PVE Technical Data

Technical data for PVEO and PVEM

Supply voltage U_{DC}	rated	12 V DC	24 V DC
	range	11 V to 15 V	22 V to 30 V
	max. ripple	5%	
Current consumption at rated voltage		0.65 A @ 12 V	0.33 A @ 24 V
Signal voltage (PVEM)	neutral	0.5 x U_{DC}	
	A-port ↔ B-port	0.25 • U_{DC} to 0.75 • U_{DC}	
Signal current at rated voltage (PVEM)		0.25 mA	0.50 mA
Input impedance in relation to 0.5 • U_{DC}		12 KΩ	
Power consumption		8 W	

Reaction time for PVEO and PVEM

Supply voltage	**Function**		**PVEO ON/OFF s**	**PVEO-R ON/OFF s**	**PVEM Prop. medium s**
Disconnected by means of neutral switch	Reaction time from neutral position to max. spool travel	max.	0.235	0.410	0.700
		rated	0.180	0.350	0.450
		min.	0.120	0.250	0.230
Disconnected by means of neutral switch	Reaction time from max. spool travel to neutral position	max.	0.175	0.330	0.175
		rated	0.090	0.270	0.090
		min.	0.065	0.250	0.065
Constant voltage	Reaction time from neutral position to max. spool position	max.	-	-	0.700
		rated	-	-	0.450
		min.	-	-	0.230
Constant voltage	Reaction time from max. spool travel to neutral position	max.	-	-	0.700
		rated	-	-	0.450
		min.	-	-	0.230
Hysteresis *		rated	-	-	20%

* Hysteresis (control signal/spool travel) is indicated at rated voltage and f = 0.02 Hz for one cycle. (one cycle = neutral → full A → full B → neutral)

Technical data for PVEA, PVEH and PVES

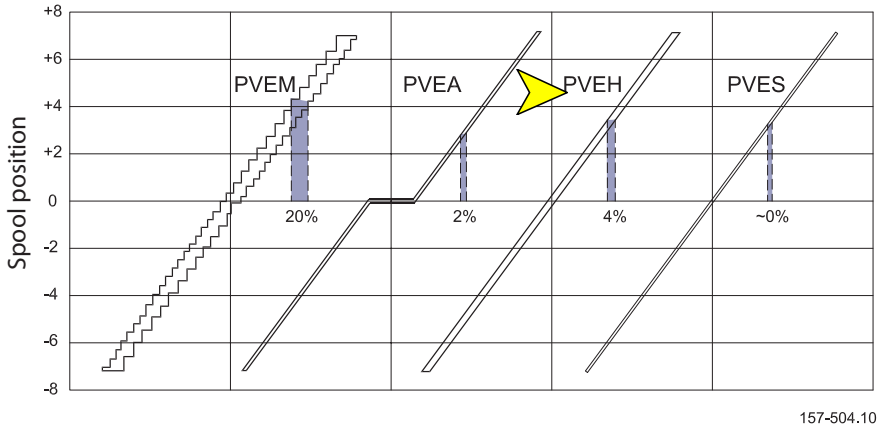
PVEA, PVEH and PVES				
Supply voltage U_{DC}		rated	11 V to 32 V	
		range	11 V to 32 V	
		max. ripple	5%	
Current consumption at rated voltage		PVEH/PVES (PVEA)	0.57 (0.33) A @ 12 V	0.3 (0.17) A @ 24 V
Signal voltage		neutral	0.5 x U_{DC}	
		A-port ↔ B-port	0.25 • U_{DC} to 0.75 • U_{DC}	
Signal current at rated voltage			0.25 mA to 0.70 mA	
Input impedance in relation to 0.5 • U_{DC}			12 KΩ	
Input capacitor			100 ηF	
Power consumption		PVEH/PVES (PVEA)	7 (3.5) W	
(PVEH/PVES)		Max. load	100 mA	60 mA
	Active	Reaction time at fault	500 ms (PVEA: 750 ms)	
	Passive	Reaction time at fault	250 ms (PVEA: 750 ms)	

PVE Technical Data (continued)

Reaction time for PVEA, PVEH and PVES

Supply voltage	Function		PVEA Prop. fine s	PVEH Prop. high s	PVES Prop. super s
Disconnected by means of neutral switch	Reaction time from neutral position to max. spool travel	max.	0.50	0.23	0.23
		rated	0.32	0.15	0.15
		min.	0.25	0.12	0.12
Disconnected by means of neutral switch	Reaction time from max. spool travel to neutral position	max.	0.55	0.175	0.175
		rated	0.40	0.09	0.09
		min.	0.30	0.065	0.065
Constant voltage	Reaction time from neutral position to max. spool travel	max.	0.50	0.20	0.20
		rated	0.32	0.12	0.12
		min.	0.25	0.05	0.05
Constant voltage	Reaction time from max. spool travel to neutral position	max.	0.25	0.10	0.10
		rated	0.20	0.09	0.09
		min.	0.15	0.065	0.065
Hysteresis *		rated	2%	4%	~ 0%

*Typical hysteresis characteristics for control signal vs spool travel af different PVE types**



* Hysteresis (control signal/spool travel) is indicated at rated voltage and f = 0.02 Hz.
(one cycle = neutral → full A → full B → neutral)

The following technical data are from typical test results. For the hydraulic system a mineral based hydraulic oil with a viscosity of 21 mm^2/s [102 SUS] and a temperature of 50 °C [122 °F] were used.

PVE Technical Data (continued)

Pilot oil consumption PVEA, PVEH, PVES, PVEO and PVEM

Function	PVEA Prop. fine	PVEH Prop. high	PVES Prop. super	PVEO ON/OFF	PVEM Prop. medium
Neutral without supply voltage	0	0	0.3 l/min [0.079 US gal/min]	0	0
Locked with supply voltage	0.4 l/min [0.106 US gal/min]	0.1 l/min [0.026 US gal/min]	0.1 l/min [0.026 US gal/min]	0.1 l/min [0.026 US gal/min]	0.1 l/min [0.026 US gal/min]
One actuation (neutral → max) with supply voltage	2 cm^3 [0,12 in^3]				
Continuous actuations with supply voltage	1 l/min [0.26 US gal/min]	0.7 l/min [0.185 US gal/min]	0.8 l/min [0.211 US gal/min]	0.7 l/min [0.185 US gal/min]	0.5 l/min [0.132 US gal/min]

Oil viscosity *	**recommended range**	12 - 75 mm^2/s	[65 - 347 SUS]
	minimum	4 mm^2/s	[39 SUS]
	maximum	460 mm^2/s	[2128 SUS]
Oil temperature	**recommended range**	30 - 60˚C	[86 -140˚F]
	minimum	-30˚C	[-22˚F]
	maximum	90˚C	[194˚F]
Ambient temperature	**recommended range**	-30° → 60°C	[-22° → 140°F]
Filtering in the hydraulic system		Max. allowed degree of contamination: 23/19/16 (ISO 4406, 1999 version)	

* Max. start up viscosity 2500 mm^2/s.

PVPX, Electrical LS Unloading Valve

Technical data for PVPX

Max. operating pressure		350 bar [5075 psi]	
Enclosure to IEC 529		IP65	
Max. pressure drop at an oil flow of 0.1 l/min [2.6 US gal/min]		2 bar [30 psi]	
Oil temperature (Inlet)	Recommended temperature	30°C to 60°C [86°F to 140°F]	
	Min. temperature	-30°C [-22°F]	
	Max. temperature	90°C [194°F]	
Max. coil surface temperature		155°C [311°F]	
Ambient temperature		-30°C to 60°C [-22°F to 140°F]	
Oil viscosity	Operating range	12 to 75 mm^2/s [65 to 347 SUS]	
	Min. viscosity	4 mm^2/s [39 SUS]	
	Max. viscosity	460 mm^2/s [2128 SUS]	
Response time for LS pressure relief		300 ms	
Rated voltage		12 V	24 V
Max. premissible deviation from rated supply voltage		± 10%	
Current consumption at rated voltage	at 22°C [72°F] coil temperature	1.55 A	0.78 A
	at 110°C [230°F] coil temperature	1 A	0.5 A
Power consumption	at 22°C [72°F] coil temperature	19 W	
	at 110°C [230°F] coil temperature	12 W	

Electrical control of PVG

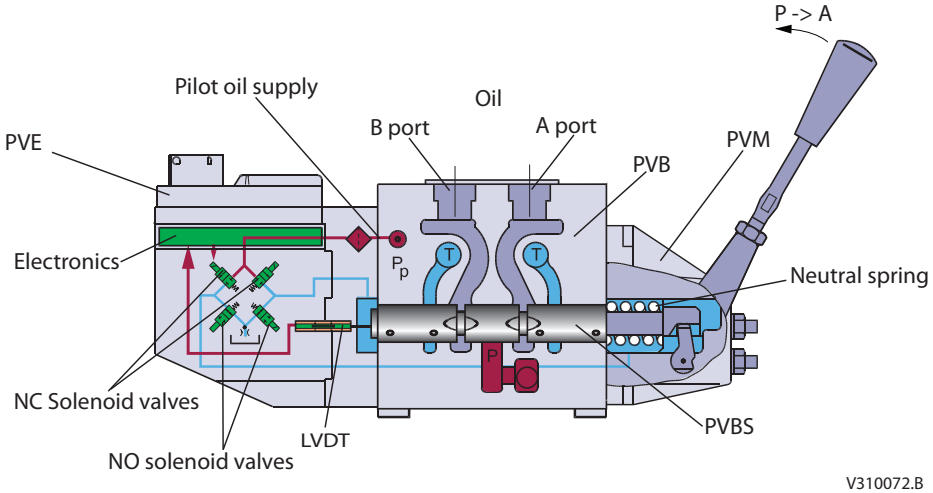
Valve actuation with electrical actuators has been supported by Sauer-Danfoss for a long time. The actuation can be controlled directly by joystick, by a PLUS+1 controller or by a broad range of third part controllers.

The actuator controls the spool by building up pilot oil pressure on the end of the spool. For the PVE a pilot oil pressure between 10 and 15 bar is used. For the PVHC a pilot oil pressure between 20 and 25 bar is used.

PVG with PVE

F500113

Valve section with naming - standard mounted - seen from PVP



V310072.B

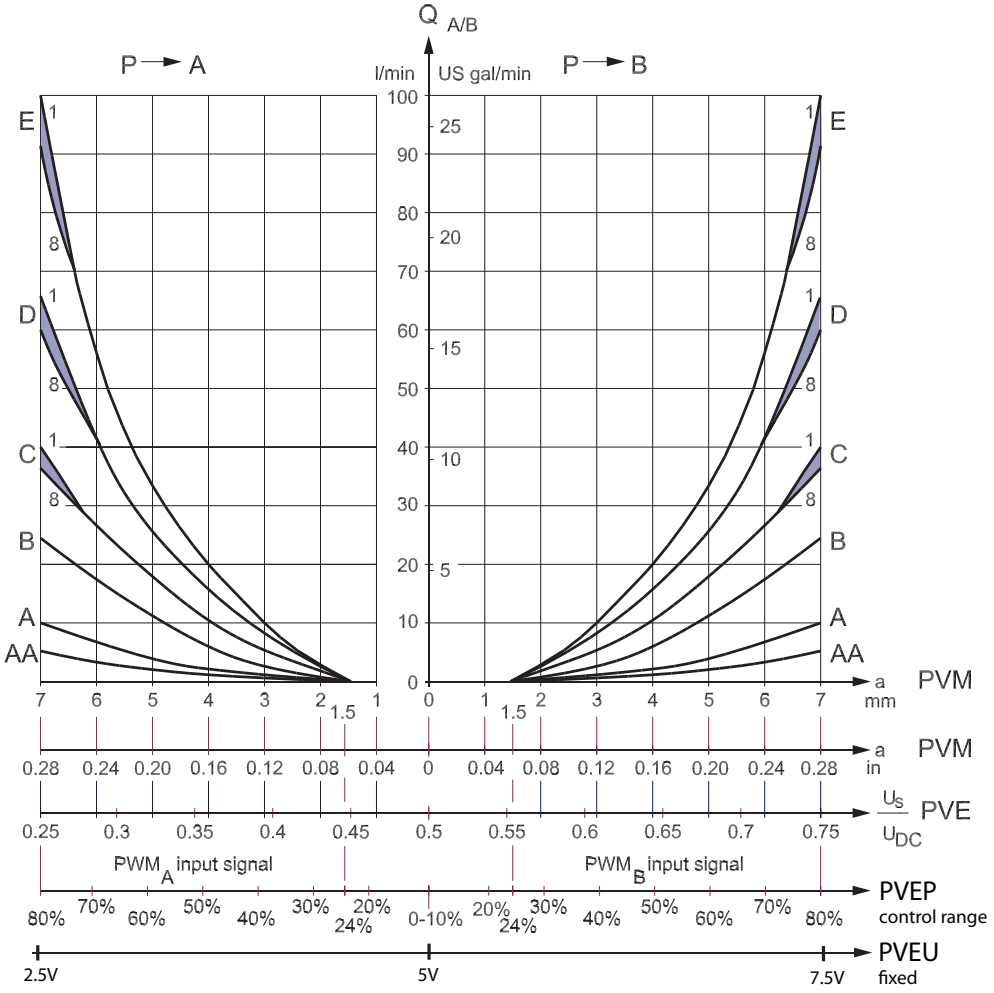
A detailed description of the variants is presented in the *PVE-Series 4 for PVG 32, PVG 100 and PVG 120 Technical Information,* **520L0553**, covers all analogue PVE – PVEO, PVEH, PVES, PVEA, PVEM, PVEU, PVEP – and the current controlled PVHC.

Electrohydraulic Actuator – PVED-CC Series 4 Technical Information, **520L0665**, covers the ISOBUS/SAE J1939 CAN controlled PVED-CC.

Electrohydraulic Actuator – PVED-CX Series 4 Technical Information, **11070179**, covers the IEC61508 SIL2 certified CANopen controlled PVED-CX.

Electrical control of PVG (continued)

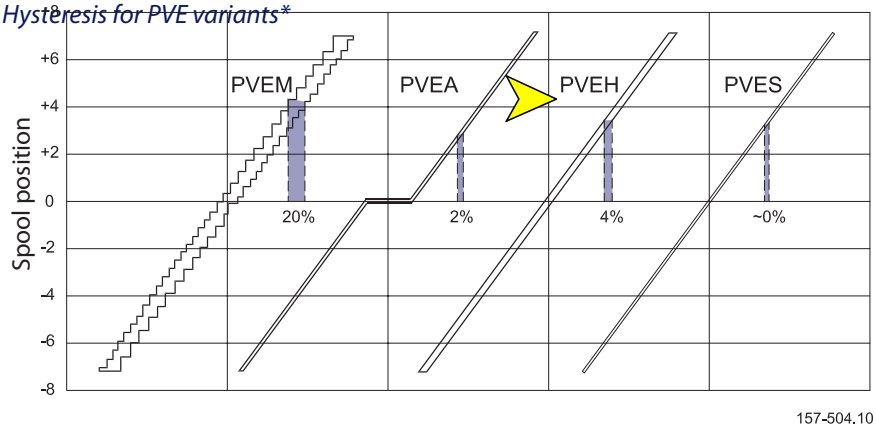
PVE characteristic – control by voltage



Closed loop control

The PVE variants PVEA/H/M/S/U/P and the PVED-CC/-CX has a closed loop control supported by a spool position sensor that ensures integrity towards flow forces and oil viscosity.

*Hysteresis for PVE variants**



Hysteresis (Control signal /spool travel) is indicated at rated voltage and f = 0.02 Hz for one cycle (one cycle = neutral → full A → full B → neutral).

The values are typical test data for exact ranges, see *PVE Technical Information*, **520L0553**.

- PVEU is available with PVEH and PVES hysteresis
- PVEP, PVED-CC and PVED-CX are available with PVES hysteresis

The standard PVE's are proportional activated actuator except PVEO which is on/off. The PVE's have fault-monitoring.

Fault monitoring overview

Type	Fault monitoring	Delay before error out	Error mode	Error output status	Fault output on PVE [1]	LED light	Memory (reset needed)
PVEO PVEM	No fault monitoring	–	–	–	–	–	–
PVEA PVEH PVEP PVES PVEU	Active	500 ms (PVEA: 750 ms)	No fault	Low	< 2 V	Green	–
			Input signal faults	High	~U_{DC}	Flashing red	Yes
			Transducer (LVDT)			Constant red	
			Close loop fault				
	Passive	250 ms (PVEA: 750 ms)	No fault	Low	< 2 V	Green	–
			Input signal faults	High	~U_{DC}	Flashing red	No
			Transducer (LVDT)			Constant red	
			Close loop fault				
PVE Float six pin	Active	500 ms	Float not active	High	~U_D	Constant red	Yes
		750 ms	Float still active				

1) Measured between fault output pin and ground.

PVEO

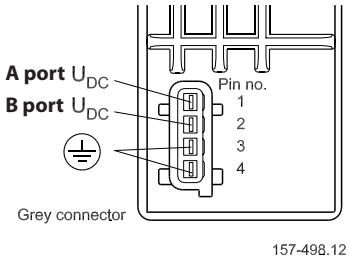
The PVEO is an on/off activated actuator. The PVEO has not fault-monitoring.

Variants:
- PVEO-R with a ramp delayed actuation
- PVEO-DI with direction indication feedback
- Anodized aluminum block
- ATEX certified

Power supply:
- 12V
- 24V

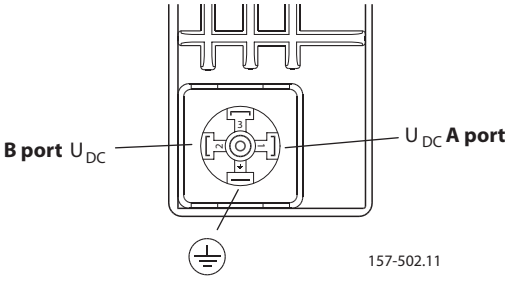
Connectors:
- Deutsch
- AMP
- DIN/Hirshmann

AMP version of PVEO/PVEO–R



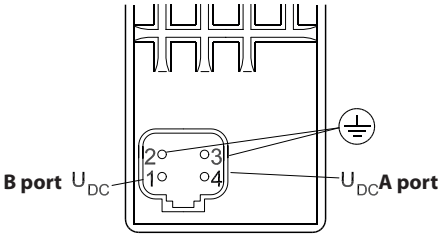
157-498.12

Hirschmann/DIN version of PVEO / PVEO–R



157-502.11

Deutsch version of PVEO



157-760.13

PVEM

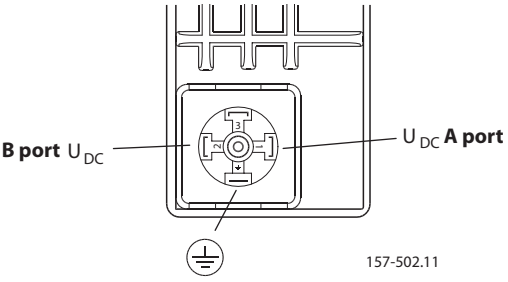
The PVEM is a proportional activated actuator. The PVEM has not fault-monitoring.

Variants:
- PVEM -R with a ramp delayed actuation
- PVEM for float in B-direction and max flow B at 4.8mm

Power supply:
- 12V
- 24V

Connectors:
- DIN/Hirshmann

Hirschmann/DIN version of PVEO / PVEO–R



157-502.11

PVEA/H/S/U

Variants:

- -F for float in B-direction and max flow B at 4.8 mm
- -F for float in A-direction and max flow A at 5.5 mm
- PVES-SP with spool position feedback
- Anodized aluminum block
- ATEX certified

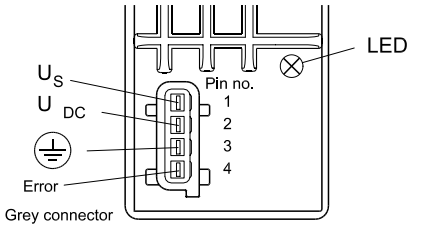
Power supply:

- 11-32V

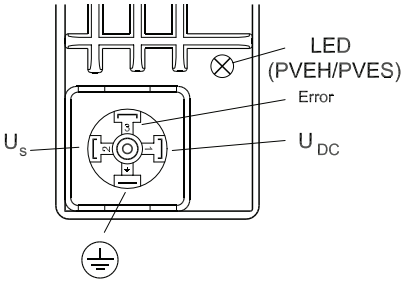
Connectors:

- Deutsch
- AMP
- DIN/Hirshmann

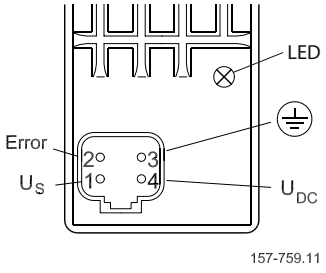
AMP version PVEA/PVEH/PVES/PVEU/PVEH-Float A



Hirschmann/DIN version PVEH/PVEM/ PVES/PVEH float B/PVEM float B



Deutsch version PVEA/PVEH/PVES/PVEU/ PVEH-Float B



PVEP

The PVEP is controlled with separate PWM control signals for A and B direction. The PVEP has hysteresis and fault monitoring like the PVES.

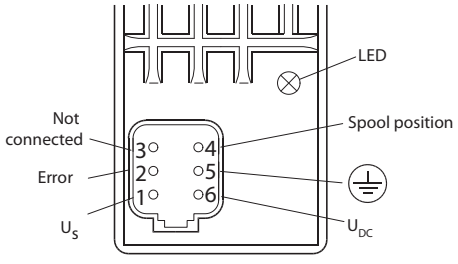
Power supply:

- 11-32V

Connectors:

- Deutsch

Deutsch version PVEP



PVED-CC and PVED-CX

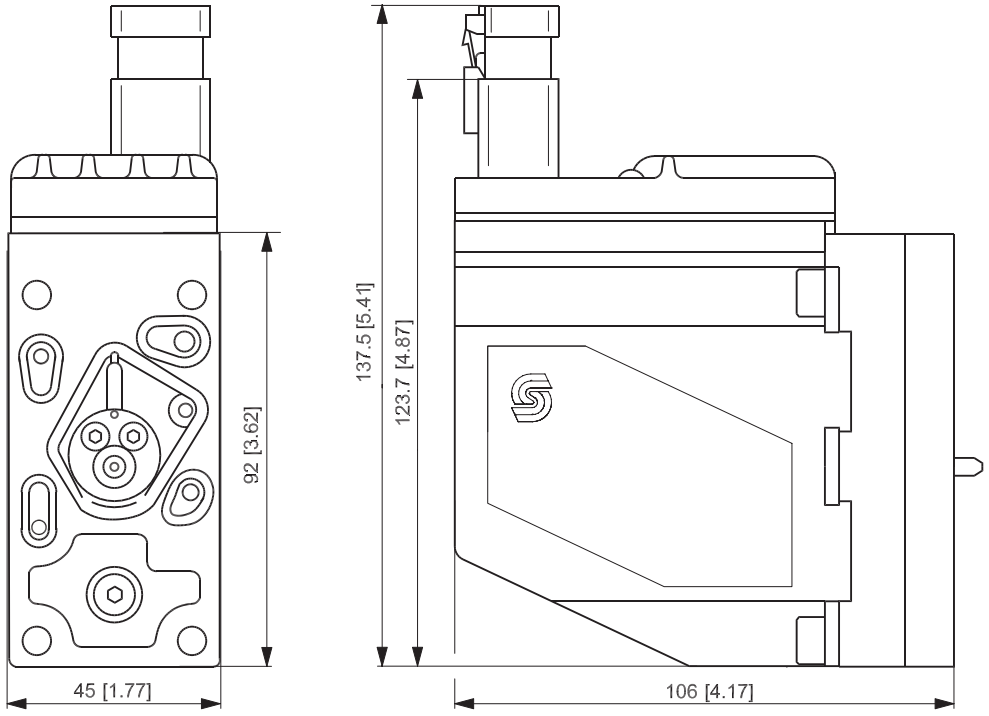
The CAN controlled PVE embedded microcontrollers support the same high spool controllability as the PVES and additional has high quality feedbacks, safety monitoring and detailed diagnostics.

PVED has digital communication, that allows a wide range of feedback, setpoint and highly costumized settings. CAN-Bus serial communication makes wiring much easier. Only one cable per PVG group.

Power supply:
- 11-32V

Connectors:
- Deutsch
- AMP (PVED-CX only AMP)

PVE with Deutsch connector incl. female connector

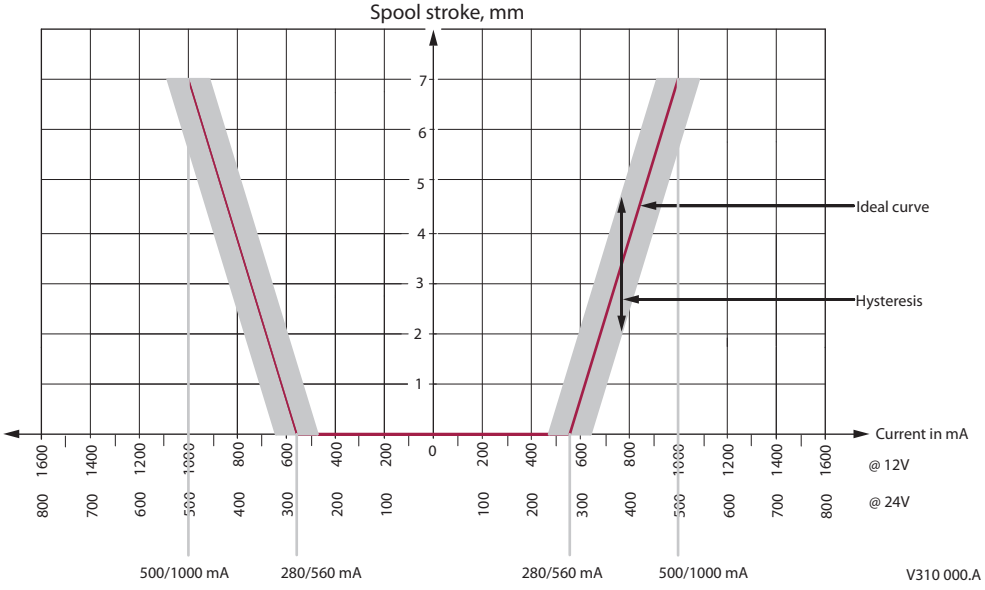


For more information on PVED please see the *Electrohydraulic Actuator - PVED-CC Series 4 Technical Information*, **520L0665**.

PVHC

The PVHC is controlled with separate PWM control signals for A and B direction. The PVHC has not fault-monitoring nor closed loop spool control.

Spool stroke vs current

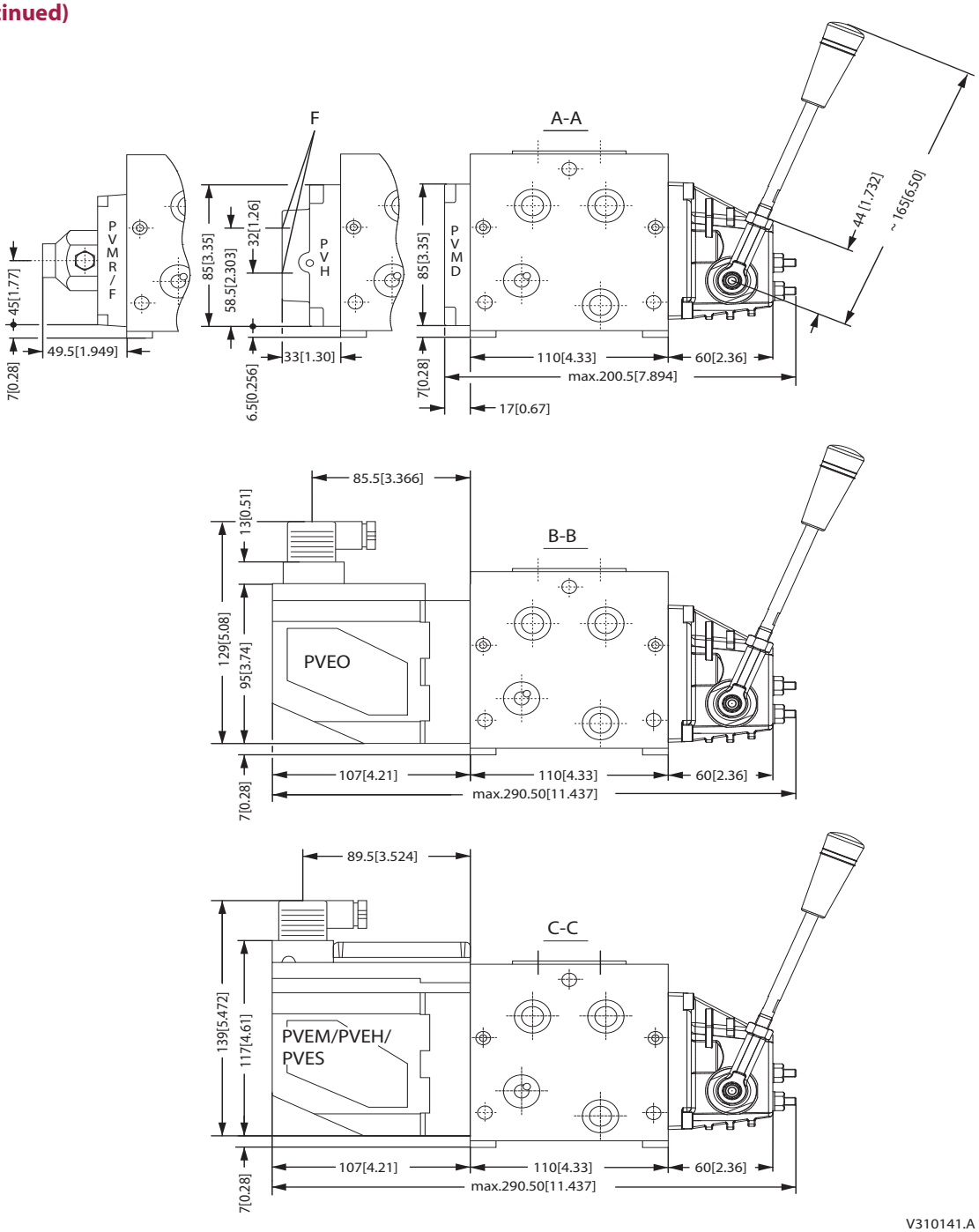


The ideal curve is determined by the main spool neutral spring. The hysteresis is affected by viscosity, friction, flow forces, dither frequency and modulation frequency.

Power supply:
- 12V
- 24V

Connectors:
- Deutsch
- AMP

Dimensions (continued)



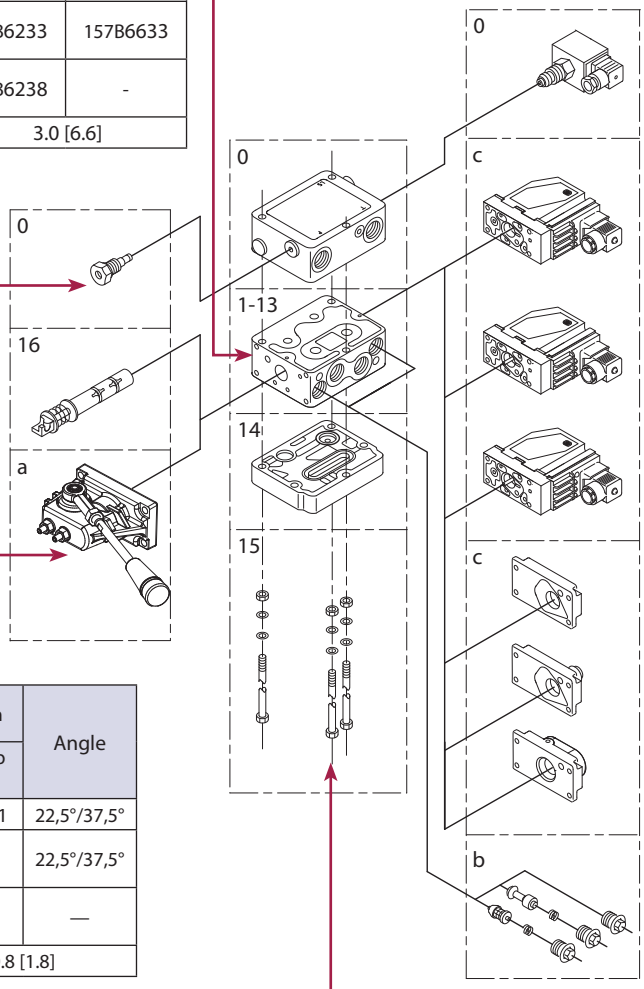
F: G 1/4, 12 mm deep [1/2 in - 20, 0.47 in deep]

PVB, basic valves

Description	No facilities for shock valves A and B		Facilities for shock valves A and B	
	G ½	⅞ - 14 UNF	G ½	⅞ - 14 UNF
Without compensator /check valve	157B6000	157B6400	157B6030	157B6430
With check valve	157B6100	157B6500	157B6130	157B6530
With check valve and $LS_{A/B}$ shuttle valve	-	-	157B6136	157B6536
With compensator valve	157B6200	157B6600	157B6230	157B6630
With damped compensator valve	157B6206	-	157B6236	-
With compensator valve, $LS_{A/B}$ relief valve and $LS_{A/B}$ shuttle valve	157B6203	157B6603	157B6233	157B6633
With damped compensator valve, $LS_{A/B}$ relief valve and $LS_{A/B}$ shuttle valve	157B6208	-	157B6238	-
Weight kg [lb]	3.1 [6.8]		3.0 [6.6]	

PVPC, plugs

Description	G ½	½ in - 20	Weight kg	Weight [lb]
External pilot supply	157B5400	—	0.05	0.1
External pilot supply incl. check valve	157B5600	157B5700	0.05	0.1



V310168.A

PVM, mechanical actuation

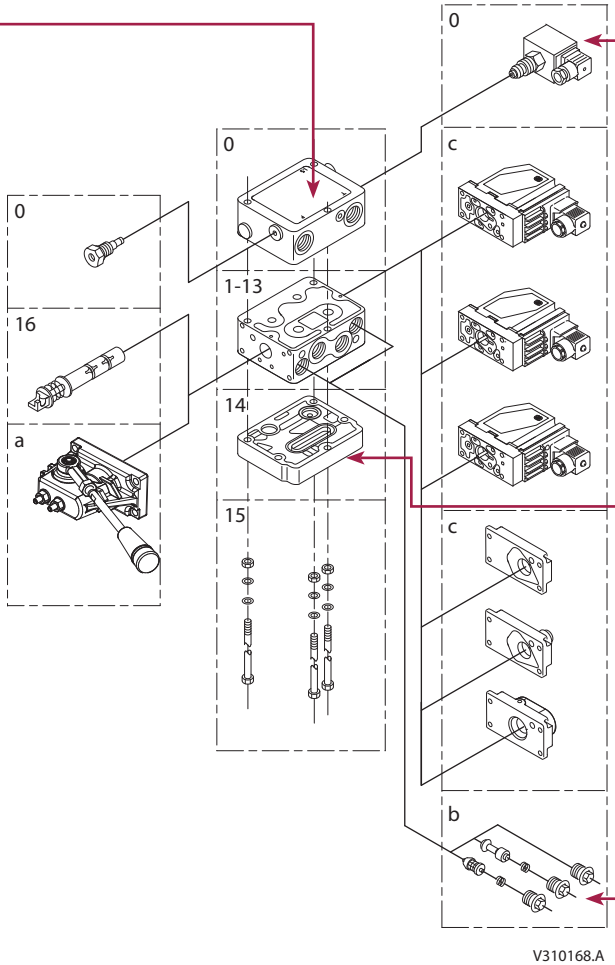
Description	Alu		Alu anodized	Cast iron	Angle
	with stop screws	without stop screws	with stop screws	with stop screws	
Standard	157B3171	157B3191	157B3184	157B3161	22,5°/37,5°
Standard with base, without arm and button	157B3174	157B3194	—	—	22,5°/37,5°
Standard without base, without arm and button	157B3173	157B3193	157B3186	—	—
Weight kg [lb]	0.4 [0.9]			0.8 [1.8]	

PVAS, assembly kit

Code no.	0	1	2	3	4	5	6	7	8	9	10	11	12
PVB's	157B8000	157B8001	157B8002	157B8003	157B8004	157B8005	157B8006	157B8007	157B8008	157B8009	157B8010	157B8061	157B8062
PVB + PVPVM	-	157B8021	157B8022	157B8023	157B8024	157B8025	157B8026	157B8027	157B8028	157B8029	157B8030	157B8081	157B8082
Weight kg [lb]	0.1[0.2]	0.15 [0.3]	0.25 [0.6]	0.30 [0.7]	0.40 [0.9]	0.45 [1.0]	0.50 [1.1]	0.60 [1.3]	0.65 [1.4]	0.70 [1.6]	0.80 [1.7]	0.85 [1.8]	0.9 [2.0]

PVP, pump side module

Description		Without pilot supply		With pilot supply			
		for PVE	for PVE with facilit. for PVPX	for PVE	for PVE and facilit. for PVPX	for PVE and pilot oil pressure take-off	for PVH and pilot oil pressure take-off
Open center	P = G1/2, T = G3/4	157B5000	-	157B5010	157B5012	-	-
	P = 7/8 -14, T = 1 1/16 -12	157B5200	-	157B5210	157B5212	-	-
	P = G3/4, T = G3/4	157B5100	157B5102	157B5110	157B5112	157B5180	157B5190
	P = 1 1/16 -12, T = 1 1/16 -12	157B5300	-	157B5310	157B5312	157B5380	157B5390
Closed center	P = G1/2, T = G3/4,	157B5001	-	157B5011	157B5013	-	-
	P = 7/8 -14, T = 1 1/16 -12	157B5201	-	157B5211	157B5213	-	-
	P = G3/4, T = G3/4,	157B5101	157B5103	157B5111	157B5113	157B5181	157B5191
	P = 1 1/16 -12, T = 1 1/16 -12	157B5301	-	157B5311	157B5313	157B5381	157B5391
Weight	kg [lb]	3 [6.6]					



PVPX, electrical LS pressure relief valves

Description/ Supply voltage		Code No. Hirsch.	Code No. AMP	Weight kg [lb]
Normally open	12 V	157B4236	157B4981	0.3 [0.7]
	24 V	157B4238	157B4982	
Normally closed	12 V	157B4246	157B4983	
	24 V	157B4248	157B4984	
Normally open with manual override	12 V	157B4256	157B4985	
	24 V	157B4258	157B4986	
Plug		157B5601		0.06 [.13]

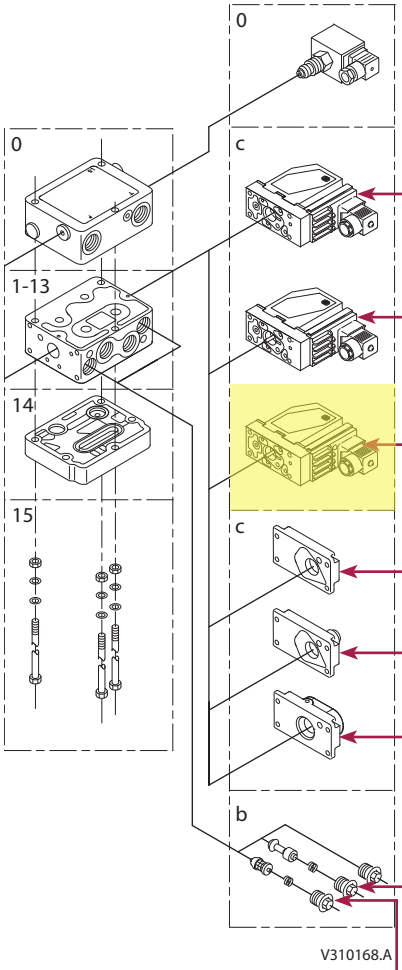
PVS and PVSI, End plate

Description	BSP	SAE	Weight kg [lb]
PVS, without connections	157B2000	157B2020	0.5 [1.1]
PVS, with LX connection G 1/8 [3/8 -24 UNF]	157B2011	157B2021	
PVSI, without connections	157B2014	157B2004	1.7 [3.6]
PVSI, with LX connections G 1/4 [1/2 -20 UNF]	157B2015	157B2005	

PVLP, shock/ and anti-cavitation valves

Code no.		157B2032	157B2050	157B2063	157B2080	157B2100	157B2125	157B2140	157B2150	157B2160	157B2175	157B2190
Settings	bar	32	50	63	80	100	125	140	150	160	175	190
	[psi]	460	725	914	1160	1450	1813	2031	2175	2320	2538	2755
Weight for all		0.05 kg [0.17 lb]										
Code no.		157B2210	157B2230	157B2240	157B2250	157B2265	157B2280	157B2300	157B2320	157B2350	157B2380	157B2400
Settings	bar	210	230	240	250	265	280	300	320	350	380	400
	[psi]	3045	3335	3480	3625	3845	4061	4351	4641	5075	5511	5801

Module Selection Chart



PVE, electrical actuation

Description		Code No. Hirsch	Code No. AMP	Code No. Deut.	Weight kg [lb]
PVEO, on-off	12 V	157B4216	157B4901	157B4291	0.6 [1.3]
	24 V	157B4228	157B4902	157B4292	
PVEO-R, on/off	12 V	157B4217	157B4903	-	
	24 V	157B4229	157B4904	-	
PVEM, prop. medium – Standard	12 V	157B4116	-	-	0.9 [2.0]
	24 V	157B4128	-	-	
PVEM, prop. medium – Float -> B	12 V	157B4416	-	-	1.0 [2.2]
	24 V	157B4428	-	-	
PVEA, active fault mon.		-	157B4734	157B4792	0.9 [2.0]
PVEA, passive fault mon.		-	157B4735	-	
PVEA-DI, active fault mon.		-	157B4736	157B4796	
PVEA-DI, passive fault mon.		-	157B4737	-	
PVEH active fault mon.		157B4032	157B4034	157B4092	1.0 [2.2]
PVEH passive fault mon.		157B4033	157B4035	157B4093	
PVEH float -> B, act. fault		157B4332	-	157B4392	
PVEH float -> A, act. fault		-	157B4338	-	
PVEH- DI active fault mon.		-	157B4036	157B4096	
PVEH - DI passive fault mon.		-	157B4037	-	
PVES, active fault mon.		157B4832	157B4834	157B4892	
PVES, passive fault mon.		157B4833	157B4835	-	

PVMD, PVMR, PVMF, PVH covers

Description	Code No.	Material	Anodized	Weight kg [lb]
PVMD Cover for PVB	157B0001	aluminium	no	0.1 [0.2]
	157B0009		yes	
	157B0021	cast iron	N/A	0.9 [2.0]
PVMR (Frict. Detent)	157B0004	aluminium	no	0.3 [0.6]
	157B0012		yes	
	157B0024	cast iron	N/A	
PVMF (Mech. float position)	157B0005	aluminium	no	
Hydraulic actuation PVH 9/16-18 UNF	157B0007	aluminium	no	0.2 [0.4]
	157B0010		yes	
	157B0014	cast iron	N/A	
Hydraulic actuation PVH G1/4	157B0008	aluminium	no	
	157B0011		yes	
	157B0016	cast iron	N/A	0.9 [2.0]

PVLA, anti-cavitation valve

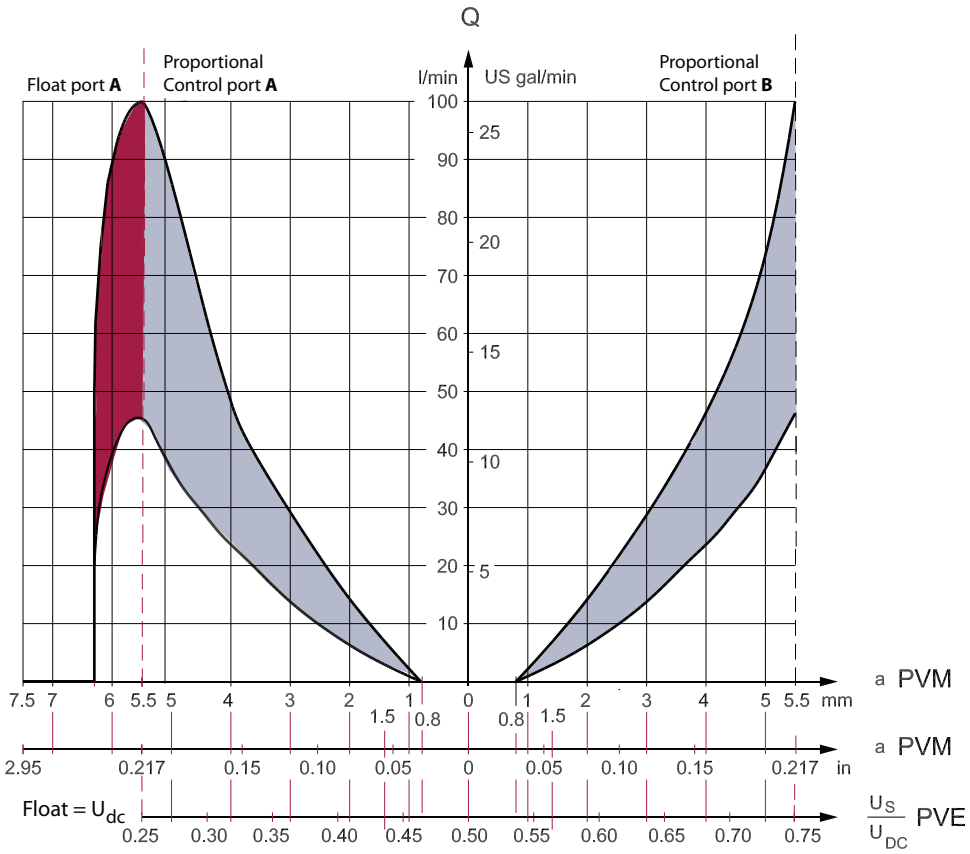
Description	Code No.	Weight kg	Weight [lb]
Plug A or B	157B2002	0.04	0.09
Valve A or B	157B2001	0.05	0.1

PVE control

Variants of the float spool PVBS

Float	PVE	PVBS	Progressive control	Float control
A	PVEH-F (6 pin)	Dead band 0.8 mm Max float at 5.5 mm	U_S: 25% -> 75% U_{DC}	U_{DC} to float pin Has priority
B	PVEH-F (4 pin)	Dead band 1.5 mm Max float at 4.8 mm	U_S: 35% -> 65% U_{DC}	U_S= 75% U_{DC}

PVE characteristic – Float A



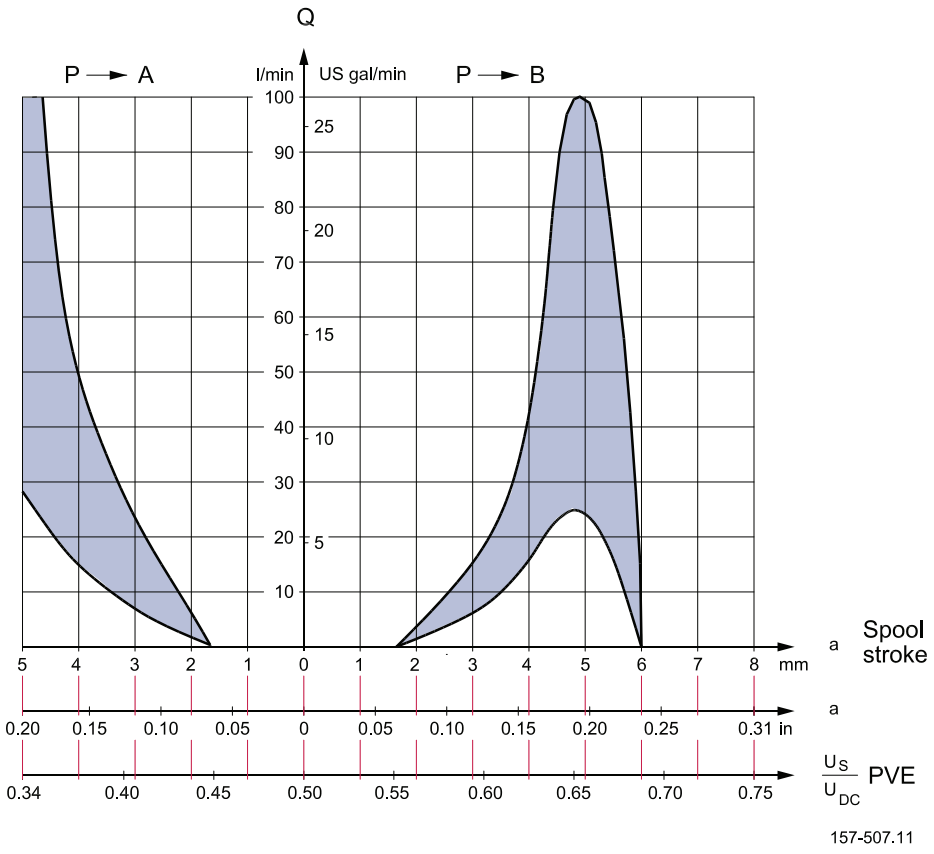
PVBS maximum float is 5.5 mm [0.22 in].

PVE has six pins.

Float when special pin powered at U_{DC}.

PVE control

PVE characteristic – Float B



PVBS maximum float is 4.8 mm [0.19 in].

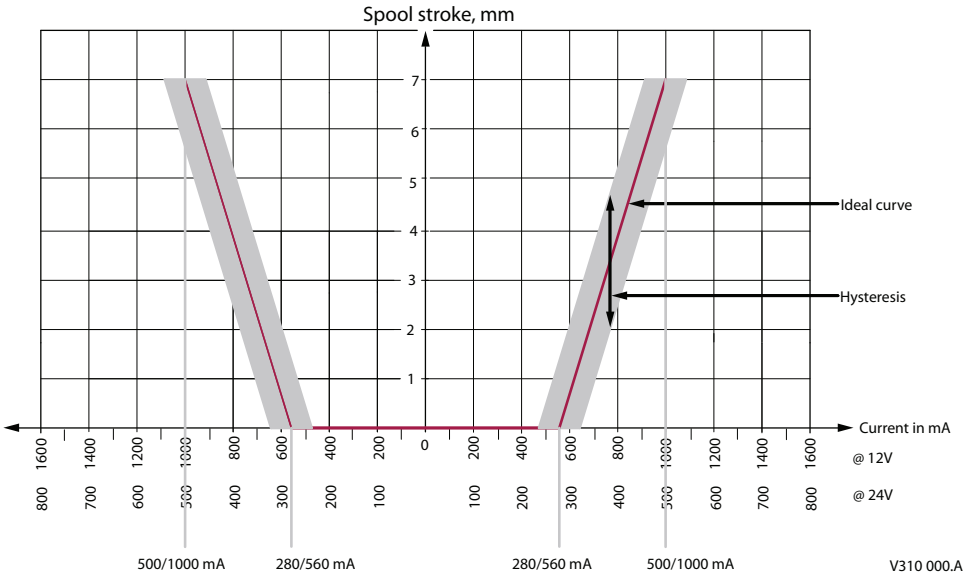
PVE has four pins.

Float at $U_S / U_{DC} = 0.75$

PVE control

PVHC control

PVHC characteristic



PVHC current response and hysteresis @ 25 bar Pp, 21 ctS, 25 °C. The PVHC control is done by dual Pulse Width Modulated (PVM) high current supply 100-400 Hz PWM control signals.

The PVHC does not have fault monitoring and internal closed loop control of the spool.

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

The spool position will shift when conditions are changed e.g. temperature change.

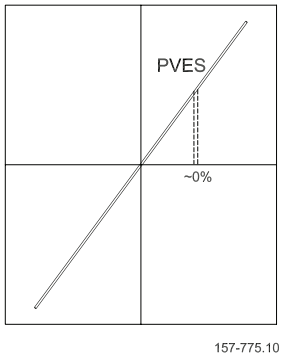
For PVG controlled by PVHC hysteresis is influenced by lever (PVM).

PVE hysteresis

The controllability of the PVE depends on the solenoid valve bridge and the electronic capacity of the module. Hysteresis is a measurement on spool position precision and repeatability. Hysteresis is not a description of position maintaining.

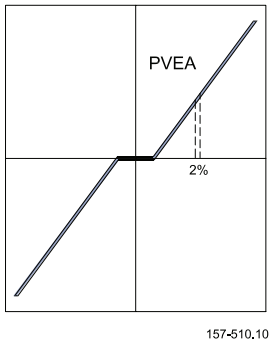
PVES Series 4

PVES voltage, position diagram



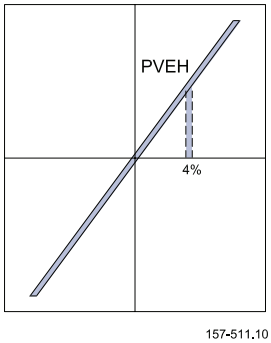
PVEA Series 4

PVEA voltage, position diagram



PVEH Series 4

PVEH voltage, position diagram



PVE control

PVES Series 4

The PVES has an ASIC closed loop circuit and the NC-S solenoids.

PVEA Series 4

The PVEA has an ASIC closed loop circuit, standard NC solenoids and orifice instead of NO solenoids.

Caution

PVEA is not for use on PVG 100.

PVEH Series 4

The PVEH has an ASIC closed loop circuit and the standard NC solenoids.

PVE hysteresis overview

PVE	S	A	H	M
Maximum	2 %	6 %	6 %	35 %
Typical	<½ %	2 %	4 %	25 %

- PVEP has the PVES characteristic.
- PVEU is available with both standard PVEH and super fine PVES characteristic.
- PVHC has hysteresis like PVEM at fixed temperature and viscosity. (For PVHC temperature and viscosity shifts control signal effect.)

Example of PVE use

Signal leads must not act as supply leads at the same time unless the distance between the actuator module PVE and terminal board is less than 3 m [3.3 yards] and the lead cross-section is min. 0.75 mm^2 [AWG 18].

PVE's for PVG 32

Series 0			Series 4		
Code	Type	Voltage	Code	Type	Voltage
157B4012	PVEH	12V	157B4032	PVEH	11-32V
157B4024	PVEH	24V			
157B4054	PVEH-Ex	24V	157B4063	PVEH-Ex	24V
157B4082	PVEH	12V	157B4033	PVEH	11-32V
157B4084	PVEH	24V			
157B4112	PVEM	12V	157B4116	PVEM	12V
157B4124	PVEM	24V	157B4128	PVEM	24V
157B4212	PVEO	12V	157B4216	PVEO	12V
157B4224	PVEO	24V	157B4228	PVEO	24V
157B4255	PVEO-Ex	24V	157B4218	PVEO-Ex	24V
157B4312	PVEH	12V	157B4332	PVEH	11-32V
157B4324	PVEH	24V			
157B4412	PVEM	12V	157B4416	PVEM	12V
157B4424	PVEM	24V	157B4428	PVEM	24V
157B4472	PVEM	12V	Discontinued. PVEH with float (157B4332), which offers the same control input, can be used as replacement		
157B4512	PVEH	12V	157B4033	PVEH	11-32V
157B4524	PVEH	24V	157B4033	PVEH	11-32V
157B4612	PVEM	12V	157B4616	PVEM	12V
157B4712	PVEM	12V	Discontinued. Standard PVEH (157B4032), which offers the same control input, can be used as replacement		
157B4724	PVEM	24V			
157B4812	PVES	12V	157B4832	PVES	11-32V
157B4824	PVES	24V			

Series 1			Series 4		
Code	Type	Voltage	Code	Type	Voltage
157B4013	PVEH	12V	157B4032	PVEH	11-32V
157B4025	PVEH	24V			
157B4055	PVEH-Ex	24V	157B4063	PVEH-Ex	24V
157B4083	PVEH	12V	157B4033	PVEH	11-32V
157B4085	PVEH	24V			
157B4113	PVEM	12V	157B4116	PVEM	12V

157B4125	PVEM	24V	157B4128	PVEM	24V
157B4213	PVEO	12V	157B4216	PVEO	12V
157B4225	PVEO	24V	157B4228	PVEO	24V
157B4278	PVEO-Ex	24V	157B4218	PVEO-Ex	24V
157B4313	PVEH	12V	157B4332	PVEH	11-32V
157B4325	PVEH	24V			
157B4413	PVEM	12V	157B4416	PVEM	12V
157B4425	PVEM	24V	157B4428	PVEM	24V
157B4473	PVEM	12V	Discontinued. PVEH with float (157B4332), which offers the same control input, can be used as replacement		
157B4086	PVEH	12V	157B4033	PVEH	11-32V
157B4088	PVEH	24V	157B4033	PVEH	11-32V
157B4613	PVEM	12V	157B4616	PVEM	12V
157B4713	PVEM	12V	Discontinued. Standard PVEH (157B4032), which offers the same control input, can be used as replacement		
157B4725	PVEM	24V			
157B4813	PVES	12V	157B4832	PVES	11-32V
157B4825	PVES	24V			

Series 2/3			**Series 4**		
Code	Type	Voltage	Code	Type	Voltage
157B4016	PVEH	12V	157B4032	PVEH	11-32V
157B4028	PVEH	24V			
157B4058	PVEH-Ex	24V	157B4063	PVEH-Ex	24V
157B4066	PVEH	12V	157B4073	PVEH	11-32V
157B4068	PVEH	24V			
157B4086	PVEH	12V	157B4033	PVEH	11-32V
157B4088	PVEH	24V			
157B4116	PVEM	12V	157B4116	PVEM	12V
157B4128	PVEM	24V	157B4128	PVEM	24V
157B4172	PVEK	24V	157B4775	PVEA	11-32V
157B4216	PVEO	12V	157B4216	PVEO	12V
157B4217	PVEO-R	12V	157B4217	PVEO-R	12V
157B4228	PVEO	24V	157B4228	PVEO	24V
157B4227	PVEO	24V	157B4227	PVEO	24V
157B4229	PVEO-R	24V	157B4229	PVEO-R	24V
157B4278	PVEO-Ex	24V	157B4218	PVEO-Ex	24V

157B4266	PVEO	12V	157B4266	PVEO	12V
157B4268	PVEO	24V	157B4268	PVEO	24V
157B4272	PVEO	24V	157B4272	PVEO	24V
157B4296	PVEO	12V	157B4216	PVEO	12V
157B4316	PVEH	12V	157B4332	PVEH	11-32V
157B4328	PVEH	24V			
157B4416	PVEM	12V	157B4416	PVEM	12V
157B4428	PVEM	24V	157B4428	PVEM	24V
157B4476	PVEM	12V	Discontinued. PVEH with float (157B4332), which offers the same control input, can be used as replacement		
157B4086	PVEH	12V	157B4033	PVEH	11-32V
157B4516	PVEM	12V	157B4516	PVEM	12V
157B4088	PVEH	24V	157B4033	PVEH	11-32V
157B4528	PVEM	24V	157B4528	PVEM	24V
157B4616	PVEM	12V	157B4616	PVEM	12V
157B4628	PVEM	24V	157B4628	PVEM	24V
157B4716	PVEM	12V	Discontinued. Standard PVEH (157B4032), which offers the same control input, can be used as replacement		
157B4728	PVEM	24V			
157B4816	PVES	12V	157B4832	PVES	11-32V
157B4828	PVES	24V			
157B4886	PVES	12V	157B4833	PVES	11-32V
157B4888	PVES	24V			
157B4901	PVEO	12V	157B4901	PVEO	12V
157B4902	PVEO	24V	157B4902	PVEO	24V
157B4903	PVEO-R	12V	157B4903	PVEO-R	12V
157B4904	PVEO-R	24V	157B4904	PVEO-R	24V
157B4905	PVEO-DI	12V	157B4905	PVEO-DI	12V
157B4906	PVEO-DI	24V	157B4906	PVEO-DI	24V
157B4911	PVEK	12V	157B4734	PVEA	11-32V
157B4912	PVEK	24V	157B4735	PVEA	11-32V
157B4913	PVEK-DI	12V	157B4736	PVEA-DI	11-32V
157B4914	PVEK-DI	24V	157B4737	PVEA-DI	11-32V
157B4921	PVEB	12V	157B4034	PVEH	11-32V
157B4922	PVEB	24V			
157B4923	PVEB	12V	157B4036	PVEH-DI	11-32V
157B4924	PVEB	24V			
157B4925	PVEB	12V	157B4034	PVEH	11-32V

157B4926	PVEB	24V			
157B4927	PVEB-DI	12V	157B4036	PVEH-DI	11-32V
157B4928	PVEB-DI	24V			
157B4942	PVED-CC	12V	157B4943	PVED-CC	11-32V