

Variable displacement axial piston pump type V30D

Product documentation

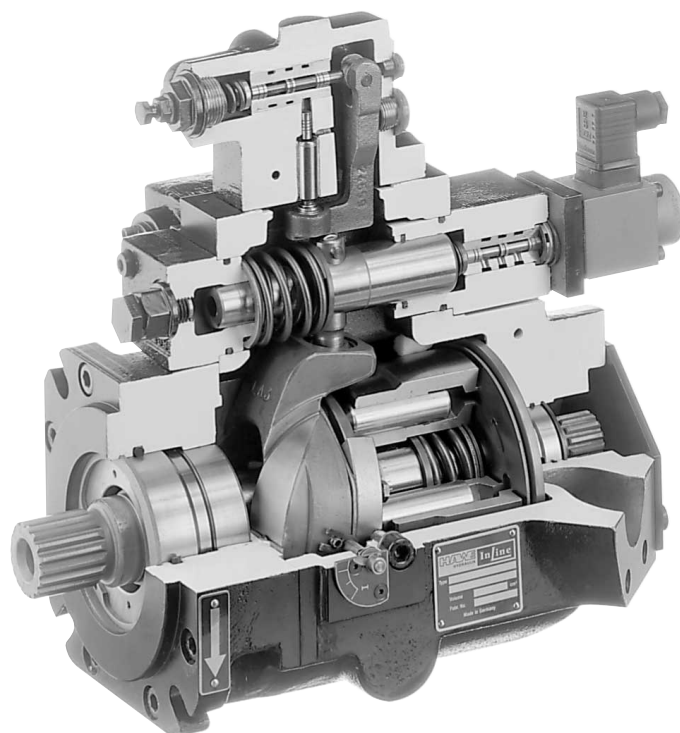


Open circuit

Nominal pressure $p_{\text{nom max}}$: 350 bar

Peak pressure p_{max} : 420 bar

Geometric displacement V_{max} : 250 cm³/U



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Overview: variable displacement axial piston pump type V30D

Variable displacement axial piston pumps adjust the geometric output volume from maximum to zero. As a result they vary the flow rate that is provided to the consumers.

The axial piston pump type V30D is designed for open circuits in industrial hydraulics and operate according to the swash plate principle. They are available with the option of a thru-shaft for operating additional hydraulic pumps in series.

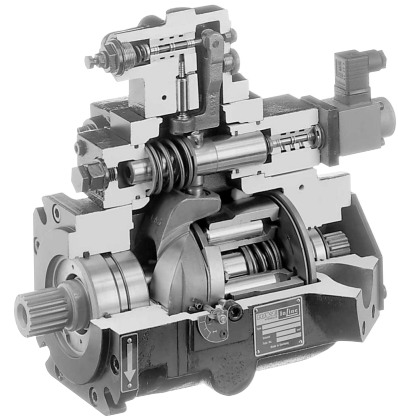
The sturdy pump is particularly suitable for continuous operation in challenging applications. The range of pump controllers allows the axial piston pump to be used in a wide variety of applications.

Features and benefits:

- Low-noise emissions
- Long lifetime even under demanding application conditions
- Broad selection of controllers
- Full torque available at the second pump in tandem pump applications

Intended applications:

- Hydraulic presses
- Marine applications
- Industrial plants
- Power pack assembly
- Mining and tunnel boring machines

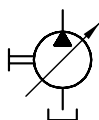


Variable displacement axial piston pump type V30D

2 Available versions, main data

2.1 Basic version

Circuit symbol:



Order coding example:

V30D	-075	R	K	G	N	- 1	- 0	- 02	/NL	- 2	/65	- 350
												Pressure specification (bar)
												Torque setting (Nm)
												Stroke limitation Table 10 Stroke Limitation
												Controller Table 8 Controllers; Table 9 Solenoid voltage and version
												Release Release
												Swash plate angle indicator Table 7 Swash plate angle indicator
												Housing version Table 6 Housing versions
												Seal Table 5 Seals
												Flange version Table 4 Flange versions (input side)
												Shaft version Table 3 Shaft versions
												Rotation direction Table 2 Rotation directions
												Nominal size Table 1 Nominal size

Basic type

Table 1 Nominal size

Coding	Geometric displacement (cm ³ /rev)	Nominal pressure p _{nom} (bar)	Peak pressure p _{max} (bar)
045	45	350	420
075	75	350	420
095	96	350	420
115	115	250 ¹	300 ¹
140	142	350	420
160	164	250 ¹	300 ¹
250	250	350	420

¹ Higher pressures are possible with reduced geometric displacement.

Table 2 Rotation directions

Coding	Description
L	Anti-clockwise
R	Clockwise
B	Rotation direction both sides (only V30D-075, V30D-095, V30D-115, V30D-140, V30D-160, V30D-250)

When looking at the shaft journal.

Table 3 Shaft versions

Coding	Description	Designation/standard	Size	Max. drive torque (Nm)
D	Spline shaft (DIN 5480)	W35x2x16x9g DIN 5480	V30D-045	550
		W40x2x18x9g DIN 5480	V30D-075	910
			V30D-095/115	1,200
		W50x2x24x9g DIN 5480	V30D-140/160	1,700
		W60x2x28x9g DIN 5480	V30D-250	3,100
K	Parallel key shaft (DIN 6885)	∅ 35 - AS10x8x56 DIN 6885	V30D-045	280
		∅ 40 - AS12x8x70 DIN 6885	V30D-075	460
		∅ 40 - AS12x8x80 DIN 6885	V30D-095/115	650
		∅ 50 - AS14x9x80 DIN 6885	V30D-140/160	850
		∅ 60 - AS18x11x100 DIN 6885	V30D-250	1,550
S	Spline shaft (SAE J744 or DIN ISO 3019-1)	SAE-C J744 14T 12/24 DP 32-4 DIN ISO 3019-1	V30D-045/075	500
		SAE-D J744 13T 8/16 DP 44-4 DIN ISO 3019-1	V30D-095/115/140/160/250	1,200

Table 4 Flange versions (input side)

Coding	Description	Designation	Size
G	Flange (DIN ISO 3019-2)	125 B4 HW DIN ISO 3019-2	V30D-045
		140 B4 HW DIN ISO 3019-2	V30D-075
		160 B4 HW DIN ISO 3019-2	V30D-095/115
		180 B4 HW DIN ISO 3019-2	V30D-140/160/250
F	Flange (SAE J744 or DIN ISO 3019-1)	SAE-C 4-hole J744 127-4 DIN ISO 3019-1	V30D-045/075
		SAE-D 4-hole J744 152-4 DIN ISO 3019-1	V30D-095/115/140/160/250

Table 5 Seals

Coding	Description
N	NBR
V	FKM
E	EPDM
C	NBR, suitable for HFC, for restrictions, see "Assembly, operation and maintenance recommendations"

Table 6 Housing version

Coding	Description
1	Without thru-shaft, suction port 45°
2	With thru-shaft, suction port 45°
3	Without thru-shaft, suction port 90° (only V30D-140, V30D-160)
4	With thru-shaft, suction port 90° (only V30D-140, V30D-160)

Table 7 Swash plate angle indicator

Coding	Description
0	Without display
1	With display
2	With pivoting angle pick-up (Hall sensor)

Table 8 Controllers

Coding	Description
Delivery flow controller	
LS	Load sensing controller
LSN	Load sensing controller with integrated pressure limitation
LSP	Load sensing controller with remote-control port for external pressure limitation
LSD	Load sensing controller without integrated pressure limitation for parallel operation of multiple pumps
Q	Flow controller for setting a constant flow rate independently of the speed.
Qb	Flow controller for setting a constant flow rate independently of the speed, for applications with high demands on accuracy
V	Electric proportional delivery flow controller with increasing characteristic curve
VH	Hydraulic delivery flow controller with increasing characteristic curve
Pressure controller	
N	Pressure controller
P	Pressure controller with remote-control port for external pilot valve
Pb	Pressure controller with remote-control port for external pilot valve. Specifically for extremely vibration-prone applications.
PD5	Parallel pressure controller
Power controller	
L	Power controller
Lf	Hydraulically adjustable power controller with increasing characteristic curve
Lf1	Hydraulically adjustable power controller with decreasing characteristic curve

Table 9 Solenoid voltage and design

Coding	Electrical connection	Nominal voltage	Protection class (IEC 60529)
V/12	DIN EN 175 301-803 A	12 V DC	IP 65
V/24	DIN EN 175 301-803 A	24 V DC	IP 65

Table 10 Stroke limitation

Coding	Description
No designation	No stroke limitation
1	Prepared for power controller
2	With adjustable stroke limitation (not possible in combination with pump controller type V, VH)
2/...	Stroke limitation fixed with specification of the set geometric displacement V_g (cm ³ /rev.)

Order coding example

V30D-075 RDGN-2-0-02/LSN-350 - C 426

Table 11 Flange version (output side)

Coding V30D						Flange	Shaft
045	075	095	115	140/160	250		
C 411	C 421	C 431	C 441	C 451/C 461	C 471	SAE-A 2-hole J744 82-2 DIN ISO 3019-1	SAE-A J744 (16-4 DIN ISO 3019-1) 9T 16/32 DP
C 412	C 422	C 432	C 442	C 452/C 462	C 472	SAE-A 2-hole J744 82-2 DIN ISO 3019-1	SAE-A J744 (16-4 DIN ISO 3019-1) ¹⁾ 9T 16/32 DP
C 413	C 423	C 433	C 443	C 453/C 463	C 473	SAE-A 2-hole J744 82-2 DIN ISO 3019-1	19-4 DIN ISO 3019-1 11T 16/32 DP
C 414	C 424	C 434	C 444	C 454/C 464	C 474	SAE-B 2-hole J744 101-2 DIN ISO 3019-1	SAE-B J744 (22-4 DIN ISO 3019-1) 13T 16/32 DP
C 415	C 425	C 435	C 445	C 455/C 465	C 475	SAE-B 4-hole J744 101-4 DIN ISO 3019-1	SAE-B J744 (22-4 DIN ISO 3019-1) 13T 16/32 DP
C 416	C 426	C 436	C 446	C 456/C 466	C 476	SAE-B 2-hole J744 101-2 DIN ISO 3019-1	SAE-BB J744 (25-4 DIN ISO 3019-1) 15T 16/32 DP
C 417	C 427	C 437	C 447	C 457/C 467	C 477	SAE-C 2-hole J744 127-2 DIN ISO 3019-1	SAE-C J744 (32-4 DIN ISO 3019-1) 14T 12/24DP
C 418	C 428	C 438	C 448	C 458/C 468	C 478	SAE-C 4-hole J744 127-4 DIN ISO 3019-1	SAE-C J744 (32-4 DIN ISO 3019-1) 14T 12/24 DP
C 419	C 429	C 439	C 449	C 459/C 469	C 479	SAE-C 2-hole J744 127-2 DIN ISO 3019-1	SAE-CC J744 (38-4 DIN ISO 3019-1) 17T 12/24 DP
--	--	C 440	C 450	C 460/C 470	C 480	SAE-D 4-hole J744 152-4 DIN ISO 3019-1	SAE-D J744 (44-4 DIN ISO 3019-1) 13T 8/16 DP
C 500	C 501	C 503	C 506	C 510/C 515	C 521	125 B4 HW DIN ISO 3019-2	W35x2x16x9gDIN 5480)
--	C 502	C 504	C 507	C 511/C 516	C 522	140 B4 HW DIN ISO 3019-2	W40x2x18x9gDIN 5480)
--	--	C 505	C 509	C 512/C 517	C 523	160 B4 HW DIN ISO 3019-2	W40x2x18x9gDIN 5480)
--	--	--	--	C 514/C 520	C 525	180 B4 HW DIN ISO 3019-2	W50x2x24x9gDIN 5480)
--	--	--	--	--	C 527	180 B4 HW DIN ISO 3019-2	W60x2x28x9gDIN 5480)

1) ANSI B 92.1, FLAT ROOT SIDE FIT spline width deviating from the standard, $s = 2.357-0.03$

NOTE

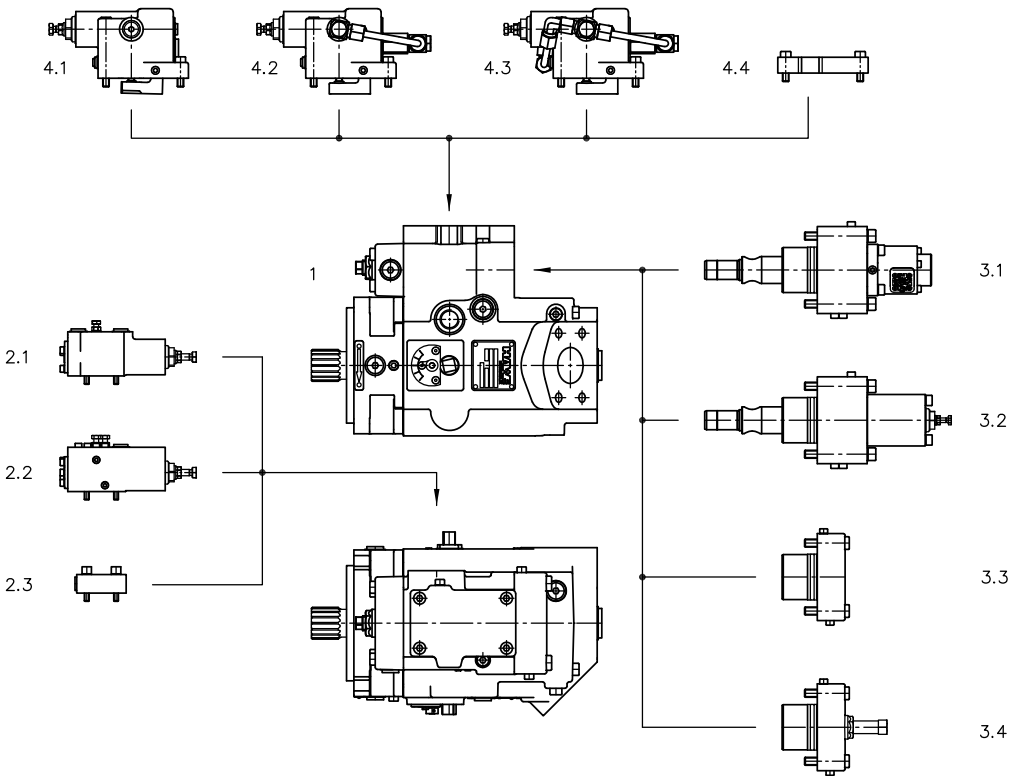
Pay attention to the maximum permissible drive torque, as the flange or shaft may be damaged otherwise.


NOTE

An additional support is to be provided for pump combinations.

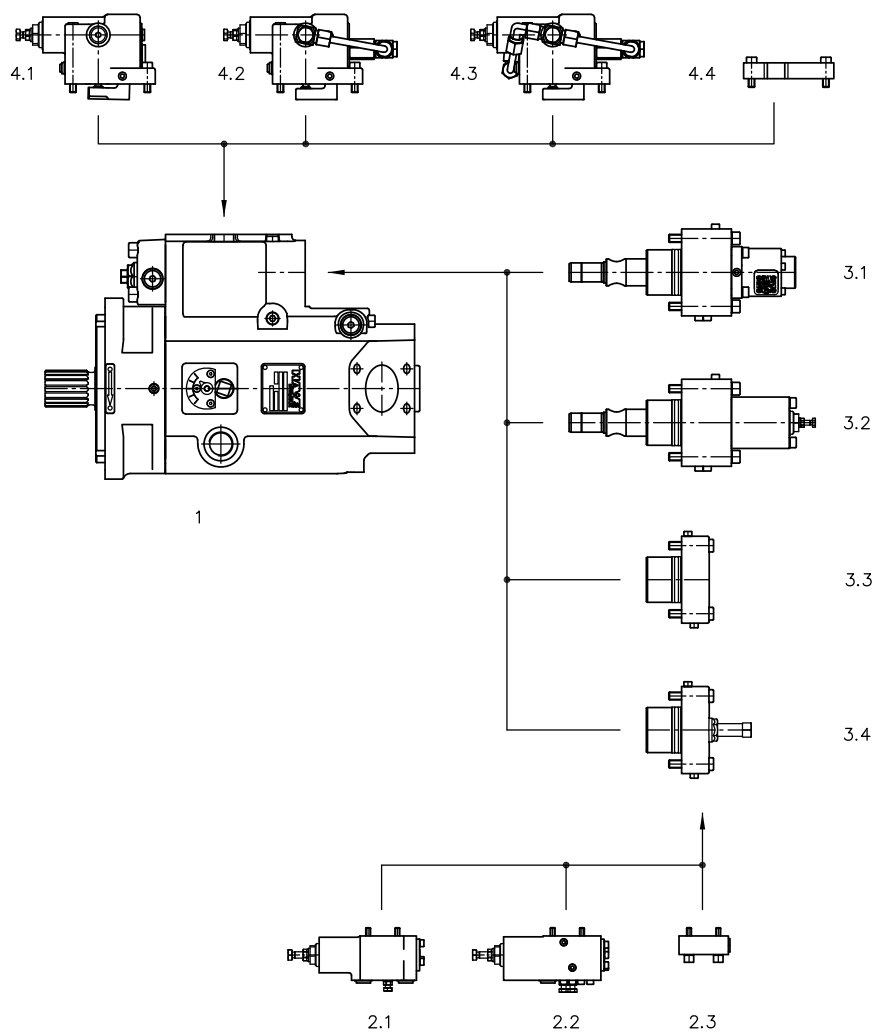
2.2 Controller

V30D-045/075/140/160



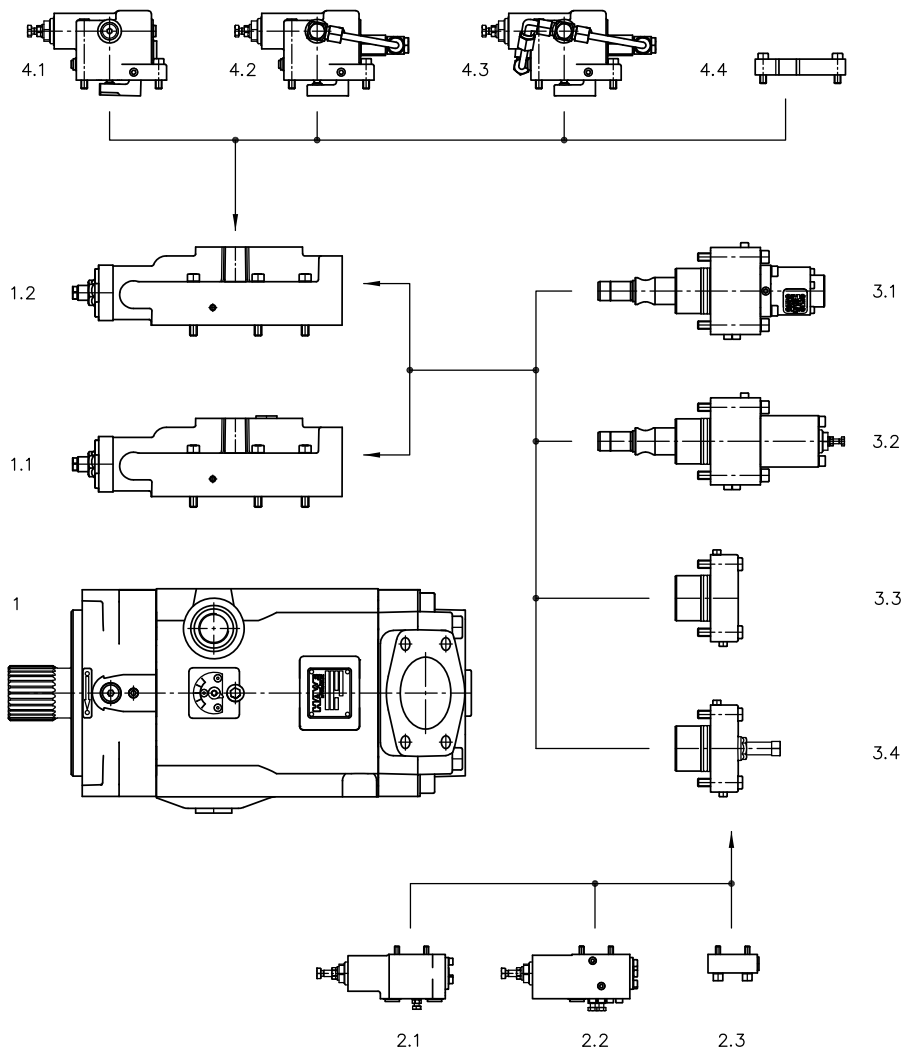
- 1 Basic pump
- 2.1 Controller type N, P, Pb, LS, Q, Qb
- 2.2 Controller type LSN, LSP
- 2.3 Cover for version without N, P, Pb, LS, LSN, LSP, Q, Qb
- 3.1 Controller type V
- 3.2 Controller type VH
- 3.3 Cover for version without V or VH, without stroke limitation
- 3.4 Cover for version without V or VH, with stroke limitation
- 4.1 Controller type L, Lf1
- 4.2 Controller type LSD
- 4.3 Controller type PD5
- 4.4 Cover for version without L, Lf1, LSD, PD5

V30D-095/115



- 1 Basic pump
- 2.1 Controller type N, P, Pb, LS, Q, Qb
- 2.2 Controller type LSN, LSP
- 2.3 Cover for version without N, P, Pb, LS, LSN, LSP, Q, Qb
- 3.1 Controller type V
- 3.2 Controller type VH
- 3.3 Cover for version without V or VH, without stroke limitation
- 3.4 Cover for version without V or VH, with stroke limitation
- 4.1 Controller type L, Lf1
- 4.2 Controller type LSD
- 4.3 Controller type PD5
- 4.4 Cover for version without L, Lf1, LSD, PD5

V30D-250



- 1 Basic pump
- 1.1 Control head without L, Lf1, LSD, PD5 (series)
- 1.2 Control head for L, Lf1, LSD, PD5
- 2.1 Controller type N, P, Pb, LS, Q, Qb
- 2.2 Controller type LSN, LSP
- 2.3 Cover for version without N, P, Pb, LS, LSN, LSP, Q, Qb
- 3.1 Controller type V
- 3.2 Controller type VH
- 3.3 Cover for version without V or VH, without stroke limitation
- 3.4 Cover for version without V or VH, with stroke limitation
- 4.1 Controller type L, Lf1
- 4.2 Controller type LSD
- 4.3 Controller type PD5
- 4.4 Cover for version without L, Lf1, LSD, PD5

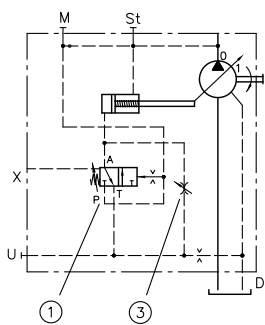
2.2.1 Controller LS, LSN, LSP, LSD

The LS(N,P,D) controller is a delivery flow controller that generates a variable flow rate independently of the speed. It adapts the geometric displacement of the pump to the required flow rate of the consumer and regulates a constant difference between load pressure and pump pressure.

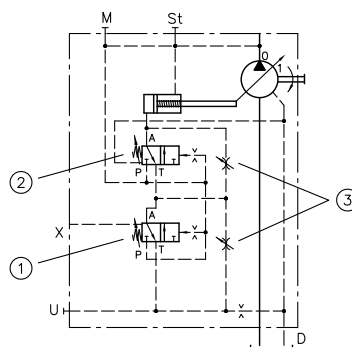
- **LS:** Without pressure limitation
- **LSN:** With integrated pressure limitation
- **LSP:** With remote-control port for external pressure limitation
- **LSD:** Without pressure limitation for parallel operation of several pumps

The LSD controller is used if several pumps supply the same consumer. It regulates the same geometric displacement on all pumps.

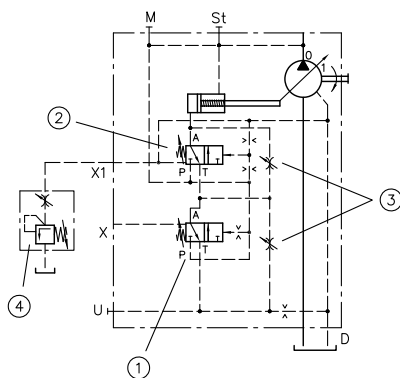
Coding **LS**



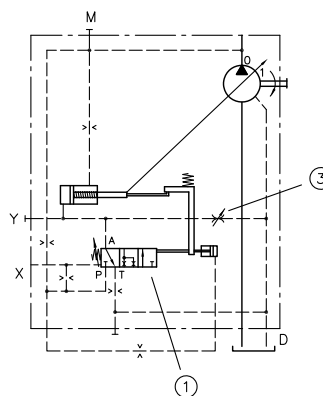
Coding **LSN**



Coding **LSP**

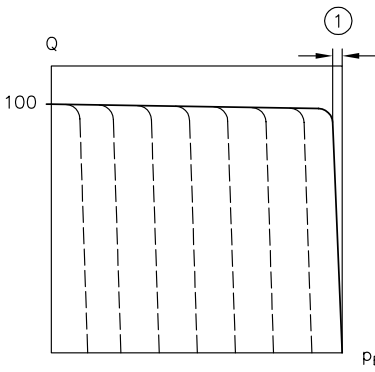


Coding **LSD**



- 1 Delivery flow controller: Regulates a constant difference between load pressure and pump pressure
- 2 Pressure limitation: Limits the pump pressure to a maximum value
- 3 Bypass throttle
- 4 External pressure-limiting valve (not included in scope of delivery)

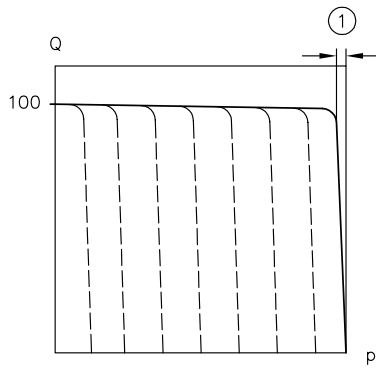
Characteristic curve LS, LSN, LSP



p_B operating pressure (bar); Q delivery flow (%)

1 Approx. 3 bar

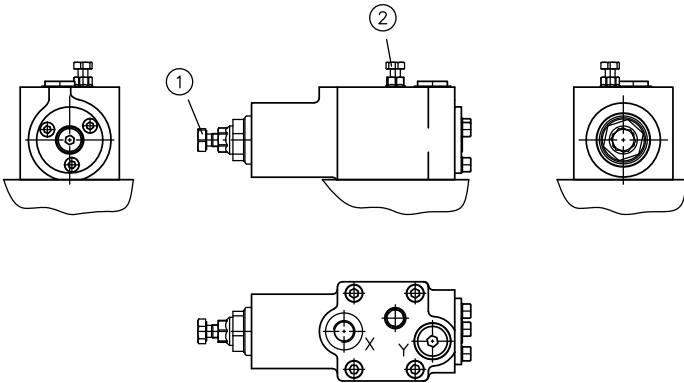
Coding LSD



p_B operating pressure (bar); Q delivery flow (%)

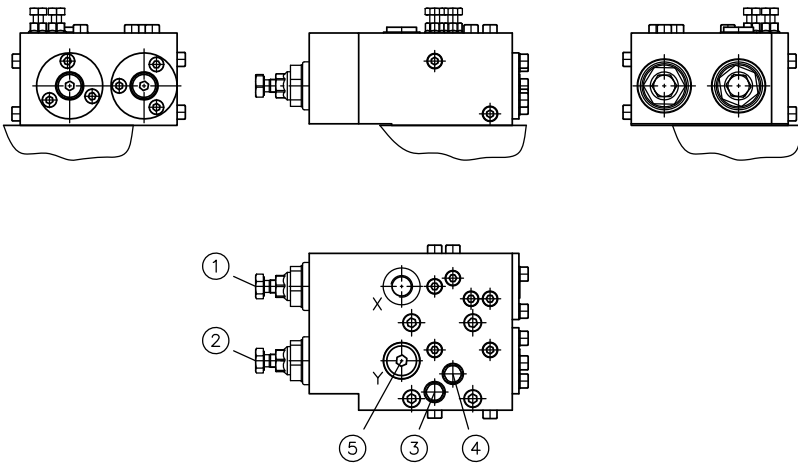
1 Approx. 12 bar

Coding LS



- 1 Differential pressure Δp (stand-by pressure)
- 2 Bypass throttle

Coding LSN, LSP



- 1 Differential pressure Δp (stand-by pressure)
- 2 Maximum pressure p_{max} (pressure limitation)
- 3 Bypass throttle LS
- 4 Bypass throttle N
- 5 For coding LSN with tapped plug closed

Pressure adjustment

Pressure adjustment	Pressure range (bar)	Δp (bar)/revolution	Factory-set pressure setting (bar)
Maximum pressure p_{\max} (N250) ¹⁾	50 ... 200	Approx. 50	200
Maximum pressure p_{\max} (N400) ¹⁾	100 ... 350	Approx. 100	300
Differential pressure Δp (P)		Approx. 15	15
Differential pressure Δp (LS)		Approx. 15	30

1) Depending on the pressure setting, either a weak spring (N250) or a strong spring (N400) is installed.



CAUTION

Risk of injury on overloading components due to incorrect pressure settings!

Risk of minor injury.

- Always monitor the pressure gauge when setting and changing the pressure.



NOTE

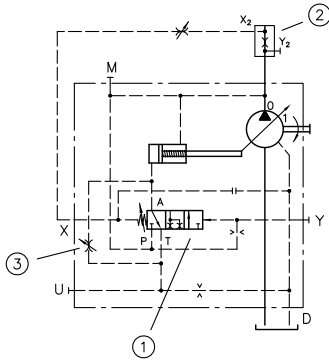
Loosen the lock nut sufficiently before setting so that the sealing ring is not damaged.

2.2.2 Controller Q, Qb

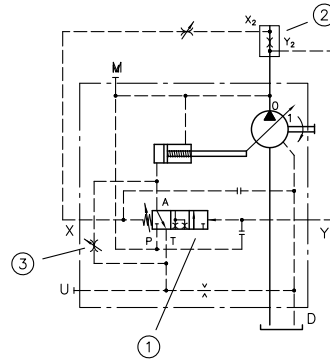
The Q(b) controller is a delivery flow controller that generates a constant flow rate independently of the speed. It regulates a constant differential pressure via an orifice in the P gallery. The differential pressure can be set between 15 and tbd bar; the orifice is available in different graduations (see table).

- **Q:** Standard version
- **Qb:** Version with external feedback of the pump pressure to compensate for a pressure loss in the P line. For use in hydrostatic applications with high demands on the speed consistency, e.g. generator drives.

Coding **Q**



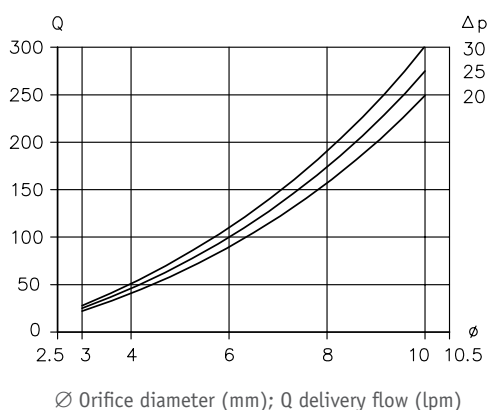
Coding **Qb**



- 1 Delivery flow controller: Regulates a constant differential pressure before and after the orifice
- 2 Orifice: Selection based on the table (not included in the scope of supply)
- 3 Bypass throttle

Orifice (mm)	Flow rate at 20 bar differential pressure (lpm)	Orifice (mm)	Flow rate at 20 bar differential pressure (lpm)
3	Approx. 23	7	Approx. 127
3.5	Approx. 32	7.5	Approx. 146
4	Approx. 42	8	Approx. 166
4.5	Approx. 53	8.5	Approx. 188
5	Approx. 65	9	Approx. 210
5.5	Approx. 79	9.5	Approx. 234
6	Approx. 94	10	Approx. 260
6.5	Approx. 110		

Coding **Q, Qb**



Determination of the flow rate

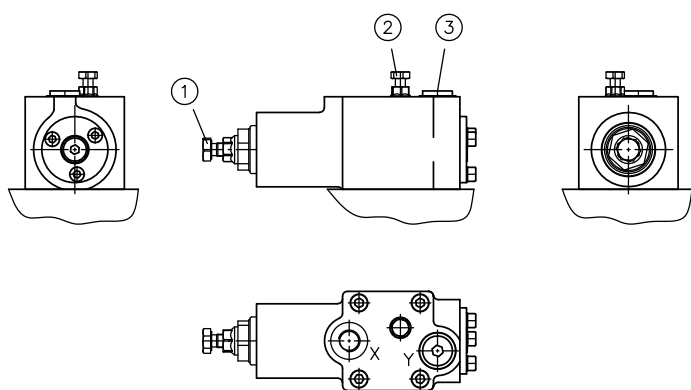
$$Q = 0,55 \cdot d^2 \sqrt{\Delta p}$$

Q = Flow rate (lpm)

d = Orifice diameter (mm)

Δp = Pressure difference (bar)

Coding **Q, Qb**



- 1 Differential pressure Δp (stand-by pressure)
- 2 Bypass throttle
- 3 Y-port. For coding Q with tapped plug closed With coding Qb pressure signal port before the orifice.

Pressure adjustment

Pressure adjustment	Pressure range (bar)	Δp (bar)/revolution	Factory-set pressure setting (bar)
Differential pressure Δp		Approx. 15	15

i NOTE

Loosen the lock nut sufficiently before setting so that the sealing ring is not damaged.

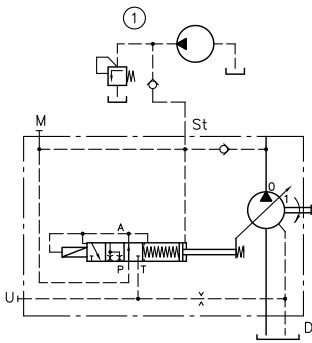
2.2.3 Controller V, VH

The V and VH controllers are proportional flow controllers that generate a variable, speed-dependent flow rate. They adjust the geometric displacement of the pump based on an electrical or hydraulic input signal. The resulting flow rate depends on the geometric displacement and the rotation speed.

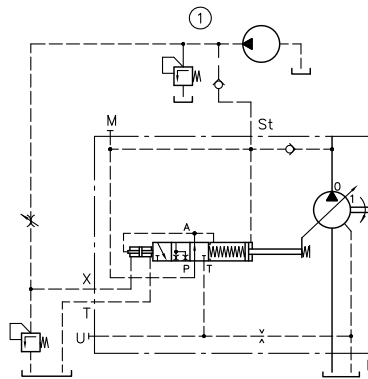
The required pilot pressure for adjusting the pivoting angle is tapped internally. When used in open centre systems with operating pressures of < 25 bar, an external auxiliary pump or a pre-load valve must be provided to ensure reliable adjustment.

- **V:** Electric flow controller with increasing characteristic curve.
- **VH:** Hydraulic delivery flow controller with increasing characteristic curve.

Coding **V**

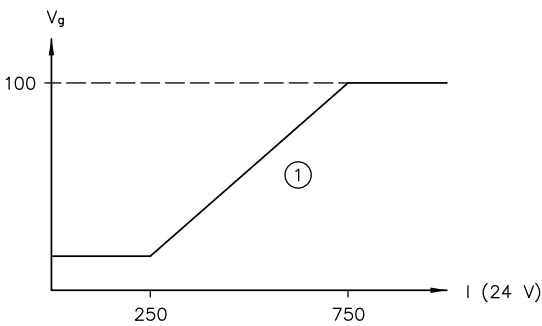


Coding **VH**



1 External auxiliary pump, pressure-limiting valve and check valve (not included in scope of delivery)

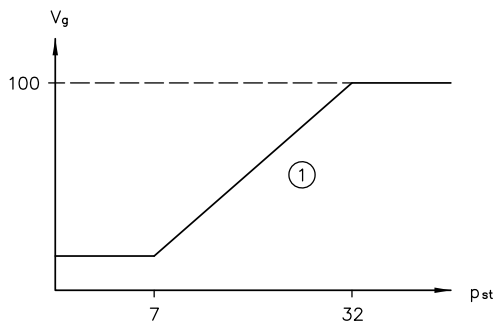
Coding **V**



I current (mA); V_g geometric displacement (%)

1 Hysteresis approx. 2 %

Coding **VH**



p_{st} pilot pressure (bar); V_g geometric displacement (%)

1 Hysteresis approx. 4 %

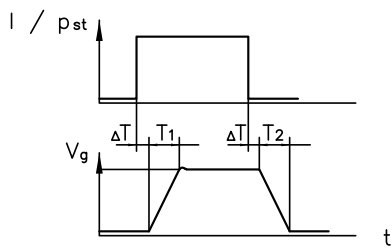
i NOTE

$Q = 0$ lpm possible through the use of an auxiliary pump.

At $V_g = 0$ cm³/rev, additional rinsing via the drain port is required to ensure sufficient lubrication of the pump.

Recommended flow rate: 2 lpm (V30D-045/075), 3 lpm (V30D-095/115), 4 lpm (V30D-140/160) or 5 lpm (V30D-250)

Response time

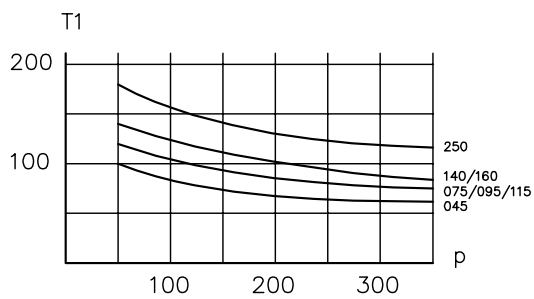


ΔT = Delay

T_1 = On-stroke time 0 to max.

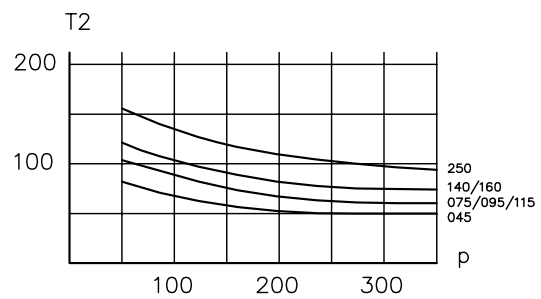
T_2 = On-stroke time max. to 0

Acting time T_1 (ms)



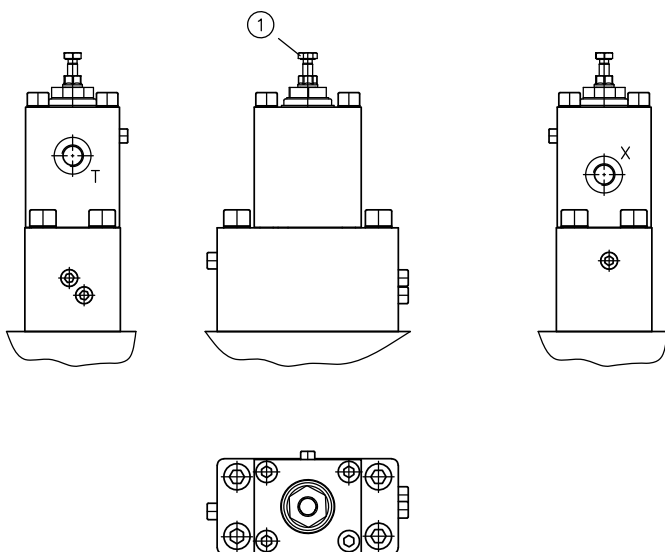
p pressure (bar); acting time T_1 (ms)

Acting time T_2 (ms)



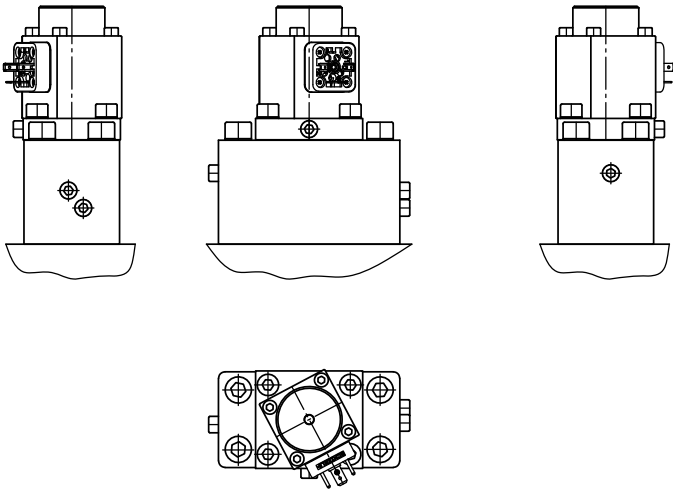
p pressure (bar); acting time T_2 (ms)

Coding VH



1 Stroke limitation control valve

Coding V



2.2.4 Controller N, P, Pb and PD5

The N, P, Pb and PD5 controllers are pressure controllers. As soon as the pump pressure exceeds the set value, they reduce the pivoting angle of the pump and regulate a constant pressure level.

Depending on the controller type, the pressure setting takes place either via a setting screw directly on the controller or via an external pilot valve.

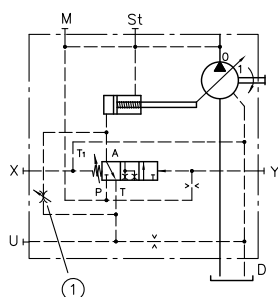
- **N:** The pressure setting takes place via a setting screw directly on the controller.
- **P:** The pressure setting takes place via an external pilot valve connected to the controller via a control port.
- **Pb:** The pressure setting takes place via an external pilot valve connected to the controller via a control port. The pressure in the P line is recorded outside the pump.

It is really only useful for extremely vibration-prone systems (e.g. accumulator systems).

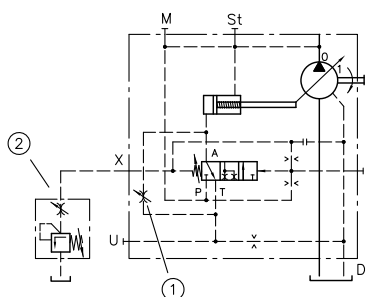
- **PD5:** Parallel pressure controller. The PD5 controller is used if several pumps supply the same consumer. It regulates the same geometric displacement on all pumps. The pressure setting takes place via an external pilot valve connected to the controllers via a control ports.

The pressure controllers can either be used in constant pressure systems or as low-loss pressure limitation in combination with a flow controller (e.g. type V or VH).

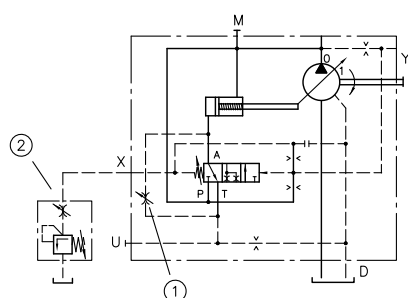
Coding N



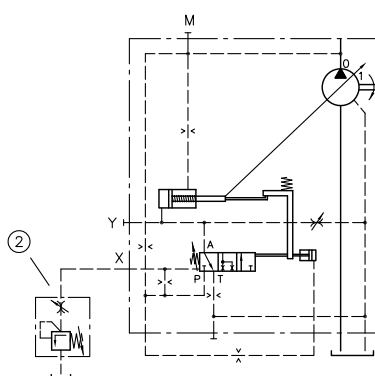
Coding P



Coding Pb

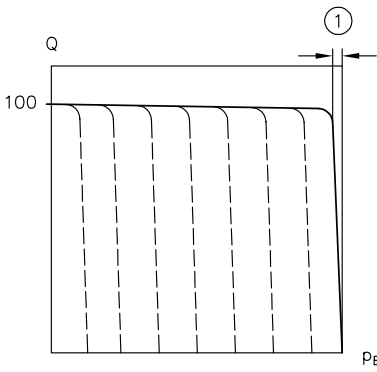


Coding PD5



- 1 Bypass throttle
- 2 External pressure-limiting valve (not included in scope of delivery)

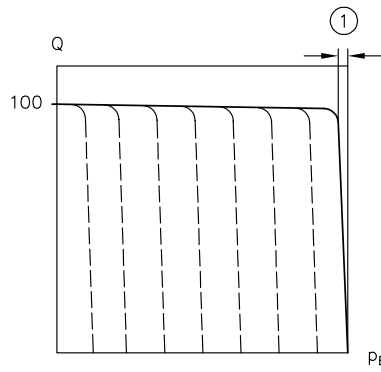
Characteristic curve **N, P, Pb**



p_B operating pressure (bar); Q delivery flow (%)

1 Approx. 3 bar

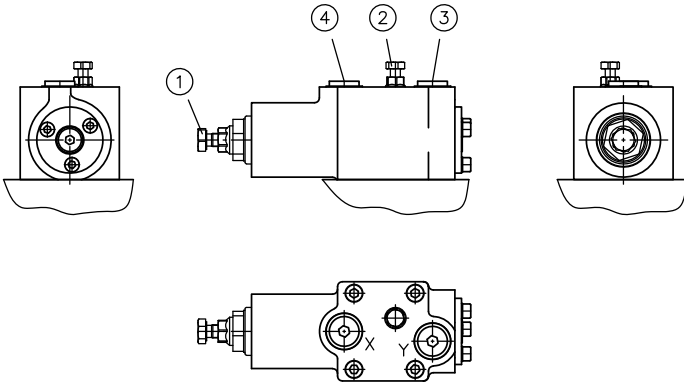
Characteristic curve **PD5**



p_B operating pressure (bar); Q delivery flow (%)

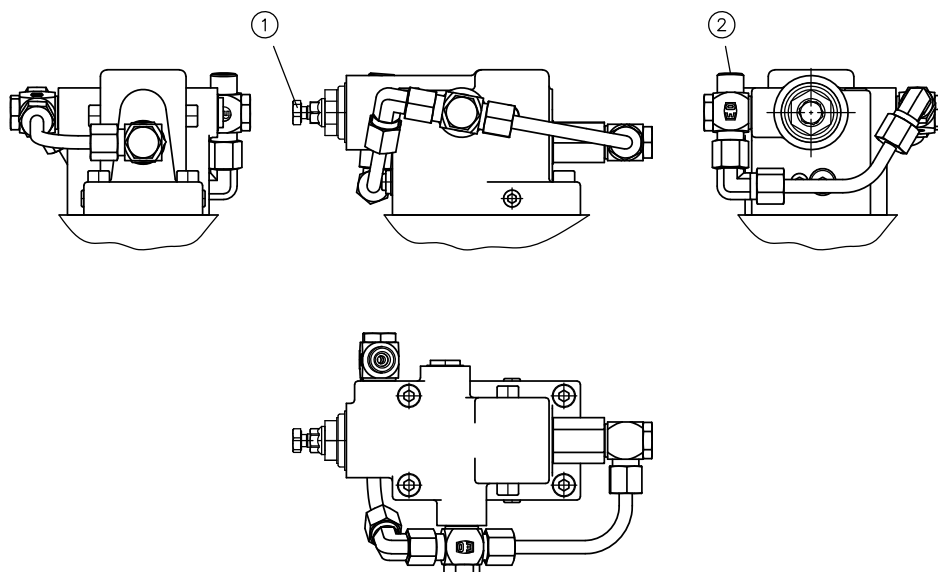
1 Approx. 12 bar

Coding **N, P, Pb**



- 1 Pressure setting p
- 2 Bypass throttle
- 3 Y-port: For coding N and P with tapped plug closed
- 4 X port: For coding N with tapped plug closed

Coding PD5



1 Pressure setting p

2 X port

Pressure adjustment

	Pressure range (bar)	Δp (bar)/revolution	Factory-set pressure setting (bar)
N 250 ¹⁾	50 to 200	Approx. 50	200
N 400 ¹⁾	100 to 350	Approx. 100	300
P, Pb, PD5		Approx. 15	15

1) Depending on the pressure setting, either a weak spring (N250) or a strong spring (N400) is installed.

CAUTION

Risk of injury on overloading components due to incorrect pressure settings!

Risk of minor injury.

- Always monitor the pressure gauge when setting and changing the pressure.

NOTE

Loosen the lock nut sufficiently before setting so that the sealing ring is not damaged.

2.2.5 Controller L, Lf and Lf1

The L, Lf and Lf1 controllers are power controllers. As soon as the product of geometric displacement and pressure exceeds the set value, the controller reduces the pivoting angle of the pump to protect the drive shaft, motor or gearbox from overload ($p_B \times V_g = \text{constant}$).

The setting is made either as a torque limitation (Nm) or power limitation (kW) at the corresponding rotation speed (rpm).

Drive torque

$$M = \frac{V_g \cdot \Delta p}{20 \cdot \pi \cdot \eta_{mh}} \text{ (Nm)}$$

Drive power

$$P = \frac{2\pi \cdot M \cdot n}{60000} = \frac{Q \cdot \Delta p}{600 \cdot \eta_t} \text{ (kW)}$$

M = Torque (Nm)

V_g = Geometric output volume (cm³/rev)

Δp = Differential pressure

p_B = Operating pressure

P = Power (kW)

Q = Flow rate (lpm)

n = Rotation speed (rpm)

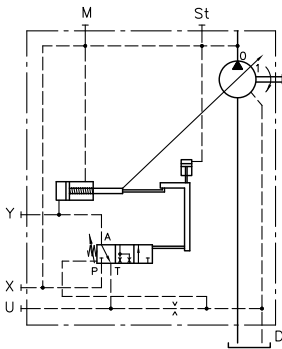
η_v = Volumetric efficiency

η_{mh} = Mechanical-hydraulic efficiency

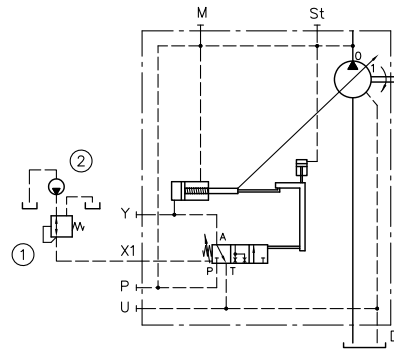
η_T = Overall efficiency $\eta_T = \eta_v \cdot \eta_w$

- **L**: Power controller with fixed setting value
- **Lf**: Hydraulically adjustable power controller with increasing characteristic curve
- **Lf1**: Hydraulically adjustable power controller with decreasing characteristic curve

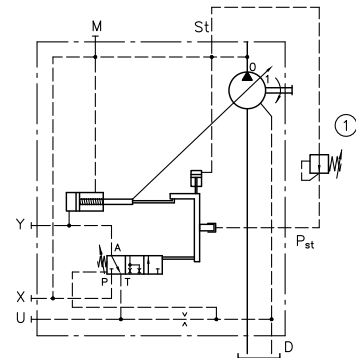
Coding L



Coding Lf

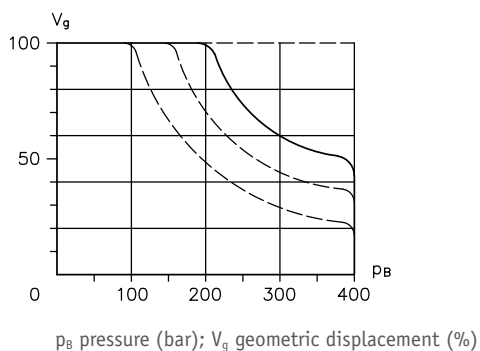


Coding Lf1



- 1 External pressure reducing valve (not included in scope of delivery)
- 2 External auxiliary pump (not included in scope of delivery)

Coding L, Lf, Lf1

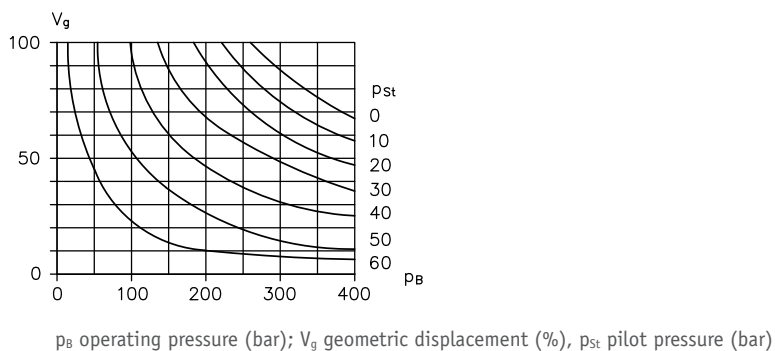


Smallest recommended nominal torque setting (only valid for versions without additional controllers)

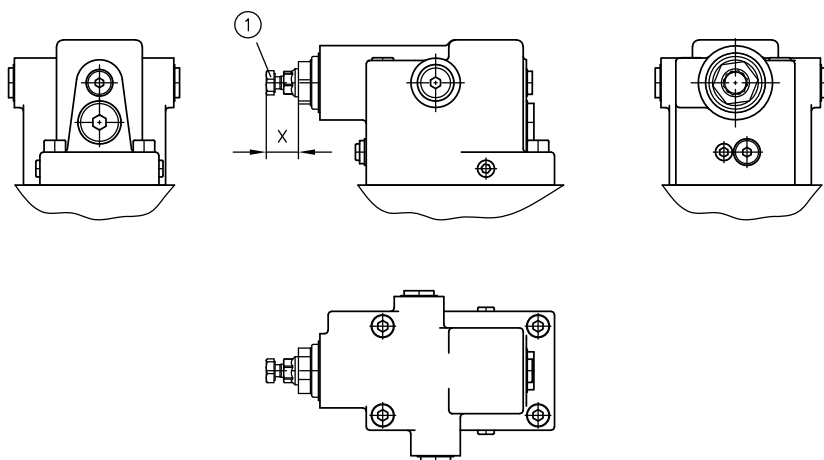
Coding	Nm	Corresponds to kW/ rpm
045	40	6/1500
075	70	11/1500
095/115	99	15/1500
140/160	146	22/1500
250	271	41/1500

Coding Lf1

rough reference values for the remote setting of the Lf1 controller

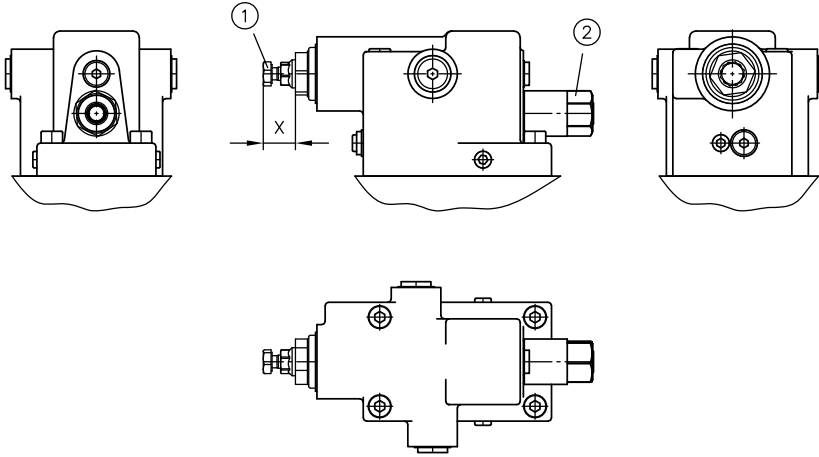


Coding L



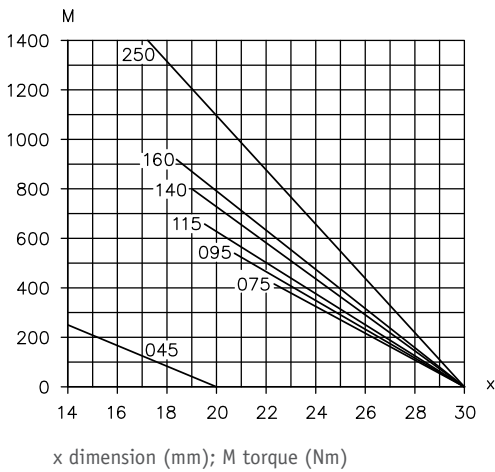
1 Torque setting

Coding Lf, Lf1



- 1 Differential pressure Δp (stand-by pressure)
- 2 p_{St} port

Coding L, Lf, Lf1



i NOTE

Loosen the lock nut sufficiently before setting so that the sealing ring is not damaged.

3 Parameters

3.1 General

Designation	Variable displacement axial piston pump
Design	Axial piston pump according to the swash plate principle
Mounting	Mounting flange according to DIN ISO 3019-1 or DIN ISO 3019-2
User interface	Primed
Drive/output torque	See " Max. permissible drive/output torque "
Installation position	Any (for installation information see 5 "Assembly, operation and maintenance recommendations")
Rotation direction	Right, left or on both sides
Connections	<ul style="list-style-type: none"> ▪ Suction port ▪ Pressure connection ▪ Drain port ▪ Pressure gauge connection
Hydraulic fluid	<ul style="list-style-type: none"> ▪ Hydraulic oil according to Part 1 to 3; ISO VG 10 to 68 according to DIN 51519 ▪ Viscosity range: min. 10; max. 1000 mm²/s optimal operation between 16 and 60 mm²/s ▪ Also suitable for biologically degradable hydraulic fluids type HEPG (polyalkylene glycol) and HEES (synthetic ester) at operating temperatures up to approx. +70°C
Cleanliness level	ISO 4406 20/18/15
Temperatures	<ul style="list-style-type: none"> ▪ Surrounding area: -40°C to +60°C (observe viscosity range) ▪ Oil: - 25°C to +80°C (observe viscosity range) ▪ Start temperature: Down to -40°C permissible (note start viscosities), if the application limits are observed, See "Operating instructions" ▪ Biologically degradable hydraulic fluids: Not above +70°C

Pressure and delivery flow

Operating pressure	See Chapter 2, "Available versions, main data"
Geometric displacement	See Chapter 2, "Available versions, main data"

Weight

Type V30D	Without controller (kg)	With controller (kg)
045	40	46
075	60	66
095	70	76
115	70	76
140	85	91
160	85	91
250	130	136

Additional parameters

Designation		Nominal size						
		045	075	095	115	140	160	250
Max. swash plate angle		17°	17.5°	17°	20°	17.5°	20°	17.5°
Absolute inlet pressure required in open circuit	bar	0.8	0.85	0.85	0.85	0.85	0.85	0.85
Max. permissible housing pressure (static/dynamic)	bar	1 / 2	1 / 2	1 / 2	1 / 2	1 / 2	1 / 2	1 / 2
Max. permissible inlet pressure	bar	25	25	25	25	25	25	25
Max. rotation speed during suction operation and max. swash plate angle at 1 bar abs. Inlet pressure	rpm	2,600	2,400	2,200	2,000	2,200	1,900	1,800
Max. rotation speed with zero stroke and 1 bar abs. Inlet pressure	rpm	3,600	3,200	2,900	2,800	2,600	2,500	2,000
Min. rotation speed in continuous operation	rpm	500	500	500	500	500	500	500
Required drive torque at 100 bar	Nm	77	128	164	197	240	275	430
Drive power at 250 bar and 1450 rpm	kW	30	50	64	77	95	109	174
Inertia torque	kg m ²	0.0056	0.0124	0.0216	0.0216	0.03	0.03	0.0825
Lifetime L ₁₀ of the shaft bearing at 250 bar, 1450 rpm and max. swash plate angle	h	31,000	20,000	17,000	10,000	17,000	10,000	23,000
Noise level at 250 bar, 1450 rpm and max. swash plate angle (measured in acoustic measurement chamber according to DIN ISO 4412-1, measuring distance 1 m)	dB(A)	72	74	75	75	76	76	77

Max. permissible drive/output torque

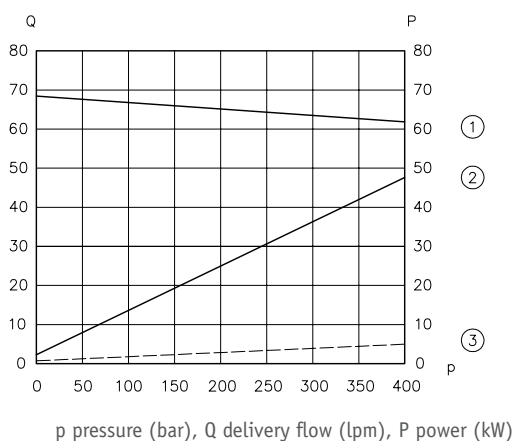
Designation		Nominal size				
		045	075	095/115	140/160	250
Spline shaft D	Drive/output	550 Nm/275 Nm	910 Nm/455 Nm	1200 Nm/600 Nm	1700 Nm/850 Nm	3100 Nm/1550 Nm
Parallel key K	Drive	280 Nm	460 Nm	650 Nm	850 Nm	1550 Nm
Spline shaft S	Drive/output	500 Nm/272 Nm	500 Nm/445 Nm	1200 Nm/600 Nm	1200 Nm/850 Nm	1200 Nm/1000 Nm

3.2 Characteristics

Delivery flow and power (basic pump)

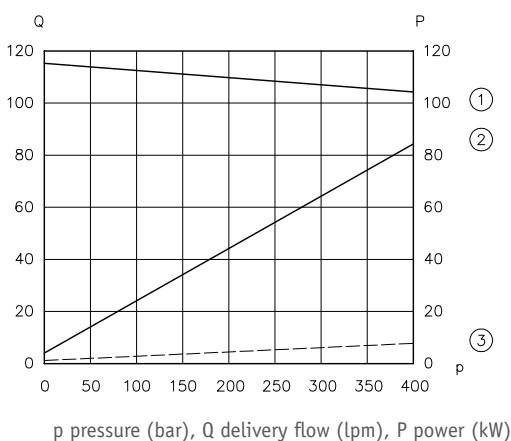
The diagrams show delivery flow and drive power over pressure without a controller at 1450 rpm.

V30D-045



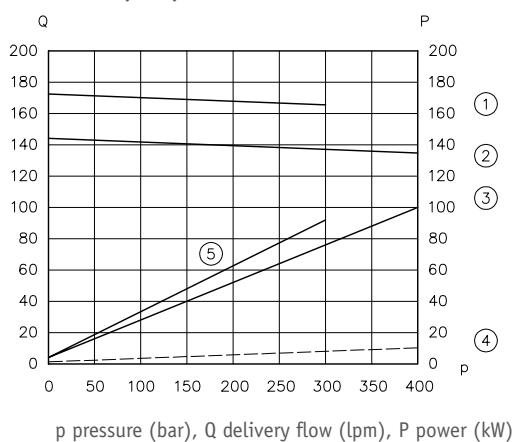
- 1 Delivery flow/pressure
- 2 Drive power/pressure (max. swash plate angle)
- 3 Drive power/pressure (zero stroke)

V30D-075



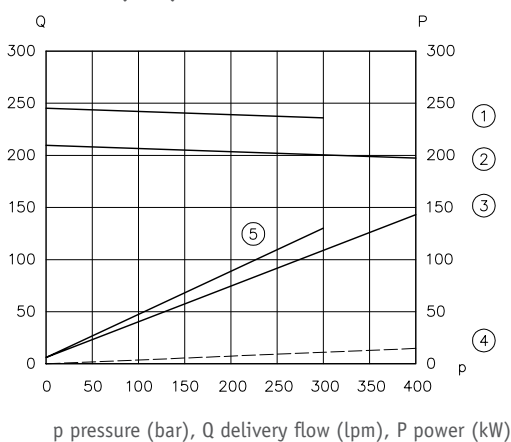
- 1 Delivery flow/pressure
- 2 Drive power/pressure (max. swash plate angle)
- 3 Drive power/pressure (zero stroke)

V30D-095(115)



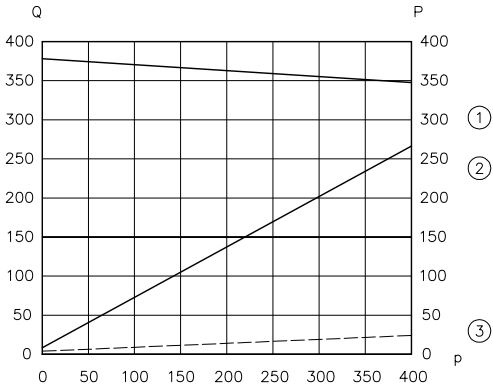
- 1 Delivery flow/pressure (V30D-115)
- 2 Delivery flow/pressure (V30D-095)
- 3 Drive power/pressure (V30D-095, max. swash plate angle)
- 4 Drive power/pressure (V30D-095/115, zero stroke)
- 5 Drive power/pressure (V30D-115, max. swash plate angle)

V30D-140(160)



- 1 Delivery flow/pressure (V30D-160)
- 2 Delivery flow/pressure (V30D-140)
- 3 Drive power/pressure (V30D-140, max. swash plate angle)
- 4 Drive power/pressure (V30D-140/160, zero stroke)
- 5 Drive power/pressure (V30D-160, max. swash plate angle)

V30D-250

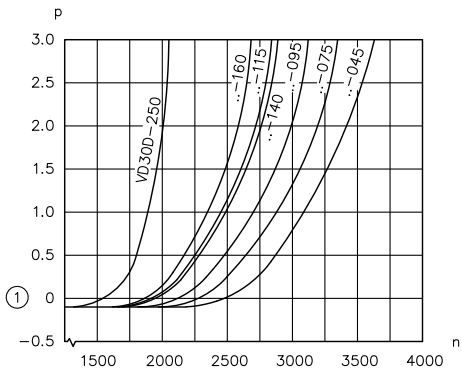


p pressure (bar), Q delivery flow (lpm), P power (kW)

- 1 Delivery flow/pressure
- 2 Drive power/pressure (max. swash plate angle)
- 3 Drive power/pressure (zero stroke)

Inlet pressure and self-suction speed

The diagrams show the inlet pressure/rotation speed at the max. swash plate angle and an oil viscosity of 75 mm²/s.



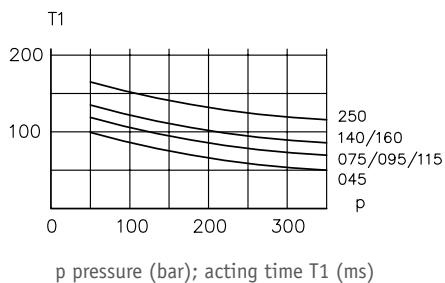
p inlet pressure (bar), n rotation speed (rpm)

- 1 0 bar relative = 1 bar absolute

Acting times

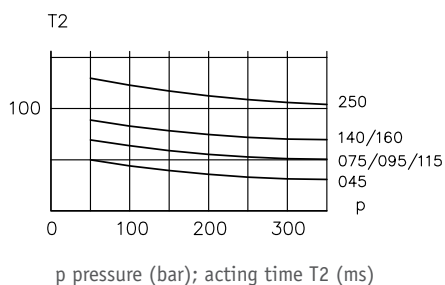
Acting times T1 (LSN controller)

The diagram illustrates the on-stroke time based on the pressure for the LSN controller, i.e. the time required to swing out the pump and to adjust the geometric displacement from the minimum to the maximum.

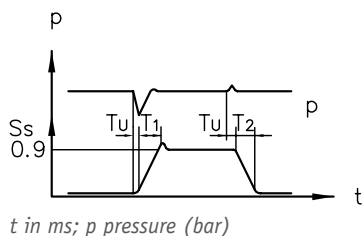


Acting times T2 (LSN controller)

The diagram illustrates the on-stroke time based on the pressure for the LSN controller, i.e. the time required to swing in the pump and to adjust the geometric displacement from the maximum to the minimum.



Acting times Tu, T1 and T2



S_s	= positioning travel of actuator
T_u	= delay < 3 ms
T_1	= on-stroke time
T_2	= destroke time
p	= pressure

LS line approx. 10% of the volume of the P line

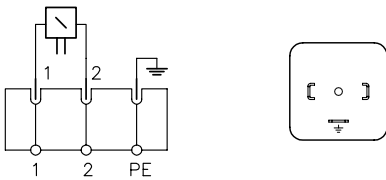
3.3 Electric parameters V30D

Controller coding V

Nominal voltage	12 VDC	24 VDC
Resistance R_{20}	4.6 Ω	21.7 Ω
Current, cold I_{20}	2.6 A	1.2 A
Limit current I_G	1.8 A	0.81 A
Limit power P_G	21.5 W	21.5 W
Actuated time	S1 (100 %)	S1 (100 %)
Dither frequency	50 - 150 Hz	50 - 150 Hz
Dither amplitude $A_D(\%) = \frac{I_{Spitze-Spitze}}{I_G} \cdot 100$	$20 \% \leq A_D \leq 40 \%$	$20 \% \leq A_D \leq 40 \%$

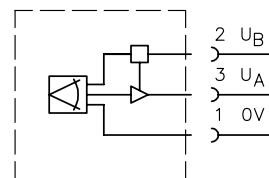
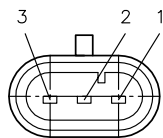
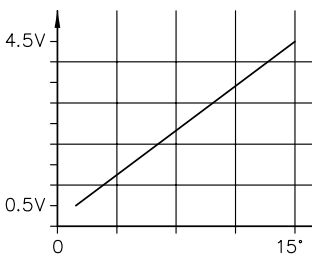
Electrical connection

Coding V



3.4 Pivoting angle pick-up

Pivoting angle pick-up



Operating voltage	U_B 10 to 30 V DC
Output signal	U_A 0.5 to 4.5 V
Tested for automotive field	DIN 40839
Test pulse	1, 2, 3 a/b
Electrical connection	3-PIN AMP Superseal 1.5 plug

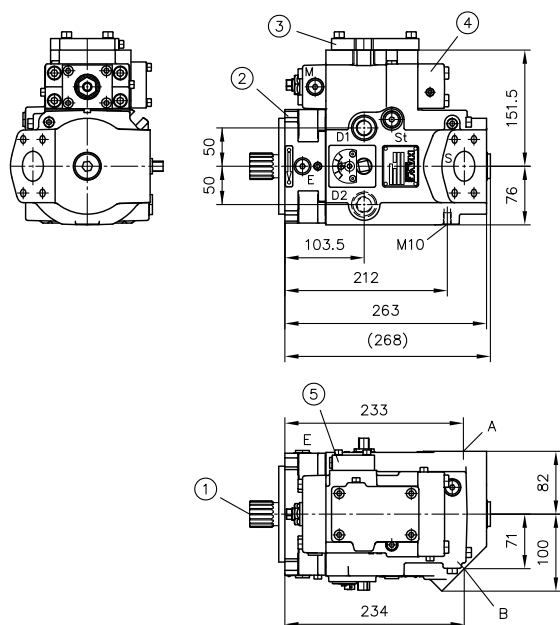
4 Dimensions

All dimensions in mm, subject to change.

4.1 Basic pump

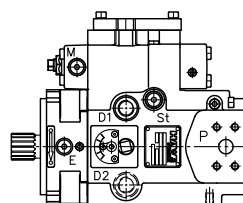
4.1.1 Type V30D-045

Rotating direction **clockwise** (viewed from shaft journal)

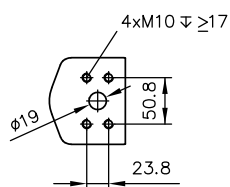


- 1 Shaft version
- 2 Flange version
- 3 Controller for L, Lf1, LSD, PD5
- 4 Controller V, VH
- 5 Controller N, P, Pb, LS, Q, Qb, LSN, LSP

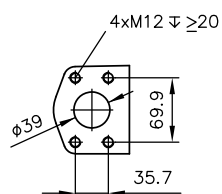
Rotating direction **anti-clockwise** (viewed from shaft journal)



Pressure port



Suction port



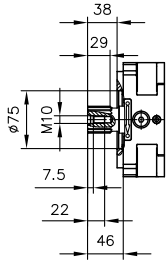
Ports D1, D2, E, M, St (DIN EN ISO 228-1)

D1, D2	Drain port G 1/2 (BSPP)
E	Bleeding and flushing port G 1/4 (BSPP)
M	Measurement fitting G 1/4 (BSPP)
St	Control oil connection G 1/4 (BSPP)

Shaft versions

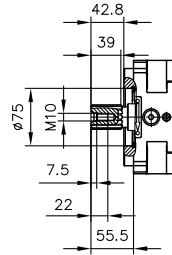
Spline shaft

Coding **D**
(W35x2x16x9g DIN 5480)



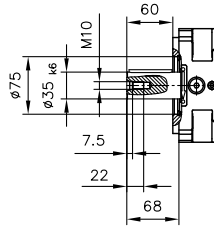
Spline shaft

Coding **S**
(SAE-C J744 14T 12/24 DP)



Parallel key shaft

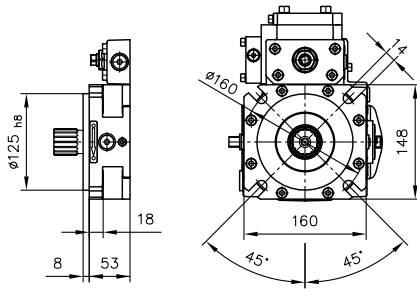
Coding **K**
($\phi 35$ - AS10x8x56 DIN 6885)



Flange versions

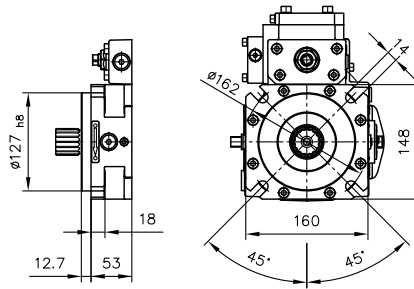
Coding G

(125 B4 HW DIN ISO 3019-2)

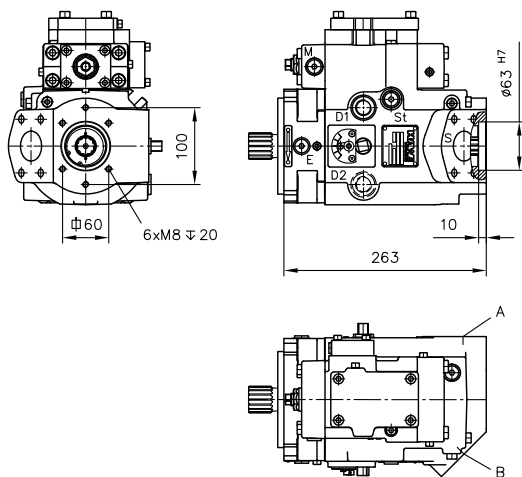


Coding F

(SAE-C 4-hole J744)
(127-4 DIN ISO 3019-1)

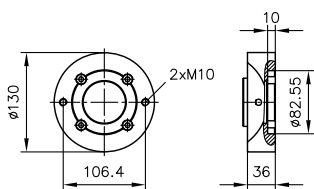


Housing version -2 (with thru-shaft)

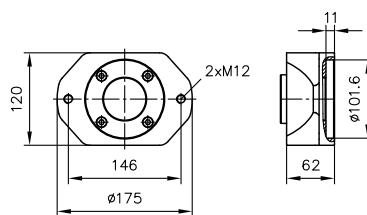


Flange version (output side)

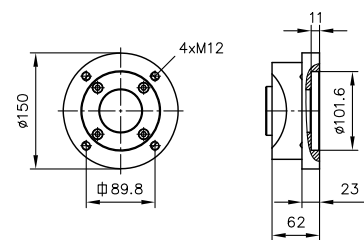
Coding **C411, C412, C413**
(SAE-A 2-hole)



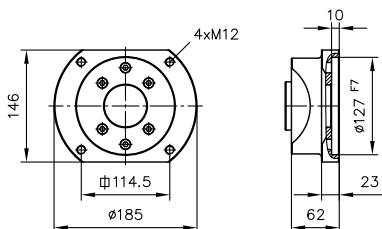
Coding **C414, C416**
(SAE-B 2-hole)



Coding **C415**
(SAE-B 4-hole)

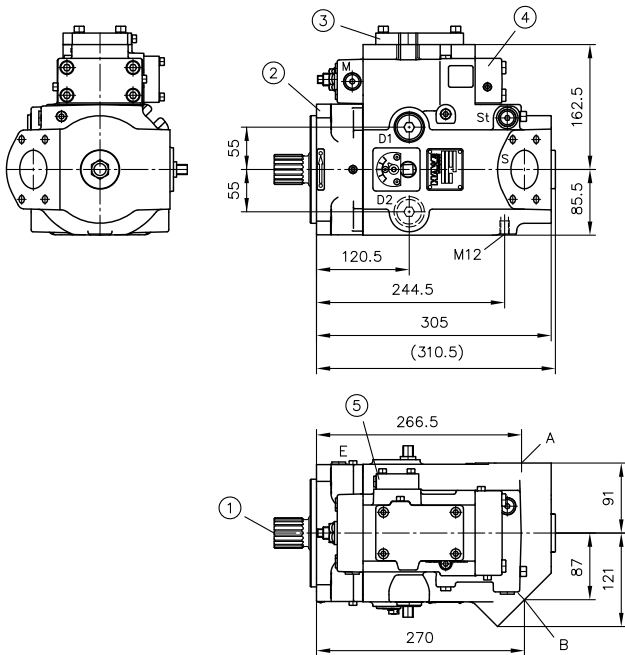


Coding **C418**
(SAE-C 4-hole)

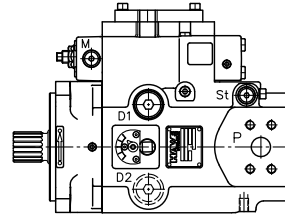


4.1.2 Type V30D-075

Rotating direction **clockwise** (viewed from shaft journal)

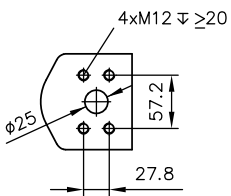


Rotating direction **anti-clockwise** (viewed from shaft journal)

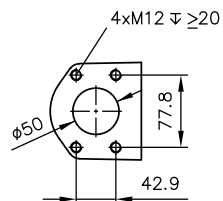


- 1 Shaft version
- 2 Flange version
- 3 Controller for L, Lf1, LSD, PD5
- 4 Controller V, VH
- 5 Controller N, P, Pb, LS, Q, Qb, LSN, LSP

Pressure port



Suction port



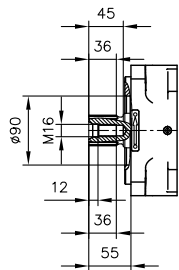
Ports D1, D2, E, M, St (DIN EN ISO 228-1)

D1, D2	Drain port G 1/2 (BSPP)
E	Bleeding and flushing port G 1/4 (BSPP)
M	Measurement fitting G 1/4 (BSPP)
St	Control oil connection G 1/4 (BSPP)

Shaft versions

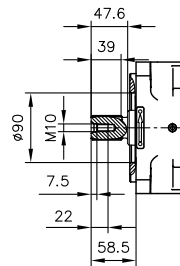
Spline shaft

Coding **D**
(W40x2x18x9g DIN 5480)



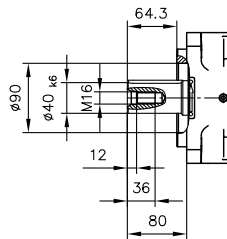
Spline shaft

Coding **S**
(SAE-C J744 14T 12/24 DP)



Parallel key shaft

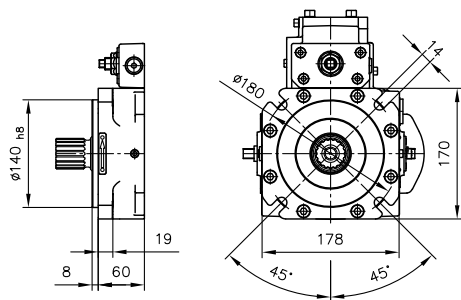
Coding **K**
($\phi 40$ - A12x8x70 DIN 6885)



Flange versions

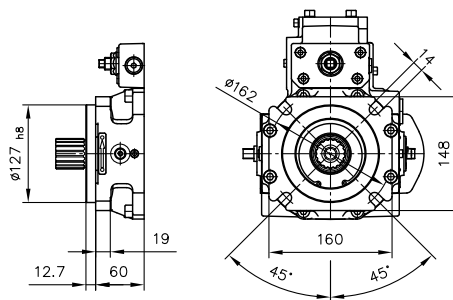
Coding G

(140 B4 HW DIN ISO 3019-2)

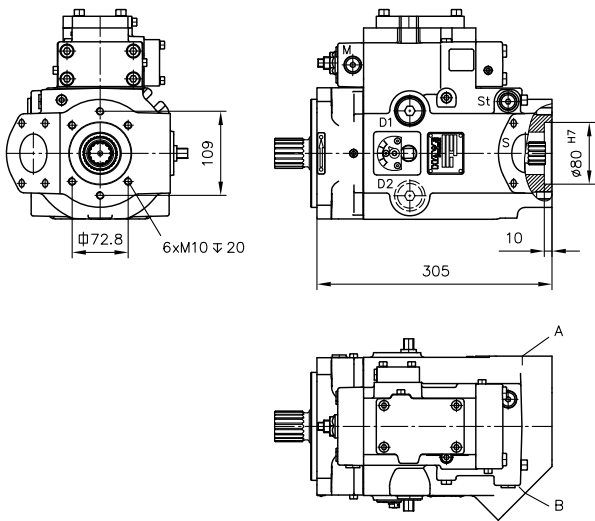


Coding F

(SAE-C 4-hole J744)
(152-4 DIN ISO 3019-1)

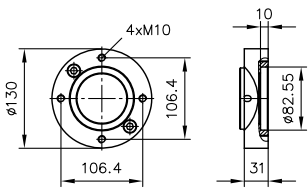


Housing version -2 (radial ports, with thru-shaft)

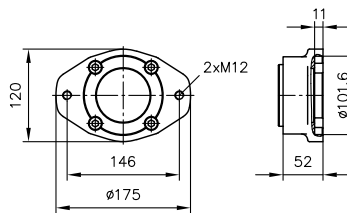


Flange version (output side)

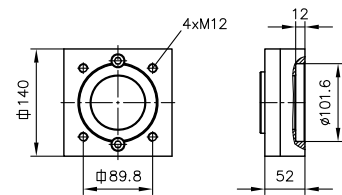
Coding **C421, C422, C423**
(SAE-A 2-hole)



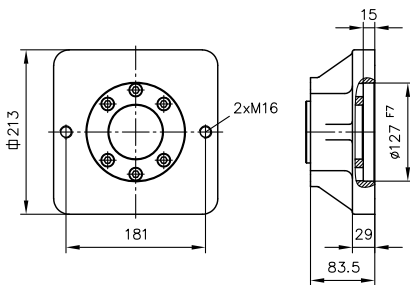
Coding **C424, C426**
(SAE-B 2-hole and SAE-B 4-hole)



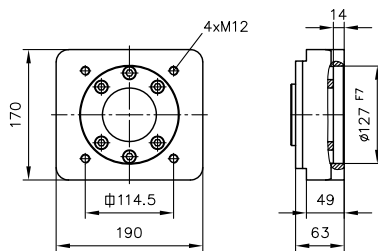
Coding **C425**
(SAE-B 4-hole)



Coding **C427, C429**
(SAE-C 4-hole and SAE-C 2-hole)

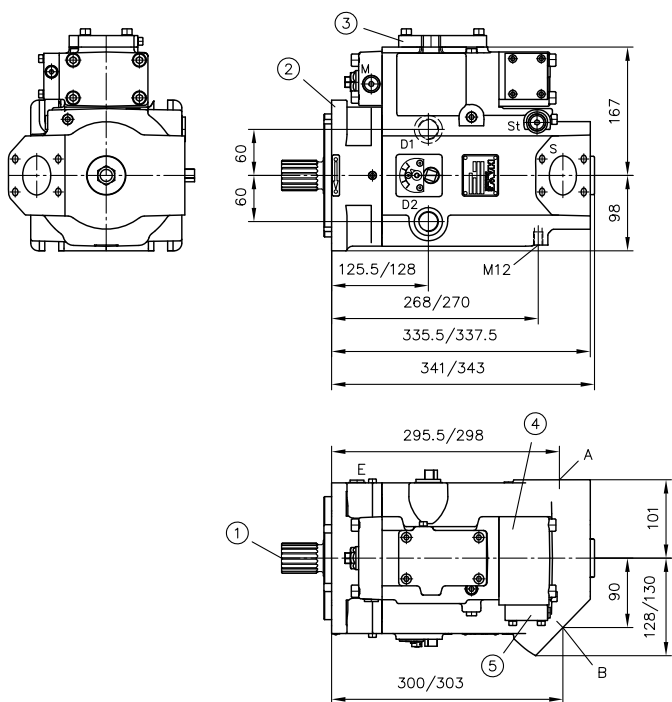


Coding **C428**
(SAE-D 4-hole)

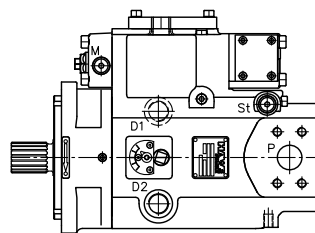


4.1.3 Type V30D-095/115

Rotating direction **clockwise** (viewed from shaft journal)

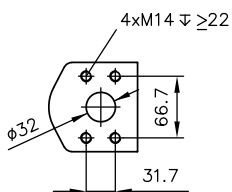


Rotating direction **anti-clockwise** (viewed from shaft journal)

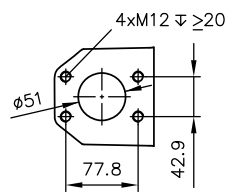


- 1 Shaft version
- 2 Flange version
- 3 Controller for L, Lf1, LSD, PD5
- 4 Controller V, VH
- 5 Controller N, P, Pb, LS, Q, Qb, LSN, LSP

Pressure port



Suction port



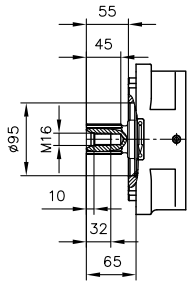
Ports D1, D2, E, M, St (DIN EN ISO 228-1)

D1, D2	Drain port G 3/4 (BSPP)
E	Bleeding and flushing port G 1/4 (BSPP)
M	Measurement fitting G 1/4 (BSPP)
St	Control oil connection G 1/4 (BSPP)

Shaft versions

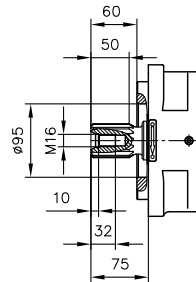
Spline shaft

Coding **D**
(W40x2x18x9g DIN 5480)



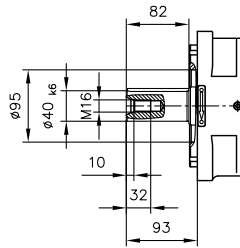
Spline shaft

Coding **S**
(SAE-D J744 13T 8/16 DP)



Parallel key shaft

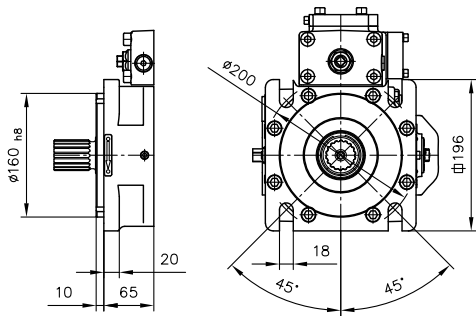
Coding **K**
($\varnothing 40$ - A12x8x80 DIN 6885)



Flange versions

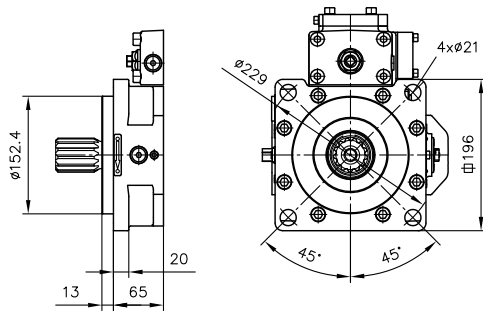
Coding G

(160 B4 HW DIN ISO 3019-2)

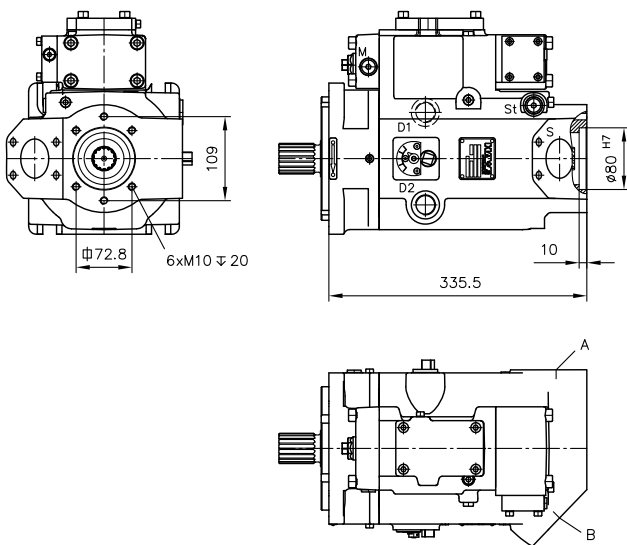


Coding F

(SAE-D 4-hole J 744)
(152-4 DIN ISO 3019-1)

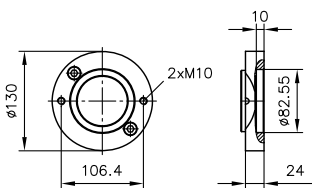


Housing version -2 (radial ports, with thru-shaft)

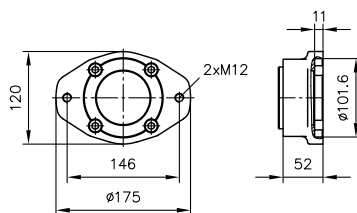


Flange version (output side)

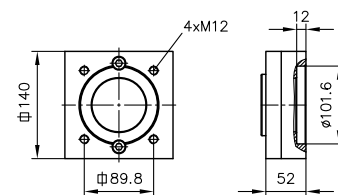
Coding **C431 (C441)**, **C432 (C442)**, **C433 (C443)**
(SAE-A 2-hole)



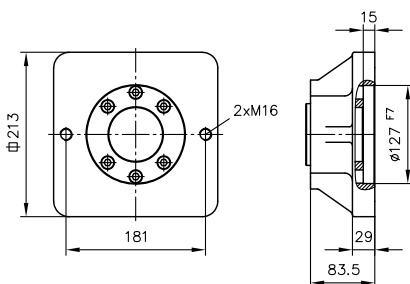
Coding **C434 (C444)**, **C436 (C446)**
(SAE-B 2-hole and SAE-B 4-hole)



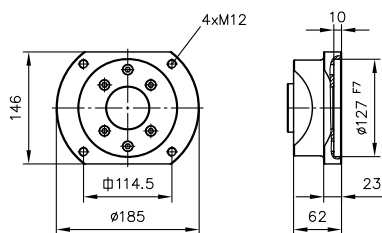
Coding **C435 (C445)**
(SAE-B 4-hole)



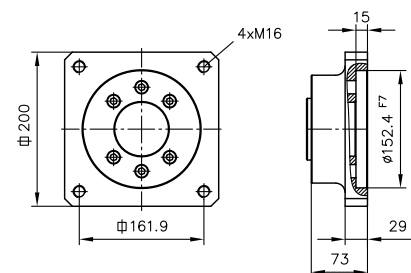
Coding **C437 (C447)**, **C439 (C449)**
(SAE-C 4-hole and SAE-C 2-hole)



Coding **C438 (C448)**
(SAE-D 4-hole)

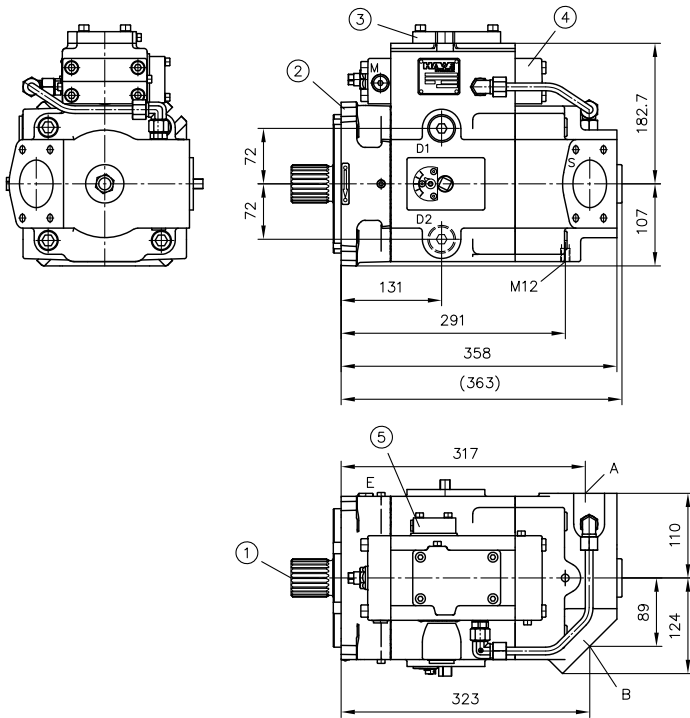


Coding **C440 (C450)**
(SAE-D 4-hole)

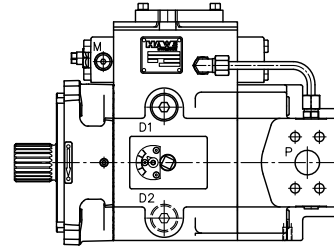


4.1.4 Type V30D-140/160

Rotating direction **clockwise** (viewed from shaft journal)

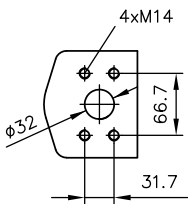


Rotating direction **anti-clockwise** (viewed from shaft journal)

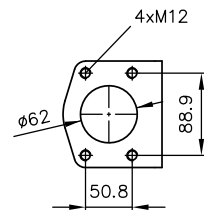


- 1 Shaft version
- 2 Flange version
- 3 Controller for L, Lf1, LSD, PD5
- 4 Controller V, VH
- 5 Controller N, P, Pb, LS, Q, Qb, LSN, LSP

Pressure port



Suction port



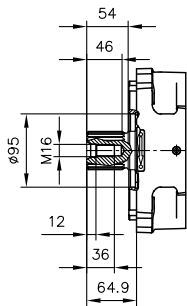
Ports D1, D2, E, M, St (DIN EN ISO 228-1)

D1, D2	Drain port G 3/4 (BSPP)
E	Bleeding and flushing port G 1/4 (BSPP)
M	Measurement fitting G 1/4 (BSPP)
St	Control oil connection G 1/4 (BSPP)

Shaft versions

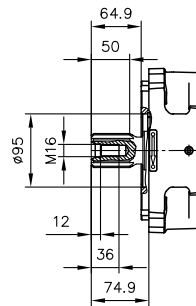
Spline shaft

Coding **D**
(W50x2x24x9g DIN 5480)



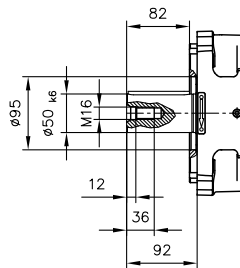
Spline shaft

Coding **S**
(SAE-D J 744 13T 8/16 DP)



Parallel key shaft

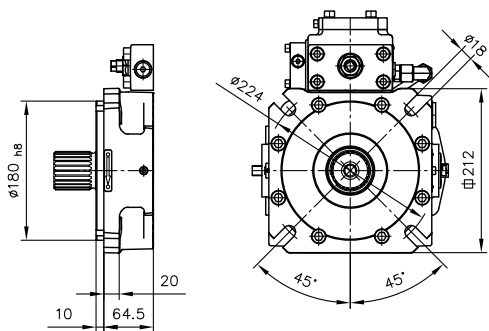
Coding **K**
(Ø50 - AS14x9x80 DIN 6885)



Flange versions

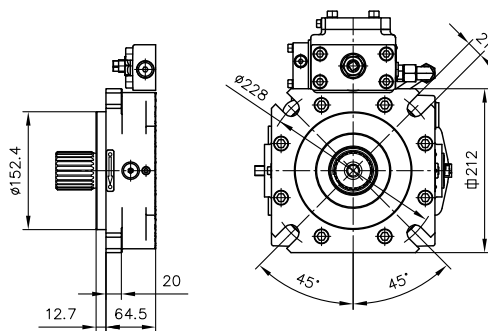
Coding G

(180 B4 HW DIN ISO 3019-2)

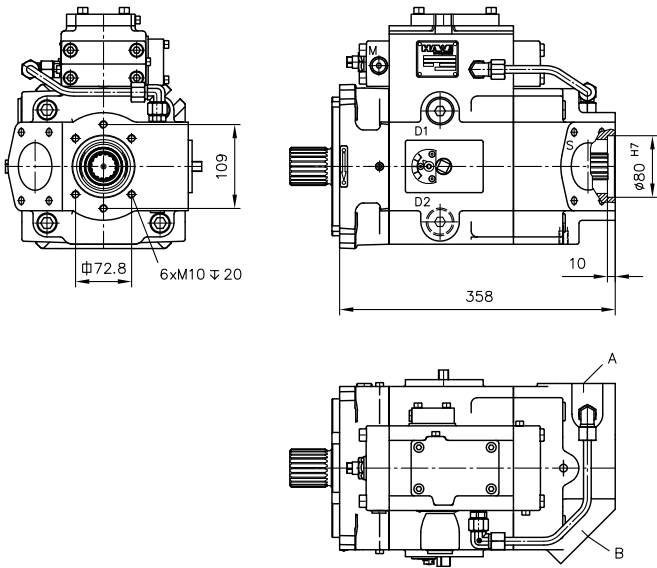


Coding F

(SAE-D 4-hole J 744)
(152-4 DIN ISO 3019-1)

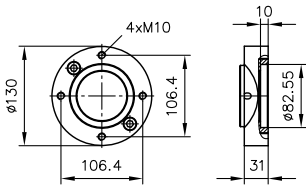


Housing version -2 (radial ports, with thru-shaft)

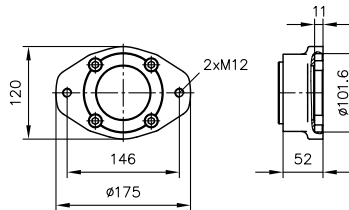


Flange version (output side)

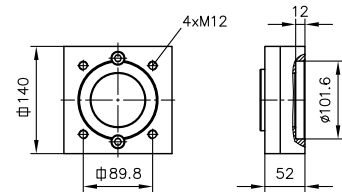
Coding **C451 (C461), C452 (C462), C453 (C463)**
(SAE-A 2-hole)



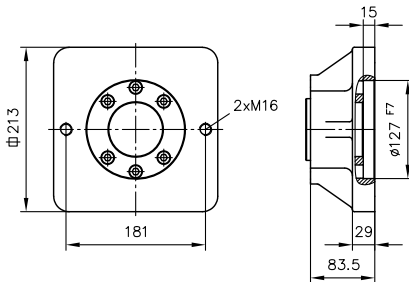
Coding **C454 (C464), C456 (C466)**
(SAE-B 2-hole and SAE-B 4-hole)



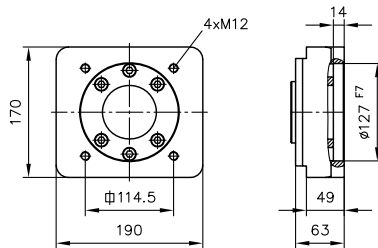
Coding **C455 (C465)**
(SAE-B 4-hole)



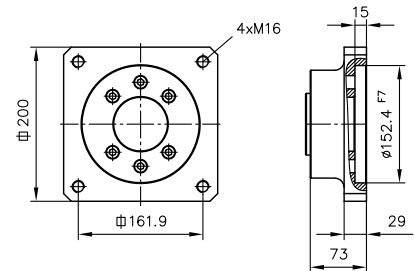
Coding **C457 (C467), C459 (C469)**
(SAE-C 4-hole and SAE-C 2-hole)



Coding **C458 (C468)**
(SAE-D 4-hole)

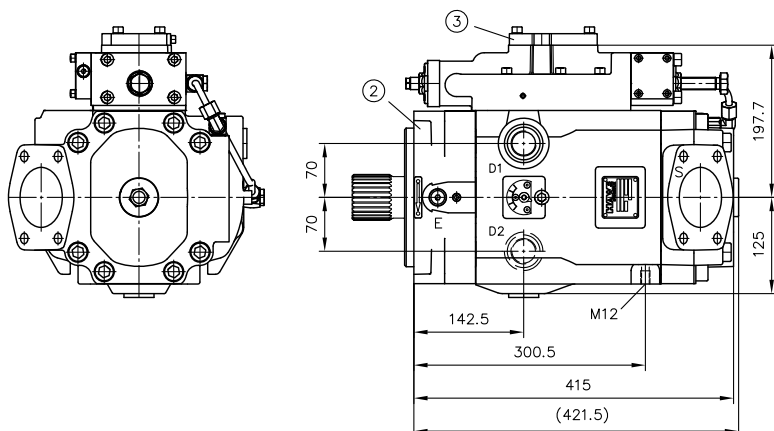


Coding **C460 (C470)**
(SAE-D 4-hole)

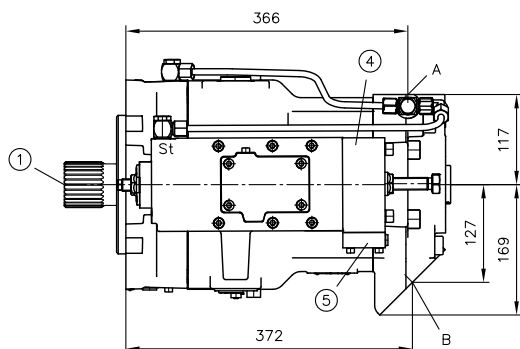
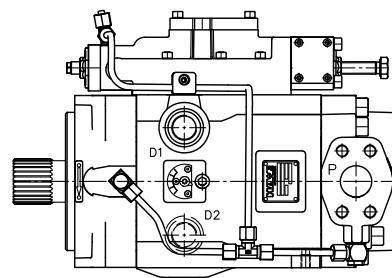


4.1.5 Type V30D-250

Rotating direction **clockwise** (viewed from shaft journal)

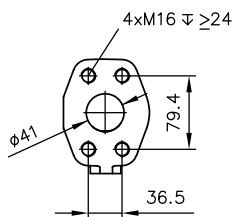


Rotating direction **anti-clockwise** (viewed from shaft journal)

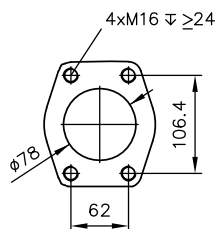


- 1 Shaft version
- 2 Flange version
- 3 Controller for L, Lf1, LSD, PD5
- 4 Controller V, VH
- 5 Controller N, P, Pb, LS, Q, Qb, LSN, LSP

Pressure port



Suction port



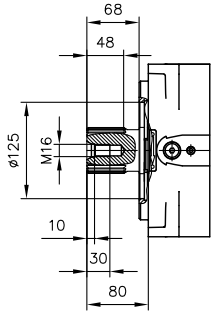
Ports D1, D2, E, St (DIN EN ISO 228-1)

D1, D2	Drain port M33x2
E	Bleeding and flushing port G 1/4 (BSPP)
St	Control oil connection pipe connection Ø8

Shaft versions

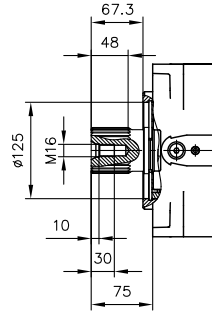
Spline shaft

Coding **D**
(W60x2x28x9g DIN 5480)



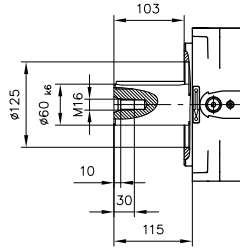
Spline shaft

Coding **S**
(SAE-D J 744 13T 8/16 DP)



Parallel key shaft

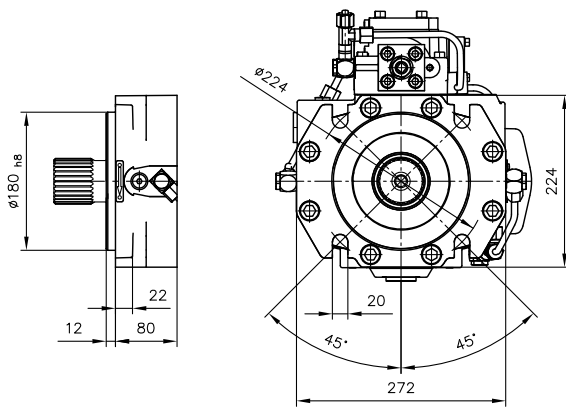
Coding **K**
($\phi 60$ - AS18x11x100 DIN 6885)



Flange versions

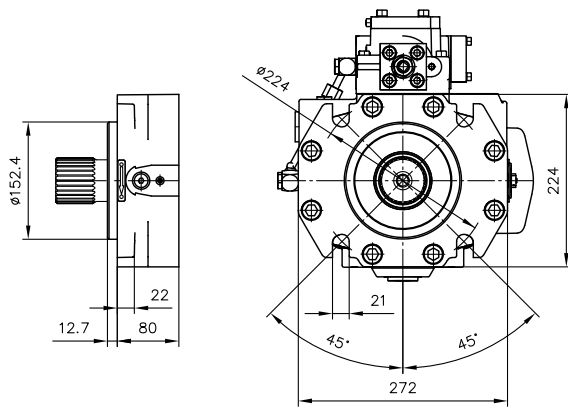
Coding G

(160 B4 INSTR DIN ISO 3019-2)

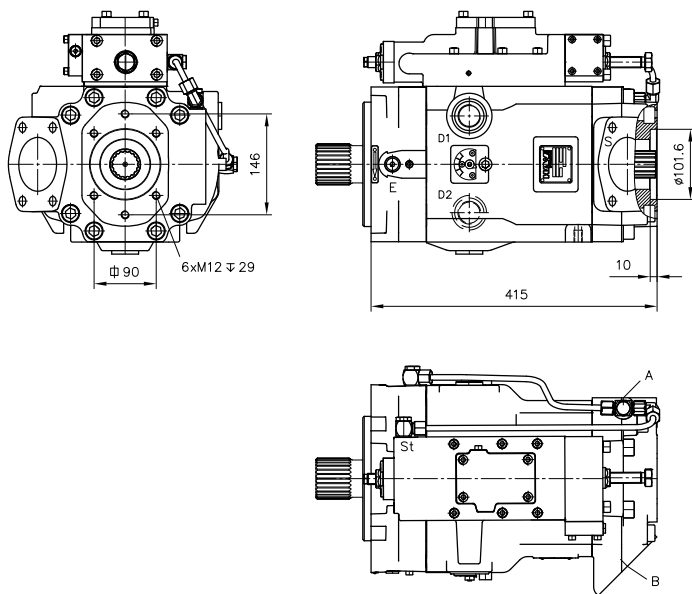


Coding F

(SAE-D 4-hole J 744)
(152-4 DIN ISO 3019-1)

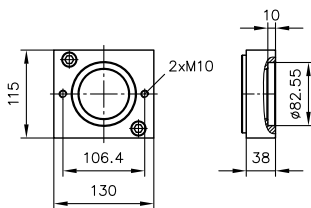


Housing version -2 (radial ports, with thru-shaft)

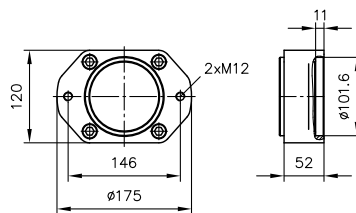


Flange version (output side)

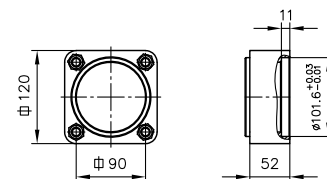
Coding **C471, C472, C473**
(SAE-A 2-hole)



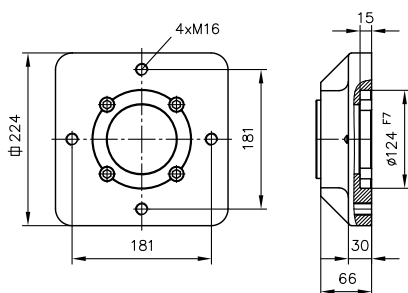
Coding **C474, C476**
(SAE-B 2-hole and SAE-B 4-hole)



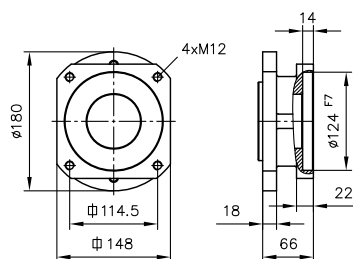
Coding **C475**
(SAE-B 4-hole)



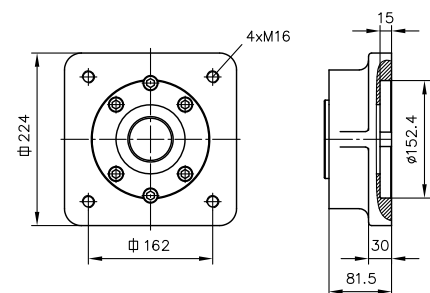
Coding **C477, C479**
(SAE-C 4-hole and SAE-C 2-hole)



Coding **C478**
(SAE-D 4-hole)

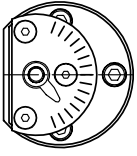


Coding **C480**
(SAE-D 4-hole)

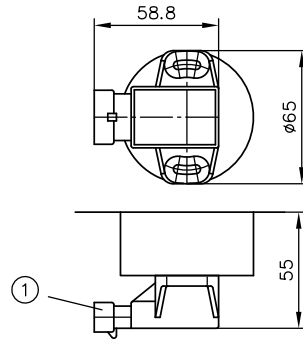


4.2 Swash plate angle indicator

swash plate angle indicator



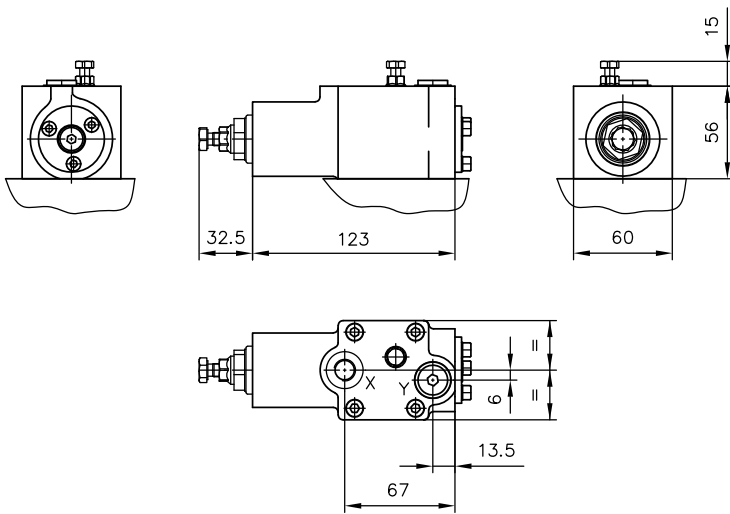
swash plate angle pick-up



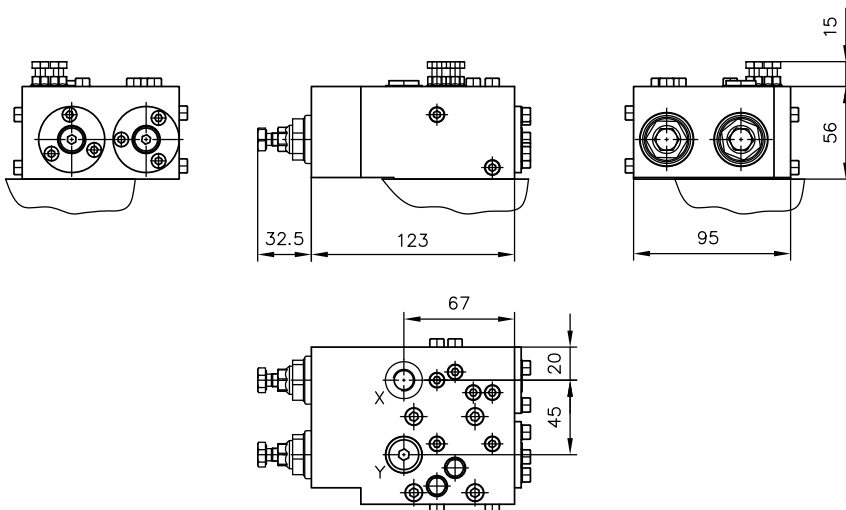
1 3-PIN AMP Superseal

4.3 Controller

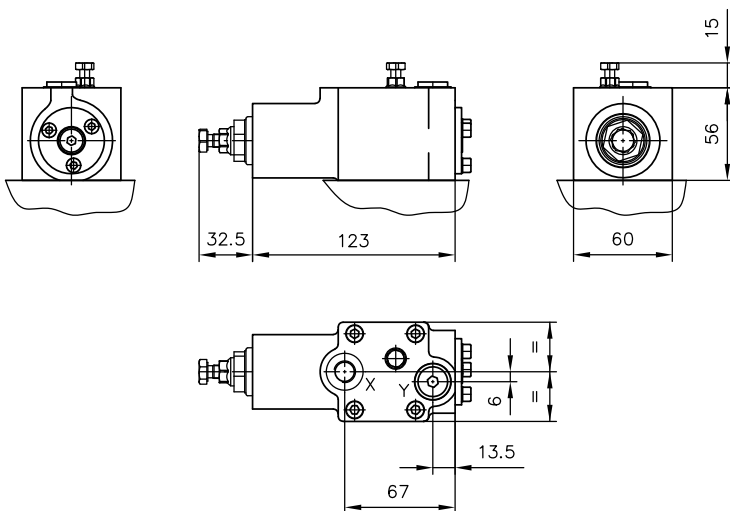
Coding LS



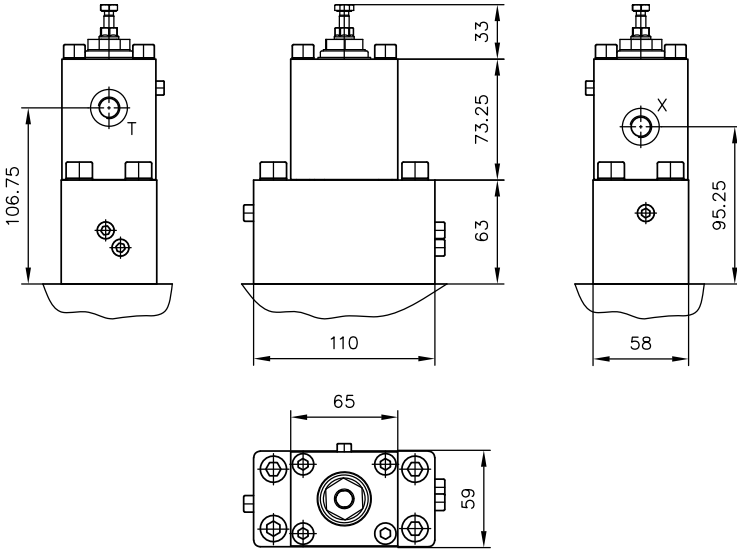
Coding LSN, LSP



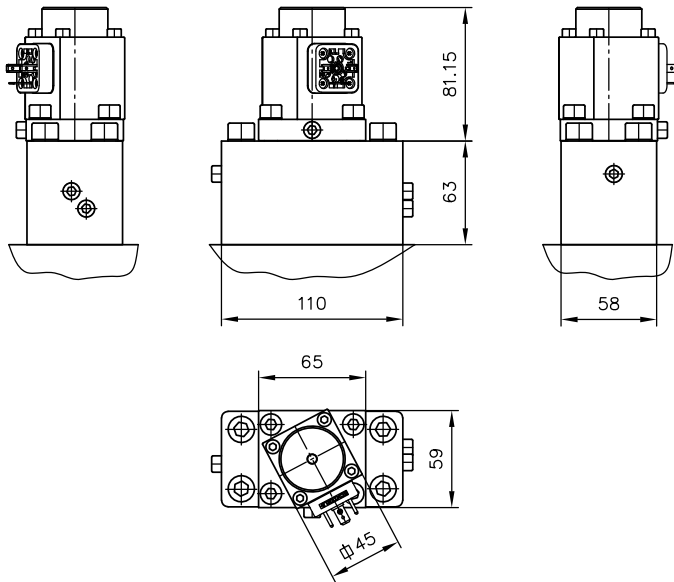
Coding Q, Qb



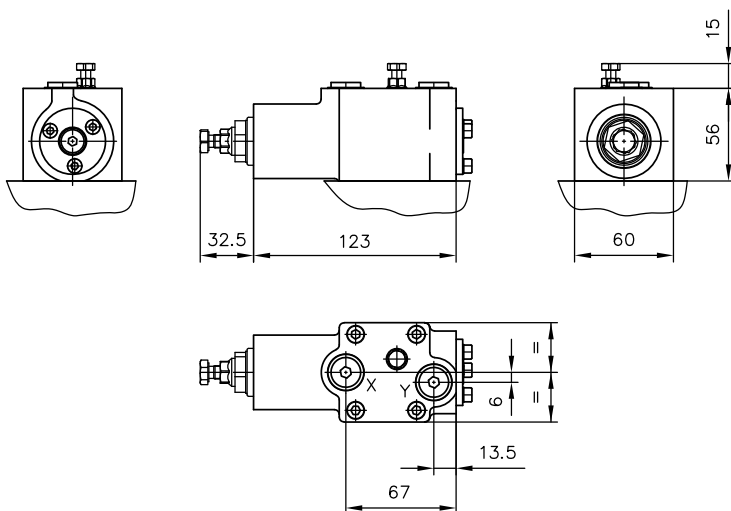
Coding **VH**



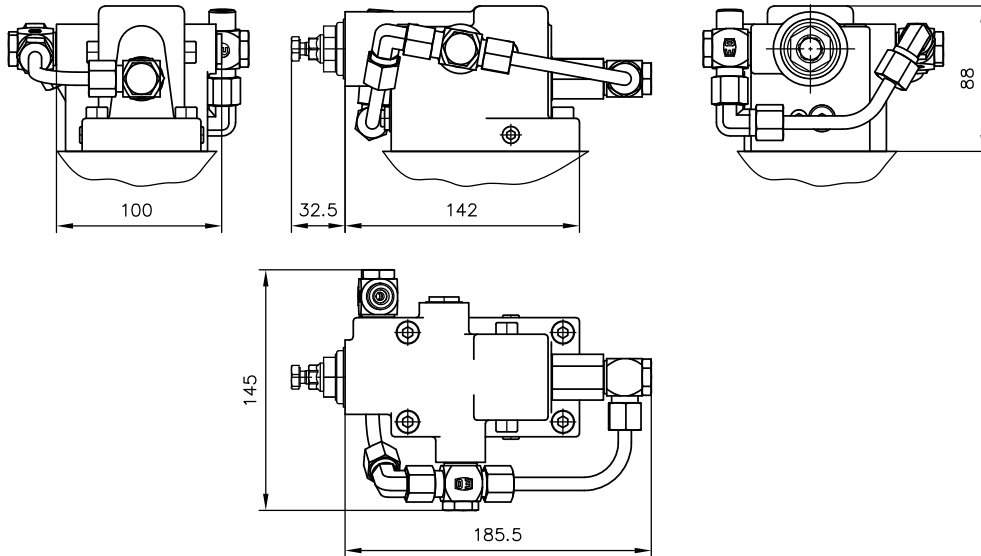
Coding **V**



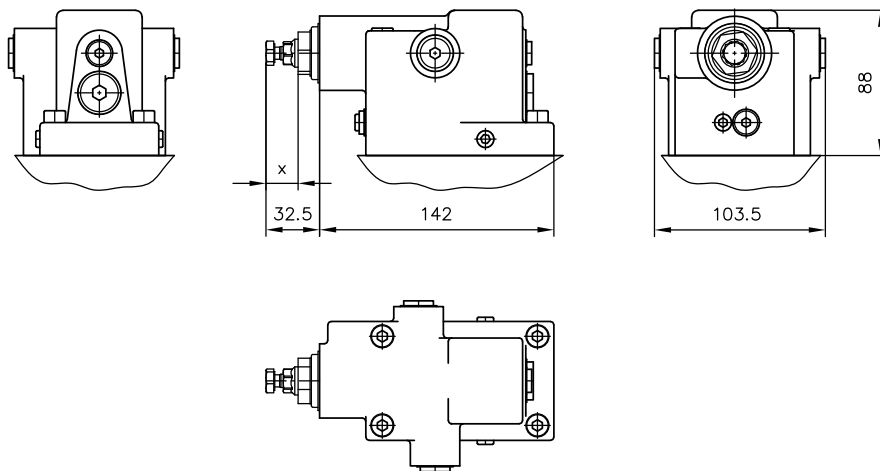
Coding **N, P, Pb**



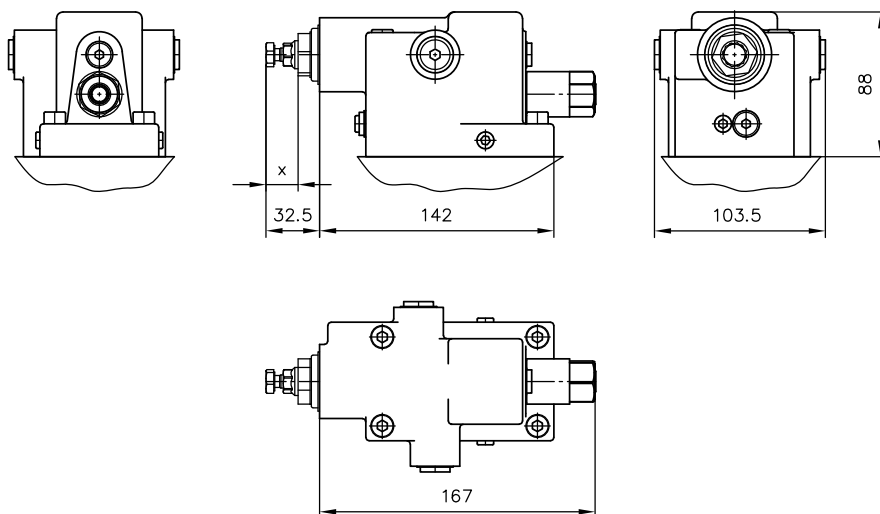
Coding PD5



Coding L



Coding Lf1



5.1 Intended use

This product is intended exclusively for hydraulic applications (fluid technology).

The user must observe the safety measures and warnings in this documentation.

Essential requirements for the product to function correctly and safely:

- All information in this documentation must be observed. This applies in particular to all safety measures and warnings.
- The product must only be assembled and put into operation by qualified personnel.
- The product must only be operated within the specified technical parameters. The technical parameters are described in detail in this documentation.
- The operating and maintenance manual of the components, assemblies and the specific complete system must also always be observed.

If the product can no longer be operated safely:

1. Remove the product from operation and mark it accordingly.
- ✓ It is then not permitted to continue using or operating the product.

5.2 Assembly information

The product must only be installed in the complete system with standard and compliant connection components (screw fittings, hoses, pipes, fixtures etc.).

The product must be shut down correctly prior to dismantling (in particular in combination with hydraulic accumulators).

**DANGER****Risk to life caused by sudden movement of the hydraulic drives when dismantled incorrectly!**

Risk of serious injury or death.

- Depressurise the hydraulic system.
- Perform safety measures in preparation for maintenance.

5.2.1 General information

The V30D variable displacement axial piston pump is designed for use in an open circuit. It can be mounted using a mounting flange in accordance with ISO 3019-1 or DIN ISO 3019-2.

During assembly, note the following principles:

Only trained persons are allowed to mount or remove the pump. Always ensure absolute cleanliness to prevent contamination from affecting the pump.

- Remove all plastic plugs before operation.
- Avoid installation above the tank (see installation positions in [Chapter 5.2.3, "Installation positions"](#)).
- For electric reference values Suction intakes must be adhered to.
- Before initial use, fill the pump with hydraulic fluid and bleed. Automatic pump filling via the suction line by opening the drain ports is not possible.
- Never drain the pump.
- Always supply the pump with hydraulic fluid from the start. Even just a short period with insufficient hydraulic fluid can damage the pump. Such damage is not immediately visible once the pump is put into operation.
- Hydraulic fluid which flows back into the tank must not be sucked back in immediately (install baffles!).
- Before first use, run the pump for approx. 10 minutes at max. 50 bar after initial start-up.
- Do not use the entire pressure range of the pump until it has been thoroughly bled and flushed.
- From the start, always keep the temperature within the specified range (see [Chapter 3, "Parameters"](#)). Never exceed the maximum temperature.
- Always comply with the cleanliness level of the hydraulic fluid. In addition, always filter the hydraulic fluid appropriately (see [Chapter 3, "Parameters"](#)).
- Self-installed filters in the suction line must be approved beforehand by HAWE Hydraulik.
- A system pressure-limiting valve must be installed in the pressure line so that the maximum system pressure is not exceeded.

5.2.2 Connections

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 rotation speed of the pump. In principle we recommend the use of hose lines due to the superior damping characteristics.

Bleeding and flushing port

V30D pumps are fitted with two G1/4 (BSPP) bleeding and flushing ports. These are used to bleed and flush the front shaft bearing in the case of vertical installation.

Pressure connection

The pressure connection takes place via SAE ports, see [Chapter 4, "Dimensions"](#). Metric attachment threads are used in deviation from the standard.

Observe the tightening torque specified by the fitting manufacturer.

Suction port

The suction port can be established via SAE ports for the pump; see [Chapter 4, "Dimensions"](#). Metric attachment threads are used in deviation from the standard.

If possible, route the suction line to the tank on a rising gradient. This allows trapped air to escape. Observe the specifications in Installation positions [Chapter 5.2.3, "Installation positions"](#). The absolute suction pressure must not fall below 0.85 bar. A hose line should generally be used in preference to a rigid pipe.

Drain port

The V30D pumps have 2 drain ports G 1/2 (BSPP), G 3/4 (BSPP) or M33.

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

Integrate the leakage line in the system in such a way as to prevent direct connection with the suction line of the pump.

All drain ports can be used simultaneously.

A separate leakage line from the controller to the tank is not required. Observe the specifications in [Chapter 5.2.3, "Installation positions"](#).

The top drain port can be used to fill the housing.

LS port with version LS, LSN, LSP, Q and Qb

The LS line is connected to the controller via a G 1/4 (BSPP) threaded connection.

The nominal width of the line depends on the installation position of the pump and should be 10% of the pressure line capacity. A hose line should generally be used in preference to a rigid pipe connection.

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

For operation with HFC (35 - 50 % water content) the following restrictions apply

- The tank is above the pump
- The temperature does not exceed 50°C
- The fluid velocity in the suction line is below 1 m/s
- Pump pressure maximum 200 bar
- The two shaft bearings of the pump are each flushed with a separate supply of cool oil, per bearing with 2 lpm (V30D-045/075), 3 lpm (V30D-095/115), 4 lpm (V30D-140/160) and 5 lpm (V30D-250)

For operation with liquids with a water content $\leq 20\%$ the following restrictions apply

- The tank is above the pump
- The tank temperature does not exceed 70°C
- The fluid velocity in the suction line is below 1 m/s
- Pump pressure maximum 300 bar
- Possible without bearing flushing

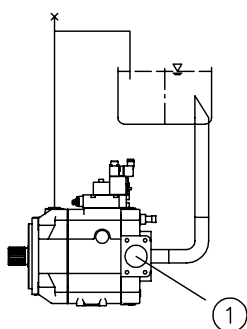
5.2.3 Installation positions

The V30D variable displacement axial piston pump can be mounted in any installation position.

A support is required for tandem pumps or multiple hydraulic pumps mounted in series (see [Chapter 5.2.1, "General information"](#)). The following points must be observed:

Horizontal installation: (pump below the min. fill level)

⇒ For horizontal installation, use the uppermost drain port



Vertical installation: (pump below the min. fill level)

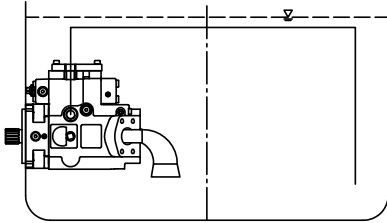
- ⇒ Assemble the pump so that the pump mounting flange is facing upwards.
- ⇒ For vertical installation, use the uppermost drain port.
- ⇒ Also connect the G 1/8" (BSPP) bleeding port on the pump flange (see [Chapter 4, "Dimensions"](#)).
- ⇒ Take appropriate measures to ensure continuous bleeding of this line (line routing/bleeding).

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

5.2.4 Tank installation

Tank installation (pump below the min. fill level)

The pump can be operated either with or without a suction intake. It is recommended to use a short suction intake (see [D 7960 N](#), 6.1.1 Suction intakes).

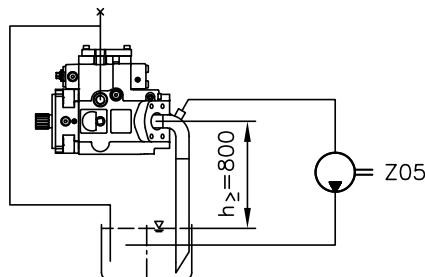
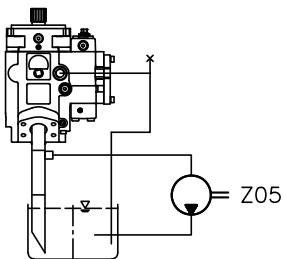


Additional notes regarding installation above the fill level

Special measures are required if the pump is installed above the fill 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.

- The leakage line must be installed in the tank in such a way that it ends below the oil level.
- Facilitate bleeding of connecting lines via separate bleed openings.
- Adjust the bleeding sequence to the specific installation.
- If necessary, a gear pump should be provided in order to draw air from the suction line.

For specialist advice on designing axial piston pumps, the following contact form is available:
[Checklist for designing variable displacement axial piston pumps: B 7960 checklist.](#)



For further information on installation, operation and maintenance, see the relevant assembly instructions:
[B 7960](#), [B 5488](#).

5.3 Operating instructions

Restrictions in operation during cold start phase and warm-up phase

Phase	Temperature	Viscosity (mm ² /s)
Cold start phase	-25 -40°C	< 1000
Warm-up phase	-25 80 °C	500 ... 1000
Normal operation	-25 80 °C	10 ... 500

i NOTE

Optimum range: 16 - 35 mm²/s

Cold start phase:

- $p_B = 20 - 30$ bar
- $n \leq 1000$ rpm

Warm-up phase:

- $p_B = 20 - 200$ bar
- $n \leq 1500$ rpm

Normal operation:

No further restrictions. Service conditions according to Chapter 3 Parameters.

Note product configuration and pressure / flow rate

The statements and technical parameters in this documentation must be strictly observed. The instructions for the complete technical system must also always be followed.

i NOTE

- Read the documentation carefully before usage.
- The documentation must be accessible to the operating and maintenance staff at all times.
- Keep documentation up to date after every addition or update.

⚠ CAUTION

Risk of injury on overloading components due to incorrect pressure settings!

Risk of minor injury.

- Always monitor the pressure gauge when setting and changing the pressure.

Purity and filtering of the hydraulic fluid

Fine contamination can significantly impair the function of the hydraulic component. Contamination can cause irreparable damage.

Examples of fine contamination include:

- Metal chips
- Rubber particles from hoses and seals
- Dirt due to assembly and maintenance
- Mechanical debris
- Chemical ageing of the hydraulic fluid

i NOTE

Fresh hydraulic fluid from the drum does not always have the necessary degree of purity. When pouring in hydraulic fluid, filter it.

Adhere to the cleanliness level of the hydraulic fluid in order to maintain faultless operation.
(also see cleanliness level in [Chapter 3, "Parameters"](#))

Additionally applicable document: [D 5488/1](#) Oil recommendations

6 Other information

6.1 Planning information

Determination of nominal sizes

Delivery flow	$Q = \frac{V_g \cdot n \cdot \eta_V}{1000} (l/min)$	Q	= Flow rate (lpm)
Drive torque	$M = \frac{V_g \cdot \Delta p}{20 \cdot \pi \cdot \eta_{mh}} (Nm)$	M	= Torque (Nm)
Drive power	$P = \frac{2\pi \cdot M \cdot n}{60000} = \frac{Q \cdot \Delta p}{600 \cdot \eta_t} (kW)$	P	= Power (kW)
		V_g	= Geom. output volume (cm ³ /rev.)
		Δp	= Differential pressure
		n	= Rotation speed (rpm)
		η_V	= Volumetric efficiency
		η_{mh}	= Mechanical-hydraulic efficiency
		η_t	= Overall efficiency ($\eta_t = \eta_V \cdot \eta_{mh}$)

Further information

Additional versions

- General operating manual for the assembly, initial operation and maintenance of hydraulic components and systems: B 5488
- Variable displacement axial piston pump type V30E: D 7960 E
- Variable displacement axial piston pump type V60N: D 7960 N
- Fixed displacement axial piston pump type K60N: D 7960 K
- Fixed displacement axial piston pump type K61N: D 7961 K
- Axial piston motors type M60N: D 7960 M
- 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 size 3: D 7700-3F
- Proportional directional spool valve type PSLF, PSVF and SLF size 5: D 7700-5F
- Proportional directional spool valve banks type PSLF and PSVF size 7: D 7700-7F
- Load-holding valve type LHT: D 7918
- Load-holding valve type LHDV: D 7770
- Proportional amplifier type EV1M3: D 7831/2
- Proportional amplifier type EV1D: D 7831 D