

Mobile Motor/Pump

Accessories

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climate control
electromechanical
filtration
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hydraulics
pneumatics
process control
sealing & shielding



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Speed sensor for F11/F12 and V12/V14

General information

A speed sensor kit is available for series F11-12, F11-14 and F11-19, for series F12 and the I and S versions of series V12 and V14.

The sensor consists of a ferrostat differential (Dual Channel) speed sensor and a seal nut. The sensor installs in a threaded hole in the F12 or V12 bearing housing, and in the F11 barrel housing.

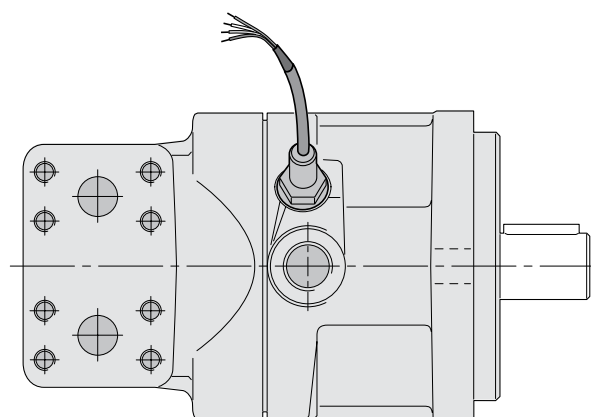
The speed sensor is directed towards the teeth of the F12 ring gear or, on the V12/V14, towards depressions in the shaft head, on F11 towards the piston.

The sensor output is a 2 phase shifted square wave signal within a frequency range of 0 Hz to 15 kHz. The sensor detects both speed and direction of rotation.

The sensor withstands high as well as low temperatures and is highly moisture protected (IP68).

Frame size	No. of pulses/rev
F11-12, 14, -19	5
F12 (all sizes)	35
V12/V14 (I and S)	36
T12/V12-060 C	9

Pulses per shaft rev



Speed sensor (installed on an F12-60).

Technical data

Power supply 11V to 32 V **protected against reverse polarity**

Current consumption (without load) Max 20 mA

Signal output - 2 phase shifted square wave signals:

- Open Collector outputs with 10KΩ pull-up, I_{max} = -20mA

The outputs are short circuit proof and protected against reverse polarity

Frequency	Min 0 Hz max 15 kHz
Insulation	Housing and electronics galvanically separated (500V/50Hz/1 min)
Operating temperature	-40 to +125 °C [-40 to +255 °F]
Sensor head pressure	Max 25 bar [360 psi]
Protection class	IP68 (DIN 40050)
Weight (incl. cable)	0.15 kg [0.33 lb]
Sensing distance	0.1 to 2.0 mm; 1.0 recom. [0.004 to 0.08 in; 0.04 recom.]
Transistor	NPN
Amplifier variant	Variant: .02 SHW Output 1: Speed Output 2: Speed Output type: Open Col. Power supply: 11-32 V

Cable

Material	PUR casting
Length	2.5 m
No. of wires	4 (plus screen; transparent)
Wire area	4 x 0.34 mm ²
Screen	Stranded metal net (insulated from housing)
NOTE:	Screen must be connected to 0 V (zero volt) power supply. Bending radius Min 50 mm [1 in]

Connection

Sensor wires are susceptible to radiated noise. Therefore, the following should be noted:

- Uninterrupted screened 4 wire cable must be used and the screen only connected to the appropriate instrument screen input terminal or 0V. Connections to power earth are not advisable.
- The sensor wires must be installed as far away as possible from electrical machines and must not run in parallel with power cables in the vicinity.

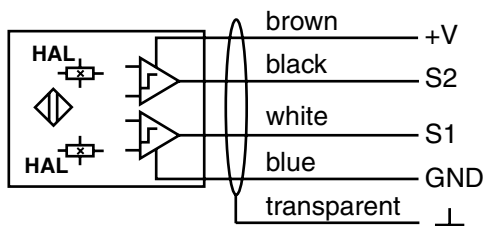
The maximum cable length that can be utilized is dependent on sensor voltage, how the cable is installed, and cable capacitance and inductance.

It is, however, always advantageous to keep the distance as short as possible.

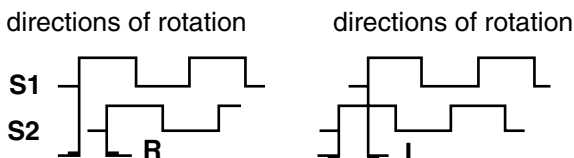
The sensor cable supplied can be lengthened via a terminal box located in an IP20 protected connection area (per DIN 40050).

Contact Parker Hannifin, Pump and Motor Division for recommendations.

Connections:



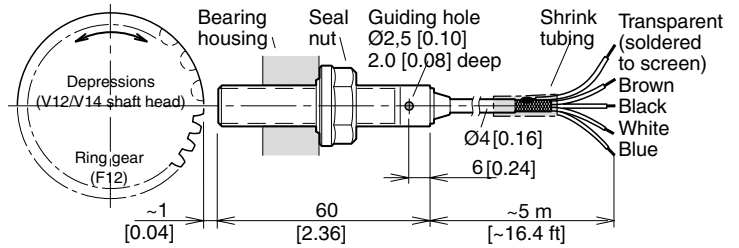
Pulse diagram:



Installation information

As the sensor has a built-in differential Hall-effect device, the sensor housing must be aligned according to the drawing of the Speed Sensor Installation picture. If it is not, the sensor may not function properly and noise immunity decreases.

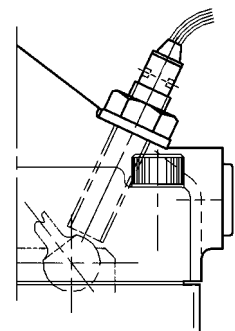
The sensor is non-sensitive to oil and the stain-less steel housing stands arduous environment conditions.



Speed sensor installation, F12, V12, V14.

Installation procedure

- Install the sensor in the threaded hole (M12x1) of the **F12/V12/V14** bearing housing; turn the sensor until its head just touches the ring gear teeth (F12) or the shaft head (V12/V14); refer to the installation drawing above.
- On **F11** the **pistons positions must be known** before mounting the sensor. Install the sensor in the threaded hole (M12x1) of the F11 barrel housing; turn the sensor until its head just touches the piston.
- When mounting the sensor in the threaded hole be sure that you also rotate the cable so the cable not get twisted.
- Back off the sensor one turn (counter clockw.).
- If required, back it off further until the sensor guiding hole centerline is parallel to the F12/V12/V14 shaft centerline (either as shown or 180° opposite).
- Tighten the seal nut; max 12 Nm (100 lb in). Be sure that the position of the guiding hole centerline still is correct.
- Connect the electrical wires as shown in the schematic. Please note the instructions on page 3 regarding screening.
- If you only use one signal, we recommend you to use S2 cable. Cut S1 cable and isolate.



F11-12, -14, -19.

Ordering information

- F11 - 014 - HB - CV - K - 000 - 000 - P
- F12 - 080 - MF - IV - K - 000 - L01 - P
- V12 - 080 - MS - SV - S - 000 - D - P - ...
- V14 - 110 - IVD - EPH3N - N000 - P - ...

P - Prepared for speed sensor

The Hydraulic motors or pumps are ordered "P" prepared for speed sensor

- The speed sensor is ordered separately:
Order kit P/N 378 5190 (sensor and seal nut).

NOTE: The speed sensor is not installed in the motor during transportation.

General information

In an open circuit, hydraulic propulsion system, there is a risk of cavitation when the vehicle is going downhill or is being braked. Cavitation occurs when the speed of the motor corresponds to a higher flow than what is available. This condition may lead to a complete loss of the hydraulic braking torque and also to motor deterioration.

When installed correctly, the BT brake valve prevents cavitation by throttling the return line from the motor as soon as the differential pressure between the inlet and return lines decreases to a specific value.

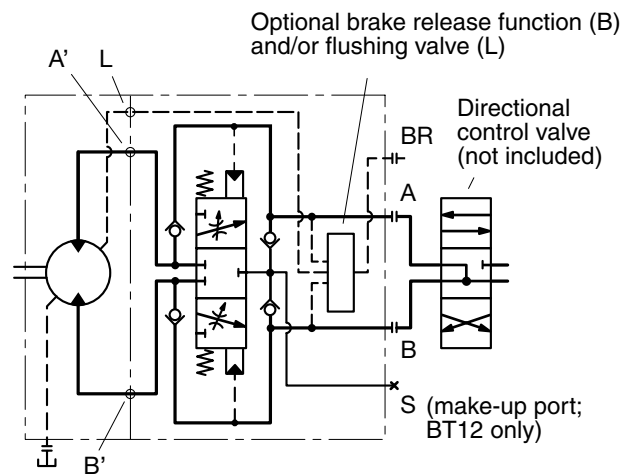
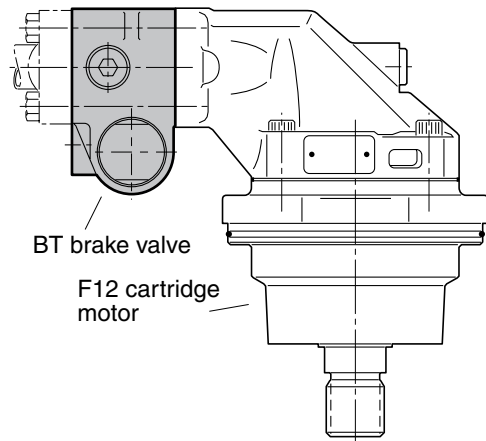
The BT brake valve consists mainly of a spool valve. The position of the spool is determined by the differential pressure. When the differential pressure decreases and approaches 35 bar (500 psi), the spool begins to close the port connected to the return line. It leads to pressure build-up on the return side of the motor, which gives a braking torque.

The BT brake valve makes sure the speed of the motor is in balance with the supplied flow. The special check valve arrangement on the pump side of the brake valve gives extra protection against cavitation. If the supply pressure drops below the return line pressure, fluid is fed directly back to the motor inlet.

The BT brake valve is very compact and installs between the F12 or T12 port flange and the main line split-flanges.

NOTE: - Before designing a system with a BT brake valve, Product Support (Pumps & Motors) should be contacted.

- When utilizing the flushing valve (L) and/or the brake release function (B), make sure the F12 is ordered with the third drain connection. On the T12, the third drain line plug must be removed before installing the BT valve.



Hydraulic schematic (F12 motor with BT brake valve).

IMPORTANT

When ordering, a filled-in 'BT brake valve specification form' (MI 119) must be attached.

Ordering code

BT			-			-					
Valve type	Version	Main ports	Spool function	Valve damping			Optional functions		Spring cover	Seals	
Brake valve (for track drives)											
Code Version		Code Main ports (SAE 6000psi)		Code Spool function		Code Valve damping, etc.		Code Spring cover location		Code Seals	
2 Issued by Parker Hydraulics		1 3/4" (for F12-30/-40/-60; T12-60) 2 1" (for F12-80/-90, T12-80, V14-110)		11 Standard		14 Standard		A At port A (see page 10) B At port B (see page 10)		N Nitrile rubber (optional) V (optional)	
								Code Optional functions			
								L Flushing valve B Brake release function V5 Check valve (5 bar spring)			

Brake valve

The diagrams to the right show the pressure drop, motor to return line (refer to the schematic on page 1) when the brake valve spool is completely open.

To keep the brake valve completely open, the pressure differential between ports A and B must be at least 35 bar (500 psi).

If this differential tends to decrease, i.e. when the vehicle is going downhill or whenever the driver decides to decrease the speed, the valve closes sufficiently to maintain the speed or slow down the vehicle, and the Δp will be higher than shown in the diagrams.

Cold-start function

It is well known that, due to high viscosity when operating in the low temperature range, the response time of the brake valve of e.g. the left hand motor in a propel drive can be different from that of the brake valve of the right hand motor.

This means that one of the brake valves opens before the other which, in turn, means that the machine doesn't start to move in a straight forward direction.

To correct this situation, the BT valve is supplied with a cold start function which makes the brake valves open simultaneously when starting; the machine will then go straight forward independent of oil viscosity.

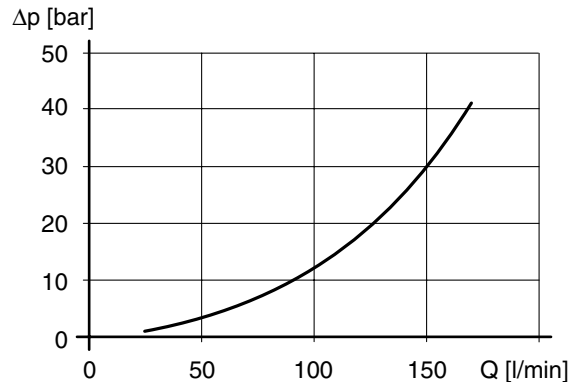
Check valves

The check valve characteristics for series BT are shown in the diagram below right.

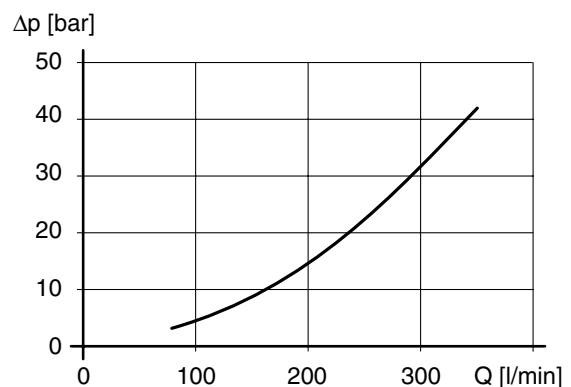
Brake release function

The BT brake valve can be ordered with a brake release function. If, for example, an F12 motor with BT valve is installed on a planetary gearbox, the BR port is connected to the brake release port. When the motor is started, the BR port is pressurized and the gearbox disc brake is automatically released.

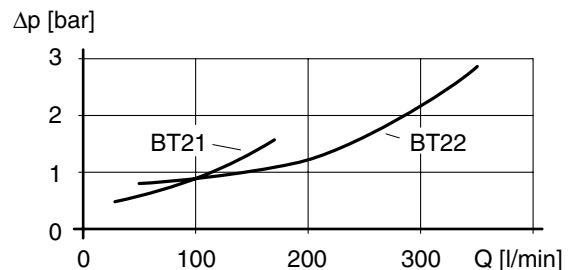
The bottom right diagram illustrates the BT brake release characteristic (port BR pressure vs. Δp between the main ports) at 10 bar (150 psi) return line pressure.



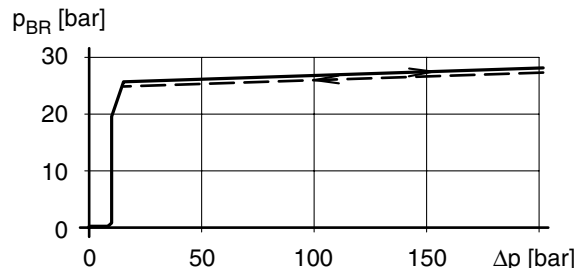
BT21 brake valve characteristic (A' to A; B' to B).



BT22 brake valve characteristic (A' to A; B' to B).



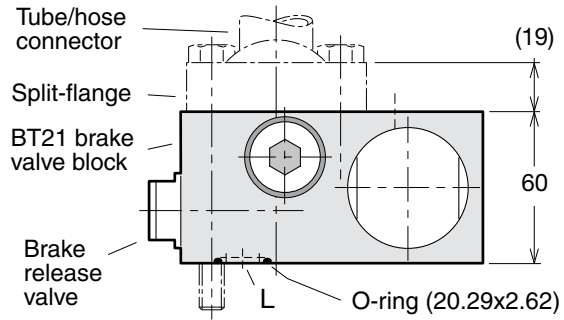
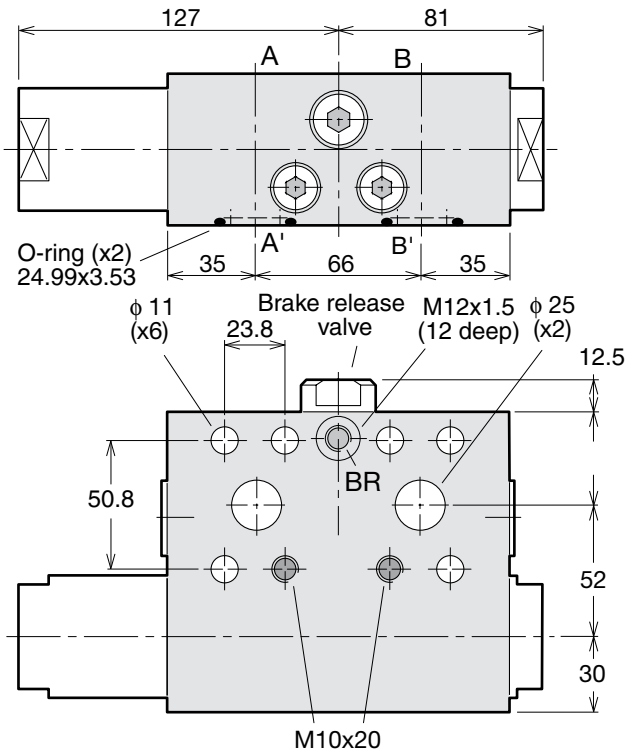
BT check valve characteristic (A to A'; B to B').



BT brake release valve characteristic.

IMPORTANT
 The vehicle must be provided with a mechanical braking system which is independent of the **open loop type** hydrostatic transmission.

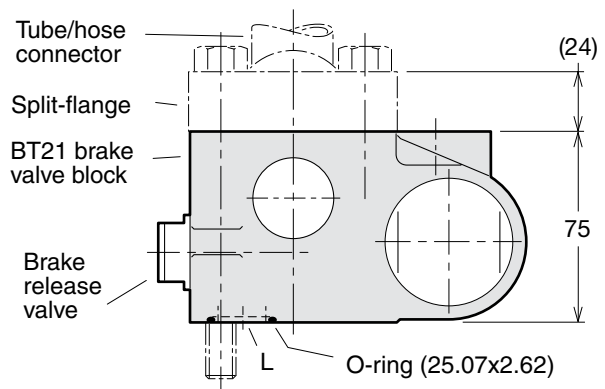
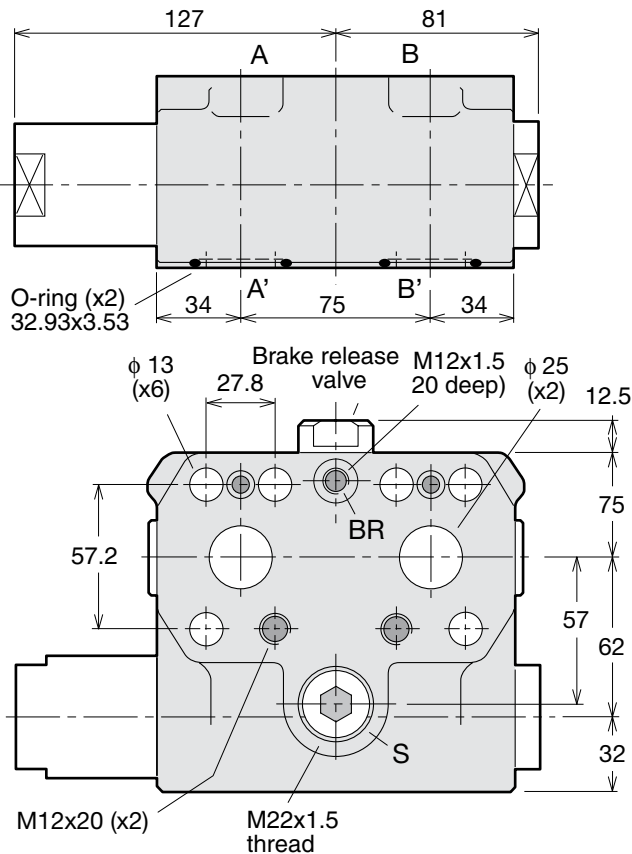
BT21 installation



Installation information

- 1) The BT21 brake valve block flange mounts between the motor main port flange and the split-flange tube/hose connections utilizing six M10x100 and two M10x40 screws (with 19 mm split-flanges as shown). O-rings are provided (but no screws, split-flanges or tube/hose connectors).
 When utilized, make sure port L connects with the corresponding port on the motor.
- 2) When factory mounted, the BT21 brake valve block is attached to the motor with two M10x75 screws.

BT22 installation



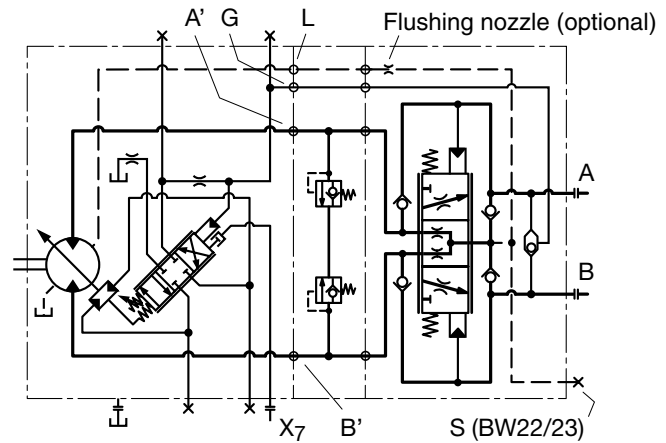
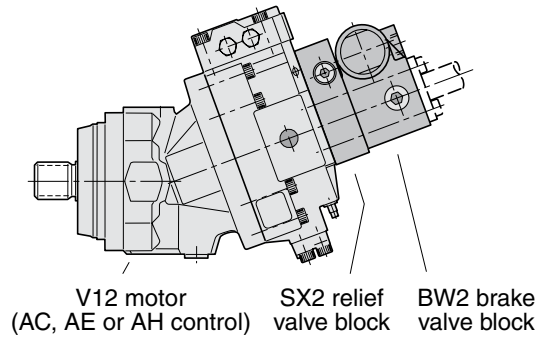
Installation information

- 1) The BT22 brake valve block flange mounts between the motor main port flange and the split-flange tube/hose connections utilizing six M12x120 and two M12x40 screws (with 24 mm split-flanges as shown). O-rings are provided (but no screws, split-flanges or tube/hose connectors).
 When utilized, make sure port L connects with the corresponding port on the motor end cap.
- 2) When factory mounted, the BT22 brake valve block is attached to the motor with two M12x90 screws.

General information

- The BW2/SX2 brake/relief valve consists of two separate valve blocks, one containing the brake valve and the other pressure relief valves.
- The BW2 valve provides smooth braking on all V12 wheel driven vehicles and reduces the risk of motor cavitation when braking or coasting. Cavitation occurs when the speed of the motor corresponds to a higher flow than available. This, in turn, may lead to complete loss of hydraulic braking torque and motor deterioration.
- The BW2 also contains a brake defeat function, consisting of a shuttle valve. This function prevents the V12 motor from increasing its displacement when the vehicle is going downhill. Without this function, too hard braking and engine over-speed could be experienced.
- The brake valve spool is controlled by the differential pressure (supply pressure less return pressure). When the differential pressure drops below 35 bar the valve spool begins to close. This leads to pressure build-up on the return side of the motor, which in turn produces a braking torque.
- The BW2 brake valve makes sure the speed of the motor is in balance with the supplied flow. The valve characteristic and the residual area ensures smooth braking of the vehicle.

(continued on page 9)



Hydraulic schematic (V12 with AH control).

BW2/SX2 Ordering code

<p>BW [] [] - [] [] [] - [] [] [] / SX [] [] - [] [] [] - [] [] [] - [] [] []</p> <p>Valve function Main ports Valve damping Optional functions Spring cover location Seals</p>	<p>Version Spool configuration Pressure settings Ports Seals</p> <div style="border: 1px solid black; padding: 2px; margin-bottom: 5px;"> <p>Code Valve function</p> <p>2 Issued by Parker</p> </div> <div style="border: 1px solid black; padding: 2px; margin-bottom: 5px;"> <p>Code Main ports (SAE 6000 psi)</p> <p>1 3/4" (V12-60/-80) 2 1" (V14-110) 3 1 1/4" (V14-160)</p> </div> <div style="border: 1px solid black; padding: 2px; margin-bottom: 5px;"> <p>Code Spool configuration</p> <p>15 Standard</p> </div> <div style="border: 1px solid black; padding: 2px; margin-bottom: 5px;"> <p>Kod Valve damping</p> <p>15 Standard</p> </div> <div style="border: 1px solid black; padding: 2px; margin-bottom: 5px;"> <p>Kod Optional functions</p> <p>G Brake defeat valve L Flushing valve (and two digits for orifice size) V5 Check valve (5 bar spring)</p> </div> <div style="border: 1px solid black; padding: 2px; margin-bottom: 5px;"> <p>Code Spring cover location</p> <p>A At port A (see pages 3 and 4) B At port B (see pages 3 and 4)</p> </div> <div style="border: 1px solid black; padding: 2px; margin-bottom: 5px;"> <p>Code Seals</p> <p>N Nitrile rubber V FPM (optional)</p> </div>
	<p>Version Main ports Pressure settings Ports Seals</p> <div style="border: 1px solid black; padding: 2px; margin-bottom: 5px;"> <p>Code Valve function</p> <p>SX Relief valve</p> </div> <div style="border: 1px solid black; padding: 2px; margin-bottom: 5px;"> <p>Code Main ports (SAE 6000 psi)</p> <p>1 3/4" (V12-60/-80) 2 1" (V14-110) 3 1 1/4" (V14-160)</p> </div> <div style="border: 1px solid black; padding: 2px; margin-bottom: 5px;"> <p>Code Pressure settings (A/B ports) [bar]</p> <p>280, 300, 350, 380, 400 or 420</p> </div> <div style="border: 1px solid black; padding: 2px; margin-bottom: 5px;"> <p>Code Ports</p> <p>G Brake defeat L Flushing (optional)</p> </div> <div style="border: 1px solid black; padding: 2px; margin-bottom: 5px;"> <p>Code Seals</p> <p>N Nitrile rubber V FPM (optional)</p> </div>

NOTE:

- The V12 motor must be ordered with a special end cap designated **TX** (e. g. V12-110-TX-IH-C- ... -AH).
- Each valve block has its own name plate with the corresponding ordering code.

(Continued from page 8)

Additional protection against cavitation can be obtained by pressurizing port S on the BW2 valve block (refer to the schematic on page 1).

The pressure reliefs in the SX2 valve block protect the V12 motor against pressure peaks and provides sufficient braking torque to stop the vehicle in a steep downhill, should the need arise.

NOTE: Before designing a system with the BW2/SX2 brake/relief valve, Parker Hydraulics (Mobile Controls Div.) should be consulted.

BW 2 characteristics

The upper three diagrams to the right show the pressure drop, motor to return line (refer to the schematic on page 1), for the BW2 frame sizes when the brake valve is completely open.

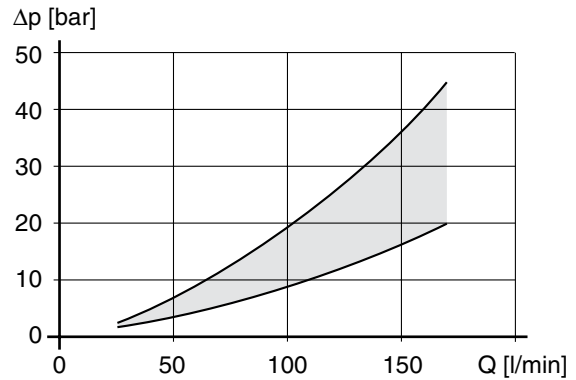
To keep the brake valve completely open, the pressure differential between ports A and B must be at least 35 bar (500 psi).

If this differential tends to decrease, i.e. when the vehicle is going downhill or when the driver decides to decrease the speed, the valve closes sufficiently to maintain or slow down the speed, and the Δp will be higher than what is shown in the diagrams.

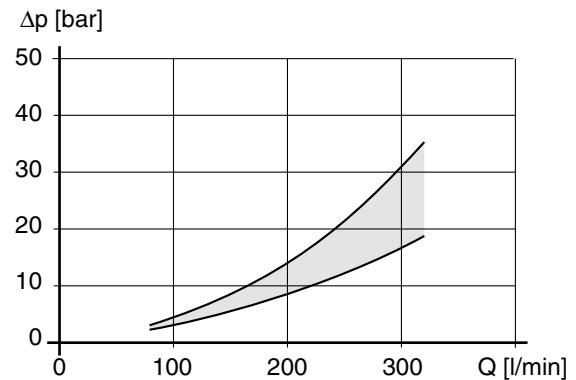
To give the vehicle the desired braking performance, Parker Hydraulics (Mobile Controls Div.) will assist in optimizing the brake valve characteristic (within the shaded areas shown) as well as giving the valve a suitable response time for a forceful but smooth vehicle braking.

The check valve characteristics of the BW2 are shown in the bottom diagram.

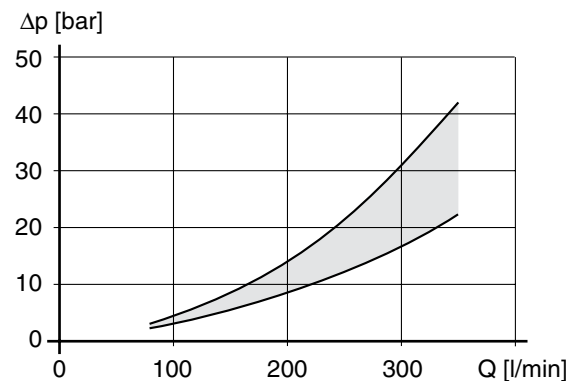
IMPORTANT
The vehicle must be provided with a mechanical braking system which is independent of the **open loop type** hydrostatic transmission.



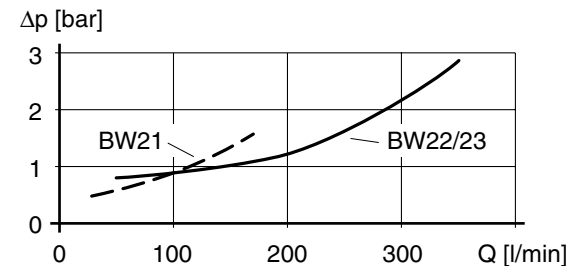
Brake valve characteristic for BW21 (A' to A; B' to B).



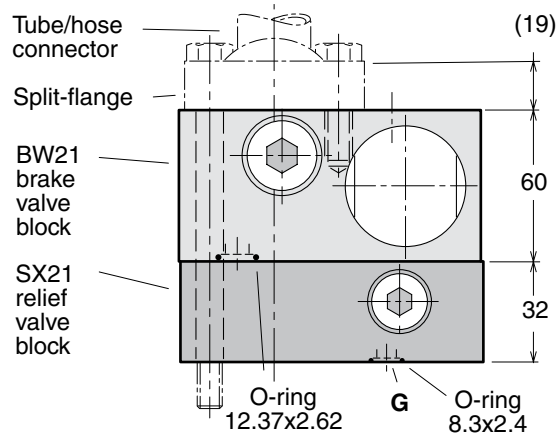
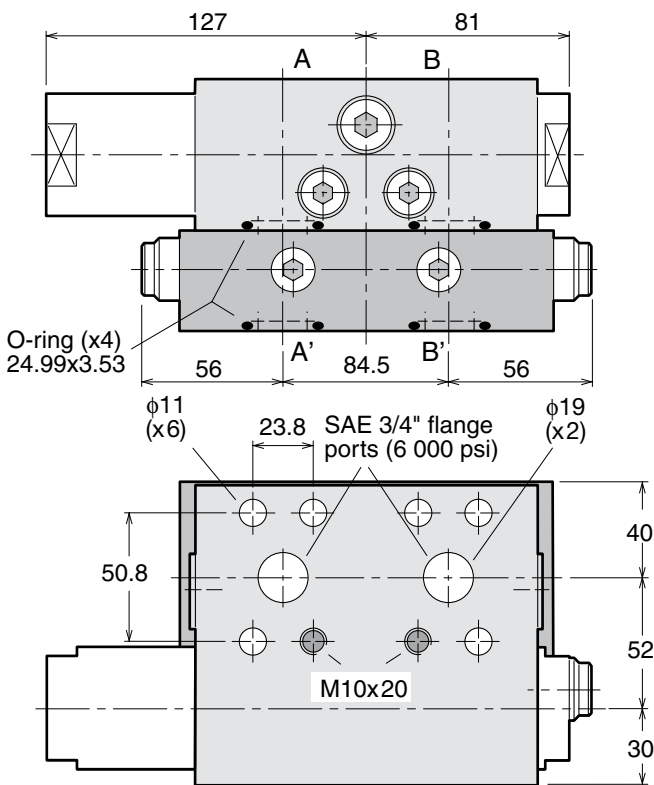
Brake valve characteristic for BW22 (A' to A; B' to B).



Brake valve characteristic for BW23 (A' to A; B' to B).



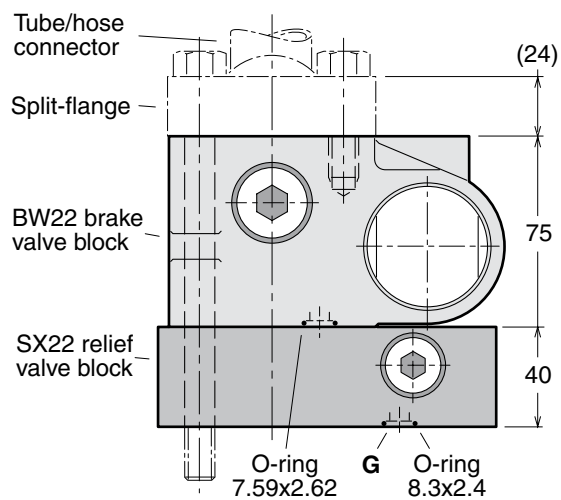
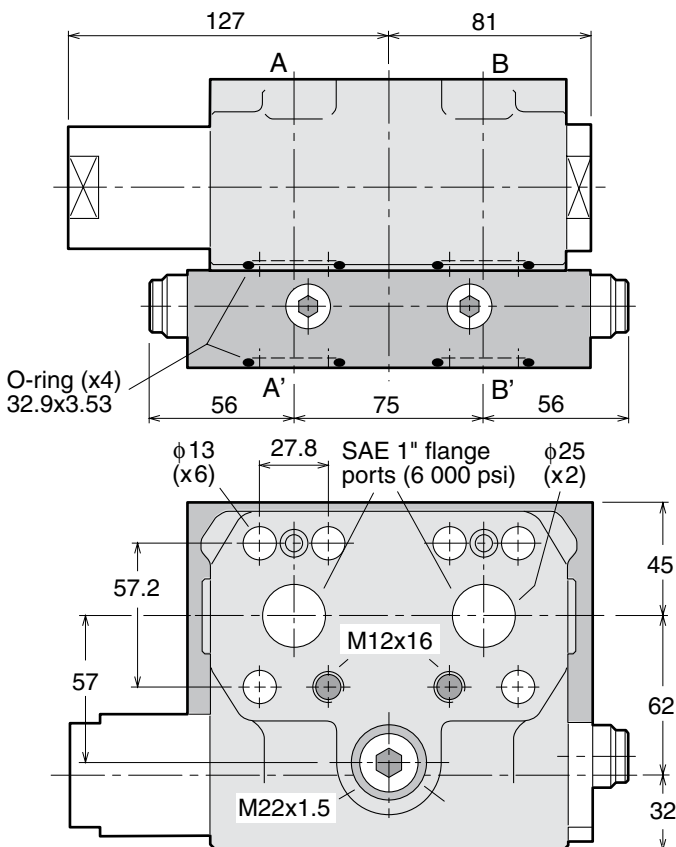
Brake valve characteristic (A to A'; B to B').



Installation information

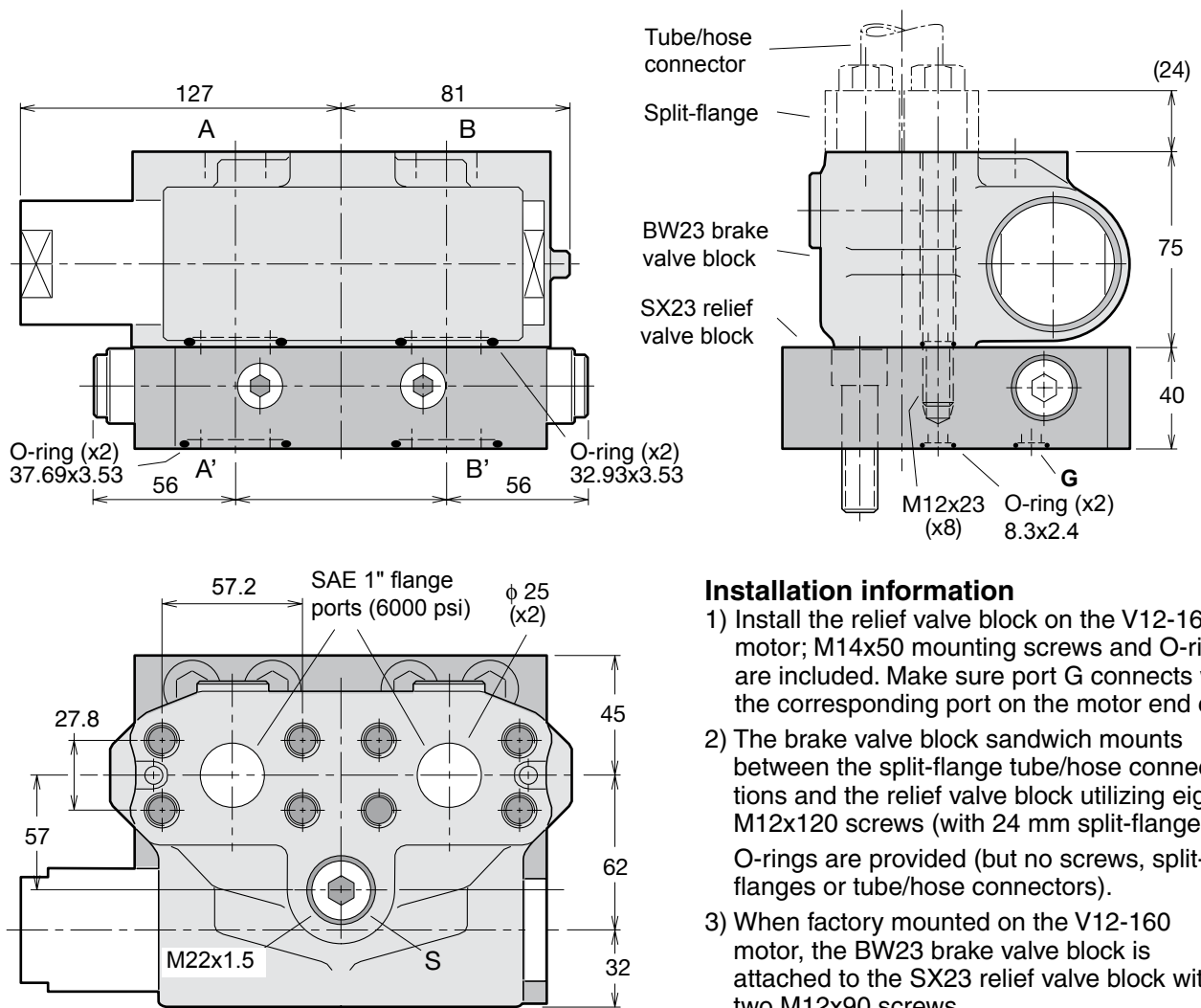
- 1) The BW21/SX21 brake/relief valve blocks sandwich mount between the split-flange tube/hose connections and the V12-060/-080 motor utilizing six M10x140 and two M10x40 screws (with 19 mm split-flanges). O-rings are provided (but no screws, split-flanges or tube/hose connectors). Make sure port G connects with the corresponding port on the motor end cap.
- 2) When factory mounted, the BW21/SX21 brake/relief valve blocks are attached to the V12-060/-080 motor with two M10x110 screws.

BW22/SX22 installation



Installation information

- 1) The BW22/SX22 brake/relief valve blocks sandwich mount between the split-flange tube/hose connections and the V12-110 motor utilizing six M12x160 and two M12x40 screws (with 24 mm split-flanges). O-rings are provided (but no screws, split-flanges or tube/hose connectors). Make sure port G connects with the corresponding port on the motor end cap.
- 2) When factory mounted, the BW22/SX22 brake/relief valve blocks are attached to the V12-110 motor with two M12x130 screws.



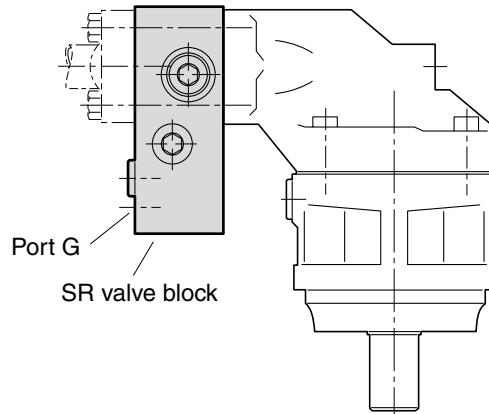
Installation information

- 1) Install the relief valve block on the V12-160 motor; M14x50 mounting screws and O-rings are included. Make sure port G connects with the corresponding port on the motor end cap.
- 2) The brake valve block sandwich mounts between the split-flange tube/hose connections and the relief valve block utilizing eight M12x120 screws (with 24 mm split-flanges). O-rings are provided (but no screws, split-flanges or tube/hose connectors).
- 3) When factory mounted on the V12-160 motor, the BW23 brake valve block is attached to the SX23 relief valve block with two M12x90 screws.

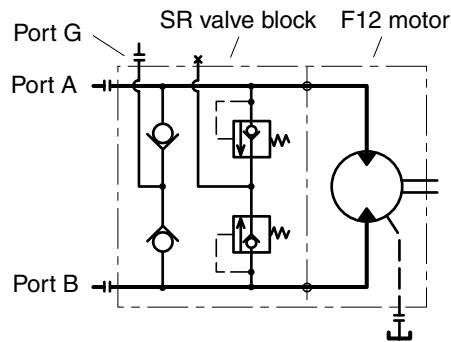
General information

- The SR pressure relief/make-up valve block for series F12 and V12 motors is designed to protect the motor and the main hydraulic lines from short duration pressure spikes. The valve block also provides an excellent make-up function.
- The valve block installs directly on the motor port flange, and is available in three sizes:
 - 1 3/4" for F12-30/-40/-60, T12-60 and V12-60/-80
 - 2 1" for F12-80, -90, T12-80 and V14-110
 - 3 1 1/4" for F12-110, -125 and V14-160.
- The SR valve block consists of a housing containing two high pressure relief cartridges and two separate check valves for make-up. Cartridges are available in non-adjustable pressure settings between 280 and 420 bar (4000 and 6000 psi respectively).
- A make-up port (G) is also provided. In certain operating conditions, the motor (when operating as a pump) may cavitate because of insufficient inlet pressure. To prevent this, the G port should be pressurized. Contact Parker Hannifin for further information.
- The pressure drop through the main ports (A-A' or B-B') is low. As an example, the pressure drop on size 1 (3/4") is 0.45 bar (6.5 psi) at 175 l/min, and on size 2 (1") 0.7 bar (10 psi) at 250 l/min.

NOTE: The valve block includes main port O-rings (facing the motor) but no mounting screws.



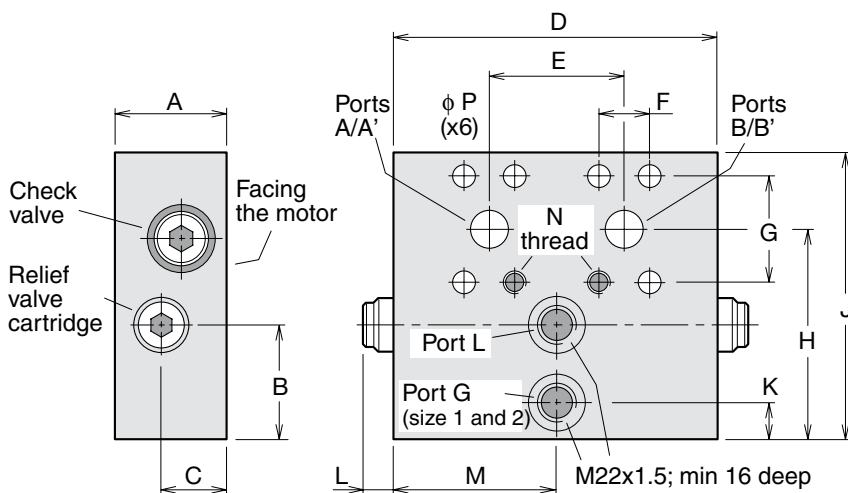
SR valve block location.



SR valve block schematic.

Ordering code

SR	1		-		/		-	00	-	H	F	-	A		
Valve function	Version	Port size		Pressure settings				Serial number		Seals	Threads		Techn. status		
Code Version 1 Factory assigned		Code Port size (SAE 6000 psi) 1 3/4" For: F12-30, -40, -60, T12-60 and V12-60, -80 2 1" For: F12-80, -90, T12-80 and V14-110 3 1 1/4" For: F12-110, -125 and V14-160			Code Pressure settings (A/B ports) [bar] 280, 300, 330, 350, 380, 400 or 420			Code Serial number 00 Factory assigned		Code Seals H Nitrile rubber		Code Threads (port G) F Metric		Code Techn. status A Factory assigned	



Dim. [mm]	Size 1 (3/4")	Size 2 (1")	Size 3 (1 1/4")
A	55	57	57
B	55	55	25
C	32	32	26
D	157	160	160
E	66	75	83
F	23.8	27.8	31.8
G	50.8	57.15	66.7
H	103	109	88
J	140	150	135
K	18	18	-
L	16	16	16
M	78.5	80	-
N	M10 x18	M12 x20	M14 x23
P	11	13	15.5

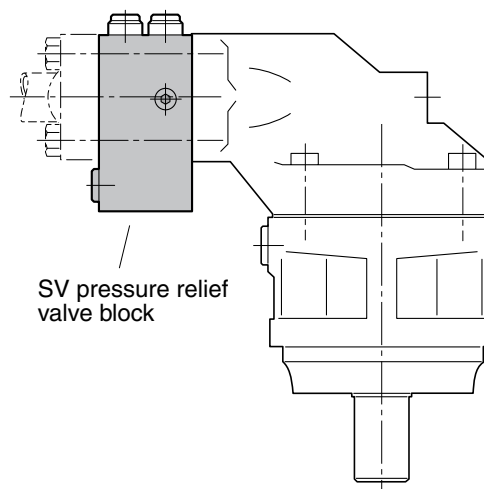
Weight [kg]	Size 1 (3/4")	Size 2 (1")	Size 3 (1 1/4")
	7.4	9.1	8.5

SV pressure relief valve

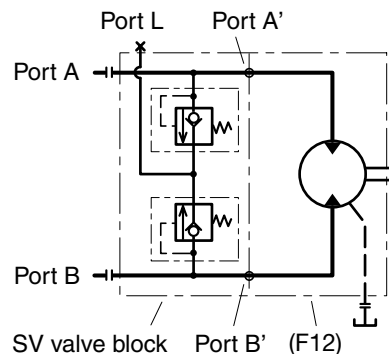
General information

- The SV pressure relief valve block for series F12 and V12 motors is designed to protect the motor and adjacent hydraulic components from short duration pressure peaks.
- It installs directly on the motor port flange and is available in three sizes:
 - '1': 3/4" for F12-30/-40/-60, T12-60 and V12-60/-80
 - '2': 1" for F12-80/-90, T12-80 and V14-110
 - '3': 1 1/4" for F12-110/-125 and V14-160
- The valve block consists of a housing containing two high pressure relief cartridges with anti-cavitation function. Cartridges are available in non-adjustable pressure settings between 280 and 420 bar.
- A make-up/drain port, L, is also provided. In certain operating conditions the motor may cavitate because of in-sufficient inlet pressure. To prevent this, the L port can be pressurized. When there is a risk of overheating, the L port can also be utilized to take out part of the flow for cooling. Contact Parker Hannifin for further information.
- The pressure drop through the main ports (A-A' or B-B') is low. As an example, the pressure drop on size 1 (3/4") is 0.45 bar (6,5 psi) at 175 l/min (45 gpm), and on size 2 (1") 0.7 bar (10 psi) at 250 l/min (65 gpm).

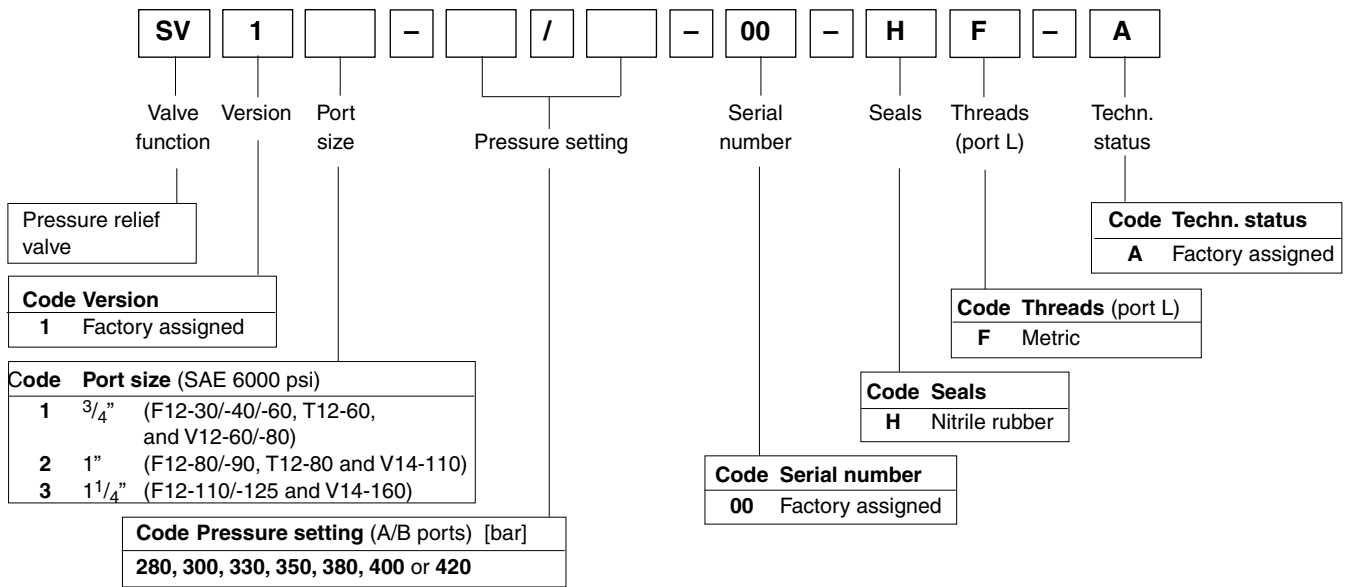
- NOTE:**
- The valve block includes main port O-rings (facing the motor) but no mounting screws.
 - The valve blocks can be used on all versions of series F12 as well as V12 and T12 motors.



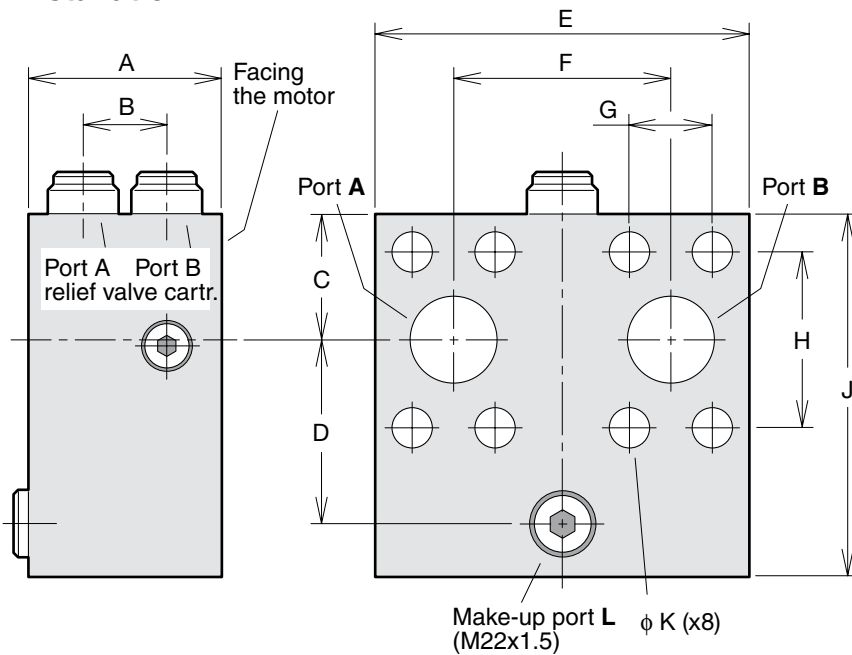
SV valve block installed on an F12 motor.



Hydraulic schematic.



Installation



Dim. [mm]	SV11	SV12	SV13
A	71	73	73
B	31	31	31
C	36	41	47
D	47	51	68
E	130	127	142
F	66	75	83
G	23.8	27.8	31.8
H	50.8	57.2	66.7
J	99	109	135
K	11	13	15.5
Weight [kg]	4.2	5.0	6.7

The SP, super shockless, pressure relief/make-up valve block for series F12 motors is designed mainly for protection of the swing function of an excavator. It features a very 'soft' relief characteristic with very little overshoot and an excellent make-up function.

The pressure/time diagram to the right is a recording of an actual start-brake sequence of an excavator swing function. In the left part ('Start'), port A is pressurized and the swing is accelerating; the pump pressure is limited by the relief valve setting.

In the right part ('Brake'), port B is pressurized (as determined by the relief valve setting), and the swing movement stops.

The valve block installes directly on the motor port flange, and is available in three sizes:

SP11 3/4" for F12-30/-40/-60

SP12 1" for F12-80/-90

SP13 1 1/4" for F12-110/-125

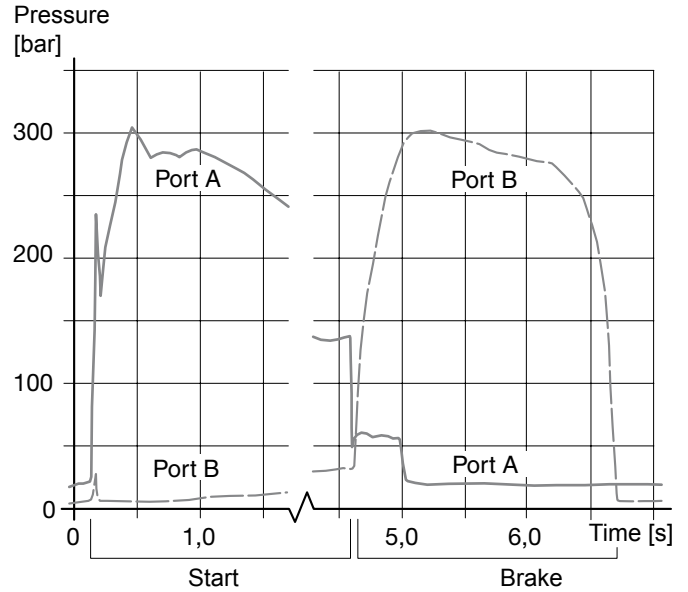
The SP valve consists of a valve block containing two high pressure relief cartridges and two separate check valves for make-up; refer to the split view below.

Cartridges are available in five non-adjustable pressure settings between 190 and 315 bar.

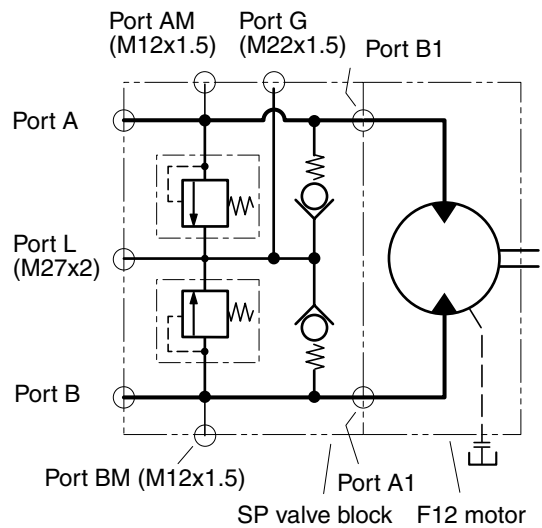
A make-up port (G) is also provided. In certain operating conditions, the motor (when operating as a pump) may cavitate because of insufficient inlet pressure. To prevent this, the G port should be pressurized.

Contact Parker Hannifin, for further information.

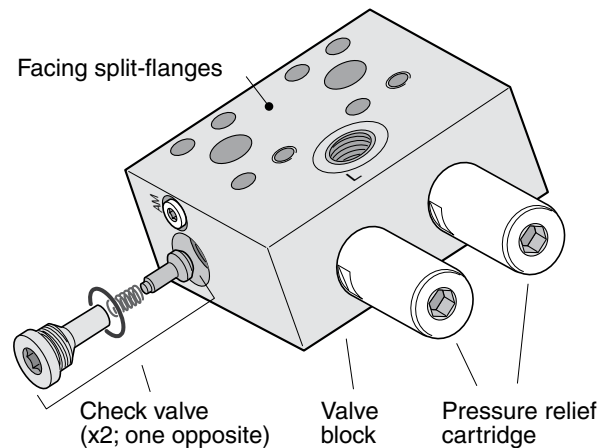
NOTE: The valve block includes main port O-rings (facing the motor) but no mounting screws.



Pressure/time diagram (example).

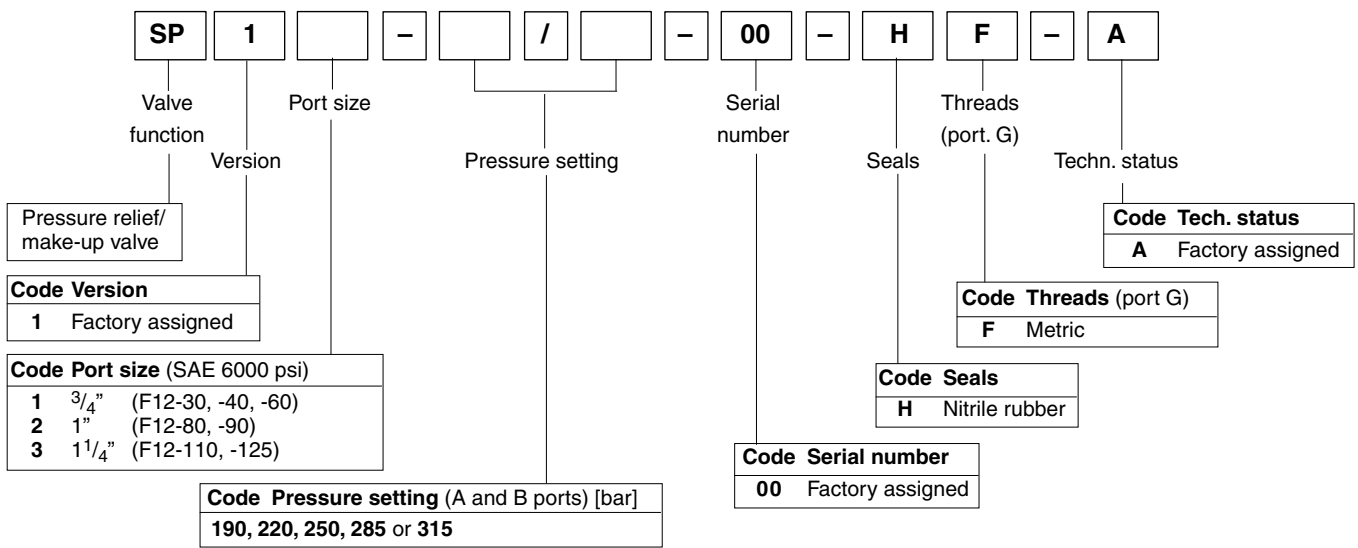


SP/F12 schematic.

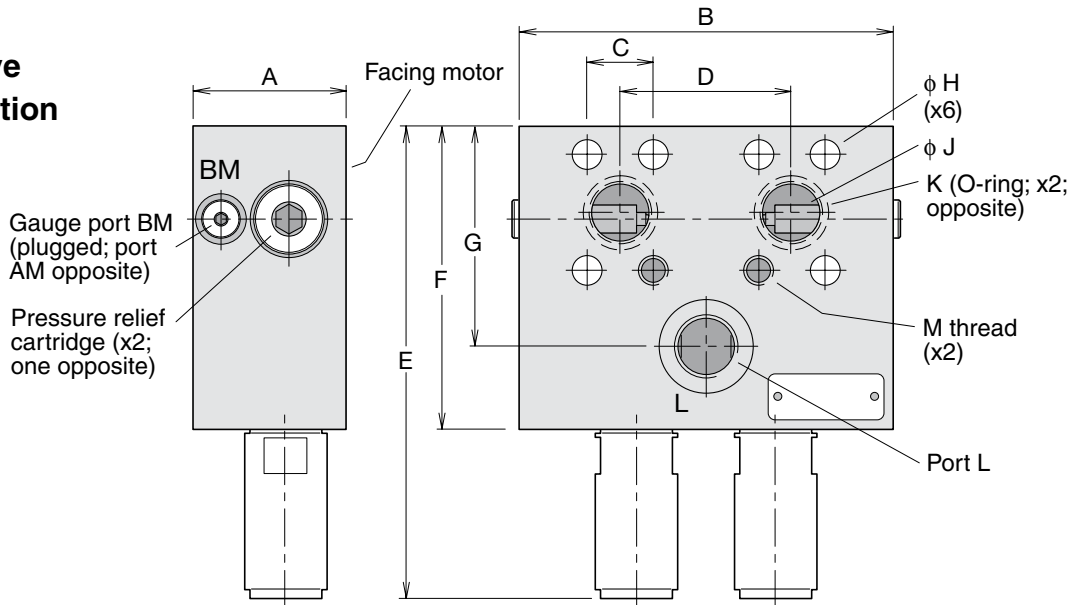


SP valve components.

Ordering code



SP valve installation



Installation dimensions (refer to the illustration)

Valve type	For F12-30/-40/-60	For F12-80/-90	For F12-110/-125
A	63	66	70
B	156	160	160
C	23.8	27.8	31.8
D	66	75	83
E	207	207	225
F	133	133	151
G	97	97	115
H	11	13	15
J	3/4"	12	1 1/4"
K	24.99x3.53	32.93x3.53	37.69x3.53
M	M10 (20 deep)	M12 (20 deep)	M14 (26 deep)
Art. No	0686 371 810	0663 918 801	0663 919 101

Valve assembly part numbers

For motor type	Pressure setting [bar] at 20 l/min ¹⁾				
	190	220	250	285	315
F12-30/-40/-60	376 6320		376 4631		376 3674
		376 7157		376 3675	
F12-80/-90	376 7161		376 6924		376 3677
		376 7158		376 3678	
F12-110/-125	376 7162		376 7163		376 3679
		376 7159		376 7164	

1) Setting within ±10 bar

Pressure relief cartridges

Cartridge type	Pressure setting [bar] at 20 l/min ¹⁾				
	190	220	250	285	315
Spare part number	376 4610		376 4632		376 3825
		376 7156		376 3824	



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