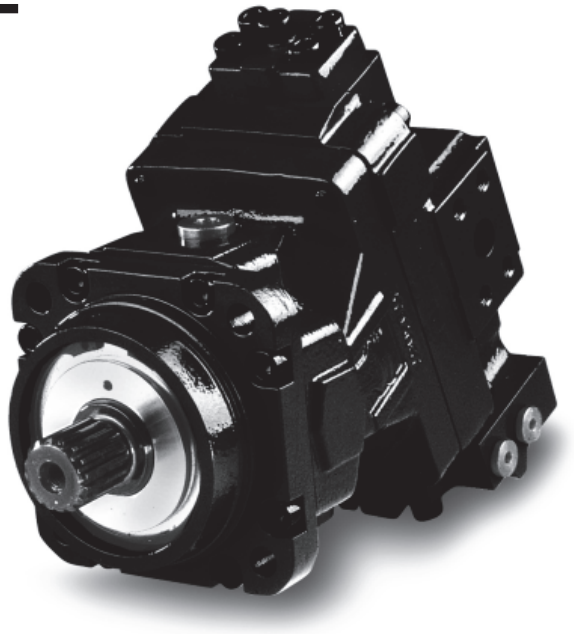
# V12



**Content** **Page**

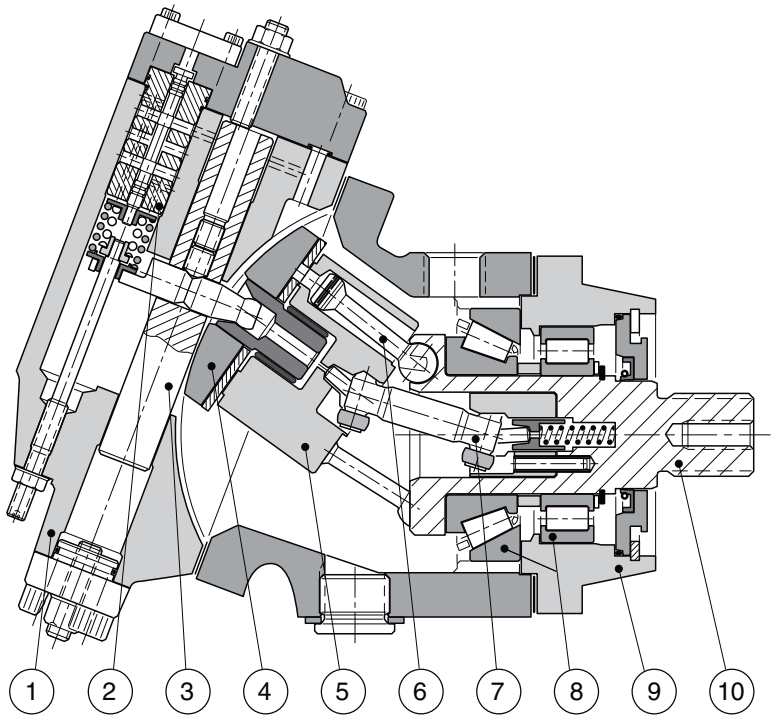




**Parker Hannifin**
Mobile Controls Division
Trollhättan, Sweden

## 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** [cm³/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.

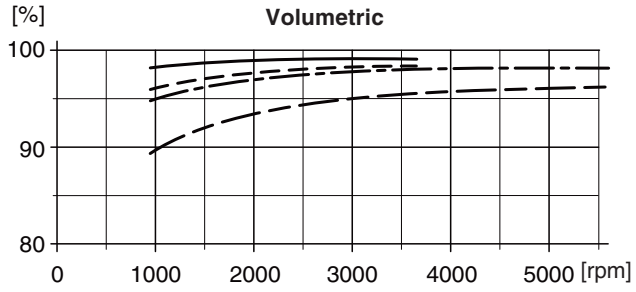
Information on efficiencies for a specific load condition can be made available from Parker Hannifin.

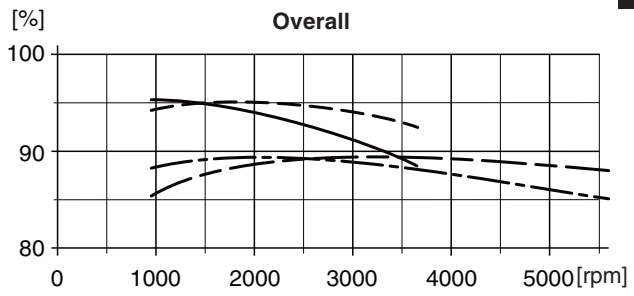
210 bar at full displacement
420 bar " " "

210 bar at reduced displacement
420 bar " " "

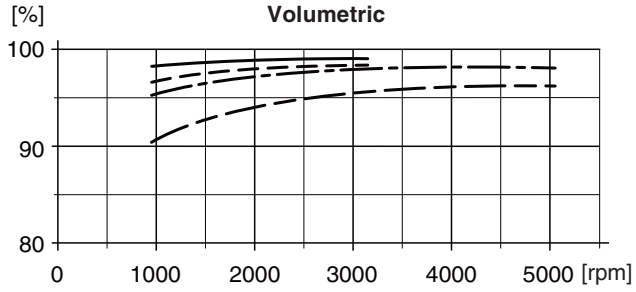


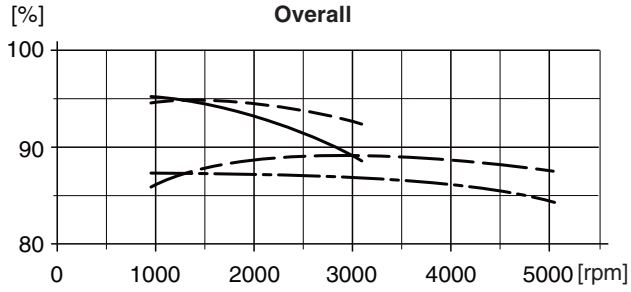
### V12-60



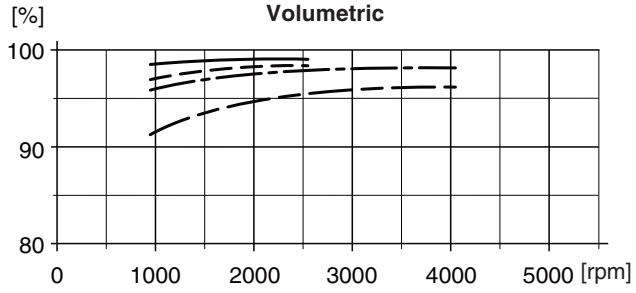



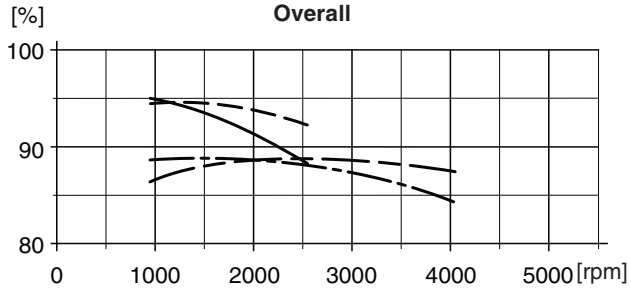

### V12-80



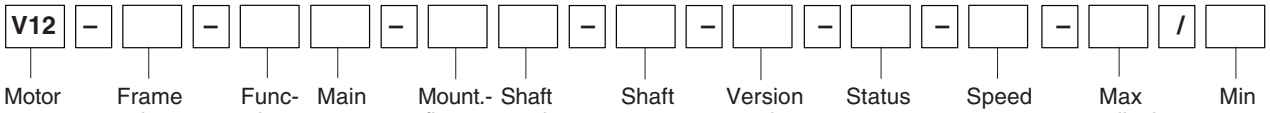




### V12-160



**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 |

| 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 |

| 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 Main ports** | | | |
| **A** SAE flange; metric threads, rear ports | x | x | x |
| **F** SAE flange; metric threads, side ports | x | x | x |

| 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



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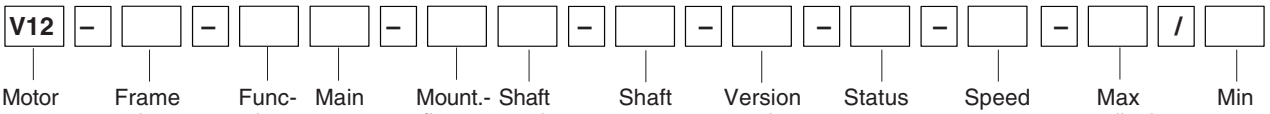
**Cartridge version** (basic configuration)




| 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 |

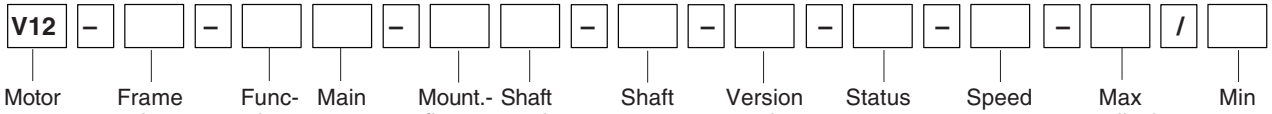
| Frame size | | 60 | 80 |
|---|---|---|---|
| **Code** | **Mounting flange** | | |
| **C** | Cartridge flange | x | x |

| 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 |

| 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 |

**Version number**
Factory assigned for special versions

| 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<br>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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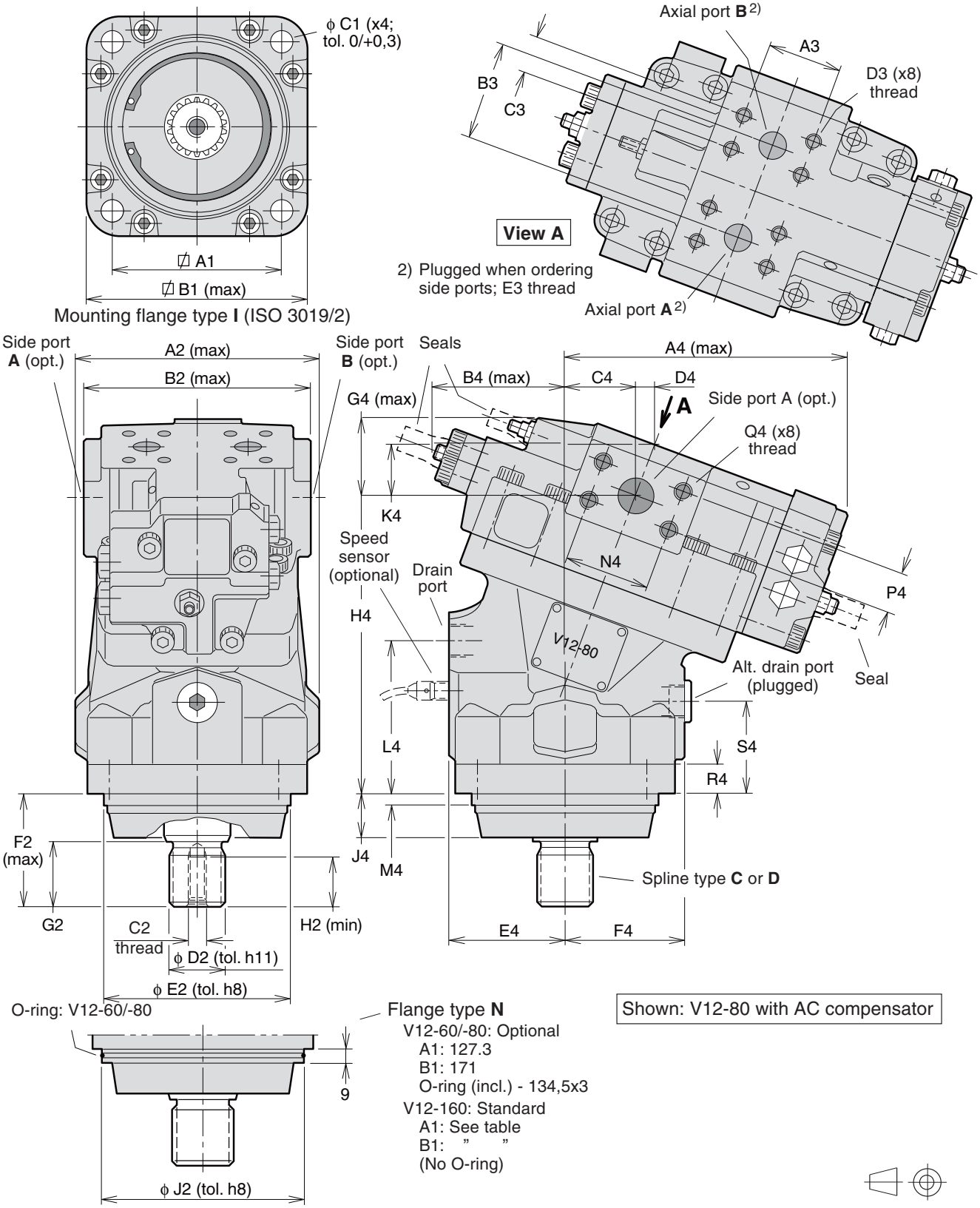
Mobile Controls Division
Trollhättan, Sweden

## ISO version


ϕ C1 (x4; tol. 0/+0,3)
⏍ A1
⏍ B1 (max)
Mounting flange type **I** (ISO 3019/2)
Axial port **B** 2)
A3
D3 (x8) thread
B3
C3
**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
H2 (min)
E4
F4
ϕ D2 (tol. h11)
ϕ E2 (tol. h8)
O-ring: V12-60/-80
Flange type **N**
V12-60/-80: Optional
A1: 127.3
B1: 171
O-ring (incl.) - 134,5x3
V12-160: Standard
A1: See table
B1: ” ”
(No O-ring)
9
ϕ J2 (tol. h8)
Shown: V12-80 with AC compensator

| 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 |

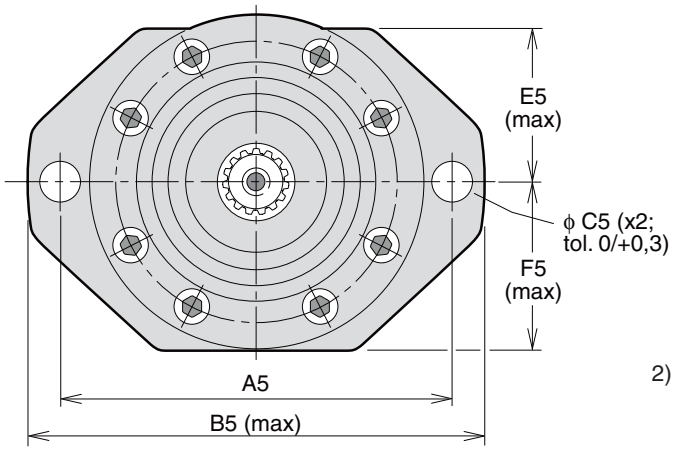
Spline type **D** 3) (DIN 5480)

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

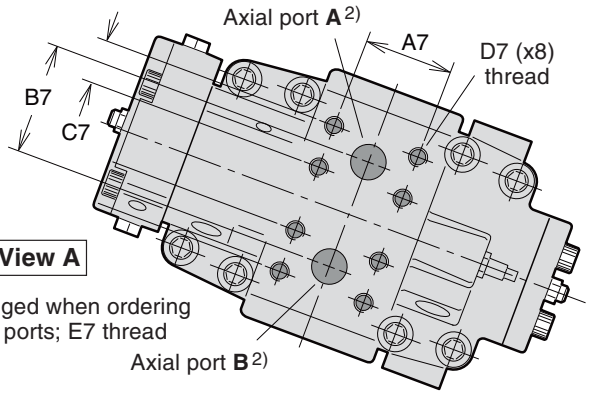
Flange

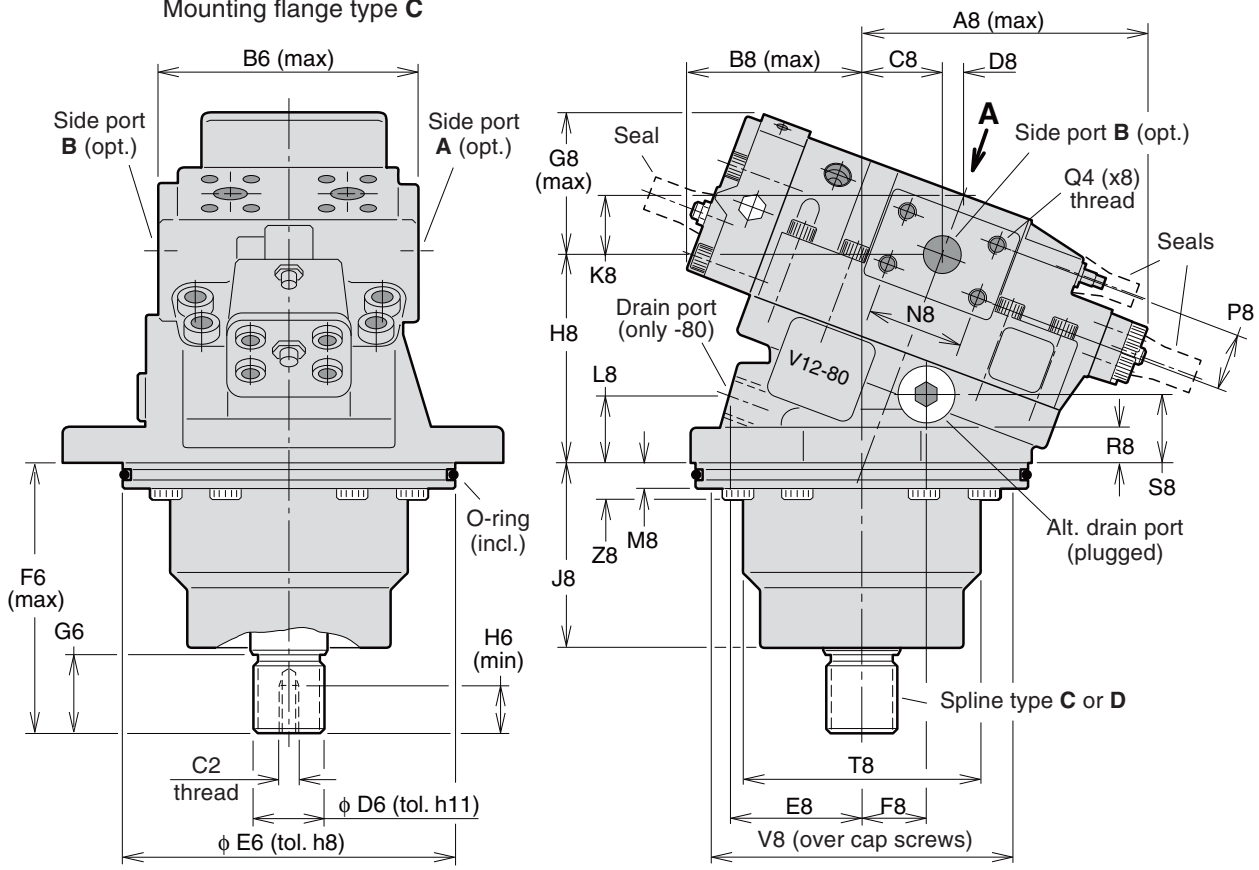
| Size | **I** | **N** |
|---|---|---|
| V12-60 | standard | optional |
| -80 | standard | optional |
| -160 | - | standard |

## Cartridge version




Mounting flange type **C**




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 |

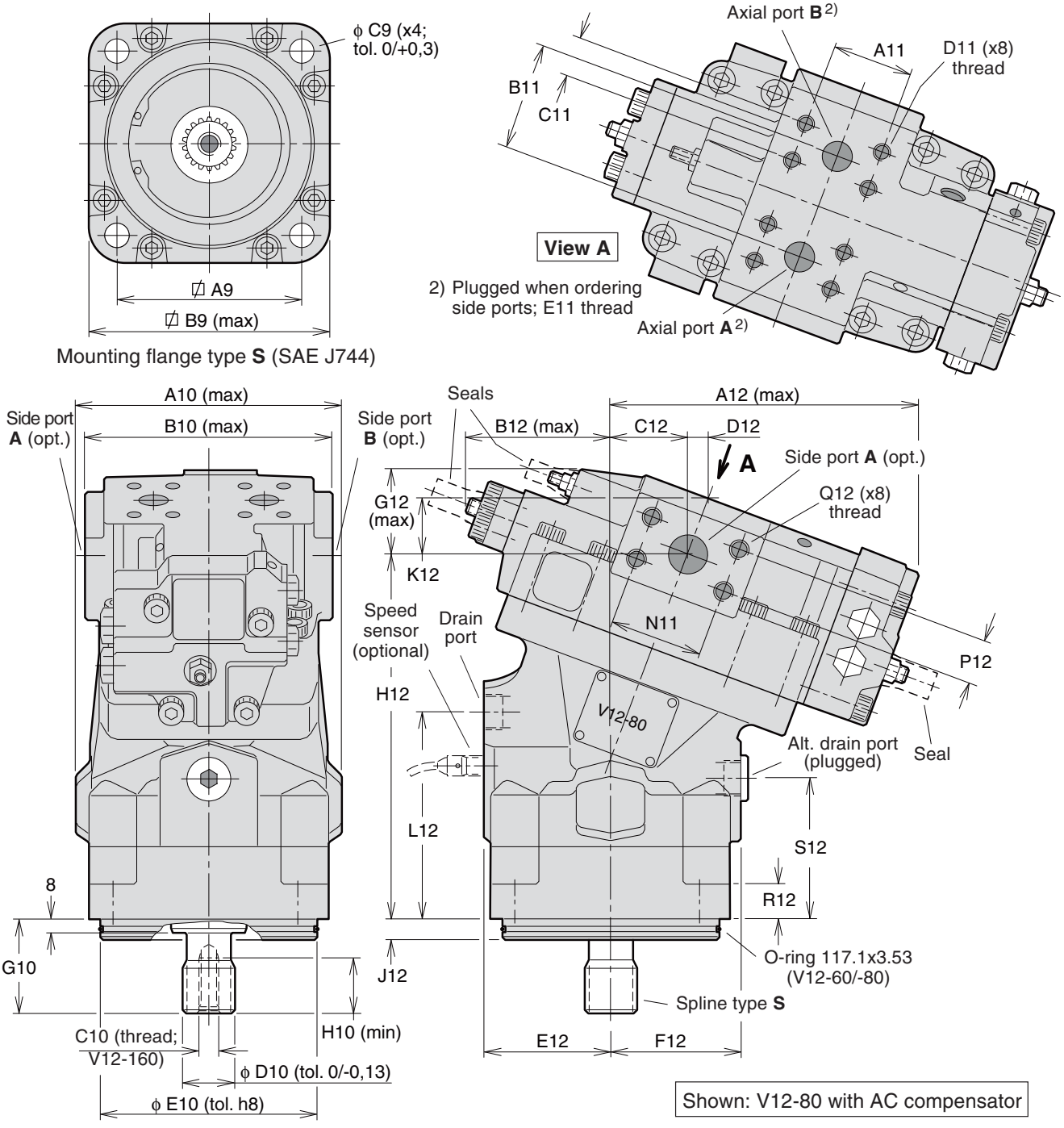
Spline type **D** 3) (DIN 5480)

| Size | Dimension |
|---|---|
| V12-60 | W35x2x16x9g |
| -80 | W40x2x18x9g |

O-rings (70° IRH)

| Size | Dimension |
|---|---|
| V12-60 | 150x4 |
| -80 | 180x4 |

## SAE version




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

Shown: V12-80 with AC compensator



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Mobile Controls Division
Trollhättan, Sweden

| 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'.





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## Bearing life

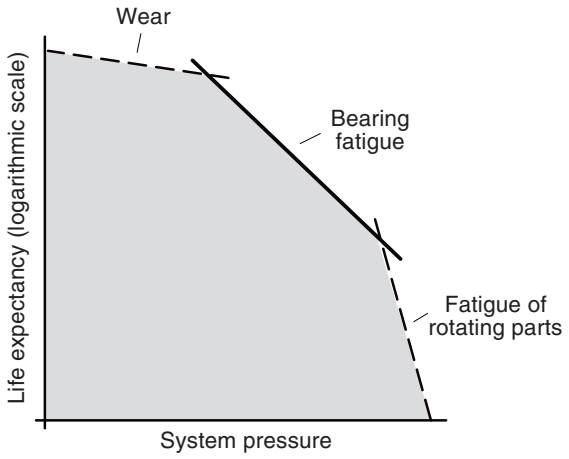
### General information

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 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.

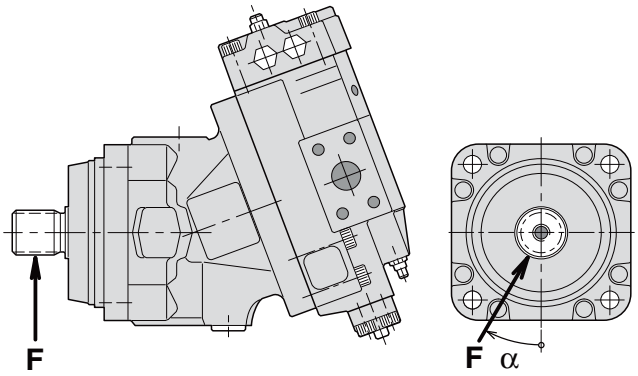
Bearing life is also dependent on external shaft loads, case fluid viscosity and fluid contamination.

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 ($\alpha$) 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 ($\Delta p$) above the threshold pressure ($p_s$) is required.

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

The AC compensator is available in two versions:

**ACI 01 I** - Internal pilot pressure

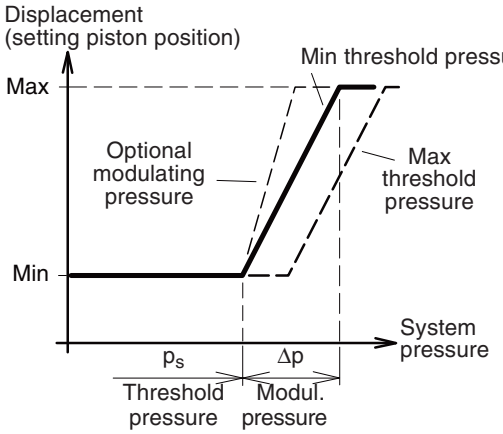
**ACE 01 I** (optional) - External pilot pressure; port X5 can, for example, be connected to the 'forward drive' pressure line of a vehicle transmission to prevent motor displacement increase when the vehicle is going downhill.

Gauge/pilot ports (AC compensator):

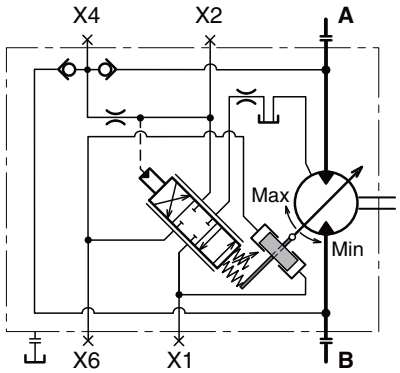
- X1 Setting piston pressure (increasing displ.)
- X2 Servo supply pressure (after orifice)
- X4 Servo supply pressure (before orifice)
- X5 External pilot pressure
- X6 Setting piston pressure (decreasing displ.)

Ports are:

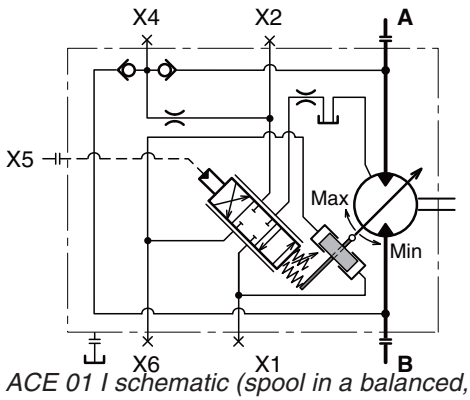
- M14x1.5 (ISO and cartridge versions)
- $^{9}/_{16}$"-18 O-ring boss (SAE version).




*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):

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

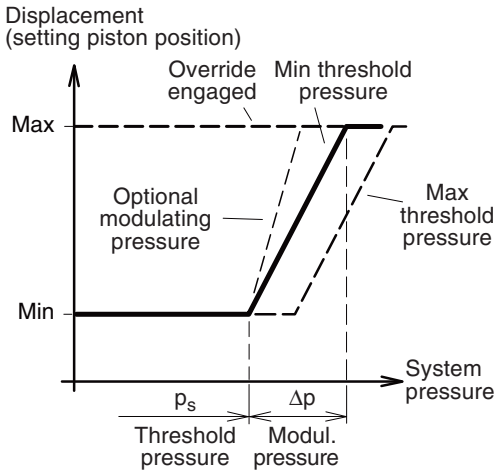
$p_7$ = Override pressure
$p_s$ = System pressure
$\Delta p$ = Modulating pressure

Gauge/pilot ports (AH compensator):

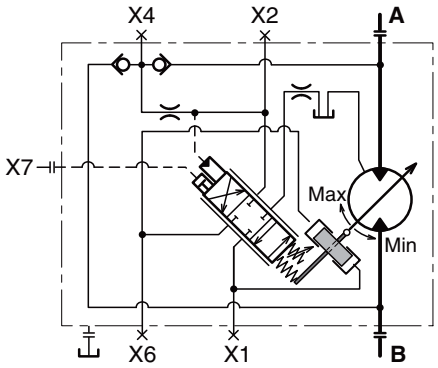
- X1 Setting piston pressure (increasing displ.)
- X2 Servo supply pressure (after orifice)
- X4 Servo supply pressure (before orifice)
- X5 External pilot pressure
- X6 Setting piston pressure (decreasing displ.)
- X7 Override pressure

Ports are:

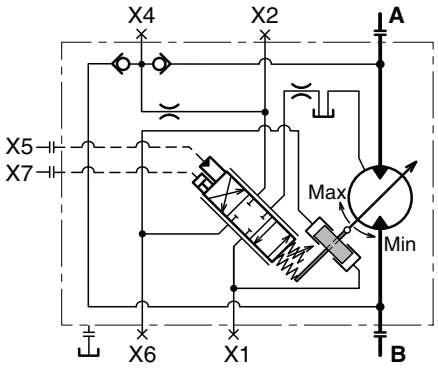
- M14x1.5 (ISO and cartridge versions)
- $^{9}/_{16}$"-18 O-ring boss (SAE version).




*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)

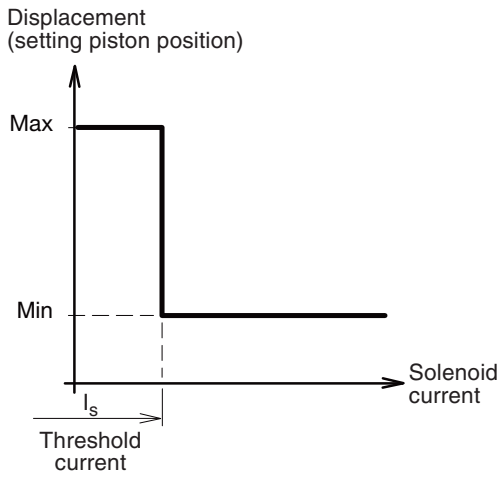
X4 Servo supply pressure (before orifice)

X6 Setting piston pressure (min-to-max)

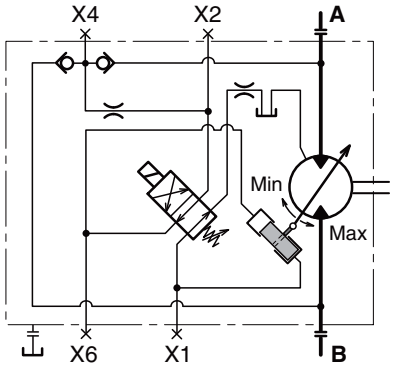
Ports are:

– M14x1.5 (ISO and cartridge versions)

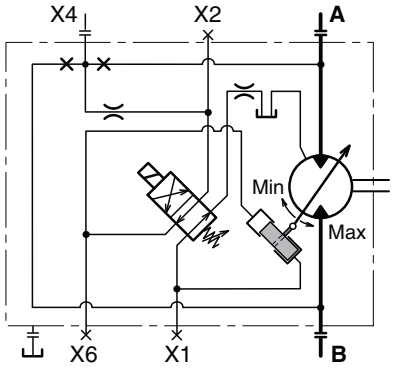
– $^{9}/_{16}$"-18 O-ring boss (SAE version).




*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 ($\Delta I$) 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 ($\Delta I$) is not adjustable.

The EP control is available in four versions:

**EP H 01 I** - Internal servo supply, 24 VDC

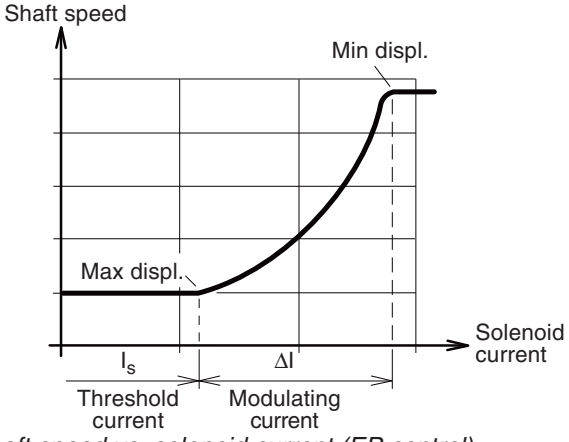
**EP L 01 I** - Internal servo supply, 12 VDC

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

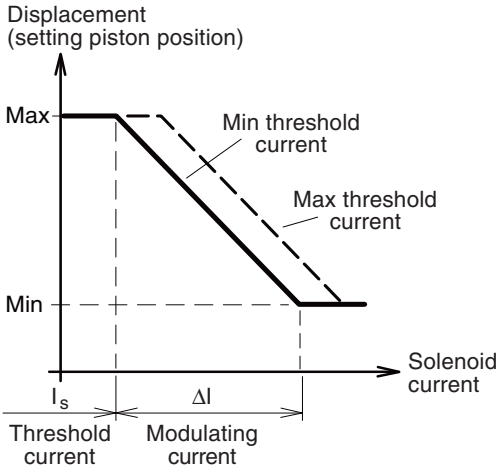
**EP L 01 E** - External servo supply, 12 VDC (optional)

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.)

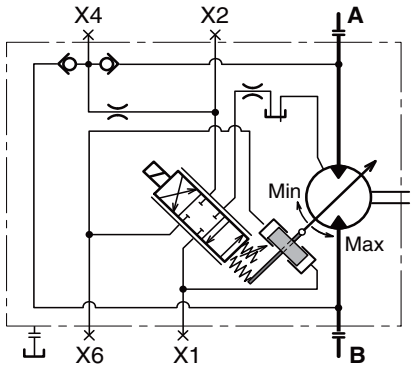
Ports are:
- M14x1.5 (ISO and cartridge versions)
- $^{9}/_{16}$"-18 O-ring boss (SAE version).



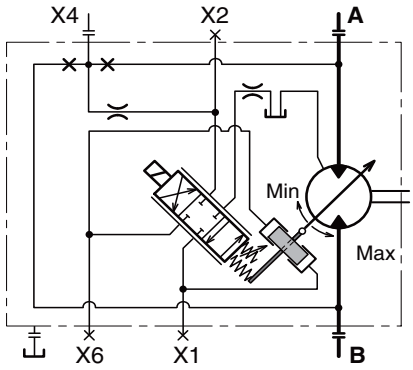

*Shaft speed vs. solenoid current (EP control).*




*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

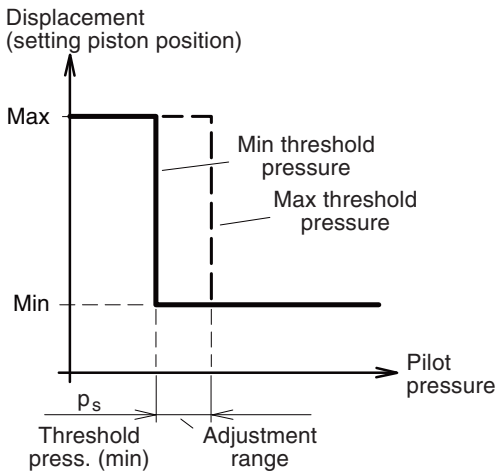
**HO S 01 E** - External servo supply (port X4) (optional)

Gauge/pilot ports (HO control):

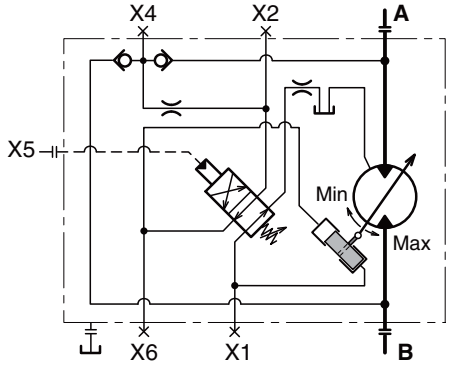
- X1 Setting piston pressure (max-to-min)
- X2 Servo supply pressure (after orifice)
- X4 Servo supply pressure (before orifice)
- X5 External pilot pressure
- X6 Setting piston pressure (min-to-max)

Ports are:

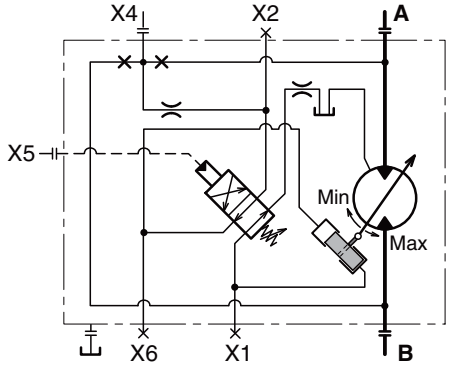
- M14x1.5 (ISO and cartridge versions)
- $^{9}/_{16}$"-18 O-ring boss (SAE version).




*HO diagram.*




*HO S 01 I schematic (X5 not pressurized).*




*HO S 01 E schematic (X5 not pressurized).*



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## 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 ($\Delta p$) 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

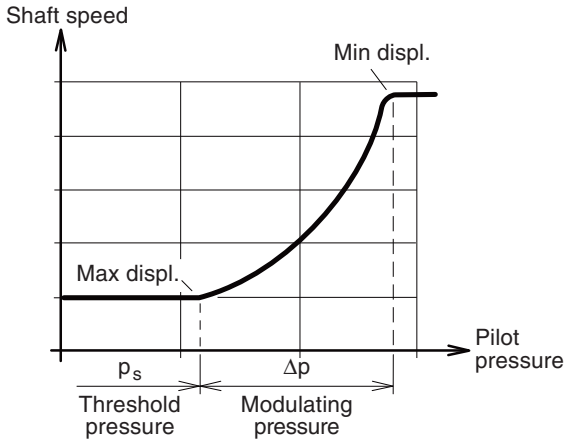
**HPS 01 E** - External servo supply (port X5) (optional)

Gauge/pilot ports (HP control):

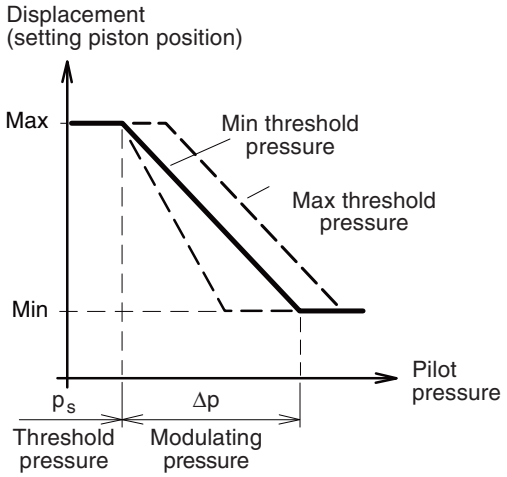
X1 Servo piston pressure (decreasing displ.)
X2 Servo supply pressure (after orifice)
X4 Servo supply pressure (before orifice)
X5 External pilot pressure
X6 Servo piston pressure (increasing displ.)

Ports are:

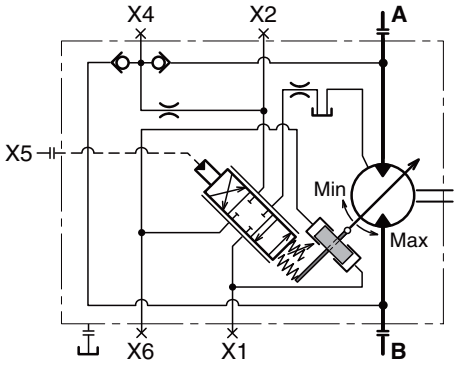
– M14x1.5 (ISO and Cartridge versions)
– $^{9}/_{16}$"-18 O-ring boss (SAE version).



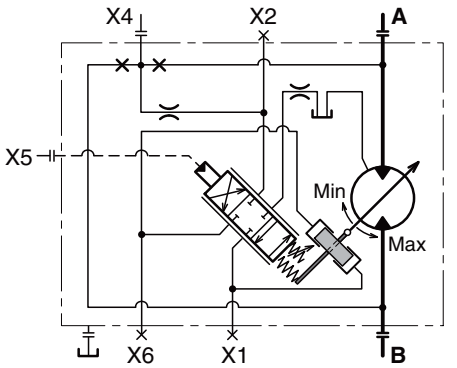

*Shaft speed vs. pilot pressure (HP control).*




*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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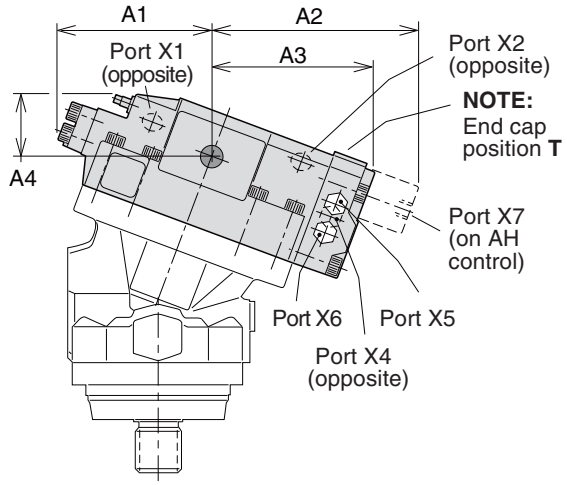
## Control installation dimensions

**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.

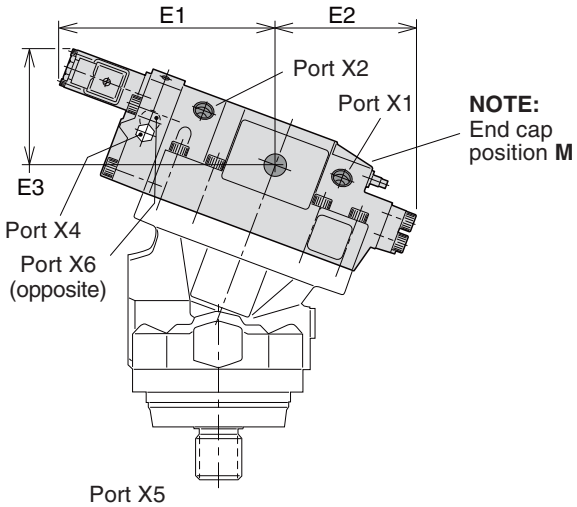
**AC and AH compensators**

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



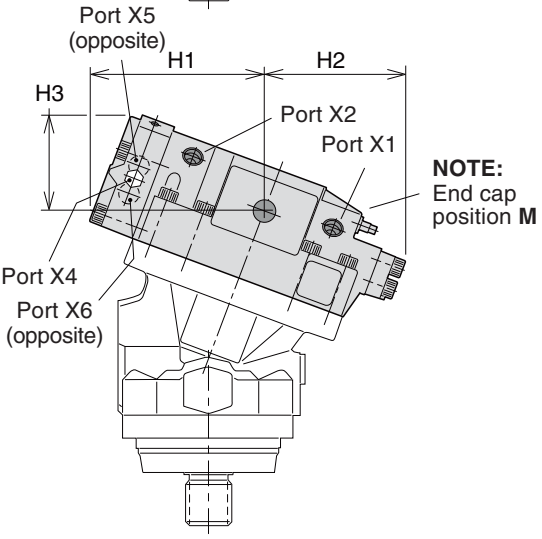

**EO and EP controls**

| 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 |



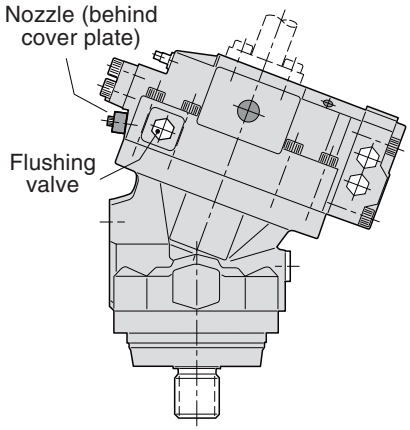
## Flushing valve

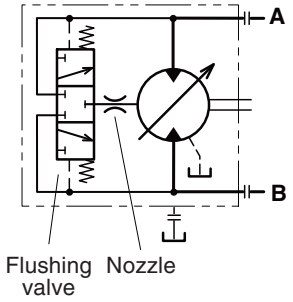
As an option, **L**, the V12 is available with a flushing (or shuttle) valve that supplies the motor with a cooling flow through the case. Cooling the motor may be required when operating at high speeds and/or power levels.

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.

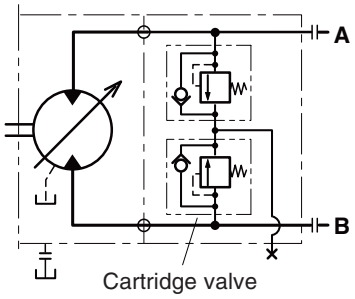
An external port for make-up fluid is provided. When sufficiently pressurized, it prevents motor cavitation due to pressure losses in the main circuit.

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.*

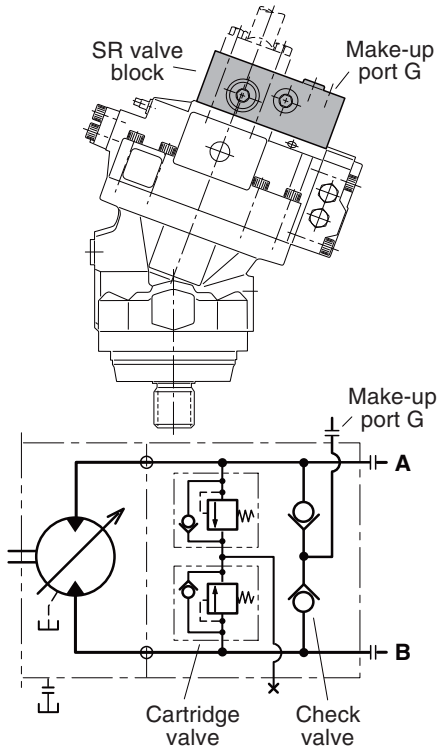
### BW2/SX2 brake/relief valves

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.

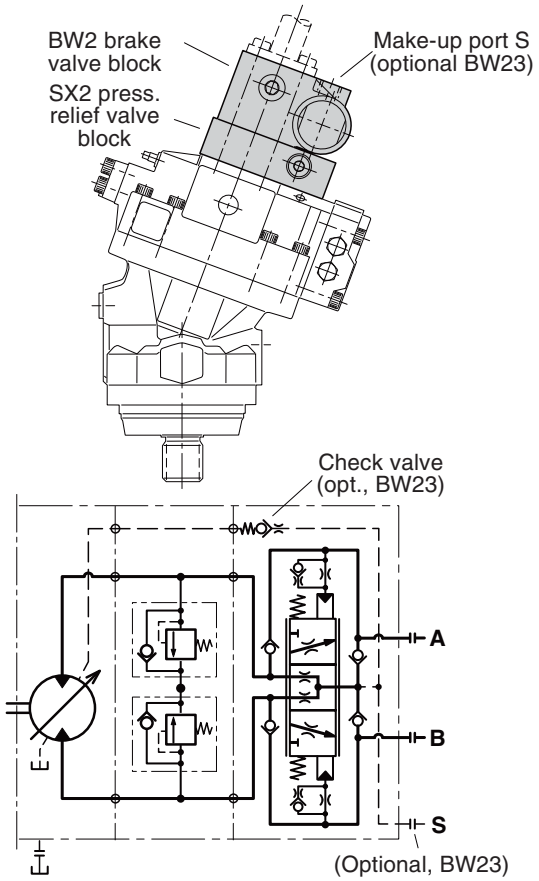
Brake/relief valves, type BW2/SX2, are available for series V12 motors. The two valve blocks mount directly on the motor end cap as shown to the right.

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.*

## 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.