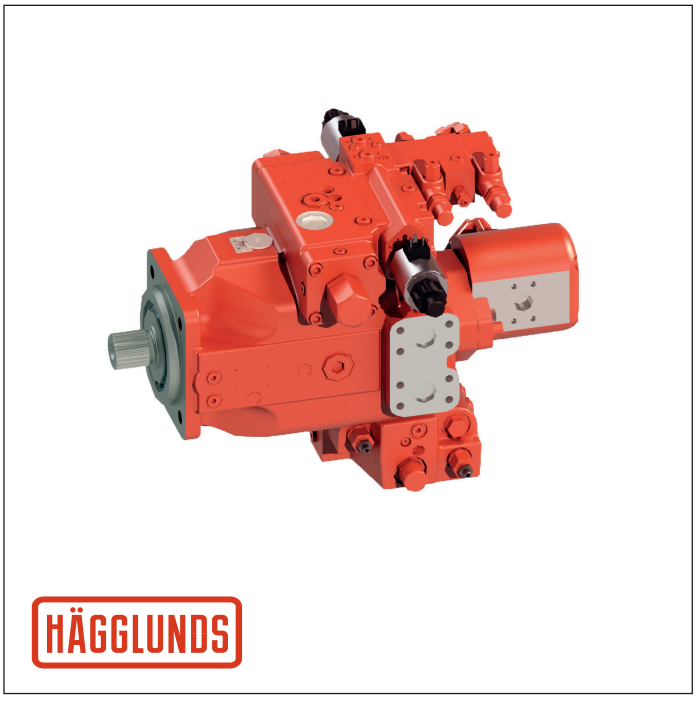
RE 15328/06.2021
Replaces: New

rexroth
A Bosch Company

Axial-piston pump Hägglunds SP 40 to SP 180



- Sizes 40 to 180
- Nominal pressure 350 bar
- Maximum pressure 400 bar
- Closed circuit

Features

- Variable pump in axial piston swashplate design for hydrostatic drives in closed circuit
- The flow is proportional to the drive speed and displacement
- By controlling the swashplate angle, infinitely variable flow is possible
- The boost pump required for closed-circuit operation
- The boost pump acts as a feed pump and pilot pressure supply
- Compact design with short installation length
- Favorable power/weight ratio
- Low noise level
- Long service life
- High efficiency
- Electrohydraulic proportional control with neutral position in the event of a power failure
- Through drive and pump combination also possible

Contents

Ordering code

In order to identify Hägglunds equipment exactly, the following ordering code is used. These ordering codes should be stated in full in all correspondence e.g. when ordering spare parts.

Example: Single Hägglunds SP pump

SP		125		S	R	-	V	-	EP	1234567		
01		02		03	04		05		06	07		08

Example: Tandem combinations Hägglunds SP pump

SP		180+180		S	R	-	V	-	EP	1234567		
01		02		03	04		05		06	07		08

01	**Axial-piston pump**	
	Superior pump	**SP**

02	**Size. Displacement V_{gmax} [cm³]**	
	40	**40**
	71	**71**
	125	**125**
	180	**180**
	Available tandem combinations see *Table 18*	

03	**Drive shaft**	
	Splined to DIN 5480	**S**
	Key shaft DIN 6885 (only spare pumps)	**K**

04	**Direction of rotation**	
	Clockwise	**R**
	Counter clockwise (optional)	**L**

05	**Sealing material**	
	FKM (Flourelastomer)	**V**

06	**Control device**	
	Electro-hydr. with prop. solenoid	EP
	Hydr. control, pilot press. dependent	HD

07	**Identy number**	
		1234567

08	**Special index**	

For more information please contact your Bosch Rexroth representative

The SP-pump is of closed loop type, in sizes of 40 cc to 180 cc, with an external boost pump of gear type (see *Table 1* for sizes). The main pump is a variable axial piston type with swashplate design. For detailed information about shaft, ports, flanges, dimension see *"Dimensions" page 12*.

External boost pump is always included as a part in the SP pump.

Table 1: Sizes of gear types

SP Pump	Charge pump size cm3/rev
SP 40	20
SP 71	25
SP 125	40
SP 180	45

Observe some important issues with the SP pump

- Control device as standard is electrohydraulic, EPG see RE 92084. An option is hydraulic control see RE 92080
- The different sizes of Hägglunds SP pumps has different versions, SP 40 and SP 71 are series 11, SP 125 and SP 180 are series 30.
- Charge flow filtration is solved separate from the pump with the SP-pumps, the filter is not mounted on the pump.

Identification plate

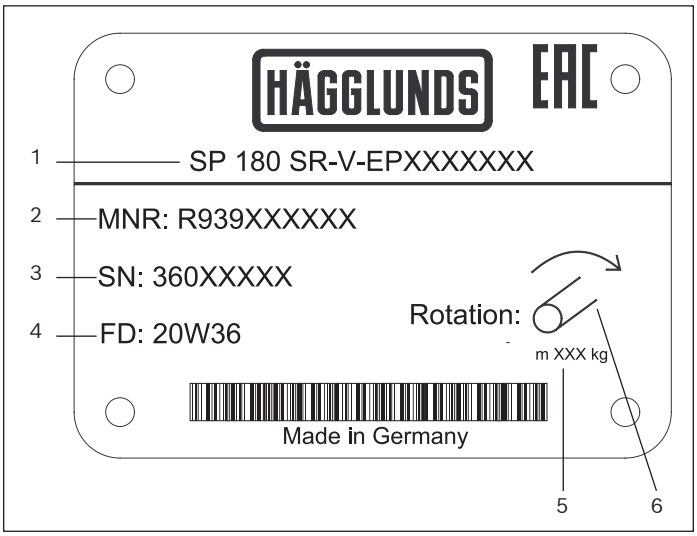


Fig. 1: Example of identification plate

1. Type designation
2. Material number
3. Seriel number
4. Manufacturing date
5. Net weight
6. Rotation direction viewed from shaft end

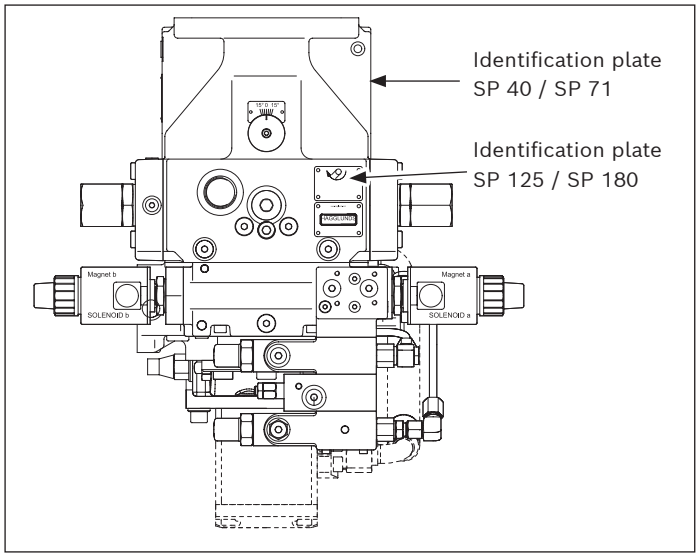


Fig. 2: Placement of identification plate

Notice

- The identification plate only refer to the material number of the main pump.
- The material number in the order specific documentation for Hägglunds drive units refers to the complete pump.
- When ordering a complete spare pump, use the material number in the order specific documentation.

Hydraulic fluids

Hägglunds SP pumps is primarily designed for operation with hydraulic fluids according to ISO 11158 HM. Before the start of project planning, see data sheet RE 15414, Hydraulic fluid quick reference, for detailed information on hydraulic fluids and specific additional demands.

Table 2: Applicable fluids

ISO 11158 (see 90220)	ISO 15380 (see 90221)
Mineral oil based and mineral oil related hydraulic fluids	Environmentally acceptable hydraulic fluids

Within these standards, not all fluid classes are allowed, some are recommended, and there are also additional demands (see data sheet RE 15414).

Details regarding the selection of hydraulic fluid

The hydraulic fluid should be selected such that the operating viscosity in the temperature range, as measured in the motor housing, is within optimum operation range, see *Fig. 3*. General recommendation is to have a system temperature of 50°C, see dotted line in *Fig. 3*. An ISO VG 68 fluid will render just above 40 cSt at this point. Hägglunds recommend to follow these points below.

- Recommended viscosity range for Hägglunds drive systems is 40 to 150 cSt.
- Running above 150 cSt or below 40 cSt results in reduced efficiency.
- Running above 400 cSt results in substantial efficiency loss.
- Starting at above 1000 cSt impact unnecessary strain on parts.
- Running below 30 cSt may impact service life.
- At no point on the component may the temperature be higher than 90 °C.

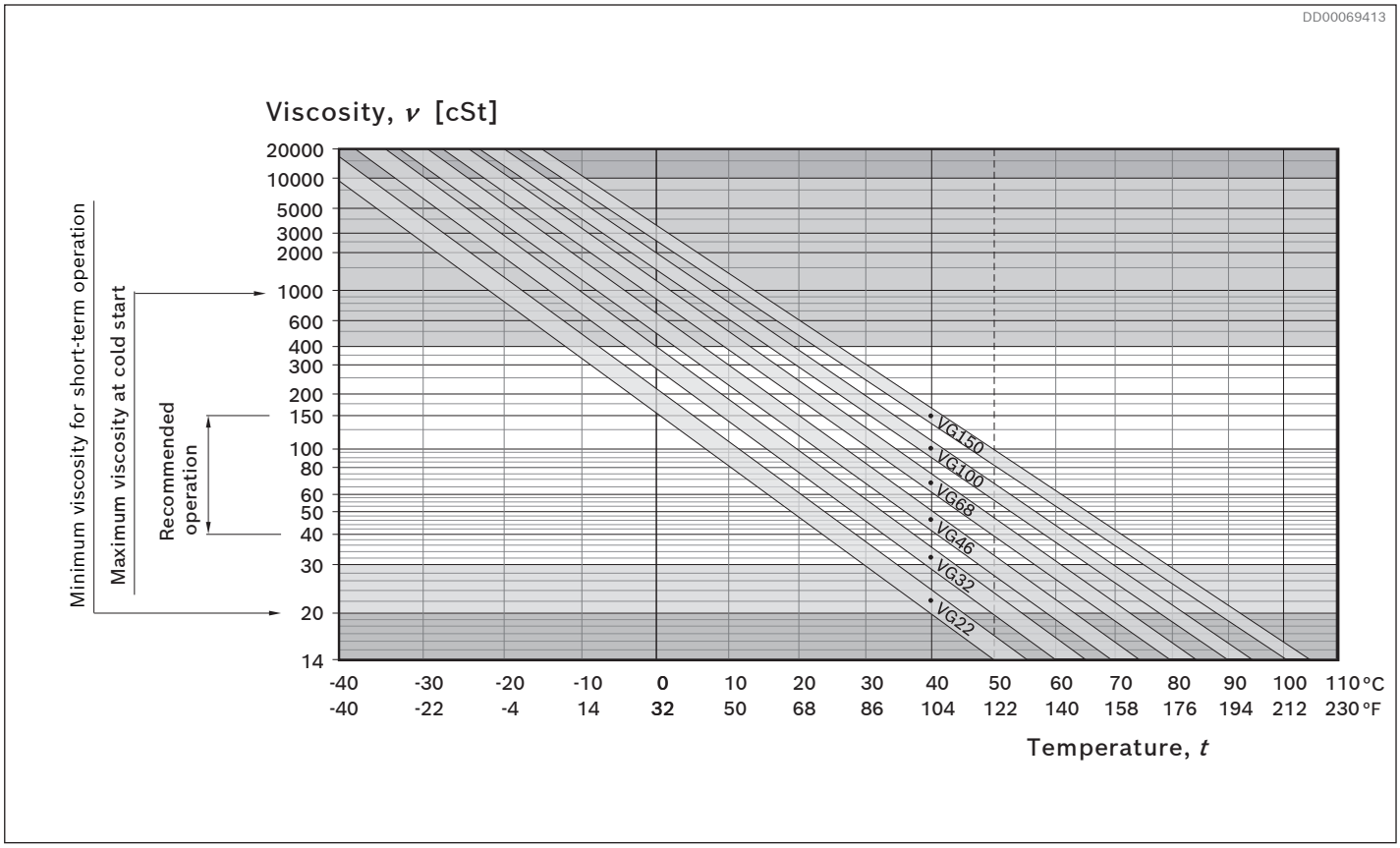


Fig. 3: Selection diagram for viscosity ranges with straight fluids, i.e. viscosity index 100

Filtration of the hydraulic fluid

Finer filtration improves the cleanliness level of the hydraulic fluid, which increases the service life of the axial piston unit.
A cleanliness level of at least 18/16/13 is to be maintained according to ISO 4406.
Depending on system and application, filter cartridges with at least B20 >100 is recommended.

Bearing flushing

For the following operating conditions bearing flushing is required for reliable continuous operation:

- Applications with special fluids (non mineral oils), due to limited lubricity and narrow operating temperature range
- Operation with critical conditions of temperature and viscosity with mineral oil
- High installed power, see *Table 4*

Flushing is carried out via U-port, which is located in the front flange area of the pump. The flushing oil flows through the front bearing and leaves the system together with the leakage oil at the case drain port.

Recommended flushing flows for the various pump sizes: See *Table 3*
These flushing flows create a pressure drop of approximately 3 bar between U-port and pump housing (including fitting).

Note. When using bearing flushing at U-port the throttle screw, which can be found at U-port, has to be turned in all the way to the stop.

Table 3: Recommended flushing flows

Size	Flushing flow, q_{fl} l/min
40	3
71	4
125	5
180	7

Table 4: Installed electric motor power when flushing is needed

Size	Installed electric motor power, kW	Installed electric motor power, hp
40	50	67
71	69	93
125	108	145
180	132	177

Shaft seal

Permissible pressure load

The service life of the shaft seal ring is affected by the rotational speed of the axial piston unit and the leakage pressure (case pressure). The service life of the shaft seal decreases with an increase in the frequency of pressure peaks and an increase in the mean differential pressure.
The pressure in the case must be equal to or greater than the ambient pressure.

Case drain pressure

Table 5: Maximum case pressure (housing pressure)

$p_{L\ continious}$	5 bar
$p_{L\ abs\ max}$	8 bar

T_1 T_2 and T_3 must be unloaded to tank.

Working pressure range

Table 6: Allowed pressure and pressure settings

Pressure at working ports A or B			**Definition**
Nominal pressure p_{nom} *(see Fig. 5)*		350 bar	The nominal pressure corresponds to the maximum design pressure.
Maximum pressure p_{max} *(see Fig. 5)*		400 bar	The maximum pressure corresponds to the maximum working pressure within the single operating period. The sum of the single operating periods must not exceed the total operating period.
Single operating period		1 s	
Total operating period		300 h	
Minimum pressure (high-pressure side) *(see Fig. 5)*		15 bar	Minimum pressure at the high-pressure side (**A** or **B**) which is required to prevent damage to the axial piston unit.
Minimum pressure (low-pressure side)		Speed related (see *Fig. 4*)	Minimum pressure at the low-pressure side (**A** or **B**) which is required in order to prevent damage to the axial piston unit. The low pressure is present at port $\mathbf{M_{K4}}$ with the flushing slide deflected.
Rate of pressure change $R_{A\ max}$		16000 bar/s	Maximum permissible speed of pressure build-up and reduction during a pressure change across the entire pressure range.
Boost pressure			
Minimum boost pressure p_{Sp} (at n_{nom})		16 bar	Measuring port $\mathbf{M_{K4}}$ (Please contact Bosch Rexroth representative for coupled multiple pumps)
Maximum static boost pressure $p_{Sp\ max}$		25 bar	
Permissible pressure peaks in boost pressure	minimum	4 bar	
	maximum	40 bar	
Pressure at suction port S (version with integrated boost pump)			
Minimum pressure $p_{S\ min}$		≥ 0.8 bar absolute	Minimum pressure at suction port **S** (inlet) that is required in order to avoid damage to the axial piston unit.
Maximum pressure $p_{S\ max}$		30 bar absolute	
Control pressure for EP and HD control.			
Minimum required control pressure $p_{St\ min}$		30 bar + (Pn-Ps)	Measuring port $\mathbf{ME_3}$ for Pn= pump in neutral,Ps= pump on stroke **ME** measuring port for control pressure (should be about 37 bar depending on viscosity and pump size)

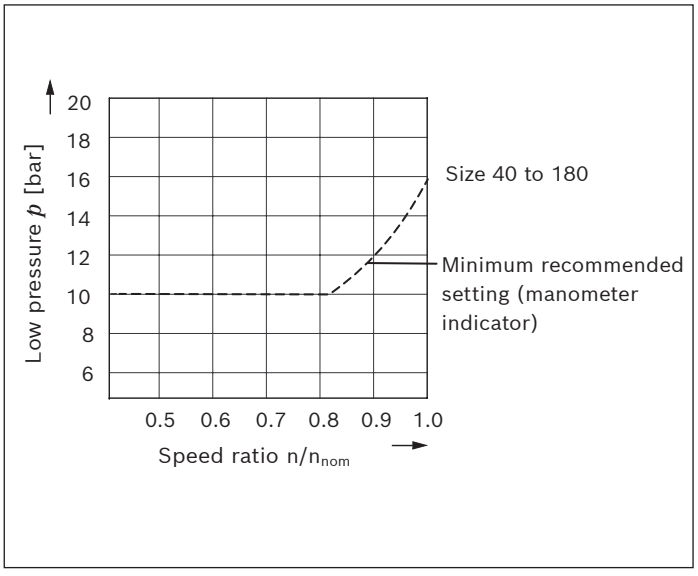


Fig. 4: Required low pressure depending on the speed ratio

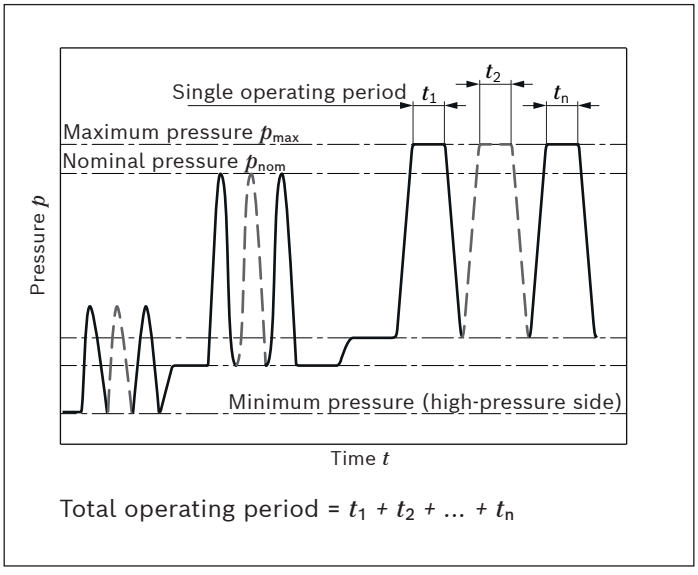


Fig. 5: Working pressure

Notice

Working pressure range valid when using hydraulic fluids based on mineral oils. Values for other hydraulic fluids, please contact your Bosch Rexroth representative

Technical data

Table 7: Technical data

Size		NG		40	71	125	180
Displacement, geometric, per revolution	Variable pump	$V_{g\,max}$	cm^3	40	71	125	180
	Boost pump	$V_{g\,Sp}$	cm^3	20	25	40	45
Rotational speed[1]	maximum at $V_{g\,max}$	n_{nom}	rpm	3000	3000	2600	2400
	minimal	n_{min}	rpm	500	500	500	500
Flow (variable pump) at $V_{g\,max}$ and	n_{max}	q_v	L/min	148	227	325	432
	n_E = 1500 rpm	q_{VE}	L/min	60	107	186	270
Power[2] at $V_{g\,max}$, Δp = 350 bar and	n_{max}	P	kW	86	132	190	252
	n_E = 1500 rpm	P_E	kW	35	62	109	158
Torque[2] at $V_{g\,max}$ and	Δp = 350 bar	T	Nm	223	395	696	1002
	Δp = 100 bar	T	Nm	64	113	199	286
Rotary stiffness of drive shaft	P	c	kNm/rad	80	146	260	328
	Z	c	kNm/rad	77	146	263	332
Moment of inertia for rotary group		J_{TW}	kgm^2	0.0049	0.0121	0.03	0,055
Maximum angular acceleration[3]		α	rad/s^2	17000	11000	8000	6800
Case volume		V	L	2	2.5	5	4
Weight (pump with EP control and boost pump without filter) approx.		m	kg	74	97	150	158

Table 8: Equations for characteristics

Determining the characteristics		
Flow	$q_v = \frac{V_g \cdot n \cdot \eta_v}{1000}$	[l/min]
Torque	$T = \frac{V_g \cdot \Delta p}{20 \cdot \pi \cdot \eta_{mh}}$	[Nm]
Power	$P = \frac{2\,\pi \cdot T \cdot n}{60000} = \frac{q_v \cdot \Delta p}{600 \cdot \eta_t}$	[kW]

Key

V_g	=	Displacement per revolution [cm^3]
Δp	=	Differential pressure [bar]
n	=	Rotational speed [rpm]
η_v	=	Volumetric efficiency
η_{mh}	=	Mechanical-hydraulic efficiency
η_t	=	Total efficiency ($\eta_t = \eta_v \cdot \eta_{mh}$)

Notice

- Theoretical values, without efficiency and tolerances; values rounded
- Operation above the maximum values or below the minimum values may result in a loss of function, a reduced service life or in the destruction of the axial piston unit. Bosch Rexroth recommends testing the loads by means of experiment or calculation / simulation and comparison with the permissible values.

Table 9: Flow direction

Direction of rotation of pump shaft		Swiveling range*
clockwise	counter-clockwise	
B to A	A to B	clockwise
A to B	B to A	counter-clockwise

* cf. swivel angle indicator see *Fig. 6*

1) The values are applicable:
   – for the optimum viscosity see “Hydraulic fluids” page 4
   – for hydraulic fluid based on mineral oils
2) Without boost pump
3) The data are valid for values between the minimum required and maximum permissible rotational speed.
   Valid for external excitation (e.g. diesel engine 2 to 8 times rotary frequency, cardan shaft twice the rotary frequency).
   The limit value is only valid for a single pump.
   The load capacity of the connecting parts must be considered.

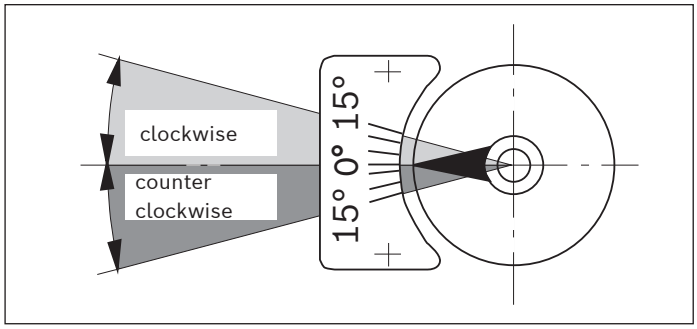


Fig. 6: Swiveling indicator

Total efficiency

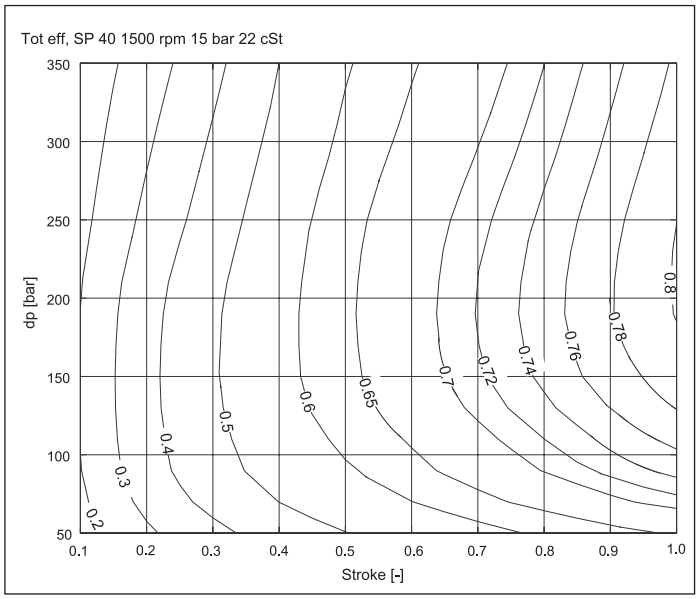


Fig. 7: SP 40 1500 rpm

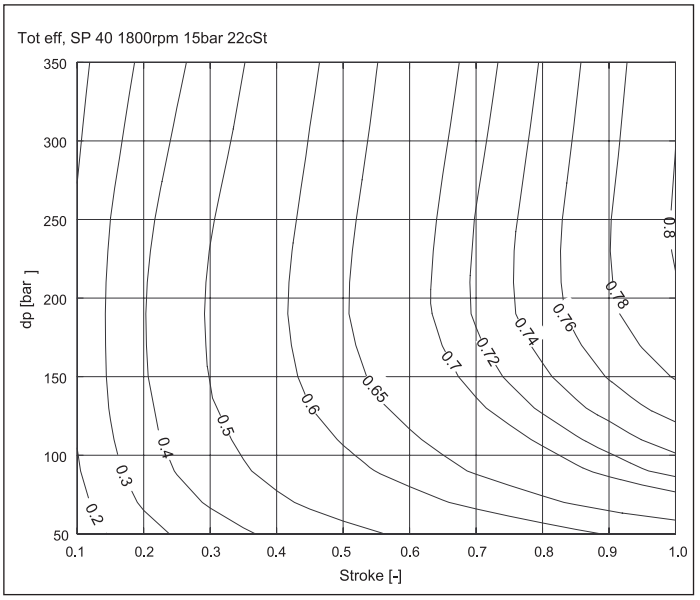


Fig. 8: SP 40 1800 rpm

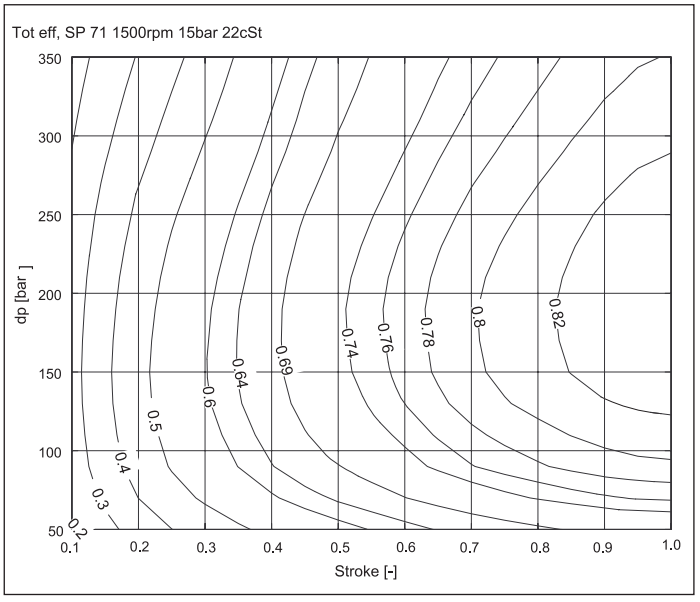


Fig. 9: SP 71 1500 rpm

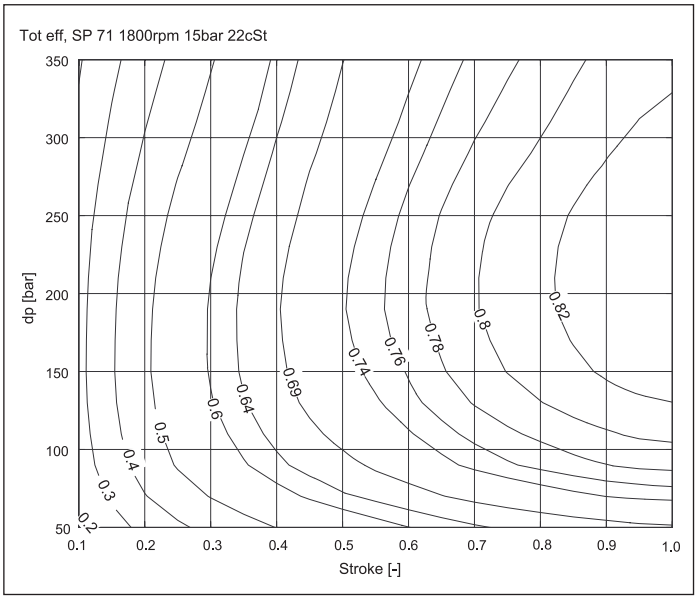


Fig. 10: SP 71 1800 rpm

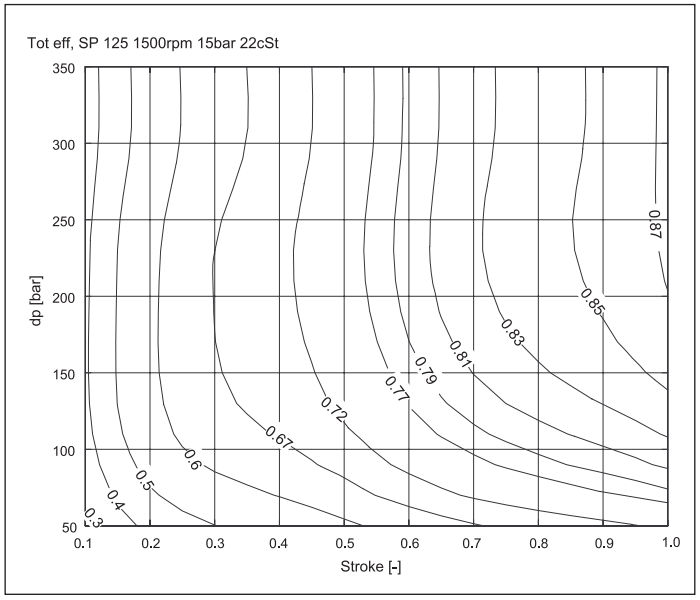


Fig. 11: SP 125 1500 rpm

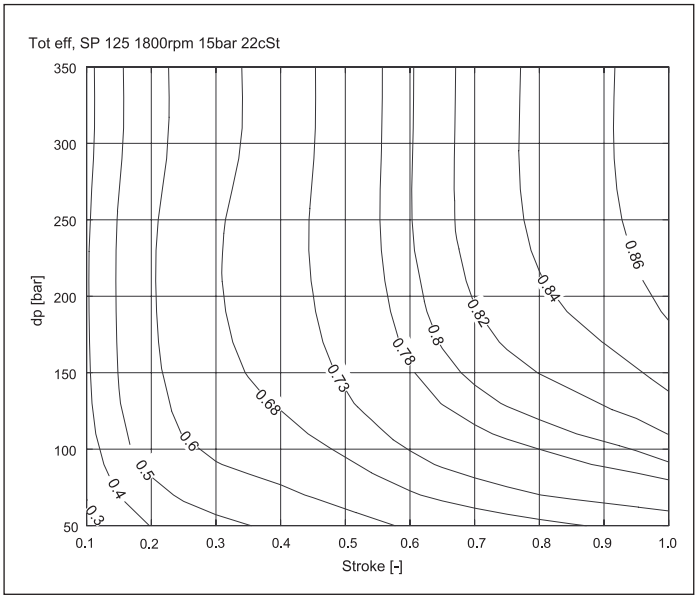


Fig. 13: SP 125 1800 rpm

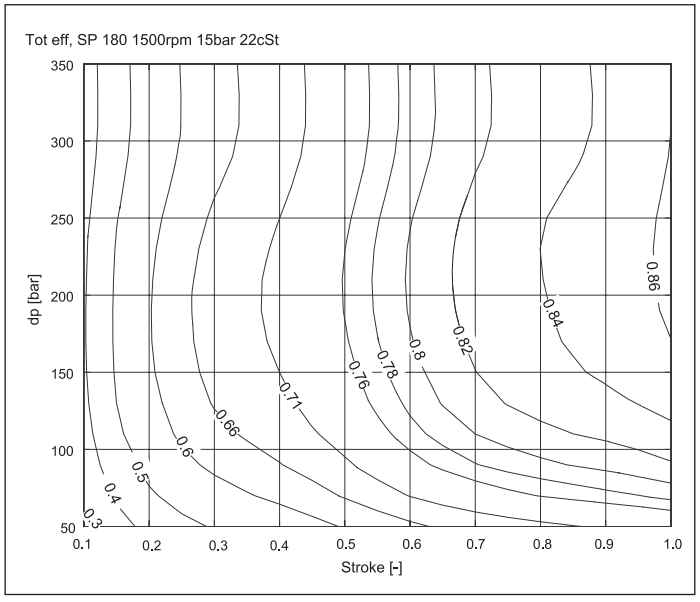


Fig. 12: SP 180 1500 rpm

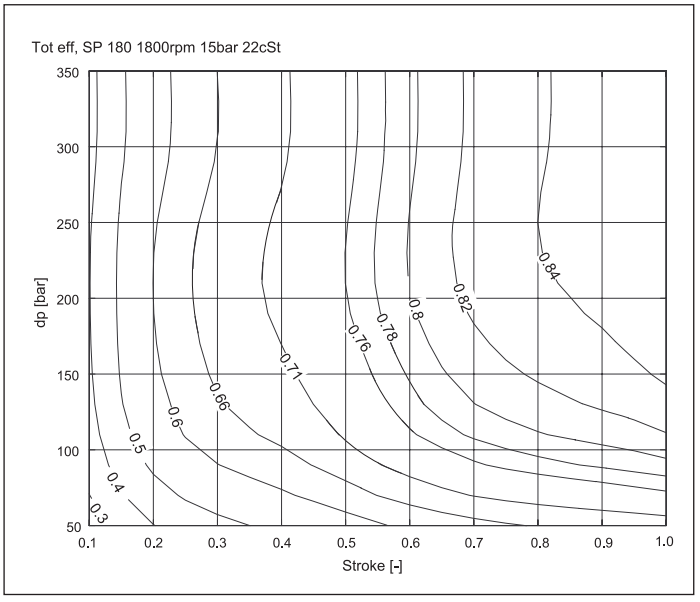
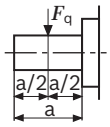
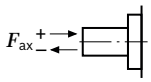


Fig. 14: SP 180 1800 rpm

Table 10: Permissible radial and axial forces of the drive shafts

Size		NG		40	71	125	180
Drive shaft							
Maximum radial force at X/2		$F_{q\,max}$	N	1000	1200	1600	2000
Maximum axial force		+ $F_{ax\,max}$ − $F_{ax\,max}$	N N	600	800	1000	1400

Note

Special requirements apply in the case of belt drives. Please contact your Bosch Rexroth representative.

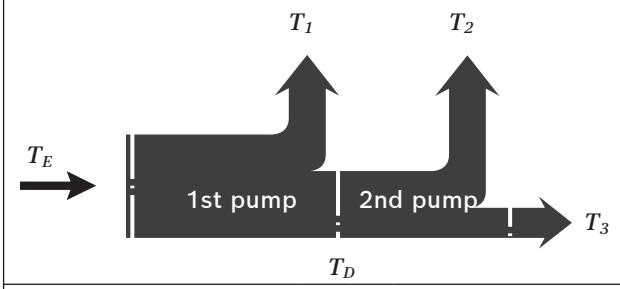
Table 11: Permissible input and through-drive torques

Size		NG		40	71	125	180
Torque at $V_{g\,max}$ and Δp = 350 bar[1)]		T_{max}	Nm	223	395	696	1002
Maximum input torque at drive shaft[2)]							
	Splined shaft S	$T_{E\,max}$	Nm	446	790	1392	2004
	Shaft key K	$T_{E\,max}$	Nm	380	700	1392	1400
Maximum through-drive torque				$T_{D\,max} = T_{E\,max}$			

1) Efficiency not considered
2) For drive shafts free of radial force

Note

Avoid to use shaft key, the standard SP pump has a splined shaft.



Torque at 1st pump	T_1		
Torque at 2nd pump	T_2		
Torque at 3rd pump	T_3		
Input torque	T_E	=	$T_1 + T_2 + T_3$
	T_E	<	$T_{E\,max}$
Through-drive torque	T_D	=	$T_2 + T_3$
	T_D	<	$T_{D\,max}$

Fig. 15: Distribution of torqes

Overview of control devices

EP – proportional control, electrohydraulic
(see data sheet RE 92084)
The EP control adjusts the pump displacement proportionally to the current at the solenoid. Current-regulated control units with pulse-width modulation are recommended for controlling the solenoids.
With existing boost pump, the control is supplied internally with the control pressure from the boost circuit. This saves using a separate control pressure pump.

- Remote pressure control EP(G)

HD – Proportional control, hydraulic, pilot-pressure related (see data sheet RE 92080)
Stepless adjustment of the pump displacement according to the pilot pressure. The control is proportional to the specified pilot pressure setpoint value (difference between X_1, X_2).
With existing boost pump, the control is supplied internally with the control pressure from the boost circuit. This saves using a separate control pressure pump.

Optional:
- Control characteristics (HD1)

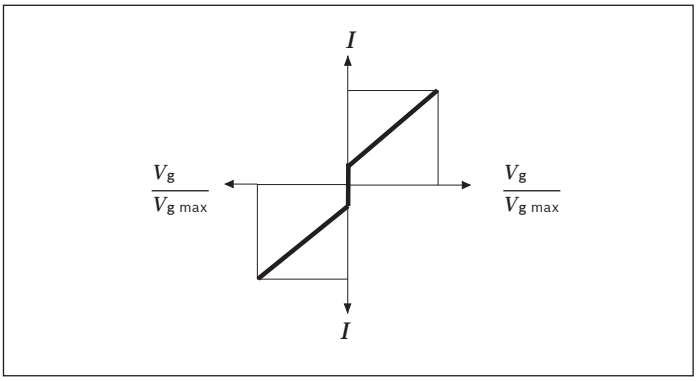


Fig. 16: Characteristic curve SP 125/180 EP

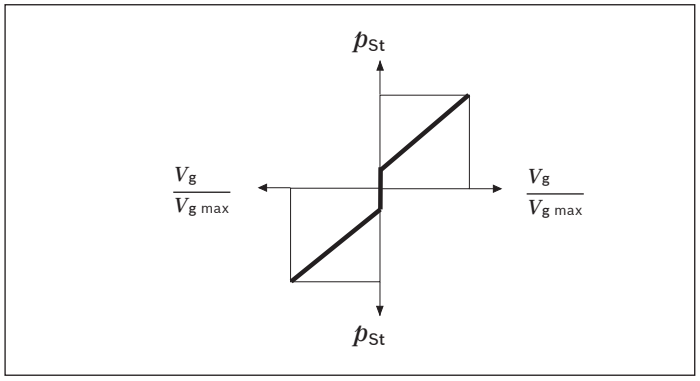


Fig. 18: Characteristic curve SP 125/180 HD1

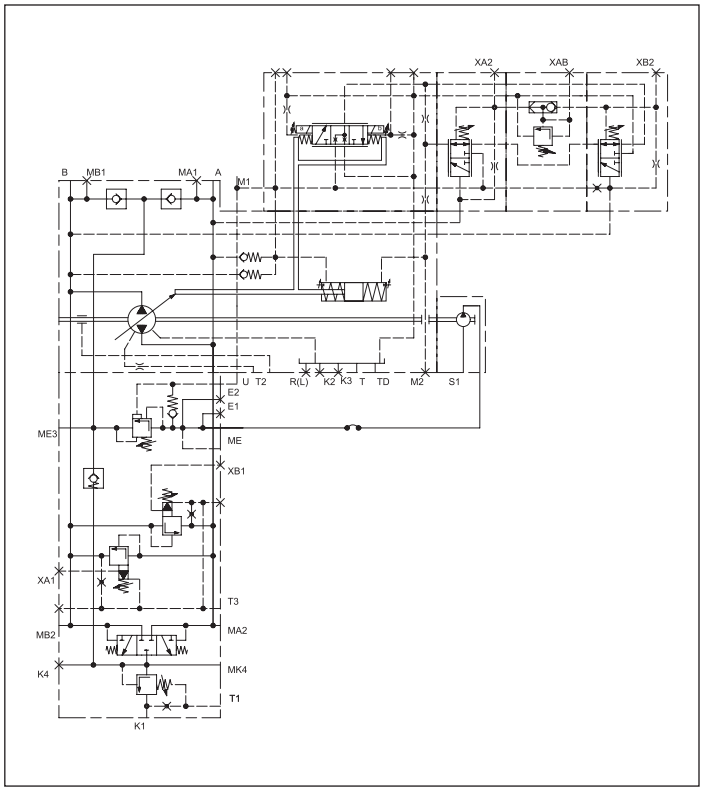


Fig. 17: Circuit diagram, example SP 125/180 EP

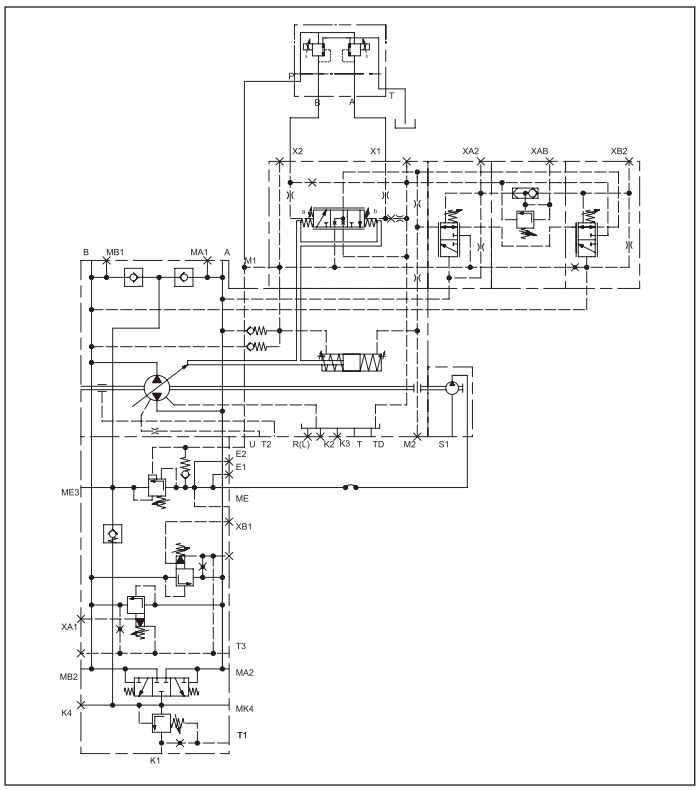


Fig. 19: Circuit diagram, example SP 125/180 HD

Dimensions

Hägglunds SP 40

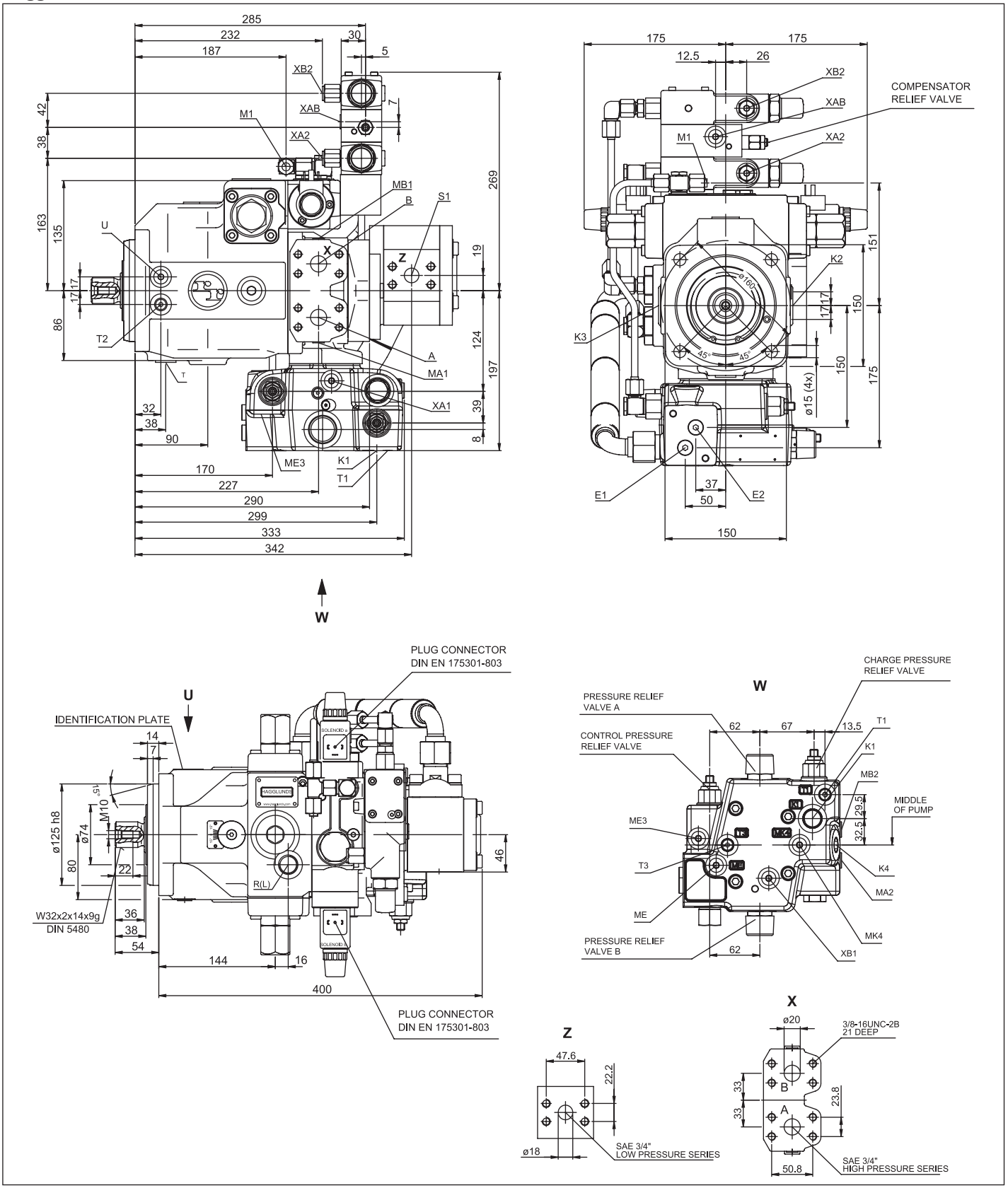


Fig. 20: Dimension SP 40

Table 12: Connections SP 40

Ports		Size[1]	$p_{max\ abs}$ [bar][3]	State
A, B	Pressure port	SAE 3/4" code 62	400	O
S1	Suction port	SAE 3/4" code 61[2]	30	O
ME3	Measuring port charge pressure	9/16-18UNF-2B	40	X
ME	Measuring port control pressure	9/16-18UNF-2B	40	X
E1	To pump mounted filter (not used by Hägglunds)	M14 × 1.5	40	X
E2	From pump mounted filter (not used by Hägglunds)	M14 × 1.5	40	X
K1, K2, K3	Flushing port	7/8-14UNF-2B	5	O[6]
K4	Accumulator port	1 5/16-12UNF-2B	40	X
MK4	Measuring port charge pressure	9/16-18UNF-2B	40	X
MA1, MB1	Measuring port operating pressure	7/16-20UNF-2B	400	X
MA2, MB2	Measuring port operating pressure	M14x1.5	400	X
M1	Measuring port control/high pressure	S8 DIN3852 From W	400	X
R(L)	Return resp, aeration	7/8-14UNF-2B	4	O[4]
T	Oil discharge	7/8-14UNF-2B[3]	4	X[4]
T1, T3	Drain port pressure relief valve	9/16-18UNF-2B	4	O
T2	Drain port shaft seal	9/16-18UNF-2B	4	O
U	Flushing port (bearing flushing)	9/16-18UNF-2B[3]	7	X
XA2, XB2, XAB	Pilot pressure port, pressure control	9/16-18UNF-2B	350	X
XA1, XB1	Pilot pressure port, relief valve A & B	9/16-18UNF-2B	350	X

1) Depending on the application, momentary pressure peaks can occur. Keep this in mind when selecting measuring devices and fittings.
2) Only dimensions according to SAE J518, metric fastening thread is a deviation from standard.
3) The countersink can be deeper than that specified in the standard.
4) Depending on the installation position, T, K_2, K_3 or R(L) must be connected (see also*"Installation instructions" page 27*)
5) O = Must be connected (plugged when delivered)
X = Plugged (in normal operation)
6) K_2 and K_3 Normally plugged

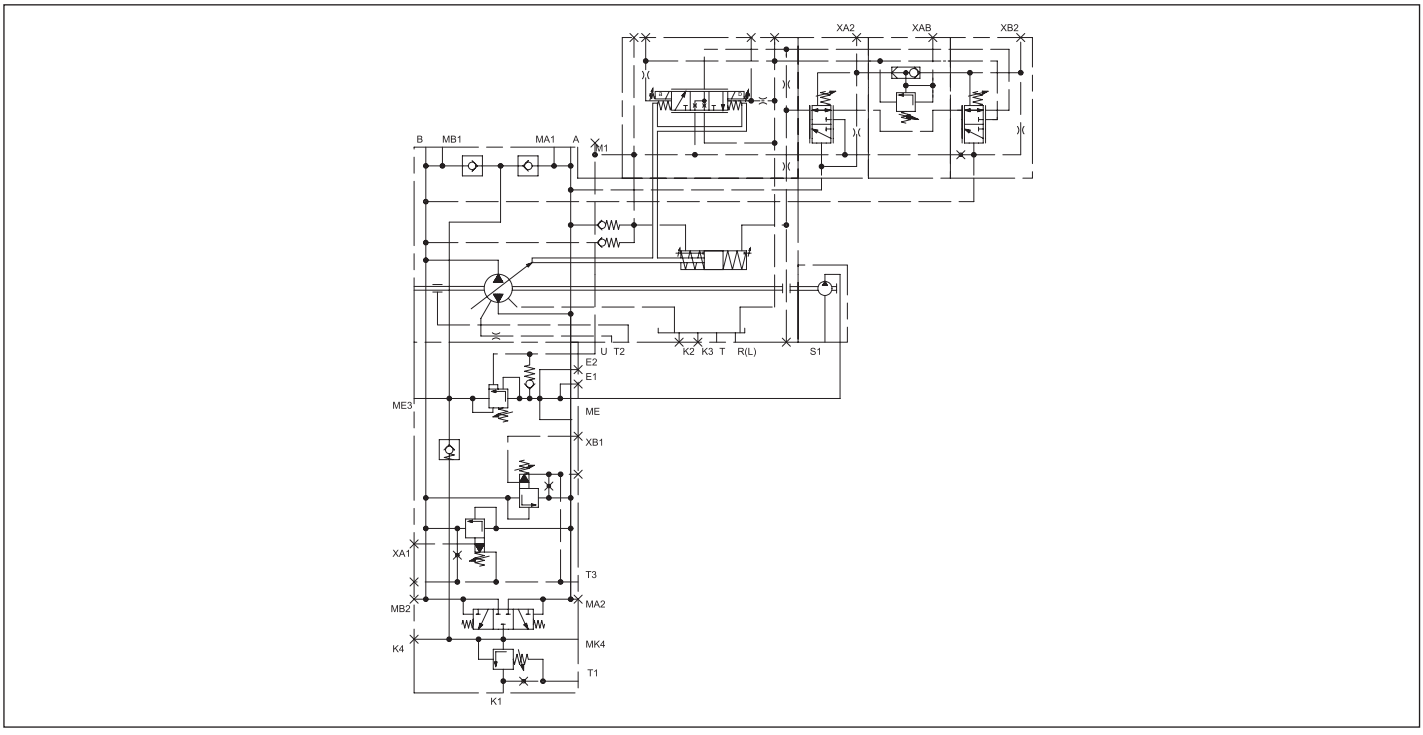


Fig. 21: Hydraulic circuit for SP 40

Hägglunds SP 71

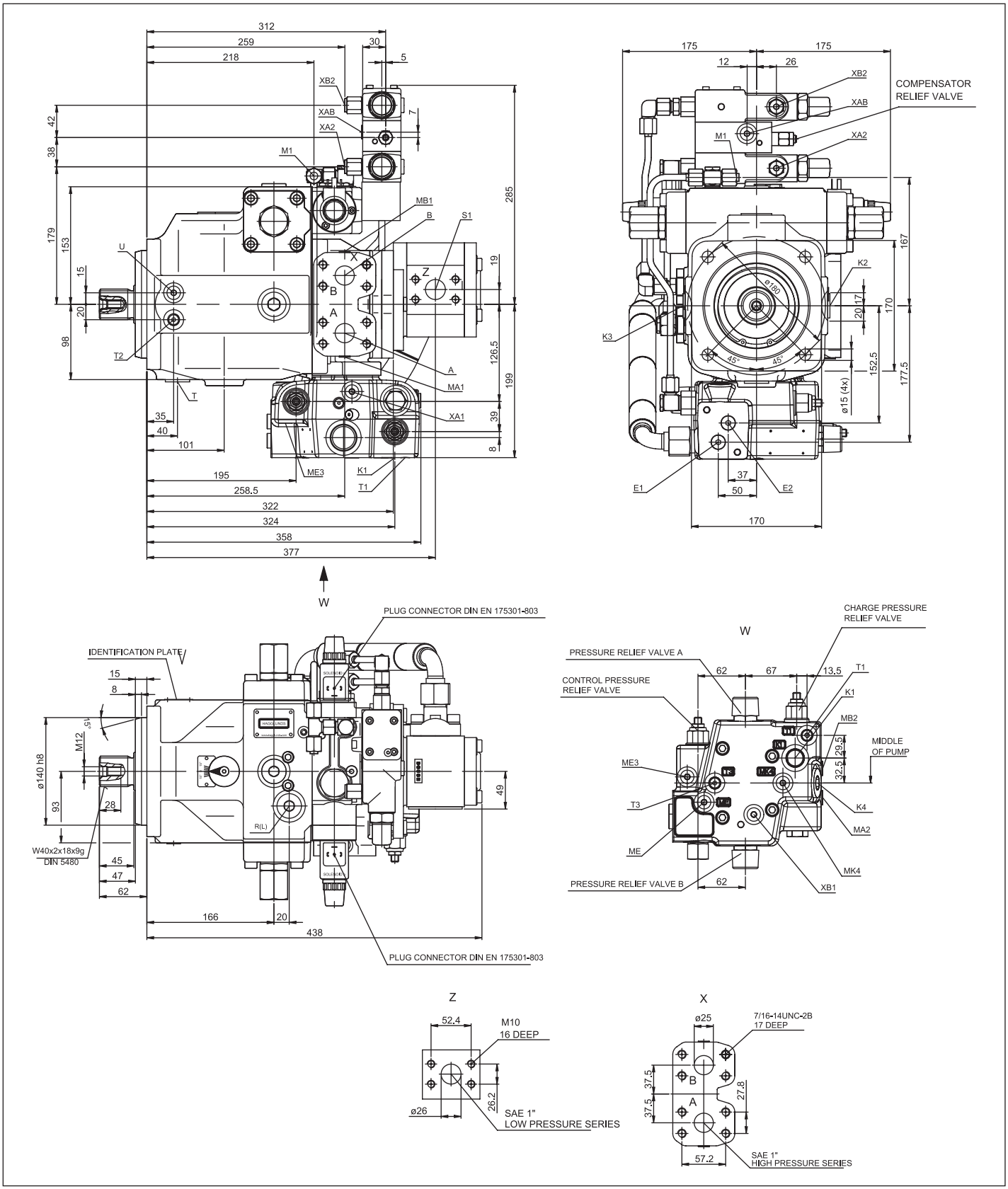


Fig. 22: Dimension SP 71

Table 13: Connections SP 71

Ports		Size[1]	$p_{max\ abs}$ [bar][3]	State
A, B	Pressure port	SAE 1" code 62	400	O
S1	Suction port	SAE 1" code 61[2]	30	O
ME	Measuring port boost pump	9/16-18UNF-2B	40	X
E1	To pump mounted filter (not used by Hägglunds)	M14 × 1.5	40	X
E2	From pump mounted filter (not used by Hägglunds)	M14 × 1.5	40	X
K1	Flushing port	7/8-14UNF-2B	5	O
K2, K3	Flushing port	1 1/16-12UNF-2B	5	X
K4	Accumulator port	1 5/16-12UNF-2B	40	X
MK4, ME3	Measuring port flushing pressure	9/16-18UNF-2B	40	X
MA1, MB1	Measuring port operating pressure	7/16-20UNF-2B	400	X
MA2, MB2	Measuring port operating pressure	M14x1.5	400	X
M1	Measuring port control/high pressure	S8 DIN3852 From W	400	X
R(L)	Return resp, aeration	1 1/16-12UNF-2B	4	O[4]
T	Oil discharge	1 1/16-12UNF-2B[3]	4	X[4]
T1, T3	Drain port pressure relief valve	9/16-18UNF-2B	4	O
T2	Drain port shaft seal	9/16-18UNF-2B	4	O
U	Flushing port (bearing flushing)	9/16-18UNF-2B[3]	7	X
XA2, XB2, XAB	Pilot pressure port, pressure control	9/16-18UNF-2B	350	X

1) Depending on the application, momentary pressure peaks can occur. Keep this in mind when selecting measuring devices and fittings.
2) Only dimensions according to SAE J518, metric fastening thread is a deviation from standard.
3) The countersink can be deeper than that specified in the standard.
4) Depending on the installation position, T, K_2, K_3 or R(L) must be connected (see also*"Installation instructions" page 27*)
5) O = Must be connected (plugged when delivered)
X = Plugged (in normal operation)

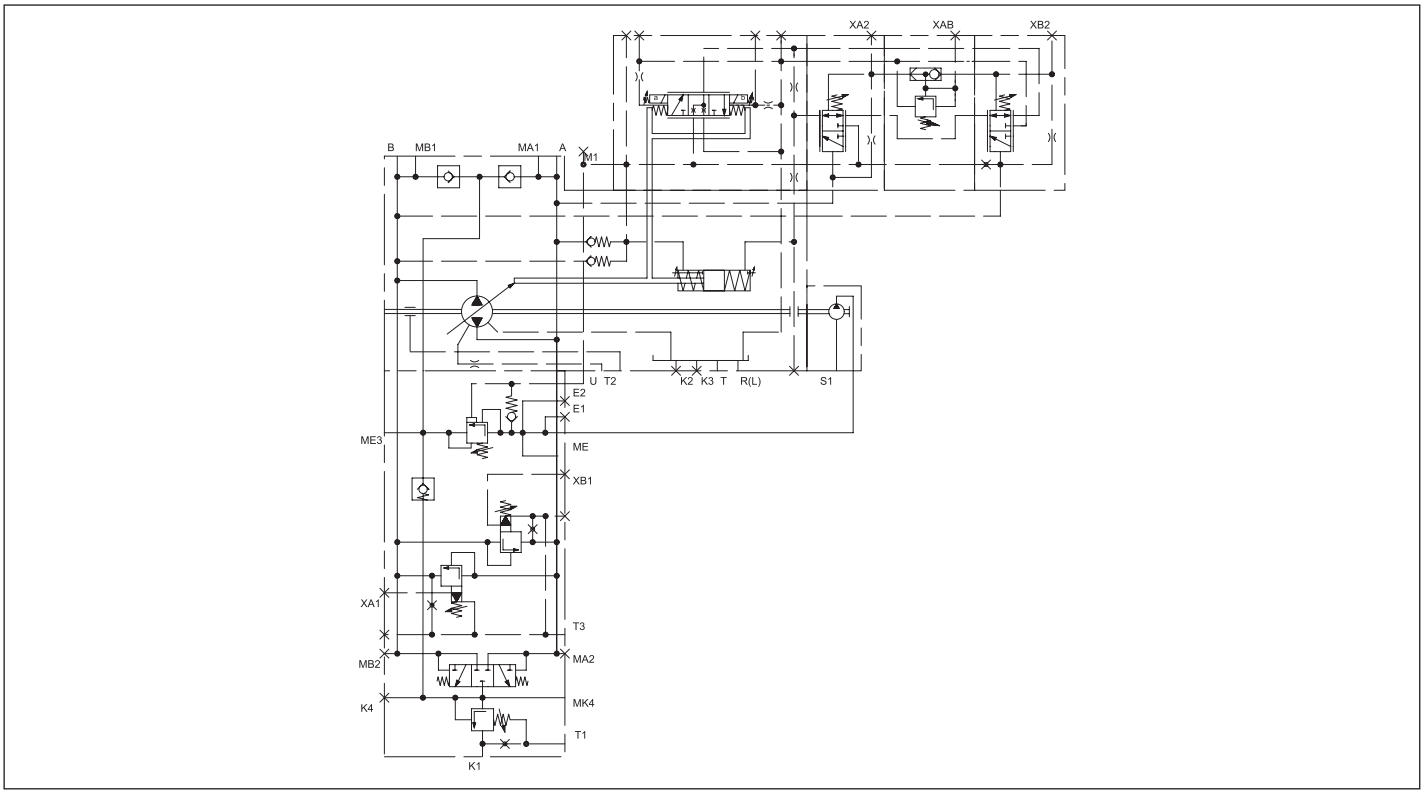


Fig. 23: Hydraulic circuit for SP 71

Hägglunds SP 125

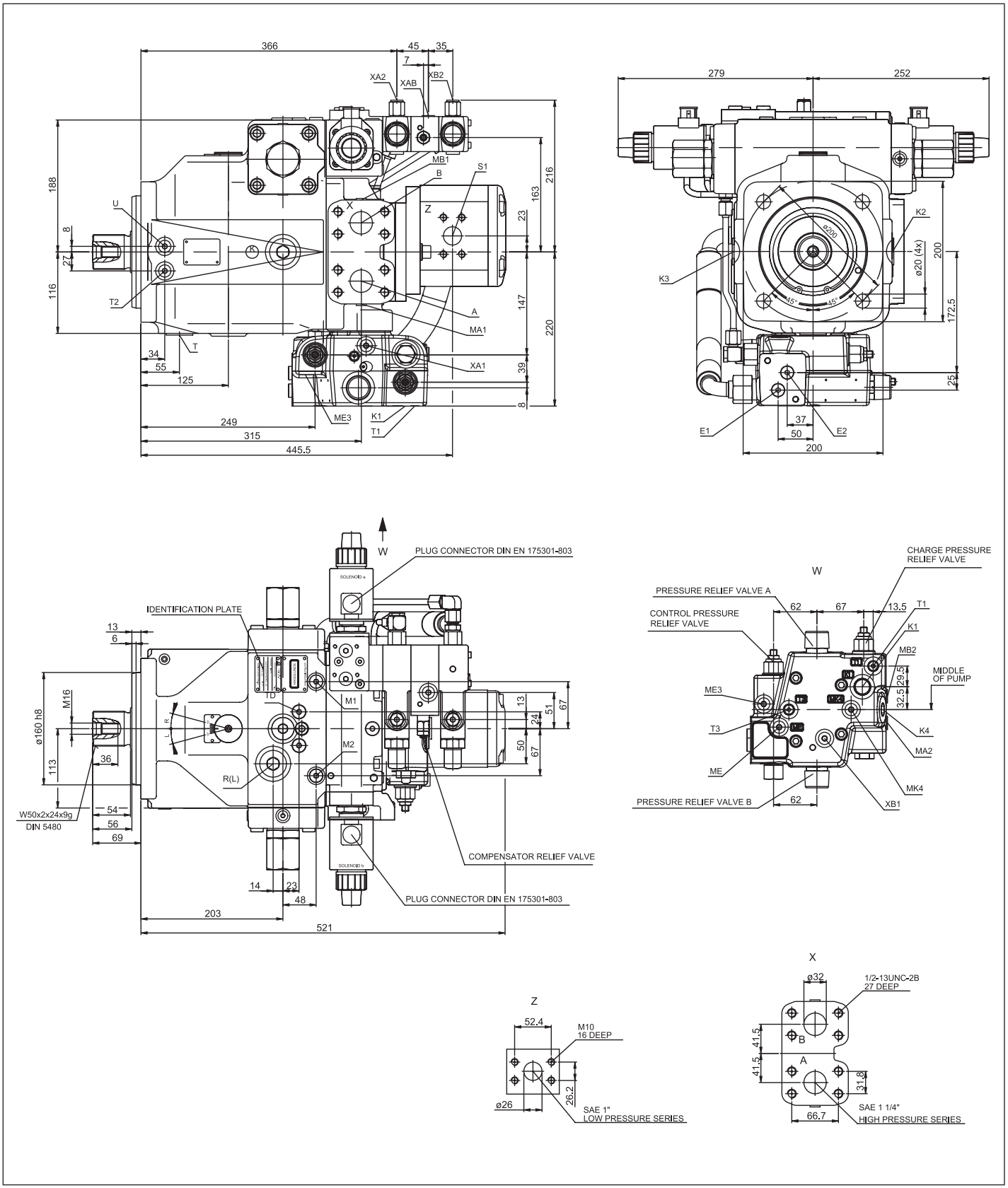


Fig. 24: Dimension SP 125

Table 14: Connections SP 125

Ports		Size[1]	$p_{max\ abs}$ [bar][3]	State
A, B	Pressure port	SAE 1 1/4" code 62	400	O
S1	Suction port	SAE 1" code 61[2]	30	O
ME	Measuring port boost pump	9/16-18UNF-2B	40	X
E1	To pump mounted filter (not used by Hägglunds)	M14 × 1.5	40	X
E2	From pump mounted filter (not used by Hägglunds)	M14 × 1.5	40	X
K1	Flushing port	7/8-14UNF-2B	5	O
K2, K3	Flushing port	1 5/16-12UNF-2B	5	X
K4	Accumulator port	1 5/16-12UNF-2B	40	X
MK4, ME3	Measuring port flushing pressure	9/16-18UNF-2B	40	X
MA1, MB1	Measuring port operating pressure	7/16-20UNF-2B	400	X
MA2, MB2	Measuring port operating pressure	M14x1.5	400	X
M1, M2	Measuring port control/high pressure	M14x1.5	400	X
R(L)	Return resp, aeration	1 5/16-12UNF-2B	4	O[4]
T	Oil discharge	1 5/16-12UNF-2B[3]	4	X[4]
T1, T3	Drain port pressure relief valve	9/16-18UNF-2B	4	O
T2	Drain port shaft seal	9/16-18UNF-2B	4	O
U	Flushing port (bearing flushing)	9/16-18UNF-2B[3]	7	X
XA1, XB1	Pilot pressure relief valve	9/16-18UNF-2B	350	X
XA2, XB2, XAB	Pilot pressure port, pressure control	9/16-18UNF-2B	350	X
TD	Drain	M14x1.5	4	X

1) Depending on the application, momentary pressure peaks can occur. Keep this in mind when selecting measuring devices and fittings.
2) Only dimensions according to SAE J518, metric fastening thread is a deviation from standard.
3) The countersink can be deeper than that specified in the standard.
4) Depending on the installation position, T, K_2, K_3 or R(L) must be connected (see also*"Installation instructions" page 27*)
5) O = Must be connected (plugged when delivered)
X = Plugged (in normal operation)

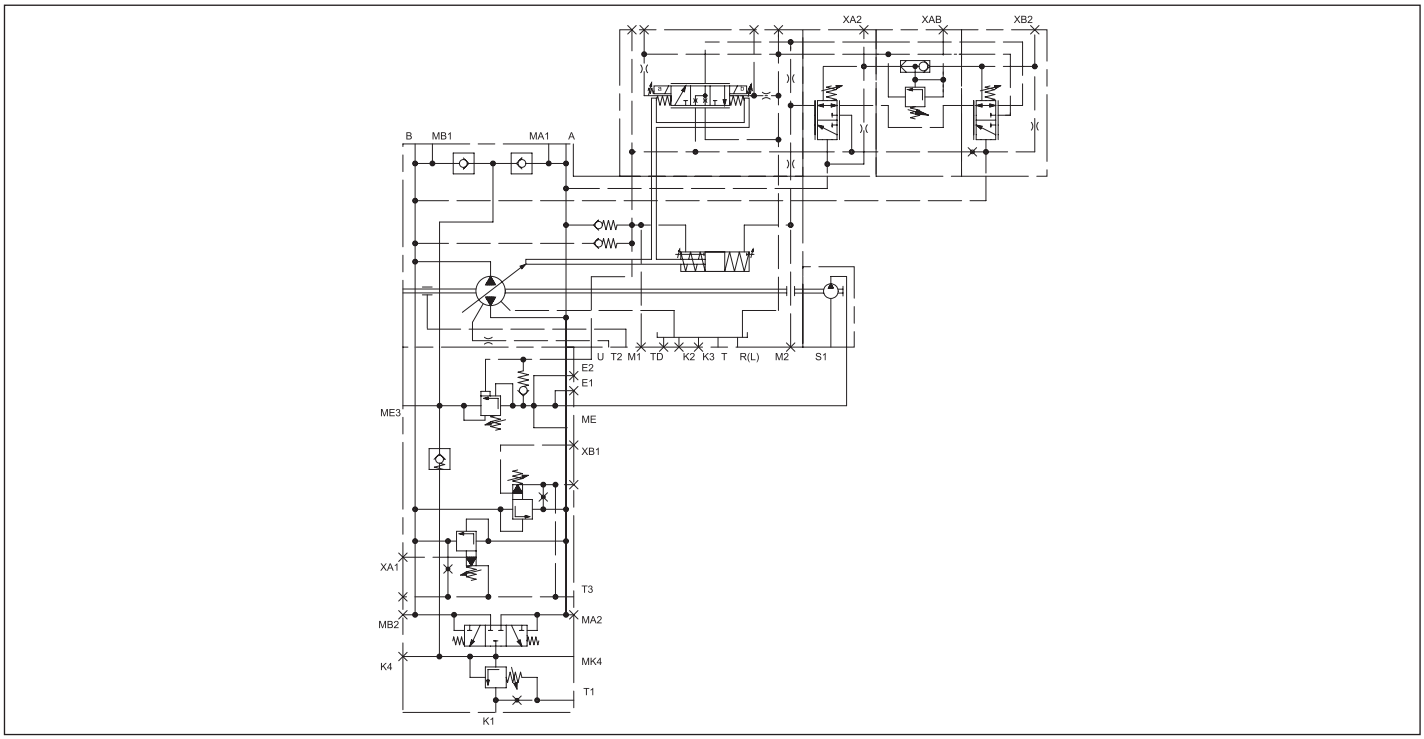


Fig. 25: Hydraulic circuit for SP 125

Hägglunds SP 180

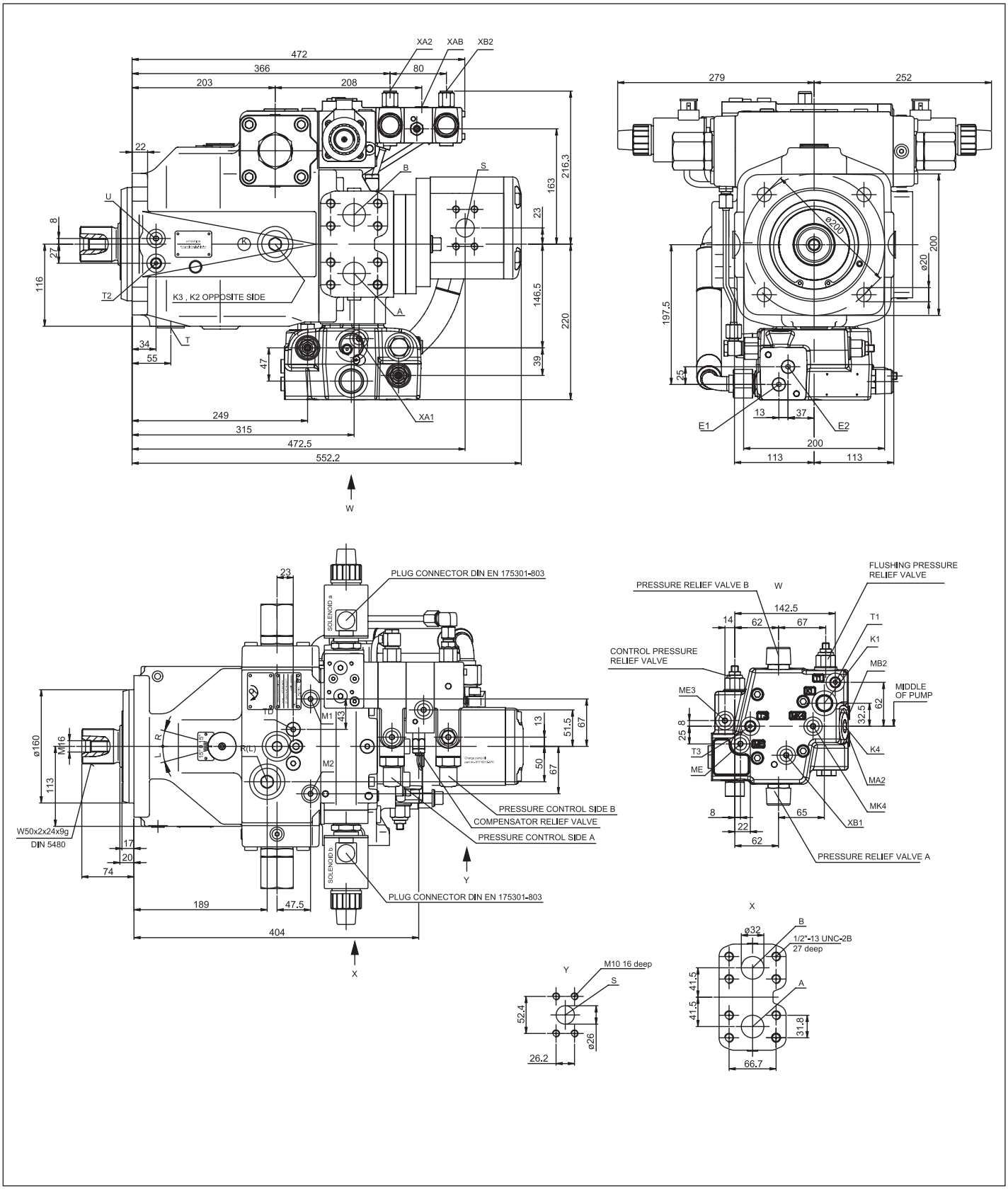


Fig. 26: Dimension SP 180

Table 15: Connections SP 180

Ports		Size[1]	$p_{max\ abs}$ [bar][3]	State
A, B	Pressure port	SAE 1 1/4" code 62	400	O
S1	Suction port	SAE 1" code 61[2]	30	O
ME3	Measuring port charge pressure	9/16-18UNF-2B	40	X
ME	Measuring port control pressure	9/16-18UNF-2B	40	X
E1	To pump mounted filter (not used by Hägglunds)	M14 × 1.5	40	X
E2	From pump mounted filter (not used by Hägglunds)	M14 × 1.5	40	X
K1	Flushing port	7/8-14UNF-2B	5	O
K2, K3	Flushing port	1 5/16-12UNF-2B	5	X
K4	Accumulator port	1 5/16-12UNF-2B	40	X
MK4	Measuring port charge pressure	9/16-18UNF-2B	40	X
MA1, MB1	Measuring port operating pressure	7/16-20UNF-2B	400	X
MA2, MB2	Measuring port operating pressure	M14x1.5	400	X
M1, M2	Measuring port control/high pressure	M14x1.5	400	X
R(L)	Return resp, aeration	1 5/16-12UNF-2B	4	O[4]
T	Oil discharge	1 5/16-12UNF-2B[3]	4	X[4]
T1, T3	Drain port pressure relief valve	9/16-18UNF-2B	4	O
T2	Drain port shaft seal	9/16-18UNF-2B	40	O
U	Flushing port (bearing flushing)	9/16-18UNF-2B[3]	7	X
XA1, XB1	Pilot pressure relief valve	9/16-18UNF-2B	350	X
XA2, XB2, XAB	Pilot pressure port, pressure control	9/16-18UNF-2B	350	X
TD	Drain	M14x1.5	40	X

1) Depending on the application, momentary pressure peaks can occur. Keep this in mind when selecting measuring devices and fittings.
2) Only dimensions according to SAE J518, metric fastening thread is a deviation from standard.
3) The countersink can be deeper than that specified in the standard.
4) Depending on the installation position, T, K_2, K_3 or R(L) must be connected (see also*"Installation instructions" page 27*)
5) O = Must be connected (plugged when delivered)
X = Plugged (in normal operation)

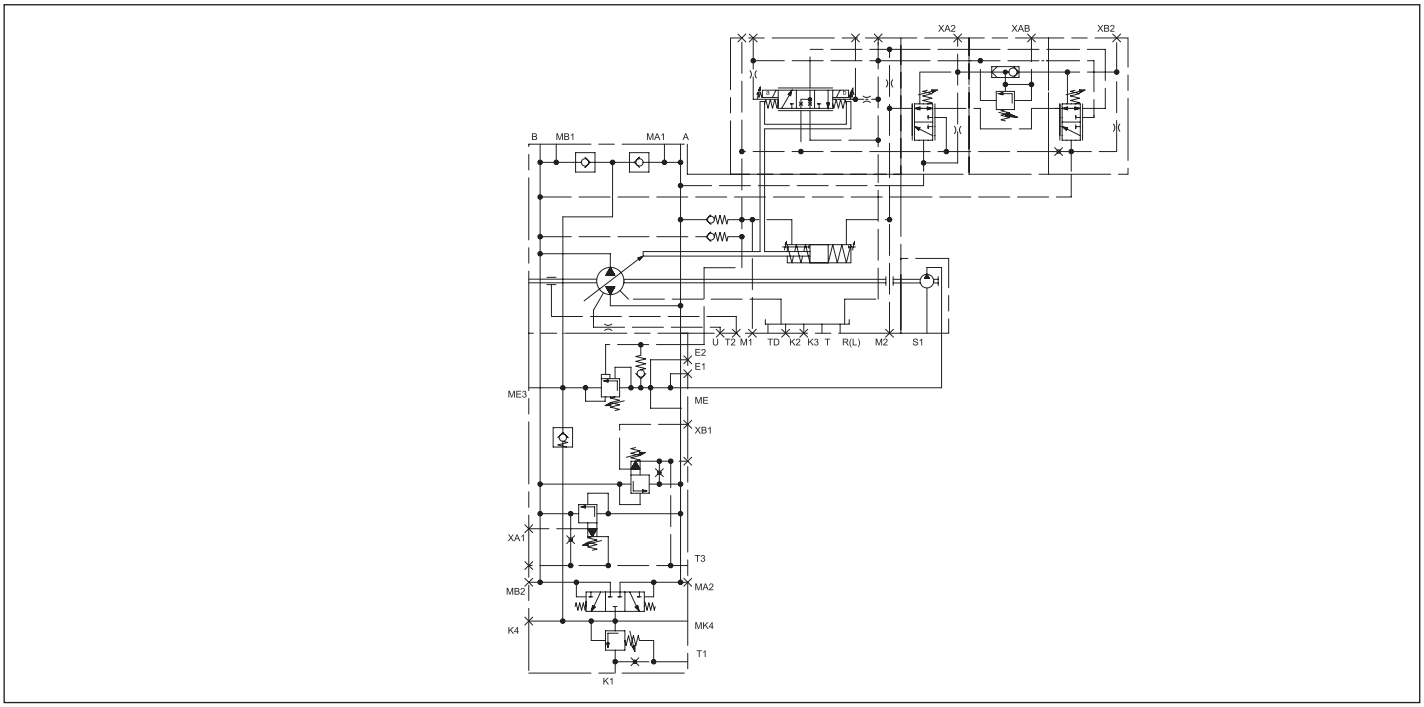


Fig. 27: Hydraulic circuit for SP 180

Through drive

Hägglunds SP can be supplied with through drive despite the external boost pump, in accordance with the type code for tandem combinations on *2*. The external boost pump will be mounted on the second pump,see *Fig. 28*. When ordering combination pumps, the type designations of the 1st and 2nd pump must be connected by a “+”.

▶ Order example:
SP 180+125 SR-V-EP1234567

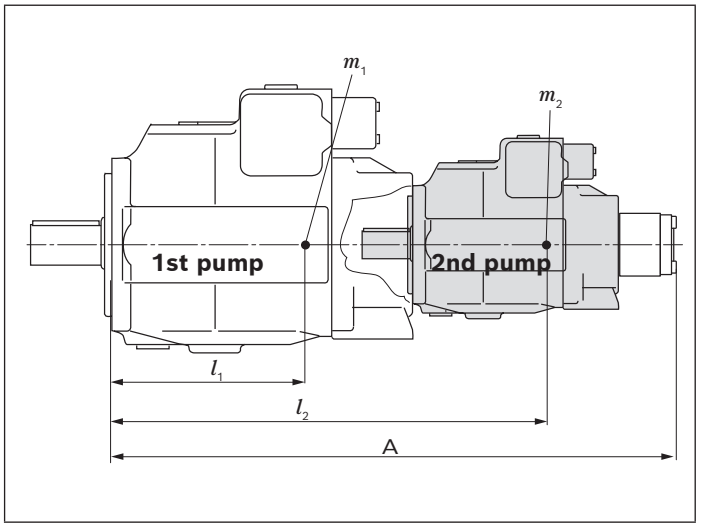


Fig. 28: Tandem pump

Table 16: Total length A

	SP (2nd pump)			
SP (1st pump)	**40**	**71**	**125**	**180**
40	805 mm	–	–	–
71	834 mm	879 mm	–	–
125	924 mm	974 mm	1068 mm	–
180	967 mm	1010 mm	1087 mm	1121 mm

Through drive kit

The scope of delivery include: hub, mounting bolts, seal and, if applicable, an intermediate flange. See *Table 18* for material numbers to the different through drive kits.

Note!
If combining two pumps with external boost pumps a tandem boost pump kit must also be used.

m_1, m_2 [kg]
l_1, l_2 [mm]

$$T_m = \left(m_1 \cdot l_1 + m_2 \cdot \frac{}{l_2} + m_3 \cdot l_3\right) \frac{1}{102} \text{ [Nm]}$$

Table 17: Permissible mass torque

Size			**40**	**71**	**125**	**180**
Permissible mass torque	T_m	Nm	1800	2000	4200	4200
Permissible mass torque for dynamic mass acceleration $10g \triangleq 98.1$ m/s²	T_m	Nm	180	200	420	420
Weight (without boost pump)	m_1, m_2	kg	69	90	139	142
Distance from center of gravity	l_1	mm	120	140	170	180
	l_2	mm	See *Table 18*			

Overview of mounting options on SP

Table 18: Through drive kit for SP combinations

First pump	Second pump[1)]	Material number through drive kit[1)]	l_2 mm
40	40	R902466736	On request
71	40	R902448949	
71	71	R902453552	
125	40	R902460618	
125	71	R902446419	
125	125	R902439195	
180	40	R902460618	
180	71	R902446419	
180	125	R902439195	
180	180	R902434126	

1) Hub for spline shaft according to DIN 5480 (e.g. W32)

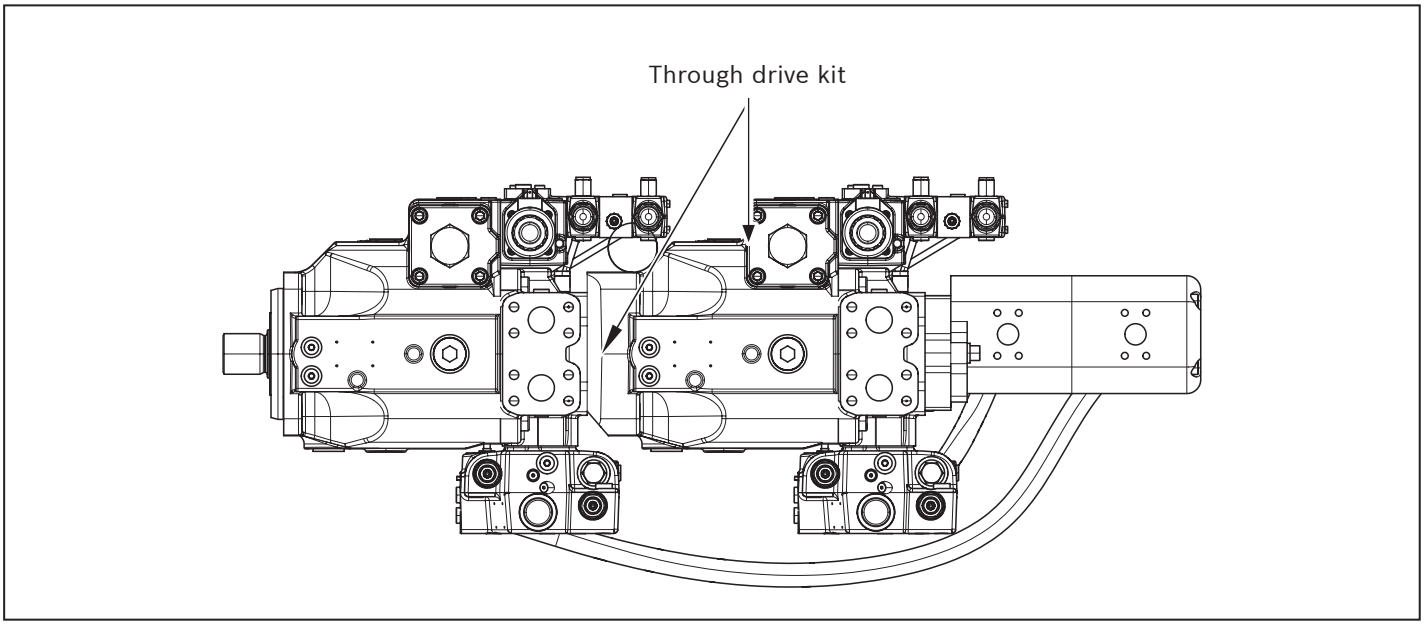


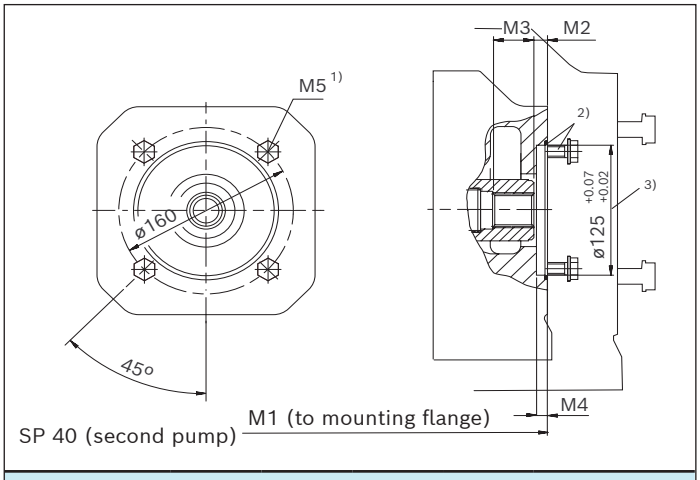
Fig. 29: Through drive kit

Dimensions through drive

Table 19: Dimensions through drive

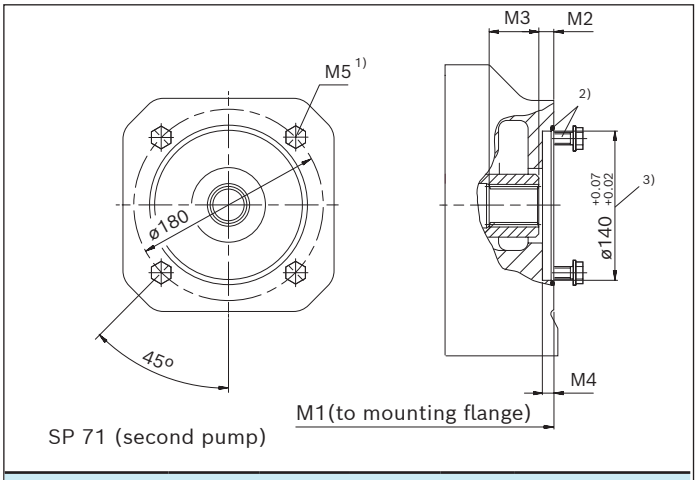
Flange ISO 3019-2	Hub for splined shaft DIN 5480	Availability over sizes			
Diameter		**40**	**71**	**125**	**180**
125, 4-hole	W32x2x14x9g	●	●	●	●
140, 4-hole	W40x2x18x9g	–	●	●	●

● = Available



First pump Size	M1	M2	M3	M4	M5
40	288	12.5	41.4	9.5	M12; 25 deep
71	316	12.5	33.6	10	
125	373	12.5	42	9.5	
180	397	12.5	42	9.5	

Fig. 30: Dimensions through drive SP 40



First pump Size	M1	M2	M3	M4	M5
71	316	11.5	44	9	M12; 25 deep
125	373	12.5	50	9.5	
180	397	12.5	43.8	9.5	

Fig. 31: Dimensions through drive SP 71

1) Thread according to DIN 13, see instruction manual for details on tightening torques

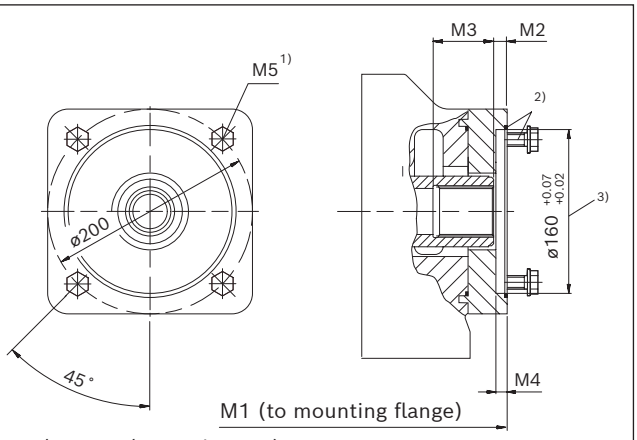
2) Four mounting bolts and O-ring seal are included in the scope of delivery.

3) Flange dimension second pump

Table 20: Dimensions through drive

Flange ISO 3019-2	Hub for splined shaft DIN 5480	Availability over sizes			
Diameter		**40**	**71**	**125**	**180**
160, 4-hole	W50×2×24×8g	–	–	●	●

● = Available



SP 125/SP 180 (second pump)

First pump Size	M1	M2	M3	M4	M5
125	379	12.5	58	10	M16; 30 deep
180	403	12.5	58	10	

Fig. 32: Dimensions through drive SP 125/SP 180

1) Thread according to DIN 13, see instruction manual for details on tightening torques
2) Four mounting bolts and O-ring seal are included in the scope of delivery.
3) Flange dimension second pump

Boost pump and valve technology

(see *Fig. 34* for position references)

Pressure compensator valve (Pos. 2)

The SP pump has one common integrated pressure compensator relief valve (2) for both sides, A and B.
For different pressure setting between the sides, two external pressure relief valves must be added. The valves are connected to XA2 (A-port compensator setting) and XB2 (B-port compensator setting). The external valves must be drained to tank.
Observe that relief valve (2) must be set on a higher pressure level than the two external relief valves.
These relief valves must be ordered separately and must be installed on site. (They are not mounted on the pump) (Spare part pump). If pump is in a new manufacturing of a drive unit then these will of course be mounted in the drive unit.

Standard value that is set on pressure compensation is 350 bar, if other value is needed add a comment when ordering the pump.

High-pressure relief valve (Pos. 5)

Two pilot-operated pressure relief valves use pressure limitation to prevent damage to the hydraulic pump resulting from overpressure. A pressure relief valve is assigned to each pressure side.
Protection is provided by reducing the high pressure to the low pressure side.
The pressure limitation is set by default to pressure compensator (2) + 40 bar, if another setting is required add that as a comment when order the pump.

Boost pressure

To prevent damage to the system, low pressure monitoring is recommended, which monitors the static pressure component. Port $\mathbf{M_{K4}}$ are suitable, also $\mathbf{M_{E3}}$ can be used.
In this datasheet all values for charge pressure monitoring are refered to $\mathbf{M_{K4}}$. For normal operations, 15bar (measured in $\mathbf{M_{K4}}$) charge pressure is set. For operation in applications where dynamic pressure drops may occur.a higher charge pressure value must be set.

The lowest allowed value is 8 bar (occuring during 2 seconds).
For shock load applications use an accumulatior in $\mathbf{K_4}$.

Boost pump (Pos. 9)

Sizes see *Table 1*

Control pressure relief valve (for EP and HD) (Pos. 8)

Direct operated, high-pressure-related relief.
At low working pressure, the auxiliary pump pressure is regulated to the set value (e.g. 32 bar). This pressure is needed by the HD and EP controls to swivel out reliably. Using this valve saves the use of a separate control pressure pump.
If the working pressure exceeds the pressure of the boost pump, control is provided by the check valve via the high pressure. At the same time, the increase in working pressure relieves the control pressure relief valve.
The boost pump pressure is hereby reduced to the set boost pressure (e.g. 15 bar).
This function leads to energy savings, improved efficiency and a longer service life of the auxiliary pump.
For setting values, see *Table 6*.

Flushing valve (Pos. 4)

To open the flushing valve safely, the pressure differential between A and B is required, as shown in *Fig. 33*. The required pressure at 1500 rpm. The circuit temperature needs to be monitored to avoid any damage to the system.

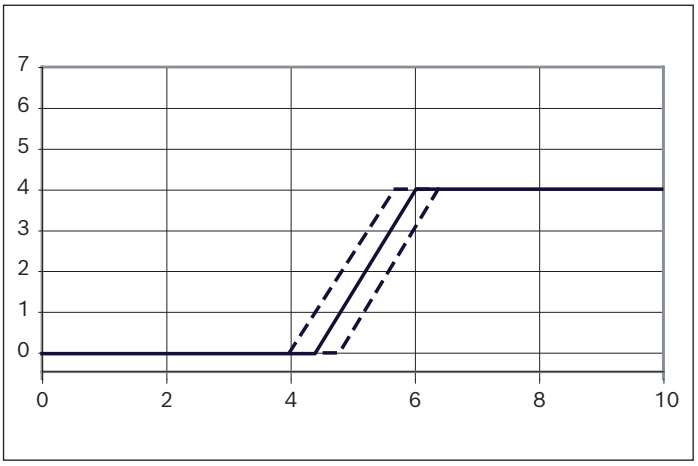


Fig. 33: Cracking pressure differential for flushing valve

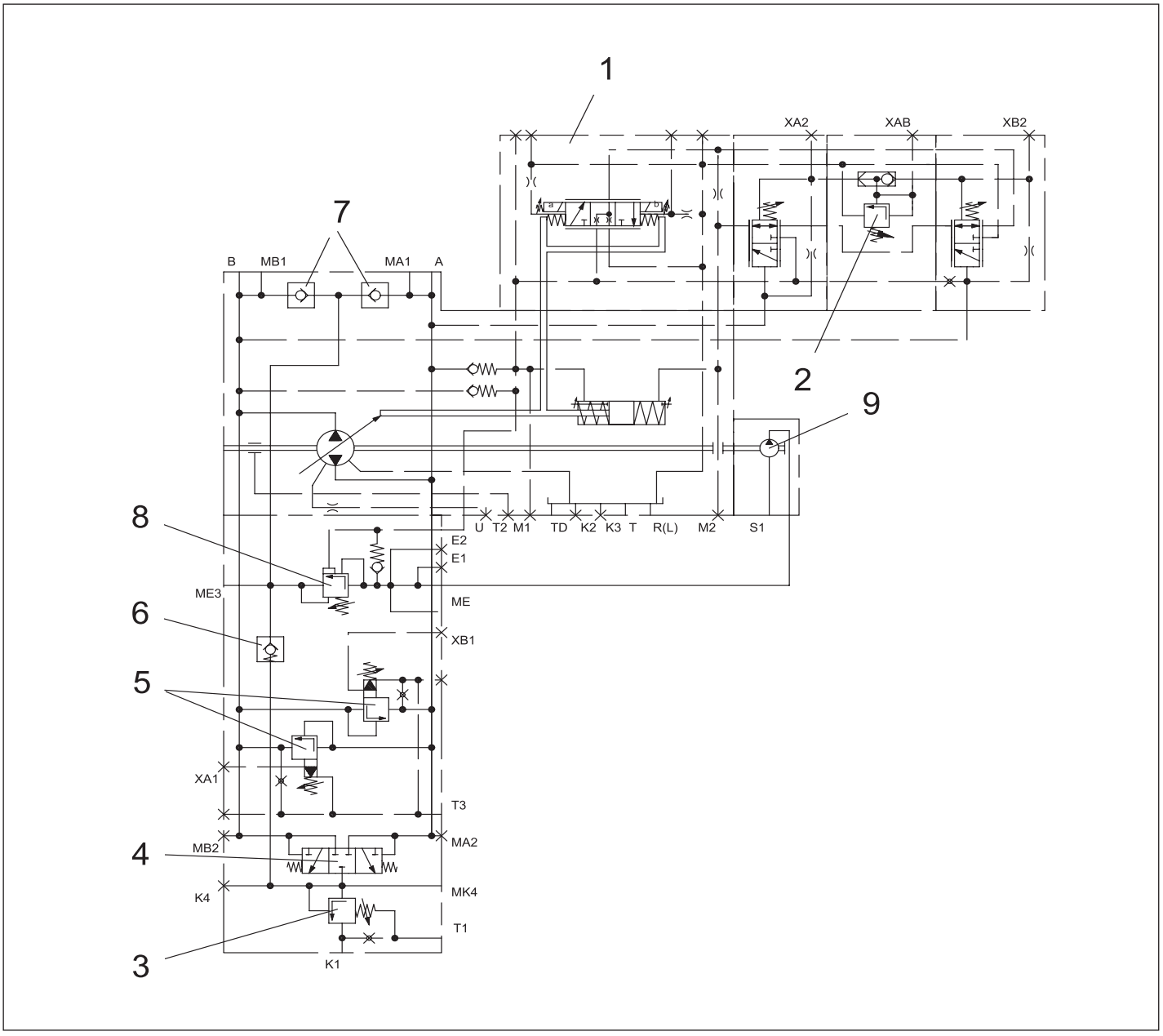


Fig. 34: Example circuit diagram SP 180

Table 21: Component descriptions

Components	
1	EPG control
2	**Pressure relief valve**
3	Boost-pressure relief valve
4	**Flushing valve**
5	High-pressure relief valves
6	Bypass valve
7	Boost check valves
8	Control pressure relief valve
9	External boost pump

Filtration types[1)]

Without filter in the boost circuit

SP pumps are normally not configured for boost circuit filtration.

Ports **E_1** and **E_2** are delivered plugged, pressure-proof and internally connected.

Ports for external boost circuit filtration

A boost circuit filter can be connected between boost(charge) pump and main pump (see *Fig. 36* pos 10).

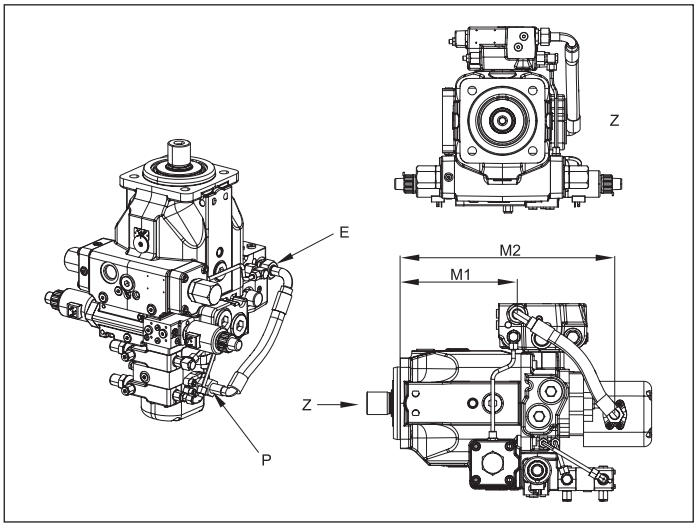


Fig. 35: Port locations

Table 22: Distance and port dimensions

Size	M1	M2	Port E/P
40	178	342	ISO 8434-1 22L Male
71	202	377	ISO 8434-1 22L Male
125	257	445	ISO 8434-1 22L Male
180	257	471	ISO 8434-1 22L Male

Port P outlet boost pump.

Port E inlet boost flow on main pump.

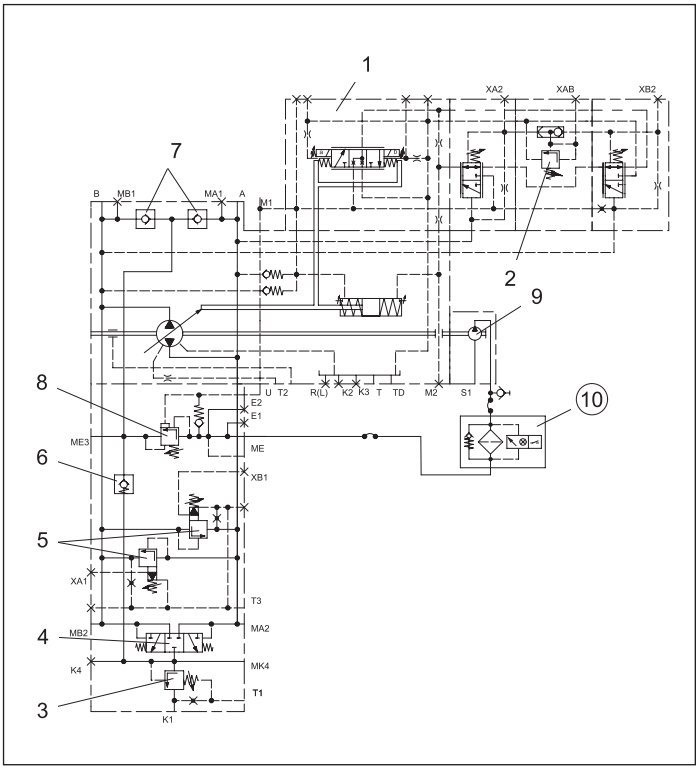


Fig. 36: Example Circuit diagram SP 180[1)]

Table 23: Component description

Components	
1	EPG control
2	Pressure relief valve
3	Boost-pressure relief valve
4	Flushing valve
5	High-pressure relief valves
6	Bypass valve
7	Boost check valves
8	Control pressure relief valve
9	External boost pump
10	Filter with bypass

1) For components see *Table 23* and ports, *Table 12, Table 13, Table 14 and Table 15*

Installation instructions

General

The axial piston unit must be filled with hydraulic fluid and air bled during commissioning and operation. This must also be observed following a longer standstill as the axial piston unit may empty via the hydraulic lines.
With particular regard to the “drive shaft upwards” installation position, we recommend bearing flushing to lubricate the front bearing and shaft seal at port **U**. See page *5*.
The leakage in the housing area must be directed to the reservoir via the highest drain port (**T**, **R**(**L**), **K_2**, **K_3**).
If a shared drain line is used for several units, make sure that the respective case pressure is not exceeded. The shared drain line must be dimensioned to ensure that the maximum permissible case pressure of all connected units is not exceeded in any operational conditions, particularly at cold start. If this is not possible, separate reservoir lines must be installed if necessary.
To achieve favorable noise values, decouple all connecting lines using elastic elements and avoid above-reservoir installation.
In all operating conditions, the suction lines and the drain lines must flow into the reservoir below the minimum fluid level. The permissible suction height h_S results from the overall loss of pressure, it must not, however, be higher than $h_{S\ max}$ = 800 mm. The minimum suction pressure at port **S** must also not fall below 0.8 bar absolute during operation.
For external boost pressure supply please refer to the attachment pump data sheet for details on the minimum suction pressure.
When designing the reservoir, ensure that there is adequate spacing between the suction line and the drain line. This minimizes oil turbulence and carries out degassing, which prevents the heated hydraulic fluid from being sucked directly back in again.

Installation position

See the following examples (1 to 8) in *Fig. 37* to *Fig. 44*.
Further installation positions are available upon request.
Usually in Hägglunds Drive Units the installation example 4 in *Fig. 40* is used

Note!
You can expect installation examples **2**, **3**, **6** and **7** to affect the closed loop control. Due to gravity, dead weight and case pressure, minor characteristic shifts and actuating time changes may occur.

Table 24: Important ports and distances when pump is installed

Key	
S	Suction port
T, **K_2**, **K_3**, **R**(**L**)	Fluid filling + air bleeding (drain port)
A, B	Pressure port
U	Bearing flushing port
SB	Baffle (baffle plate)
$h_{t\ min}$	Minimum required immersion depth (200 mm)
h_{min}	Minimum required distance to the reservoir bottom (100 mm)
$h_{s\ max}$	Maximum permissible suction height 800 mm. To be sure always check boost pump specification!

Below-reservoir installation (recommended)

Below-reservoir installation means that the axial piston unit is installed outside of the reservoir and below the minimum fluid level of the reservoir.

Installation position	Air bleeding[1)]	Filling
	R(L)	R(L)

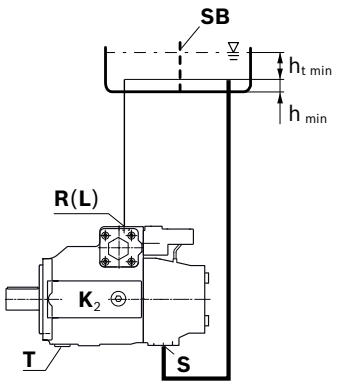


Fig. 37: Example 1 [2)]

Installation position	Air bleeding[1)]	Filling
	K_3; R(L) plug	K_3

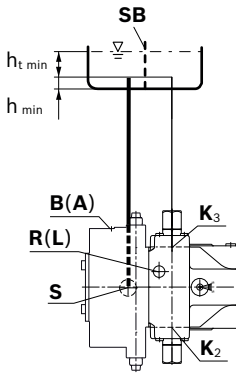


Fig. 39: Example 3 [2)]

Installation position	Air bleeding[1)]	Filling
	K_2; R(L) plug	K_2

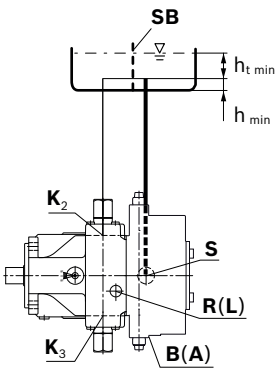


Fig. 38: Example 2 [2)]

Installation position	Air bleeding[1)]	Filling
	T; R(L) plug	T

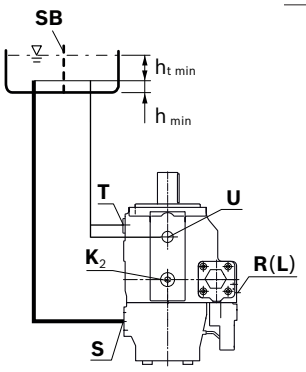


Fig. 40: Example 4 [2)]

1) To air bleed the stroking chamber, use the highest port on the control (see control data sheet 92080, 92084)

2) Observe the drawing of the pump is just symbolic and does not describe its correct shape

Above-reservoir installation

Above-reservoir installation means that the axial piston unit is installed above the minimum fluid level of the reservoir.

A check valve in the drain line is to be avoided. Exceptions may be permissible, please consult your Bosch Rexroth representative first.

Installation position	Air bleeding[1)]	Filling
	R(L)	R(L)

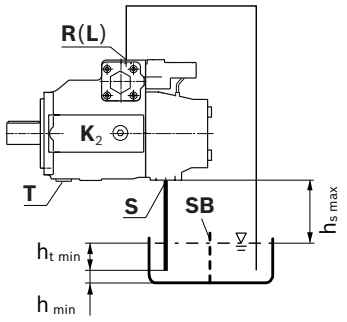


Fig. 41: Example 5 [2)]

Installation position	Air bleeding[1)]	Filling
	K2 ; R(L) plug	K2

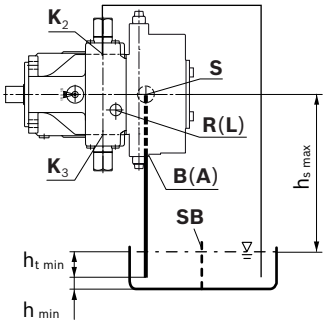


Fig. 42: Example 6 [2)]

Installation position	Air bleeding[1)]	Filling
	K3 ; R(L) plug	K3

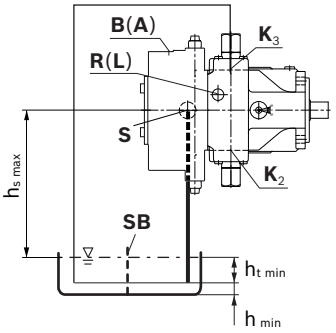


Fig. 43: Example 7 [2)]

Installation position	Air bleeding[1)]	Filling
	T; R(L) plug	T

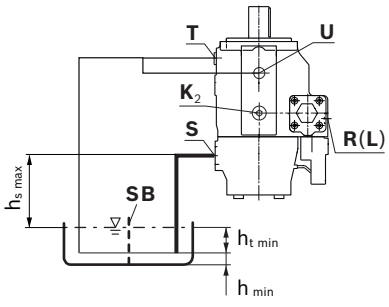


Fig. 44: Example 8 [2)]

1) To air bleed the stroking chamber, use the highest port on the control (see control data sheet 92080, 92084)

2) Observe the drawing of the pump is just symbolic and does not describe its correct shape

Project planning notes

- The pump SP is designed to be used in closed circuit.
- The project planning, installation and commissioning of the axial piston unit requires the involvement of qualified skilled personnel.
- Before using the axial piston unit, please read the corresponding instruction manual (92100-01-B) completely and thoroughly. If necessary, this can be requested from Bosch Rexroth.
- The specified data and notes contained herein must be observed.
- Preservation: Our axial piston units are supplied as standard with preservative protection for a maximum of 12 months. If longer preservative protection is required (maximum 24 months), please specify this in plain text when placing your order. The preservation periods apply under optimal storage conditions, details of which can be found in the data sheet 90312 or in the instruction manual.
- Depending on the operating conditions of the axial piston unit (working pressure, fluid temperature), the characteristic curve may shift.
- Not all versions of the product are approved for use in a safety function according to ISO 13849. Please consult the responsible contact person at Bosch Rexroth if you require reliability parameters (e.g. $MTTF_d$) for functional safety.

Safety instructions

- During and shortly after operation, there is a risk of getting burnt on the axial piston unit and especially on the solenoids. Take the appropriate safety measures (e.g. by wearing protective clothing).
- Moving parts in control equipment (e.g. valve spools) can, under certain circumstances, get stuck in position as a result of contamination (e.g. impure hydraulic fluid, abrasion, or residual dirt from components). As a result, the hydraulic fluid flow and the build-up of torque in the axial piston unit can no longer respond correctly to the operator's specifications. Even the use of various filter elements (external or internal flow filtration) will not rule out a fault but merely reduce the risk. The machine/system manufacturer must test whether remedial measures are needed on the machine for the application concerned in order to bring the driven consumer into a safe position (e.g. safe stop) and ensure any measures are properly implemented.

Related documents

For more information of pump in drive systems see documents in *Table 25*

Table 25: Related documents

	Title	Document no	Document type
🕮	Hägglunds DUe drive unit	RE 15325	Data sheet
🕮	Hägglunds DUc drive unit	RE 15326	Data sheet
🕮	Hydraulic Fluids Based on Mineral Oil and Related Hydrocarbons	90220	Data sheet
🕮	Environmentally Acceptable Hydraulic Fluids	90221	Data sheet
🕮	Axial Piston Variable Pump A4VSG series 1x and 3x	92100	Data sheet
🕮	Storage and preservation of axial piston units	90312	Data sheet
🕮	Electro-hydraulic control with proportional solenoid	92084	Data sheet
🕮	Control devices HD	92080	Data sheet
🕮	Hydraulic fluid quick reference	RE 15414	Data sheet
🕮	Hägglunds DUe drive unit	RE 15325-WA	Installation & Maintenance manual
🕮	Hägglunds DUc drive unit	RE 15326_WA	Installation & Maintenance manual
🕮	Axial Piston Variable Pump A4VSG, Series 10, 11 and 30	92100-01-B	Instruction manual

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