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 and 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.

(cont'd ...)

T12

Available motors

Model	Frame size	Version	Chapter
V12	60	ISO	2
	"	Cartridge	"
	"	SAE	"
	80	ISO	"
	"	Cartridge	"
	"	SAE	"
	160	ISO	"
	"	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 side 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.

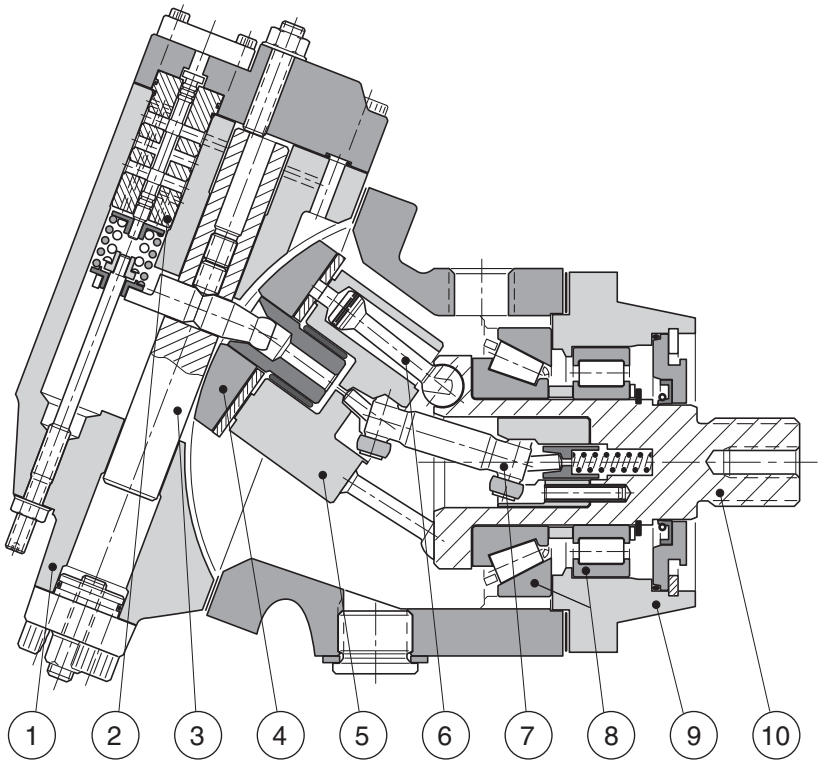
V12

Content **Page**

V12 cross section 8
Specifications 8
Efficiency diagrams 9
Ordering codes 10
V12 installation:
- ISO version 14
- Cartridge version 16
- SAE version 18
Bearing life 20
Controls (general information) 21
- AC pressure compensator 21
- AH pressure compensator 22
- EO electrical, two-position control 23
- EP electrical, proportional control 24
- HO hydraulic, two-position control 25
- HP hydraulic, proportional control 26
- Control installation dimensions 27
Flushing valve 28
High speed operation 28
Accessory valve blocks 29
Speed sensor 30

V12 cross section

1. End cap
2. Servo control valve
3. Setting piston
4. Valve segment
5. Cylinder barrel1
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**	**160***
Displacement [cm^3/rev]			
- max, at 35°	60	80	160
- min, at 6.5°	12	16	32
Operating pressure [bar]			
- max intermittent [1)]	480		480
- max continuous	420		420
Operating speed [rpm]			
- at 35°, max intermittent [1)]	4 400	4 000	3200
max continuous	3 600	3 100	2500
- at 6.5°–10°, max intermittent [1)]	7 000	6 250	5000
max continuous	5 600	5 000	4000
- min continuous	50		50
Flow [l/min]			
- max intermittent [1)]	265	320	510
- max continuous	215	250	400
Torque (theor.) at 100 bar [Nm]	95	127	255
Output power [kW]			
- max intermittent [1)]	150	175	280
- max continuous	95	105	170
Corner power [kW]			
- intermittent [1)]	335	400	640
- continuous	235	280	450
Mass moment of inertia ($x10^{-3}$) [kg m^2]	3.1	4.4	14.6
Weight [kg]	28	33	58

1) Max 6 seconds in any one minute.

***** Will be replaced by V14-160.

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Trollhättan, Sweden

Efficiency diagrams

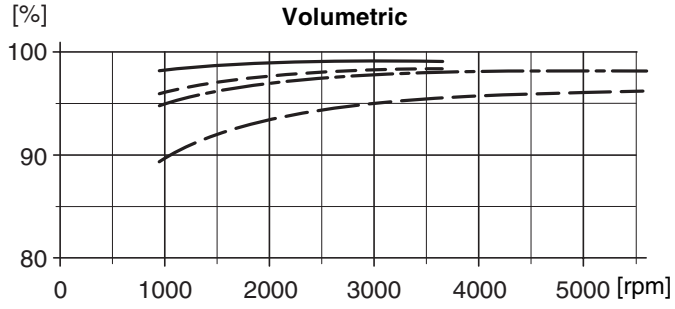
The following diagrams show volumetric and overall efficiencies versus shaft speed at 210 and 420 bar operating pressure, and at full (35°) and reduced (10°) displacements.

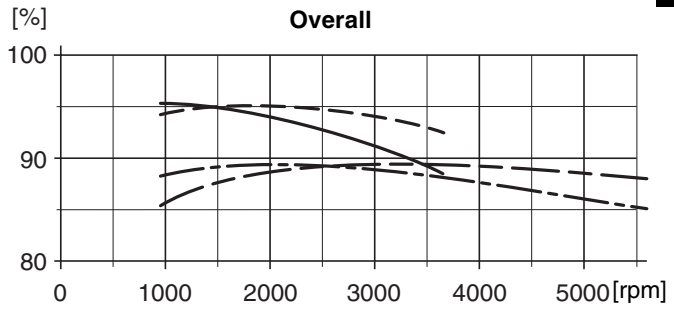
Information on efficiencies for a specific load condition can be made available from Parker Hannifin.

——— 210 bar at full displacement
– – – – 420 bar " " "

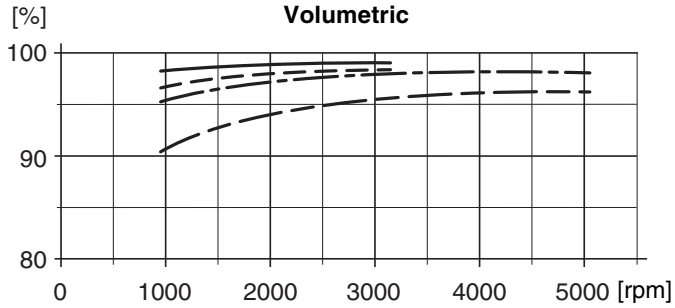
—·—·— 210 bar at reduced displacement
— – — – 420 bar " " "

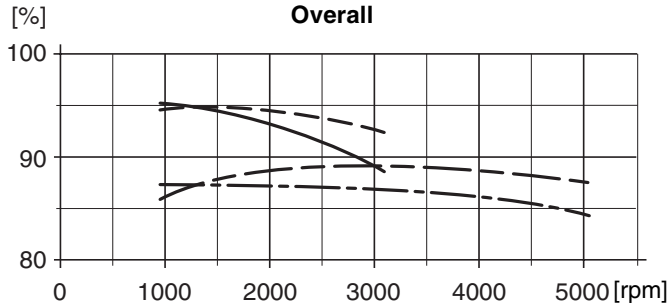
V12-60



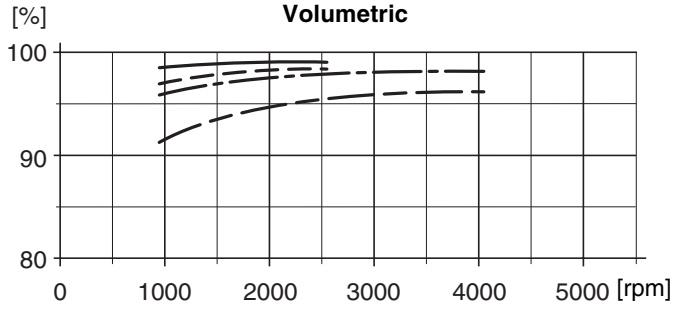


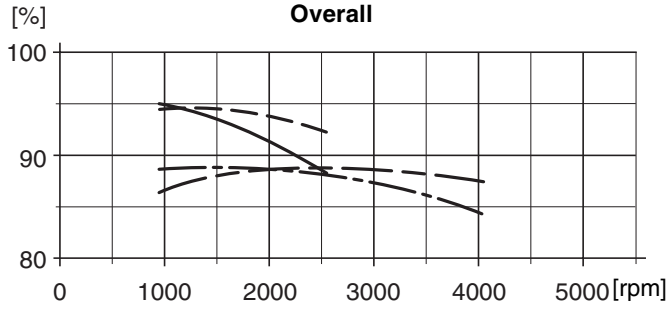
V12-80





V12-160





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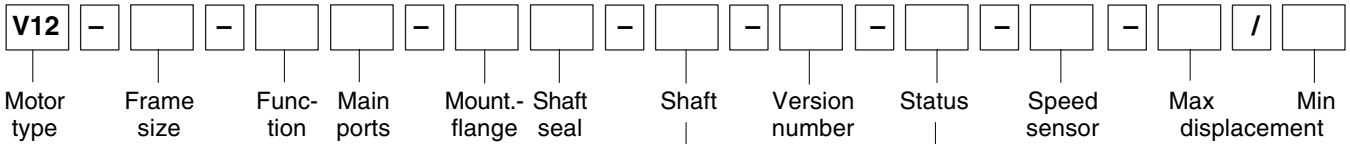
ISO version (basic configuration)



Code	Frame size [cm³/rev]
060	60
080	80
160	160

Max and min displacement [cm³/rev]

Code	Speed sensor (refer to page 30)
S	Speed sensor (not installed)
P	Prepared for speed sensor

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

Frame size	60	80	160
Code **Function**			
M Motor; normal end cap position: EO, EP, HO and HP	x	x	x
T Motor; normal end cap position: AC and AH	x	x	x

Frame size	60	80	160
Code **Main ports**			
A SAE flange; metric threads, rear ports	x	x	x
F SAE flange; metric threads, side ports	x	x	x

Code	Version number
	Factory assigned for special versions

Frame size	60	80	160
Code **Mounting flange**			
I ISO flange	x	x	–
N ISO flange	(x)	(x)	x

Frame size	60	80	160
Code **Shaft seal**			
H NBR (nitirile)	x	x	x
V FPM (high temp.; fluorocarbon)	(x)	(x)	(x)

Frame size	60	80	160
Code **Shaft** (DIN 5480)			
C Spline	(x)	(x)	(x)
D Spline	x	x	x

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

Cartridge version (basic configuration)

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

Code	Frame size (cm^3/rev)
060	60
080	80

Max and min displacement [cm^3/rev]

Code	Speed sensor
–	(Speed sensor not available)

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

Version number
Factory assigned for special versions

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

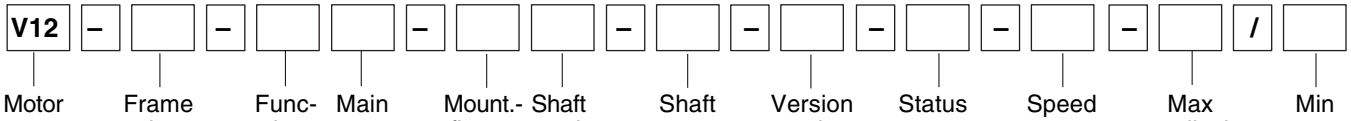
Frame size		60	80
Code	**Mounting flange**		
C	Cartridge flange	x	x

Frame size		60	80
Code	**Shaft seal**		
H	NBR (nitirile)	x	x
V	FPM (high temp.; fluorocarbon)	(x)	(x)

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

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

SAE version (basic configuration)



Code	Frame size [cm³/rev]
060	60
080	80
160	160

Max and min displacement [cm³/rev]

Code	Speed sensor (refer to page 30)
S	Speed sensor (not installed)
P	Prepared for speed sensor

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

Version number
Factory assigned for special versions

Frame size	60	80	160
Code **Function**			
M Motor; normal end cap position: EO, EP, HO and HP	x	x	x
T Motor; normal end cap position: AC and AH	x	x	x

Frame size	60	80	160
Code **Main ports**			
S SAE flange; UN threads, side ports	x	x	x
U SAE flange; UNthreads, rear ports	x	x	x

Frame size	60	80	160
Code **Mounting flange**			
S SAE flange	x	x	x

Frame size	60	80	160
Code **Shaft seal**			
H NBR (nitirile)	x	x	x
V FPM (high temp.; fluorocarbon)	(x)	(x)	(x)

Frame size	60	80	160
Code **Shaft** (SAE J498b)			
S Spline	(x)	(x)	(x)

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

Controls and flushing valve

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

Control designation | Settings | Flushing valve

Frame size		60	80	160
Code	Control designation			
AC I 01 I	Pressure compensator, internal pilot pressure, internal servo supply	x	x	x
AC E 01 I	Pressure compensator, external pilot pressure, internal servo supply	(x)	(x)	(x)
AH I 01 I	Pressure compensator, hydraulic override, internal pilot pressure, internal servo supply	x	x	x
AH E 01 I	Pressure compensator, hydraulic override, external pilot pressure, internal servo supply	(x)	(x)	(x)
EOL 01 I	Electrohydraulic, two-position, 12 VDC, internal servo supply	x	x	x
EOL 01 E	Electrohydraulic, two-position, 12 VDC, external servo supply	(x)	(x)	(x)
EOH 01 I	Electrohydraulic, two-position, 24 VDC, internal servo supply	x	x	x
EOH 01 I	Electrohydraulic, two-position, 24 VDC, external servo supply	(x)	(x)	(x)
EPL 01 I	Electrohydraulic proportional, 12 VDC, internal servo supply	x	x	x
EPL 01 E	Electrohydraulic, proportional, 12 VDC, external servo supply	(x)	(x)	(x)
EPH 01 I	Electrohydraulic, proportional, 24 VDC, internal servo supply	x	x	x
EPH 01 E	Electrohydraulic, proportional, 24 VDC, external servo supply	(x)	(x)	(x)
HOS 01 I	Hydraulic two-position, standard version internal servo supply	x	x	x
HOS 01 E	Hydraulic two-position, standard version external servo supply	(x)	(x)	(x)
HPS 01 I	Hydraulic proportional, standard version internal servo supply	x	x	x
HPS 01 E	Hydraulic proportional, standard version external servo supply	(x)	(x)	(x)

NOTE: '01' - Standard nozzles x: Available (x): Optional – : Not available

Settings

AC, AH:	Threshold pressure: **150**, **200** or **250** 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 28).

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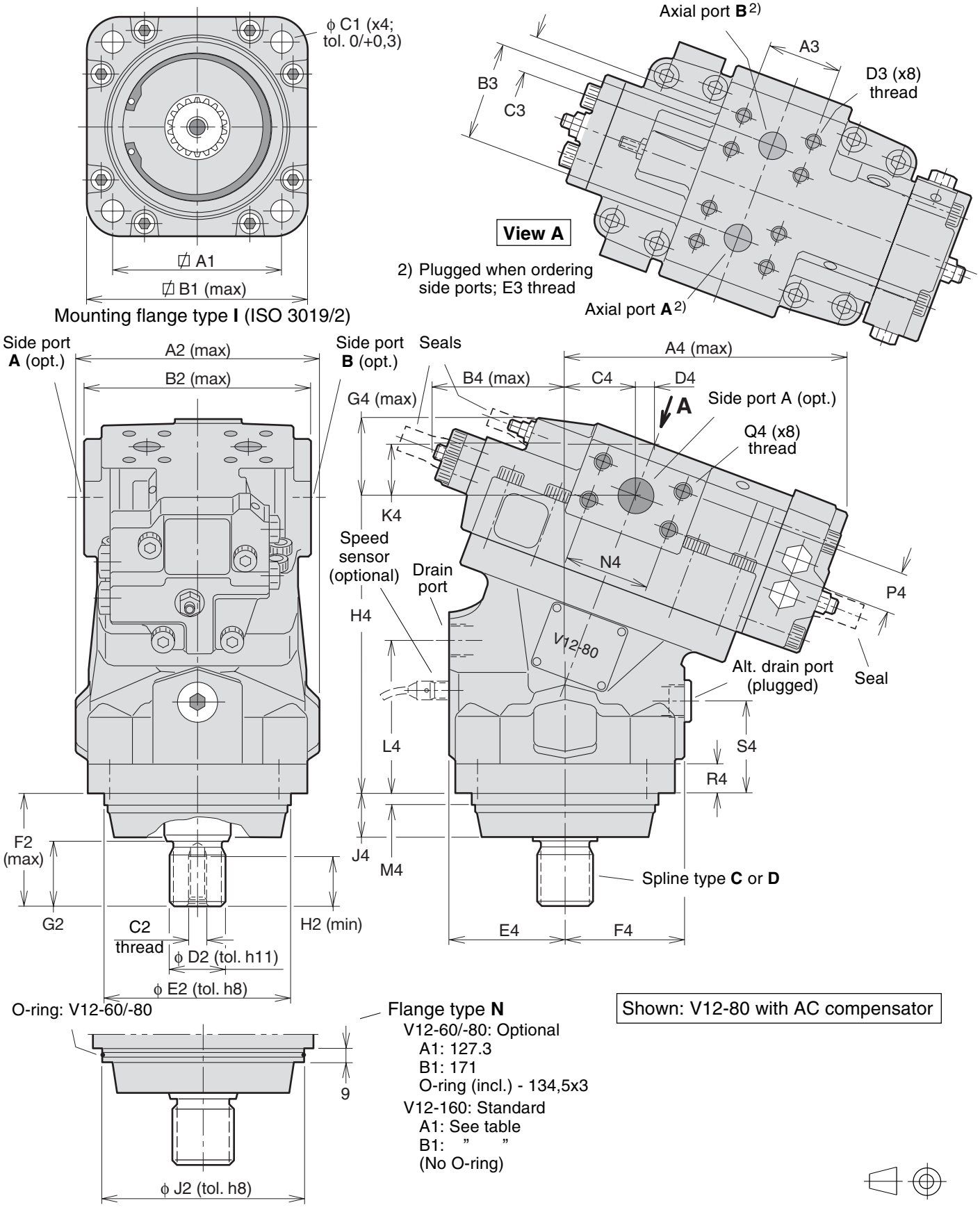
ISO version



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Size	V12-60	V12-80	V12-160
A1	113.2	113.2	158.4
B1	151	151	212
C1	14	14	18
A2	159	165	197
B2	146	154	179
C2	M12	M12	M12
D2*	34.6	39.6	49.6
E2	125	125	180
F2*	73	78	96
G2*	40	45	55
H2	28	24	24
J2	140	140	see E2
A3	50.8	50.8	66.7
B3	66	66	83
C3	23.8	23.8	31.75
D3 1)	M10x20	M10x20	M14x23
E3 2)	M22x1.5	M22x1.5	M22x1.5
A4	188	193	218
B4	87	90	114
C4	45	48.3	56
D4	13.4	13.1	14.2
E4	76	78	94
F4	77	80	94
G4	55	57	67
H4	188	199	243
J4	31.5	31.5	39.5
K4	35.5	34.6	37.4
L4	94	101	125
M4	9	9	9
N4	50.8	57.2	66.7
P4	23.8	27.8	31.75
Q4 1)	M10x20	M12x23	M14x23
R4	20	20	22
S4	57.5	60.5	77

***** 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	V12-160
Axial	19 [$^3/_4$"]	19 [$^3/_4$"]	32 [$1^1/_4$"]
Side	19 [$^3/_4$"]	25 [1"]	32 [$1^1/_4$"]
Drain 2)	M22x1.5	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
-160	W45x2x21x9g

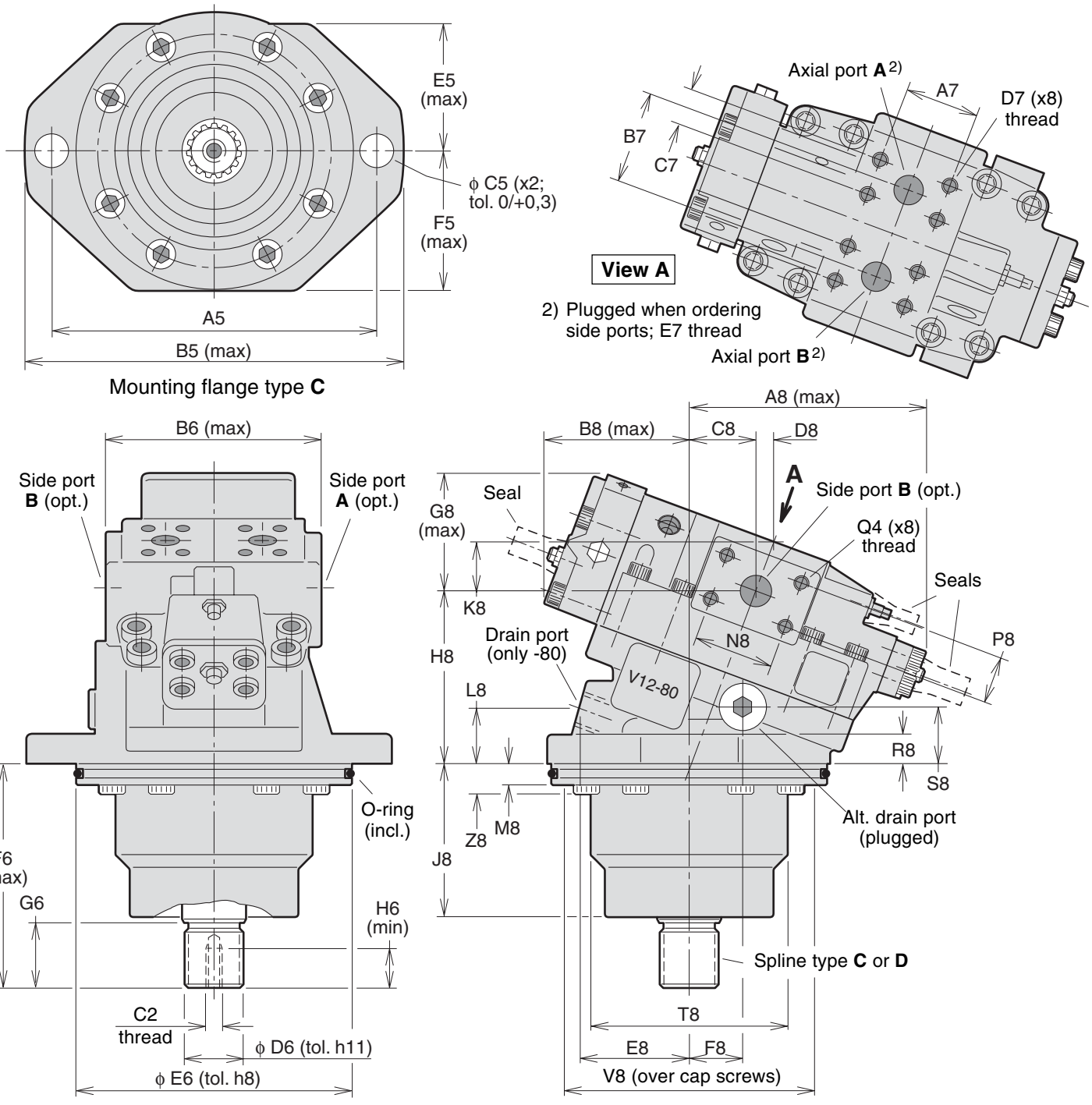
Spline type **D** 3) (DIN 5480)

Size	Dimension
V12-60	W35x2x16x9g
-80	W40x2x18x9g
-160	W50x2x24x9g

Flange

Size	I	N
V12-60	standard	optional
-80	standard	optional
-160	-	standard

Cartridge version



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 (70° IRH)

Size	Dimension
V12-60	150x4
-80	180x4

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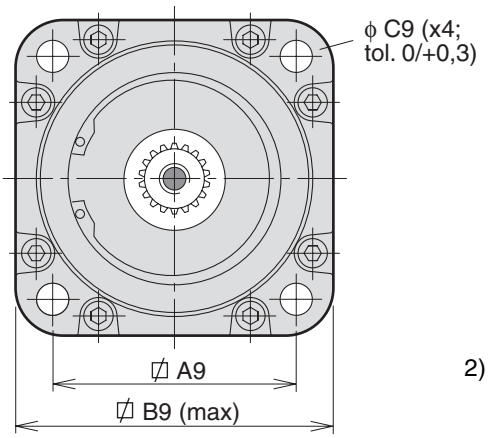
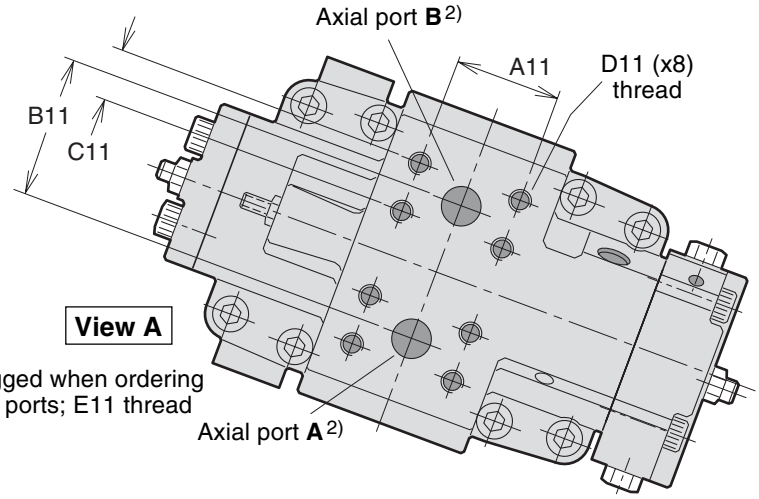
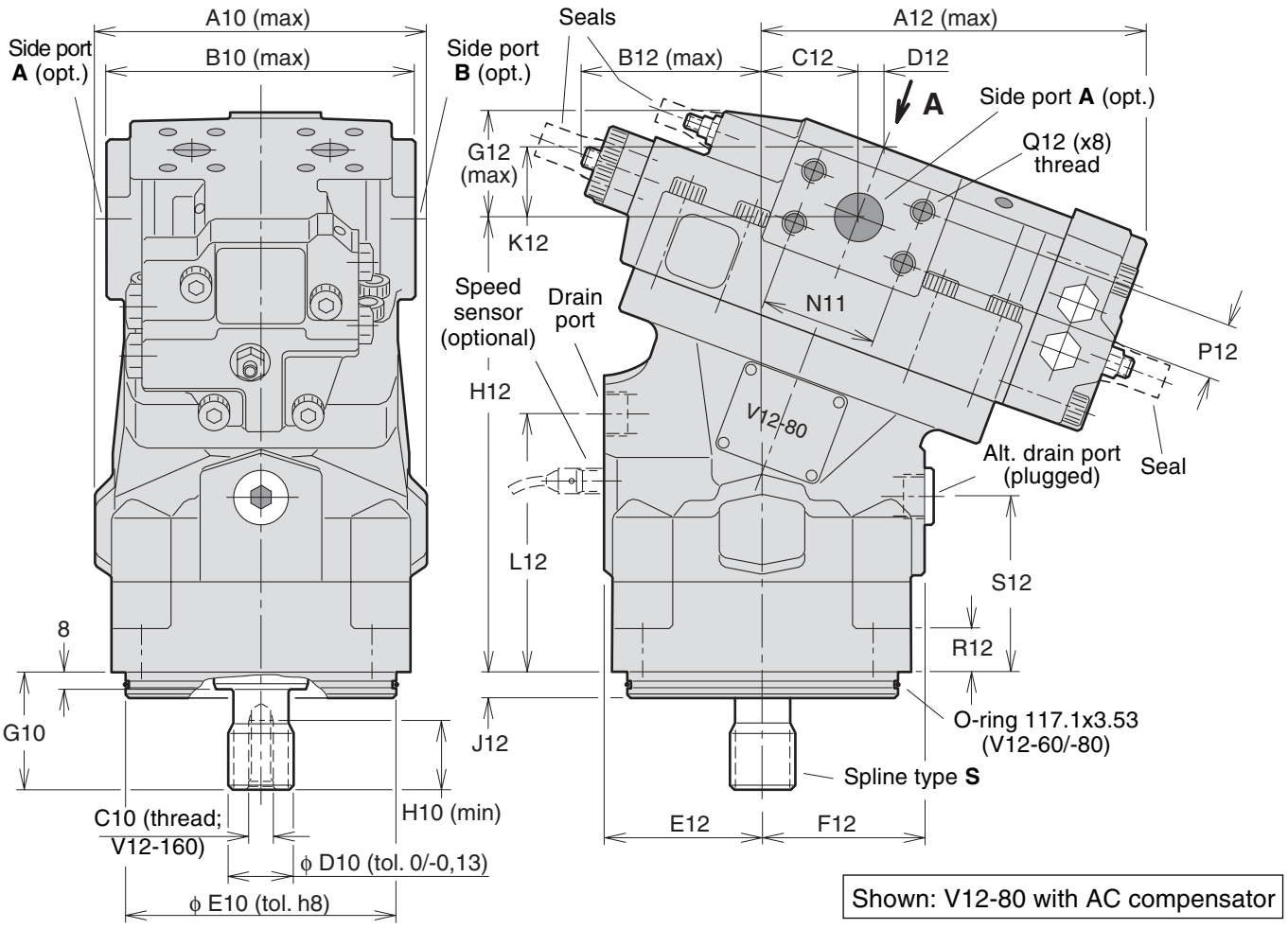
SAE version



Mounting flange type **S** (SAE J744)





Shown: V12-80 with AC compensator

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Size	**V12-60**	**V12-80**	**V12-160**
A9	114.5	114.5	161.6
B9	149	149	200
C9	14.3	14.3	20.6
A10	159	165	197
B10	146	154	179
C10	-	-	1/2"-13
D10	31.22	31.22	43.71
E10	127.00	127.00	152.40
G10	55.6	55.6	75
H10	-	-	36
A11	50.8	50.8	66.7
B11	66	66	83
C11	23.8	23.8	31.75
D11[1)]	3/8"-16 x20	3/8"-16 x20	1/2"-13 x23
E11[2)]	M22x1.5	M22x1.5	M22x1.5
A12	188	193	218
B12	87	90	114
C12	45	48.3	56
D12	13.4	13.1	14.2
E12	76	78	94
F12	77	80	94
G12	55	57	67
H12	212	223	276
J12	12.7	12.7	12.7
K12	35.5	34.6	37.4
L12	118	125	157
N12	50.8	57.2	66.7
P12	23.8	27.8	31.75
Q12*	3/8"-16 x20	7/16"-14 x23	1/2"-13 x23
R12	20	20	23.5
S12	81.5	84.5	109

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

Ports

Type	V12-60	V12-80	V12-160
Axial	3/4"	3/4"	1 1/4"
Side	3/4"	1"	1 1/4"
Drain	7/8"-14	7/8"-14	1 1/16"-12

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

Flange type **S** (SAE J744c)

Size	Dimension
V12 -60	SAE 'C'
-80	SAE 'C'
-160	SAE 'D'

Spline type **S** (SAE J498b*)

Size	Dimension
V12 -60	SAE 'C' (14T, 12/24 DP)
-80	SAE 'C' (14T, 12/24 DP)
-160	SAE 'D' (13T, 8/16 DP)

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

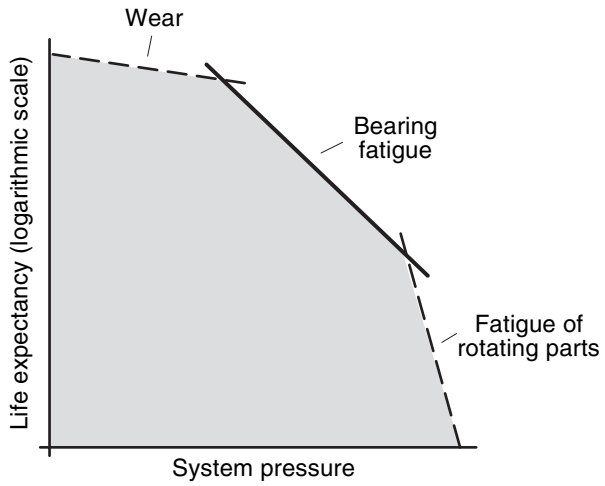
Bearing life

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 consideration 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, operating 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.

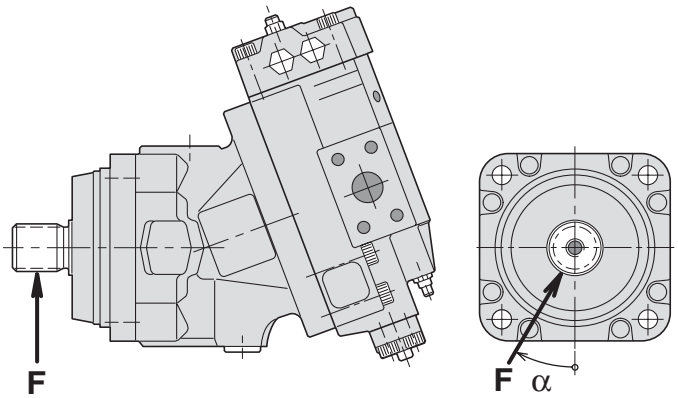
Bearing life is also dependent on external shaft loads, case fluid viscosity and fluid contamination.

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:

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

All controls utilize a setting piston that connects to the valve segment (refer to the picture on page 8).

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: Control ordering codes are shown on page 13 and installation dimensions on page 27.

AC pressure compensator

The AC compensator is used in off-road vehicle hydrostatic transmissions; it automatically adjusts motor displacement 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 ('p_s'; 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 (p_s) 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

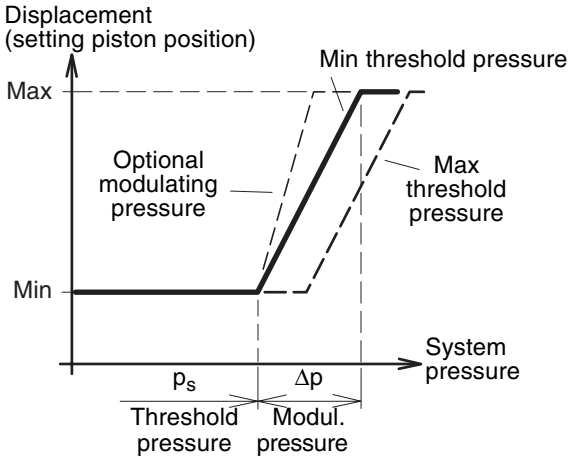
ACE 01 I (optional) - External pilot pressure; port X5 can, for example, be connected to the 'forward drive' pressure line of a vehicle transmission to prevent motor displacement increase when the vehicle is going downhill.

Gauge/pilot ports (AC compensator):

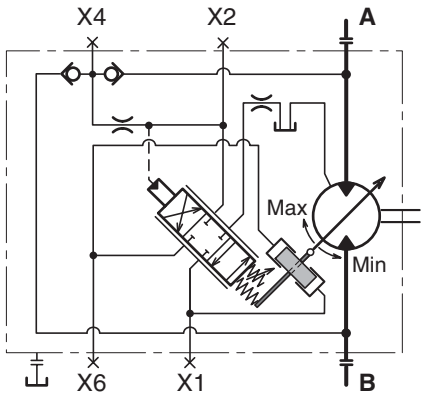
- X1 Setting piston pressure (increasing displ.)
- X2 Servo supply pressure (after orifice)
- X4 Servo supply pressure (before orifice)
- X5 External pilot pressure
- X6 Setting piston pressure (decreasing displ.)

Ports are:

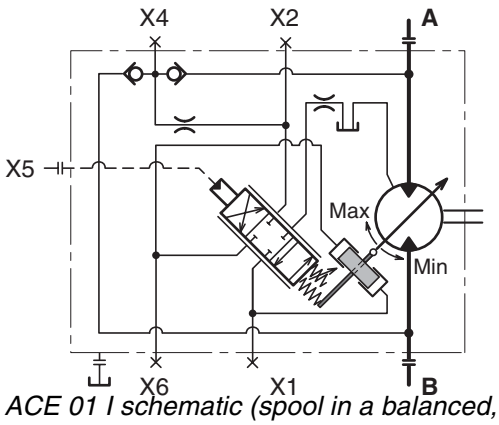
- M14x1.5 (ISO and cartridge versions)
- $^{9}/_{16}$"-18 O-ring boss (SAE version).



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 21) 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 21).

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

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

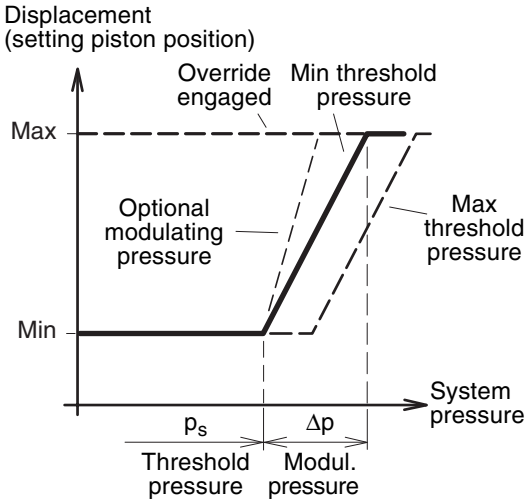
p_7 = Override pressure
p_s = System pressure
Δp = Modulating pressure

Gauge/pilot ports (AH compensator):

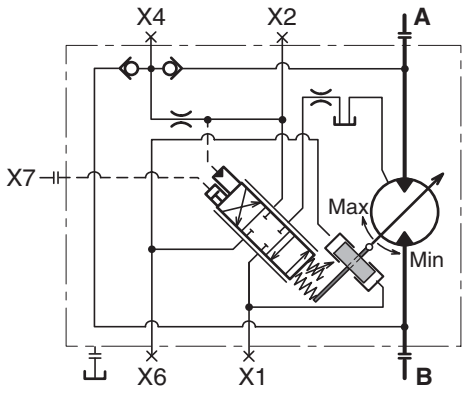
X1 Setting piston pressure (increasing displ.)
X2 Servo supply pressure (after orifice)
X4 Servo supply pressure (before orifice)
X5 External pilot pressure
X6 Setting piston pressure (decreasing displ.)
X7 Override pressure

Ports are:

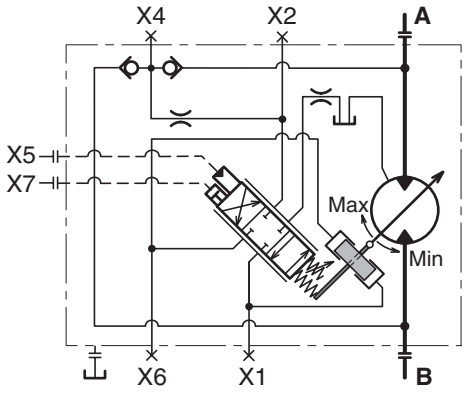
– M14x1.5 (ISO and cartridge versions)
– $^9/_{16}$"-18 O-ring boss (SAE version).



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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EO two-position control

The EO is a two-position control, where max and min displacements are governed by a DC solenoid attached to the control cover (refer to the installation drawing on page 27).

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)

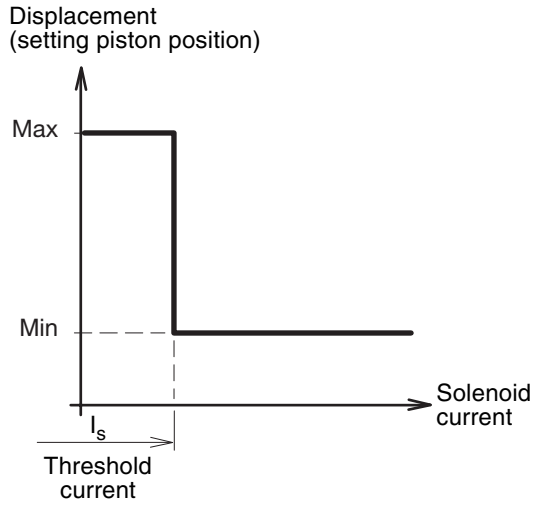
X4 Servo supply pressure (before orifice)

X6 Setting piston pressure (min-to-max)

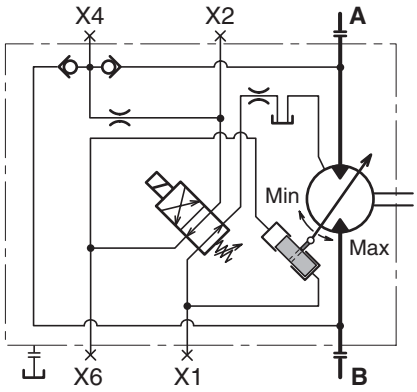
Ports are:

– M14x1.5 (ISO and cartridge versions)

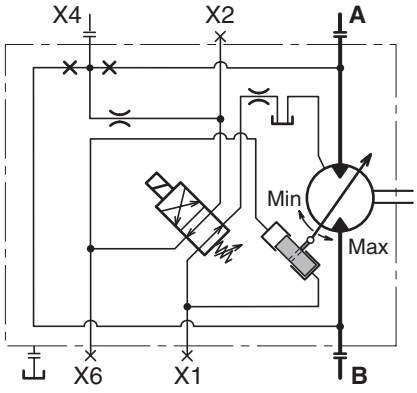
– $^{9}/_{16}$"-18 O-ring boss (SAE version).



EO diagram.



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



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

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.

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

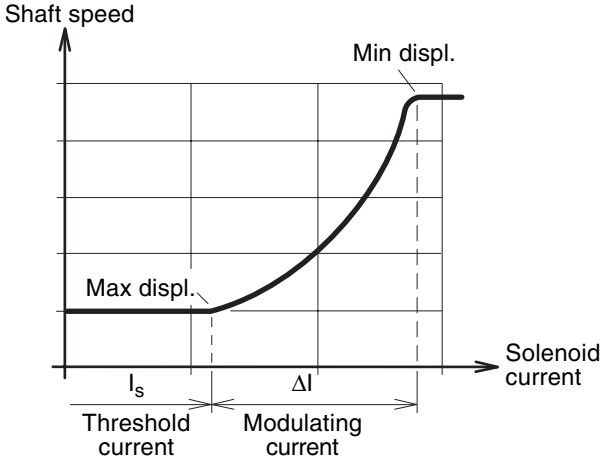
EP L 01 I - Internal servo supply, 12 VDC

EP H 01 E - External servo supply, 24 VDC (optional)

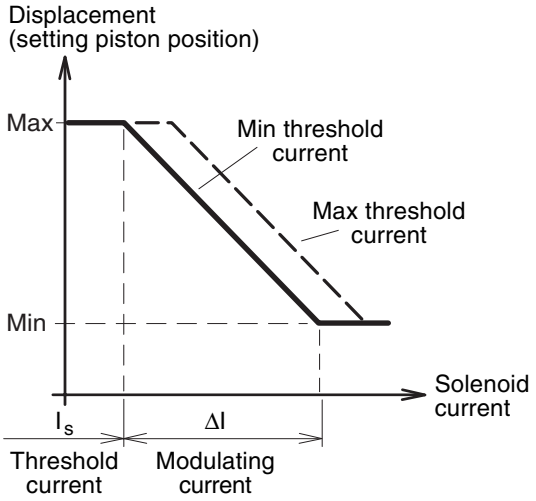
EP L 01 E - External servo supply, 12 VDC (optional)

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.)

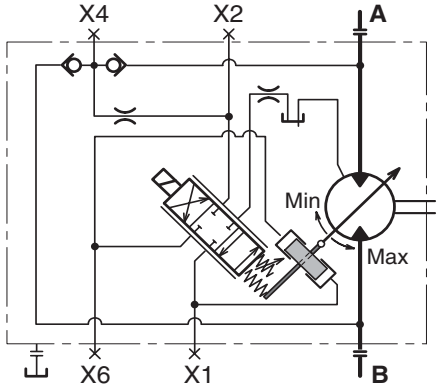
Ports are:
- M14x1.5 (ISO and cartridge versions)
- $^{9}/_{16}$"-18 O-ring boss (SAE version).



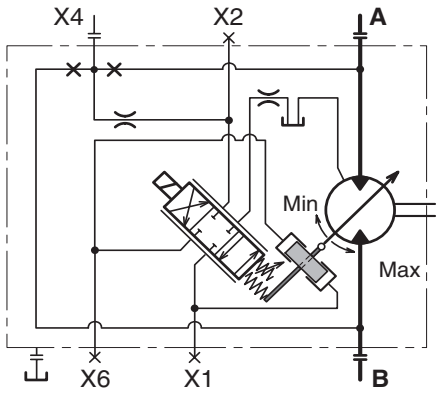
Shaft speed vs. solenoid current (EP control).



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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HO two-position control

The two-position HO control is similar to the EO (page 23) 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

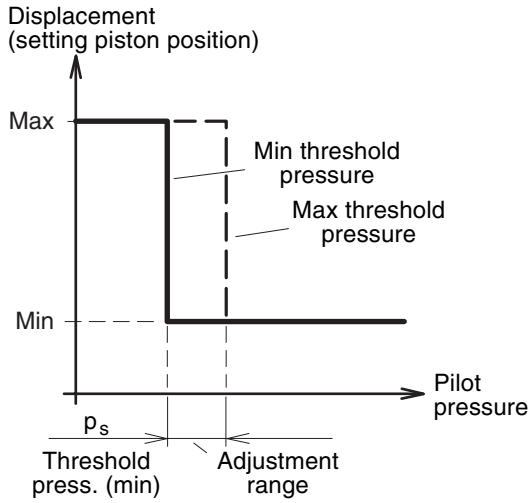
HO S 01 E - External servo supply (port X4) (optional)

Gauge/pilot ports (HO control):

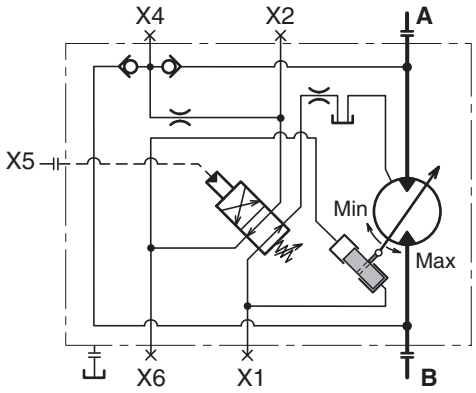
- X1 Setting piston pressure (max-to-min)
- X2 Servo supply pressure (after orifice)
- X4 Servo supply pressure (before orifice)
- X5 External pilot pressure
- X6 Setting piston pressure (min-to-max)

Ports are:

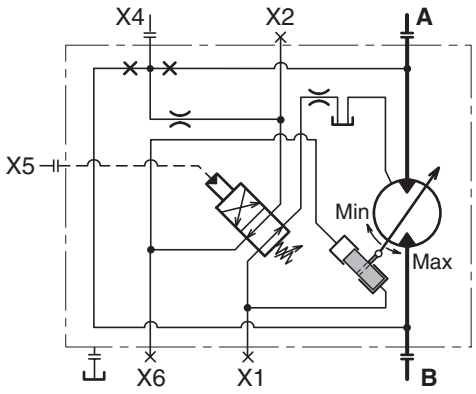
- M14x1.5 (ISO and cartridge versions)
- $^{9}/_{16}$"-18 O-ring boss (SAE version).



HO diagram.



HO S 01 I schematic (X5 not pressurized).



HO S 01 E schematic (X5 not pressurized).

HP proportional control

Like the EP control described on page 24, 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.

Two versions of the HP control are available:

HPS 01 I - Internal servo supply

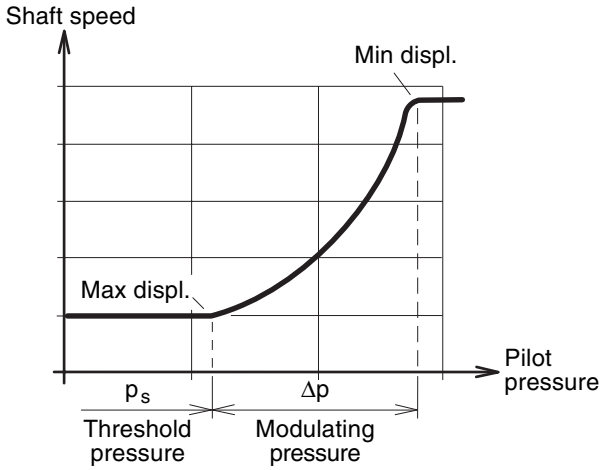
HPS 01 E - External servo supply (port X5) (optional)

Gauge/pilot ports (HP control):

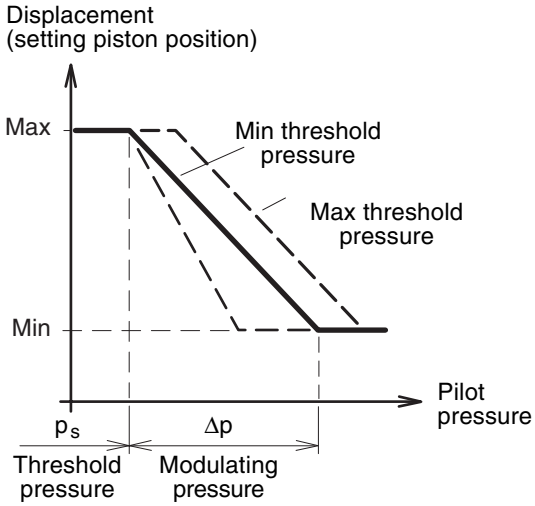
X1 Servo piston pressure (decreasing displ.)
X2 Servo supply pressure (after orifice)
X4 Servo supply pressure (before orifice)
X5 External pilot pressure
X6 Servo piston pressure (increasing displ.)

Ports are:

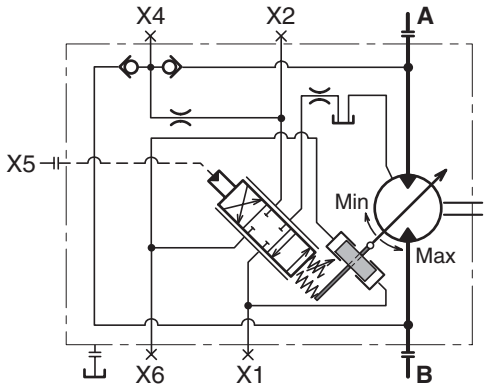
– M14x1.5 (ISO and Cartridge versions)
– $^{9}/_{16}$"-18 O-ring boss (SAE version).



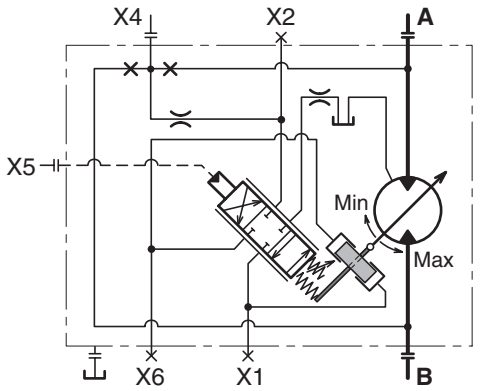
Shaft speed vs. pilot pressure (HP control).



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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Trollhättan, Sweden

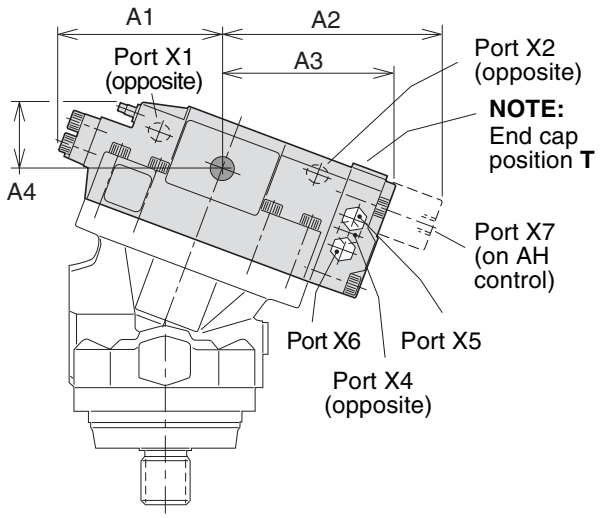
Control installation dimensions

NOTE: - The basic motor side port locations are shown on pages 14, 16 and 18.

- End cap position: Refer to the ordering codes, pages 10-12.
- Control/gauge ports are:
  - M14x1.5 (ISO and cartridge versions).
  - $^{9}/_{16}$"-18 UNF (SAE version).
- All dimensions are max.

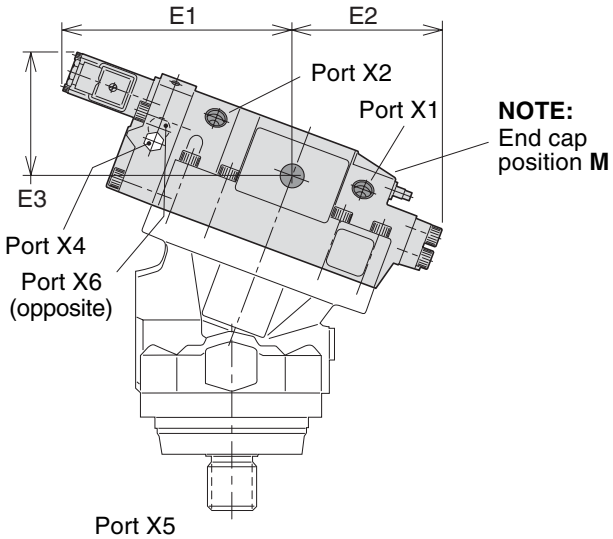
AC and AH compensators

Dim.	V12-60	-80	-160
A1	132	138	170
A2	186	188	206
A3	143	145	162
A4	55	57	67



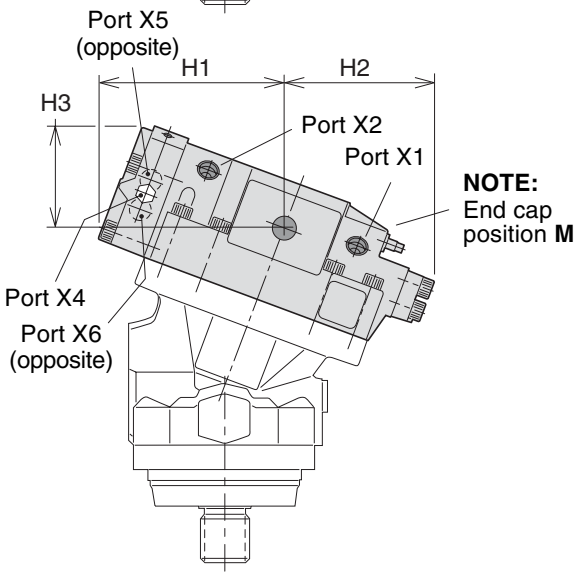
EO and EP controls

Dim.	V12-60	-80	-160
E1	190	192	208
E2	121	125	155
E3	106	106	115



HO and HP controls

Dim.	V12-60	-80	-160
H1	153	156	170
H2	121	125	153
H3	86	85	92



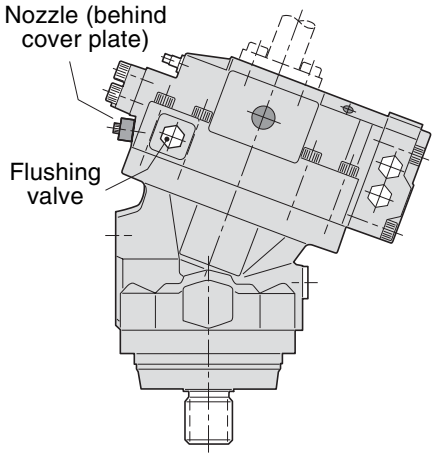
Flushing valve

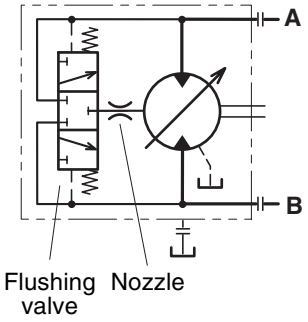
As an option, **L**, the V12 is available with a flushing (or shuttle) valve that supplies the motor with a cooling flow through the case. Cooling the motor may be required when operating at high speeds and/or power levels.

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 13 (‘L 01’).





Available nozzles

Nozzle design.	Orifice size [mm]	Status
L 01	**1.3**	**Standard**
L 02	0.8	Optional
L 03	1.0	“
L 04	1.2	“
L 05	1.5	“
L 06	1.7	“
L 07	2.0	“
L 08	3.0	“

NOTE: - ’00’ - no nozzle

High speed operation

Contact Parker Hannifin for additional information.

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.

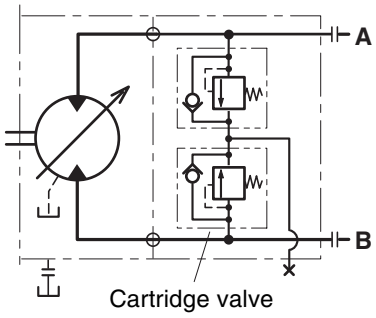
An external port for make-up fluid is provided. When sufficiently pressurized, it prevents motor cavitation due to pressure losses in the main circuit.

For additional information, refer to 'Mobile motor/pump accessories' (catalogue HY17-8258/UK).

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, and to 'Mobile motor/pump accessories' (catalogue HY17-8258/UK).



V12 with SV relief valve block.

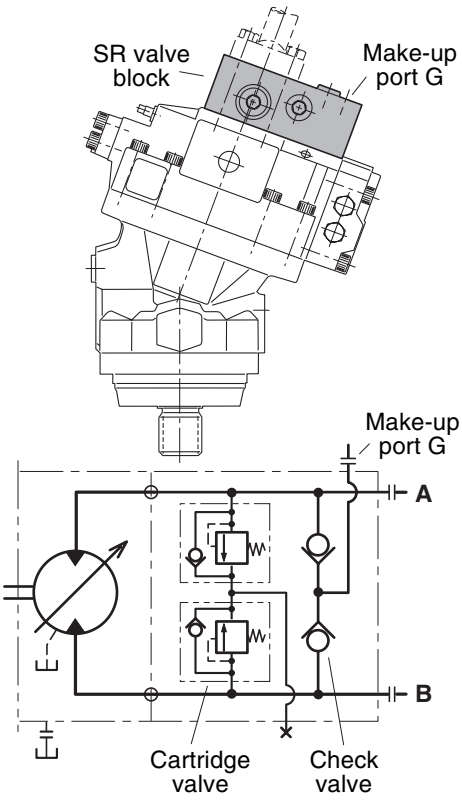
BW2/SX2 brake/relief valves

In applications, such as open circuit wheel drives, a counterbalance or 'brake' valve is required. It provides smooth braking and greatly reduces the risk of motor cavitation when coasting or braking.

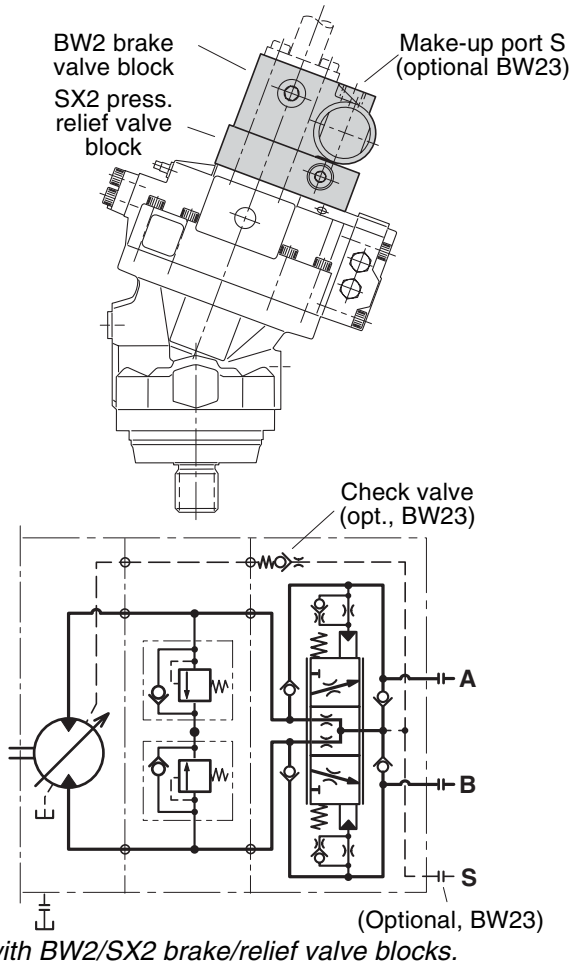
Brake/relief valves, type BW2/SX2, are available for series V12 motors. The two valve blocks mount directly on the motor end cap as shown to the right.

As an option, size BW23 can be supplied with a make-up port; when sufficiently pressurized, motor cavitation due to pressure losses in the main circuit is being prevented.

For additional information, refer to 'Mobile motor/pump accessories' (catalogue HY17-8258/UK).



V12 with SR relief valve block.



V12 with BW2/SX2 brake/relief valve blocks.

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Trollhättan, Sweden

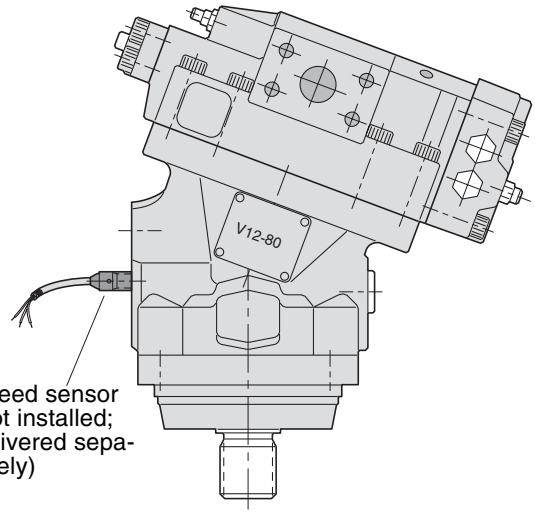
Speed sensor

A speed sensor kit is available for the **I** and **S** versions of series V12.

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 square wave signal within a frequency range of 5 Hz to 20 kHz. Number of pulses per shaft rev is 36 which, at 5 Hz, corresponds to approx. 8 rpm.

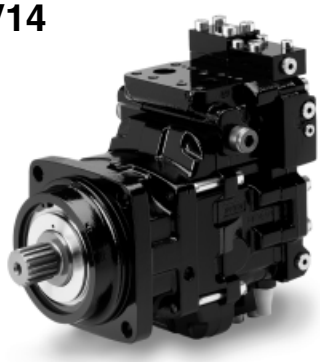
When a 'Speed sensor' is ordered (refer to the ordering codes on pages 10 and 12), the housing is machined with the threaded hole; the speed sensor kit is delivered in a separate bag.

NOTE:
- The motor bearing housing must be prepared for the speed pick-up; refer to the V12 ordering codes on pg. 10 and 12.
- Additional information is provided in our publication 'Mobile motor/pump accessories' (catalogue HY17-8258/UK); available from Parker Hannifin.
- The speed sensor is also shown in the illustrations on pg. 14 and 18.



V12

V14



T12

Content

Page

Direction of rotation 64
Filtration 64
Case pressure 64
Required inlet pressure 64
Operating temperatures 64
Drain ports 65
Hydraulic fluids 65
Before start-up 65
Split-flange kits 66

5

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.

Filtration

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

A 10 µm (absolute) filter is recommended.

Case pressure

The lowest and highest recommended case pressure (shaft seal type **H**) at selected shaft speeds is shown in the table below.

The min pressure secures sufficient lubrication, and the max pressure nominal seal life.

Case pressure should be measured in the drain port.

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
V12-160	max 10	1–6	1.5–5	2–4.5	–
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].

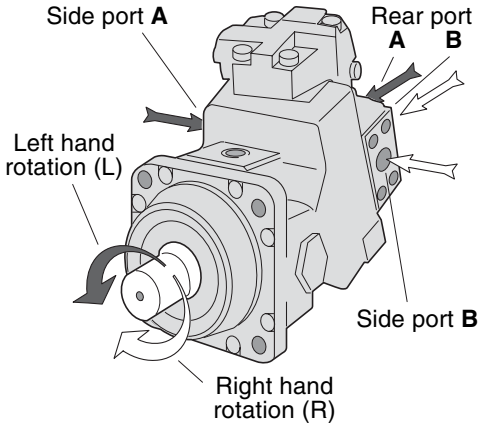
NOTE: Contact Parker Hannifin for information on other shaft seals.

Required inlet pressure

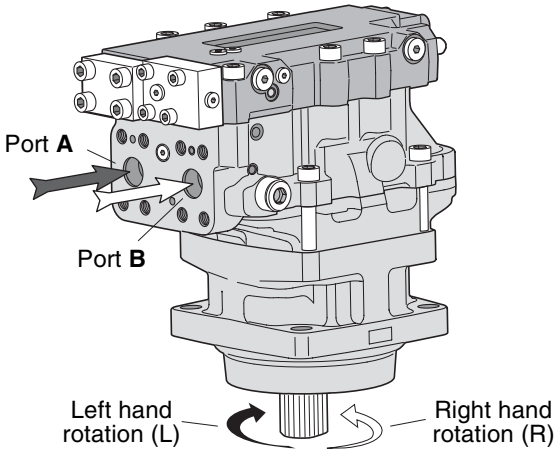
The motor may operate as a pump under certain conditions. When this occurs, a minimum pressure must be maintained at the inlet port; increased noise and gradually deteriorating performance due to cavitation may otherwise be experienced.

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.



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).

Operating temperatures

The following temperatures should not be exceeded (type **H** shaft seal):

Main circuit: 80 °C.

Drain fluid: 100 °C.

FPM shaft seals (fluorocarbon; type **V**) can be used to 115 °C drain fluid temperature.

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 28.
- V14: ‘Flushing valve’, page 53
- T12: ‘Flushing valve block’, page 59.

Drain ports

There are two drain ports on the V12, V14 and T12 motors. The uppermost drain port should always be utilized (see illustrations on the previous page).

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

When the motor is operating, the case must be filled with fluid to at least 50%.

NOTE: - A spring loaded check valve in the drain line (shown in the V14 illustrations to the right) may have to be installed in order to prevent oil from being siphoned out of the motor case. This can otherwise happen if, e.g., the reservoir is located below the utilized motor drain port.

- 'High speed operation' available from Parker Hannifin.

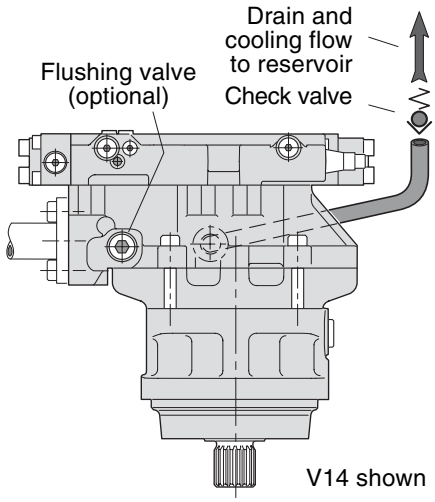


Fig. 1.

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 transmission 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.

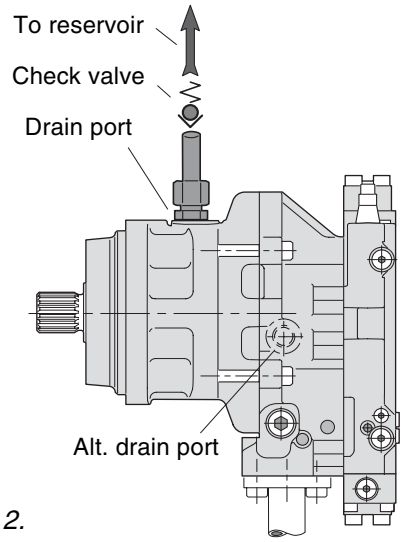


Fig. 2.

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.

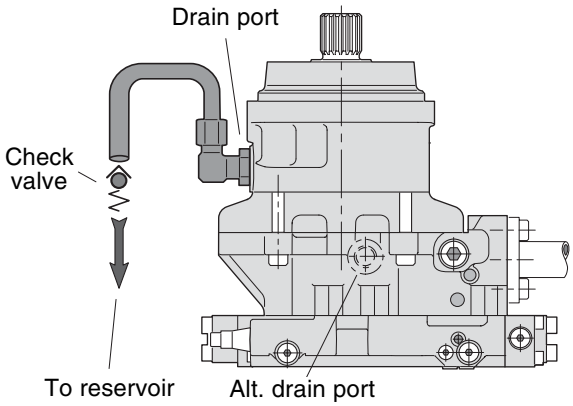


Fig. 3.

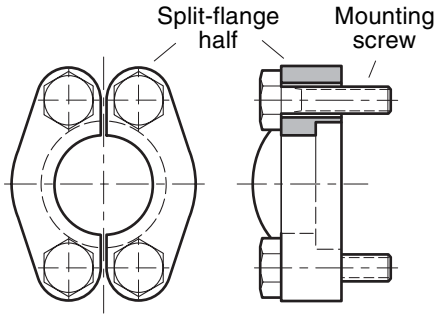
5

Parker Hannifin
Mobile Controls Division
Trollhättan, Sweden

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
379 4405	$^3/_4$"	V12-60/-80	M10x35
370 4330	$1^1/_4$"	V12-160	M14x45
370 4329	1"	V14-110	M12x40
370 4330	$1^1/_4$"	V14-160	M14x45
379 4405	$^3/_4$"	T12-60/-80	M10x35



5

⚠ WARNING

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