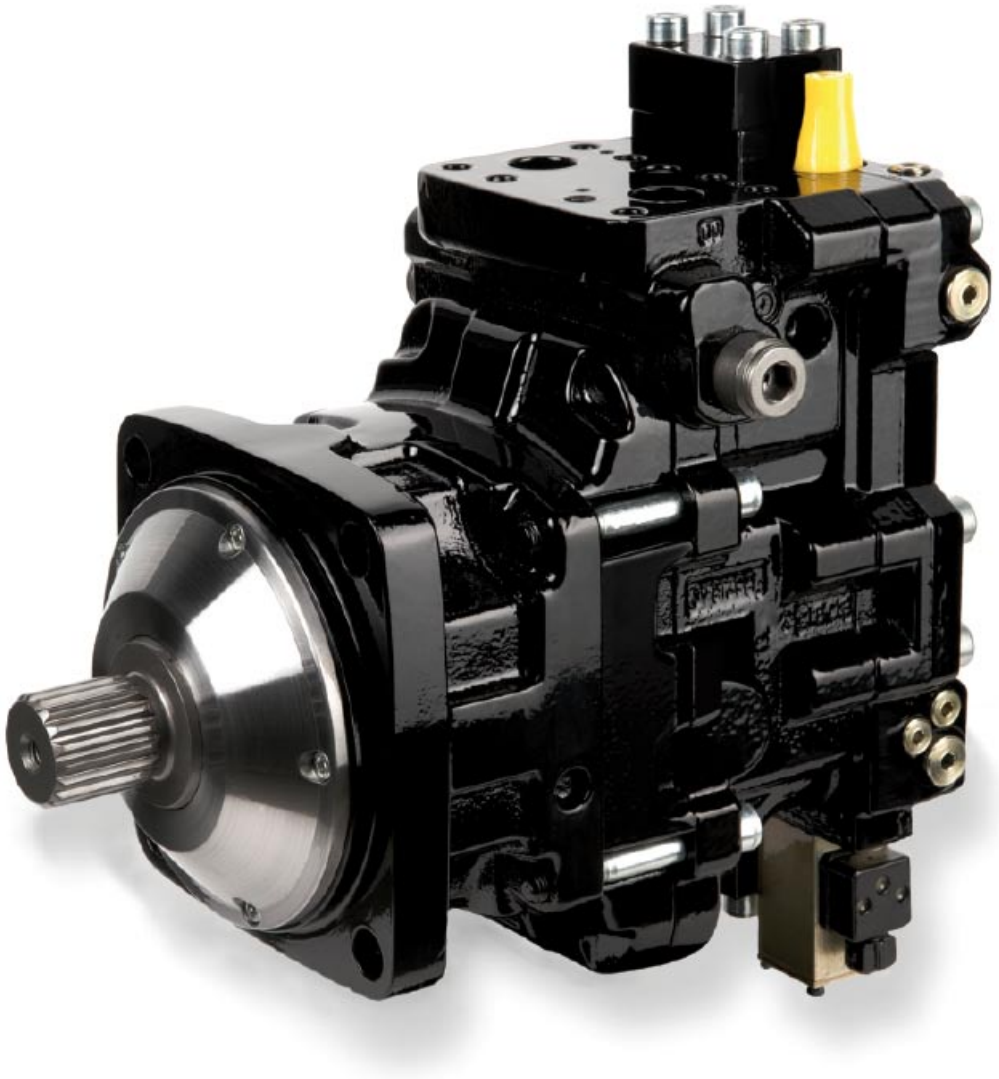


Hydraulic Motors

Series V12, V14, T12
Variable Displacement

aerospace
climate control
electromechanical
filtration
fluid & gas handling
hydraulics
pneumatics
process control
sealing & shielding

Parker

ENGINEERING YOUR SUCCESS.

Basic formulas for hydraulic motors

A) Displacement (D_α)

$$D_\alpha = D_{35} \times \frac{\sin \alpha}{\sin 35°} \text{ [cm}^3\text{/rev]}$$

α - displacement angle [°] (between 35° and 6.5°)

D_{35} - max displ. at 35° [cm³/rev]

B) Flow (q)

$$q = \frac{D \times n}{1000 \times \eta_v} \text{ [l/min]}$$

D - displacement [cm³/rev]

n - shaft speed [rpm]

η_v - volumetric efficiency

C) Torque (M)

$$M = \frac{D \times \Delta p \times \eta_{hm}}{63} \text{ [Nm]}$$

Δp - differential pressure [bar] (between inlet and outlet)

η_{hm} - mechanical efficiency

D) Power (P)

$$P = \frac{q \times \Delta p \times \eta_t}{600} \text{ [kW]}$$

η_t - overall efficiency ($\eta_t = \eta_v \times \eta_{hm}$)

Conversion factors

1 bar	14.5 psi
1 cm³	0.061 cu in
1 kg	2.20 lb
1 kW	1.34 hp
1 l	0.264 US gallons
1 mm	0.039 in
1 N	0.225 lbf
1 Nm	0.738 lbf ft
1 °C	1.8 °F + 32

V12

V14

Series V12

Series V12 is a bent-axis, variable displacement motor.

It is intended for both open and closed circuits, mainly in mobile applications, but the V12 can also be utilized in a wide variety of other applications.

Features

- Max intermittent pressure to 480 bar and continuous operating pressure to 420 bar
- Thanks to low weight pistons with laminated piston rings and a compact design of the rotating parts, the V12 tolerates very high speeds
- High allowable speeds and operating pressures means high output power; the overall efficiency remains high throughout the entire displacement range
- The 9-piston design provides high start-up torque and smooth motor operation
- Wide displacement ratio (5:1)
- Broad range of controls and accessory valves for most applications
- Small envelop size and a high power-to-weight ratio
- ISO, cartridge and SAE versions
- Low noise levels due to a very compact and sturdy design with smooth fluid passages
- Positive piston locking, strong synchronizing shaft, heavy-duty bearings and small number of parts add up to a compact and robust motor with long service life and proven reliability.

Series V14

Series V14 is a new generation of variable displacement, bent-axis motors, a further development of our well known V12 motor.

It is designed for both open and closed circuit transmissions with focus on high performance machines .

Applications

- Excavators
- Forestry machines
- Mining and drilling machines
- Wheel loaders
- Winch drives

Optional equipment

- Integrated sensors for speed and displacement
- Integrated flushing or pressure relief valves

Additional benefits (compared to those of the V12)

- Improved speed capability
- Improved control performance
- Reduced number of parts
- Stronger shaft bearing support.

T12

Available motors

Model	Frame size	Version	Chapter
V12	60	ISO	2
	"	Cartridge	"
	"	SAE	"
	80	ISO	"
	"	Cartridge	"
	"	SAE	"
V14	110	ISO	3
	"	Cartridge	"
	"	SAE	"
	160	ISO	"
	"	SAE	"
T12	60	Cartridge	4
	80	"	"

Series T12

The T12 two-displacement motor is tailor-made for track drives. It allows a high ratio between high and low speed and installs as easily as a fixed displacement motor. Max speed ratio is 3.33-to-1.

The T12 is a cartridge motor based on the well proven V12 series. The specially designed end cap with dual ports permits a very short installation.

A simple setting device moves the cylinder barrel to the maximum or minimum displacement position. The setting is controlled by an external hydraulic pilot signal.

A brake valve can be fitted without increasing the axial length of the motor. The twin ports have the same mounting pattern as those of the F12 and V12 motors.

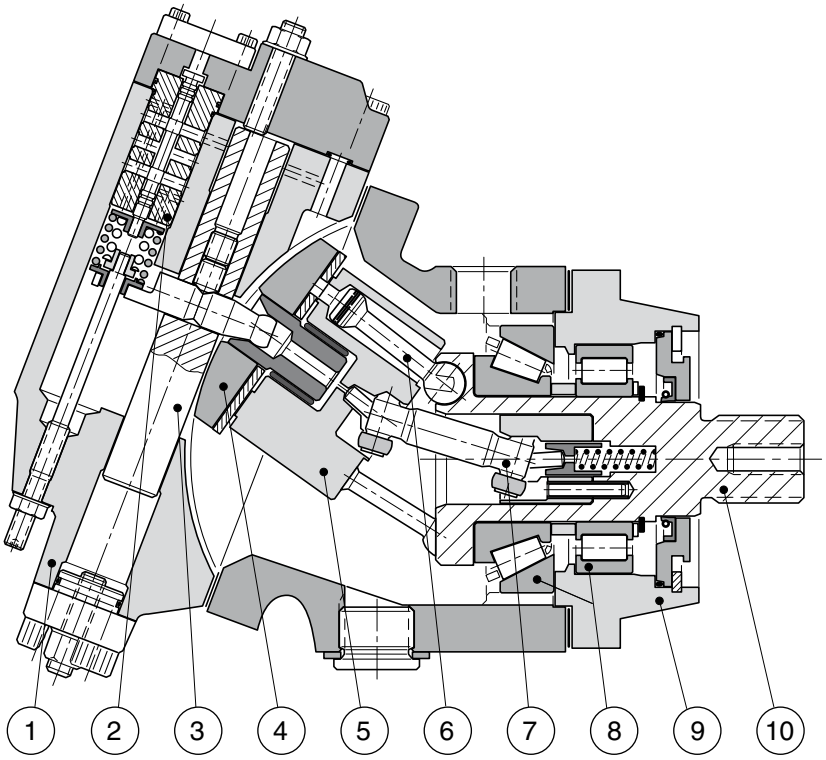
The F12/V12 accessory valve program also fits the T12 motor. As an option, integrated pressure relief valves can be included.

V12

Content **Page**

V12 cross section

1. End cap
2. Servo control valve
3. Setting piston
4. Valve segment
5. Cylinder barrel
6. Spherical piston with laminated piston ring
7. Synchronizing shaft
8. Heavy-duty roller bearings
9. Bearing housing
10. Output shaft



Specifications

V12 frame size	**60**	**80**
Displacement [cm^3/rev]		
- max, at 35°	60	80
- min, at 6.5°	12	16
Operating pressure [bar]		
- max intermittent [1)]	480	480
- max continuous	420	420
Operating speed [rpm]		
- at 35°, max intermittent [1)]	4 400	4 000
max continuous	3 600	3 100
- at 6.5°–20°, max intermittent [1)]	7 000	6 250
max continuous	5 600	5 000
- min continuous	50	50
Flow [l/min]		
- max intermittent [1)]	265	320
- max continuous	215	250
Torque (theor.) at 100 bar [Nm]	95	127
Output power [kW]		
- max intermittent [1)]	150	175
- max continuous	95	105
Corner power [kW]		
- intermittent [1)]	335	400
- continuous	235	280
Mass moment of inertia (x10^{-3}) [kg m^2]	3.1	4.4
Weight [kg]	28	33

1) Max 6 seconds in any one minute.

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Trollhättan, Sweden

Efficiency diagrams

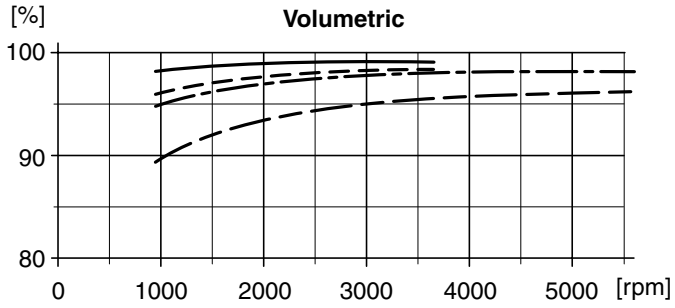
The following diagrams show volumetric and overall efficiencies versus shaft speed at 210 and 420 bar operating pressure, and at full (35°) and reduced (10°) displacements.

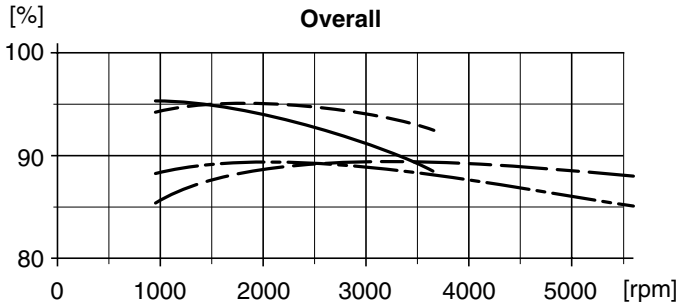
Information on efficiencies for a specific load condition can be made available from Parker Hannifin.

210 bar at full displacement
420 bar " " "

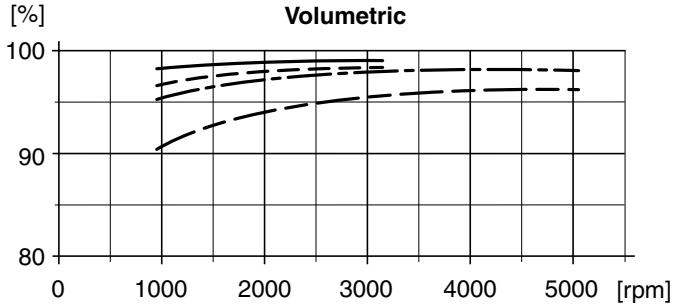
210 bar at reduced displacement
420 bar " " "

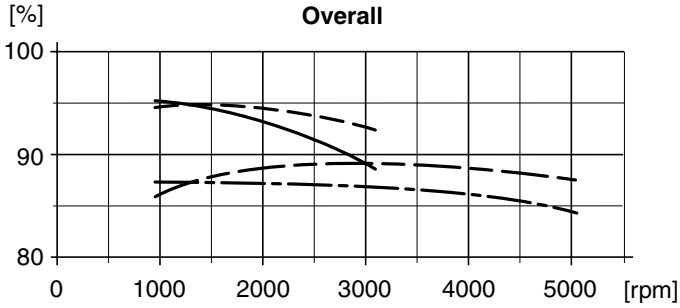
V12-60





V12-80





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Bearing life

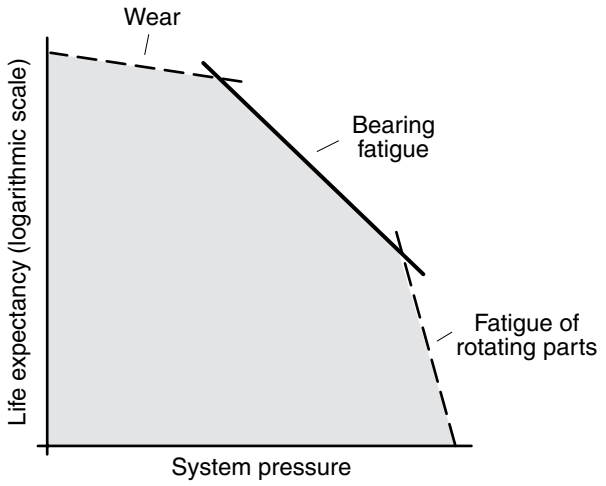
General information

Bearing life can be calculated for that part of the load/ life curve (shown below) that is designated 'Bearing fatigue'. 'Fatigue of rotating parts' and 'Wear'caused by fluid contamination, etc., should also be taken into consi-deration when estimating the service life of a motor/pump in a specific application.

In reality, bearing life can vary considerably due to the quality of the hydraulic system (fluid condition, cleanliness, etc.)

Bearing life calculations are mainly used when comparing different motor frame sizes. Bearing life, designated B_{10} (or L_{10}), depends of system pressure, opera-ting speed, external shaft loads, fluid viscosity in the motor case, and fluid contamination level.

The B_{10} value means that 90% of the bearings survive at least the number of hours calculated. Statistically, 50% of the bearings will survive at least five times the B_{10} life.



Hydraulic motor life versus system pressure.

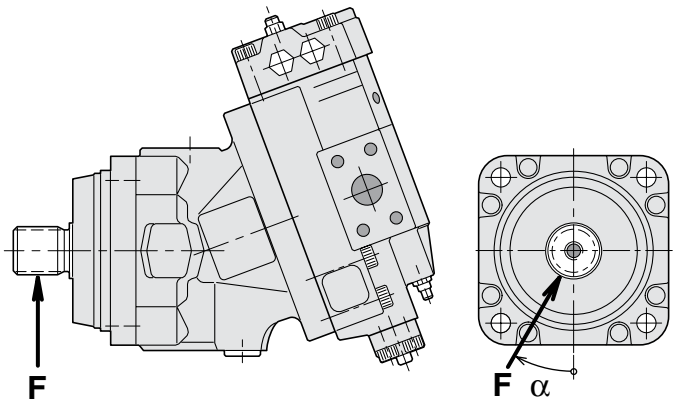
Bearing life calculation

An application is usually governed by a certain duty or work cycle where pressure, speed and displacement vary with time during the cycle.
Bearing life is also dependent on external shaft loads, case fluid viscosity and fluid contamination.
Parker Hannifin has a computer program for bearing life calculation and will assist in determining life for specific V12 load conditions; refer to MI 170, 'V12 bearing life', available from Parker Hannifin.

Required information

When requesting a bearing life calculation from Parker Hannifin, the following information (where applicable) should be provided:

- A short presentation of the application
- V12 size and version
- Duty cycle (pressure and speed versus time at specified displacements)
- Low pressure
- Case fluid viscosity
- Life probability (B_{10}, B_{20}, etc.)
- Direction of rotation (L or R)
- Axial load
- Fixed or rotating radial load
- Distance between flange and radial load
- Angle of attack (α) as defined below.



Controls (general information)

The following six V12 controls described below satisfy most application requirements:

- **AC** and **AH** (Pressure compensator)
- **EO** and **HO** (Two-position controls)
- **EP** and **HP** (Proportional controls).

All controls utilize a setting piston that connects to the valve segment (refer to the picture on page 7).

The built-in four-way servo valve acts on the setting piston and determines the displacement which can vary between 35° (max) and 6.5° (min).

Servo supply pressure is usually obtained from the main high pressure port through the built-in shuttle valve.

When using external servo supply, the servo pressure should be at least 30 bar.

The response time (i.e. from max to min displacement) is determined by orifices in the servo valve supply and return lines.

NOTE: The modulating pressure/current, $\Delta p/\Delta I$ values are valid for motors that are not displacement limited.

AC pressure compensator

The AC compensator is used in off-road vehicle hydrostatic transmissions; it automatically adjusts motor dis-placement to the output torque requirement (up to max available system pressure).

Normally, the motor stays in the minimum displacement position. When there is a demand for additional torque, i.e. when the vehicle enters an upgrade, the displacement increases (providing more torque) while the motor shaft speed decreases proportionally.

The threshold pressure ('ps'; refer to the AC diagram) where displacement starts to increase, is adjustable between 150 and 400 bar.

To reach max displacement, an additional modulating pressure (Δp) above the threshold pressure (ps) is required.

To satisfy specific hydraulic circuit requirements, a modulating pressure, Δp, of 15, 25 or 50 bar can be selected.

The AC compensator is available in two versions:

ACI 01 I - Internal pilot pressure

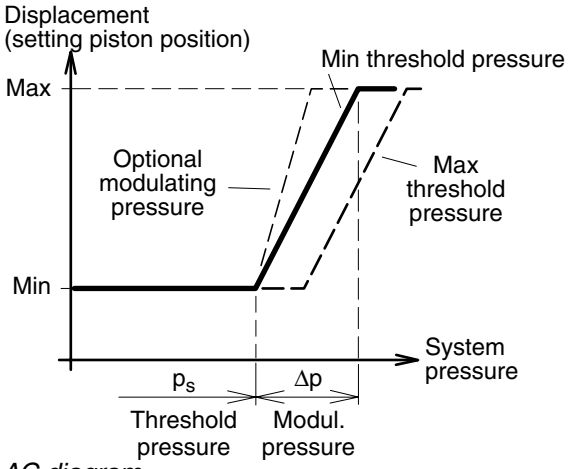
ACE 01 I (optional) - External pilot pressure; port X5 can, for example, be connected to the 'forward drive' pressure line of a vehicle transmission to prevent motor displacement increase when the vehicle is going downhill.

Gauge/pilot ports (AC compensator):

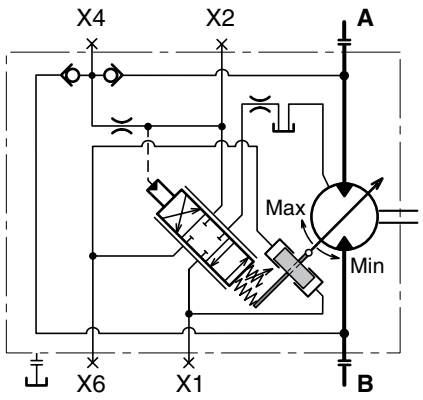
X1	Setting piston pressure (increasing displ.)
X2	Servo supply pressure (after orifice)
X4	Servo supply pressure (before orifice)
X5	External pilot pressure
X6	Setting piston pressure (decreasing displ.)

Ports are:

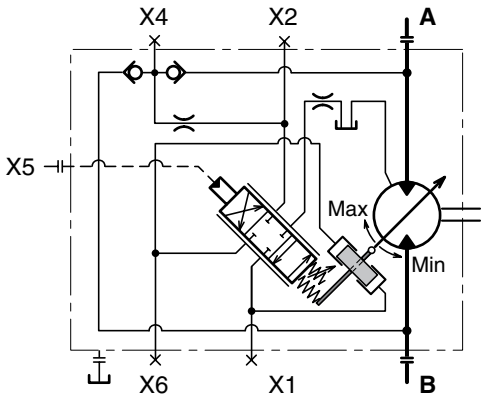
- M14x1.5 (ISO and cartridge versions)
- $^{9}/_{16}$"-18 O-ring boss (SAE version).



AC diagram.



ACI 01 I schematic (spool in a balanced, mid-pos.).



ACE 01 I schematic (spool in a balanced, mid-pos.).

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AH pressure compensator

The AH compensator is similar to the AC (page 10) but incorporates an hydraulic override device. It is utilized in hydrostatic transmissions where a high degree of manœuvrability at low vehicle speeds is desirable.

When the override is pressurized, the servo piston moves to the max displacement position irrespective of system pressure, provided the servo supply pressure is at least 30 bar.

The AH compensator is available in two versions:

AHI 01 I - Same as the ACI except for the override; internal pilot pressure.

AHE 01 I (optional) - External pilot pressure (port X5; compare ACE, page 10).

Required override pressure, port X7 (min 20 bar):

$$p_7 = \frac{p_S + \Delta p}{24} \text{ [bar]}$$

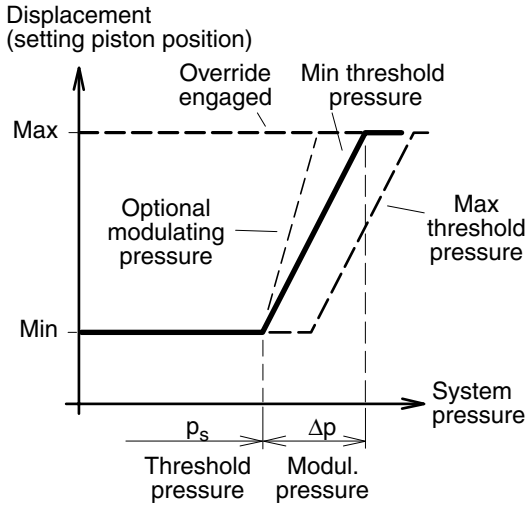
p_7 = Override pressure
p_s = System pressure
Δp = Modulating pressure

Gauge/pilot ports (AH compensator):

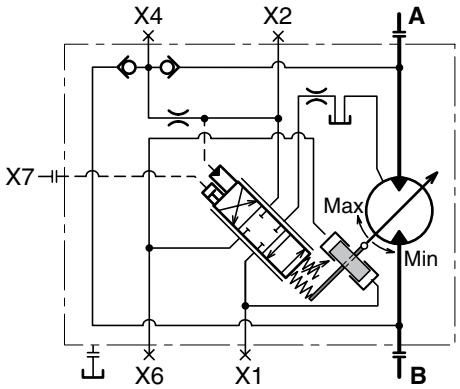
X1 Setting piston pressure (increasing displ.)
X2 Servo supply pressure (after orifice)
X4 Servo supply pressure (before orifice)
X5 External pilot pressure
X6 Setting piston pressure (decreasing displ.)
X7 Override pressure

Ports are:

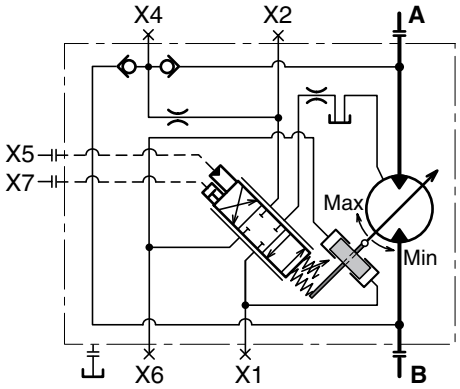
– M14x1.5 (ISO and cartridge versions)
– $^9/_{16}$"-18 O-ring boss (SAE version).



AH diagram.



AHI 01 I schematic (spool in a balanced, mid-pos.).



AHE 01 I schematic (spool in a balanced, mid-pos.).

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AE pressure compensator with brake defeat

The **AE** control is similar to the ACI (internal pilot pressure supply; page 10) but incorporates a solenoid controlled override function.

In addition, the AE includes a brake defeat valve which prevents motor displacement increase in the braking mode.

The **override** consists of a piston built into the AE end cover and an external electrohydraulic solenoid valve. When the solenoid is energized, system pressure is directed to the piston which in turn pushes on the spool of the servo control valve.

This causes the motor to lock in the max displacement position, irrespective of system pressure (min 30 bar).

Solenoids are available in 12 VDC (designated **L**) and 24 VDC (design. **H**); the required current is 2 and 1 A respectively.

The **brake defeat** valve is also part of the AE end cover and consists of a two-position, three-way spool. The two ports, x9 and x10 (below) should be connected to the corresponding ports of the displacement control of the variable displacement pump.

The brake defeat function prevents the motor outlet port pressure to influence the pressure compensator. If, for example, port A is being pressurized when driving 'forward', pressure in port B during braking will not cause the motor to increase its displacement.

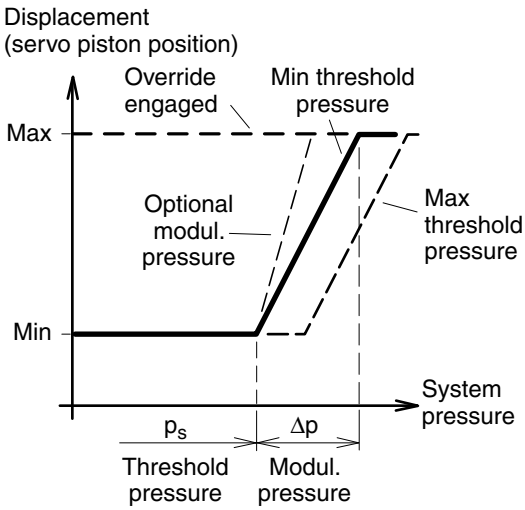
Likewise, when driving in 'reverse' (port B pressurized), any braking pressure in port A will not influence the control; refer to the schematic.

Gauge/pilot ports (AE control):

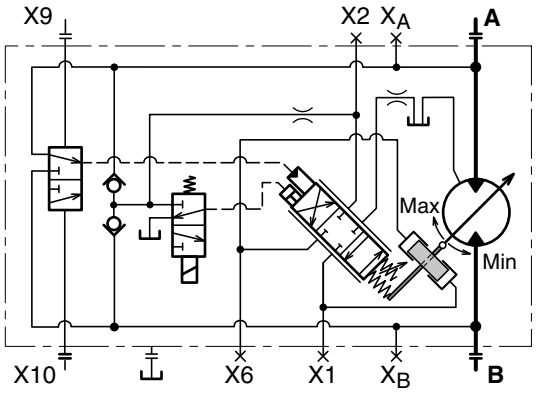
- XA System pressure, port A
- XB System pressure, port B
- X1 Servo piston pressure (increasing displ.)
- X2 Servo supply pressure (after orifice)
- X6 Servo piston pressure (decreasing displ.)
- X9 Brake defeat, port A
- X10 Brake defeat, port B

Ports are:

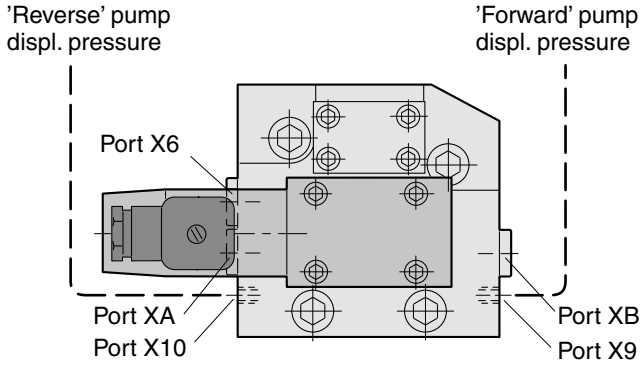
- M14x1.5 (ISO and Cartridge versions)
- 9/16"-18 O-ring boss (SAE version).



AE diagram.



AE schematic (spool in balanced, mid-position).



AE end cover with solenoid valve and brake defeat.

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Trollhättan, Sweden

EO two-position control

The EO is a two-position control, where max and min dis-placements are governed by a DC solenoid attached to the control cover (refer to the installation drawing on page 30).

The EO control is utilized in transmissions where only two operating modes are required: Low speed/high torque or high speed/low torque.

The servo piston, normally in the max displacement position, shifts to the min displacement position when the solenoid is activated. Intermediate displacements cannot be obtained with this control.

Servo pressure is supplied internally (through the shuttle valve from one of the main high pressure ports) or externally (port X4).

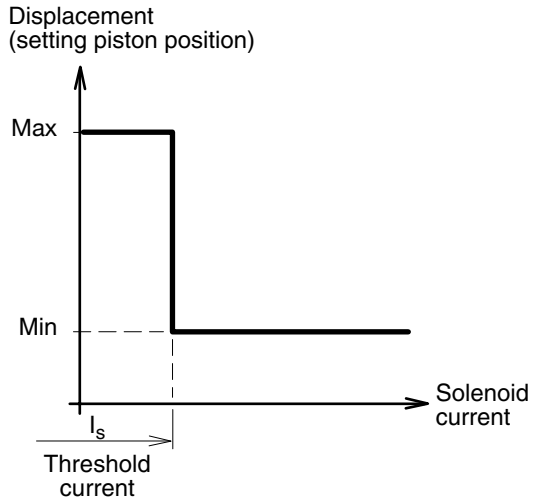
The solenoid is either 12 or 24 VDC, requiring 1.2 and 0.6 A respectively. An electrical connector is included (DIN 43650/IP54).

The EO two-position control is available in four versions:

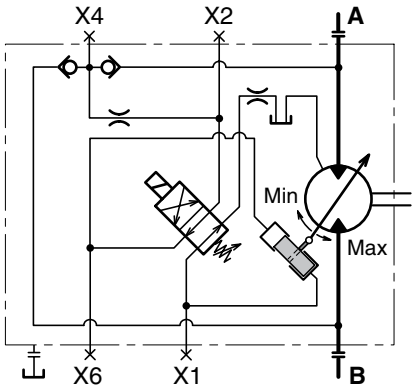
EOH 01 I - Internal servo supply, 24 VDC
EOL 01 I - Internal servo supply, 12 VDC
EOH 01 E - External servo supply, 24 VDC (optional)
EOL 01 E - External servo supply, 12 VDC (optional)

Gauge ports (EO control):
- X1 Setting piston pressure (max-to-min)
- X2 Servo supply pressure (after orifice)
- X4 Servo supply pressure (before orifice)
- X6 Setting piston pressure (min-to-max)

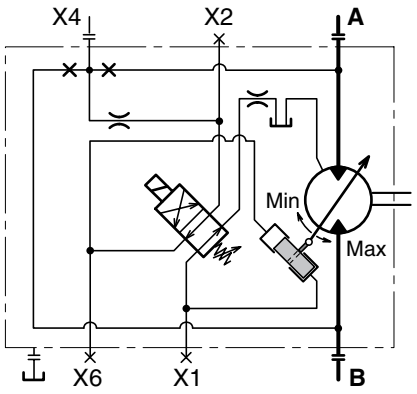
Ports are:
- M14x1.5 (ISO and cartridge versions)
- $^{9}/_{16}$"-18 O-ring boss (SAE version).



EO diagram.



EO H 01 I schematic (non-activated solenoid).



EO H 01 E schematic (non-activated solenoid).

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EP proportional control

The EP electrohydraulic proportional control is used in hydrostatic transmissions requiring a continuously variable shaft speed. The servo valve is governed by a DC solenoid attached to the control cover.

When the solenoid current increases above the threshold current, the servo piston starts to move from the max towards the min displacement position. The displacement vs. solenoid current is shown in the diagram to the right. Please note, that the shaft speed vs. current is non-linear; refer to the diagram below.

Solenoids are available in 12 and 24 VDC versions, requiring a max current of approx. 1.1 and 0.55 A respectively.

The threshold current (I_s) is factory set (0.4 A at 12 VDC/0,2 A at 24 VDC) but is adjustable (12 VDC: 0.25–0.45 A; 24 VDC: 0.10–0.23 A).

When utilizing the full displacement range, the required modulating current (ΔI) is 0.6 and 0.3 A respectively. In order to minimize hysteresis, a pulse-width modulated control signal of 70 to 90 Hz should be utilized.

See also “Controls, Note” on page 10.

NOTE: The modulating current (ΔI) is not adjustable.

The EP control is available in four versions:

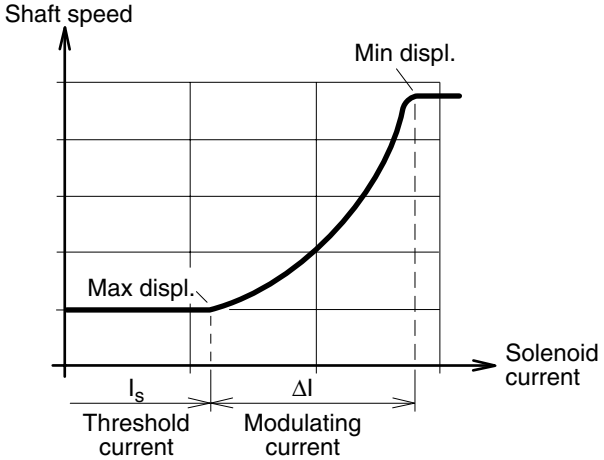
EP H 01 I - Internal servo supply, 24 VDC
EP L 01 I - Internal servo supply, 12 VDC
EP H 01 E - External servo supply, 24 VDC (optional)
EP L 01 E - External servo supply, 12 VDC (optional)

Gauge ports (EP control):

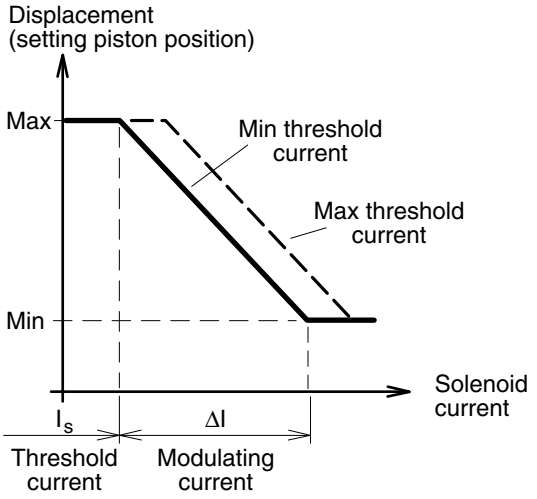
X1 Setting piston pressure (decreasing displ.)
X2 Servo supply pressure (after orifice)
X4 Servo supply pressure (before orifice)
X6 Setting piston pressure (increasing displ.)

Ports are:

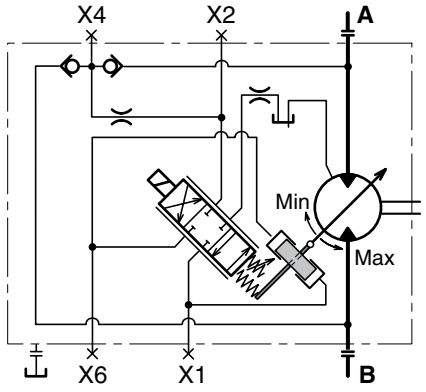
– M14x1.5 (ISO and cartridge versions)
– $^{9}/_{16}$"-18 O-ring boss (SAE version).



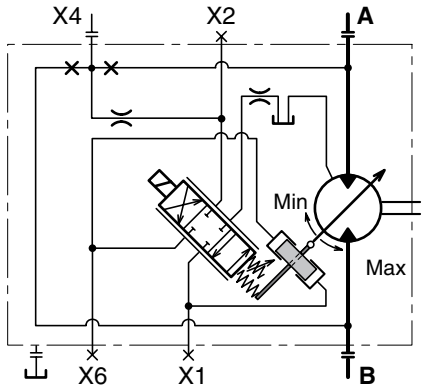
Shaft speed vs. solenoid current (EP control).



EP diagram.



EP H 01 I schematic (spool in a balanced, mid-pos.).



EP H 01 E schematic (spool in a balanced, mid-pos.).

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Pump and Motor Division
Trollhättan, Sweden

HO two-position control

The two-position HO control is similar to the EO (page 13) but the pilot signal is hydraulic. The position of the setting piston is governed by the built-in servo valve (same on all compensators and controls).

When the applied pilot pressure (port X5) exceeds the pre-set threshold pressure, the piston moves from the max to the min displacement position.

The threshold pressure is factory set at 10 bar but can be adjusted between 5 and 25 bar.

The HO two-position control is available in two versions:

HO S 01 I - Internal servo supply

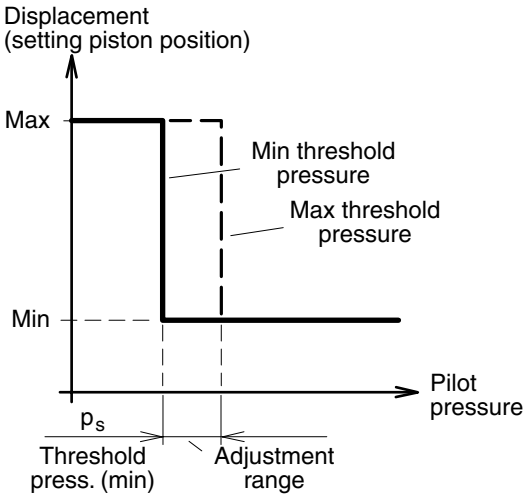
HO S 01 E - External servo supply (port X4) (optional)

Gauge/pilot ports (HO control):

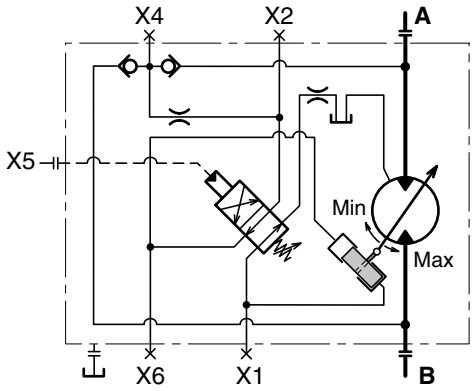
- X1 Setting piston pressure (max-to-min)
- X2 Servo supply pressure (after orifice)
- X4 Servo supply pressure (before orifice)
- X5 External pilot pressure (max 100 bar)
- X6 Setting piston pressure (min-to-max)

Ports are:

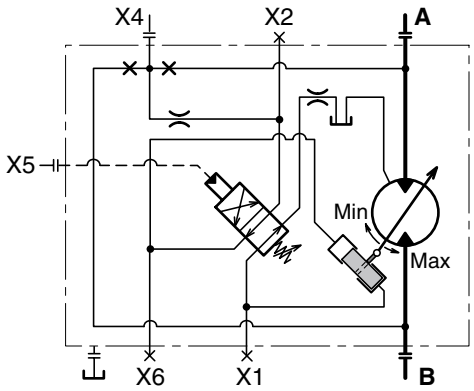
- M14x1.5 (ISO and cartridge versions)
- $^{9}/_{16}$"-18 O-ring boss (SAE version).



HO diagram.



HO S 01 I schematic (X5 not pressurized).



HO S 01 E schematic (X5 not pressurized).

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HP proportional control

Like the EP control described on page 14, the HP proportional control offers continuously variable displacement, but the pilot signal is hydraulic.

Normally, the servo piston stays in the max displacement position. When a sufficiently high pilot pressure (p_s) is applied to port X5, the piston starts to move towards the min displacement position.

As can be seen in the diagram to the right, the displacement changes in proportion to the applied modulating pressure.

In contrast, shaft speed vs. pilot pressure is non-linear; refer to the diagram below.

The following modulating pressures (Δp) can be selected: 15 or 25 bar.

The threshold pressure (p_s) is factory set at 10 bar but is adjustable between 5 and 25 bar.

See also “Controls, Note” on page 10.

Two versions of the HP control are available:

HPS 01 I - Internal servo supply

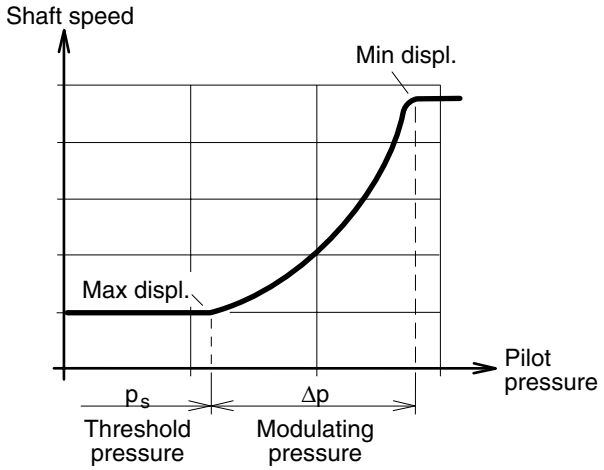
HPS 01 E - External servo supply (port X5) (optional)

Gauge/pilot ports (HP control):

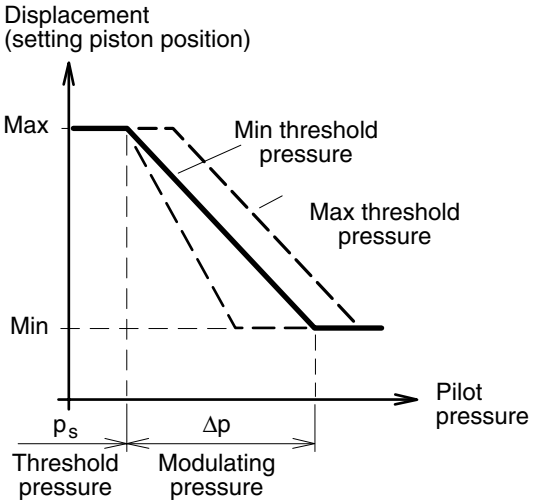
X1 Servo piston pressure (decreasing displ.)
X2 Servo supply pressure (after orifice)
X4 Servo supply pressure (before orifice)
X5 External pilot pressure (max 100 bar)
X6 Servo piston pressure (increasing displ.)

Ports are:

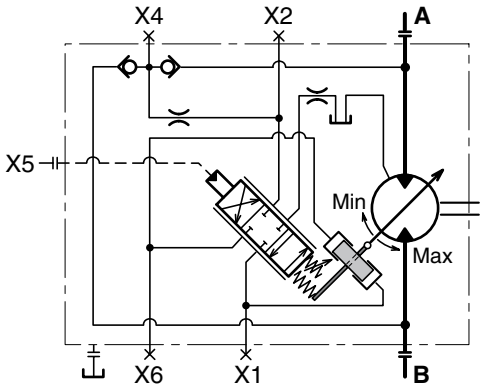
– M14x1.5 (ISO and Cartridge versions)
– $^{9}/_{16}$"-18 O-ring boss (SAE version).



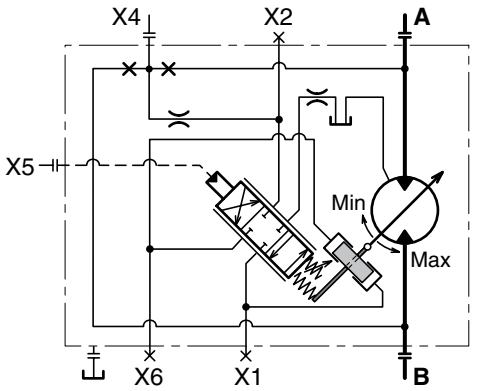
Shaft speed vs. pilot pressure (HP control).



HP diagram.



HP S 01 I schematic (spool in a balanced, mid-pos.).



HP S 01 E schematic (spool in a balanced, mid-pos.).

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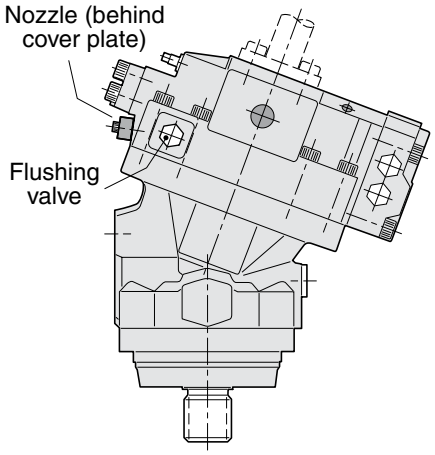
Flushing valve

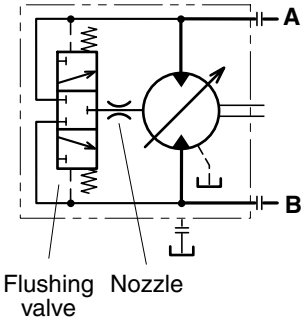
As an option, **L**, the V12 is available with a flushing (or shuttle) valve that supplies the motor with a cooling flow through the case. Cooling the motor may be required when operating at high speeds and/or power levels.

The flushing valve consists of a three-position, three-way spool valve built into a special end cap. It connects the low pressure side of the main circuit to a nozzle (optional size) that empties fluid into the motor case.

In a closed circuit transmission, the flushing valve removes part of the fluid in the main loop. The removed fluid is continuously being replaced by cool, filtered fluid from the low pressure charge pump on the main pump.

NOTE: The flushing valve ordering code is shown on page 23 (‘L 01’).





Available nozzles

Nozzle design.	Orifice size [mm]	Status
L01	**1.3**	**Standard**
L02	0.8	Optional
L03	1.0	“
L04	1.2	“
L05	1.5	“
L06	1.7	“
L07	2.0	“
L08	3.0	“

NOTE: ’L00’ - plug

High speed operation

Contact Parker Hannifin for additional information.

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Accessory valve blocks

SR pressure relief/check valve

To protect the main hydraulic circuit from unwanted pressure peaks, an add-on valve block, type SR, with two independent pressure relief cartridges and two large capacity check valves can be ordered for series V12.

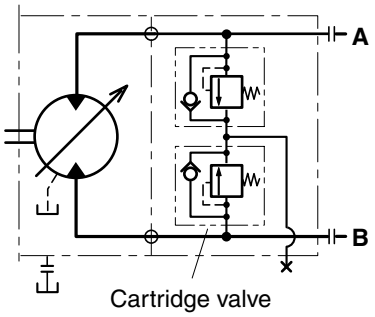
The valve block is mounted on the motor end cap as shown to the right. The individual cartridge has a fixed, factory-set opening pressure.

An external port for make-up fluid is provided. When sufficiently pressurized, it prevents motor cavitation due to pressure losses in the main circuit.

SV pressure relief valves

The SV relief valve block is an alternative to the SR valve block above.

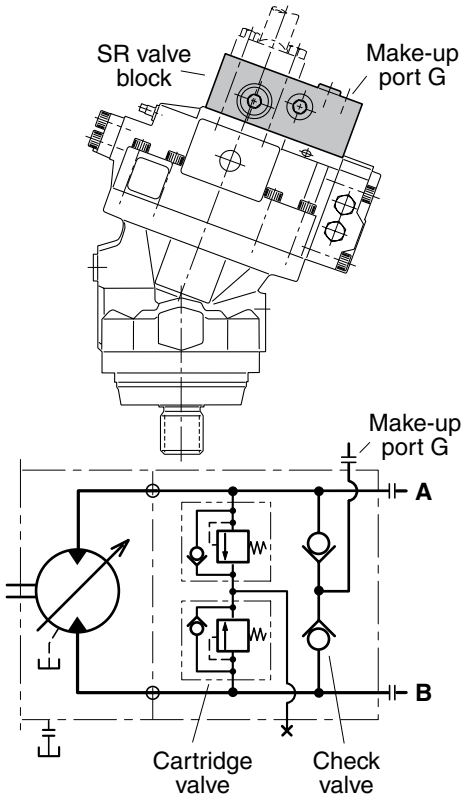
The SV contains the same cartridge valves as the SR but lacks the two check valves; refer to the SV schematic, below.



V12 with SV relief valve block.

Note:

Brake valves, please contact Parker Hannifin for additional information.



V12 with SR relief valve block.

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Speed sensor

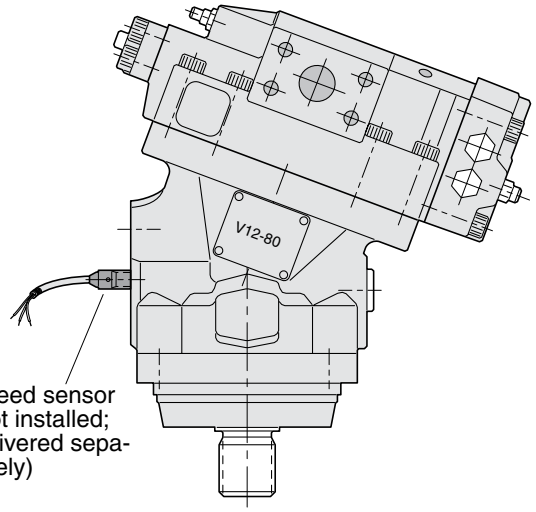
A speed sensor kit is available for the **ISO, Cartridge** and **SAE** versions of series V12, V12-80-Cartridge excepted.

The ferrostat differential (Hall-effect) sensor installs in a separate, threaded hole in the V12 bearing housing.

The speed sensor is directed towards the V12 shaft flange and outputs a 2 phase shifted square wave signal within a frequency range of 0 Hz to 15 kHz. Number of pulses per shaft rev is 36 which, at 5 Hz, corresponds to approx. 8 rpm.

When a 'Speed sensor' is ordered (refer to the ordering codes on pages 20 to 22), the housing is machined with the threaded hole; the speed sensor kit is delivered in a separate bag.

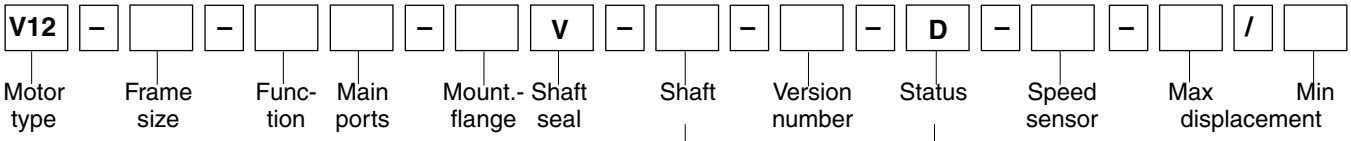
NOTE:
- The motor bearing housing must be prepared for the speed pick-up; refer to the V12 ordering codes on pg. 20, 21 and 22 (Code P).
- Additional information is provided in our publication HY30-8301/UK 'Speed sensor for series F11/F12 and V12/T12/V14'; available from Parker Hannifin.
- The speed sensor is also shown in the illustrations on pg. 24 and 28.



How to order
Please order the speed sensor on a separate order line next to the product order line.

Part number for speed sensor is 3785190.

ISO version (basic configuration)



Code	Frame size [cm³/rev]
060	60
080	80

Max and min displacement [cm³/rev]

Code	Speed sensor*
P	Prepared for speed sensor
O	None

Code	Status
D	Control pressure setting; max and min displacement screws sealed

Version number
Factory assigned for special versions

* Note.
See information on page 19, Speed Sensor

Frame size		60	80
Code	**Function**		
M	Motor; normal end cap position: EO, EP, HO and HP	x	x
T	Motor; normal end cap position: AC and AH	x	x

Frame size		60	80
Code	**Main ports**		
A	SAE flange; metric threads, rear ports	x	x
F	SAE flange; metric threads, side ports	x	x

Frame size		60	80
Code	**Mounting flange**		
I	ISO flange	x	x
N	ISO flange	(x)	(x)

Frame size		60	80
Code	**Shaft seal**		
V	PPS	x	x

Frame size		60	80
Code	**Shaft** (DIN 5480)		
C	Spline	(x)	(x)
D	Spline	x	x

x: Available (x): Optional – : Not available

Controls and flushing valve, see page 23

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Cartridge version (basic configuration)

V12	–		–			–	C	V	–		–		–	D	–		–		/	
Motor type		Frame size		Func-tion	Main ports		Mount.-flange	Shaft seal		Shaft		Version number		Status		Speed sensor		Max displacement		Min

Code	Frame size [cm³/rev]
060	60
080	80

Max and min displacement [cm³/rev]

Code	Speed sensor*
P	(Speed sensor only available for V12-60)
O	None

Code	Status
D	Control pressure setting; max and min displacement screws sealed

Version number
Factory assigned for special versions

* Note.
See information on page 19, Speed Sensor

Frame size	60	80
Code Function		
M Motor; normal end cap position: EO, EP, HO and HP	x	x
T Motor; normal end cap position: AC and AH	x	x

Frame size	60	80
Code Main ports		
A SAE flange; metric threads, rear ports	x	x
F SAE flange; metric threads, side ports	x	x

Frame size	60	80
Code Mounting flange		
C Cartridge flange	x	x

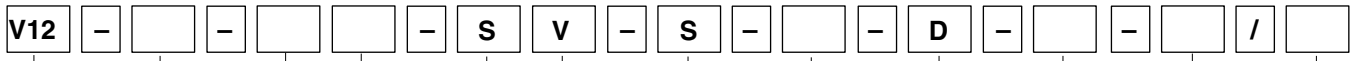
Frame size	60	80
Code Shaft seal		
V PPS	x	x

Frame size	60	80
Code Shaft (DIN 5480)		
C Spline	(x)	(x)
D Spline	x	x

x: Available (x): Optional – : Not available

Controls and flushing valve, see page 23

SAE version (basic configuration)



Code	Frame size [cm³/rev]
060	60
080	80

Frame size	60	80
Code **Function**		
M Motor; normal end cap position: EO, EP, HO and HP	x	x
T Motor; normal end cap position: AC and AH	x	x

Frame size	60	80
Code **Main ports**		
S SAE flange; UN threads, side ports	x	x
U SAE flange; UNthreads, rear ports	x	x

Frame size	60	80
Code **Mounting flange**		
S SAE flange	x	x

Frame size	60	80
Code **Shaft seal**		
V PPS	x	x

Frame size	60	80
Code **Shaft** (SAE J498b)		
S Spline	x	x

x: Available (x): Optional – : Not available

Max and min displacement [cm³/rev]

Code	Speed sensor*
P	Prepared for speed sensor
O	None

Code	Status
D	Control pressure setting; max and min displacement screws sealed

Version number
Factory assigned for special versions

* Note.
See information on page 19, Speed Sensor

Controls and flushing valve, see page 23

Controls and flushing valve

Basic configuration (ISO, Cartridge or SAE; see previous three pages) – [ ] – [ ] – [ ]

Control designation | Settings | Flushing valve

Frame size		60	80
Code	Control designation		
AC I 01 I	Pressure compensator, internal pilot pressure, internal servo supply	x	x
AC E 01 I	Pressure compensator, external pilot pressure, internal servo supply	(x)	(x)
AH I 01 I	Pressure compensator, hydraulic override, internal pilot pressure, internal servo supply	x	x
AH E 01 I	Pressure compensator, hydraulic override, external pilot pressure, internal servo supply	(x)	(x)
AEL 01 B	Pressure compensator electrohydraulic override, 12 VDC	-	x
AEH 01 B	Pressure compensator electrohydraulic override, 24 VDC	-	x
EOL 01 I	Electrohydraulic, two-position, 12 VDC, internal servo supply	x	x
EOL 01 E	Electrohydraulic, two-position, 12 VDC, external servo supply	(x)	(x)
EOH 01 I	Electrohydraulic, two-position, 24 VDC, internal servo supply	x	x
EOH 01 E	Electrohydraulic, two-position, 24 VDC, external servo supply	(x)	(x)
EPL 01 I	Electrohydraulic proportional, 12 VDC, internal servo supply	x	x
EPL 01 E	Electrohydraulic, proportional, 12 VDC, external servo supply	(x)	(x)
EPH 01 I	Electrohydraulic, proportional, 24 VDC, internal servo supply	x	x
EPH 01 E	Electrohydraulic, proportional, 24 VDC, external servo supply	(x)	(x)
HOS 01 I	Hydraulic two-position, standard version internal servo supply	x	x
HOS 01 E	Hydraulic two-position, standard version external servo supply	(x)	(x)
HPS 01 I	Hydraulic proportional, standard version internal servo supply	x	x
HPS 01 E	Hydraulic proportional, standard version external servo supply	(x)	(x)

NOTE: '01' - Standard nozzles x: Available (x): Optional – : Not available
Brake defeat valve: Internal servo supply

Settings

AC, AE, AH: Threshold pressure: **150** to **400** bar / Modulating pressure: **015**, **025** or **050** bar
EO, EP: Threshold current: 12 VDC - **400** mA; 24 VDC - **200** mA
Modulating current: EO - **000**; EP, 12 VDC - **600** mA; EP, 24 VDC - **300** mA
HO, HP: Threshold pressure: **010** bar / Modulating pressure: HO - **000**; HP - **015** or **025** bar

Code	Flushing valve
L 01	Integrated flushing valve; 01 - std. nozzle 1.3 mm (option; refer to page 17).

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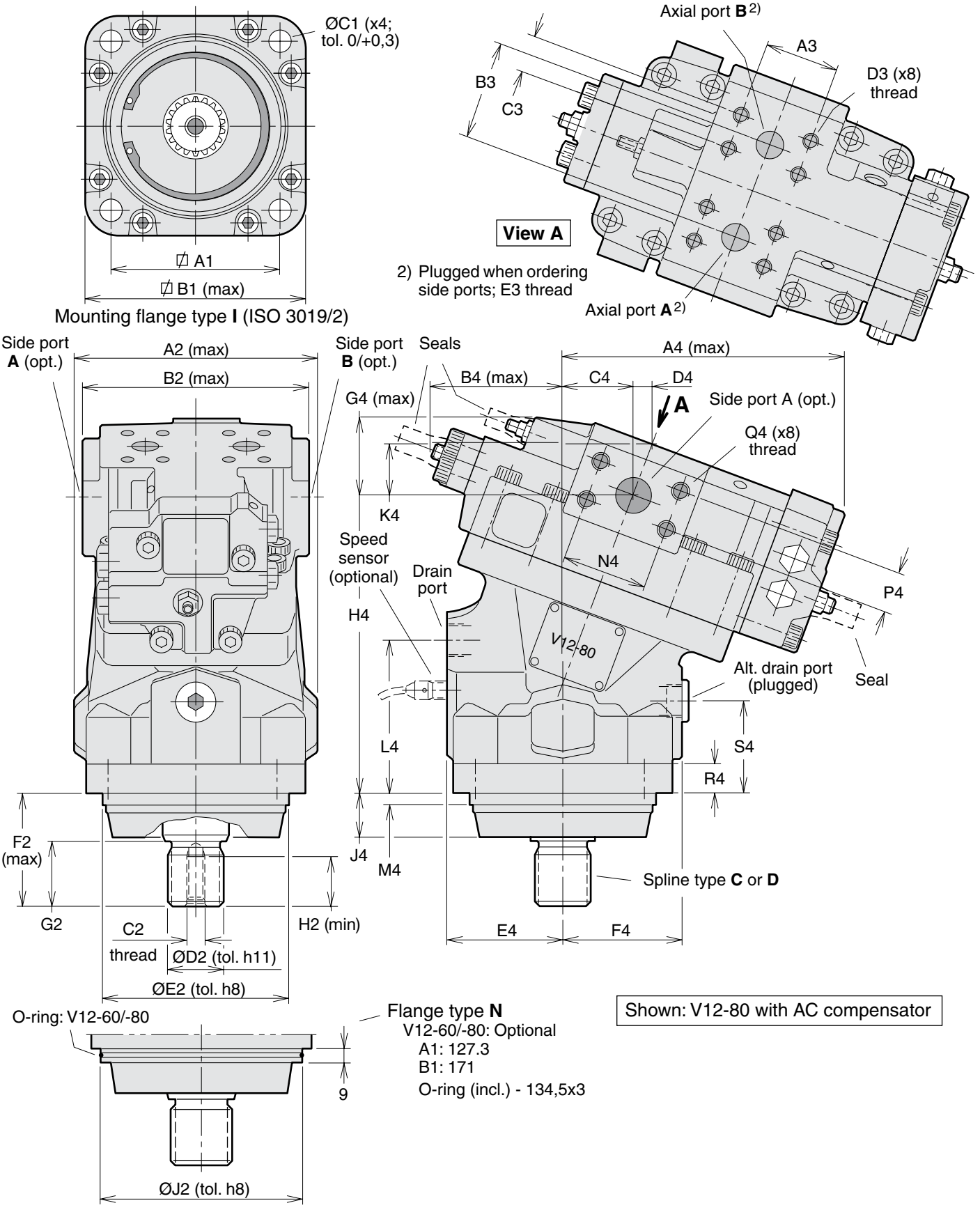
ISO version


ØC1 (x4; tol. 0/+0,3)
⏍ A1
⏍ B1 (max)
Mounting flange type **I** (ISO 3019/2)
Axial port **B** 2)
A3
B3
C3
D3 (x8) thread
View A
2) Plugged when ordering side ports; E3 thread
Axial port **A** 2)
Side port **A** (opt.)
A2 (max)
B2 (max)
Side port **B** (opt.)
Seals
A4 (max)
B4 (max)
C4
D4
G4 (max)
A
Side port A (opt.)
Q4 (x8) thread
K4
Speed sensor (optional)
Drain port
N4
P4
H4
V12-80
Alt. drain port (plugged)
Seal
L4
S4
R4
F2 (max)
J4
M4
Spline type **C** or **D**
G2
C2 thread
ØD2 (tol. h11)
H2 (min)
E4
F4
ØE2 (tol. h8)
O-ring: V12-60/-80
Flange type **N**
V12-60/-80: Optional
A1: 127.3
B1: 171
O-ring (incl.) - 134,5x3
9
ØJ2 (tol. h8)
Shown: V12-80 with AC compensator

Size	**V12-60**	**V12-80**
A1	113.2	113.2
B1	151	151
C1	14	14
A2	159	165
B2	146	154
C2	M12	M12
D2*	34.6	39.6
E2	125	125
F2*	73	78
G2*	40	45
H2	28	24
J2	140	140
A3	50.8	50.8
B3	66	66
C3	23.8	23.8
D3[1)]	M10x20	M10x20
E3[2)]	M22x1.5	M22x1.5
A4	188	193
B4	87	90
C4	45	48.3
D4	13.4	13.1
E4	76	78
F4	77	80
G4	55	57
H4	188	199
J4	31.5	31.5
K4	35.5	34.6
L4	94	101
M4	9	9
N4	50.8	57.2
P4	23.8	27.8
Q4[1)]	M10x20	M12x23
R4	20	20
S4	57.5	60.5

***** Dimension for shaft type **D**. Shaft type **C** dimensions are 5 mm shorter than those of type D.

1) Metric thread x depth in mm

2) Metric thread x pitch in mm

3) '30° involute spline, side fit'.

Ports

Type	V12-60	V12-80
Axial	19 [$^3/_4$"]	19 [$^3/_4$"]
Side	19 [$^3/_4$"]	25 [1"]
Drain[2)]	M22x1.5	M22x1.5

Main ports: ISO 6162, 41.5 MPa, type II (SAE J518c, 6000 psi)

Spline type **C** [3)] (DIN 5480)

Size	Dimension
V12-60	W30x2x14x9g
-80	W35x2x16x9g

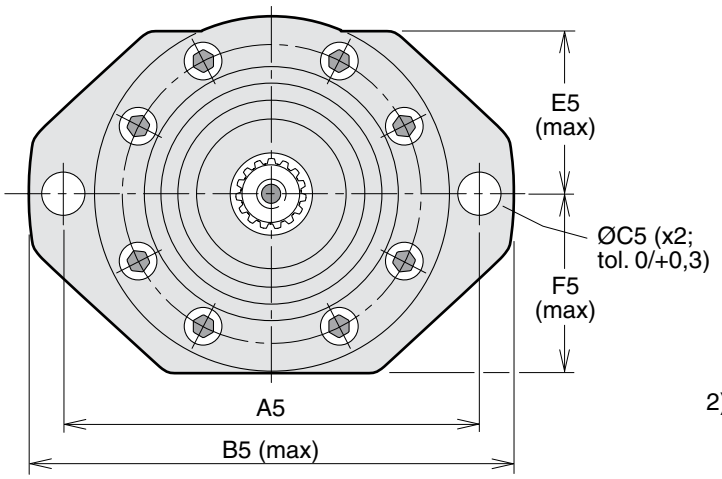
Spline type **D** [3)] (DIN 5480)

Size	Dimension
V12-60	W35x2x16x9g
-80	W40x2x18x9g

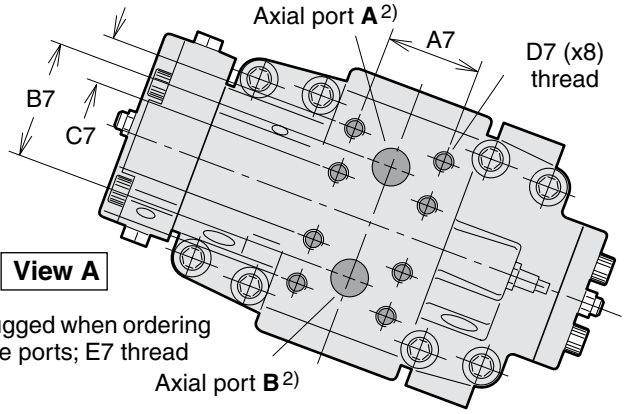
Flange

Size	**I**	**N**
V12-60	standard	optional
-80	standard	optional

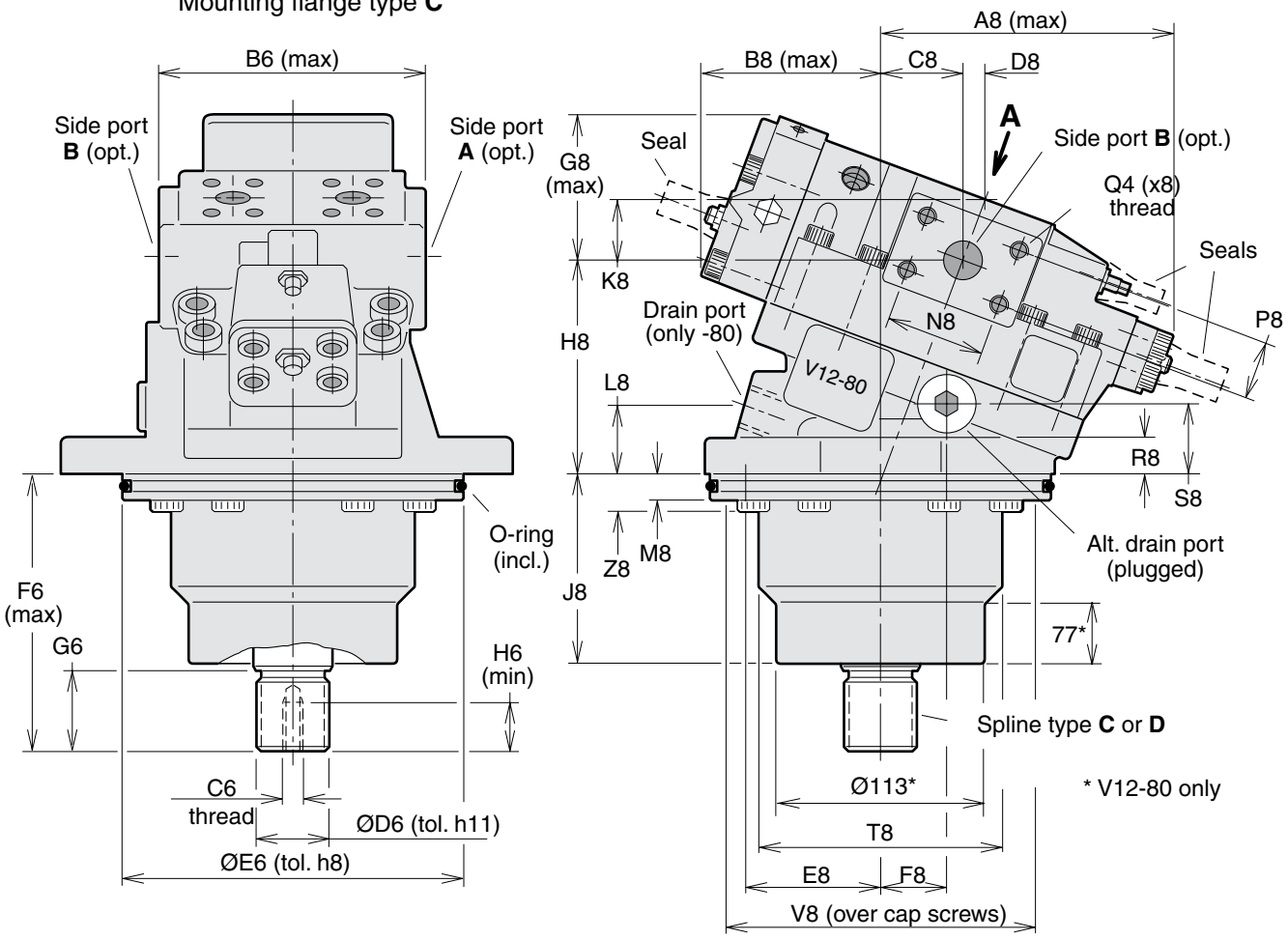
Cartridge version



Mounting flange type **C**



2) Plugged when ordering side ports; E7 thread



* V12-80 only

Shown: V12-80 with HO control

Size	**V12-60**	**V12-80**
A5	200	224
B5	238	263
C5	18	22
E5	78.5	89.5
F5	83	99.5
B6	146	154
C6	M12	M12
D6*	34.6	39.6
E6	160	190
F6	133	156.5
G6*	40	45
H6	28	28
A7	50.8	50.8
B7	66	66
C7	23.8	23.8
D7[1)]	M10x20	M10x22
E7[2)]	M22x1.5	M22x1.5
A8	166	173
B8	108	108
C8	45	48.3
D8	13.4	13.1
E8	77	77.5
F8	39	38
G8	86	85
H8	127	120.5
J8	90	106
K8	35.5	34.6
L8	39	39
M8	15	15
N8	50.8	57.2
P8	23.8	27.8
Q8[1)]	M10x20	M12x23
R8	20	20
S8	39	39
T8	121	139
V8	151	177
Z8	22	22

***** Dimension for shaft type **D**. Shaft type **C** dimensions are 5 mm shorter than those of type D.

1) Metric thread x depth in mm

2) Metric thread x pitch in mm

3) '30° involute spline, side fit'.

Ports

Type	V12-60	V12-80
Axial	19 [$^3/_4$"]	19 [$^3/_4$"]
Side	19 [$^3/_4$"]	25 [1"]
Drain	–	M22x1.5
Alt. drain	M18x1.5	M18x1.5

Main ports: ISO 6162, 41.5 MPa, type II
[SAE J518c, 6000 psi]

Spline type **C**[3)] (DIN 5480)

Size	Dimension
V12-60	W30x2x14x9g
-80	W35x2x16x9g

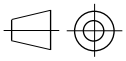
Spline type **D**[3)] (DIN 5480)

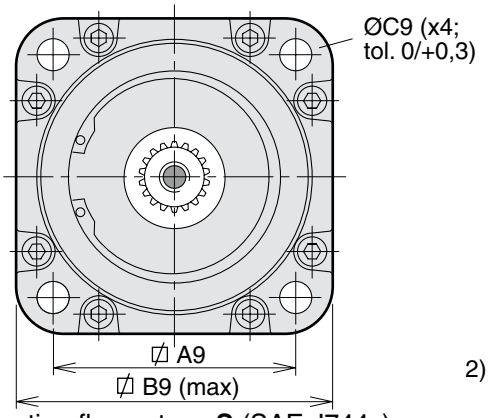
Size	Dimension
V12-60	W35x2x16x9g
-80	W40x2x18x9g

O-rings

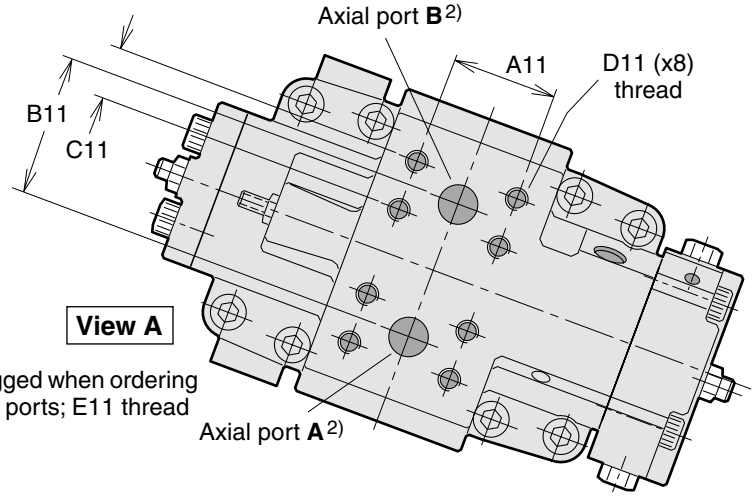
Size	Dimension
V12-60	150x4
-80	180x4

SAE version

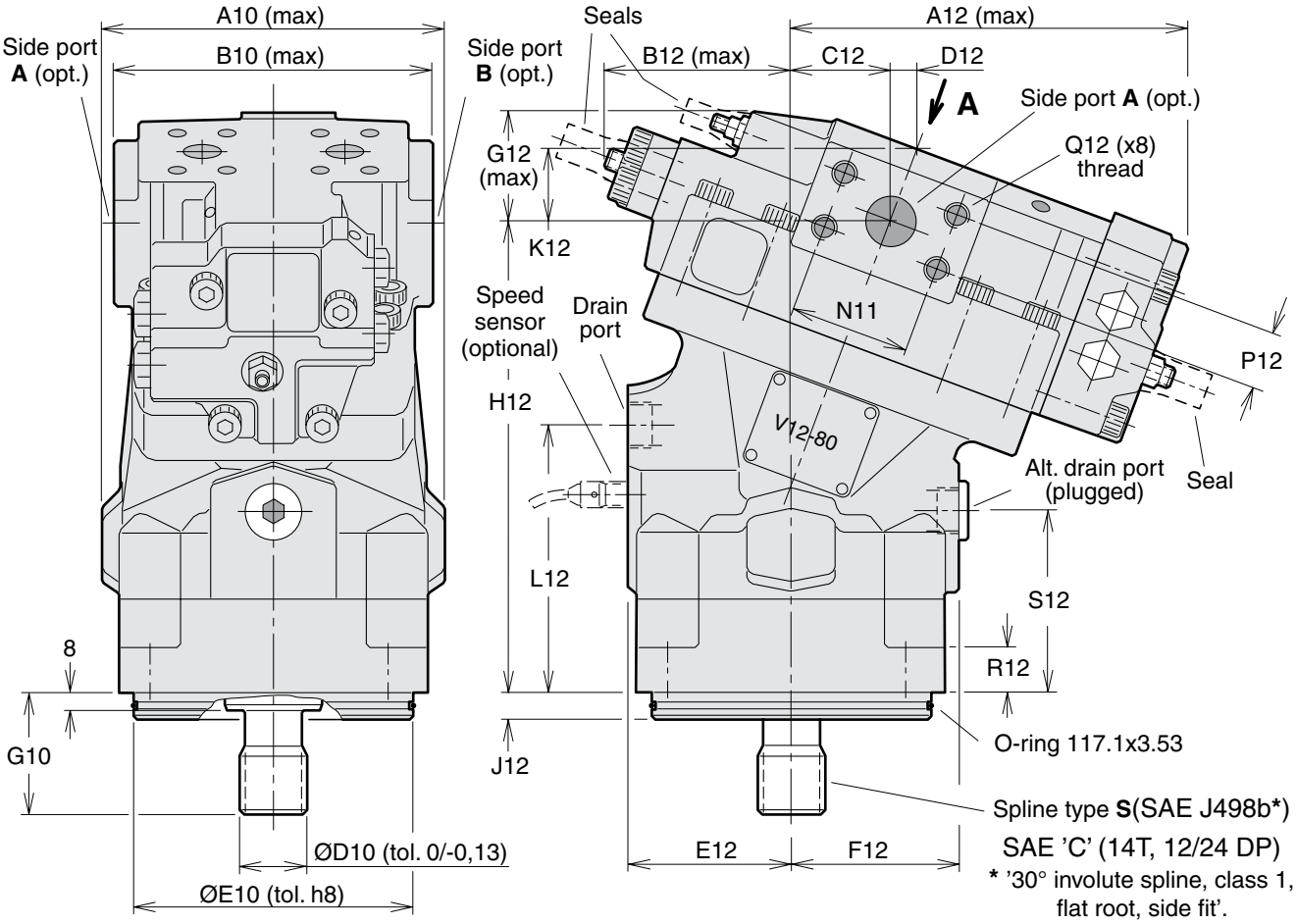




Mounting flange type **S** (SAE J744c)
Dimension SAE C



2) Plugged when ordering side ports; E11 thread



* '30° involute spline, class 1, flat root, side fit'.

Shown: V12-80 with AC compensator

Size	**V12-60**	**(inch)**	**V12-80**	**(inch)**
A9	114.5	4.51	114.5	4.51
B9	149	5.87	149	5.87
C9	14.3	0.56	14.3	0.56
A10	159	6.26	165	6.50
B10	146	5.75	154	6.06
D10	31.22	1.23	31.22	1.23
E10	127.00	5.00	127.00	5.00
G10	55.6	2.19	55.6	2.19
A11	50.8	2.00	50.8	2.00
B11	66	2.60	66	2.60
C11	23.8	0.98	23.8	0.98
D11[1)]	3/8"-16 x20	3/8"-16 x0.79	3/8"-16 x20	3/8"-16 x0.79
E11[2)]	M22x1.5	-	M22x1.5	-
A12	188	7.40	193	7.60
B12	87	3.43	90	3.54
C12	45	1.77	48.3	1.90
D12	13.4	0.53	13.1	0.52
E12	76	2.99	78	3.07
F12	77	3.03	80	3.15
G12	55	2.17	57	2.24
H12	212	8.35	223	8.78
J12	12.7	0.50	12.7	0.50
K12	35.5	1.40	34.6	1.36
L12	118	4.65	125	4.92
N12	50.8	2.00	57.2	2.25
P12	23.8	0.93	27.8	1.09
Q12*	3/8"-16 x20	3/8"-16 x0.79	7/16"-14 x23	7/16"-14 0.91
R12	20	0.79	20	0.79
S12	81.5	3.21	84.5	3.33

1) UNC thread x depth in mm
2) Metric thread x pitch in mm.

Ports

Type	V12-60	V12-80
Axial	3/4"	3/4"
Side	3/4"	1"
Drain	7/8"-14	7/8"-14

Main ports: 6000 psi (SAE J518c).
Drain ports: O-ring boss, UNF thread (SAE 514).

2

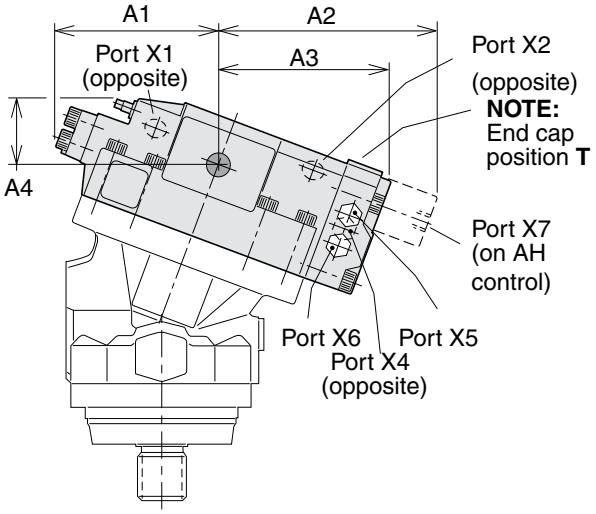
Control installation dimensions

NOTE: - The basic motor side port locations are shown on pages 24, 26 and 28.

- End cap position: Refer to the ordering codes, pages 20-22.
- Control/gauge ports are:
  - M14x1.5 (ISO and cartridge versions).
  - $^{9}/_{16}$"-18 UNF (SAE version).
- All dimensions are max.

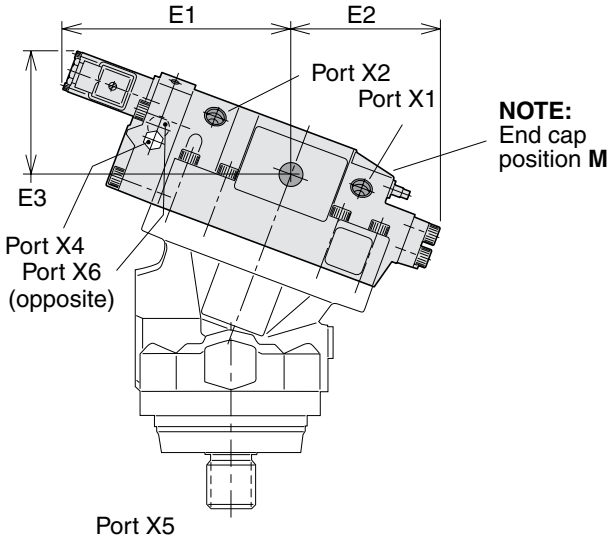
AC and AH compensators

Dim.	V12-60	(inch)	V12-80	(inch)
A1	132	5.20	138	5.43
A2	186	7.32	188	7.40
A3	143	5.63	145	5.71
A4	55	2.17	57	2.24



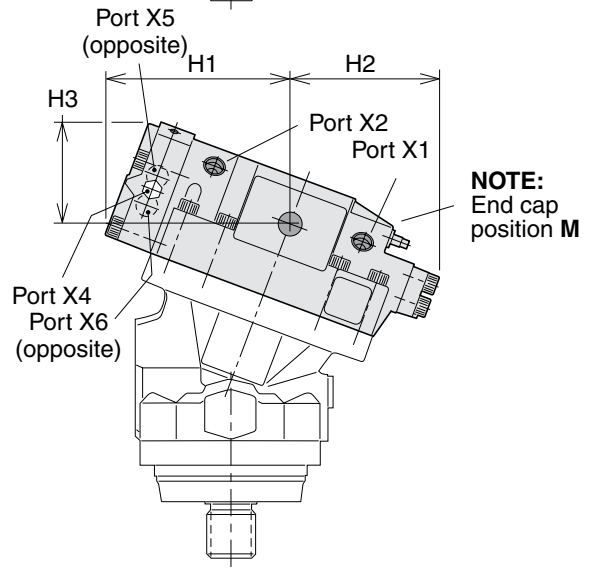
EO and EP controls

Dim.	V12-60	(inch)	V12-80	(inch)
E1	190	7.48	192	7.56
E2	121	4.76	125	4.92
E3	106	4.17	106	4.17



HO and HP controls

Dim.	V12-60	(inch)	V12-80	(inch)
H1	153	6.02	156	6.14
H2	121	4.76	125	4.92
H3	86	3.39	85	3.35



V14

3

Content

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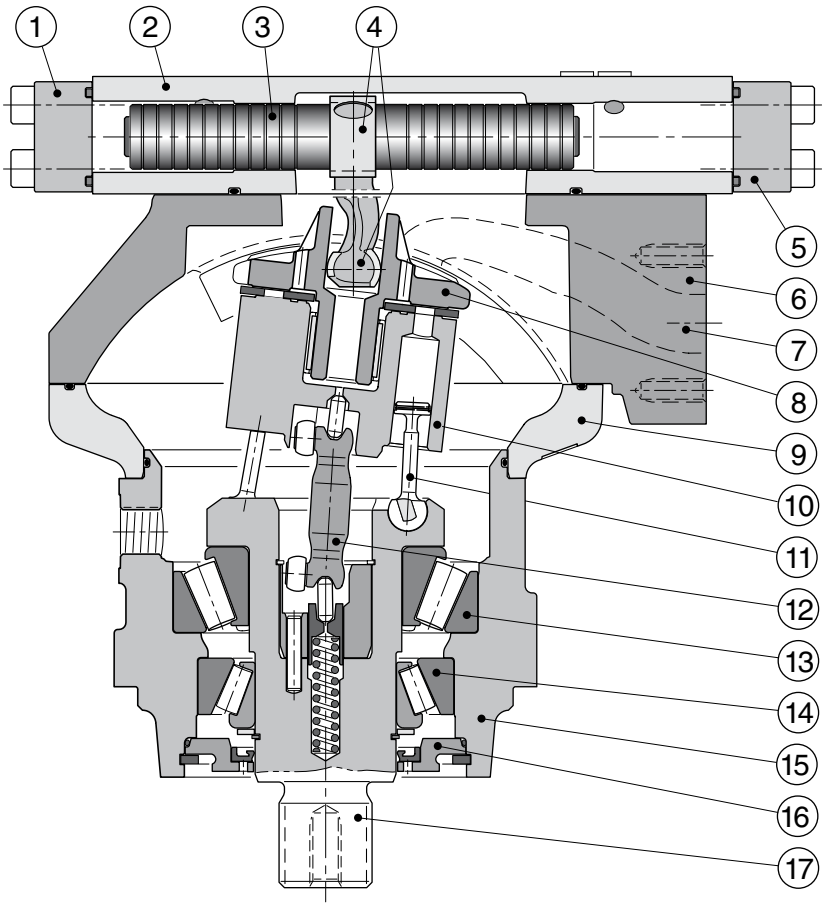
V14 cross section

1. End cover, min displ.
2. Control module
3. Setting piston
4. Connecting arm
5. End cover, max displ.
6. Connection module
7. Main pressure port
8. Valve segment
9. Intermediate housing
10. Cylinder barrel
11. Spherical piston with laminated piston ring
12. Synchronizing shaft
13. Inner roller bearing
14. Outer roller bearing
15. Bearing housing
16. Shaft seal with retainer
17. Output shaft



Specifications

V14 frame size	**110**	**160**
Displacement [cm^3/rev]		
- at 35° (max)	110	160
- at 6.5° (min)	22	32
Operating pressure [bar]		
- max intermittent[1)]	480	480
- max continuous	420	420
Operating speed [rpm]		
- max intermittent at 35°[1)]	3 900	3 400
- max continuous at 35°	3 400	3 000
- max intermittent at 6.5°-20°[1)]	6 500	5 700
- max continuous at 6.5°-20°	5 700	5 000
- min continuous	50	50

1) Max 6 seconds in any one minute.

V14 frame size	**110**	**160**
Flow [l/min]		
- max intermittent[1)]	430	550
- max continuous	375	480
Output torque [Nm]		
at 100 bar (theor.)	175	255
Max output power[1)] [kW]	262	335
Corner power [kW]		
- intermittent[1)]	570	730
- continuous	440	560
Mass moment of inertia		
($x10^{-3}$) [kg m^2]	8.2	14.5
Weight [kg]	54	68

Efficiency diagrams

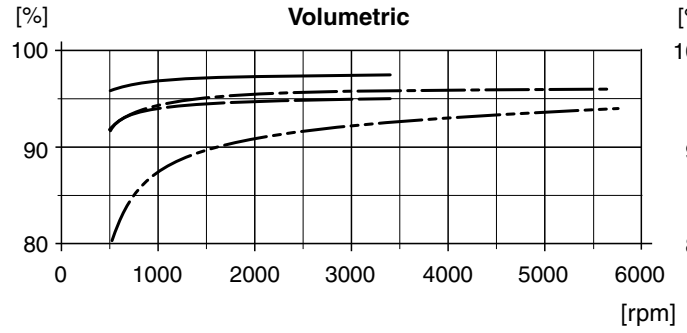
The following diagrams show volumetric, mechanical and overall efficiencies versus shaft speed at 210 and 420 bar operating pressure, and at full (35°) and reduced (10°) displacements.

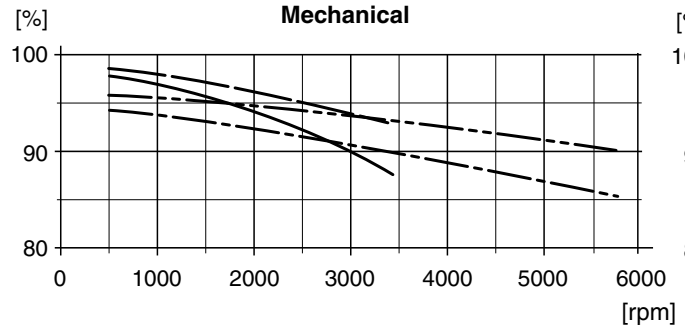
Information on efficiencies for a specific load condition can be made available from Parker Hannifin.

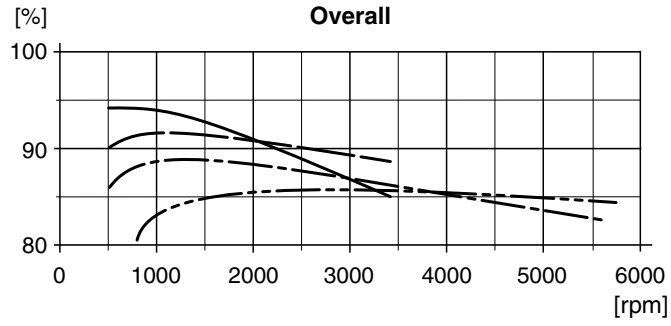
210 bar at full displacement
420 bar " " "

210 bar at reduced displacement
420 bar " " "

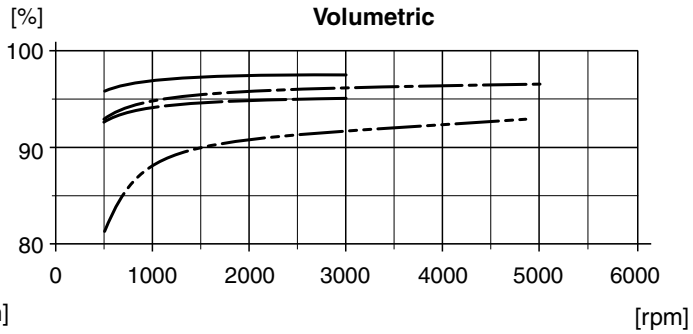
V14-110

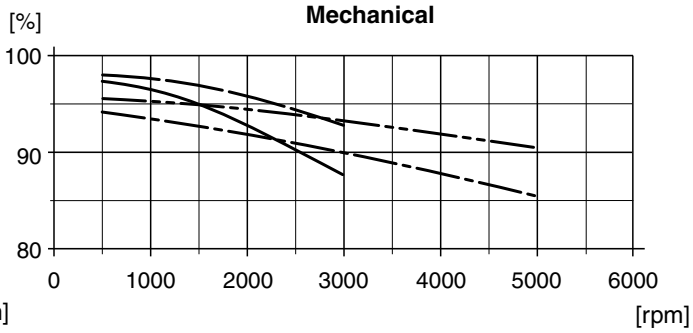


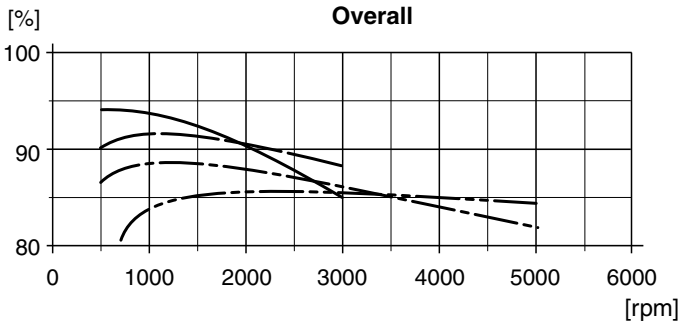




V14-160







Controls - general information

The following V14 controls satisfy most application requirements:

- **AC**, **AD** and **AH** (automatic pressure compensators)
- **EO** and **HO** (two-position controls)
- **EP** and **HP** (proportional controls)
- **HPC** (HP control with pressure cut off, see page 45)

All controls utilize a servo piston that connects to the valve segment (refer to the illustration on page 32).

The built-in four-way servo valve determines the position of the servo piston and, in turn, the displacement.

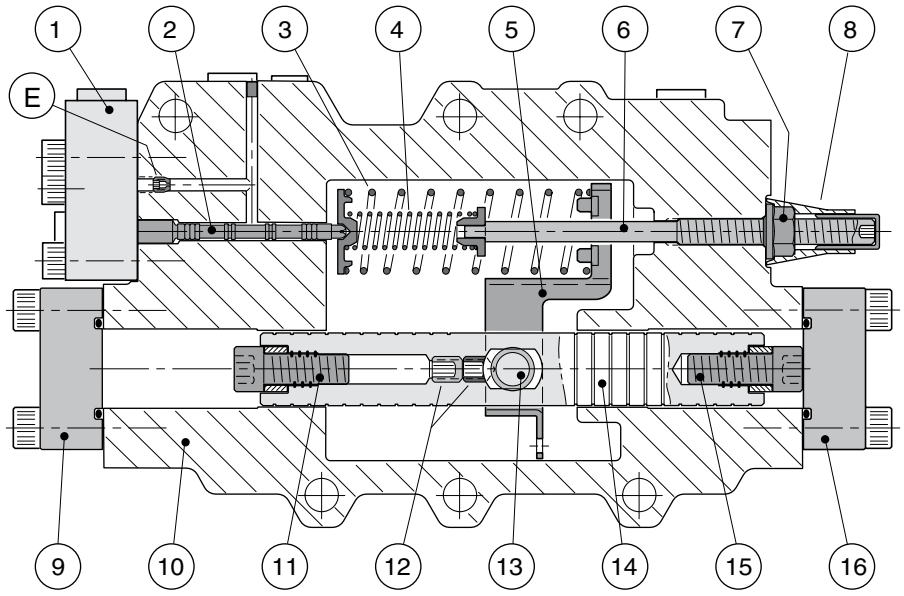
The displacement angle (between output shaft and cylinder barrel) ranges from 35° (max) to 6.5° (min).

Servo supply pressure is obtained from the pressurized, main port through the corresponding, built-in shuttle valve.

The response time (i.e. from max-to-min or from min-to-max displacement) is determined by restrictor nozzles in the servo valve supply and return lines; refer to the schematics.

NOTE: The modulating pressure/current, $\Delta p/\Delta I$ values are valid for motors that are not diplacement limited.

AC pressure compensator



Cross section of the AC pressure compensator module.

1. AC control cover
2. Servo valve spool
3. Modulating spring
4. Threshold spring
5. Feedback arm
6. Threshold adjustment screw
7. Seal nut
8. Two-part seal (threshold adjustm't) *
9. End cover (max displ.)
10. Control module housing
11. Max displ. limiting screw/bushing
12. Set screws
13. Connecting arm
14. Setting piston
15. Min displ. limiting screw/bushing
16. End cover (min displ.).

E. Nozzle location; refer to the hydraulic schematics, pag. 35-37.

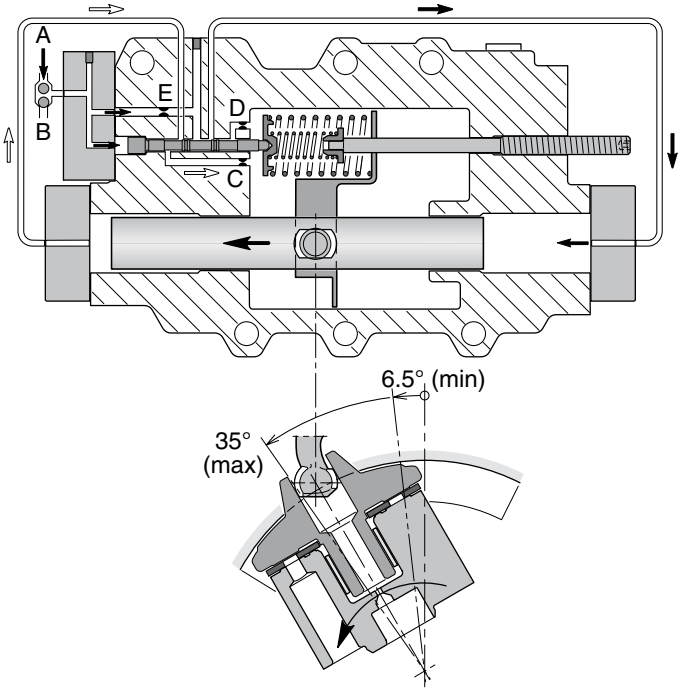
* Yellow cap = factory set.
Red cap 3797065 available as spare parts

AC compensator function

Refer to the illustration below (left):

When pressure in port A (or B) increases, the servo valve spool is pushed to the right, directing flow to the right hand setting chamber - the setting piston moves to the left; displacement and output torque increases.

At the same time, the shaft speed decreases correspondingly (at a constant pump flow to the motor).

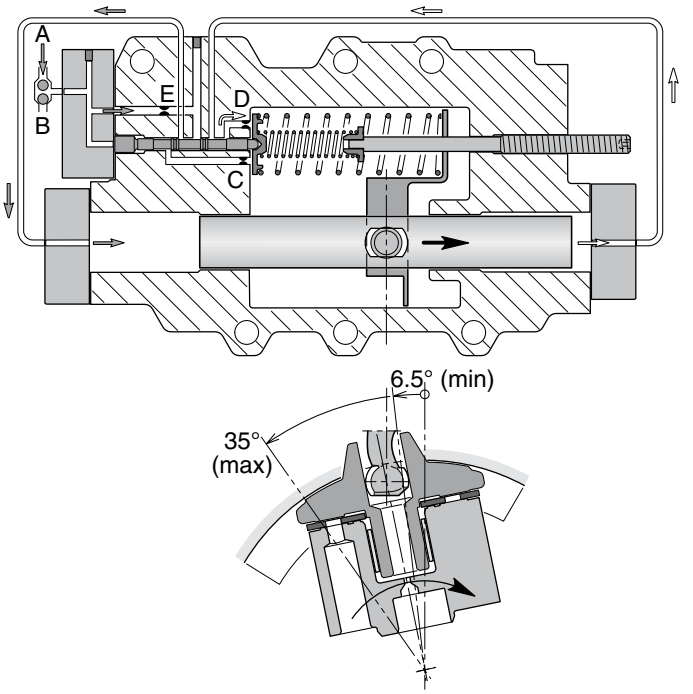


AC function (displ. increases at increasing system pressure).

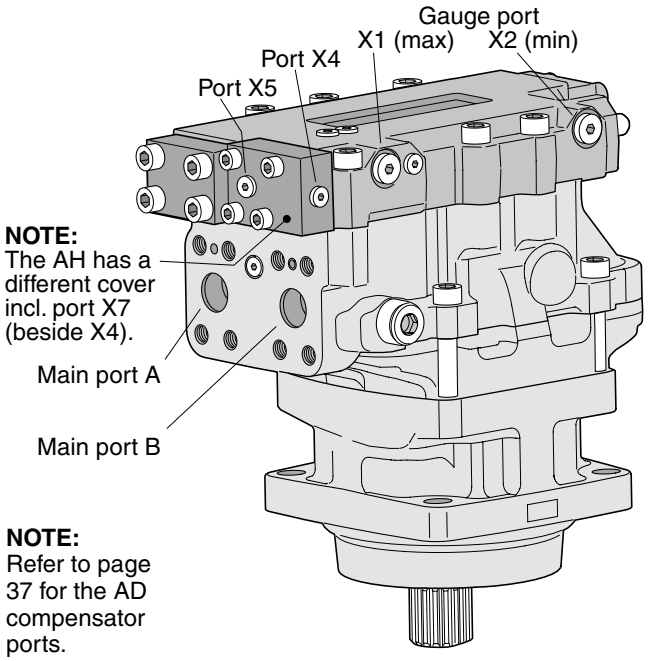
Refer to the illustration below (right):

When pressure in port A (or B) decreases, the servo valve spool moves to the left, directing flow to the left hand setting chamber - the setting piston moves to the right; displacement and output torque decreases.

At the same time, the shaft speed increases correspondingly (at a constant pump flow to the motor).



AC function (displ. decreases at decreasing system pressure).



Port locations - V14- with AC or AH compensator.

Gauge/pilot ports (AC and AH compensators):

- X1 Setting piston pressure (decreasing displ.)
- X2 Setting piston pressure (increasing displ.)
- X4 Servo supply pressure (before orifice and filter)
- X5 Pilot pressure
- X7 Override pressure (on the AH)

Port sizes:

- M14x1.5 (ISO and cartridge versions)
- $^{9}/_{16}$"-18 O-ring boss (SAE version)

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AC compensator function (cont'd)

The AC compensator is used in off-road vehicle hydrostatic propel transmissions. The compensator automatically adjusts motor displacement between available max and min to the output torque requirement (up to max available system pressure).

Normally, the motor stays in the minimum displacement position. When there is a demand for additional torque, e.g. when the vehicle enters an upgrade, the displacement increases (providing more torque) while the motor shaft speed decreases proportionally.

The threshold pressure, where displacement starts to increase ('p_s'; refer to the AC diagram), is adjustable between 100 and 400 bar.

To reach max displacement, an additional modulating pressure (Δp) above the threshold pressure is required.

To satisfy specific hydraulic circuit requirements, a modulating pressure of 15, 25, 50 or 80 bar can be selected.

The pressure compensator is supplied with a small filter installed in the AC control cover (between ports X4 and X5); refer to the schematic below right.

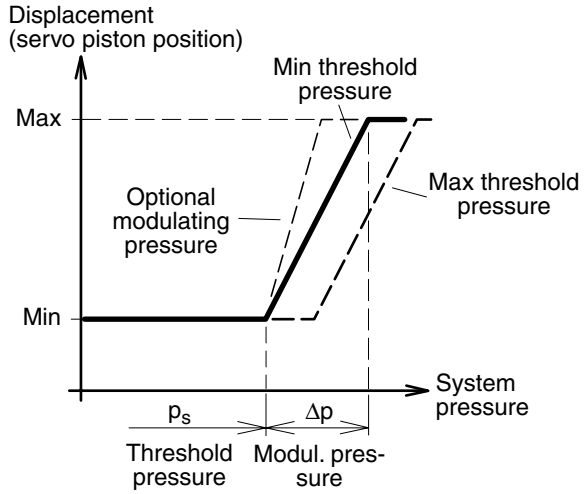
Gauge/pilot ports (AC and AH compensators):

- X1 Setting piston pressure (decreasing displ.)
- X2 Setting piston pressure (increasing displ.)
- X4 Servo supply pressure (before orifice and filter)
- X5 Pilot pressure

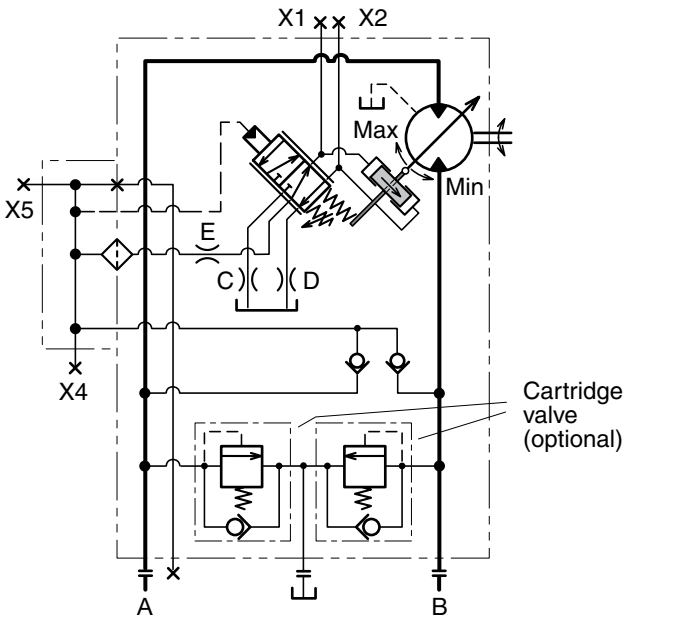
Port sizes:

- M14x1.5 (ISO and cartridge versions)
- $^{9}/_{16}$"-18 O-ring boss (SAE version)

NOTE: Port locations are shown in the illustration on page 35.



AC diagram (displacement vs. system pressure).



AC schematic (shown: control moving towards min displ.)

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AD pressure compensator

The AD control is similar to the AC (shown on previous pages) but incorporates a solenoid controlled override function and a brake defeat valve.

Override

- The override consists of a piston built into a special end cover and an external solenoid.
- When the solenoid is energized, system pressure is directed to the piston which in turn pushes on the spool of the servo control valve. This causes the motor to lock in the max displacement position, irrespective of system pressure (min 30 bar).
- Solenoids are available in 12 VDC (designated **L**) and 24 VDC (design. **H**); the required current is 2 and 1 A respectively.

Brake defeat valve

- The brake defeat function, which is also built into the special end cover, consist of a two-position, three-way valve. Ports X9 and X10 (refer to the schematic) are connected to the corresponding ports of the pump displacement control.
- The function prevents any pressure in the motor return port to influence the pressure compensator. Say, e.g., that motor port A is pressurized to move the vehicle 'forward'. Thus, back pressure in return port B, which develops in the braking mode, will not cause the compensator to move towards the max displacement position and vehicle braking will be smooth.
- Likewise, when port B is pressurized when the vehicle moves 'backward', braking presssure in port A will not influence the compensator.

Gauge/pilot ports (AD compensator):

X2 Servo piston pressure (increasing displ.)

X9 Pressure (from the pump control) to the brake defeat valve (for port A)

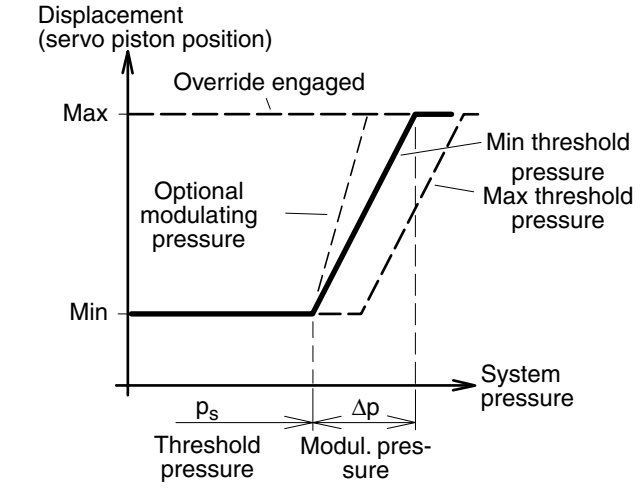
X10 Pressure (from the pump control) to the brake defeat valve (for port B)

Port sizes:

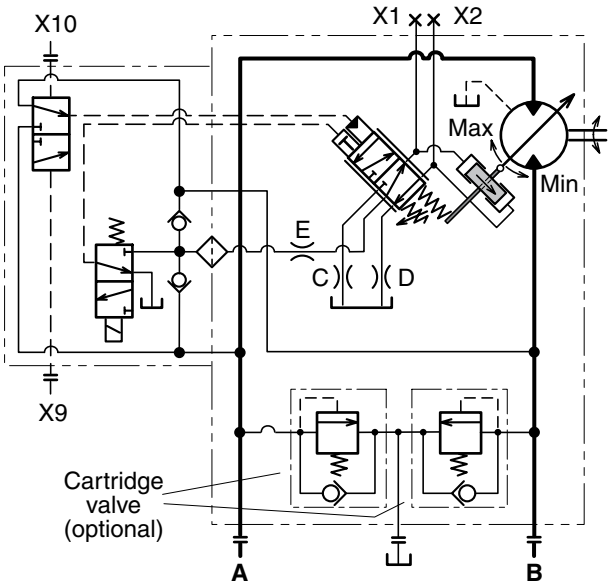
– M14x1.5 (ISO version)

– X2 is M14x1.5 O-ring boss (SAE version)

NOTE: Some of the ports are shown in the illustration on page 35.



AH diagram (displacement vs. system pressure).



AD schematic (shown: override solenoid not engaged; the compensator moves towards min displacement).

3

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AH pressure compensator

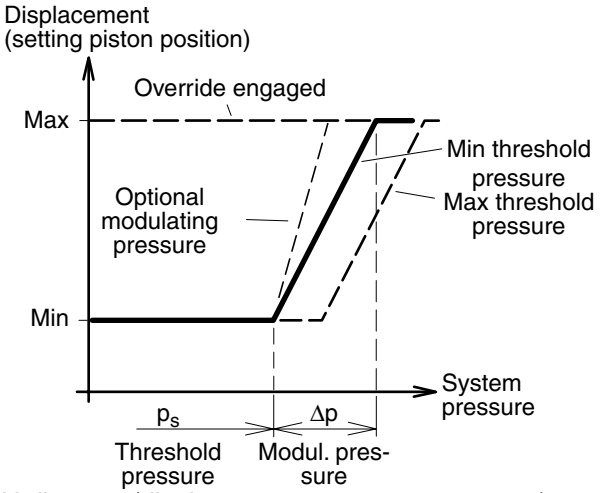
The AH compensator is similar to the AD (shown on previous page) but incorporates only an hydraulic override device. It is utilized in hydrostatic transmissions where a high degree of manœuvrability at low vehicle speeds is desirable.

When the override is pressurized, the servo piston moves to the max displacement position irrespective of system pressure, provided the servo supply pressure is at least 30 bar.

Required override pressure, port X7 (min 20 bar):

$$p_7 = \frac{p_S + \Delta p}{24} \quad [bar]$$

p_7 = Override pressure
p_s = System pressure
Δp = Modulating pressure



AH diagram (displacement vs. system pressure).

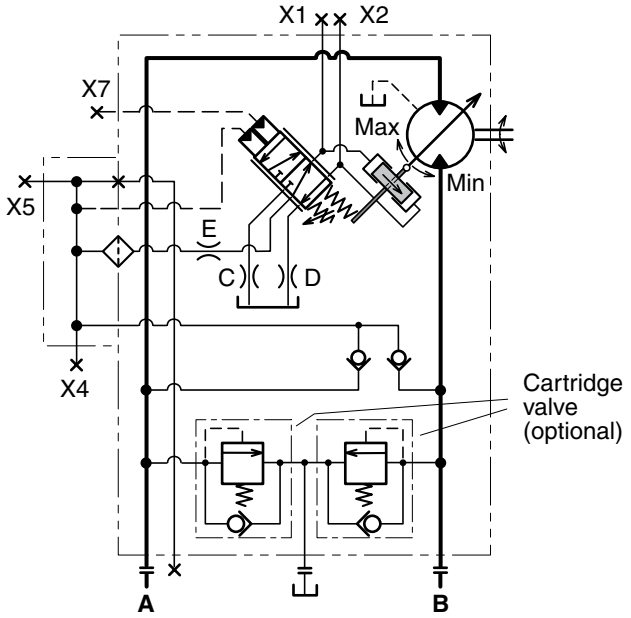
Gauge/pilot ports (AH compensator):

- X1 Servo piston pressure (decreasing displ.)
- X2 Servo piston pressure (increasing displ.)
- X4 Servo supply pressure (before orifice and filter)
- X5 Pilot pressure
- X7 Override pressure

Port sizes:

- M14x1.5 (ISO version)
- $^{9}/_{16}$"-18 O-ring boss (SAE version)

NOTE: Port locations are shown in the illustration on page 35.



AH schematic (shown: override port X7 not pressurized; the compensator is moving towards min displacement).

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EO, EP, HO and HP controls (general information)

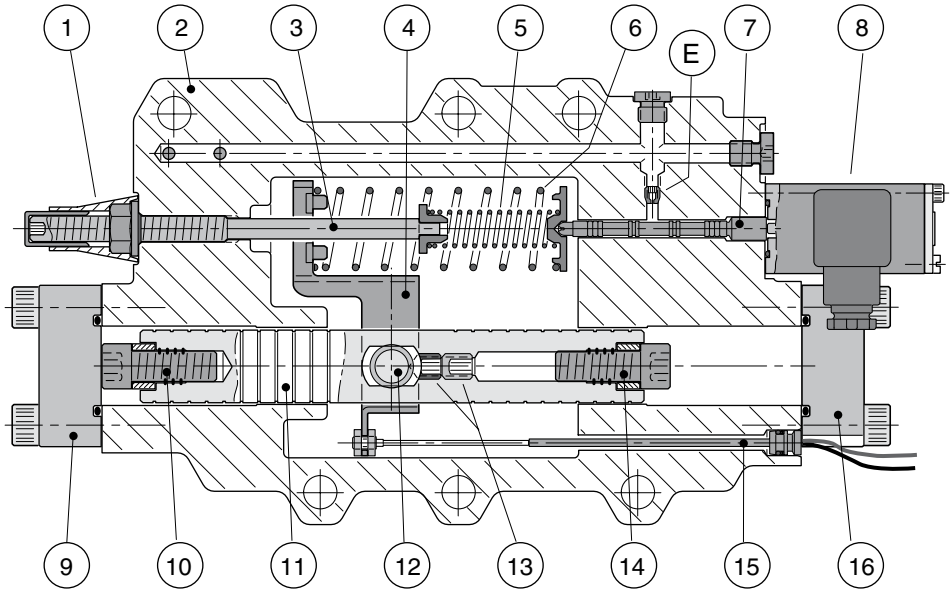
Basically, these controls function in a similar way.

At increasing solenoid current (EP) or increasing pilot pressure (HP) the control moves towards the min displacement position.

At decreasing current or pilot pressure, the control retracts towards max displacement.

In comparison with EP and HP, the EO and HO controls have no modulating spring; this means that only min and max displacements can be obtained with these controls.

Max and min displacements can be limited by a screw with spacer bushing as shown below.



Cross section of the EP control module.

1. Two-part seal (threshold adjustm't) *
2. Control module housing
3. Threshold adjustment screw
4. Feedback arm
5. Threshold spring
6. Modulating spring (EP, HP only)
7. Servo valve spool
8. Solenoid (EO, EP only); cover on HO, HP
9. End cover (max displ. limit)
10. Max displ. limiting screw/bushing
11. Setting piston
12. Connecting arm
13. Set screws
14. Min displ. limiting screw/bushing
15. Setting piston position sensor
16. End cover (min displ. limit)

E. Nozzle location; refer to the hydraulic schematics.

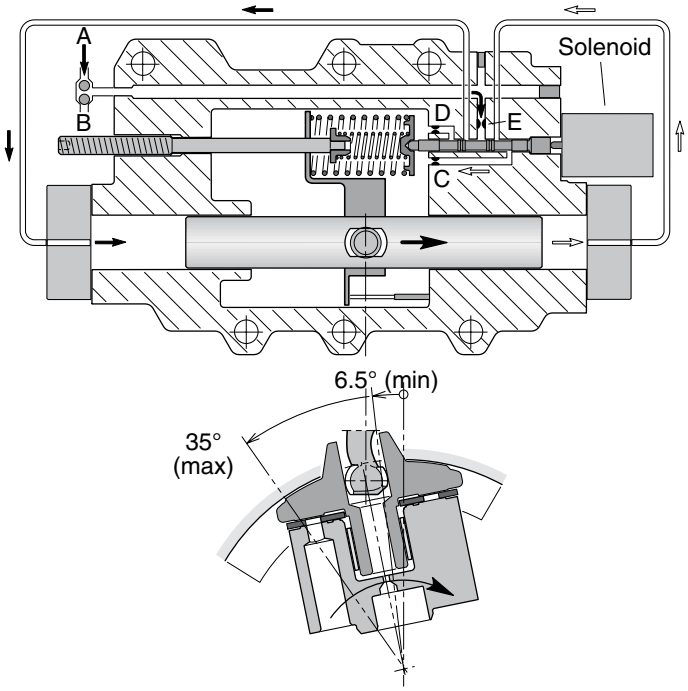
* Yellow cap = factory set.
Red cap 3797065 available as spare parts

EP control function (solenoid current increasing)

NOTE: Valid also for the HP at increasing pilot pressure.

Refer to the illustration below left:

At an increasing current (above the threshold value), the solenoid spool pushes left on the servo valve spool, and flow is directed to the left hand setting chamber - the setting piston moves to the right and the displacement decreases. This means, that the shaft speed in-creases while the output torque decreases correspondingly (at a constant pump flow and system pressure).



EP control function (displ. decrease at increasing current).

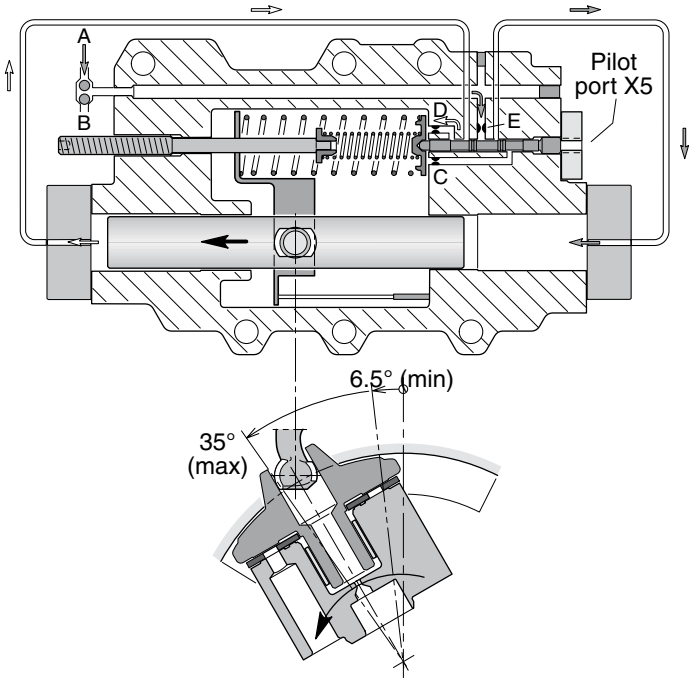
HP control function (decreasing pilot pressure)

NOTE: Valid also for the EP at decreasing current.

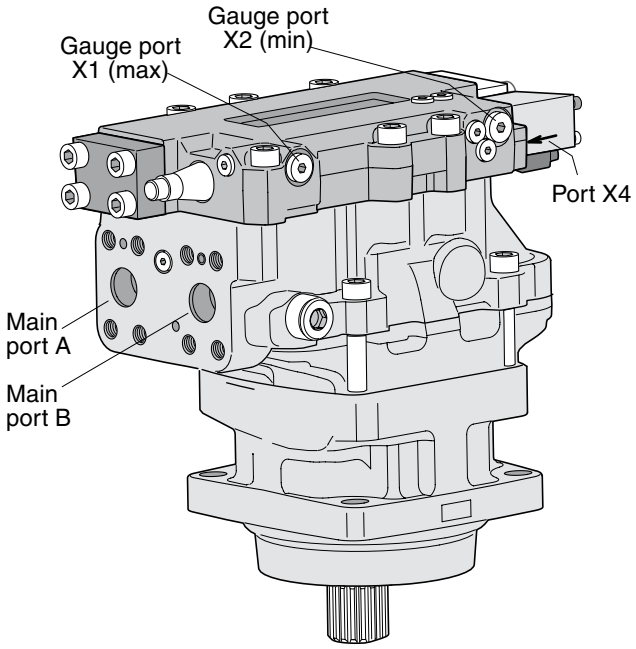
Refer to the illustration below right:

When the pilot pressure decreases, the servo valve spool moves to the right and flow is directed to the right hand setting chamber - the setting piston moves to the left and the displacement increases.

The shaft speed now decreases and the available output torque increases correspondingly (at a constant pump flow and system pressure).



HP control function (displ. increase at decreasing pilot press.).



Port locations - V14- with EO or EP control.

Gauge ports (EO and EP controls):

X1 Setting piston pressure (decreasing displ.)

X2 Setting piston pressure (increasing displ.)

X4 Servo supply pressure (before orifice)

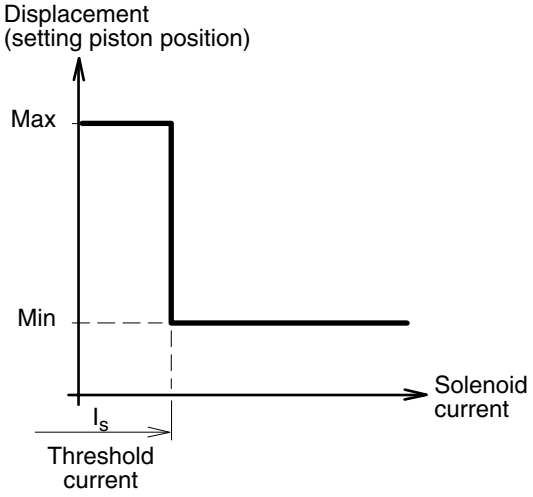
Port sizes:

–M14x1.5 (ISO version)

–$^{9}/_{16}$"-18 O-ring boss (SAE version).

EO electric two-position control

- The EO is a two-position control where the max and min displacements are governed by a DC solenoid (acting on the servo spool) which is attached to the control module (refer to the illustration on page 49).
- The EO is utilized in transmissions where only two operating modes are required - low speed/high torque and high speed/low torque.
- The servo piston, normally in the max displacement position, shifts to min displacement as soon as the solenoid is activated.
- Intermediate displacements cannot be obtained with this control.

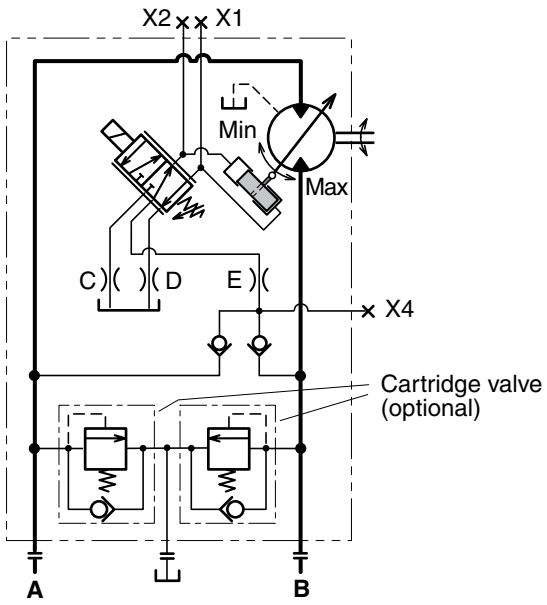


Gauge ports (EO and EP controls):
- X1 Setting piston pressure (decreasing displ.)
- X2 Setting piston pressure (increasing displ.)
- X4 Servo supply pressure (before orifice)

Port sizes:
- M14x1.5 (ISO version)
- $^{9}/_{16}$"-18 O-ring boss (SAE version).

NOTE: Port locations are shown in the illustration on page 40.

- Servo pressure is supplied internally (through a check valve from the utilized high pressure port); refer to the schematic below.
- The solenoid is either 12 or 24 VDC, requiring 1 .2 and 0.6 A respectively.
- The male connector (type 'Junior Timer') is permanently installed on the solenoid. The corresponding female connector is not included. **Note:** The female connector is available as spare part P-N 3781939.
- The threshold current of the 12 VDC solenoid is factory set at 400 mA; it is adjustable between 200 and 500 mA. The 24 VDC solenoid is factory set at 200 mA and is adjustable between 100 and 500 mA.

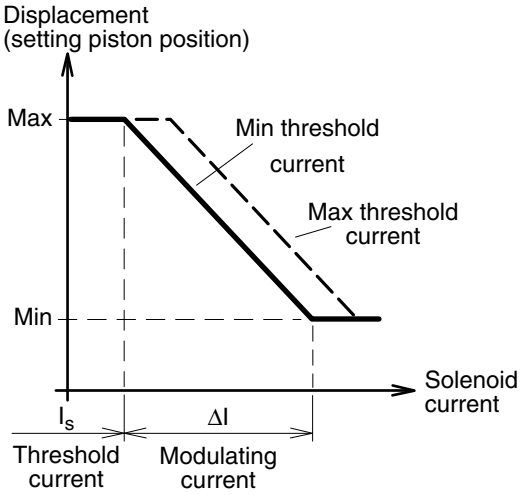


EO schematic (shown: non-activated solenoid; control in max displacement position).

EP electrohydraulic proportional control

- The EP electrohydraulic proportional control is used in hydrostatic transmissions requiring a continuously variable shaft speed. The servo valve is governed by a DC solenoid (acting on the servo spool), attached to the control module (refer to the illustration on page 49).
- When the solenoid current increases above the threshold value, the servo piston starts to move from max towards min displacement. The displacement vs. solenoid current is shown in the diagram below.

NOTE: The shaft speed is **not** proportional to the solenoid current; refer to the bottom diagram.

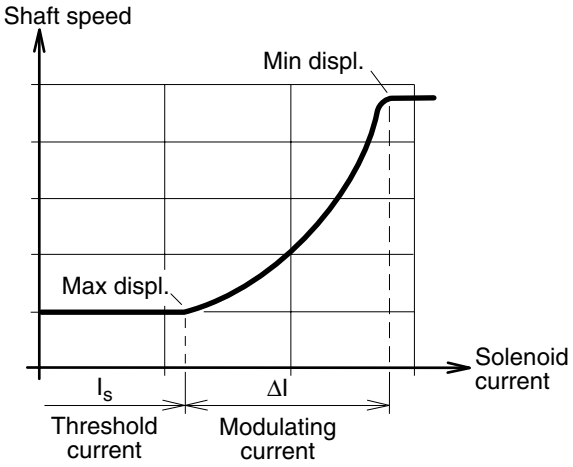


EP diagram (displacement vs. solenoid current).

Gauge ports (EP control):
- X1 Setting piston pressure (decreasing displ.)
- X2 Setting piston pressure (increasing displ.)
- X4 Servo supply pressure (before orifice)

Port sizes:
- M14x1.5 (ISO version)
- $^{9}/_{16}$"-18 O-ring boss (SAE version).

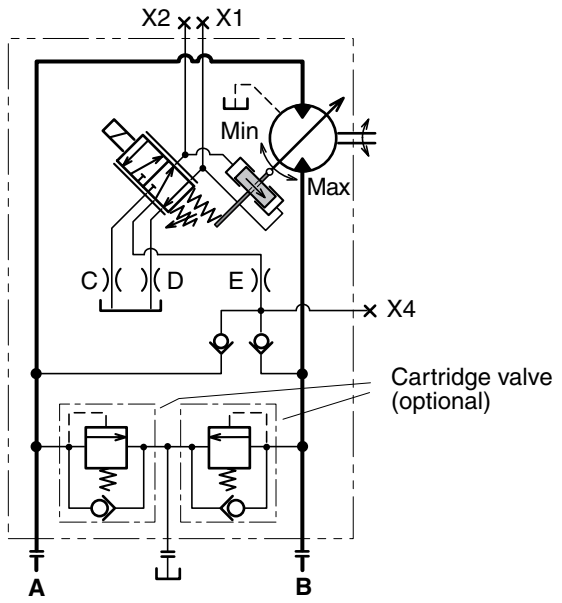
NOTE: Port locations are shown in the illustration on page 40.



Please note: The shaft speed is **not** proportional to the solenoid current.

- The solenoid (which is the same as the one used on the EO control) is either 12 or 24 VDC, requiring 1200 and 600 mA respectively.
- The male connector (type 'Junior Timer') is permanently installed on the solenoid. The corresponding female connector is not included. **Note:** The female connector is available as spare part P-N 3781939
- The threshold current of the 12 VDC solenoid is factory set at 400 mA; it is adjustable between 200 and 500 mA. The 24 VDC solenoid is factory set at 200 mA and is adjustable between 100 and 250 mA.
- When utilizing the full displacement range, the required modulating current (ΔI) is 0.6 and 0.3 A respectively. In order to minimize hysteresis, a pulse-width modulated control signal of 50 to 60 Hz should be provided.

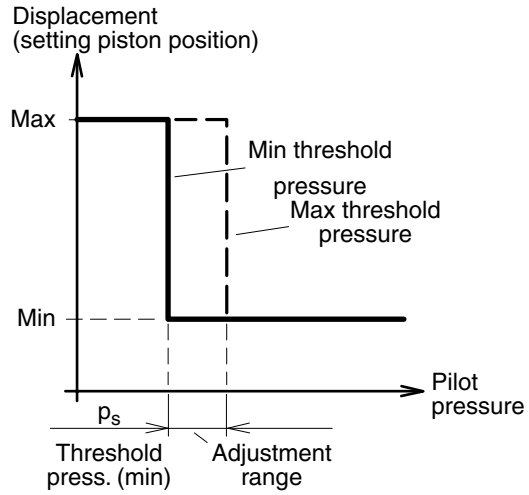
NOTE: The modulating current (ΔI) is not adjustable.



EP schematic (shown: non-activated solenoid; control moving towards max displacement).

HO hydraulic two-position control

- The two-position HO control is similar to the EO (page 41) but the control signal is hydraulic. The position of the servo piston is governed by the built-in servo valve (same as on all controls).
- When the applied pilot pressure (port X5) exceeds the pre-set threshold value, the piston moves from the max to the min displacement position.
- Positions between max and min cannot be obtained with this control.
- The threshold pressure is factory set at 10 bar but is adjustable between 5 and 25 bar.



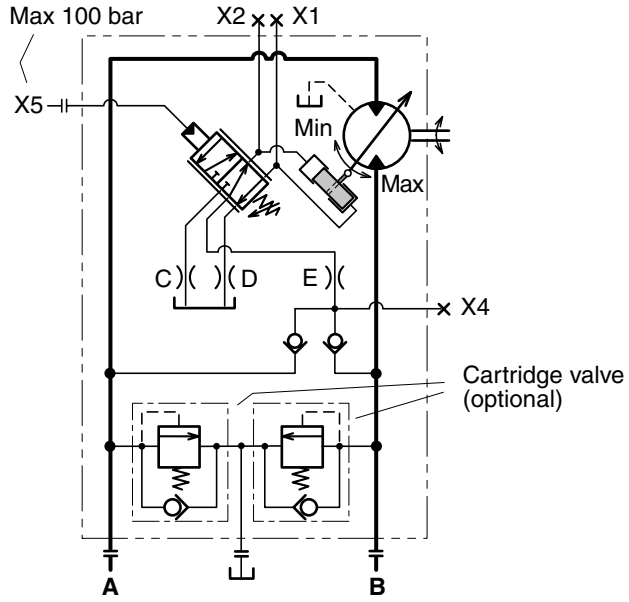
HO diagram (displacement vs. pilot pressure).

Gauge ports (HO and HP controls):

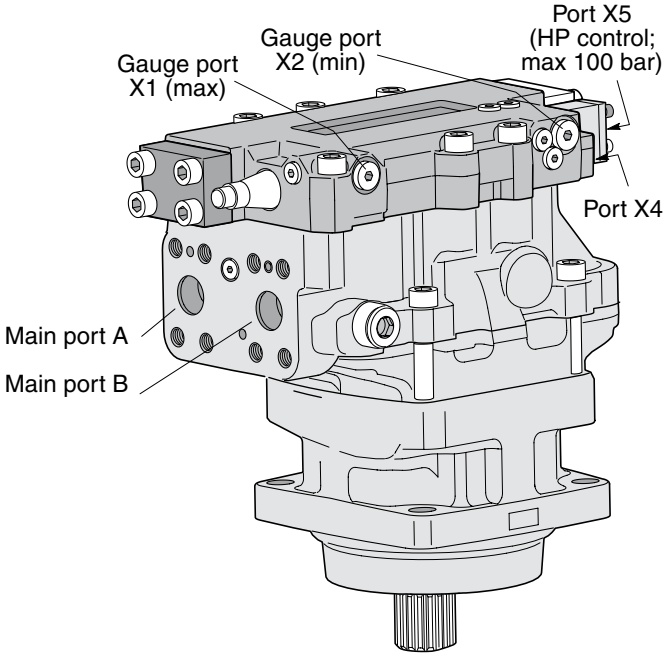
- X1 Setting piston pressure (decreasing displ.)
- X2 Setting piston pressure (increasing displ.)
- X4 Servo supply pressure (before orifice)
- X5 External pilot pressure (max 100 bar; HP control)

Port sizes:

- M14x1.5 (ISO version)
- $^{9}/_{16}$"-18 O-ring boss (SAE version).



HO schematic (shown: port X5 not pressurized; control in max displ. position).



Port locations - V14-110 with HO or HP control.

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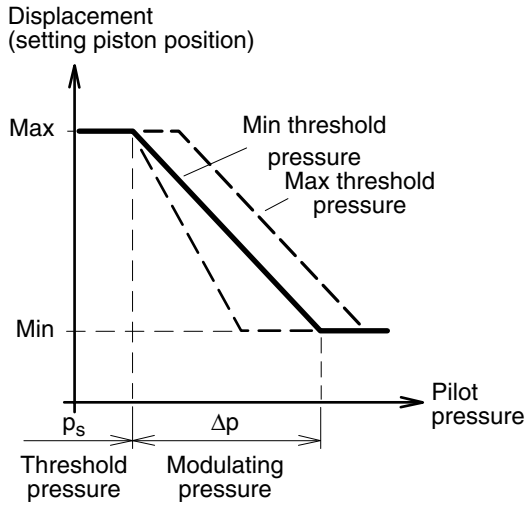
Trollhättan, Sweden

HP hydraulic proportional control

- Like the EP described on page 40, the HP proportional control offers continuously variable displacement, but the controlling signal is hydraulic.
- Normally, the servo piston stays in the max displacement position. When a sufficiently high pilot pressure (p_s) is applied to port X5, the piston starts to move towards the min displacement position.

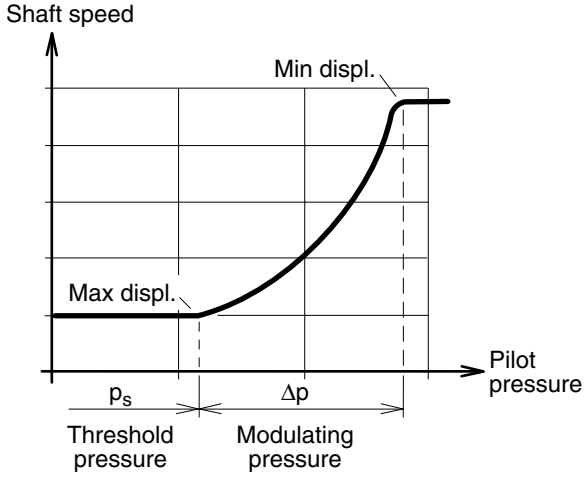


HP diagram (displacement vs. pilot pressure).

Gauge/pilot ports (HP control):
- X1 Setting piston pressure (decreasing displ.)
- X2 Setting piston pressure (increasing displ.)
- X4 Servo supply pressure (before orifice)
- X5 External pilot pressure (max 100 bar)

Port sizes:
- – M14x1.5 (ISO version)
- – $^{9}/_{16}$"-18 O-ring boss (SAE version).

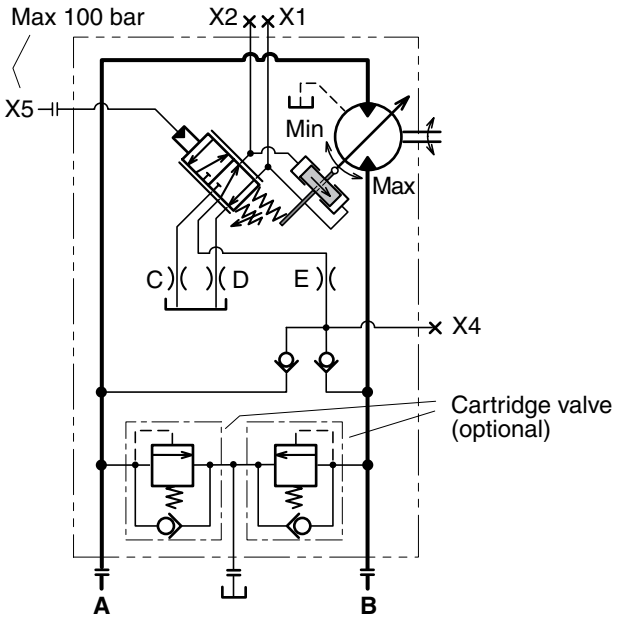
NOTE: Port locations are shown in the illustration on page 43.



Please note: The shaft speed is **not** proportional to the pilot pressure.

- As can be seen from the pilot pressure/displacement diagram below, the displacement changes in proportion to the applied modulating pressure.
- In contrast, the shaft speed is not proportional to the pilot pressure; refer to the bottom left diagram.
- To satisfy specific hydraulic circuit requirements, a modulating pressure of 15 or 25 bar can be selected; the threshold pressure (p_s) is set at 10 bar but is adjustable between 5 and 25 bar.

See also “Controls, Note” on page 34.



HP schematic (shown: port X5 not pressurized; control moving towards max displacement).

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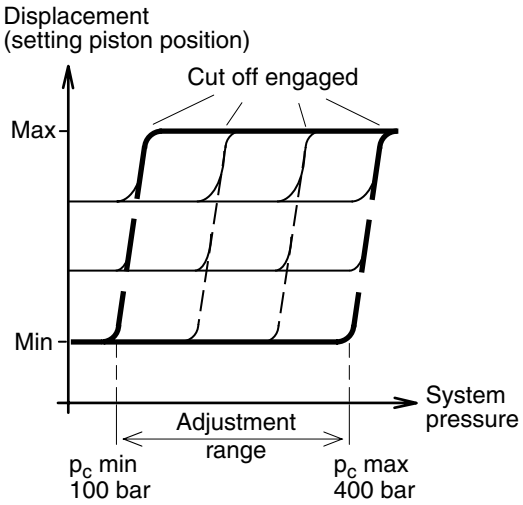
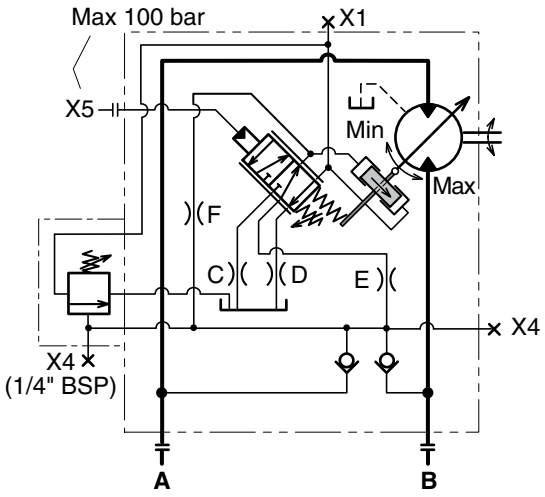
HPC, HP control with pressure cut off

- The pressure cut off overlays the HP control.
- If the system pressure increase, due to the load or reduced motor displacement to the setting of the pressure cut off valve, the control increases displacement. When displacement increases, the available torque increases as well but the system pressure remains constant.
- Pressure cut off setting range is 100-400 bar.
- Threshold pressure is preset from factory to 10 bar but is adjustable between 5 and 25 bar.

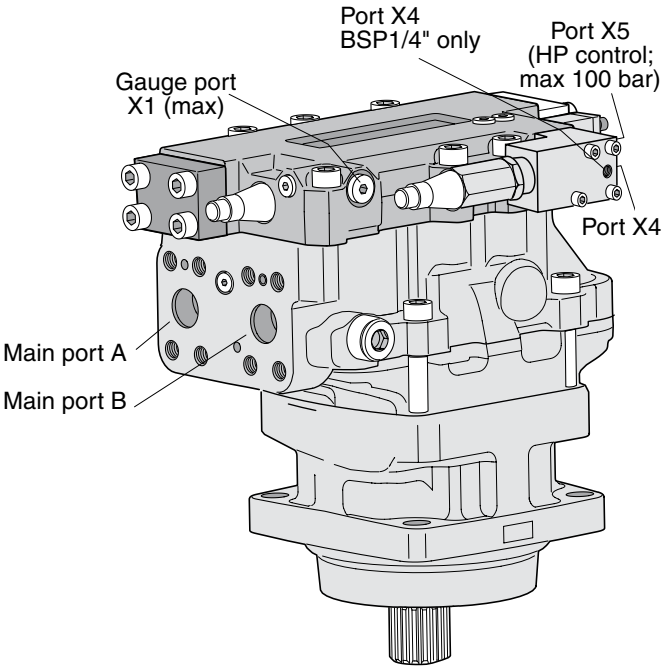




HPC schematic (shown: port X5 not pressurized; control moving towards max displacement).

Gauge/pilot ports (HP control):
- X1 Setting piston pressure (decreasing displ.)
- X4 Servo supply pressure (before orifice)
- X4 Servo supply pressure (on HPC) BSP1/4" only
- X5 External pilot pressure (max 100 bar)

Port sizes:
- M14x1.5 (ISO version)
- $^{9}/_{16}$"-18 O-ring boss (SAE version).



Port locations - V14-110 with HPC control.

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V14-110/-160

Valve options (overview)

- Brake valve and pressure relief valves (opt. **B**;)*
- Flushing valve (option **L**; below)
- Pressure relief valves (option **P**; page 47)
- Extra valve block (option **R)***
- Load holding valve (option **W**)*

* Contact Parker Hannifin for additional information

Sensor options (overview)

- Shaft speed sensor (option **P**; page 48)
- Setting piston position sensor (option **L**; page 49)

Flushing valve (option L)

The V14 is available with a flushing (or shuttle) valve that supplies the motor with a cooling flow through the case. Cooling the motor may be required when operating at high speeds and/or power levels.

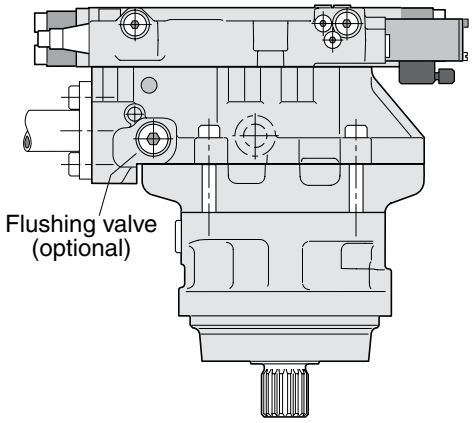
The flushing valve consists of a three-position, three-way spool valve built into the connection module. It connects the low pressure side of the main circuit to a nozzle (optional sizes below) that empties fluid into the motor case.

In a closed circuit transmission, the flushing valve re-moves part of the fluid in the main loop. The removed fluid is continuously being replaced by cool, filtered fluid from the low pressure charge pump on the main pump.

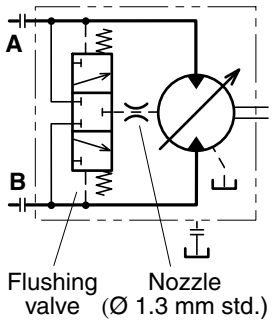
Available nozzles

Ordering code	Orifice size [mm]	Status
L010	1.0	Optional
L013	**1.3**	**Standard**
L015	1.5	Optional
L017	1.7	”
L020	2.0	”
L030	3.0	”

NOTE: ‘L000’ - plug



V14-110 (EP control) with built-in flushing valve.



Hydraulic schematic - V14 with built-in flushing valve.

Pressure relief valves (option P)

To protect the motor (and the main hydraulic circuit) from unwanted, high pressure peaks, the V14 can be supplied with relief valve cartridges.

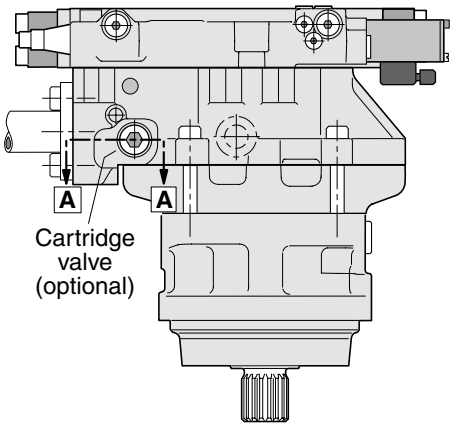
The individual cartridge (with integrated check valve function) has a non-adjustable, factory-set opening pressure, available in pressure settings shown below.

The cross section (below right) shows a situation, where the upper cartridge has opened because of high fluid pressure. This, in turn, forces the opposite cartridge to open to the low pressure area (this cartridge now acting as a check valve).

As shown, a small part of the flow may go directly to the reservoir.

PLEASE NOTE:

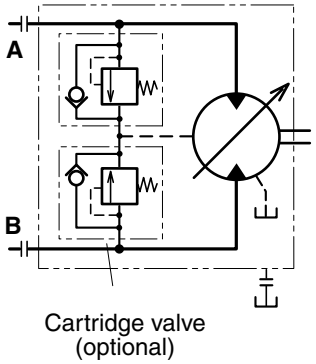
- The pressure relief cartridges should not be used as main pressure reliefs; in a motor application, they should only be relied on to limit short duration pres-sure peaks (or the temperature of the fluid which cir-culates through the motor will rapidly reach damaging high levels).
- The main pressure relief is usually installed in the main pump or in the directional control valve, or is line mounted between pump and motor.



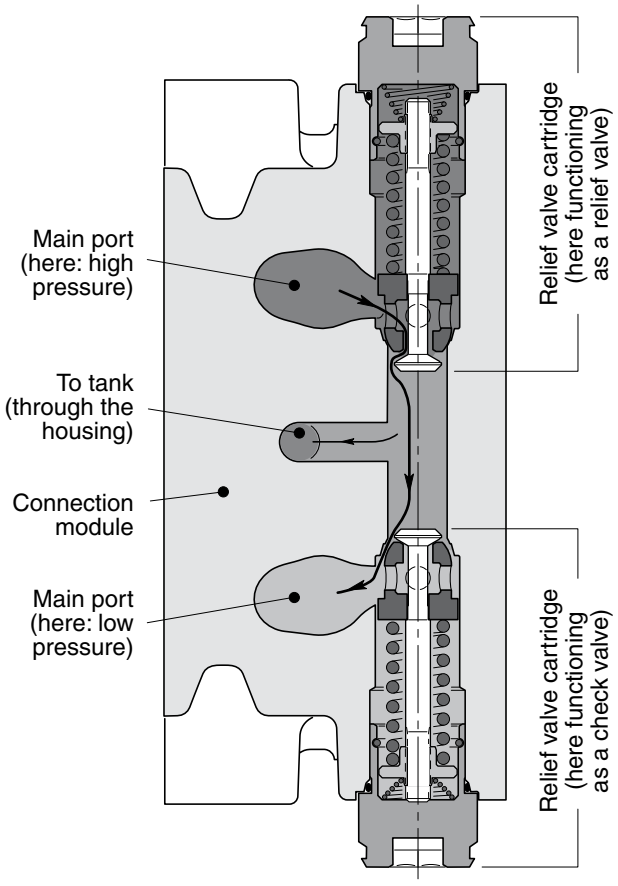
V14- 110 (EP control) with relief valve cartridges.

Available cartridges

Ordering code	Pressure setting [bar]	Part number
P300	300	3794616
P330	300	3794617
P350	350	3794618
P380	380	3794619
P400	400	3794620
P420	420	3793529
P450	450	3794622



Hydraulic schematic - V14 with cartridge valves.



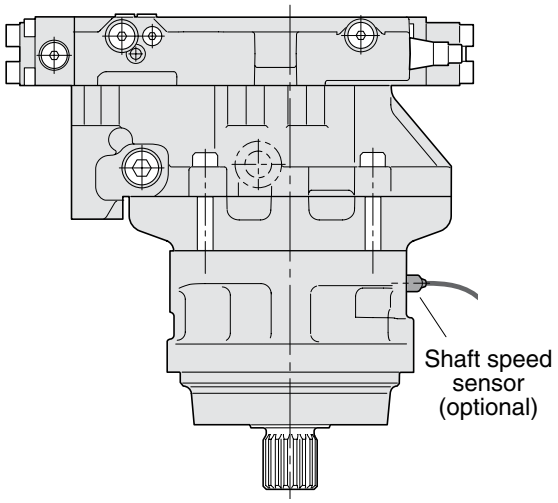
Section A-A (showing pressure relief cartridges).

Shaft speed sensor (option P)

A speed sensor kit is available for the V14.

The ferrostat differential (Hall-effect) sensor installs in a separate, threaded hole in the V14 bearing housing.

The speed sensor is directed towards the V14 shaft flange and outputs a 2 phase shifted square wave signal within a frequency range of 0 Hz to 15 kHz. Number of pulses per shaft rev is 36 which, at 5 Hz, corresponds to approx. 8 rpm.



V14-160 (AC control) with speed sensor.

Ordering information

(refer to the ordering codes on pages 50-52)

N - None

C - Prepared for setting piston position and shaft speed sensors. To be ordered separate.

D - Setting piston position sensors and prepared for shaft speed sensor.

P - Prepared for shaft speed sensor. To be ordered separate.

NOTE: Additional information is provided in our publication HY30-8301/UK, 'Speed sensor for series F11/F12 and V12/T12/V14', available from Parker Hannifin.

How to order

Please order the speed sensor on a separate order line next to the product order line.

Part number for speed sensor is 3785190.

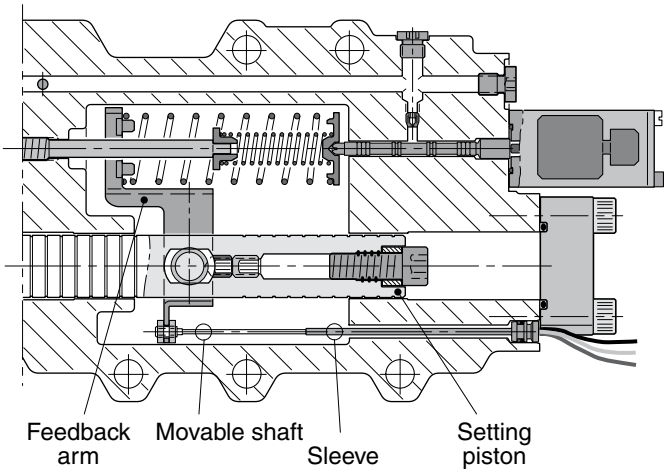
Setting piston position sensor (option L)

The setting piston position sensor, also referred to as a 'Sub-Miniature In-Cylinder Transducer', combines the best features associated with LVDT's (Linear Variable Differential Transformer) and potentiometers into one rugged, contactless, highly reliable position sensor.

The stationary part of the sensor, the sleeve, is provided with a flange that fits in a specially machined boring in the control module housing.

The movable shaft of the sensor is attached to the feedback arm as shown in the illustration to the right. When the sensor is properly connected to the electronic module (packed separately with an installation sheet), the produced output signal is proportional to the position of the setting piston.

In order to obtain the correct electrical max and min position settings, as determined by the utilized max and min displacements, the programming module (part of the electronic module, illustrated below right) must be adjusted; for further information please contact Parker Hannifin.

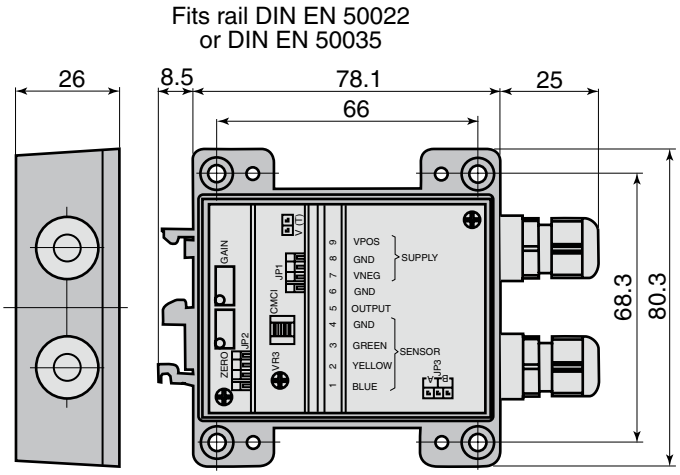


EP control section with setting piston position sensor.

Specifications

Supply voltage	10 to 60 VDC
Supply current	max 10 mA
Output voltage	0.5 to 4.5 VDC*
Output load	max 10 kΩ
Output current - shaft retracted	0.020 mA
- shaft extended	0.5 mA
Linearity	≤ 1% of stroke
Operational temperature	0 °C to +70 °C
Distance between sensor and electronic module	Max 30 m
Electrical wiring	PTFE insulated, heat shrink sleeved, 500 mm long leads
Weight	100 g

***** Other voltages can be selected; contact Parker Hannifin.



Electronic module (incl. internal programming module).

Ordering information (refer to 'Sensor options' in the ordering codes on pages 34-36)

Basic V14 configuration (ISO, cartridge or SAE; see pages 34-36) – [ ]

Sensor options

Code	Sensor options
N	None
C	Prepared for setting piston position and shaft speed sensors
D	Setting piston position sensors and prepared for shaft speed sensor.
L	Setting piston position sensor
P	Prepared for shaft speed sensor
T	Prepared for setting piston position sensor

ISO version

V14 – [ ] – **I** **V** [ ] – [ ] [ ] [ ] [ ] – [ ] [ ] – [ ] – [ ] – [ ] / [ ] – [ ] [ ]

Motor type | Frame size | Mounting flange | Shaft seal | Shaft end | Control | Control signal | Restrictor set | Modulating press./current | Valve options | Valve opening pressure | Sensor options | Version | Max and min displacement | Threshold setting | Pressure cut off HPC

Code Frame size
110 110 [cm³/rev]
160 160 [cm³/rev]

Code Mounting flange
I ISO version
Z ISO (optional)

Code Shaft seal
V PPS

Code Shaft end
C DIN (ISO version)
D DIN (ISO version)

Code Control
AC Pressure compensator
AD Press. compensator with electrohydraulic override and brake defeat valve
AH Pressure compensator with hydraulic override
EO Electrohydraulic, two-position
EP Electrohydraulic, proportional
HO Hydraulic, two-position
HP Hydraulic, proportional

Code Pilot control signal
C Pressure cut off (HP)
E External pressure (AH, HO, HP)
I Internal pressure (AC, AD, AH)
H 24 VDC (AD, EO, EP)
L 12 VDC (AD, EO, EP)

Code Control restrictor set (orifice dia in mm)
1 0.7
2 0.8
3 **1.0 (standard)**
4 1.2
5 HPC
X Special

Code Control modulating pressure/current
N AC, AD, AH, EO, HO: 0 bar; EP: Non-selectible current
A 15 [bar] (AC, AD, AH, HP, HPC)
B 25 [bar] (AC, AD, AH, HP, HPC)
C 50 [bar] (AC, AD, AH)
D 80 [bar] (AC, AD, AH)

000 without pressure relief valve
Pressure relief valve opening pressure [bar] (page 47)
Alternatively:
Flushing valve restrictor (page 46)

Code Valve options (pages 46-47)
N None
B Brake valve and pressure relief valves*
L Flushing valve
P Pressure relief valves
R Extra valve block *
W Load hold valve (for HPC only) **

Code Sensor options (pages 48-49)
N None
C Prepared for setting piston position sensor and shaft speed sensor
D Setting piston position sensor and prepared for shaft speed sensor
L Setting piston position sensor
P Prepared for speed sensor*
T Prepared for setting piston position sensor

Factory issued for special versions

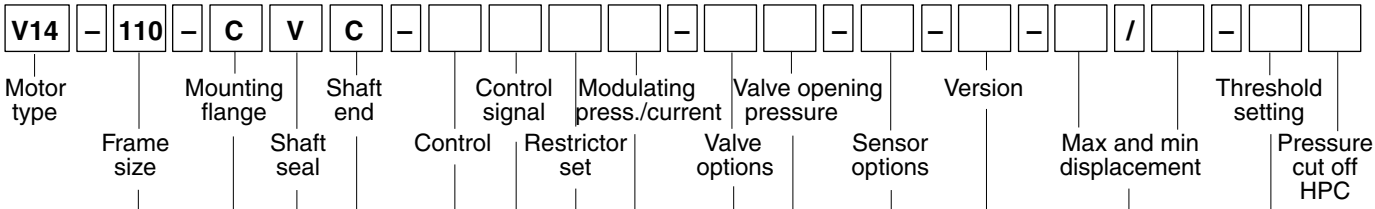
Max and min displ. [cm³/rev]

Threshold setting
AC, AD, AH:
Select pressure between 100 and 350 [bar]
EO, EP:
400 [mA] - 12 [VDC]
200 [mA] - 24 [VDC]
HO, HP:
10 [bar]

Note:
* Contact Parker Hannifin for additional information

** Possible to combined with pressure relief valve
Contact Parker Hannifin for additional information

Cartridge version



Code Frame size
110 110 [cm³/rev]

Code Mounting flange
C Cartridge version

Code Shaft seal
V PPS

Code Shaft end
C DIN (ISO version)

Code Control
AC Pressure compensator
AD Press. compensator with electrohydraulic override and brake defeat valve
AH Pressure compensator with hydraulic override
EO Electrohydraulic, two-position
EP Electrohydraulic, proportional
HO Hydraulic, two-position
HP Hydraulic, proportional

Code Pilot control signal
C Pressure cut off (HP)
E External pressure (AH, HO, HP)
I Internal pressure (AC, AD, AH)
H 24 VDC (AD, EO, EP)
L 12 VDC (AD, EO, EP)

Code Control restrictor set (orifice dia in mm)
1 0.7
2 0.8
3 **1.0 (standard)**
4 1.2
5 HPC
X Special

Code Control modulating pressure/current
N AC, AD, AH, EO, HO: 0 bar; EP: Non-selectible current
A 15 [bar] (AC, AD, AH, HP, HPC)
B 25 [bar] (AC, AD, AH, HP, HPC)
C 50 [bar] (AC, AD, AH)
D 80 [bar] (AC, AD, AH)

000 without pressure relief valve
Pressure relief valve opening pressure [bar] (page 47)
Alternatively:
Flushing valve restrictor (page 46)

Code Valve options (pages 46-47)
N None
B Brake valve and pressure relief valves*
L Flushing valve
P Pressure relief valves
R Extra valve block *
W Load hold valve (for HPC only) **

Code Sensor options (pages 48-49)
N None
C Prepared for setting piston position sensor and shaft speed sensor
D Setting piston position sensor and prepared for shaft speed sensor
L Setting piston position sensor
P Prepared for speed sensor*
T Prepared for setting piston position sensor

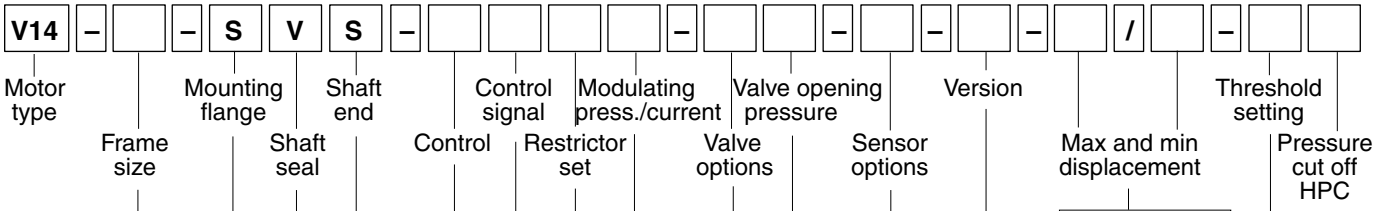
Factory issued for special versions

Max and min displ. [cm³/rev]

Threshold setting
AC, AD, AH:
Select pressure between 100 and 350 [bar]
EO, EP:
400 [mA] - 12 [VDC]
200 [mA] - 24 [VDC]
HO, HP:
10 [bar]

Note:
* Contact Parker Hannifin for additional information
** Possible to combined with pressure relief valve Contact Parker Hannifin for additional information

SAE version



Code Frame size
110 110 [cm³/rev]
160 160 [cm³/rev]

Code Mounting flange
S SAE version

Code Shaft seal
V PPS

Code Shaft end
S SAE (SAE version)

Code Control
AC Pressure compensator
AD Press. compensator with electrohydraulic override and brake defeat valve
AH Pressure compensator with hydraulic override
EO Electrohydraulic, two-position
EP Electrohydraulic, proportional
HO Hydraulic, two-position
HP Hydraulic, proportional

Code	Pilot control signal
C	Pressure cut off (HP)
E	External pressure (AH, HO, HP)
I	Internal pressure (AC, AD, AH)
H	24 VDC (AD, EO, EP)
L	12 VDC (AD, EO, EP)

Code	Control restrictor set (orifice dia in mm)
1	0.7
2	0.8
3	**1.0 (standard)**
4	1.2
5	HPC
X	Special

Code	Control modulating pressure/current
N	AC, AD, AH, EO, HO: 0 bar; EP: Non-selectible current
A	15 [bar] (AC, AD, AH, HP, HPC)
B	25 [bar] (AC, AD, AH, HP, HPC)
C	50 [bar] (AC, AD, AH)
D	80 [bar] (AC, AD, AH)

000 without pressure relief valve
Pressure relief valve opening pressure [bar] (page 47)
Alternatively:
Flushing valve restrictor (page 46)

Code	Valve options (pages 46-47)
N	None
B	Brake valve and pressure relief valves*
L	Flushing valve
P	Pressure relief valves**
R	Extra valve block *
W	Load hold valve (for HPC only) ***

Code	Sensor options (pages 48-49)
N	None
C	Prepared for setting piston position sensor and shaft speed sensor
D	Setting piston position sensor and prepared for shaft speed sensor
L	Setting piston position sensor
P	Prepared for speed sensor*
T	Prepared for setting piston position sensor

Factory issued for special versions

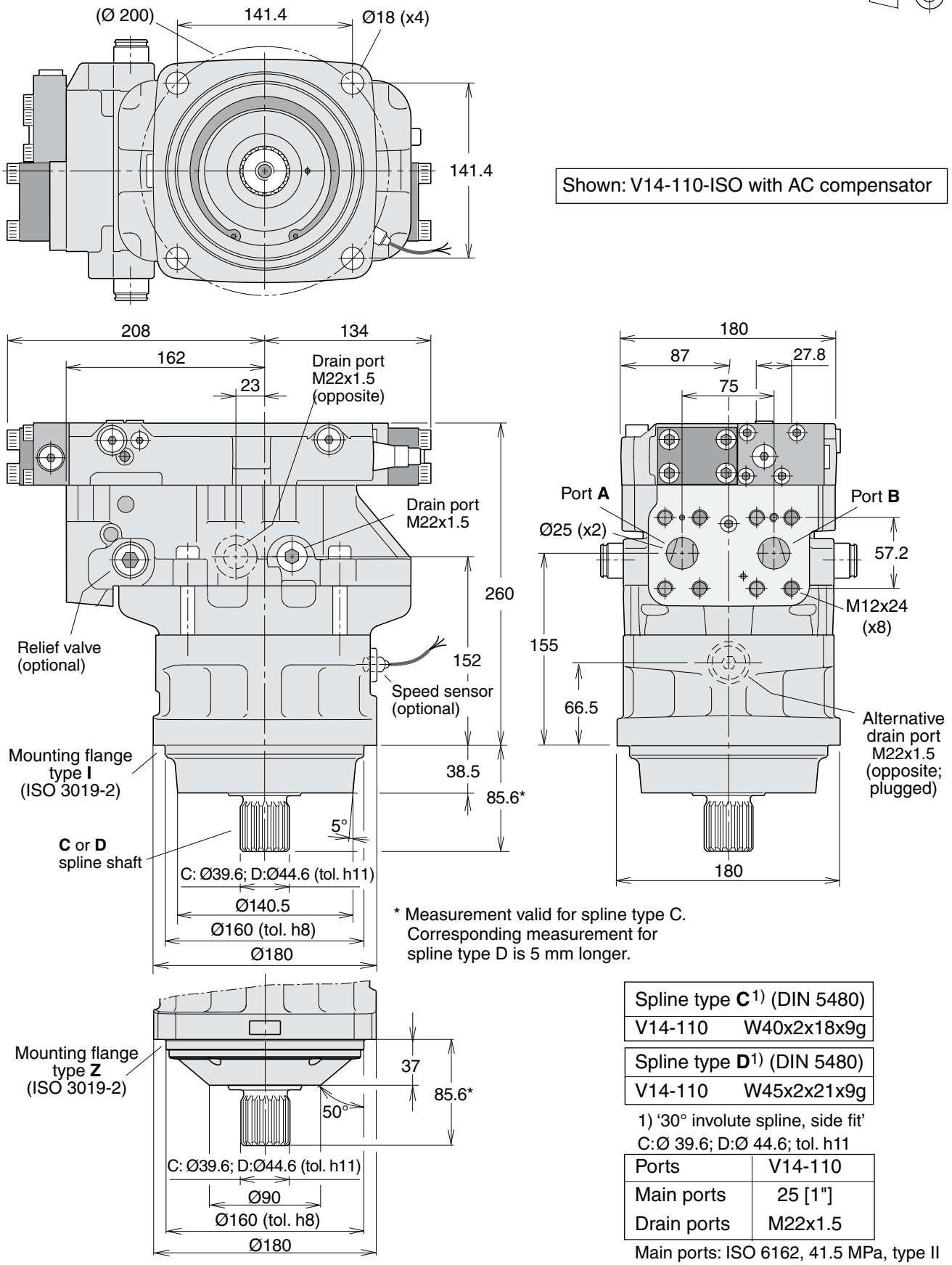
Max and min displ. [cm³/rev]

Threshold setting
AC, AD, AH:
Select pressure between 100 and 350 [bar]
EO, EP:
400 [mA] - 12 [VDC]
200 [mA] - 24 [VDC]
HO, HP:
10 [bar]

Note:
* Contact Parker Hannifin for additional information

** Possible to combined with pressure relief valve
Contact Parker Hannifin for additional information

V14-110, ISO version



* Measurement valid for spline type C.
Corresponding measurement for
spline type D is 5 mm longer.

Spline type **C**[1] (DIN 5480)	
V14-110	W40x2x18x9g

Spline type **D**[1] (DIN 5480)	
V14-110	W45x2x21x9g

1) '30° involute spline, side fit'
C:Ø 39.6; D:Ø 44.6; tol. h11

Ports	V14-110
Main ports	25 [1"]
Drain ports	M22x1.5

Main ports: ISO 6162, 41.5 MPa, type II

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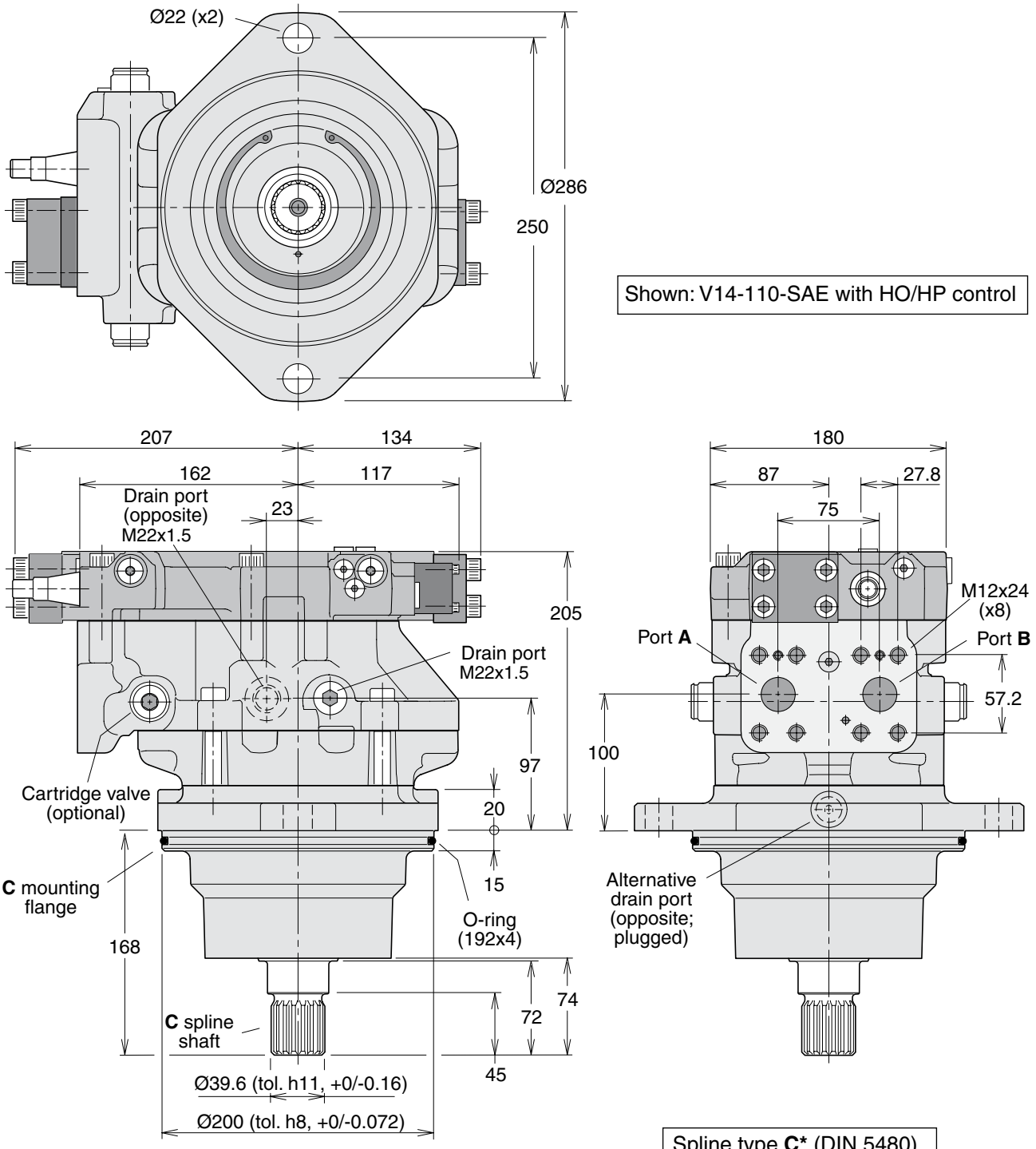
V14-110, Cartridge version



Shown: V14-110-SAE with HO/HP control

Spline type **C*** (DIN 5480)	
V14-110	W40x2x18x9g

***** '30° involute spline, side fit'.

Ports	V14-110
Main ports	25 [1"]
Drain ports	M22x1.5

Main ports: ISO 6162, 41.5 MPa, type II

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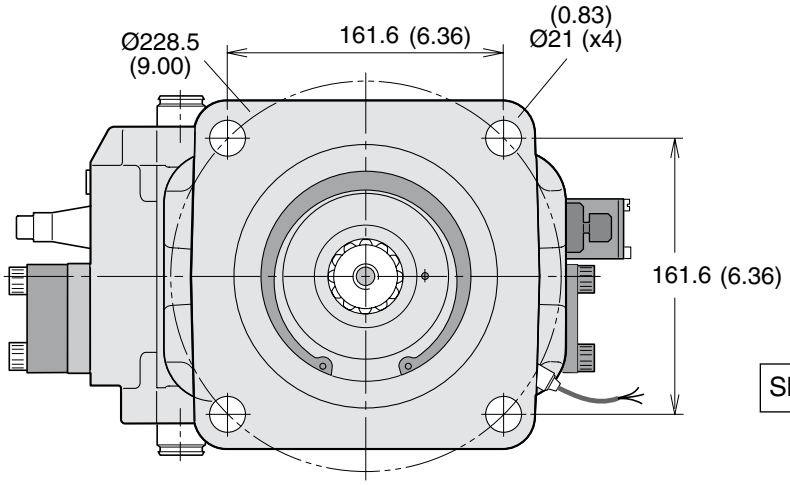
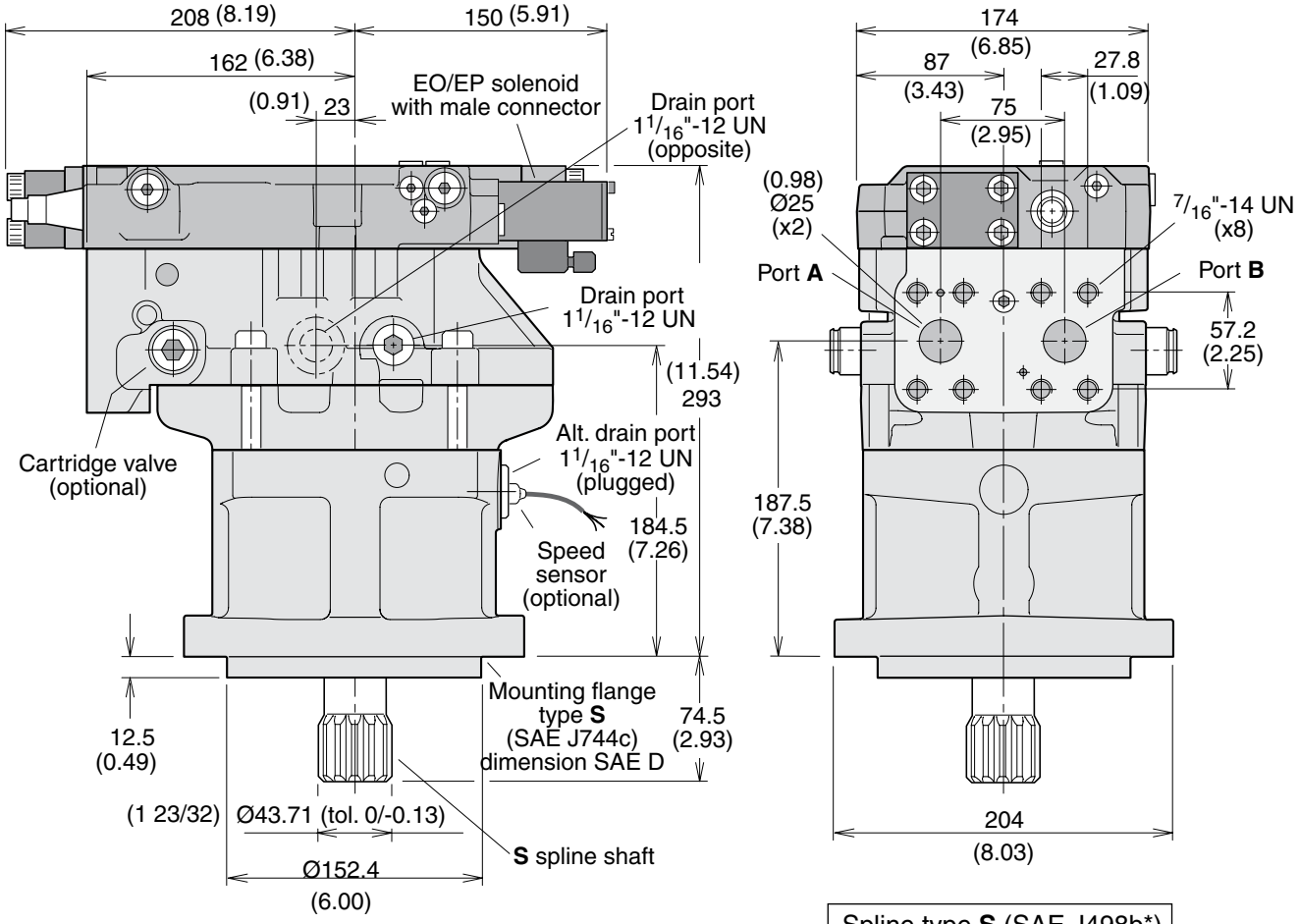
V14-110, SAE version

(inch)



Shown: V14-110-SAE with EO/EP control



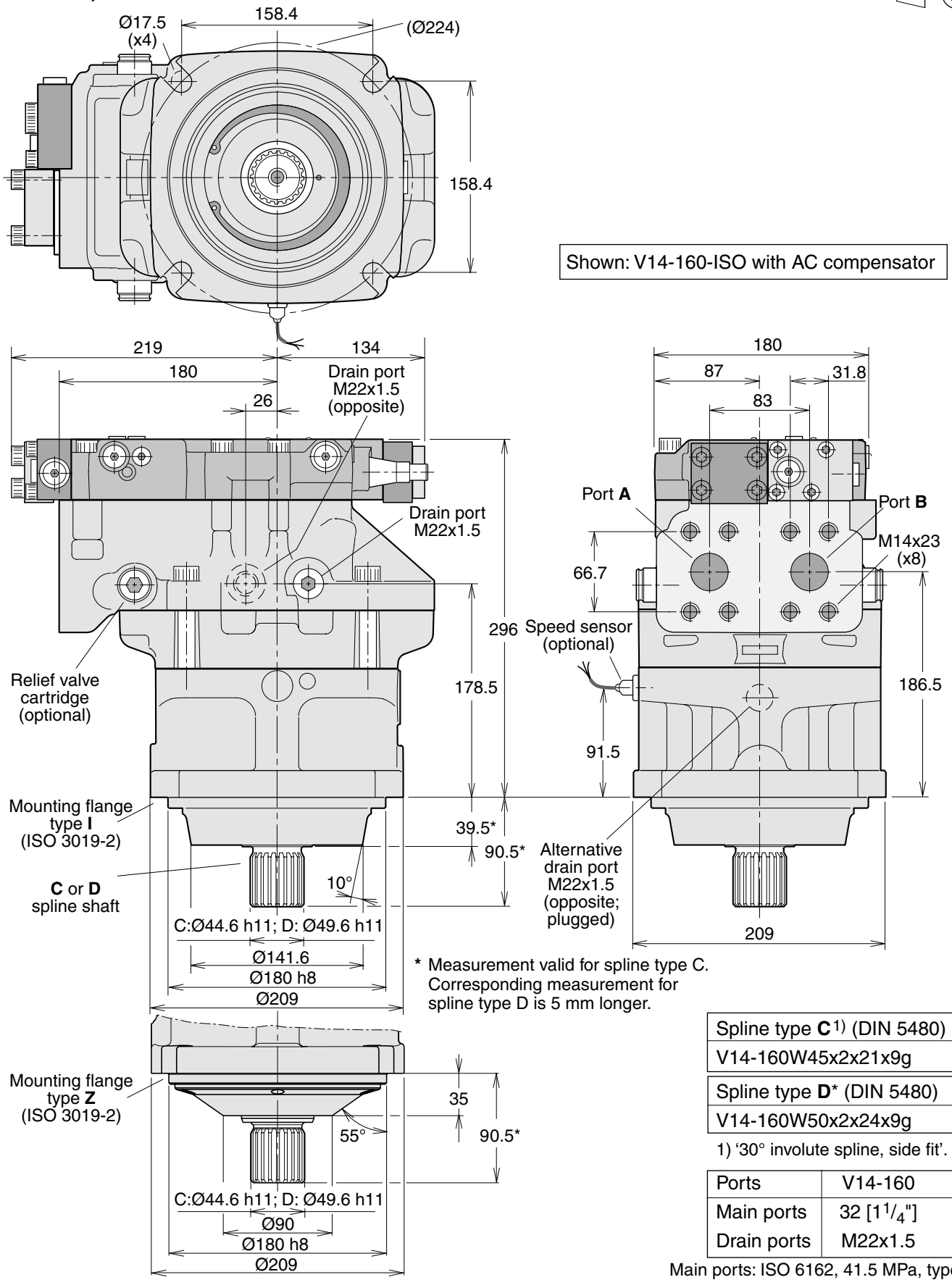
Spline type **S** (SAE J498b*)	
V14-110	SAE 'D' (13T, 8/16 DP)

***** 30° involute spline, side fit

Ports	V14-110
Main ports	25 [1"]
Drain ports	1 1/16"-12 UN

Main ports: SAE J518c, 6000 psi

V14-160, ISO version



* Measurement valid for spline type C. Corresponding measurement for spline type D is 5 mm longer.

Spline type **C** 1) (DIN 5480)
V14-160W45x2x21x9g

Spline type **D*** (DIN 5480)
V14-160W50x2x24x9g

1) '30° involute spline, side fit'.

Ports	V14-160
Main ports	32 [$1^1/_4$"]
Drain ports	M22x1.5

Main ports: ISO 6162, 41.5 MPa, type II

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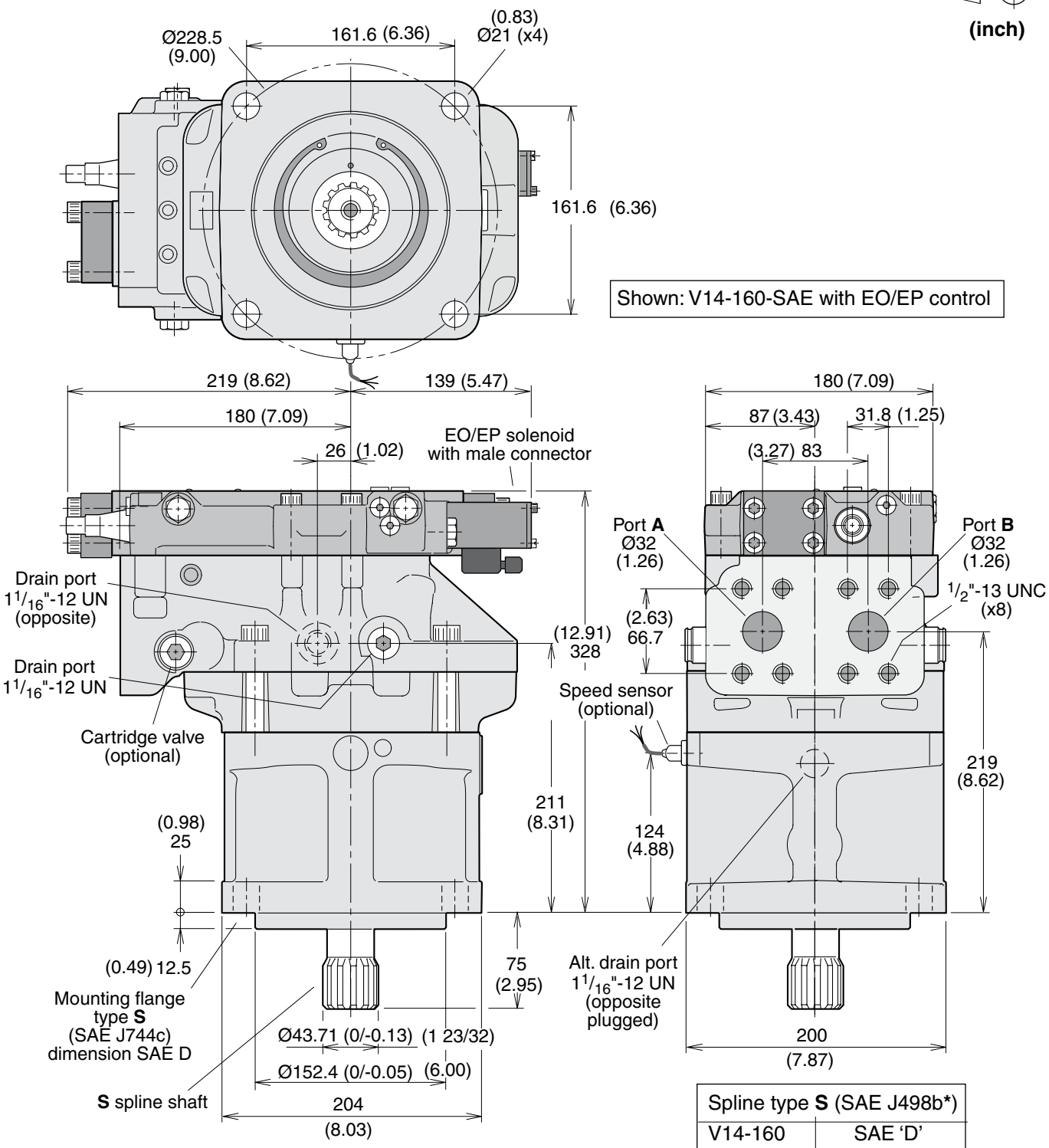
V14-160, SAE version

(inch)



Spline type **S** (SAE J498b*)	
V14-160	SAE 'D' (13T, 8/16 DP)

***** '30° involute spline, side fit'.

Ports	V14-160
Main ports	32 [1 1/4"]
Drain ports	1 1/16"-12 UN

Main ports: SAE J518c, 6000 psi

T12

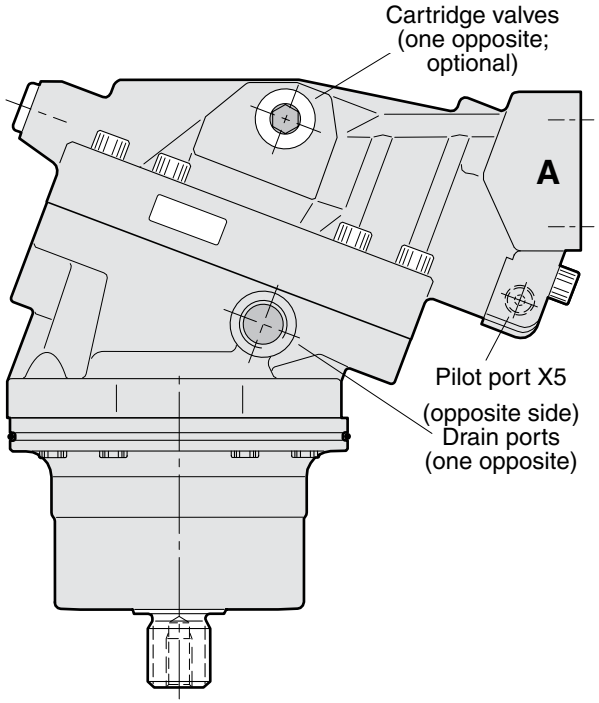
Content

Specifications

T12 frame size	**60**	**80**
Displacement [cm³/rev]		
- at 35° (max)	60	80
- at 10° (min)	18	24
Operating pressure [bar]		
- max intermittent[1)]	480	480
- max continuous	420	420
Operating speed [rpm]		
- max intermittent at 35°[1)]	4400	4000
- max continuous at 35°	3600	3100
- max intermittent at 10°[1)]	7000	6250
- max continuous at 10°	5600	5000
- min continuous	50	50
Flow [l/min]		
- max intermittent[1)]	265	320
- max continuous	215	250
Output torque [Nm] at 100 bar (theor.)	95.2	127.0
Output power [kW]		
- max intermittent[1)]	150	175
- max continuous	95	105
Corner power [kW]		
- intermittent[1)]	335	400
- continuous	235	280
Weight [kg]	26	30.5

1) Max 6 sec's in any one minute

Port and relief valve locations



4

Efficiency diagrams

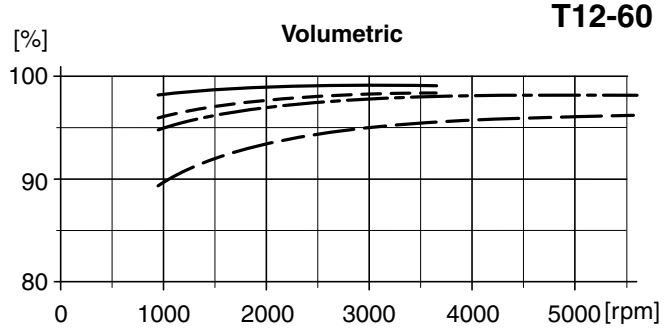
The following diagrams show volumetric and overall efficiencies versus shaft speed at 210 and 420 bar operating pressure, and at full (35°) and reduced (10°) displacements.

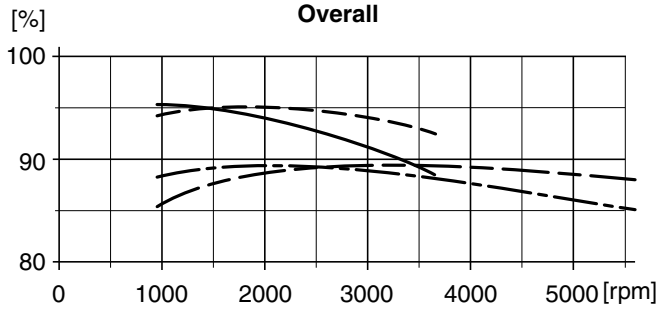
Information on efficiencies for a specific load condition can be made available from Parker Hannifin.

210 bar at full displacement
420 bar " " "

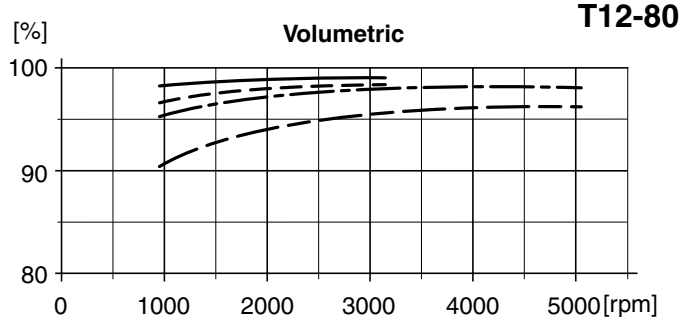
210 bar at reduced displacement
420 bar " " "

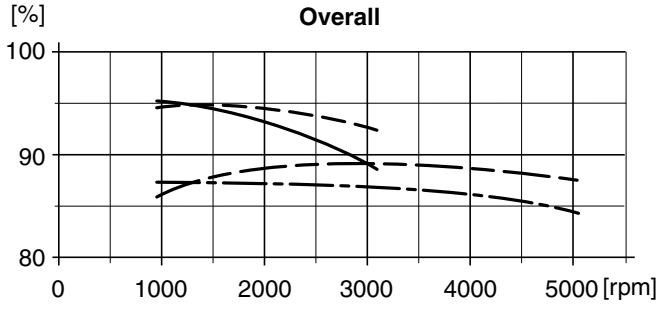
T12-60





T12-80





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Two-position control (HO T _ _ I)

The displacement is controlled by means of pilot pressure in port X5. When this pressure exceeds the threshold pressure, 15 bar, the displacement is switched to min.

The T12 motor can be ordered with max and/or min displacement limiters.

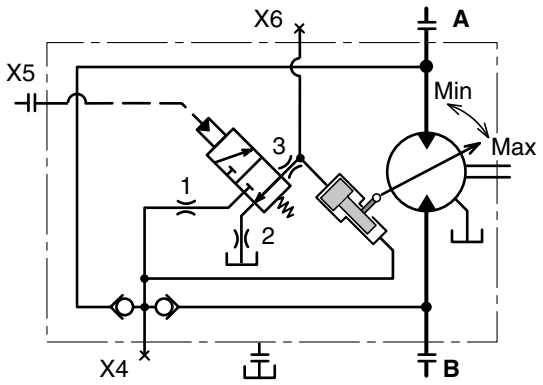
The control is available in two versions:

- **HO T 01 I** (with standard nozzles) provides a 'fast' control response (max-to-min and min-to-max)
- **HO T 02 I** (optional) with 'slow' control response.

Gauge and pilot ports
- X4 Servo supply (before nozzle)
- X5 Pilot pressure (min 15 bar; standard)
- X6 Setting piston pressure (decreasing displ.)

Port size
- M14x1.5 (all)

NOTE: '1', '2' and '3' are nozzles.

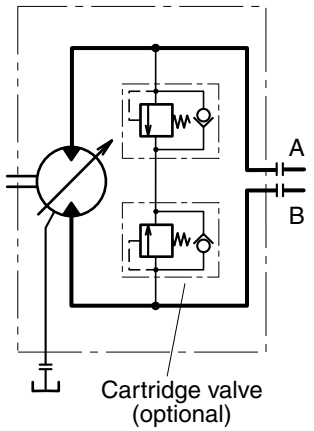


T12 schematic (no pilot pressure; the control is in max displacement position).

Pressure relief valves (optional)

As an option, T12 motors can be ordered with pressure relief valves, designed to protect the motor and the main hydraulic system from short duration pressure peaks.

The non-adjustable cartridge valves are integrated in the motor end cap and available with the following pressure settings:



T12 with cartridge valves.

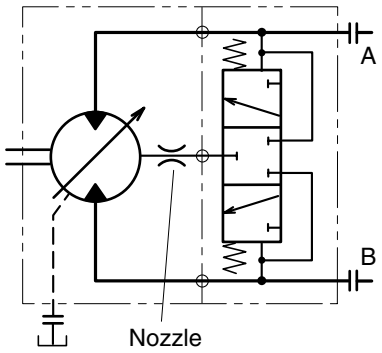
Available cartridges

Ordering code	Pressure setting [bar]	Part number
P300	300	3794616
P330	300	3794617
P350	350	3794618
P380	380	3794619
P400	400	3794620
P420	420	3793529
P450	450	3794622

FV flushing valve block (optional)

The FV flushing valve supplies the T12 motor with a cooling flow usually required when the motor is operating at high speeds and/or high power levels.

The valve block mounts directly on the main port flange.

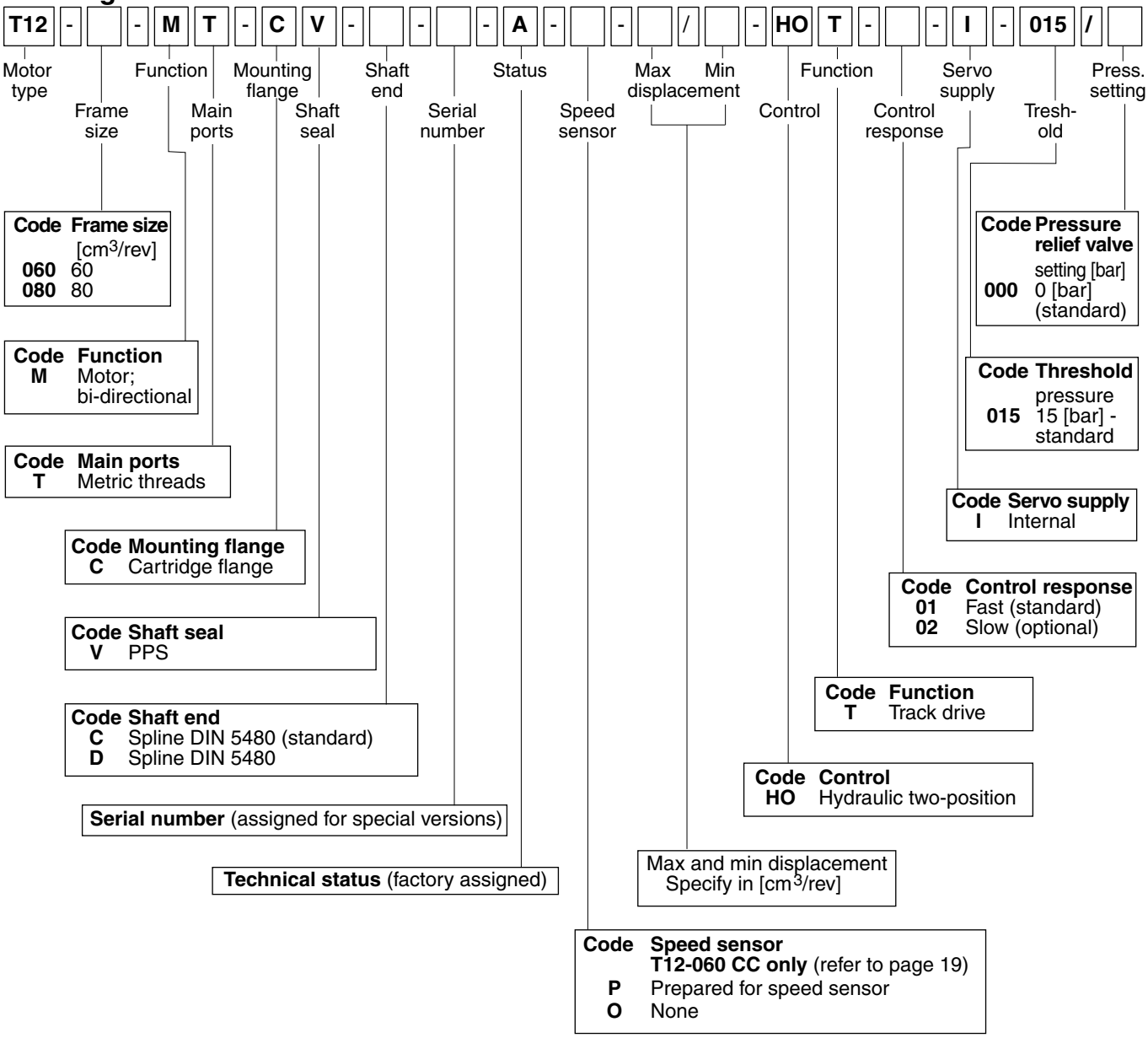


T12 with flushing valve block type FV.

Brake valve

Contact parker Hannifin for additional information

Ordering code



4

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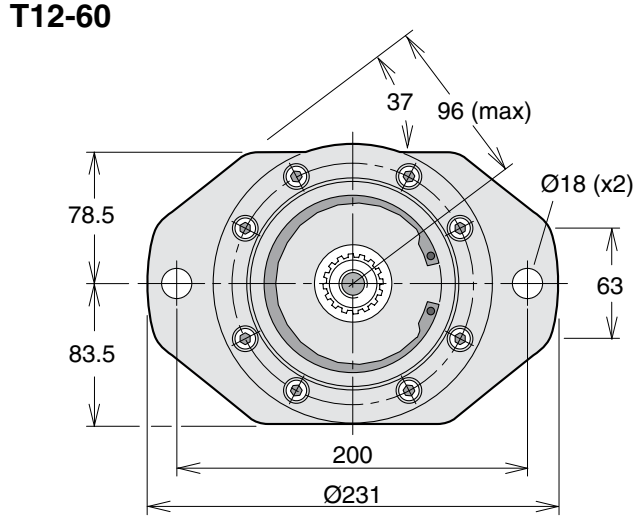
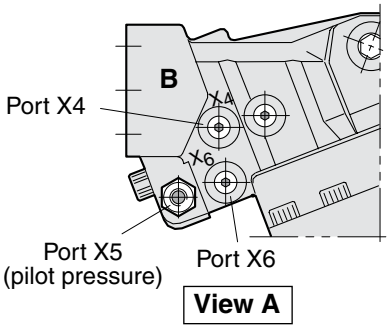
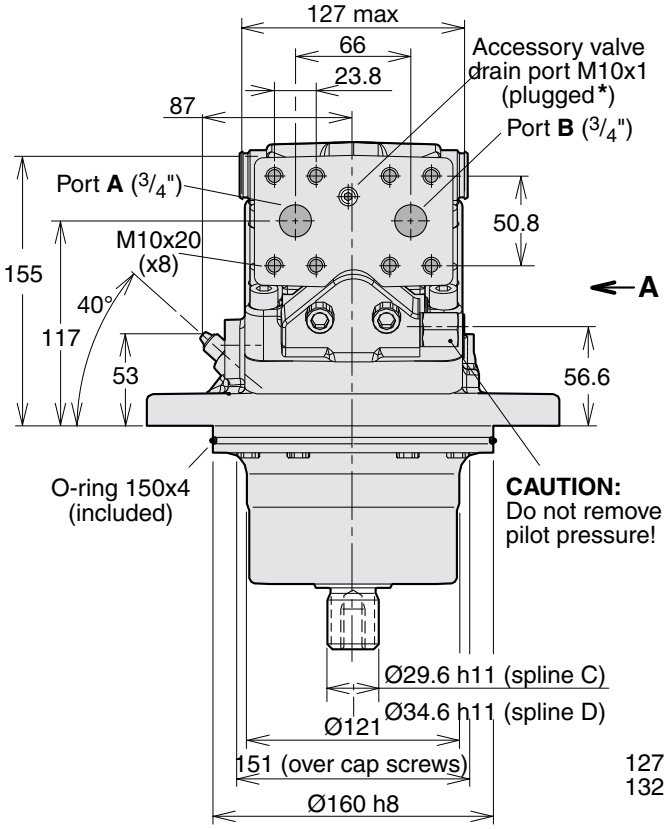
T12-60

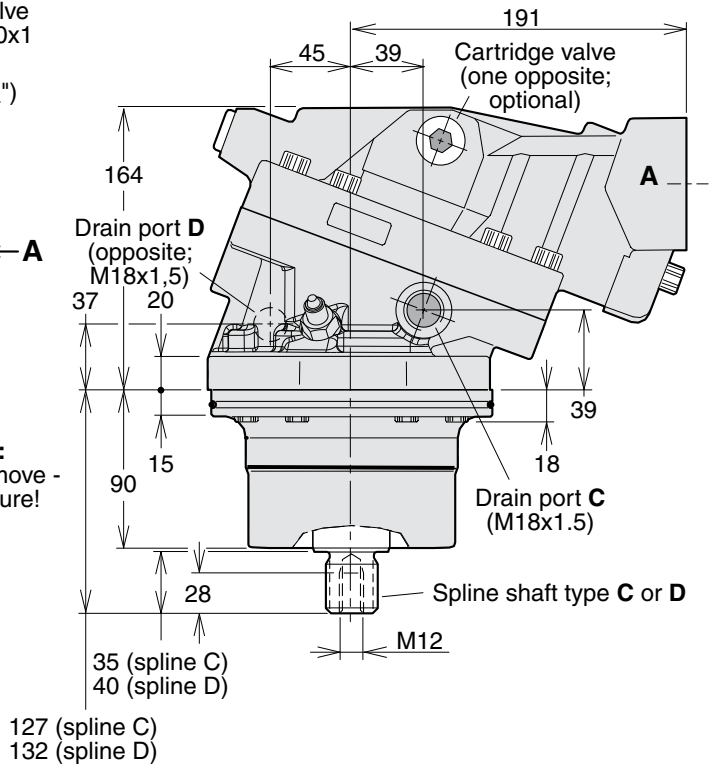


Type **C** mounting flange



View A





*** NOTE:**

The accessory valve drain port plug **must be removed** before installing the following valve:

- **FV** flushing valve.

Spline[1)]	**C** (standard)	**D** (optional)
T12-60	W30x2x14x9g	W35x2x16x9g

1) DIN 5480 ('30° involute spline, side fit').

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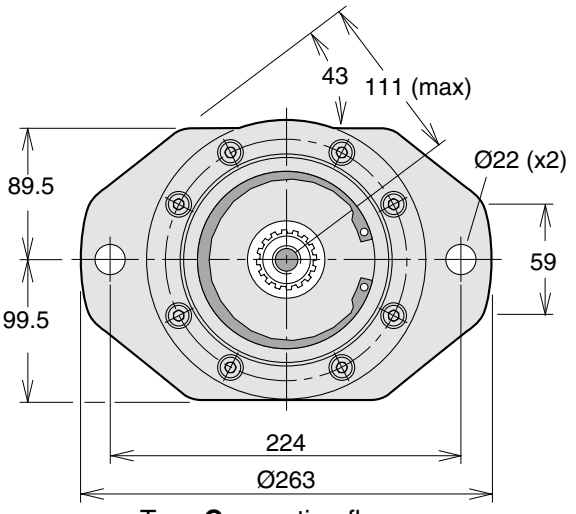
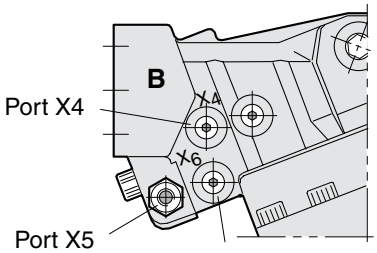
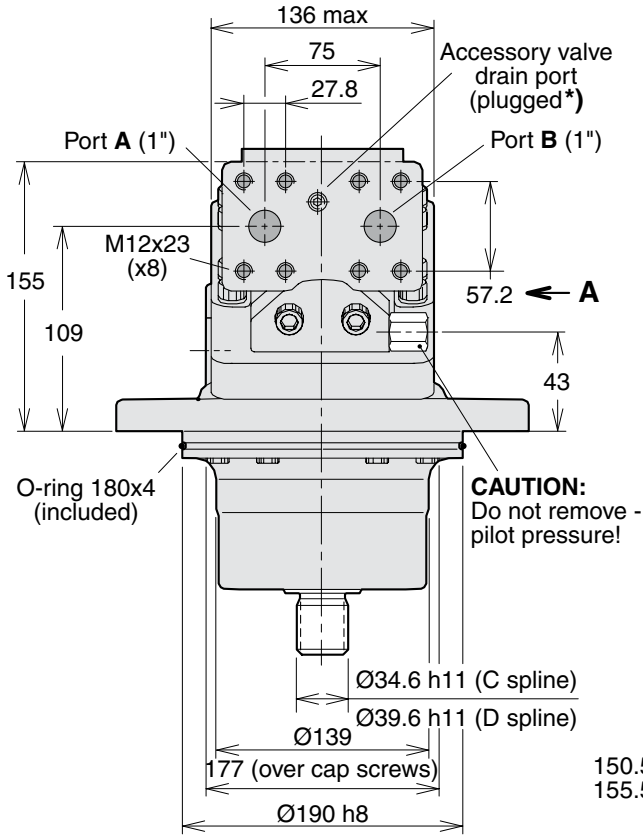
T12-80

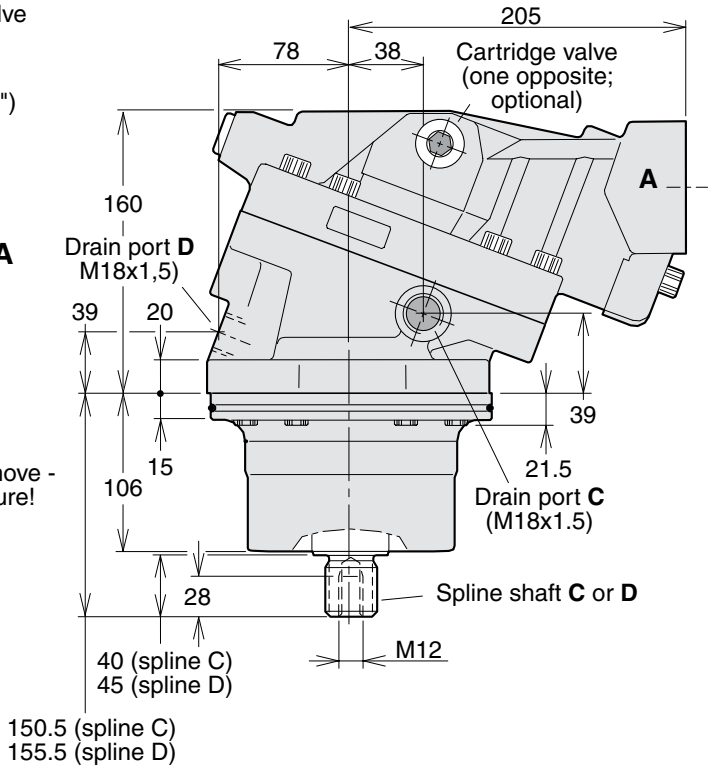


Type **C** mounting flange



View A





*** NOTE:**
The accessory valve drain port plug **must be removed** before installing the following valve:
- **FV** flushing valve.

Spline[1)]	**C** (standard)	**D** (optional)
T12-80	W35x2x16x9g	W40x2x18x9g

1) DIN 5480 ('30° involute spline, side fit').

V12

V14

T12

Content

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Direction of rotation versus flow

NOTE: The V12, V14 and T12 motors are bi-directional.

V12 rotation:

- End cap position T (AC, AD and AH controls): When port B (open arrow) is pressurized, the motor rotates clockwise (right hand; R), and when port A (black arrow) is pressurized, the motor turns counter clockwise (left hand; L)
- End cap position M (EO, EP, HO and HP controls): A and B port positions interchange (A-to-B, B-to-A).

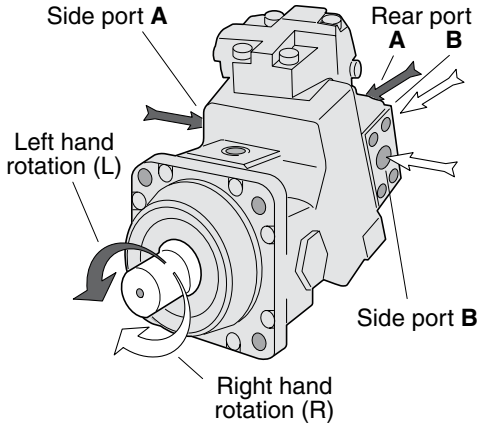
V14 rotation:

- Refer to the V14 illustration below right (valid for all compensators and controls).

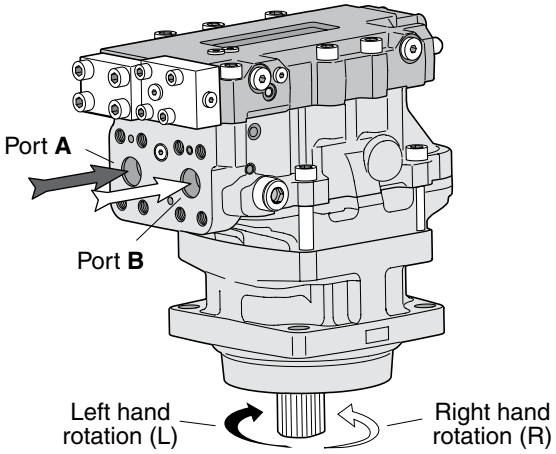
T12 rotation:

- Refer to the V14 illustration below right.

NOTE: Before installing a V12, V14 or T12 motor in series (when both A and B ports can be subject to high pressures simultaneously) contact Parker Hannifin.



Direction of rotation vs. flow for the V12 motor (here shown with AC-compensator; end cap position T).



Direction of rotation vs. flow for the V14 motor (shown with AC-compensator).

Filtration

Maximum motor sevice life is obtained when the fluid cleanlineness meets or exceeds ISO code 20/18/13 (ISO 4406).

A 10 µm (absolute) filter is recommended.

Case pressure

To secure correct case pressure and lubrication, a spring loaded check valve, 1-3 bar, in the drain line (shown on next page) is recommended

NOTE: Contact Parker Hannifin for information when operating at high speeds.

Frame size	1500	3000	4000	5000	6000
V12-60	max 12	0.5–7	1–5.5	1.5–5	2–5
V12-80	max 12	0.5–7	1–5.5	1.5–5	2.5–5
V14-110	max 10	1–6	1.5–5	2–4.5	3–5
V14-160	max 10	1–6	2–5.5	2.5–5.5	-

Min and max case pressure [bar] vs. shaft speed [rpm].

Required inlet pressure

The motor may operate as a pump under certain conditions. When this occurs, a minimum pressure must be maintained at the inlet port; increased noise and gradually deteriorating performance due to cavitation may otherwise be experienced.

A 15 bar inlet pressure, measured at the motor inlet port, satisfies most operating conditions.

Contact Parker Hannifin for more specific information on inlet pressure requirements.

Operating temperatures

The following temperatures should not be exceeded

Main circuit: 80 °C.

Drain fluid: 115 °C.

Continuous operation at high power levels usually requires case flushing in order for the fluid to stay above the minimum viscosity requirement. A flushing valve and restricting nozzle, available as an option, provide the necessary main circuit flushing flow.

Refer to fig. 1 (next page), and to:

- V12: ‘Flushing valve’, page 17.
- V14: ‘Flushing valve’, page 46.
- T12: ‘Flushing valve block’, page 62-63.

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Drain ports

There are two drain ports on the V12 and T12 and three on the V14motors. The uppermost drain port should always be utilized.

In order to avoid excessively high case pressure, the drain line should be connected directly to the reservoir.

Hydraulic fluids

Ratings and performance data for the motors are valid when a good quality, contamination-free, petroleum-based fluid is used in the hydraulic system.

Hydraulic fluids type HLP (DIN 51524), automatic trans-mission fluids type A, or API CD engine oils can be used.

When the hydraulic system has reached full operating temperature, the motor drain oil viscosity should be above 8 mm^2/s (cSt).

At start-up, the viscosity should not exceed 1500 mm^2/s.

The ideal operating range for the motor is 15 to 30 mm^2/s.

Fire resistant fluids, when used under modified operating conditions, and synthetic fluids are also suitable.

Contact Parker Hannifin for additional information about:

- Hydraulic fluid specifications
- Fire resistant fluids.

Before start-up

Make sure the motor case as well as the entire hydraulic system is filled with hydraulic fluid.

The internal leakage, especially at low operating pressures, is not sufficient to provide lubrication at start-up.

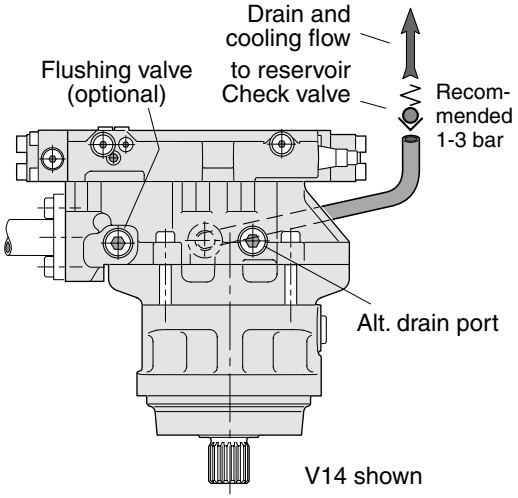


Fig. 1.

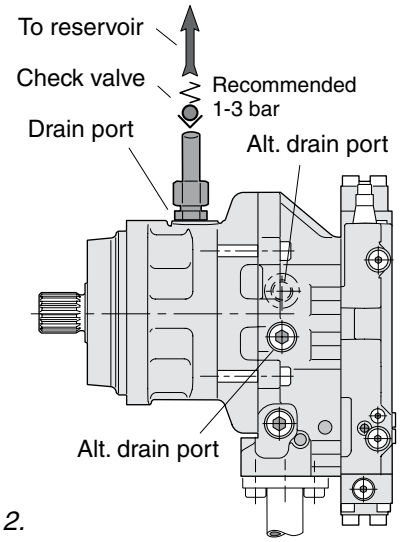


Fig. 2.

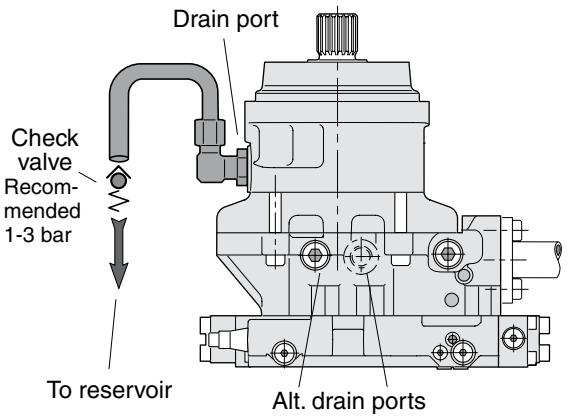
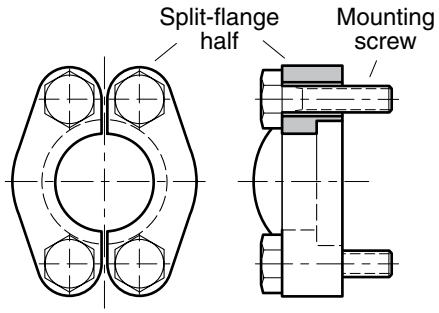


Fig. 3.

Split-flange kits

Metric split-flange kits, consisting of two split-flange halves and four mounting screws for use on V12 ISO and cartridge versions, are available from Parker Hannifin.

Part no.	SAE size	For	Screw size
3794405	$^3/_4$"	V12-60/-80	M10x35
3704329	1"	V14-110	M12x40
3704330	$1^1/_4$"	V14-160	M14x45
3794405	$^3/_4$"	T12-60/-80	M10x35



5

⚠ WARNING – USER RESPONSIBILITY

FAILURE OR IMPROPER SELECTION OR IMPROPER USE OF THE PRODUCTS DESCRIBED HEREIN OR RELATED ITEMS CAN CAUSE DEATH, PERSONAL INJURY AND PROPERTY DAMAGE.

This document and other information from Parker-Hannifin Corporation, its subsidiaries and authorized distributors provide product or system options for further investigation by users having technical expertise.

The user, through its own analysis and testing, is solely responsible for making the final selection of the system and components and assuring that all performance, endurance, maintenance, safety and warning requirements of the application are met. The user must analyze all aspects of the application, follow applicable industry standards, and follow the information concerning the product in the current product catalog and in any other materials provided from Parker or its subsidiaries or authorized distributors.

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HK – Hong Kong
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