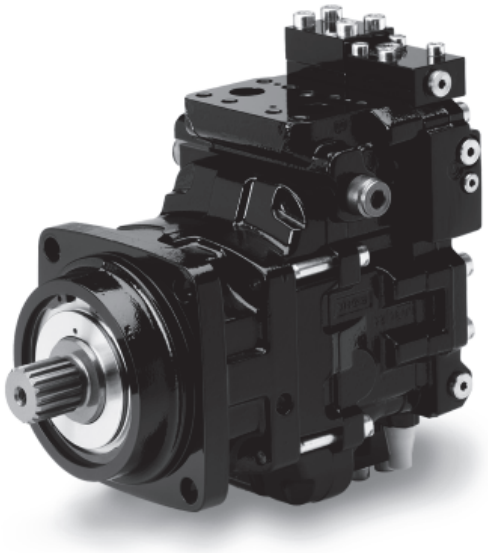
V14

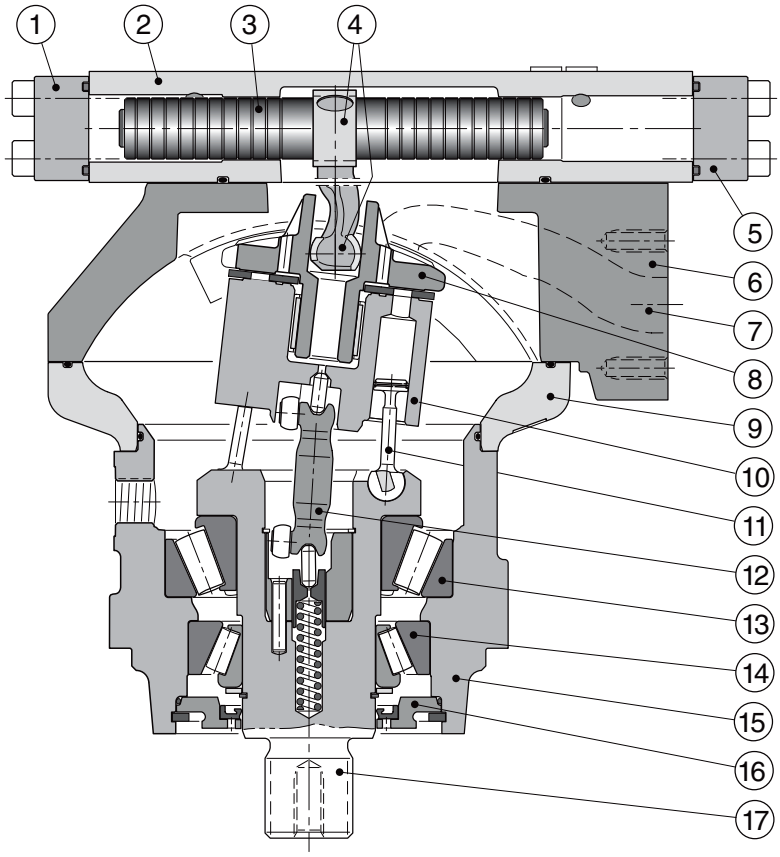


3

Content

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 [cm³/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

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
Weight [kg]	54	68

1) Max 6 seconds in any one minute.

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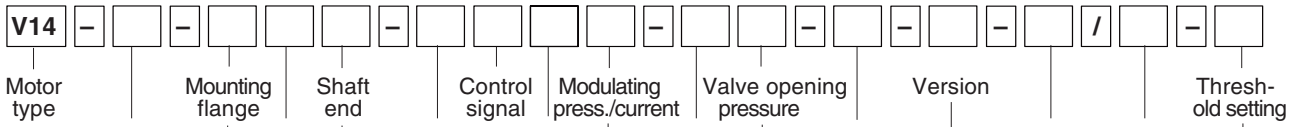
ISO version



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

Code Mounting flange
I ISO version

Code Shaft seal
H NBR (nitrile)
V FPM (high temperature; fluorocarbon)

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
E External pressure (HO, HP)
I Internal pressure (AC, AE, AH)
H 24 VDC (EO, EP)
L 12 VDC (EO, EP)

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

Code Control modulating pressure/current
N AC, AD, AH: 0 bar; EP: Non-selectible current
A 15 bar (AC, AD, AH, HP)
C 50 bar (AC, AD, AH)

Code Valve options (pages 52-54)
N None
B Brake valve and pressure relief valves
L Flushing valve
P Pressure relief valves

Pressure relief valve opening pressure [bar] (page 54)
Alternatively:
Flushing valve restrictor (page 53)

Code Sensor options (pages 52, 53, 55)
N None
C Prepared for setting piston position sensor and shaft speed sensor (EP)
D Setting piston position sensor and shaft speed sensor (EP)
L Setting piston position sensor (EP)
P Prepared for speed sensor
S Speed sensor
T Prepared for setting piston position sensor (EP)

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]

3

(continued)

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Cartridge version

Code Frame size
110 110 [cm³/rev]

Code Mounting flange
C Cartridge version

Code Shaft seal
H NBR (nitrile)
V FPM (high temperature; fluorocarbon)

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	Control signal
E	External pressure (HO, HP)
I	Internal pressure (AC, AD, AH)
H	24 VDC (EO, EP)
L	12 VDC (EO, EP)

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

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

Pressure relief valve opening pressure [bar] (page 54)
Alternatively:
Flushing valve restrictor (page 53)

Code	Valve options (pages 52-54)
N	None
B	Brake valve and pressure relief valves
L	Flushing valve
P	Pressure relief valves

Code Sensor options (pages 52, 53, 55)
N None
C Prepared for setting piston position sensor and shaft speed sensor (EP)
D Setting piston position sensor and shaft speed sensor (EP)
L Setting piston position sensor (EP)
P Prepared for speed sensor
S Speed sensor
T Prepared for setting piston position sensor (EP)

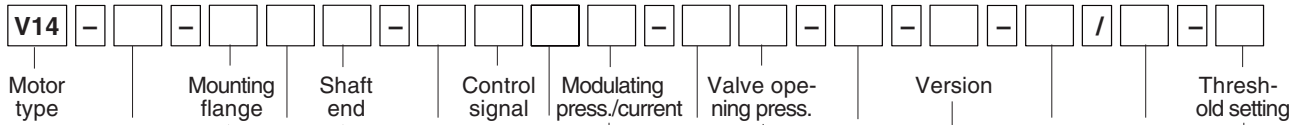
Factory issued for special versions

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]

(continued)

SAE version



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

Code Mounting flange
- **S** SAE version

Code Shaft seal
- **H** NBR (nitrile)
- **V** FPM (high temperature; fluorocarbon)

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 Control signal
- **E** External pressure (HO, HP)
- **I** Internal pressure (AC, AD, AH)
- **H** 24 VDC (EO, EP)
- **L** 12 VDC (EO, EP)

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

Code Control modulating pressure/current
- **N** AC, AD, AH: 0 bar; EP: Non-selectible current
- **A** 15 bar (AC, AD, AH, HP)
- **C** 50 bar (AC, AD, AH)

Code Valve options (pages 52-54)
- **N** None
- **B** Brake valve and pressurerelief valves
- **L** Flushing valve
- **P** Pressure relief valves

Pressure relief valve opening pressure [bar] (page 54)
Alternatively:
Flushing valve restrictor (page 53)

Code Sensor options (pages 52, 53, 55)
- **N** None
- **C** Prepared for setting piston position sensor and shaft speed sensor (EP)
- **D** Setting piston position sensor and shaft speed sensor (EP)
- **L** Setting piston position sensor (EP)
- **P** Prepared for speed sensor
- **S** Speed sensor
- **T** Prepared for setting piston position sensor (EP)

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]

3

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)

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

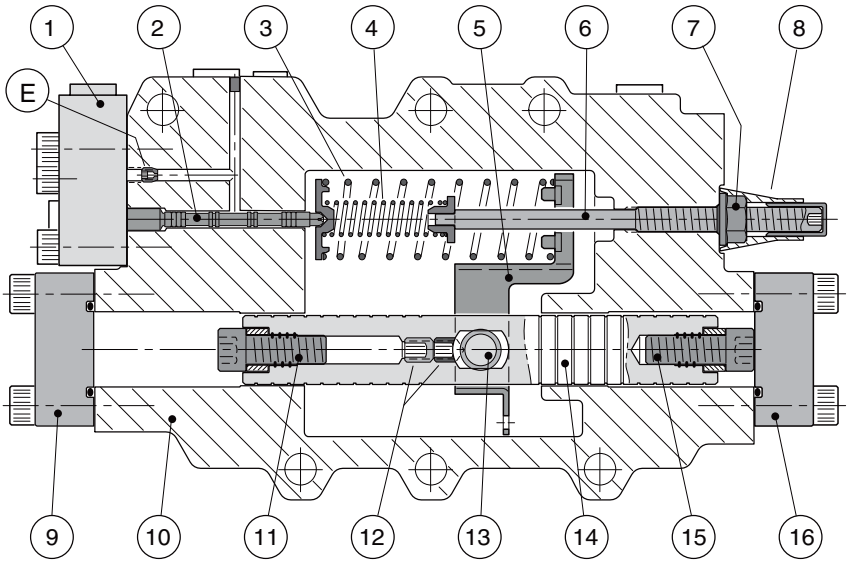
The built-in four-way servo valve determines the position of the servo piston and, in turn, the displacement.

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.

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. 38-40.

AC compensator function

Refer to the illustration below (left):

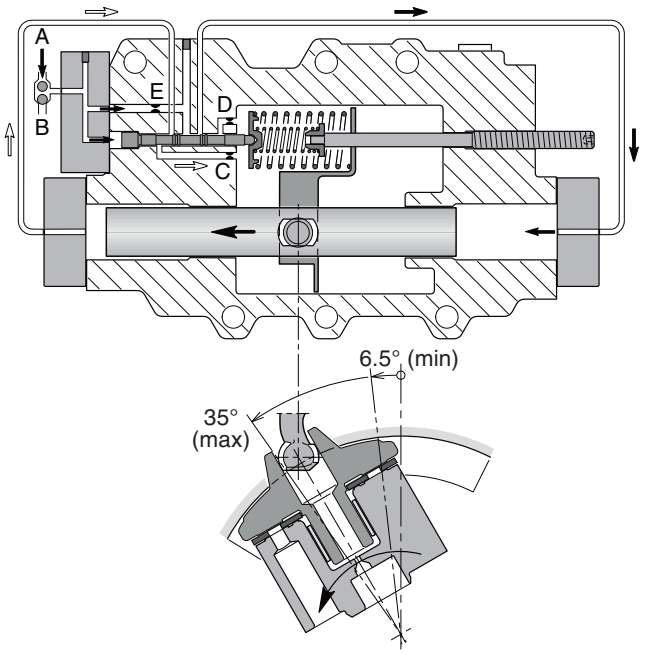
When pressure in port A (or B) increases, the servo valve spool is pushed to the right, directing flow to the right hand setting chamber - the setting piston moves to the left; displacement and output torque increases.

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

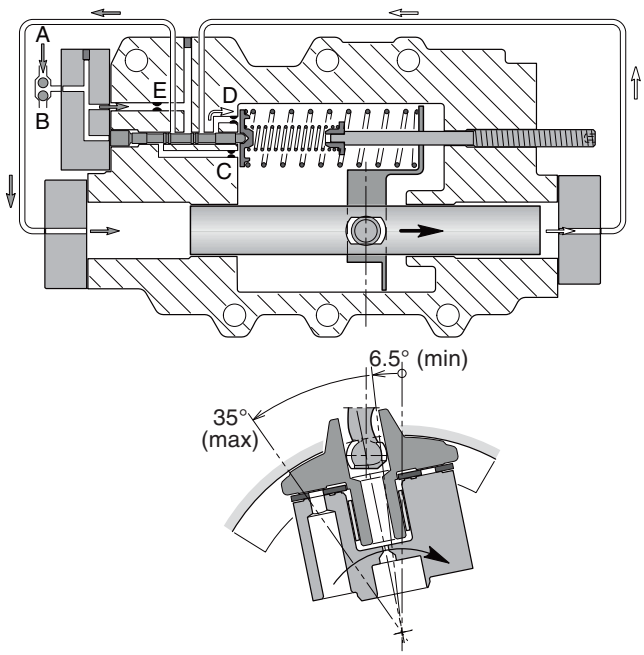
Refer to the illustration below (right):

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.

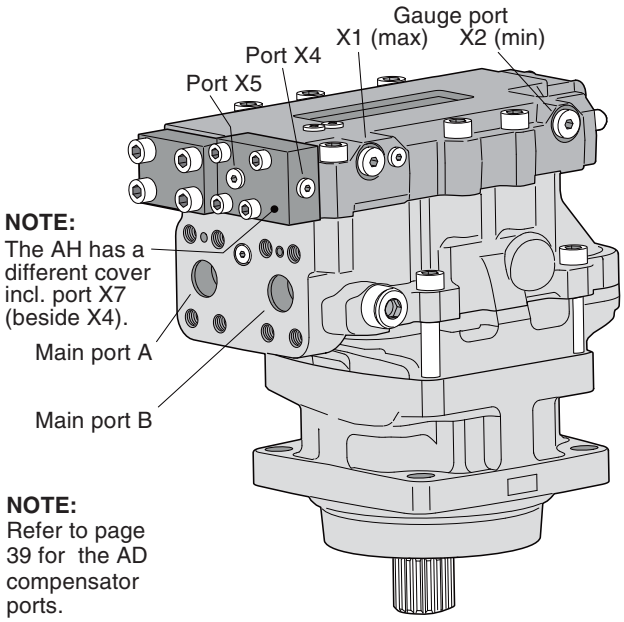
At the same time, the shaft speed increases correspondingly (at a constant pump flow to the motor).



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



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



Port locations - V14-110 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)

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 modu-lating pressure of 15 or 50 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.

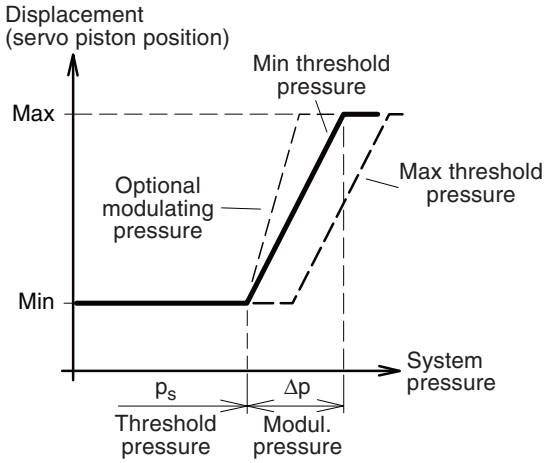
Gauge/pilot ports (AC and AH compensators):

- X1 Setting piston pressure (decreasing displ.)
- X2 Setting piston pressure (increasing displ.)
- X4 Servo supply pressure (before orifice and filter)
- X5 Pilot pressure
- X6 Override pressure (on the AH)

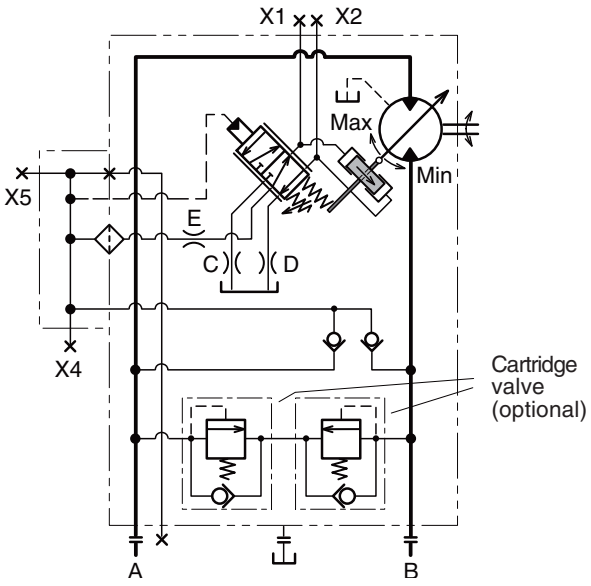
Port sizes:

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

NOTE: Port locations are shown in the illustration on page 37.



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):

X1 Servo piston pressure (decreasing displ.)

X2 Servo piston pressure (increasing displ.)

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

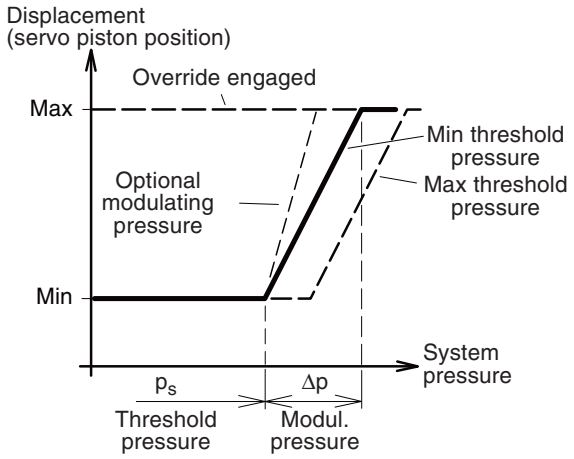
X10 Pressure (from the pump control) to the brake defeat valve (for port B)

Port sizes:

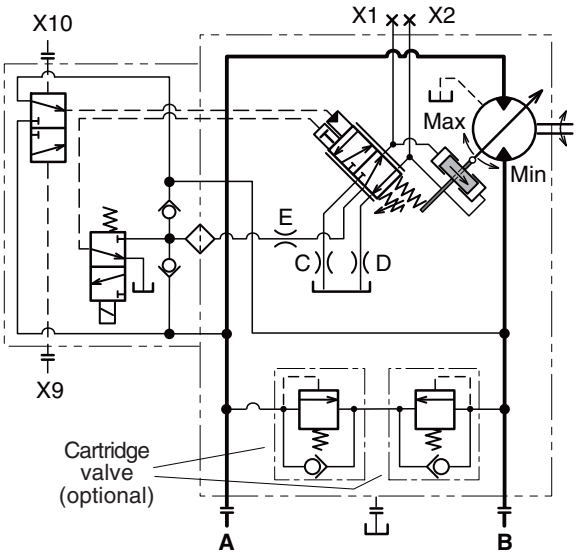
– M14x1.5 (ISO version)

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

NOTE: Some of the ports are shown in the illustration on page 37.



AH diagram (displacement vs. system pressure).



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

AH pressure compensator

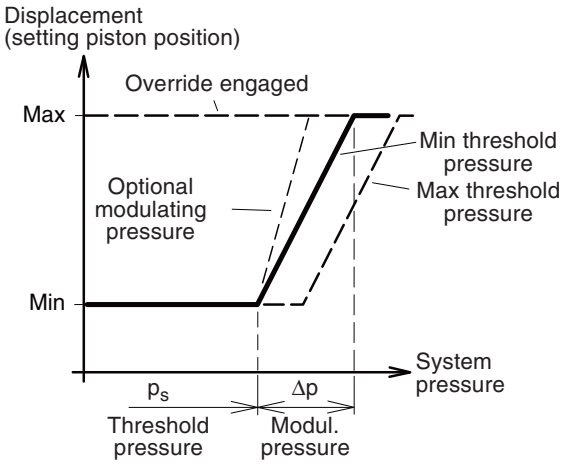
The AH compensator is similar to the AD (shown on previous page) but incorporates only an hydraulic override device. It is utilized in hydrostatic transmissions where a high degree of manœuvrability at low vehicle speeds is desirable.

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 X6 (min 20 bar):

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

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



AH diagram (displacement vs. system pressure).

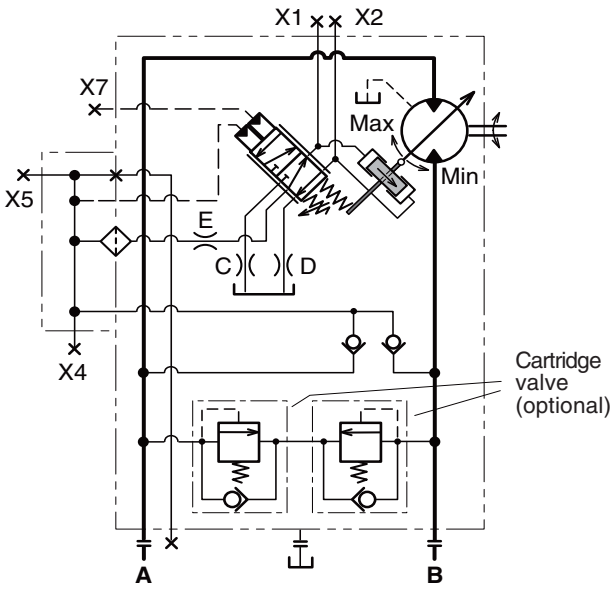
Gauge/pilot ports (AH compensator):

- 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 37.



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)

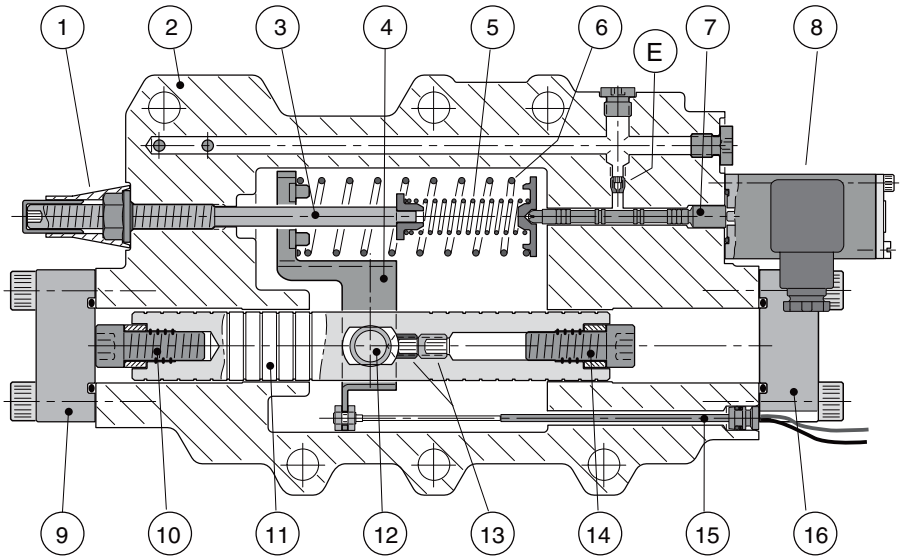
Basically, these controls function in a similar way.

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 (EP and HP options)
16. End cover (min displ. limit)

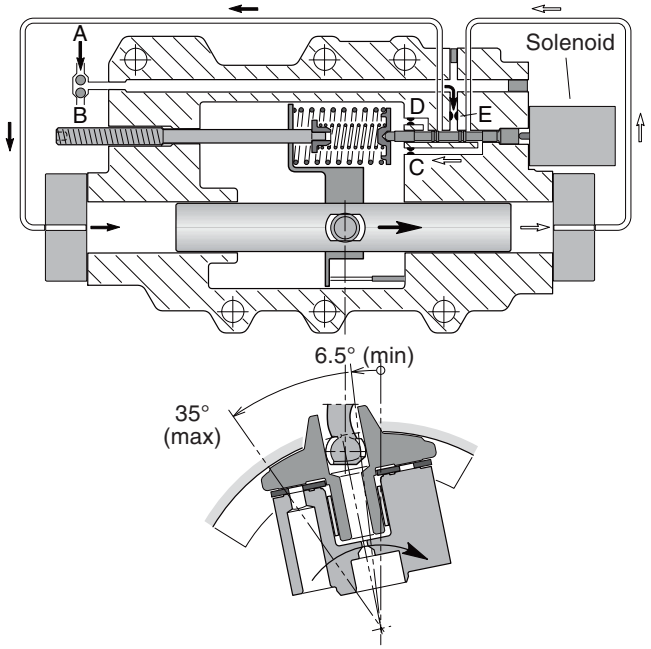
E. Nozzle location; refer to the hydraulic schematics.

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 increases while the output torque decreases correspondingly (at a constant pump flow and system pressure).



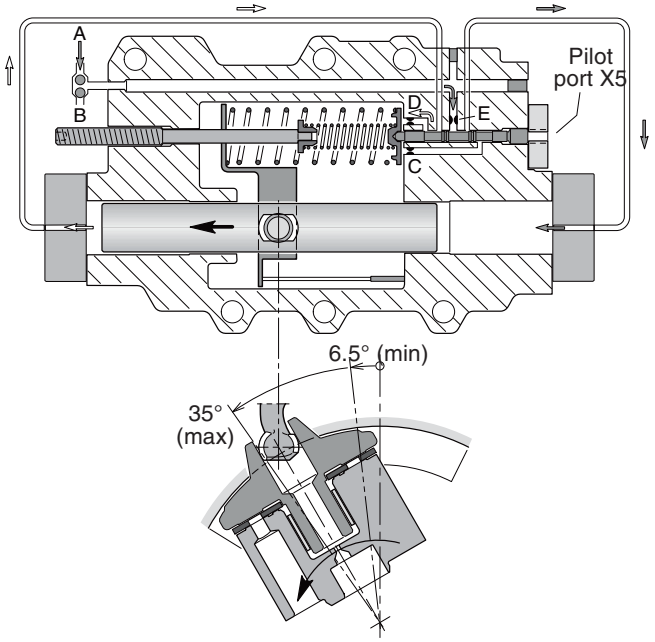
EP control function (displ. decrease at increasing current).

HP control function (decreasing pilot pressure)

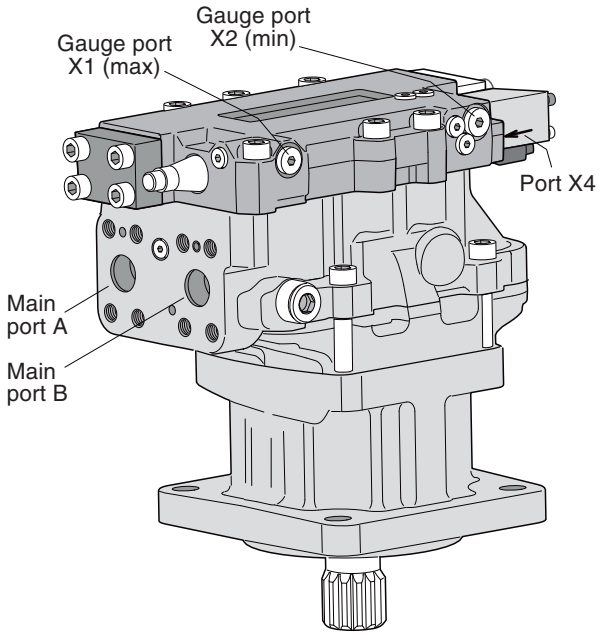
NOTE: Valid also for the EP at decreasing current.

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.).



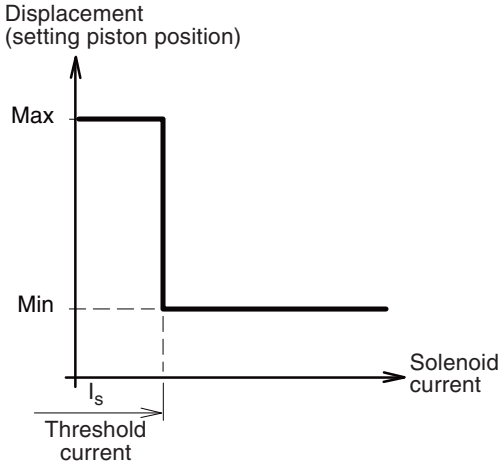
Port locations - V14-110 with EO or EP control.

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

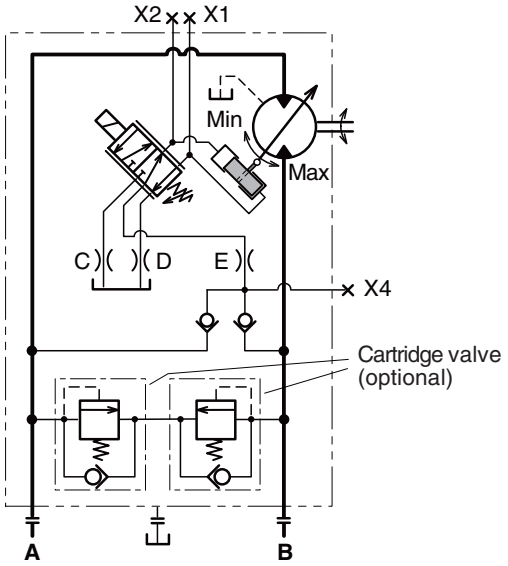
Port sizes:
- M14x1.5 (ISO version)
- $^{9}/_{16}$"-18 O-ring boss (SAE version).

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 42).
- 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.



- 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 delivered separately in a bag with the motor; it is also available as a spare part, P/N 378 1939.
- 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.



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

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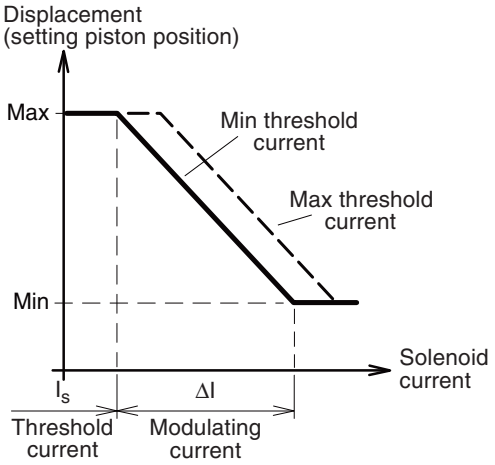
EP electrohydraulic proportional control

- 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 42).
- 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.

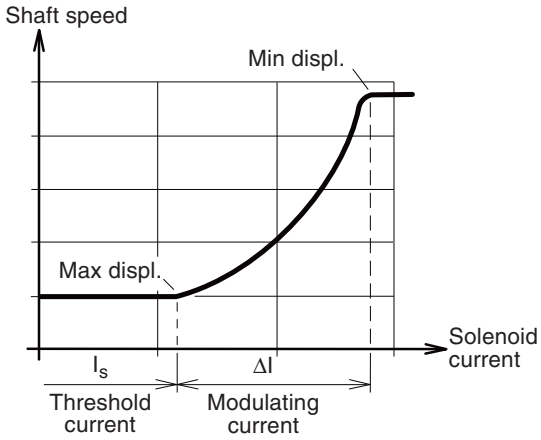


EP diagram (displacement vs. solenoid current).

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).

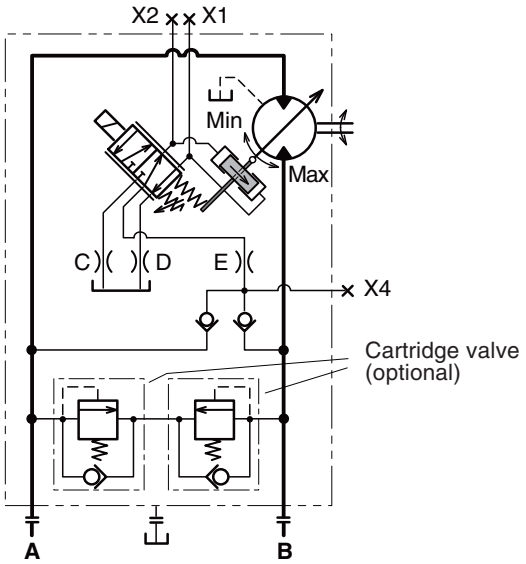
NOTE: Port locations are shown in the illustration on page 42.



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 delivered in a separate bag with the motor; it is also available as a spare part: P/N 378 1939.
- 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).

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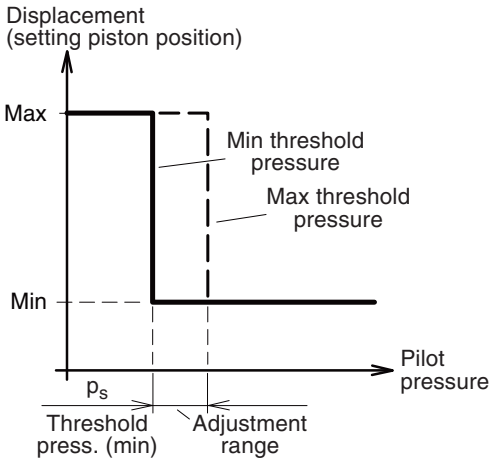
HO hydraulic two-position control

- The two-position HO control is similar to the EO (page 43) 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.



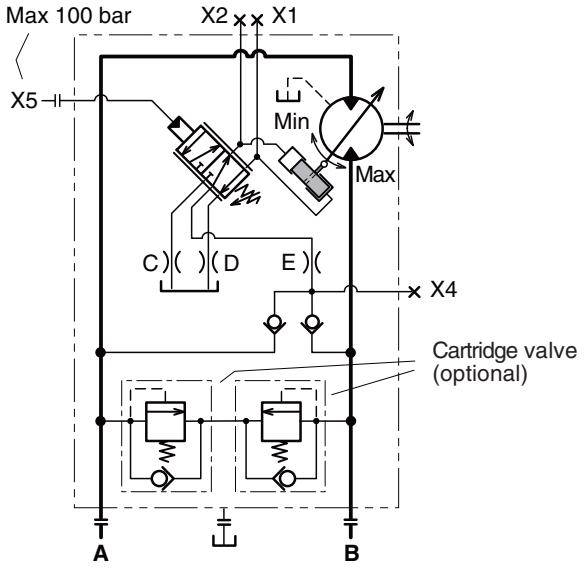
HO diagram (displacement vs. pilot pressure).

Gauge ports (HO and HP controls):

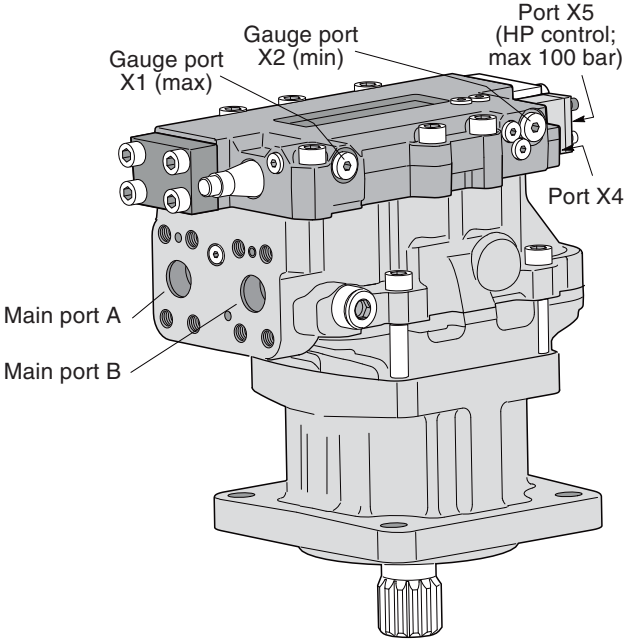
- X1 Setting piston pressure (decreasing displ.)
- X2 Setting piston pressure (increasing displ.)
- X4 Servo supply pressure (before orifice)
- X5 External pilot pressure (max 100 bar; HP control)

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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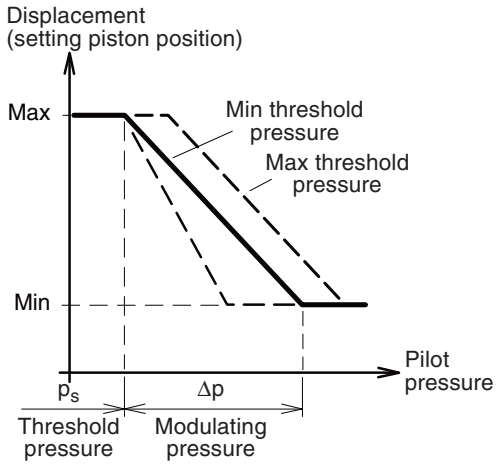
HP hydraulic proportional control

- Like the EP described on page 44, 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).

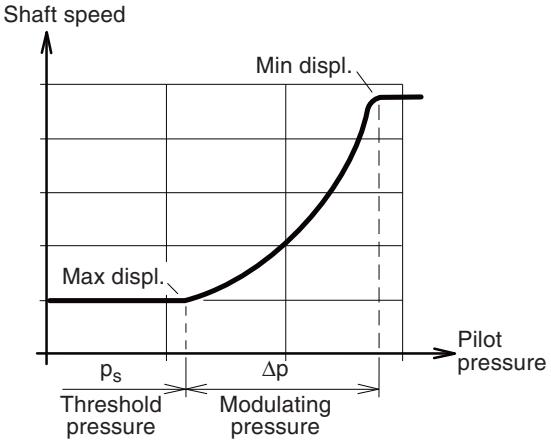
Gauge/pilot ports (HP control):

- 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:

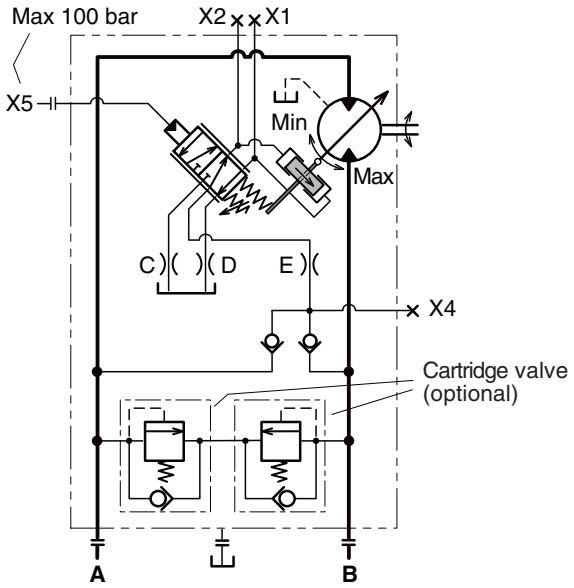
- – M14x1.5 (ISO version)
- – $^{9}/_{16}$"-18 O-ring boss (SAE version).

NOTE: Port locations are shown in the illustration on page 45.



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.
- The modulating pressure (Δp) is factory set at 15 bar; the threshold pressure (p_s) is set at 10 bar but is adjustable between 5 and 25 bar.



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

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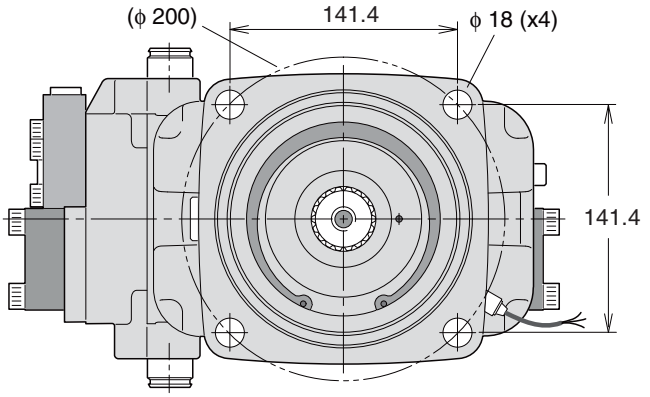
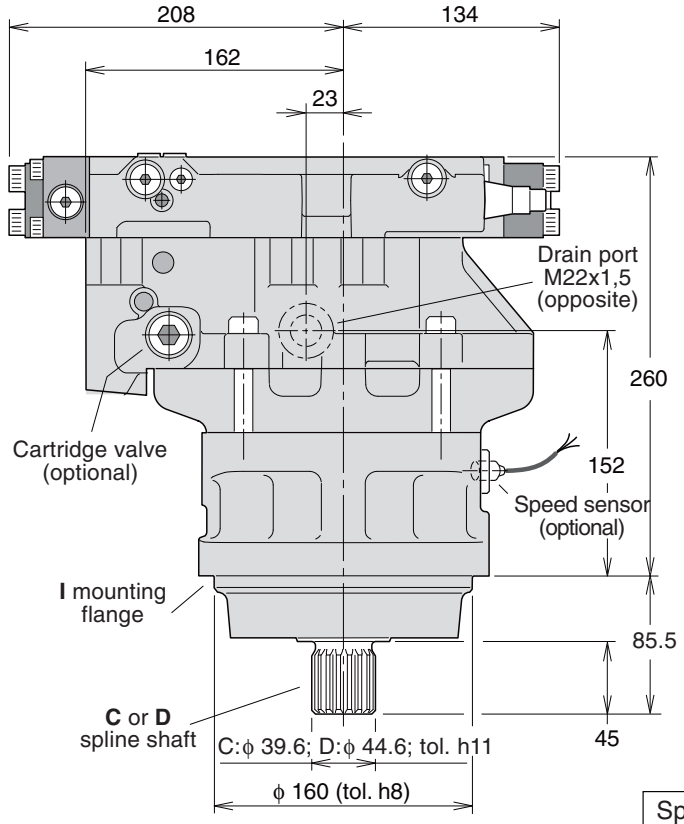
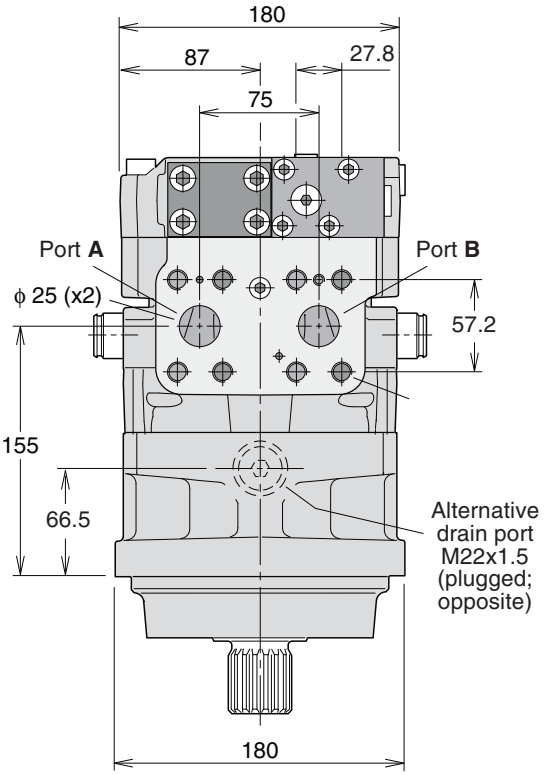
V14-110, ISO version



Shown: V14-110-ISO with AC compensator





* 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

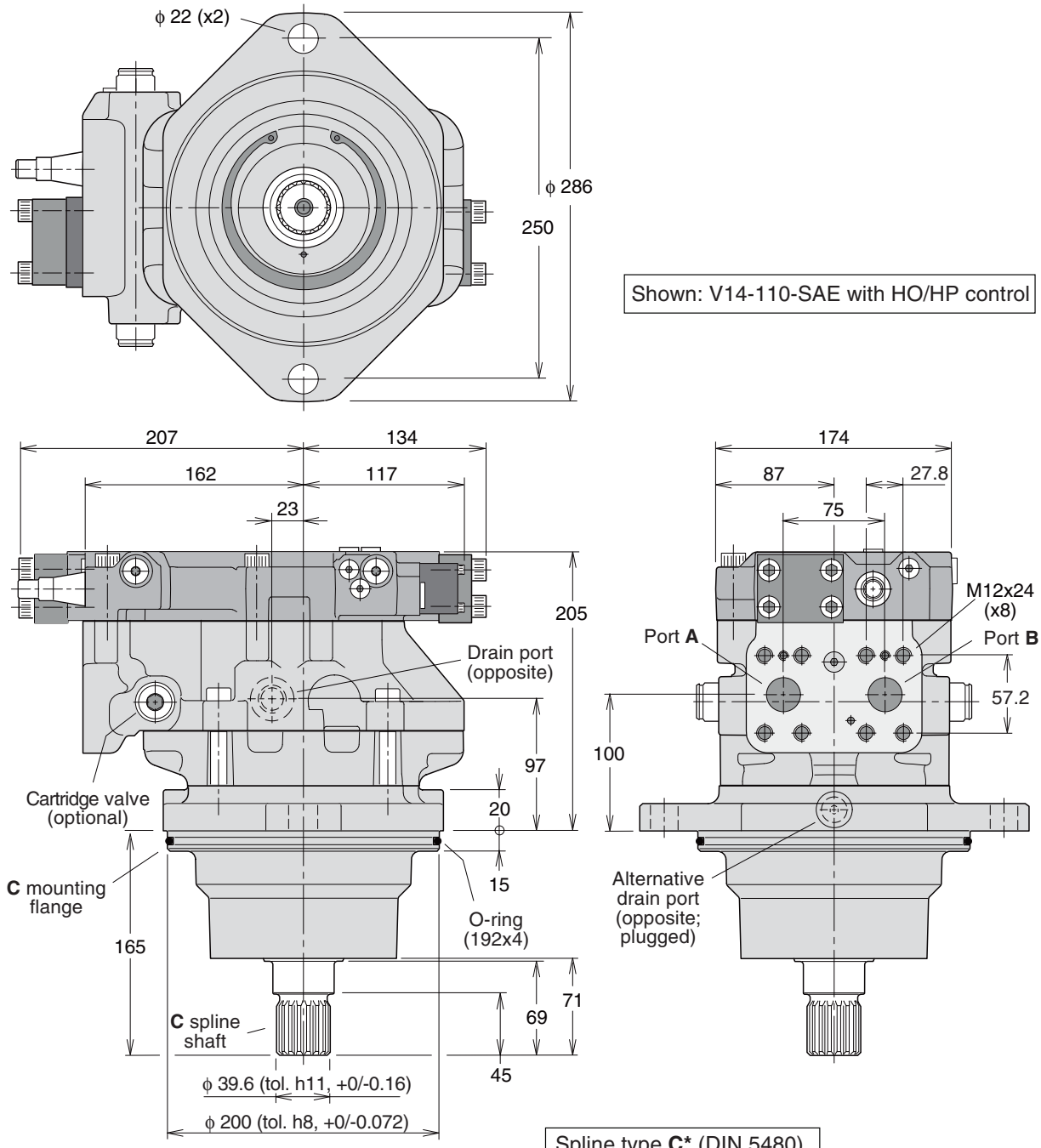
Spline type **D** 1) (DIN 5480)	
V14-110	W45x2x21x9g

1) '30° involute spline, side fit'

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

Main ports: ISO 6162, 41.5 MPa, type II

V14-110, Cartridge version



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

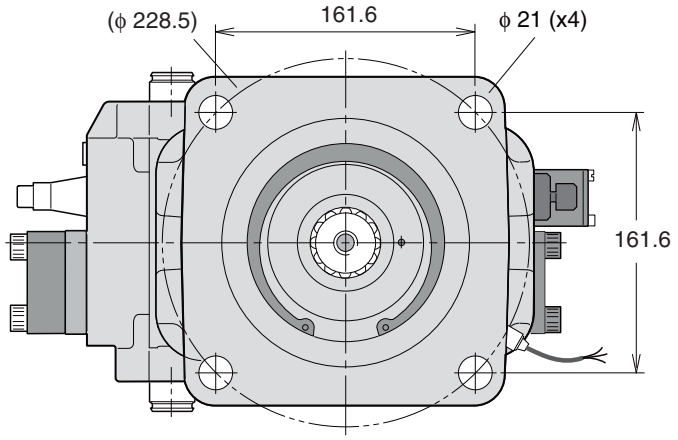
Spline type **C*** (DIN 5480)	
V14-110	W40x2x18x9g

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

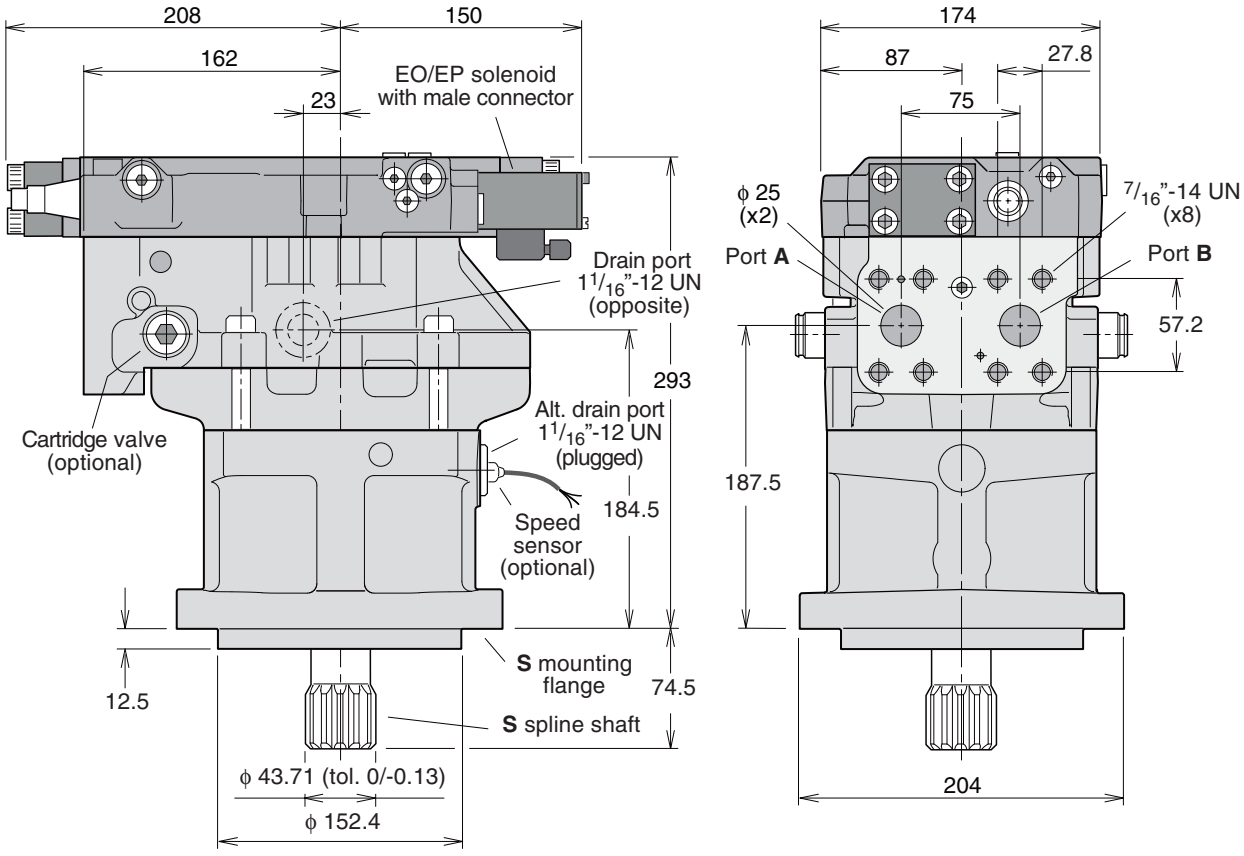
Ports	V14-110
Main ports	25 [1"]
Drain ports	M22x1.5

Main ports: ISO 6162, 41.5 MPa, type II

V14-110, SAE version



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



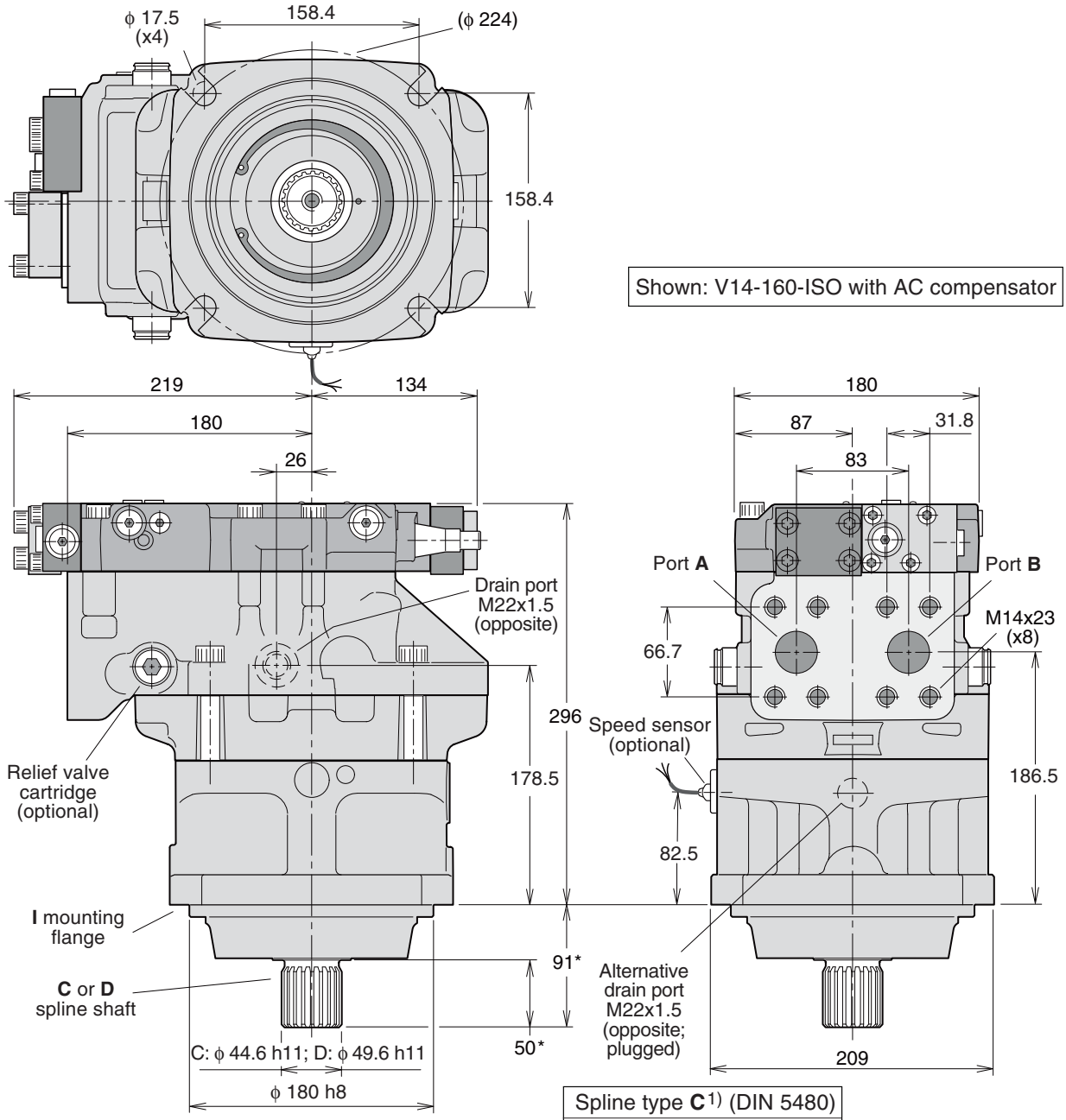
Spline type **S** (SAE J498b*)	
V14-110	SAE 'D' (13T, 8/16 DP)

***** 30° involute spline, side fit

Ports	V14-110
Main ports	25 [1"]
Drain ports	11/16"-12 UN

Main ports: SAE J518c, 6000 psi

V14-160, ISO version



Shown: V14-160-ISO with AC compensator

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

Spline type **C**[1] (DIN 5480)	
V14-160	W40x2x18x9g

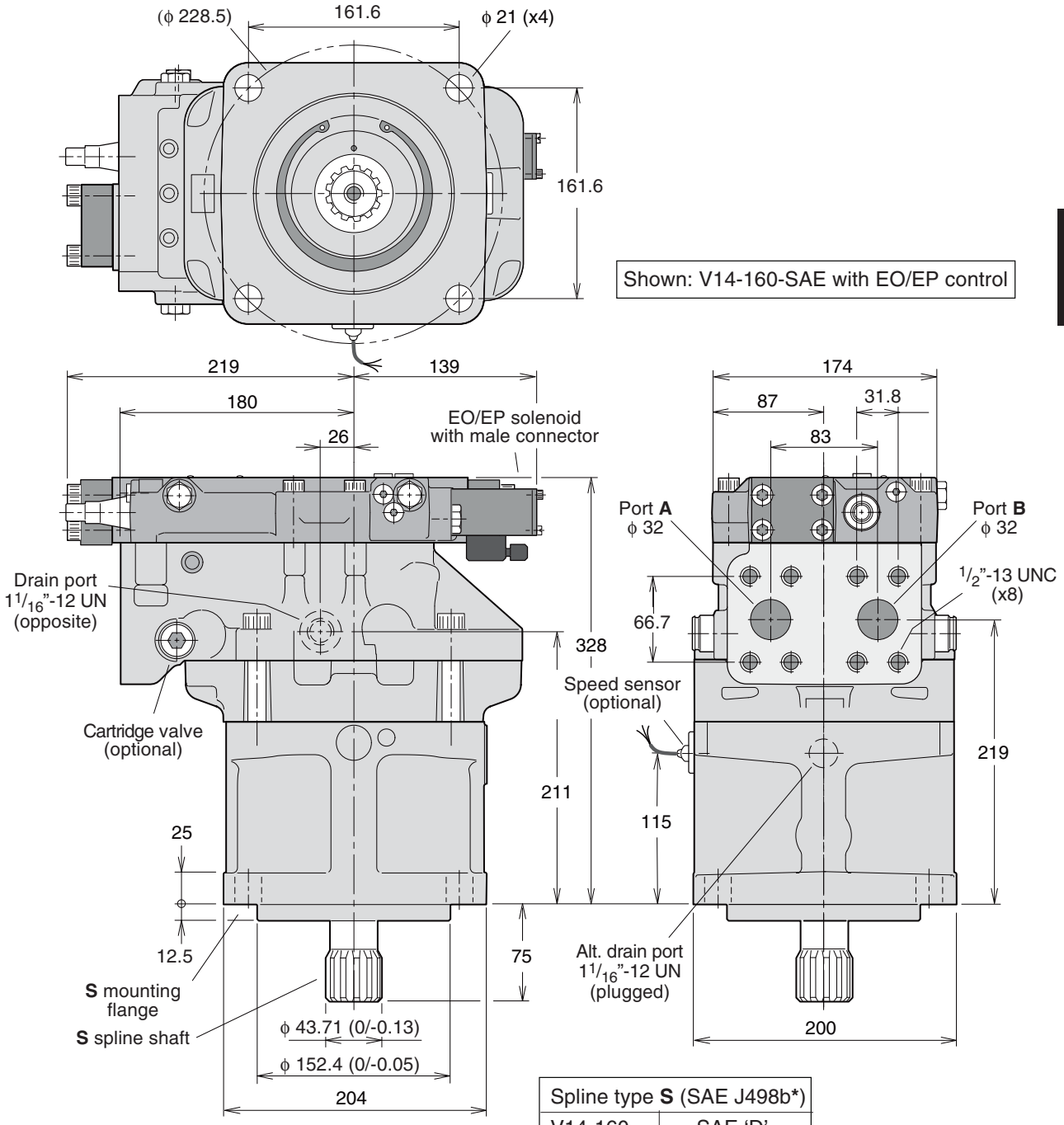
Spline type **D*** (DIN 5480)	
V14-160	W45x2x21x9g

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

V14-160, SAE version



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

Valve options (overview)

- Brake valve and pressure relief valves (opt. **B**; below)
- Flushing valve (option **L**; page 53)
- Pressure relief valves (option **P**; page 54)

Sensor options (overview)

- Shaft speed sensor (option **S**; page 53)
- Setting piston position sensor (option **L**; page 55)

Brake valve and pressure relief valves

(option B)

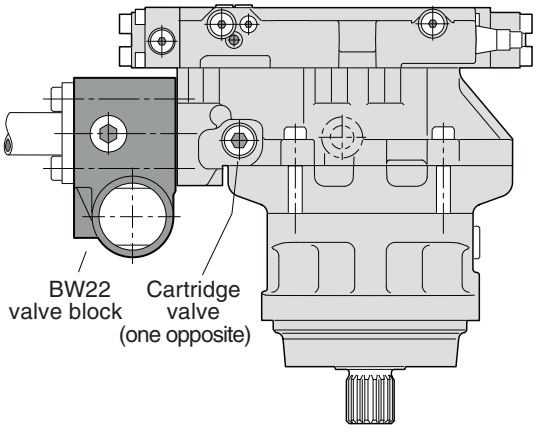
In applications, such as open circuit excavator wheel drives, a counterbalance or 'brake' valve is normally required.

The BW22 brake valve provides smooth braking and reduces the risk of motor cavitation when the vehicle is in a coasting or braking mode.

The BW22 brake valve block installs directly on the motor connection module as shown in the illustration. The 'S' port is provided for supply of make-up fluid; when sufficiently pressurized, motor cavitation due to pressure losses in the main circuit is greatly reduced.

PLEASE NOTE:

1. In order to obtain the intended performance, the BW22 valve must be properly matched to the hydraulic system of a particular vehicle. When considering utilizing this valve, contact Parker Hannifin who will assist in the specification and testing.
2. As a first step, a 'BW2 brake valve specification form' (MI 118) should be requested, filled in and sent to Parker Hannifin. With this information, a valve, suitable for testing, can then be specified.

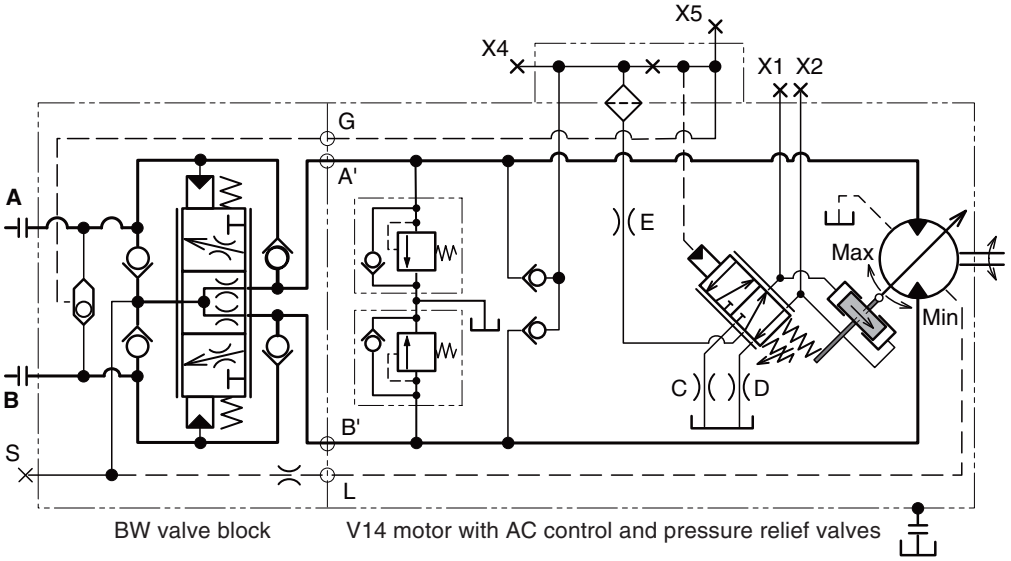


V14- 110 (AC control) with BW22 valve block.

Additional BW22 brake valve information is available in 'Mobile motor/pump accessories', cat. HY17-8258/UK.

Pressure relief (cartridge) valves are included when ordering 'option B'. The relief valves are integrated in the V14 motor (as shown in the illustration above).

Detailed information is shown on page 54 ('option P').



Hydraulic schematic - V14 with BW22 valve block.

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Flushing valve (option L)

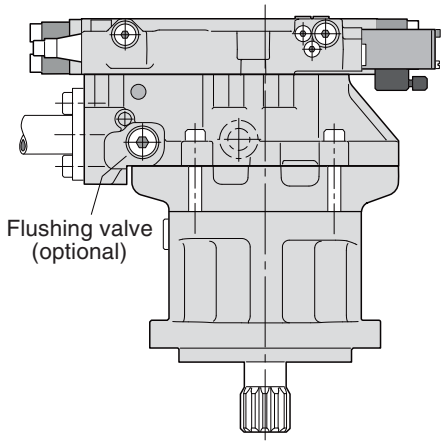
The V14 is available with a flushing (or shuttle) valve that supplies the motor with a cooling flow through the case. Cooling the motor may be required when operating at high speeds and/or power levels.

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.

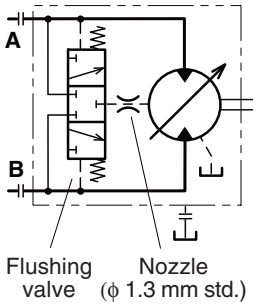
In a closed circuit transmission, the flushing valve removes part of the fluid in the main loop. The removed fluid is continuously being replaced by cool, filtered fluid from the low pressure charge pump on the main pump.

Available nozzles

Ordering code	Orifice size [mm]	Status
L 010	1.0	Optional
L 013	**1.3**	**Standard**
L 015	1.5	Optional
L 017	1.7	"
L 020	2.0	"



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



Hydraulic schematic - V14 with built-in flushing valve.

Shaft speed sensor (option S)

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 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.

Ordering information
(refer to the ordering codes on pages 33-35)

N - None

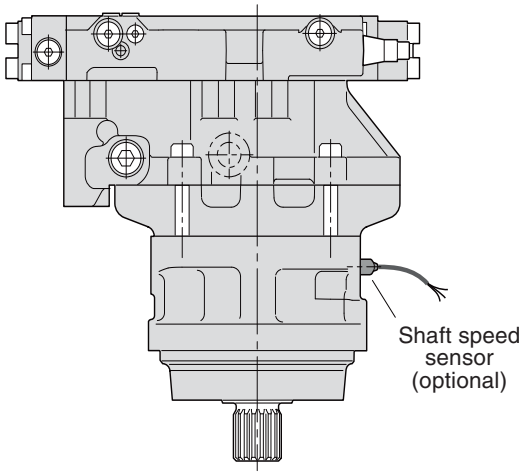
C - Prepared for setting piston position and shaft speed sensors

D - Shaft speed and setting piston position sensors

P - Prepared for shaft speed sensor

S - Shaft speed sensor.

NOTE: Additional information is provided in our publication MI 146, 'Speed sensor for series F12, V12 and V14', available from Parker Hannifin.



V14-110 (AC control) with speed sensor.

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).

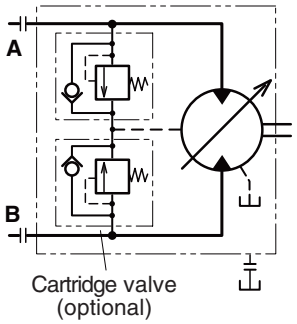
As shown, a small part of the flow may go directly to the reservoir.

PLEASE NOTE:

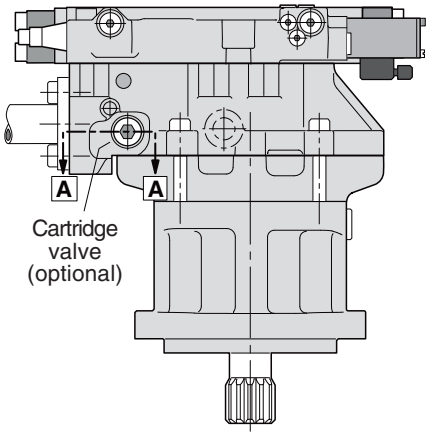
- The pressure relief cartridges should not be used as main pressure reliefs; in a motor application, they should only be relied on to limit short duration pressure peaks (or the temperature of the fluid which circulates through the motor will rapidly reach damaging high levels).
- The main pressure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

Available cartridges

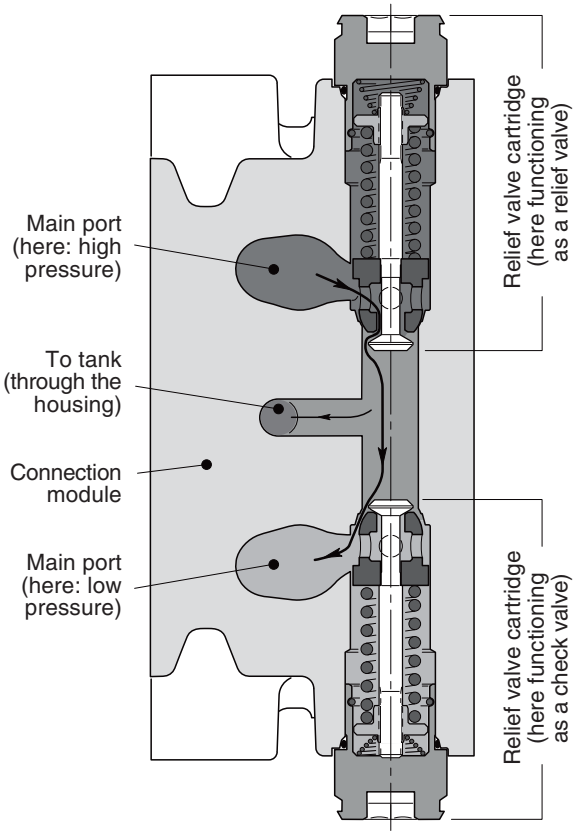
Ordering code	Pressure setting [bar]
P250	250
P300	300
P350	350
P400	400
P420	420
P450	450



Hydraulic schematic - V14 with cartridge valves.



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



Section A-A (showing pressure relief cartridges).

Setting piston position sensor (option L)

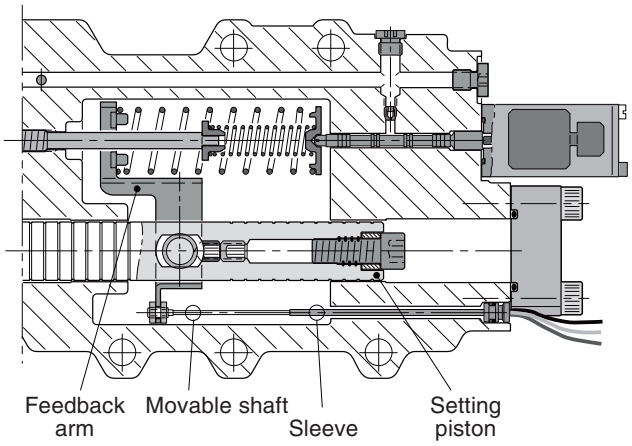
NOTE: The position sensor is available only in connection with the EP control.

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.

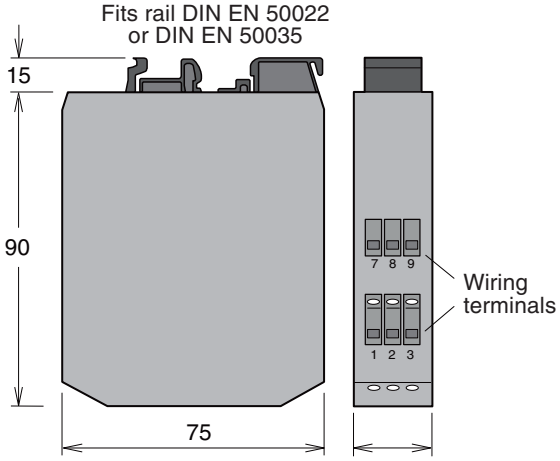
The stationary part of the sensor, the sleeve, is provided with a flange that fits in a specially machined boring in the control module housing.

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; refer to the detailed installation information available from Parker Hannifin.



EP control section with setting piston position sensor.



Electronic module (incl. internal programming module).

Specifications

Supply voltage	18 to 30 VDC
Supply current	max 100 mA
Output voltage	0 to 10 VDC* **or** 0 to 5 VDC (for IQAN)*
Output current - shaft retracted - shaft extended	4 mA 20 mA
Linearity	≤ 1% of stroke
Operational temperature	-40°C to +100°C
Distance between sensor and electronic module	Max 30 m
Electrical wiring	PTFE insulated, heat shrink sleeved, 250 mm long leads

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

Ordering information (refer to 'Sensor options' in the ordering codes on pages 33-35)

Basic V14 configuration (ISO, cartridge or SAE; see pages 33-35) – [ ]

Sensor options

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