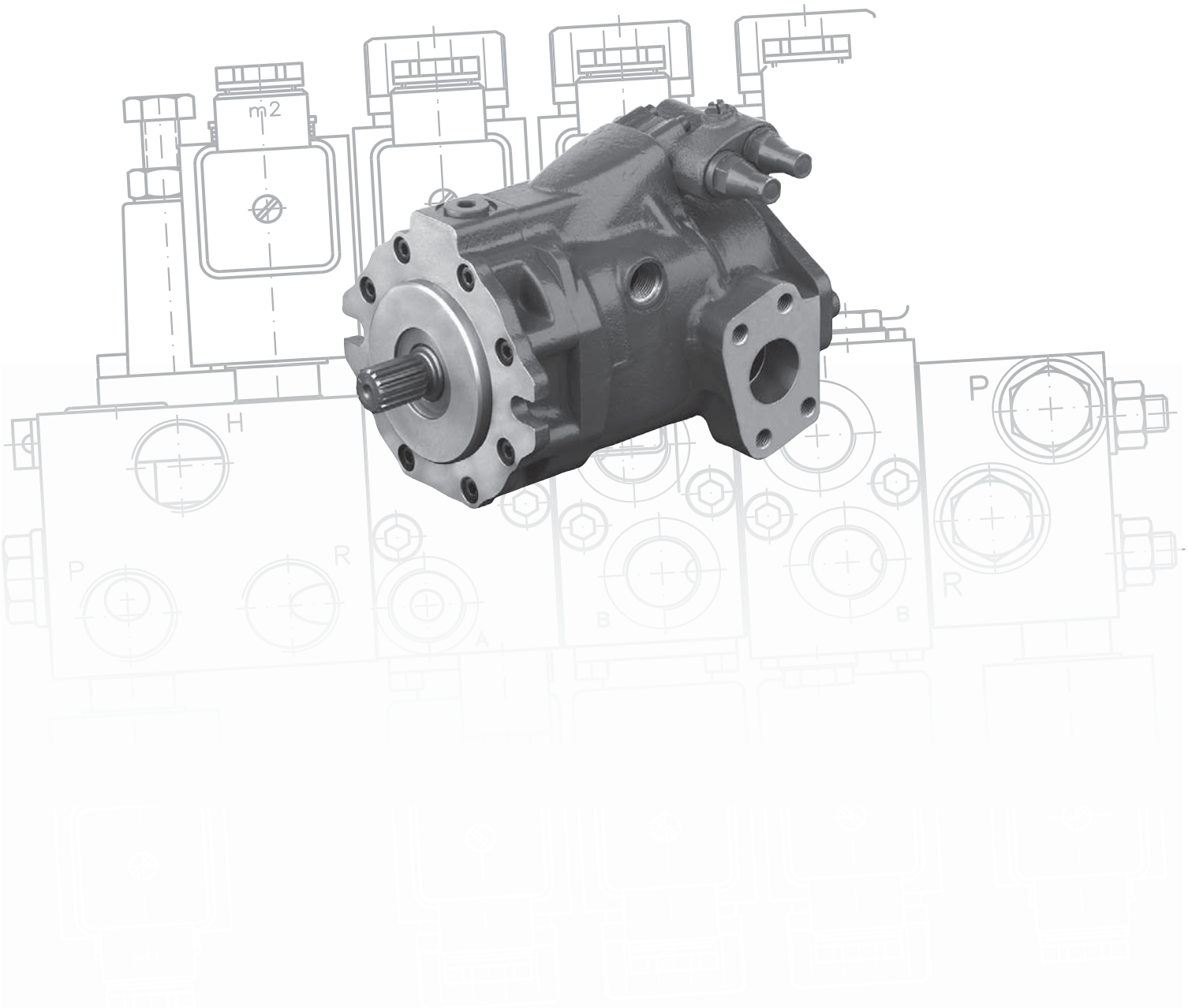
Variable displacement axial piston pump type V40M

Applications including commercial vehicles, open circuit

Nominal pressure $p_{nom\ max}$: 380 bar
Maximum pressure p_{max}: 400 bar
Geometric displacement V_{max}: 46 cm^3/rev.

Switching symbol:



Product documentation
D 7961

03-2013-1.6

HAWE Hydraulik SE - Streitfeldstr. 25 • 81673 München

Contents

1 Overview of variable displacement axial piston pump type V40M

Thanks to its sturdy construction, the variable displacement axial piston pump is designed for a standard connection using an SAE flange. The benchmark figures for this product are 45 cm^3/rev and 400 bar end pressure, allowing for a wide range of applications. These are supported by a high self-suction speed rating and low noise level.
Variations with thru-shaft for flange mounting additional variable displacement axial piston pumps and auxiliary pumps are also available. Several different controllers offer the user a wide range of application possibilities. Particular advantages with regard to the mutual coordination arise from a combined application of variable displacement axial piston pumps with proportional directional spool valves type PSV and possibly required load-holding valves type LHT and LHDV.

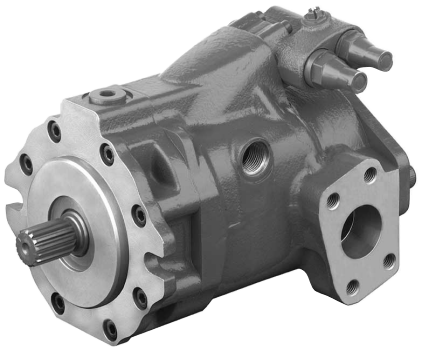


Image 1: Variable displacement axial piston pump type V40M

Features and benefits:

- Good performance/weight ratio
- High self-suction speed
- Different shaft and flange versions

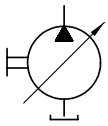
Intended applications:

- Machines for forestry and agricultural purposes
- Cranes and lifting equipment
- Truck-mounted concrete pumps
- Municipal trucks

2 Available versions, main data

2.1 Basic version

Switching symbol:



Order coding example:

V40M	-045	L	T	X	V	- 2	- 0	- 00	/LS-DA	C 01

Basic type

Nominal size Table 1 Nominal size

Rotation direction Table 2 Rotation direction

Shaft version Table 3 Shaft version

Flange version Table 4 Flange version (input side)

Seals Table 5 Seals

Housing version Table 6 Housing version

Additional functions Table 7 Additional functions

Release

Controllers Table 8 Controllers

Through drive version Table 9 Through drive version

Table 1: Nominal size

Coding	Geometric displacement (cm^3/rev.)	Nominal pressure p_{nom} (bar)	Maximum pressure p_{max} (bar)
045	46,5	250	320
045 H	46,5	380	400

Table 2: Rotation direction

Coding	Description
L	Anti-clockwise
R	Clockwise

When looking at the shaft journal (for information on change of rotation direction, see Chapter 3.1, "General")

Table 3: Shaft version

Coding	Description	Standard	Max. drive torque (Nm)
H	Spline shaft	SAE-B J 744 22-4 ISO 3019-1	280
T	Spline shaft	SAE-B-B J 744 25-4 ISO 3019-1	400

Table 4: Flange version (input side)

Coding	Description	DIN no.
X	Flange	SAE-B-2-Hole J 744 101-2 ISO 3019-1

Table 5: Seals

Coding	Description
V	FKM

Table 6: Housing version

Coding	Description
2	Suction and pressure port radial, with thru-shaft
3	Suction and pressure port radial

Table 7: Additional function

Coding	Description
0	No additional function

Table 8: Controllers, intermediate plates

Coding	Description
LS-DA	Load-sensing controller with integrated pressure limitation.
P1R1-AMP 24	Electric proportional controller with pressure decrease as current increases and reliable residual function in the event of a power failure, 24 V DC, AMP Junior Timer 2-pole

Order coding example:

V40M-045 LTXV-2-0-00/LS-DA- **C 00**

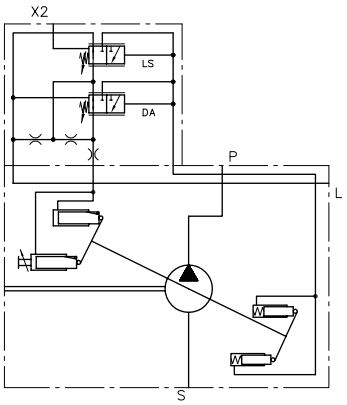
Table 9 Through drive version V40M-045

Coding	Flange		Shaft		
C 00	SAE AA 2-Hole J 744	50-2 ISO 3019-1	SAE AA J 744	9T 20/40 DP	13-4 ISO 3019-1
C 11	SAE A 2-Hole J 744	82-2 ISO 3019-1	SAE A J 744	9T 16/32 DP	16-4 ISO 3019-1
C 12	SAE A 2-Hole J 744	82-2 ISO 3019-1		11T 16/32 DP	19-4 ISO 3019-1
C 23	SAE B 2-Hole J 744	101-2 ISO 3019-1	SAE B J 744	13T 16/32 DP	22-4 ISO 3019-1
C 24	SAE B 2-Hole J 744	101-2 ISO 3019-1	SAE BB J 744	15T 16/32 DP	25-4 ISO 3019-1
C 35	SAE C 2-Hole J 744	127-2 ISO 3019-1	SAE C J 744	14T 12/24 DP	32-4 ISO 3019-1
C 36	SAE C 2-Hole J 744	127-2 ISO 3019-1		21T 16/32 DP	35-4 ISO 3019-1
C 37	SAE C 2-Hole J 744	127-2 ISO 3019-1	SAE CC J 744	17T 12/24 DP	38-4 ISO 3019-1
C 48	SAE D 2-Hole J 744	152-2 ISO 3019-1	SAE D&E J 744	13T 8/16 DP	44-4 ISO 3019-1
C 58	SAE E 2-Hole J 744	165-2 ISO 3019-1	SAE D&E J 744	13T 8/16 DP	44-4 ISO 3019-1
C 69	SAE F 2-Hole J 744	177-2 ISO 3019-1	SAE F J 744	15T 8/16 DP	50-4 ISO 3019-1

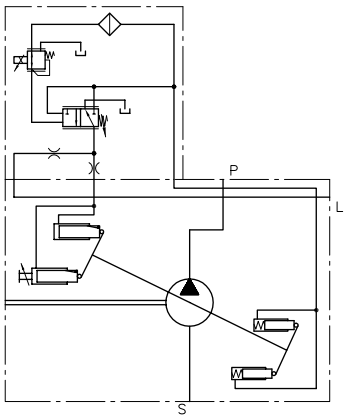
2.2 Controller

Variable displacement axial piston pump complete with controllers

Coding LS-DA



Coding P1R1



3 Parameters

3.1 General

General information

Designation	Variable displacement axial piston pump
Design	Axial piston pump according to the swash plate principle
Mounting	Flange mounting (flange SAE/ISO 3019-1)
Surface	Primed
Drive/output torque	See “Additional parameters” in Chapter 3.1, "General"
Installed position	Any (for installation information see Chapter 5, "Installation information for variable displacement axial piston pump V40M")
Rotation direction	Clockwise or anti-clockwise
Ports	■ Suction port ■ Pressure port ■ Drain port
Hydraulic fluid	Hydraulic oil: according to DIN 51 524 Part 1 to 3; ISO VG 10 to 68 according to DIN 51 519 Viscosity range: min. approx. 10; max. approx. 1000 mm ²/s Optimal operating range: 16 to 35 mm²/s Also suitable for biologically degradable pressure fluids type HEPG (polyalkalene glycol) and HEES (synthetic ester) at operating temperatures up to approx. +70°C.
Purity class	**ISO 4406**: 21/18/15...19/17/13 **NAS 1638**: 12 ... 8 **SAE T 490**: ≥ 6
Temperatures	Ambient: approx. -40 to +60°C, oil: -25 to +80°C, pay attention to the viscosity range! Start temperature: down to -40°C is permissible (observe start-viscosity!), as long as the steady-state temperature is at least 20K higher for subsequent operation. Biologically degradable pressure fluids: note manufacturer specifications. With consideration for the seal compatibility, not above +70°C.

Pressure and flow

Operating pressure	Medium pressure version 250 bar High pressure version 380 bar
Geometric displacement	46.5 cm²/rpm

Mass

	Type V40M	**With controller (kg)**
	045	20.9

For information on output (S) see footnote [2)]

Designation	**Nominal size**
	045
Max. swash plate angle	18°
Required inlet pressure (absolute) for open circuit	0.85 bar
Max. permissible inlet pressure, absolute	3 bar
Max. permissible housing pressure, absolute	3 bar
Max. permissible drive torque, depending on flange/shaft	400 Nm
Max. permissible drive torque at thru-shaft, depending on flange/shaft	400 Nm
Max. speed in suction operation and max. swash plate angle at 1 bar absolute Inlet pressure	2900 rpm
Min. speed in continuous operation	500 rpm
Required drive torque at 100 bar	74 Nm
Drive power at 250 bar and 2000 rpm	38.75 kW
Weight torque	23 Nm
Inertia torque	0.0042 kg m²
Noise level at 250 bar, 1500 rpm and max. swash plate angle (measured in the acoustic measurement chamber according to DIN ISO 4412, measurement distance 1 m)	85 dB(A)

3.2 Planning information

Determination of nominal sizes

Delivery flow	**Drive torque**	**Drive power**
$Q = \frac{V_g \cdot n \cdot \eta_V}{1000} (l/min)$	$M = \frac{V_g \cdot \Delta p}{20 \cdot \pi \cdot \eta_{mh}} (Nm)$	$P = \frac{2\pi \cdot M \cdot n}{60000} = \frac{Q \cdot \Delta p}{600 \cdot \eta_t} (kW)$

V_g = geom. delivery volume (cm³/rev.)
Δp = differential pressure
n = speed (rpm)
η_V = volumetric efficiency
η_{mh} = mechanical-hydraulic efficiency
η_t = overall efficiency ($\eta_t = \eta v \cdot \eta_{mh}$)

[2)] Drive torque must not be exceeded

3.3 Characteristic curves

Delivery flow and power (basic pump)

The diagrams illustrate the delivery flow/pressure (without controller).
Drive power at max. swash plate angle and drive power at zero stroke and 1500 rpm.

Delivery flow and power

The diagrams illustrate delivery flow/pressure (without controller).
Drive power at max. swash plate angle and drive power at zero stroke and 1500 rpm.

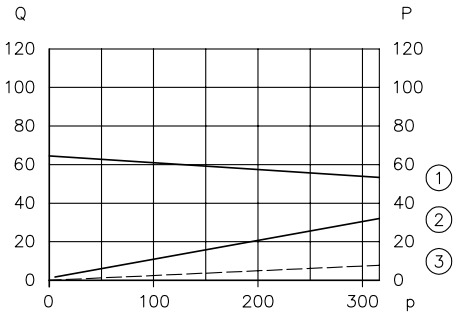


Image 2: p pressure (bar); Q delivery flow (l/min); P power (kW)

1. Delivery flow
2. Power
3. Power (zero stroke)

Inlet pressure and self-suction speed

The curve applies for viscosity of 75 mm²/s at max. swash plate angle

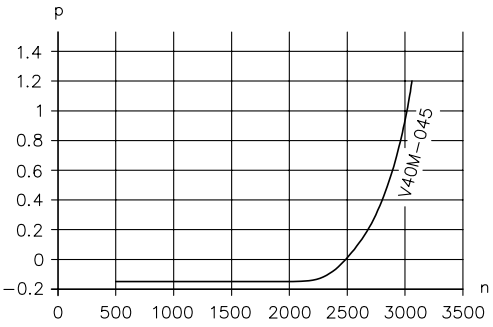


Image 3: n speed (rpm); p inlet pressure (bar)

3.4 Controller characteristic curves

Controller characteristic curves

Coding LS-DA

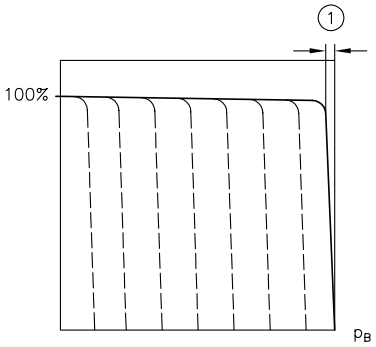


Image 4: p_B operating pressure (bar); Q geometric displacement (%)

1. Approx. 4 bar

Coding P1R1

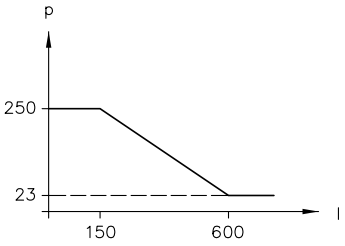


Image 5: I solenoid current (mA); p pressure (bar)

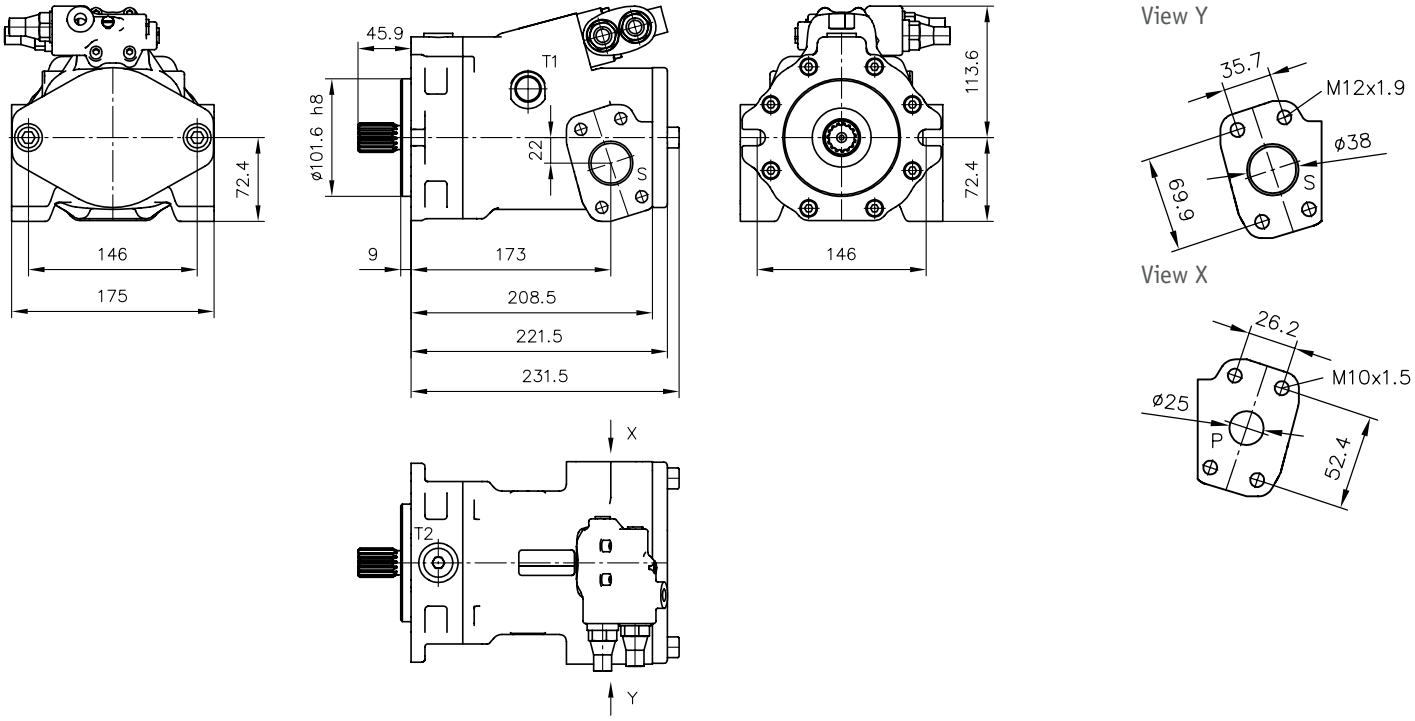
4 Dimensions

All dimensions in mm, subject to change.

4.1 Basic pump

4.1.1 Type V40M-045

Rotation direction: clockwise(when looking at shaft journal)



Ports P, S, T1 and T2 (SAE J 514):

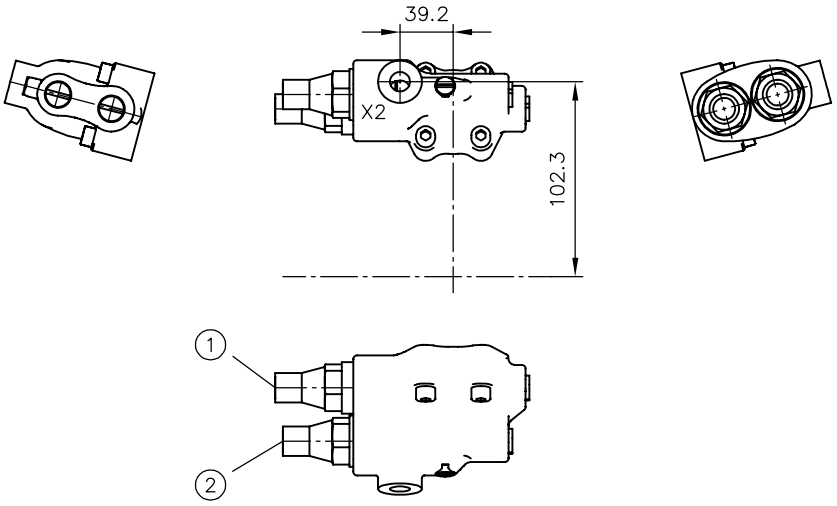
P	= pressure port SAE 1”	(6000 psi)
S	= suction port SAE 1 1/2”	(5000 psi)
T1, T2	= drain port 7/8-14 UNF-28	

Note
For pressures above 210 bar, use M10 screws with a strength of 10.8.

4.1.2 Controllers and intermediate plates

Adjustment range for ① restricted by retaining ring

Controller coding **LS-DA**



Port (ISO 228/1):
X2 = M12 x 1.5
LS signal port

Image 6: Controller LS-DA

1. Pressure limitation
2. Differential pressure Δp (stand-by pressure)

Controller coding **P1R1**

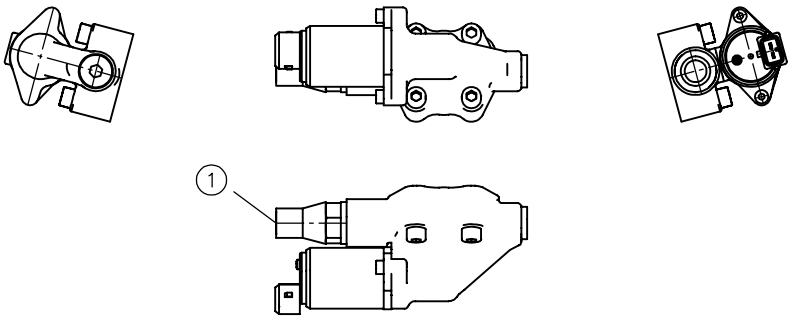


Image 7: Controller P1R1

1. Pressure limitation

Pressure adjustment

	Pressure range (bar)	Δp (bar) / 1/2 revolution	Default pressure setting (bar)
Pressure limitation (type P1R1)	20 ... 250	100	250
Pressure limitation (type LS-DA)	20 ... 250	approx. 50	250
Differential pressure Δp (type LS-DA)	20 ... 55	approx. 12.5	20

Caution
Always monitor the pressure gauge when setting or changing the pressure!

5 Installation information for variable displacement axial piston pump V40M

General information

The V40M is designed for use in an open circuit. It can be fitted with an ISO 3019-2 or SAE-C 4-Hole. Further connection options are available with a propshaft and suitable coupling sleeves.

The following essential points must be noted when installing the pump:

Mounting and removal of the pump and attached components may be performed by trained persons only. Ensure absolute cleanliness during all work. Contamination may have an adverse effect on the function and service life of the pump.

- Remove all plastic plugs prior to initial operation.
- Avoid installing the pump above the tank (see “Installation positions” in Chapter 5, "Installation information for variable displacement axial piston pump V40M").
- Observe the reference values in during selection of connecting lines.
- Prior to initial operation, fill the pump with oil and bleed. Automatic pump filling via the suction line by opening the drain ports is not possible.
- Prevent the pump and suction line from running dry.
- Always ensure a constant supply of oil. Even a brief shortage in the supply of hydraulic fluid to the pump may damage internal parts. This may not be immediately evident after initial start-up.
- The hydraulic oil returning to the tank from the system must not be sucked back in immediately (baffles).
- Run the pump for approx. 10 minutes at max. 50 bar after initial start-up.
- Thorough bleeding/flushing of the entire system is recommended before the full pressure range is used.
- Observe the max. permissible operating range temperatures (see Chapter 3, "Parameters") at all times.
- Ensure compliance with the specified oil purity classes (see Chapter 3, "Parameters"); provide appropriate hydraulic fluid filtering.
- Use of a filter in the intake line must be approved by HAWE Hydraulik.
- Include a main pressure-limiting valve in the pressure line to limit the max. system pressure.

Ports

The nominal width of the connecting lines depends on the specified operating conditions, the viscosity of the hydraulic fluid, the start-up and operating temperatures and the speed of the pump. In principle we recommend the use of hose lines due to the superior damping characteristics.

Pressure port

The pressure port is established in type V40M-045via a 1” flange port. Observe the torque specification of the part manufacturer.

Suction port

The suction port is established in type V40M-045 via a 1 1/2” flange port. The specification of the max. delivery flow Q_{max} must be observed. This can be found in the following table.

Nominal width (N)	1 1/2”	2"
Q_{max} (l/min)	75	125

If possible, route the suction line to the tank in such a way that it is steadily rising. This allows trapped air to escape. Observe the specifications in Chapter 5, "Installation information for variable displacement axial piston pump V40M" under “Installation positions”. The absolute intake pressure must not fall below 0.85 bar. A hose line should generally be used in preference to a rigid pipe.

Drain port

The V40M pumps have 2 drain ports of 7/8-14UNF-2B .

The nominal width of the overflow oil line must not be less than 16 mm. The cross-section is determined by the max. permissible housing pressure.

Integrate the overflow oil line in the system in such a way as to prevent direct connection with the intake line of the pump. Both drain ports can be used simultaneously.

A separate overflow oil line from the controller to the tank is not required. Observe the specifications in the Installation positions section.

LS port for version (LS-DA)

The LS line is connected to the controller via a M12x1.5 threaded connection. The nominal width of the line depends on the installation position of the pump and should hold 10% of the pressure line capacity. A hose line should generally be used in preference to a rigid pipe.

- When the proportional directional spool valve is in a neutral position, the LS line must be fully released!

Installation positions

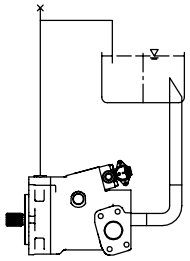
The V40M can be installed in any installation position. Observe the truck manufacturer's specifications if installing the pump directly on a truck power take-off.

The can be installed in any installation position.

A support is required for tandem pumps or two hydraulic pumps mounted in series. The following points must be observed:

Horizontal installation: (pump below the min. hydraulic oil level)

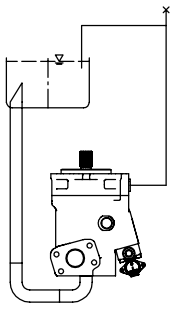
For horizontal installation, use the uppermost drain port.



Vertical installation: (pump below the min. hydraulic oil level)

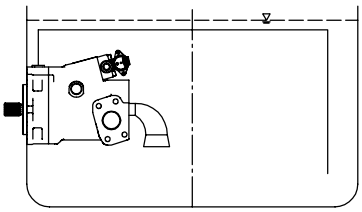
Mount the pump so that the pump mounting flange is facing upwards. For vertical installation, use the uppermost drain port. Take appropriate measures to ensure continuous bleeding of this line (line routing/bleeding).

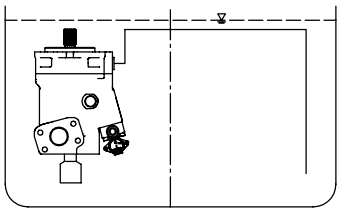
For installation with the pump flange facing downwards, please contact HAWE Hydraulik.



Tank installation (pump below the min. hydraulic oil level)

The pump can be operated either with or without a suction tube.

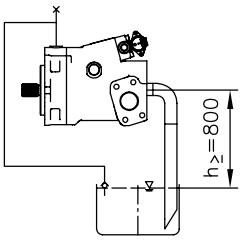


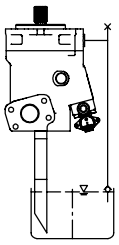


Additional notes regarding installation above the tank fluid level

Special measures are required if the pump is installed above the tank fluid level. The pump must not run dry via the pressure, intake, drain/bleed or control lines. This applies in particular to long periods of downtime. A check valve (opening pressure approx. 0.5 to 0.6 bar) in the overflow oil line can prevent the pump housing from being emptied. Facilitate bleeding of connecting lines via separate bleed openings. Adjust the bleeding sequence to the specific installation.

For specialist guidance, use the form B 7960 – Axial piston pump checklist.





6 Installation, operation and maintenance information

6.1 Designated use

This fluid-power product has been designed, manufactured and tested using standards and regulations generally applicable in the European Union and left the plant in a safe and fault-free condition.

To maintain this condition and ensure safe operation, operators must observe the information and warnings in this documentation.

This fluid-power product must be installed and integrated in a hydraulic system by a qualified specialist who is familiar with and adheres to general engineering principles and relevant applicable regulations and standards.

In addition, application-specific features of the system or installation location must be taken into account if relevant.

This product may only be used as a pump within oil-hydraulic systems.

The product must be operated within the specified technical parameters. This documentation contains the technical parameters for various product versions.

Note
Non-compliance will void any warranty claims made against HAWE Hydraulik.

6.2 Installation information

The hydraulic system must be integrated in the equipment with standard connection components that comply with market requirements (screw fittings, hoses, pipes, etc.). The hydraulic system must be shut down as a precautionary measure prior to dismounting; this applies in particular to systems with hydrostatic accumulators.

6.3 Operating instructions

Product, pressure and/or flow settings

Generally, the manufacturer sets the product. If the customer is setting the product, the information in this documentation must be observed in full.

Filtering and purity of the hydraulic fluid

Fine contamination (e.g. grit and dust) or contamination in the macro range (e.g. filings, rubber particles from hoses and seals) can significantly impair the function of a hydraulic system. It should also be noted that new hydraulic fluid straight from the container does not necessarily meet the highest purity standards.

Attention must therefore be paid to the purity of the hydraulic fluid to ensure smooth operation (see also “Purity class” in Chapter 3, "Parameters").

Maintenance information

Further information on installation, operation and maintenance can be found in the relevant operating instructions .

Additional versions

- General operating manual for the assembly, initial operation and maintenance of hydraulic components and systems: B 5488
- Proportional directional spool valve, type PSL and PSV size 2: D 7700-2
- Proportional directional spool valve, type PSL, PSM and PSV size 3: D 7700-3
- Proportional directional spool valve, type PSL, PSM and PSV size 5: D 7700-5
- Proportional directional spool valve, type PSLF, PSVF and SLF: D 7700-F
- Proportional directional spool valve banks, type PSLF, PSVF and SLF size 7: D 7700-7F
- Over-center valves type LHT: D 7918
- Load-holding valves (over center valves) type LHDV: D 7770
- Type EV1M 2-12/24 and EV1M 2-24/48 electronic amplifier: D 7831/1
- Electronic amplifier type EV1D: D 7831 D
- Axial piston variable displacement pump type V60N: D 7960 N
- Type V40M variable displacement axial piston pump: D 7961
- Type V30D variable displacement axial piston pump: D 7960
- Fixed displacement axial piston pump type K60N: D 7960 K
- Axial piston motors type M60N: D 7960 M

HAWE Hydraulik SE
Streitfeldstr. 25
81673 Munich, Germany
Postfach 800804
81608 Munich, Germany
Tel. +49 (0)89 37 91 00-0
Fax +49 (0)89 37 91 00-12 69
e-mail: info@hawe.de
www.hawe.de