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THE PRODUCTION LINE OF HANSA-TMP

Variable Displacement Closed Loop System Axial Piston Pump

TPV 1100

INDEX

TPV 1100

GENERAL INFORMATION

- TPV 1100 is a variable displacement, compact tandem axial piston pump, with swashplate system, for closed loop hydrostatic transmissions.

- Flow rate is proportional to the rotation speed and displacement, and is continuously variable.
  It increases as the swashplate angle moves from “0” to maximum position.
  If the swashplate is positioned beyond the neutral point, the flow rate respectively follows one of the two directions.

- The TPV 1100 is equipped with a boost pump, “gerotor” type of new design and high efficiency to keep the circuit pressurised, to compensate the oil leakages of the hydrostatic transmission, to avoid cavitation of the piston pump and to supply low pressure oil flow to the remote controls of the pumps and of the hydraulic transmission (max 3 MPa).

- The standard version is of mechanical type on which, by means of a lever, the change of flow in the two directions is obtained.

- This series of pumps can be with a hydraulic servo control or electro-proportional control which allows the control of the pump by means of hydraulic or electric joysticks.

- Moreover the pump is fitted with relief valves and it is adapted for assembly of auxiliary gear pumps.

- The compact tandem TPV 1100, are available with splined or parallel shaft and can be supplied with options such as purge valve, screw by-pass valve and, for
  security, "man on board" valve.

- The piston pumps are to be considered as individual components for the purposes of Directive 98/37/EC, therefore have been built to be integrated into a circuit or to be assembled with other components to form a machine or system. They can be operated only after they have been installed in the machine/system which they are intended for.

- The TPV 1100 pumps must be used to create, manage and regulate oil flow in a closed loop system. Any other use should be considered improper.

- The pumps are built according to the technology normally used for this type of product. There is the risk of injury or damage to personnel during their installation and use if you do not respect the normal safety instructions or if used by untrained personnel.

TECHNICAL SPECIFICATIONS

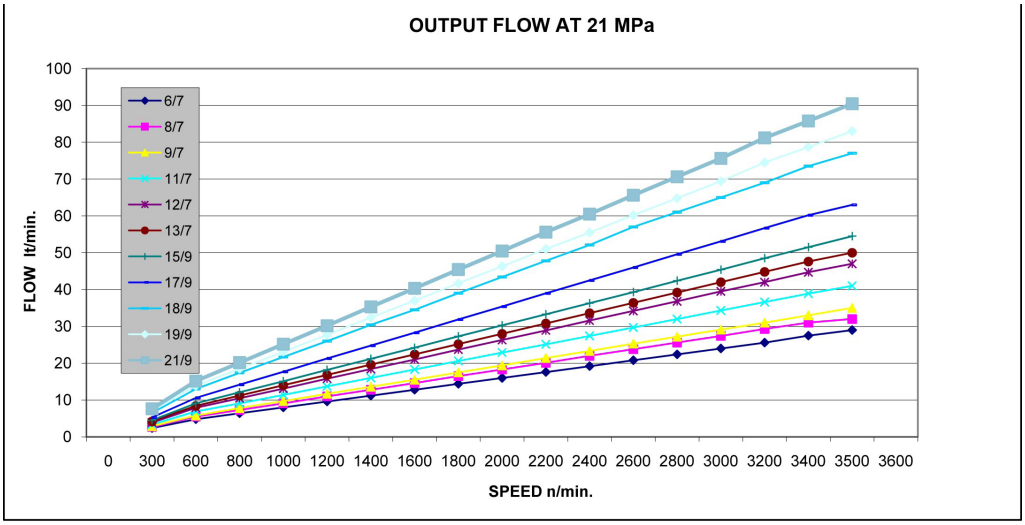
PUMP MODEL		TPV 6-7	TPV 8-7	TPV 9-7	TPV 11-7	TPV 12-7	TPV 13-7	TPV 15-9	TPV 17-9	TPV 18-9	TPV 19-9	TPV 21-9
Max. Displacement	cm^3	7,4	8,9	9,6	11,2	12,8	13,6	15,00	17,1	18,2	19,4	21,15
Flow rating(1)	l/min	25,01	31,96	34,74	40,32	46,08	48.88	54,00	61,77	66,37	69,84	76,4
Power rating(1)	kW	8,75	11,18	12,15	14,11	16,12	17,11	18,9	21,61	23,23	24,44	31,73
Boost pump displacement	cm^3/n	3,9 (rear cover closed B1, B2) 4,7 (rear cover SAE-A)										
Rated pressure	MPa	30						25			22	
Max. pressure	MPa	35	35	35	35	35	35	30	30	30	28	
Max. relief valve setting	MPa	38										
Standard boost pressure (2)	MPa	0,6 (Mechanical Control) 2 (Hydraulic / Electric Servo Control)										
Suction pressure	MPa (assoluta)	> = 0,08										
Max. case pressure	MPa	0,15										
Min. shaft speed	n/min	500										
Rated speed	n/min	3.600									2900	
Max. speed	n/min	3.900									3200	
Max. oil temperature	°C	80										
Oil viscosity	cSt	15-35										
Fluid contamination		18/15/12 ISO 4406 (NAS 7)										
Dry weight (single pump)(3)	kg	11										
Dry weight (tandem pump)(3)	kg	23										

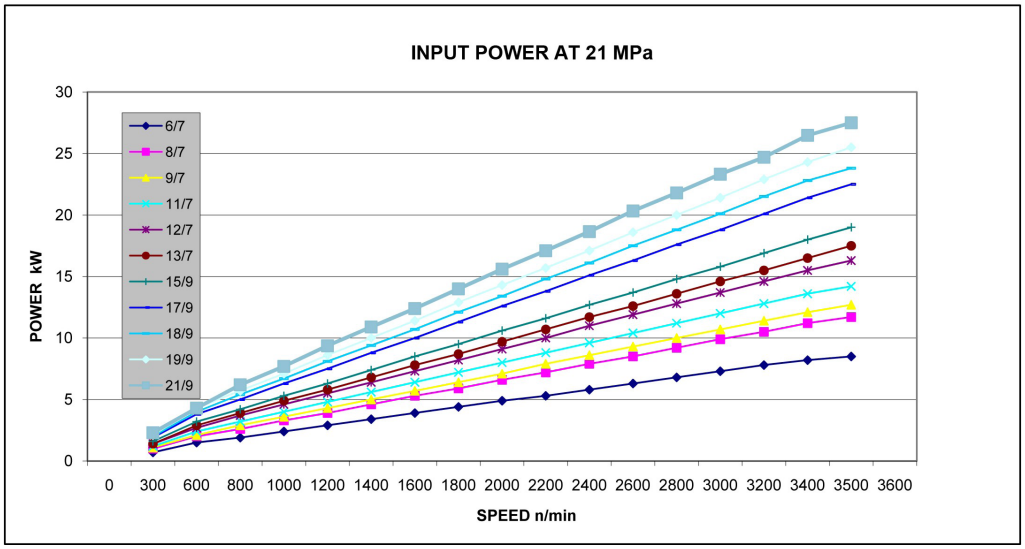
(1) 3.600 n/min 21 MPa
(2) 1.000 n/min
(3) Nominal data, weight varies depending on configuration and optional

SYSTEM DESIGN PARAMETERS

HYDRAULIC MEASURE	USEFUL FORMULAS	CONVERSION FACTORS
Flow rate: Q = (l/min)	$\mathbf{Q} = V\,[cm^3/n] \times \eta_v \times n \times 10^{-3}$	1 l/min = 0,2641 US Gal/min
Pressure: P = (MPa)		1 MPa = 145 PSI
Displacement: V = (cm^3/n)		
Torque: M = (Nm)	$\mathbf{M} = \frac{\Delta p\,[MPa] \times V\,[cm^3/n]}{6.283 \times \eta_m}$	1 Nm = 8,851 in lbs
Power: P = (kW)	$\mathbf{P} = \frac{\Delta p\,[MPa] \times V\,[cm^3/n] \times n}{60 \times 1000 \times \eta_t}$	1 KW = 1,36 HP
Shaft speed: n = n/min		
Hydraulic efficiency: = ηv		
Mechanical efficiency: = ηm		
Overall efficiency: = ηt		
		1 mm = 0,0394 in
		1 kg = 2,205 lbs
		1 N = 0,2248 lbs

PERFORMANCE DIAGRAM





Performance diagrams

- The diagrams show the data of maximum speed and maximum continuous pressure.
- Data may vary depending on pump displacement.

Pressure

- Continuous pressure: is the average pressure for continuous work, which must not be exceeded, to ensure a correct and long lasting service of the pump.
- Maximum pressure: is the maximum allowable pressure for short periods and must never be exceeded.

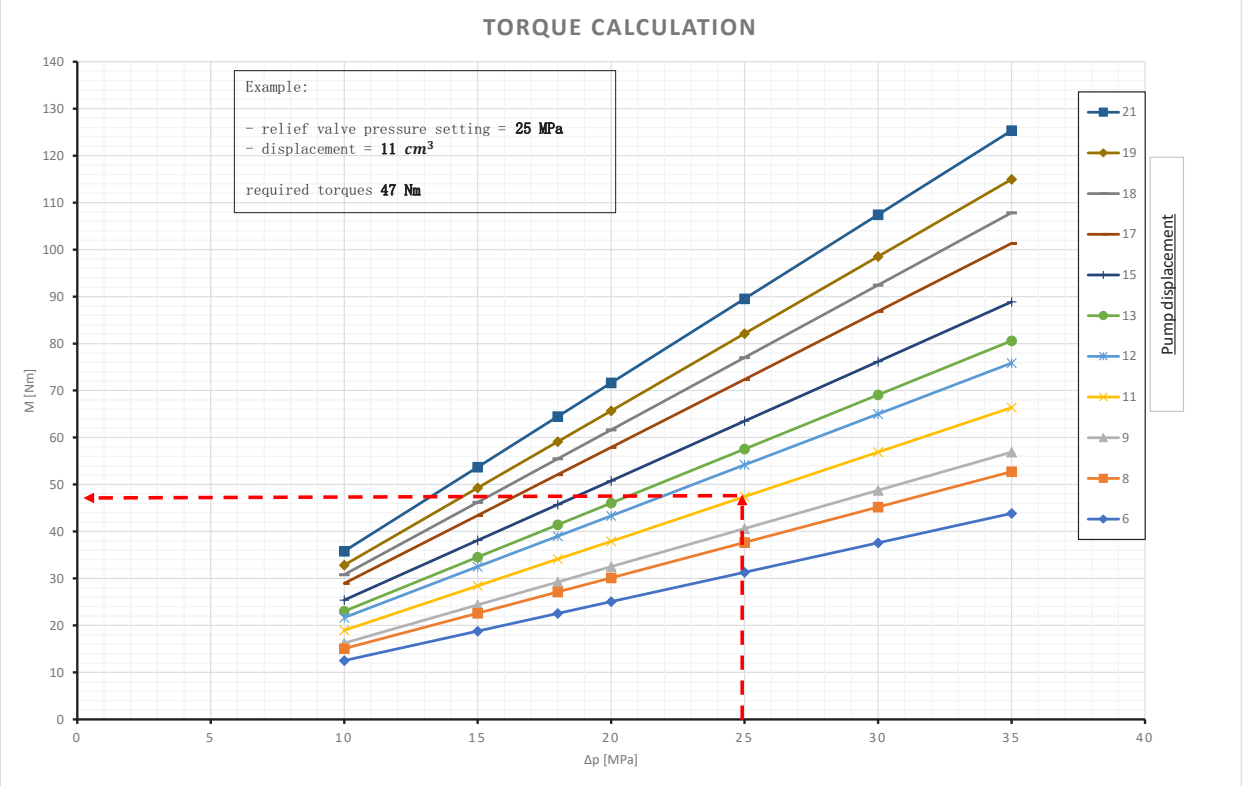
Speed

- Continuous work speed: is the maximum recommended speed for continuous operation of the pump under full load.
- Maximum speed: is the maximum permissible speed for the pump for short periods and not fully loaded. The use of the pump with this speed can reduce the life cause a loss of power or hydrostatic braking capacity.

Caution

Any damage caused to the pump can reduce or eliminate the hydrostatic braking capacity. It is therefore necessary to provide an auxiliary braking system capable of stopping and supporting the weight of the complete machine, in the event of loss of hydrostatic power.

TORQUE CALCULATION



For a correct selection of the product, it is necessary to verify that the selected shaft is able to guarantee the mechanical resistance to the specific operating conditions.

The check involves comparing the torque value reached in the heaviest working condition with the one allowed by the pump shaft.
For multiple pump, is necessary to consider the sum of the torques required for each pump units.

The displacements and the working pressures for each unit are required for the verification.
With these data is possible to calculate analytically or through the use of graph, the total torque required to the shaft.

The following equation shows the torque value:

$$\boldsymbol{M}\,[Nm] = \sum_{i=1}^{k} \frac{\boldsymbol{V_i}\left[\frac{cm^3}{n}\right] \cdot \Delta \boldsymbol{p_i}[MPa]}{\boldsymbol{2 \cdot \pi \cdot \eta_m}}$$

V_i = i pump displacement i, expressed in cm^3;
Δp_i = i pressure difference between pump inlet and outlet, expressed in bar;
η_m = mechanical efficiency that we can assume equal to 0,94;
k = number of pumps.

INSTALLATION INSTRUCTIONS

Standards for the installation, start up and maintenance

- When mounting the pump above the minimum level of the tank, distance of the highest point of the pump over the oil level MUST NOT exceed 250 mm.

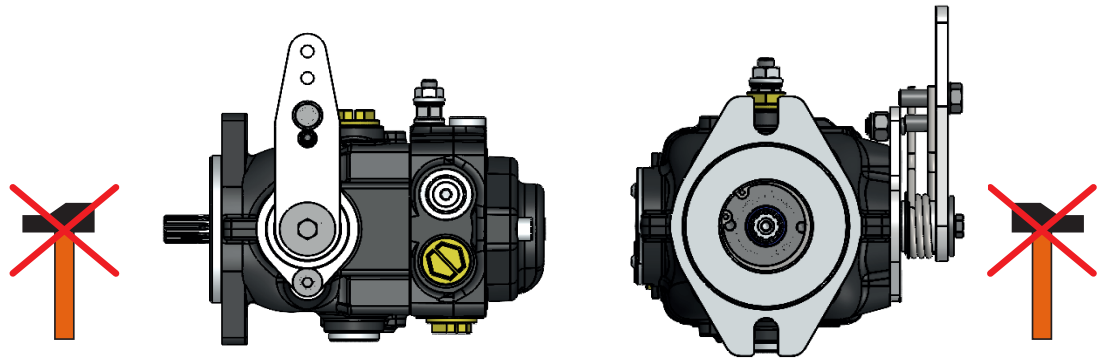
- To reduce the noise level typical of all piston pumps we recommend:
  - use hoses instead of pipes
  - limit to a minimum the length of eventual pipes
  - fix rigid pipe sections with special supports equipped with rubber vibration dampening devices
  - use pipes and hoses with a diameter according to the speed values below:

    Suction line = 0,6 ÷ 1,2 m / s
    Drain = 1,5 ÷ 3,6 m / s
    Pressurized lines = max 6 m / s

- To calculate the speed of the oil in the lines refer to the formula below:

    V = (Q * 21,22) / D
    V = speed (m/s)
    Q = flow rate (l/min)
  D = internal pipe/hose diameter (mm)

- In any case NEVER use pipes/hoses or fittings with diameter smaller than that of the corresponding ports on the pump. This indication is ABSOLUTELY OBLIGATORY for the drain line to avoid to pressurize the pump housing and extrude the lip seal of the pump shaft.
- During mounting cure the alignment of the pump, concentric with the drive shaft sleeve to prevent overloading of the bearing.
- For the hydraulic system, we recommend using pipes/hoses washed internally with hydraulic oil or, even better, with solvent.
- Special care must be taken when cleaning the inside of the tank (painting is recommended after sand blasting).
- To improve the functionality of the boost pump, it is recommended to place it below minimum tank level.
- The pumps can be installed in any direction and position.
  For further information contact our Technical Department.



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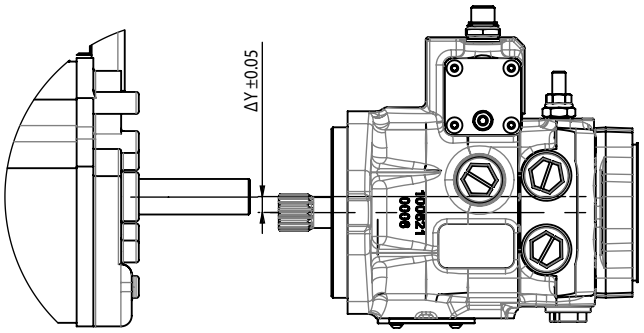
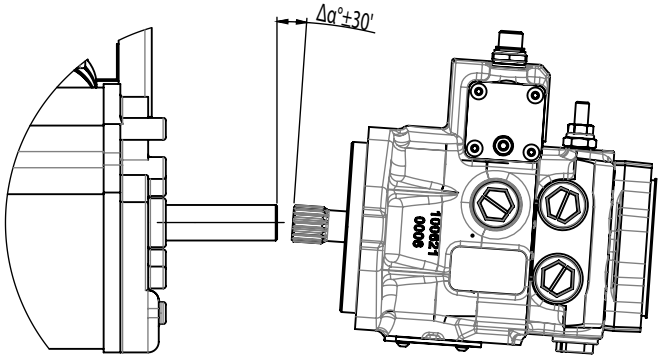
INSTALLATION INSTRUCTIONS

Shaft Coupling

To connect the pump shaft to the engine flywheel or prime motor shaft use a flexible





coupling. The alignment must be within the tolerances indicated in the figures below.
For an optimal function of the pump the shaft should not be subjected to radial or axial loads. In the presence of radial and axial loads the maximum allowable values are shown below.
During the installation or removal, do not force the coupling of the pump shaft, but always use the threaded hole on the shaft.

Start up

- Before starting fill the tank and the other components with new filtered oil. You should run a flushing of the complete hydraulic system (see Use and Maintenance Manual). Check that the low pressure value is correct (refer to the Use and Maintenance Manual).
- Restore the oil level in the tank.

Maintenance

- The first oil change should be made after 500 hours of operation. Later change the oil every 2000 hours.
- The first replacement of the filter cartridge has to be made after 50 hours for a preliminary circuit cleaning. Then after further 500 hours.
- These frequencies have to be reduced in the case where the indicator shows the clogging of the filter cartridge and in case of operation in environments with a high level of contamination.

CAUTION

- Always work with the utmost attention to the moving parts; do not use loose or fluttering clothing.
- Do not approach rotating wheels, tracks, chains or shafts if not properly protected, or when they may start moving without notice.
- Do not loosen or disconnect fittings and pipes/hoses while the engine is running.
- Avoid oil leaks in order to prevent environmental pollution.

Load capacity of rear shaft (through drive shaft)

- The rear shaft is not able to carry radial loads.

HYDRAULIC FLUID

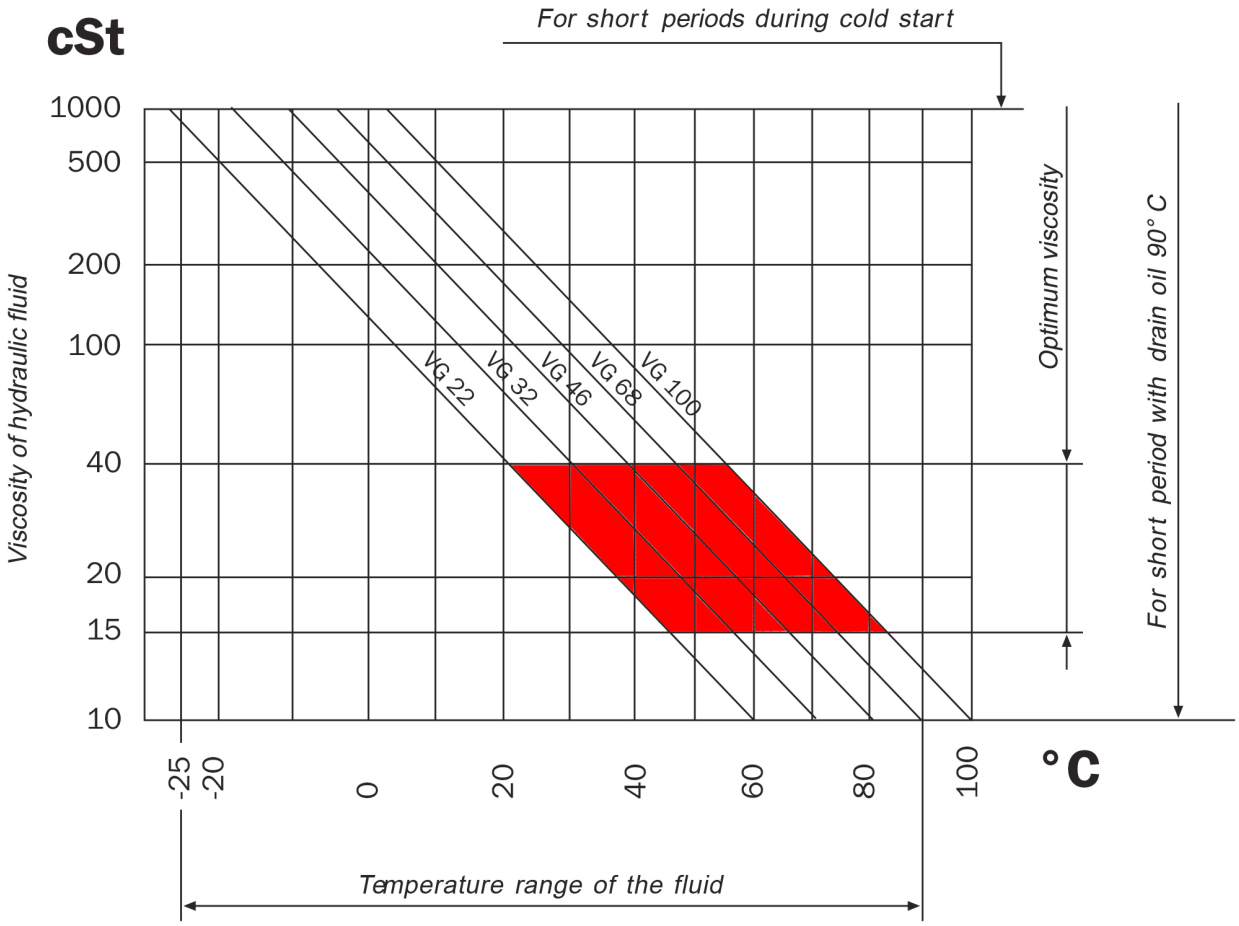
Viscosity

The maximum duration and the maximum efficiency are related to the optimum range of viscosity.
Viscosity = optimal operating viscosity 15 ÷ 40 cSt referred to the temperature of the closed circuit.

Minimum viscosity = 10 cSt for short moments and with the maximum temperature of the drain oil at 90 °C.
Max. viscosity = 1000 cSt for a few seconds, only during cold starting.

Working conditions

For working conditions apply the following limits:



HANSA - TMP cannot be held responsible concerning non compliance of these instructions and observance of safety regulations, although not covered by this document.

HYDRAULIC FLUID FILTRATION

The contaminating particles suspended in the hydraulic fluid cause the wear of the hydraulic mechanisms moving parts.
On hydraulic pumps these parts operate with very small dimensional tolerances.
In order to prolong the parts life, it is recommended to use a filter that maintains the hydraulic fluid contamination class at max.

8 according to NAS 1638
5 according to SAE, ASTM, AIA
19/17/14 according to ISO 4406

According to the type of application decided for the pump, it is necessary to use filtration elements with a filtration ratio of:

$$ß_{(X)}\ 20 \div 30 \geq 75$$

making sure that this ratio does not worsen together with the increasing of the filter cartridge differential pressure. While the pump is working, its temperature increases (over 80° to 110°C) with negative effects on pump performances; as a consequence, it is important to observe a max. contamination level of:

7 according to NAS 1638
4 according to SAE, ASTM, AIA
18/16/13 according to ISO 4406

If these values cannot be secured, the component life will consequently be reduced and it is recommended to contact our Tech. Dept.

Suction filters

The suction filters will have a clogging indicator and bypass. The max. pressure drop of the filtration element must not exceed 0,04 absolute MPa (0,08 absolute MPa with cold start).

Filter assembling

The suction filter is mounted in the suction line. Check that the pressure before the boost pump is 0,08 absolute bar, measured on the pump suction port (0,05 MPa for cold starting).

ORDER CODE

0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18
TPV/TPVS	1100	06	CR	SS2	B	F1	SHI	OAL	20	04	20	000	B2	000	0	00	G	00
TPVT2		06 I 06					SHI I SHI	OAL I OAL	20 I 20									
TPVT3		06 I 06 I 06					SHI I SHI I SHI	OAL I OAL I OAL	20 I 20 I 20									

0 - Pump Model

TPV = Closed loop circuit single pump
TPVS = Closed loop circuit special single pump on customer request
TPVT2 = Closed loop circuit tandem pump
TPVT3 = Closed loop circuit triple pump

1 - Pump Series

1100 = Pump Series 1100 (ex TPV 1000)

2 - Pump displacement

6 = 7,4 cm³/n **8** = 8,9 cm³/n **9** = 9,6 cm³/n **11** = 11,2 cm³/n
12 = 12,8 cm³/n **13** = 13,6 cm³/n **15** = 15 cm³/n **17** = 17,1 cm³/n
18 = 18,2 cm³/n **19** = 19,4 cm³/n **21** = 21,15 cm³/n

3 - Rotation

CR = Clockwise rotation (right)
CC = Counter-clockwise rotation (left)

4 - Shafts

SS2 = Splined shaft Z9 - 16/32" D.P.

SS3 = Splined shaft Z13 - 16/32" D.P.

SS4 = Splined shaft Z11 - 16/32" D.P.

PS1 = Parallel keyed shaft ø15.875 with key (Available only for single pump. Attention: check shaft drive torque for high displacements and pressures)

PS3 = Parallel keyed shaft ø18 with increased bearing for external radial load

5 - Swashplate bearings

B = Bushings
C = Needle roller bearing
Attention: In case of displacement 21 cc with working pressure greater than or equal to 250 bar, select configuration B - SELF-LUBRICATING BUSHINGS

		DM	SHI	SEI
F1	SS2	X	X	X
	SS3	X	X	X
	SS4	X	X	X
	PS1	X	X	X
	PS3	X	X	X
F2	SS2	-	-	-
	SS3	-	X	X
	SS4	-	X	X
	PS1	-	-	-
	PS3	-	X	X

6 - Mounting flange

F1 = SAE-A 2 holes - pilot diam. 82,5 mm

F2 = SAE-B 2 holes - pilot diam. 101,6 mm

(available only with servo-control SHI, SEI and shaft SS3)

7 - Pump controls

DM = Direct mechanical (without control lever)

BC = Tapered bush

LC = Direct Mechanical Control with Lever

DMS = Control lever with return to zero position (torsion spring standard diameter 3,6 mm.)

DMS (30) = Control lever with return to zero position (torsion spring diameter 3 mm.)
DMS (33) = Control lever with return to zero position (torsion spring diameter 3,3 mm.)
DMS (40) = Control lever with return to zero position (torsion spring diameter 4 mm.)
DMS (50) = Control lever with return to zero position (torsion spring diameter 5 mm.)
DMZ = Control lever with return to zero position (red compression spring)

SHI = Integrated hydraulic servo control

SHIC = Compact integrated hydraulic servo control

SEI 1 = Integrated electro-proportional servo control 12V DC

SEI 2 = Integrated electro-proportional servo control 24V DC

SEI 1 D = Integrated electro-proportional servo control 12V DC DEUTSCH

SEI 2 D = Integrated electro-proportional servo control 24V DC DEUTSCH

(continued)

ORDER CODE

40

8 - Control devices position

Device control DM, BC

OA = Upper position (STD)
OB = Lower position

Device control LC, DMS e DMZ

LA = Left lever upper position
RA = Right lever upper position
LB = Left lever lower position
RB = Right lever lower position

Device control SHI - SEI (all)

OAL = Upper servo position, left zero screw (STD)
OBL = Lower servo position, left zero screw
OAR = Upper servo position, right zero screw
OBR = Lower servo position, right zero screw

	OA	OB	LA	LB	RA	RB	OAL	OBL	OAR	OBR
DM	X	X								
BC	X	X								
LC			X	X	X	X				
DMS			X	X	X	X				
DMZ			X	X	X	X				
SHI							X	X	X	X
SEI							X	X	X	X

9 - Relief valve pressure setting

10 = 10 MPa **15** = 15 MPa **18** = 18 MPa
20 = 20 MPa **25** = 25 MPa **30** = 30 MPa
35 = 35 MPa

10 - Boost pump

00 (yy) = Without boost pump [indicate pressure (xx) and flow rate (yy)]
01 (yy) = Without boost pump in compact B1-B2 version [indicate pressure (xx) and flow rate (yy)]
04 = Boost pump STD C-B1-B2 (3.9 cm³/rev), SA (4.7 cm³/rev)

For pressures other than STD, required between 0.5 MPa and 3 MPa MAX (calibration carried out at 1000 rpm).
If in doubt contact our technical department.

	00	01	04	
			3,9 cm³/rev	4,7 cm³/rev
C	X		X	
B1	X	X	X	
B2	X	X	X	
SA	X			X

11 - Boost pressure

05 = 0.5 MPa **06** = 0.6 MPa (1) **07** = 0.7 MPa **08** = 0.8 MPa
09 = 0.9 MPa **10** = 1.0 MPa **11** = 1.1 MPa **12** = 1.2 MPa
13 = 1.3 MPa **14** = 1.4 MPa **15** = 1.5 MPa **16** = 1.6 MPa
17 = 1.7 MPa **18** = 1.8 MPa **19** = 1.9 MPa **20** = 2.0 MPa (2)
21 = 2.1 MPa **22** = 2.2 MPa **23** = 2.3 MPa **24** = 2.4 MPa
25 = 2.5 MPa **26** = 2.6 MPa

Note: Boost pressures are recorded at 1000 n/min
Note 1: STD for DM-BC-LC-DMS-DMZ control pumps
Note 2: STD for SHI-SEI control pumps

12 - Boost flow rating

000= Like boost pump
Only for pumps with external charge

025= 2,5 l/min **070** = 7 l/min **130** = 13 l/min **220** = 22 l/min **310** = 31 l/min
030= 3 l/min **075** = 7,5 l/min **140** = 14 l/min **230** = 23 l/min **320** = 32 l/min
035= 3,5 l/min **080** = 8 l/min **150** = 15 l/min **240** = 24 l/min **330** = 33 l/min
040= 4 l/min **085** = 8,5 l/min **160** = 16 l/min **250** = 25 l/min **340** = 34 l/min
045= 4,5 l/min **090** = 9 l/min **170** = 17 l/min **260** = 26 l/min
050= 5 l/min **095** = 9,5 l/min **180** = 18 l/min **270** = 27 l/min
055= 5,5 l/min **100** = 10 l/min **190** = 19 l/min **280** = 28 l/min
060= 6 l/min **110** = 11 l/min **200** = 20 l/min **290** = 29 l/min
065 = 6,5 l/min **120** = 12 l/min **210** = 21 l/min **300** = 30 l/min

WARNING: For red flow rate, contact our technical department.

(continued)

ORDER CODE

13 - Cover/rear mounting flange

C	= Closed cover	**43**
B1	= For German standard pump GR1 mounting (pilot flange ø32)	**43**
B2	= For German standard pump GR2 mounting (pilot flange ø52)	**44**
SA	= Version SAE A 2+2 holes Z.9 16/32" D.P.	**45**
SA-C	= Version SAE A 2+2 holes Z.9 16/32" D.P. + Closed cover	**46**

14 - Gear pump displacements (also available multiple gear pumps e.g. 204+117)

Group 1

112 = 1,2 cm^3/n	**117** = 1,7 cm^3/n	**122** = 2,1 cm^3/n	**126** = 2,6 cm^3/n
132 = 3,1 cm^3/n	**138** = 3,6 cm^3/n	**143** = 4,2 cm^3/n	**149** = 4,9 cm^3/n
159 = 5,9 cm^3/n	**165** = 6,5 cm^3/n	**178** = 7,5 cm^3/n	

Group 2

204 = 4,2 cm^3/n	**206** = 6,0 cm^3/n	**209** = 8,4 cm^3/n	**211** = 10,8 cm^3/n
214 = 14,4 cm^3/n	**217** = 16,8 cm^3/n	**219** = 19,2 cm^3/n	**222** = 22,8 cm^3/n
226 = 26,2 cm^3/n			

Group 2 (SAE-A)

S204 = 4,2 cm^3/n	**S206** = 6,0 cm^3/n	**S209** = 8,4 cm^3/n	**S211** = 10,8 cm^3/n
S214 = 14,4 cm^3/n	**S217** = 16,8 cm^3/n	**S219** = 19,2 cm^3/n	**S222** = 22,8 cm^3/n
S226 = 26,2 cm^3/n			

Attention: For GR 1 pumps, GAS ports is standard; for GR 2 pumps flanged is standard

15 - Gear pumps connections **42**

0	= Without gear pump	
F	= Connection with holes for flange	**42**
G	= Connection with GAS holes (BSPP)	**42**

16 - Optional **47**

00	= Without optional	
LB	= Lever by-pass	**47**
VS	= Flushing valve	**48**
VSLB	= Lever by-pass + Purge Valve	**49**
SB	= Screw by-pass (not possible with optional SA and SA.C)	**50**
SB (0.8)	= Perforated screw by-pass ø0.8 for DMS control pumps (not possible with optional SA and SA.C)	
ST	= Conversion coupling from 9 teeth to 13 teeth	**51**
FB	= Conversion flange from SAE-A to SAE-B	**51**
FBST	= Conversion flange from SAE-A to SAE-B + Conversion shaft 9 teeth to 13 teeth	**52**

17 - Ports

Combination		S	A-B	T-T1	P1-P2	Ma-Mb	IN-OUT	G
		Suction	Ports	Tanks	Pilot	Pressure connection	Remote filter connection	Suction pressure connection
G	GAS Ports (STD)	1/2" BSPP	1/2" BSPP	1/2" BSPP	1/4" BSPP	1/4" BSPP	3/8" BSPP	1/4" BSPP
U	UNF Ports (1)	7/8-14 UNF	7/8-14 UNF	7/8-14 UNF	9/16-18 UNF	9/16-18 UNF	7/8-14 UNF	9/16-18 UNF

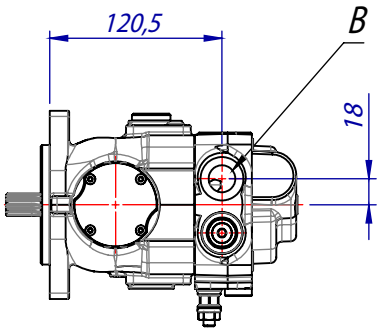
Note 1: Only on request and minimum quantity of 50 pieces.

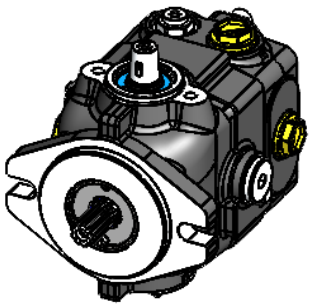
18 - Restrictor on servo control (only SHI and SEI versions)

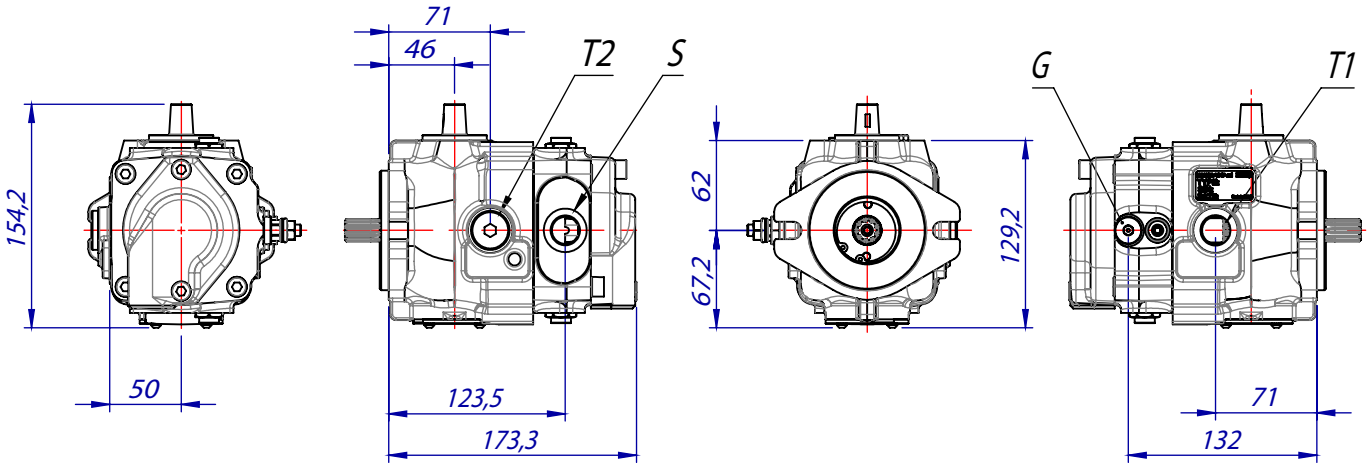
00	= Without restrictor
06	= Restrictor orifice ø0,6 mm
07	= Restrictor orifice ø0,7 mm
08	= Restrictor orifice ø0,8 mm
10	= Restrictor orifice ø1,0 mm
12	= Restrictor orifice ø1,2 mm

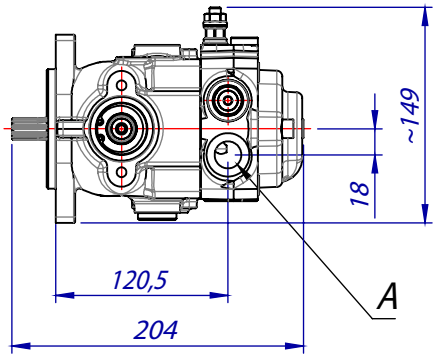
SINGLE PUMP

(Direct mechanical control - overall dimensions)



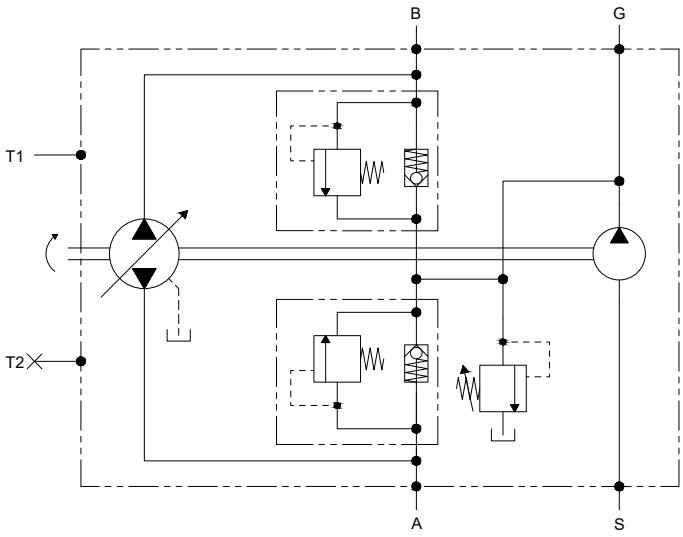






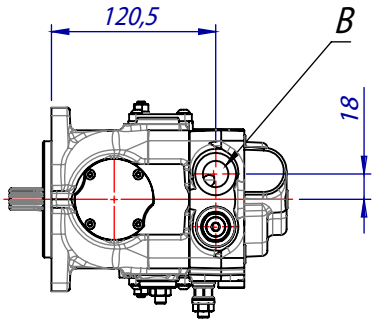
PIPE CONNECTIONS		
A - B	Main ports	1/2" BSPP
T1 - T2	Drain	1/2" BSPP
S	Suction	1/2" BSPP
G	Pressure connection	1/4" BSPP

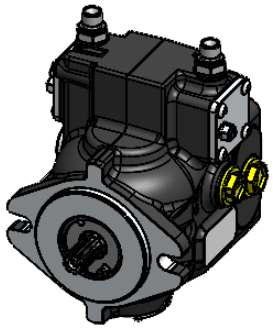
HYDRAULIC CIRCUIT

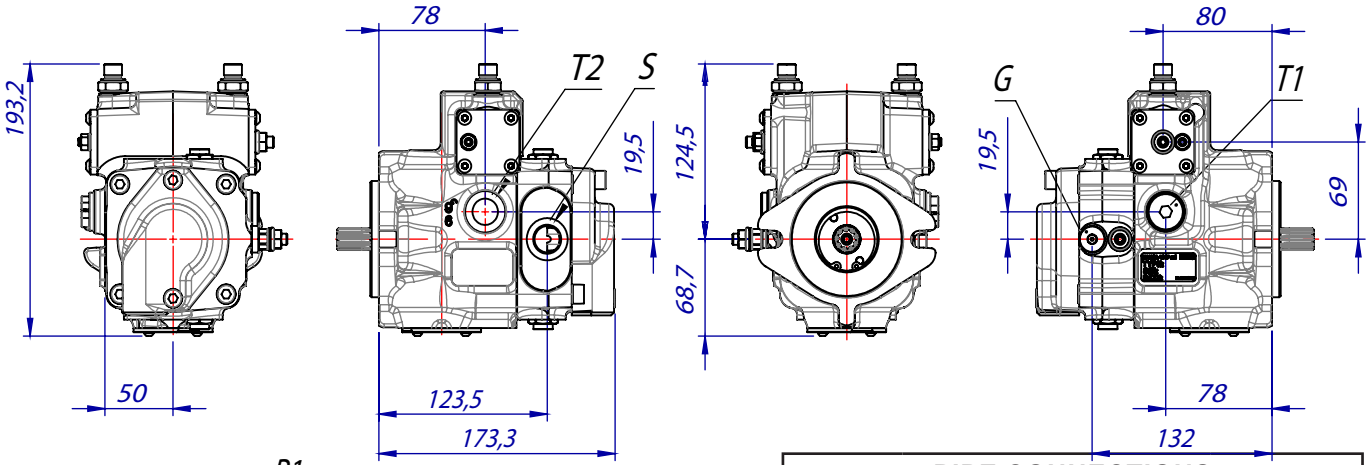


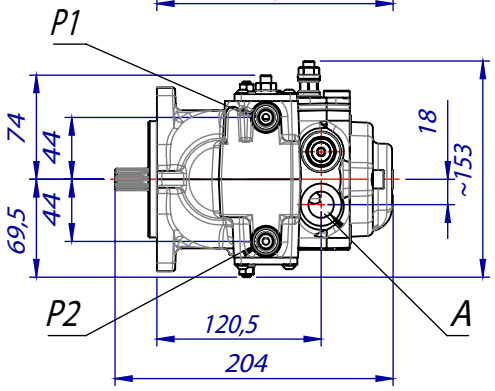
SINGLE PUMP

(Hydraulic Servo Control - overall dimensions)



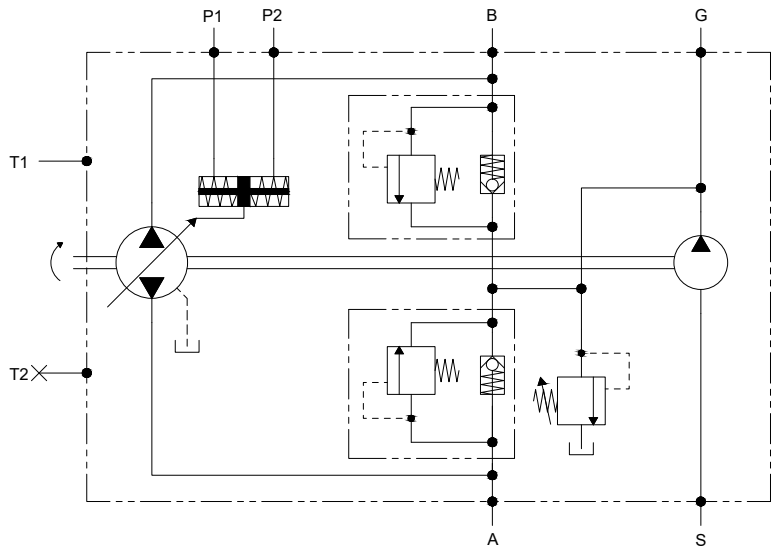






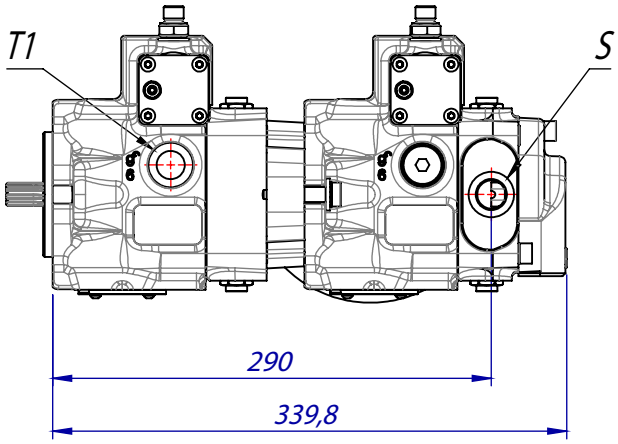
PIPE CONNECTIONS		
A - B	Main ports	1/2" BSPP
T1 - T2	Drain	1/2" BSPP
S	Suction	1/2" BSPP
G	Pressure connection	1/4" BSPP
P1 - P2	Servo connections	1/4" BSPP

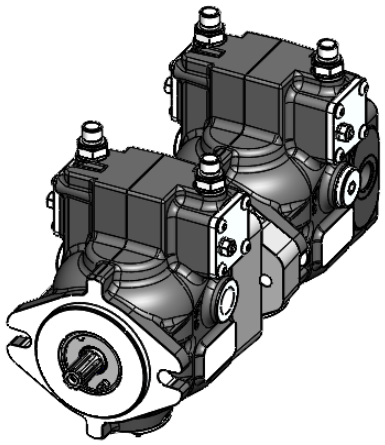
HYDRAULIC CIRCUIT



TANDEM PUMP WITH SHI CONTROL

(Overall dimensions)

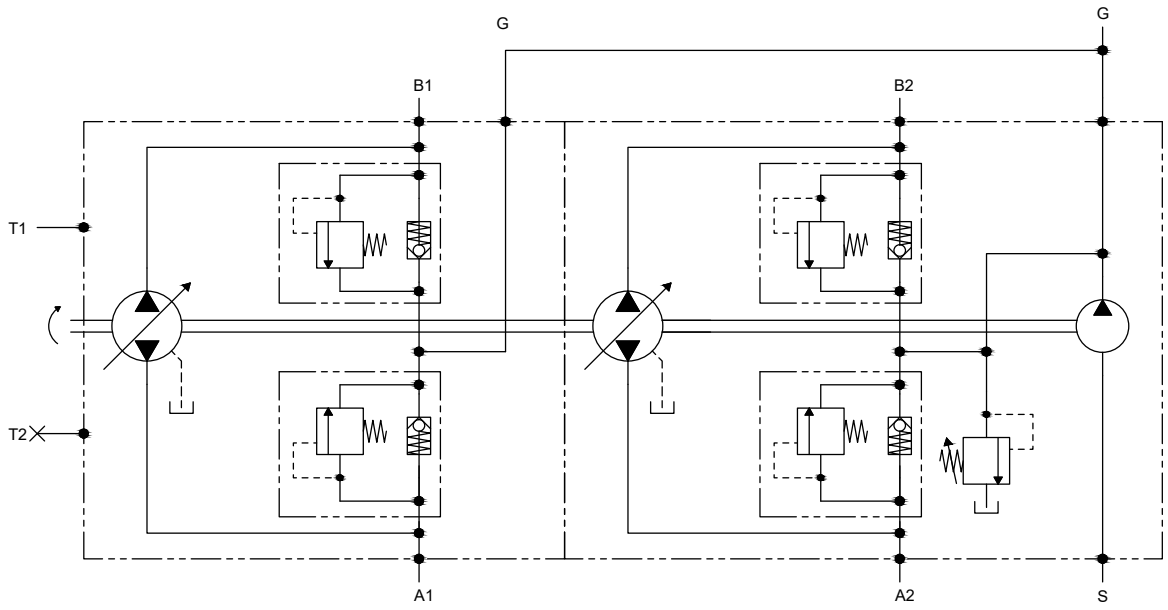




PIPE CONNECTIONS		
A1 - B1	Pump connections 1	1/2" BSPP
A2 - B2	Pump connections 2	1/2" BSPP
T1-T2	Drain	1/2" BSPP
S	Suction	1/2" BSPP
P1-P2	Servo control ports	1/4" BSPP
P3-P4		
G	Boost gauge	1/4" BSPP

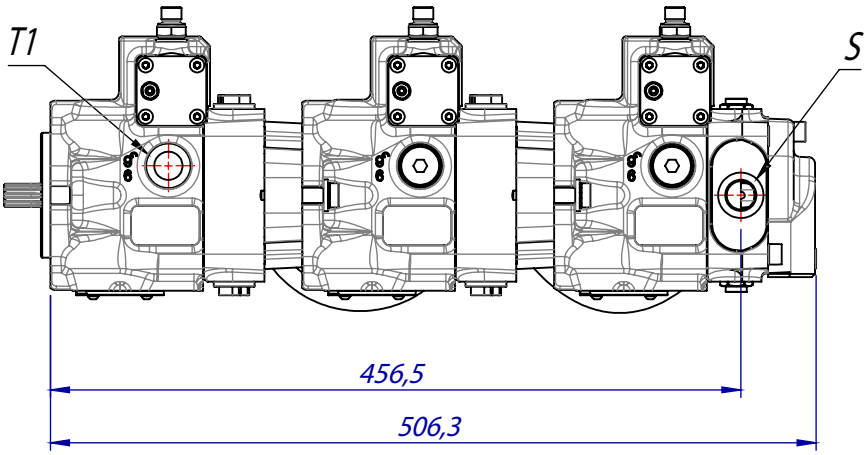
For technical specifications, please refer to single pump.

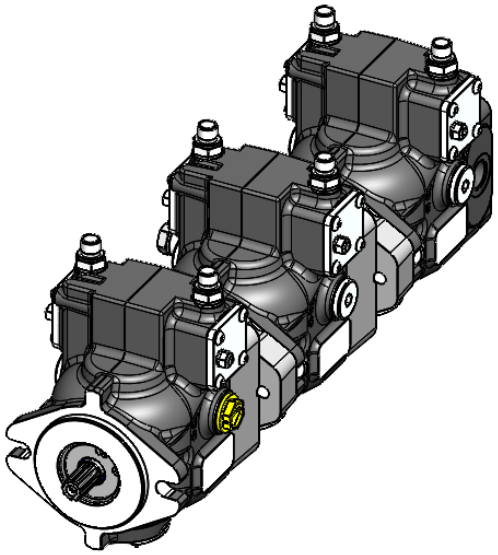
HYDRAULIC CIRCUIT



TRIPLE PUMP WITH SHI CONTROL

(Overall dimensions)

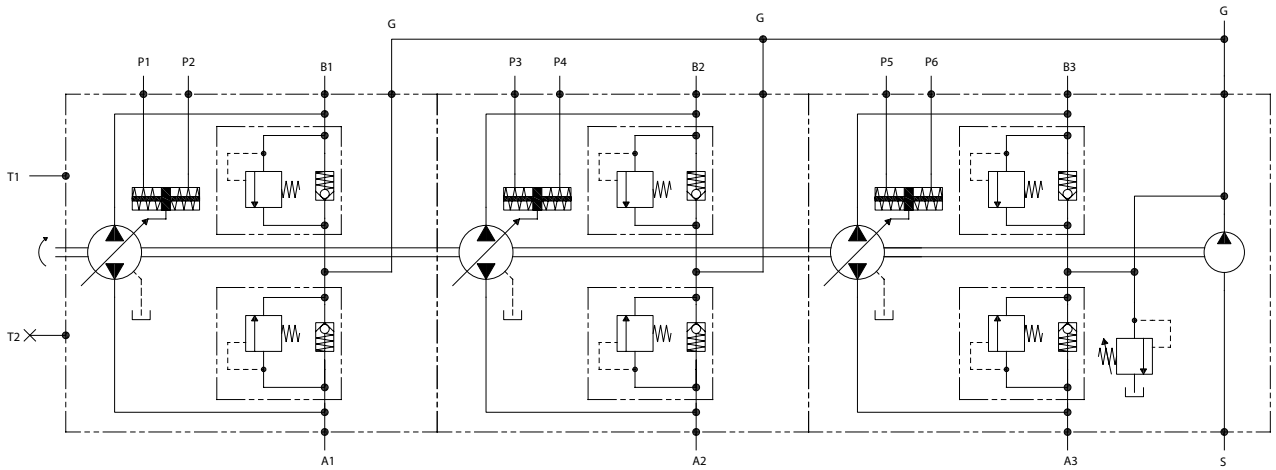




PIPE CONNECTIONS		
A1 - B1	Main ports	1/2" BSPP
A2 - B2		
A3 - B3		
T1-T2	Drain	1/2" BSPP
S	Suction	1/2" BSPP
P1-P2	Servo control ports	1/4" BSPP
P3-P4		
P5-P6		
G	Boost gauge	1/8" BSPP

For technical specifications, please refer to single pump.

HYDRAULIC CIRCUIT

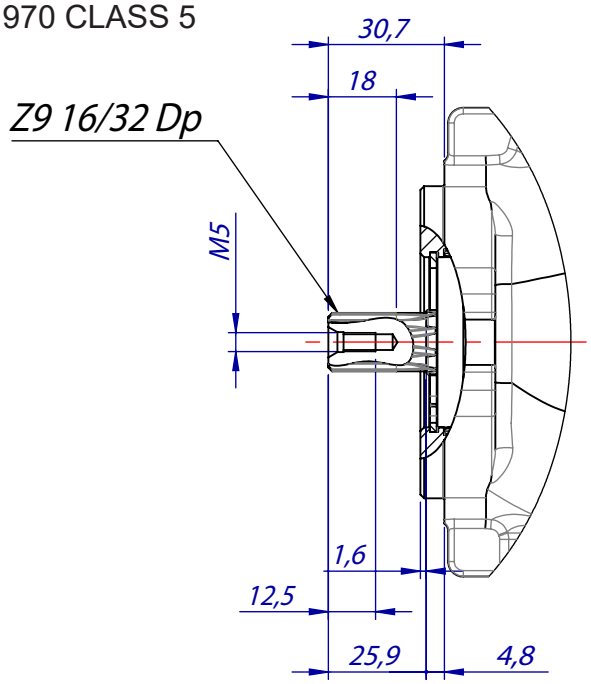


SHAFTS

SS2

SPLINED SHAFT Z=09 16/32 DP

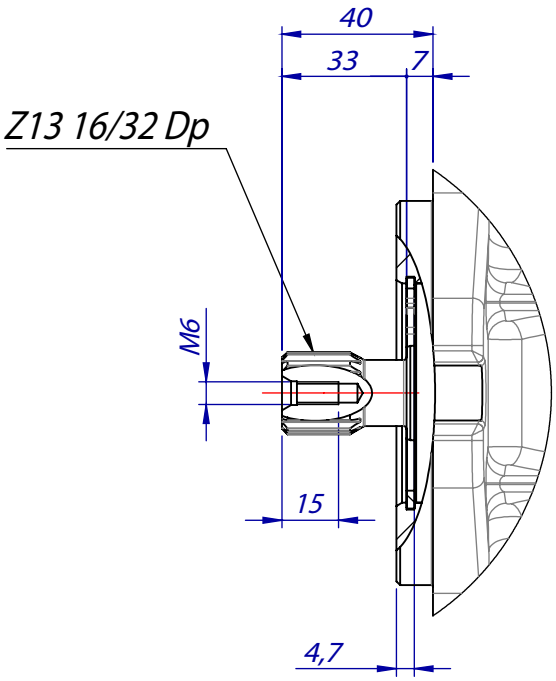
ANSI standard B92.2-1970 CLASS 5
Max. torque = 120 Nm



SS3

SPLINED SHAFT Z=13 16/32 DP

ANSI standard B92.2-1970 CLASS 5
Max. torque. = 320 Nm

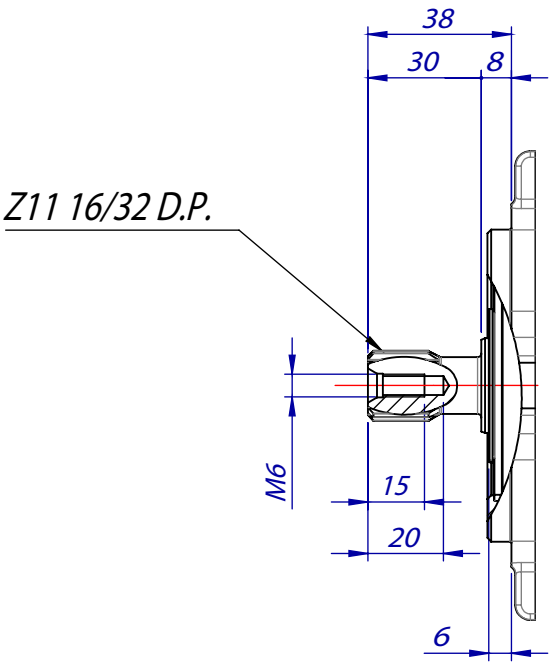


(continua)
SHAFTS

SS4

SPLINED SHAFT Z=11 16/32 DP

ANSI standard B92.2-1970 CLASS 5
Max. torque = 160 Nm

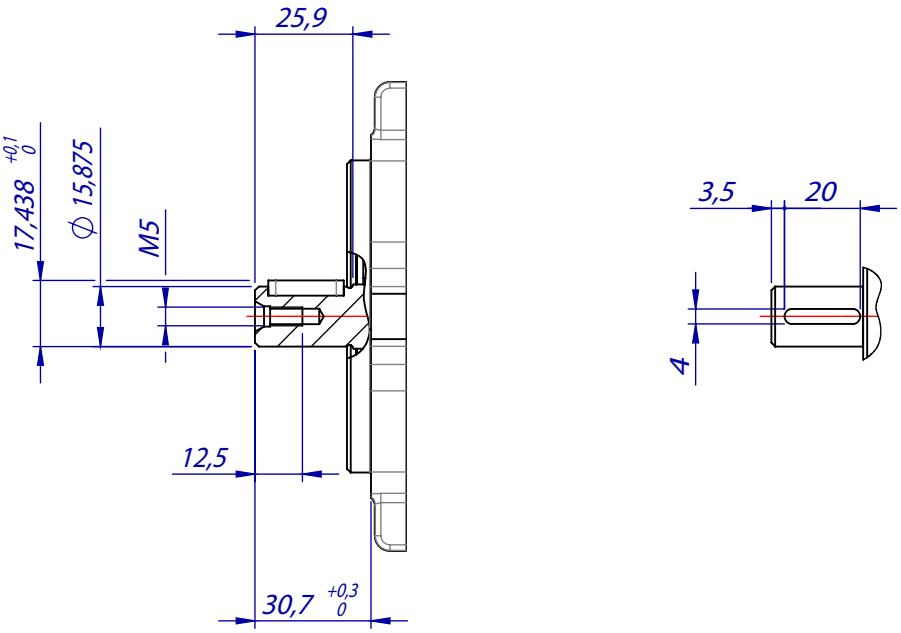


SHAFTS

PS1

PARALLEL KEYED SHAFT DIAM. 15.857

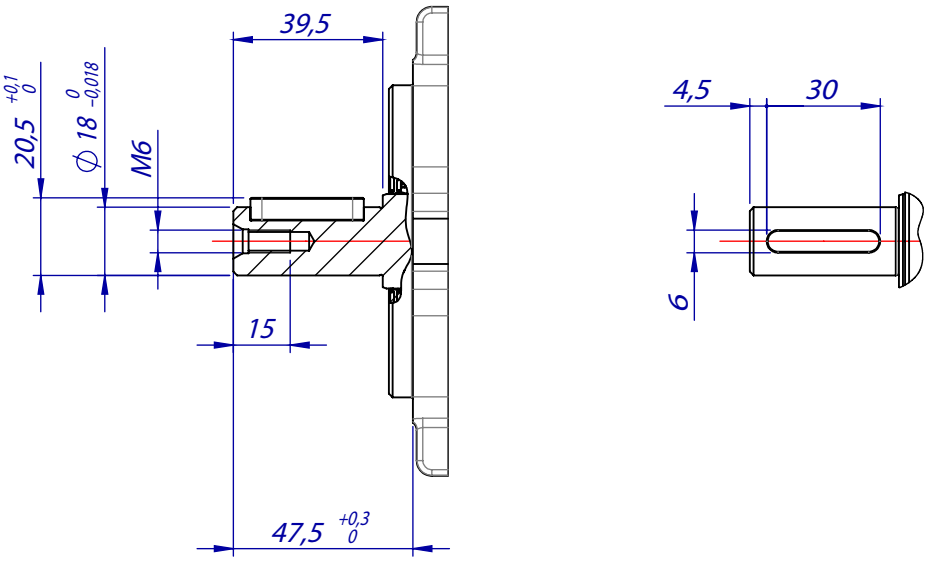
Max. torque = 65 Nm



PS3

PARALLEL KEYED SHAFT DIAM. 18

Max. torque = 85 Nm

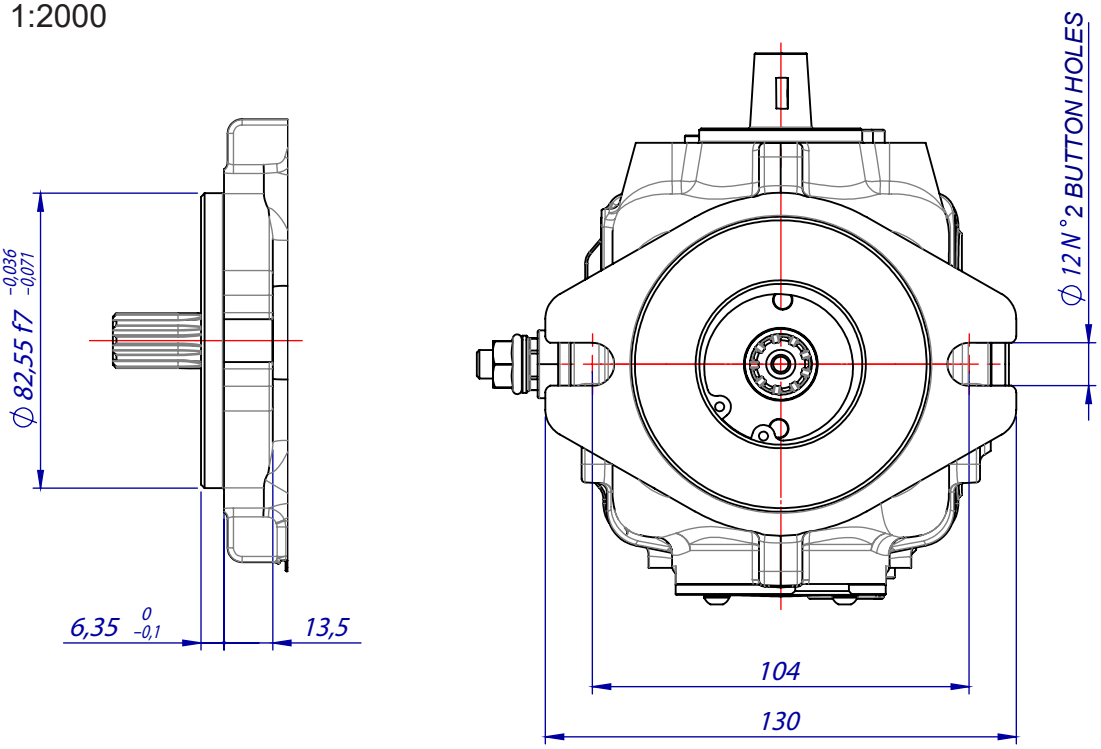


MOUNTING FLANGES

F1

SAE-A - 2 HOLES FLANGE

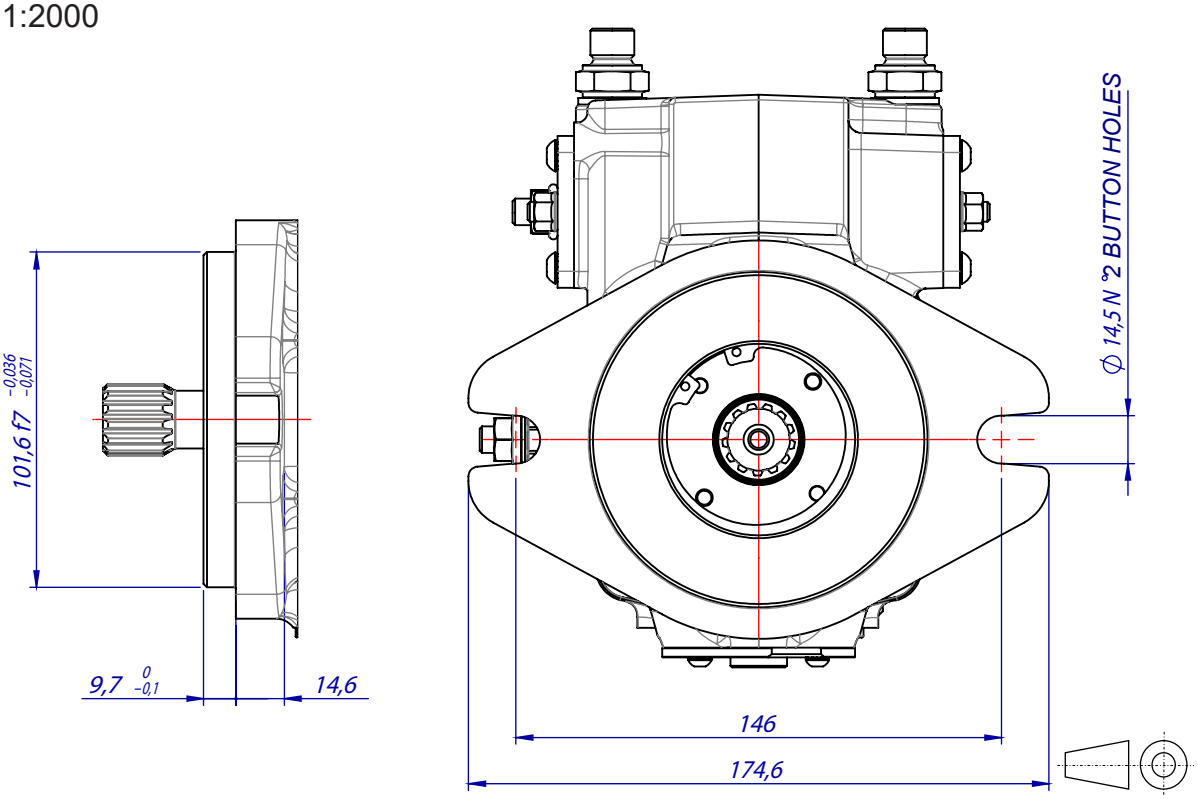
ISO 3019 - 1:2000



F2

SAE-B - 2 HOLES FLANGE

ISO 3019 - 1:2000

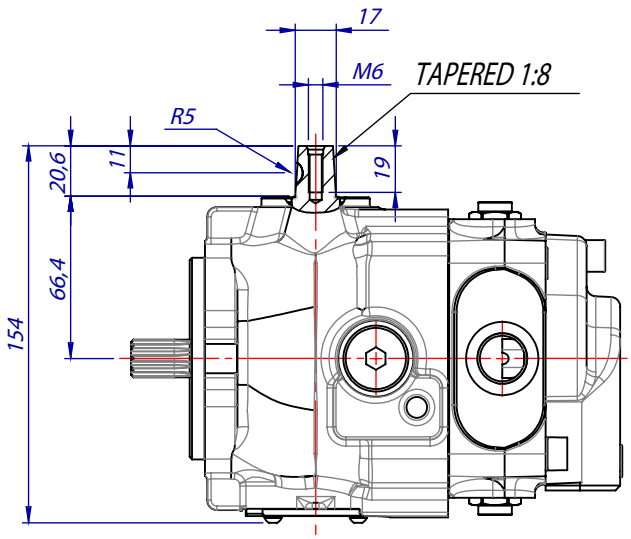


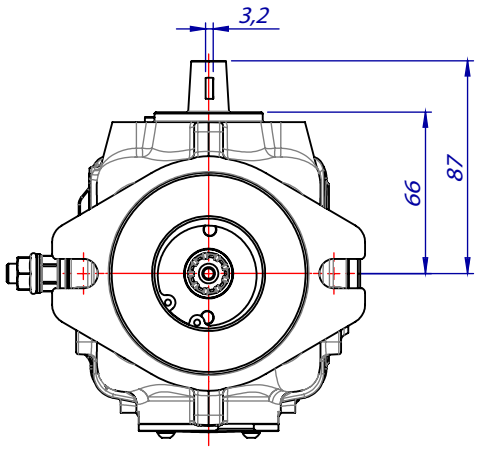
DM

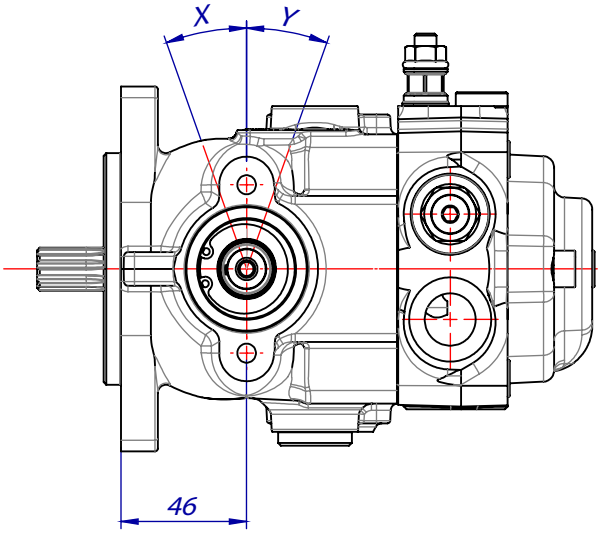
DIRECT MECHANICAL WITHOUT CONTROL LEVER

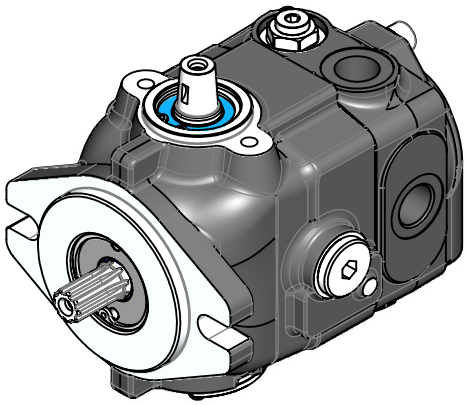
The change of pump displacement is given by clockwise or conter-clockwise rotation of the shaft of the swashplate.

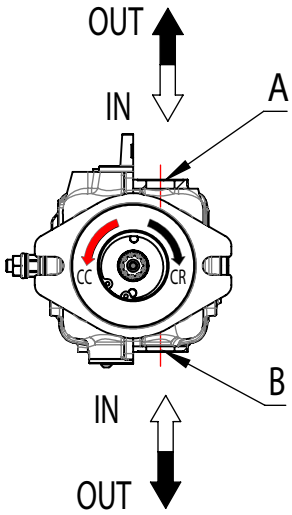
The shaft is directly linked with the swashplate.







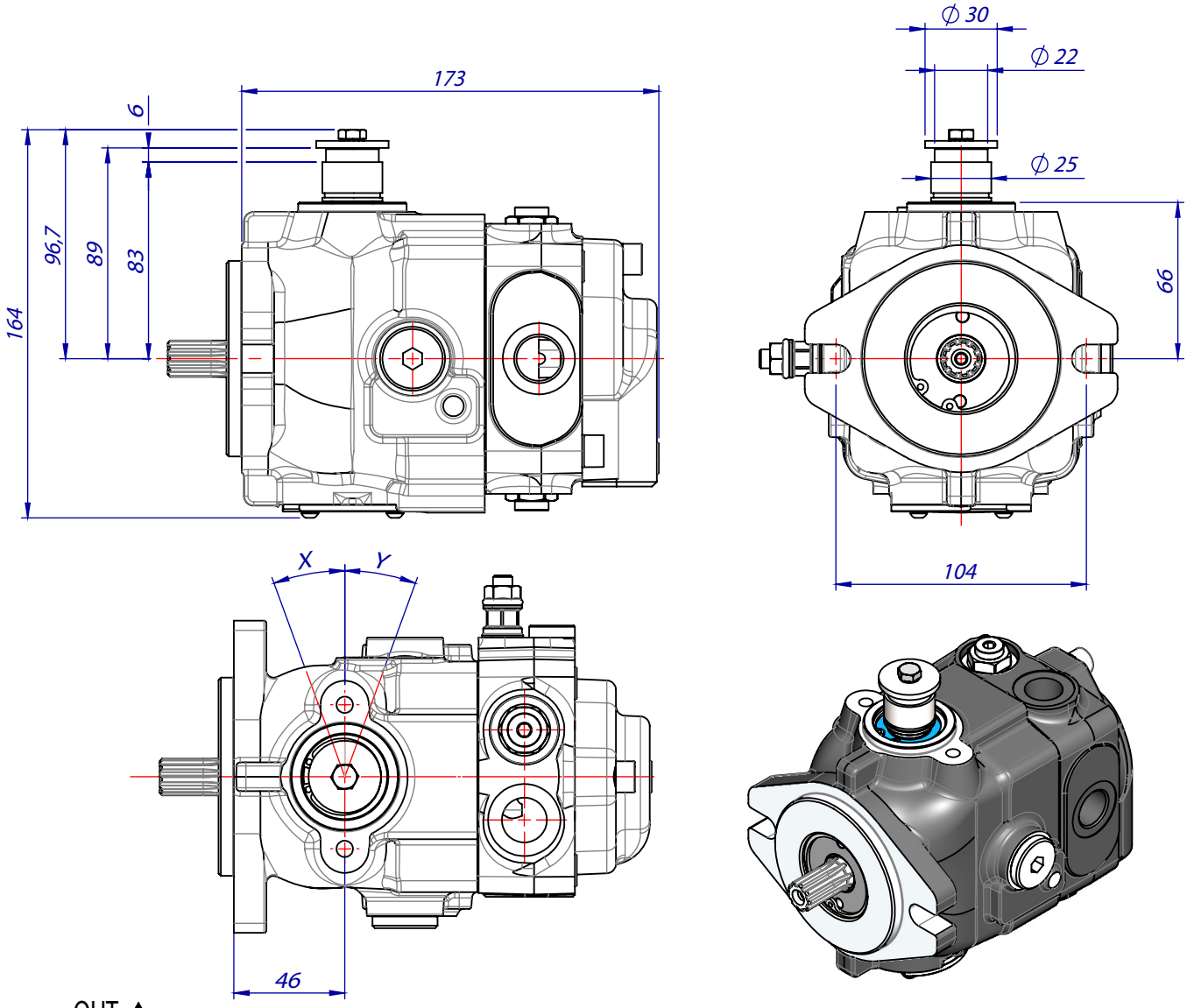


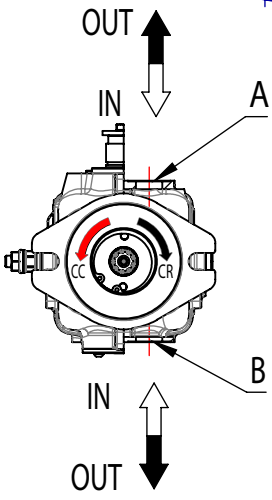


FLOW DIRECTION	PUMP		
Pump rotation	Lever position	OUT	IN
Clockwise CR	X Y	A B	B A
Counter-clockwise CC	X Y	B A	A B

BC
TAPERED BUSH

Tapered bush with Woodruff key UNI 6606, external cylindric.
Suitable for arrangement of specific control levers.



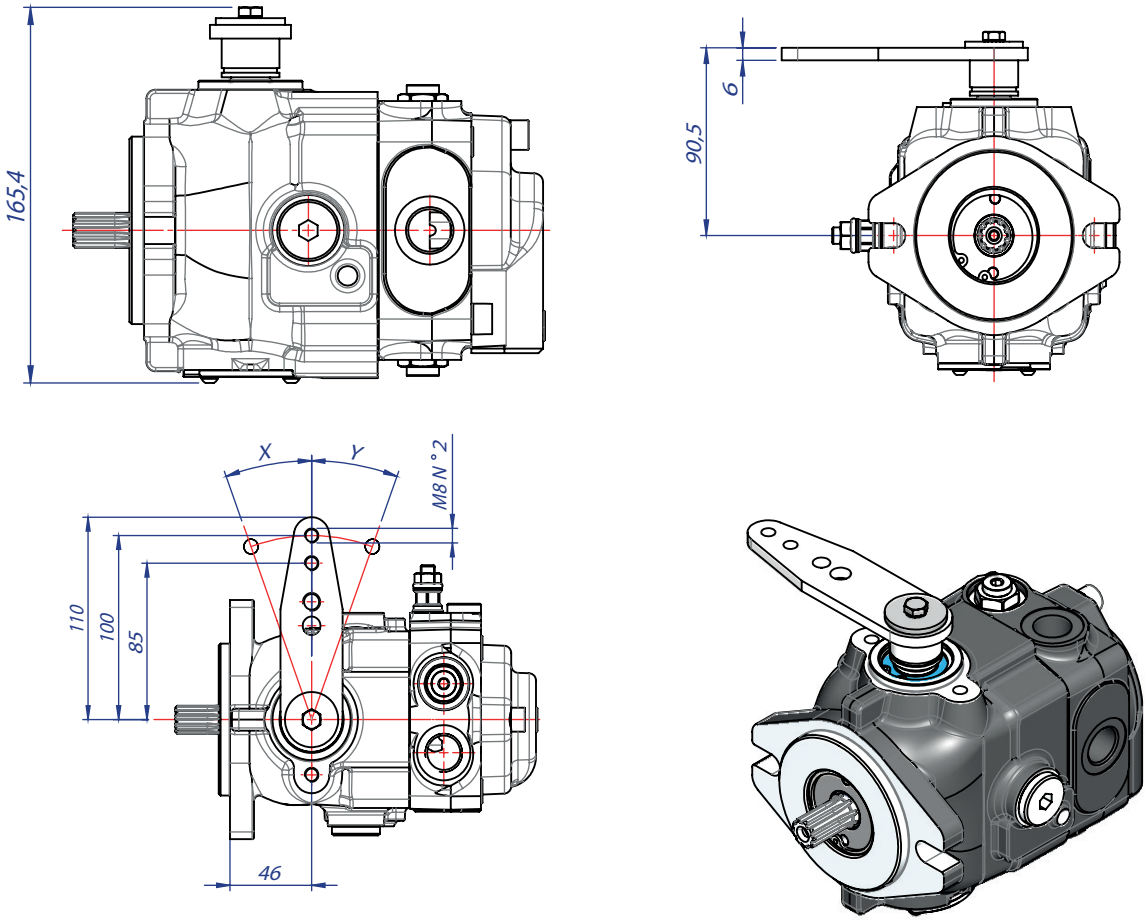


FLOW DIRECTION	PUMP		
Pump rotation	Lever position	OUT	IN
Clockwise CR	X Y	A B	B A
Counter-clockwise CC	X Y	B A	A B

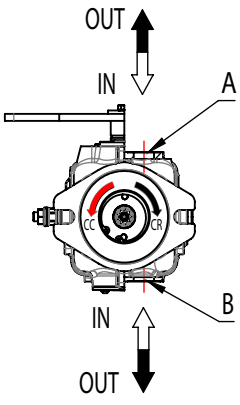
LC

DIRECT MECHANICAL CONTROL WITH LEVER

The pump displacement variation is given by clockwise or counter-clockwise movement of the lever. The lever shaft is directly linked to the swashplate.



Lever Angle											
Pump Model	6 / 7	8 / 7	9 / 7	11 / 7	12 / 7	13 / 7	15 / 9	17 / 9	18 / 9	19 / 9	21 / 9
Lever Angle (X - Y)	10°	12°	13°	15°	17°	18°	15°	17°	18°	19°	19°



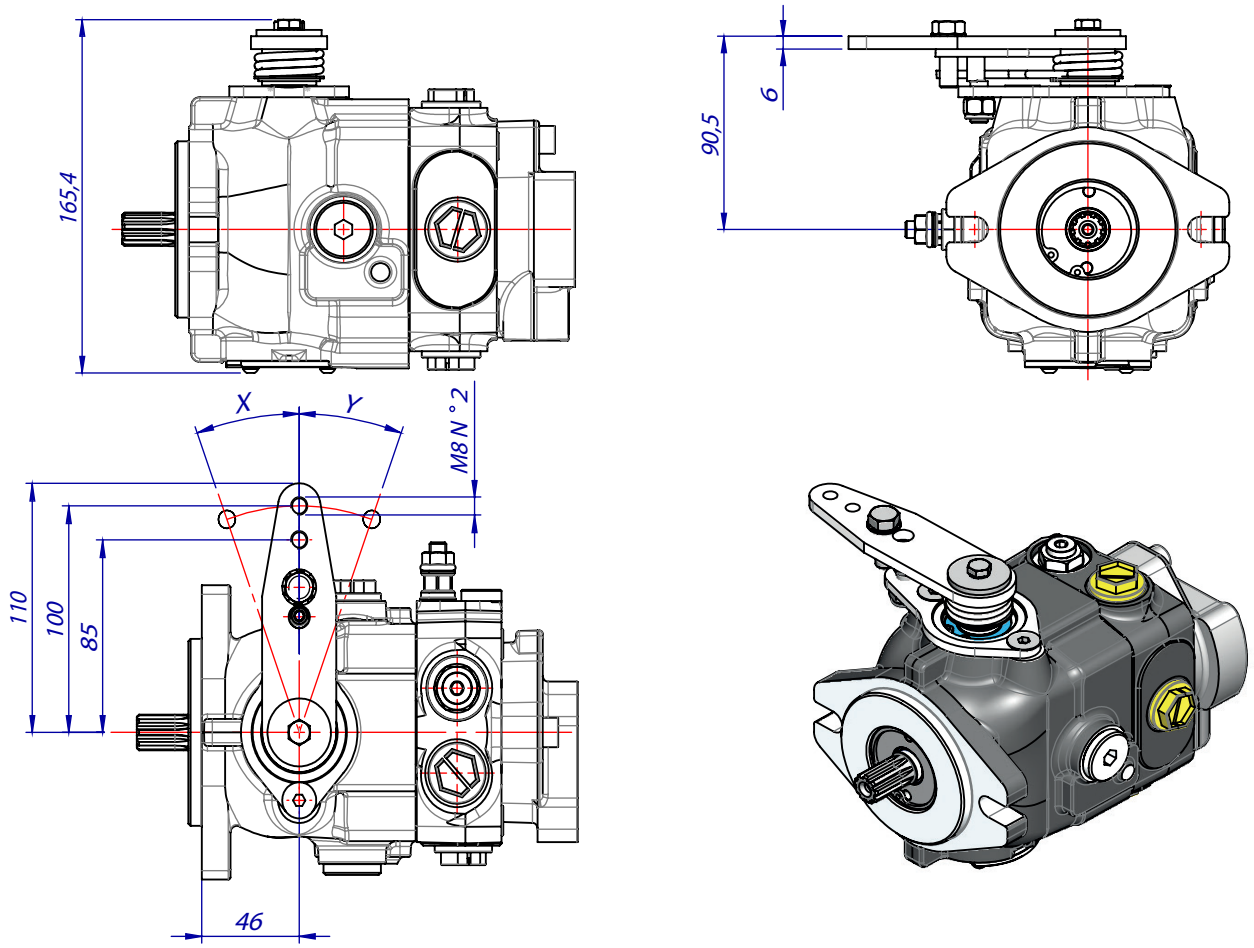
FLOW DIRECTION	PUMP		
Pump rotation	Lever position	OUT	IN
Clockwise CR	X Y	A B	B A
Counter-clockwise CC	X Y	B A	A B

DMS

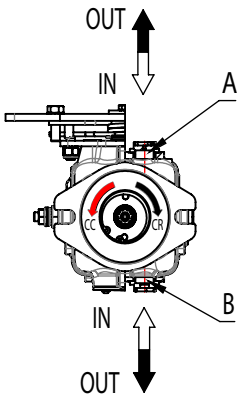
CONTROL LEVER WITH RETURN TO ZERO FLOW POSITION

(torsion spring)

The pump displacement variation is given by a clockwise or counter-clockwise movement of the lever. Return to zero flow is obtained by a spring which is part of the leverism.
The lever shaft is directly linked to the swashplate.



Lever Angle											
Pump Model	6 / 7	8 / 7	9 / 7	11 / 7	12 / 7	13 / 7	15 / 9	17 / 9	18 / 9	19 / 9	21 / 9
Lever Angle (X - Y)	10°	12°	13°	15°	17°	18°	15°	17°	18°	19°	19°



FLOW DIRECTION	PUMP		
Pump rotation	Lever position	OUT	IN
Clockwise CR	X Y	A B	B A
Counter-clockwise CC	X Y	B A	A B

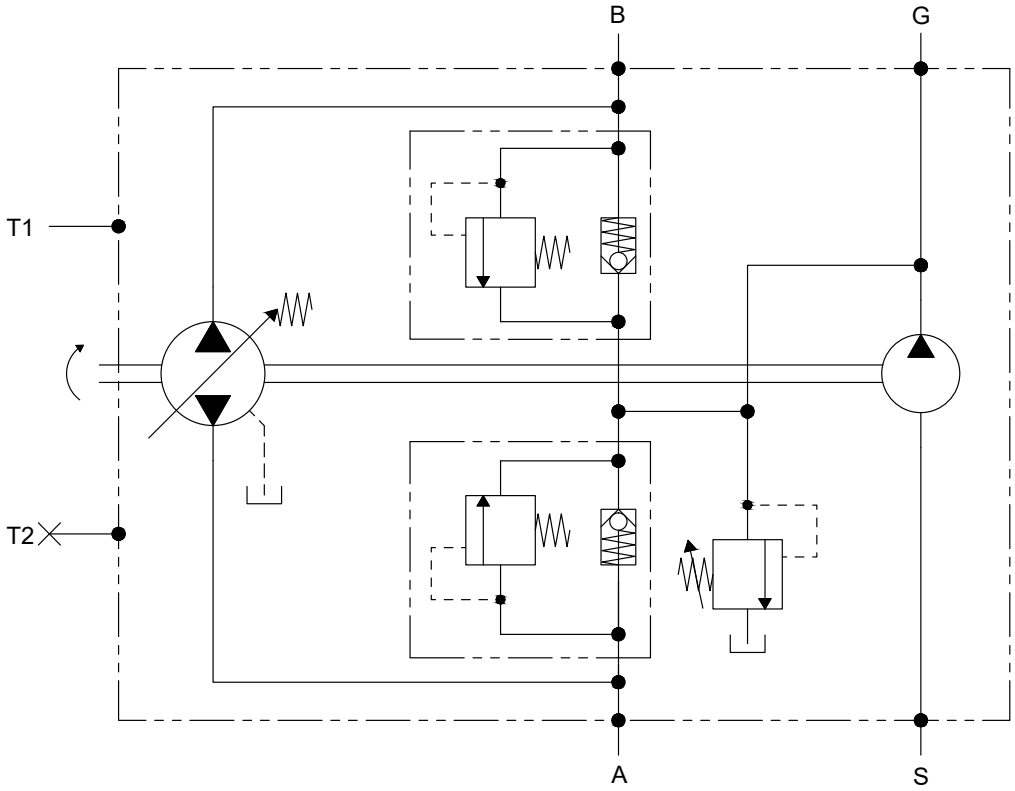
(continued)

DMS

CONTROL LEVER WITH RETURN TO ZERO FLOW POSITION

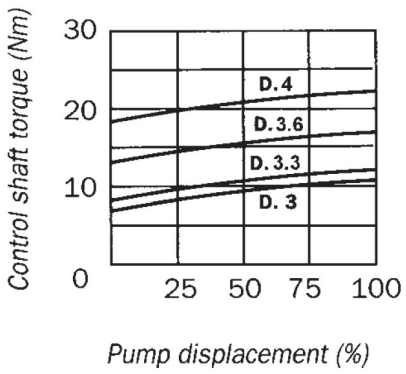
(torsion spring)

HYDRAULIC CIRCUIT

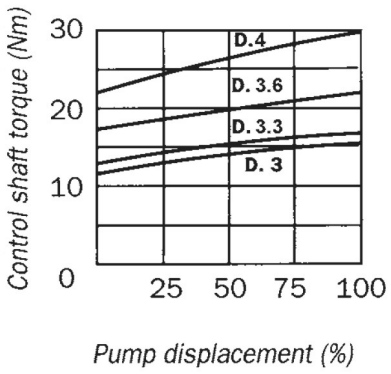


Standard spring diameter: **3,6 mm**
Other available diameters: **3 - 3,3 - 4 - 5 mm**

Lever force - 10 MPa



Lever force - 20 MPa

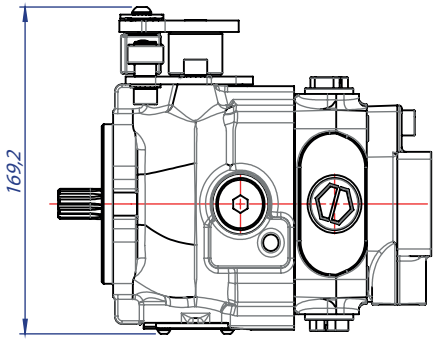


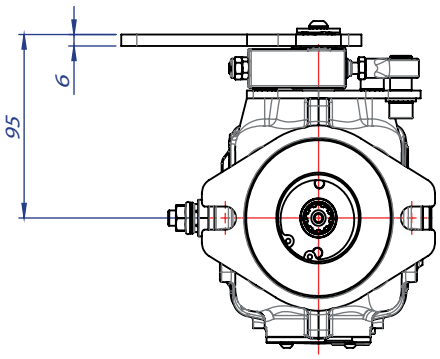
DMZ

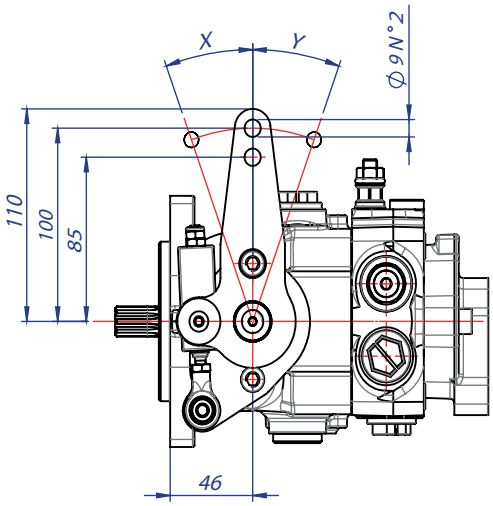
CONTROL LEVER WITH RETURN TO ZERO FLOW POSITION

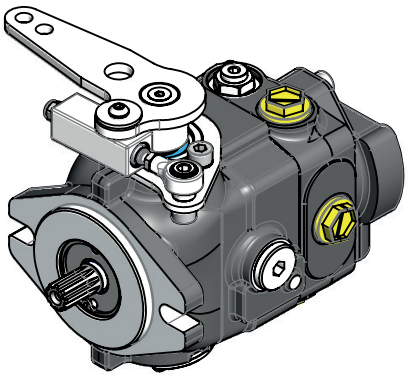
(compression spring)

The pump displacement variation is given by a clockwise or counter-clockwise movement of the lever.
Return to zero flow is obtained by a spring which is part of the leverism.
The lever shaft is directly linked to the swashplate.

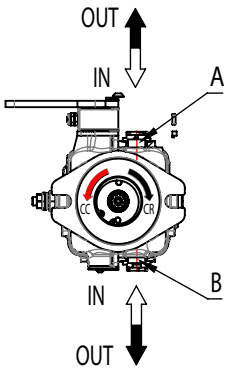








Lever Angle											
Pump Model	6 / 7	8 / 7	9 / 7	11 / 7	12 / 7	13 / 7	15 / 9	17 / 9	18 / 9	19 / 9	21 / 9
Lever Angle (X - Y)	10°	12°	13°	15°	17°	18°	15°	17°	18°	19°	19°



FLOW DIRECTION	PUMP		
Pump rotation	Lever position	OUT	IN
Clockwise CR	X Y	A B	B A
Counter-clockwise CC	X Y	B A	A B

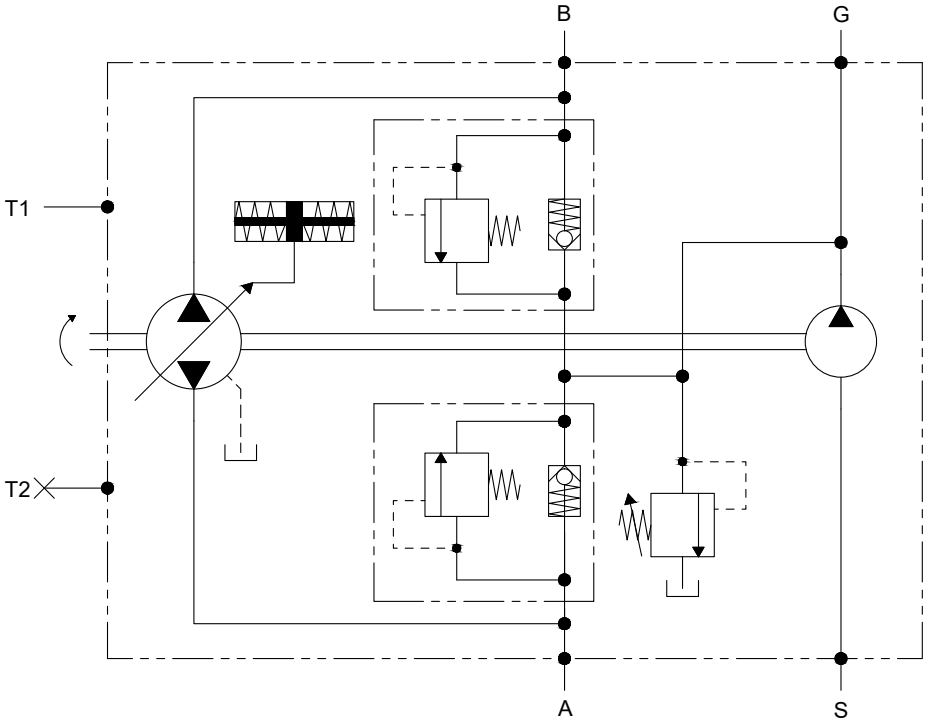
(continued)

DMZ

CONTROL LEVER WITH RETURN TO ZERO FLOW POSITION

(compression spring)

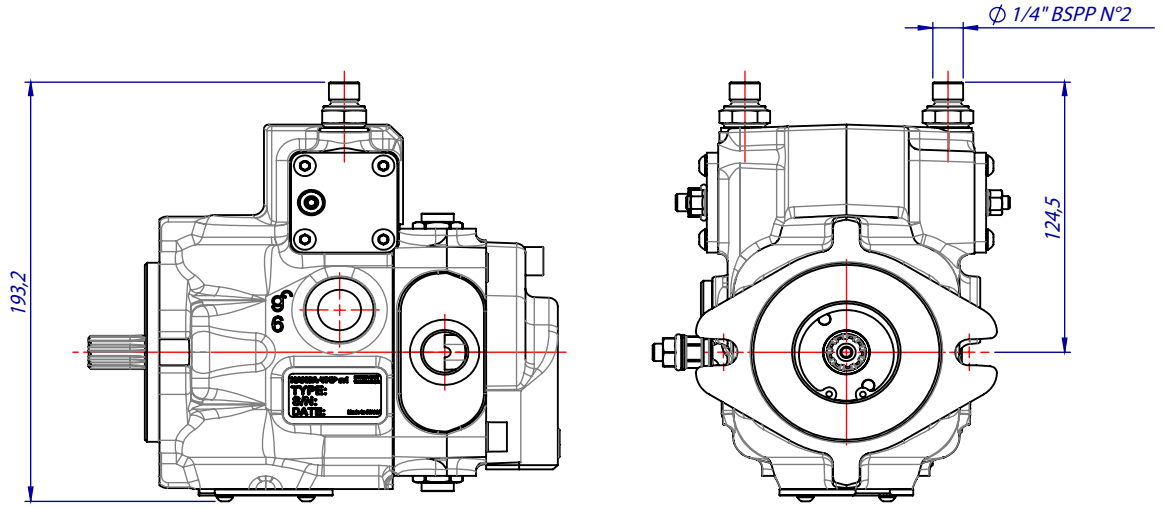
HYDRAULIC CIRCUIT

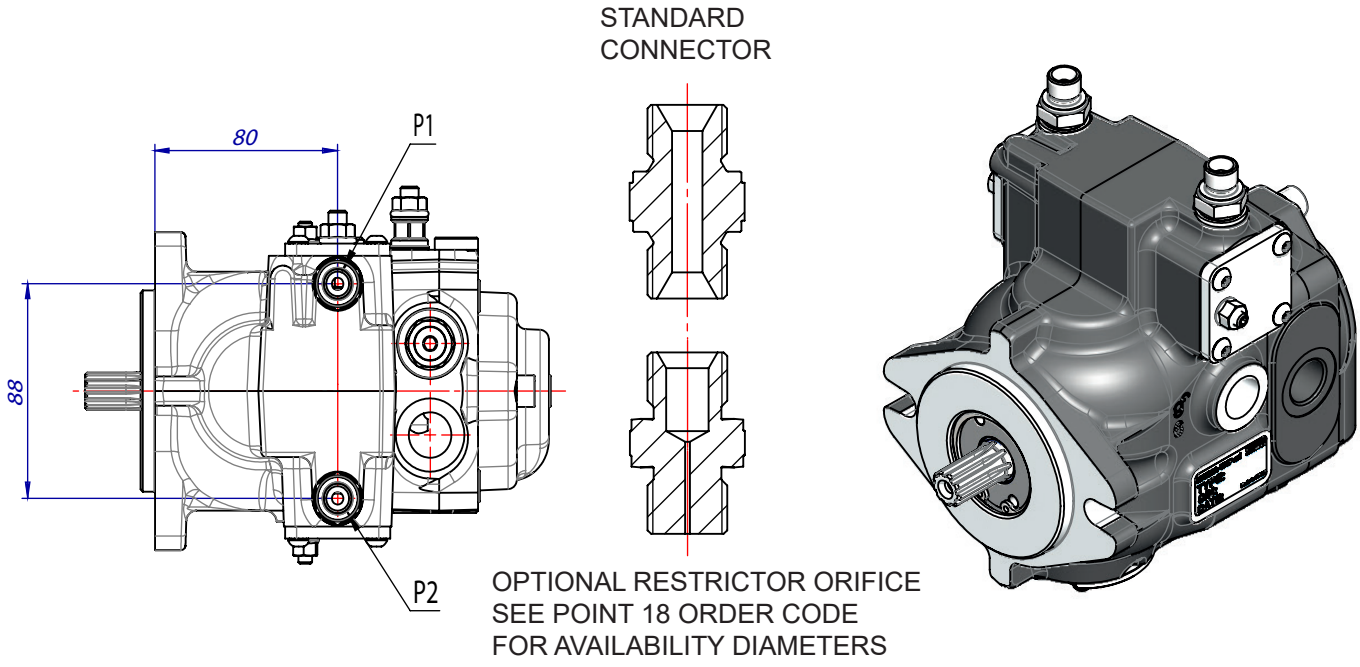


SHI

HYDRAULIC SERVO-CONTROL

The variation in pump displacement is obtained by adjusting the pressure on the P1-P2 servo control connections by means of a hydraulic proportional joystick (containing pressure reducing valves).
The oil supply for the joystick can be obtained by taking pressure from the boost pump (G port).
The servo control reacting time can be adjusted by inserting a restrictor on the joystick supply line (0,5 ÷ 1,2 mm).
The servo control operation curve in both control directions goes from 0,4 MPa to 1,8 MPa (tolerance ± 5%).
The adjustment curve of the hydraulic control system has to be wider (0,3 MPa ÷ 1,9 MPa).
Suggested curves for HPV series Joysticks: CR062 (see HT/73/B/105/0919/E catalogue).



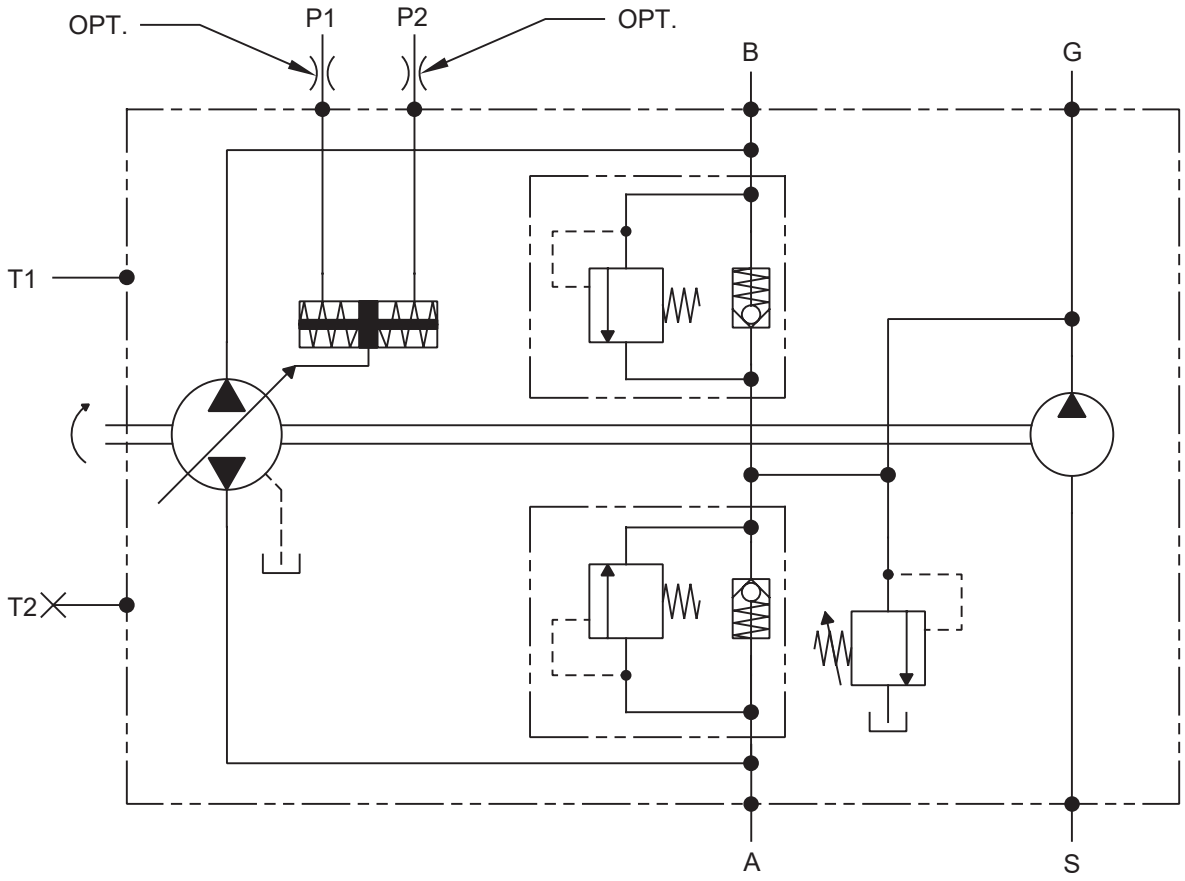


(continued)

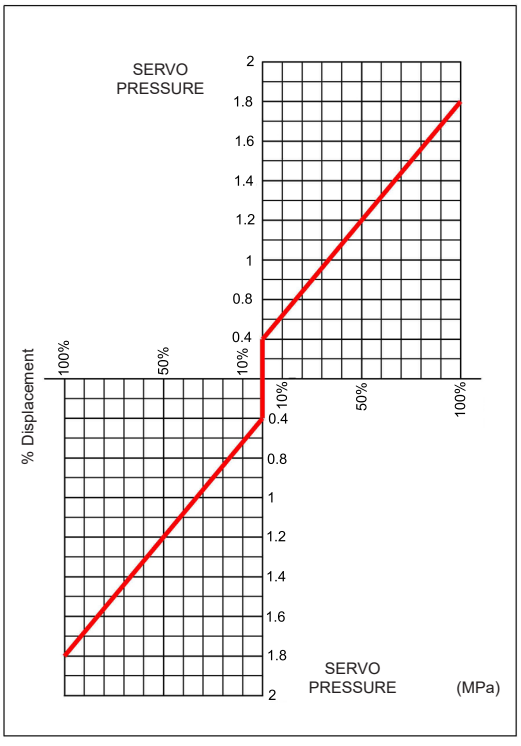
SHI

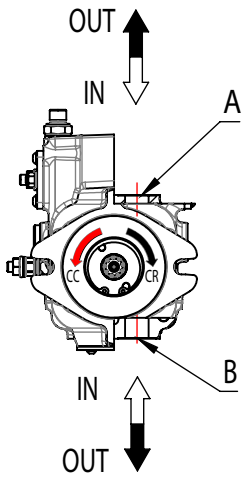
HYDRAULIC SERVO-CONTROL

HYDRAULIC CIRCUIT



SERVO PRESSURE - DISPLACEMENT GRAPHIC



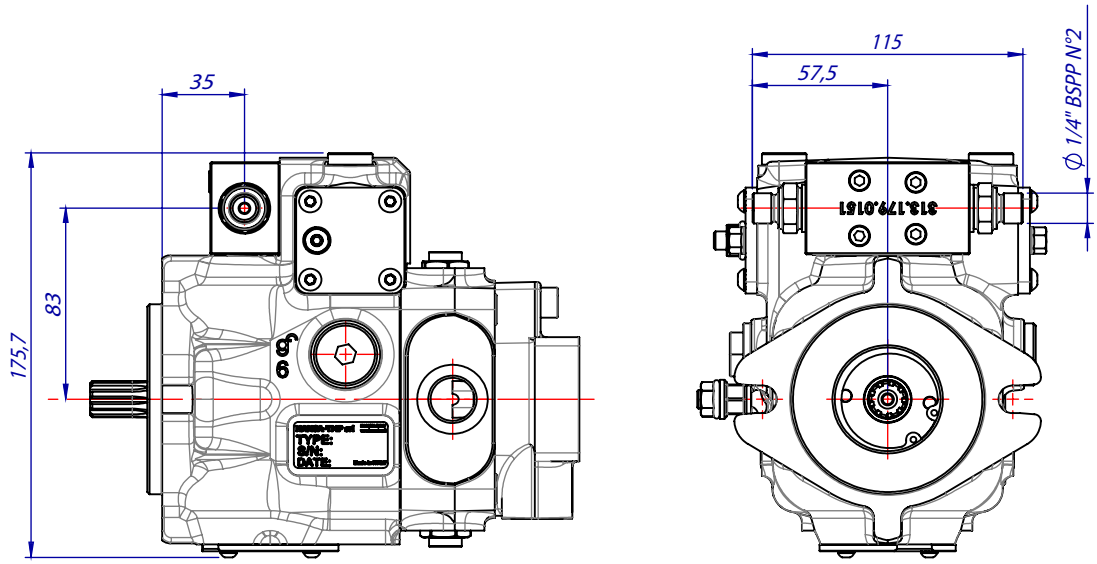


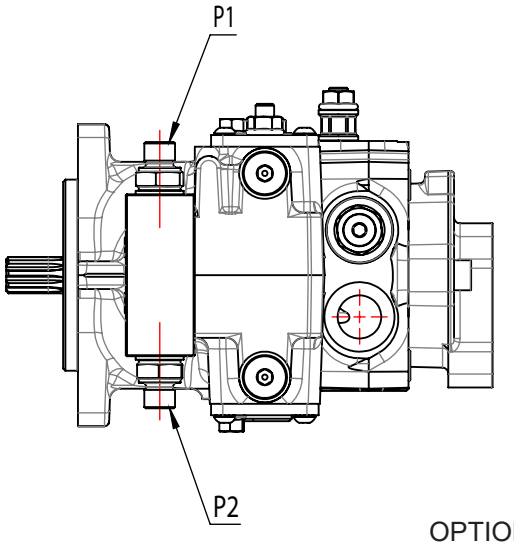
FLOW DIRECTION	PUMP		
Pump rotation	Port	OUT	IN
Clockwise CR	P_1 P_2	B A	A B
Counter-clockwise CC	P_1 P_2	A B	B A

SHIC

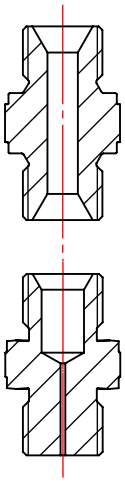
COMPACT HYDRAULIC SERVO-CONTROL

The variation in pump displacement is obtained by adjusting the pressure on the P1-P2 servo control connections by means of a hydraulic proportional joystick (containing pressure reducing valves).
The oil supply for the joystick can be obtained by taking pressure from the boost pump (G port). The servo control reacting time can be adjusted by inserting a restrictor on the joystick supply line (0,5 ÷ 1,2 mm).
The servo control operation curve in both control directions goes from 0,4 MPa to 1,8 MPa (tolerance ± 5%).
The adjustment curve of the hydraulic control system has to be wider (0,3 MPa ÷ 1,9 MPa).
Suggested curves for HPV series Joysticks: CR062 (see HT/73/B/105/0919/E catalogue).

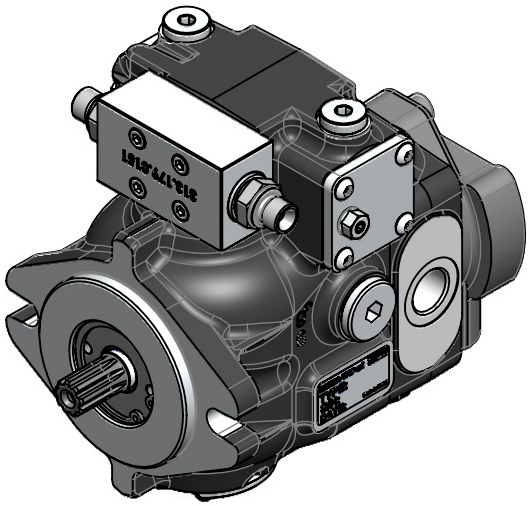




STANDARD CONNECTOR



OPTIONAL RESTRICTOR ORIFICE
SEE POINT 18 ORDER CODE
FOR AVAILABILITY DIAMETERS

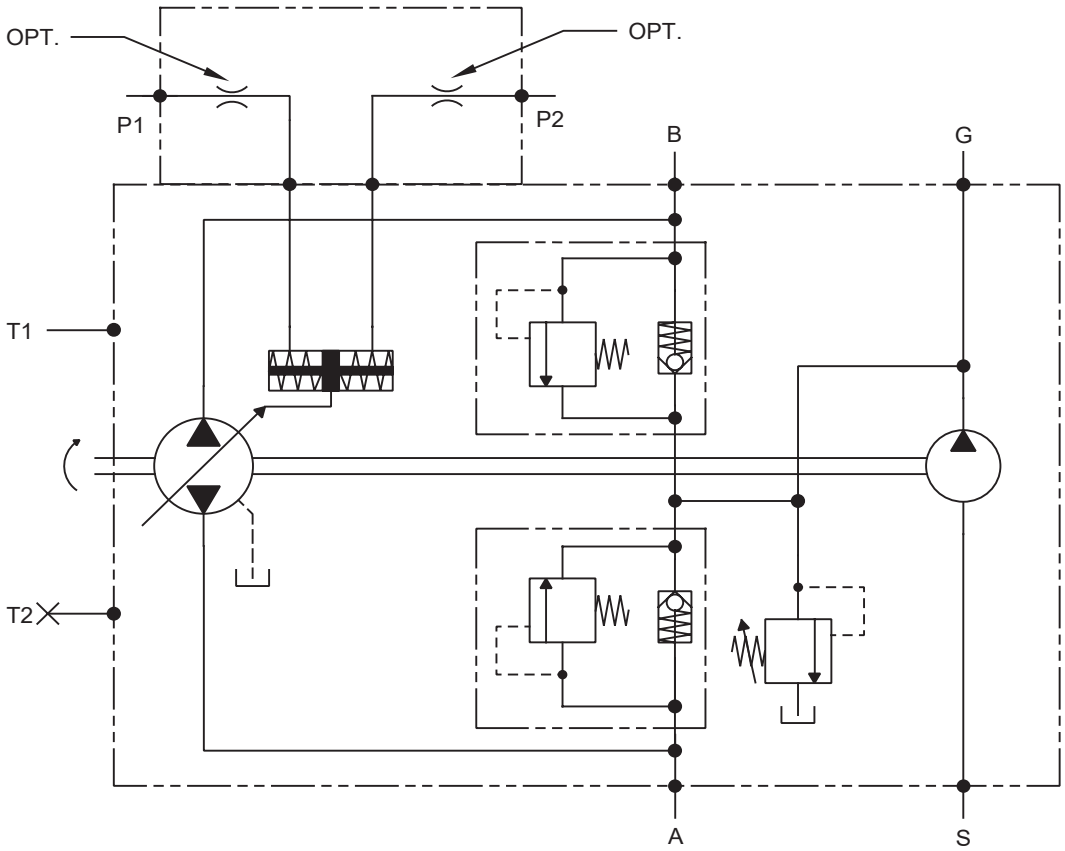


(continued)

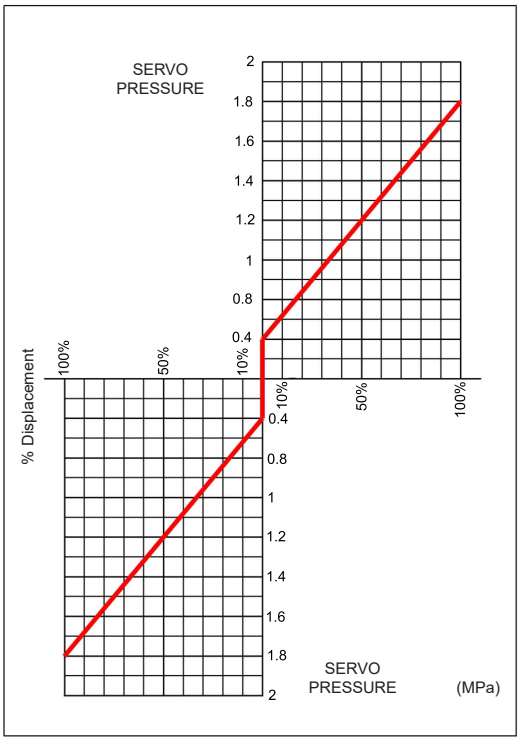
SHIC

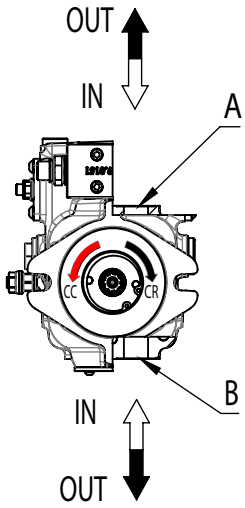
COMPACT HYDRAULIC SERVO-CONTROL

HYDRAULIC CIRCUIT



SERVO PRESSURE - DISPLACEMENT GRAPHIC





FLOW DIRECTION	PUMP		
Pump rotation	Port	OUT	IN
Clockwise CR	P_1 P_2	B A	A B
Counter-clockwise CC	P_1 P_2	A B	B A

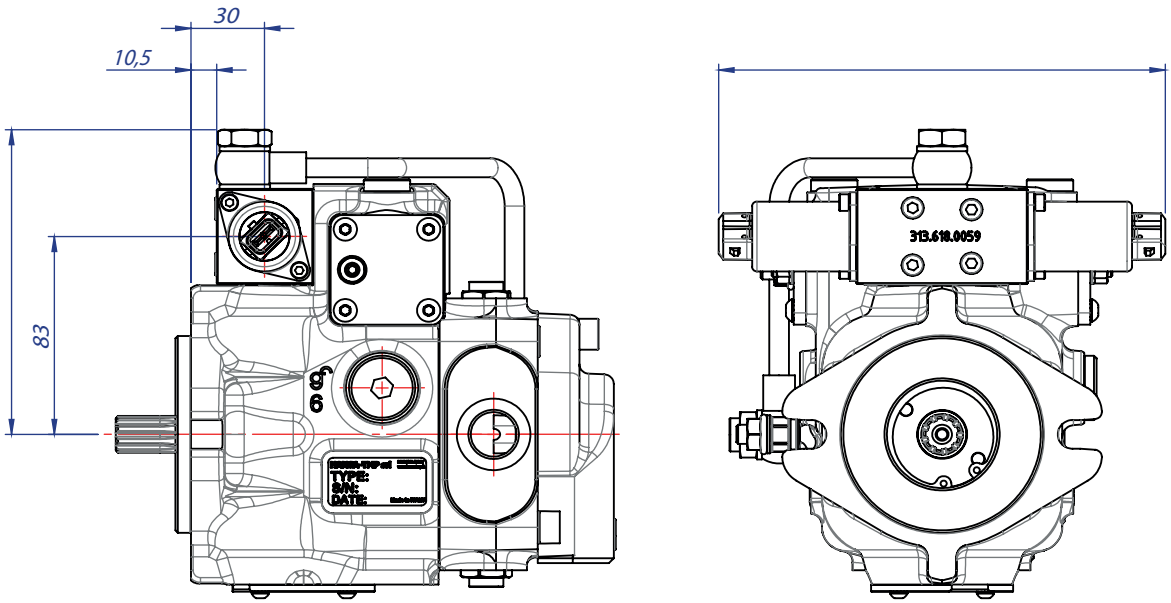
SEI 1 (12V DC)
SEI 2 (24V DC)

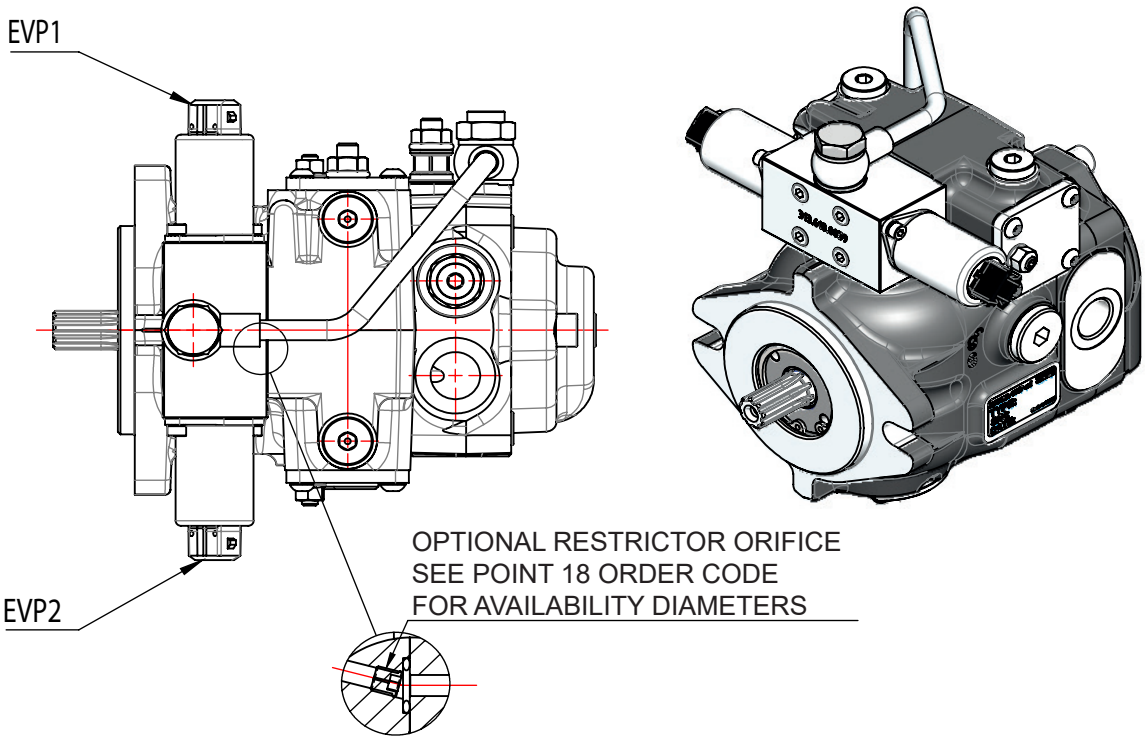
ELECTRO-PROPORTIONAL SERVO-CONTROL

(with AMP Junior Timer connector)

The pump displacement variation is obtained by an electric signal, which varies approx.:

- from 315 to 630 mA (24V DC voltage)
- from 630 to 1260 mA (12V DC voltage)





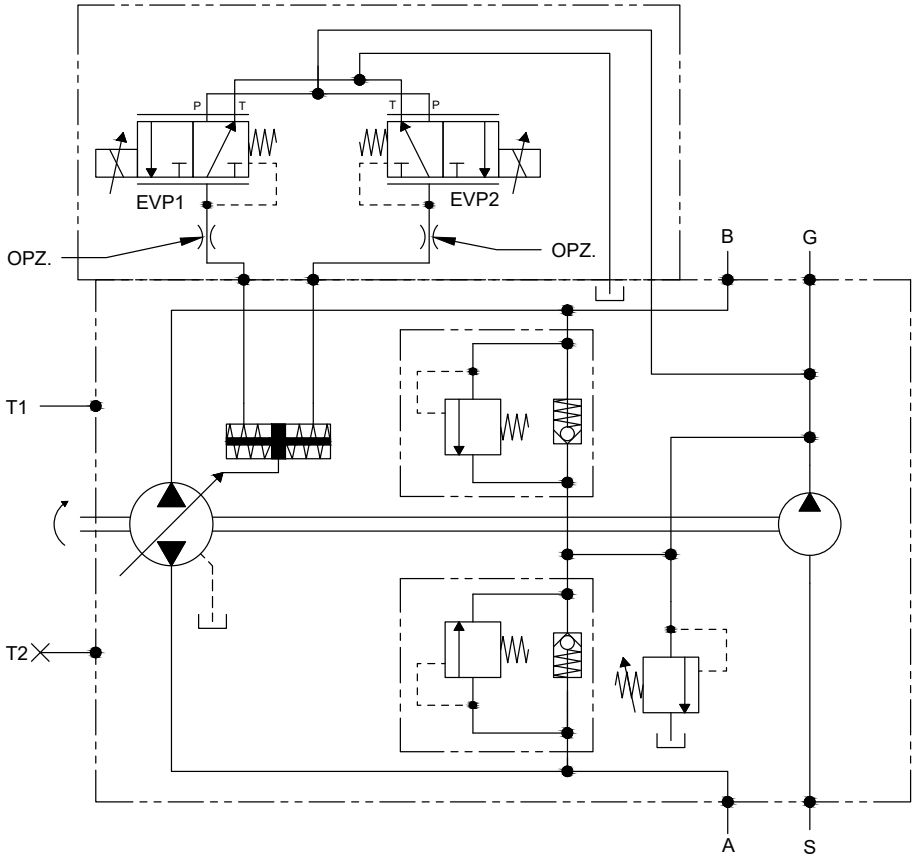
(continua)

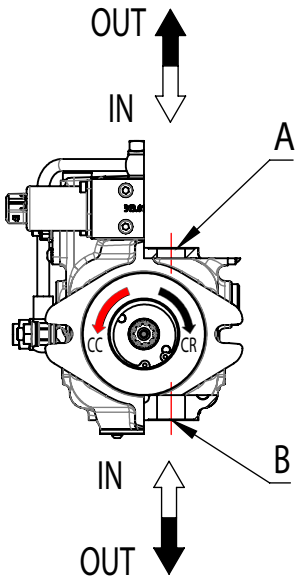
SEI 1 (12V DC)
SEI 2 (24V DC)

ELECTRO-PROPORTIONAL SERVO-CONTROL

(with AMP Junior Timer connector)

HYDRAULIC CIRCUIT





FLOW DIRECTION	PUMP		
Pump rotation	Port	OUT	IN
Clockwise CR	EVP1 EVP2	B A	A B
Counter-clockwise CC	EVP1 EVP2	A B	B A

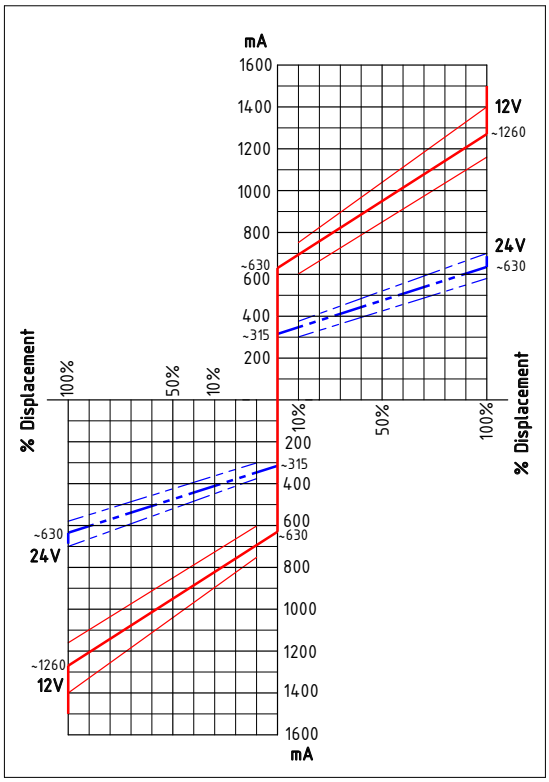
(continua)

SEI 1 (12V DC)
SEI 2 (24V DC)

ELECTRO-PROPORTIONAL SERVO-CONTROL

(with AMP Junior Timer connector)

CURRENT-DISPLACEMENT GRAPHIC



ELECTRICAL FEATURES		
Voltage	12 V	24 V
Electric current max.	1500 mA	750 mA
Load resistence	4,72 Ω ± 5%	20,8 Ω ± 5%
Type of control	Current control	
	PWM 100 Hz indicated	
Type of connection	AMP Junior Timer	
Protection class	Until IP6K6 / IPX9K	

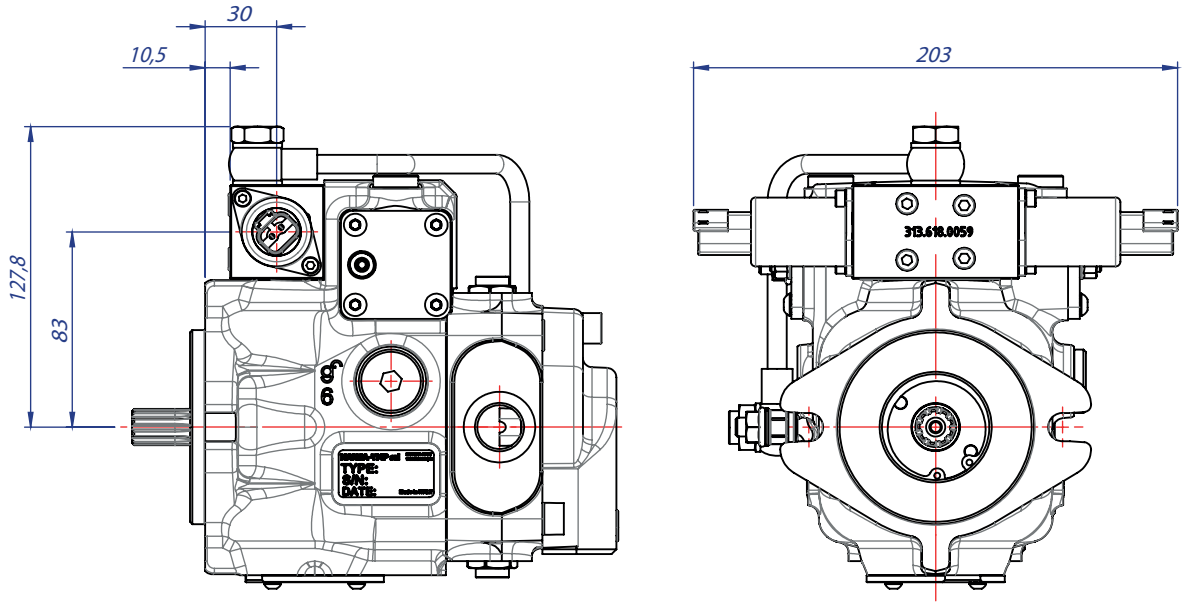
HYDRAULIC FEATURES	
Max. pressure (P, T)	pP= 5 MPa, pT= 3 MPa
Hysteresis (w/PWM)	<0,07 MPa (pA=2,0)
	<0,1 MPa (pA=2,5)
	<0,15 MPa (pA=3,5)
Filtration ratio	125 µm
Oil contamination level	Min. filtration ratio: 20/18/15
	According ISO 4406
	Hydraulic oil DIN 51524
Min./max. oil temperature	from -40 to +105°C

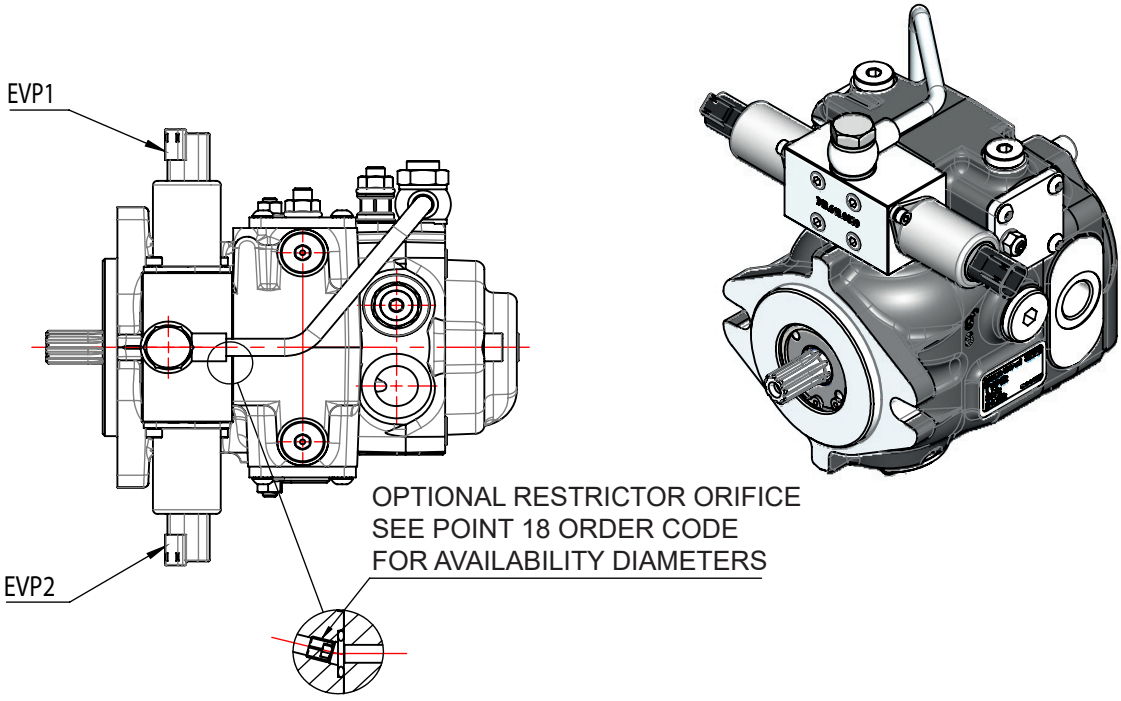
SEI 1.D (12V DC)
SEI 2.D (24V DC)

ELECTRIC SERVO-CONTROL

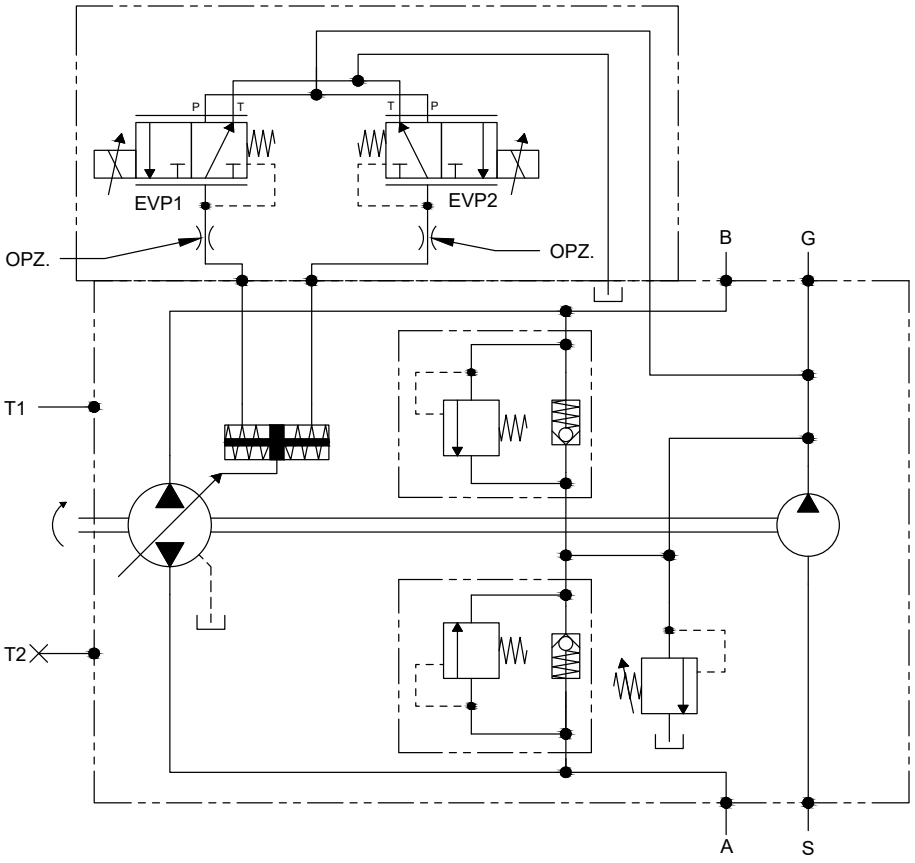
(with Deutsch connector)

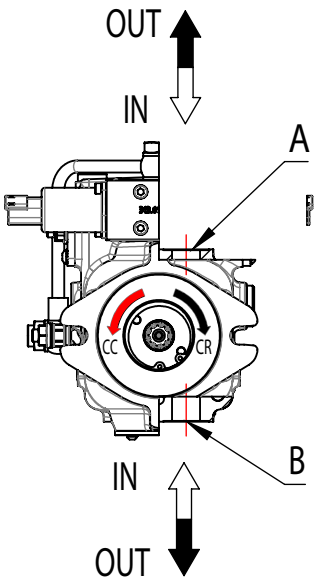
The pump displacement variation is obtained by an electric signal, which varies approximately:
- from 315 to 630 mA (24V DC voltage)
- from 630 to 1260 mA (12V DC voltage)





SEI 1.D (12V DC)
SEI 2.D (24V DC)
ELECTRIC SERVO-CONTROL
(with Deutsch connector)

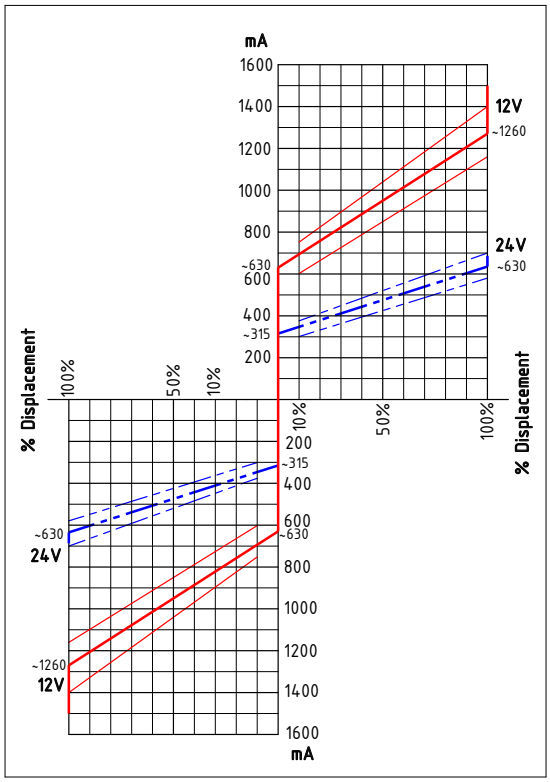




FLOW DIRECTION	PUMP		
Pump rotation	Port	OUT	IN
Clockwise CR	EVP1 EVP2	B A	A B
Counter-clockwise CC	EVP1 EVP2	A B	B A

SEI 1.D (12V DC)
SEI 2.D (24V DC)
ELECTRIC SERVO-CONTROL
(with Deutsch connector)

CURRENT-DISPLACEMENT GRAPHIC



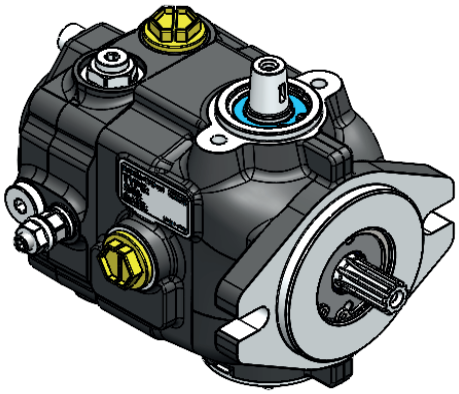
ELECTRICAL FEATURES		
Voltage	12 V	24 V
Electric current max.	1500 mA	750 mA
Load resistence	4,72 Ω ± 5%	20,8 Ω ± 5%
Type of control	Current control	
	PWM 100 Hz indicated	
Type of connection	Deutsch	
Protection class	Until IP6K6 / IPX9K	

HYDRAULIC FEATURES	
Max. pressure (P, T)	pP= 5 MPa, pT= 3 MPa
Hysteresis (w/PWM)	<0,07 MPa (pA=2,0)
	<0,1 MPa (pA=2,5)
	<0,15 MPa (pA=3,5)
Filtration ratio	125 µm
Oil contamination level	Min. filtration ratio: 20/18/15
	According ISO 4406
	Hydraulic oil DIN 51524
Min./max. oil temperature	from -40 to +105°C

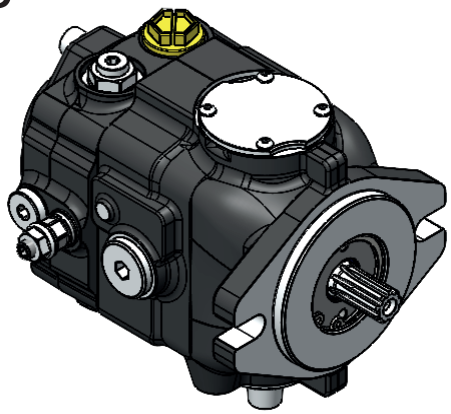
CONTROL DEVICE POSITION

(Primary and secondary pump)

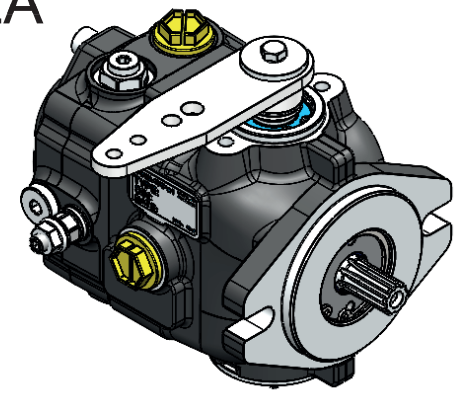
OA



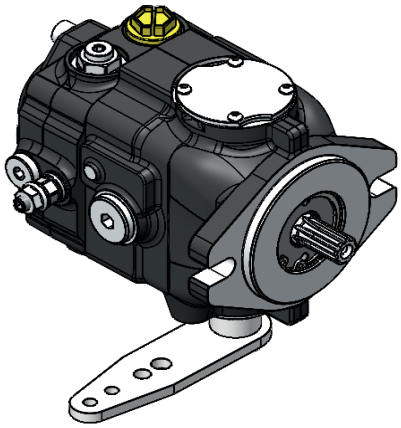
OB



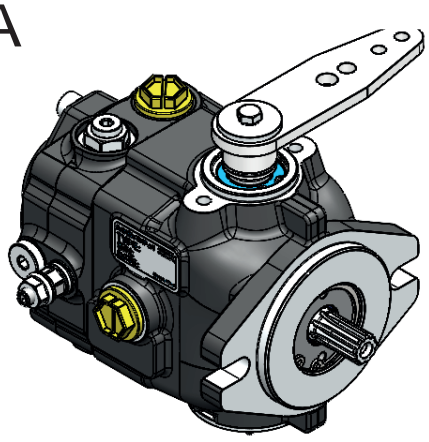
LA



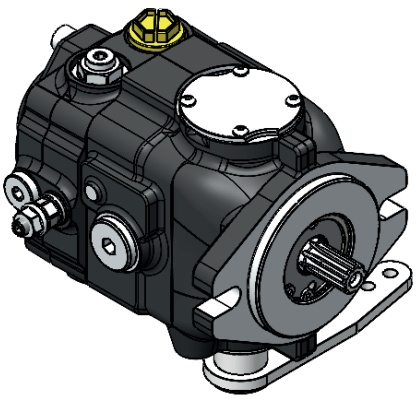
LB



RA



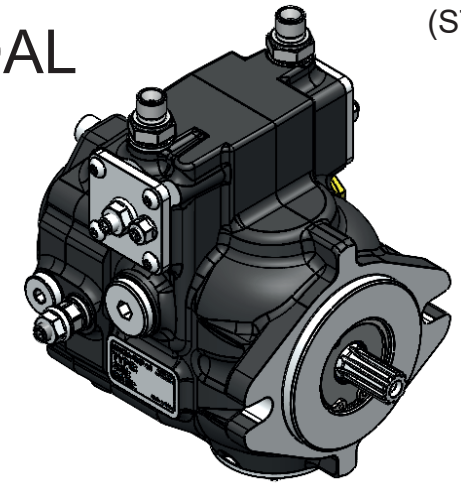
RB



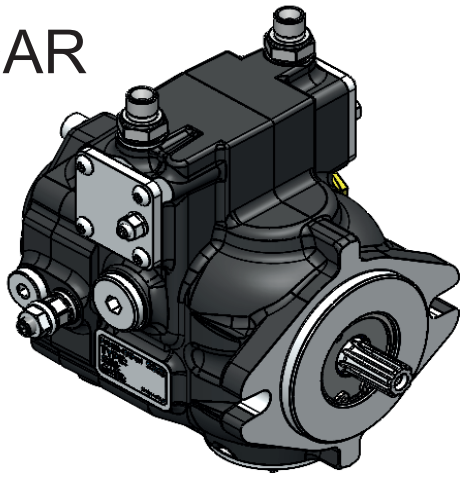
CONTROL DEVICE POSITION

(Primary and secondary pump)

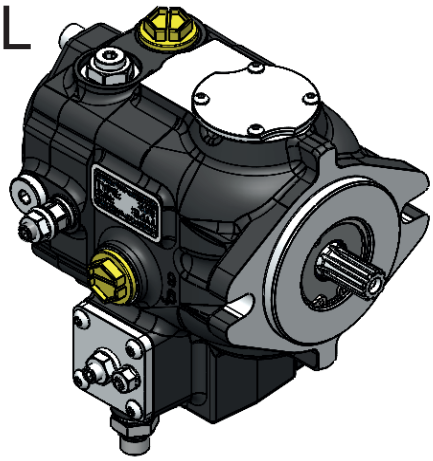
OAL (STD)



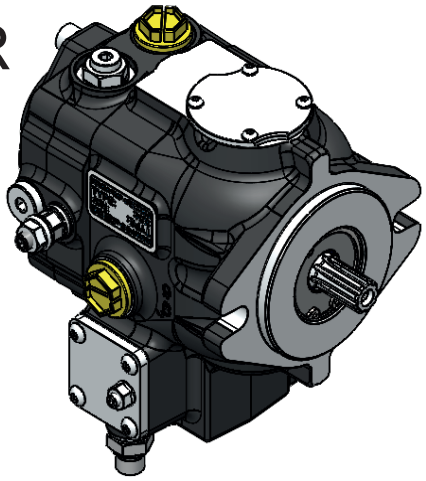
OAR



OBL



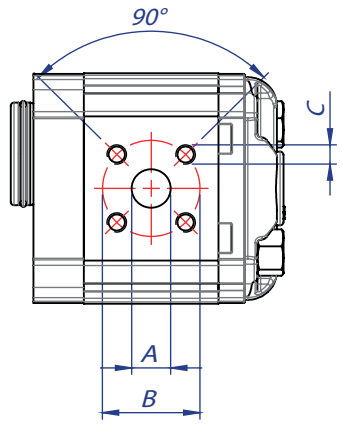
OBR



GEAR PUMPS CONNECTION

F

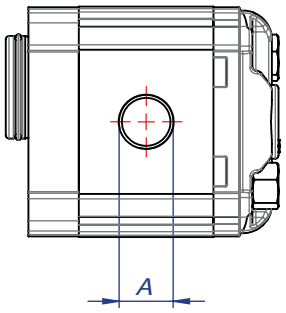
OPTIONAL
GROUP 1



PUMP CONNECTION SIZE					
SUCTION IN			OUTLET OUT		
A	*B*	*C*	*A*	*B*	*C*
12 mm	30 mm	M6	12 mm	30 mm	M6

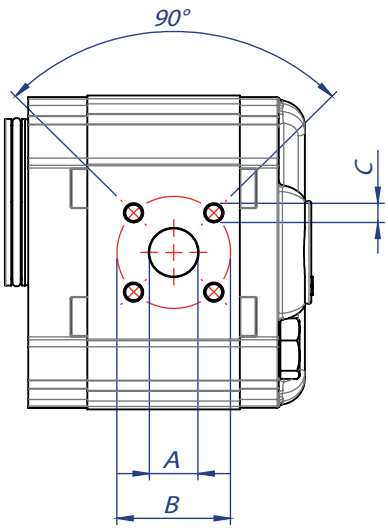
STANDARD
GROUP 1

G



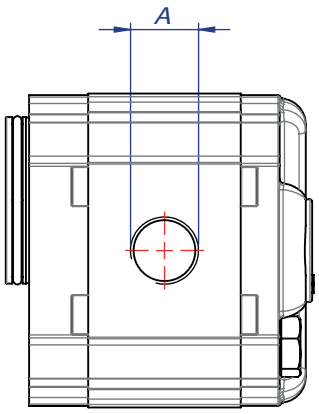
PUMP CONNECTION SIZE	
SUCTION IN	OUTLET OUT
A	*A*
3/8" BSPP	3/8" BSPP

STANDARD
GROUP 2



PUMP CONNECTION SIZE					
SUCTION IN			OUTLET OUT		
A	*B*	*C*	*A*	*B*	*C*
20 mm	40 mm	M6	15 mm	35 mm	M6

OPTIONAL
GROUP 2



PUMP CONNECTION SIZE		
DISPLACEMENT	SUCTION IN	OUTLET OUT
cm³/n	*A*	*A*
4	G 1/2"	G 1/2"
6		
8		
11	G 3/4"	
14		
16		
19		
22		
26		
31		

REAR PUMP MOUNTING FLANGES

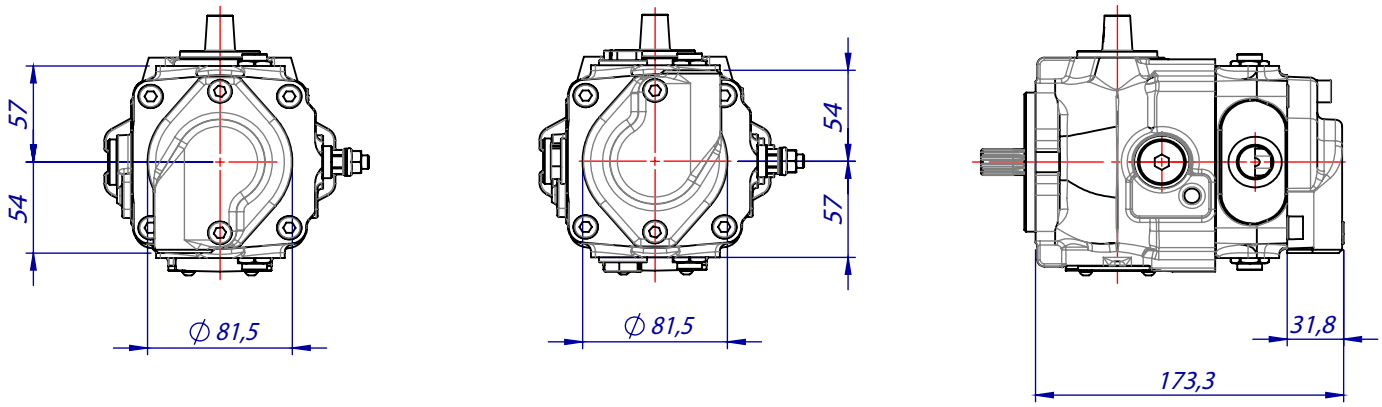
(Dimensions valid for all versions)

C

CLOSED (WITHOUT CONNECTION FOR REAR PUMP) - STANDARD VERSION

CR
clockwise rotation
(right)

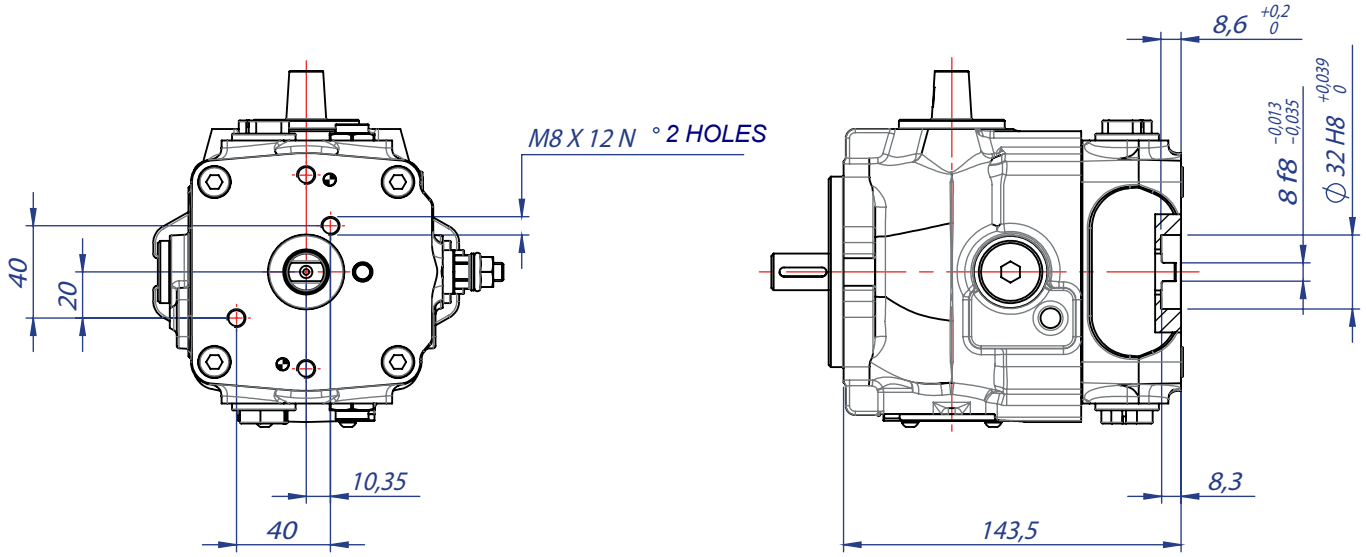
CC
counter-clockwise rotation
(left)



B1

GERMAN STANDARD (WITHOUT BOOST PUMP) COMPACT VERSION

Max. torque = 70 Nm



REAR PUMP MOUNTING FLANGES

(Dimensions valid for all versions)

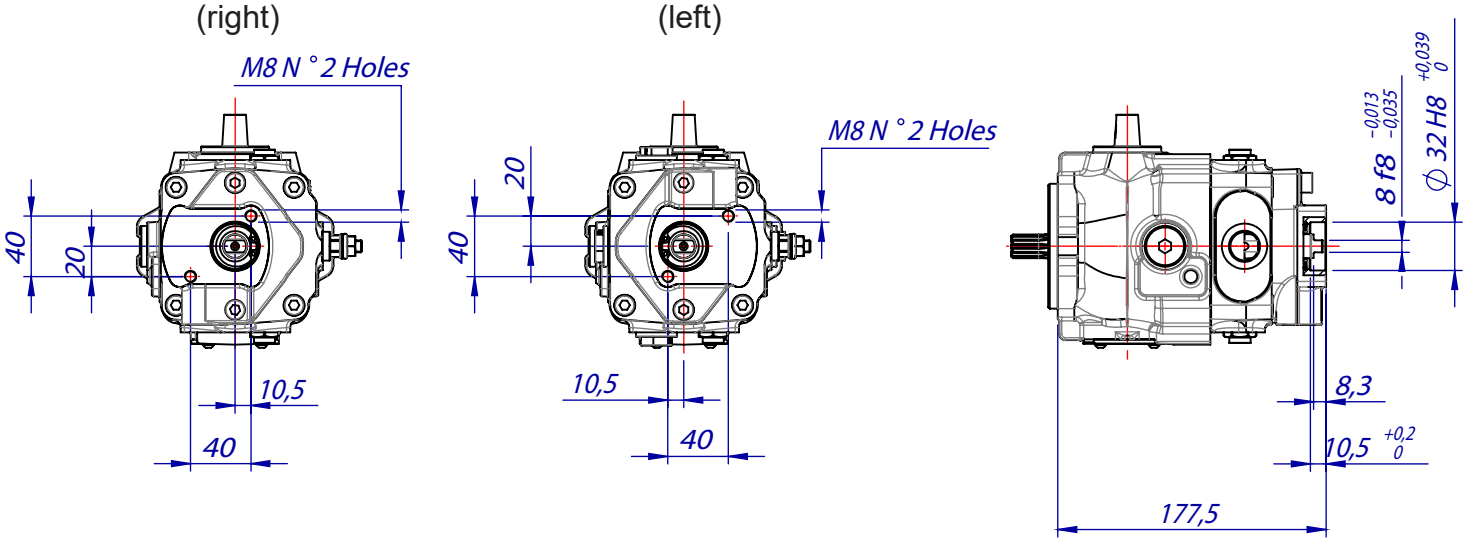
B1

GERMAN STANDARD

Max. torque = 70 Nm

CR
clockwise rotation
(right)

CC
counter-clockwise rotation
(left)



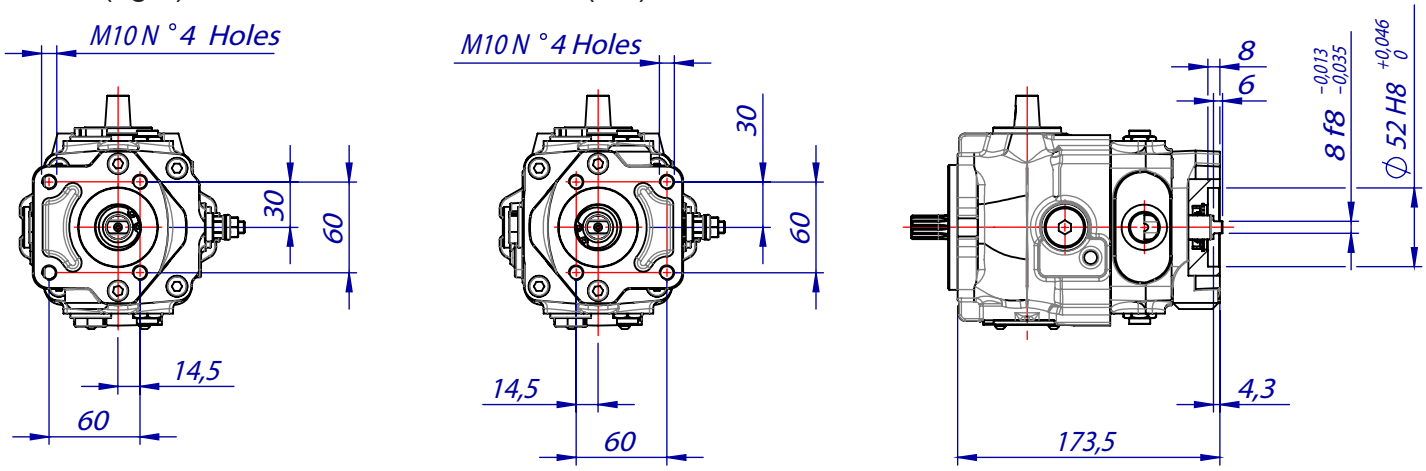
B2

GERMAN STANDARD

Max. torque = 70 Nm

CR
clockwise rotation
(right)

CC
counter-clockwise rotation
(left)



REAR PUMP MOUNTING FLANGES

(Dimensions valid for all versions)

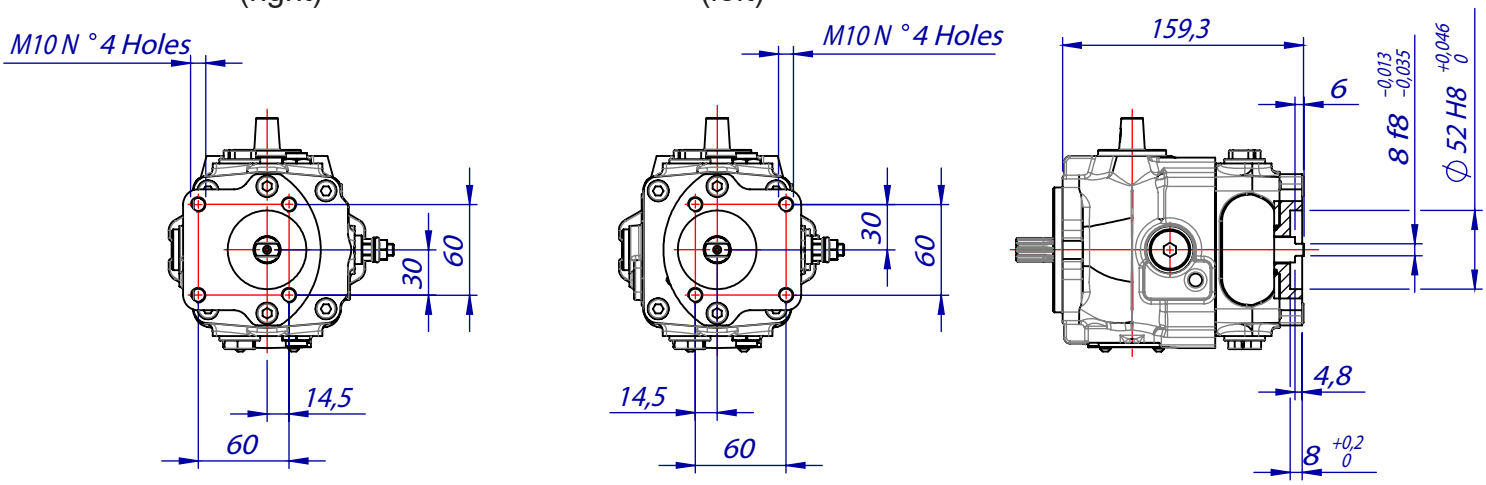
B2

GERMAN STANDARD (WITHOUT BOOST PUMP) COMPACT VERSION

Max. torque = 70 Nm

CR
clockwise rotation
(right)

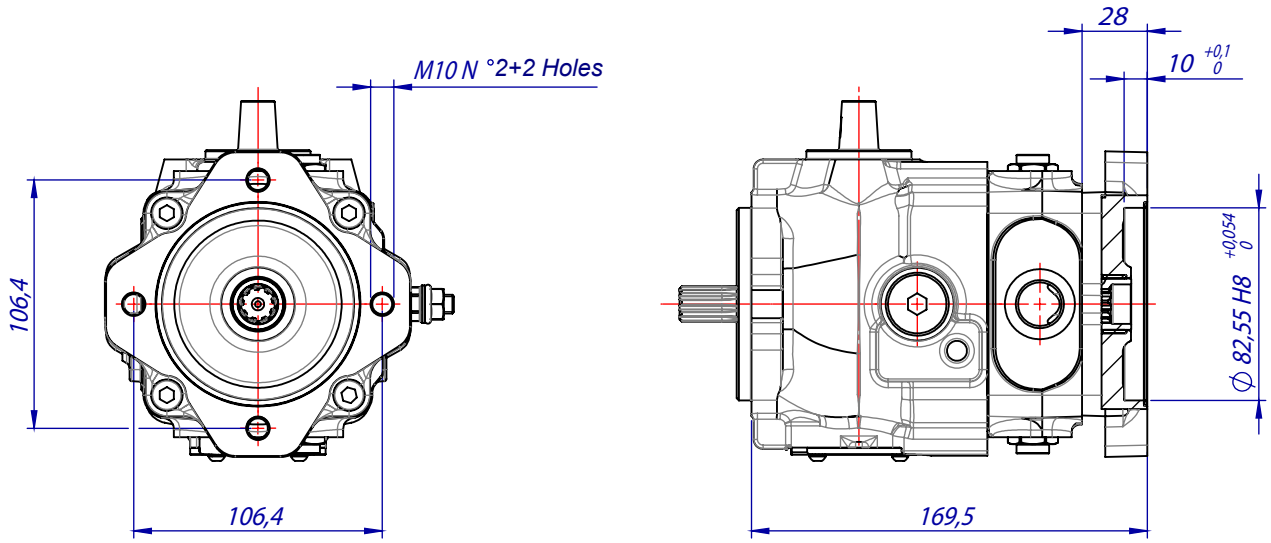
CC
counter-clockwise rotation
(left)



SA

SAE-A - 2 HOLES FLANGE

Max. torque = 120 Nm



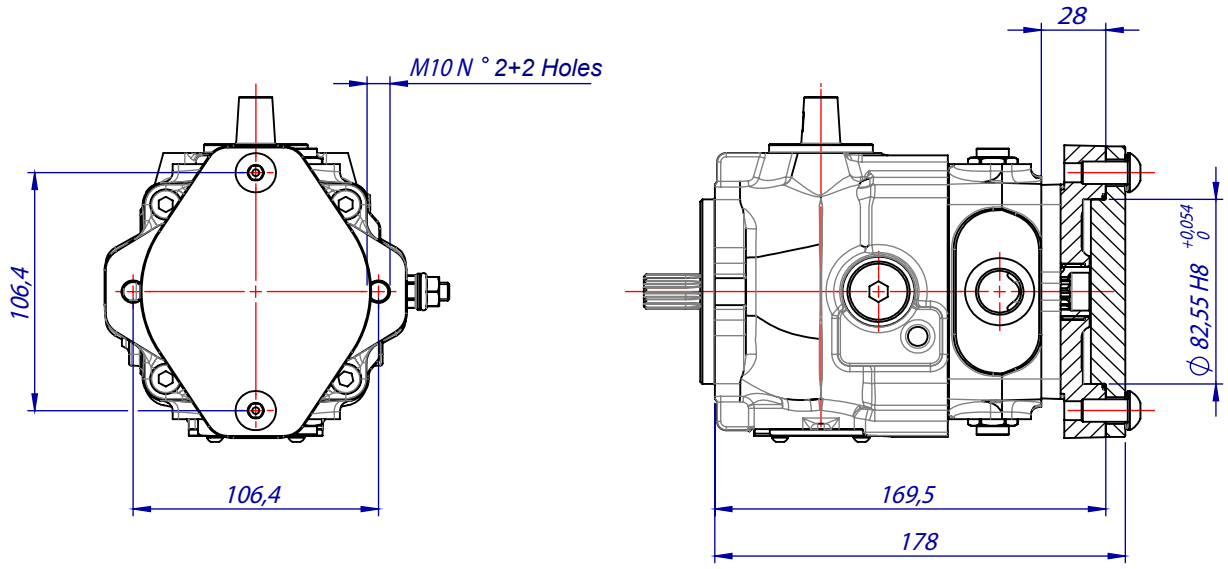
REAR PUMP MOUNTING FLANGES

(Dimensions valid for all versions)

SA-C

SAE-A - 2+2 HOLES FLANGE + CLOSED COVER

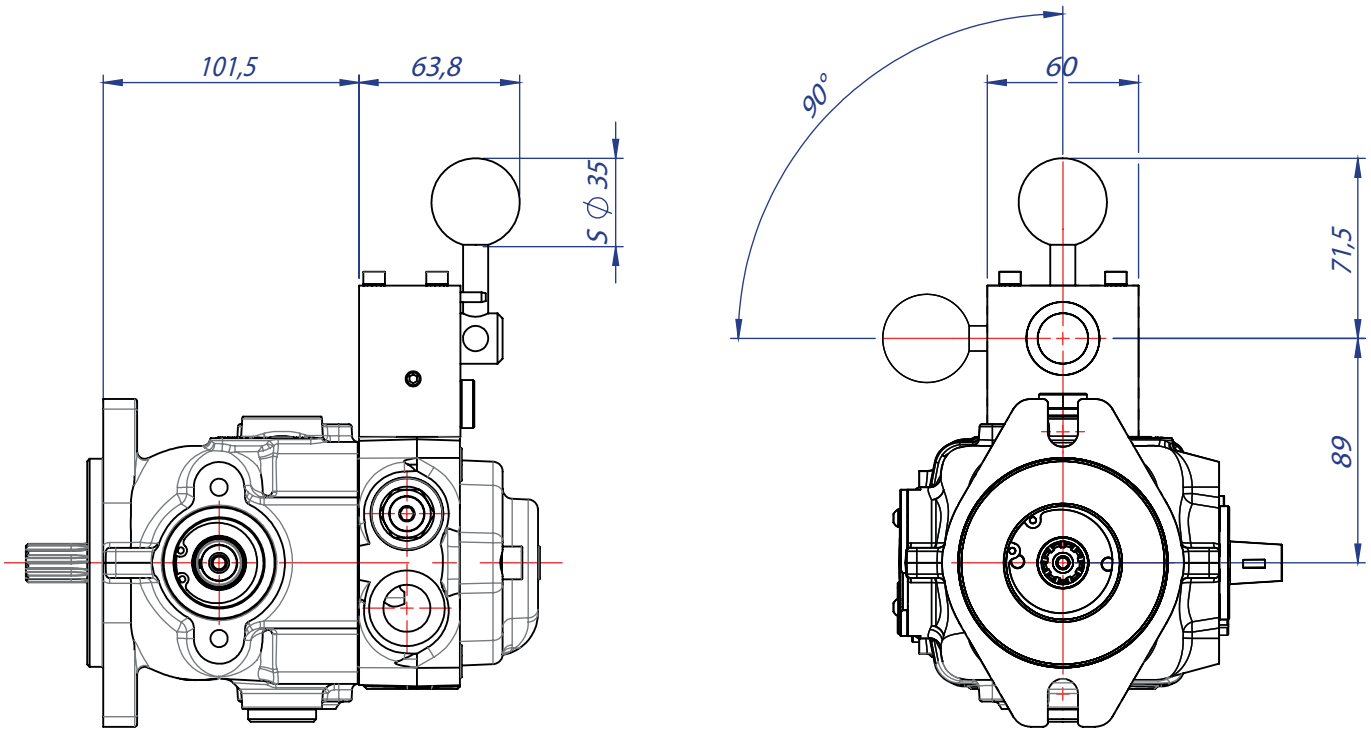
Max. torque = 120 Nm



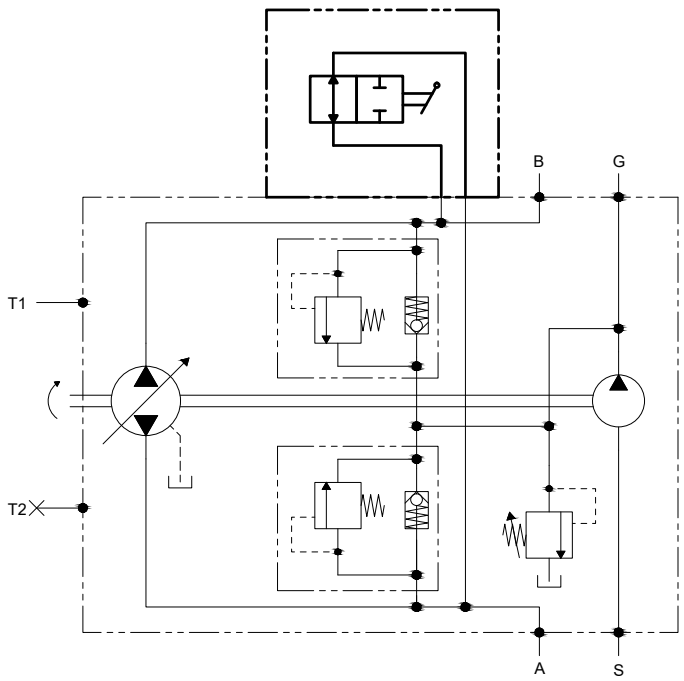
OPTIONAL LB

LEVER BY-PASS

Manual valve to connect the A and B ports together to allow the free-wheeling of the hydraulic motor.



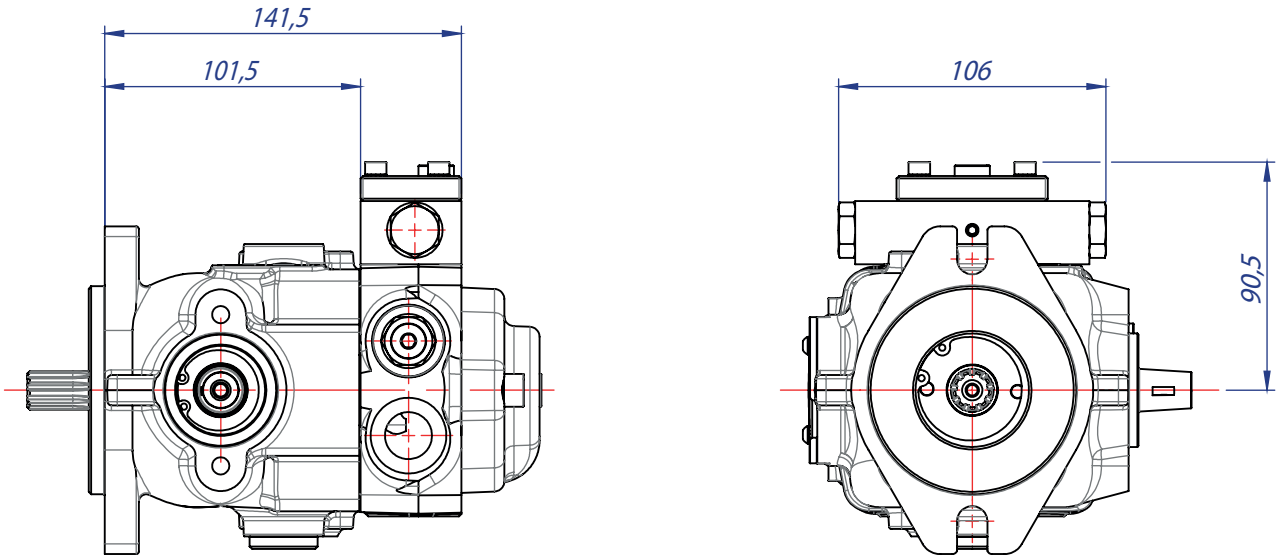
HYDRAULIC CIRCUIT



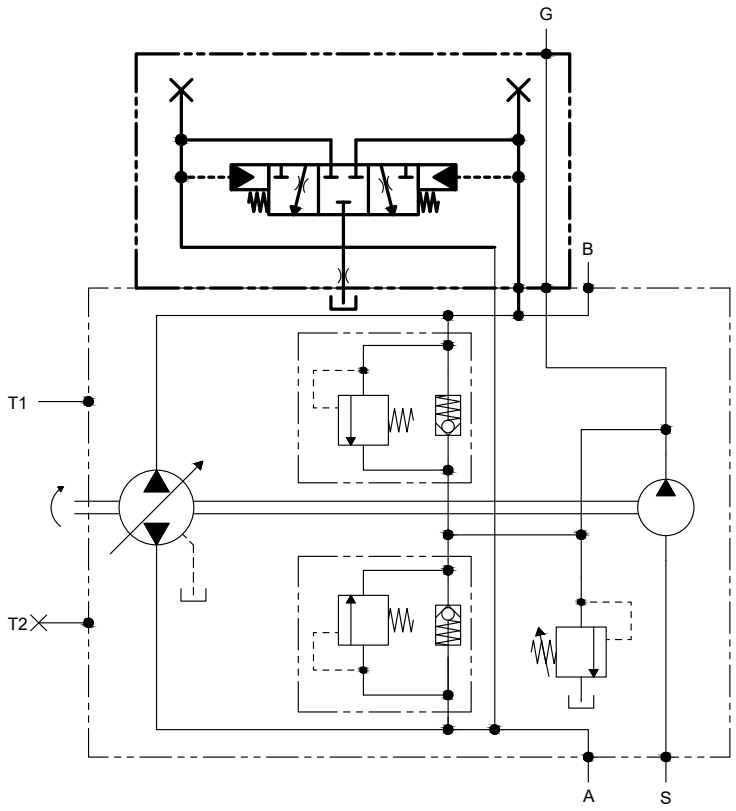
OPTIONAL VS

FLUSHING VALVE

Subtracting warm oil from the closed circuit, the flushing valve allows the flow of cool fluid from the boost system.
Oil flow for cooling from 1.1 l/min (with 1 MPa pressure) up to 1.6 l/min (with 2 MPa pressure).



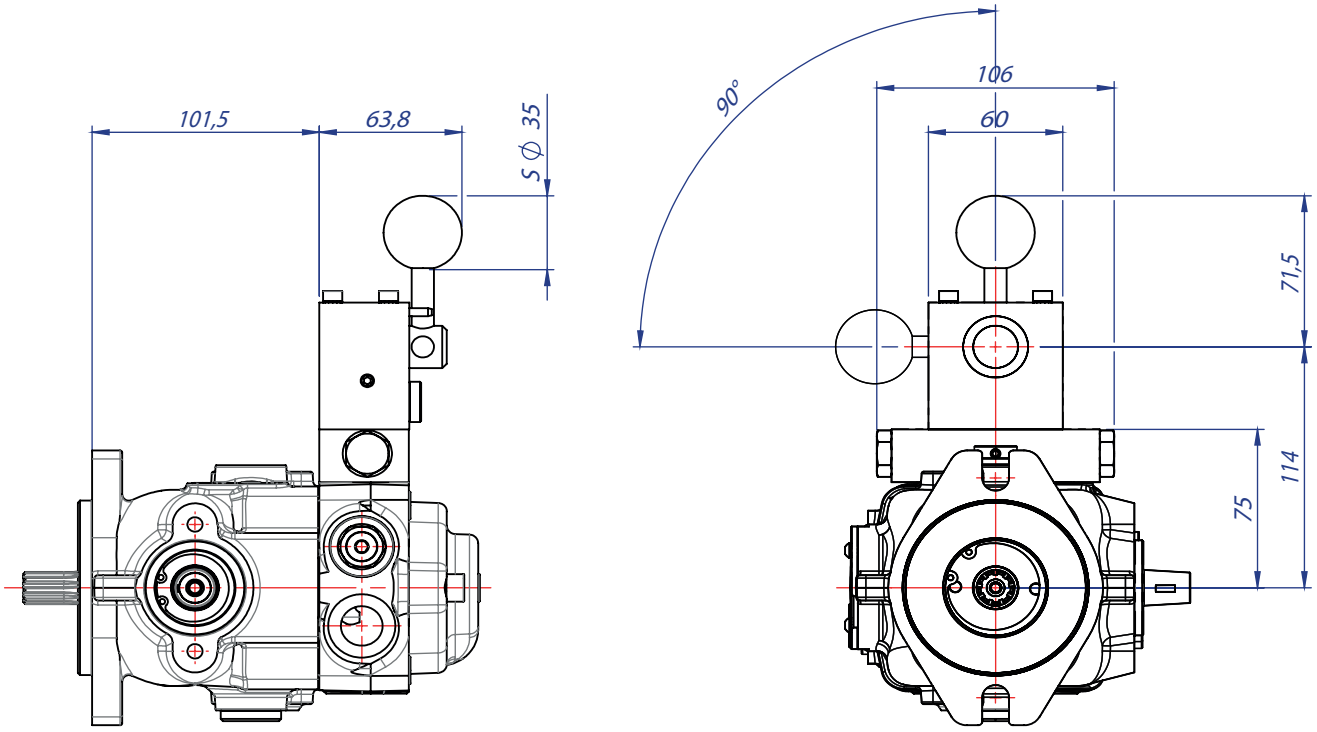
HYDRAULIC CIRCUIT



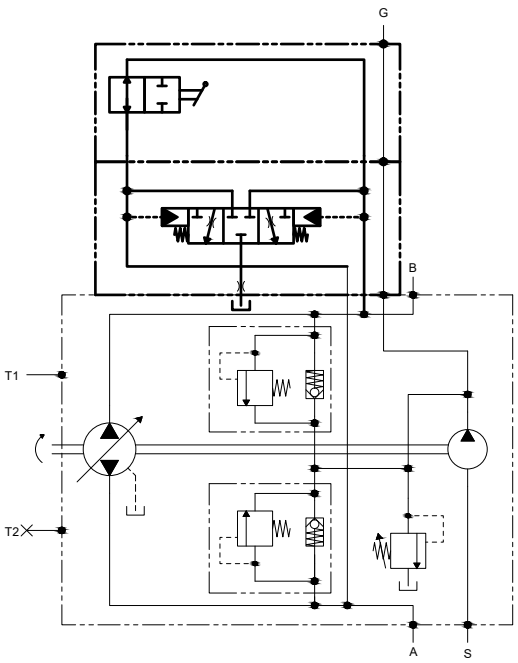
OPTIONAL VSLB

FLUSHING VALVE + LEVER BY-PASS

The manual valve connects the A and B ports together to allow the free-wheeling of the hydraulic motor.
The flushing valve, subtracting warm oil from the closed circuit, allows the flow of cool fluid from the boost system.
Oil flow for cooling from 1.1 l/min (with 1 MPa pressure) up to 1.6 l/min (with 2 MPa pressure).



HYDRAULIC CIRCUIT

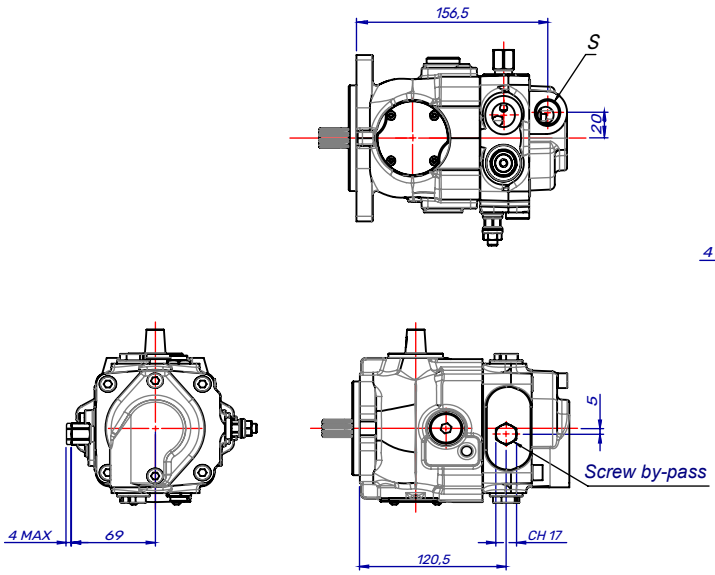


OPTIONAL SB

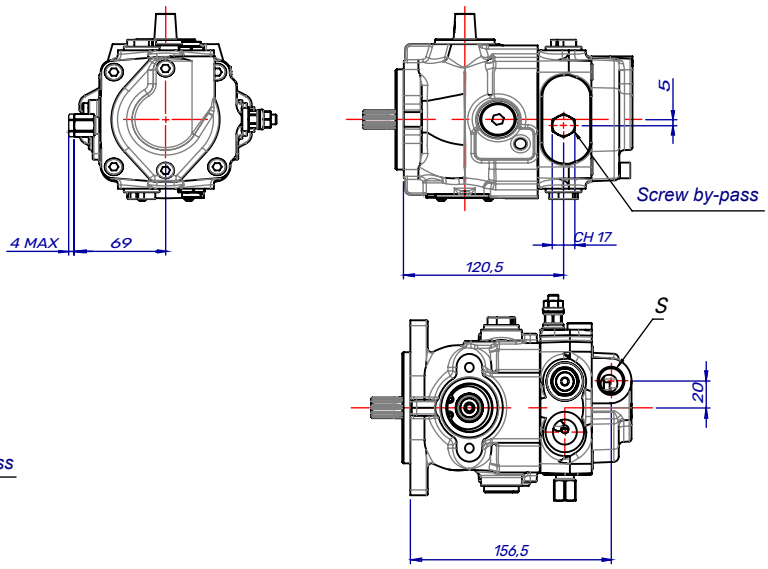
SCREW BY-PASS

Manual valve to connect the A+B ports together for free rotation of the hydraulic motor.
NOTE: not possible with optional SA and SA.C

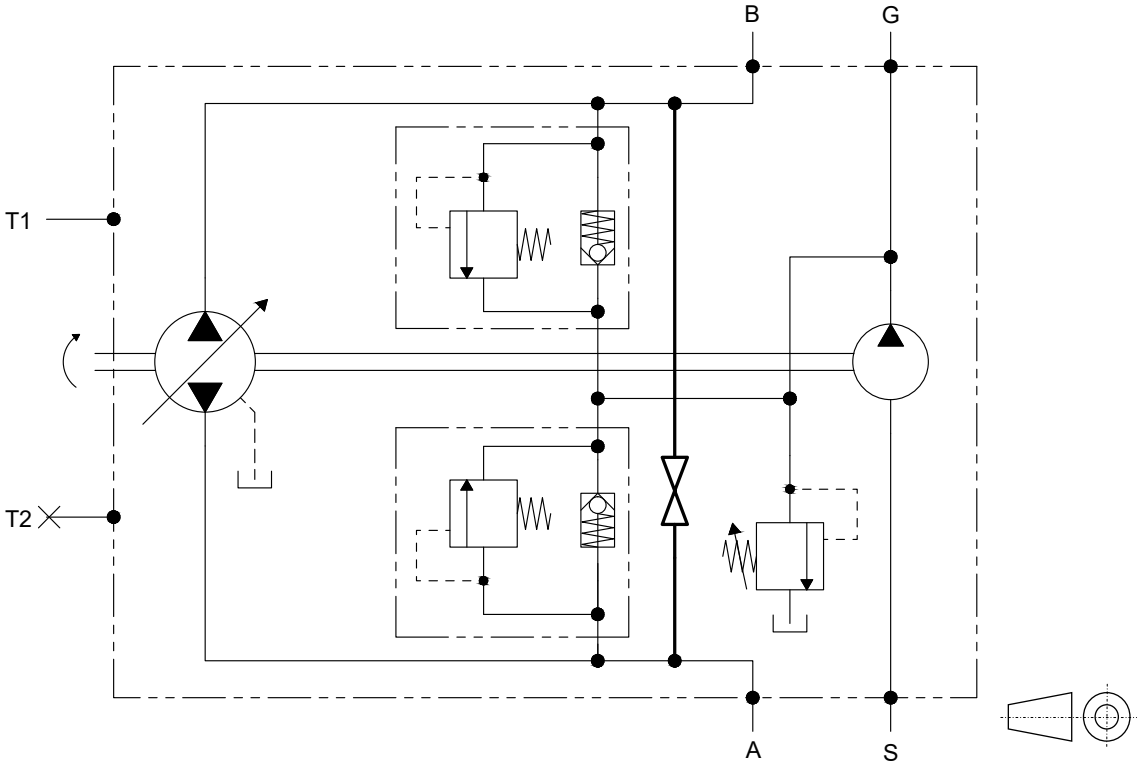
CLOCKWISE ROTATION CR



COUNTER-CLOCKWISE ROTATION CC



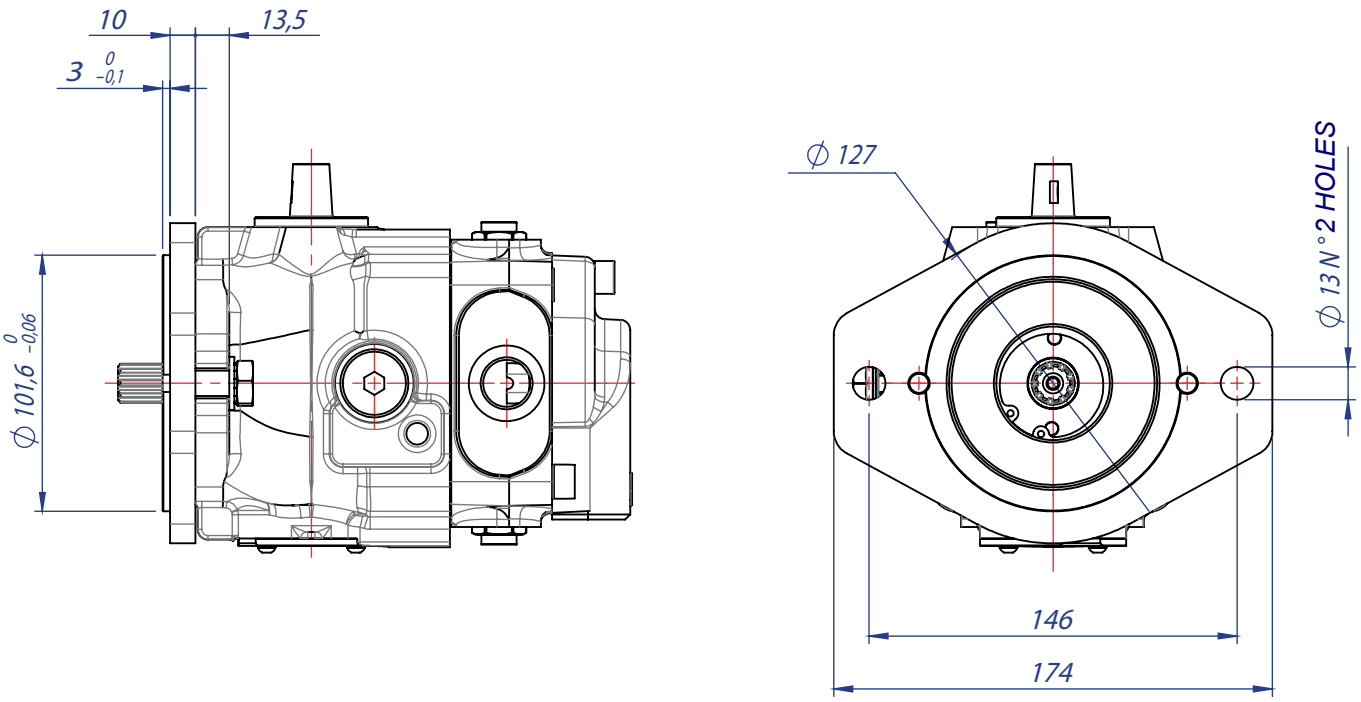
HYDRAULIC CIRCUIT



OPTIONAL FB

SAE-A / SAE-B MOUNTING FLANGE (CONVERSION)

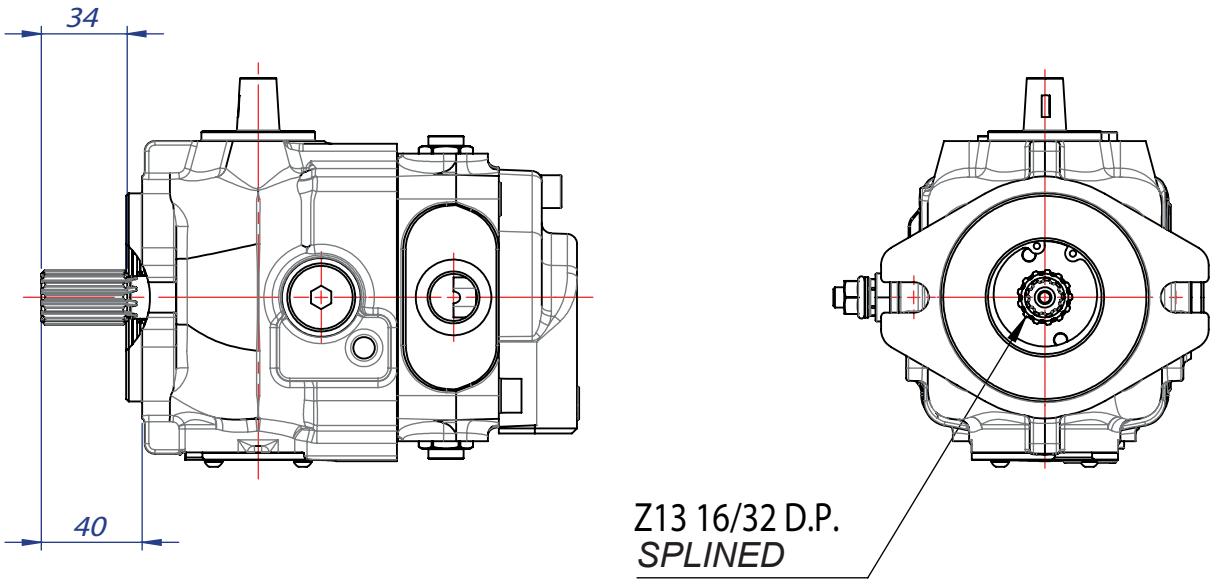
Max. torque = 120 Nm



OPTIONAL ST

COUPLING Z = 9 / Z = 13 (SAE-A / SAE-B CONVERSION OF SHAFT)

Max. torque = 120 Nm

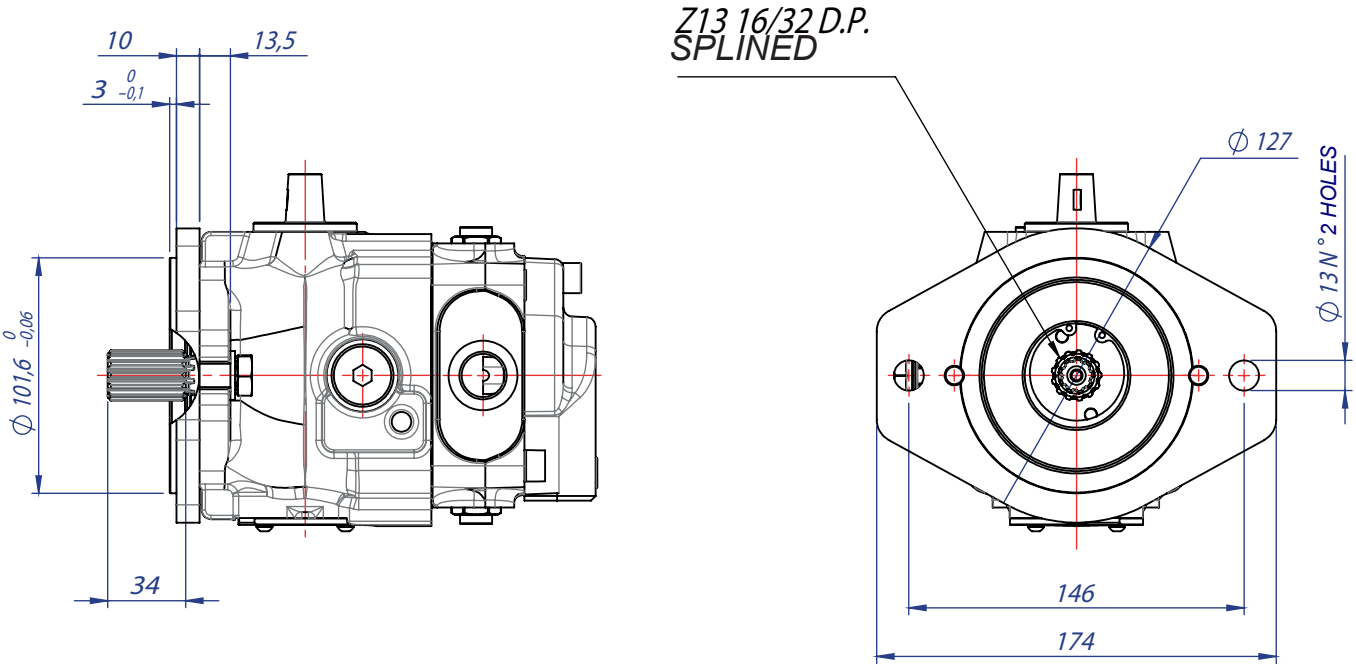


OPTIONAL FBST

SAE-A / SAE-B MOUNTING FLANGE

COUPLING Z = 9 / Z = 13 (SAE-A / SAE-B CONVERSION OF SHAFT)

Max. torque = 120 Nm



TROUBLESHOOTING

TROUBLES	CAUSE	REMEDY
High noise level	Too high rotation speed of the pump.	Reduce pump rotation speed.
	Wrong rotation direction.	Check the rotation direction of the pump.
	Obstruction in suction line - air in the suction line - wrong oil viscosity - diameter of suction line too small.	Check oil type and viscosity. Check internal diameter of suction line. Remove restrictions. Check oil level of reservoir. Eliminate air intake.
	Not correct connection of the pump. Not correct diameter of pipes / hoses.	Check the pump connections and the pipe / hose diameters according to notes.
	Vibrations of relief valves .	Check the inlet suction line - Check and replace relief valves.
	Internal parts worn out.	Check and replace.
	Wrong pump connection to the prime mover.	Check connections and rotation of direction.
	Too low rotation speed of the pump.	Increase the pump rotation speed.
Low flow rate	Obstructions in the suction line - wrong viscosity.	Check oil type and viscosity. Check internal diameter of suction line. Remove restrictions. Check oil level of reservoir. Eliminate air intake.
	Low remote control pressure.	Check and adjust.
	High internal leakage.	Check the case drain flow.
	Low rotation speed of the pump.	Increase speed of the pump.
Instable or low pressure	Obstruction of suction line - air in the suction line - wrong oil viscosity - diameter of suction line too small.	Check oil type and viscosity. Check internal diameter of suction line. Remove restrictions. Check oil level of reservoir. Eliminate air intake.
	Vibration of relief valves.	Check the inlet suction line. Check and replace relief valves.
	Internal parts worn out.	Check and replace.
Over heating	High oil temperature at suction inlet.	Check the cooling system.
	Internal parts worn out.	Check - replace.
	Wrong setting of pressure relief valves.	Check - adjust the setting of relief valves.

ACCESSORIES

Hydraulic Gear Pump German Standard B1
Hydraulic Gear Pump German Standard B2
Hydraulic Gear Pump SAE-A Standard

For more detailed information ask for catalogue HT 15 F 20.....

Hydraulic Remote Servo Controls

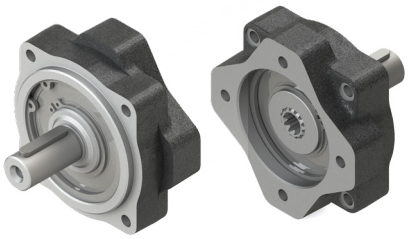
For more detailed information ask for catalogue HT 73 B 105 0919 E

Electric and Electronic Remote Servo Controls

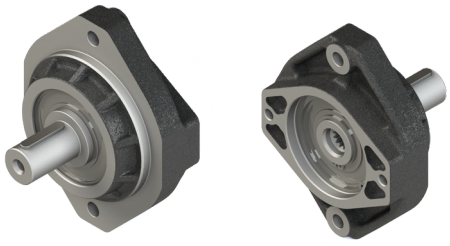
For more detailed information ask for catalogue HT 73 B 203 0516 E

Belt Drive Support BDS SAE-A / SAE-B

For more detailed information ask

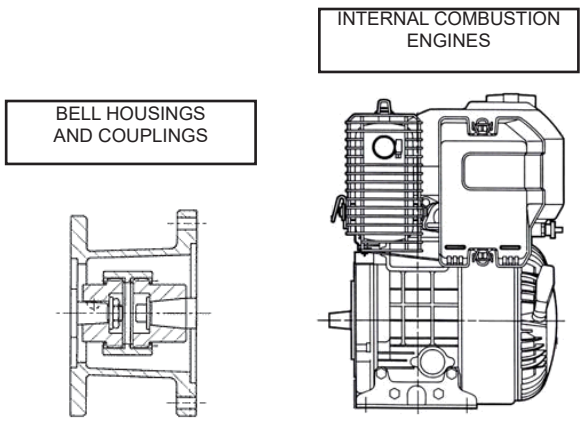


SAE-A



SAE-B

Bell Housings and Couplings for Pump Assembly on Internal Combustion Engines



For more detailed information ask our technical departement

PUMPS

Closed Loop Axial Piston Pumps (Variable Displacement) - 6-110 cc

Model	Displacement $cm^3/n.$	Rated Pressure MPa	Peak Pressure MPa	Maximum speed n/min.	Weight kg (single pump)
TPV 1100 TPV 1300	6, 8, 9, 11, 12, 13	30	35	3.600	8,8
	15, 17		30		
	18		30		
	19, 21	22	28	3.200	
TPV-TPVTC 1500	17, 18, 19, 21	35	40	3.600	14
TPV 3200	21, 28	25	35		22
TPV-TPVT 3600	26, 28, 30, 31, 32, 34, 36, 38, 43	40	45		28
TPV 4300	32, 38, 45, 50	28	35		23
TPV 5000	46, 50, 64	30	40		29
TPV 9000	55	40	45	4.000	55
	72			4.100	68
	90			4.000	
	110			3.800	

Open Loop Axial Piston Pumps (Fixed Displacement) - 32-50 cc

Model	Displacement $cm^3/n.$	Rated Pressure MPa	Peak Pressure MPa	Maximum speed n/min.	Weight kg (single pump)
TPF 60	35, 40, 46	35	42	2.800	20,5
	50		41	2.500	

Bent Axis Pumps - 12-130 cc

Model	Displacement $cm^3/n.$	Rated Pressure MPa	Peak Pressure MPa	Maximum speed n/min.	Weight kg
TPB - TAP 70	12.6	35	40	3.300	7,5
	17.0			3.200	
	25.4			2.550	8,5
	34.2			2.250	
	41.2, 47.1			2.200	15,5
	56.0			2.100	
	63.6			2.050	
	83.6, 90.7, 108.0			1.700	27,0
	130.0			1.600	29,5
The table values can change in function of the configuration.					

As HANSA-TMP has a very extensive range of products and some products have a variety of applications, the information supplied may often only apply to specific situations.

If the catalogue does not supply all the information required, please contact HANSA-TMP.
In order to provide a comprehensive reply to queries we may require specific data regarding the proposed application.

Whilst every reasonable endeavour has been made to ensure accuracy, this publication cannot be considered to represent part of any contract, whether expressed or implied.

The data is this catalogue refer to the standard product. The policy of HANSA-TMP consists of a continuous improvement of its products. It reserves the right to change the specifications of the different products whenever necessary and without giving prior information.

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