Variable displacement axial piston pump type C41V

Product documentation

Open circuit

Nominal pressure $p_{nom\ max}$:	280 bar
Peak pressure p_{max}:	350 bar
Displacement volume V_{max}:	85 cm^3/rev

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HAWE HYDRAULIK

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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 C41V is designed for open circuits in mobile hydraulics and operates on the swash plate principle.

The large selection of different pump controllers allows the axial piston pump type C41V to be used in a variety of applications.

Variable displacement axial piston pump type C41V

Features and advantages

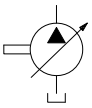
- Optimised power-to-weight ratio
- Broad selection of controllers
- High self-suction speed
- Thru-shaft compatibility
- Compact design

Intended applications

- Machines for forestry and agricultural purposes
- Municipal trucks
- Construction machines
- Fan control systems
- Lifting platforms

2 Available versions

Circuit symbol



Ordering example

C41V 48.45	D	-05	S5	-L	SD/SB	-N	-PEC	-2	-D	-G	-AS5/04

2.12 "Thru-shaft"
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2.1 Basic type and nominal size

Type	Displacement volume V_g (cm³/rev)	Nominal pressure p_{nom} (bar)	Peak pressure p_{max} (bar)
C41V 30.28	28	280	350
C41V 30.34	34.8	250	315
C41V 48.45	45	280	350
C41V 48.53	53.7	250	315
C41V 60.60	60	280	350
C41V 60.72	72	280	350
C41V 60.84	84.7	250	315
C41V 100.100	100	280	350
C41V 100.115	115	250	315

2.2 Rotation direction

Coding	Description
S	Anticlockwise
D	Clockwise

When looking at the shaft journal.

2.3 Shaft version

Coding	Description	Max. drive torque (Nm)
03	▪ SAE-A J 744 ▪ 9T 16/32 DP ▪ 16-4 ISO 3019-1 ▪ Without undercut Only in combination with C41V 30.28 or C41V 30.34	110
07	▪ 11T 16/32 DP ▪ 19-4 ISO 3019-1 ▪ Without undercut Only in combination with C41V 30.28 or C41V 30.34	170
04	▪ SAE-B J 744 ▪ 13T 16/32 DP ▪ 22-4 ISO 3019-1 ▪ With undercut	270
4R	▪ SAE-B J 744 ▪ 13T 16/32 DP ▪ 22-4 ISO 3019-1 ▪ Without undercut Only in combination with C41V 30.28, C41V 30.34, C41V 48.45 or C41V 48.53	290
32	▪ SAE-B Parallel key shaft A6.35x6.35x25.4 Only in combination with C41V 30.28, C41V 30.34, C41V 48.45 or C41V 48.53	210
05	▪ SAE-BB J 744 ▪ 15T 16/32 DP ▪ 25-4 ISO 3019-1 ▪ With undercut Only in combination with C41V 48.45, C41V 48.53, C41V 60.60, C41V 60.72 or C41V 60.84	440
5R	▪ SAE-BB J 744 ▪ 15T 16/32 DP ▪ 25-4 ISO 3019-1 ▪ Without undercut Only in combination with C41V 48.45, C41V 48.53, C41V 60.60, C41V 60.72 or C41V 60.84	460

Coding	Description	Max. drive torque (Nm)
06	▪ SAE-C J 744 ▪ 14T 12/24 DP ▪ 32-4 ISO 3019-1 ▪ With undercut Only in combination with C41V 60.60, C41V 60.72, C41V 60.84, C41V.100.100 or C41V 100.115	810
6R	▪ SAE-C J 744 ▪ 14T 12/24 DP ▪ 32-4 ISO 3019-1 ▪ Without undercut Only in combination with C41V 60.60, C41V 60.72, C41V 60.84, C41V.100.100 or C41V 100.115	880
34	▪ SAE-C Parallel key A7.94x7.94x38.1 Only in combination with C41V 60.60, C41V 60.72 or C41V 60.84	670
HM	▪ SAE-CC J 744 ▪ 17T 12/24 DP ▪ 38-4 ISO 3019-1 ▪ With undercut	1240
HK	▪ SAE-CC J 744 ▪ 17T 12/24 DP ▪ 38-4 ISO 3019-1 ▪ Without undercut	1280
HJ	▪ SAE-D J 744 ▪ 13T 8/16 DP ▪ 44-4 ISO 3019-1 ▪ With undercut	1660
HI	▪ SAE-D J 744 ▪ 13T 8/16 DP ▪ 44-4 ISO 3019-1 ▪ Without undercut	1770

2.4 Flange version

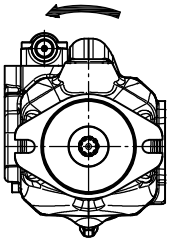
Coding	Description
S1	▪ SAE-A 2-Loch J 744 ▪ 82-2 ISO 3019-1 Only in conjunction with shaft version coding 03 or 07
S5	▪ SAE-B 2-Loch J 744 ▪ 101-2 ISO 3019-1 Only in conjunction with shaft version coding 04, 4R, 05, 5R or 32
S7	▪ SAE-C 2-Loch J 744 ▪ 127-2 ISO 3019-1 Only in conjunction with shaft version coding 06, 6R or 34
S8	▪ SAE-C 4-Loch J 744 ▪ 127-4 ISO 3019-1 Only in conjunction with shaft version coding 06, 6R or 34
	▪ SAE-C 2+4-Loch J 744 ▪ 127-2 ISO 3019-1 / 127-4 ISO 3019-1 Only in combination with C41V 100.100 and C41V 100.15 and the shaft versions 06, 6R, HM, HK, HJ and HI

2.5 Housing versions

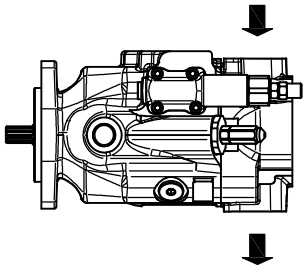
Coding	Description
L	Suction and pressure connection radial
P	Suction and pressure connection axial

2.6 Suction and pressure connection

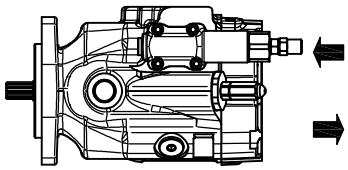
Left rotation direction (anticlockwise)



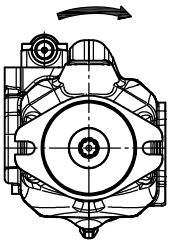
Radial connections



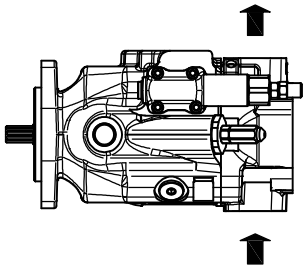
Axial connections



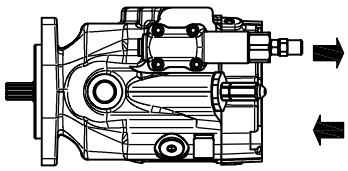
Right rotation direction (clockwise)



Radial connections



Axial connections



C41V 30..

Coding	Designation
MD/MB	Flange port with metric threads ▪ ISO 60° ISO/R 262 ▪ SAE J 518 Code 61
SD/SB	Flange port with UNC threads ▪ UNF 60° ANSI B 1.1 ▪ SAE J 518 Code 61
OG/OD	Threaded connection ▪ UNF 60° ANSI B 1.1 ▪ SAE J 514 Only in combination with housing version coding P

C41V 48..

Coding	Designation
ME/MC	Flange port with metric threads ▪ ISO 60° ISO/R 262 ▪ SAE J 518 Code 61
SE/SC	Flange port with UNC threads ▪ UNF 60° ANSI B 1.1 ▪ SAE J 518 Code 61
OH/OF	Threaded connection ▪ UNF 60° ANSI B 1.1 ▪ SAE J 514 Only in combination with housing version coding P

C41V 60..

Coding	Designation
MF/MC	Flange port with metric threads ▪ ISO 60° ISO/R 262 ▪ SAE J 518 Code 61
SF/SC	Flange port with UNC threads ▪ UNF 60° ANSI B 1.1 ▪ SAE J 518 Code 61
MF/OF	Combination of flange port and threaded connection ▪ Suction port: Flange port with metric threads – ISO 60° ISO/R 262 – SAE J 518 Code 61 ▪ Pressure connection: Threaded connection – UNF 60° ANSI B 1.1 – SAE J 514

C41V 100..

Coding	Designation
MG/QD	Flange port with metric threads ▪ ISO 60° ISO/R 262 ▪ SAE J 518 Code 61/62
SG/VD	Flange port with UNC threads ▪ UNF 60° ANSI B 1.1 ▪ SAE J 518 Code 61/62

2.7 Seals

Coding	Description
N	NBR
V	FKM

2.8 Pump controller

Pressure controller

Coding	Description
RP0	Mechanically adjustable pressure controller
RP2	2-stage pressure controller with electrical switching between two pressure settings
LS3	Mechanically adjustable pressure controller with remote-control port
PEC	Electro-proportional pressure controller with falling characteristic line
PEC-LS0	Combination of electro-proportional pressure controller with falling characteristic line and load-sensing controller with LS relief (LS0)
PEC-LS2	Combination of electro-proportional pressure controller with falling characteristic line and load-sensing controller without LS relief (LS2)

see Chapter 6.2.1, "Pressure controller"

Load-sensing controller

Coding	Description
LS0	Load-sensing controller with integrated pressure limitation and additional LS relief (only for use with hydraulic valves without their own relief of the LS signal)
LS2	Load-sensing controller with integrated pressure limitation (Standard version for combination with hydraulic valves that relieve the LS signal in the valve, for example, type PSV proportional directional spool valve)
RP2-LS2	Combination of load-sensing controller without LS relief (LS2) and 2-stage pressure controller (RP2)

see Chapter 6.2.2, "Load-sensing controller"

Power controller

Coding	Description
RN0	Combination of power controller and load-sensing controller with integrated pressure limitation without LS relief
RN1	Combination of power controller and mechanically adjustable pressure controller
RN2-LS0	Combination of power controller with electrical switching between two torque settings and load-sensing controller with pressure limitation with LS relief
RN2-LS2	Combination of power controller with electrical switching between two torque settings and load-sensing controller with pressure limitation without LS relief
TEC	Combination of electro-proportional power controller with falling characteristic line and mechanically adjustable pressure controller (RP0)
TEC-LS0	Combination of electro-proportional power controller with falling characteristic line and load-sensing controller with LS relief (LS0)
TEC-LS2	Combination of electro-proportional power controller with falling characteristic line and load-sensing controller without LS relief (LS2)

see Chapter 6.2.3, "Power controller"

Flow controller

Coding	Description
DEC	Combination of electro-proportional flow controller and mechanically adjustable pressure controller (RP0)
DEC-LS0	Combination of electro-proportional flow controller and load-sensing controller with LS relief (LS0)
DEC-LS2	Combination of electro-proportional flow controller and load-sensing controller without LS relief (LS2)

see Chapter 6.2.4, "Flow controller"

2.9 Additional and solenoid voltage

Coding	Description	Nominal voltage
1	N/C contact (closed in normal position)	12 V DC
2		24 V DC
6	N/O contact (open in normal position)	12 V DC
7		24 V DC

2.10 Magnetic plug

Coding	Description
D	Deutsch plug (DT04-2P)
S	DIN plug (EN 175 301-803 A)
JT	AMP plug (Junior Timer)

2.11 Stroke limitation

Coding	Description
G	With minimum stroke and maximum stroke limitation

2.12 Thru-shaft

2.12.1 Overview of thru-shaft

Coding	Description
without coding	Without thru-shaft
AS./..	With thru-shaft ▪ Flange version see Chapter 2.12.2, "Coupling flange" ▪ Coupling sleeve see Chapter 2.12.3, "Coupling sleeve for thru-shaft"
PHP ..	Integrated gear pump with common suction port with C41V ▪ Radial connections ▪ Technical details under Chapter 2.12.4, "Integrated gear pump"

2.12.2 Coupling flange

Coding	Description
AS1	With thru-shaft Flange version: ▪ SAE-A 2-Loch J 744 ▪ 82-2 ISO 3019-1 Only in combination with C41V 30.28 or C41V 30.34
AS5	With thru-shaft Flange version: ▪ SAE-B 2-Loch J 744 ▪ 101-2 ISO 3019-1
AS7	With thru-shaft Flange version: ▪ SAE-C 2-Loch J 744 ▪ 127-2 ISO 3019-1

2.12.3 Coupling sleeve for thru-shaft

Coding	Description	Max. output torque (Nm)
03	▪ SAE-A J 744 ▪ 9T 16/32 DP ▪ 16-4 ISO 3019-1 Only in conjunction with thru-shaft version coding AS1	100
31	SAE-A Parallel key shaft with ∅16 Only in conjunction with thru-shaft version coding AS1	70
04	▪ SAE-B J 744 ▪ 13T 16/32 DP ▪ 22-4 ISO 3019-1 Only in conjunction with thru-shaft version coding AS5	▪ C41V 30.28 and C41V 30.34: 100 ▪ C41V 48.45, C41V 48.53, C41V 60.60, C41V 60.72 and C41V 60.84: 200
32	SAE-B Parallel key shaft with ∅22 Only in conjunction with thru-shaft version coding AS5 and with – C41V 30.28 – C41V 30.34 – C41V 48.45 – or C41V 48.53	▪ C41V 30.28 and C41V 30.34: 100 ▪ C41V 48.45 and C41V 48.53: 250
05	▪ SAE-BB J 744 ▪ 15T 16/32 DP ▪ 25-4 ISO 3019-1 Only in conjunction with thru-shaft version coding AS5 and with – C41V 48.45 – C41V 48.53 – C41V 60.60 – C41V 60.72 – or C41V 60.84	250
33	SAE-BB Parallel key shaft with ∅25 Only in conjunction with thru-shaft version coding AS5 and with – C41V 48.45 – or C41V 48.53	250
06	▪ SAE-C J 744 ▪ 14T 12/24 DP ▪ 32-4 ISO 3019-1 Only in conjunction with thru-shaft version coding AS5 and with – C41V 60.60 – C41V 60.72 – or C41V 60.84	430

2.12.4 Integrated gear pump

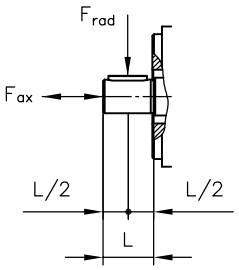
Coding	Displacement volume V_g (cm³/rev)	Nominal pressure p_{nom} (bar)	Peak pressure p_{max} (bar)
PHP 20.8-L **/GD	8.26	250	280
PHP 20.10.5-L **/GD	10.9	250	280
PHP 20.11.2-L **/GD	11.23	250	280
PHP 20.14-L **/GD	14.53	250	280
PHP 20.16-L **/GD	16.85	250	280
PHP 20.19-L **/GD	19.09	250	280
PHP 20.20-L **/GD	21.14	250	280
PHP 20.25-L **/GD	26.42	230	260
PHP 20.31.5-L **/GD	33.03	200	230

3 Parameters

3.1 General data

Designation	Variable displacement axial piston pump
Pump version	Axial piston pump according to the swash plate principle
Mounting	DIN ISO 3019-1, SAE J 744
Surface	Painted
Installation position	As desired Installation information see Chapter 5, "Installation, operation and maintenance information"
Rotation direction	▪ right ▪ left
Ports/connections	▪ Suction port ▪ Pressure connection ▪ Drain port ▪ LS port or remote-control port
Hydraulic fluid	Hydraulic fluid, according to DIN 51524 Parts 1 to 3; ISO VG 10 to 68 according to DIN ISO 3448 Viscosity range: 10 - 1500 mm²/s Optimal operating range: approx. 15 - 35 mm²/s see Chapter 5.3, "Operating instructions"
Cleanliness level	**ISO 4406** 19/17/14
Temperatures	Environment: approx. -40 to +60 °C, hydraulic fluid: -25 to +80 °C, pay attention to the viscosity range. Start temperature: down to -40 °C is permissible (take account of the start viscosities!), as long as the steady-state temperature is at least 20 K higher during subsequent operation.

Designation			Nominal size								
			30.28	30.34	48.45	48.53	60.60	60.72	60.84	100,100	100,115
Absolute inlet pressure required in open circuit		bar	0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.8
Max. permissible housing pressure (static/dynamic)		bar	1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5
Max. permissible inlet pressure (static/dynamic)		bar	25	25	25	25	25	25	25	25	25
Max. rotation speed during suction operation and max. swash plate angle at 1 bar abs. inlet pressure		min^{-1}	3500	2900	3000	2500	3000	2700	2300	2200	2000
Max. rotation speed with zero stroke and 1 bar abs. inlet pressure		min^{-1}	3500	3500	3000	3000	3000	3000	3000	2200	2200
Required drive torque at $V_{g\ max}$ and p_{nom}		Nm	124.8	138.5	200.5	213.7	267.4	320.9	337	445	458
Drive power at $V_{g\ max}$, n_{max} and p_{nom}		kW	45.7	42.1	63	55.9	84	90.7	81	102.6	95.8
Inertia torque		kg m^2	0.002	0.002	0.003	0.003	0.008	0.008	0.008	0.014	0.014
Fill volume		l	0.85	0.85	1.0	1.0	1.3	1.3	1.3	1.8	1.8
Max. permissible force on drive shaft	F_{ax} axial force	N	1000	1000	1500	1500	2000	2000	2000	2000	2000
	F_{rad} radial force	N	1500	1500	1500	1500	3000	3000	3000	3000	3000



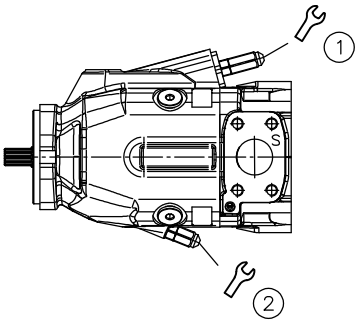
Maximum rotation speed depending on the inlet pressure and displacement volume

Inlet pressure absolute (bar)	Displacement volume (% of $V_{g\ max}$)					
	65	70	80	90	100	
0.8	120	115	105	97	90	Rotation speed (% of n_{max})
0.9	120	120	110	103	95	
1.0	120	120	115	107	100	
1.2	120	120	120	113	106	
1.4	120	120	120	120	112	
1.6	120	120	120	120	117	
2.0	120	120	120	120	120	

Max. rotation speed with zero stroke and 1 bar abs. Inlet pressure (see Chapter 3.1, "General data") must not be exceeded.

- **Example 1:**
  - Displacement volume: 100%
  - Rotation speed: 100%
  - Inlet pressure abs.: 1.0 bar
- **Example 2:**
  - Displacement volume: 80%
  - Inlet pressure abs.: 1.0 bar
  - Rotation speed: 115%
- **Example 3:**
  - Displacement volume: 100%
  - Inlet pressure abs.: 1.4 bar
  - Rotation speed: 112%

Setting for the minimum and maximum stroke limitation



1 Maximum stroke limitation
2 Minimum stroke limitation

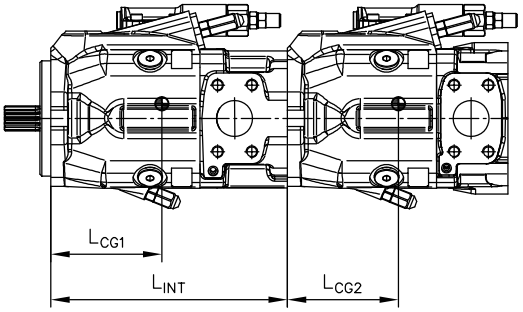
Tightening torque 15 ±1 Nm			C41V 30..	C41V 48..	C41V 60..	C41V 100..
Adjustment range for maximum stroke limitation	**cm³/rev**		14 - 34	34 - 53	53 - 84	84 - 115
Adjustment range for minimum stroke limitation	**cm³/rev**		0 - 14	0 - 10.7	0 - 38.1	0 - 38
Change of the setting value per revolution of the adjusting screw	**cm³/rev**	**Maximum stroke limitation**	approx. 2.8	approx. 3.2	approx. 5.0	approx. 6.0
		Minimum stroke limitation	approx. 2.3	approx. 3.0	approx. 4.2	approx. 5.5

3.2 Weight and weight torque

Weight

Basic pump	Nominal size	
	30.28	= 15 kg
	30.34	= 15 kg
	48.45	= 19 kg
	48.53	= 19 kg
	60.60	= 22 kg
	60.72	= 22 kg
	60.84	= 22 kg
	100,100	= 44 kg
	100,115	= 44 kg

Weight torque



= Centre of gravity

$$M_{MF} = \frac{L_{CG1} \cdot m_1 + (L_{INT} + L_{CG2}) \cdot m_2}{102} \; [Nm]$$

M_{MF} = Weight torque at the front flange

L_{CG} = Distance of the centre of gravity from the front flange (mm)

m = Weight (kg)

Type	L_{CG1} (mm)	L_{CG2} (mm)	L_{INT} (mm)
C41V 30.28 C41V 30.34	100	90	208
C41V 48.45 C41V 48.53	116	99	233
C41V 60.60 C41V 60.72 C41V 60.84	120	107	253
C41V 100.100 C41V 100.115	154	135	315.8

For single pumps: Use L_{CG2} values

Average values: Precise values for specific configurations available on request

3.3 Pressure and delivery flow

Operating pressure	see Chapter 2, "Available versions"
Displacement volume	see Chapter 2, "Available versions"

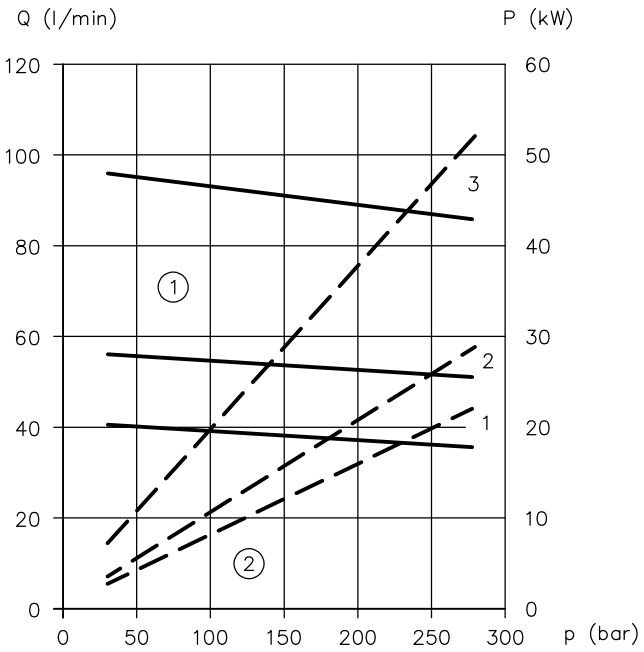
3.4 Characteristic lines

Viscosity of the hydraulic fluid approx. 40 mm²/s

Delivery flow and power

C41V 30.28

1 1500 min-1
2 2000 min-1
3 3500 min-1

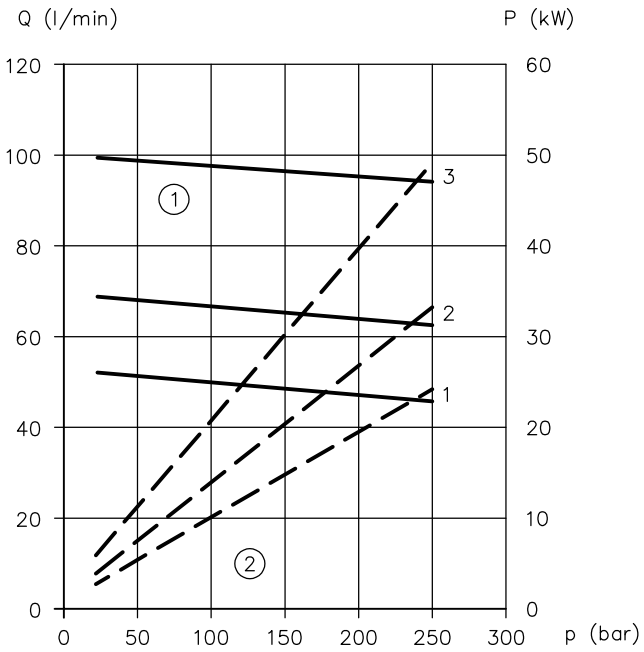


p pressure (bar); Q delivery flow (l/min); P power (kW)

① Delivery flow/pressure
② Drive power/pressure (max. swash plate angle)

C41V 30.34

1 1500 min-1
2 2000 min-1
3 2900 min-1

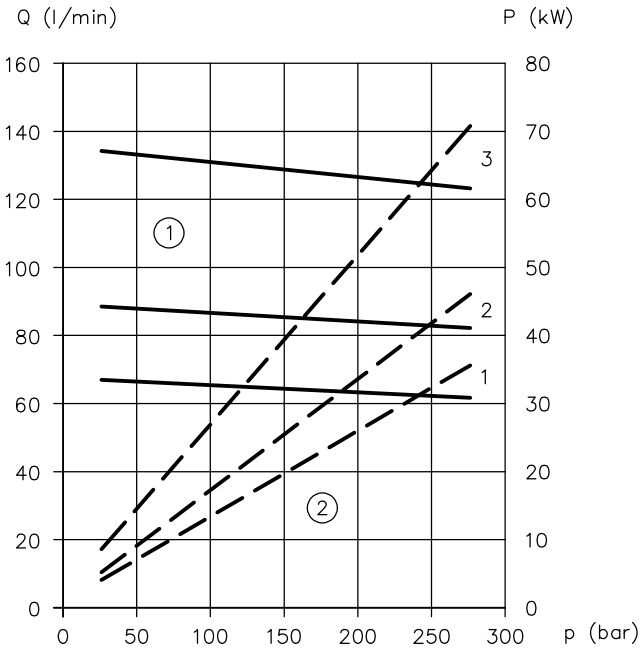


p pressure (bar); Q delivery flow (l/min); P power (kW)

① Delivery flow/pressure
② Drive power/pressure (max. swash plate angle)

C41V 48.45

1 1500 min^{-1}
2 2000 min^{-1}
3 3000 min^{-1}

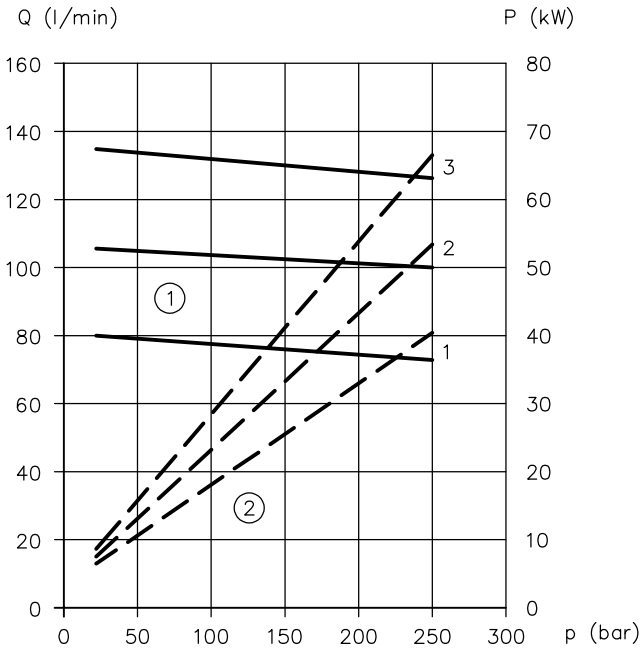


p pressure (bar); Q delivery flow (l/min); P power (kW)

① Delivery flow/pressure
② Drive power/pressure (max. swash plate angle)

C41V 48.53

1 1500 min^{-1}
2 2000 min^{-1}
3 2500 min^{-1}

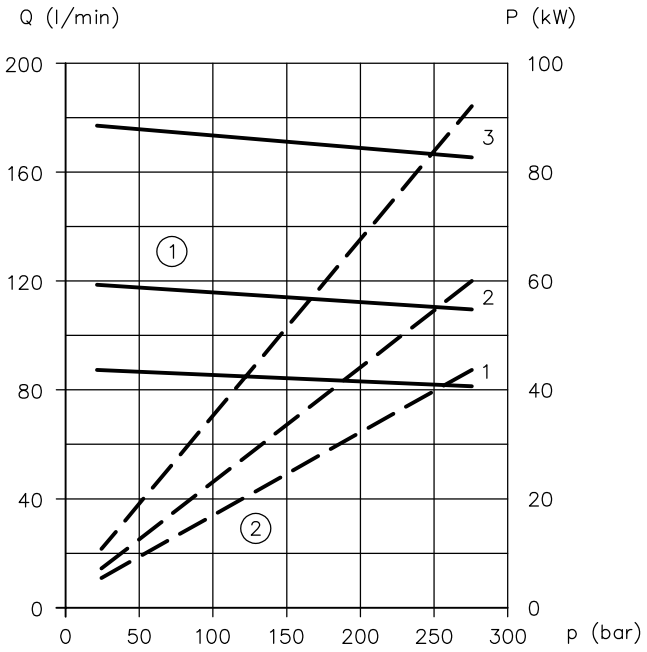


p pressure (bar); Q delivery flow (l/min); P power (kW)

① Delivery flow/pressure
② Drive power/pressure (max. swash plate angle)

C41V 60.60

1 1500 min^{-1}
2 2000 min^{-1}
3 3000 min^{-1}

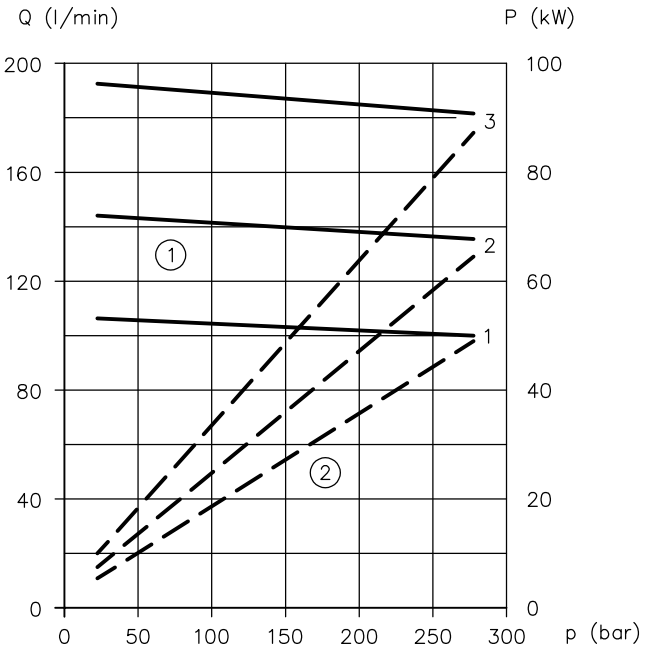


p pressure (bar); Q delivery flow (l/min); P power (kW)

① Delivery flow/pressure
② Drive power/pressure (max. swash plate angle)

C41V 60.72

1 1500 min^{-1}
2 2000 min^{-1}
3 2700 min^{-1}

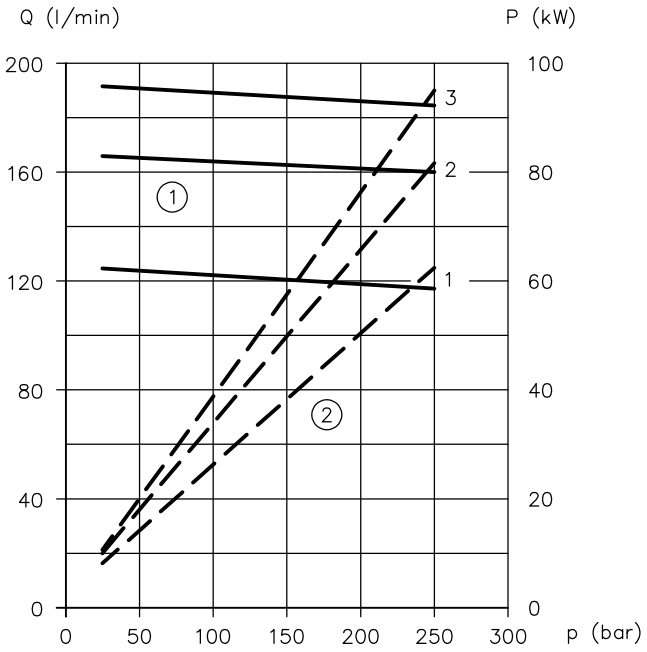


p pressure (bar); Q delivery flow (l/min); P power (kW)

① Delivery flow/pressure
② Drive power/pressure (max. swash plate angle)

C41V 60.84

1 1500 min^{-1}
2 2000 min^{-1}
3 2300 min^{-1}

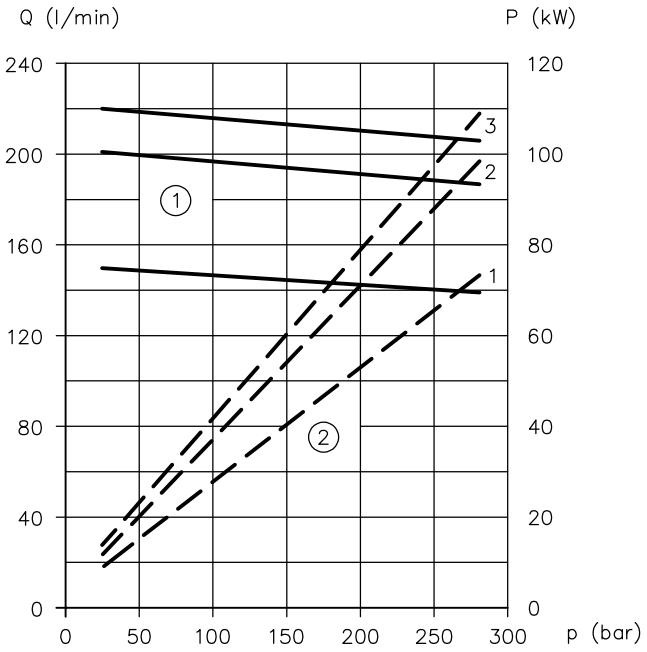


p pressure (bar); Q delivery flow (l/min); P power (kW)

① Delivery flow/pressure
② Drive power/pressure (max. swash plate angle)

C41V 100.100

1 1500 min^{-1}
2 2000 min^{-1}
3 2200 min^{-1}

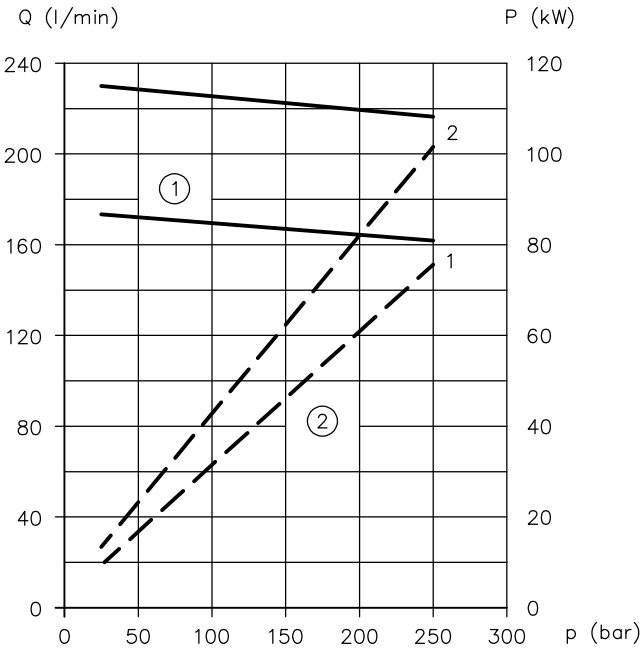


p pressure (bar); Q delivery flow (l/min); P power (kW)

1 Delivery flow/pressure
2 Drive power/pressure (max. swash plate angle)

C41V 100.115

1 1500 min^{-1}
2 2000 min^{-1}



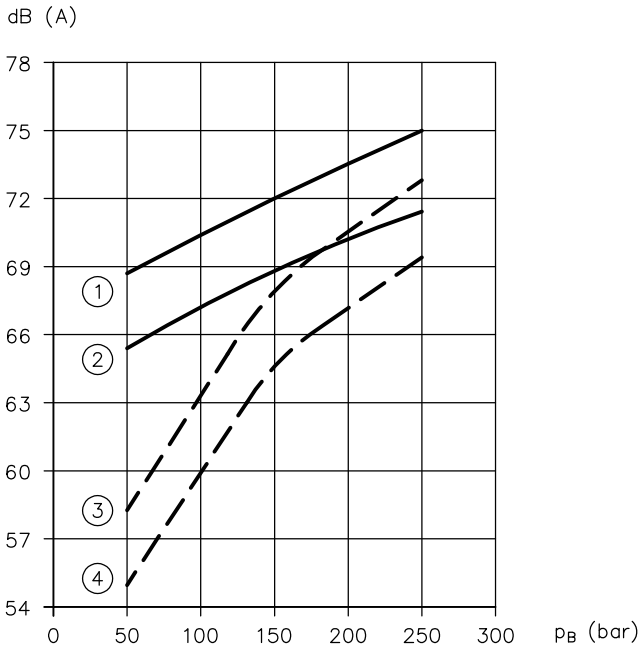
p pressure (bar); Q delivery flow (l/min); P power (kW)

1 Delivery flow/pressure
2 Drive power/pressure (max. swash plate angle)

Noise level

The diagrams show the noise level measured in the acoustic measurement chamber as per ISO 3744, distance between sound receiver and pump (d) = 1 m

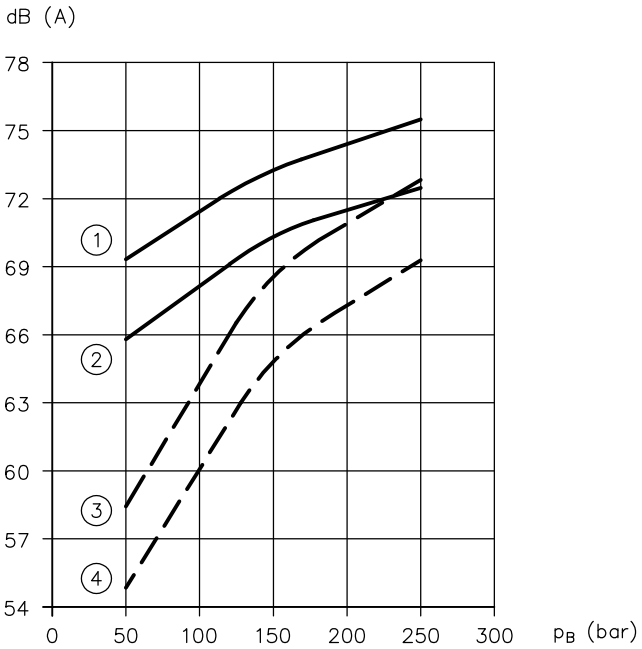
C41V 30.28



pB pressure (bar); dB noise level (A)

1 Vg max at n = 2000 min-1
2 Vg max at n = 1500 min-1
3 Vg min at n = 2000 min-1
4 Vg min at n = 1500 min-1

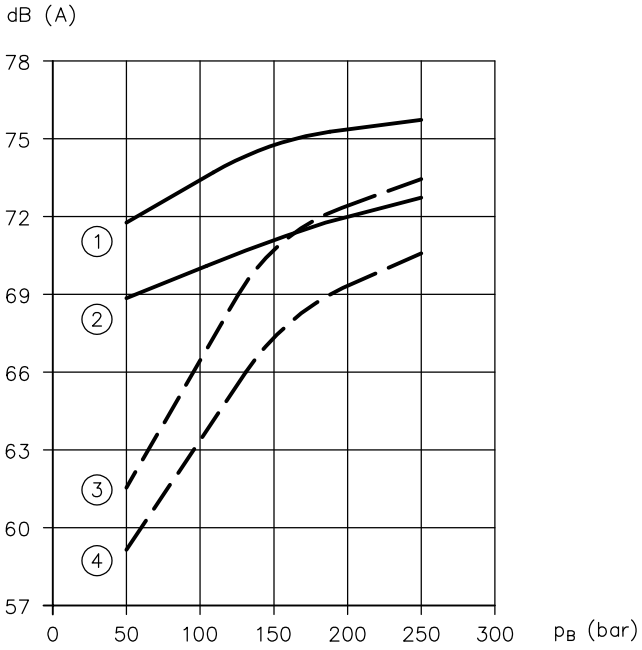
C41V 30.34



pB pressure (bar); dB noise level (A)

1 Vg max at n = 2000 min-1
2 Vg max at n = 1500 min-1
3 Vg min at n = 2000 min-1
4 Vg min at n = 1500 min-1

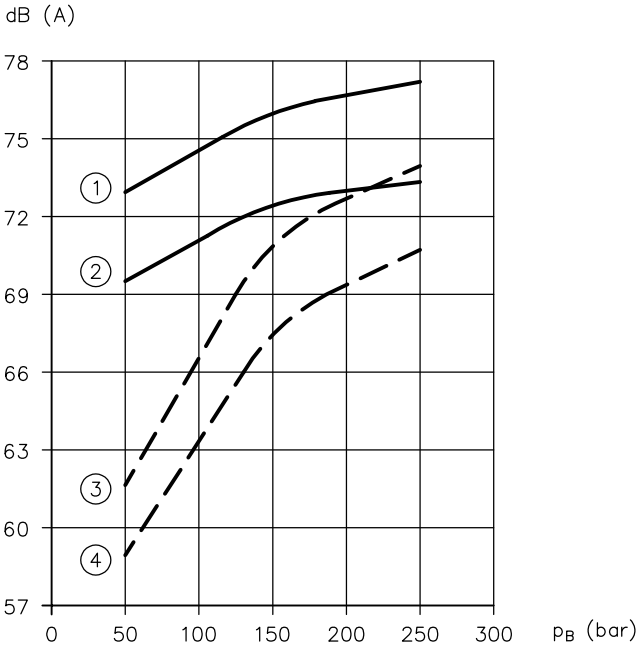
C41V 48.45



pB pressure (bar); dB noise level (A)

1 $V_{g\ max}$ at n = 2000 min-1
2 $V_{g\ max}$ at n = 1500 min-1
3 $V_{g\ min}$ at n = 2000 min-1
4 $V_{g\ min}$ at n = 1500 min-1

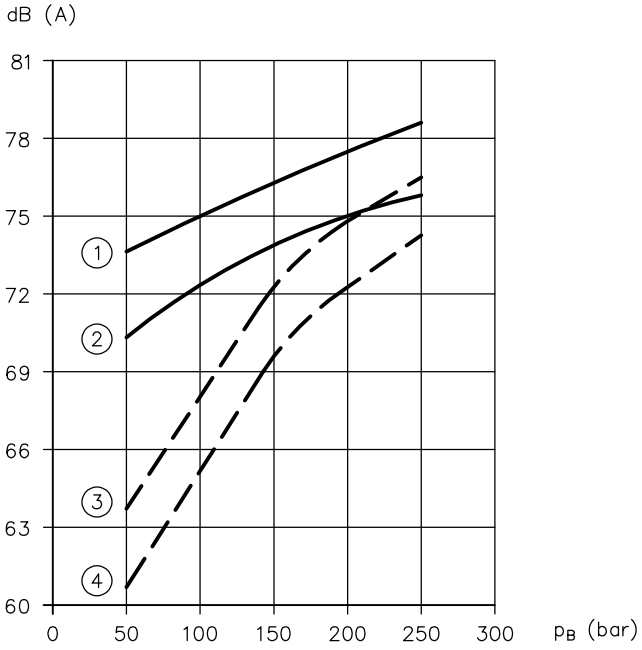
C41V 48.53



pB pressure (bar); dB noise level (A)

1 $V_{g\ max}$ at n = 2000 min-1
2 $V_{g\ max}$ at n = 1500 min-1
3 $V_{g\ min}$ at n = 2000 min-1
4 $V_{g\ min}$ at n = 1500 min-1

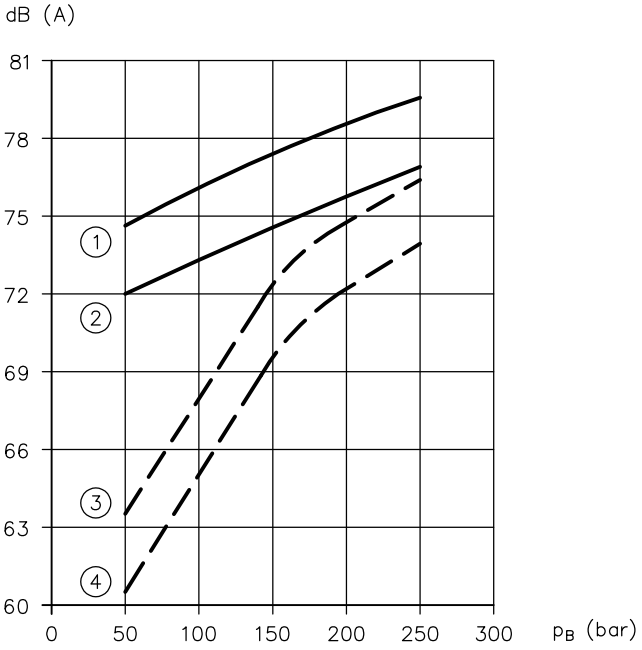
C41V 60.60



pB pressure (bar); dB noise level (A)

1 $V_{g\ max}$ at n = 2000 min-1
2 $V_{g\ max}$ at n = 1500 min-1
3 $V_{g\ min}$ at n = 2000 min-1
4 $V_{g\ min}$ at n = 1500 min-1

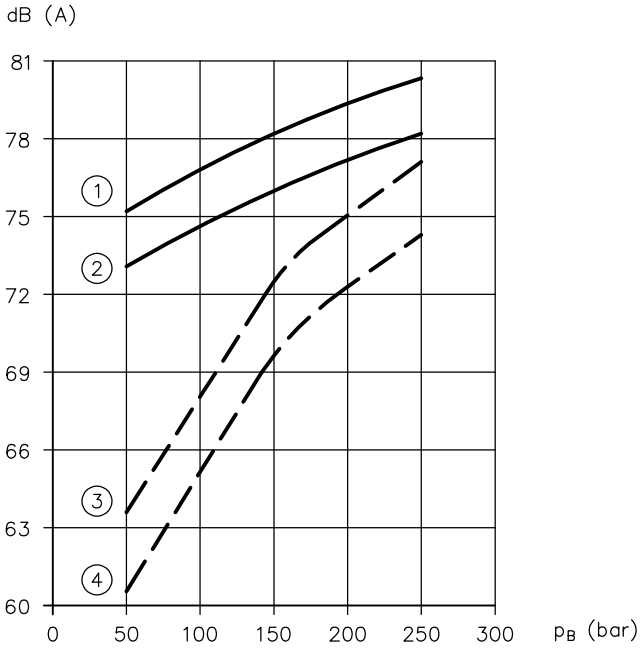
C41V 60.72



pB pressure (bar); dB noise level (A)

1 $V_{g\ max}$ at n = 2000 min-1
2 $V_{g\ max}$ at n = 1500 min-1
3 $V_{g\ min}$ at n = 2000 min-1
4 $V_{g\ min}$ at n = 1500 min-1

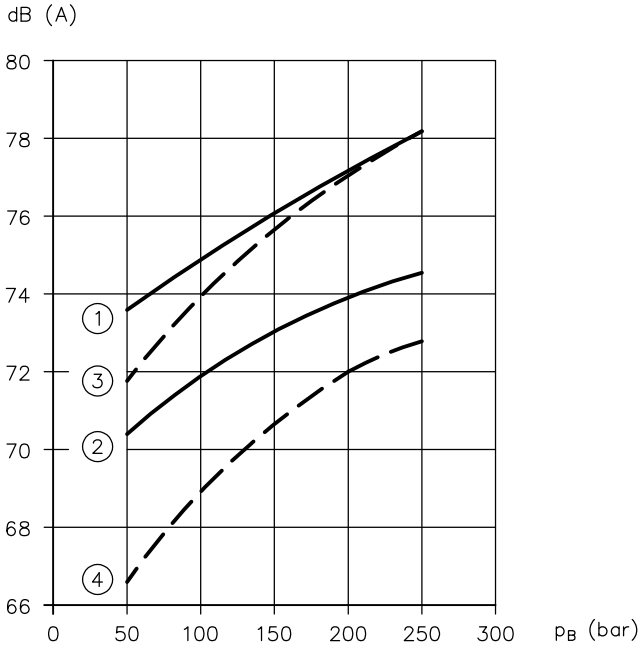
C41V 60.84



pB pressure (bar); dB noise level (A)

1 $V_{g\ max}$ at n = 2000 min-1
2 $V_{g\ max}$ at n = 1500 min-1
3 $V_{g\ min}$ at n = 2000 min-1
4 $V_{g\ min}$ at n = 1500 min-1

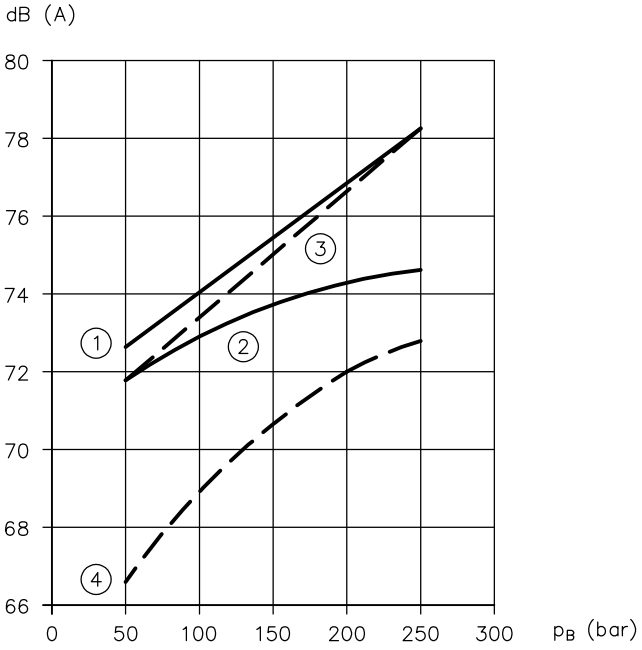
C41V 100.100



pB pressure (bar); dB noise level (A)

1 $V_{g\ max}$ at n = 2000 min-1
2 $V_{g\ max}$ at n = 1500 min-1
3 $V_{g\ min}$ at n = 2000 min-1
4 $V_{g\ min}$ at n = 1500 min-1

C41V 100.115



pB pressure (bar); dB noise level (A)

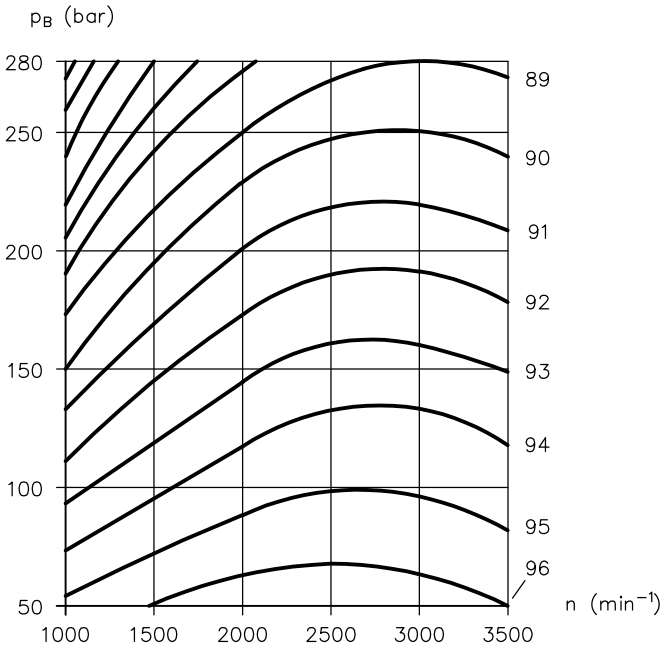
1 $V_{g\ max}$ at n = 2000 min-1
2 $V_{g\ max}$ at n = 1500 min-1
3 $V_{g\ min}$ at n = 2000 min-1
4 $V_{g\ min}$ at n = 1500 min-1

Efficiency

The diagrams show the volumetric efficiency and the total efficiency as a percentage value in each case, measured at maximum displacement volume.

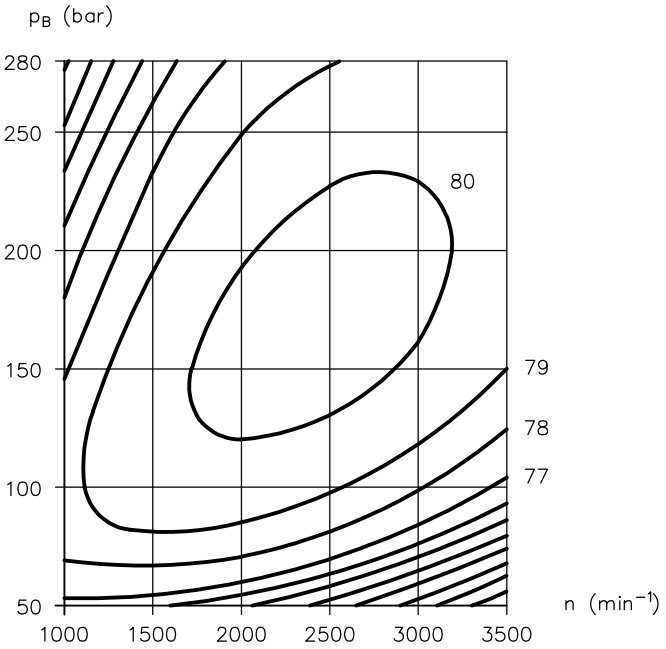
C41V 30.28

Volumetric efficiency



n rotation speed (min-1); pB pressure (bar)

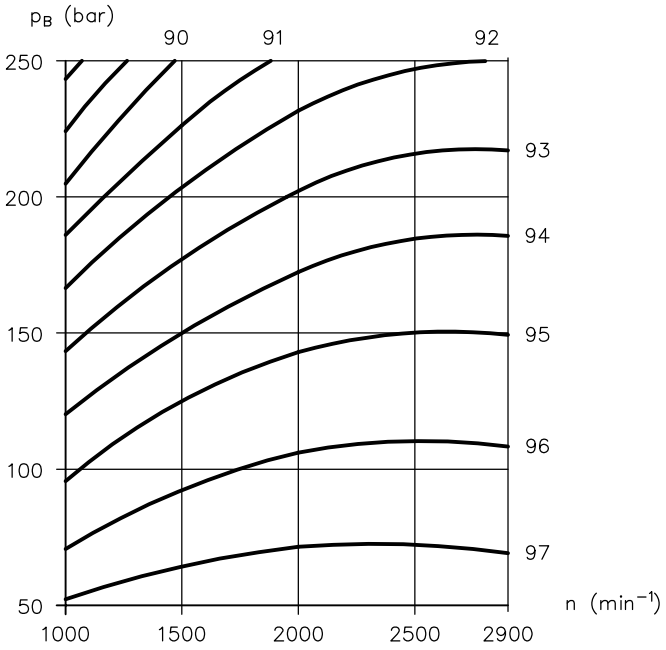
Total efficiency



n rotation speed (min-1); pB pressure (bar)

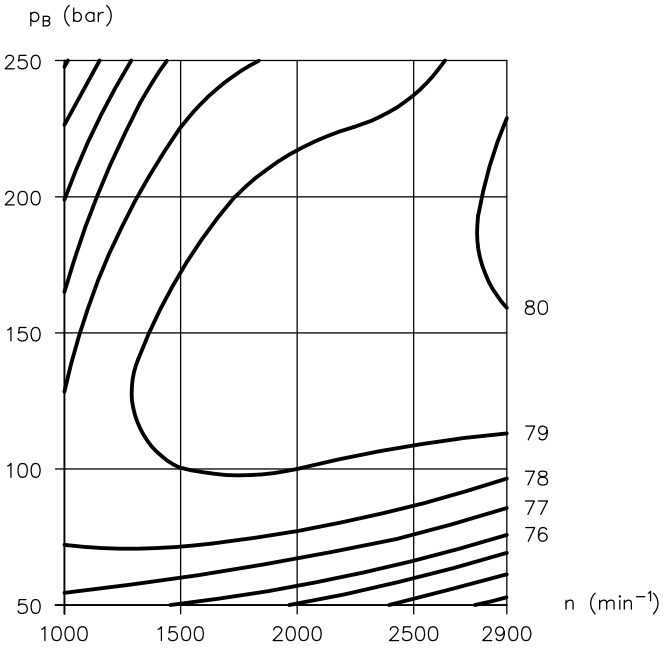
C41V 30.34

Volumetric efficiency



n rotation speed (min-1); pB pressure (bar)

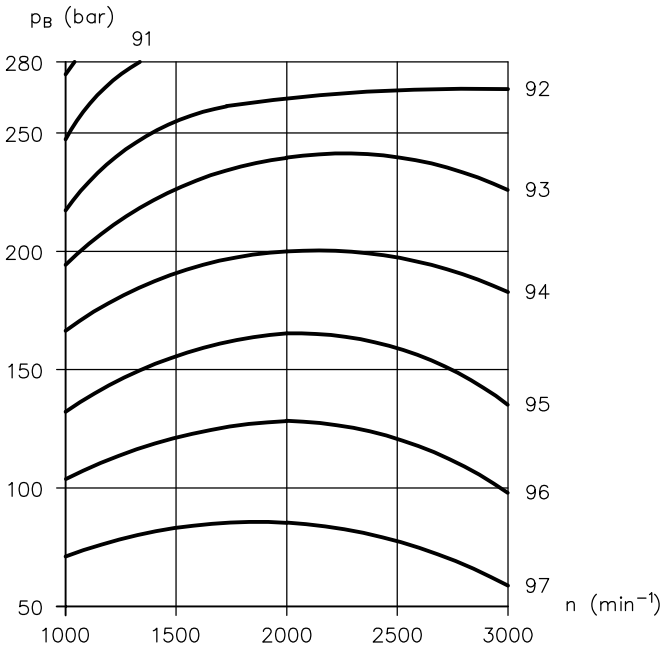
Total efficiency



n rotation speed (min-1); pB pressure (bar)

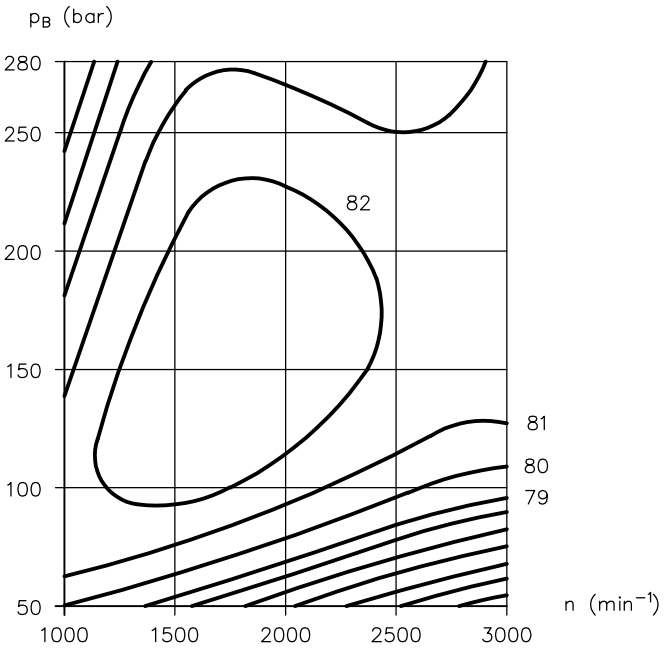
C41V 48.45

Volumetric efficiency



n rotation speed (min-1); pB pressure (bar)

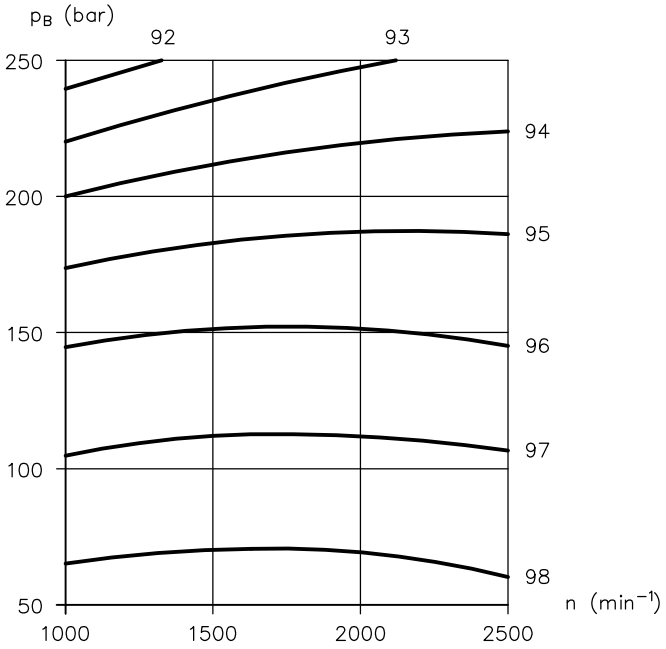
Total efficiency



n rotation speed (min-1); pB pressure (bar)

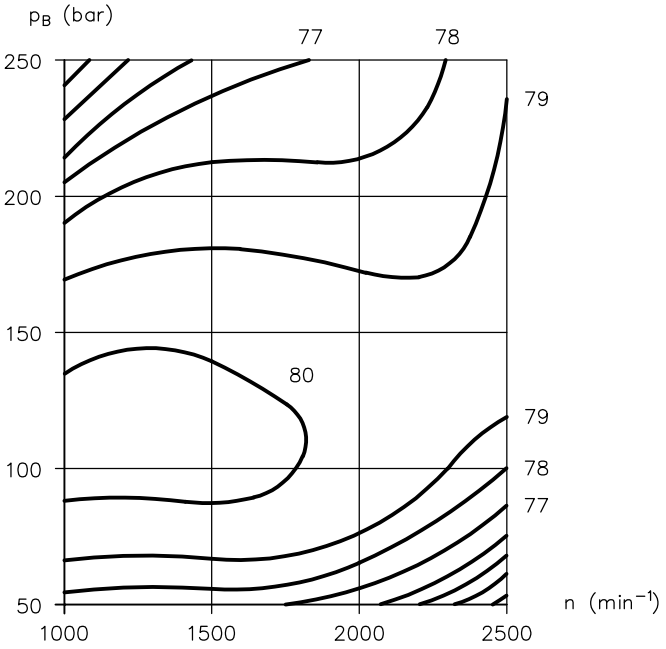
C41V 48.53

Volumetric efficiency



n rotation speed (min-1); pB pressure (bar)

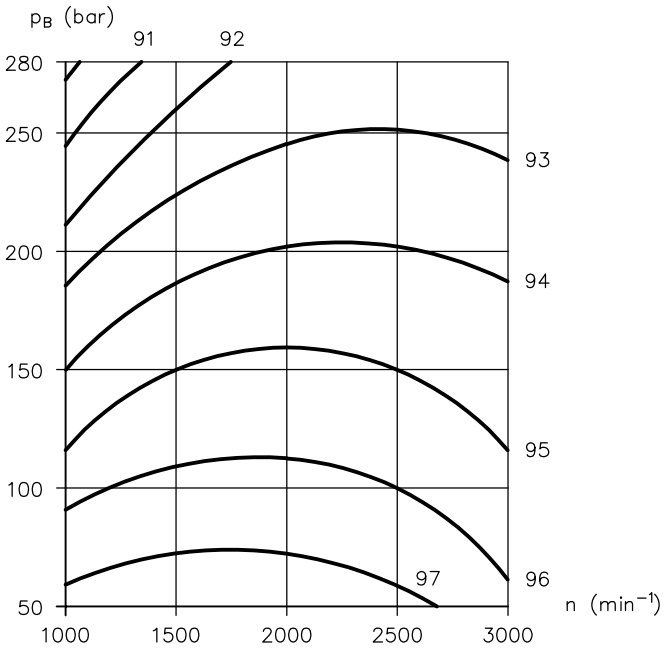
Total efficiency



n rotation speed (min-1); pB pressure (bar)

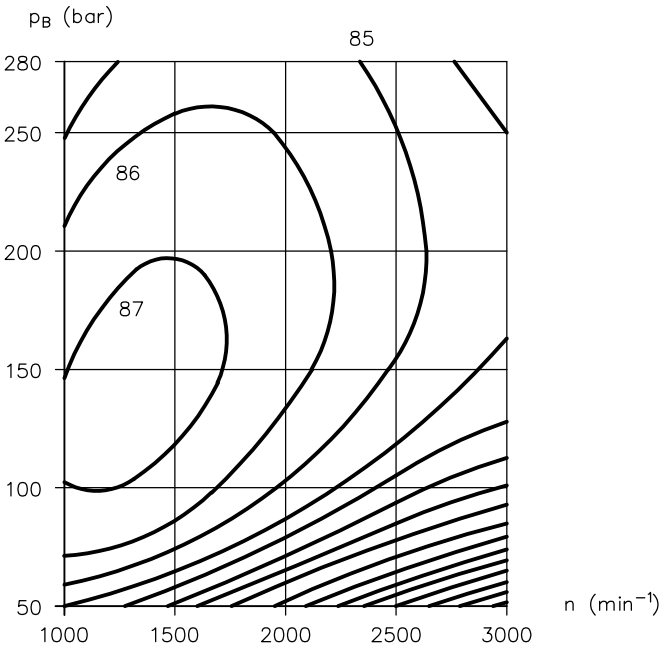
C41V 60.60

Volumetric efficiency



n rotation speed (min-1); pB pressure (bar)

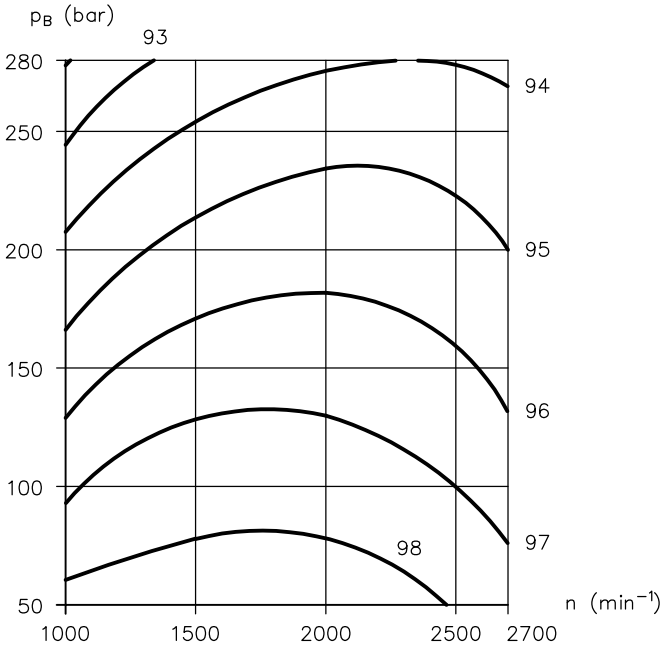
Total efficiency



n rotation speed (min-1); pB pressure (bar)

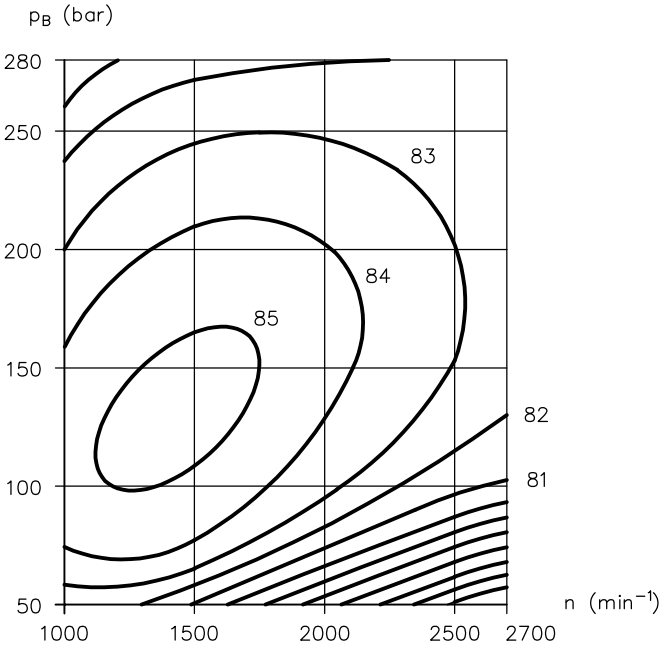
C41V 60.72

Volumetric efficiency



n rotation speed (min-1); pB pressure (bar)

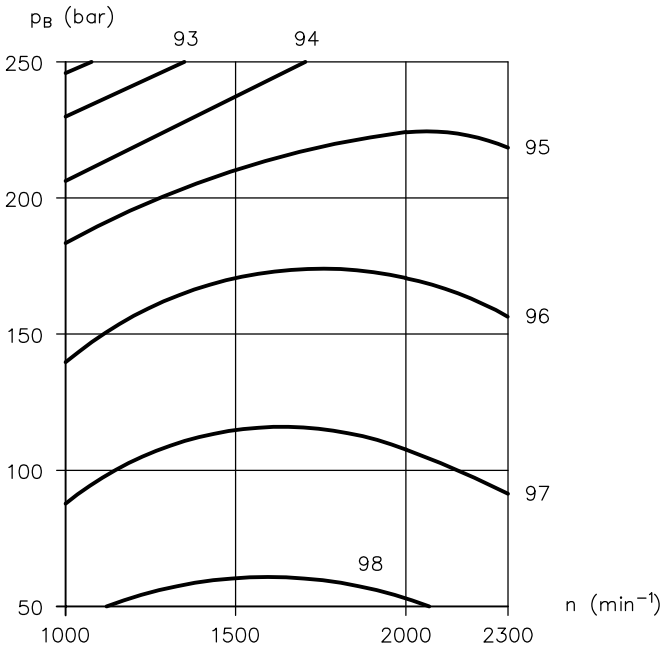
Total efficiency



n rotation speed (min-1); pB pressure (bar)

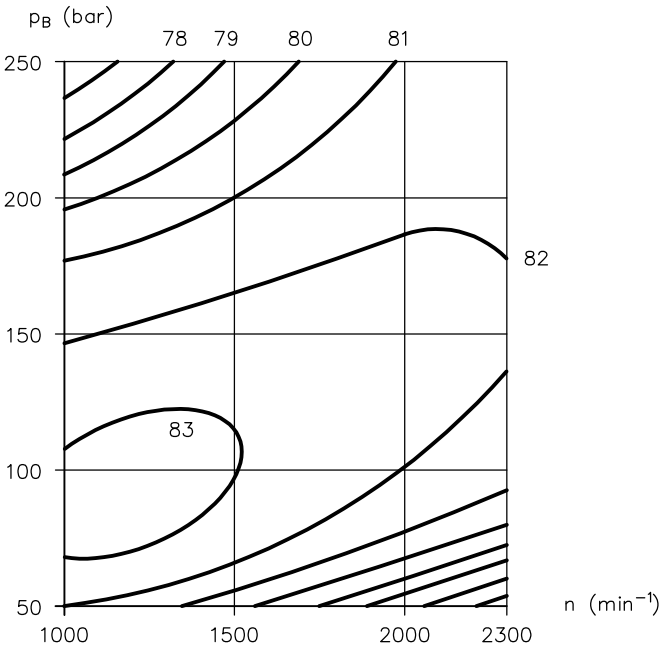
C41V 60.84

Volumetric efficiency



n rotation speed (min-1); pB pressure (bar)

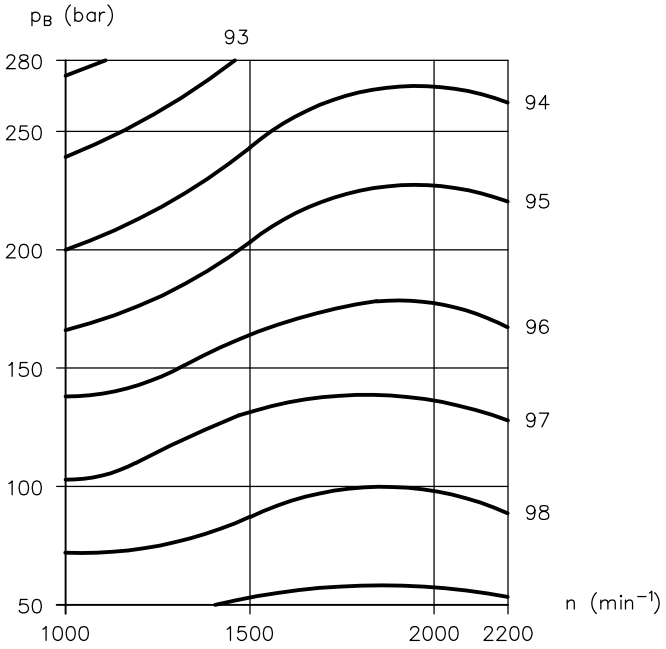
Total efficiency



n rotation speed (min-1); pB pressure (bar)

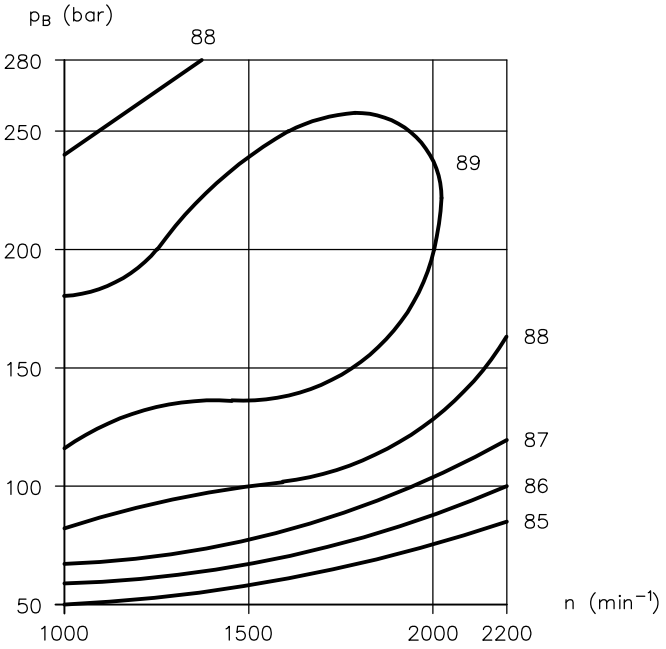
C41V 100.100

Volumetric efficiency



n rotation speed (min-1); pB pressure (bar)

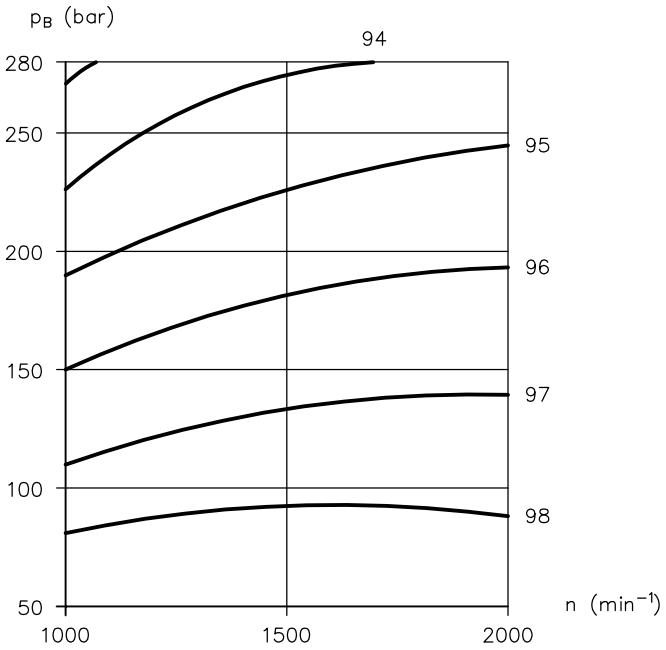
Total efficiency



n rotation speed (min-1); pB pressure (bar)

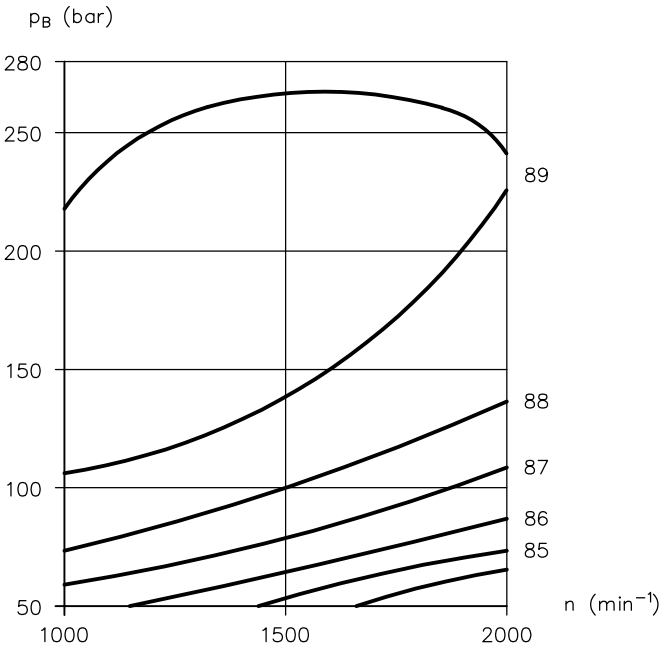
C41V 100.115

Volumetric efficiency



n rotation speed (min-1); pB pressure (bar)

Total efficiency



n rotation speed (min-1); pB pressure (bar)

3.5 Electrical data

Nominal voltage	12 V DC	24 V DC
Resistance R_{20}	4.9 Ω ± 3%	17.1 Ω ± 5%
Current, cold I_{20}	2450 mA	1400 mA
Power P	30 W	34 W
Duty cycle	S1 (100%)	
Dither frequency	150 Hz	
Dither amplitude $A_D(\%) = \frac{I_{Peak-Peak}}{IG} \cdot 100$	20% ≤ A_D ≤ 40%	
Permissible ambient temperature	-30°C to +110°C	
Protection class in accordance with DIN VDE 0470 when mounted and plugged in	Coding for magnetic plug ▪ **D:** IP 69K ▪ **S:** IP 65 ▪ **JT:** IP 67	

4 Dimensions

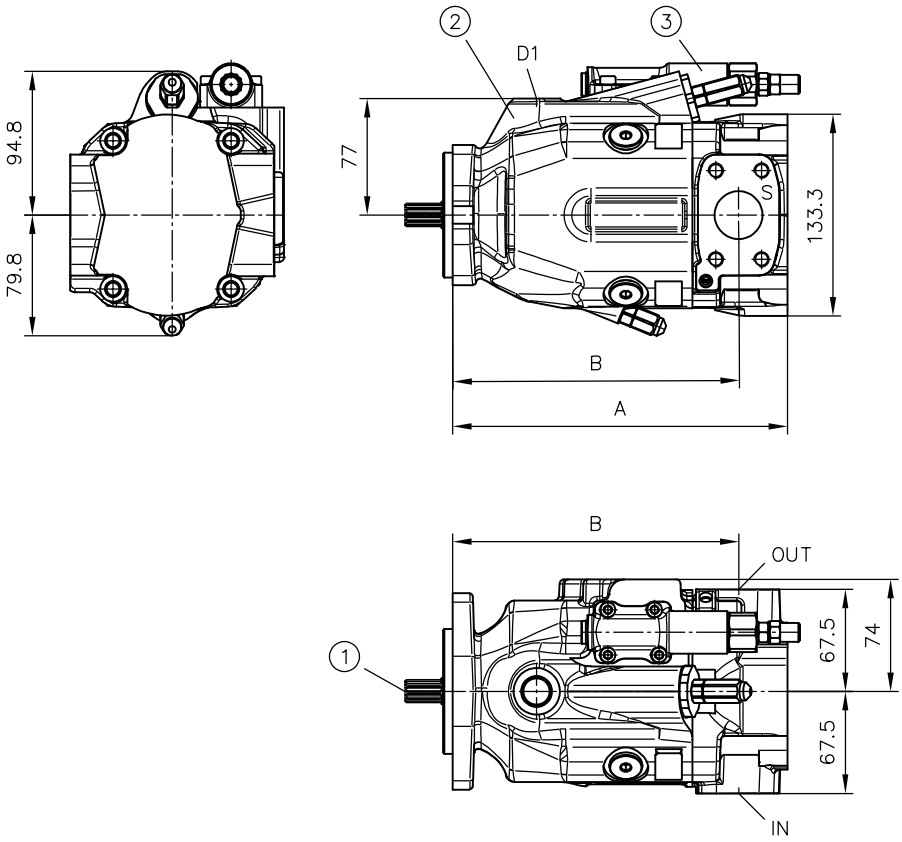
All dimensions in mm, subject to change.

4.1 Basic pump

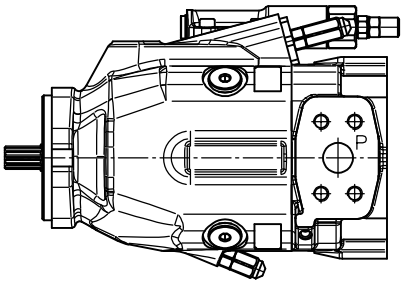
4.1.1 C41V 30.28, C41V 30.34

Version with radial connections without thru-shaft

Clockwise rotation direction
(viewed from shaft journal)



Anticlockwise rotation direction
(viewed from shaft journal)



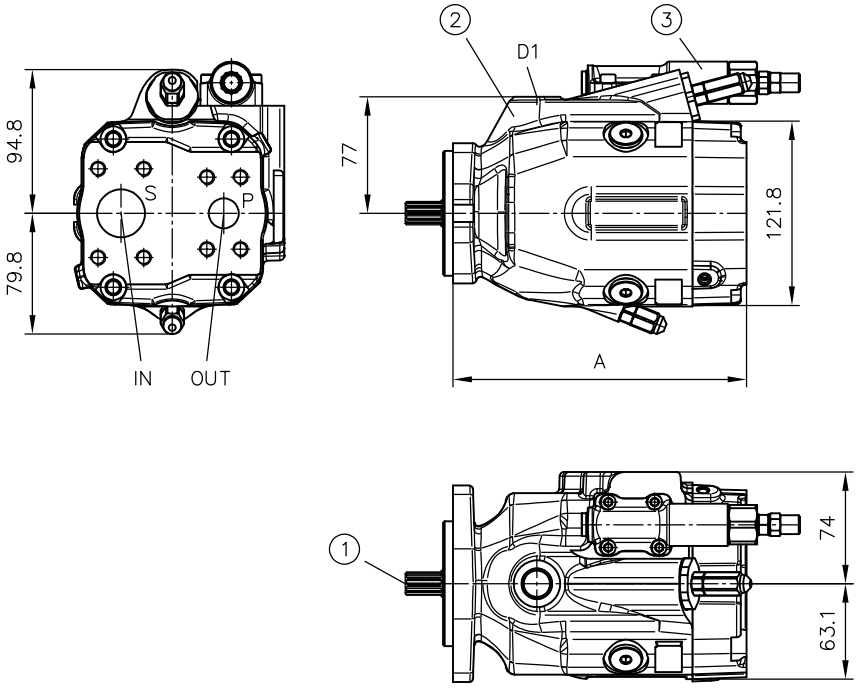
1 Shaft version
2 Flange version
3 Controller

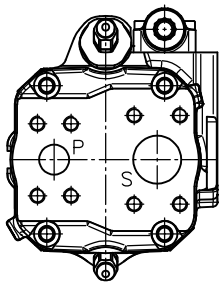
Coding	A	B
S1	221.5	189.2
S5	194.5	162.2

Version with axial connections

Clockwise rotation direction
(viewed from shaft journal)

Anticlockwise rotation direction
(viewed from shaft journal)



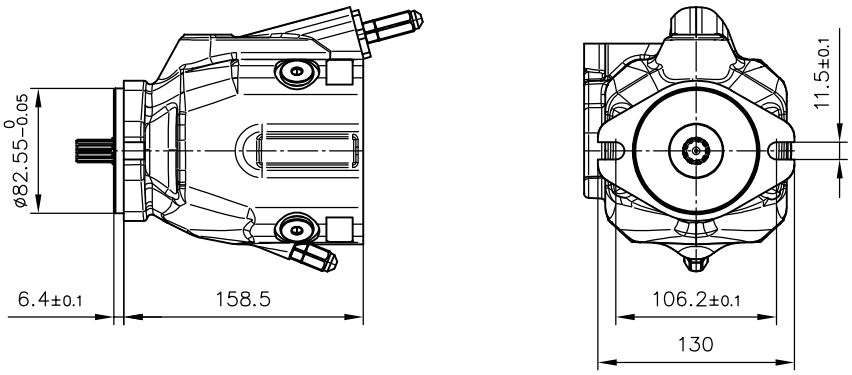


1 Shaft version
2 Flange version
3 Controller

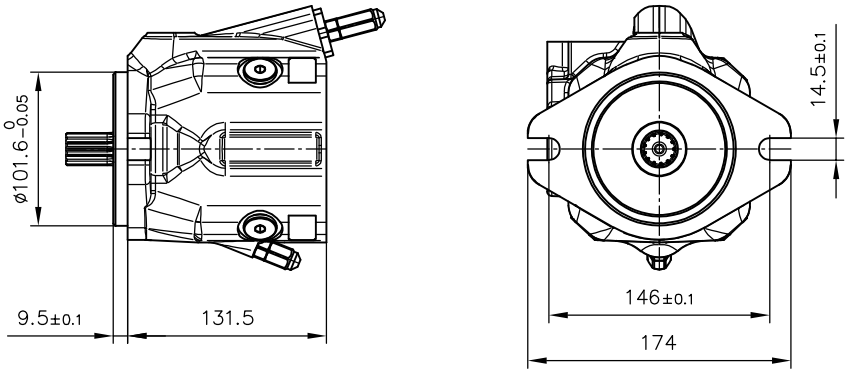
Coding	A
S1	194.2
S5	167.2

Flange version

Coding **S1**

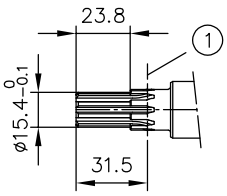


Coding **S5**

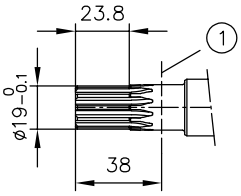


Shaft version

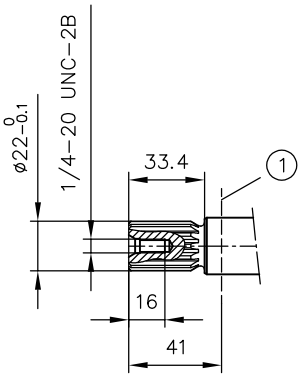
Coding **03**



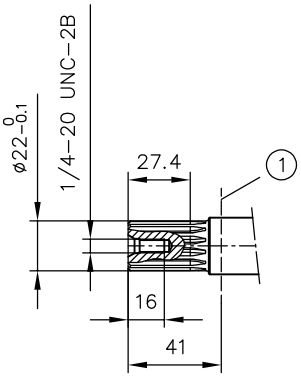
Coding **07**



Coding **04**

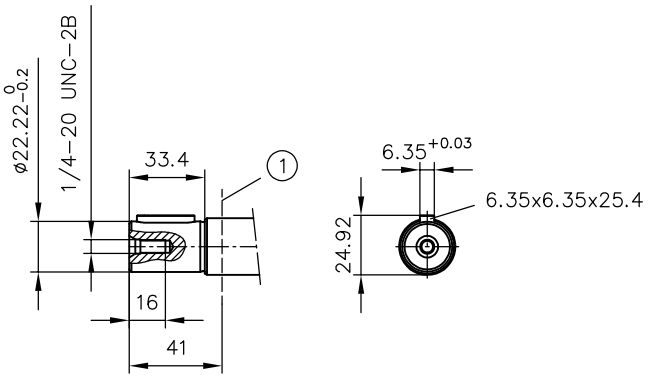


Coding **4R**



1 Mounting surface

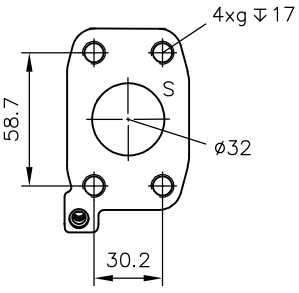
Coding **32**



Suction and pressure connection

Suction port S

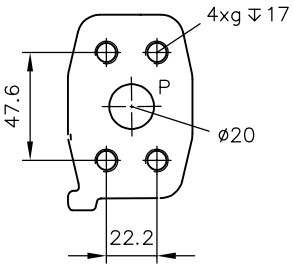
Coding **MD, SD**



Coding	g
MD	M10
SD	7/16-14 UNC-2B

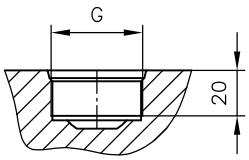
Pressure connection P

Coding **MB, SB**



Coding	g
MB	M10
SB	3/8-16 UNC-2B

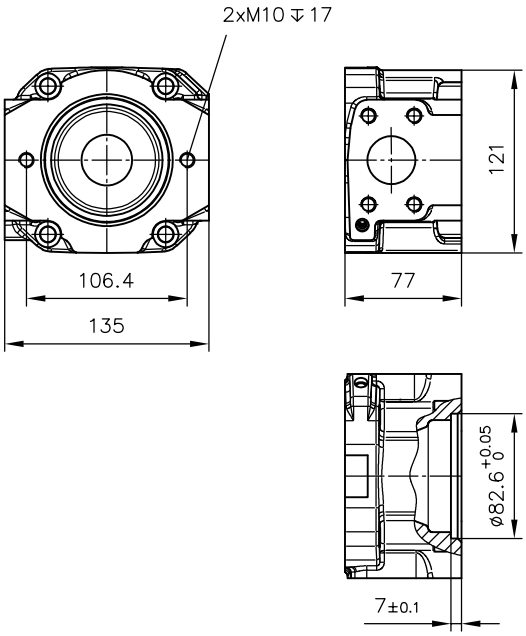
Suction and pressure connection for axial connections



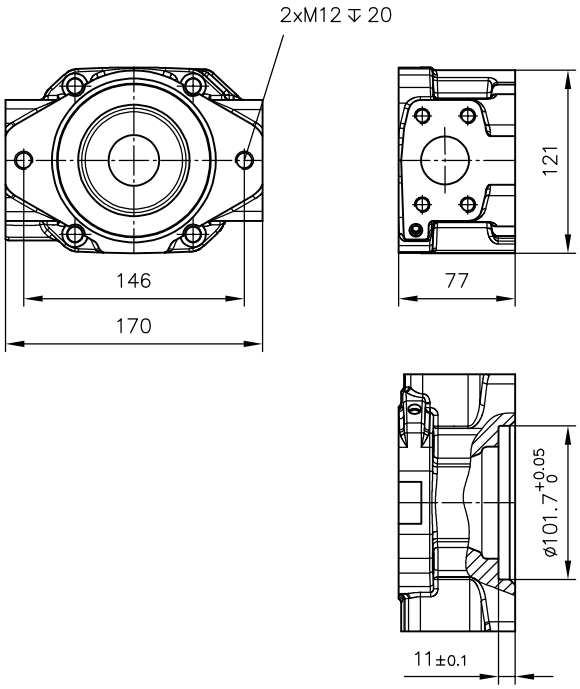
Coding	G
Suction port S	
OG	1 5/8"-12 UNF-2B
Pressure connection P	
OD	1 1/16"-12 UNF-2B

Version with radial connections with thru-shaft

Coding **AS1**

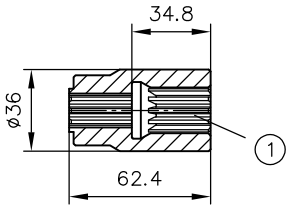


Coding **AS5**



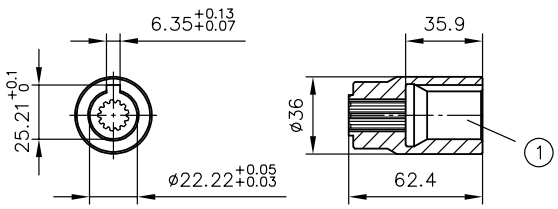
Coupling sleeve for thru-shaft

Coding **04**



1 ANSI B92.1a-1976
Class 6 - 13 teeth
16/32 spacing - 30°
Shallow tooth root - tooth flank fit
Second pump side

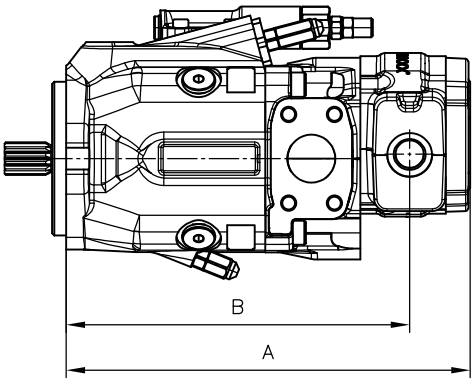
Coding **32**



1 SAE “B” straight
Second pump side

Version with integrated gear pump

Coding **8; 10.5; 11.2; 14; 16; 19; 20; 25; 31.5**

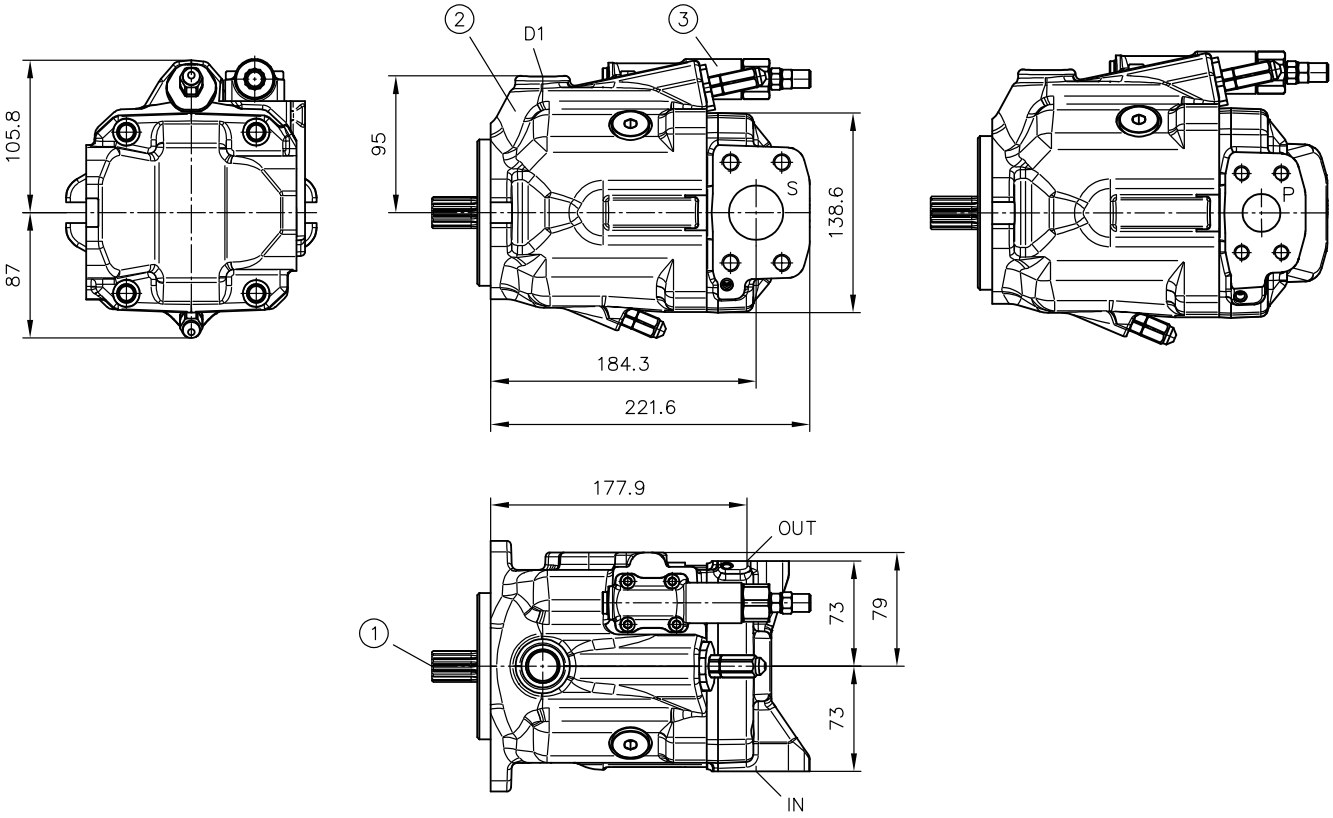


Coding	A	B	Suction port (sealed) BSPP	Pressure connection BSPP
8	274.6	228	1/2"	1/2"
10.5	278.6	231		
11.2	279.1	231.5		
14	284.1	236.5	3/4"	
16	287.6	239.5		
19	291	231		
20	294.1	232.5		
25	301.6	236.5	1"	
31.5	311.6	241.5		

4.1.2 C41V 48.45, C41V 48.53

Version with radial connections without thru-shaft

Clockwise rotation direction
(viewed from shaft journal)



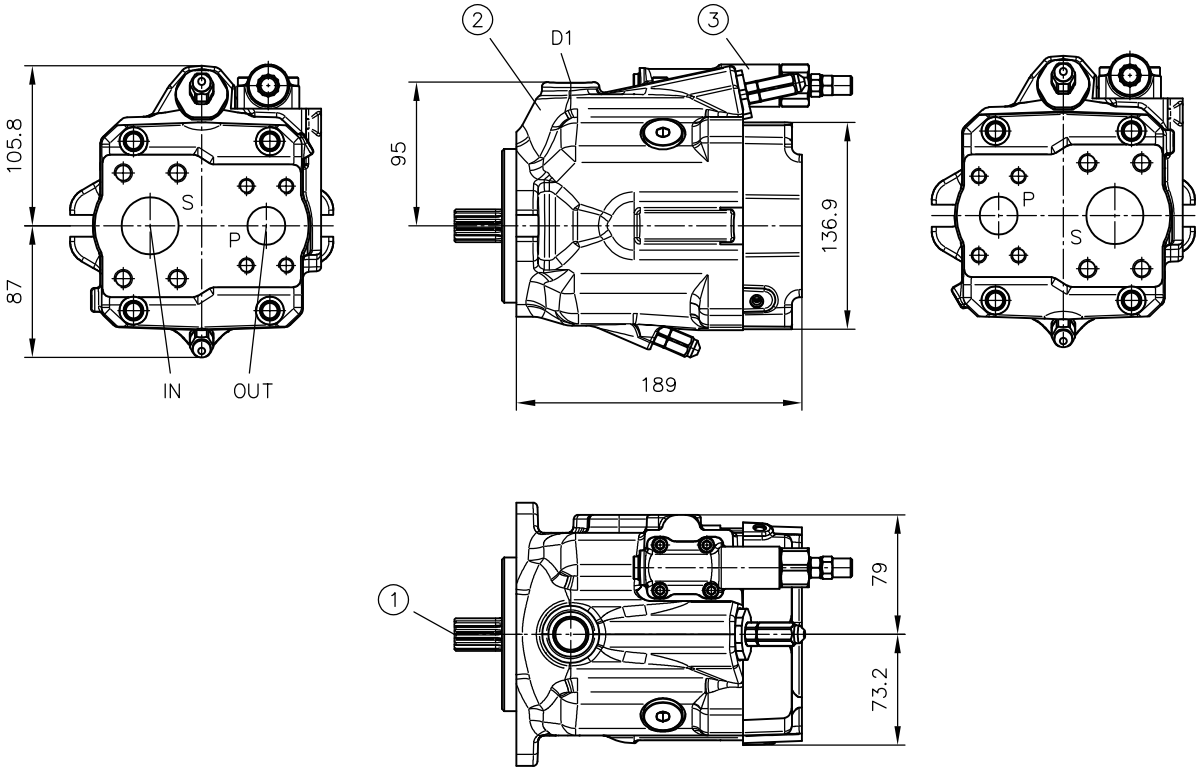
Anticlockwise rotation direction
(viewed from shaft journal)

1 Shaft version
2 Flange version
3 Controller

Version with axial connections

Clockwise rotation direction
(viewed from shaft journal)

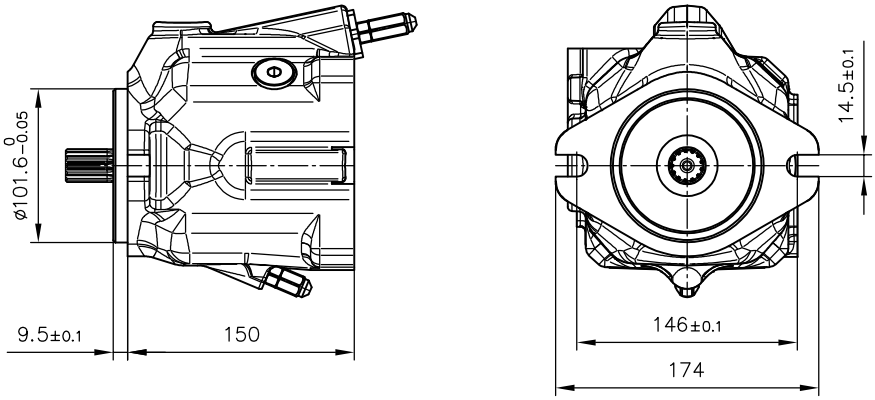
Anticlockwise rotation direction
(viewed from shaft journal)



1 Shaft version
2 Flange version
3 Controller

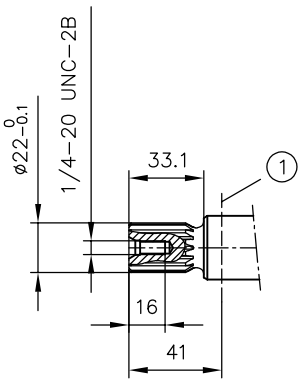
Flange version

Coding **S5**

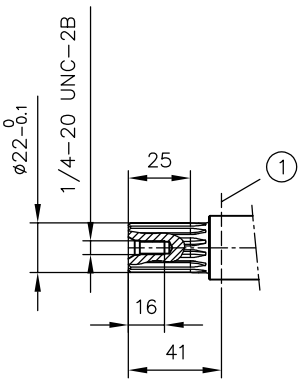


Shaft version

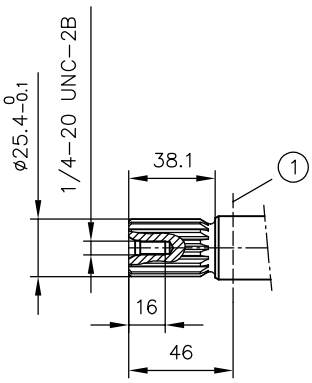
Coding **04**



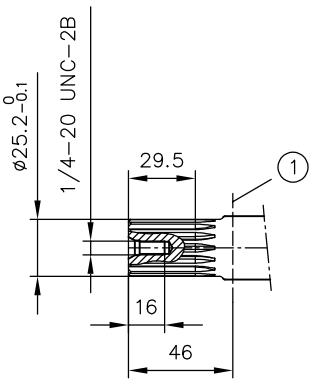
Coding **4R**



Coding **05**

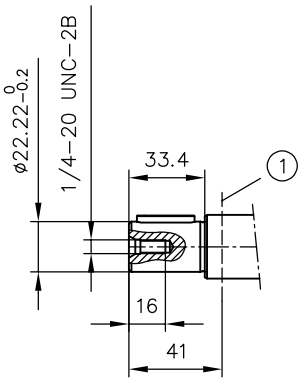


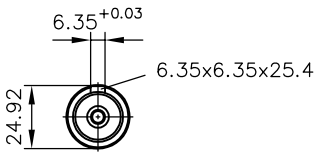
Coding **5R**



1 Mounting surface

Coding **32**

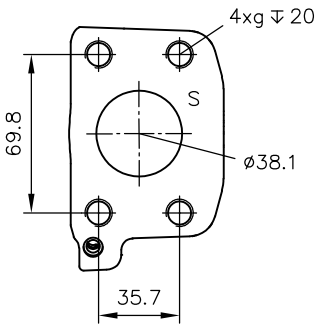




Suction and pressure connection

Suction port S

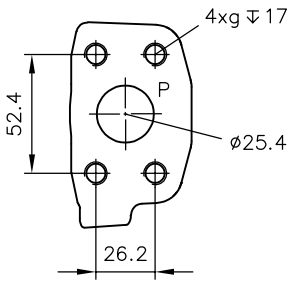
Coding **ME, SE**



Coding	g
ME	M12
SE	1/2-13 UNC-2B

Pressure connection P

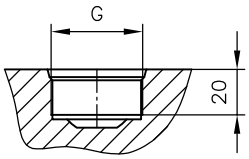
Coding **MC, SC**



Coding	g
MC	M10
SC	3/8-16 UNC-2B

Suction and pressure connection for axial connections

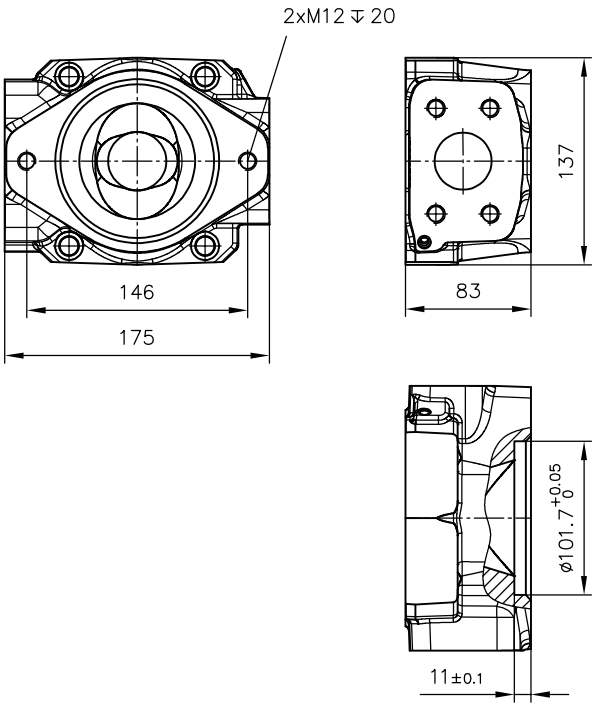
Coding **OH, OF**



Coding	G
Suction port S	
OH	1 7/8"-12 UNF-2B
Pressure connection P	
OF	1 5/16"-12 UNF-2B

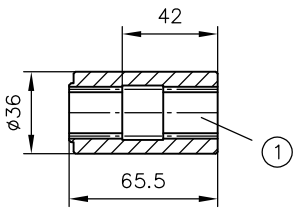
Version with radial connections with thru-shaft

Coding **AS5**



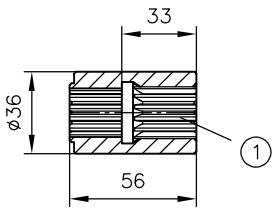
Coupling sleeve for thru-shaft

Coding **04**



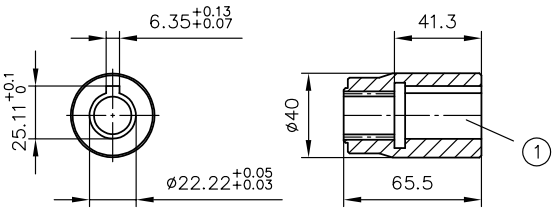
1 ANSI B92.1a-1976
Class 6 - 13 teeth
16/32 spacing - 30°
Shallow tooth root - tooth flank fit
Second pump side

Coding **05**



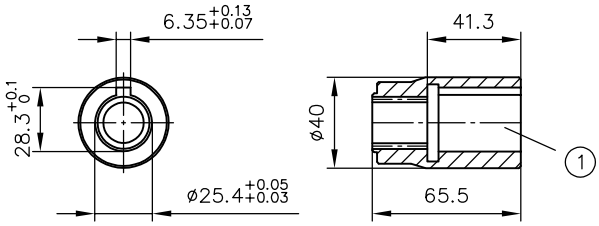
1 ANSI B92.1a-1976
Class 6 - 15 teeth
16/32 spacing - 30°
Shallow tooth root - tooth flank fit
Second pump side

Coding **32**



1 SAE “B” straight
Second pump side

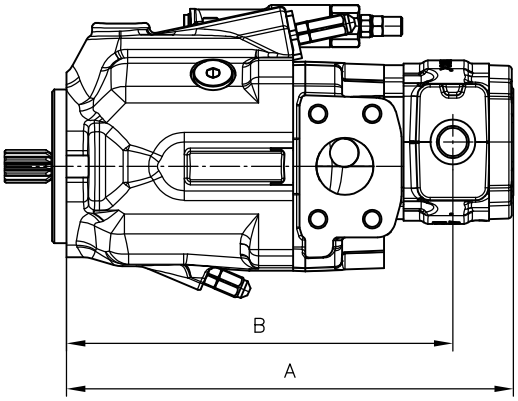
Coding **33**



1 SAE “BB” straight
Second pump side

Version with integrated gear pump

Coding **8; 10.5; 11.2; 14; 16; 19; 20; 25; 31.5**

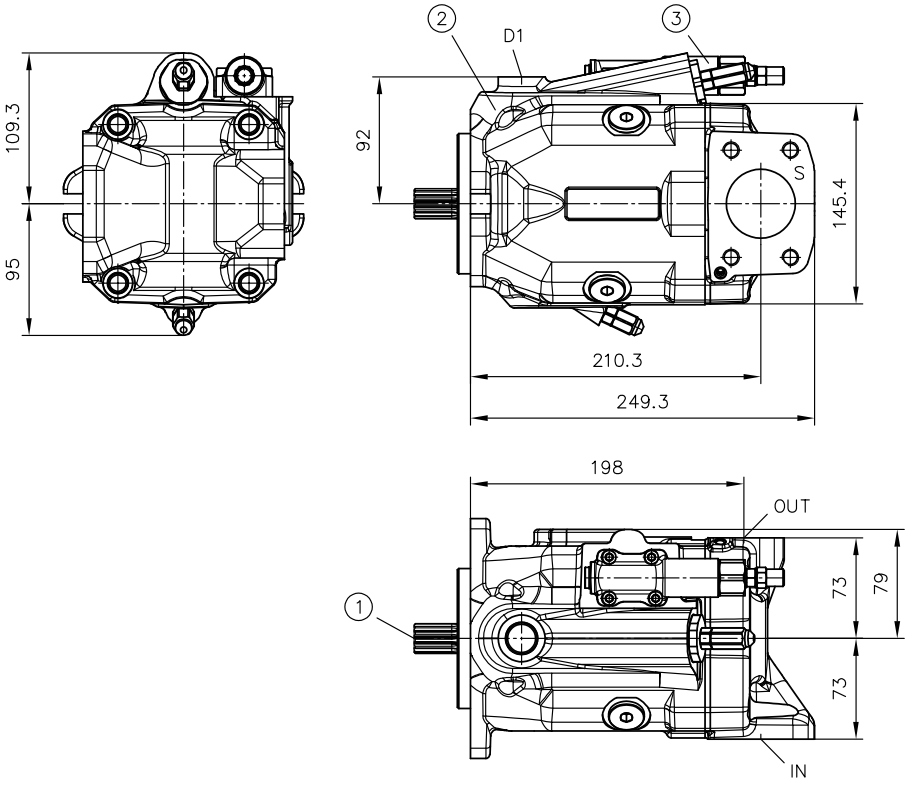


Coding	A	B	Suction port (sealed) BSPP	Pressure connection BSPP
8	290.1	243.5	1/2"	1/2"
10.5	294.1	246.5		
11.2	294.6	247		
14	299.6	252	3/4"	
16	303.1	255		
19	306.5	246.5		
20	309.6	248		
25	317.1	252	1"	
31.5	327.1	257		

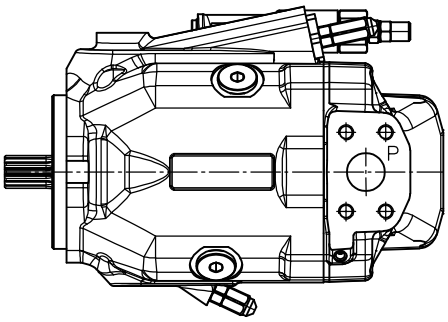
4.1.3 C41V 60.60, C41V 60.72, C41V 60.84

Version with radial connections without thru-shaft

Clockwise rotation direction
(viewed from shaft journal)



Anticlockwise rotation direction
(viewed from shaft journal)

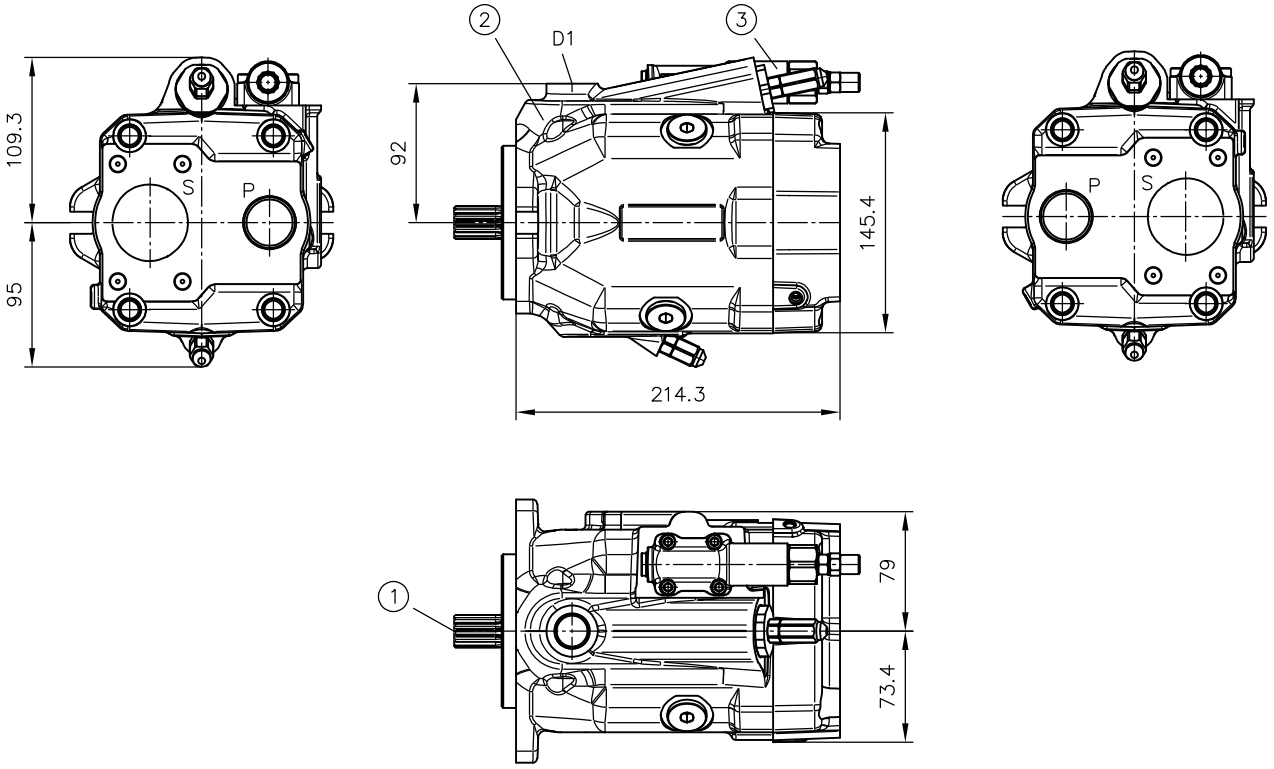


1 Shaft version
2 Flange version
3 Controller

Version with axial connections

Clockwise rotation direction
(viewed from shaft journal)

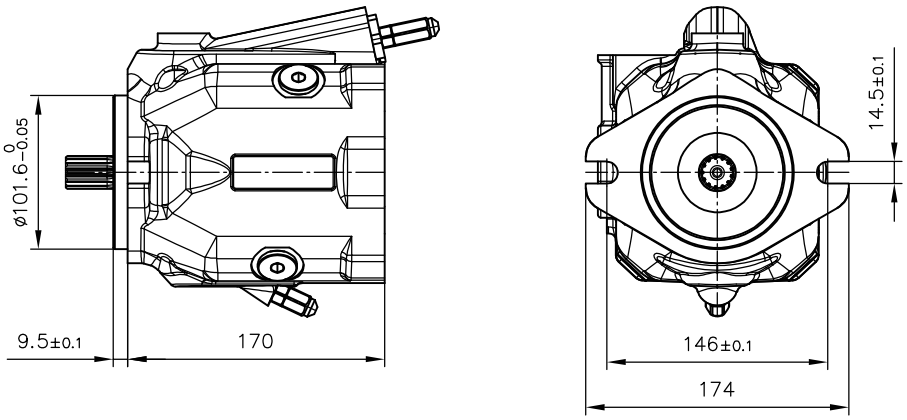
Anticlockwise rotation direction
(viewed from shaft journal)



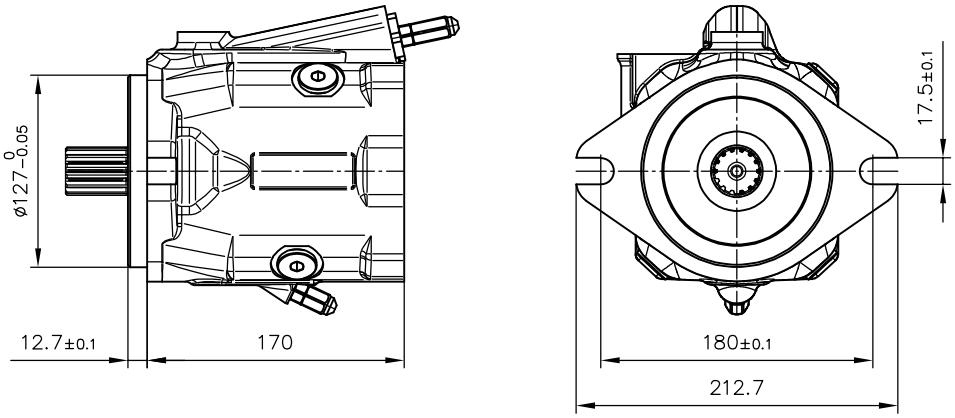
1 Shaft version
2 Flange version
3 Controller

Flange version

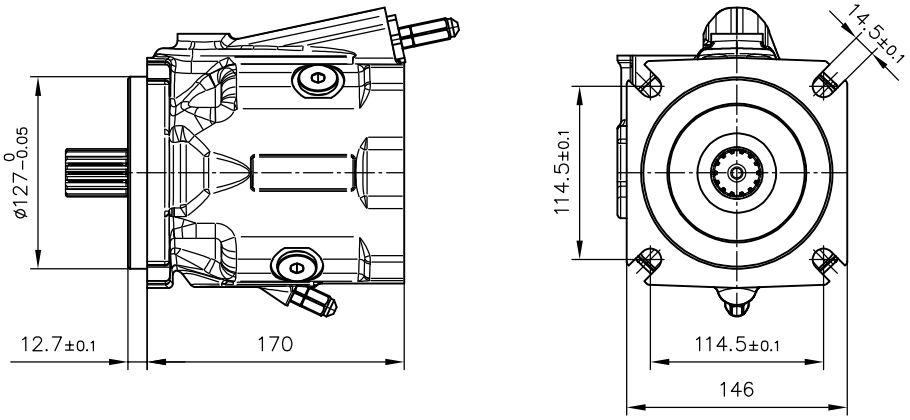
Coding **S5**



Coding **S7**

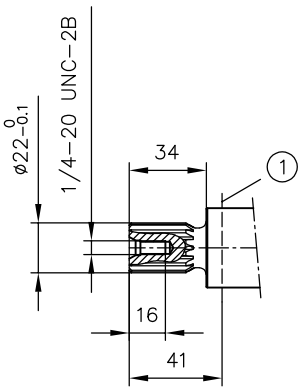


Coding **S8**

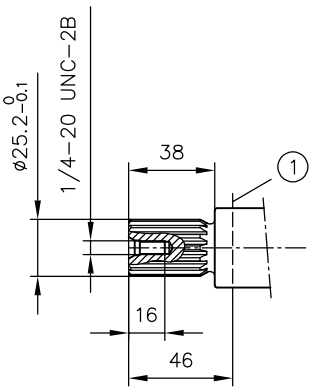


Shaft version

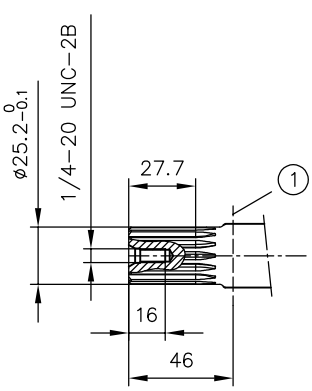
Coding **04**



Coding **05**

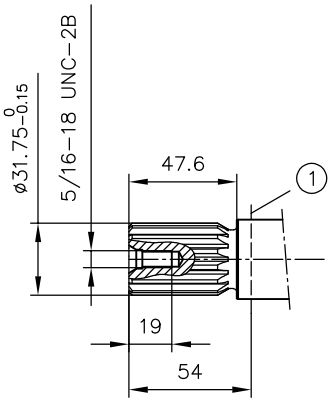


Coding **5R**

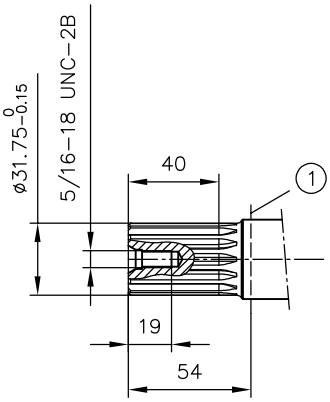


1 Mounting surface

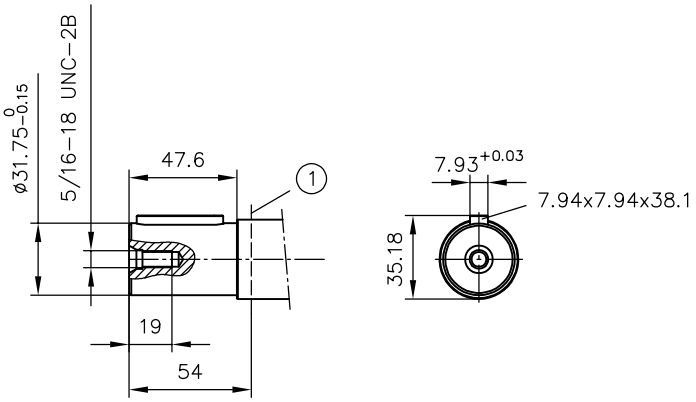
Coding **06**



Coding **6R**



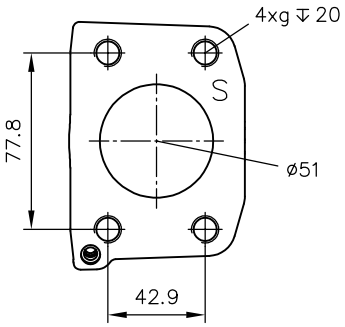
Coding **34**



Suction and pressure connection

Suction port S

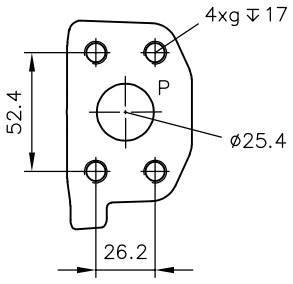
Coding **MF, SF**



Coding	g
MF	M12
SF	1/2-13 UNC-2B

Pressure connection P

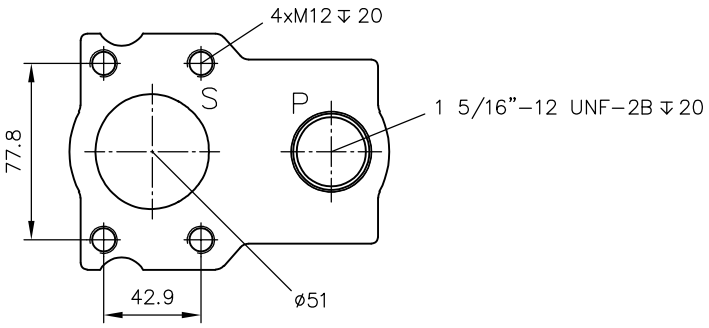
Coding **MC, SC**



Coding	g
MC	M10
SC	3/8-16 UNC-2B

Suction and pressure connection for axial connections

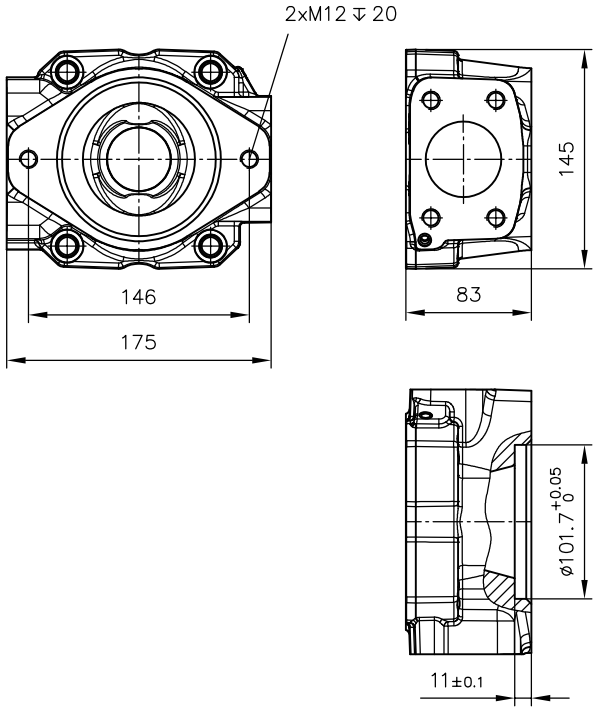
Coding **MF, OF**



- **Suction port S** = Coding **MF**
- **Pressure connection P** = Coding **OF**

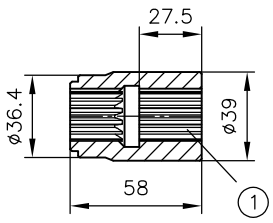
Version with radial connections with thru-shaft

Coding **AS5**



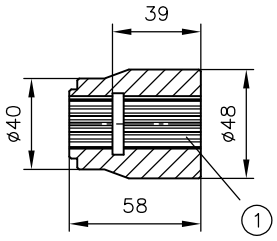
Coupling sleeve for thru-shaft

Coding **04**



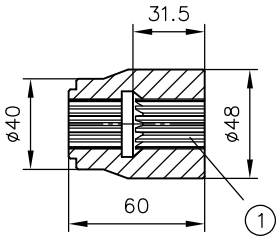
1 Involute toothing similar to ANSI B92.1
Class 7 - 13 teeth
16/32 spacing - 30°
Shallow tooth root - tooth flank fit
Second pump side

Coding **05**



1 Involute toothing similar to ANSI B92.1
Class 7 - 15 teeth
16/32 spacing - 30°
Shallow tooth root - tooth flank fit
Second pump side

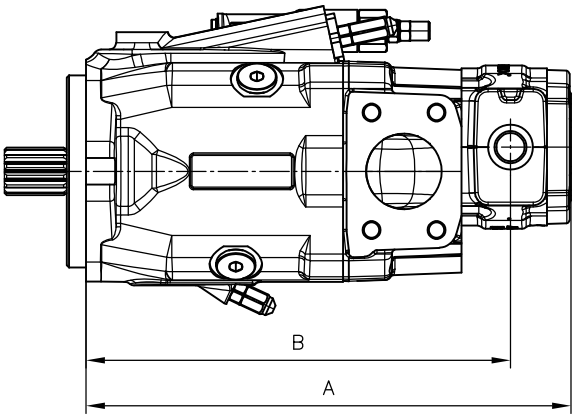
Coding **06**



1 Involute toothing similar to ANSI B92.1
Class 7 - 14 teeth
12/24 spacing - 30°
Shallow tooth root - tooth flank fit
Second pump side

Version with integrated gear pump

Coding **8; 10.5; 11.2; 14; 16; 19; 20; 25; 31.5**

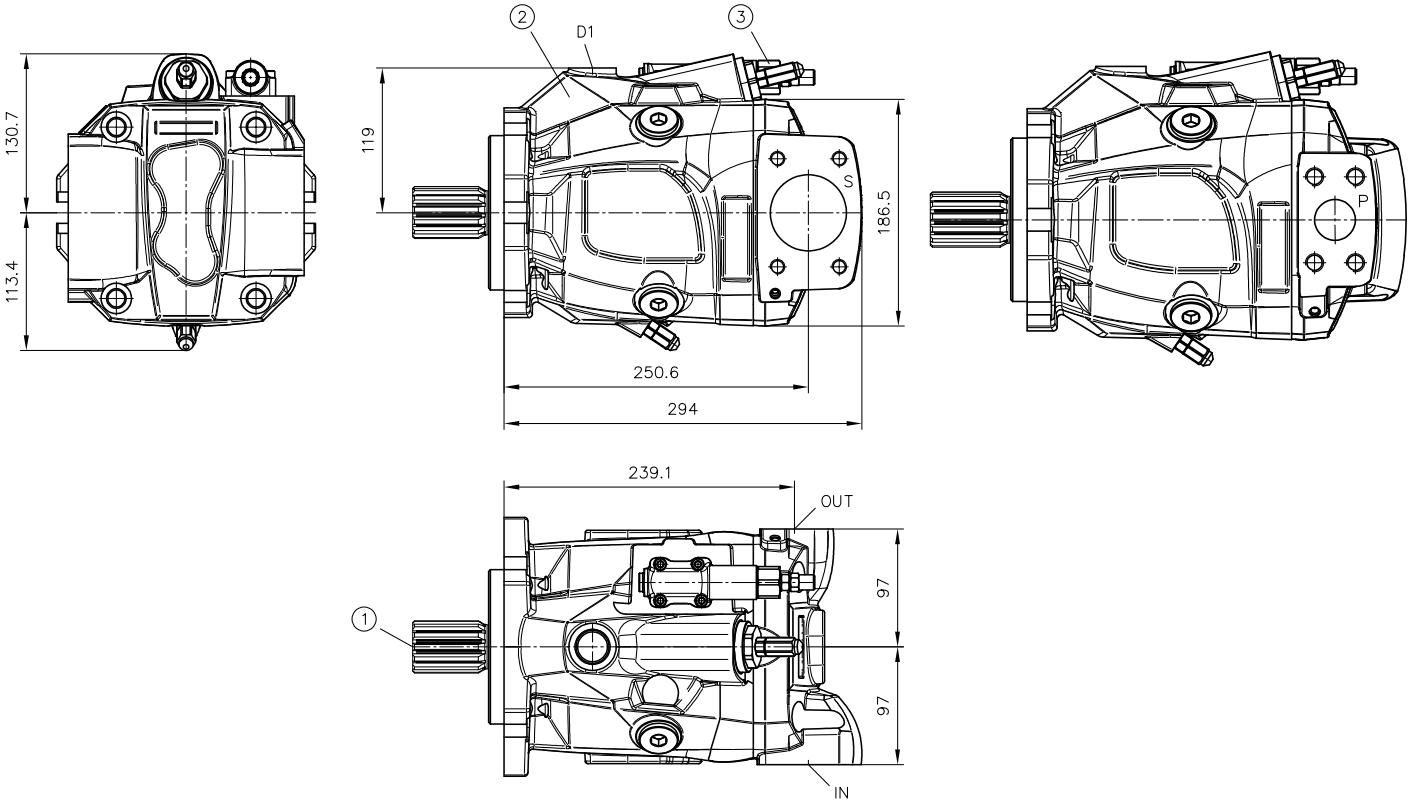


Coding	A	B	Suction port (sealed) BSPP	Pressure connection BSPP
8	328.4	281.8	1/2"	1/2"
10.5	332.4	284.8		
11.2	332.9	285.3		
14	337.9	290.3	3/4"	
16	341.4	293.3		
19	344.8	284.8		
20	347.9	286.3		
25	355.4	290.3	1"	
31.5	365.4	295.3		

4.1.4 C41V 100.100, C41V 100.115

Version with radial connections without thru-shaft

Clockwise rotation direction
(viewed from shaft journal)



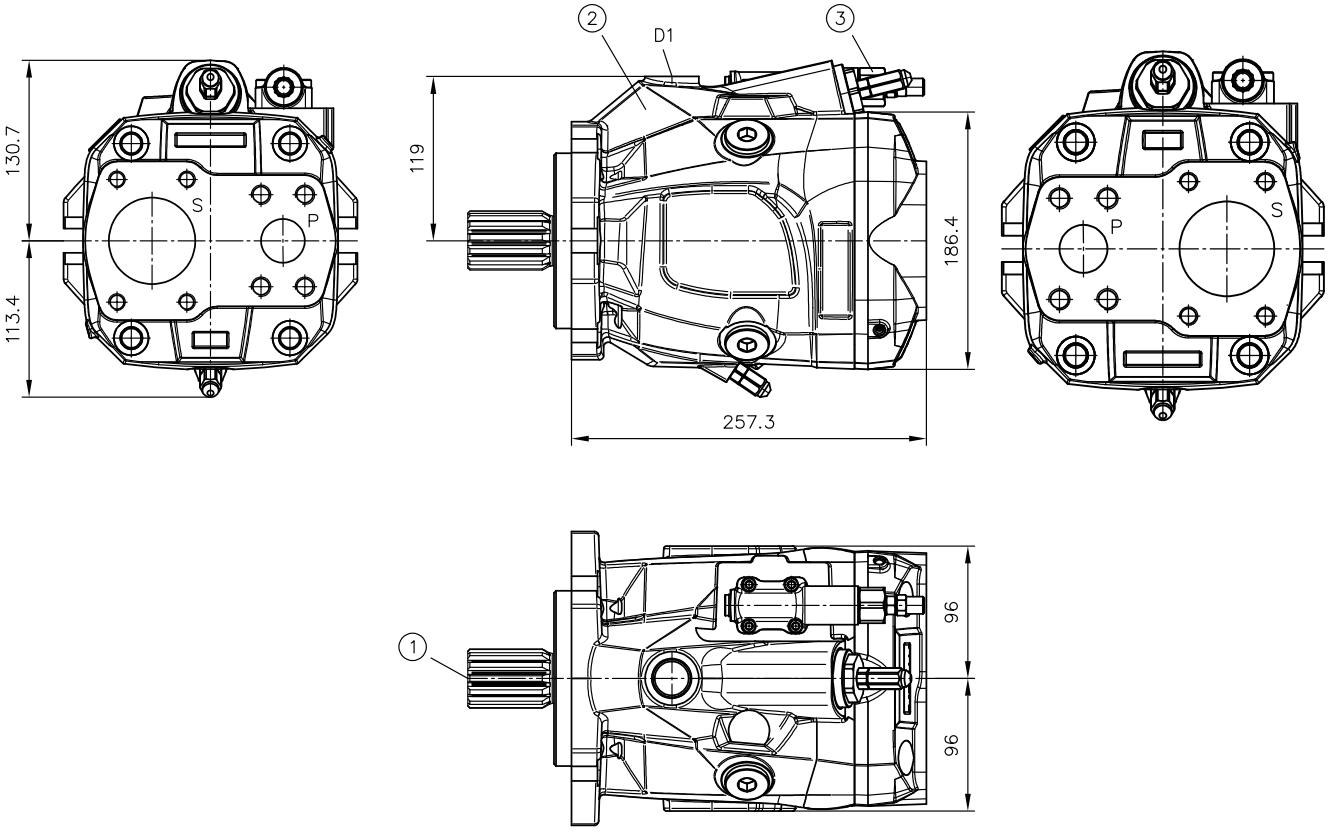
Anticlockwise rotation direction
(viewed from shaft journal)

1 Shaft version
2 Flange version
3 Controller

Version with axial connections

Clockwise rotation direction
(viewed from shaft journal)

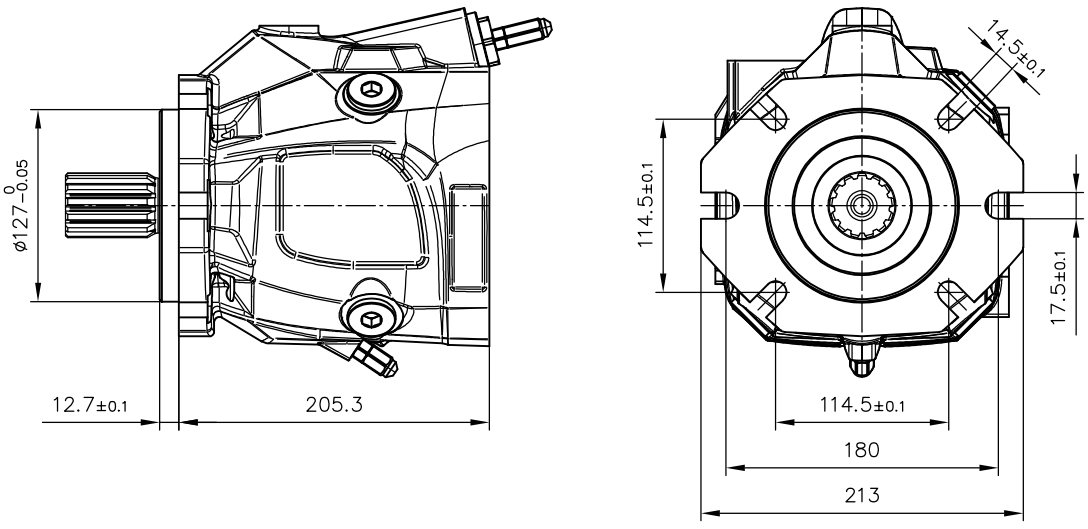
Anticlockwise rotation direction
(viewed from shaft journal)



1 Shaft version
2 Flange version
3 Controller

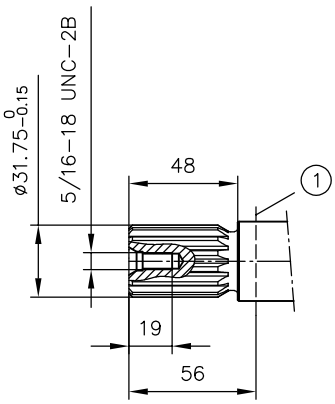
Flange version

Coding **S8**

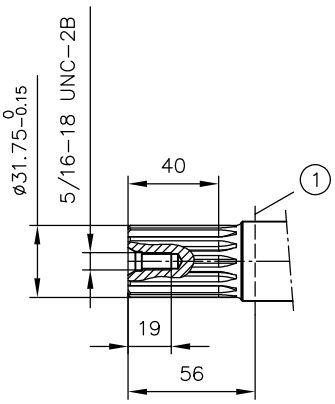


Shaft version

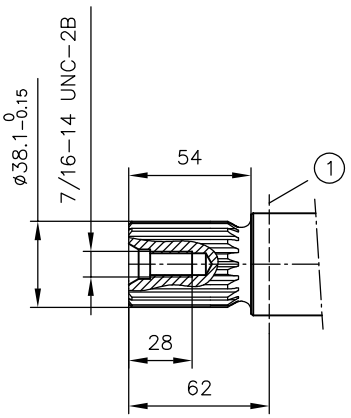
Coding **O6**



Coding **6R**

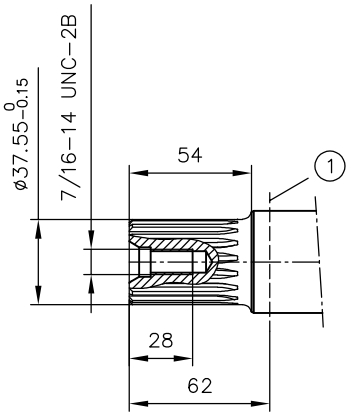


Coding **HM**

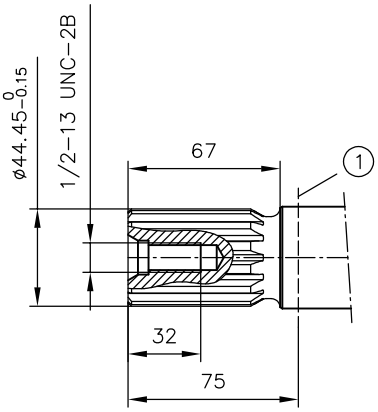


1 Mounting surface

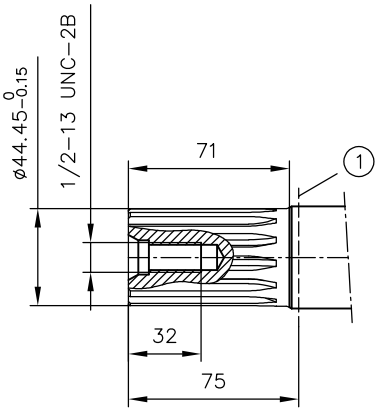
Coding **HK**



Coding **HJ**



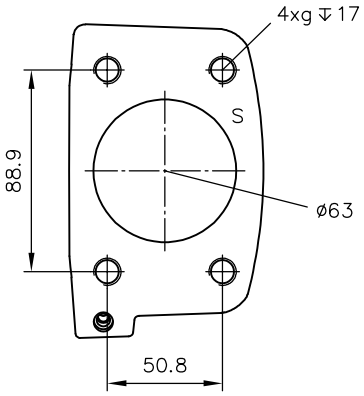
Coding **HI**



Suction and pressure connection

Suction port S

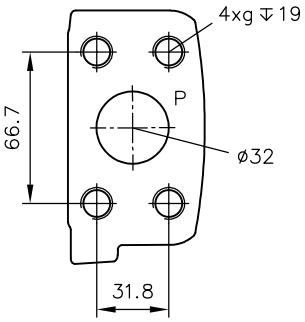
Coding **MG, SG**



Coding	g
MG	M12
SG	1/2-13 UNC-2B

Pressure connection P

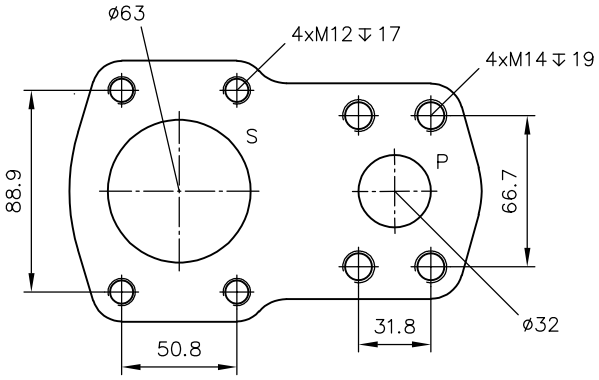
Coding **QD, VD**



Coding	g
QD	M14
VD	1/2-13 UNC-2B

Suction and pressure connection for axial connections

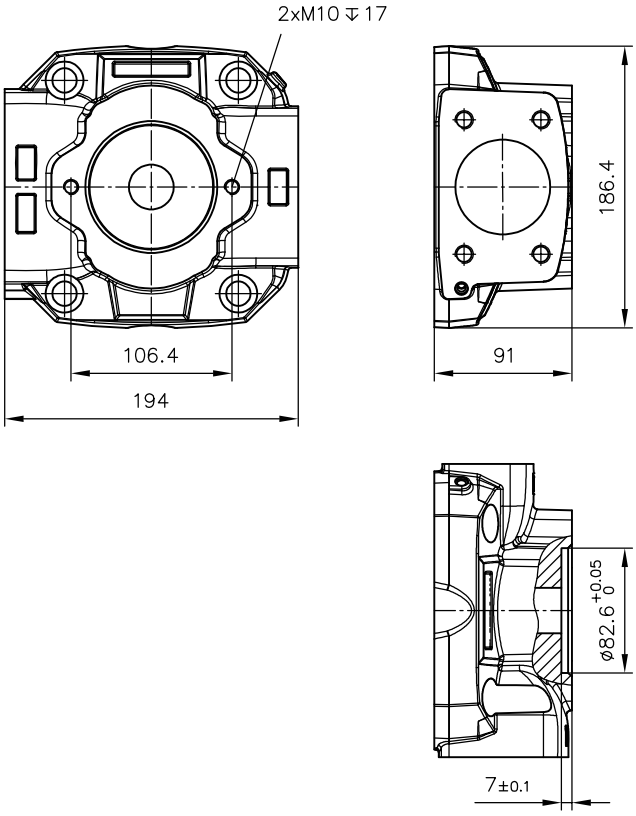
Coding **MG, QD**



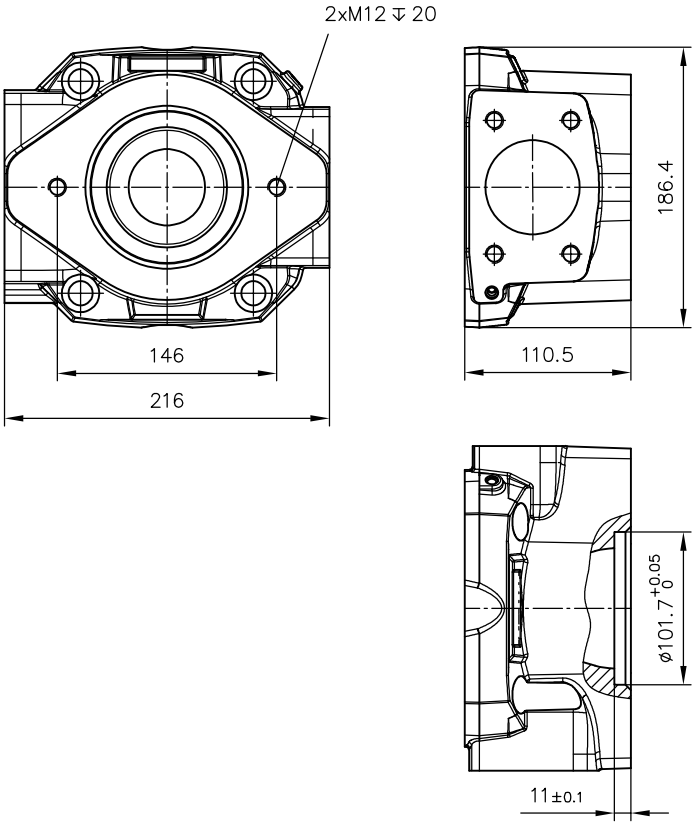
- **Suction port S** = Coding **MG**
- **Pressure connection P** = Coding **QD**

Version with radial connections with thru-shaft

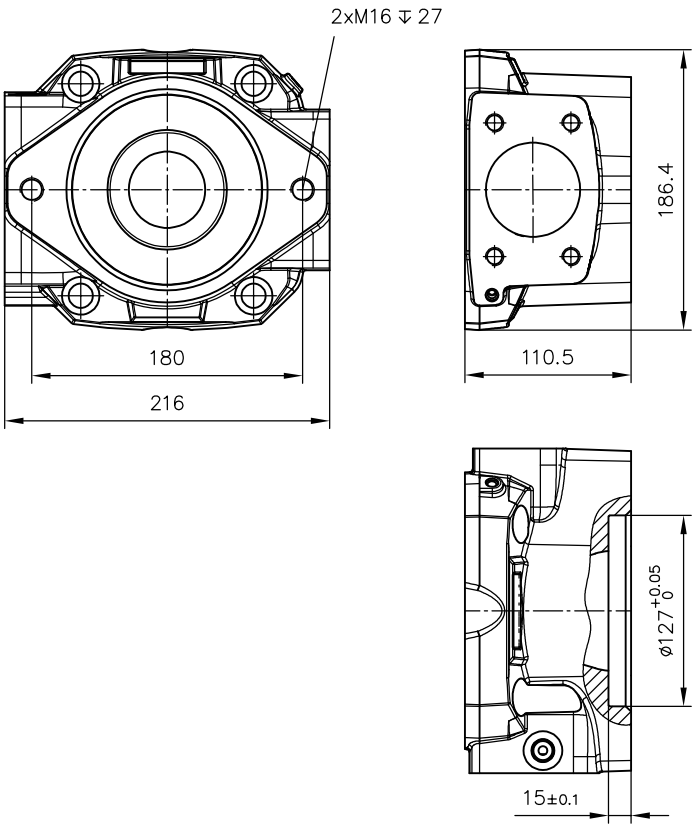
Coding **AS1**



Coding **AS5**

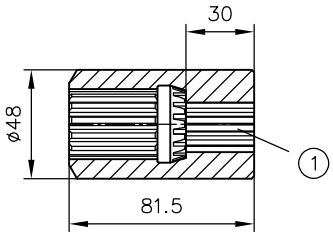


Coding **AS7**



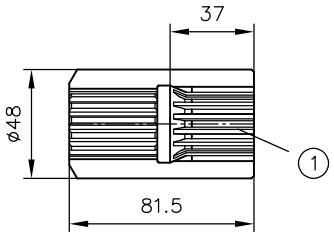
Coupling sleeve for thru-shaft

Coding **04**



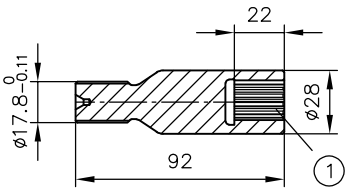
1 Involute toothing similar to ANSI B92.1
Class 7 - 13 teeth
12/24 spacing - 30°
Shallow tooth root - tooth flank fit
Second pump side

Coding **06**



1 Involute toothing similar to ANSI B92.1
Class 7 - 14 teeth
12/24 spacing - 30°
Shallow tooth root - tooth flank fit
Second pump side

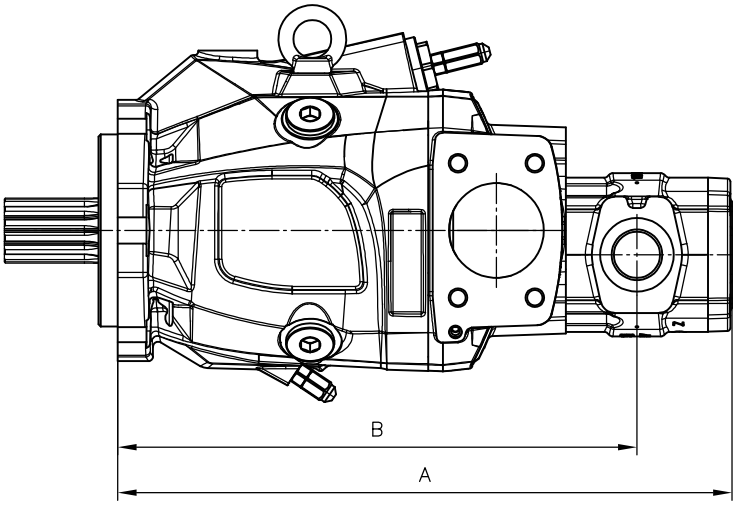
Coding **07**



1 Involute toothing similar to ANSI B92.1
Class 5 - 11 teeth
16/32 spacing - 30°
Shallow tooth root - tooth flank fit
Second pump side

Version with integrated gear pump

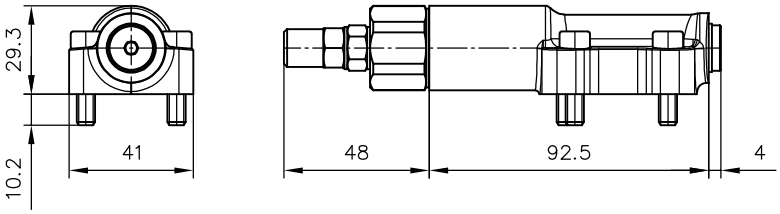
Coding **8; 10.5; 11.2; 14; 16; 19; 20; 25; 31.5**



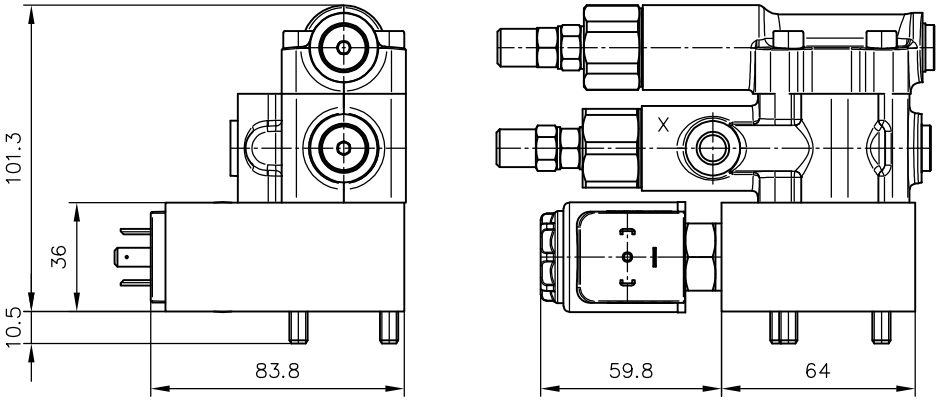
Coding	A	B	Suction port (sealed) BSPP	Pressure connection BSPP
8	375.9	328.8	1/2"	1/2"
10.5	379.9	331.8		
11.2	380.4	332.3		
14	385.4	337.3	3/4"	
16	388.9	340.3		
19	392.3	331.8		
20	395.4	333.3		
25	402.9	337.7	1"	
31.5	412.9	342.3		

4.2 Pump controller

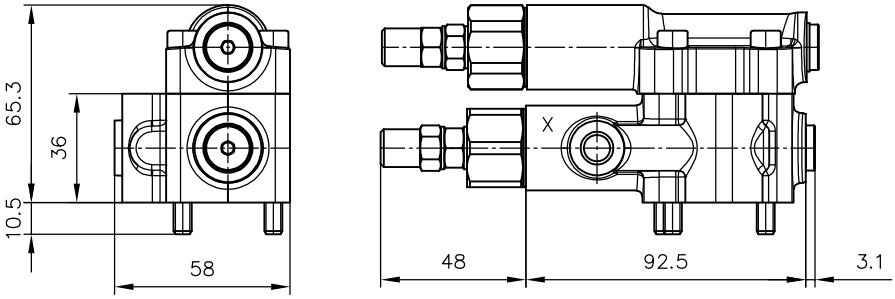
Coding **RPO**



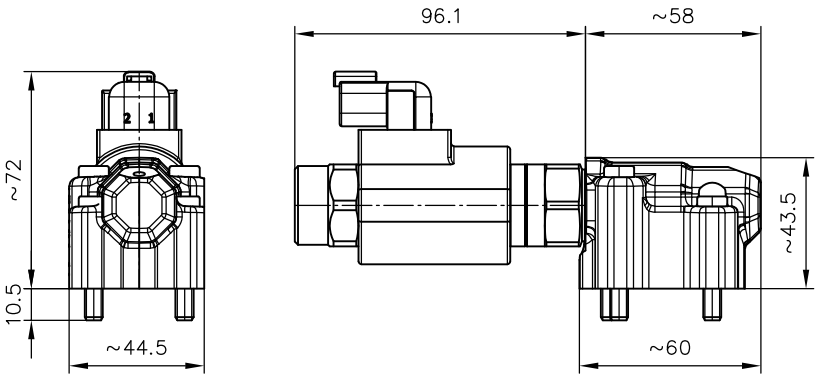
Coding **RP2 and RP2-LS2**



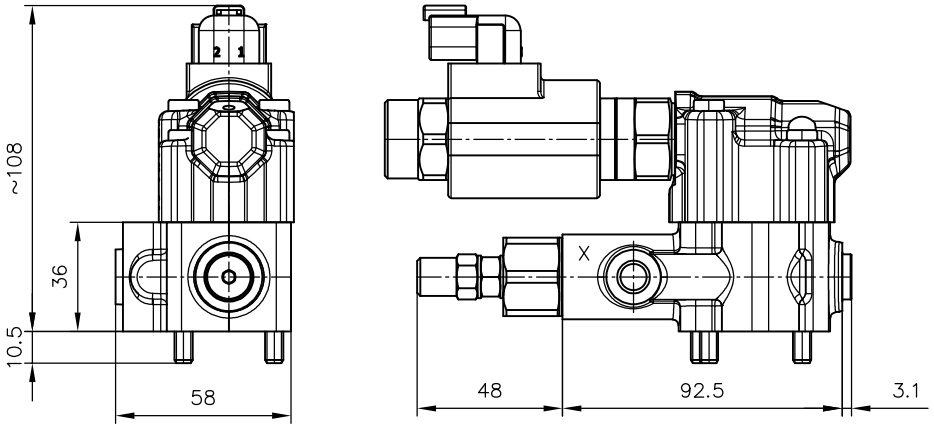
Coding **LS0, LS2, LS3**



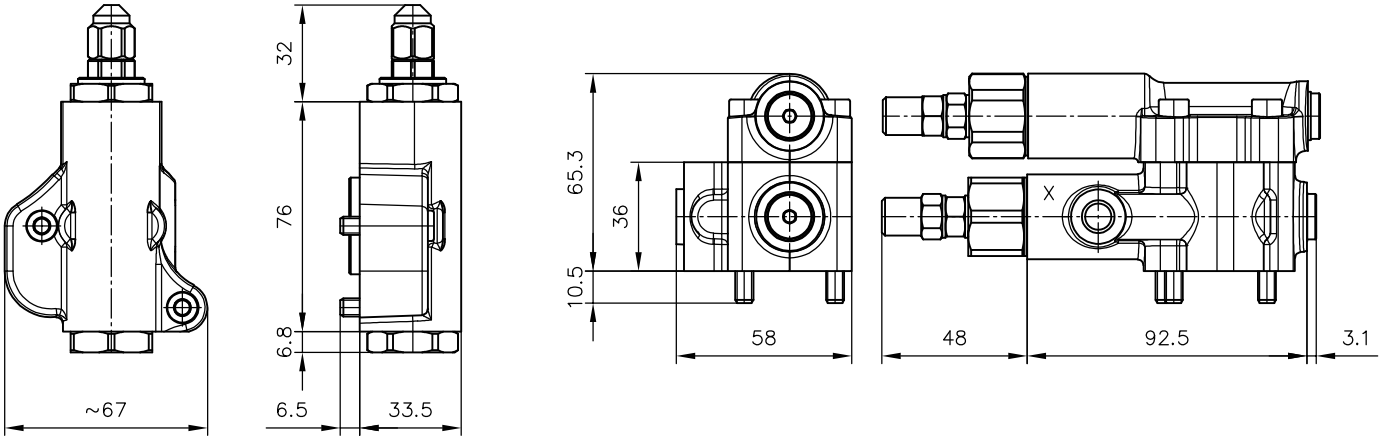
Coding **PEC**



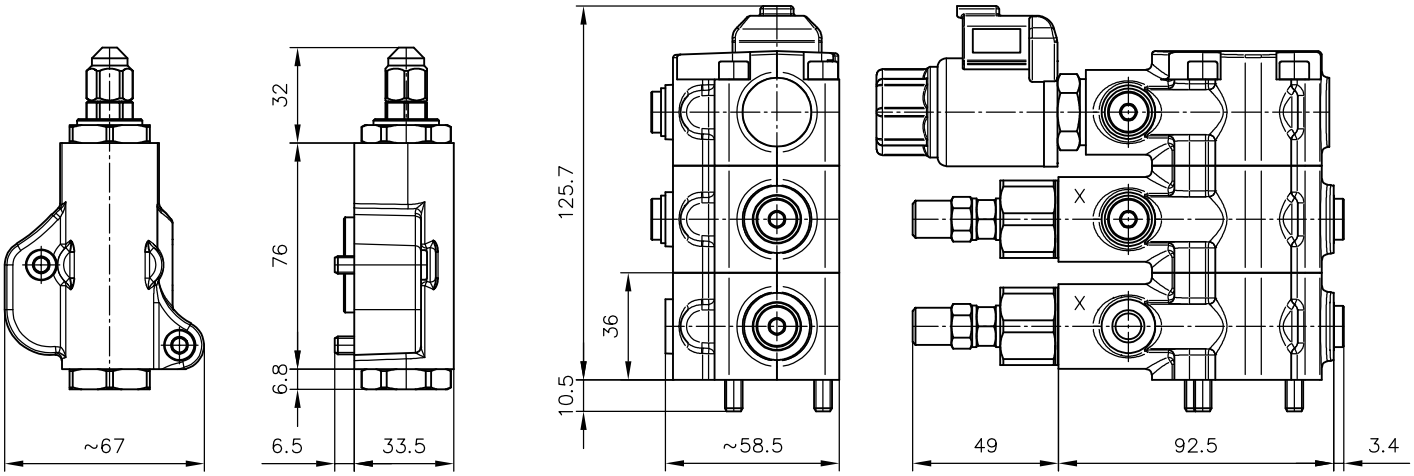
Coding **PEC-LS2, PEC-LS0**



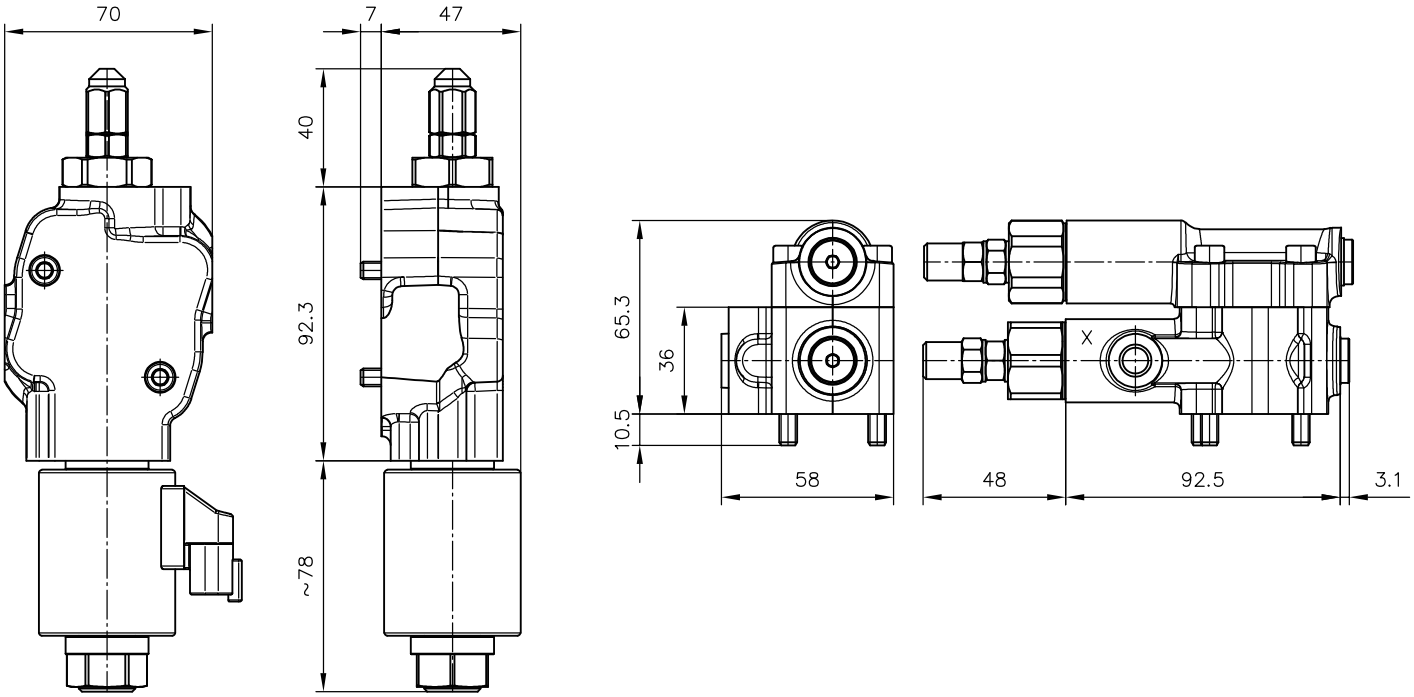
Coding **RN0 and RN1**



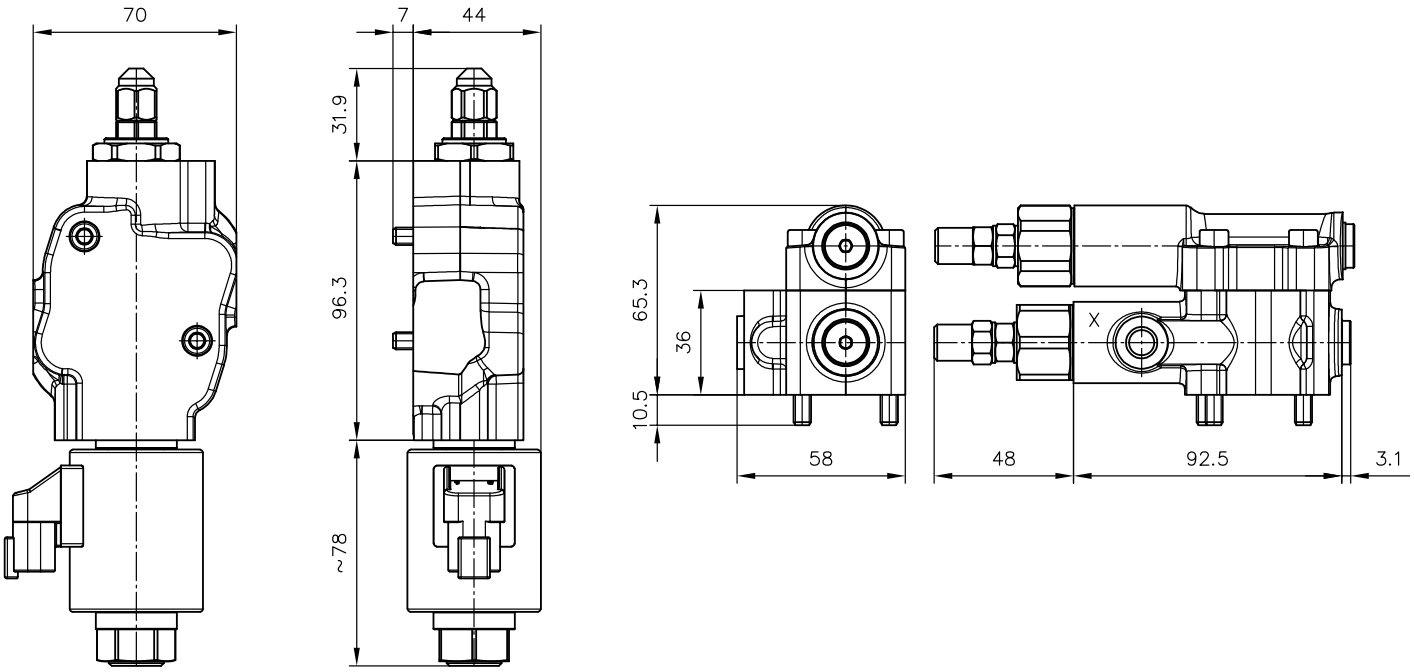
Coding **RN2-LS2 and RN2-LS0**



Coding **DEC**



Coding **TEC**



5 Installation, operation and maintenance information

Observe the document B 5488 “General operating instructions for assembly, commissioning, and maintenance.”

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 document.

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 specialist personnel.
- ► The product must only be operated within the specified technical parameters described in detail in this document.
- ► All components must be suitable for the operating conditions when using an assembly.
- ► The operating instructions for 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 disassembly (in particular in combination with hydraulic accumulators).

⚠ **DANGER**

Sudden movement of the hydraulic drives when disassembled incorrectly

Risk of serious injury or death

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

5.2.1 General information

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 ("Installation positions").
- Observe the electric reference values.
- 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.
- 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.
- Never drain the pump.
- 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 . Never exceed the maximum temperature.
- Always comply with the cleanliness level of the hydraulic fluid. In addition, filter the hydraulic fluid appropriately .

- 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 connecting lines' nominal width depends on:

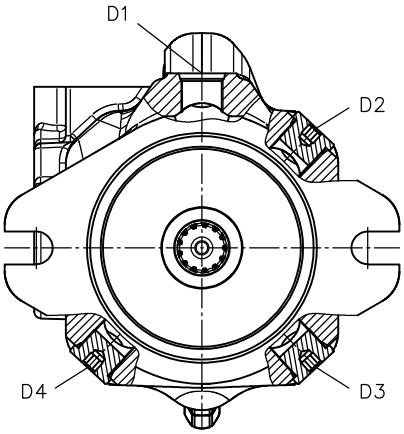
- the given usage conditions
- viscosity of the hydraulic fluid
- start-up and operating temperature
- pump speed

HAWE recommends: Use hose lines (improved damping characteristics) instead of rigid pipelines.

Pressure connection	▪ The pressure connection is implemented via flange ports or threaded connections; see Chapter 4, "Dimensions" ▪ Observe the fitting manufacturers' specified tightening torques.
Suction port	▪ The suction port is implemented via flange ports or threaded connections; see Chapter 4, "Dimensions". ▪ If possible, route the suction line to the tank on a rising gradient. This allows trapped air to escape. ▪ The absolute suction pressure must not fall below 0.8 bar. ▪ A hose line should generally be used in preference to a rigid pipe line.
Drain port	▪ The pump features 4 drain ports, see Chapter 5.2.3, "Installation positions". 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 pump controller to the tank is not required. ▪ The top drain port can be used to fill the housing.
LS port X	▪ The LS line is connected via an G 1/8 threaded connection to the X port of the controller. ▪ The nominal width of the line depends on the mounting 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 valves are in neutral position, the LS line must always be fully relieved(pump controller type LS2, RP2-LS2 and RN2-LS0LS2, RP2-LS2, RN0 and RN2-LS2 only)! For pump controller type LS0 and RN2-LS0, the relieving takes place internally in the pump controller.
Remote-control port X	The remote-control line is connected via a G 1/8 threaded connection to the X port of the LS3 controller.

5.2.3 Installation positions

The pump features 4 drain ports. In the delivery condition, connection D1 is open and connections D2, D3 and D4 are sealed.



Prior to the installation in the vehicle, fill the pump with hydraulic fluid to at least three quarters of its volume in a horizontal position.

The uppermost drain port must always be used. If D1 is not the uppermost drain port, it must be sealed; to do so, remove the tapped plug from the uppermost drain port and fit it to D1 instead.

The pump can be installed above the oil level in the tank if the minimum inlet pressure at the suction port is not undershot.

If the pump is installed outside the tank, it is recommended to provide a baffle plate in the tank between the leakage line and the suction line to calm the hydraulic fluid.

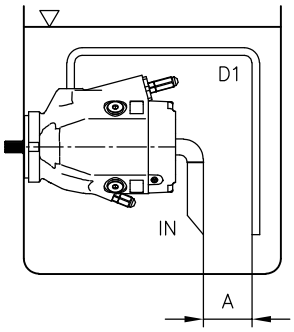
Coding	Thread size
C41V 30	3/4"-16UNF-2B
C41V 48	7/8"-14UNF-2B
C41V 60	7/8"-14UNF-2B
C41V 100	1 1/16"-12UNF-2B

Horizontal installation

Installation in the tank

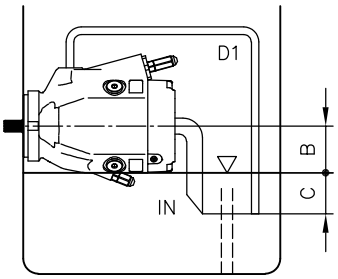
Pump below the oil level

- A ≥ 200 mm



Pump above the oil level
Inlet pressure ≧ 0.8 bar abs.

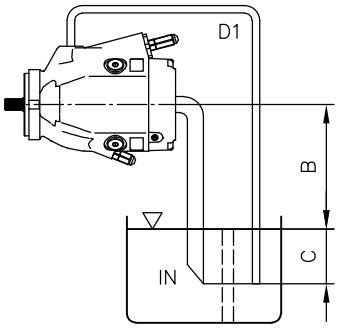
- B ≤ 800 mm
- C = 200 mm



Installation outside the tank

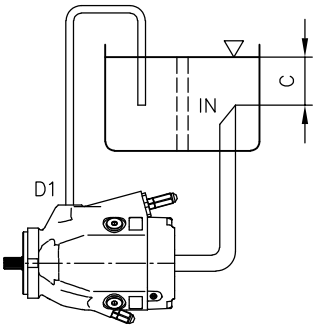
Pump above the oil level
Inlet pressure ≧ 0.8 bar abs.

- B ≤ 800 mm
- C = 200 mm



Pump below the oil level

- C = 200 mm

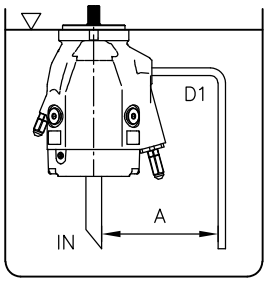


Vertical installation

Installation in the tank

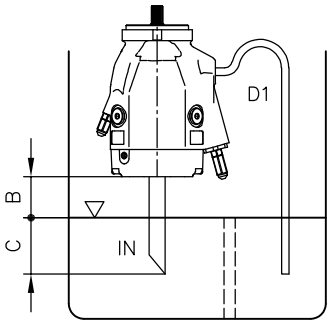
Pump below the oil level

- A ≥ 200 mm



Pump above the oil level
Inlet pressure ≧ 0.8 bar abs.

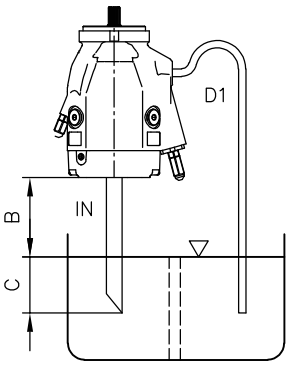
- B ≤ 800 mm
- C = 200 mm



Installation outside the tank

Pump above the oil level
Inlet pressure ≧ 0.8 bar abs.

- B ≤ 800 mm
- C = 200 mm



- **IN** = Suction line
- **D1** = Leakage line
- **A** = Minimum distance between suction line and leakage line
- **B + C** = Maximum suction height
- **C** = Minimum installation depth of suction line

5.3 Operating instructions

Observe product configuration and pressure/flow rate.

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

NOTICE

- ► 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

Overloading components due to incorrect pressure settings.
Risk of minor injury. Parts may burst or fly off, and uncontrolled leakage of hydraulic fluid.

- Pay attention to the maximum operating pressure of the pump, valves and fittings.
- 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 product. Contamination can cause irreparable damage.

Examples of fine contamination include:

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

NOTICE

New hydraulic fluid from the manufacturer may not have the required purity.
Damage to the product is possible.

- ► Filter new hydraulic fluid to a high quality when filling.
- ► Do not mix hydraulic fluids. Always use hydraulic fluid that is from the same manufacturer, of the same type, and with the same viscosity properties.

For smooth operation, pay attention to the cleanliness level of the hydraulic fluid (cleanliness level see Chapter 3, "Parameters").

Additionally applicable document: D 5488/1 oil recommendations

5.4 Maintenance information

This product is largely maintenance-free.

Check regularly (at least once a year) by visual inspection whether the hydraulic connections are damaged. If external leakages are found, shut down and repair the system.

Clean the surface of the device regularly (at least once a year) (dust deposits and dirt).

6 Other information

6.1 Planning information

Determination of nominal sizes

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

Q = Flow rate (l/min)

M = Torque (Nm)

P = Power (kW)

V_g = Geom. output volume (cm^3/rev)

Δp = Differential pressure

n = Speed (min^{-1})

η_v = Volumetric efficiency

η_{mh} = Mechanical-hydraulic efficiency

η_t = Overall efficiency ($\eta_t = \eta_v \cdot \eta_{mh}$)

6.2 Pump controller - Further information

6.2.1 Pressure controller

The RP0, RP2, LS3 and PEC controllers are pressure controllers. As soon as the pump pressure exceeds the set value, the controller reduces the swivel angle of the pump and regulates a constant pressure level.

RP0: Pressure controller with fixed pressure setting. The pressure setting is implemented via an adjusting screw on the controller.

RP2: 2-stage pressure controller for electrical switching between two pressure settings. The two pressure settings are implemented via two adjustment screws on the controller. The maximum pressure is set at one of the two main stages. The second, lower pressure is set at a pilot valve, which can be switched on or off using an electrically operated 2/2-way directional valve. The 2/2-way directional valve is available as an N/C contact (closed in normal position) or as an N/O contact (open in normal position).

Additional and solenoid voltage:

Coding	Description	Nominal voltage
1	N/C contact (closed in normal position)	12 V DC
2		24 V DC
6	N/O contact (open in normal position)	12 V DC
7		24 V DC

LS3: Pressure controller with fixed pressure setting and additionally with remote-control port. The pressure setting is implemented via an adjusting screw on the controller. An external pilot valve can be connected to the remote-control port to enable remote adjustment.

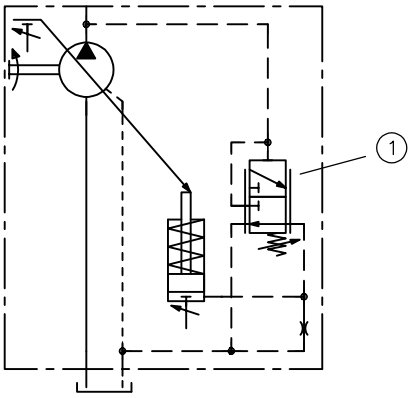
PEC: Electro-proportional pressure controller with falling characteristic line. The maximum pressure is set mechanically on the pressure controller. Below this, the pressure can be adjusted electro-proportionally.

Typical application
- Hydraulic fan control
- eLS systems

Additional and solenoid voltage:

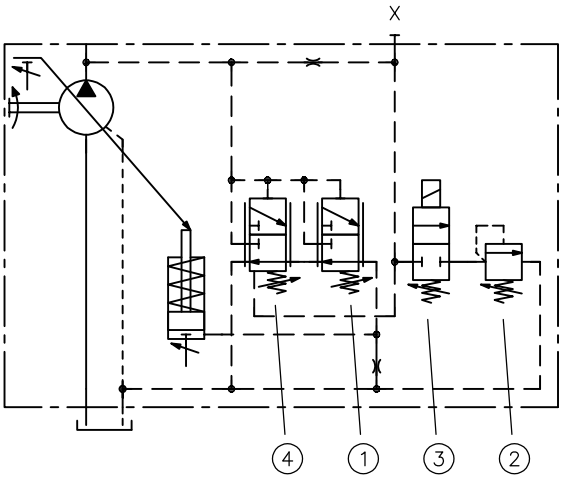
Coding	Description	Nominal voltage
1	Falling characteristic line (closed in normal position)	12 V DC
2		24 V DC

RP0



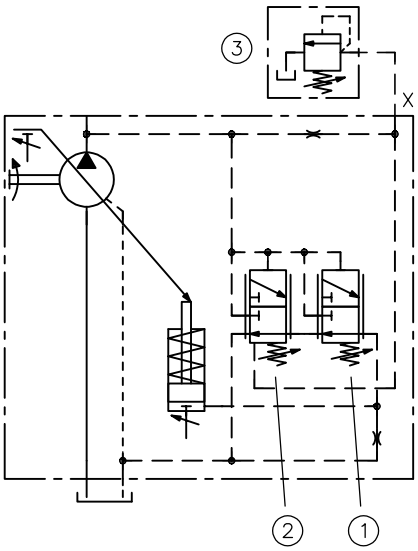
1 Pressure controller

RP2



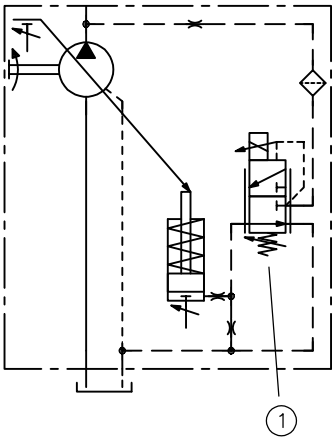
1 Main stage for setting the maximum pressure
2 Pilot valve for setting the second, lower pressure level
3 2/2-way directional valve for switching the pilot valve on or off
4 Main stage that regulates the second, lower pressure level in conjunction with the pilot valve

LS3



1 Main stage for setting the maximum pressure
2 Main stage that can regulate a lower pressure in conjunction with the pilot valve at connection X
3 Pilot valve (not included in scope of delivery)

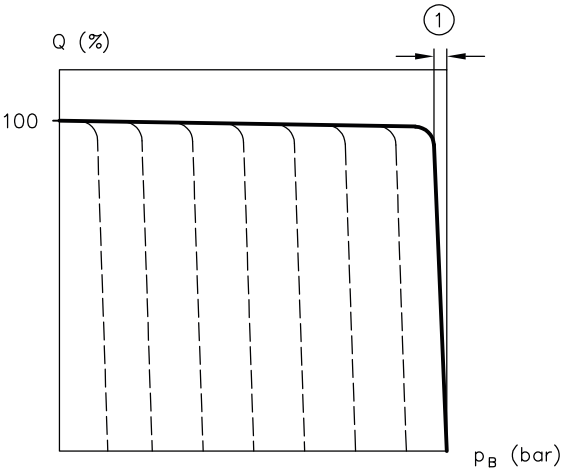
PEC



1 Electro-proportional pressure controller with falling characteristic line

Characteristic lines

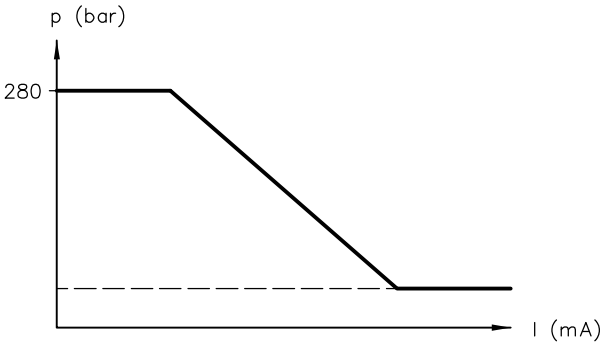
RPO, RP2, LS3



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

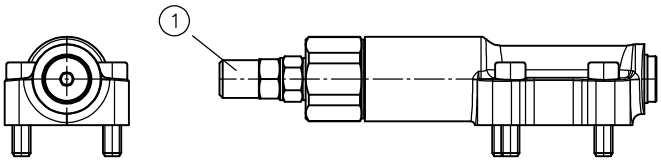
1 Approx. 4 bar

PEC



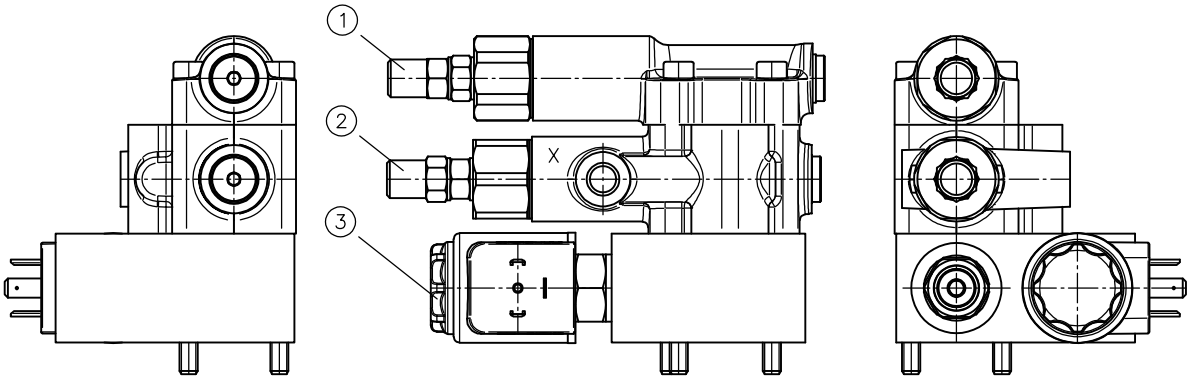
I current (mA); p pressure (bar)

RPO



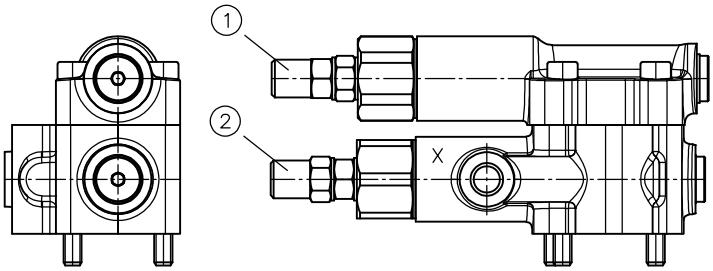
1 Maximum pressure p_{max}

RP2



1 Maximum pressure p_{max}
2 Differential pressure Δp (main stage that regulates the second, lower pressure level in conjunction with the pilot valve)
3 Pilot pressure p_{pil}

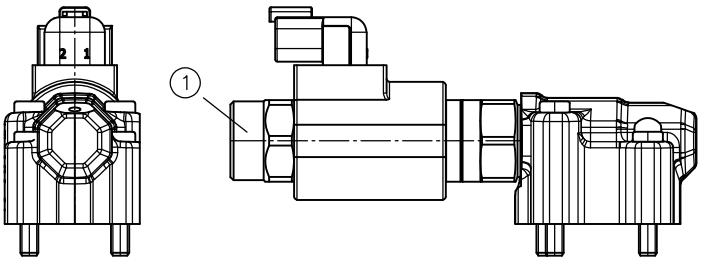
LS3



1 Maximum pressure p_{max}

2 Differential pressure Δp (main stage that can regulate a lower pressure in conjunction with the pilot valve at connection X)

PEC



1 Maximum pressure p_{max}

Pressure adjustment	Pressure range (bar)	Factory-set pressure setting (bar)
Maximum pressure p_{max} (RP0, RP2, LS3)	80 ... 250 or 280	250 or 280
Differential pressure Δp (RP2, LS3)	12 ... 40	19

⚠ CAUTION

Overloading components due to incorrect pressure settings.

Risk of minor injury. Parts may burst or fly off, and uncontrolled leakage of hydraulic fluid.

- Pay attention to the maximum operating pressure of the pump, valves and fittings.
- Always monitor the pressure gauge when setting and changing the pressure.

6.2.2 Load-sensing controller

The LS2, LS0 and RP2-LS2 controllers are flow controllers that generate a variable, speed-independent flow rate. They adapt the displacement volume of the pump to the required flow rate of the consumer and regulate a constant difference between load pressure and pump pressure.

The integrated pressure limitation restricts the maximum pressure to a set value.

LS2:

- Connection X-T sealed
- Version for combination with hydraulic valves that relieve the LS signal in the valve, for example, type PSV proportional directional spool valve

LS0:

- Connection X-T open
- Only for use with hydraulic valves without their own relief of the LS signal

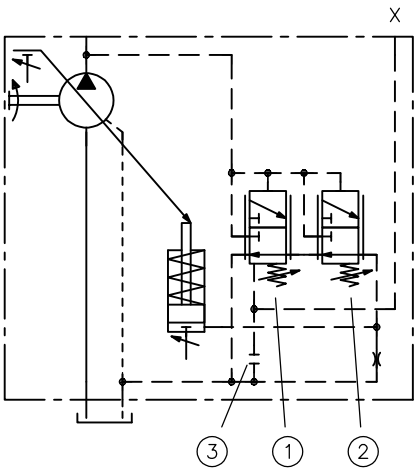
RP2-LS2:

- Combination of flow controller (LS2) and 2-stage pressure controller (RP2)
- Connection X-T sealed
- Version for combination with hydraulic valves that relieve the LS signal in the valve, for example, type PSV proportional directional spool valve
- With integrated electrical switching between two different setting values for the pressure limitation. The two pressure settings are implemented via two adjustment screws on the controller. The maximum pressure is set at one of the two main stages. The second, lower pressure is set at a pilot valve, which can be switched on or off using an electrically operated 2/2-way directional valve. The 2/2-way directional valve is available as an N/C contact (closed in normal position) or as an N/O contact (open in normal position).

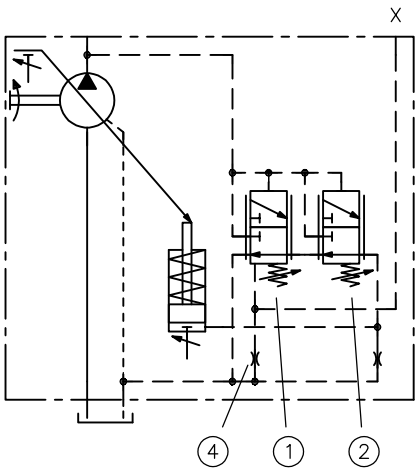
Additional and solenoid voltage:

Coding	Description	Nominal voltage
1	N/C contact (closed in normal position)	12 V DC
2		24 V DC
6	N/O contact (open in normal position)	12 V DC
7		24 V DC

LS2

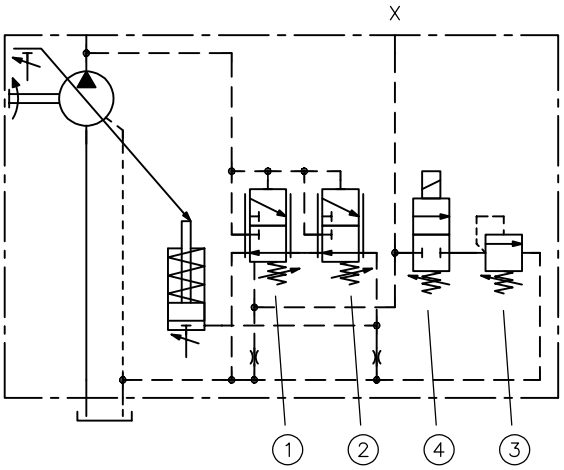


LS0



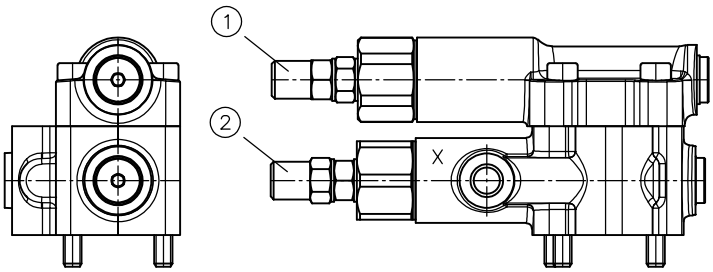
1 LS controller: Regulates a constant difference between load pressure and pump pressure
2 Pressure limitation: Limits the pump pressure to a maximum value
3 Connection X-T sealed
4 Connection X-T open for the internal relief of the LS signal

RP2-LS2



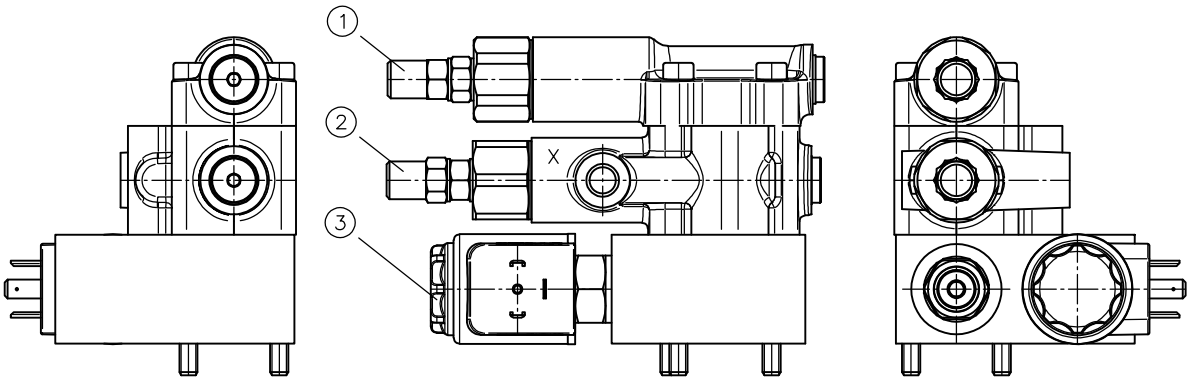
1 LS controller: Regulates a constant difference between load pressure and pump pressure
2 Pressure limitation: Limits the pump pressure to a maximum value
3 Pilot valve for setting the second, lower pressure level
4 2/2-way directional valve for switching the pilot valve on or off

LS0, LS2



1 Maximum pressure p_{max}
2 Differential pressure Δp (stand-by pressure)

RP2-LS2



1 Maximum pressure p_{max}
2 Differential pressure Δp (stand-by pressure)
3 LS pressure limitation p_{LS}

Pressure adjustment	Pressure range (bar)	Factory-set pressure setting (bar)
Maximum pressure p_{max}	80 ... 250 or 280	250 or 280
Differential pressure Δp	12 ... 40	19

CAUTION

Overloading components due to incorrect pressure settings.

Risk of minor injury. Parts may burst or fly off, and uncontrolled leakage of hydraulic fluid.

- Pay attention to the maximum operating pressure of the pump, valves and fittings.
- Always monitor the pressure gauge when setting and changing the pressure.

6.2.3 Power controller

RN0, RN1

The RN0 and RN1 controllers are power controllers with fixed settings. When the product of displacement volume times pressure exceeds the set value, the controller reduces the pump's swivel angle. This protects the drive shaft, motor or gearbox from overloading (p_B x V_g = constant).

RN0: Combination of power controller and load-sensing controller with integrated pressure limitation without LS relief

RN1: Combination of power controller and mechanically adjustable pressure controller

RN2-LS2, RN2-LS0

The RN2-LS2 and RN2-LS0 controllers are 2-stage power controllers with electrical switching between two fixed setting values. The 2/2-way directional valve for switching between the two power levels is available as an N/C contact (closed in normal position) or as an N/O contact (open in normal position).

Typical applications

- Backhoe loaders in which the entire motor power is used for the working hydraulics during excavation operation – whereas in wheel loader operation, the power is divided between the working functions and the travel drive.
- Motor-pump units (MPUs) for electrified mobile work machines in which the electric motor is briefly over-currented to cover power peaks.

RN2-LS2: Combination of power controller with electrical switching between two torque settings and load-sensing controller with pressure limitation without LS relief

RN2-LS0: Combination of power controller with electrical switching between two torque settings and load-sensing controller with pressure limitation with LS relief

Additional and solenoid voltage:

Coding	Description	Nominal voltage
1	N/C contact (closed in normal position)	12 V DC
2		24 V DC
6	N/O contact (open in normal position)	12 V DC
7		24 V DC

TEC

The TEC, TEC-LS2 and TEC-LS0 controllers are electro-proportional power controllers with falling characteristic line which keep the required torque under the variable limit value set by an electrical control signal.

TEC: Combination of electro-proportional power controller and mechanical pressure controller

TEC-LS2: Combination of electro-proportional power controller with falling characteristic line and load-sensing controller without LS relief (LS2)

TEC-LS0: Combination of electro-proportional power controller with falling characteristic line and load-sensing controller with LS relief (LS0)

Ordering example:

TEC **-2** -LS2 **-4**

-4: Torque range

-2: Additional and solenoid voltage

Additional and solenoid voltage:

Coding	Description	Nominal voltage
1	Falling characteristic line (closed in normal position)	12 V DC
2		24 V DC

Torque ranges:

Coding	Torque range (Nm)			
	C41 30	C41V 48	C41V 60	C41V 100
1	100 to 155	150 to 245	235 to 385	--
2	85 to 135	130 to 210	200 to 335	--
3	70 to 115	110 to 180	170 to 285	--
4	60 to 95	90 to 150	140 to 235	--

Setting

The setting is made either as a torque limitation (Nm) or power limitation (kW) at the corresponding speed (min^{-1}).

Drive torque

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

Drive power

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

V_g = Geometric output volume (cm^3/rev)

Δp = Differential pressure

n = Speed (min^{-1})

η_v = Volumetric efficiency

η_{mh} = Mechanical-hydraulic efficiency

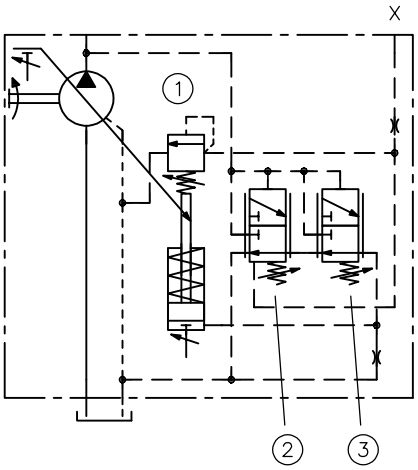
η_T = Overall efficiency $\eta_T = \eta_v * \eta_{mh}$)

Q = Flow rate (l/min)

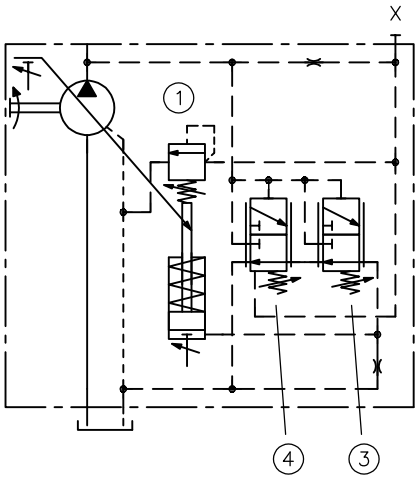
M = Torque (Nm)

P = Power (kW)

RN0

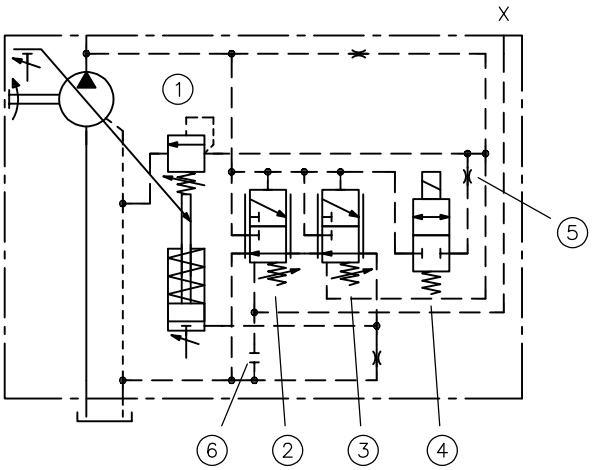


RN1

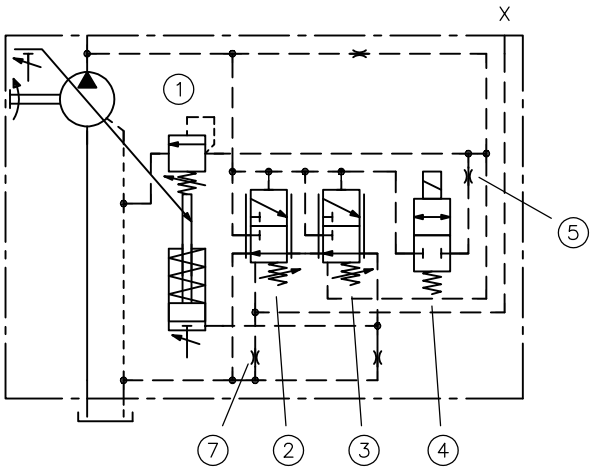


1 Power controller: Limits the torque of the pump to a set maximum value. Works as a pilot valve of the LS controller (2) or the main stage (4)
2 LS controller: Regulates a constant difference between load pressure and pump pressure
3 Pressure limitation: Limits the pump pressure to a maximum value
4 Main stage for the power controller (1)

RN2-LS2

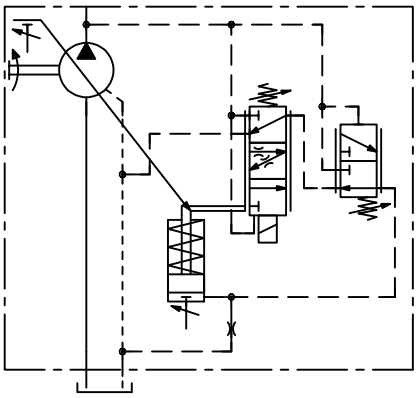


RN2-LS0

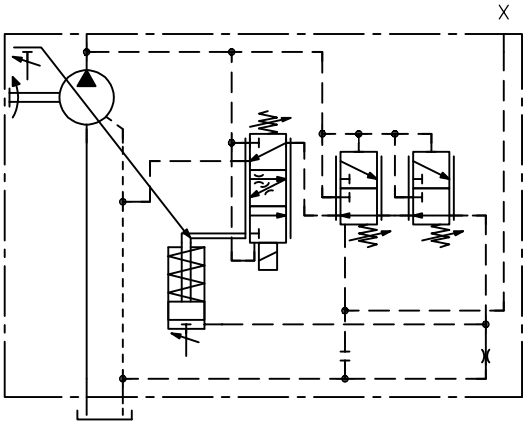


1 Power controller: Limits the torque of the pump to a set maximum value. Works as a pilot valve of the main stage (3). The lower characteristic line of the 2-stage power controller is set here.
2 LS controller: Regulates a constant difference between load pressure and pump pressure
3 Main stage for the power controller (1)
4 Electrically actuated 2/2-way directional valve for switching between two torque settings
5 Orifice for setting the upper characteristic line of the 2-stage power controller. The larger the orifice diameter, the higher the pressure on the spring side of the main stage (3) and therefore the distance between the lower and upper characteristic line of the 2-stage power controller.
6 Connection X-T sealed
7 Connection X-T open for the internal relief of the LS signal

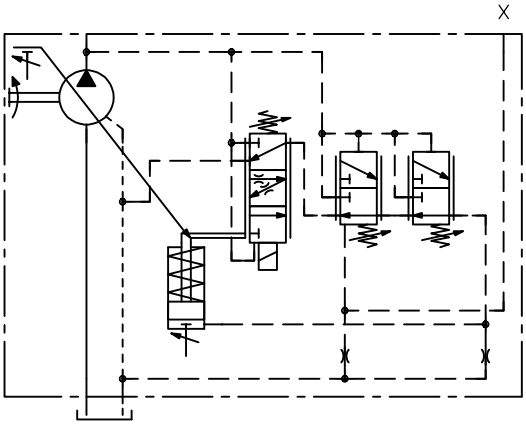
TEC



TEC-LS2

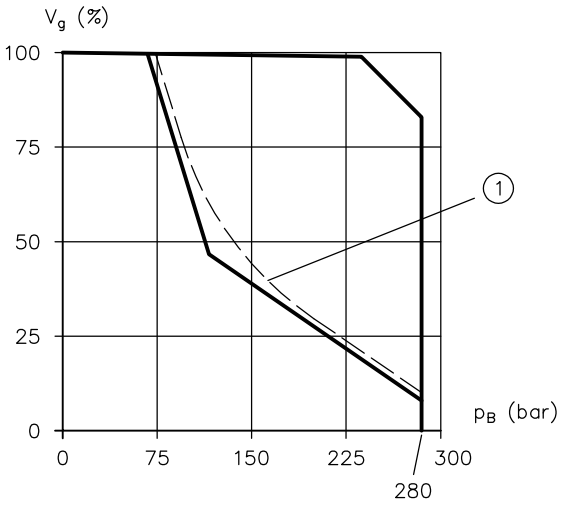


TEC-LS0



Characteristic lines

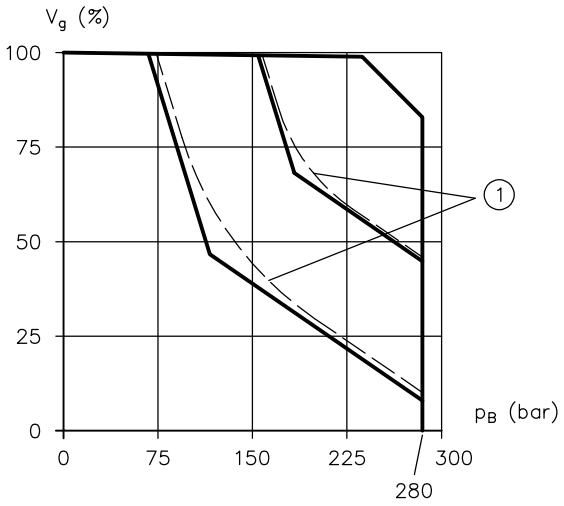
RN0, RN1



p_B pressure (bar); V_g displacement volume (%)

1 Theoretical torque

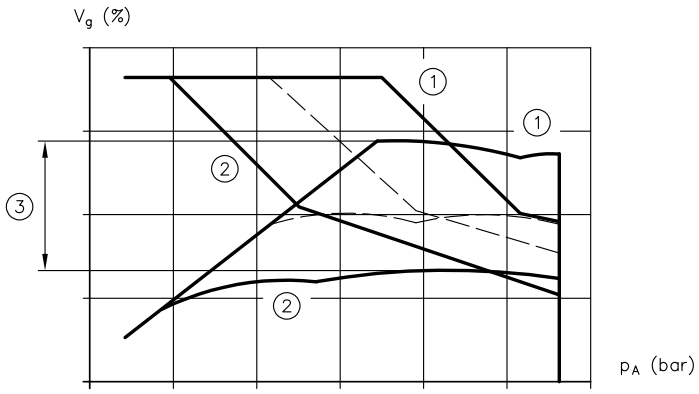
RN2-LS2, RN2-LS0



p_B pressure (bar); V_g displacement volume (%)

1 Theoretical torque

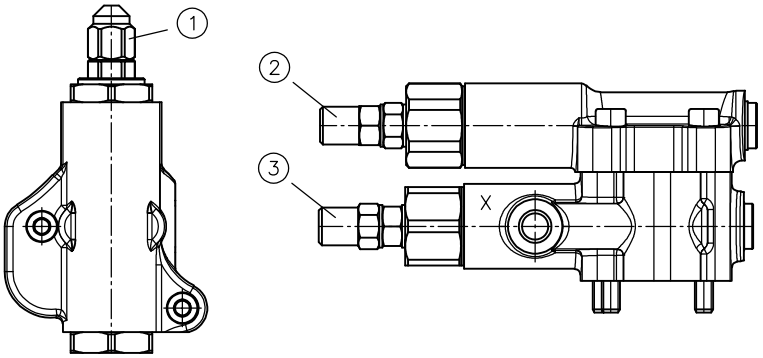
TEC



p_A pressure (bar); V_g displacement volume (%)

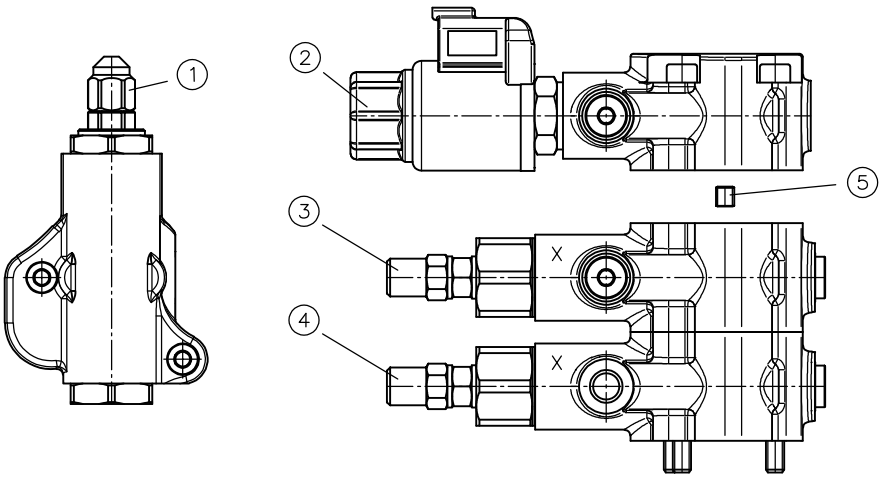
1 0 mA
2 Maximum current
3 Torque control range

RN0, RN1



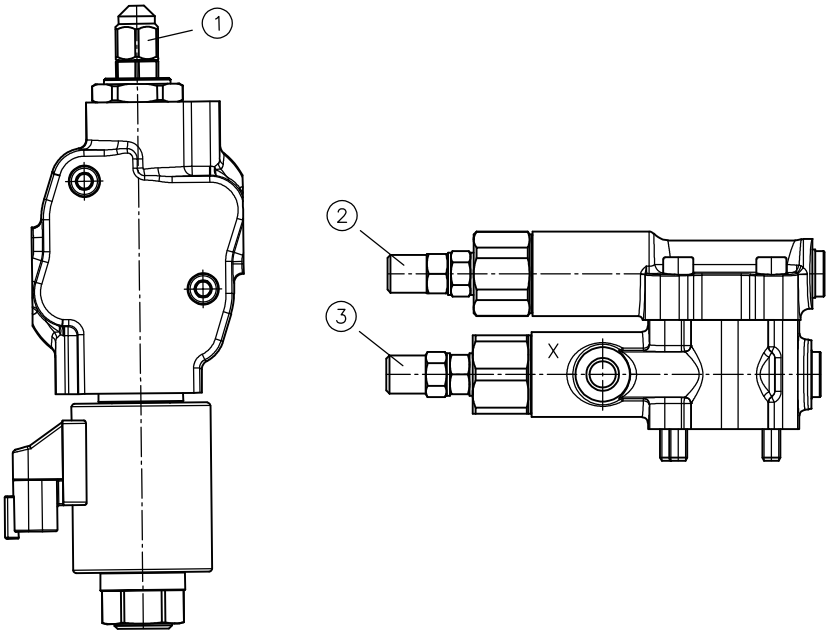
1 Torque setting M_{max}
2 Maximum pressure p_{max}
3 Differential pressure Δp (standby pressure) at RN0 or main stage for the power controller at RN1

RN2-LS2, RN2-LS0



1 Pilot valve of the power controller for setting the upper characteristic line of the 2-stage power controller
2 2/2-way directional valve
3 Main stage of the power controller
4 Differential pressure Δp (stand-by pressure)
5 Orifice for setting the upper characteristic line of the 2-stage power controller

TEC



1 Torque setting M_{max}
2 Maximum pressure p_{max}
3 Differential pressure Δp (standby pressure) at RN0 or main stage for the power controller at RN1

Torque setting	Min. setting value (Nm)
C41V 30..	45
C41V 48..	61
C41V 60..	97
C41V 100..	...

Pressure adjustment	Pressure range (bar)	Factory-set pressure setting (bar)
Maximum pressure p_{max}	80 ... 250 or 280	250 or 280
Differential pressure Δp	12 ... 40	19

CAUTION

Overloading components due to incorrect pressure settings.

Risk of minor injury. Parts may burst or fly off, and uncontrolled leakage of hydraulic fluid.

- Pay attention to the maximum operating pressure of the pump, valves and fittings.
- Always monitor the pressure gauge when setting and changing the pressure.

6.2.4 Flow controller

DEC

The DEC, DEC-LS2 and DEC-LS0 controllers are electro-proportional flow controllers that generate a variable, speed-dependent flow rate. They adjust the displacement volume of the pump based on an electrical input signal. The resulting flow rate depends on the displacement volume and rotation speed.

DEC: Combination of electro-proportional flow controller and mechanically adjustable pressure controller (RP0)

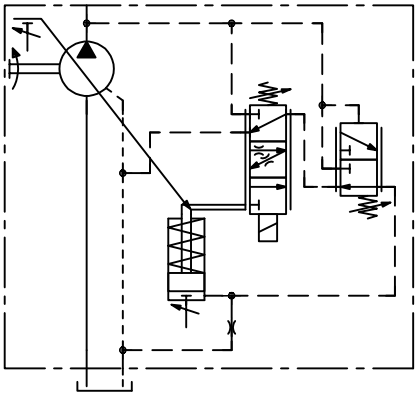
DEC-LS2: Combination of electro-proportional flow controller and load-sensing controller without LS relief (LS2)

DEC-LS0: Combination of electro-proportional flow controller and load-sensing controller with LS relief (LS0)

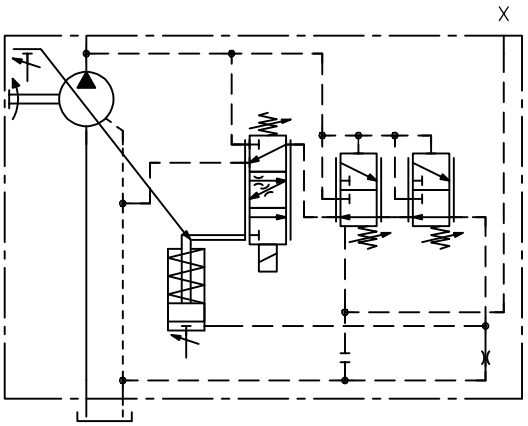
Additional and solenoid voltage:

Coding	Description	Nominal voltage
1	Falling characteristic line (closed in normal position)	12 V DC
2		24 V DC
6	Rising characteristic line (open in normal position)	12 V DC
7		24 V DC

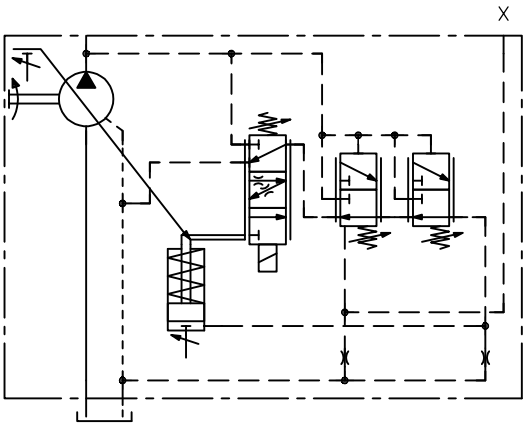
DEC



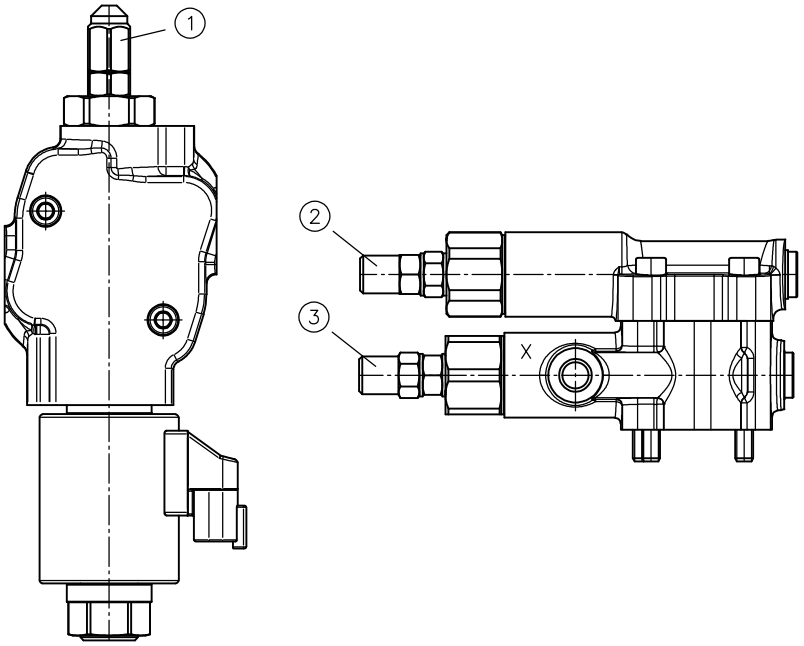
DEC-LS2



DEC-LS0



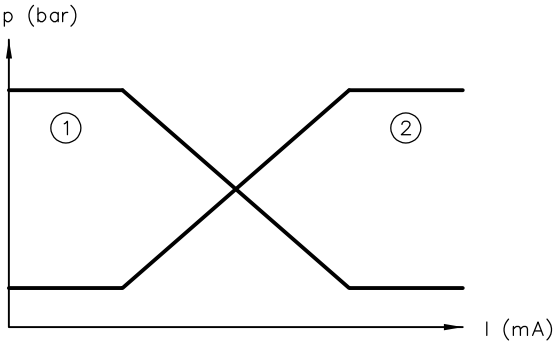
DEC



1 Torque setting M_{max}
2 Maximum pressure p_{max}
3 Differential pressure Δp (standby pressure) at RN0 or main stage for the power controller at RN1

Characteristic lines

DEC



I current (mA); p pressure (bar)

1 Falling characteristic line
2 Rising characteristic line

References

Additional versions

- Variable displacement axial piston pump type V60N: D 7960 N
- Variable displacement axial piston pump type V30E: D 7960 E
- Variable displacement axial piston pump type V30D: D 7960
- Fixed displacement axial piston pump type K60N: D 7960 K
- Axial piston motors type M60N: D 7960 M
- Proportional directional spool valve type PSL, PSV size 2 and EDL: D 7700-2
- Proportional directional spool valves types PSL/PSV/PSM, size 3: D 7700-3
- Proportional directional spool valves type PSL, PSV, PSM, size 5: D 7700-5
- Proportional directional spool valve type PSLF, PSVF and SLF size 3: D 7700-3F
- Proportional directional spool valve banks type PSLF, PSVF size 5: D 7700-5F
- Proportional directional spool valve banks type PSLF and PSVF size 7: D 7700-7F
- Valve bank (directional spool valve) type CWS: D 7951 CWS
- Directional spool valve type CWL: D 7953 CWL
- Load-holding valve type CLHV: D 7918-VI-C
- Load-holding valve type CLHV: D 7918-VI-PIB
- Load-holding valve type LHDV: D 7770
- Proportional amplifier type EV1M3: D 7831/2
- Proportional amplifier type EV1D: D 7831 D
- Proportional amplifier type EV2S: D 7818/1

Operating instructions

- General operating manual for the assembly, initial operation and maintenance of hydraulic components and systems: B 5488

D 7964/1 03-2026-1.1

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