ENGINEERING
TOMORROW

Technical Information

# PVG 16
## Proportional Valve Group

## Revision history

*Table of revisions*

| Date | Changed | Rev |
|---|---|---|
| December 2018 | Major rework of document: new sections added, data corrected. | 0901 |
| October 2018 | 'PVBS Main Spools' section reworked. 'Safety in Systems' and 'PVB Basic Modules Accessories' sections added. | 0801 |
| August 2018 | Minor update - part number typo corrected | 0702 |
| May 2018 | Major update. | 0701 |
| April 2018 | Minor change for PVEA. | 0602 |
| 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 and interfaces to other valve families enabling all machine functions being controlled from one single valve stack.

PVG 16 controls work port flow up to 65 l/min [17 US gal/min] l/min and up to 420 bar [6090 psi] 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 bullets below:

- 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
- 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, when using an interface module
- Up to 12 basic modules per PVG 16 valve group
- 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

### Safety in Systems

All types and brands of control valves, including proportional valves, can fail. Therefore, the necessary protection against the serious consequences of a functional failure should always be built into the system.

#### General safety considerations

For each application an assessment should be made for the consequences of the system in case of pressure failure and uncontrolled or blocked movements.

**Warning**

Because the proportional valve is used in many different applications and under different operating conditions, it is the sole responsibility of the manufacturer to ensure that all performance, safety and warning requirements of the application is met in his selection of products and complies with relevant machine specific and generic standards.

#### Control system example

An example of a control system using an aerial lift is shown below:

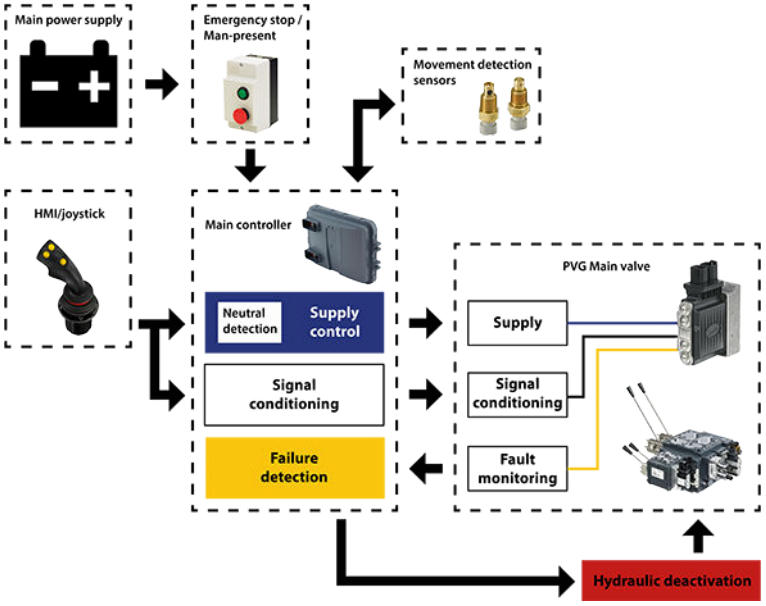
*Aerial lift*

This example breaks down the control system into smaller bits explaining the architecture in depth. Even though many Danfoss components are used in the PVG control system.

The function of the control system is to use the output from the PVE together other external sensors to ensure the PLUS+1 main controllers correct function of the aerial lift.

## General Information

*Electrical block diagram*




**Warning**

It is the responsibility of the equipment manufacturer that the control system incorporated in the machine is declared as being in conformity with the relevant machine directives.

**Caution**

A mix of electrical actuation and hydraulic actuation on the same valve stack is not safe. PVE and PVH are designed for different pilot pressure.

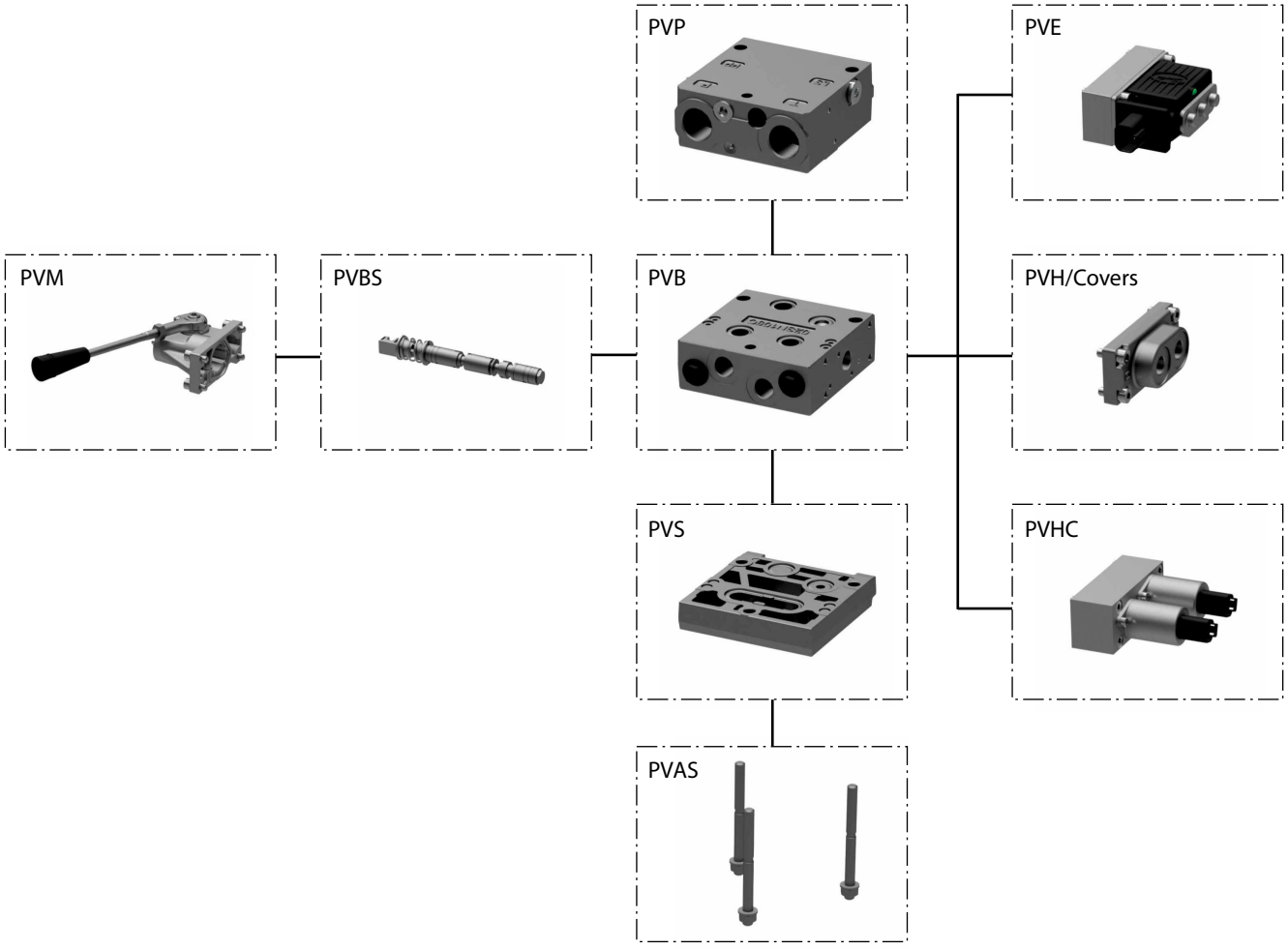
Cost-free repairs, as mentioned in Danfoss General Conditions of Sale, are carried out only at Danfoss or at service shops authorized by Danfoss.

## 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 9

*PVB Basic Modules* on page 38

*PVBS Main Spools* on page 62

*PVM Manual Actuation* on page 69

*PVE Electro-hydraulic Actuation* on page 75

*PVH Hydraulic Actuation* on page 71

*PVHC Electro-Hydraulic Actuation* on page 73

*PVS End Plates* on page 86

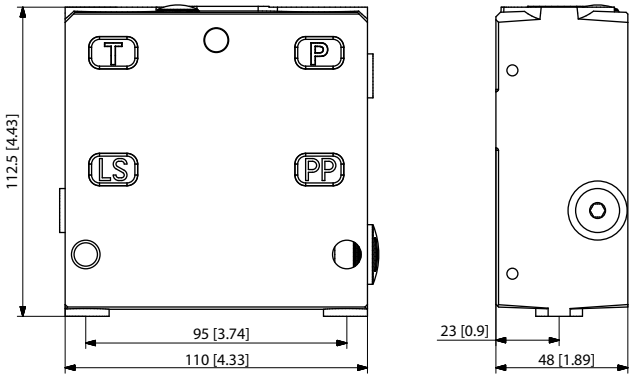
*PVAS Stay Bolts* on page 92

## 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.

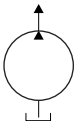
*PVP Inlet Module*


*PVP inlet module dimensions*

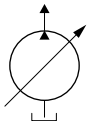



Weight: 3.1 kg [6.9 lb]

*Fixed displacement pump symbol*



*Variable displacement pump symbol*



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:

- *Open Center PVP* on page 10 (for fixed displacement pumps)
- *Open Center PVP with PPRV* on page 13 (for fixed displacement pumps)
- *Open center PVP with HPCO and PVE PPRV* on page 17 (for fixed displacement pumps)
- *Closed Center PVP* on page 20 (for variable displacement pumps)
- *Closed Center PVP with PPRV* on page 22 (for variable displacement pumps)
- *Closed center PVPV with PPRV* on page 25 (for variable displacement pumps)
- *Closed center PVPVM with PPRV* on page 27 (for variable displacement pumps)
- *Open/Closed center PVP with PPRV* on page 29
- *Open/Closed center PVPM* on page 32

## PVP Inlet Modules

### Open Center PVP

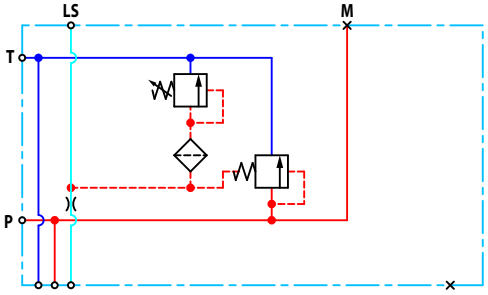
The basic Open Center PVP inlet module is intended for use with fixed displacement pumps in applications, where a valve group with mechanically controlled work sections is desired, or where the pilot pressure to the valve group is supplied externally.

**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
- Optional T0 facility and external T0 port

All modules can be manually activated with the PVM actuation.

*Open center PVP schematic*




*Technical specification for PVP*

| Max. P-port continuous | Max. P-port intermittent | Max. T-port static/ dynamic | Max. rated flow |
|---|---|---|---|
| 350 [5076 psi] | 400 bar [5800 psi] | 25/40 bar [365/580 psi] | 140 l/min [37 US gal/min] |

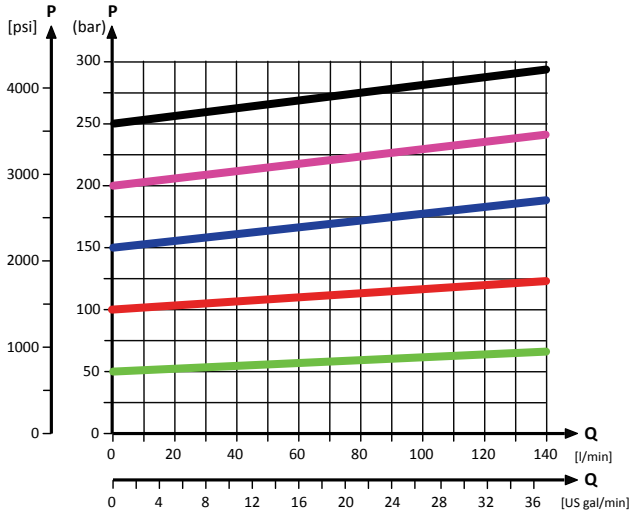
*Technical specification*

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

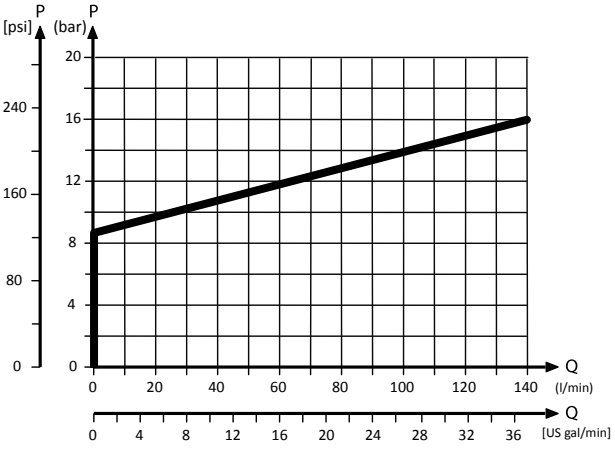
## PVP Inlet Modules

### Theoretical Performance Graphs

*Integrated LS pressure relief valve characteristics*




*Neutral by-pass pressure drop characteristics*




*Part numbers for Open Center PVP*

| Part number | P-port | T-port | LS-, M-port (LS1**) | T0-port | Mounting | PVPX* |
|---|---|---|---|---|---|---|
| **157B5000** | G1/2" | G3/4" | G1/4" | - | M8 | – |
| **157B5100** | G3/4" | | | – | | - |
| **157B5102** | G3/4" | | | - | | Yes |
| **157B5200** | 7/8-14 UNF | 1 1/16-12 UNF | 1/2-20 UNF | - | 5/16-18 UNC | - |
| **157B5300** | 1-1/16 UN | | | - | | - |
| **11008852** | G1/2 | G3/4 | G1/4 (G1/8) | - | M8 | - |
| **11030545** | G3/4 | G3/4 | G1/4 (G1/4) | G1/4 | M8 | - |
| **11053947** | G3/4 | G3/4 | G1/4 (G1/4) | G1/4 | M8 | - |
| **11151852** | 1 1/16-12 UNF | 1 1/16-12 UNF | 9/16-18 UNF | 9/16-18 UNF | M8 | - |
| **157B5908** | 1 1/16-12 UNF | 1 1/16-12 UNF | 1/2-20 UNF | - | M8 | - |
| **157B5921** | JIS 1/2 | JIS 3/4 | JIS 1/4 | - | M8 | - |

## PVP Inlet Modules

*Part numbers for Open Center PVP (continued)*

| Part number | P-port | T-port | LS-, M-port (LS1**) | T0-port | Mounting | PVPX* |
|---|---|---|---|---|---|---|
| **157B5925** | JIS 1/2 | JIS 3/4 | JIS 1/4 | - | M8 | - |
| **157B5945** | G1/2 | G3/4 | G1/4 | - | M8 | - |
| **157B5990** | 1 1/16-12 UNF | 1 1/16-12 UNF | - | - | M8 | - |

** LS1 is an extra LS-port.

* For more information see *PVPX Electrical LS Pressure Unloading Valve* on page 33.

## PVP Inlet Modules

### Open Center PVP with PPRV

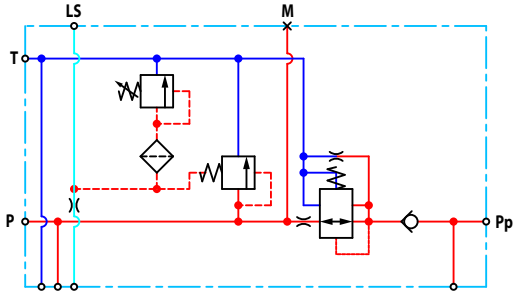
The Open Center PVP inlet with integrated pilot pressure reduction valve (PPRV) is intended for use with fixed displacement pumps in applications, where a valve group with electro-hydraulically or hydraulically controlled work sections is desired (PVE or PVH/PVHC).

**The Open Center PVP with PPRV 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

All modules can be manually activated with the PVM actuation.

*Open center PVP with PPRV schematic*




*Technical specification for PVP*

| Max. P-port continuous | Max. P-port intermittent | Max. T-port static/ dynamic | Max. rated flow |
|---|---|---|---|
| 350 [5076 psi] | 400 bar [5800 psi] | 25/40 bar [365/580 psi] | 140 l/min [37 US gal/min] |

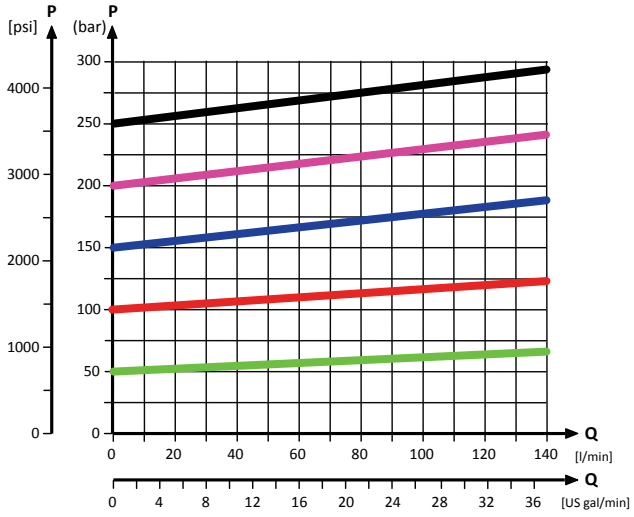
*Technical specification*

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

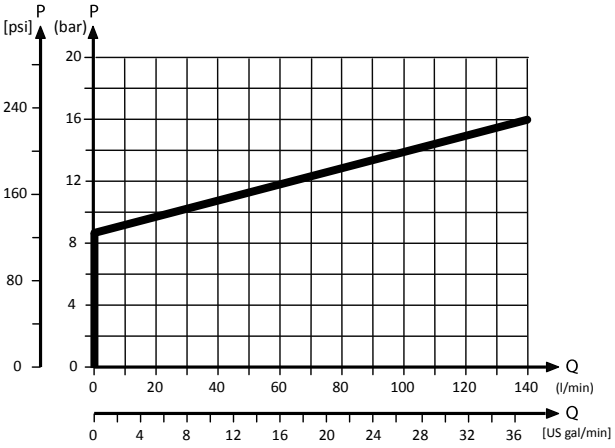
## PVP Inlet Modules

### Theoretical Performance Graphs

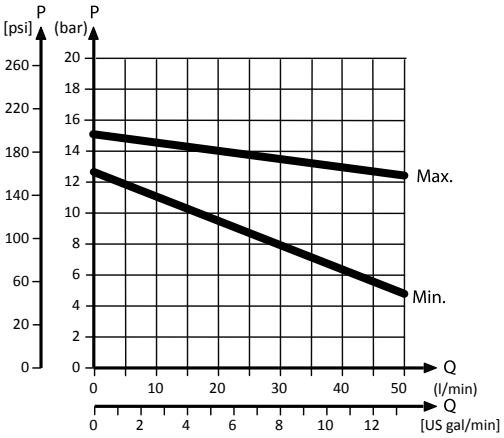
*Integrated LS pressure relief valve characteristics*




*Neutral by-pass pressure drop characteristics*




*Pilot pressure reduction valve characteristics*



## PVP Inlet Modules

*Part numbers for Open Center PVP with PPRV*

| Part number | Actuation | P-port | T-port | LS-port | M-port | Pp-port | T0-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 |
| **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 1/16-12 UNF | 1/2-20 UNF | 1/2-20 UNF | - | - | 5/16-18 UNC | - |
| **157B5212** | PVE | 7/8-14 UNF | 1 1/16-12 UNF | 1/2-20 UNF | 1/2-20 UNF | - | - | 5/16-18 UNC | Yes |
| **157B5310** | PVE | 1 1/16-12 UNF | 1 1/16-12 UNF | 1/2-20 UNF | 1/2-20 UNF | - | - | 5/16-18 UNC | - |
| **157B5312** | PVE | 1 1/16-12 UNF | 1 1/16-12 UNF | 1/2-20 UNF | 1/2-20 UNF | - | - | 5/16-18 UNC | Yes |
| **157B5380** | PVE | 1 1/16-12 UNF | 1 1/16-12 UNF | 9/16-18 UNF | 9/16-18 UNF | 9/16-18 UNF | - | 5/16-18 UNC | - |
| **157B5390** | PVH/PVHC | 1 1/16-12 UNF | 1 1/16-12 UNF | 9/16-18 UNF | 9/16-18 UNF | 9/16-18 UNF | - | 5/16-18 UNC | - |
| **11008850** | PVE | G3/4 | G3/4 | G1/4 | G1/4 | - | - | M8 | Yes |
| **11013317**[1] | PVE | G3/4 | G3/4 | G1/4 | G1/4 | G1/4 | G1/4 | M8 | - |
| **11020964** | PVE | 1 1/16-12 UNF | 1 1/16-12 UNF | 1/2-20 UNF | 1/2-20 UNF | - | - | M8 | - |
| **11087590**[1] | PVH/PVHC | G3/4 | G3/4 | G1/4 | G1/4 | G1/4 | - | M8 | - |
| **11090453** | PVE | JIS 3/4 | JIS 3/4 | JIS 1/4 | JIS 1/4 | JIS 1/4 | JIS 1/4 | M8 | - |
| **11119429**[2] | PVE | G3/4 | G3/4 | G1/4 | G1/4 | G1/4 | - | M8 | - |
| **11124965** | PVH/PVHC | G3/4 | G3/4 | G1/4 | G1/4 | G1/4 | - | M8 | Yes |
| **11124966** | PVH/PVHC | G3/4 | G3/4 | G1/4 | G1/4 | G1/4 | - | M8 | - |
| **11130941**[2] | PVE | 1 1/16-12 UNF | 1 1/16-12 UNF | 9/16-18 UNF | 9/16-18 UNF | 9/16-18 UNF | - | 5/16-18 UNC | - |
| **11167773** | PVH/PVHC | 1 1/16-12 UNF | 1 1/16-12 UNF | 1/2-20 UNF | 1/2-20 UNF | - | - | 5/16-18 UNC | Yes |
| **11187356** | PVE | G1/2 | G3/4 | G1/4 | G1/4 | - | - | M8 | Yes |
| **11190123** | PVH/PVHC | G1/2 | G3/4 | G1/4 | G1/4 | - | - | M8 | Yes |
| **11196947** | PVE | G3/4 | G3/4 | G1/4 | G1/4 | - | G1/4 | M8 | - |
| **11225941** | PVE | 1 1/16-12 UNF | 1 1/16-12 UNF | 9/16-18 UNF | 9/16-18 UNF | 9/16-18 UNF | 9/16-18 UNF | 5/16-18 UNC | - |
| **157B5135**[3] | PVE | G3/4 | G3/4 | G1/4 | G1/4 | G1/4 | G1/4 | M8 | - |
| **157B5904**[2] | PVE | G3/4 | G3/4 | G1/4 | G1/4 | G1/4 | - | M8 | - |
| **157B5923** | PVE | JIS 1/2 | JIS 3/4 | JIS 1/4 | JIS 1/4 | - | - | M8 | - |
| **157B5926** | PVE | JIS 3/4 | JIS 3/4 | JIS 1/4 | JIS 1/4 | - | - | M8 | - |
| **157B5934** | PVE | G3/4 | G3/4 | G1/4 | G1/4 | - | - | M8 | - |
| **157B5943**[2] | PVH/PVHC | G3/4 | G3/4 | G1/4 | G1/4 | G1/4 | - | M8 | - |
| **157B5953**[2] | PVE | G3/4 | G3/4 | G1/4 | G1/4 | - | - | M8 | Yes |
| **157B5954** | PVE | G3/4 | G3/4 | G1/4 | G1/4 | G1/4 | - | M8 | - |
| **157B5960** | PVE | 1 1/16-12 UNF | 1 1/16-12 UNF | 9/16-18 UNF | 9/16-18 UNF | - | 9/16-18 UNF | 5/16-18 UNF | - |
| **157B5966** | PVE | G3/4 | G3/4 | G1/4 | G1/4 | - | - | M8 | Yes |
| **157B5976** | PVE | G3/4 | 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 | T0-port | Mounting | PVPX* |
|---|---|---|---|---|---|---|---|---|---|
| **157B5977**[1,4] | PVE | G3/4 | G3/4 | G1/4 | G1/4 | - | - | M8 | - |
| **11101194** | PVE | M22 x 1.5 | M22 x 1.5 | M12 x 1.5 | M10 x 1 | - | M16 x 1.5 | M8 | - |

* For more information please see the topic *PVPX Electrical LS Pressure Unloading Valve*.

[1] Dampened LS response

[2] Pressure adjustment spool with check valve

[3] Internal T0 connection

[4] Low flow pressure adjustment spool

All modules can be manually activated with the PVM. For more information please see *PVM Manual Actuation* on page 69.

## PVP Inlet Modules

### Open center PVP with HPCO and PVE PPRV

The Open Center PVP inlet with integrated High Pressure Carry Over (HPCO) functionality is intended for use with fixed displacement pumps in applications where one pump supply for multiple hydraulic subsystems is desired.

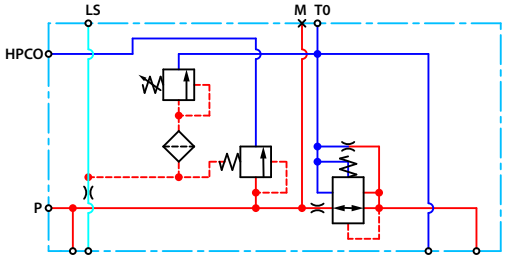
The integrated HPCO functionality guides the excess flow of the PVG 16 valve group to the external hydraulic subsystem(s), giving priority to the PVG 16 work functions.

**The Open Center PVP with HPCO and PVE PPRV features:**

- Integrated LS pressure relief valve
- Threaded ports for P/T/LS/HPCO and M measuring gauge
- Integrated pilot pressure reducing valve (PPRV) for PVE
- Optional T0 facility and external T0 port
- Optional external pilot pressure port (Pp)
- Optional LS unloading valve, PVPX

Only applicable with PVST end plates with separate T-port due to blocked T-lines for HPCO functionality.

*Open Center PVP with HPCO, PVE PPRV schematic*




*Technical specification for PVP*

| Max. P-port continuous | Max. P-port intermittent | Max. T-port static/ dynamic | Max. rated flow |
|---|---|---|---|
| 350 [5076 psi] | 400 bar [5800 psi] | 25/40 bar [365/580 psi] | 140 l/min [37 US gal/min] |

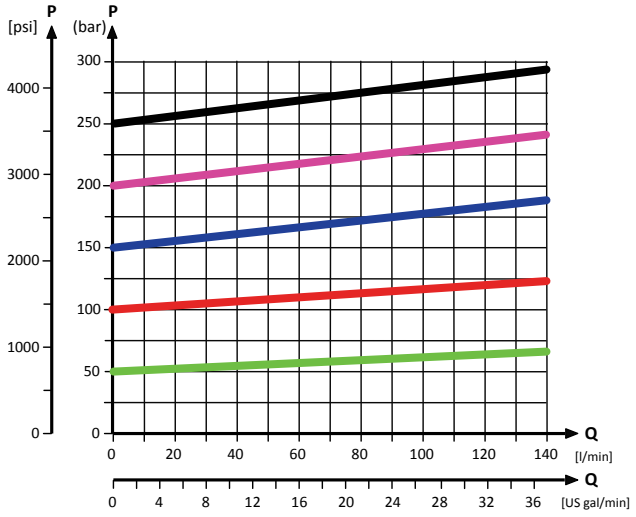
*Technical specification*

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

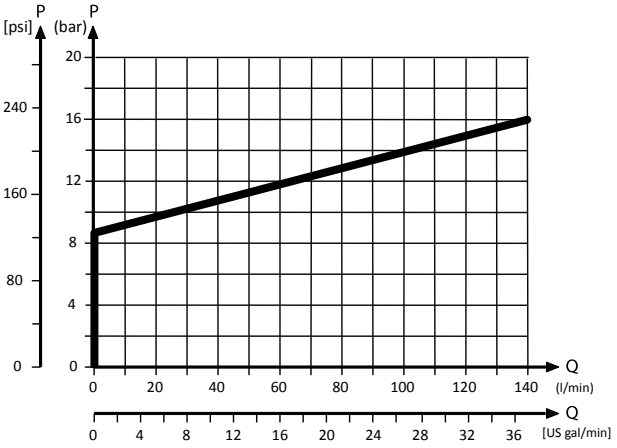
## PVP Inlet Modules

### Theoretical Performance Graphs

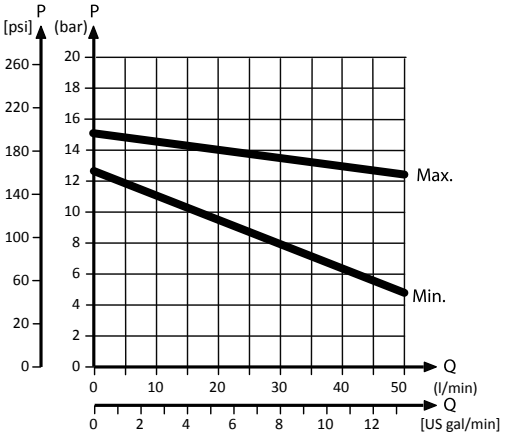
*Integrated LS pressure relief valve characteristics*




*Neutral by-pass pressure drop characteristics*




*Pilot pressure reduction valve characteristics*



## PVP Inlet Modules

*Part numbers for OC PVP (HPCO and PPRV)*

| Part number | P-port | HPCO-port | LS-port | M-port | Pp-port | T0-port | Mounting | PVPX* |
|---|---|---|---|---|---|---|---|---|
| **157B5140** | G3/4″ | G3/4" | G1/4″ | G1/4″ | G1/4″ | G1/4″ | M8 | - |
| **157B5142** | G3/4″ | G3/4" | G1/4″ | G1/4″ | G1/4″ | – | M8 | Yes |
| **157B5340** | 1 1/16-12 UNF | 1 1/16-12 UNF | 1/2-20 UNF | 1/2-20 UNF | 1/2-20 UNF | 1/2-20 UNF | 5/16-18 UNC | - |
| **157B5342** | 1 1/16-12 UNF | 1 1/16-12 UNF | 1/2-20 UNF | 1/2-20 UNF | 1/2-20 UNF | – | 5/16-18 UNC | Yes |
| **157B5961** | M27x2 | M27x2 | M14x1.5 | M14x1.5 | – | M14x1.5 | M8 | – |
| **11101195** | M22x1.5<br>M16x1.5 (P2) | M22x1.5 | M12x1.5 | M10x1 | – | M16x1.5 | M8 | – |

* For more information please see the topic *PVPX Electrical LS Pressure Unloading Valve*.

## PVP Inlet Modules

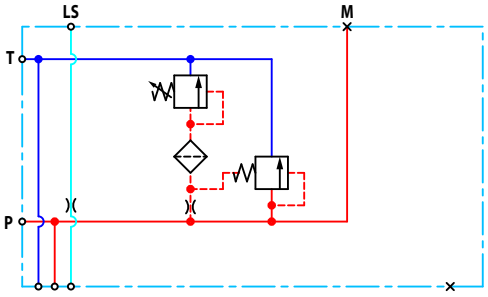
### Closed Center PVP

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
- Optional T0 facility and external T0 port

*Closed center PVP schematic*




*Technical specification for PVP*

| Max. P-port continuous | Max. P-port intermittent | Max. T-port static/ dynamic | Max. rated flow |
|---|---|---|---|
| 350 [5076 psi] | 400 bar [5800 psi] | 25/40 bar [365/580 psi] | 140 l/min [37 US gal/min] |

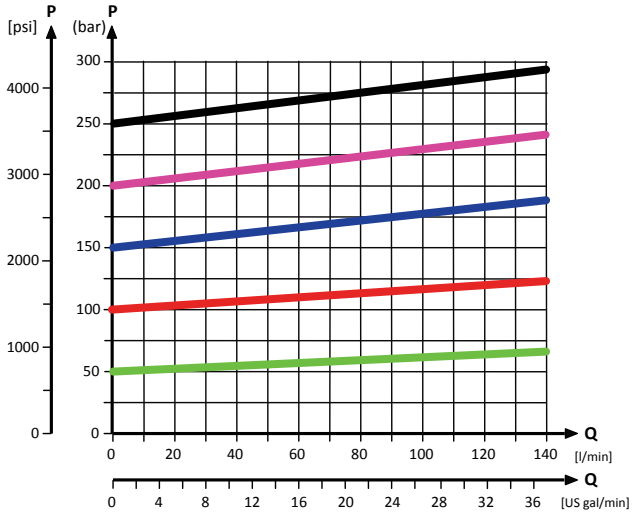
*Technical specification*

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

## PVP Inlet Modules

### Theoretical Performance Graphs

*Integrated LS pressure relief valve characteristics*




*Part numbers for Closed Center PVP*

| Part number | P-port | T-port | LS-port (LS1**) | M-port | T0-port | Mounting | PVPX* |
|---|---|---|---|---|---|---|---|
| 11030683 | G3/4 | G3/4 | G1/4 (G1/4) | G1/4 | G1/4 | M8 | - |
| 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 1/16-12 UNF | 1/2-20 UNF | 1/2-20 UNF | -- | 5/16-18 UNC | - |
| 157B5301 | 1 1/16-12 UNF | 1 1/16-12 UNF | 1/2-20 UNF | 1/2-20 UNF | - | 5/16-18 UNC | - |
| 15B5907 | 1 1/16-12 UNF | 1 1/16-12 UNF | 1/2-20 UNF | 1/2-20 UNF | - | M8 | - |
| 157B5922 | JIS 1/2 | JIS 3/4 | JIS 1/4 | JIS 1/4 | - | M8 | - |
| 157B5927 | JIS 3/4 | JIS 3/4 | JIS 1/4 | JIS 1/4 | - | M8 | - |
| 157B5946 | G1/2 | G3/4 | G1/4 (G1/8) | G1/4 | - | M8 | - |

** LS1 is an extra LS-port

* For more information see *PVPX Electrical LS Pressure Unloading Valve* on page 33

## PVP Inlet Modules

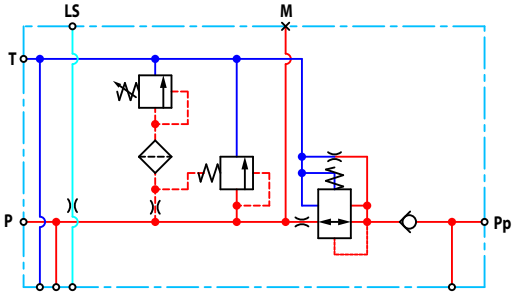
### Closed Center PVP with PPRV

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 with PPRV 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*




*Technical specification for PVP*

| Max. P-port continuous | Max. P-port intermittent | Max. T-port static/ dynamic | Max. rated flow |
|---|---|---|---|
| 350 [5076 psi] | 400 bar [5800 psi] | 25/40 bar [365/580 psi] | 140 l/min [37 US gal/min] |

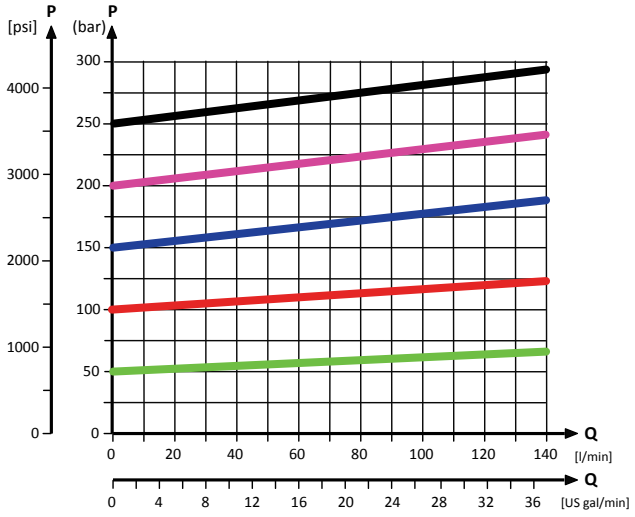
*Technical specification*

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

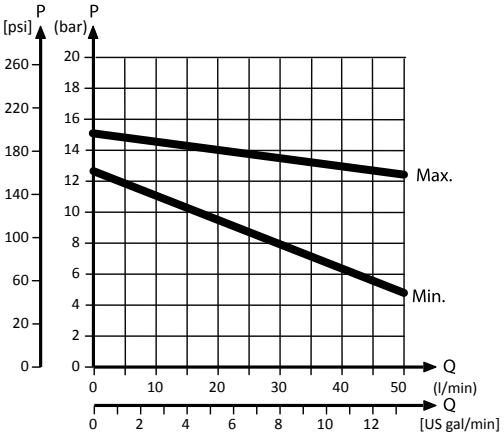
## PVP Inlet Modules

### Theoretical Performance Graphs

*Integrated LS pressure relief valve characteristics*




*Pilot pressure reduction valve characteristics*




*Part numbers for Closed Center PVP with PPRV*

| Part number | Actuation | P-port | T-port | LS-port (LS1**) | M-port | Pp-port | T0-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 1/16-12 UNF | 1/2-20 UNF | 1/2-20 UNF | - | - | 5/16-18 UNC | - |
| **157B5213** | PVE | 7/8-14 UNF | 1 1/16-12 UNF | 1/2-20 UNF | 1/2-20 UNF | - | - | 5/16-18 UNC | Yes |
| **157B5311** | PVE | 1 1/16-12 UNF | 1 1/16-12 UNF | 1/2-20 UNF | 1/2-20 UNF | - | - | 5/16-18 UNC | - |
| **157B5313** | PVE | 1 1/16-12 UNF | 1 1/16-12 UNF | 1/2-20 UNF | 1/2-20 UNF | - | - | 5/16-18 UNC | Yes |

## PVP Inlet Modules

*Part numbers for Closed Center PVP with PPRV (continued)*

| Part number | Actuation | P-port | T-port | LS-port (LS1**) | M-port | Pp-port | T0-port | Mounting | PVPX* |
|---|---|---|---|---|---|---|---|---|---|
| **157B5381** | PVE | 1 1/16-12 UNF | 1 1/16-12 UNF | 9/16-18 UNF | 9/16-18 UNF | 9/16-18 UNF | - | 5/16-18 UNC | - |
| **157B5391** | PVH/PVHC | 1 1/16-12 UNF | 1 1/16-12 UNF | 9/16-18 UNF | 9/16-18 UNF | 9/16-18 UNF | - | 5/16-18 UNC | |

** LS1 is an extra LS-port

* For more information please see *PVPX Electrical LS Pressure Unloading Valve* on page 33

All modules can be manually activated with the PVM actuation.

For more information, please see *PVM Manual Actuation* on page 69.

## PVP Inlet Modules

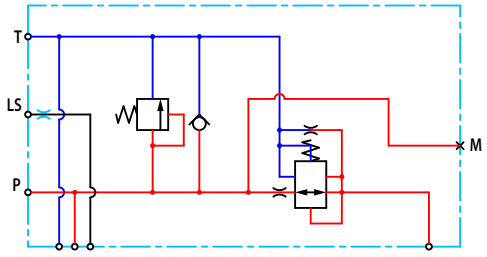
### Closed center PVPV with PPRV

The Closed Center PVPV 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 PVPV with PPRV features:**

- Optional shock/anti-cavitation valve facility (PVLP)
- Threaded ports for P/T/LS and M measuring gauge
- Integrated pilot pressure reducing valve (PPRV) for PVE or PVH/PVHC

*Hydraulic schematic*



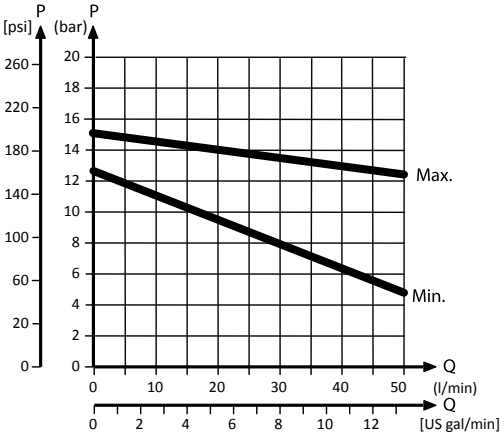

*Technical specification for PVP*

| Max. P-port continuous | Max. P-port intermittent | Max. T-port static/ dynamic | Max. rated flow |
|---|---|---|---|
| 350 [5076 psi] | 400 bar [5800 psi] | 25/40 bar [365/580 psi] | 140 l/min [37 US gal/min] |

*Technical specification*

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

*Pilot pressure reduction valve characteristics*



## PVP Inlet Modules

*Part numbers for Closed Center PVPV with PPRV*

| Part number | Actuation | P-, T-port | LS-, M-port | Mounting | TO-port | PVPX* |
|---|---|---|---|---|---|---|
| **11008856** | PVH/PVHC | G1″ | G1/4″ | M8 | – | Yes |
| **11051803** | | 1 5/16-12 UN | 9/16-18 UNF | 5/16-18 UNC | – | Yes |
| **11003806** | PVE | M27x2<br>M14x1.5 (P2) | M14x1.5 | M8 | M14x1.5 | – |
| **157B5911** | | 1 5/16-12 UN | 9/16-18 UNF | 5/16-18 UNC | – | – |
| **157B5913** | | | | | – | Yes |
| **157B5938** | | G1″ | G1/4″ | M8 | – | – |
| **157B5941** | | | | | – | Yes |
| **157B5969** | | M33x2<br>M14x1.5 (T2) | M14x1.5 | | M16x1.5 | Yes |

* For more information please see the topic *PVPX Electrical LS Pressure Unloading Valve*.

All modules can be manually activated with the PVM actuation.

## PVP Inlet Modules

### Closed center PVPVM with PPRV

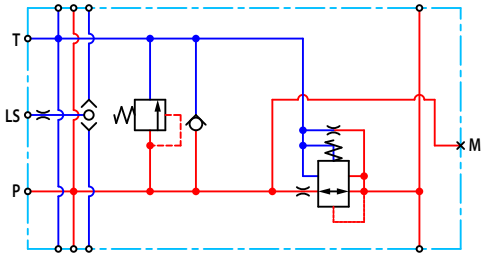
The Closed Center PVPVM mid-inlet module with integrated pilot pressure reduction valve (PPRV) is intended for use with variable displacement pumps in applications where a valve group with electro-hydraulic or hydraulically controlled work sections is desired.

Using a PVPVM module in a valve group requires a 180° degree rotation of the PVG work sections on one side.

**The Closed Center PVPVM with PPRV features:**

- Optional shock/anti-cavitation valve facility (PVLP)
- Threaded ports for P/T/LS and M measuring gauge
- Integrated pilot pressure reducing valve (PPRV) for PVE or PVH/PVHC

*Hydraulic schematic*



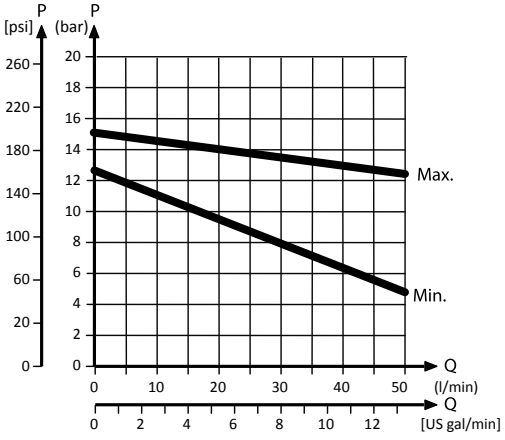

*Technical specification for PVP*

| Max. P-port continuous | Max. P-port intermittent | Max. T-port static/ dynamic | Max. rated flow |
|---|---|---|---|
| 350 [5076 psi] | 400 bar [5800 psi] | 25/40 bar [365/580 psi] | 140 l/min [37 US gal/min] |

*Technical specification*

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

*Pilot pressure reduction valve characteristics*



## PVP Inlet Modules

*Part numbers for Closed Center PVPVM with PPRV*

| Part number | Actuation | P-, T-port | LS-, M-port | Mounting | PVLP |
|---|---|---|---|---|---|
| **11083156** | PVH/PVHC | 1 5/16-12 UN | 9/16-18 UNF | 5/16-18 UNC | Yes |
| **157B5912** | PVE | | | | - |
| **157B5914** | | | | | Yes |
| **157B5937** | | G1″ | G1/4″ | M8 | - |
| **157B5940** | | | | | Yes |

All modules can be manually activated with the PVM actuation.

## PVP Inlet Modules

### Open/Closed center PVP with PPRV

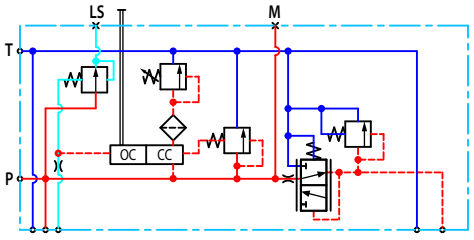
The Open Center/Closed Center PVP with integrated pilot pressure reduction valve (PPRV) is intended for use with fixed or variable displacement pumps in applications where the application manufacturer does not determine the pump type.

The modules allow an easy switch between Open Center and Closed Center configuration by means of an external hexagon selector key. Variants also feature an LS boost functionality, increasing the LS pressure to the pump LS regulator with a constant 6 bar, compensating for potential LS bleed-off and leakage.

**The Open/closed center PVPV with PPRV features:**

- Integrated OC/CC selector
- 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 LS boost functionality

*Hydraulic schematic*




*Technical specification for PVP*

| Max. P-port continuous | Max. P-port intermittent | Max. T-port static/ dynamic | Max. rated flow |
|---|---|---|---|
| 350 [5076 psi] | 400 bar [5800 psi] | 25/40 bar [365/580 psi] | 140 l/min [37 US gal/min] |

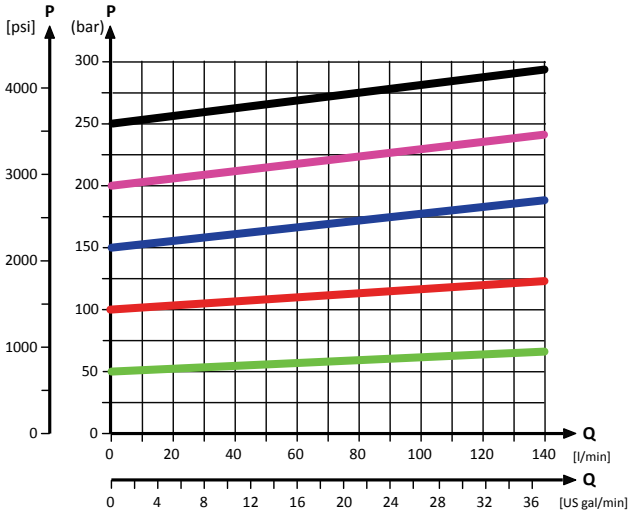
*Technical specification*

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

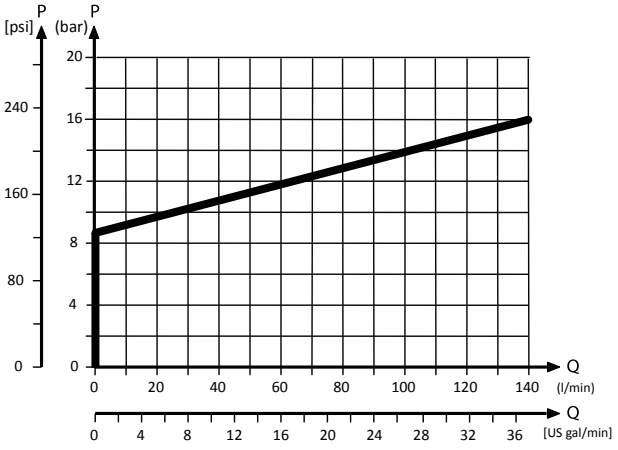
## PVP Inlet Modules

### Theoretical Performance Graphs

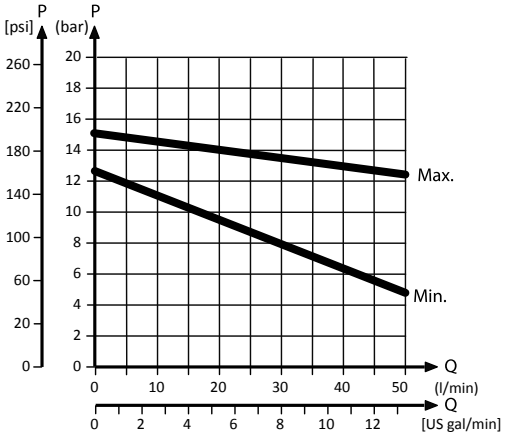
*Integrated LS pressure relief valve characteristics*




*Neutral by-pass pressure drop characteristics*




*Pilot pressure reduction valve characteristics*



## PVP Inlet Modules

*Part numbers for Open/Closed Center PVP with PPRV*

| Part number | Actuation | P-port | T-port | LS-port (LS1**) | M-port | T0-port | Mounting | LS Boost |
|---|---|---|---|---|---|---|---|---|
| 11093273 | PVE | G3/4 | G3/4 | - | G1/4 | - | M8 | Yes |
| 11119094 | PVE | G3/4 | G3/4 | - | G1/4 | - | M8 | - |
| 11119095 | PVE | 1 1/16-12 UNF | 1 1/16-12 UNF | 1/2-20 UNF | 1/2-20 UNF | - | M8 | - |
| 11131344 | PVH/PVHC | G3/4 | G3/4 | - | G1/4 | - | M8 | Yes |
| 11168608[1] | PVE | G3/4 | G3/4 | - | G1/4 | - | M8 | Yes |

** LS1 is an extra LS-port

[1] Dampened LS response

All modules can be manually activated with the PVM actuation.

## PVP Inlet Modules

### Open/Closed center PVPM

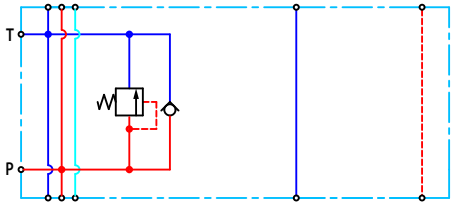
The Open Center/Closed Center PVPM mid-inlet acts as a simple manifold and is intended for use with fixed or variable displacement pumps. The PVPM features no logic other than a PVLP shock/anti-cavitation valve facility for pressure peak protection and anti-cavitation prevention.

The PVPM module must be configured together with an Open Center PVP module for **fixed displacement pumps** and for **variable displacement pumps** can be configured together with a PVSI start plate or a Closed Center PVP/PVPV module.

**The Open center/closed center PVPM features:**

- Integrated shock/anti-cavitation valve facility (PVLP)
- Threaded ports for P/T
- Pilot pressure and T0 lines through module

*Hydraulic schematic*




*Technical specification for PVP*

| Max. P-port continuous | Max. P-port intermittent | Max. T-port static/ dynamic | Max. rated flow |
|---|---|---|---|
| 350 [5076 psi] | 400 bar [5800 psi] | 25/40 bar [365/580 psi] | 140 l/min [37 US gal/min] |

*Technical specification*

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

*Part numbers for Open Center/Closed Center PVPM*

| Part number | P-, T-port | Mounting | PVLP |
|---|---|---|---|
| **11093682** | 1 5/16-12 UN | 5/16-18 UNC | Yes |
| **11093684** | G1″ | M8 | Yes |

## PVP Inlet Module Accessories

The generic PVP inlet module accessory platform includes the PVPX Electrical LS pressure unloading valve, External pilot pressure adapters PVPC with or without check valve for all Open Center PVP with PPRV.


- *PVPX Electrical LS Pressure Unloading Valve* on page 33
- *PVPC without Check Valve* on page 36
- *PVPC with Check Valve* on page 37


### PVPX Electrical LS Pressure Unloading Valve

The electrical LS pressure unloading valve is an accessory available for PVP inlet modules with PVPX facility. The PVPX consist of a solenoid valve and a magnetic coil package, allowing the operator to relieve the LS pressure to tank electrically.

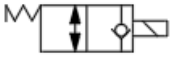
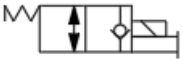
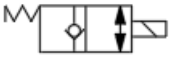
Configuration variants also feature a Manual Override functionality to activate the PVPX manually:

- Normally Open (NO),
- Normally Open with Manual Override (NOMO)

There are two types of NOMO-configurations - PUSH, and PUSH & TURN. With the TURN function you can keep the override function until you unlock it again.

- Normally Closed (NC)

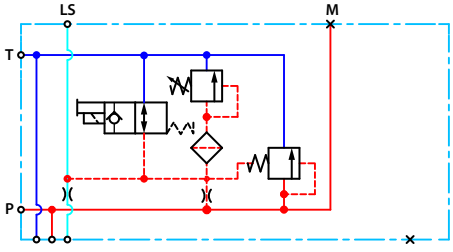
*Configuration variants*

| Normally Open (NO) | Normally Open with MOR (NOMO) | Normally Closed (NC) |
|---|---|---|
|  |  |  |

Relieving the LS pressure to tank results in a reduced system pressure level, which is determined by:

- the sum of the tank and neutral by-pass pressure drop in a **Open Center** PVP configuration
- the sum of the tank and standby-pressure in a **Closed Center** PVP configuration

*PVPX with NOMO schematic*




*PVPX technical data*

| | |
|---|---|
| **Voltage supply** | 12/24 $V_{DC}$ ± 10% |
| **Resistance @ 12 $V_{DC}$** | 7.2 Ω ± 7% |
| **Resistance @ 24 $V_{DC}$** | 28.2 Ω ± 7% |
| **Power consumption** | 20 W |
| **Maximum LS response time** | 300 ms |
| **Max. pressure drop @ 0.1 l/min [2.6 US gal/min]** | 2 bar [30 psi] |

## PVP Inlet Module Accessories

*PVPX technical data (continued)*

| | |
|---|---|
| **Max. coil surface temperature** | 155°C [311°F] |
| **Thread size** | 3/4-16 UNF |

*Technical specification*

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

### Part numbers for PVPX

*Part numbers for PVPX, NO and NC configuration*

| Part number | Configuration | Voltage Supply | Connector | IP Rating |
|---|---|---|---|---|
| **157B4236** | NO | 12 $V_{DC}$ | 1x2 DIN | IP 65 |
| **157B4238** | NO | 24 $V_{DC}$ | | |
| **157B4246** | NC | 12 $V_{DC}$ | | |
| **157B4248** | NC | 24 $V_{DC}$ | | |
| **157B4976** | NC | 26 $V_{DC}$ | | |
| **157B4981** | NO | 12 $V_{DC}$ | 1x2 AMP | IP 66 |
| **157B4982** | NO | 24 $V_{DC}$ | | |
| **157B4983** | NC | 12 $V_{DC}$ | | |
| **157B4984** | NC | 24 $V_{DC}$ | | |
| **11180766** | NO | 12 $V_{DC}$ | 1x2 DEUTSCH | IP 67 |
| **11180767** | NO | 24 $V_{DC}$ | | |
| **11180768** | NC | 12 $V_{DC}$ | | |
| **11180769** | NC | 24 $V_{DC}$ | | |
| **11225108** | NO | 26 $V_{DC}$ | | |
| **11225109** | NC | 26 $V_{DC}$ | | |

*Part numbers for PVPX, NOMO configuration*

| Part number | Manual Override | Voltage Supply | Connector | IP Rating |
|---|---|---|---|---|
| **157B4256** | PUSH | 12 $V_{DC}$ | 1x2 DIN | IP 65 |
| **157B4257** | PUSH & TURN | 12 $V_{DC}$ | | |
| **157B4258** | PUSH | 24 $V_{DC}$ | | |
| **157B4259** | PUSH & TURN | 24 $V_{DC}$ | | |
| **157B4260** | PUSH | 26 $V_{DC}$ | | |
| **157B4985** | PUSH | 12 $V_{DC}$ | 1x2 AMP | IP 66 |
| **157B4986** | PUSH | 24 $V_{DC}$ | | |

## PVP Inlet Module Accessories

*Part numbers for PVPX, NOMO configuration (continued)*

| Part number | Manual Override | Voltage Supply | Connector | IP Rating |
|---|---|---|---|---|
| **11193839** | PUSH | 12 $V_{DC}$ | 1x2 DEUTSCH | IP 67 |
| **11193836** | PUSH | 24 $V_{DC}$ | | |
| **11225111** | PUSH | 26 $V_{DC}$ | | |
| **11225110** | PUSH & TURN | | | |

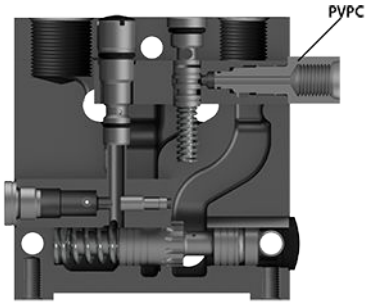
## PVP Inlet Module Accessories

### PVPC without Check Valve

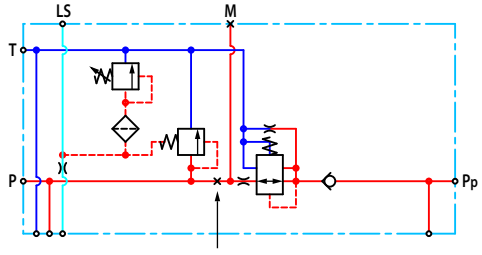
The PVPC external pilot pressure adapter without check valve is an accessory in the M-port available for PVP inlet modules with integrated pilot pressure reduction valve (PPRV).

The PVPC without check valve cuts off the integrated PPRV to the PVE or PVH/PVHC in the valve group and enables an external pilot pressure supply through the PVPC adapter.

*PVPC without Check Valve*




*PVP with PVPC without check valve schematic*




One application example for the PVPC without check valve is where it is a wanted feature to supply the valve group with oil from a manually operated emergency pump without directing oil flow to the PPRV.

When the main pump is running in its normal operation mode, the oil is directed through the PVPC adapter via the PPRV to the PVE electrical actuators.

When the main pump flow fails, the external shuttle valve ensures that the oil flow from the manually operated emergency pump is used to pilot open the over-center valve and lower the load. The load is only possible to lower when using the mechanical operating lever of the PVG work sections.

*Part numbers for Open Center/Closed Center PVPM*

| **Part number** | **157B5400** | **158X1000** |
|---|---|---|
| Thread | G1/2" | 1/2-20 UNF |

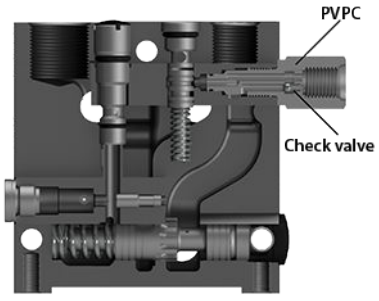
## PVP Inlet Module Accessories

### PVPC with Check Valve

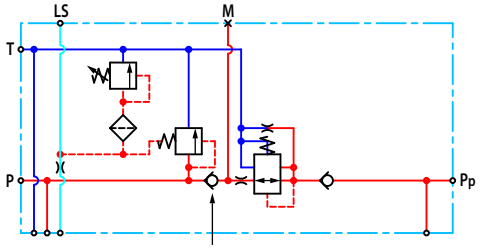
The PVPC external pilot pressure adapter with check valve is an accessory in the M-port available for PVP inlet modules with integrated pilot pressure reduction valve (PPRV).

The PVPC with check valve enables an external pilot pressure supply through the PVPC adapter and the PPRV, while also allowing the main pump to supply the PPRV through the P-gallery as a standard Open Center PVP with PPRV.

*PVPC with Check Valve*




*PVP with PVPC with check valve schematic*




One application example for the PVPC with check valve is where it is a wanted feature to operate the valve group by means of the PVE electrical actuators without pump flow.

When the external solenoid valve is opened, oil from the pressure side of the cylinder is fed via the PVPC through the PPRV to act as the pilot supply for the PVE electrical actuators. This means that it is possible to lower a load by means of the PVE electrical actuators without starting the pump.

The built-in check valve prevents the oil from flowing via the pressure adjustment spool to tank. With the pump functioning normally the external solenoid valve is closed to ensure that the load is not lowered due to the pilot supply oil flow requirement of approximately 1 l/min [0.25 US gal/min].

With a Closed Center PVP the external pilot oil supply can be connected to the pressure gauge connection without the use of a PVPC plug.

*Part numbers for Open Center/Closed Center PVPM*

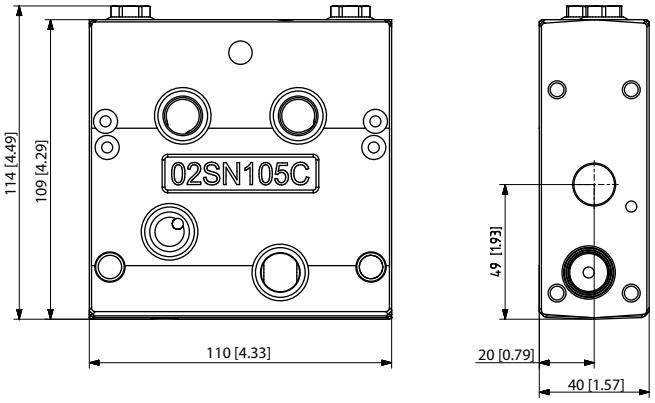
| **Part number** | **157B5600** | **157B5700** |
|---|---|---|
| Thread | G1/2" | 1/2-20 UNF |

## PVB Basic Modules

The PVG 16 PVB basic modules, also referred to as work sections, are the interface between the PVG 16 proportional valve group and the work function such as a cylinder or a motor.

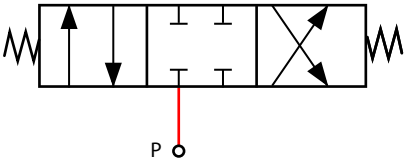
*PVB Basic Module*


*PVB 16 dimensions*

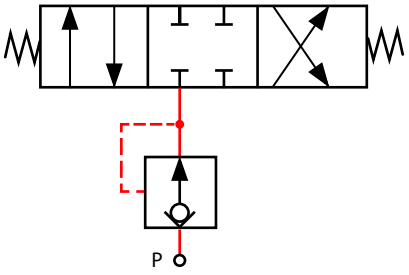



Weight: 2,6 kg [5,7 lb]

*Uncompensated PVB schematic symbol*




*Compensated PVB schematic symbol*




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:

- Compensated basic module; *Compensated PVB* on page 39
- Compensated basic module with facilities for shock and anti-cavitation valves (PVLP/PVLA); *Compensated PVB with PVLP/PVLA* on page 42
- Compensated basic module with one common adjustable LS valve for port A and port B; *Compensated PVB with LS A/B* on page 46
- Uncompensated basic module with optional integrated load drop check valve; *Uncompensated PVB* on page 50
- Uncompensated basic module with facilities for shock valves (PVLP) and optional integrated load drop check valve; *Uncompensated PVB with PVLP* on page 53

## PVB Basic Modules

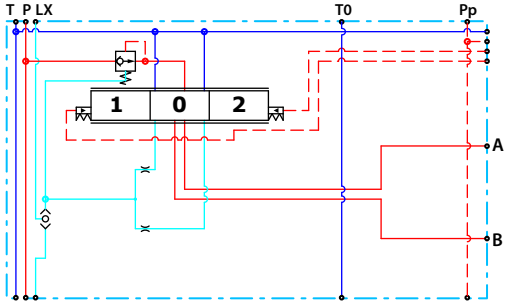
### Compensated PVB

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*




*Technical specification for A/B-port*

| Max. continuous pressure | Max. intermittent pressure | Max. rated flow |
|---|---|---|
| 350 bar [5067 psi] | 420 bar [6090 psi] | 60 l/min [15 US gal/min] |

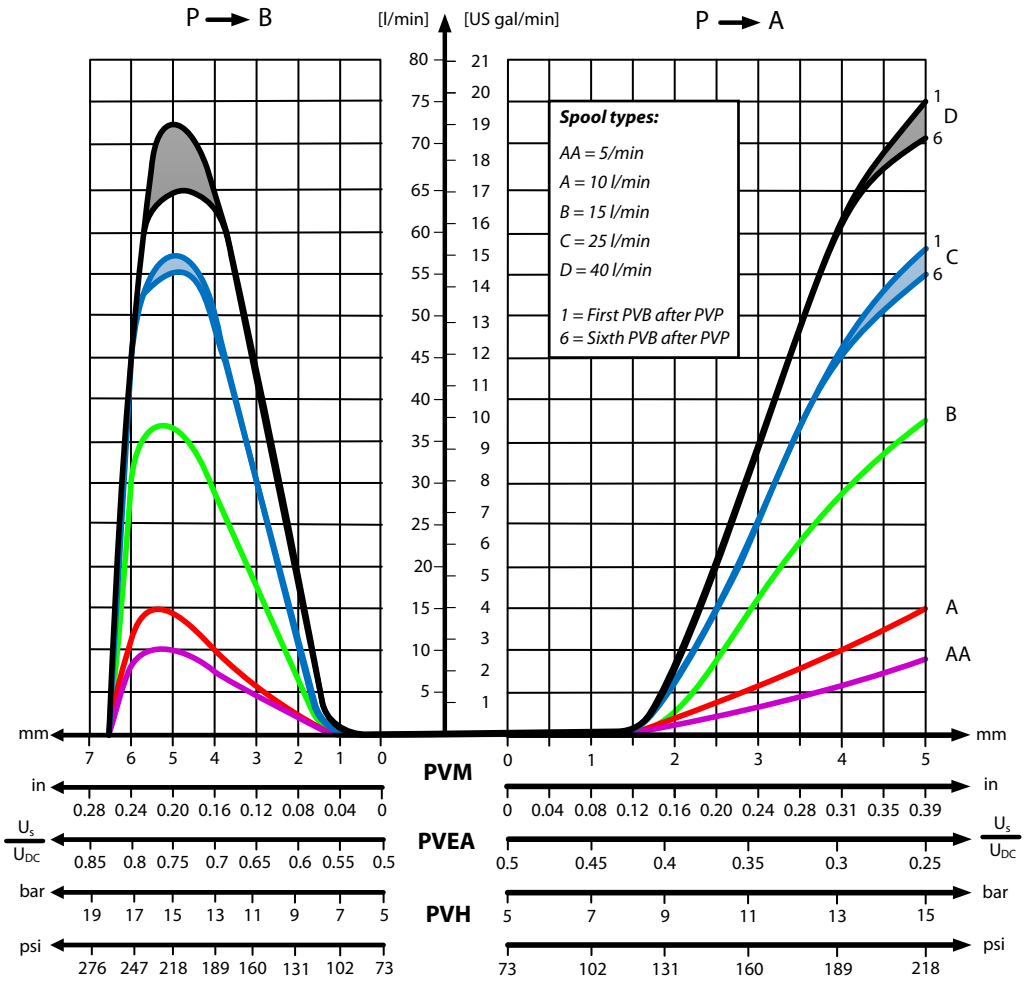
*Technical specification*

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

## PVB Basic Modules

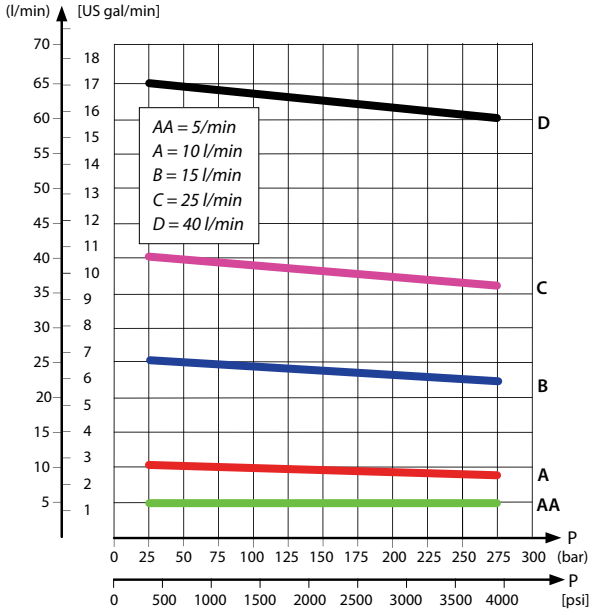
### Performance graphs (Theoretical)

*Fluid flow as a function of spool travel*

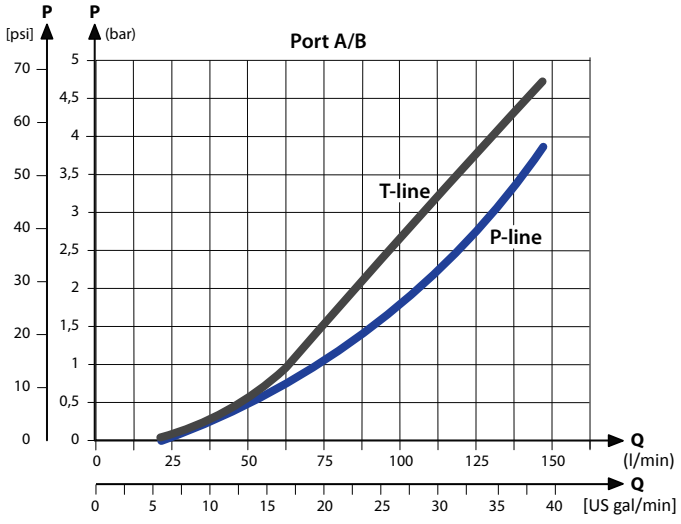


## PVB Basic Modules

*Load Independent Fluid Flow – Pressure Compensated PVB*




*PVB pressure compensated P-line and T-line characteristics*




*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.

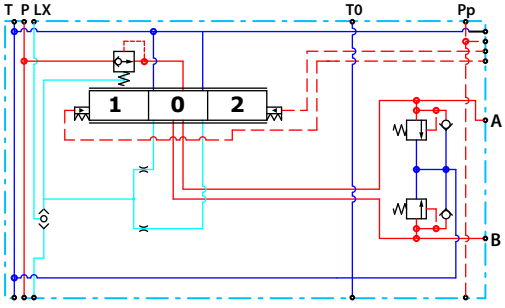
The compensated PVB is intended for controlling a work function where the function behavior in terms of flow and pressures requires independence on the load pressure of other functions used simultaneously.

Featuring an optional shock and anti-cavitation valves (PVLP/PVLA ) 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/anti-cavitation and suction valves facility (PVLP/PVLA)

*Compensated PVB with PVLP/PVLA schematic*




*Technical specification for A/B-port*

| Max. continuous pressure | Max. intermittent pressure | Max. rated flow |
|---|---|---|
| 380 bar [5510 psi] | 420 bar [6090 psi] | 60 l/min [15 US gal/min] |

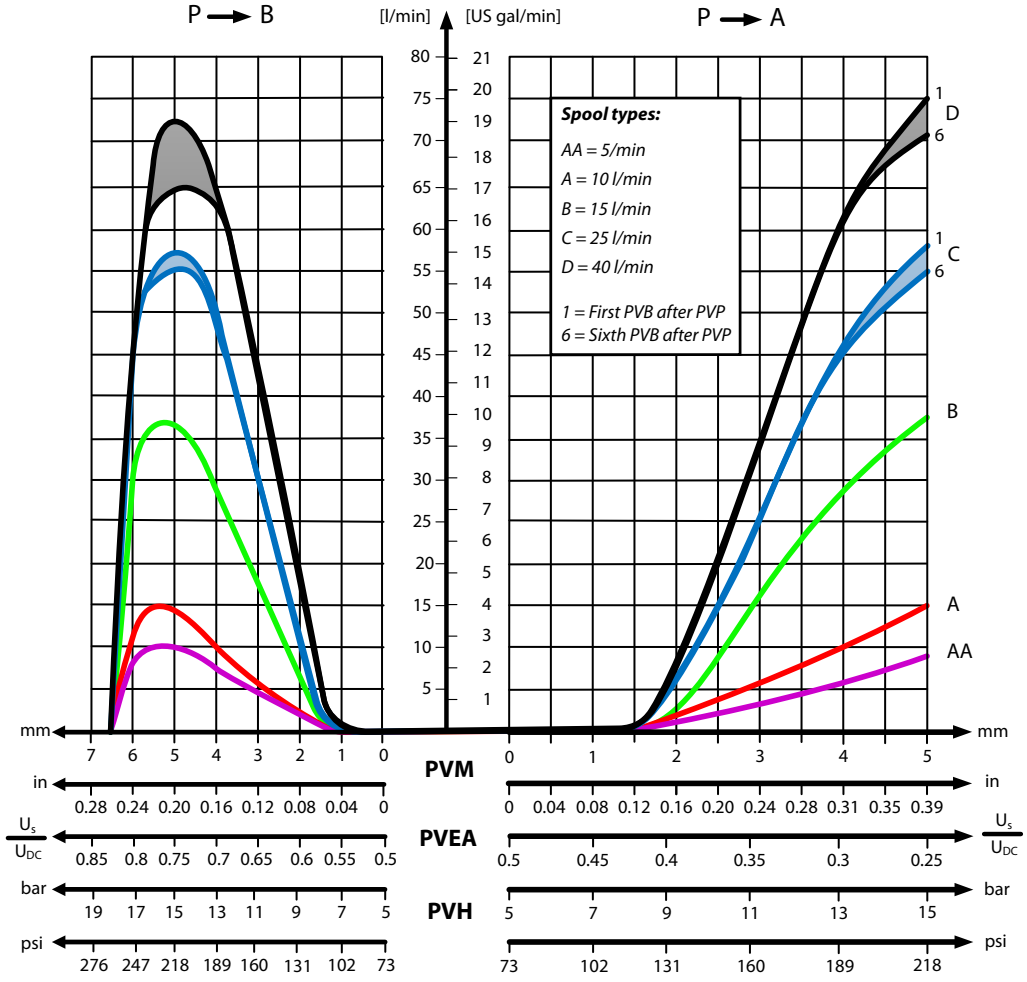
*Technical specification*

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

## PVB Basic Modules

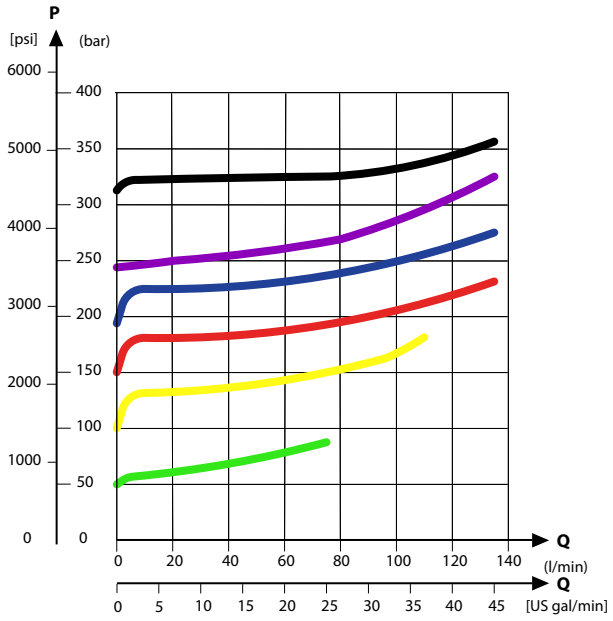
### Performance graphs (Theoretical)

*Fluid flow as a function of spool travel*

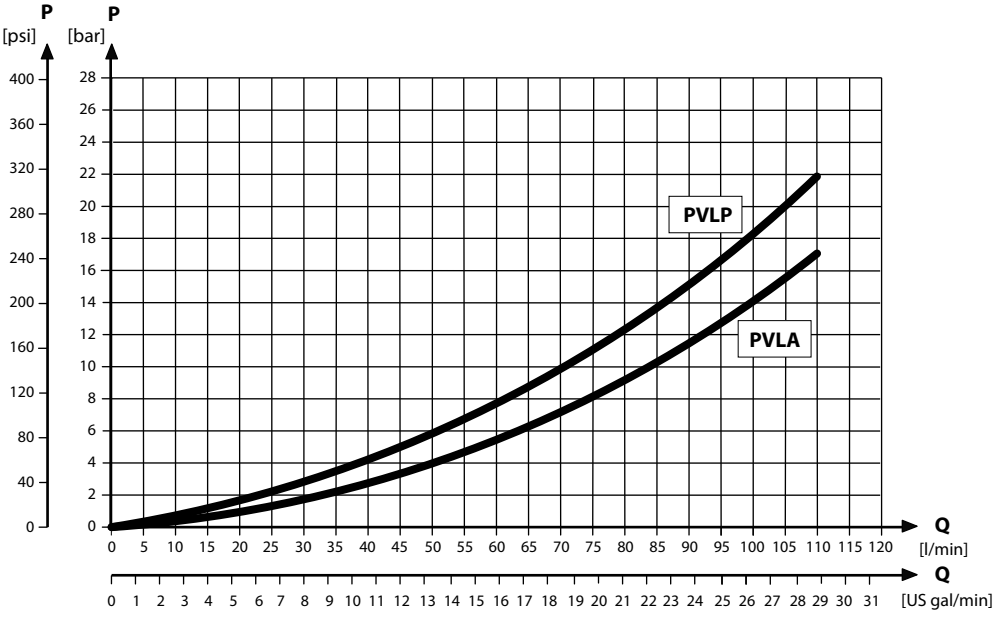


## PVB Basic Modules

*PVLP shock valve characteristics*

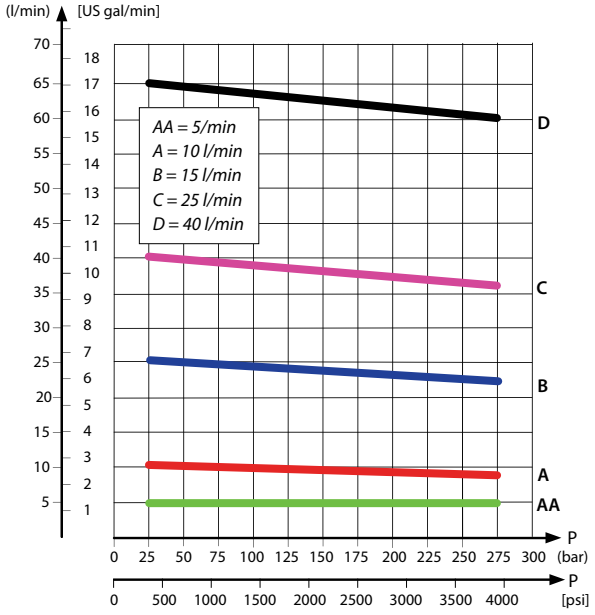



*PVLP/PVLA suction valve characteristics*

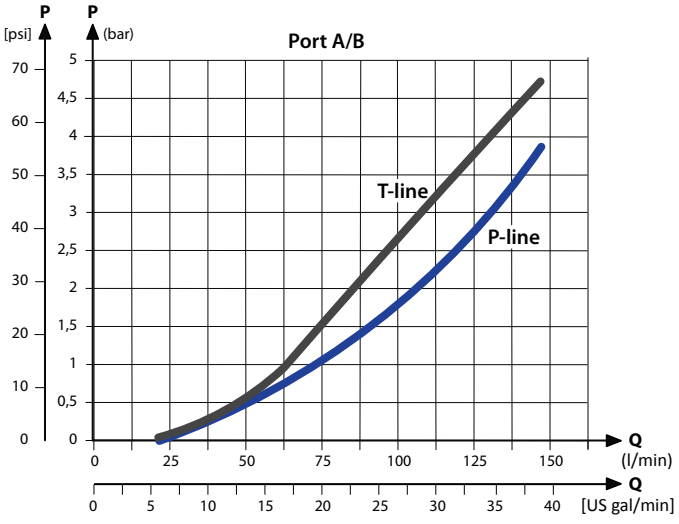


## PVB Basic Modules

*Load Independent Fluid Flow – Pressure Compensated PVB*




*PVB pressure compensated P-line and T-line characteristics*




*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

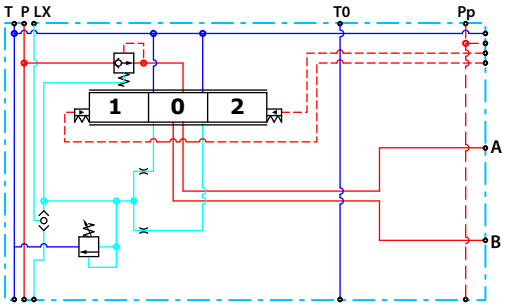
### Compensated PVB with LS A/B

The compensated PVB is intended for controlling a work function where the function behavior in terms of flow and pressures requires independency on the load pressure of other functions used simultaneously. The integrated $LS_{A/B}$ relief valve is used to limit the maximum work port build-up on the A/B-ports individually.

***The compensated PVB with $LS_{A/B}$ features:***

- Integrated LS shuttle network
- Integrated compensator

*Compensated PVB with LS A/B schematic*




*Technical specification for A/B-port*

| Max. continuous pressure | Max. intermittent pressure | Max. rated flow |
|---|---|---|
| 350 bar [5076 psi] | 420 bar [6090 psi] | 60 l/min [15 US gal/min] |

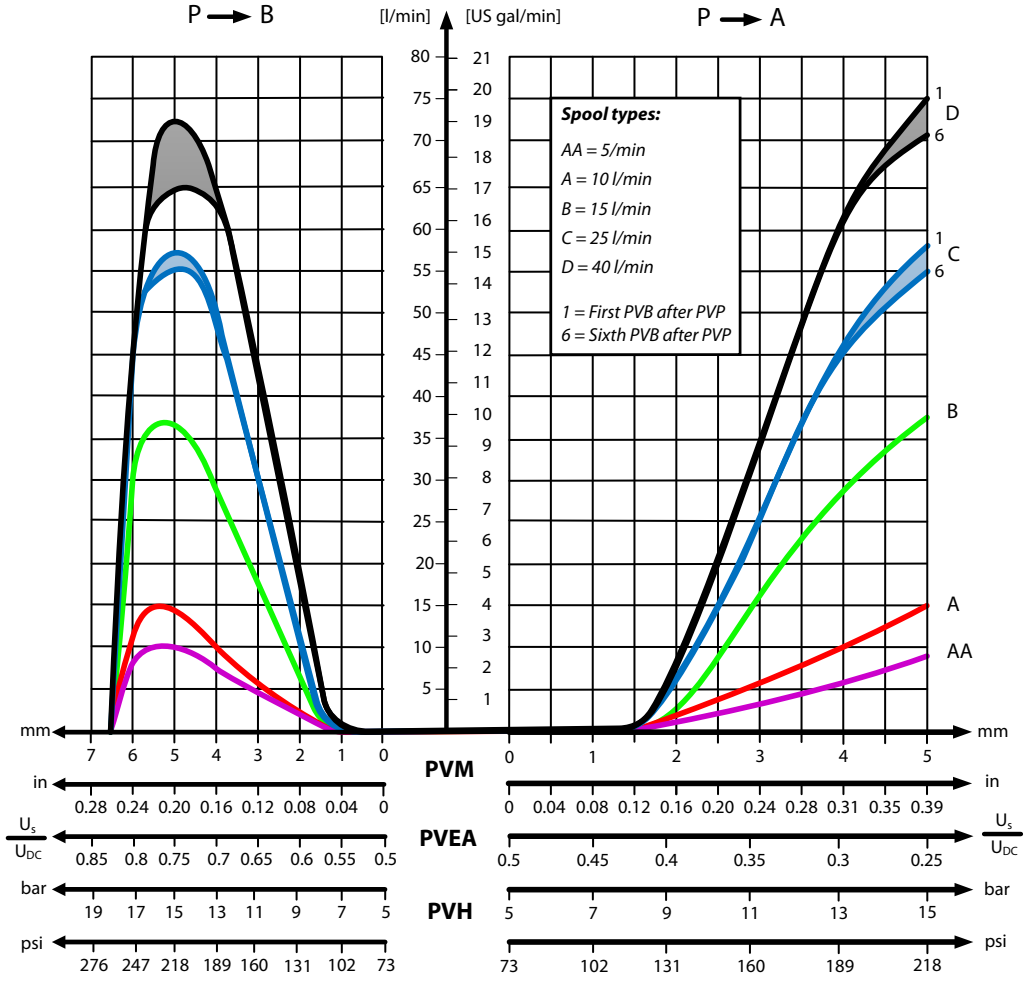
*Technical specification*

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

## PVB Basic Modules

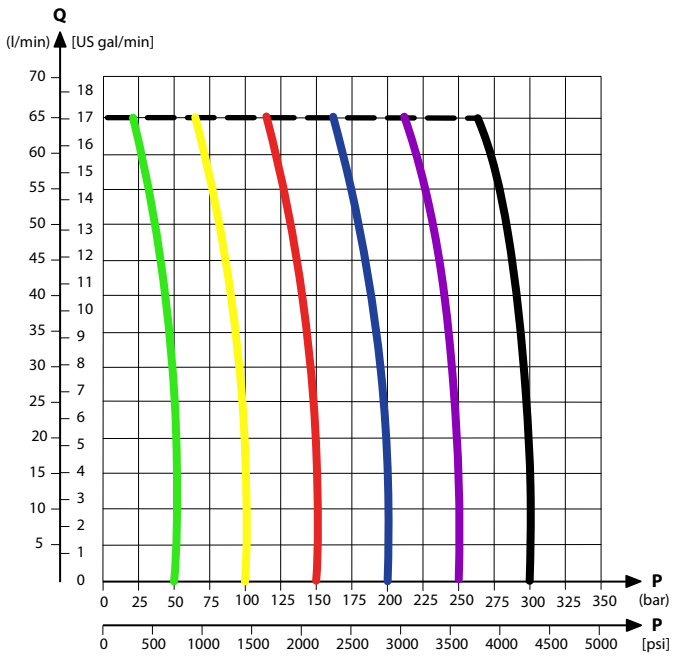
### Performance graphs (Theoretical)

*Fluid flow as a function of spool travel*

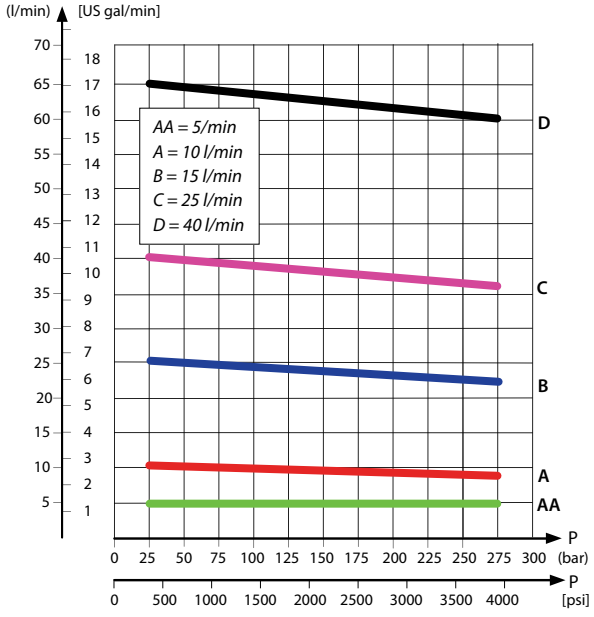


## PVB Basic Modules

*PVB pressure compensated for LS A/B characteristics*

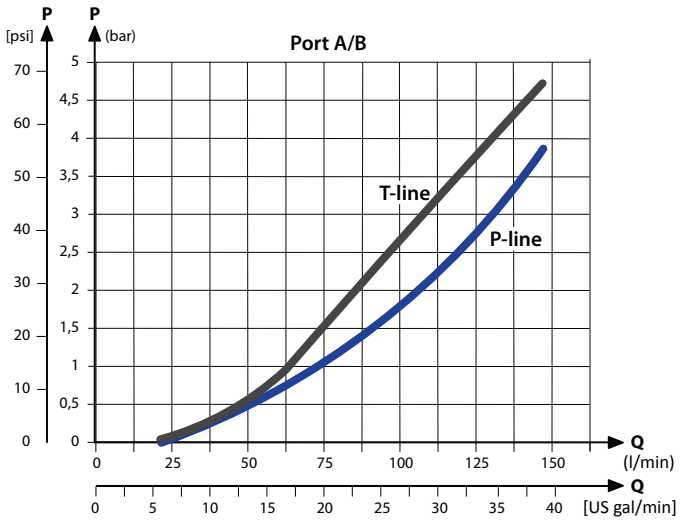



*Load Independent Fluid Flow – Pressure Compensated PVB*



## PVB Basic Modules

*PVB pressure compensated P-line and T-line characteristics*




*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

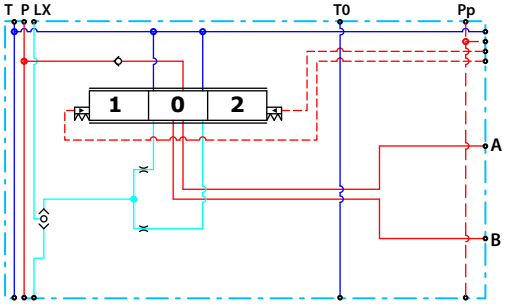
### Uncompensated PVB

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*




*Technical specification for A/B-port*

| Max. continuous pressure | Max. intermittent pressure | Max. rated flow |
|---|---|---|
| 380 bar [5510 psi] | 420 bar [6090 psi] | 65 l/min [17 US gal/min] |

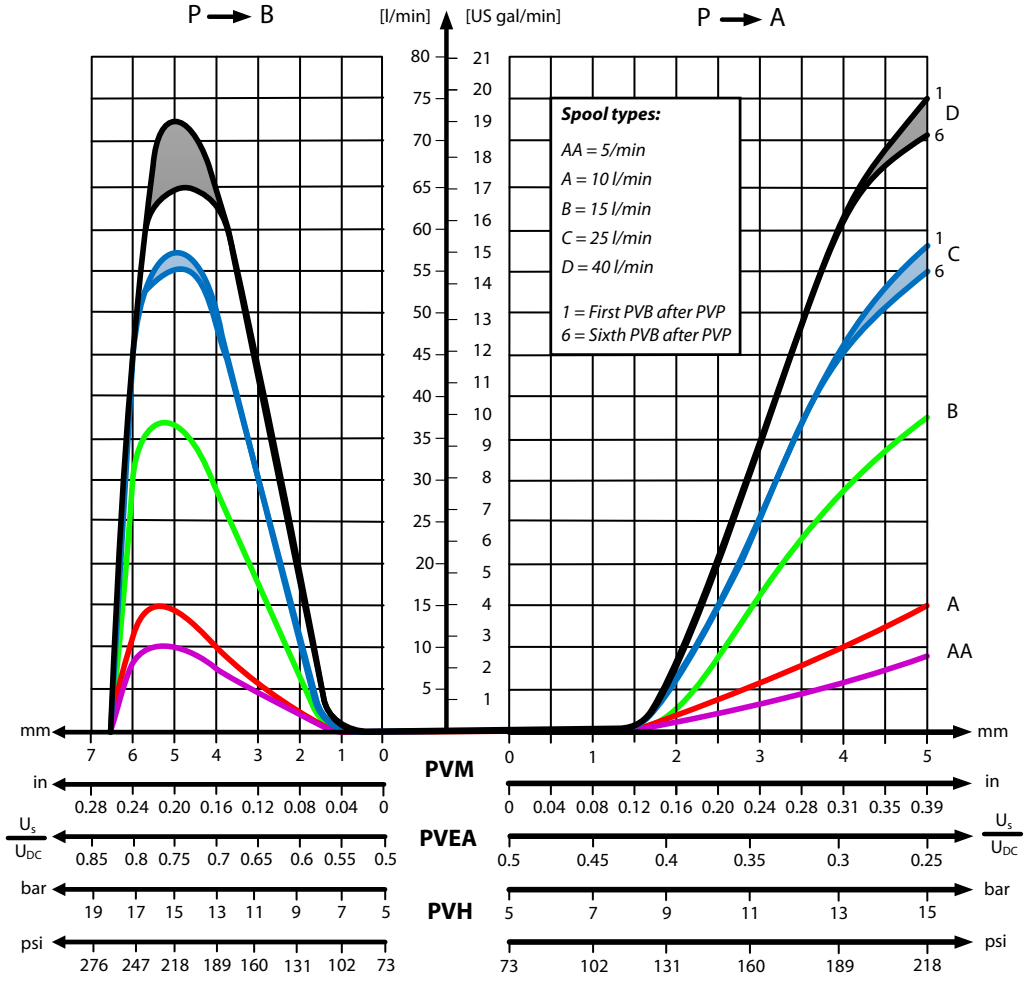
*Technical specification*

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

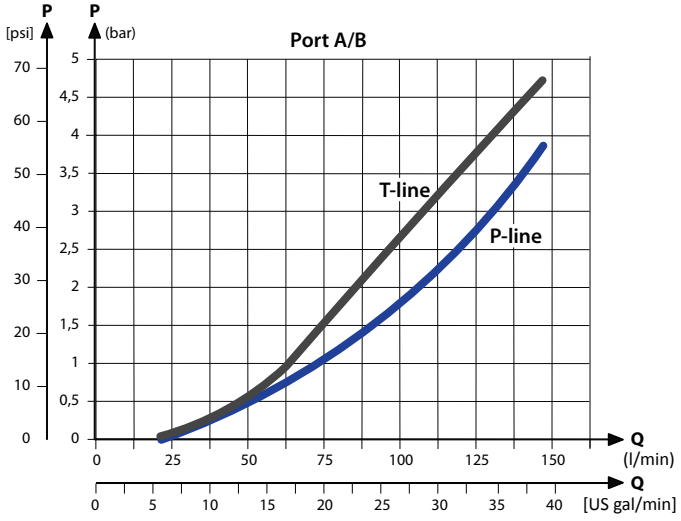
## PVB Basic Modules

### Performance graphs (Theoretical)

*Fluid flow as a function of spool travel*




*PVB pressure compensated P-line and T-line characteristics*



## PVB Basic Modules

*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

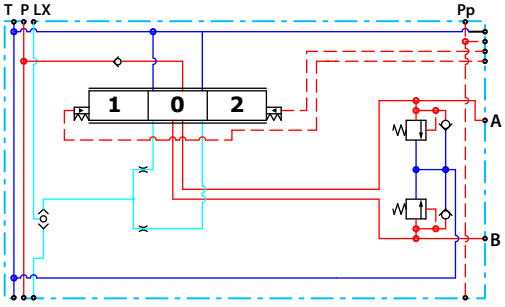
### Uncompensated PVB with PVLP

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 Uncompensated PVB with PVLP features:***

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

*Uncompensated PVB with PVLP schematic*




*Technical specification for A/B-port*

| Max. continuous pressure | Max. intermittent pressure | Max. rated flow |
|---|---|---|
| 380 bar [5510 psi] | 420 bar [6090 psi] | 65 l/min [17 US gal/min] |

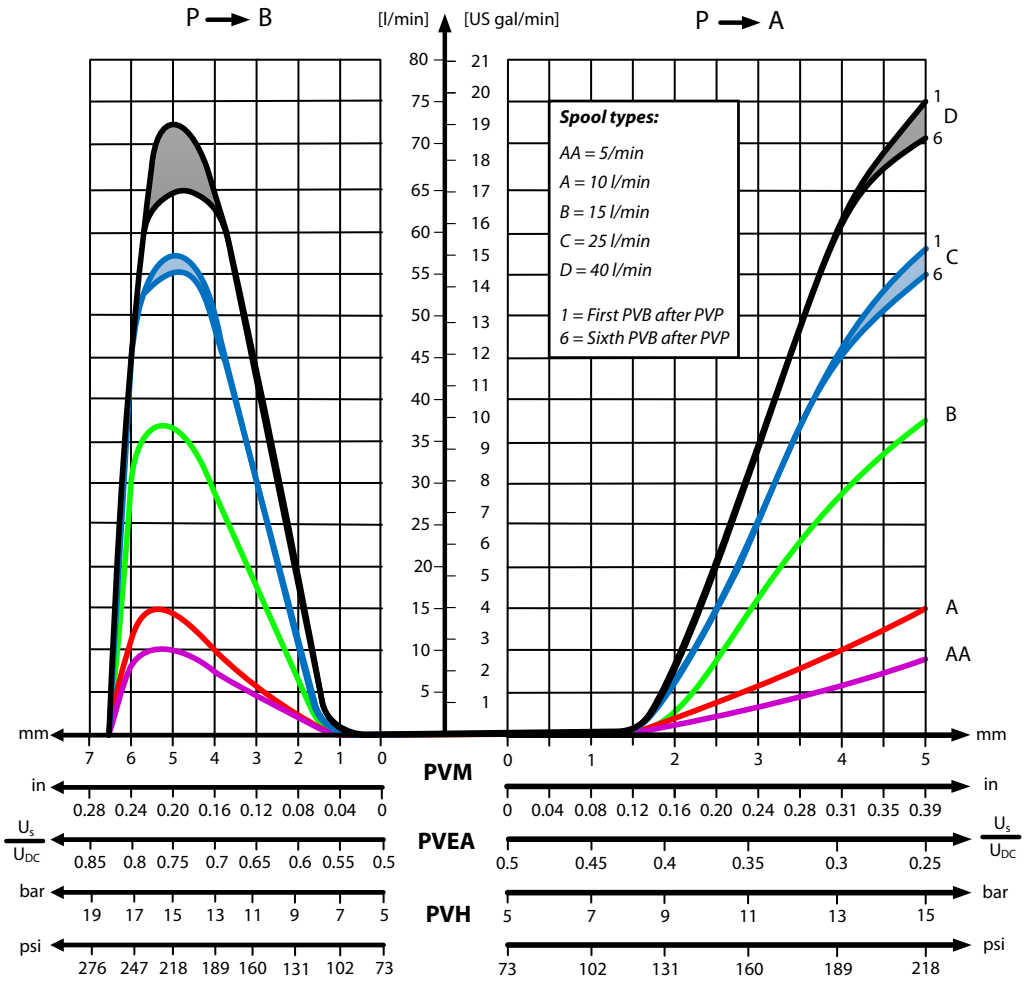
*Technical specification*

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

## PVB Basic Modules

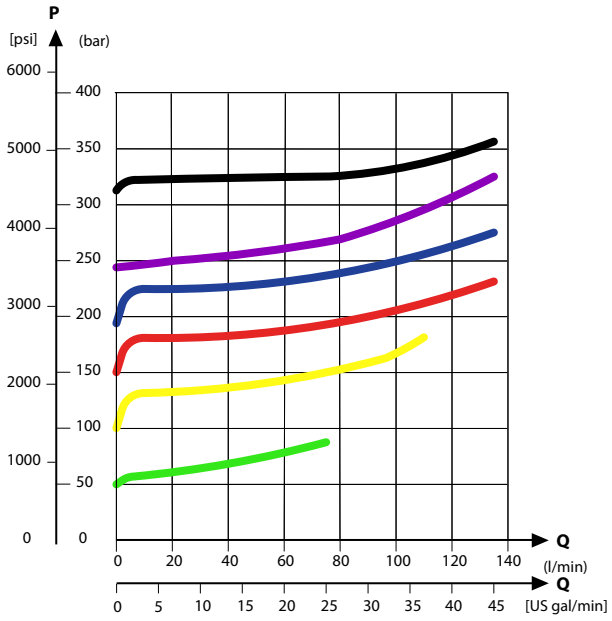
### Performance graphs (Theoretical)

*Fluid flow as a function of spool travel*

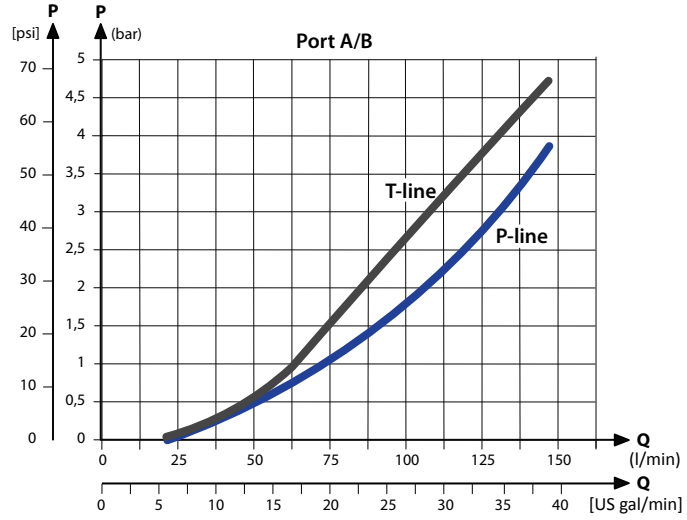


## PVB Basic Modules

*PVLP shock valve characteristics*




*PVB pressure compensated P-line and T-line characteristics*




*Part numbers for Uncompensated PVB with PVLP*

| Part number | A/B-port | PVLP | 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 | — |

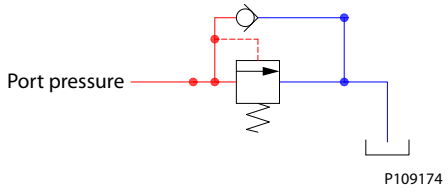
## PVB Basic Modules

### PVLP Shock and Anti-Cavitation Valve

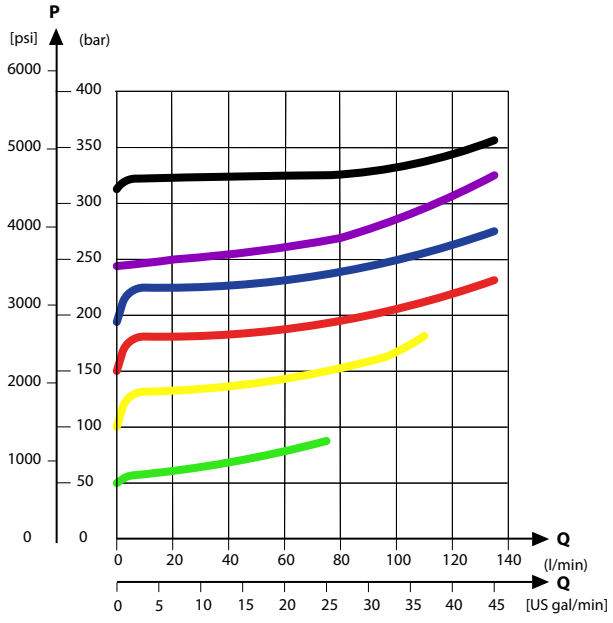
The PVLP shock and anti-cavitation valve will relieve a pressure peak to the internal tank galleries and will furthermore suck oil from the tank to the work port to prevent cavitation. Pressure settings range: 32–400 bar [460–5801 psi].

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*

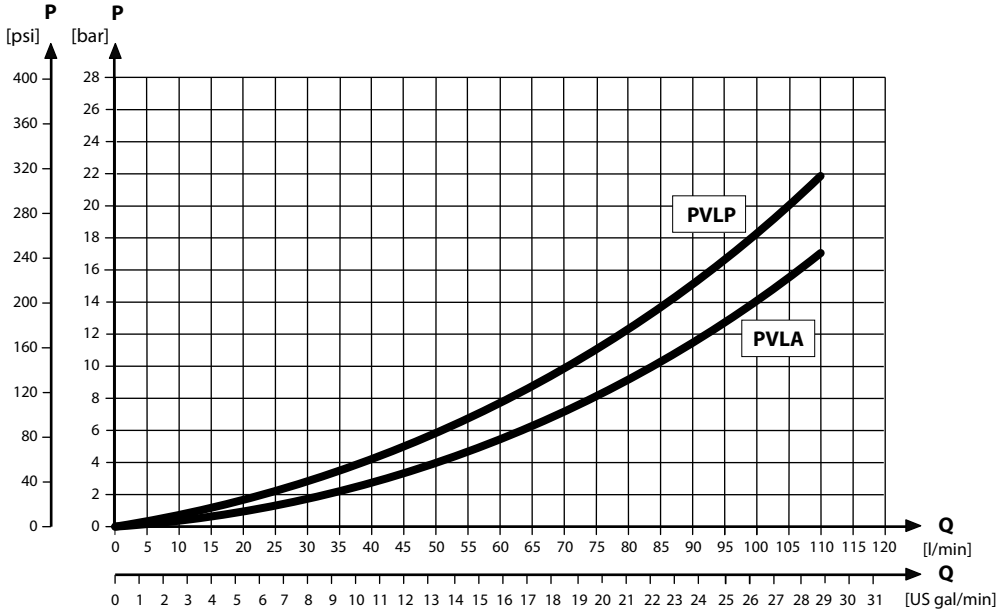



*PVLP shock valve characteristics*



## PVB Basic Modules

*PVLP/PVLA suction valve characteristics*




*Technical specification*

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

*Part numbers for PVLP according to pressure settings*

| Part number | Pressure in bar [psi] | Part number | Pressure in bar [psi] |
|---|---|---|---|
| **157B2032** | 32 [464] | **157B2210** | 210 [3045] |
| **157B2050** | 50 [725] | **157B2230** | 230 [3335] |
| **157B2063** | 63 [913] | **157B2240** | 240 [3480] |
| **157B2080** | 80 [1160] | **157B2250** | 250 [3626] |
| **157B2100** | 100 [1450] | **157B2265** | 265 [3844] |
| **157B2125** | 125 [1813] | **157B2280** | 280 [4061] |
| **157B2140** | 140 [2031] | **157B2300** | 300 [4351] |
| **157B2150** | 150 [2176] | **157B2320** | 320 [4641] |
| **157B2160** | 160 [2321] | **157B2350** | 350 [5076] |
| **157B2175** | 175 [2538] | **157B2380** | 380 [5511] |
| **157B2190** | 190 [2756] | — | |

## PVB Basic Modules Accessories

The generic PVB module accessory platform include the PVLP shock and anti-cavitation valve and PVLA suction valve.

- *PVLP Shock and Anti-Cavitation Valve* on page 56
- *PVLA Suction Valve* on page 61

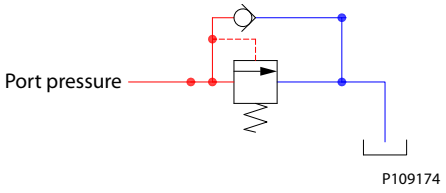
## PVB Basic Modules Accessories

### PVLP Shock and Anti-Cavitation Valve

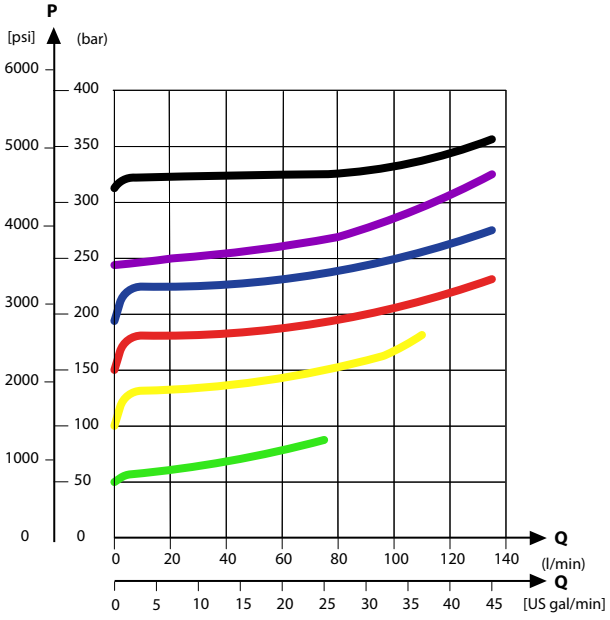
The PVLP shock and anti-cavitation valve will relieve a pressure peak to the internal tank galleries and will furthermore suck oil from the tank to the work port to prevent cavitation. Pressure settings range: 32–400 bar [460–5801 psi].

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*

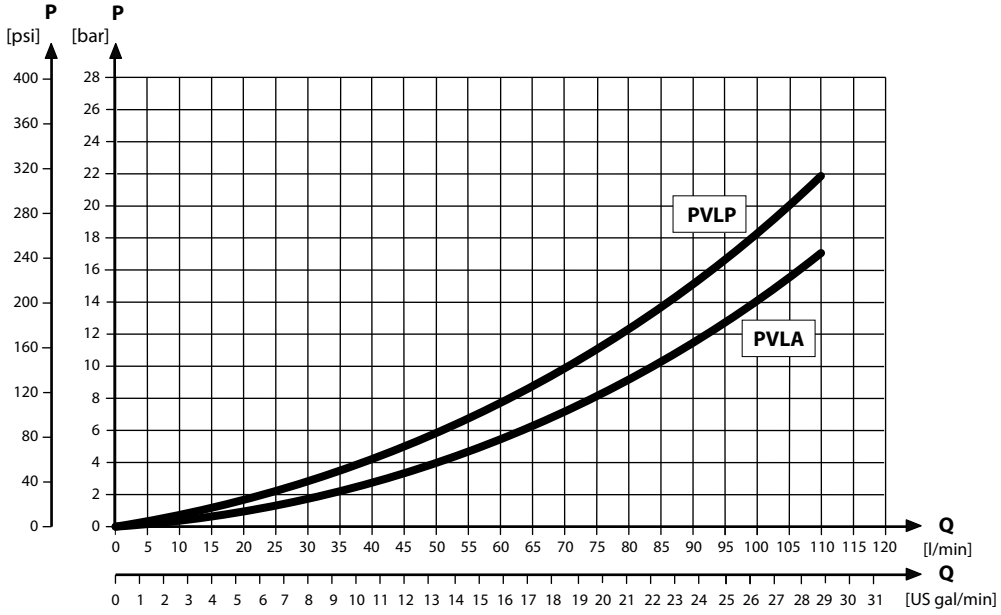



*PVLP shock valve characteristics*



## PVB Basic Modules Accessories

*PVLP/PVLA suction valve characteristics*




*Technical specification*

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

*Part numbers for PVLP according to pressure settings*

| Part number | Pressure in bar [psi] | Part number | Pressure in bar [psi] |
|---|---|---|---|
| **157B2032** | 32 [464] | **157B2210** | 210 [3045] |
| **157B2050** | 50 [725] | **157B2230** | 230 [3335] |
| **157B2063** | 63 [913] | **157B2240** | 240 [3480] |
| **157B2080** | 80 [1160] | **157B2250** | 250 [3626] |
| **157B2100** | 100 [1450] | **157B2265** | 265 [3844] |
| **157B2125** | 125 [1813] | **157B2280** | 280 [4061] |
| **157B2140** | 140 [2031] | **157B2300** | 300 [4351] |
| **157B2150** | 150 [2176] | **157B2320** | 320 [4641] |
| **157B2160** | 160 [2321] | **157B2350** | 350 [5076] |
| **157B2175** | 175 [2538] | **157B2380** | 380 [5511] |
| **157B2190** | 190 [2756] | — | |

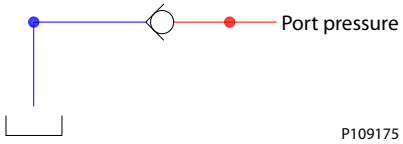
## PVB Basic Modules Accessories

### PVLA Suction Valve

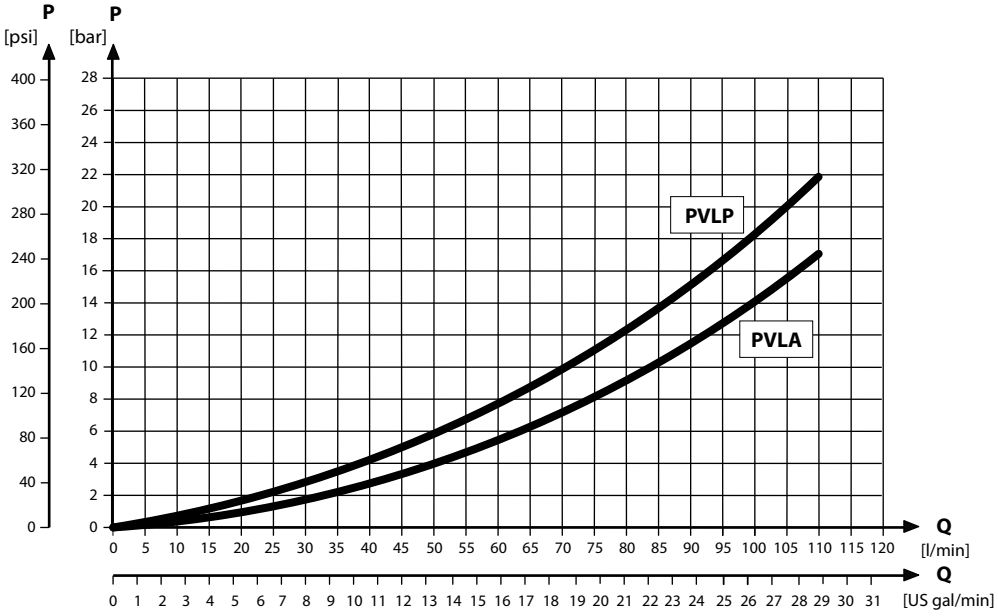
The PVLA valve is an accessory available for PVB basic modules.

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*




*PVLP/PVLA suction valve characteristics*




*Technical specification*

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

*PVLA suction valve part number*

| PVLA suction valve | Plug |
|---|---|
| 157B2001 | 157B2002 |

## PVBS Main Spools

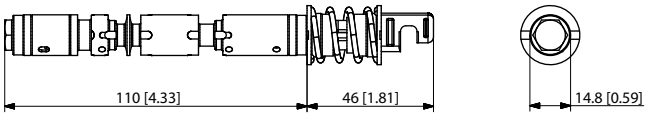
The main spools (PVBS) determine the flow out of the work section or the pressure build up and are based on a generic platform with a wide selection of additional features, enabling you to tailor the PVBS to suit the demands of any hydraulic system and any function.

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

*PVBS main spool*

*PVBS main spool dimensions*




Weight: 0.16 kg [0.35 lb]

### General features

- 4-way, positions
- Optional 4-way, 4 positions with the right PVM
- Flow control AB
- Dead band 1.2mm [0.047 in]

### PVBS Technical Parameters

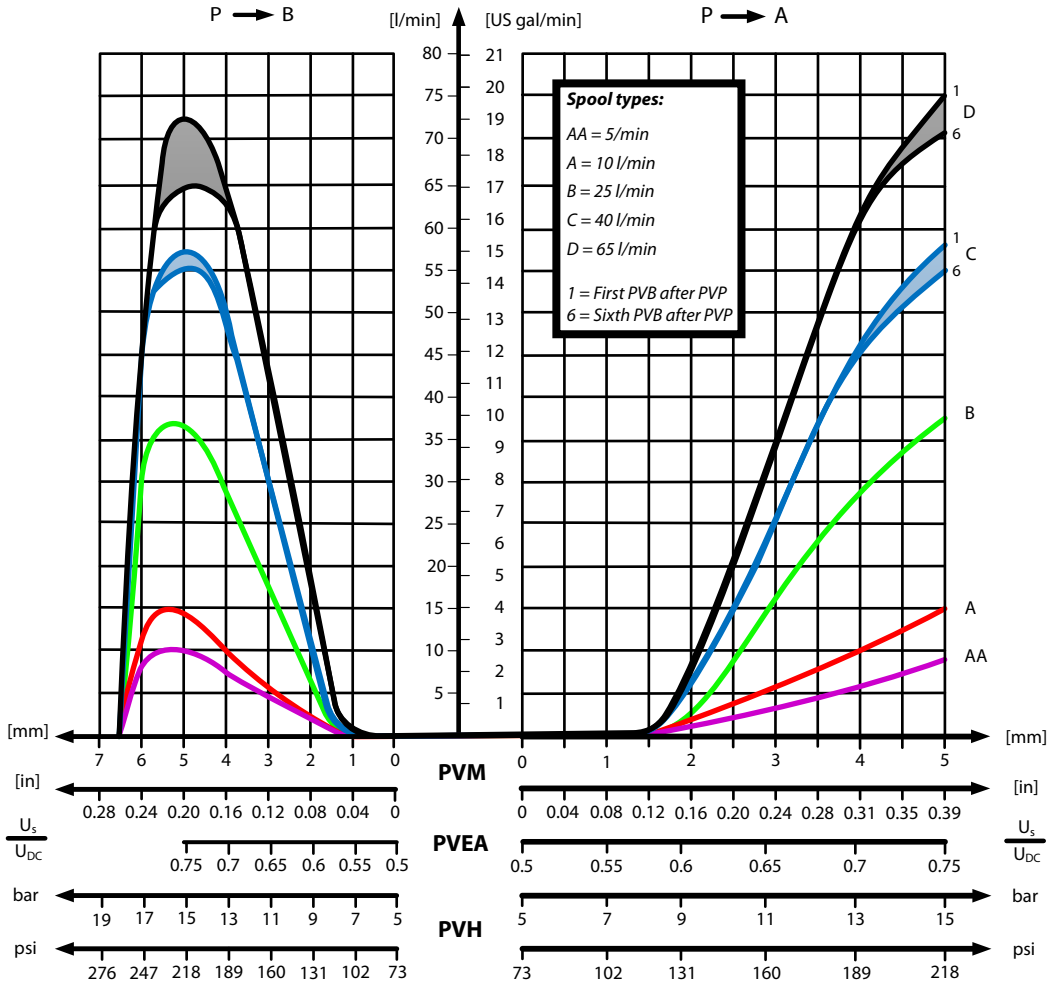
*Technical specification*

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

## PVBS Main Spools

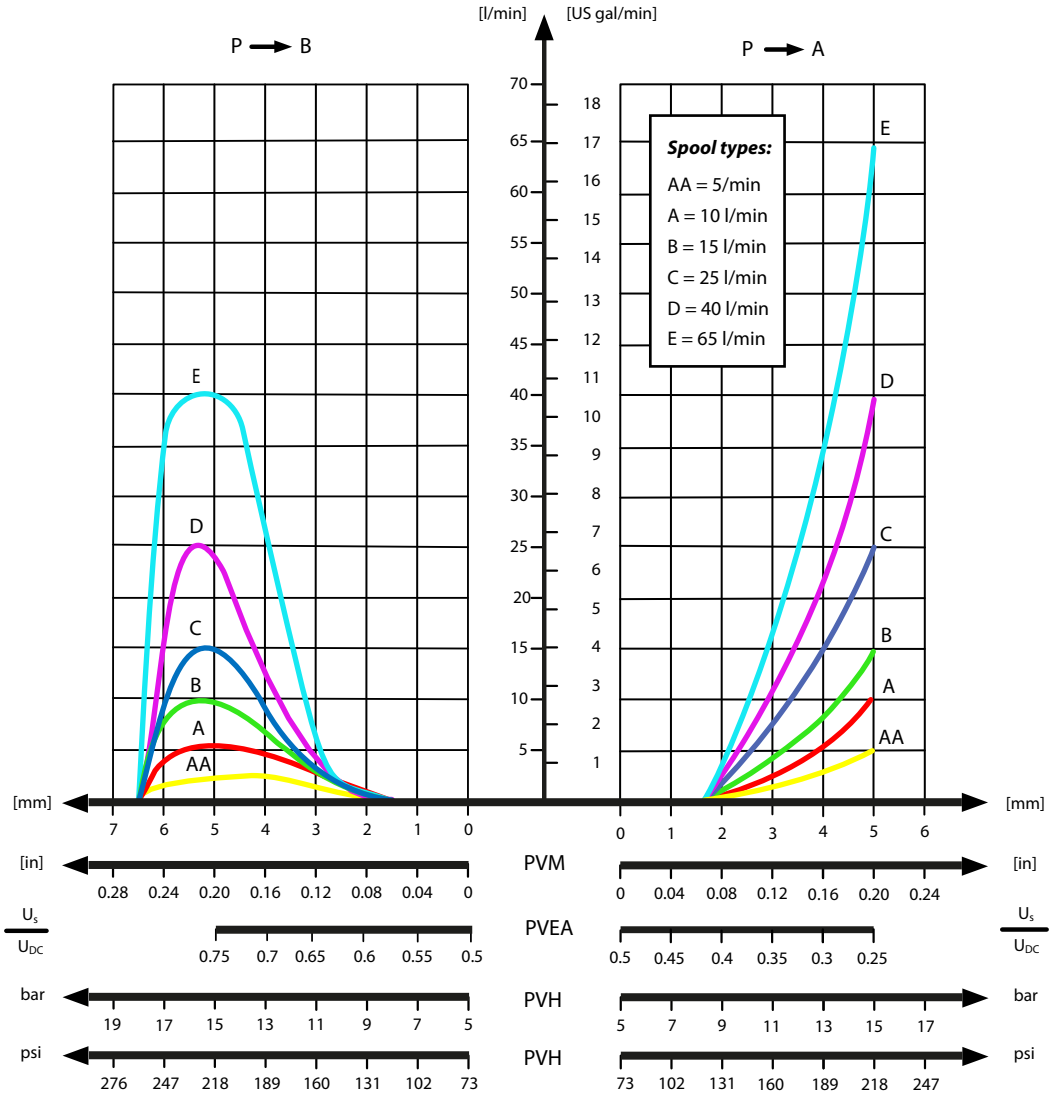
### PVBS Fluid Flow Characteristics - Theoretical Performance

*Fluid flow as a function of spool travel*



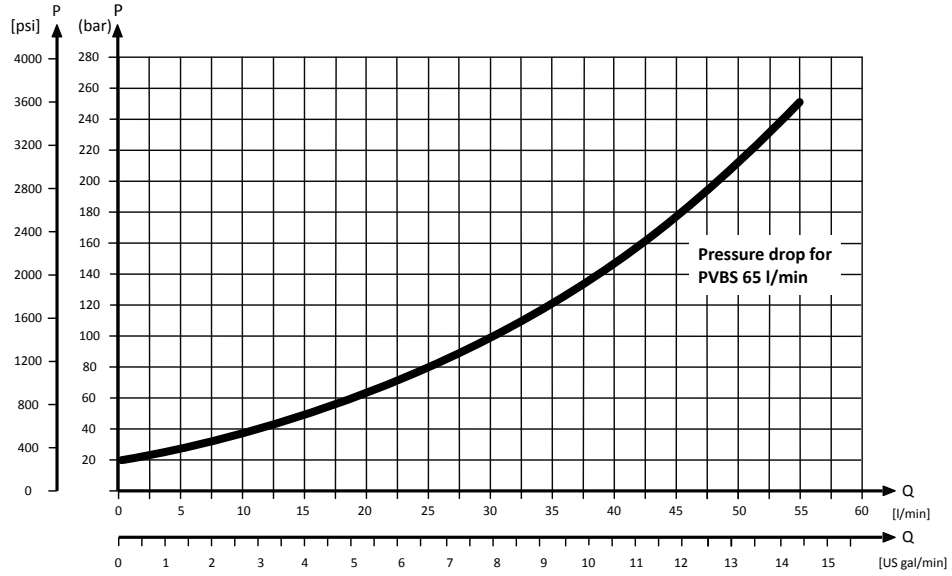
## PVBS Main Spools

*Fluid flow as a function of spool travel (asymmetrical spools)*



## PVBS Main Spools

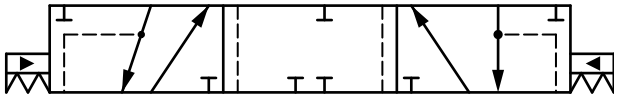
*Pressure drop to T (open spool in neutral)*



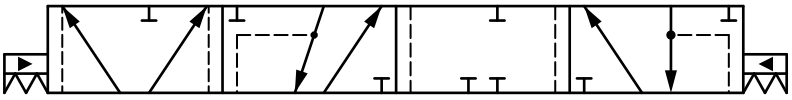
## PVBS Main Spools Part Numbers

### Flow Control Spools - Closed Neutral Position

*Schematic for PVBS - 4-way, 3 positions*



*Schematic for PVBS - 4-way, 4 positions*



*Symmetrical spools*

| Part number | Actuation* | Flow – l/min [US gal/min] | | | |
|---|---|---|---|---|---|
| | | A → T | P → A | P → B | B → T |
| **11105532** | PVE | 5 [1.32] | 5 [1.32] | 5 [1.32] | 5 [1.32] |
| **11105533** | PVE | 10 [2.64] | 10 [2.64] | 10 [2.64] | 10 [2.64] |
| **11105534** | PVE | 25 [6.60] | 25 [6.60] | 25 [6.60] | 25 [6.60] |
| **11105535** | PVE | 40 [10.57] | 40 [10.57] | 40 [10.57] | 40 [10.57] |
| **11105536** | PVE | 65 [17.17] | 65 [17.17] | 65 [17.17] | 65 [17.17] |
| **11109632** | PVH/PVHC | 5 [1.32] | 5 [1.32] | 5 [1.32] | 5 [1.32] |
| **11109633** | PVH/PVHC | 10 [2.64] | 10 [2.64] | 10 [2.64] | 10 [2.64] |
| **11109634** | PVH/PVHC | 25 [6.60] | 25 [6.60] | 25 [6.60] | 25 [6.60] |
| **11109635** | PVH/PVHC | 40 [10.57] | 40 [10.57] | 40 [10.57] | 40 [10.57] |
| **11109636** | PVH/PVHC | 65 [17.17] | 65 [17.17] | 65 [17.17] | 65 [17.17] |

* All spools can be mechanically actuated with a PVM, for more details see *PVM Manual Actuation* on page 69

*Asymmetrical spools*

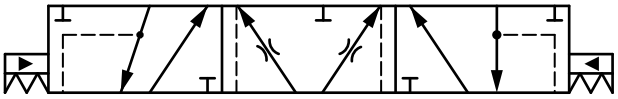
| Part number | Actuation* | Flow – l/min [US gal/min] | | | |
|---|---|---|---|---|---|
| | | A → T | P → A | P → B | B → T |
| **11109642** | PVE | 5 [1.32] | 5 [1.32] | 2.5 [0.66] | 2.5 [0.66] |
| **11109643** | PVE | 10 [2.64] | 10 [2.64] | 5 [1.32] | 5 [1.32] |
| **11156296** | PVE | 15 [3.96] | 15 [3.96] | 25 [6.60] | 25 [6.60] |
| **11109644** | PVE | 25 [6.60] | 25 [6.60] | 10 [2.64] | 10 [2.64] |
| **11109645** | PVE | 25 [6.60] | 25 [6.60] | 15 [3.96] | 15 [3.96] |
| **11156298** | PVE | 25 [6.60] | 25 [6.60] | 40 [10.57] | 40 [10.57] |
| **11109646** | PVE | 40 [10.57] | 40 [10.57] | 15 [3.96] | 15 [3.96] |
| **11146752** | PVH/PVHC | 5 [1.32] | 5 [1.32] | 2.5 [0.66] | 2.5 [0.66] |
| **11146753** | PVH/PVHC | 10 [2.64] | 10 [2.64] | 5 [1.32] | 5 [1.32] |
| **11145754** | PVH/PVHC | 25 [6.60] | 25 [6.60] | 10 [2.64] | 10 [2.64] |
| **11146755** | PVH/PVHC | 25 [6.60] | 25 [6.60] | 15 [3.96] | 15 [3.96] |
| **11146756** | PVH/PVHC | 40 [10.57] | 40 [10.57] | 15 [3.96] | 15 [3.96] |
| **11146757** | PVH/PVHC | 40 [10.57] | 40 [10.57] | 25 [6.60] | 25 [6.60] |

* All spools can be mechanically actuated with a PVM, for more details see *PVM Manual Actuation* on page 69

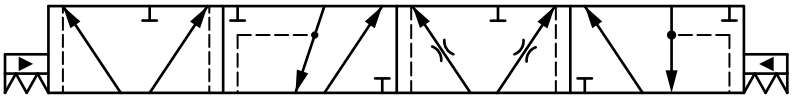
## PVBS Main Spools Part Numbers

### Flow Control Spools - Throttled Open Neutral Position

*Schematic for PVBS - 4-way, 3 positions*



*Schematic for PVBS - 4-way, 4 positions*



| Part number | Actuation* | Flow – l/min [US gal/min] | | | |
|---|---|---|---|---|---|
| | | A → T | P → A | P → B | B → T |
| **11105537** | PVE | 5 [1.32] | 5 [1.32] | 5 [1.32] | 5 [1.32] |
| **11105538** | PVE | 10 [2.64] | 10 [2.64] | 10 [2.64] | 10 [2.64] |
| **11105539** | PVE | 25 [6.60] | 25 [6.60] | 25 [6.60] | 25 [6.60] |
| **11105540** | PVE | 40 [10.57] | 40 [10.57] | 40 [10.57] | 40 [10.57] |
| **11105541** | PVE | 65 [17.17] | 65 [17.17] | 65 [17.17] | 65 [17.17] |
| **11109637** | PVH/PVHC | 5 [1.32] | 5 [1.32] | 5 [1.32] | 5 [1.32] |
| **11109638** | PVH/PVHC | 10 [2.64] | 10 [2.64] | 10 [2.64] | 10 [2.64] |
| **11109639** | PVH/PVHC | 25 [6.60] | 25 [6.60] | 25 [6.60] | 25 [6.60] |
| **11109640** | PVH/PVHC | 40 [10.57] | 40 [10.57] | 40 [10.57] | 40 [10.57] |
| **11109641** | PVH/PVHC | 65 [17.17] | 65 [17.17] | 65 [17.17] | 65 [17.17] |

* All spools can be mechanically actuated with a PVM, for more details see *PVM Manual Actuation* on page 69

*Asymmetrical spools*

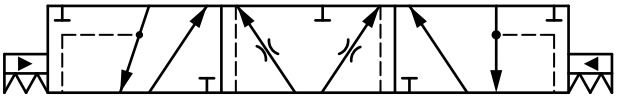
| Part number | Actuation* | Flow – l/min [US gal/min] | | | |
|---|---|---|---|---|---|
| | | A → T | P → A | P → B | B → T |
| **11160953** | PVE | 5 [1.32] | 5 [1.32] | 2.5 [0.66] | 2.5 [0.66] |
| **11159472** | PVE | 5 [1.32] | 5 [1.32] | 5 [1.32] | 5 [1.32] |
| **11156160** | PVE | 15 [3.96] | 15 [3.96] | 25 [6.60] | 25 [6.60] |
| **11156158** | PVE | 25 [6.60] | 25 [6.60] | 40 [10.57] | 40 [10.57] |
| **11160957** | PVE | 40 [10.57] | 40 [10.57] | 25 [6.60] | 25 [6.60] |
| **11156155** | PVE | 40 [10.57] | 40 [10.57] | 65 [17.17] | 65 [17.17] |
| **11189195** | PVH/PVHC | 15 [3.96] | 15 [3.96] | 25 [6.60] | 25 [6.60] |

* All spools can be mechanically actuated with a PVM, for more details see *PVM Manual Actuation* on page 69

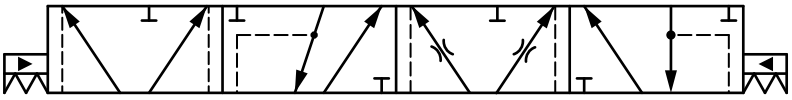
## PVBS Main Spools Part Numbers

### Flow Control Spools - Open/Closed Neutral Position

*Schematic for PVBS - 4-way, 3 positions*



*Schematic for PVBS - 4-way, 4 positions*



*Asymmetrical spools*

| Part number | Actuation* | Flow – l/min [US gal/min] | | | |
|---|---|---|---|---|---|
| | | A → T | P → A | P → B | B → T |
| **11179510** | PVE | 15 [3.96] | 15 [3.96] | 5 [1.32] | 15 [3.96] |

* All spools can be mechanically actuated with a PVM, for more details see *PVM Manual Actuation* on page 69

## PVG 16 Actuation

PVG 16 actuation can be done manually, hydraulically, electro-hydraulically and electrically.

PVG 16 actuation overview:


- *PVM Manual Actuation* on page 69
  - *PVMD Cover* on page 70
- *PVH Hydraulic Actuation* on page 71
- *PVHC Electro-Hydraulic Actuation* on page 73
- *PVE Electro-hydraulic Actuation* on page 75
  - *PVEO* on page 77
  - *PVEA Series 6 Proportional Control Actuator* on page 80


## 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.

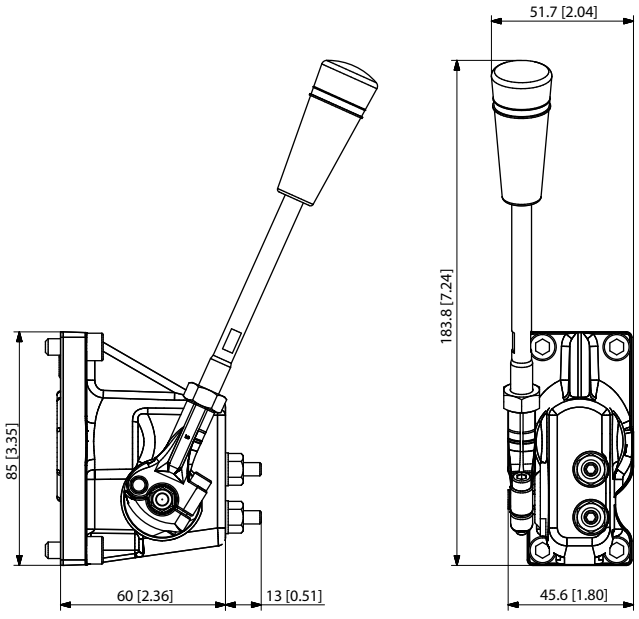
The PVM variants are based on a generic platform with a selection of additional features, enabling you to tailor the PVM to suit the demands of any hydraulic system, which includes the following main variants:

- PVM manual actuation or override of a function
- Spring centering cover without manual override (PVML)
  - Optional with lever base
  - Optional with lever base and lever
  - Optional flow adjustment screws

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

*PVM cover*

*PVM dimensions*




*Control lever data*

| Standard control range | Control lever range + float position |
|---|---|
| ± 13.9° | 22.3° |

## PVG 16 Actuation

*PVM torque data*

| Spool displacement | PVM+PVMD<br>PVM+PVE | PVM+PVH |
|---|---|---|
| From neutral position | 2.2 ± 0.2 N•m<br>[19.5 ± 1.8 lb•in] | 2.7 ± 0.2 N•m<br>[23.9 ± 1.8 lb•in] |
| Max. spool travel | 2.8 ± 0.2 N•m<br>[24.8 ± 1.8 lb•in] | 7.1 ± 0.2 N•m<br>[62.8 ± 1.8 lb•in] |

*Part numbers for PVM Manual Actuation*

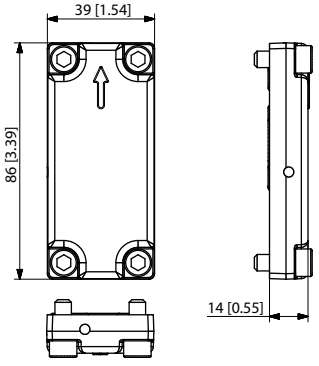
| Part number | Float | Adjustment screws | Lever base and lever | Weight |
|---|---|---|---|---|
| **11107332** | — | Yes | Yes | 0,22 kg<br>[0,49 lb] |
| **11107333** | — | — | Yes | |
| **11107335** | Yes | — | Yes | |
| **11107505** | — | — | — | |
| **11107506** | Yes | — | — | |
| **11107507** | — | Yes | — | |

### 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] |

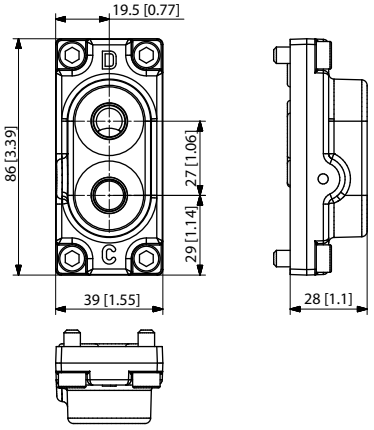
## PVG 16 Actuation

### 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 spool spring package must match with this activation method.

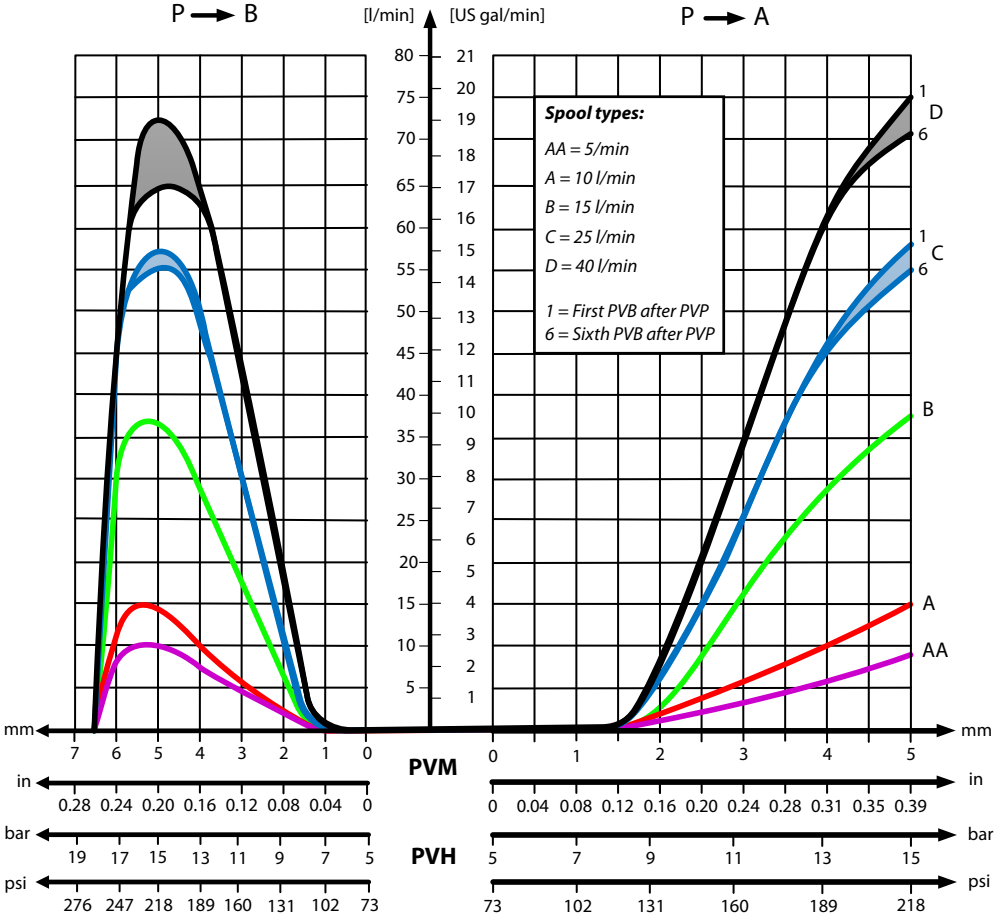
*PVH cover*

*PVH 16 cover dimensions*




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

*Fluid flow as a function of spool travel*



## PVG 16 Actuation

*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 | Weight |
|---|---|---|---|
| 11108380 | Aluminum | G1/4" BSP | 0,13 kg [0.29 lb] |
| 11108381 | | 9/16"-18 UNF | |

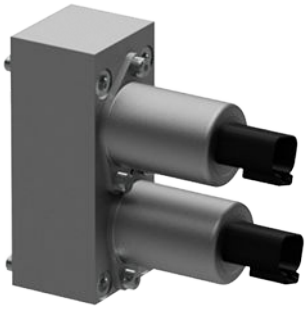
## PVG 16 Actuation

### PVHC Electro-Hydraulic Actuation

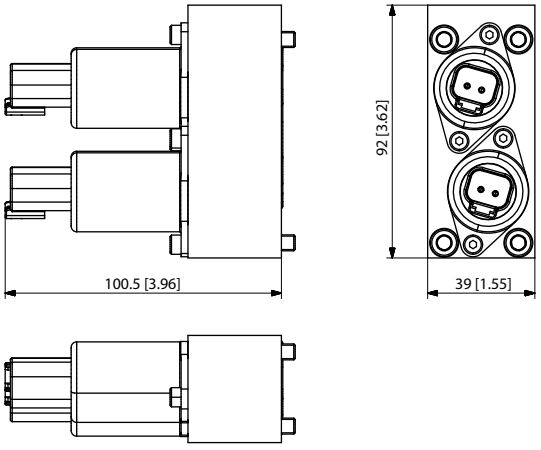
The PVHC is an electrical actuator module for main spool control. The PVHC control is done by dual Pulse Width Modulated, high current supply 100-400 Hz PWM control signals. The spool position will shift when conditions are changed such as temperature change.

Inlet with Hydraulic Pilot Pressure is needed.

*PVHC, Electro-Hydraulic Actuator*

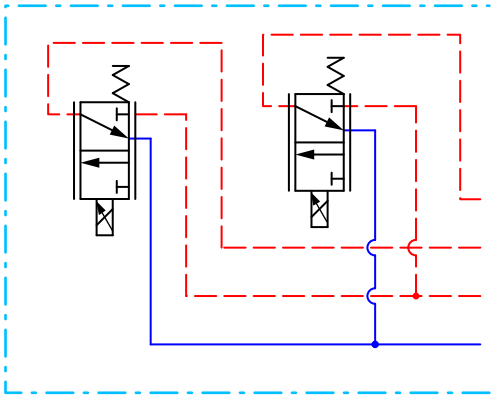


*PVHC dimensions*




Weight: 0,9 kg [1,98 lb]

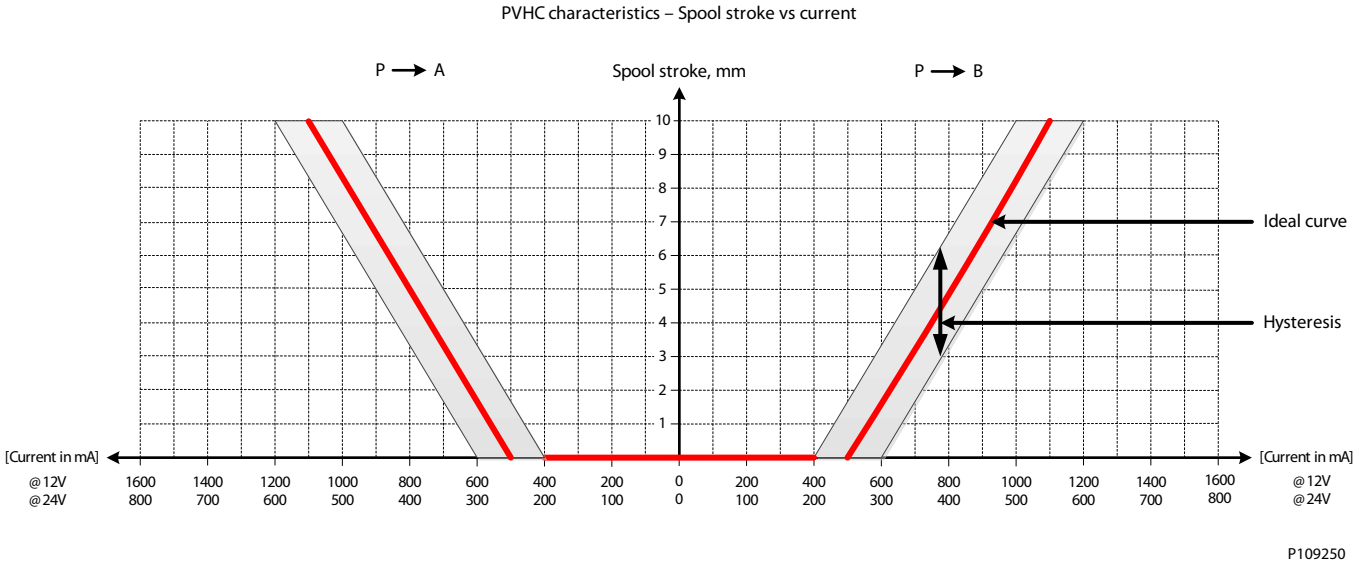
*PVHC schematic*



Dither frequency with a certain amplitude is needed for optimal application performance.

## PVG 16 Actuation

*PVHC spool stroke vs current characteristics*




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

*Technical data*

| **Supply Voltage $U_{DC}$** | **12 $V_{DC}$** | **24 $V_{DC}$** |
|---|---|---|
| Current input | 0 – 1500 mA | 0 – 750 mA |
| Resistance | 4.75 Ω ± 5 % | 20.8 Ω ± 5 % |
| Response time | 150 to 200 ms | |
| PWM frequency | 100 to 400 Hz | |
| Main spool spring control pressure range | 5 – 15 bar [73 – 218 psi] | |
| Pilot oil pressure range | 20 – 25 bar [290 – 362 psi] | |
| 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 | 23/19/16 (according to ISO 4406) | |

*Part numbers for PVHC Actuators*

| **Part number** | **Power supply** | **Connector type** | **Protection Class** |
|---|---|---|---|
| 11126941 | 12V | 2x2 DEUTSCH | IP 67 |
| 11127535 | 24V | | |

## PVG 16 Actuation

### PVE Electro-hydraulic 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 actuator program for PVG 16 includes variants with different performance levels and features.

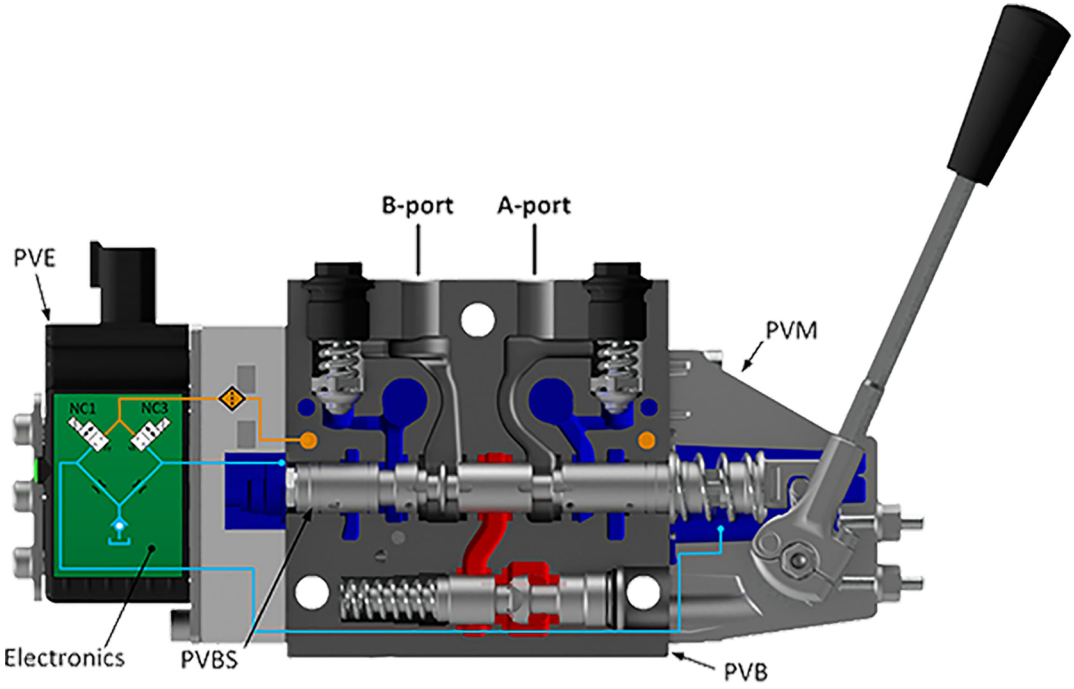
The actuator positions the main spool in a PVG work section to control either the flow or the pressure of the oil distributed to and from the work function. The control signal to the actuator is an analog voltage signal, enabling the user to operate the work function remotely by means of a joystick,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

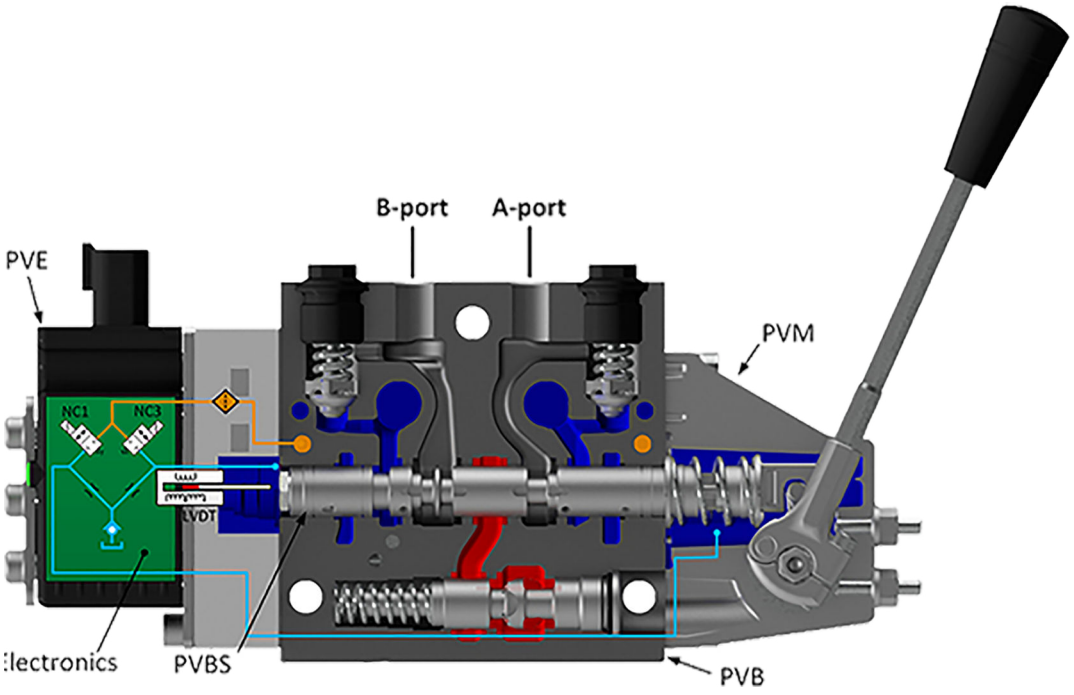
The different hydraulic principles combined with the different solenoid valve regulation principles determine whether the actuator controls the spool proportionally according to a demand signal or ON/OFF according to a voltage signal. The voltage control characteristic of the PVE actuators is shown in the figure below on the left side.

*PVG 16 with PVEO sectional view*



## PVG 16 Actuation

*PVG 16 with PVEA sectional view*




*PVE Series 6 Overview*

| ON/OFF voltage control, non-proportional functions | Proportional spool control for work functions |
|---|---|
| *PVEO Series 6*  For more information please see *PVEO* on page 77. | *PVEA Series 6*  |

## PVG 16 Actuation

### PVEO

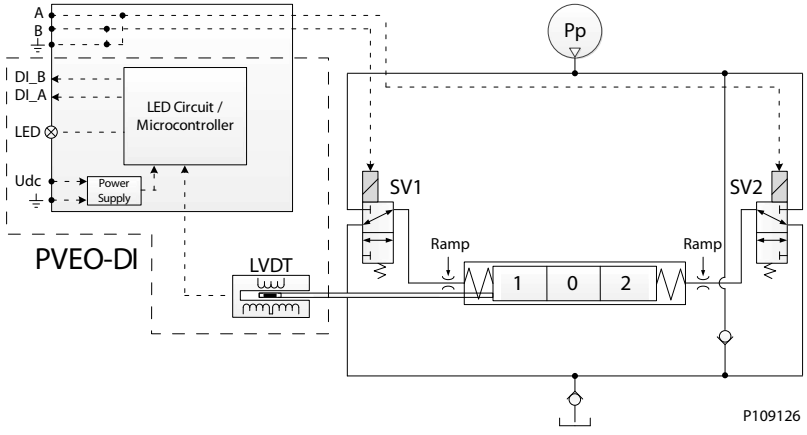
The PVEO actuator is a non-proportional ON/OFF control actuator with open-loop spool control primarily used to control simple ON/OFF work functions where a proportional control of speed or oil flow is not a requirement.

*PVEO Series 6*

- 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 [196 psi]
- LED only indicating Power ON or Power OFF
- CAN-interface (-CI)
- Ramp (-R) or Direction Indication output (-DI) functionality

#### Functionality principle

*PVEO-DI functionality*

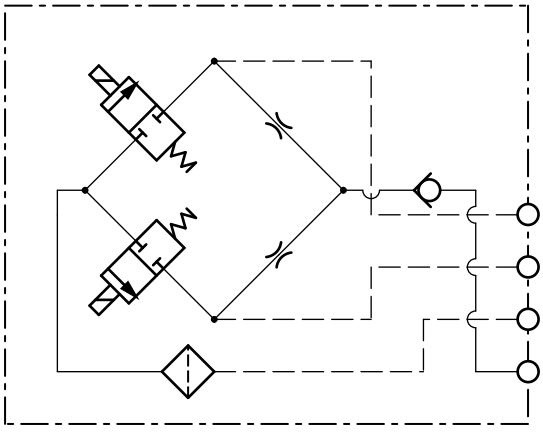



The standard PVEO/PVEO-HP functionality includes the simplest electric circuit of the PVE actuator program, using a fixed 12 $V_{DC}$ or 24 $V_{DC}$ supply voltage or signal voltage and a simple LED circuit to control the LED light indicating Power ON/OFF.

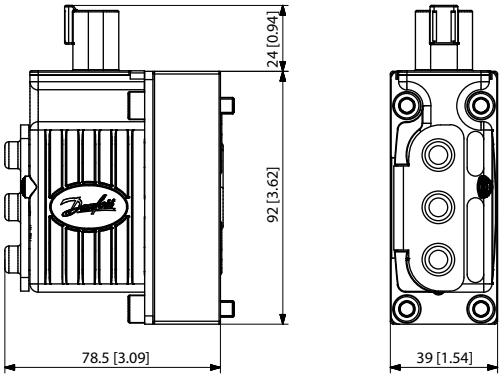
An energization of solenoid valve SV1 and a simultaneous de-energization of SV2 will cause the main spool to move to the right direction and vice versa. If both SV1 and SV2 are energized or de-energized simultaneously, the main spool stays locked in its neutral position.

## PVG 16 Actuation

*PVEO Series 6 schematic*



*PVEO Series 6 dimensions*




Weight: 0.7 kg [1.54 lb]

## PVG 16 Actuation

### PVEO Technical Data

*Control Specifications*

| Description | Type | 12 $V_{DC}$ ± 10% | 24 $V_{DC}$ ± 10% |
|---|---|---|---|
| Supply Voltage ($U_{DC}$) | Range | 11 to 15 $V_{DC}$ | 12 to 30 $V_{DC}$ |
| | Max. ripple | 5% | 5% |
| Current Consumption | Typical | 320 mA | 160 mA |

*Pilot pressure*

| Minimum | Nominal | Maximum |
|---|---|---|
| 10.0 bar [145 psi] | 13.5 bar [196 psi] | 15.0 bar [218 psi] |

*Fluid consumption*

| Neutral/Locked position | Actuating |
|---|---|
| 0.4 l/min [0.11 US gal/min] | 0.6 l/min [0.16 US gal/min] |

*Technical specification*

| Parameter | Minimum | Recommended range | Maximum |
|---|---|---|---|
| **Fluid viscosity** | 4 $mm^2/s$ [39 SUS] | 12 to 75 $mm^2/s$ [65 to 347 SUS] | 460 $mm^2/s$ [2128 SUS] |
| **Fluid cleanliness** | 18/16/13 (according to ISO 4406) | | |
| **Storage temperature** | Ambient: -50 to 90°C [-58 to 194°F] | | |
| **Operating temperature** | Ambient: -30 to 60°C [-22 to 140°F] | | |

*LED characteristic*

| Color | LED characteristic | Description |
|---|---|---|
| Green constant | | 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

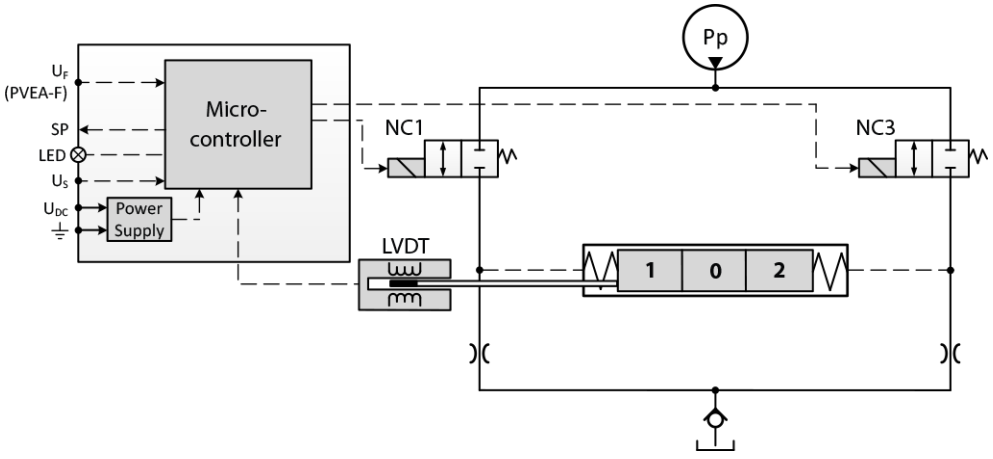
### PVEA Series 6 Proportional Control Actuator

The PVEA actuator is a proportional control actuator with a closed-loop spool control primarily used to control work functions with above medium performance requirements

*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*



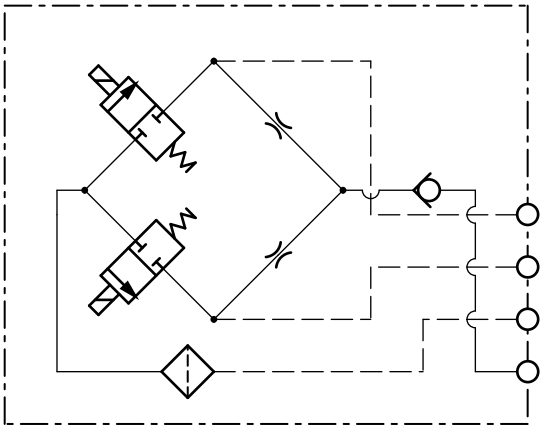

**Power Save** mode is entered when the command signal to the PVEA is below 15% of the supply voltage. Entering Power Save mode will torn off the power to the solenoid valves. Power Save mode can be identified by the LED blinking green at 1 Hz.

All variants available with following features:

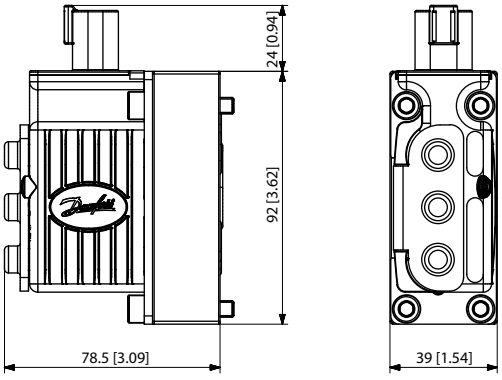
- Neutral position or max. spool stroke according to control signal
- 11–32 $V_{DC}$ multi-voltage power supply
- DEUTSCH connectors
- Standard PVE pilot oil pressure of 13.5 bar [196 psi]
- LED indicating error state and passive fault monitoring
- Float (-F) and CAN-interface (-CI)

## 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 kΩ |
| 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 | | No error – Actuating |
| Green flashing @ 1.5 Hz | | Neutral – Power save |
| Red constant | | Internal error |
| Red flashing @ 1.5 Hz | | External or Float error |

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

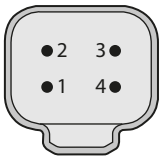
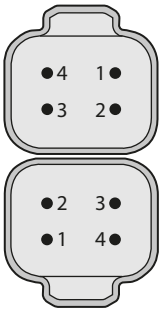
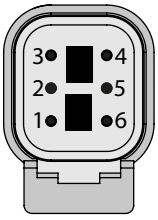
| Part number | Type | Connector | Protection Class | Interface | Functionality |
|---|---|---|---|---|---|
| **11103692** | PVEA | 1x4 DEUTSCH | IP 67 | — | Standard |
| **11106795** | PVEA-F | 1x4 DEUTSCH | IP 67 | — | Float B-port |
| **11121945** | PVEA-CI | 1x4 DEUTSCH | IP 67 | J1939/ISObus | Standard |
| **11149437** | PVEA-CI | 1x4 DEUTSCH | IP 67 | CANopen | Standard |

## PVG 16 Actuation

### PVG 16 connector variants

PVG 16 connector variants for PVEO, PVEA, PVEO-CI, PVEA-CI, PVEA-F with pin layout information.

*Pin connector*

| 1 x 4 DEUTSCH | 2 x 4 DEUTSCH | 1 x 6 DEUTSCH |
|---|---|---|
|  |  |  |

*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 | NC2 | Vneg | Vneg | NC4 |
| 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 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.

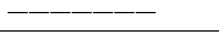
## Generic Fault Reaction

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

| | |
|---|---|
| **Control Signal Monitoring** | The Control signal voltage ($U_S$) is continuously monitored.<br>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 $U_S$ 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 *in control*. |
| **Float Position Monitoring** | Float position must be entered or left within a time limit.<br>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 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 |
| $U_{DC}$ > max. | Passive |  | Disabled | — | 250 |
| $U_{DC}$ < 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 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 end plate variants are based on a generic platform with a wide selection of additional features, enabling you to tailor the PVS 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/PVSI*

*PVS/PVSI with LX-connection*

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


*PVST with T-connection*


For more information about PVS End Plates, see:

*PVS/PVSI* on page 87
*PVS/PVSI with LX-connection* on page 88
*PVSI with P-, T-, LX- and M-connection* on page 90
*PVST with T-connection* on page 91

## PVS End Plates

### PVS/PVSI

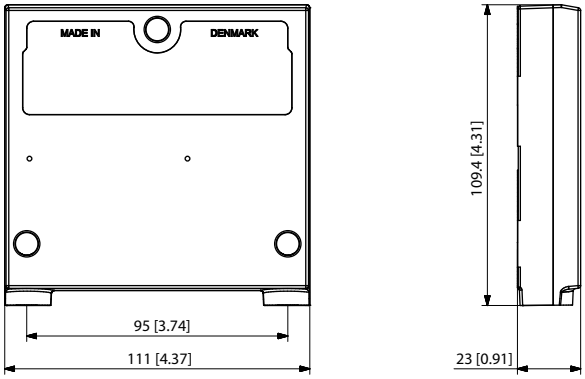
The PVS/PVSI are made of either aluminum or cast iron material and works as an end plate.

*The PVSI Start Plates features:*

- Integrated LS pressure relief valve to tank
- Optional integrated thermal orifice
- Optional version without seals

*PVS/PVSI*

*PVS/PVSI dimensions*




Weight: 0.47 kg [1.05 lb]

*PVS/PVSI schematic*

See part number table for details on maximum pressure capacity

*Technical specification for A/B-port*

| Max. continuous pressure | Max. intermittent pressure | Max. rated flow |
|---|---|---|
| 380 bar [5510 psi] | 420 bar [6090 psi] | 65 l/min [17 US gal/min] |

*Technical specification*

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

*Part numbers for PVS end plates*

| Part number | Maximum pressure | Material | Weight kg [lb] | Seals | Mounting |
|---|---|---|---|---|---|
| **157B2000** | 300 bar [4351 psi] | Aluminum | 0.475 [1.05] | Yes | M8 |
| **157B2020** | 300 bar [4351 psi] | Aluminum | 0.475 [1.05] | Yes | 5/16-18 UNC |
| **157B2004** | 350 bar [5076 psi] | Cast iron | 1.745 [3.85] | Yes | 5/16-18 UNC |
| **157B2014** | 350 bar [5076 psi] | Cast iron | 1.745 [3.85] | Yes | M8 |

## PVS End Plates

### PVS/PVSI with LX-connection

The PVG 16 PVS end plates are placed at the end the valve stack section. Furthermore, the end plate is ensuring Load Sense (LS) is relieved to tank pressure when the valve is not operated. The LX port enables other remote valves to be connected onto the Load Sense shuttle network.

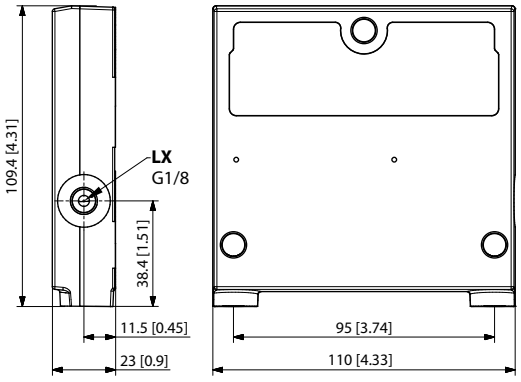
The PVS type end plates are made of aluminum while the PVSI types are made of cast iron thereby being able to withstand a higher pressure.

*The PVS/PVSI with LX-port connection features:*

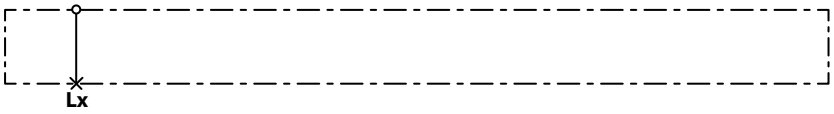
- Integrated LS pressure relief valve to tank
- Threaded LX port for connecting another valve to LS network

*PVS/PVSI with LX-connection*

*PVS/PVSI with LX-connection dimensions*




*PVS/PVSI with LX-connection schematic*




See part number table for details on maximum pressure capacity

*Technical specification for A/B-port*

| Max. continuous pressure | Max. intermittent pressure | Max. rated flow |
|---|---|---|
| 380 bar [5510 psi] | 420 bar [6090 psi] | 65 l/min [17 US gal/min] |

*Technical specification*

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

*Part numbers for PVS/PVSI with LX-port connection*

| Part number | Max. pressure | Material | Weight kg [lb] | LX port | Mounting |
|---|---|---|---|---|---|
| **157B2005** | 350 bar 5076 psi] | Cast iron | 1.695 [3.74] | 1/2-20 UNF | 5/16-18 UNC |
| **157B2015** | | | | G1/4" | M8 |
| **157B2910** | | | | M12x1.5 ISO 6149 | |

## PVS End Plates

*Part numbers for PVS/PVSI with LX-port connection (continued)*

| Part number | Max. pressure | Material | Weight kg [lb] | LX port | Mounting |
|---|---|---|---|---|---|
| **157B2011** | 300 bar [4351 psi] | Aluminum | 0.495 [1.09] | G1/8″ | M8 |
| **157B2021** | | | | 3/8-24 UNF | 5/16-18 UNC |

## PVS End Plates

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

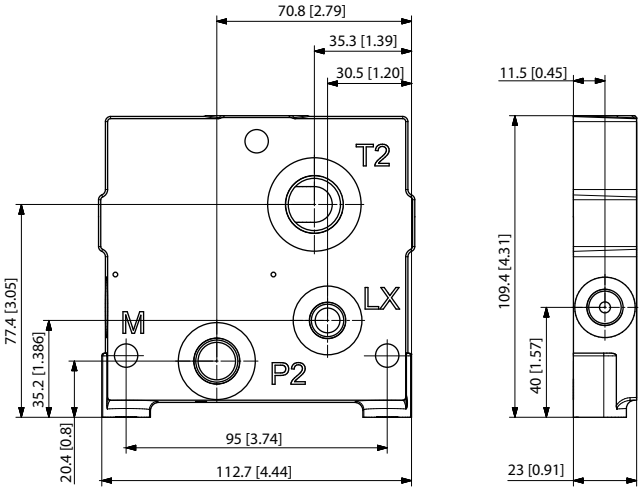
PVSI is made of cast iron and works as an end plate. The PVSI with LX connection enables another valves LS pressure to be shuttled to the pump when needed. The additional P- and T-port connections enables an additional pump flow to a PVG 16 valve.

*The PVSI with P-, T-, LX- and M-connection features:*

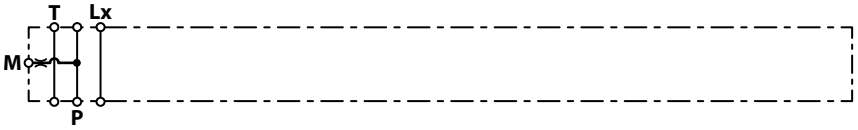
- Integrated LS pressure relief valve to tank
- Threaded ports for P/T/LS/LX and M measuring gauge

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


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




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




See part number table for details on maximum pressure capacity

*Technical specification for A/B-port*

| Max. continuous pressure | Max. intermittent pressure | Max. rated flow |
|---|---|---|
| 380 bar [5510 psi] | 420 bar [6090 psi] | 65 l/min [17 US gal/min] |

*Technical specification*

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

*Part number for PVSI with P-, T-, LX-, M-ports*

| Part number | P-port | T-port | LX-port | M-port | Mounting feet | Weight |
|---|---|---|---|---|---|---|
| **157B2920** | G3/8 | G1/2 | G1/8 | G1/4 | M8 | 0.47 kg [1.05 lb] |

## PVS End Plates

### PVST with T-connection

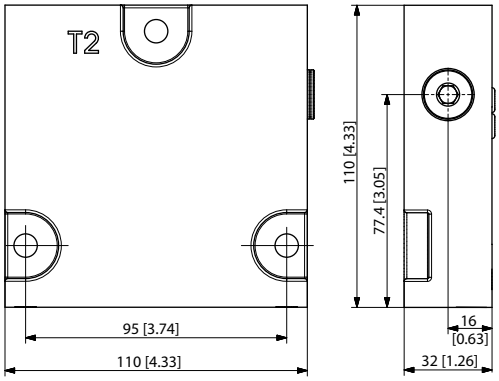
The PVST end plate closes off the valve stack section placed between them by placing it at the end. Furthermore, the end plate is ensuring Load Sense (LS) is relieved to tank pressure when the valve is not operated.

*The PVSI Start Plates features:*

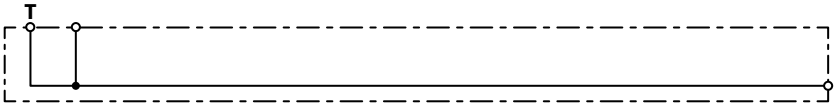
- Integrated LS pressure relief valve to tank
- Threaded T port
- Optional integrated thermal orifice

*PVST with T-connection*


*PVST with T-connection dimensions*




*PVST with T-connection schematic*




See part number table for details on maximum pressure capacity

*Technical specification for A/B-port*

| Max. continuous pressure | Max. intermittent pressure | Max. rated flow |
|---|---|---|
| 380 bar [5510 psi] | 420 bar [6090 psi] | 65 l/min [17 US gal/min] |

*Technical specification*

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

When using a PVST with T-connection it is not possible to use the LS A/B fitting in the bottom of the PVG section next to the PVST.

*Part numbers for PVST with T-connection*

| Part number | Material | T-port | Mounting feet | Weight |
|---|---|---|---|---|
| **157B2500** | Steel | G1/2 | M8 | 0.47 kg [1.05 lb] |
| **157B2520** | | 7/8–14 | 5/16–18 | |

## 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 93 and find the length. Then go to the table *PVAS Part Numbers* on page 93 and find the matching part number.

For stay bolts for a PVG 32/16 combination, see this *PVG 32/16 Combinations* on page 94.

Stay bolts for PVG 256/128/32/16 combinations consist of two different kits. See *PVG 256/128/32/16 Combinations* on page 95 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

Table with total length of the PVG 16 depending on the number of PVB modules.

| No. of PVB 16 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Length mm [in] | 111 [4.37] | 151 [5.94] | 191 [7.52] | 231 [9.09] | 271 [10.67] | 311 [12.24] | 351 [13.82] | 391 [15.39] | 431 [16.97] | 471 [18.54] | 511 [20.12] | 551 [21.69] |
| Weight* kg [lb] | 7.2 [15.9] | 10.9 [24] | 14.6 [32.2] | 18.3 [40.3] | 22.0 [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 in mm [in]** | | **1** | **2** | **3** | **4** | **5** | **6** | **7** | **8** | **9** | **10** | **11** |
| **PVB 32** | **1** | 159 [6.26] | 199 [7.83] | 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] |
| | **2** | 207 [8.15] | 247 [9.72] | 287 [11.30] | 327 [12.87] | 367 [14.45] | 407 [16.02] | 447 [17.60] | 487 [19.17] | 527 [20.74] | 567 [22.32] | 607 [23.90] |
| | **3** | 255 [10.04] | 295 [11.61] | 335 [13.19] | 375 [14.76] | 415 [16.34] | 455 [17.91] | 495 [19.49] | 535 [21.06] | 575 [22.64] | 615 [24.21] | 655 [25.79] |
| | **4** | 303 [11.93] | 343 [13.50] | 383 [15.08] | 423 [16.65] | 463 [18.23] | 503 [19.80] | 543 [21.38] | 583 [22.95] | 623 [24.53] | 663 [26.10] | - |
| | **5** | 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] | - | - |
| | **6** | 399 [15.71] | 439 [17.28] | 479 [18.86] | 519 [20.43] | 559 [22.01] | 599 [23.58] | 639 [25.16] | - | - | - | - |
| | **7** | 447 [17.60] | 487 [19.17] | 527 [20.75] | 567 [22.32] | 607 [23.90] | 647 [25.47] | - | - | - | - | - |
| | **8** | 495 [19.49] | 535 [21.06] | 575 [22.64] | 615 [24.21] | 655 [25.79] | - | - | - | - | - | - |
| | **9** | 543 [21.38] | 583 [22.95] | 623 [24.53] | 663 [26.10] | - | - | - | - | - | - | - |
| | **10** | 591 [23.27] | 631 [24.84] | 671 [26.42] | - | - | - | - | - | - | - | - |
| | **11** | 639 [25.16] | - | - | - | - | - | - | - | - | - | - |

## 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 93.

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 2 – PVG 256/128 combinations*

| | | PVB 256 | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| **Modules (mm)** | | **0** | **1** | **2** | **3** | **4** | **5** | **6** | **7** |
| **PVB 128** | 0 | 11187676+ 40 | 11187672+ 126 | 11187673+ 212 | 11187656+ 298 | 11187675+ 384 | 11187696+ 470 | 11187697+ 556 | 11187698+ 642 |
| | **1** | 11187320+ 106 | 11187677+ 192 | **11187681+ 278** | 11187658+ 364 | 11187685+ 450 | 11187687+ 536 | 11187690+ 622 | |
| | **2** | 11187617+ 172 | 11187678+ 258 | 11187682+ 344 | 11187686+ 430 | 11187691+ 516 | 11187704+ 602 | | |
| | **3** | 11187655+ 238 | 11187679+ 324 | 11187683+ 410 | 11187705+ 496 | 11187694+ 582 | 11187695+ 668 | | |
| | **4** | 11187684+ 304 | 11187680+ 390 | 11187696+ 476 | 11187697+ 562 | 11187689+ 648 | | | |
| | **5** | 11187658+ 370 | 11187699+ 456 | 11187688+ 542 | 11187710+ 628 | | | | |
| | **6** | 11187693+ 436 | 11187703+ 522 | 11187704+ 608 | | | | | |
| | **7** | 11187705+ 502 | 11187694+ 588 | | | | | | |
| | **8** | 11187692+ 568 | 11187709+ 654 | | | | | | |
| | **9** | 11187710+ 634 | | | | | | | |

## PVAS Stay Bolts

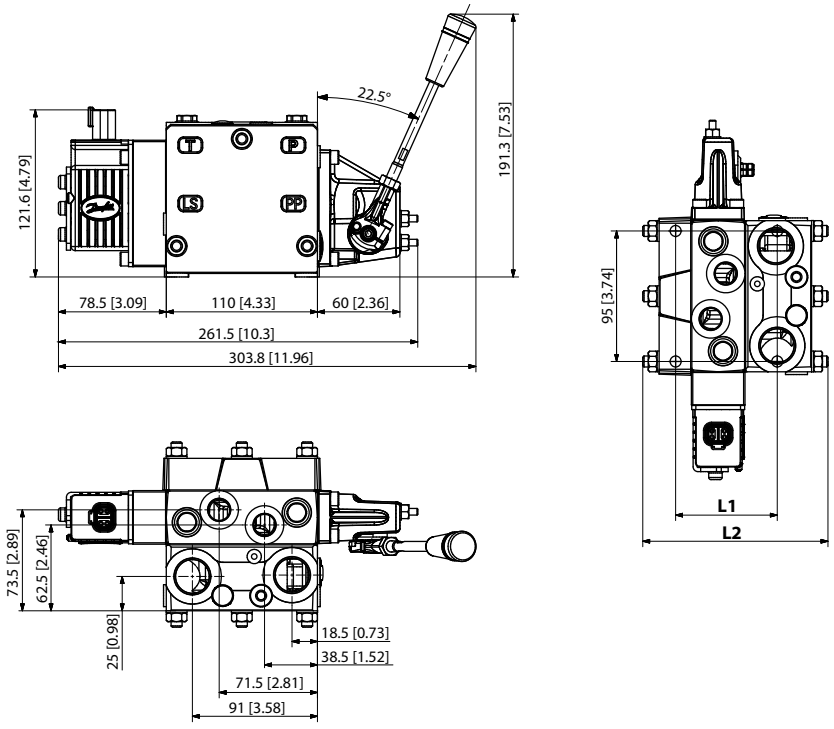
*Table 2 – PVG 32/16 combinations*

| | | 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.



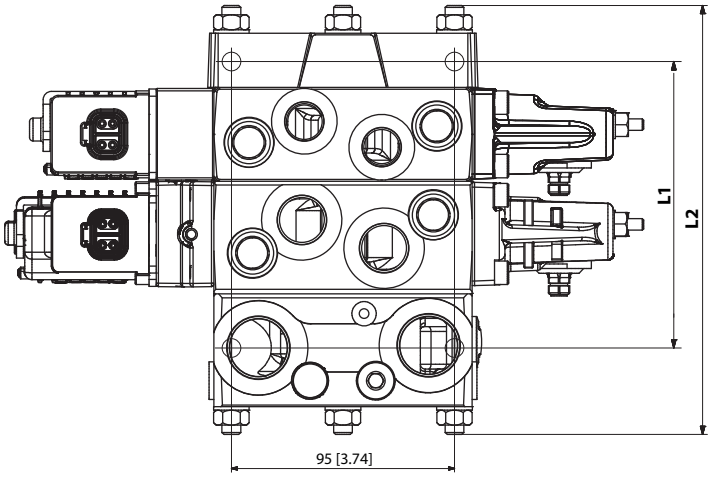

*PVB 16 dimensions (12 sections)*

| Number of PVB 16 | | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| L1 | mm [in] | 74 [2.91] | 114 [4.49] | 154 [6.06] | 194 [7.64] | 234 [9.21] | 274 [10.79] | 314 [12.36] | 354 [13.94] | 394 [15.51] | 434 [17.09] | 474 [18.66] | 514 [20.24] |
| L2 | 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] |

## 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:*

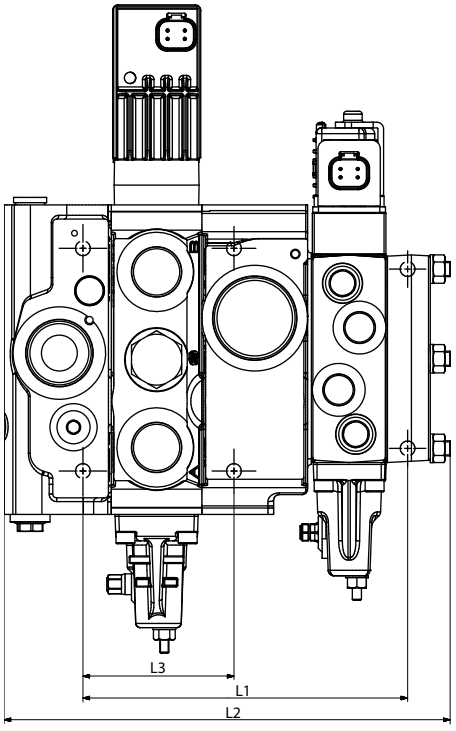
**(Numbers of PVB 32 x 4,42) + (numbers of PVB 16 x 3,67) + 3,6 = Weight in kg**

**(Numbers of PVB 32 x 9.75) + (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:*

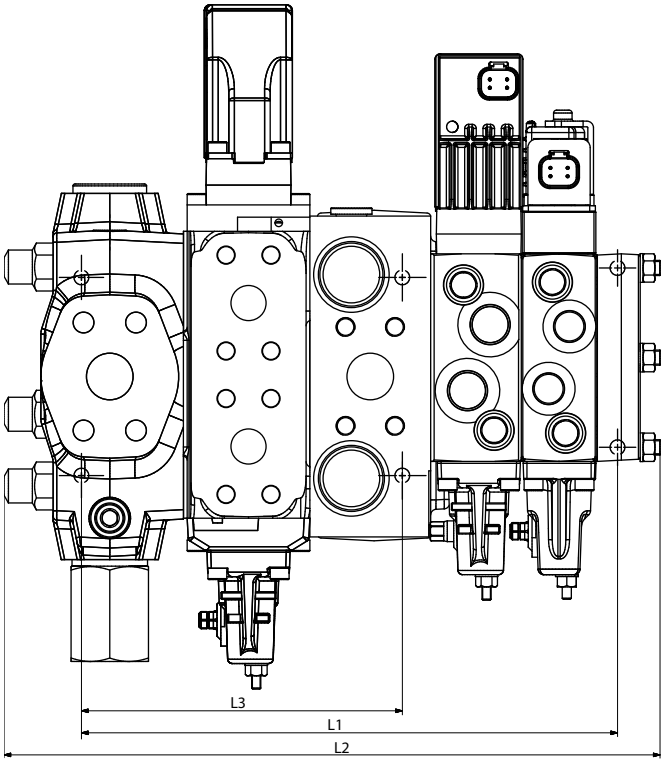
**(Numbers of PVB 100 x 7) + (numbers of PVB 16 x 3.67) + 10 = Weight in kg**

**(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] | 545 [21.46] | 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] | | | | | | | | | | |

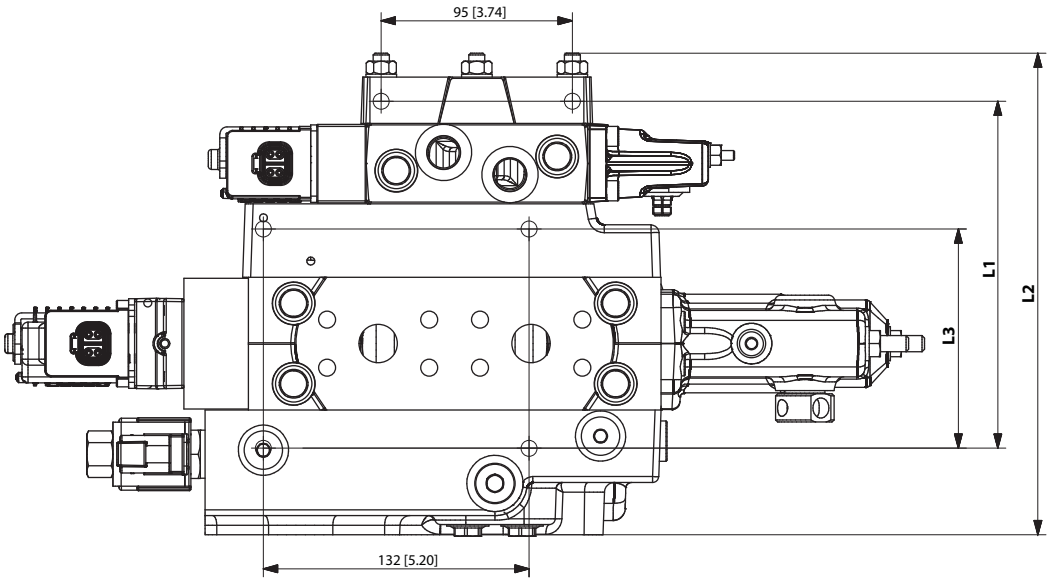
There is a horizontal difference 62.5 mm [2.46 in] in the mounting plane of the PVG 120/PVG 16.

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:*

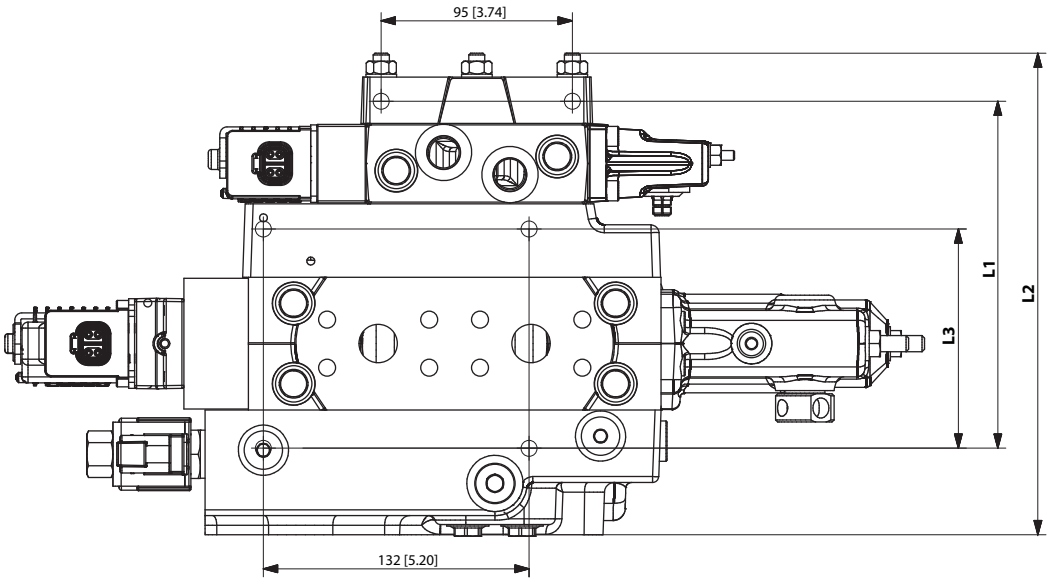
**(Numbers of PVB 128 x 16.9) + (numbers of PVB 16 x 3,67) + 17.5 = Weight in kg**

**(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:*

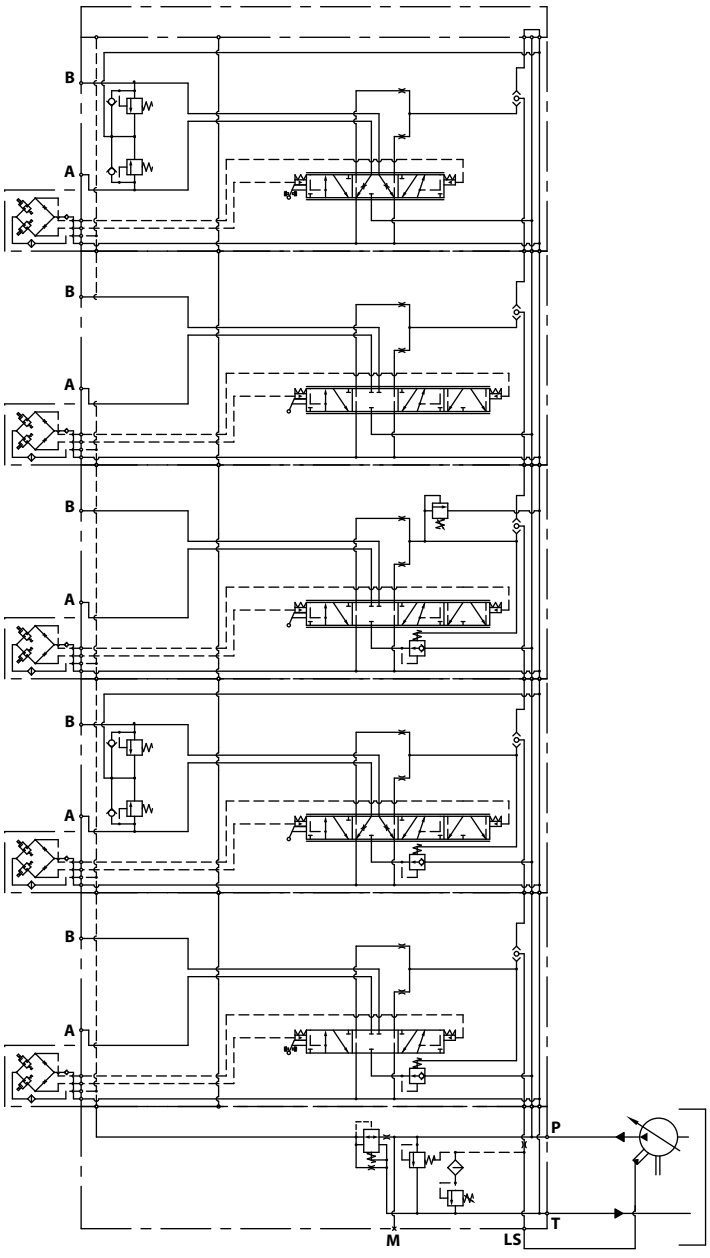
**(Numbers of PVB 256 x 20.9) + (numbers of PVB 16 x 3,67) + 17.5 = Weight in kg**

**(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

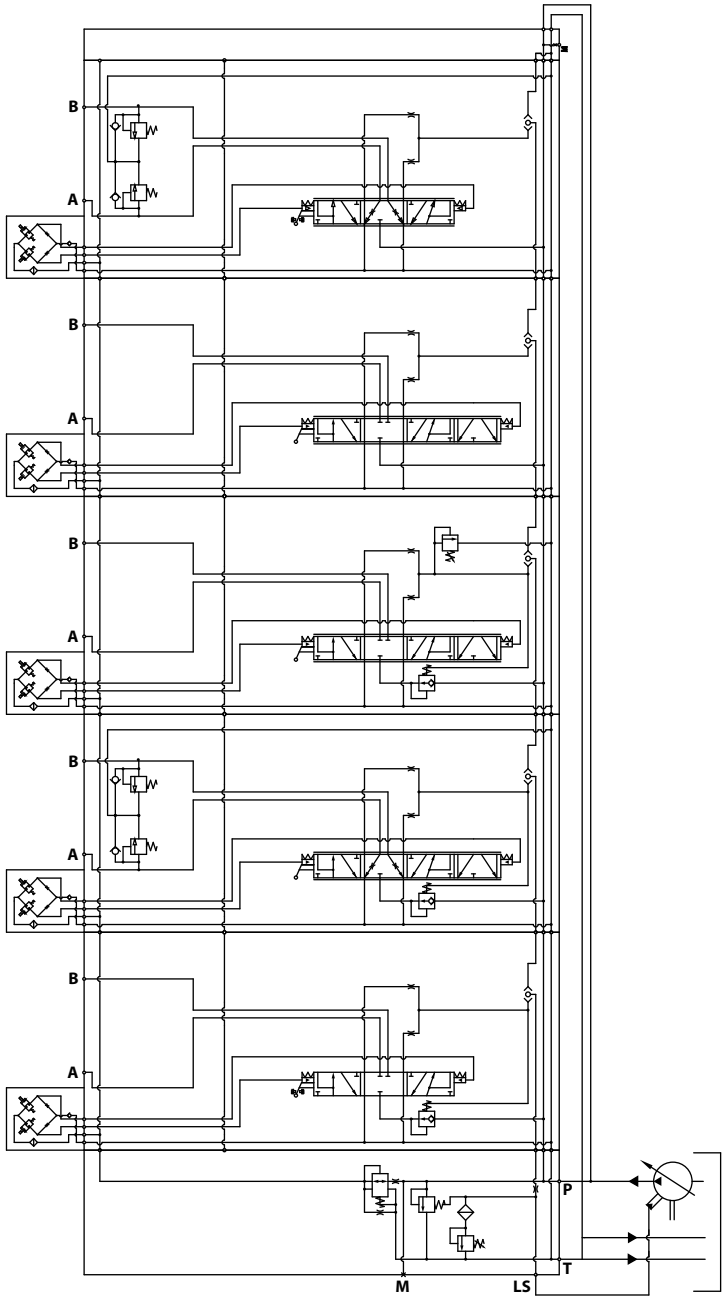
The schematic example of PVG 16 with basic end plate.



## 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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