid flow as a function of spool travel

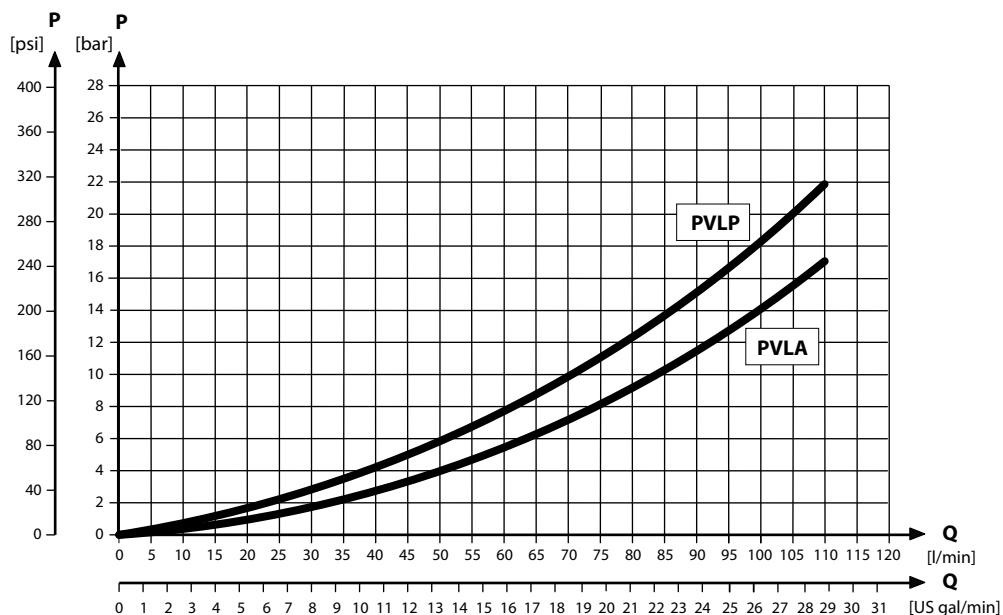


PVLP shock valve characteristics

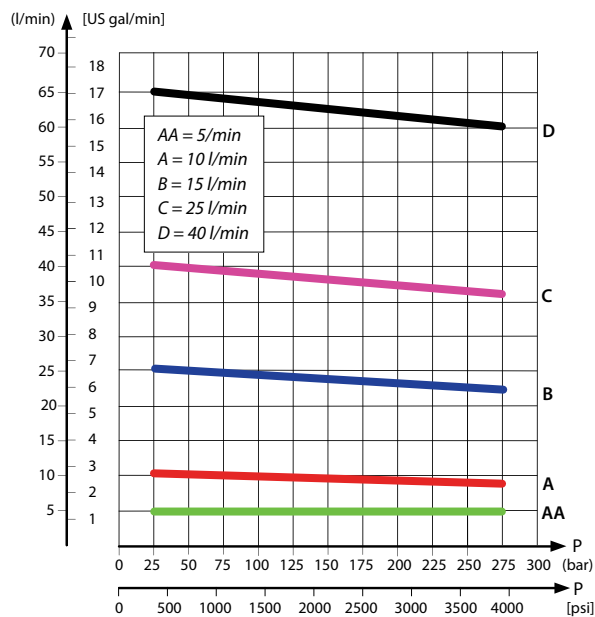


PVB Basic Modules

PVLP/PVLA suction valve characteristics



PVB pressure compensated fluid flow characteristics



Technical data

Maximum rated pressure	A/B-port continuous	380 bar [5510 psi]
	A/B-port intermittent	420 bar [6090 psi]
Maximum rated flow	A/B-port	65 l/min [17 US gal/min]
Fluid temperature	Recommended	30 to 60°C [86 to 140°F]
	Ambient	-30 to 60°C [-22 to 140°F]
	Minimum	-30°C [-22°F]
	Maximum	90° [194°F]

PVB Basic Modules

Technical data (continued)

Fluid viscosity	Operating range	12 to 75 mm ² /s [65 to 347 SUS]
	Minimum	4 mm ² /s [39 SUS]
	Maximum	460 mm ² /s [2128 SUS]
Fluid cleanliness	Minimum	23/19/16 (according to ISO 4406)

Part numbers for Compensated PVB with PVLP/PVLA

Part number	A/B-port	PVLP/PVLA
11130978	3/8" BSP	1
11130979	3/4" – 16 UNF	1

PVB Basic Modules

Compensated PVB with LS A/B

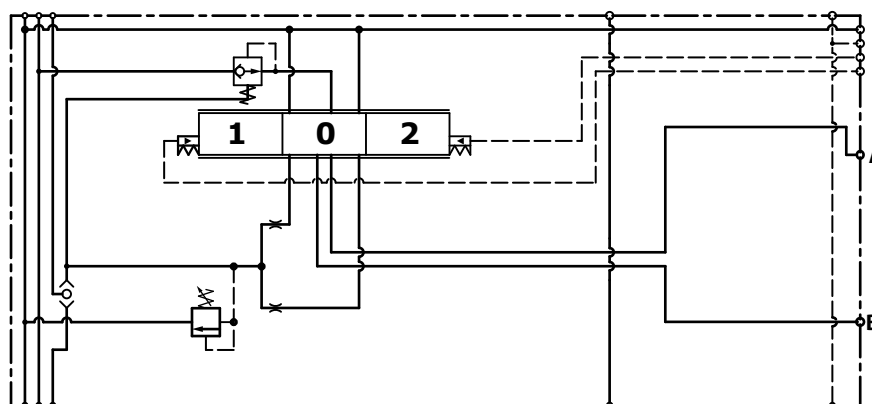
The compensated PVB with the integrated LS A/B relief valves is intended for controlling a work function where the function behavior in terms of flow and pressures requires independence on the load pressure of other functions used simultaneously.

The integrated LS A/B relief valves are used to limit the maximum work port pressure on the A and B ports individually.

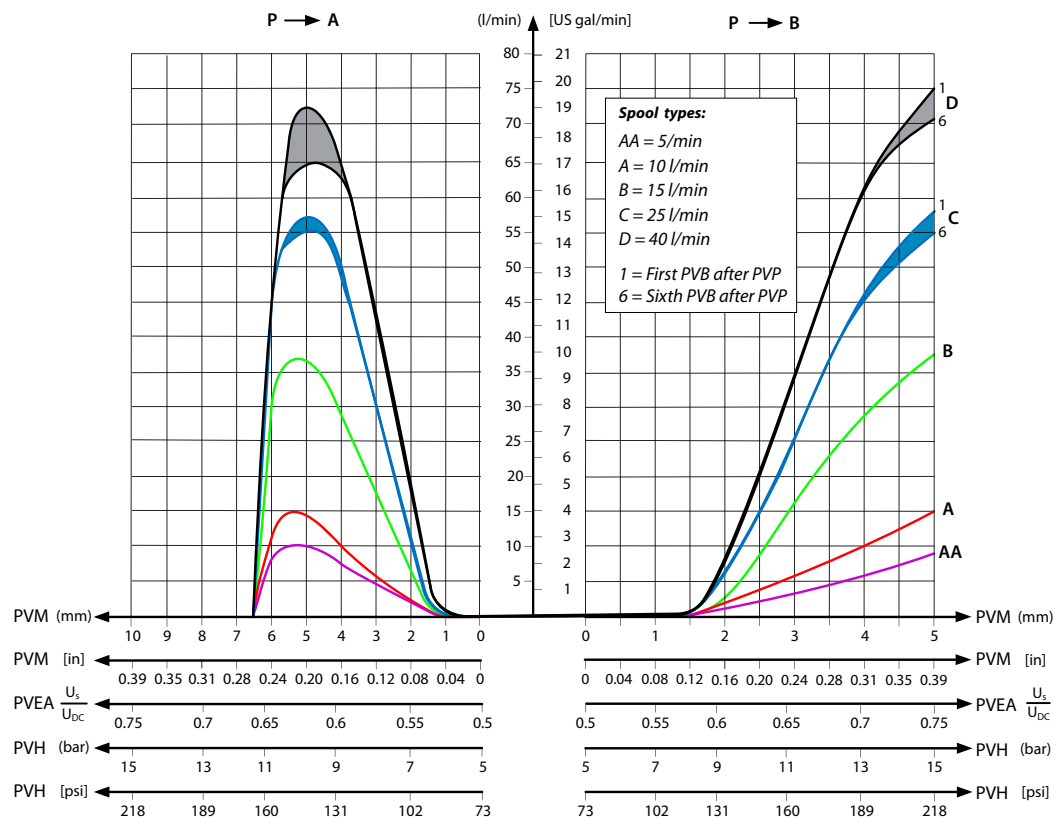
The Compensated PVB with LS A/B features:

- Integrated LS shuttle network
- Integrated compensator
- Integrated adjustable LS A/B pressure relief valves

Compensated PVB with LS A/B schematic

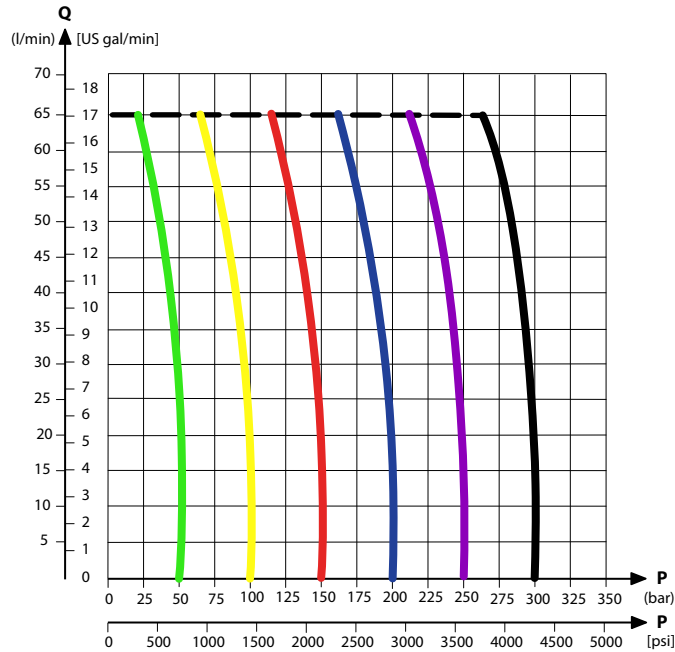


Fluid flow as a function of spool travel

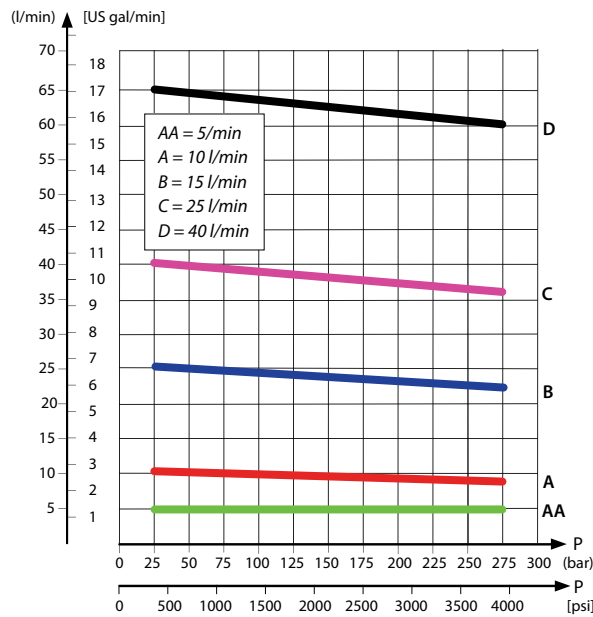


PVB Basic Modules

PVB pressure compensated for LS A/B characteristics



PVB pressure compensated fluid flow characteristics



Technical data

Maximum rated pressure	A/B-port continuous	380 bar [5510 psi]
	A/B-port intermittent	420 bar [6090 psi]
Maximum rated flow	A/B-port	65 l/min [17 US gal/min]

PVB Basic Modules

Technical data (continued)

Fluid temperature	Recommended	30 to 60°C [86 to 140°F]
	Ambient	-30 to 60°C [-22 to 140°F]
	Minimum	-30°C [-22°F]
	Maximum	90° [194°F]
Fluid viscosity	Operating range	12 to 75 mm ² /s [65 to 347 SUS]
	Minimum	4 mm ² /s [39 SUS]
	Maximum	460 mm ² /s [2128 SUS]
Fluid cleanliness	Minimum	23/19/16 (according to ISO 4406)

Part numbers for Compensated PVB with LS A/B

Part number	A/B-port
11130982	3/8" BSP
11130983	3/4" – 16 UNF

PVB Basic Modules

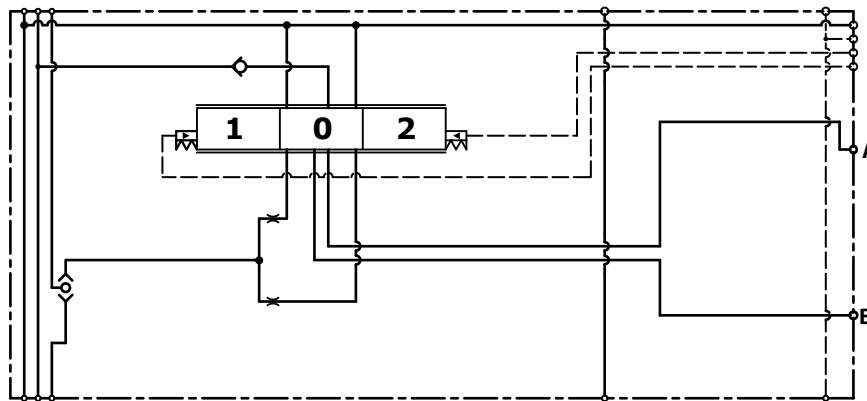
Uncompensated PVB

The uncompensated PVB is intended for controlling a work function where the function behavior in terms of flow and pressures requires independence on the load pressure of other functions used simultaneously.

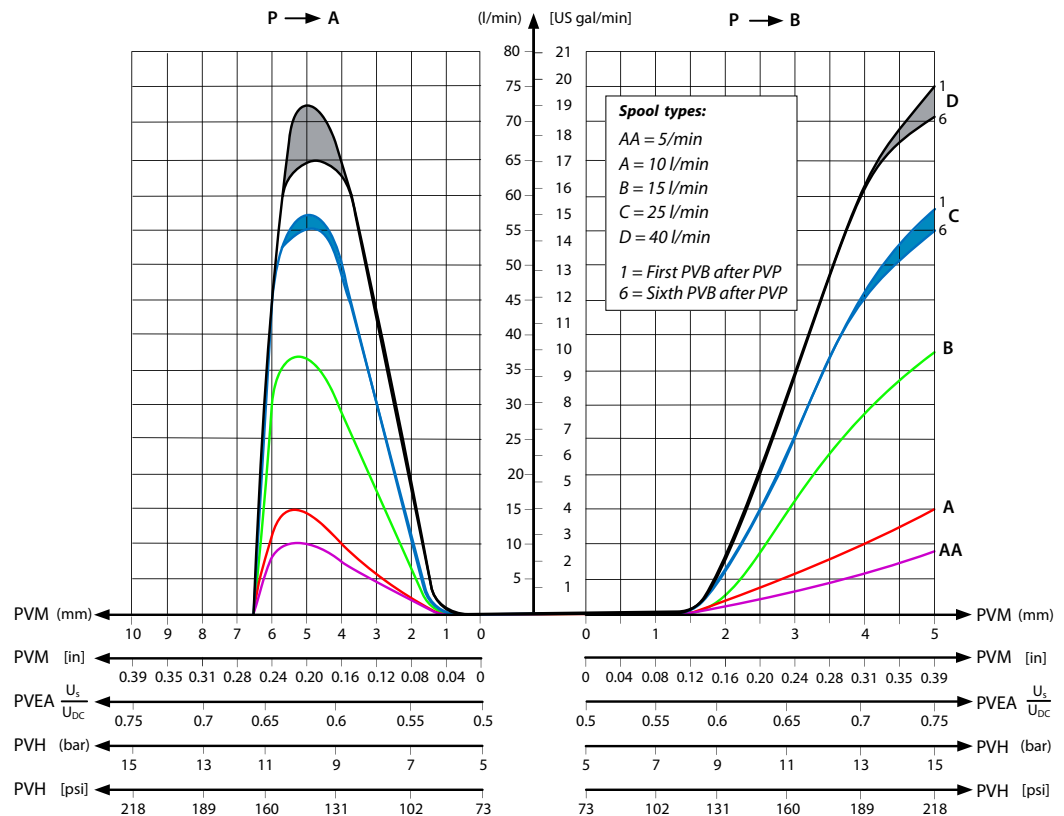
The Uncompensated PVB features:

- Integrated LS shuttle network
- Optional load drop check valve

Uncompensated PVB schematic

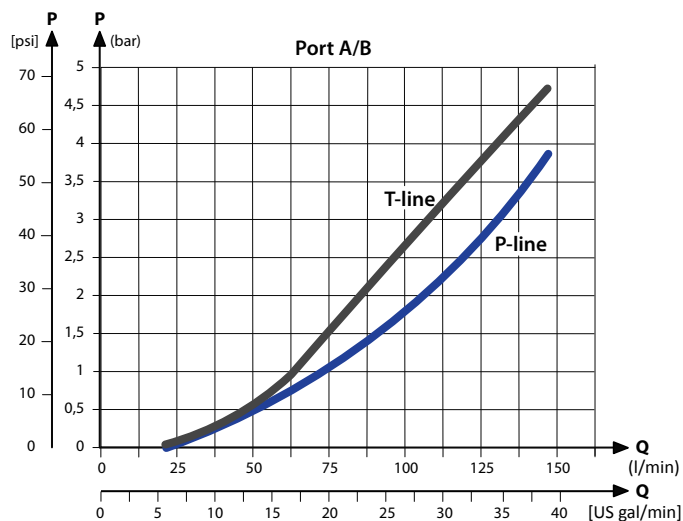


Fluid flow as a function of spool travel



PVB Basic Modules

PVB pressure compensated P-line and T-line characteristics



Technical data

Maximum rated pressure	A/B-port continuous	380 bar [5510 psi]
	A/B-port intermittent	420 bar [6090 psi]
Maximum rated flow	A/B-port	65 l/min [17 US gal/min]
Fluid temperature	Recommended	30 to 60°C [86 to 140°F]
	Ambient	-30 to 60°C [-22 to 140°F]
	Minimum	-30°C [-22°F]
	Maximum	90° [194°F]
Fluid viscosity	Operating range	12 to 75 mm ² /s [65 to 347 SUS]
	Minimum	4 mm ² /s [39 SUS]
	Maximum	460 mm ² /s [2128 SUS]
Fluid cleanliness	Minimum	23/19/16 (according to ISO 4406)

Part numbers for Uncompensated PVB

Part number	A/B-port	Check valve
11106801	3/8" BSP	Yes
11101421	3/8" BSP	—
11106797	3/4" – 16 UNF	Yes
11101423	3/4" – 16 UNF	—

PVB Basic Modules

Uncompensated PVB with PVLP

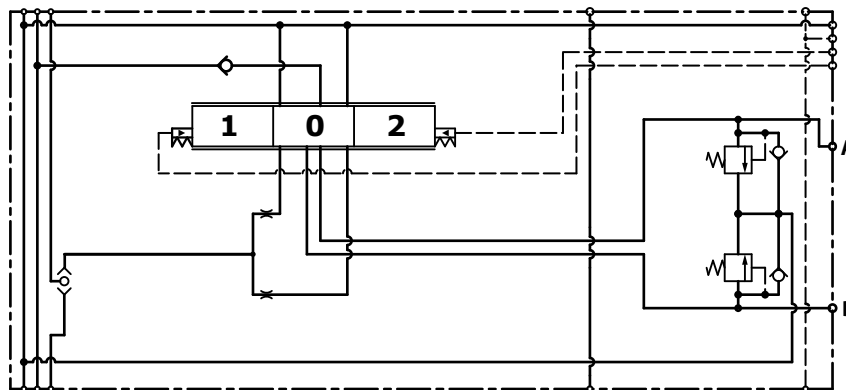
The uncompensated PVB featuring an optional PVLP shock valve on each work port for pressure peak protection and anti-cavitation prevention, is intended for controlling a work function where the function behavior in terms of flow and pressures requires independence on the load pressure of other functions used simultaneously.

The compensated PVB is intended for controlling a work function where the function behavior in terms of flow and pressures requires independence on the load pressure of other functions used simultaneously.

The Uncompensated PVB with PVLP features:

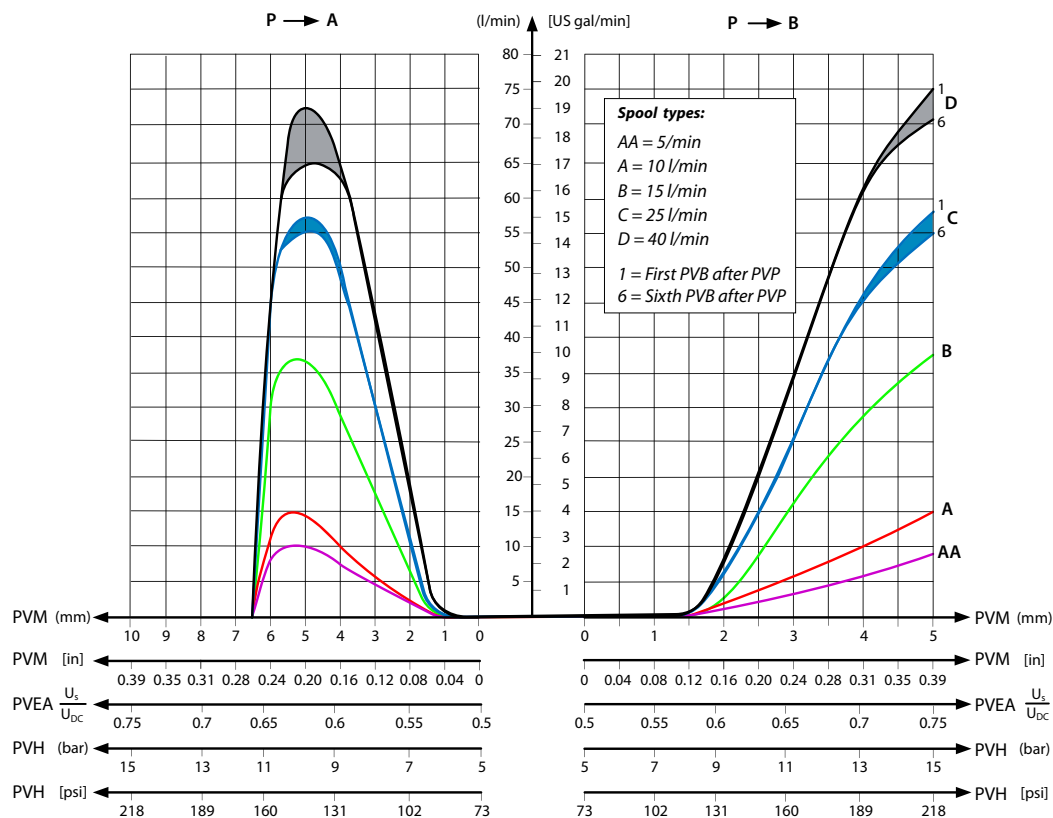
- Integrated LS shuttle network
- Optional shock valve facility (PVLP)
- Optional load drop check valve

Uncompensated PVB with PVLP schematic

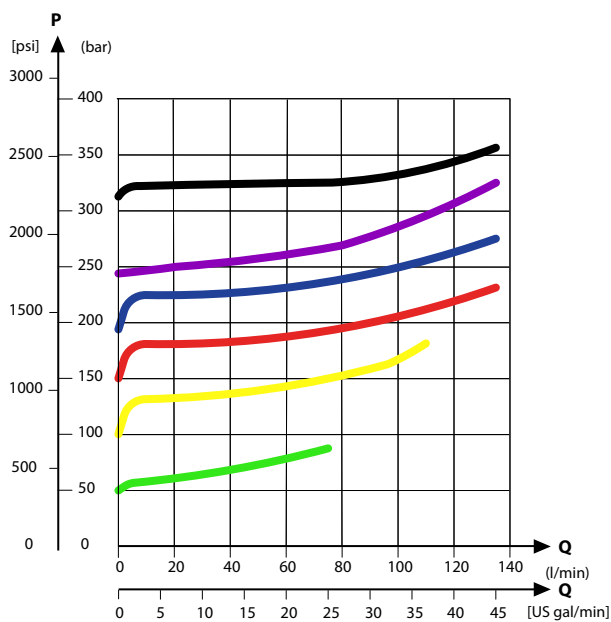


PVB Basic Modules

Fluid flow as a function of spool travel

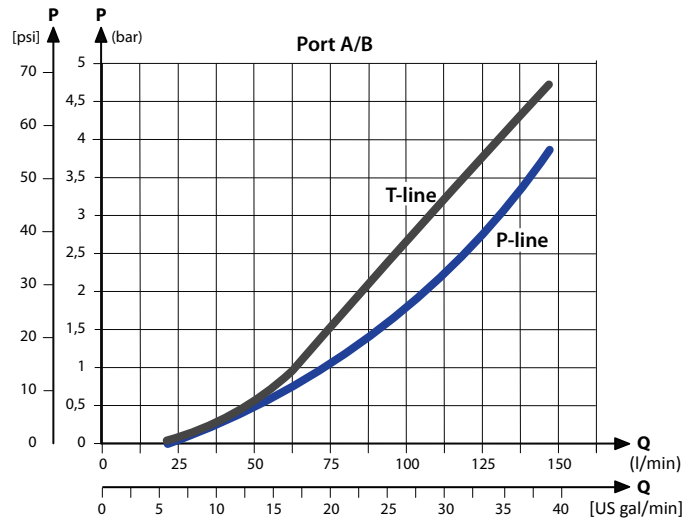


PVLP shock valve characteristics



PVB Basic Modules

PVB pressure compensated P-line and T-line characteristics



Technical Data

Maximum rated pressure	P-port continuous	350 bar [5076 psi]
	P-port intermittent	400 bar [5800 psi]
	T-port static/dynamic	25/40 bar [363/580 psi]
Maximum rated flow	P-port	140 l/min [37 US gal/min]
Fluid temperature	Recommended	30 to 60°C [86 to 140°F]
	Minimum	-30°C [-22°F]
	Maximum	90° [194°F]
Ambient temperature	Recommended	-30 to 60°C [-22 to 140°F]
Fluid viscosity	Operating range	12 to 75 mm ² /s [65 to 347 SUS]
	Minimum	4 mm ² /s [39 SUS]
	Maximum	460 mm ² /s [2128 SUS]
Fluid cleanliness	Minimum	23/19/16 (according to ISO 4406)

Part numbers for Uncompensated PVB with PVL P

Part number	A/B-port	PVL P	Check valve
11101424	3/8" BSP	1	Yes
11106754	3/8" BSP	1	—
11101425	3/4" – 16 UNF	1	Yes
11106755	3/4" – 16 UNF	1	—

PVB Basic Modules

PVLP, Shock/Anti-Cavitation and PVLA, Suction Valves

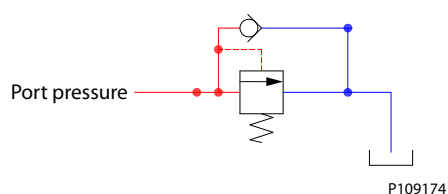
The PVLP Shock/Anti-Cavitation valve is an accessory available for PVB basic and PVP inlet modules. The PVLA valve is an accessory available for PVB basic modules only.

PVLP shock/anti-cavitation valve

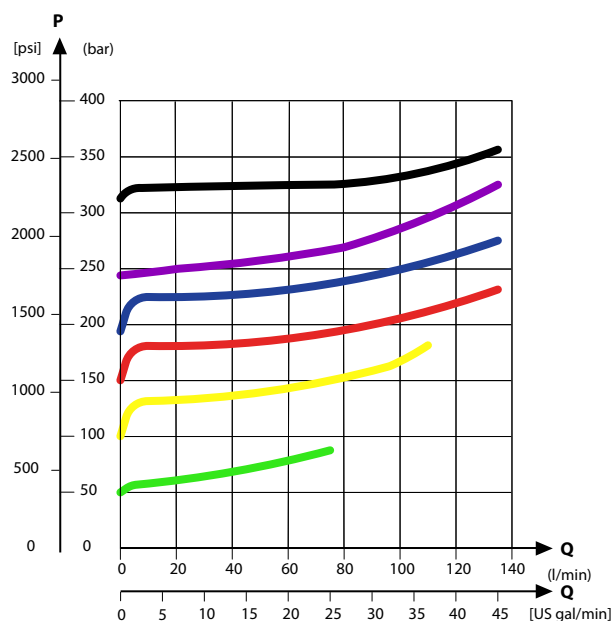
The PVLP shock and anti-cavitation valve will relieve a pressure peak to the internal tank galleries and will furthermore suck oil from the tank to the work port to prevent cavitation. Pressure settings range 32–400 bar [460–5801 psi].

The pressure setting of the PVLP must always be 20 bar [290 psi] higher than LS A/B setting in the same module.

PVLP schematic



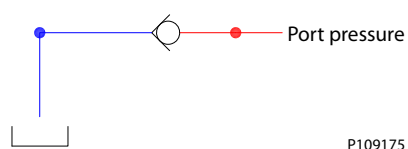
PVLP shock valve characteristics



PVLA suction valve

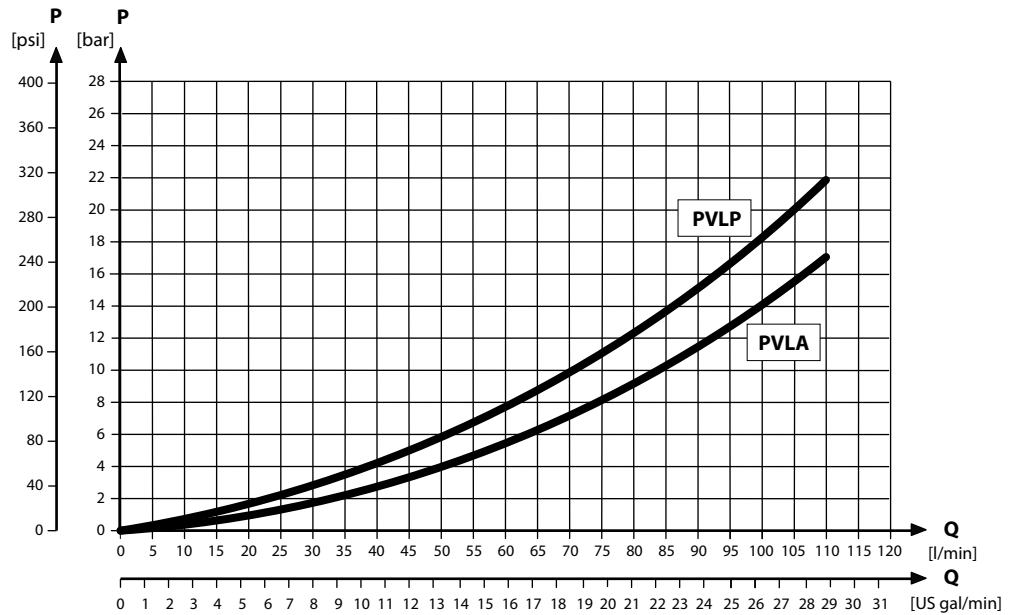
The PVLA will suck fluid from the tank to the work port to prevent cavitation by the 0.5 bar spring. The plug will ensure that when using a single acting spool, all flow returning through the work port is led to tank.

PVLA schematic



PVB Basic Modules

PVLP/PVLA suction valve characteristics



Fluid technical specification

Fluid temperature	Recommended range	30 to 60°C [86 to 140°F]
	Minimum	-30°C [-22°F]
	Maximum	90° [194°F]
Ambient temperature	Recommended range	-30 to 60°C [-22 to 140°F]
Fluid viscosity	Operating range	12 to 75 mm ² /s [65 to 347 SUS]
	Minimum	4 mm ² /s [39 SUS]
	Maximum	460 mm ² /s [2128 SUS]
Fluid cleanliness	Minimum	23/19/16 (according to ISO 4406)

PVB Basic Modules

Part numbers for PVLP and PVLA valves

Description	Pressure setting in bar	Part number
PVLP shock valve	32	157B2032
	50	157B2050
	63	157B2063
	80	157B2080
	100	157B2100
	125	157B2125
	140	157B2140
	150	157B2150
	160	157B2160
	175	157B2175
	190	157B2190
	210	157B2210
	230	157B2230
	240	157B2240
	250	157B2250
	265	157B2265
	280	157B2280
300	157B2300	
320	157B2320	
350	157B2350	
380	157B2380	
PVLA suction valve	—	157B2001
PLUG	—	157B2002

PVBS Main Spools

The main spools (PVBS) determines the flow out of the work section or the pressure build up.

PVBS main spool



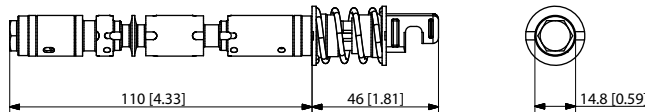
The PVBS main spool variants are based on a generic platform with a wide selection of additional features, enabling you to tailor the PVBS to suit the demands of any hydraulic system and any function. The PVBS main spool can be activated in three different ways:

- Mechanically by a PVM lever
- Electrically by a PVE/PVHC actuator
- Hydraulically by a PVH actuator

The generic platform includes the following main variants:

- **Electric and/or Mechanical Actuation Symmetrical PVBS Spools**
 - Standard FC spools throttled open neutral position
 - Standard FC spools closed neutral position
- **Electric and/or Mechanical Actuation Asymmetrical PVBS Spools**
 - Standard FC spools throttled open neutral position
 - Standard FC spools closed neutral position
- **Hydraulic and/or Mechanical Actuation Symmetrical PVBS Spools**
 - Standard FC spools throttled open neutral position
 - Standard FC spools closed neutral position
- **Hydraulic and/or Mechanical Actuation Asymmetrical PVBS Spools**
 - Standard FC spools throttled open neutral position
 - Standard FC spools closed neutral position

PVBS main spool dimensions



Weight: 0.16 kg [0.35 lb]

For more information please see:

- [Electric and/or Mechanical Actuation, Symmetrical PVBS Spools](#) on page 43
- [Electric and/or Mechanical Actuation, Asymmetrical PVBS Spools](#) on page 46
- [Hydraulic and/or Mechanical Actuation Symmetrical PVBS Spools](#) on page 49
- [Hydraulic and/or Mechanical Actuation, Asymmetrical PVBS Spools](#) on page 51

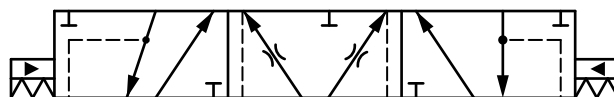
PVBS Main Spools

Electric and/or Mechanical Actuation, Symmetrical PVBS Spools

PVBS Electric and/or Mechanical Actuation symmetrical spools with standard FC spools featuring either throttled open or closed neutral position

Standard FC Spools Throttled Open Neutral Position

- 4-way, 3 positions
- Optional 4-way, 4 positions with the right PVM
- Flow control AB
- Spools with flow range from 5 - 65 l/min

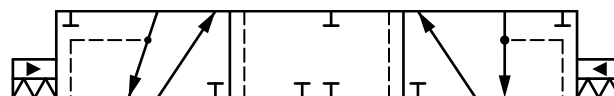


Part numbers for symmetrical open neutral spools

Part number	P → A/B l/min [US gal/min]	Flow Control	Dead Band mm [in]
11105537	5 [1.32]	FC AB	1.2 [0.047]
11105538	10 [2.64]	FC AB	1.2 [0.047]
11105539	25 [6.60]	FC AB	1.2 [0.047]
11105540	40 [10.57]	FC AB	1.2 [0.047]
11105541	65 [17.17]	FC AB	1.2 [0.047]

Standard FC Spools Closed Neutral Position

- 4-way, 3 positions
- Optional 4-way, 4 positions with the right PVM
- Flow control AB
- Spools with flow range from 5 - 65 l/min

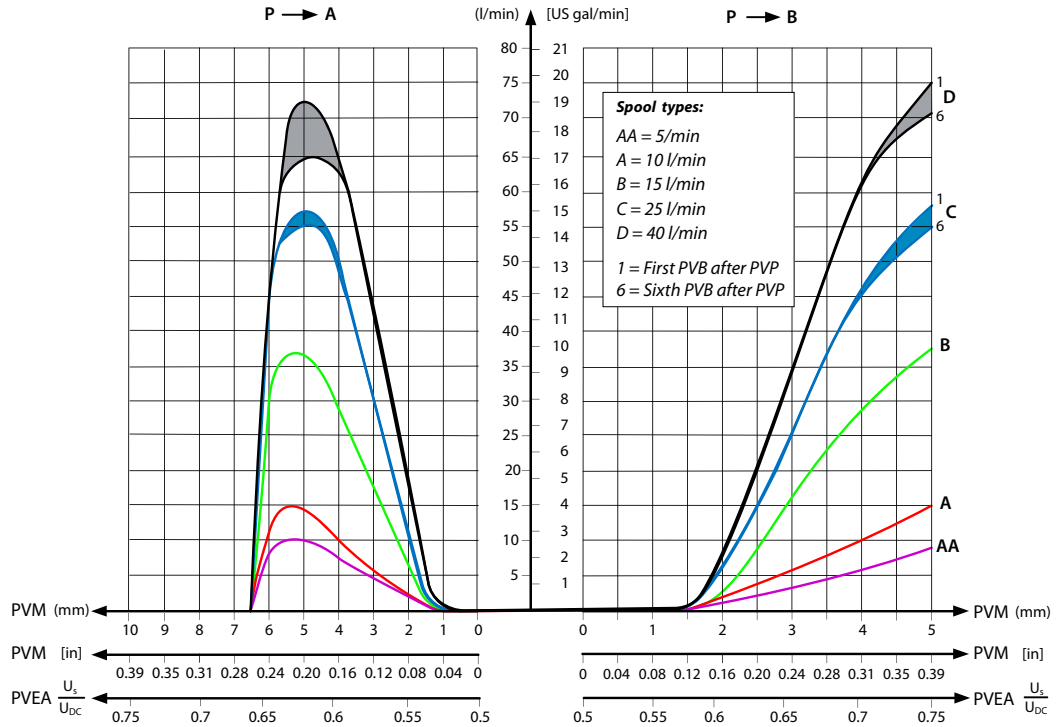


Part numbers for symmetrical closed neutral position spools

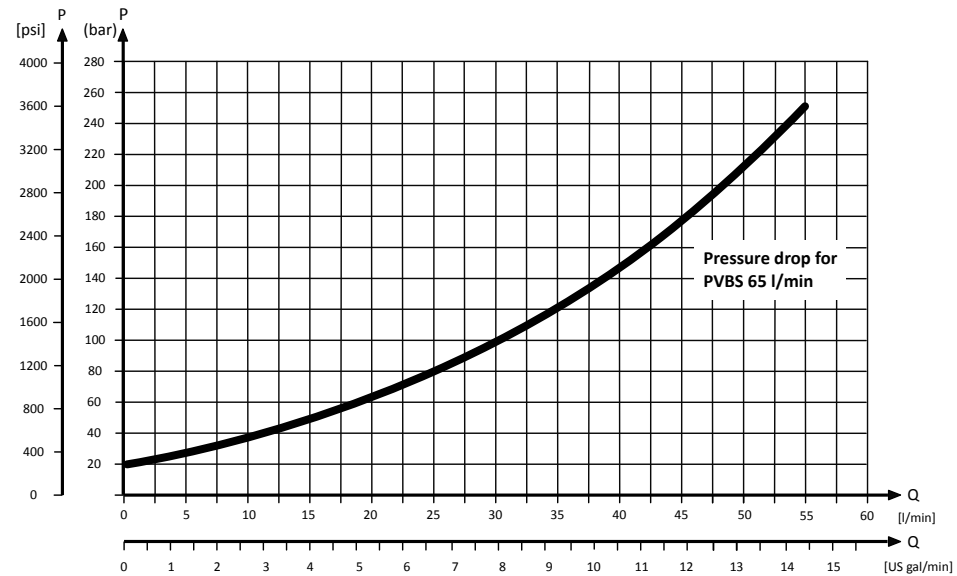
Part number	P → A/B l/min [US gal/min]	Flow Control	Dead Band mm [in]
11105532	5 [1.32]	FC AB	1.2 [0.047]
11105533	10 [2.64]	FC AB	1.2 [0.047]
11105534	25 [6.60]	FC AB	1.2 [0.047]
11105535	40 [10.57]	FC AB	1.2 [0.047]
11105536	65 [17.17]	FC AB	1.2 [0.047]

PVBS Main Spools

Fluid flow as a function of spool travel



Pressure drop to T (open spool in neutral)



Fluid technical specification

Fluid temperature	Recommended range	30 to 60°C [86 to 140°F]
	Minimum	-30°C [-22°F]
	Maximum	90° [194°F]
Ambient temperature	Recommended range	-30 to 60°C [-22 to 140°F]

PVBS Main Spools

Fluid technical specification (continued)

Fluid viscosity	Operating range	12 to 75 mm ² /s [65 to 347 SUS]
	Minimum	4 mm ² /s [39 SUS]
	Maximum	460 mm ² /s [2128 SUS]
Fluid cleanliness	Minimum	23/19/16 (according to ISO 4406)

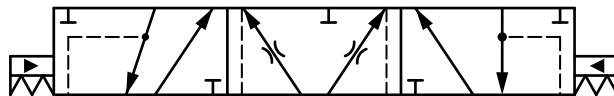
PVBS Main Spools

Electric and/or Mechanical Actuation, Asymmetrical PVBS Spools

PVBS Electric and/or Mechanical Actuation asymmetrical spools with standard FC spools featuring either throttled open or closed neutral position

Standard FC Spools Asymmetrical Throttled Open Neutral Position

- 4-way, 3 positions
- Optional 4-way, 4 positions with the right PVM
- Flow control AB
- A flow range from 5 – 65 l/min
- B flow range from 2.5 – 65 l/min

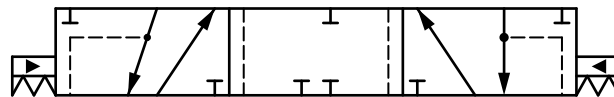


Part numbers for asymmetrical open neutral spools

Part number	P → A l/min [US gal/min]	P → B l/min [US gal/min]	Flow Control	Dead Band mm [in]
11160953	5 [1.32]	2.5 [0.66]	FC AB	1.2 [0.047]
11159472	5 [1.32]	10 [2.64]	FC AB	1.2 [0.047]
11156160	15 [3.96]	25 [6.60]	FC AB	1.2 [0.047]
11156158	25 [6.60]	40 [10.57]	FC AB	1.2 [0.047]
11160957	40 [10.57]	25 [6.60]	FC AB	1.2 [0.047]
11156155	40 [10.57]	65 [17.17]	FC AB	1.2 [0.047]

Standard FC Spools Asymmetrical Closed Neutral Position

- 4-way, 3 positions
- Optional 4-way, 4 positions with the right PVM
- Flow control AB
- A flow range from 5 – 65 l/min
- B flow range from 2.5 – 65 l/min



Part numbers for asymmetrical closed neutral position spools

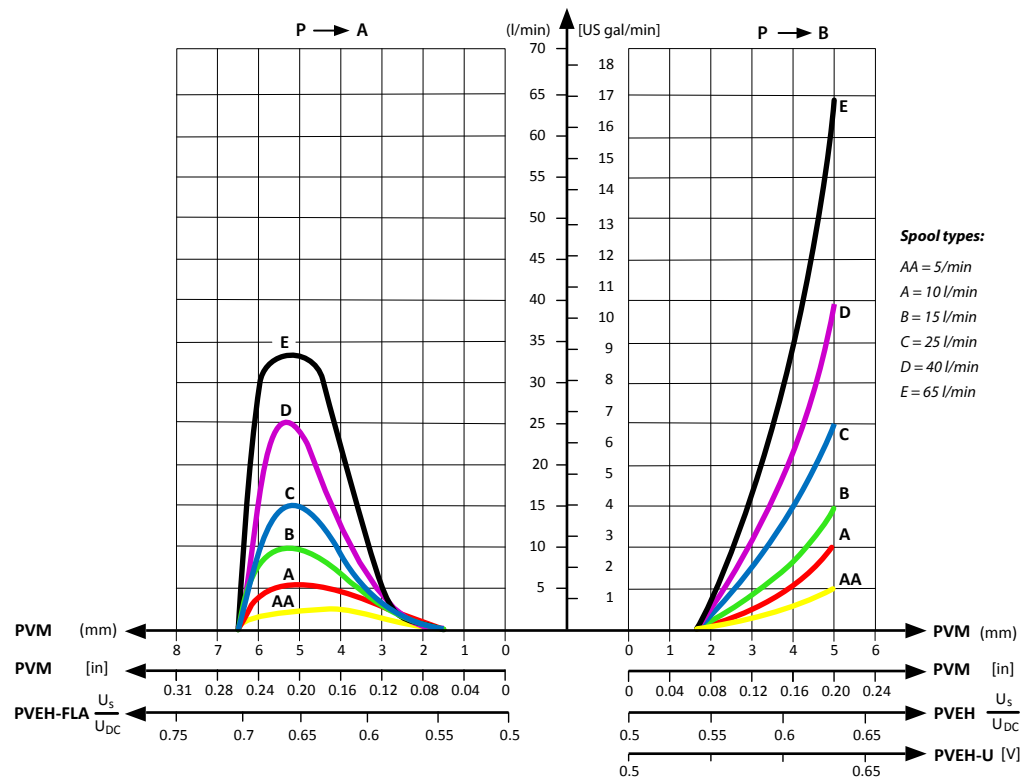
Part number	P → A l/min [US gal/min]	P → B l/min [US gal/min]	Flow Control	Dead Band mm [in]
11109642	5 [1.32]	2.5 [0.66]	FC AB	1.2 [0.047]
11109643	10 [2.64]	5 [1.32]	FC AB	1.2 [0.047]
11156296	15 [3.96]	25 [6.60]	FC AB	1.2 [0.047]
11109644	25 [6.60]	10 [2.64]	FC AB	1.2 [0.047]
11109645	25 [6.60]	15 [3.96]	FC AB	1.2 [0.047]
11156298	25 [6.60]	40 [10.57]	FC AB	1.2 [0.047]
11109646	40 [10.57]	15 [3.96]	FC AB	1.2 [0.047]

PVBS Main Spools

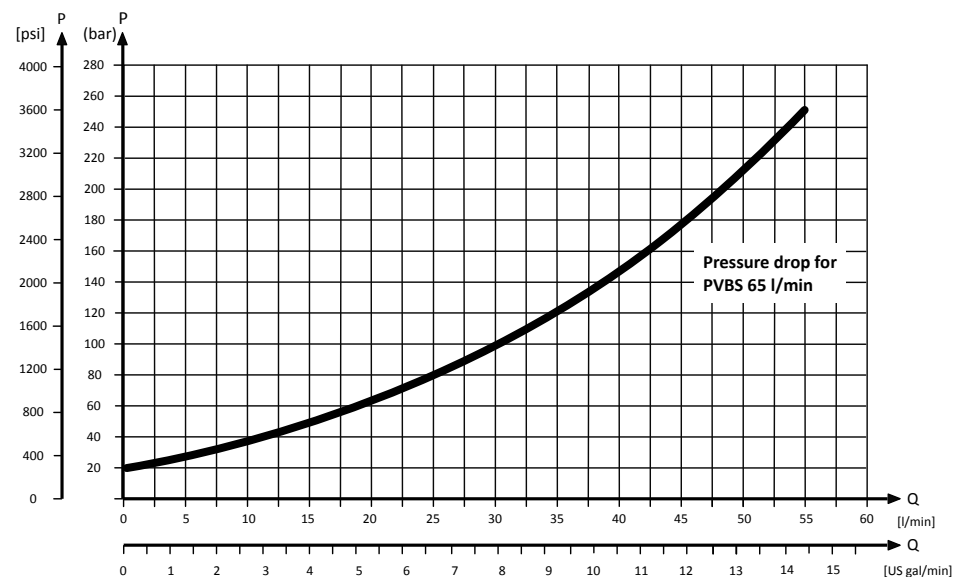
Part numbers for asymmetrical closed neutral position spools (continued)

Part number	P → A l/min [US gal/min]	P → B l/min [US gal/min]	Flow Control	Dead Band mm [in]
11109647	40 [10.57]	25 [6.60]	FC AB	1.2 [0.047]
11109648	65 [17.17]	25 [6.60]	FC AB	1.2 [0.047]

Fluid flow as a function of spool travel



Pressure drop to T (open spool in neutral)



PVBS Main Spools

Fluid technical specification

Fluid temperature	Recommended range	30 to 60°C [86 to 140°F]
	Minimum	-30°C [-22°F]
	Maximum	90° [194°F]
Ambient temperature	Recommended range	-30 to 60°C [-22 to 140°F]
Fluid viscosity	Operating range	12 to 75 mm ² /s [65 to 347 SUS]
	Minimum	4 mm ² /s [39 SUS]
	Maximum	460 mm ² /s [2128 SUS]
Fluid cleanliness	Minimum	23/19/16 (according to ISO 4406)

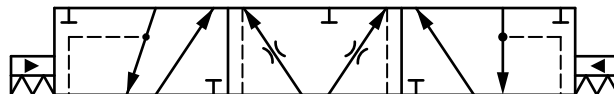
PVBS Main Spools

Hydraulic and/or Mechanical Actuation Symmetrical PVBS Spools

PVBS Hydraulic and/or Mechanical Actuation symmetrical spools with standard FC spools featuring either throttled open or closed neutral position

Standard FC Spools Throttled Open Neutral Position

- 4-way, 3 positions
- Optional 4-way, 4 positions with the right PVM
- Flow control AB
- Spools with flow range from 5 - 65 l/min

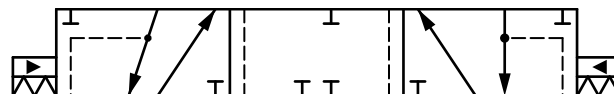


Part numbers for symmetrical open neutral spools

Part number	P → A/B l/min [US gal/min]	Flow Control	Dead Band mm [in]
11109637	5 [1.32]	FC AB	1.2 [0.047]
11109638	10 [2.64]	FC AB	1.2 [0.047]
11109639	25 [6.60]	FC AB	1.2 [0.047]
11109640	40 [10.57]	FC AB	1.2 [0.047]
11109641	65 [17.17]	FC AB	1.2 [0.047]

Standard FC Spools Closed Neutral Position

- 4-way, 3 positions
- Optional 4-way, 4 positions with the right PVM
- Flow control AB
- Spools with flow range from 5 - 65 l/min

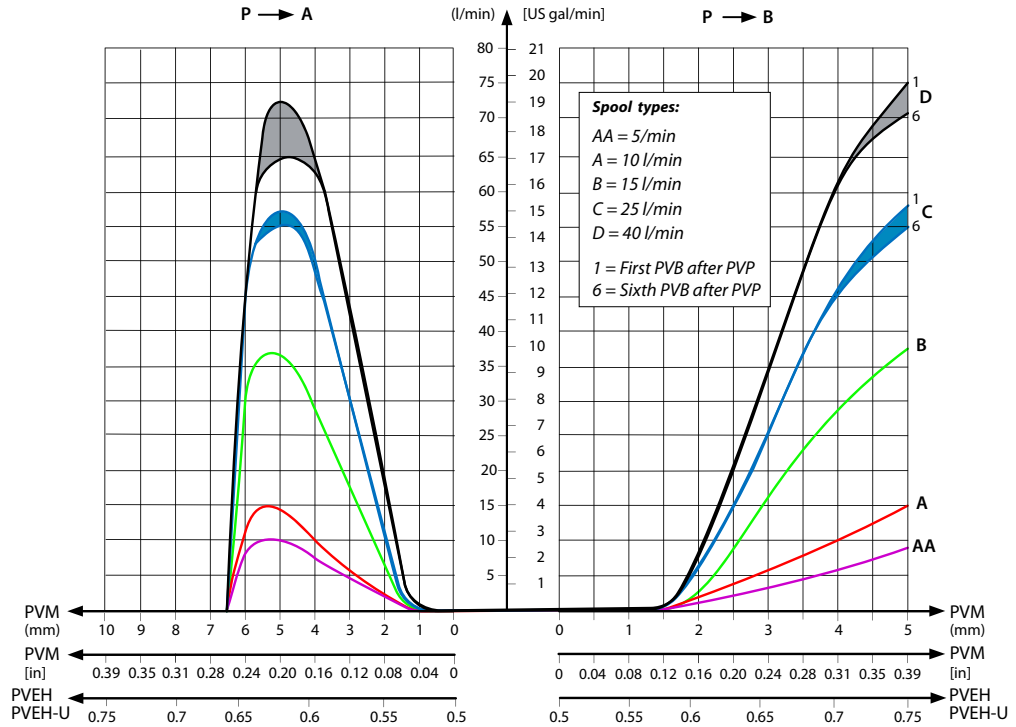


Part numbers for symmetrical closed neutral position spools

Part number	P → A/B l/min [US gal/min]	Flow Control	Dead Band mm [in]
11109632	5 [1.32]	FC AB	1.2 [0.047]
11109633	10 [2.64]	FC AB	1.2 [0.047]
11109634	25 [6.60]	FC AB	1.2 [0.047]
11109635	40 [10.57]	FC AB	1.2 [0.047]
11109636	65 [17.17]	FC AB	1.2 [0.047]

PVBS Main Spools

Fluid flow as a function of spool travel



Fluid technical specification

Fluid temperature	Recommended range	30 to 60°C [86 to 140°F]
	Minimum	-30°C [-22°F]
	Maximum	90° [194°F]
Ambient temperature	Recommended range	-30 to 60°C [-22 to 140°F]
Fluid viscosity	Operating range	12 to 75 mm ² /s [65 to 347 SUS]
	Minimum	4 mm ² /s [39 SUS]
	Maximum	460 mm ² /s [2128 SUS]
Fluid cleanliness	Minimum	23/19/16 (according to ISO 4406)

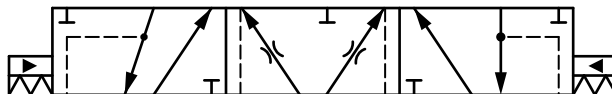
PVBS Main Spools

Hydraulic and/or Mechanical Actuation, Asymmetrical PVBS Spools

PVBS Hydraulic and/or Mechanical Actuation asymmetrical spools with standard FC spools featuring either throttled open or closed neutral position

Standard FC Spools Asymmetrical Throttled Open Neutral Position

- 4-way, 3 positions
- Optional 4-way, 4 positions with the right PVM
- Flow control AB
- Spools with flow range from 5 - 65 l/min

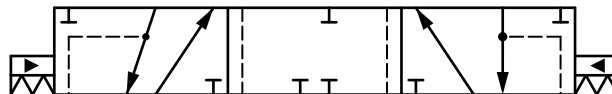


Part numbers for asymmetrical open neutral spools

Part number	P → A	P → B	Flow Control	Dead Band
11189195	15 l/min [3.96 US gal/min]	25 l/min [6.60 US gal/min]	FC AB	1.2 mm [0.047 in]

Standard FC Spools Asymmetrical Closed Neutral Position

- 4-way, 3 positions
- Optional 4-way, 4 positions with the right PVM
- Flow control AB
- A flow range from 5 – 65 l/min
- B flow range from 2.5 – 65 l/min

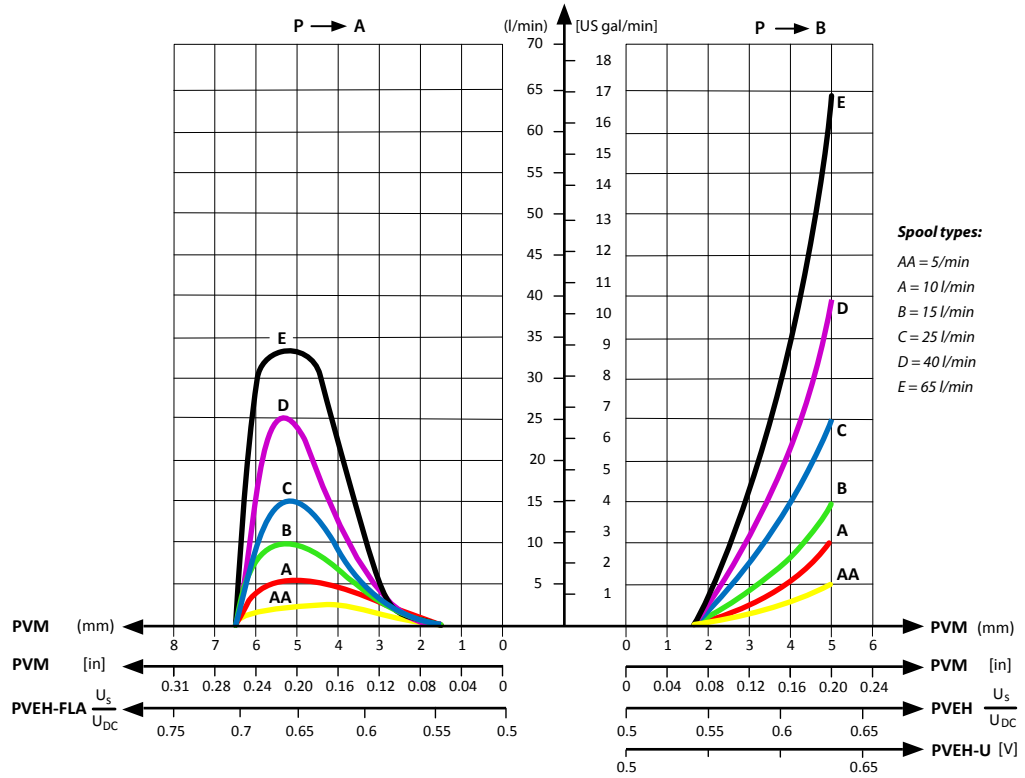


Part numbers for asymmetrical closed neutral position spools

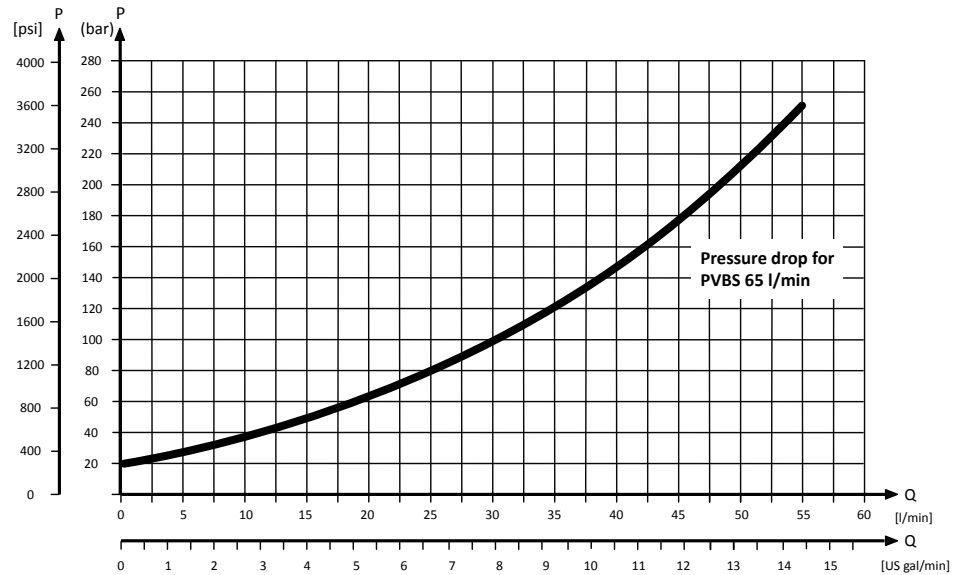
Part number	P → A l/min [US gal/min]	P → B l/min [US gal/min]	Flow Control	Dead Band mm [in]
11146752	5 [1.32]	2.5 [0.66]	FC AB	1.2 [0.047]
11146753	10 [2.64]	5 [1.32]	FC AB	1.2 [0.047]
11467554	25 [6.60]	10 [2.64]	FC AB	1.2 [0.047]
11146755	25 [6.60]	15 [3.96]	FC AB	1.2 [0.047]
11146756	40 [10.57]	15 [3.96]	FC AB	1.2 [0.047]
11146757	40 [10.57]	25 [6.60]	FC AB	1.2 [0.047]

PVBS Main Spools

Fluid flow as a function of spool travel



Pressure drop to T (open spool in neutral)



Fluid technical specification

Fluid temperature	Recommended range	30 to 60°C [86 to 140°F]
	Minimum	-30°C [-22°F]
	Maximum	90° [194°F]
Ambient temperature	Recommended range	-30 to 60°C [-22 to 140°F]

PVBS Main Spools

Fluid technical specification (continued)

Fluid viscosity	Operating range	12 to 75 mm ² /s [65 to 347 SUS]
	Minimum	4 mm ² /s [39 SUS]
	Maximum	460 mm ² /s [2128 SUS]
Fluid cleanliness	Minimum	23/19/16 (according to ISO 4406)

PVG 16 Actuation

PVG 16 Manual, Hydraulic, Electro-hydraulic and Electrical Actuation overview.

PVG 16 Actuation can be done by:

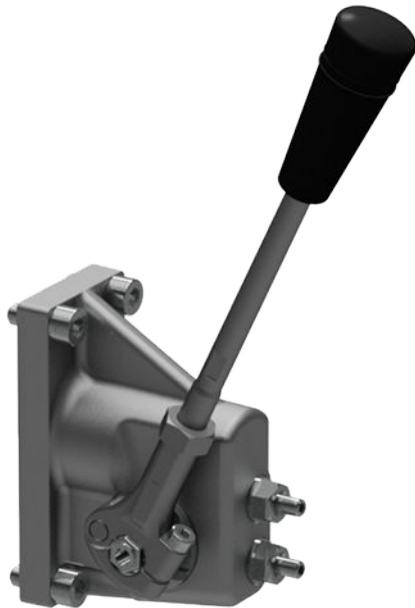
- PVM Manual Actuation, see more [PVM Manual Actuation](#) on page 54
 - PVMD cover, see more [PVMD Cover](#) on page 56
- PVH Hydraulic Actuation, see more [PVH Hydraulic Actuation](#) on page 57
- PVHC Electro-hydraulic Actuation, see more [PVHC Electro-Hydraulic Actuation](#) on page 59
- PVE Electrical Actuation, see more [PVE Electrical Actuation](#) on page 61
 - PVEO, see more [PVEO – ON/OFF Voltage Control Actuator](#) on page 63
 - PVEA, see more [PVEA – Proportional Spool Control Actuator](#) on page 66

PVM Manual Actuation

The PVM manual actuation cover is intended for use on any work section where the operator has to have the ability to interact with the spool manually.

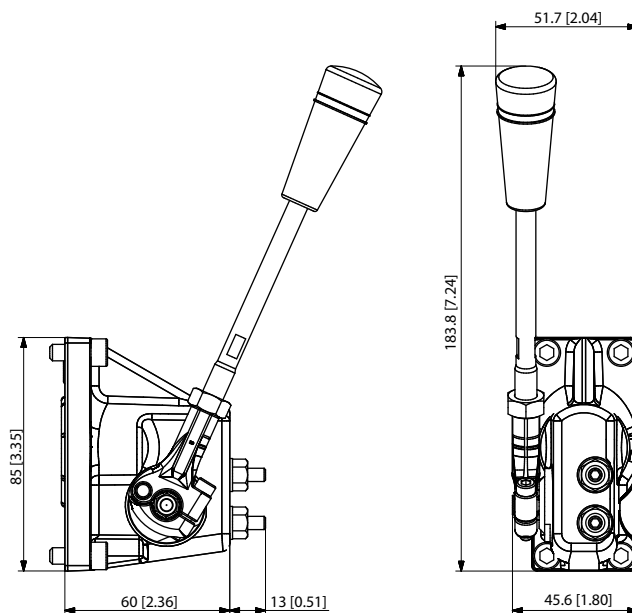
The adjustment screws are intended for limiting the spool travel and thereby the maximum achievable flow.

PVM manual actuation cover



PVG 16 Actuation

PVM manual actuation cover dimensions



Weight: 0,22 kg [0,49 lb]

Technical data

Spool displacement		Torque
From neutral position	PVM+PVMD PVM+PVE	2.2 ± 0.2 N·m [5.0 ± 1.8 lb·in]
	PVM+PVH	2.7 ± 0.2 N·m [23.9 ± 1.8 lb·in]
Max. spool travel	PVM+PVMD PVM+PVE	2.8 ± 0.2 N·m [6.3 ± 1.8 lb·in]
	PVM+PVH	7.1 ± 0.2 N·m [62.8 ± 1.8 lb·in]
Standard control range		13.9°
Control lever range + float position		22.3°

Part numbers for PVM Manual Actuation

Part number	Float	Adjustment screws	Lever base and lever
11107333	—	—	Yes
11107505	—	—	—
11107335	Yes	—	Yes
11107506	Yes	—	—
11107332	—	Yes	Yes
11107507	—	Yes	—

PVG 16 Actuation

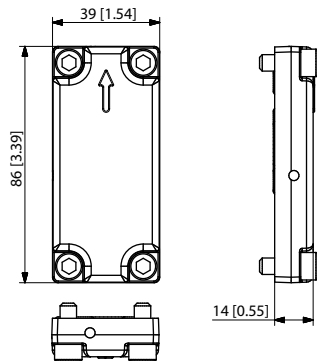
PVMD Cover

The PVMD cover is used when work section is purely mechanical activated.

PVMD Cover



Dimensions, mm [in]



Part number and weight for PVMD Cover

Part number	11105518
Weight	1.5 kg [3.3 lb]

PVG 16 Actuation

PVH Hydraulic Actuation

The PVH hydraulic actuation is intended for use on any work section where the operator wants to have a possibility to interact with the main spool via a hydraulic joystick.

The hydraulic remote control lever should be connected directly to tank.

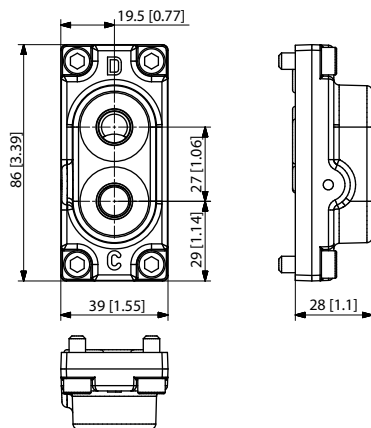
! Caution

Inlet with Hydraulic Pilot Pressure is needed.

PVH cover



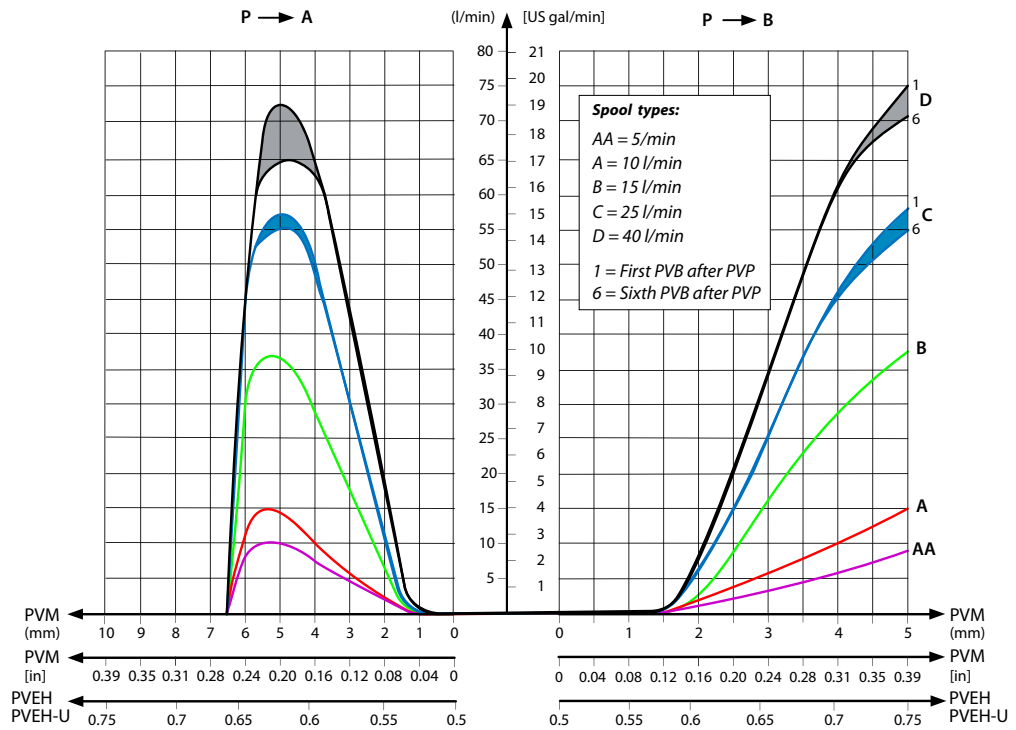
PVH cover dimensions



Weight: 0,13 kg [0.29 lb]

PVG 16 Actuation

Fluid flow as a function of spool travel



Technical data

Main spool spring control pressure range	5 – 15 bar [73 – 218 psi]
Maximum pilot oil pressure	30 bar [435 psi]
Maximum pressure on port T	10 bar [145 psi]

Part numbers for PVH Hydraulic Actuation

Part number	Material	Connection
11108380	Aluminum	G1/4" BSP
11108381	Aluminum	9/16"-18 UNF

PVG 16 Actuation

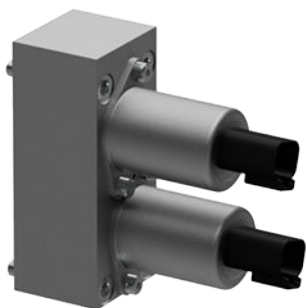
PVHC Electro-Hydraulic Actuation

The PVHC is an electrical actuator module for main spool control. The PVHC control is done by dual Pulse Width Modulated, high current supply 100-400 Hz PWM control signals. The spool position will shift when conditions are changed such as temperature change.

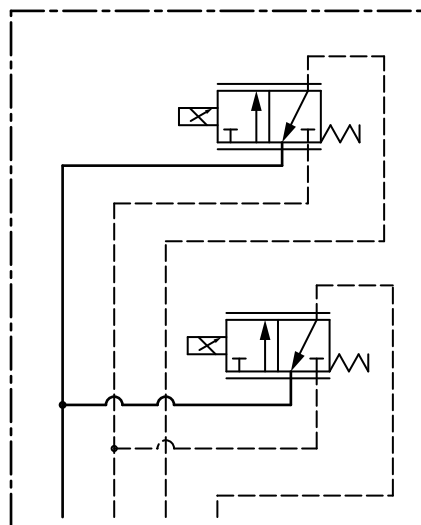
! Caution

Inlet with Hydraulic Pilot Pressure is needed.

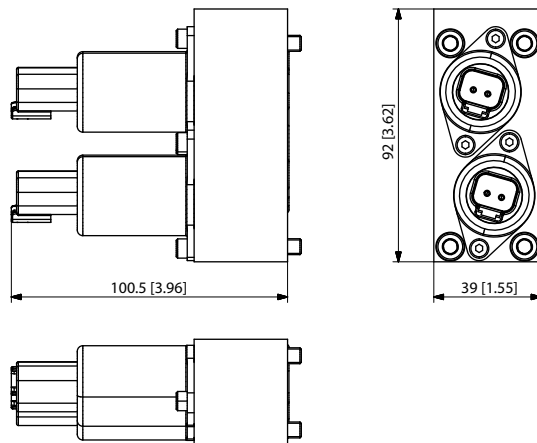
PVHC, Electro-Hydraulic Actuator



PVHC schematic

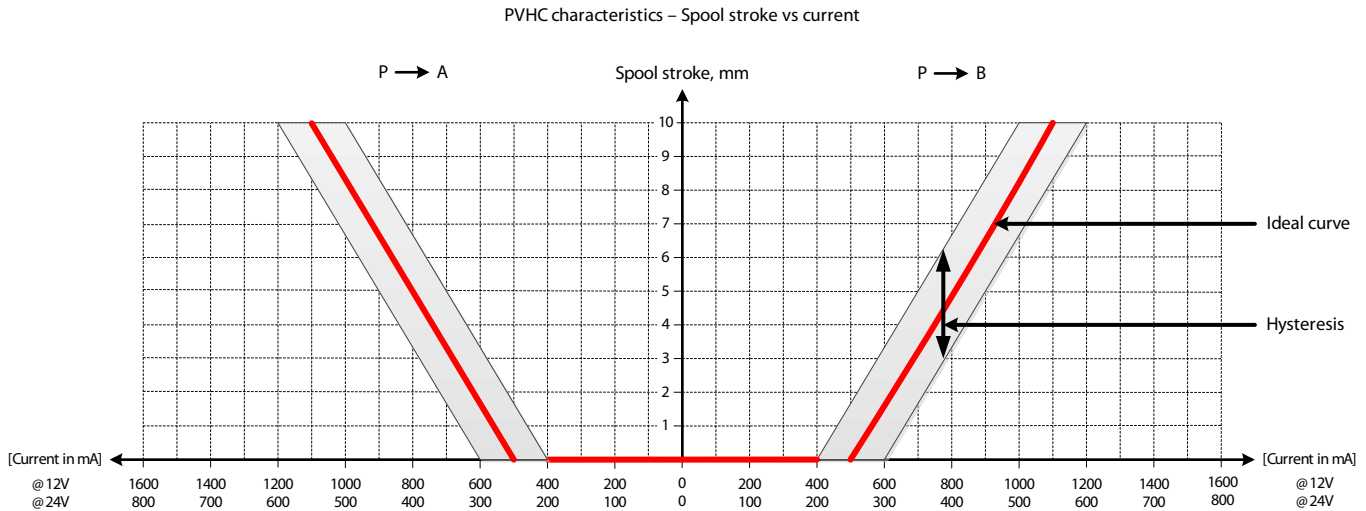


PVHC dimensions



PVG 16 Actuation

PVHC spool stroke vs current characteristics



The hysteresis is affected by viscosity, friction, flow forces, dither frequency and modulation frequency.

[Dither frequency with a certain amplitude is needed for optimal application performance.](#)

Technical data

Main spool spring control pressure range	5-15 bar [73-218 psi]
Pilot oil pressure range	20-25 bar [290-362 psi]
Max. pressure on port T	10 bar [145 psi]
Current Input 12V	0-1500 mA
Current Input 24V	0-750 mA
Ambient temperature range	-30°C to 80°C [-22 °F to 176°F]
Temperature range	-20°C to 80°C [-4 °F to 176°F]
Fluid cleanliness (according to ISO 4406)	23/19/16
Protection class	IP 67
Connector type	2x2 DEUTSCH

PVHC part numbers

Part number	Power supply	Weight
11126941	12V	0,9 kg [1,98 lb]
11127535	24V	0,9 kg [1,98 lb]

PVG 16 Actuation

PVE Electrical Actuation

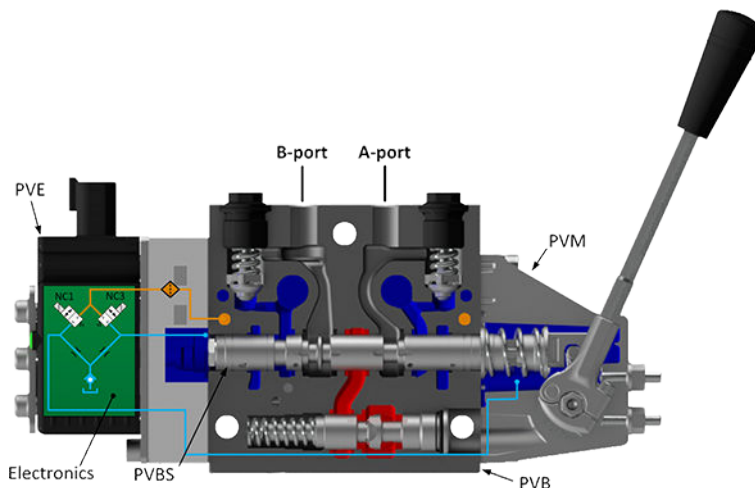
The analog PVE Series 6 is an electro-hydraulic actuator used to control a single work section of a PVG proportional valve group. The PVE Series 6 actuator program includes variants with different performance levels and features.

The actuator positions the main spool in a PVG work section to control either the flow or the pressure of the oil distributed to and from the work function. The control signal to the actuator is an analog voltage signal, enabling the user to operate the work function remotely by means of a joystick, a controller or the similar.

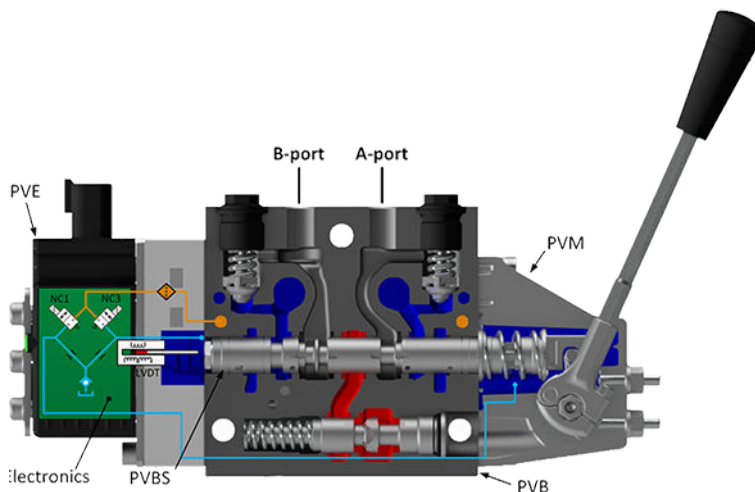
The electro-hydraulic solenoid valve bridge of the actuator is available in different designs utilizing different regulation principles, depending on performance variant. The actuator positions the main spool by distributing pilot oil pressure to either side of it, pressurizing one side by pilot pressure while relieving the opposite side to tank and vice versa. All proportional actuators feature a closed-loop spool control and continuous fault monitoring.

The analog PVE Series 6 actuator program for PVG 16 features two different main hydraulic principle variants (PVEO and PVEA). The different hydraulic principles combined with the different solenoid valve regulation principles determine whether the actuator controls the spool proportionally according to a demand signal or ON/OFF according to a voltage signal. The voltage control characteristic of the PVE Series 6 actuators is shown in the figure below to the left.

PVG 16 with PVEO sectional view





PVG 16 with PVEA sectional view



PVG 16 Actuation

PVE Series 6 Overview

ON/OFF voltage control, non-proportional functions	Proportional spool control for work functions
<p data-bbox="598 400 726 427" style="text-align: center;"><i>PVEO Series 6</i></p>  <p data-bbox="411 789 911 842">For more information please see PVEO – ON/OFF Voltage Control Actuator on page 63.</p>	<p data-bbox="1125 400 1252 427" style="text-align: center;"><i>PVEA Series 6</i></p>  <p data-bbox="959 800 1426 853">For more information please see PVEA – Proportional Spool Control Actuator on page 66.</p>

PVG 16 Actuation

PVEO – ON/OFF Voltage Control Actuator

The PVEO actuator is a non-proportional ON/OFF control actuator with open-loop spool control primarily used to control simple ON/OFF work functions where a proportional control of speed or oil flow is not a requirement.

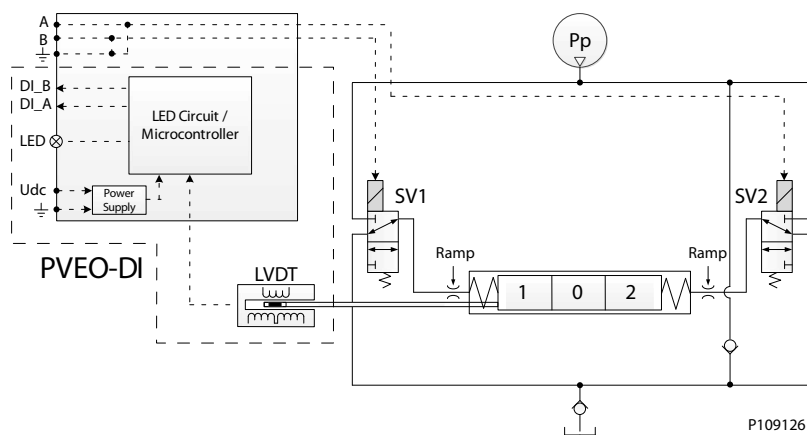
PVEO Series 6



All variants are available with following features:

- Neutral position or max. spool stroke according to control signal
- 12 V_{DC} or 24 V_{DC} supply voltage
- DEUTSCH connectors
- Standard PVE pilot oil pressure of 13.5 bar
- LED only indicating Power ON or Power OFF
- CAN-interface (-CI)

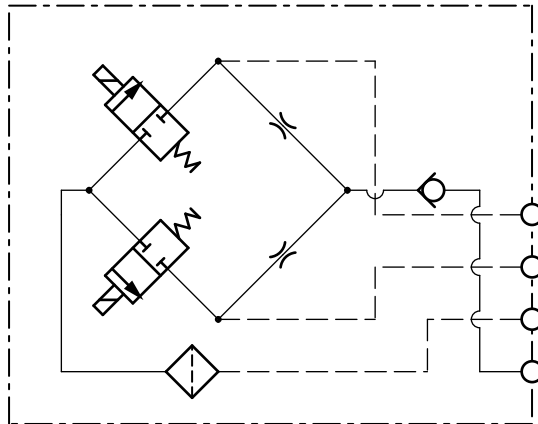
PVEO functionality diagram



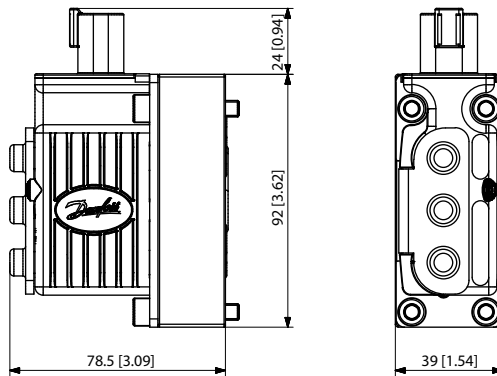
An energization of solenoid valve SV1 and a simultaneous de-energization of SV2 will cause the main spool to move to the right direction and vice versa. If both SV1 and SV2 are energized or de-energized simultaneously, the main spool stays locked in its neutral position.

PVG 16 Actuation

PVEO Series 6 schematic



PVEO Series 6 Dimensions



Weight: 0.7 kg [1.54 lb]

PVG 16 Actuation

PVEO Technical Data

PVEO/PVEO-CI actuator technical specification and part numbers.

Control specifications

Description	Type	12 V _{DC} ± 10%	24 V _{DC} ± 10%
Supply Voltage (U _{DC})	Rated/range	11 to 15 V _{DC}	12 to 30 V _{DC}
	Max. ripple	5%	5%
Current Consumption	Typical	320 mA	160 mA

Technical data

Pilot pressure	Nominal	13.5 bar [196 psi]
	Minimum	10.0 bar [145 psi]
	Maximum	15.0 bar [218 psi]
Fluid consumption	Neutral	0.04 l/min [0.01 US gal/min]
	Locked position	0.04 l/min [0.01 US gal/min]
	Actuating	0.6 l/min [0.16 US gal/min]
Fluid temperature	Ambient Storage	-50 to +90°C [-58 to +194°F]
	Ambient Operating	-40 to +90°C [-40 to +194°F]
Fluid viscosity	Operating range	12 to 75 mm ² /sec [65 to 347 SUS]
	Minimum	4 mm ² /sec [39 SUS]
	Maximum	460 mm ² /sec [2128 SUS]
Fluid cleanliness	Minimum	18/16/13 (according to ISO 4406)

LED characteristic

Color	LED characteristic	Description
Green		Power ON

Part numbers for PVEO and PVEO-CI

Part number	Type	Connector	Protection Class	Voltage	Interface
11106793	PVEO	1x4 DEUTSCH	IP 65	12 V _{DC}	—
11106794	PVEO	1x4 DEUTSCH	IP 65	24 V _{DC}	—
11124002	PVEO-CI	1x4 DEUTSCH	IP 67	—	J1939/ISObus
11149443	PVEO-CI	1x4 DEUTSCH	IP 67	—	CANopen

PVG 16 Actuation

PVEA – Proportional Spool Control Actuator

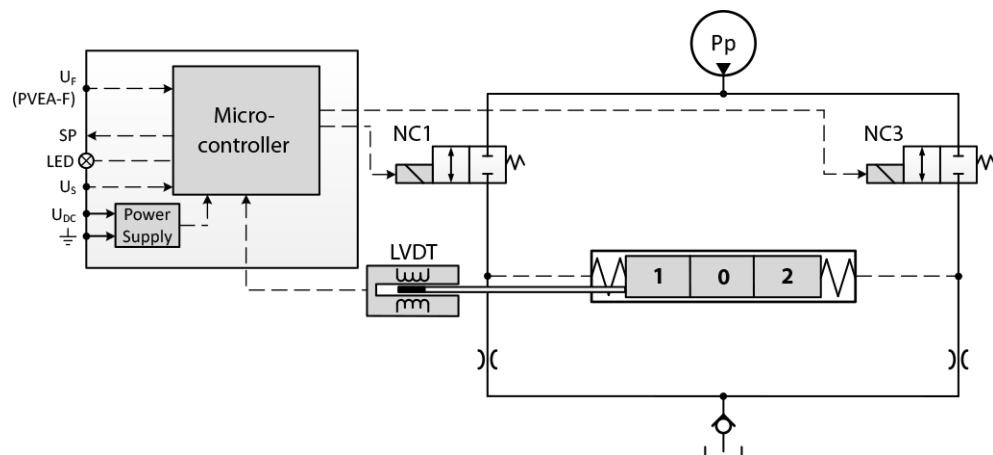
The PVEA actuator is a proportional actuator with closed-loop spool control primarily used to control work functions.

PVEA Series 6



The PVEA functionality includes an electric circuit with a closed-loop logic. An integrated feedback transducer measures spool movement in relation to the input signal. The PVEA features passive fault monitoring, LED indicating fault state, error output pin and Power Save mode.

PVEA functionality



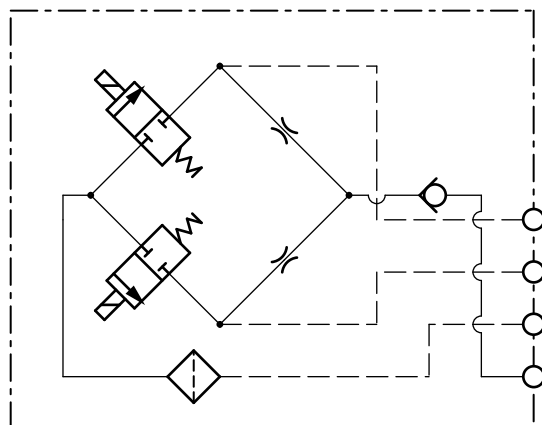
Power Save mode is entered when the command signal to the PVEA is below 15% of the supply voltage. Entering Power Save mode will turn off the power to the solenoid valves. Power Save mode can be identified by the LED blinking green at 1 Hz.

All variants available with following features:

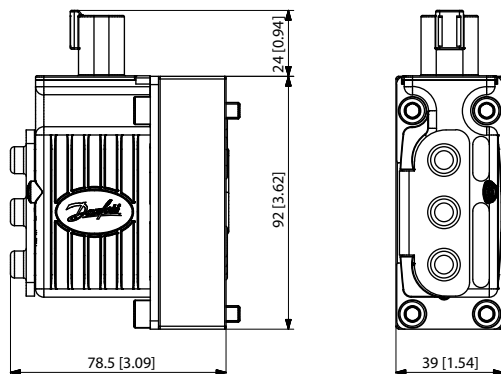
- Neutral position or max. spool stroke according to control signal
- 11–32 V_{DC} supply multi-voltage
- DEUTSCH connectors
- Standard PVE pilot oil pressure of 13.5 bar
- LED indicating error state and passive fault monitoring
- Float (-F) and CAN-interface (-CI)

PVG 16 Actuation

PVEA (-F) Series 6 schematic



PVEA (-F) Series 6 dimensions



Weight: 0.7 kg [1.54 lb]

PVEA Technical Data

PVEA/PVEA-CI/PVEA-F actuator technical specification and part numbers.

Control specification

Description	Type	Value
Supply voltage (U_{DC})	Rated/range	11 to 32 V_{DC}
	Max. ripple	15 bar [218 psi]
Signal voltage (U_S)	Neutral	0.5 U_{DC}
	Q: P -> A	0.25 U_{DC}
	Q: P -> B	0.75 U_{DC}
Current consumption	@ 12 V_{DC}	320 mA
	@ 24 V_{DC}	170 mA
Input impedance	Rated	12 k Ω
Input capacitance	Rated	100 μF

Technical data

Pilot pressure	Nominal	13.5 bar [196 psi]
	Minimum	10.0 bar [145 psi]
	Maximum	15.0 bar [218 psi]

PVG 16 Actuation

Technical data (continued)

Fluid consumption	Neutral	0.04 l/min [0.01 US gal/min]
	Locked position	0.04 l/min [0.01 US gal/min]
	Actuating	0.6 l/min [0.16 US gal/min]
Fluid temperature	Ambient Storage	-50 to +90°C [-58 to +194°F]
	Ambient Operating	-40 to +90°C [-40 to +194°F]
Fluid viscosity	Operating range	12 to 75 mm ² /sec [65 to 347 SUS]
	Minimum	4 mm ² /sec [39 SUS]
	Maximum	460 mm ² /sec [2128 SUS]
Fluid cleanliness	Minimum	18/16/13 (according to ISO 4406)

LED characteristic

Color	LED characteristic	Description
Green constant		Actuating
Green flashing 1 Hz		Power Save mode
Red flashing 1 Hz		External or float fault
Red constant		Internal fault

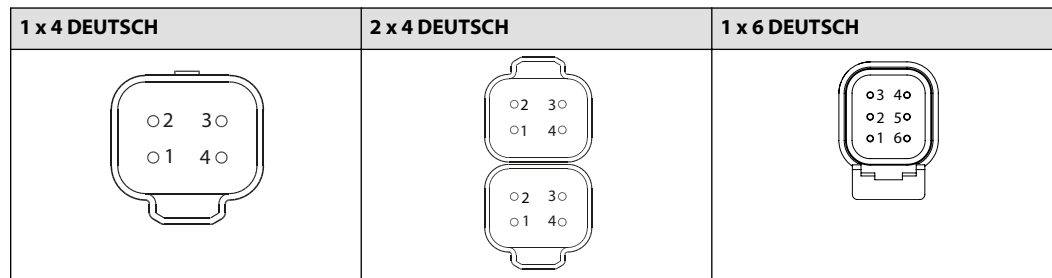
Part numbers for PVEA/PVEA-F/PVEA-CI

Part number	Type	Connector	Protection Class	Voltage	Interface	Functionality
11103692	PVEA	1x4 DEUTSCH	IP 65	12 V _{DC}	—	Standard
11106795	PVEA-F	1x4 DEUTSCH	IP 65	24 V _{DC}	—	Float B-port
11121945	PVEA-CI	1x4 DEUTSCH	IP 67	—	J1939/ISObus	Standard
11149437	PVEA-CI	1x4 DEUTSCH	IP 67	—	CANopen	Standard

PVG 16 Actuation

PVG 16 Connector Variants

PVG 16 connector variants: PVEO, PVEA, PVEO-CI, PVEA-CI, PVEA-F and pin layout information.



Pin layout for PVEO, PVEA, PVEO-CI, PVEA-CI

PVE Type	Connector	Pin 1	Pin 2	Pin 3	Pin 4
PVEO	1 x 4 DEUTSCH	NC 2	Vneg	Vneg	NC 4
PVEA	1 x 4 DEUTSCH	Vi	Sp	Vneg	Vbat
PVEO-CI, PVEA-CI	2 x 4 DEUTSCH	CAN_H	CAN_L	Vbat	Vneg

Pin layout for PVEA-F

Connector	Pin 1	Pin 2	Pin 3	Pin 4	Pin 5	Pin 6
1 x 6 DEUTSCH	Vi	NC	Vf	Sp	Vneg	Vbat

Fault Monitoring and Fault Reaction

All proportional control PVG 16 actuators feature:

- Integrated fault monitoring
- Detecting spool stroke inconsistencies
- Detecting internal hardware defects
- Detecting demand signal inconsistencies
- Fault reaction depending on the type of fault monitoring
 - Generic
 - Specific

The PVEA comes with a passive fault monitoring.

Passive fault monitoring

Passive fault monitoring does not disable the solenoid valves when an error is detected. It will continue to operate despite that an error was detected. When the error no longer is registered the passive fault monitoring will “forget” the error and continue as if the error was never there.

With a passive fault monitoring the following conditions will happen when an error is detected/occurs:

- The LED light will switch from green to red and the error pin output will go high
- The solenoid valves will continue operating at the set point given at the time of the error
 - Only exception is if the error is caused by the supply voltage (U_{DC}) being either above or below the allowed range or if the temperature measured on the internal electronics board is higher than allowed. In these cases, the solenoid valves will be disabled.

An overview of the error states and the reaction to the errors can be seen in the table [Fault Reaction Overview](#) on page 71.








Generic Fault Reaction

All PVE actuators with fault monitoring are triggered by the following main events:

Control Signal Monitoring	The Control signal voltage (U_C) is continuously monitored. The permissible range is between 15% and 85% of the supply voltage (U_{DC}). Outside this range the PVE will switch into an error state. A disconnected U_C pin (floating) is recognized as a neutral set point.
Transducer/LVDT Supervision	The internal LVDT wires are monitored. If the signals are interrupted or short-circuited, the PVE will switch into an error state.
Supervision of Spool Position	The actual position must always correspond to the demanded position (U_S). If the actual spool position is further out from neutral than the demanded spool position or in opposite direction, the PVE will switch into an error state. Spool position closer to neutral and in same direction will not cause an error state – the situation is considered <i>in control</i> .
Float Position Monitoring	Float position must be entered or left within a time limit. A too high delay on the 1x6 pin float PVE will cause an error state – this is relevant for the 1x6 pin PVEH-F actuators only.
Temperature Monitoring	When the temperature is too high the PVE LED will light constant red and solenoid valves will be disabled.

Fault Monitoring and Fault Reaction

Fault Reaction Overview

Description	Monitoring	LED	Solenoid valves	Error pin output	Reaction time (ms)
Spool not at setpoint	Passive		—	High	250
Unable to reach float position	Passive		—	High	250
$U_{DC} > \text{max.}$	Passive		Disabled	—	250
$U_{DC} < \text{min.}$	Passive		Disabled	—	250
U_S out of range	Passive		—	High	250
LVDT error	Passive		—	High	250
Temp > max.	Passive		Disabled	High	250

PVS End Plates

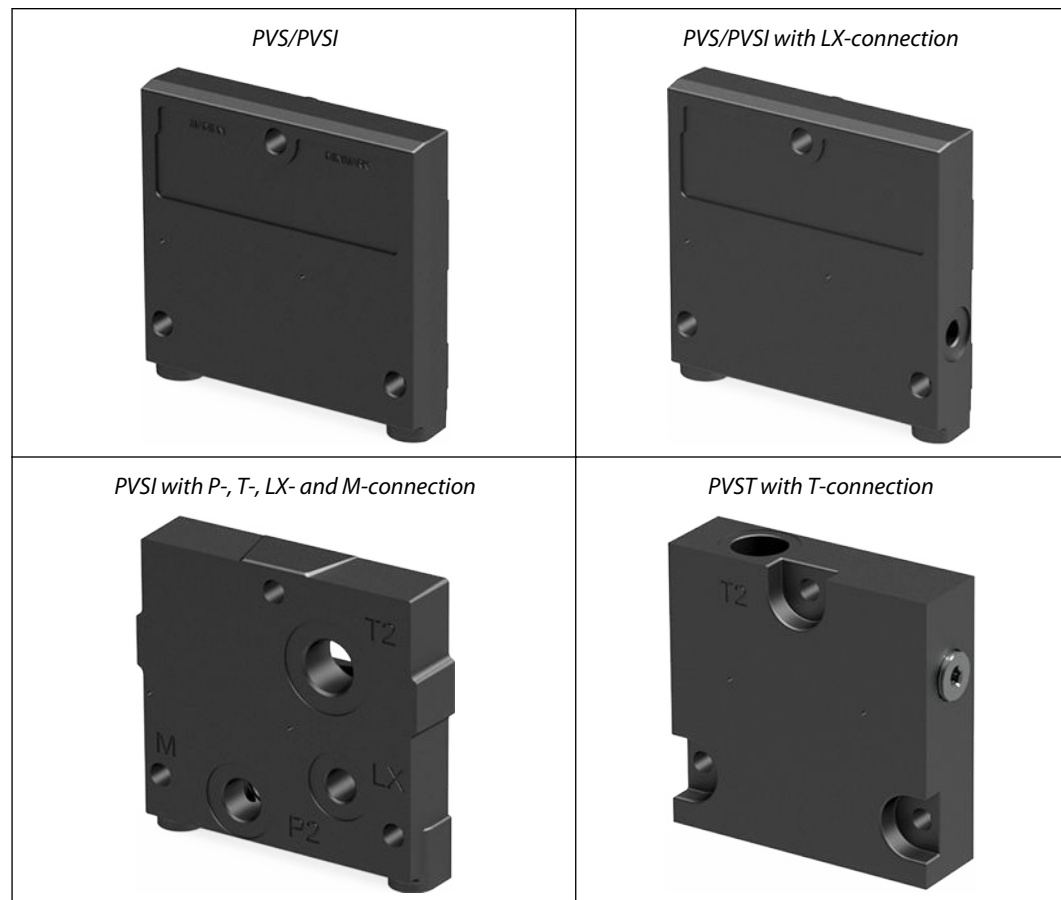
The PVG 16 PVS/PVSI end plates close off the valve stack section placed between them by placing them at the end. Furthermore, the end plate is ensuring Load Sense (LS) is relieved to tank pressure when the valve is not operated.

The PVS/PVSI end plate variants are based on a generic platform with a wide selection of additional features, enabling you to tailor the PVS/PVSI to suit the demands of any hydraulic system.

The generic PVS end plates platform includes the following main variants:

- **PVS/PVSI** – Either aluminum or cast iron
- **PVS/PVSI with LX-connection** – Either aluminum or cast iron
- **PVSI with P-, T-, LX- and M-connection** – Cast iron
- **PVST with T-connection** – Steel

PVS end plates platform overview



For more information about PVS/PVSI see:

[PVS/PVSI](#) on page 73

[PVS/PVSI with LX-connection](#) on page 75

[PVSI with P-, T-, LX- and M-connection](#) on page 77

[PVST with T-connection](#) on page 79

PVS End Plates

PVS/PVSI

The PVS/PVSI made of either aluminum or cast iron works as an end plate.

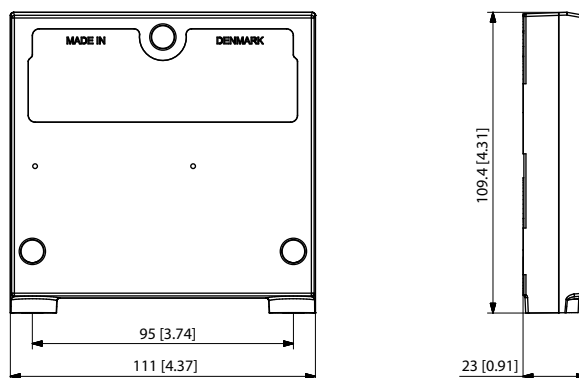
PVS/PVSI



PVS/PVSI schematic



PVS/PVSI dimensions



Weight: 0.47 kg [1.05 lb]

Technical data

Maximum rated pressure	A/B-port continuous	380 bar [5510 psi]
	A/B-port intermittent	420 bar [6090 psi]
Fluid temperature	Recommended	30 to 60°C [86 to 140°F]
	Minimum	-30°C [-22°F]
	Maximum	90° [194°F]
Ambient temperature	Recommended	-30 to 60°C [-22 to 140°F]
Fluid viscosity	Operating range	12 to 75 mm ² /s [65 to 347 SUS]
	Minimum	4 mm ² /s [39 SUS]
	Maximum	460 mm ² /s [2128 SUS]
Fluid cleanliness	Minimum	23/19/16 (according to ISO 4406)

PVS End Plates

Part numbers for PVS/PVSI end plates

Part number	Material	Mounting feet
157B2000	Aluminum	M8
157B2020	Aluminum	5/16-18
157B2014	Cast iron	M8
157B2004	Cast Iron	5/16-18

PVS End Plates

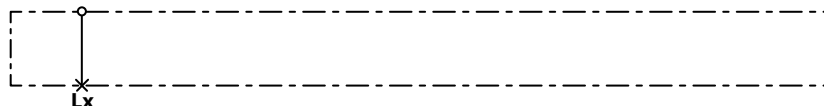
PVS/PVSI with LX-connection

The PVS/PVSI made of either aluminum or cast iron works as an End Plate. The PVSI with LX connection enables another valves LS pressure to be shuttled to the pump when needed. The LX port treads are with BSP or UNF tread.

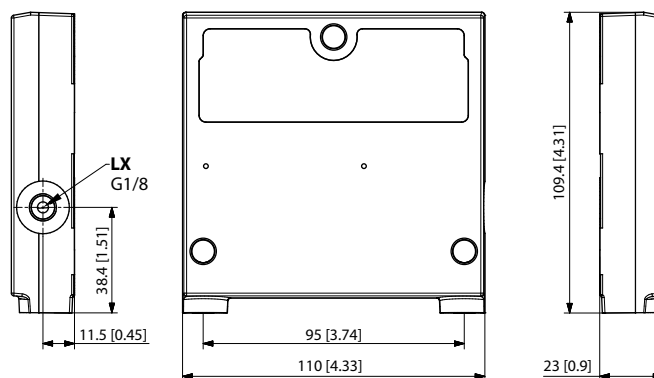
PVS/PVSI with LX-connection



PVS/PVSI with LX-connection schematic



PVS/PVSI with LX-connection dimensions



Weight: 0.47 kg [1.05 lb]

Technical data

Maximum rated pressure	A/B-port continuous	380 bar [5510 psi]
	A/B-port intermittent	420 bar [6090 psi]
Fluid temperature	Recommended	30 to 60°C [86 to 140°F]
	Minimum	-30°C [-22°F]
	Maximum	90° [194°F]
Ambient temperature	Recommended	-30 to 60°C [-22 to 140°F]
Fluid viscosity	Operating range	12 to 75 mm ² /s [65 to 347 SUS]
	Minimum	4 mm ² /s [39 SUS]
	Maximum	460 mm ² /s [2128 SUS]
Fluid cleanliness	Minimum	23/19/16 (according to ISO 4406)

PVS End Plates

Part numbers for PVS/PVSI with LX-connection end plates

Part number	Material	LX-port	Mounting feet
157B2011	Aluminum	G1/8	M8
157B2021	Aluminum	3/8-24	5/16-18
157B2015	Cast iron	G1/4	M8
157B2005	Cast Iron	1/2-20	5/16-18

PVS End Plates

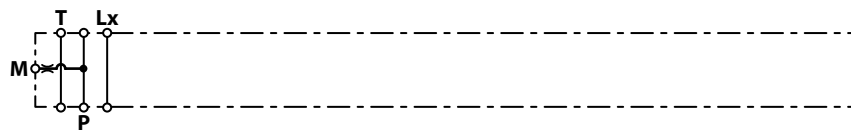
PVSI with P-, T-, LX- and M-connection

PVSI is made of cast iron and works as an end plate. The PVSI with LX connection enables another valves LS pressure to be shuttled to the pump when needed. The additional P- and T-port connections enables an additional pump flow to a PVG 16 valve.

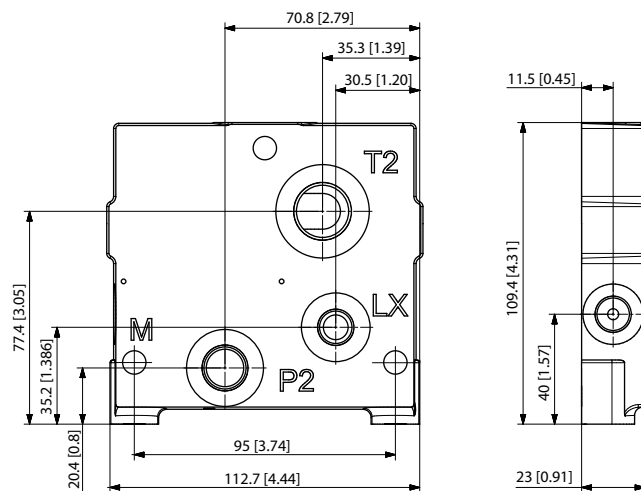
PVSI with P-, T-, LX- and M-connection



PVSI with P-, T-, LX- and M-connection schematic



PVSI with P-, T-, LX- and M-connection dimensions



Weight: 0.47 kg [1.05 lb]

Technical data

Maximum rated pressure	A/B-port continuous	380 bar [5510 psi]
	A/B-port intermittent	420 bar [6090 psi]
Fluid temperature	Recommended	30 to 60°C [86 to 140°F]
	Minimum	-30°C [-22°F]
	Maximum	90° [194°F]
Ambient temperature	Recommended	-30 to 60°C [-22 to 140°F]

PVS End Plates

Technical data (continued)

Fluid viscosity	Operating range	12 to 75 mm ² /s [65 to 347 SUS]
	Minimum	4 mm ² /s [39 SUS]
	Maximum	460 mm ² /s [2128 SUS]
Fluid cleanliness	Minimum	23/19/16 (according to ISO 4406)

Part number for PVS1 with P-, T-, LX-, M-ports

Part number	P-port	T-port	LX-port	M-port	Mounting feet
157B2920	G3/8	G1/2	G1/8	G1/4	M8

PVS End Plates

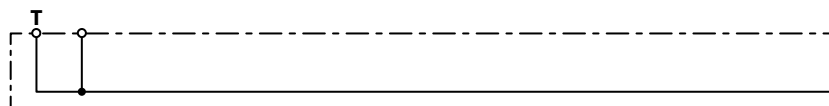
PVST with T-connection

The PVG 16 PVST iron end plate closes off the valve stack section placed between them by placing it at the end. Furthermore, the end plate is ensuring Load Sense (LS) is relieved to tank pressure when the valve is not operated.

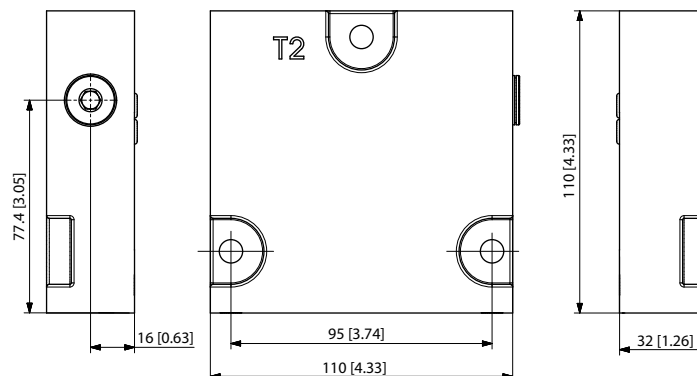
PVST with T-connection



PVST schematic with T-connection



PVST with T-connection dimensions



Weight: 0.47 kg [1.05 lb]

Technical data

Maximum rated pressure	A/B-port continuous	380 bar [5510 psi]
	A/B-port intermittent	420 bar [6090 psi]
Fluid temperature	Recommended	30 to 60°C [86 to 140°F]
	Minimum	-30°C [-22°F]
	Maximum	90° [194°F]
Ambient temperature	Recommended	-30 to 60°C [-22 to 140°F]
Fluid viscosity	Operating range	12 to 75 mm ² /s [65 to 347 SUS]
	Minimum	4 mm ² /s [39 SUS]
	Maximum	460 mm ² /s [2128 SUS]
Fluid cleanliness	Minimum	23/19/16 (according to ISO 4406)

PVS End Plates

Part numbers for PVST with T-connection end plates

Part number	Material	T-port	Mounting feet
157B2500	Steel	G1/2	M8
157B2520	Steel	7/8-14	5/16-18

When using a PVST (157B2500 or 157B2520) it is not possible to use the LS A/B fitting in the bottom of the PVG section next to the PVST.

PVAS Stay Bolts

PVAS Stay Bolts kit for various PVG combinations consist of three tie rods, six washers, six nuts and O-ring. Use the guide and reference tables how to choose PVAS kit.

The tie rods are inserted through the entire length of the PVG valve stack. The nuts are tightened at the pump side and at the end plate.

To find the PVAS kit that fits your PVG 16 valve stack, you need to go to the table [PVG 16 modules total length and weight](#) on page 82 and find the length. Then go to the table [PVAS Part Numbers](#) on page 82 and find the matching part number.

For stay bolts for a PVG 32/16 combination, see this [PVG 32/16 Combinations](#) on page 83.

Stay bolts for PVG 256/128/32/16 combinations consist of two different kits. See [PVG 256/128/32/16 Combinations](#) on page 84 to find the right kits for your combination.

[Combinations with PVG 100 and PVG 120 requires special PVAS kits. These are not included in the PVAS table.](#)

PVAS Stay Bolts

PVAS Part Numbers

PVAS part numbers according to accumulated length interval PVG 16.

PVAS part numbers

Length, mm [in]	Part number	Length, mm [in]	Part number
20 – 48 [0.79 – 1.89]	11188219	361 – 372 [14.21 – 14.65]	11188205
49 – 60 [1.93 – 2.36]	11188218	373 – 384 [14.69 – 15.12]	157B8026
61 – 72 [2.40 – 2.83]	157B8000	385 – 396 [15.16 – 15.59]	11188204
73 – 84 [2.87 – 3.31]	11188217	397 – 408 [15.63 – 16.06]	157B8007
85 – 96 [3.35 – 3.78]	157B8031	409 – 420 [16.10 – 16.54]	11188203
97 – 108 [3.82 – 4.25]	11188216	421 – 432 [16.58 – 17.01]	157B8027
109 – 120 [4.29 – 4.72]	157B8001	433 – 444 [17.05 – 17.48]	11188202
121 – 132 [4.76 – 5.20]	11188215	445 – 456 [17.52 – 17.95]	157B8008
133 – 144 [5.24 – 5.67]	157B8021	457 – 468 [17.99 – 18.43]	11188201
145 – 156 [5.71 – 6.14]	11188214	469 – 480 [18.47 – 18.90]	157B8028
157 – 168 [6.18 – 6.61]	157B8002	481 – 492 [18.94 – 19.37]	11188200
169 – 180 [6.65 – 7.09]	11188213	493 – 504 [19.41 – 19.84]	157B8009
181 – 192 [7.13 – 7.56]	157B8022	505 – 516 [19.88 – 20.31]	11188199
193 – 204 [7.60 – 8.03]	11188212	517 – 528 [20.35 – 20.79]	157B8029
205 – 216 [8.07 – 8.50]	157B8003	529 – 540 [20.83 – 21.26]	11188198
217 – 228 [8.54 – 8.98]	11188211	541 – 552 [21.30 – 21.73]	157B8010
229 – 240 [9.02 – 9.45]	157B8023	553 – 564 [21.77 – 22.20]	11188197
241 – 252 [9.49 – 9.92]	11188210	565 – 576 [22.24 – 22.68]	157B8030
253 – 264 [9.96 – 10.39]	157B8004	577 – 588 [22.72 – 23.15]	11188196
265 – 276 [10.43 – 10.87]	11188209	589 – 600 [23.19 – 23.62]	157B8061
277 – 288 [10.91 – 11.34]	157B8024	601 – 612 [23.66 – 24.09]	11188195
289 – 300 [11.38 – 11.81]	11188208	613 – 624 [24.13 – 24.57]	157B8081
301 – 312 [11.85 – 12.28]	157B8005	625 – 636 [24.61 – 25.04]	11188194
313 – 324 [12.32 – 12.76]	11188207	637 – 648 [25.08 – 25.51]	157B8062
325 – 336 [12.80 – 13.23]	157B8025	649 – 660 [25.55 – 25.98]	11188189
337 – 348 [13.27 – 13.70]	11188206	661 – 672 [26.02 – 26.46]	157B8082
349 – 360 [13.74 – 14.17]	157B8006		

PVG 16 modules total length and weight

The table of PVB 16 modules consists of total length depending on the amount of valve groups with weight.

No. of PVB 16	1	2	3	4	5	6	7	8	9	10	11	12
Length mm [in]	140 [5.51]	189 [7.44]	213 [8.39]	262 [10.31]	311 [12.24]	336 [13.23]	385 [15.16]	434 [17.09]	458 [18.03]	507 [19.96]	551 [21.69]	576 [22.68]
Weight* kg [lb]	7,2 [15.9]	10,9 [24]	14,6 [32.2]	18,3 [40.3]	22 [48.5]	25,7 [56.7]	29,4 [64.8]	33,1 [73]	36,8 [81.1]	40,5 [89.3]	44,2 [97.4]	47,9 [105.6]

* Weight is for a PVG 16 with a PVE on each working section and is only approximate.

PVAS Stay Bolts

PVG 32/16 Combinations

The table of PVB 32 and PVB 16 modules combination, the total length depending on the amount of valve groups.

PVB 16												
Modules mm [in]	1	2	3	4	5	6	7	8	9	10	11	
PVB 32	1	189 [7.44]	238 [9.37]	262 [10.31]	311 [12.24]	360 [14.17]	409 [16.10]	434 [17.09]	483 [19.02]	507 [19.96]	551 [21.69]	600 [23.62]
	2	238 [9.37]	287 [11.30]	311 [12.24]	360 [14.17]	409 [16.10]	434 [17.09]	483 [19.02]	507 [19.96]	551 [21.69]	600 [23.62]	646 [25.43]
	3	287 [11.30]	336 [13.23]	360 [14.17]	409 [16.10]	458 [18.03]	483 [19.02]	527 [20.75]	576 [22.68]	600 [23.62]	646 [25.43]	-
	4	336 [13.23]	385 [15.16]	409 [16.10]	458 [18.03]	483 [19.02]	527 [20.75]	576 [22.68]	622 [24.49]	646 [25.43]	-	-
	5	385 [15.16]	434 [17.09]	458 [18.03]	507 [19.96]	551 [21.69]	576 [22.68]	622 [24.49]	670 [26.38]	-	-	-
	6	434 [17.09]	483 [19.02]	507 [19.96]	551 [21.69]	600 [23.62]	622 [24.49]	670	-	-	-	-
	7	483 [19.02]	527 [20.75]	551 [21.69]	600 [23.62]	646 [25.43]	-	-	-	-	-	-
	8	527 [20.75]	576 [22.68]	600 [23.62]	646 [25.43]	-	-	-	-	-	-	-
	9	576 [22.68]	622 [24.49]	646 [25.43]	-	-	-	-	-	-	-	-
	10	622 [24.49]	670 [26.38]	-	-	-	-	-	-	-	-	-
	11	670 [26.38]	-	-	-	-	-	-	-	-	-	-

PVAS Stay Bolts

PVG 256/128/32/16 Combinations

The tables of PVB 256/128, 32/16 modules, total length depending on the amount of valve groups.

Stay bolts for PVG 128/256/32/16 combinations consist of 2 different kits:

1. For PVAS containing 2 stay bolts – please look in the *Table 1* below and use the part number before the + symbol.
2. For PVAS containing 3 stay bolts – please look in *Table 1* below and write down the length in millimeters which is the number after the + symbol. Next you add the number from *Table 2* below. Now find the part number for the needed stay bolts in the table *PVAS Part Numbers* on page 82.

O-rings are a part of the PVAS kits – no additional part number needed.

! Caution

It is not possible to do combinations exceeding **672 mm**.

Example

For 2 PVB 256 and 1 PVB 128 and 1 PVB 32 and 2 PVB 16: PVAS 1 Part number = **11187681** from *Table 1*.

PVAS 2 = **278** mm from *Table 1* + **152** mm from *Table 2* = 278+152 =430 mm which equals **157B8027** in the PVAS table.

Table 1 – PVG 256/128 combinations

PVB 256								
Modules (mm)	0	1	2	3	4	5	6	
PVB 128	0	36	11187672 + 123	11187673 + 209	11187674 + 295	11187675 + 381	11187676 + 467	11187677 + 553
	1	11187320 + 103	11187677 + 189	11187681 + 278	11187684 + 361	11187685 + 447	11187687 + 533	-
	2	11187617 + 169	11187678 + 255	11187682 + 341	11187686 + 427	11187691 + 513	11187692 + 599	-
	3	11187655 + 235	11187679 + 321	11187683 + 407	11187693 + 493	11187694 + 579	-	-
	4	11187656 + 301	11187680 + 387	11187696 + 473	11187697 + 559	-	-	-
	5	11187658 + 367	11187699 + 453	11187687 + 539	-	-	-	-
	6	11187702 + 433	11187703 + 519	11187704 + 605	-	-	-	-
	7	11187705 + 499	1187694 + 585	-	-	-	-	-
	8	11187697 + 565	-	-	-	-	-	-

PVAS Stay Bolts

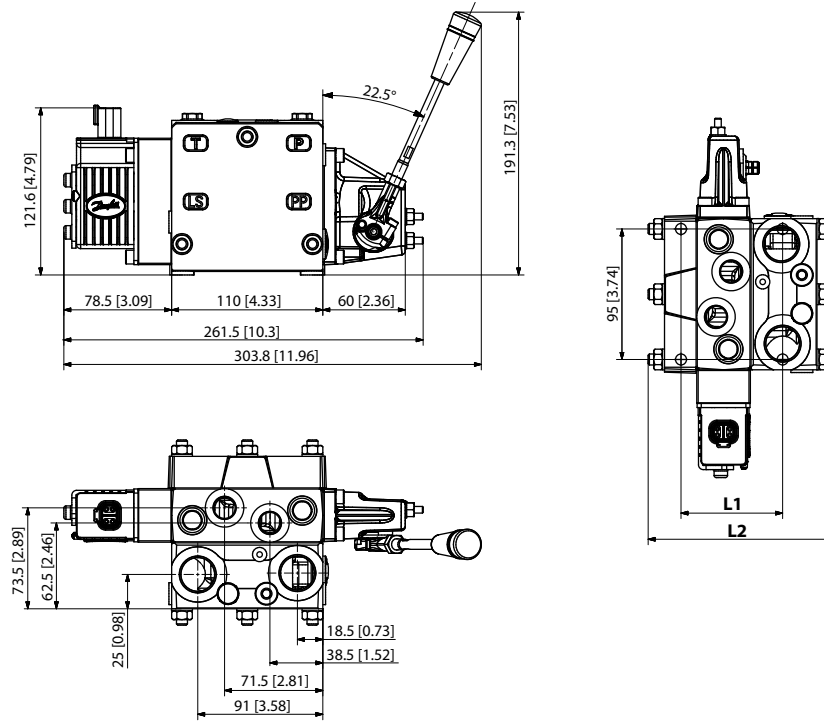
Table 2 – PVG 32/16 combinations

		PVB 16										
Modules (mm)	0	1	2	3	4	5	6	7	8	9	10	
PVB 32	0	-	64	104	144	184	224	264	304	344	384	424
	1	72	112	152	192	232	272	312	352	392	432	-
	2	120	160	200	240	280	320	360	400	440	-	-
	3	168	208	248	288	328	368	408	448	-	-	-
	4	216	256	296	236	276	416	456	-	-	-	-
	5	264	304	344	384	424	464	-	-	-	-	-
	6	312	352	392	432	472	-	-	-	-	-	-
	7	360	400	440	480	-	-	-	-	-	-	-
	8	408	448	488	-	-	-	-	-	-	-	-
	9	456	496	-	-	-	-	-	-	-	-	-
	10	504	-	-	-	-	-	-	-	-	-	-

PVG 16 Combinations Valve Stack Dimensions

PVG 16 Dimensions

The table of PVB 16 valve stack dimensions overview table with accompanying drawing.



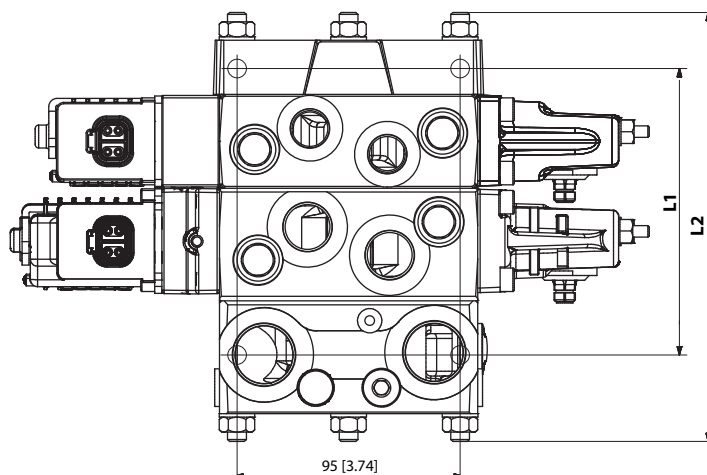
PVB 16 dimensions (12 sections)

Number of PVB 16		1	2	3	4	5	6	7	8	9	10	11	12
L1	mm	74	114	154	194	234	274	314	354	394	434	474	514
	[in]	[2.91]	[4.49]	[6.06]	[7.64]	[9.21]	[10.79]	[12.36]	[13.94]	[15.51]	[17.09]	[18.66]	[20.24]
L2	mm	140	189	213	262	311	336	385	434	458	507	551	576
	[in]	[5.51]	[7.44]	[8.39]	[10.31]	[12.24]	[13.23]	[15.16]	[17.09]	[18.03]	[19.96]	[21.69]	[22.68]

PVG 16 Combinations Valve Stack Dimensions

PVG 32/16 Dimensions

The table of PVB 32 and PVB 16 combination valve stack dimensions overview table with accompanying drawing.



PVB 32/16 combination valve stack dimensions, mm [in]

Number of PVB 32 (down)		Number of PVB 16 modules										
		1	2	3	4	5	6	7	8	9	10	11
1	L1	122 [4.80]	162 [6.38]	202 [7.95]	242 [9.53]	282 [11.10]	322 [12.68]	362 [14.25]	402 [15.83]	442 [17.40]	482 [18.98]	522 [20.55]
	L2	189 [7.44]	238 [9.37]	262 [10.31]	311 [12.24]	360 [14.17]	385 [15.16]	434 [17.09]	483 [19.02]	507 [19.96]	551 [21.69]	600 [23.62]
2	L1	170 [6.69]	210 [8.27]	250 [9.84]	290 [11.42]	330 [12.99]	370 [14.57]	410 [16.14]	450 [17.72]	490 [19.29]	530 [20.87]	570 [22.44]
	L2	238 [9.37]	287 [11.30]	311 [12.24]	360 [14.17]	409 [16.10]	434 [17.09]	483 [19.02]	507 [19.96]	551 [21.69]	600 [23.62]	646 [25.43]
3	L1	218 [8.58]	258 [10.16]	298 [11.73]	338 [13.31]	378 [14.88]	418 [16.46]	458 [18.03]	498 [19.61]	538 [21.18]	578 [22.76]	-
	L2	287 [11.30]	336 [13.23]	360 [14.17]	409 [16.10]	458 [18.03]	483 [19.02]	527 [20.75]	576 [22.68]	600 [23.62]	646 [25.43]	-
4	L1	266 [10.47]	306 [12.05]	346 [13.62]	386 [15.20]	426 [16.77]	466 [18.35]	506 [19.92]	546 [21.50]	586 [23.07]	-	-
	L2	336 [13.23]	385 [15.16]	409 [16.10]	458 [18.03]	483 [19.02]	527 [20.75]	576 [22.68]	622 [24.49]	646 [25.43]	-	-
5	L1	314 [12.36]	354 [13.94]	394 [15.51]	434 [17.09]	474 [18.66]	514 [20.24]	554 [21.81]	594 [23.39]	-	-	-
	L2	385 [15.16]	434 [17.09]	458 [18.03]	507 [19.96]	551 [21.69]	576 [22.68]	622 [24.49]	670 [26.38]	-	-	-
6	L1	362 [14.25]	402 [15.83]	442 [17.40]	482 [18.98]	522 [20.55]	562 [22.13]	602 [23.70]	-	-	-	-
	L2	434 [17.09]	483 [19.02]	507 [19.96]	551 [21.69]	600 [23.62]	622 [24.49]	670 [26.38]	-	-	-	-
7	L1	410 [16.14]	450 [17.72]	490 [19.29]	530 [20.87]	570 [22.44]	610 [24.02]	-	-	-	-	-
	L2	483 [19.02]	527 [20.75]	551 [21.69]	600 [23.62]	646 [25.43]	670 [26.38]	-	-	-	-	-
8	L1	458 [18.03]	498 [19.61]	538 [21.18]	578 [22.76]	-	-	-	-	-	-	-
	L2	527 [20.75]	576 [22.68]	600 [23.62]	646 [25.43]	-	-	-	-	-	-	-

PVG 16 Combinations Valve Stack Dimensions

PVB 32/16 combination valve stack dimensions, mm [in] (continued)

Number of PVB 32 (down)		Number of PVB 16 modules										
		1	2	3	4	5	6	7	8	9	10	11
9	L1	506 [19.92]	546 [21.50]	586 [23.07]	-	-	-	-	-	-	-	-
	L2	576 [22.68]	622 [24.49]	646 [25.43]	-	-	-	-	-	-	-	-
10	L1	554 [21.81]	594 [23.39]	-	-	-	-	-	-	-	-	-
	L2	622 [24.49]	670 [26.38]	-	-	-	-	-	-	-	-	-
11	L1	602 [23.70]	-	-	-	-	-	-	-	-	-	-
	L2	670 [26.38]	-	-	-	-	-	-	-	-	-	-

Weight for a PVG 32/16 valve stack

The combined weight of a PVG 32/16 valve stack can be defined like this:

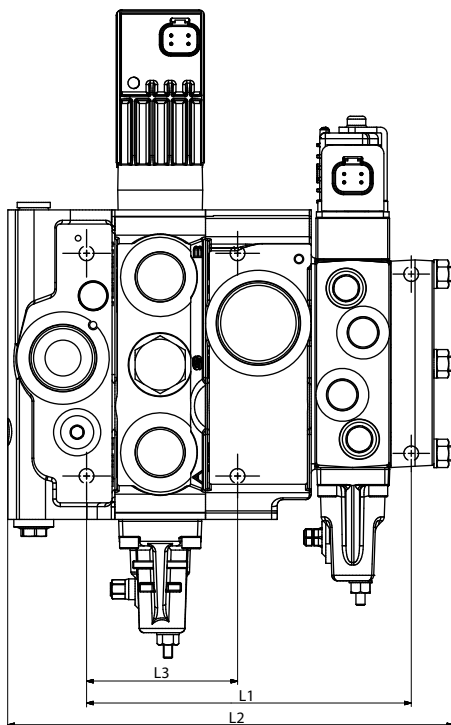
(Numbers of PVB 32 x 4,25) + (numbers of PVB 16 x 3,67) + 3,6 = Weight in kg

(Numbers of PVB 32 x 9.37) + (numbers of PVB 16 x 8.09) + 7.95 = Weight in lb

PVG 16 Combinations Valve Stack Dimensions

PVG 100/16 Dimensions

The table of PVB 100 and PVB 16 combination valve stack dimensions overview table with accompanying drawing.



PVB 100/16 combination valve stack dimensions, mm [in]

Number of PVB 100 (down)		Number of PVB 16										
		1	2	3	4	5	6	7	8	9	10	11
1	L1	172 [6.77]	212 [8.35]	252 [9.92]	292 [11.50]	332 [13.07]	372 [14.65]	412 [16.22]	452 [17.80]	492 [19.37]	532 [20.94]	572 [22.52]
	L2	236 [9.29]	285 [11.22]	311 [12.24]	358 [14.09]	407 [16.02]	432 [17.01]	481 [18.94]	530 [20.87]	554 [21.81]	603 [23.74]	652 [25.67]
	L3	80 [3.15]										
2	L1	220 [8.66]	260 [10.24]	300 [11.81]	340 [13.39]	380 [14.96]	420 [16.54]	460 [18.11]	500 [19.69]	540 [21.26]	580 [22.83]	620 [24.41]
	L2	284 [11.18]	333 [13.11]	359 [14.13]	406 [15.98]	455 [17.91]	480 [18.90]	529 [20.83]	578 [22.76]	602 [23.70]	651 [25.63]	700 [27.56]
	L3	128 [5.04]										
3	L1	268 [10.55]	308 [12.13]	348 [13.70]	388 [15.28]	428 [16.85]	468 [18.43]	508 [20.00]	548 [21.57]	588 [23.15]	628 [24.72]	668 [26.30]
	L2	332 [13.07]	381 [15.00]	407 [16.02]	454 [17.87]	503 [19.80]	528 [20.79]	577 [22.72]	626 [24.65]	650 [25.59]	699 [27.52]	748 [29.45]
	L3	176 [6.93]										
4	L1	316 [12.44]	256 [10.08]	396 [15.59]	436 [17.17]	476 [18.74]	516 [20.31]	556 [21.89]	596 [23.46]	636 [25.04]	676 [26.61]	716 [28.19]
	L2	380 [14.96]	429 [16.89]	455 [17.91]	502 [19.76]	551 [21.69]	576 [22.68]	625 [24.61]	674 [26.54]	698 [27.48]	747 [29.41]	796 [31.34]
	L3	224 [8.82]										

PVG 16 Combinations Valve Stack Dimensions

PVB 100/16 combination valve stack dimensions, mm [in] (continued)

Number of PVB 100 (down)		Number of PVB 16										
		1	2	3	4	5	6	7	8	9	10	11
5	L1	364 [14.33]	404 [15.91]	444 [17.48]	484 [19.06]	524 [20.63]	564 [22.20]	604 [23.78]	644 [25.35]	684 [26.93]	724 [28.50]	-
	L2	428 [16.85]	477 [18.78]	503 [19.80]	550 [21.65]	599 [23.58]	624 [24.57]	673 [26.50]	722 [28.43]	746 [29.37]	795 [31.30]	-
	L3	272 [10.71]										
6	L1	412 [16.22]	452 [17.80]	492 [19.37]	532 [20.94]	572 [22.52]	612 [24.09]	652 [25.67]	692 [27.24]	732 [28.82]	-	-
	L2	476 [18.74]	525 [20.67]	551 [21.69]	598 [23.54]	647 [25.47]	672 [26.46]	721 [28.39]	770 [30.31]	794 [31.26]	-	-
	L3	320 [12.60]										
7	L1	460 [18.11]	500 [19.69]	540 [21.26]	580 [22.83]	620 [24.41]	660 [25.98]	700 [27.56]	740 [29.13]	-	-	-
	L2	524 [20.63]	573 [22.56]	599 [23.58]	646 [25.43]	695 [27.36]	720 [28.35]	769 [30.28]	818 [32.20]	-	-	-
	L3	368 [14.49]										
8	L1	508 [20.00]	548 [21.57]	588 [23.15]	628 [24.72]	668 [26.30]	708 [27.87]	748 [29.45]	-	-	-	-
	L2	572 [22.52]	621 [24.45]	647 [25.47]	694 [27.32]	743 [29.25]	768 [30.24]	817 [32.17]	-	-	-	-
	L3	416 [16.38]										

Weight for a PVG 100/16 valve stack

The combined weight of a PVG 100/16 valve stack can be defined like this:

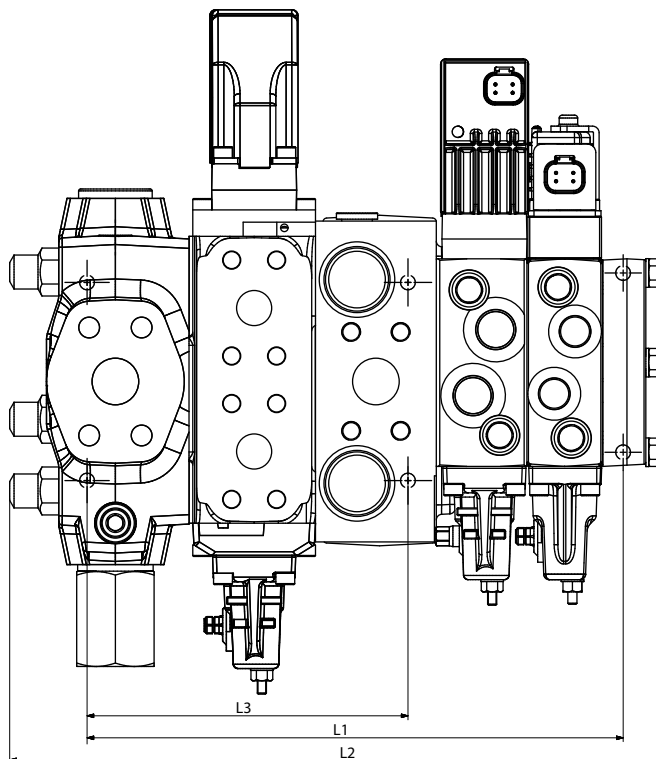
(Numbers of PVB 100 x 7) + (numbers of PVB 16 x 3.67) + 10 = Weight in kg

(Numbers of PVB 100 x 9.37) + (numbers of PVB 16 x 8.09) + 22 = Weight in lb

PVG 16 Combinations Valve Stack Dimensions

PVG 120/16 Dimensions

The table of PVB 120 and PVB 16 combination valve stack dimensions overview table with accompanying drawing.



PVB 120/16 combination valve stack dimensions, mm [in]

Number of PVB 120 (down)		Number of PVB 16 modules										
		1	2	3	4	5	6	7	8	9	10	11
1	L1	284 [11.18]	324 [12.76]	364 [14.33]	404 [15.91]	444 [17.48]	484 [19.06]	524 [20.63]	564 [22.20]	604 [23.78]	644 [25.35]	684 [26.93]
	L2	348 [13.70]	397 [15.63]	421 [16.57]	470 [18.50]	519 [20.43]	544 [21.42]	593 [23.35]	642 [25.28]	666 [26.22]	715 [28.15]	759 [29.88]
	L3	80 [3.15]										
2	L1	351 [13.82]	391 [15.39]	431 [16.97]	471 [18.54]	511 [20.12]	551 [21.69]	591 [23.27]	631 [24.84]	671 [26.42]	711 [27.99]	751 [29.57]
	L2	413 [16.26]	462 [18.19]	486 [19.13]	535 [21.06]	584 [22.99]	609 [23.98]	658 [25.91]	707 [27.83]	731 [28.78]	780 [30.71]	824 [32.44]
	L3	128 [5.04]										
3	L1	418 [16.46]	458 [18.03]	498 [19.61]	538 [21.18]	578 [22.76]	618 [24.33]	658 [25.91]	698 [27.48]	738 [29.06]	778 [30.63]	818 [32.20]
	L2	478 [18.82]	527 [20.75]	551 [21.69]	600 [23.62]	649 [25.55]	674 [26.54]	723 [28.46]	772 [30.39]	796 [31.34]	845 [33.27]	889 [35.00]
	L3	176 [6.93]										
4	L1	485 [19.09]	525 [20.67]	565 [22.24]	605 [23.82]	645 [25.39]	685 [26.97]	725 [28.54]	765 [30.12]	805 [31.69]	845 [33.27]	885 [34.84]
	L2	543 [21.38]	592 [23.31]	616 [24.25]	665 [26.18]	714 [28.11]	739 [29.09]	788 [31.02]	837 [32.95]	861 [33.9]	910 [35.83]	954 [37.56]
	L3	224 [8.82]										

PVG 16 Combinations Valve Stack Dimensions

PVB 120/16 combination valve stack dimensions, mm [in] (continued)

Number of PVB 120 (down)		Number of PVB 16 modules										
		1	2	3	4	5	6	7	8	9	10	11
5	L1	552 [21.73]	592 [23.31]	632 [24.8]	672 [26.46]	712 [28.03]	752 [29.61]	792 [31.18]	832 [32.76]	872 [34.33]	912 [35.91]	-
	L2	608 [23.94]	657 [25.87]	681 [26.81]	730 [28.74]	779 [30.67]	804 [31.65]	853 [33.58]	902 [35.51]	926 [36.46]	975 [38.39]	-
	L3	272 [10.71]										
6	L1	619 [24.37]	659 [25.94]	699 [27.52]	739 [29.09]	779 [30.67]	819 [32.24]	859 [33.82]	899 [35.39]	939 [36.97]	-	-
	L2	673 [26.50]	722 [28.43]	746 [29.37]	795 [31.30]	844 [33.23]	869 [34.21]	918 [36.14]	967 [38.07]	991 [39.02]	-	-
	L3	320 [12.60]										
7	L1	686 [27.01]	726 [28.58]	766 [30.16]	806 [31.73]	846 [33.31]	886 [34.88]	926 [36.46]	966 [38.03]	-	-	-
	L2	738 [29.06]	787 [30.98]	811 [31.93]	860 [33.86]	909 [35.79]	934 [36.77]	983 [38.70]	1032 [40.63]	-	-	-
	L3	368 [14.49]										
8	L1	753 [29.65]	793 [31.22]	833 [32.80]	873 [34.37]	913 [35.94]	953 [37.52]	993 [39.09]	-	-	-	-
	L2	803 [31.61]	852 [33.54]	876 [34.49]	925 [36.42]	974 [38.35]	999 [39.33]	1048 [41.26]	-	-	-	-
	L3	639 [25.16]										

There is a horizontal difference 62.5 mm [2.46 in] in the mounting plane of the PVG 120/PVG 16.

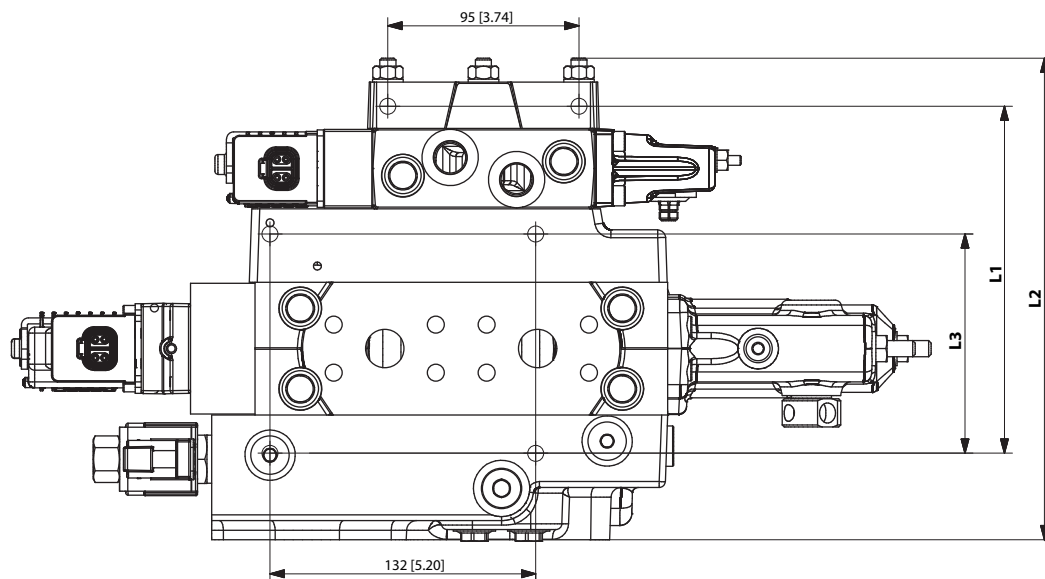
The PVG 120 interface module is large sized.

It is necessary to have at least one PVG 32 module between the PVGI and the first PVG 16 slice.

PVG 16 Combinations Valve Stack Dimensions

PVG 128/16 Dimensions

The table of PVB 128 and PVB 16 combination valve stack dimensions overview table with accompanying drawing.



PVB 128/PVB 16 valve stack dimensions, mm [in]

Number of PVB 128 (down)		Number of PVB 16										
		1	2	3	4	5	6	7	8	9	10	11
1	L1	173 [6.81]	213 [8.39]	253 [9.96]	293 [11.54]	333 [13.11]	373 [14.69]	413 [16.26]	453 [17.83]	493 [19.41]	533 [20.98]	573 [22.56]
	L2	297,5 [11.71]	346,5 [13.64]	382,5 [15.06]	418,5 [16.48]	467,5 [18.41]	503,5 [19.82]	540,5 [21.28]	588,5 [23.17]	625,5 [24.63]	661,5 [26.04]	685,5 [26.99]
	L3	98,5 [3.88]										
2	L1	239 [9.41]	279 [10.98]	319 [12.56]	359 [14.13]	399 [15.71]	439 [17.28]	479 [18.86]	519 [20.43]	559 [22.01]	599 [23.58]	—
	L2	370,5 [14.59]	406,5 [16.00]	455,5 [17.93]	491,5 [19.35]	528,5 [20.81]	576,5 [22.70]	588,5 [23.17]	649,5 [25.57]	697,5 [27.46]	734,5 [28.92]	—
	L3	164,5 [6.48]										
3	L1	305 [12.01]	345 [13.58]	385 [15.16]	425 [16.73]	465 [18.31]	505 [19.88]	545 [21.46]	585 [23.03]	—	—	—
	L2	431,5 [16.99]	479,5 [18.88]	515,5 [20.30]	552,5 [21.75]	600,5 [23.64]	637,5 [25.10]	673,5 [26.52]	722,5 [28.44]	—	—	—
	L3	230,5 [9.07]										
4	L1	371 [14.61]	411 [16.18]	451 [17.76]	491 [19.33]	531 [20.91]	571 [22.48]	611 [24.06]	—	—	—	—
	L2	503,5 [19.82]	540,5 [21.28]	588,5 [23.17]	625,5 [24.63]	661,5 [26.04]	709,5 [27.93]	746,5 [29.39]	—	—	—	—
	L3	296,5 [11.67]										
5	L1	437 [17.02]	477 [18.78]	517 [20.35]	557 [21.93]	597 [23.50]	—	—	—	—	—	—
	L2	564,5 [22.22]	612,5 [24.11]	649,5 [25.57]	685,5 [26.99]	734,5 [28.92]	—	—	—	—	—	—
	L3	362,5 [14.27]										

PVG 16 Combinations Valve Stack Dimensions

PVB 128/PVB 16 valve stack dimensions, mm [in] (continued)

Number of PVB 128 (down)		Number of PVB 16										
		1	2	3	4	5	6	7	8	9	10	11
6	L1	503 [19.80]	543 [21.38]	583 [22.95]	—	—	—	—	—	—	—	—
	L2	637,5 [25.10]	673,5 [26.52]	722,5 [28.44]	—	—	—	—	—	—	—	—
	L3	428,5 [16.87]										
7	L1	569 [22.40]	609 [23.98]	—	—	—	—	—	—	—	—	—
	L2	697,5 [27.46]	746,5 [29.39]	—	—	—	—	—	—	—	—	—
	L3	494,5 [19.47]										

Weight for a PVG 128/16 valve stack

The combined weight of a PVG 128/16 valve stack can be defined like this:

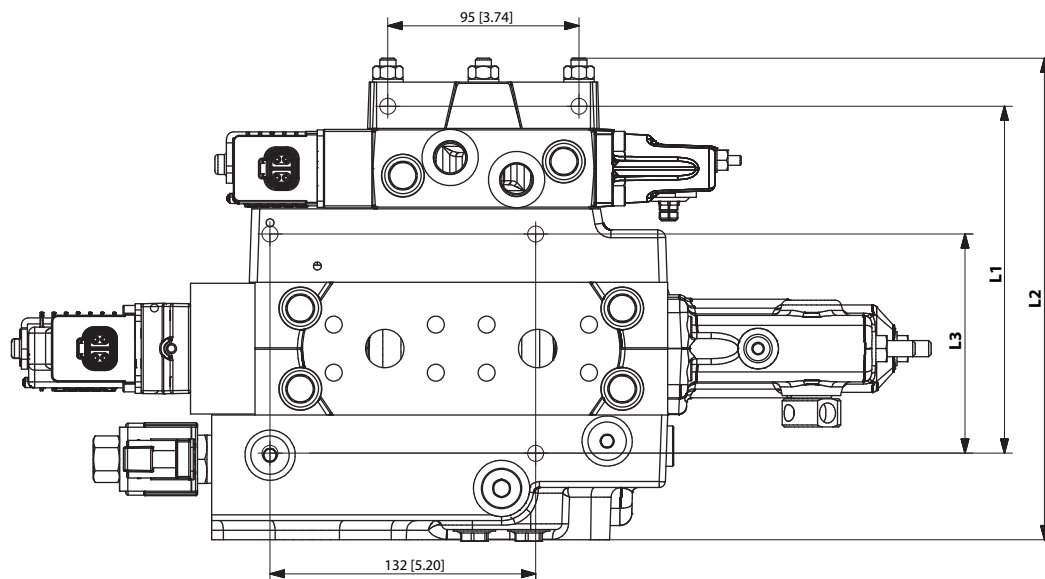
(Numbers of PVB 128 x 16.9) + (numbers of PVB 16 x 3,67) + 17.5 = Weight in kg

(Numbers of PVB 128 x 37.26) + (numbers of PVB 16 x 8.09) + 38.6 = Weight in lb

PVG 16 Combinations Valve Stack Dimensions

PVG 256/16 Dimensions

The table of PVB 256 and PVB 16 combination valve stack dimensions overview table with accompanying drawing.



PVB 256/16 combination valve stack dimensions, mm [in]

Number of PVB 256 (down)		Number of PVB 16										
		1	2	3	4	5	6	7	8	9	10	11
1	L1	193 [7.60]	233 [9.17]	273 [10.75]	313 [12.32]	353 [13.90]	393 [15.47]	433 [17.05]	473 [18.62]	513 [20.20]	553 [21.78]	593 [23.35]
	L2	321,5 [12.66]	358,5 [14.11]	406,5 [16.01]	443,5 [17.46]	479,5 [18.88]	528,5 [20.81]	564,5 [22.22]	600,5 [23.64]	649,5 [25.57]	685,5 [26.99]	734,5 [28.92]
	L3	118,5 [4.67]										
2	L1	285 [11.22]	325 [12.80]	365 [14.37]	405 [15.94]	445 [17.52]	485 [19.09]	525 [20.67]	565 [22.224]	605 [23.82]	—	—
	L2	406,5 [16.01]	455,5 [17.93]	491,5 [19.35]	528,5 [20.81]	576,5 [22.70]	612,5 [24.11]	649,5 [25.57]	697,5 [27.46]	734,5 [28.92]	—	—
	L3	204,5 [8.05]										
3	L1	371 [14.61]	411 [16.18]	451 [17.76]	491 [19.33]	531 [20.91]	571 [22.48]	611 [24.06]	—	—	—	—
	L2	491,5 [19.35]	540,5 [21.28]	576,5 [22.70]	612,5 [24.11]	661,5 [26.04]	697,5 [27.46]	734,5 [28.92]	—	—	—	—
	L3	290,5 [11.44]										
4	L1	457 [17.99]	497 [19.57]	537 [21.14]	577 [22.72]	617 [24.29]	—	—	—	—	—	—
	L2	588,5 [23.17]	625,5 [24.63]	661,5 [26.04]	709,5 [27.93]	746,5 [29.39]	—	—	—	—	—	—
	L3	376,5 [14.82]										
5	L1	543 [21.38]	583 [22.95]	623 [24.53]	—	—	—	—	—	—	—	—
	L2	673,5 [26.52]	709,5 [27.93]	746,5 [29.93]	—	—	—	—	—	—	—	—
	L3	462,5 [18.21]										

PVG 16 Combinations Valve Stack Dimensions

Weight for a PVG 256/16 valve stack

The combined weight of a PVG 256/16 valve stack can be defined like this:

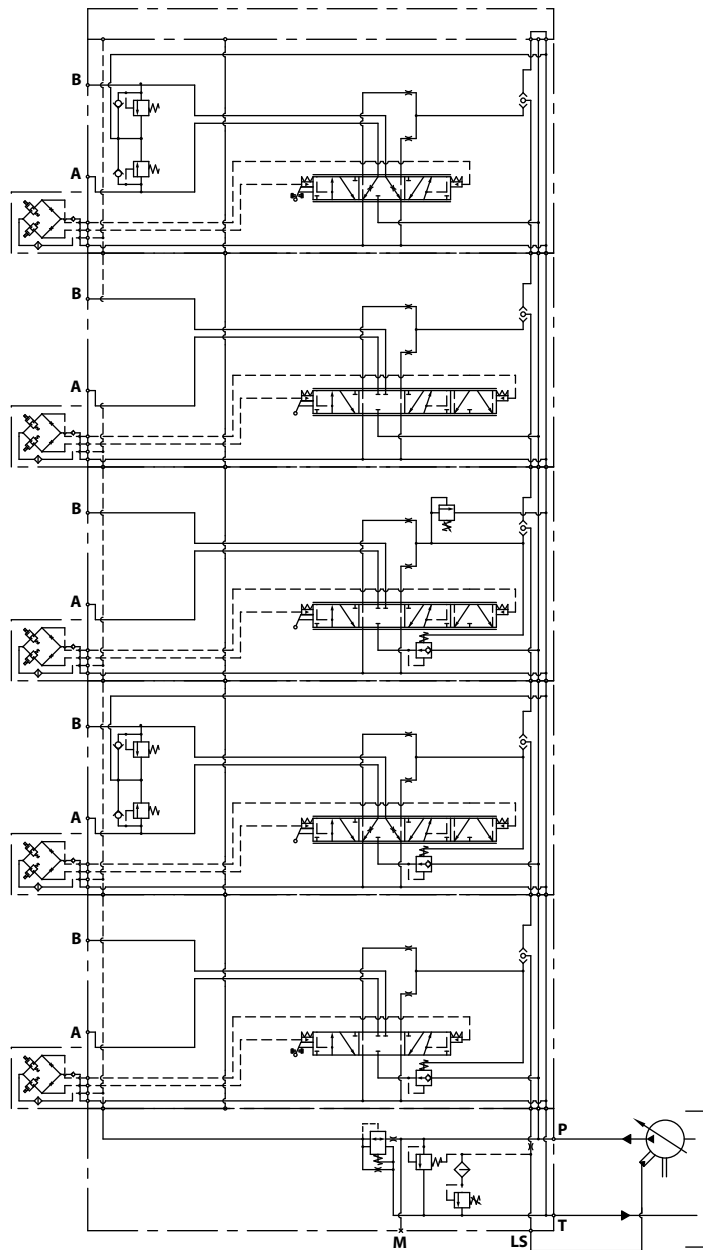
(Numbers of PVB 256 x 20.9) + (numbers of PVB 16 x 3,67) + 17.5 = Weight in kg

(Numbers of PVB 256 x 40.08) + (numbers of PVB 16 x 8.09) + 38.6 = Weight in lb

PVG 16 Applications Schematics

PVG 16 Schematic with Basic End Plate

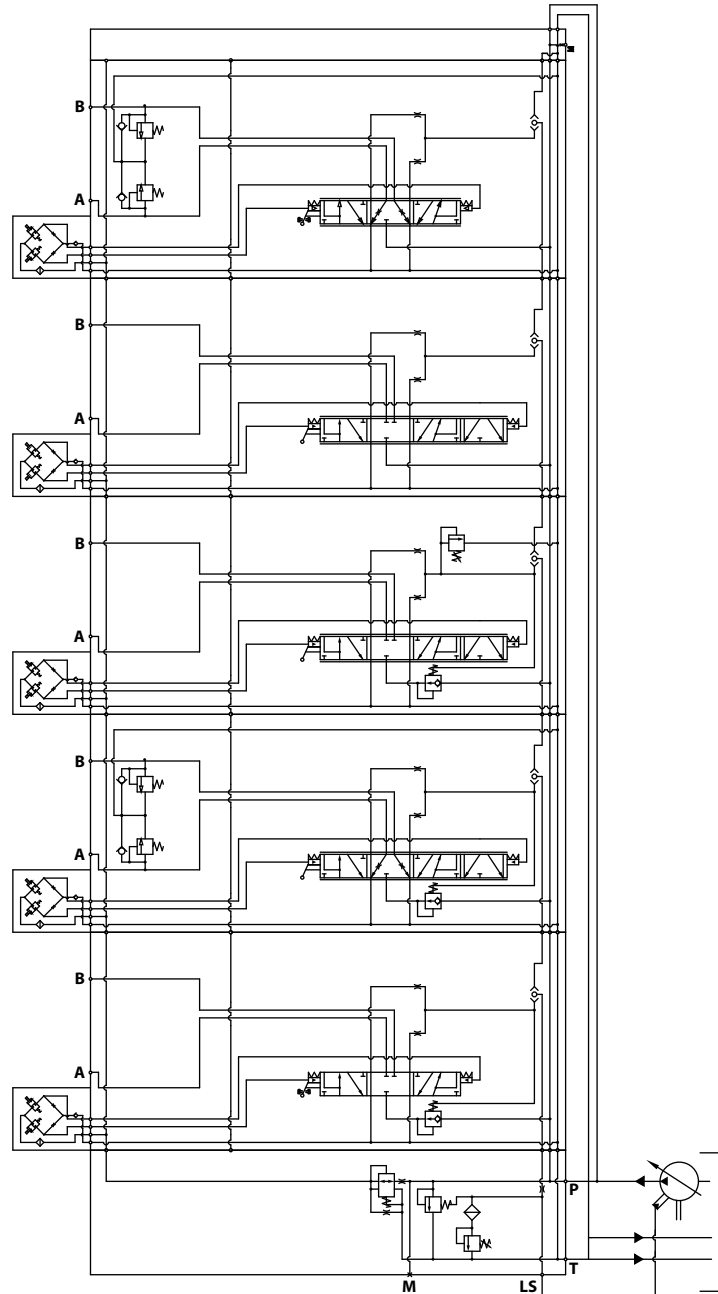
The schematic example of PVG 16 with basic end plate.



PVG 16 Applications Schematics

PVG 16 with P- and T-connection end plate

The schematic example of PVG 16 with P- and T-connection end plate.



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