HANSA · TMP srl

HYDRAULIC COMPONENTS
HYDROSTATIC TRANSMISSIONS
GEARBOXES - ACCESSORIES

Certified Company ISO 9001 - 14001

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THE PRODUCTION LINE OF HANSA-TMP

Variable Displacement Closed Loop System Axial Piston Pump

TPV - TPVTC 1500

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TPVTC 1500

GENERAL INFORMATION

- The new TPV-TPVTC 1500 are variable displacement axial piston pumps with swash-plate system, for closed loop hydrostatic transmissions, that offer the best power to weight ratio because of new innovative design and production technologies.

- The flow rate is proportional to the rotation speed and is continuously variable according to the angle of the swash-plate from "0" to maximum displacement.

- The TPV-TPVTC 1500 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).

- Different types of hydraulic or proportional controls are available for remote regulation of the pump displacement by means of hydraulic or electric joysticks.
  Pumps are also available with integrated sensors for the control of the speed, of the angular position of the swash-plate and of the oil pressure. These sensors allow a complete remote control of the pump by an external electronic system.
  The mounting flange is according to SAE-B 2 bolt, the through-drive is according SAE-A 2 bolt.
  Different other optionals are available for the TPV-TPVTC 1500.

- 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-TPVTC 1500 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.

- Before use, please read the Use and Maintenance Manual.

TECHNICAL SPECIFICATIONS

The housing and the distributor cover of the pumps TPV-TPVTC 1500 are made in cast iron.
The flow rate is proportional to the rotation speed and the displacement is continuously variable. It increases as the swash-plate angle moves from "0" to maximum position.
If the swash-plate is positioned out of the neutral position, the flow respectively follows one of the two directions.

Key features
- compact design
- integrated optionals
- high power to weight ratio
- low noise integrated boost pump

Typical applications
- construction equipments
- green mowers
- zero turn machines
- agricultural machines
- utility vehicles
- forest vehicles
- logistic machines

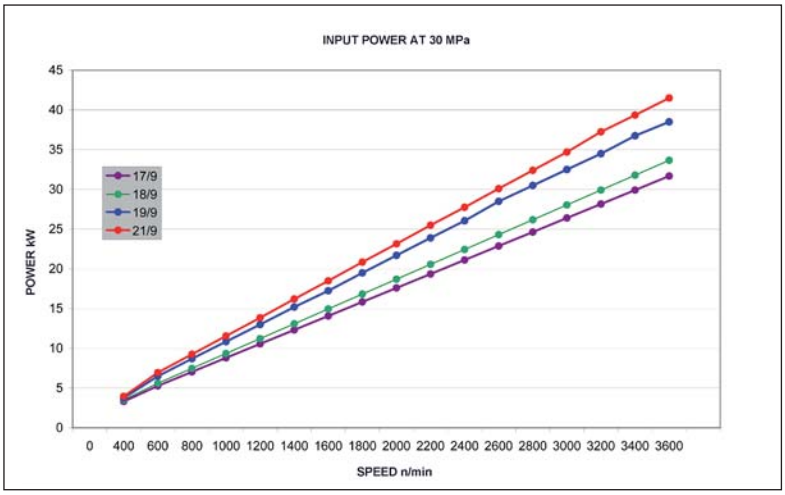
PUMP MODEL		TPV 17-9	TPV 18-9	TPV 19-9	TPV 21-9
Max. displacement	cm^3/n	17,6	18,7	19,9	21,1
Flow rate(1)	l/min	59,6	63,3	67,4	73,6
Power(1)	kW	32	34	36	38
Boost pump displacement	cm^3/n	0,58			
Continuos working pressure	MPa	30			
Max. pressure	MPa	35			
Max. relief valve setting	MPa	40			
Boost pressure relief valve setting(2)	MPa	0,2			
Suction pressure	MPa	> = 0,08			
Max. housing pressure	MPa	2			
Minimum pump shaft speed	n/min	500			
Max. pump shaft speed	n/min	3.600			
Max. pump shaft peak speed	n/min	3.800			
Max. fluid temperature	°C	80			
Fluid viscosity	cSt	15-40			
Fluid contamination level		19/17/14 ISO 4406 (NAS 8)			
Weight dry (single pump)(3)	kg	version SEI 14,5		version SHI 13	
Weight dry (tandem pump)(3)	kg	version SEI 23,2		version SHI 21,3	

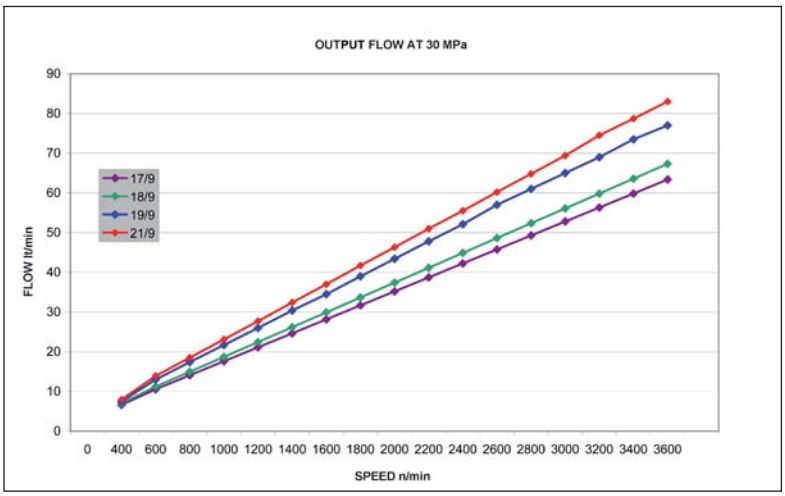
(1) 3.600 n/min and 30 MPa
(2) 1.000 n/min
(3) Approximate values, the weight may vary depending on configuration and accessories

SYSTEM DESIGN PARAMETERS

HYDRAULIC MEASURE	USEFUL FORMULAS	CONVERSION FACTORS
Flow rate: Q = (l/min)	$\mathbf{Q} = V\ [cm^3/n] \times \eta_v \times n\ 10^{-3}$	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 = (rpm)		
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 continues 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.

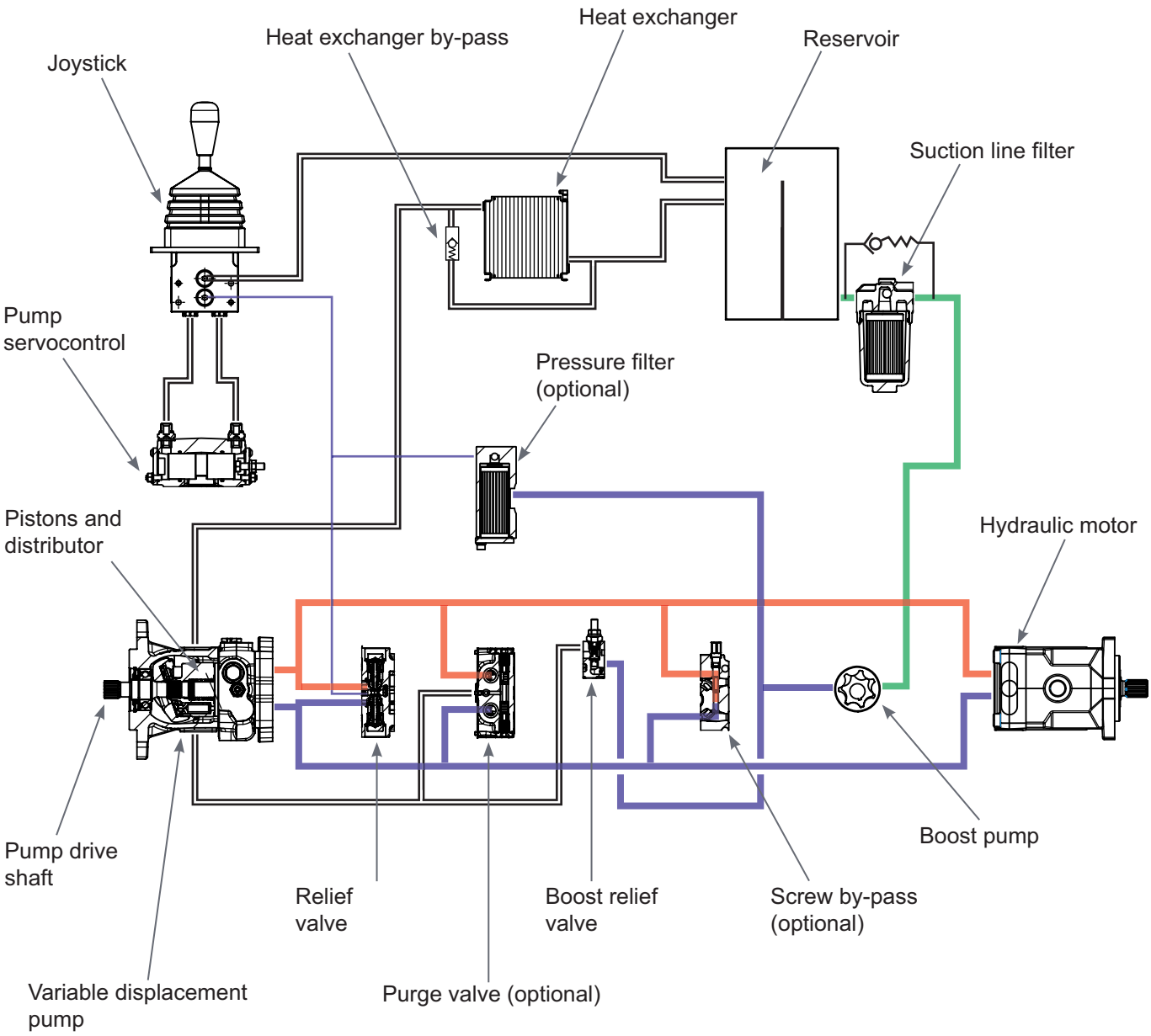
Speed

- 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 and cause a loss of power or of the 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.

HYDRAULIC DIAGRAM



COLOR INDICATIONS

■ LOW PRESSURE AND PILOT LINE ■ PRESSURE LINE ■ SUCTION LINE □ DRAIN / RETURN LINE

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:

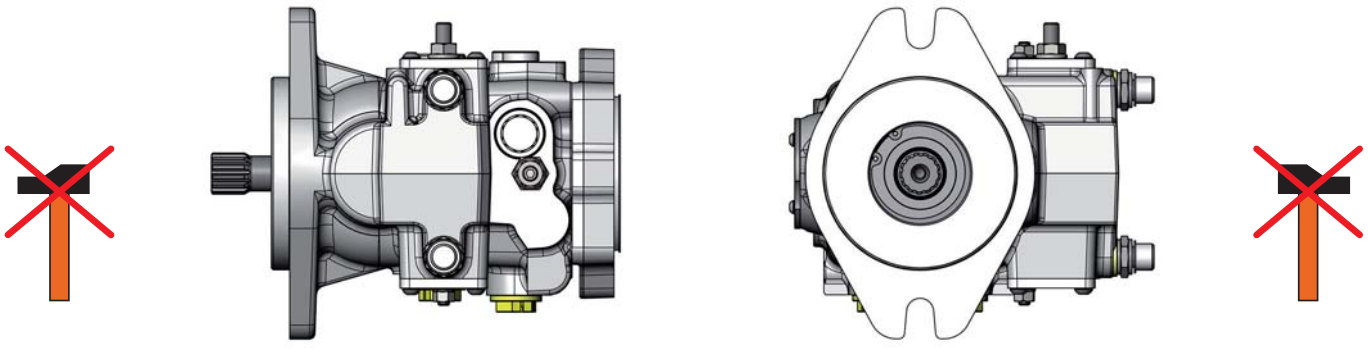
Suction line = 0,6 ÷ 1,2 m / s
Drain = 1,5 ÷ 3,6 m / s
Pressurized lines = max 6 m / s

- 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. See page 11.
- 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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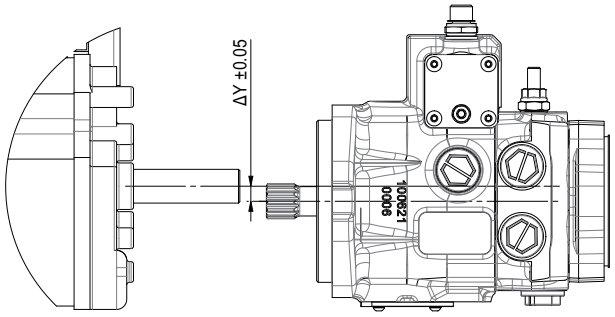
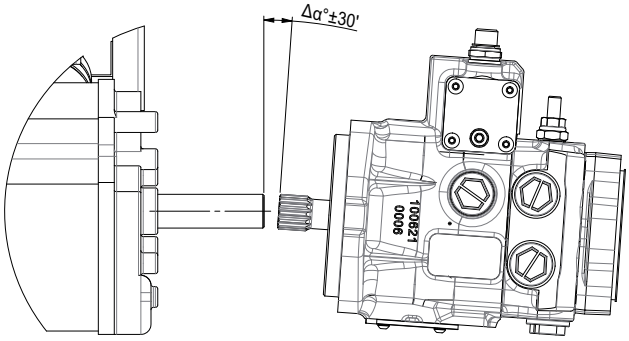
INSTALLATION INSTRUCTIONS

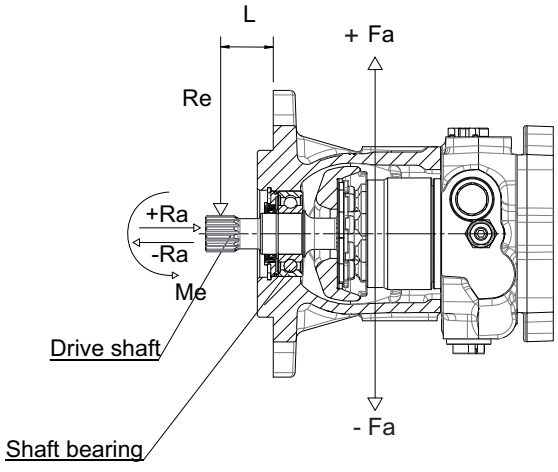
Shaft Coupling

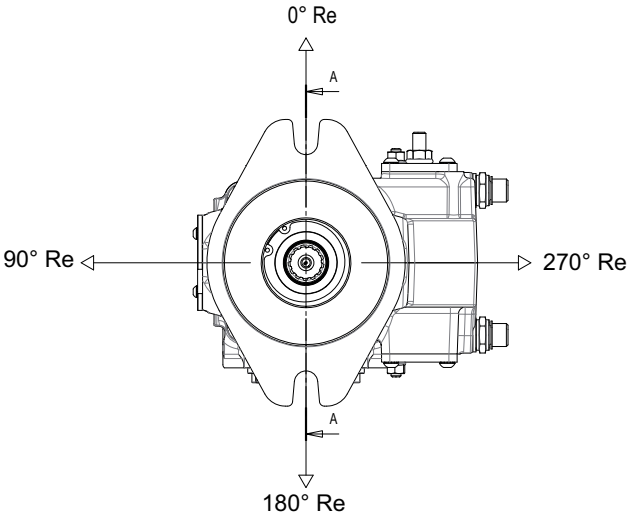
To connect the pump shaft to the engine flywheel or electric motor shaft use a flexible coupling. The alignment must be within the tolerances indicated in the figures below. For an optimal function of the pump the shaft should not be subjected to radial or axial loads. In the presence of radial and axial 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.





		DIRECTION Re			
	ROTATION	0°	90°	180°	270°
RADIAL LOAD Re	Right	**1460 N**	**2500 N**	**4680 N**	**2500 N**
	Left	**4680 N**	**2500 N**	**1460 N**	**2500 N**

AXIAL LOAD	+ Ra	**1800 N**
	- Ra	**1500 N**

(continued)

INSTALLATION

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

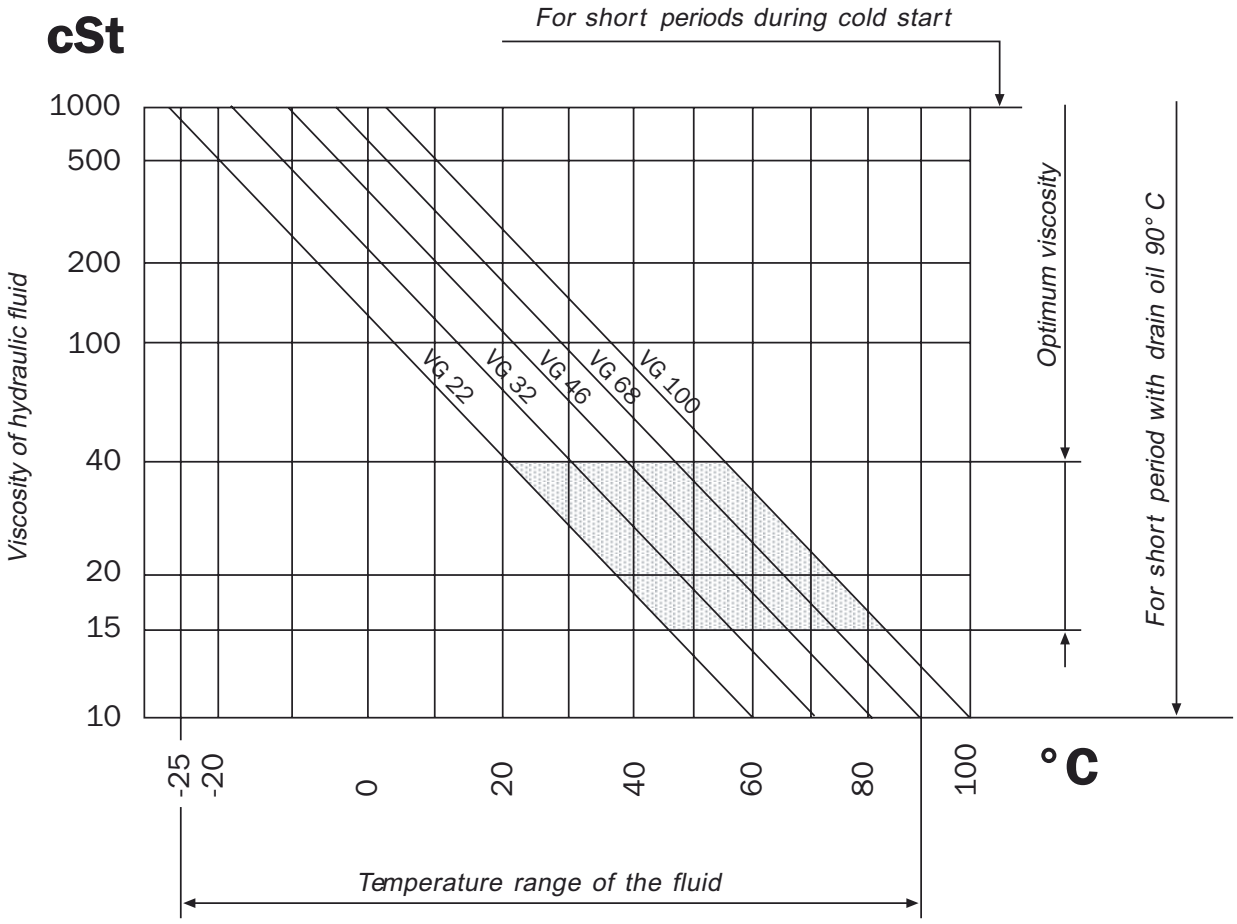
Viscosity

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 out Tech. Dept.

Suction filters

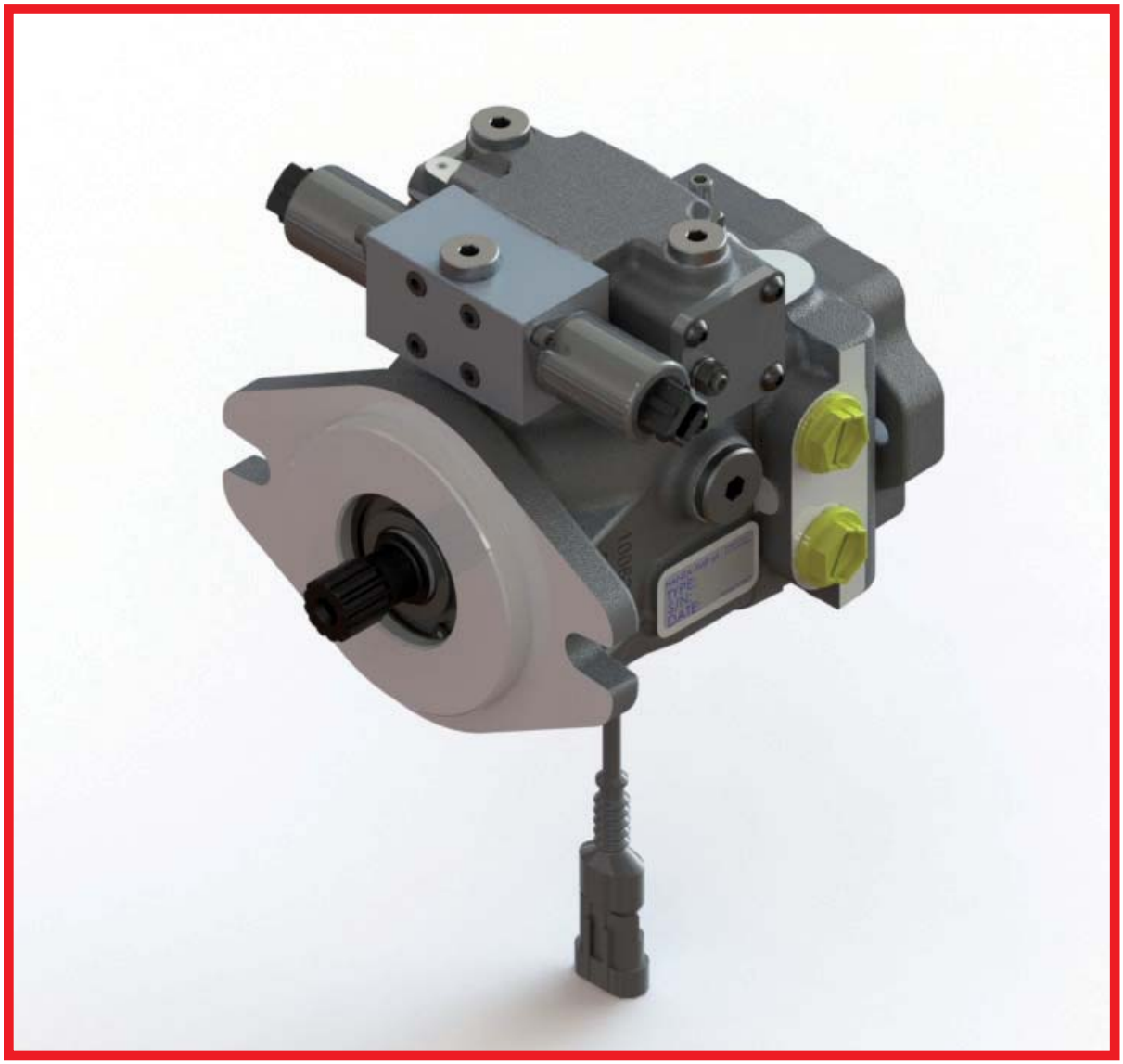
The suction filters will have a clogging indicator and bypass. The max. pressure drop of the filtration element must not exceed 0,04 absolute MPa (0,08 absolute MPa with cold start).

Filter assembling

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

TPV 1500

VARIABLE DISPLACEMENT AXIAL PISTON PUMP



ORDER CODE

1500	TPV	17-9	CR	SS3	F2	SHI	OA	10	06	SA-R	000	1	00
0	1	2	3	4	5	6	7	8	9	10	11	12	13

Pag.

0 - Pump series

1500 = Pump TPV 1500

1 - Pump model

TPV = Closed loop circuit pump

2 - Pump displacement

17-9 = 17,6 cm^3/n **18-9** = 18,7 cm^3/n **19-9** = 19,9 cm^3/n **21-9** = 21,1 cm^3/n

3 - Rotation

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

4 - Shaft (mounting side)

SS3 = Splined shaft SAE-B (ANSI B92.1A - 13T - 16/32 D.P.) **19**

5 - Mounting flange

F2 = SAE-B 2 bolt - pilot diam. 101,6 mm **19**

6 - Controls

SHI = Hydraulic servo control **20**
SHIC = Compact hydraulic servo control **22**
SEI1.3 = Electro-proportional servo control 12V DC (AMP junior timer connector) **24**
SEI2.3 = Electro-proportional servo control 24V DC (AMP junior timer connector) **24**
SEI1.3D = Electro-proportional servo control 12V DC (Deutsch connector) **27**
SEI2.3D = Electro-proportional servo control 24V DC (Deutsch connector) **27**
SHIX = Hydraulic servo control with feed back **30**
SMIX = Mechanical lever servo control with feed back **32**
SEIX1.3 = Electro-proportional servo control with feed back 12V DC (AMP junior timer connector) **34**
SEIX2.3 = Electro-proportional servo control with feed back 24V DC (AMP junior timer connector) **34**
SEIX1.3D = Electro-proportional servo control with feed back 12V DC (Deutsch connector) **37**
SEIX2.3D = Electro-proportional servo control with feed back 24V DC (Deutsch connector) **37**

7 - Control devices position

OA = Position A

8 - 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 **40** = 40 MPa

9 - Boost pump

00 = Without boost pump
06 = Standard pump (5,8 cm^3/n)
Standard setting: 2 MPa (hydraulic /electric servo control) at 1.000 n/min
06(xx) = Other pressure setting on request (between 2 and 3 MPa, please contact our Technical Department)

10 - Through drive connection for rear pump

SA-R = SAE-A 2 bolt female standard (ANSI B92.1a - 9T - 16/32 D.P.) **40**

(continued)

ORDER CODE

11 - Displacements of the auxiliary gear pumps group 2 (SAE-A)

000 = without pump

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	**230** = 30,0 cm^3/n	**234** = 34,2 cm^3/n	**240** =39,6 cm^3/n

12 - Voltage for optionals (where applicable)

0 = Without
1 = 12V DC
2 = 24V DC

13 - Optional

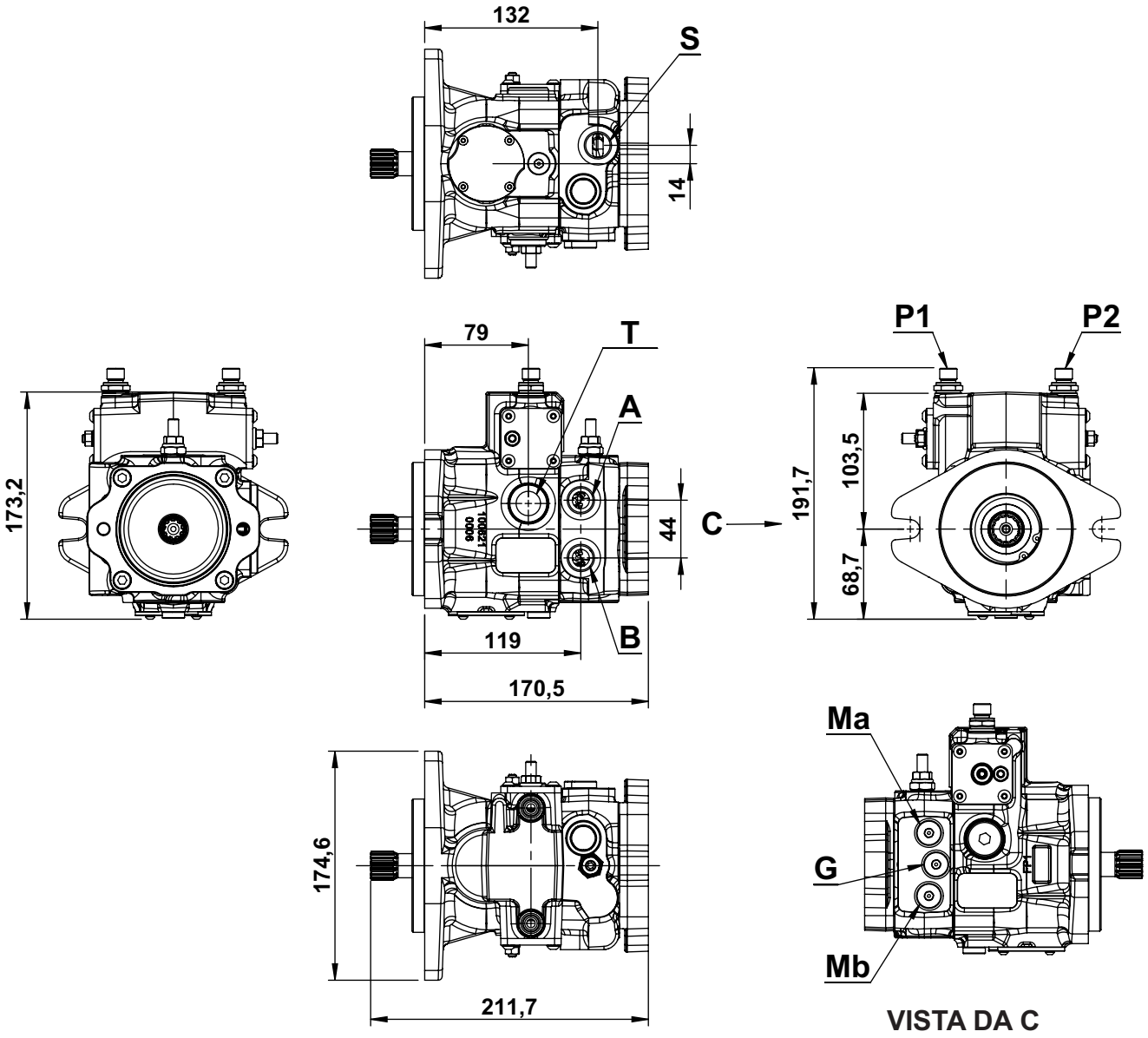
00 = Without optional
VS-SB = Purge valve with screw by-pass **41**
SB = Screw by-pass **42**
FLT = Filter without clogging indicator **43**
FLTI = Filter with clogging indicator **44**
MOB = Man on board **45**
RS = Angle sensor **47**
REV.S = RPM sensor **49**
PRS = Pressure sensor **51**
G/J/M/- = Port threads and restrictor diameter

	Servo control type	Port threads	Symbol
STANDARD	SEI	Plugged	-
	SHI	1/4" BSPP	G
ON REQUEST	SHI	JIC (7/16" - 20)	J
	SHI	METRIC (M12x1,5)	M

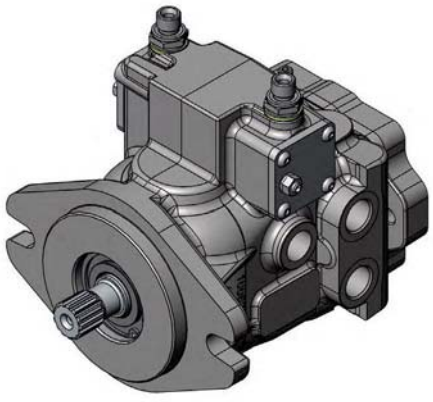
Example G/08 = 1/4" BSPP port threads and Ø 0,8 mm restrictor (SHI)
Example -/08 = Ø 0,8 mm restrictor (SEI)

Restrictor diameter (SHI/SEI)	
-	Without restrictor
06	Restrictor orifice ø 0,6 mm
08	Restrictor orifice ø 0,8 mm
10	Restrictor orifice ø 1,0 mm
12	Restrictor orifice ø 1,2 mm
16	Restrictor orifice ø 1,6 mm
20	Restrictor orifice ø 2,0 mm

GENERAL DIMENSIONS / PORTS



PORTS		
A - B	Main pressure ports	1/2" BSPP
T	Drain	1/2" BSPP
S	Suction	1/2" BSPP
G	Boost system pressure port	1/4" BSPP
P1 - P2	Servo control ports (male)	1/4" BSPP
Ma - Mb	Pressure gauge ports	1/4" BSPP

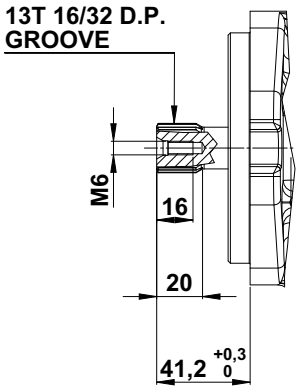


SHAFT OPTIONS AND MOUNTING FLANGES

SS3

SPLINED SHAFT 13T

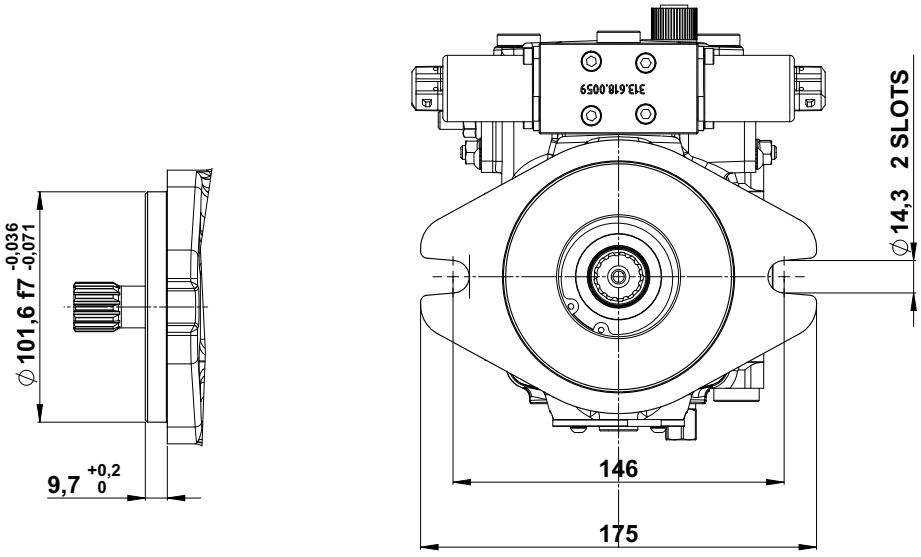
Norm SAE-B ANSI B92.2-1970 CLASS 5
Max. torque = 320 Nm



Caution: in case of multiple pump applications the total torque requested must be limited to the above value.

F2

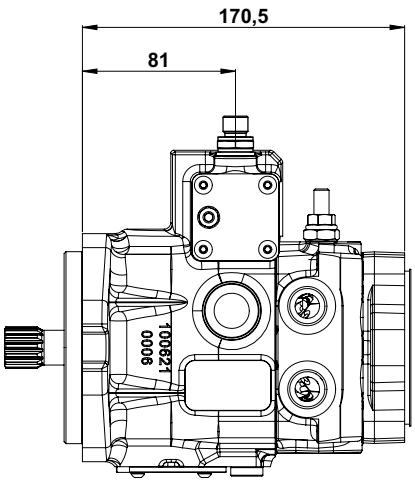
FLANGE SAE B - 2 BOLT

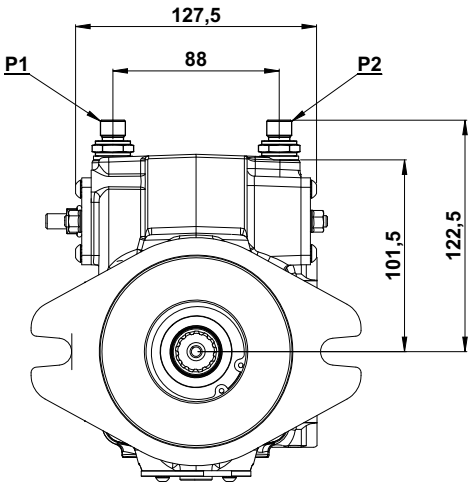


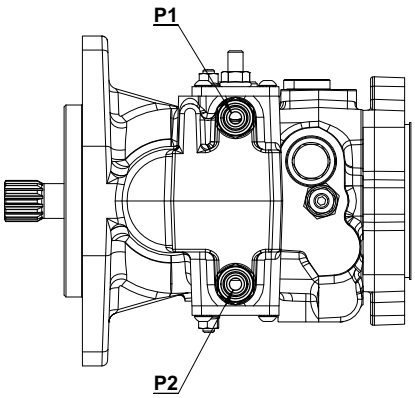
SHI

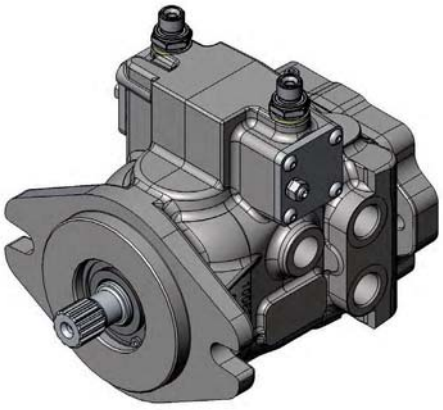
HYDRAULIC SERVO CONTROL

The pump displacement variation is obtained by adjusting the pressure on P1 and P2 servo control ports by means of a hydraulic proportional joystick (with integrated pressure reducing valves).
The servo control oils supply can be obtained by taking pressure from the boost pump (G port), see pag. 18.
The servo control return 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 directions, goes from 0,4 to 1,8 MPa (tolerance (± 5 %).
The adjusting curve of the hydraulic joystick has to be a little wider (0,3 ÷ 1,9 MPa).







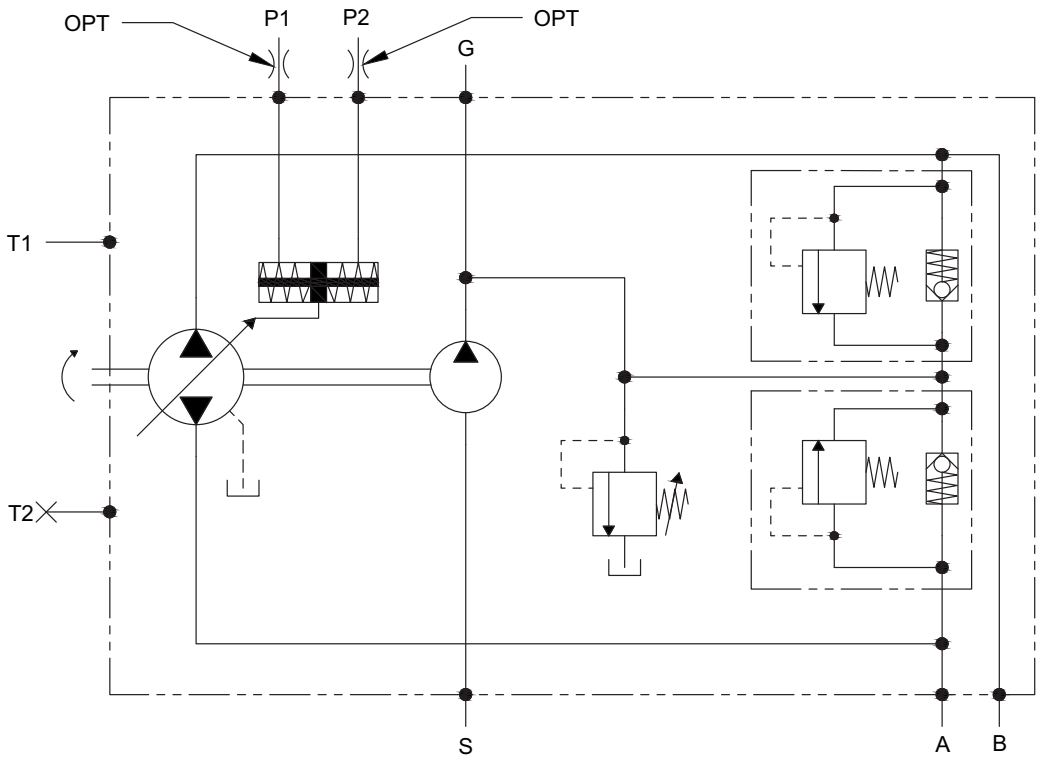


(continued)

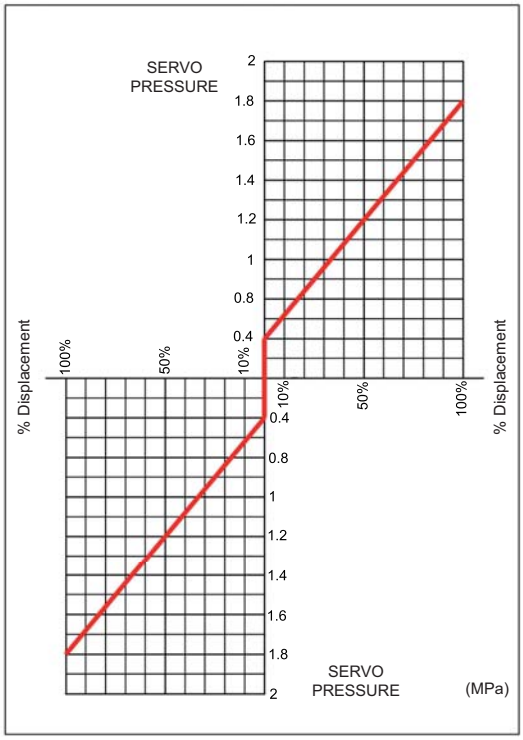
SHI

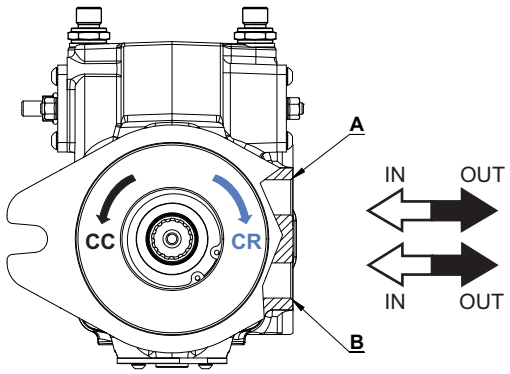
COMPACT HYDRAULIC SERVO CONTROL

HYDRAULIC DIAGRAM



SERVO PRESSURE - DISPLACEMENT GRAPHIC





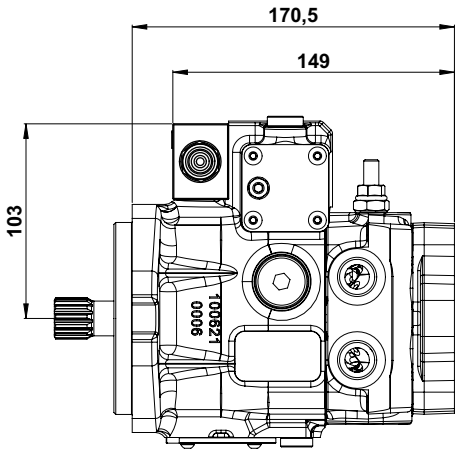
FLOW DIRECTION	PUMP		
Rotation	Port	OUT	IN
Clockwise (CR)	P_1 P_2	B A	A B
Counter clockwise (CC)	P_1 P_2	A B	B A

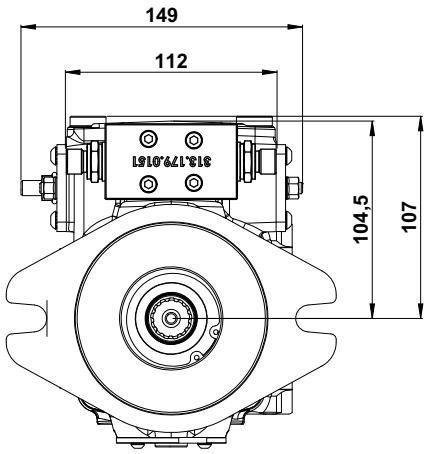
SHIC

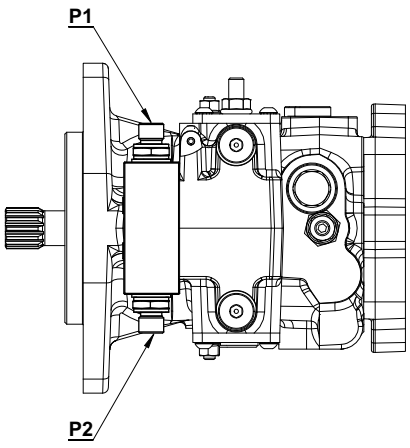
COMPACT HYDRAULIC SERVO CONTROL

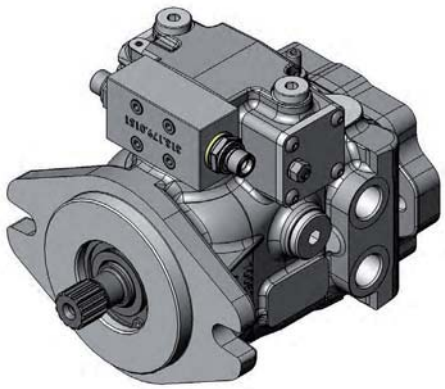
(with side pilot ports)

The pump displacement variation is obtained by adjusting the pressure on P1 and P2 servo control ports by means of a hydraulic proportional joystick (with integrated pressure reducing valves).
The servo control supply can be obtained by taking pressure from the boost pump (G port), see pag. 18.
The servo control return time can be adjusted by inserting a restrictor on the P1 and P2 ports on the pump (0,5 ÷ 1,2 mm).
The servo control operation curve, in both directions, goes from 0,4 to 1,8 MPa (tolerance (± 5 %).
The adjusting curve of the hydraulic joystick has to be a little wider (0,3 ÷ 1,9 MPa).









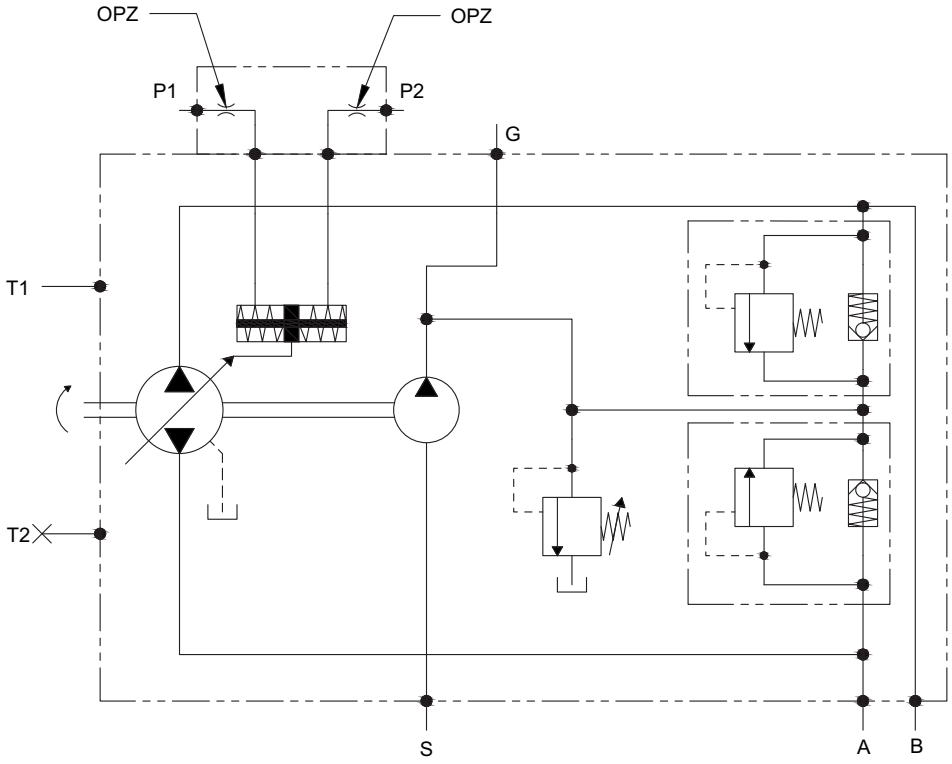
(continued)

SHIC

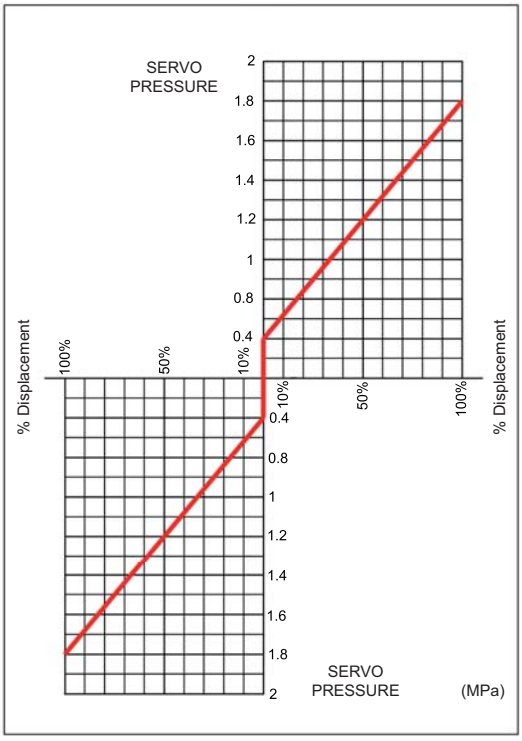
COMPACT HYDRAULIC SERVO CONTROL

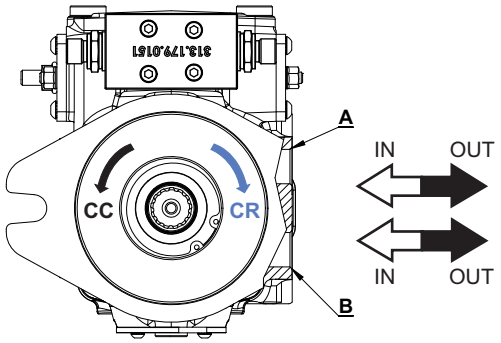
(with side pilot ports)

HYDRAULIC DIAGRAM



SERVO PRESSURE - DISPLACEMENT GRAPHIC





FLOW DIRECTION	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

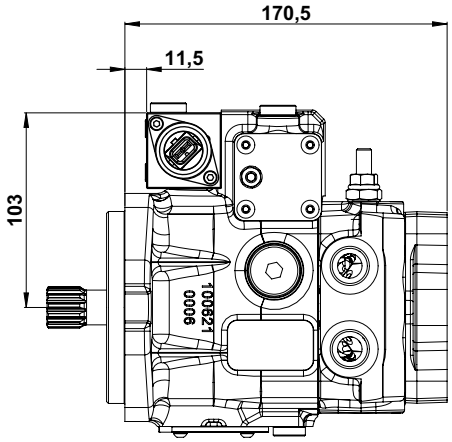
SEI 1.3 (12V DC)
SEI 2.3 (24V DC)

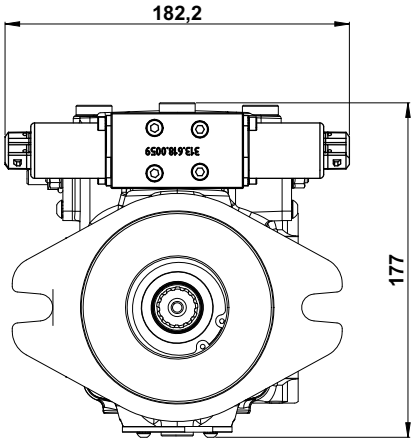
ELECTRO-PROPORTIONAL SERVO CONTROL

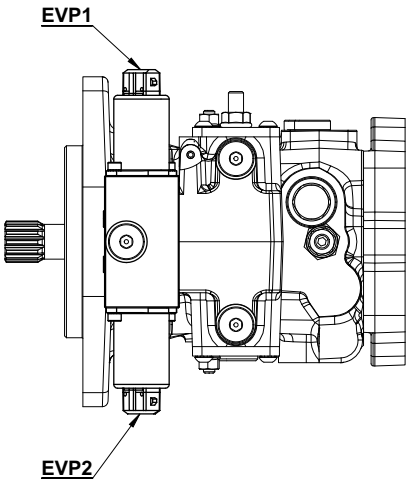
(AMP junior timer connector)

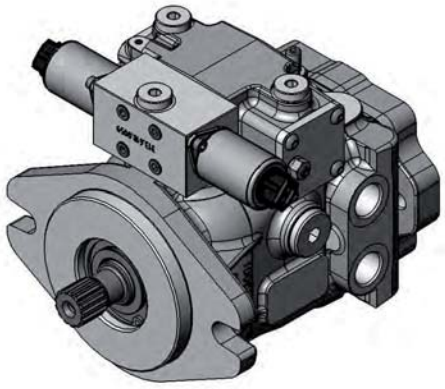
The pump displacement variation is obtained by an electric signal that goes from:

- 0 to 750 mA (24V DC voltage)
- 0 to 1500 mA (12V DC voltage)









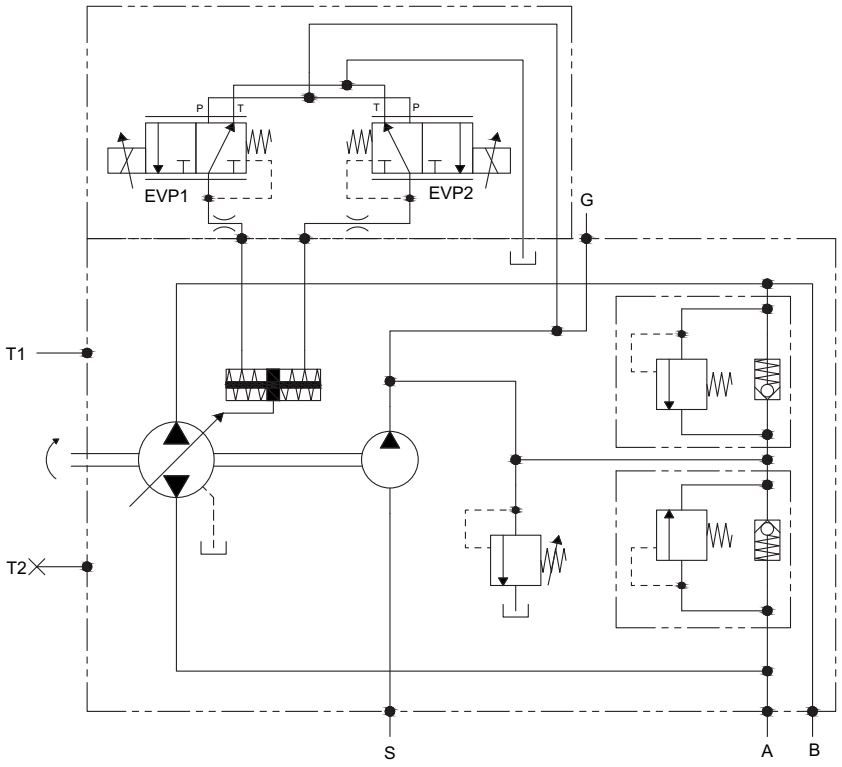
(continued)

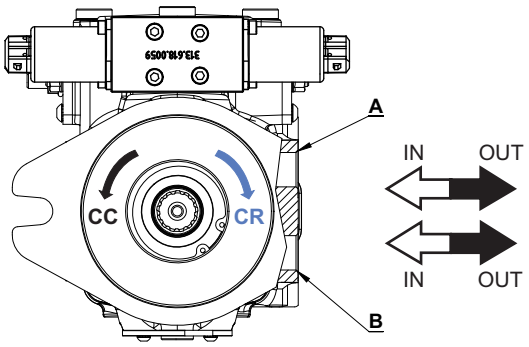
SEI 1.3 (12V DC)
SEI 2.3 (24V DC)

ELECTRO-PROPORTIONAL SERVO CONTROL

(AMP junior timer connector)

HYDRAULIC DIAGRAM





FLOW DIRECTION	PUMP		
Rotation	EVP	OUT	IN
Clockwise (CR)	EVP1 EVP2	B A	A B
Counter clockwise (CC)	EVP1 EVP2	A B	B A

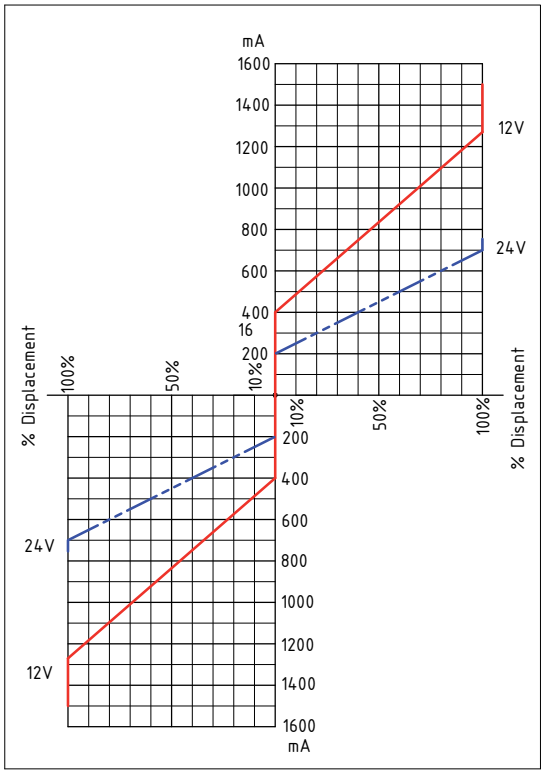
(continued)

SEI 1.3 (12V DC)
SEI 2.3 (24V DC)

ELECTRO-PROPORTIONAL SERVO CONTROL

(AMP junior timer connector)

CURRENT-DISPLACEMENT GRAPHIC



ELECTRICAL FEATURES		
Voltage	12 V DC	24 V DC
Electric current	1500 mA	750 mA
Load resistence	4,72 Ω ± 5%	20,8 Ω ± 5%
Type of control	Current control	
	PWM 100 Hz (suggested)	
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 -20 to +90°C

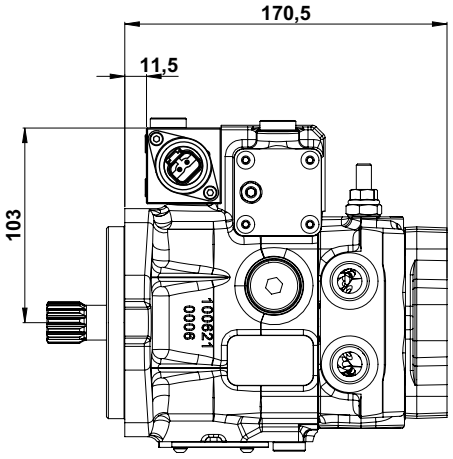
SEI 1.3D (12V DC)
SEI 2.3D (24V DC)

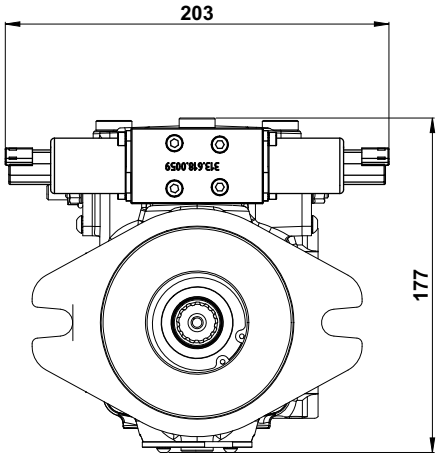
ELECTRO-PROPORTIONAL SERVO CONTROL

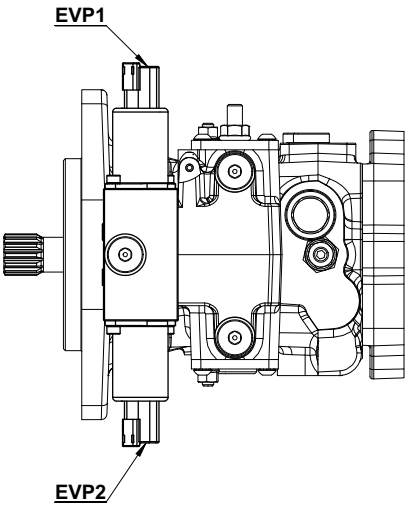
(Deutsch connector)

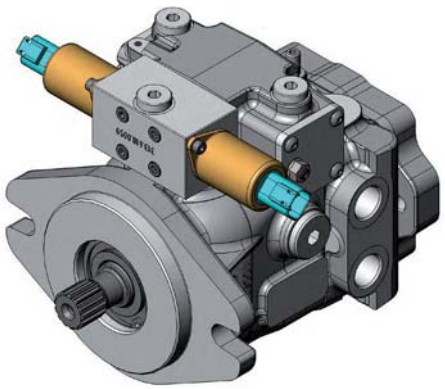
The pump displacement variation is obtained by an electric signal that goes from:

- 0 to 750 mA (24V DC voltage)
- 0 to 1500 mA (12V DC voltage)









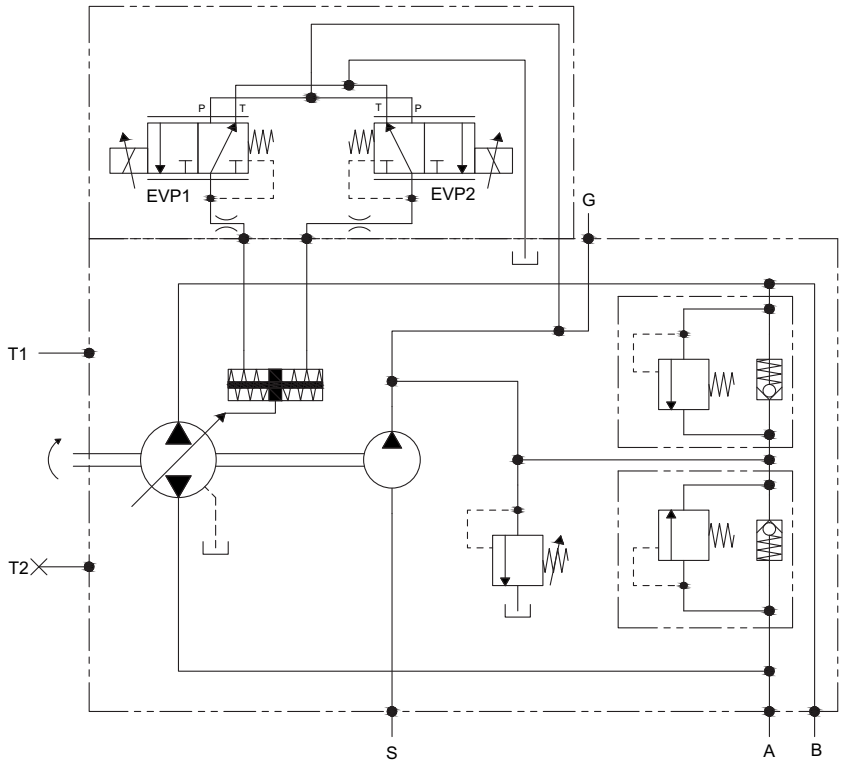
(continued)

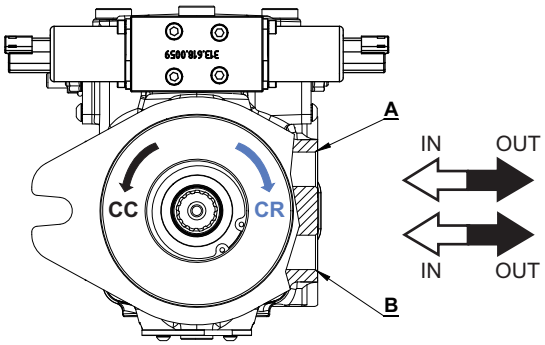
SEI 1.3D (12V DC)
SEI 2.3D (24V DC)

ELECTRO-PROPORTIONAL SERVO CONTROL

(Deutsch connector)

HYDRAULIC DIAGRAM





FLOW DIRECTION	PUMP		
Rotation	EVP	OUT	IN
Clockwise (CR)	EVP1 EVP2	B A	A B
Counter clockwise (CC)	EVP1 EVP2	A B	B A

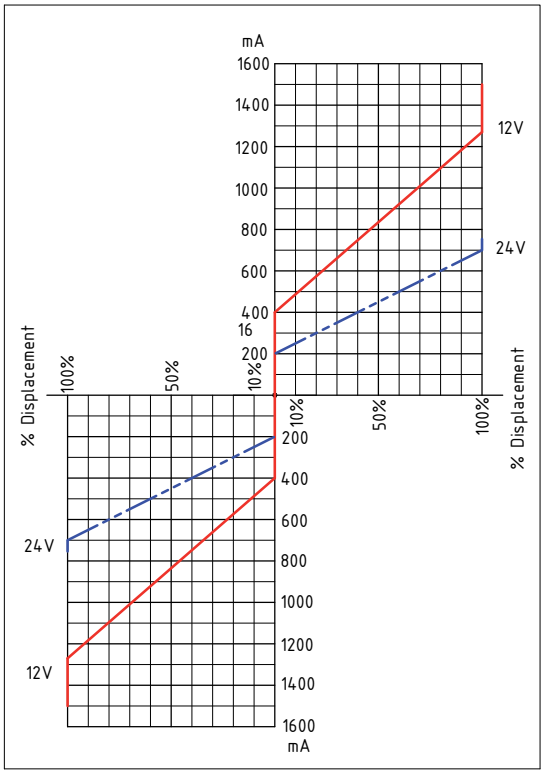
(continued)

SEI 1.3D (12V DC)
SEI 2.3D (24V DC)

ELECTRO-PROPORTIONAL SERVO CONTROL

(Deutsch connector)

CURRENT-DISPLACEMENT GRAPHIC



ELECTRICAL FEATURES		
Voltage	12 V DC	24 V DC
Electric current	1500 mA	750 mA
Load resistence	4,72 Ω ± 5%	20,8 Ω ± 5%
Type of control	Current control	
	PWM 100 Hz (suggested)	
Type of connection	DEUTSCH DT 04-2P	
Protection class	Until IP6K6 / IPX9K	

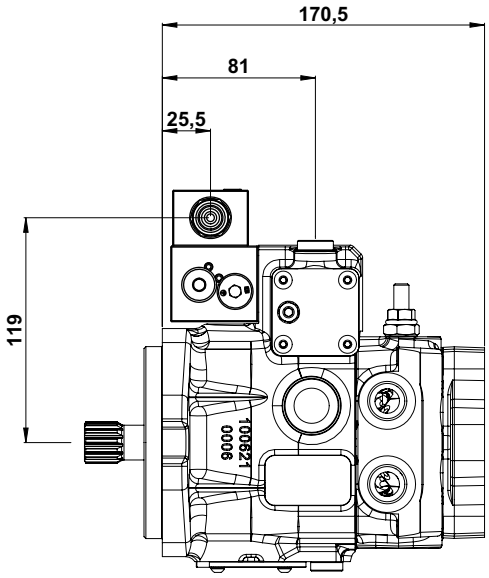
HYDRAULIC FEATURES	
Max. pressure (P, T)	pP= 5 MPa, pT= 3 MPa
Hysteresis (w/PWM)	<0,07 MPa (pA=2,0)
	<0,1 MPa (pA=2,5)
	<0,15 MPa (pA=3,5)
Filtration ratio	125 µm
Oil contamination level	Min. filtration ratio: 20/18/15
	According ISO 4406
	Hydraulic oil DIN 51524
Min./max. oil temperature	From -20 to +90°C

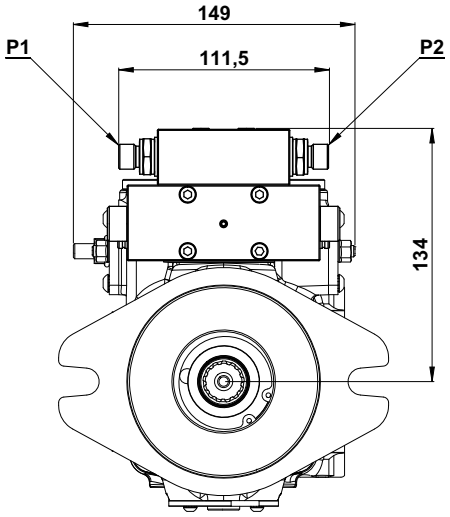
SHIX

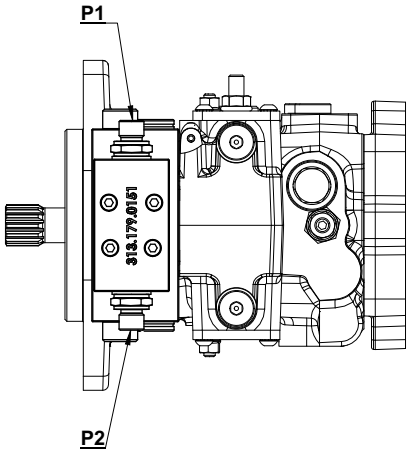
HYDRAULIC SERVO CONTROL WITH FEED BACK

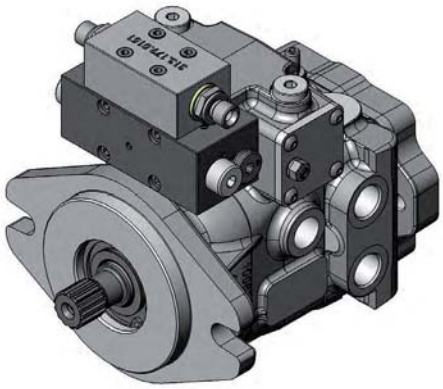
The pump displacement variation is obtained by adjusting the pressure on P1 and P2 servo control ports by means of a hydraulic proportional joystick (with integrated pressure reducing valves).
The servo control supply can be obtained by taking pressure from the boost pump (G port), see pag. 18.
The servo control return 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 directions, goes from 0,4 to 1,8 MPa (tolerance (± 5 %).
The adjusting curve of the hydraulic joystick has to be a little higher (0,3 ÷ 1,9 MPa).







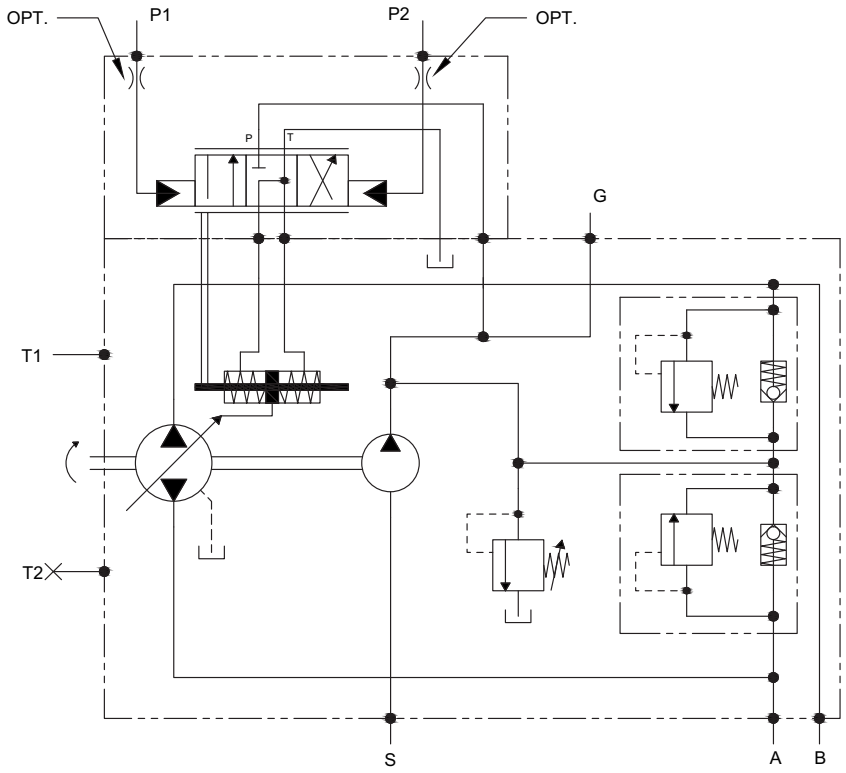


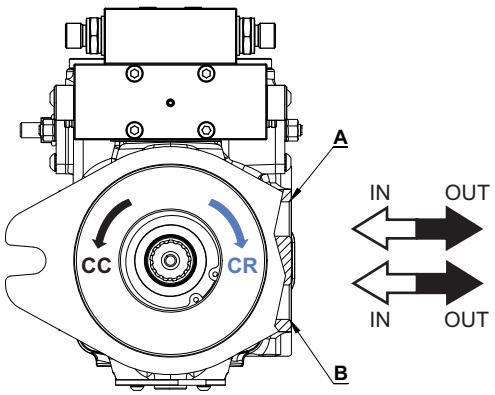
(continued)

SHIX

HYDRAULIC SERVO CONTROL WITH FEED BACK

HYDRAULIC DIAGRAM



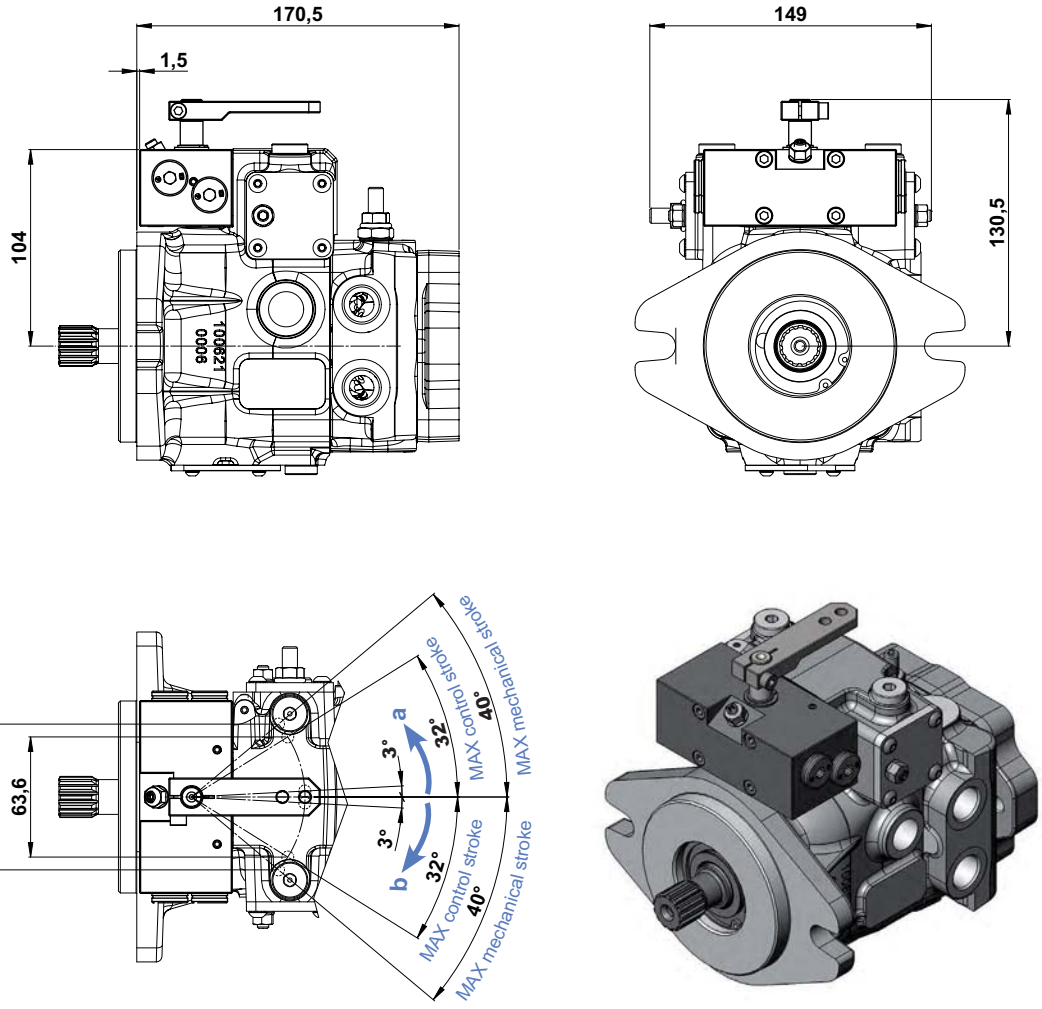


FLOW DIRECTION	PUMP		
Rotation	Port	OUT	IN
Clockwise (CR)	P_1 P_2	A B	B A
Counter clockwise (CC)	P_1 P_2	B A	A B

SMIX

MANUAL LEVER CONTROL WITH FEED BACK

The pump displacement variation is directly related to the angle position of the lever.

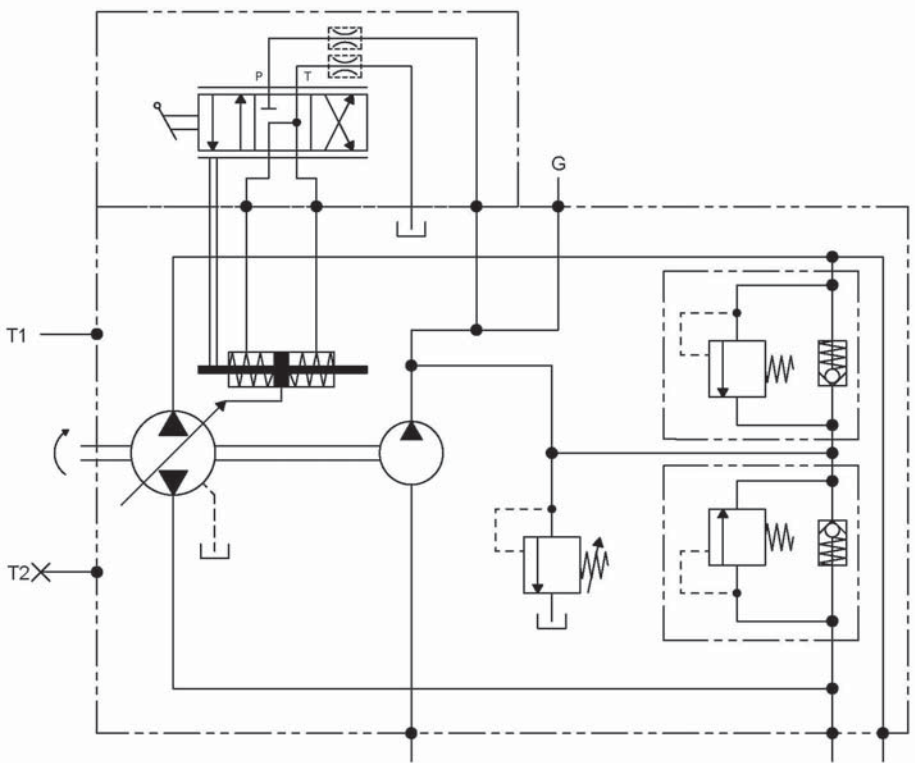


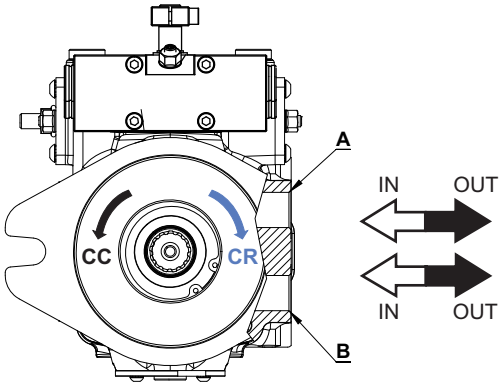
(continued)

SMIX

MANUAL LEVER CONTROL WITH FEED BACK

HYDRAULIC DIAGRAM





FLOW DIRECTION	PUMP		
Rotation	Port	OUT	IN
Clockwise (CR)	a b	B A	A B
Counter clockwise (CC)	a b	A B	B A

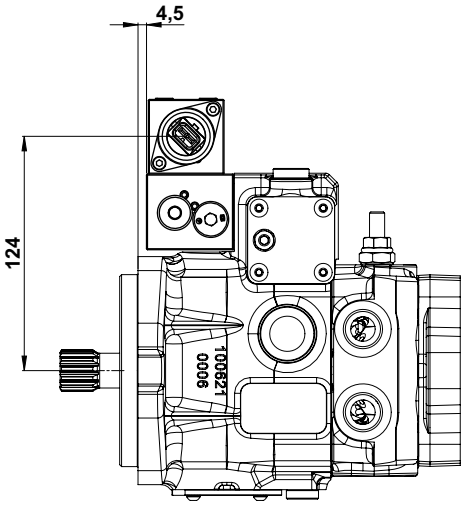
SEIX 1.3 (12V DC)
SEIX 2.3 (24V DC)

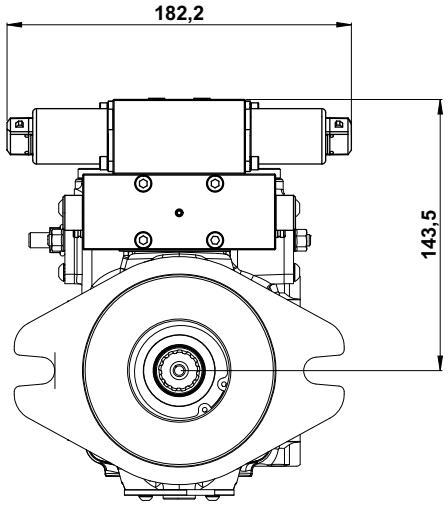
ELECTRO-PROPORTIONAL SERVO CONTROL WITH FEED BACK

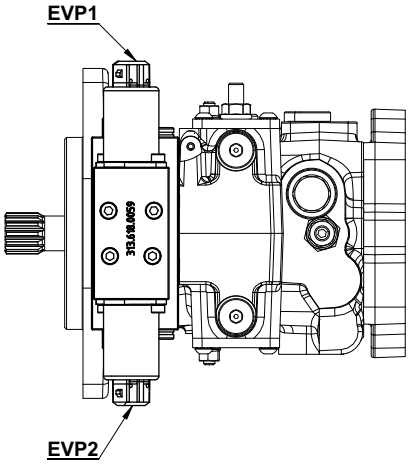
(AMP junior timer connector)

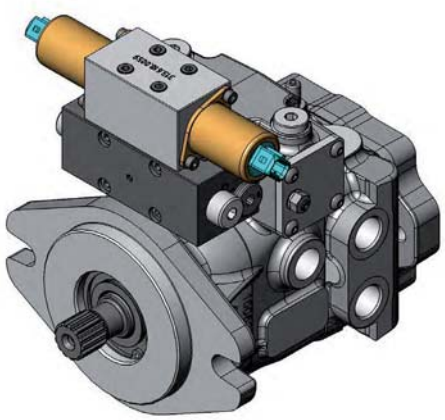
The pump displacement variation is obtained by an electric signal that goes from:

- 0 to 750 mA (24V DC voltage)
- 0 to 1500 mA (12V DC voltage)









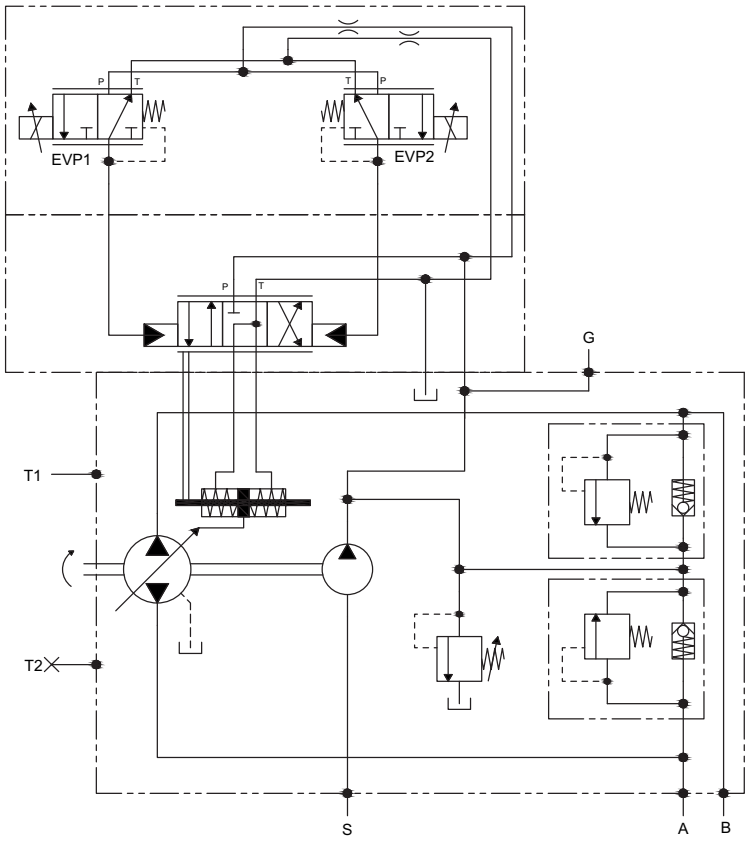
(continued)

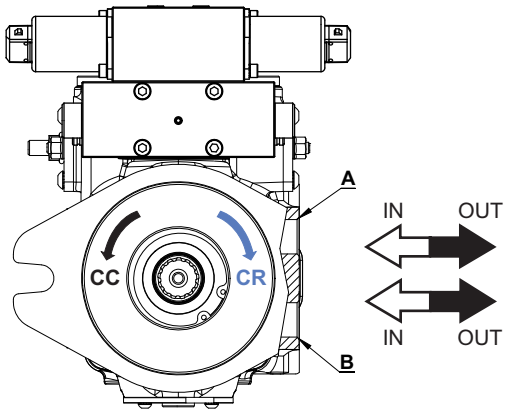
SEIX 1.3 (12V DC)
SEIX 2.3 (24V DC)

ELECTRO-PROPORTIONAL SERVO CONTROL WITH FEED BACK

(AMP junior timer connector)

HYDRAULIC DIAGRAM





FLOW DIRECTION	PUMP		
Rotation	EVP	OUT	IN
Clockwise (CR)	EVP1 EVP2	A B	B A
Counter clockwise (CC)	EVP1 EVP2	B A	A B

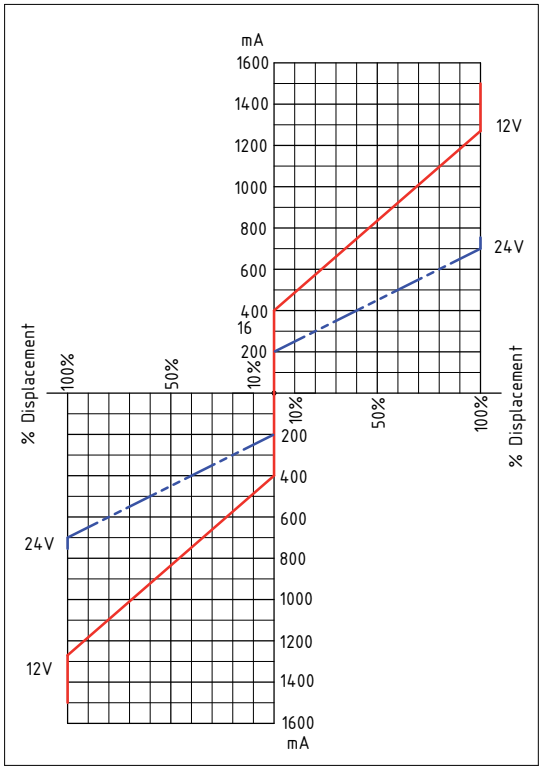
(continued)

SEIX 1.3 (12V DC)
SEIX 2.3 (24V DC)

ELECTRO-PROPORTIONAL SERVO CONTROL WITH FEED BACK

(AMP junior timer connector)

CURRENT-DISPLACEMENT GRAPHIC



ELECTRICAL FEATURES		
Voltage	12 V DC	24 V DC
Electric current	1500 mA	750 mA
Load resistence	4,72 Ω ± 5%	20,8 Ω ± 5%
Type of control	Current control	
	PWM 100 Hz (suggested)	
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 -20 to +90°C

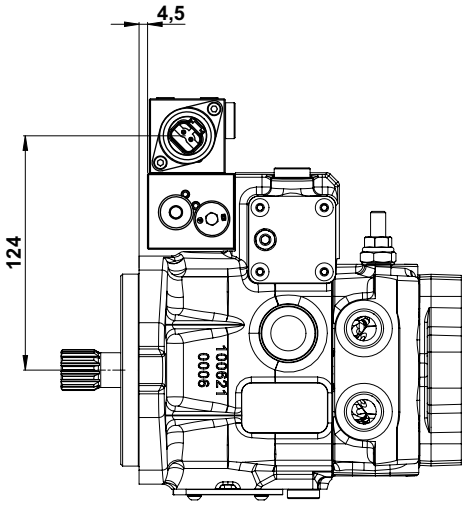
SEIX 1.3D (12V DC)
SEIX 2.3D (24V DC)

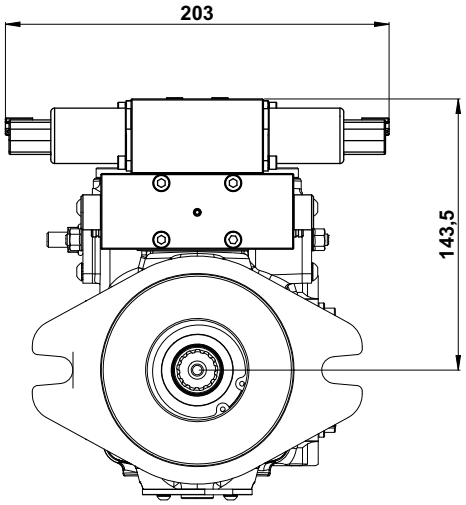
ELECTRO-PROPORTIONAL SERVO CONTROL WITH FEED BACK

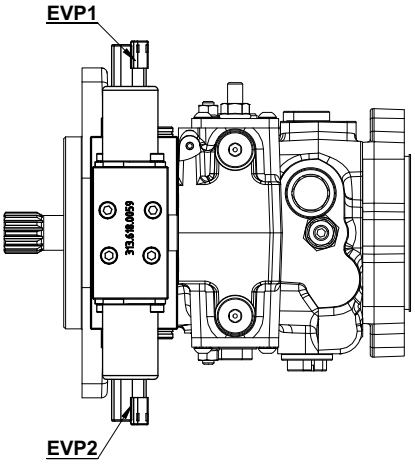
(Deutsch connector)

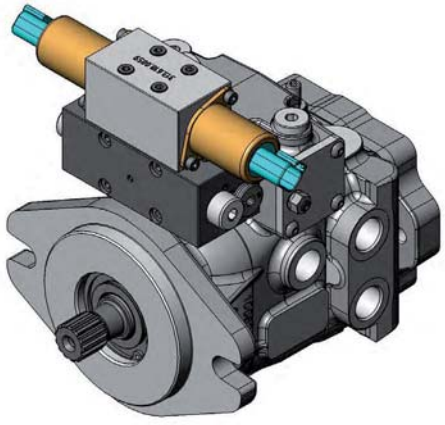
The pump displacement variation is obtained by an electric signal that goes from:

- 0 to 750 mA (24V DC voltage)
- 0 to 1500 mA (12V DC voltage)









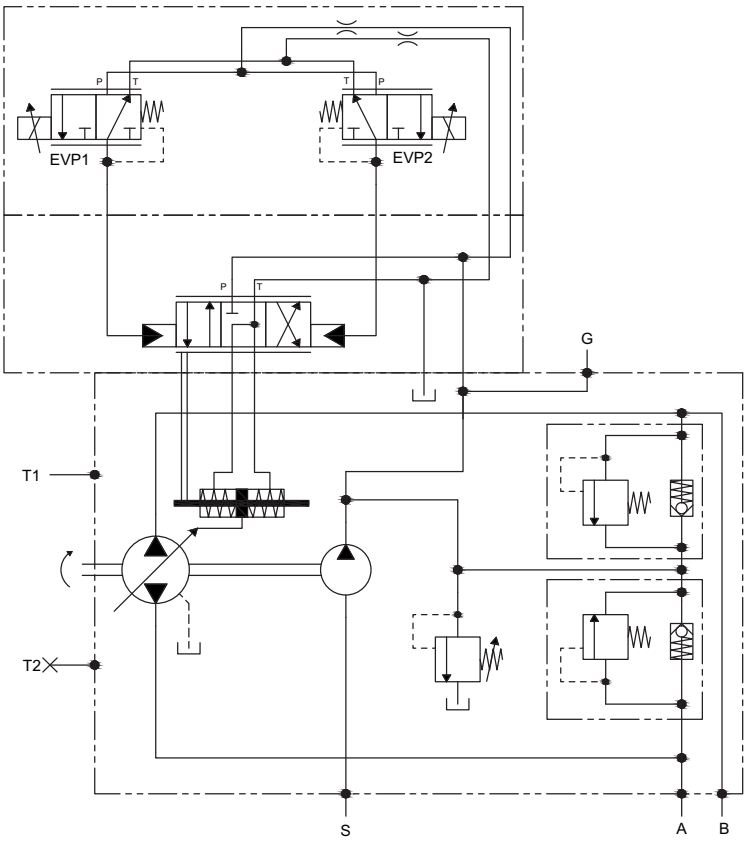
(continued)

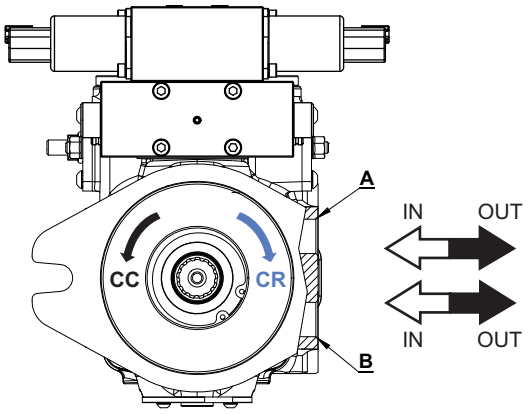
SEIX 1.3D (12V DC)
SEIX 2.3D (24V DC)

ELECTRO-PROPORTIONAL SERVO CONTROL WITH FEED BACK

(Deutsch connector)

HYDRAULIC DIAGRAM





FLOW DIRECTION	PUMP		
Rotation	EVP	OUT	IN
Clockwise (CR)	EVP1 EVP2	A B	B A
Counter clockwise (CC)	EVP1 EVP2	B A	A B

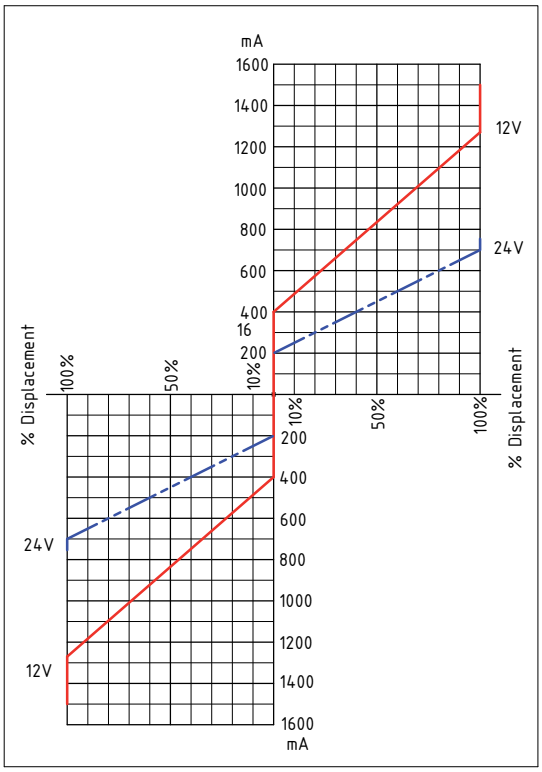
(continued)

SEIX 1.3D (12V DC)
SEIX 2.3D (24V DC)

ELECTRO-PROPORTIONAL SERVO CONTROL WITH FEED BACK

(Deutsch connector)

CURRENT-DISPLACEMENT GRAPHIC



ELECTRICAL FEATURES		
Voltage	12 V DC	24 V DC
Electric current	1500 mA	750 mA
Load resistence	4,72 Ω ± 5%	20,8 Ω ± 5%
Type of control	Current control	
	PWM 100 Hz (suggested)	
Type of connection	DEUTSCH DT 04-2P	
Protection class	Until IP6K6 / IPX9K	

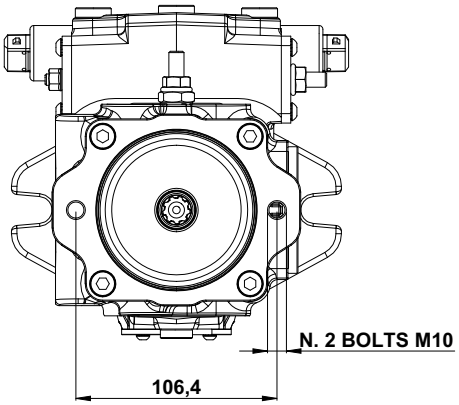
HYDRAULIC FEATURES	
Max. pressure (P, T)	pP= 5 MPa, pT= 3 MPa
Hysteresis (w/PWM)	<0,07 MPa (pA=2,0)
	<0,1 MPa (pA=2,5)
	<0,15 MPa (pA=3,5)
Filtration ratio	125 µm
Oil contamination level	Min. filtration ratio: 20/18/15
	According ISO 4406
	Hydraulic oil DIN 51524
Min./max. oil temperature	From -20 to +90°C

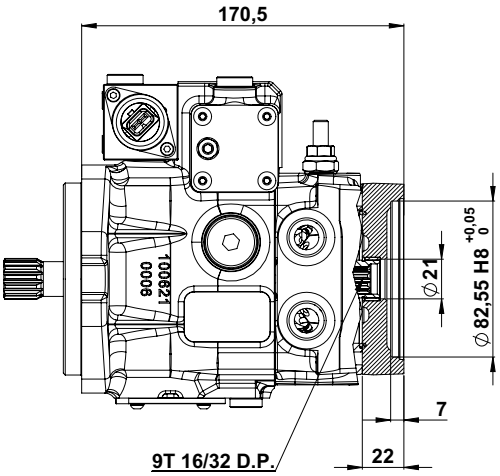
THROUGH DRIVE OPTION

SAE A - R

FLANGE SAE A - 2 BOLT

ISO 3019-7
Max. torque = 120 Nm



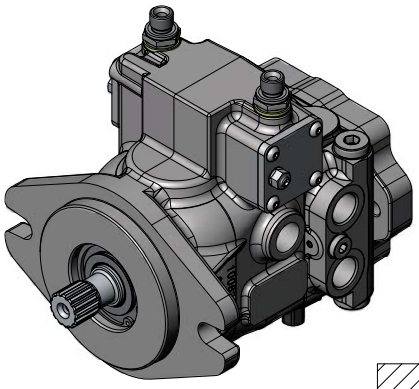


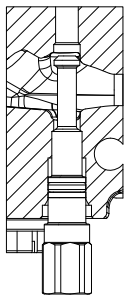
ANSI B92.1-1970 CLASS 7

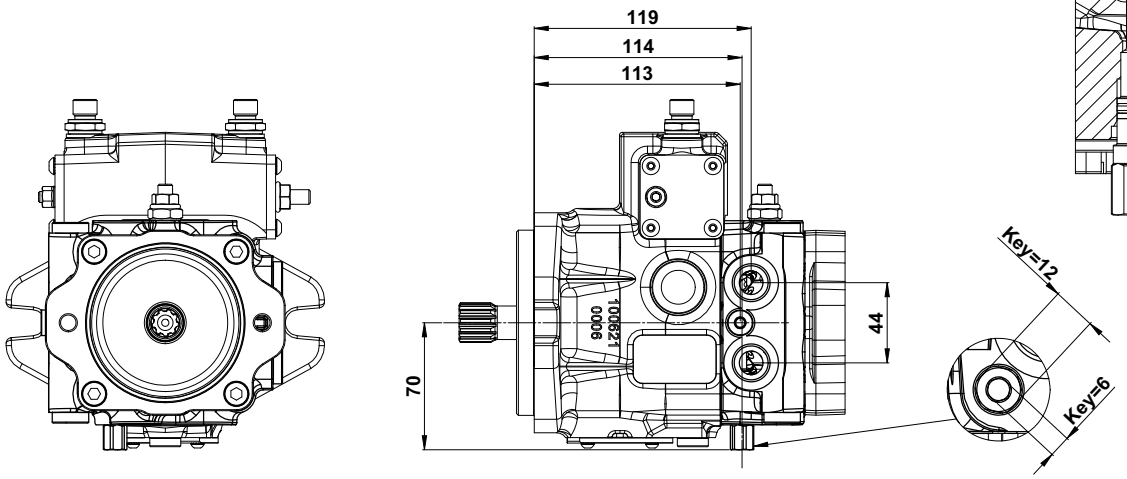
OPTIONAL VS-SB

PURGE VALVE WITH SCREW BY-PASS

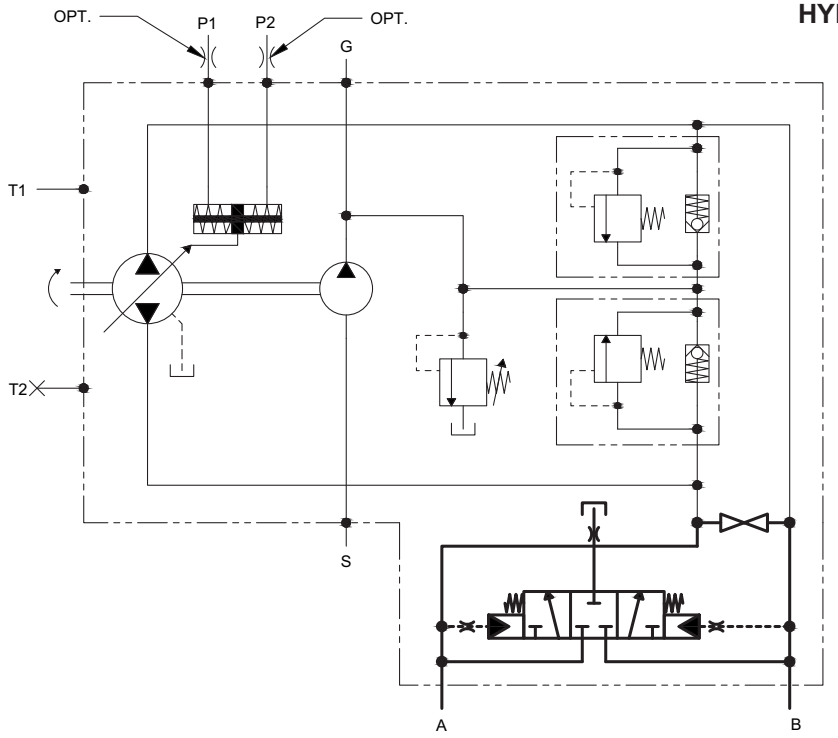
For the pump TPV-TPVTC 1500 an integrated purge valve (loop flushing) is available.
The valve consists of a spring centered shuttle spool connecting automatically the low pressure line (boost) with the reservoir removing heat from the system.
The quantity of the flushing oil is a function of the low system pressure (boost) and the size of the orifice on the valve (different orifices are available referred to the system pressure). The spool shifts at a differential pressure of about 0,8 MPa (116 PSI).







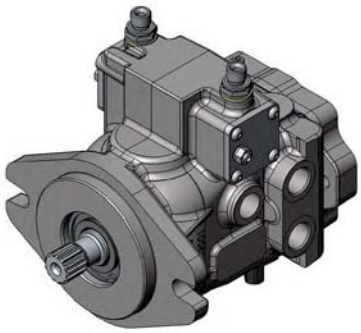
HYDRAULIC DIAGRAM

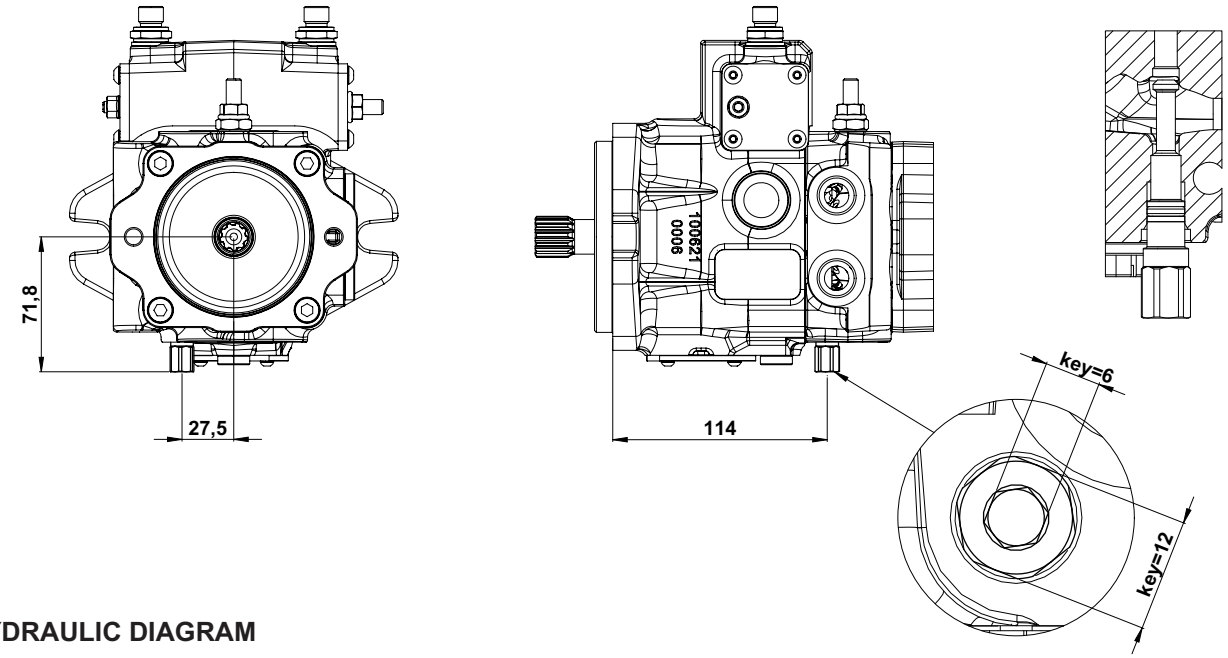


OPTIONAL SB

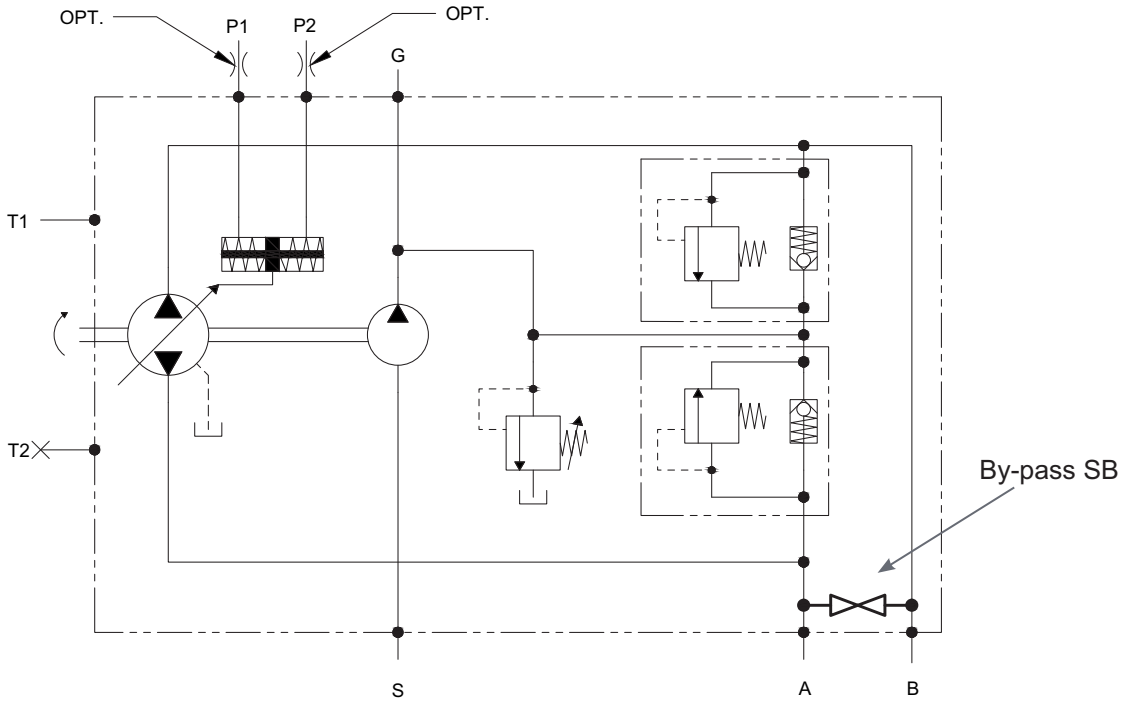
SCREW BY- PASS

To by pass the oil flow from one direction to the other, with the pump not running or in emergency condition, a by pass screw can be actuated to connect the 2 lines of the hydraulic system. The orifice is completely open after 4 counter-clockwise rotations of the screw.





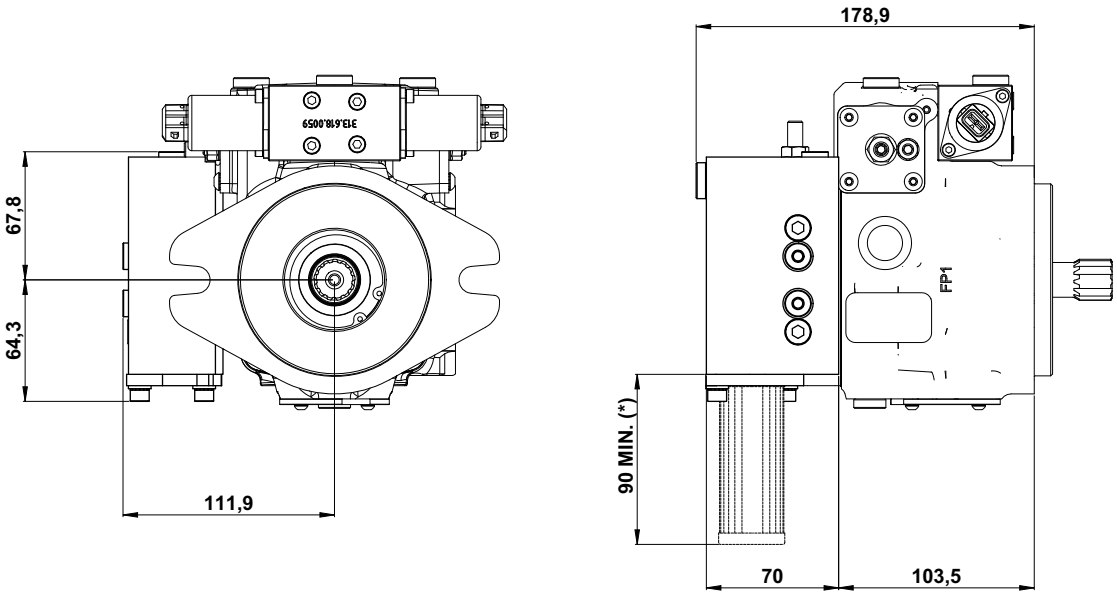
HYDRAULIC DIAGRAM



OPTIONAL FLT

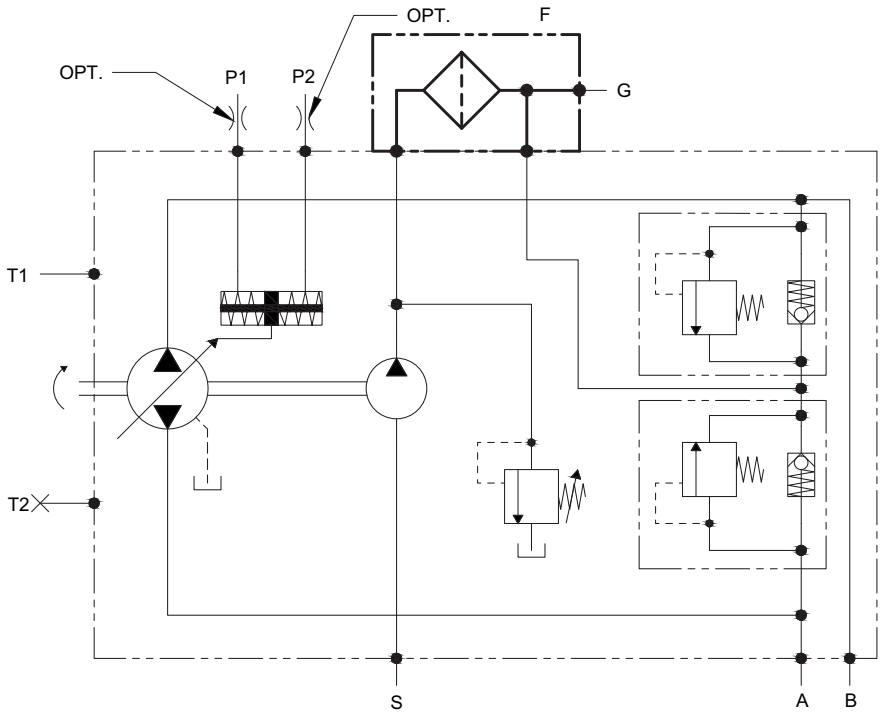
FILTER WITHOUT CLOGGING INDICATOR

To assure the oil filtration of the boost circuit, an optional filter is available, directly flanged to the pump.



(*) min. space to allow filter replacement

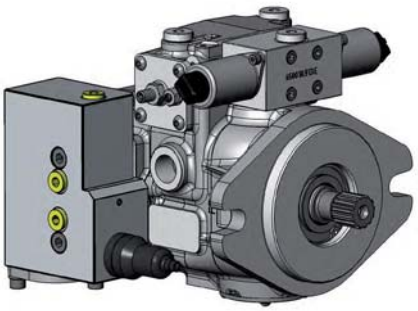
HYDRAULIC DIAGRAM

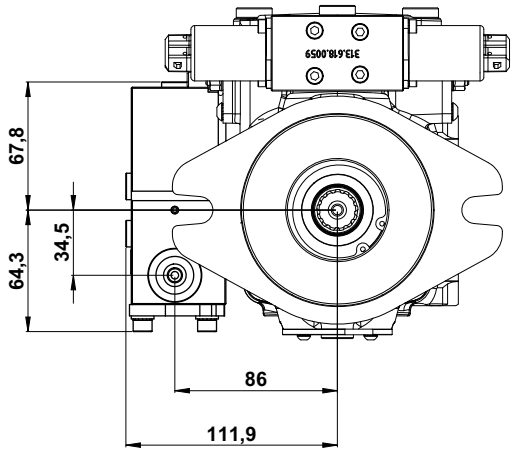


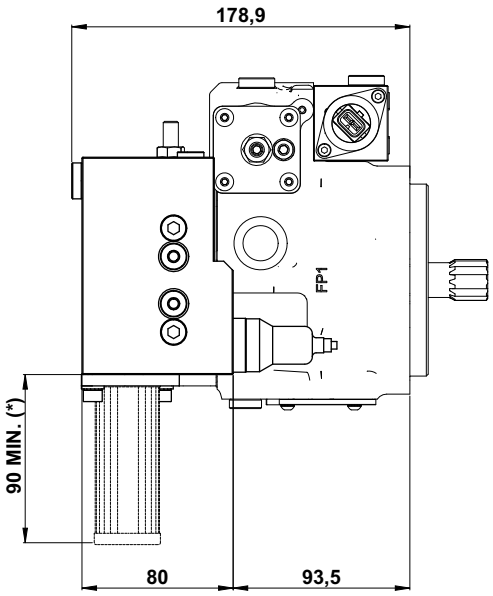
OPTIONAL FLTI

FILTER WITH CLOGGING INDICATOR

To assure the oil filtration of the boost circuit, an optional filter, with clogging indicator, is available directly flanged to the pump. The clogging indicator is set at 0,13 MPa.

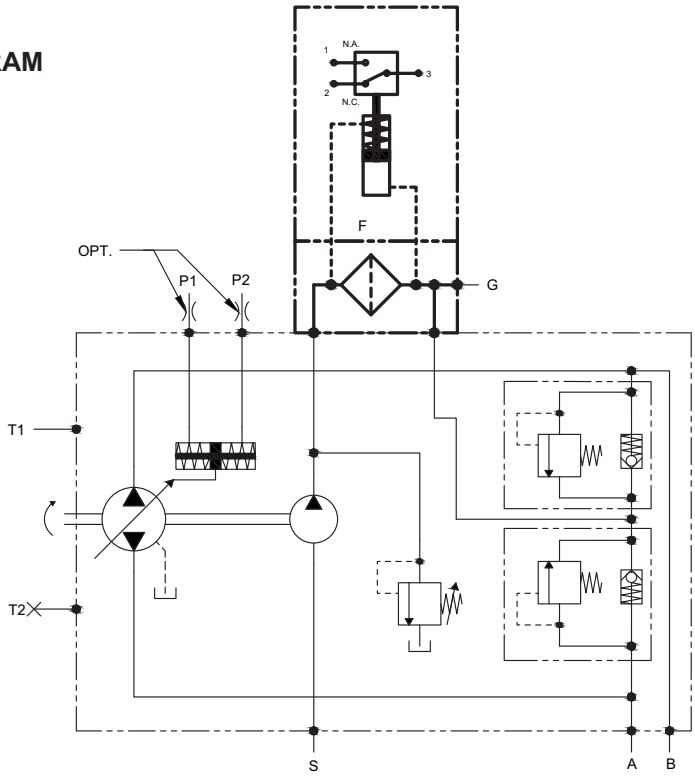






(*) min. space to allow filter replacement

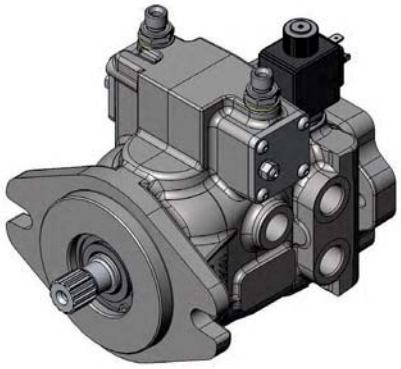
HYDRAULIC DIAGRAM

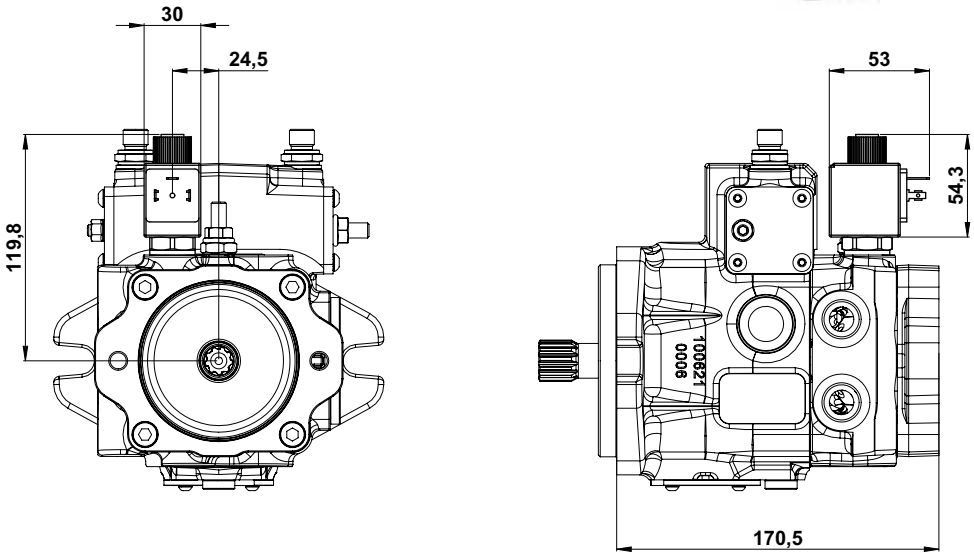


OPTIONAL MOB

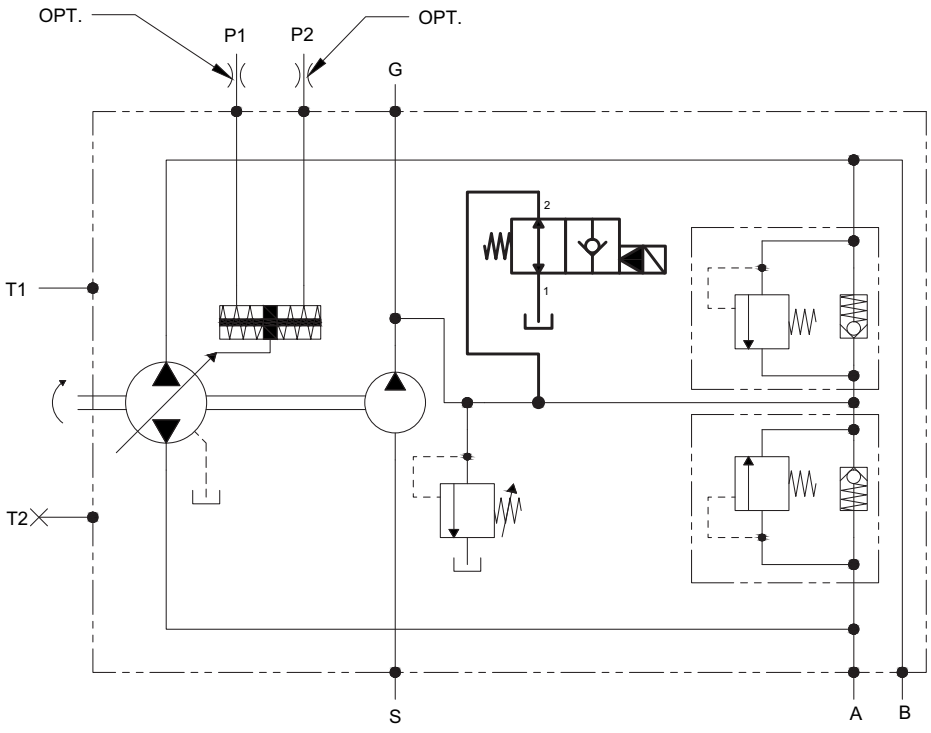
MAN ON BOARD

On the pump a normally open electrical operate valve can be fitted. The valve allow the flow delivery only when energized. This function is used to increase the safety of the machine. The solenoid valve is available for 12V or 24V DC voltage.





HYDRAULIC DIAGRAM



(continued)

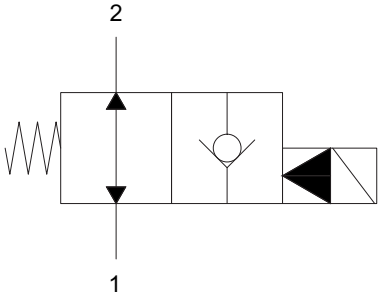
OPTIONAL MOB

MAN ON BOARD

TECHNICAL FEATURES

VALVE MOB - Hydraulic characteristics	
Max. operating pressure	30 MPa
Max. flow	40 lt/min.
Internal leakage	max. 5 drops/min. at 30 MPa
Response time	energized 20 ms
De-energized	30 ms
Temperature range	from -20°C to 90°C

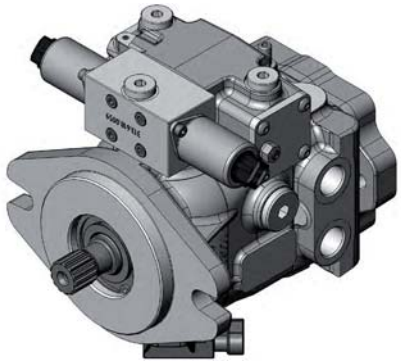
VALVE MOB - Electrical characteristics	
Power	18 W
Various voltage options available	(AC/DC)
Wire insulation	Class H
Duty factor	ED 100%
Supply power tolerance	+ 10%, - 15% (DC)
Ambient temperature	from -30°C to 60°C
Several connection options available	

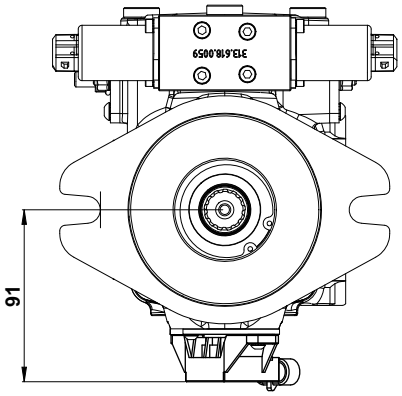


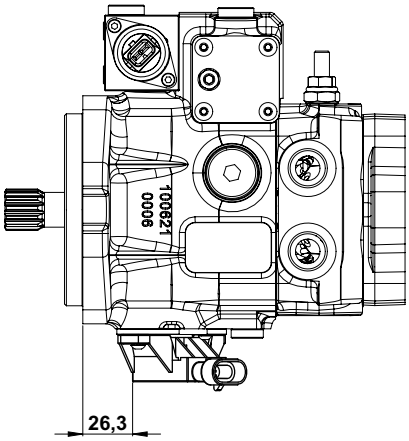
OPTIONAL RS

ANGLE SENSOR

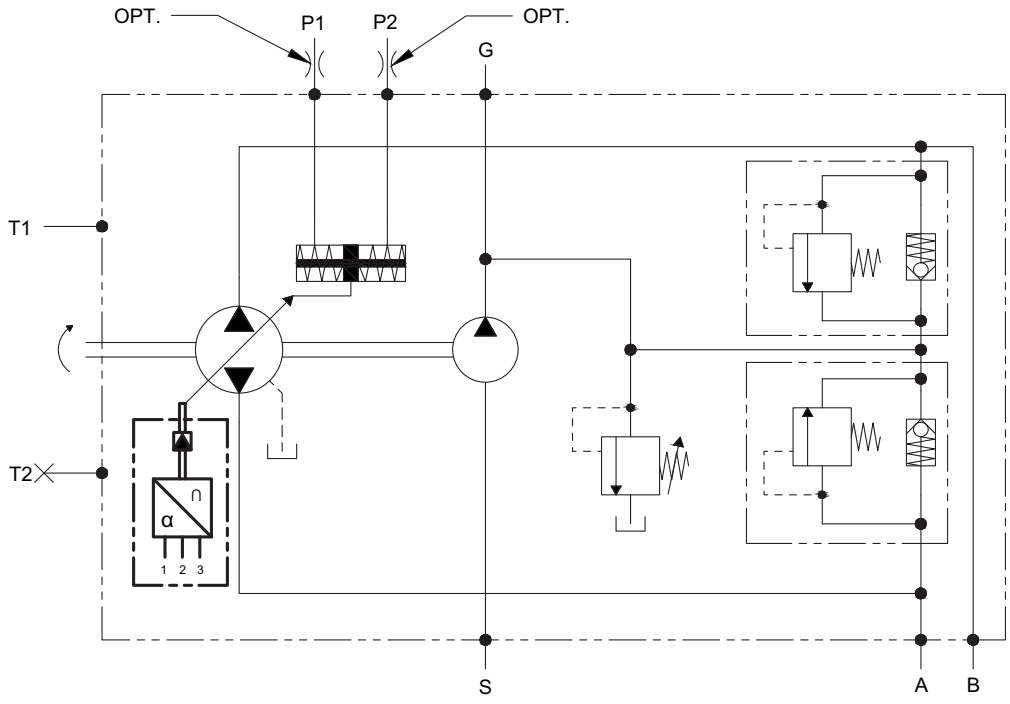
An electronic angle sensor, to measure the swash plate position, is available for the TPV-TPVTC 1500 pumps.
The signal can be used for a remote control of the pump performance. The technical features of the sensor are shown on page 48.







HYDRAULIC DIAGRAM



(continued)

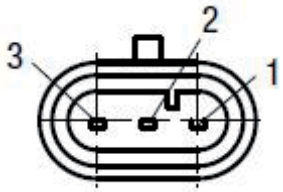
OPTIONAL RS

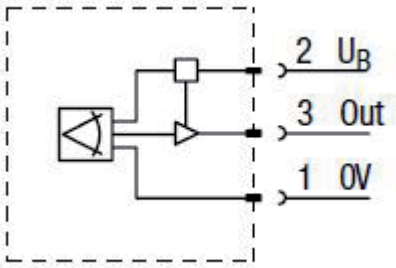
ANGLE SENSOR

TECHNICAL FEATURES

Operating voltage: 10-30 V DC
Output signal: 0.5-4.5 V
Current consumption: 12 V -> 10mA
Angular range: ± 25°
Resolution (20°C): 0.1°
Linearity error (20°C): ±0.4°
Load resistance: > 20 kΩ
Centre position: 2.5 V
Reverse connection protected: yes
Delay time of output signal: approx. 3 ms
Temperature range: -40 / +85°C

Offset temperature drift: 0.3 mV/°C - 1.2 µA/°C
IP protection class: IP 67

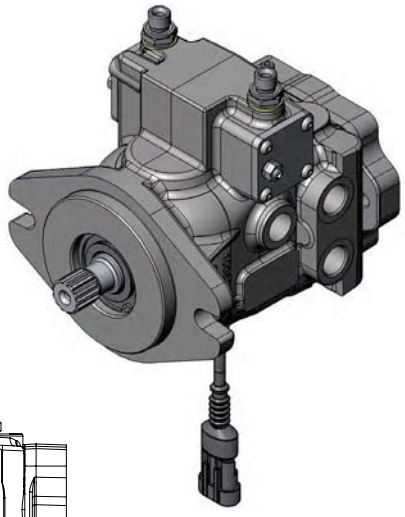


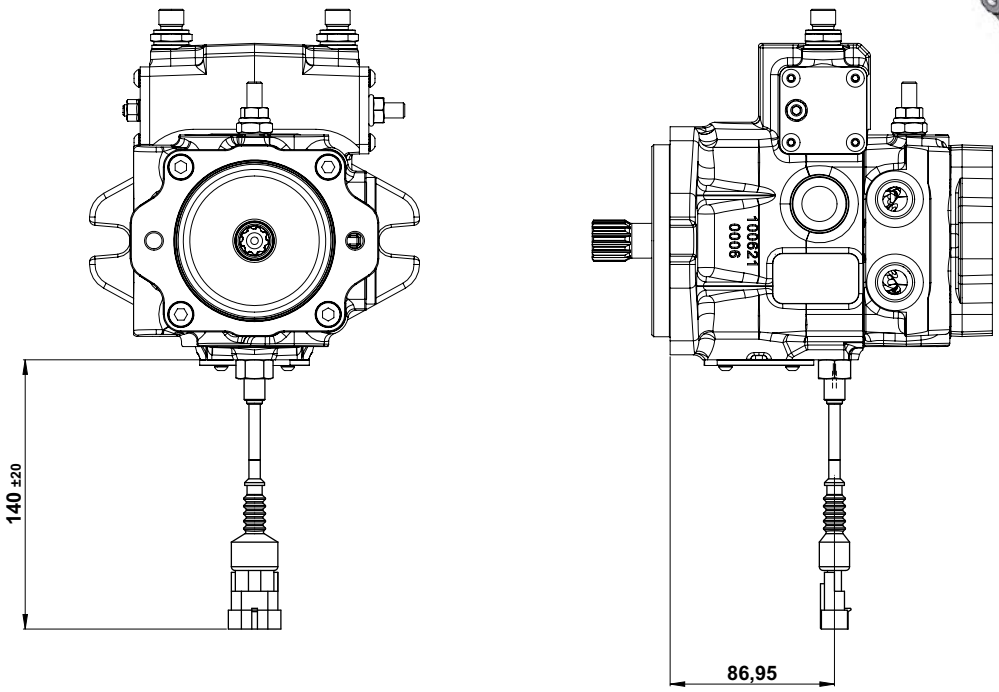


OPTIONAL REV.S

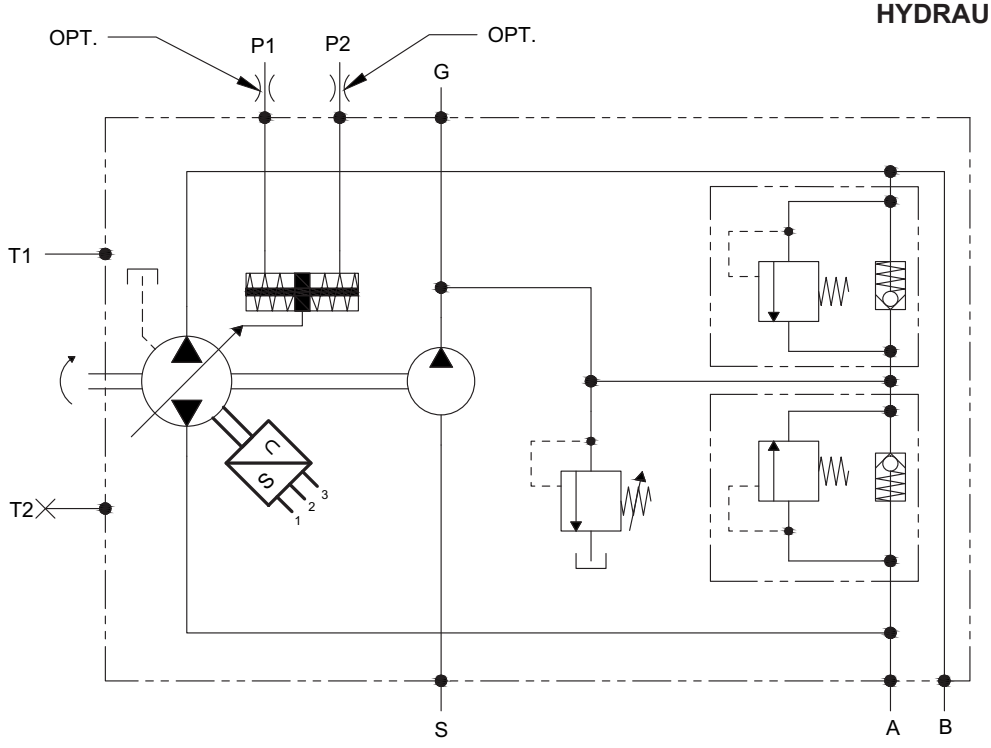
SPEED SENSOR

A speed sensor is available to monitor the pump shaft revolution speed. The technical features are shown on page 50.





HYDRAULIC DIAGRAM



(continued)

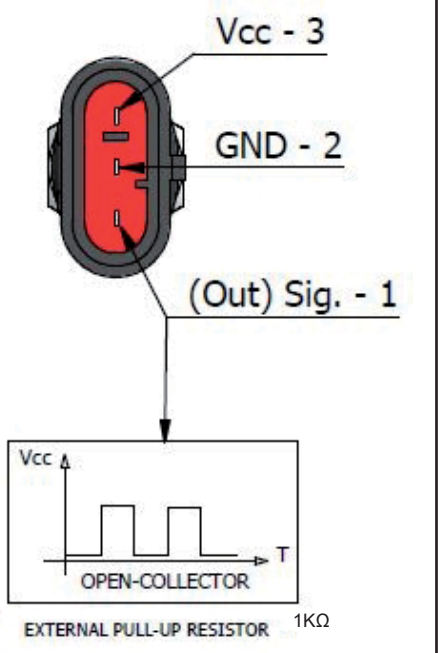
OPTIONAL REV.S

SPEED SENSOR

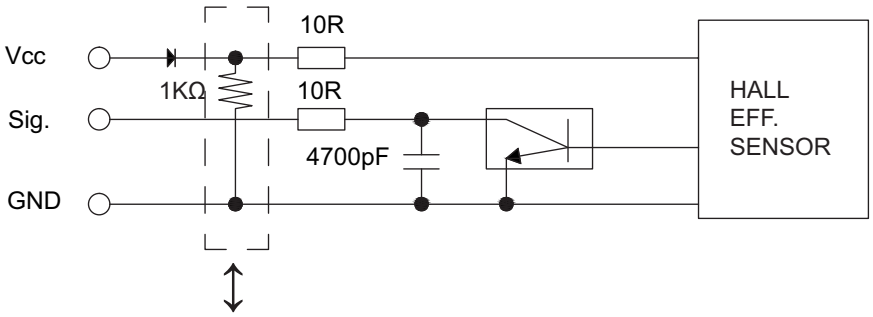
TECHNICAL FEATURES

Operating voltage: 4.5-30 V DC
Output current: max 25 mA
Maximum target: 15 kHz
Internal resistance: 140 ±30 Ω
Insulation resistance: 145 MΩ (500 V)
Protected by polarity inversion: yes
Output signal (freq): open collector (NPN)
Mechanical shock: 4 g (1mm/80Hz)
Electro magnetic compatibility: B.C.I.
-Class "C" 100 mA, 1÷400 MHz
Reverse polarity protection: -30 Vdc for 1h
Overload protection: 30 mA for 5'
Overvoltage protection: 35 V for 5'
Short circuit protection: to ground for 5'
to Vcc for 5'
Output transite voltage protection: V_{BR} min 31,35 max 34,65

Temperature range: -20 / +90°C
Protection class: IP 67
Tightening torque: 25 Nm
Output pins are protected against 2000 V electrostatic discharge according to HMB
Output signal/revolution = 1



SENSOR FUNCTIONAL SCHEME

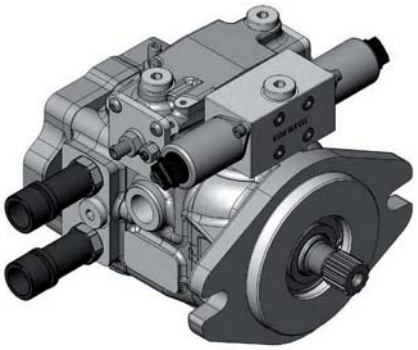


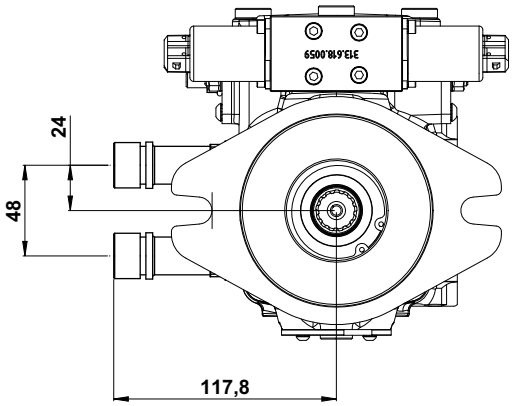
To be fitted to the electrical cable by the customer

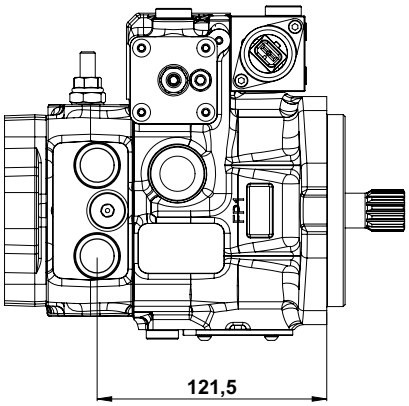
OPTIONAL PRS

PRESSURE SENSOR

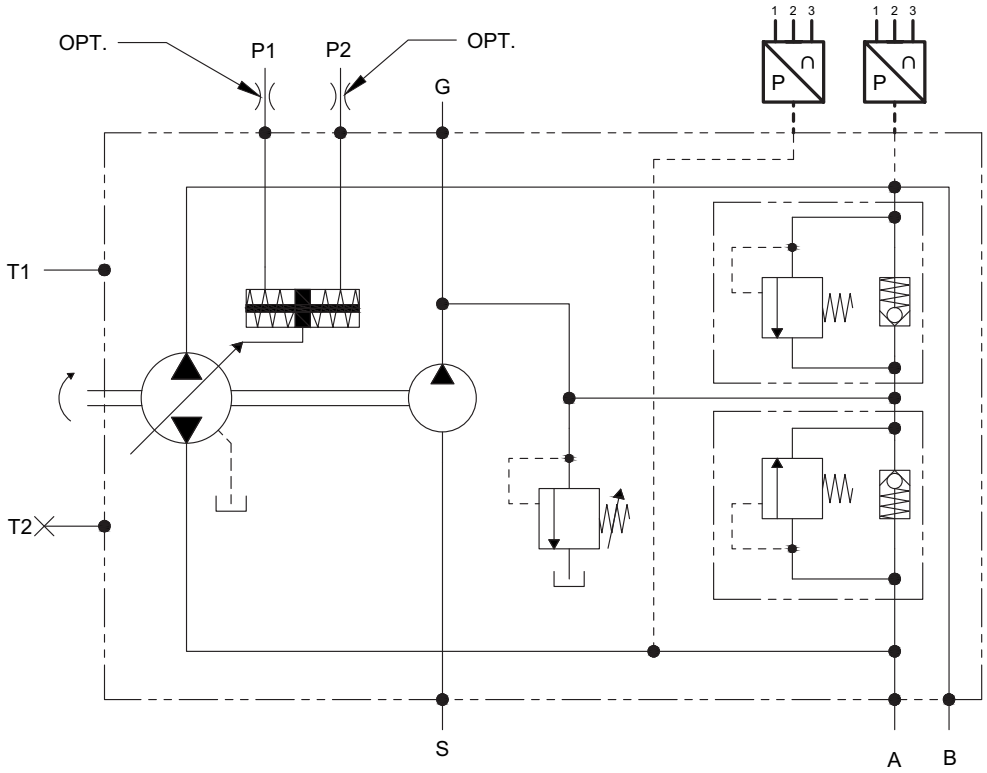
The TPV-TPVTC 1500 can fit a pressure sensor to monitor the working pressure. These information sent and processed by an electronic remote system allow a continuous remote control of the pump performance.
The technical features are shown on pag. 52.







HYDRAULIC DIAGRAM



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OPTIONAL PRS

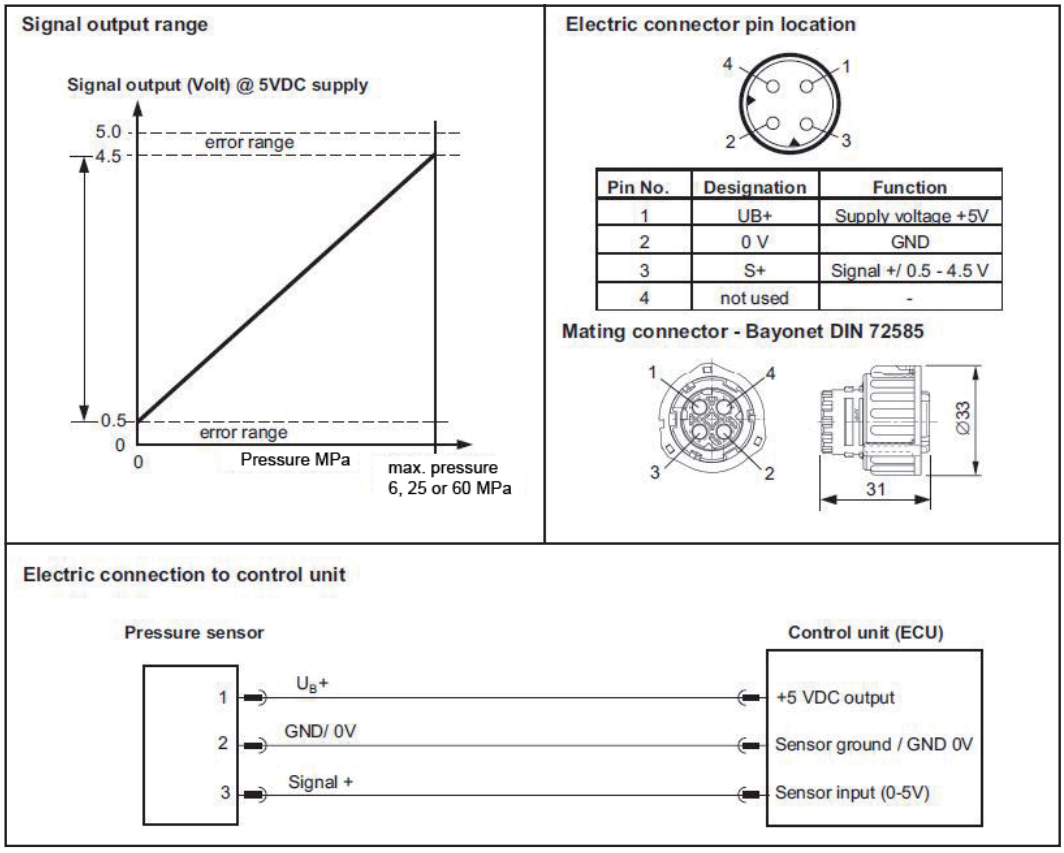
PRESSURE SENSOR

TECHNICAL FEATURES

Pressure range: 0-60 MPa
Over pressure, max permitted: 120 MPa
Burst pressure: 240 MPa
Power supply U_B: 5.0± 0.5 Volt DC
Signal output, ratiometric @5V: min. 0.5 - max. 4.5 Volt DC
Error levels, signal output: < 0.5 V and > 4.5 Volt
Response time: < 2 ms
Accuracy (IEC 61298-2): better than 1%, incl. non-linearity, hysterisis, repeatability, zero point & full scale error
Max load, R_A: > 4.5 kOhm
Temperature range:
- ambient, operating from -20 to +90°C
- hydraulic oil inlet from -20 to +90°C
- storage from -20 to +90°C

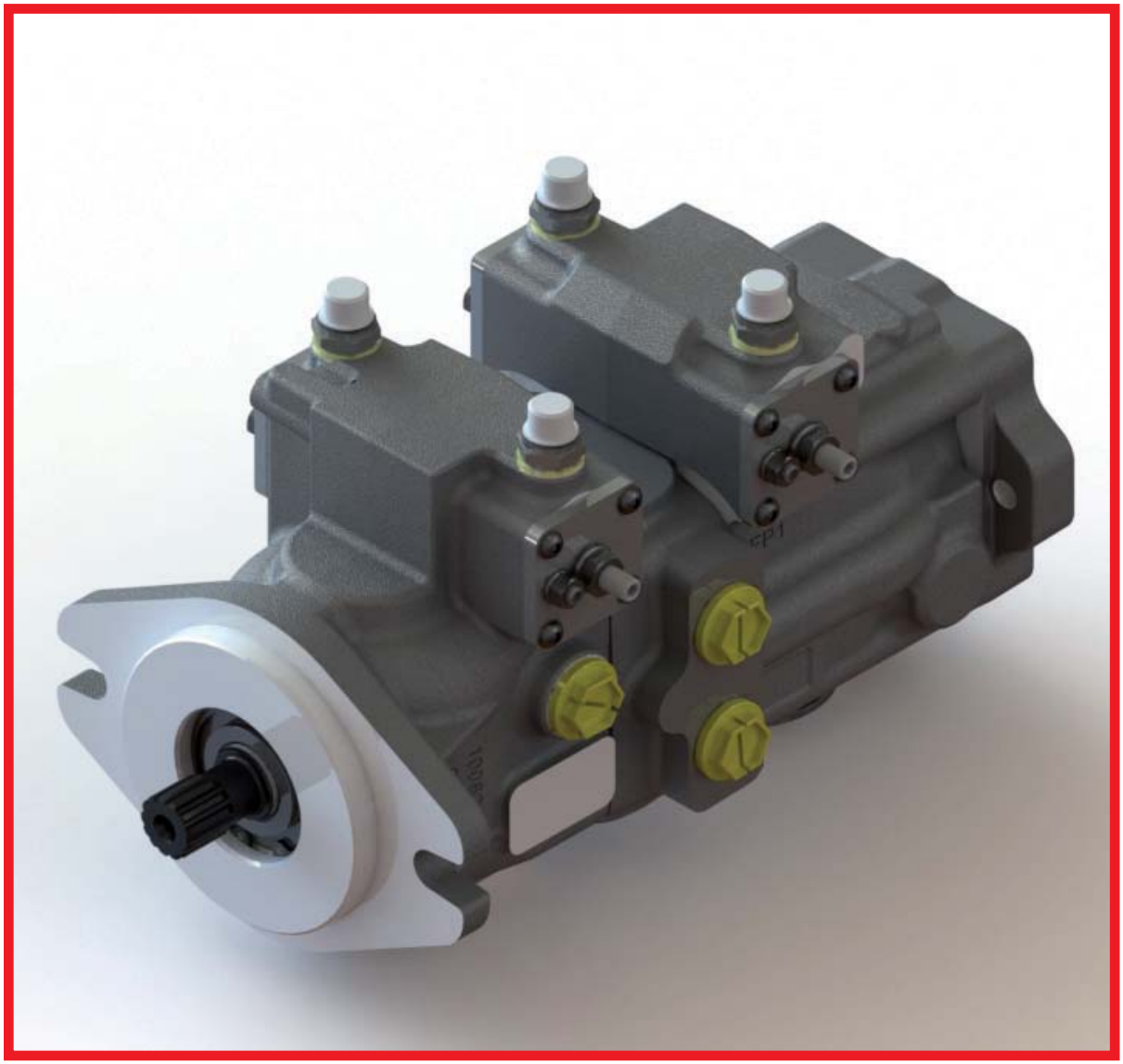
CE conformity acc. to: 89/336/EEC; EN 61326

Mechanical shock: 500 g (IEC60068-2-27)
Vibration resonance: 20 g (IEC60068-2-6)
IP protection class: IP 69K
Weight: 70 gr
Electric connector: O-ring sealed bayonet 4-way, DIN 72585 97/23/EG
Hydraulic connection: G1/4, DIN 3852-E, sealing ring 16.5x11.6x1.5



TPVTC 1500

COMPACT VARIABLE DISPLACEMENT AXIAL PISTON PUMP



ORDER CODE

1500	TPVTC	17-9	17-9	CR	SS3	F2	SHI	SHI	OA	OA	30	30	06	SA-R	000	1	00
0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17

Pag.

0 - Pump series

1500 = Pump TPV 1500

1 - Pump model

TPVTC = Compact tandem pump for closed loop circuit
TPVTC-T3 = Compact triple pump for closed loop circuit

2 - Primary pump displacement

17-9 = 17,6 cm^3/n **18-9** = 18,7 cm^3/n **19-9** = 19,9 cm^3/n **21-9** = 21,1 cm^3/n

3 - Secondary pump displacement

17-9 = 17,6 cm^3/n **18-9** = 18,7 cm^3/n **19-9** = 19,9 cm^3/n **21-9** = 21,1 cm^3/n

4 - Rotation

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

5 - Shaft (mounting side)

SS3 = Splined shaft SAE-B (ANSI B92.1A - 13T - 16/32 D.P.) **57**

6 - Mounting flange **57**

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

7 - Controls primary pump

SHI = Hydraulic servo control **58**
SHIC = Compact hydraulic servo control **60**
SEI1.3 = Electro-proportional servo control 12V DC (AMP junior timer connector) **62**
SEI2.3 = Electro-proportional servo control 24V DC (AMP junior timer connector) **62**
SEI1.3D = Electro-proportional servo control 12V DC (Deutsch connector) **65**
SEI2.3D = Electro-proportional servo control 24V DC (Deutsch connector) **65**
SHIX = Hydraulic servo control with feed back **68**
SMIX = Mechanical lever servo control with feed back **70**
SEIX1.3 = Electro-proportional servo control with feed back 12V DC (AMP junior timer connector) **72**
SEIX2.3 = Electro-proportional servo control with feed back 24V DC (AMP junior timer connector) **72**
SEIX1.3D = Electro-proportional servo control with feed back 12V DC (Deutsch connector) **75**
SEIX2.3D = Electro-proportional servo control with feed back 24V DC (Deutsch connector) **75**

8 - Controls secondary pump

SHI = Hydraulic servo control **58**
SHIC = Compact hydraulic servo control **60**
SEI1.3 = Electro-proportional servo control 12V DC (AMP junior timer connector) **62**
SEI2.3 = Electro-proportional servo control 24V DC (AMP junior timer connector) **62**
SEI1.3D = Electro-proportional servo control 12V DC (Deutsch connector) **65**
SEI2.3D = Electro-proportional servo control 24V DC (Deutsch connector) **65**
SHIX = Hydraulic servo control with feed back **68**
SMIX = Mechanical lever servo control with feed back **70**
SEIX1.3 = Electro-proportional servo control with feed back 12V DC (AMP junior timer connector) **72**
SEIX2.3 = Electro-proportional servo control with feed back 24V DC (AMP junior timer connector) **72**
SEIX1.3D = Electro-proportional servo control with feed back 12V DC (Deutsch connector) **75**
SEIX2.3D = Electro-proportional servo control with feed back 24V DC (Deutsch connector) **75**

9 - Control device position primary pump

OA = Position A

(continued)

ORDER CODE

10 - Control device position secondary pump

OA = Position A
OB = Position B

11 - Relief valve pressure setting primary pump

10 = 10 MPa **15** = 15 MPa **18** = 18 MPa **20** = 20 MPa
25 = 25 MPa **30** = 30 MPa **35** = 35 MPa **40** = 40 MPa

12 - Relief valve pressure setting secondary pump

10 = 10 MPa **15** = 15 MPa **18** = 18 MPa **20** = 20 MPa
25 = 25 MPa **30** = 30 MPa **35** = 35 MPa **40** = 40 MPa

13 - Boost pump

00 = Without boost pump
06 = Standard pump (5,8 cm^3/n)
Standard setting: 2 MPa (hydraulic /electric servo control) at 1.000 n/min
06(xx) = Other pressure setting on request (between 2 and 3 MPa, please contact our Technical Department)

14 - Through drive connection for rear pump

SA-R = SAE-A 2 bolt female standard (ANSI B92.1a - 9T - 16/32 D.P.) **78**

15 - Displacements of the auxiliary gear pumps group 2 (SAE-A)

000 = without pump
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 **230** = 30,0 cm^3/n **234** = 34,2 cm^3/n **240** =39,6 cm^3/n

16 - Voltage for optionals (where applicable)

0 = Without
1 = 12V DC
2 = 24V DC

17 - Optional

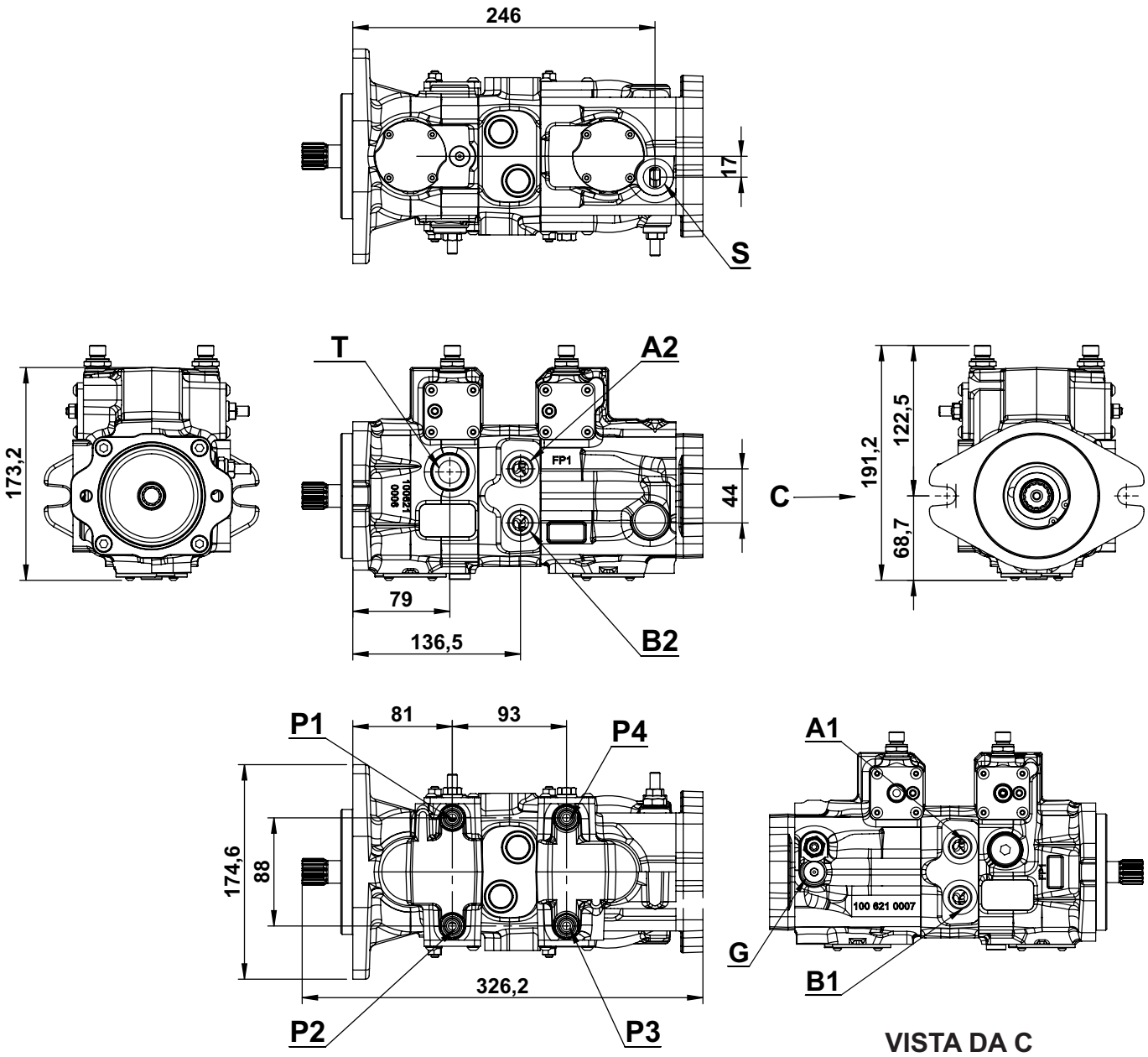
00 = Without optional
VS-SB = Purge valve with screw by-pass **79**
SB = Screw by-pass **80**
MOB = Man on board **81**
RS = Angle sensor **83**
REV.S = RPM sensor **85**
PRS = Pressure sensor **87**
G/J/M/- = Port threads and restrictor diameter

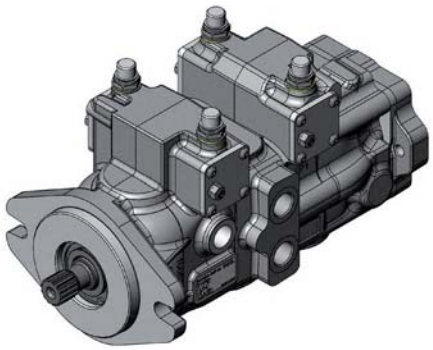
	Servo control type	Port threads	Symbol
STANDARD	SEI	Plugged	-
	SHI	1/4" BSPP	G
ON REQUEST	SHI	JIC (7/16" - 20)	J
	SHI	METRIC (M12x1,5)	M

Example G/08 = 1/4" BSPP port threads and Ø 0,8 mm restrictor (SHI)
Example -/08 = Ø 0,8 mm restrictor (SEI)

Restrictor diameter (SHI/SEI)	
-	Without restrictor
06	Restrictor orifice ø 0,6 mm
08	Restrictor orifice ø 0,8 mm
10	Restrictor orifice ø 1,0 mm
12	Restrictor orifice ø 1,2 mm
16	Restrictor orifice ø 1,6 mm
20	Restrictor orifice ø 2,0 mm

GENERAL DIMENSIONS / PORTS AND PIPES





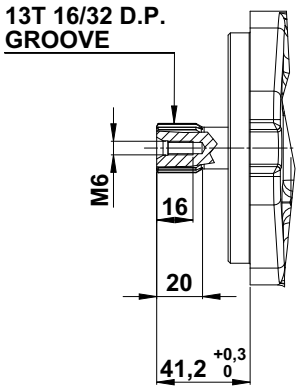
PORTS		
A_1- B_1	Main pressure ports 1	1/2" BSPP
A_2- B_2	Main pressure ports 2	1/2" BSPP
T	Drain line	1/2" BSPP
S	Suction line	1/2" BSPP
G	Boost system pressure port	1/4" BSPP
P1 - P2	Servo control ports (male) pump 1	1/4" BSPP
P3 - P4	Servo control ports (male) pump 2	1/4" BSPP

SHAFT OPTIONS AND MOUNTING FLANGES

SS3

SPLINED SHAFT SAE B 13T

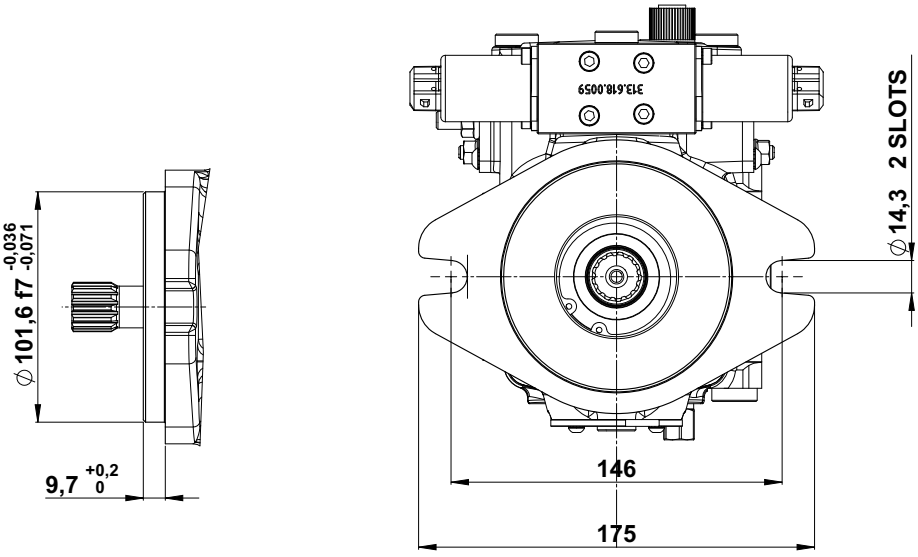
Norm ANSI B92.2-1970 CLASS 5
Max. torque = 320 Nm



Caution: in case of multiple pump applications the total torque requested must be limited to the above value.

F2

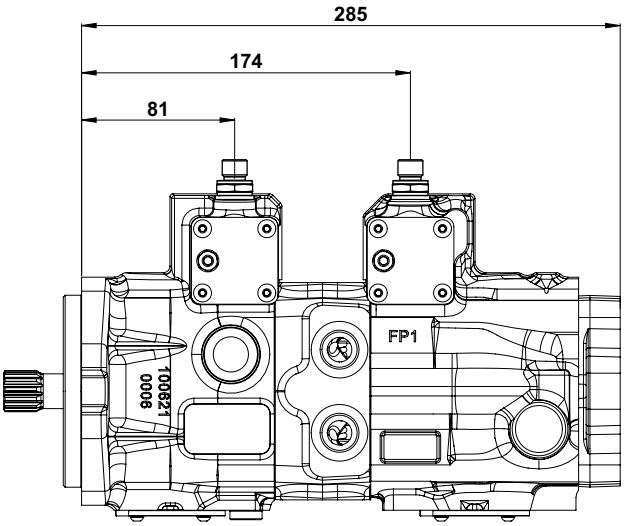
FLANGE SAE B - 2 BOLT

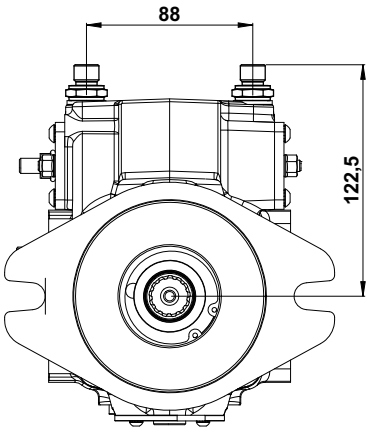


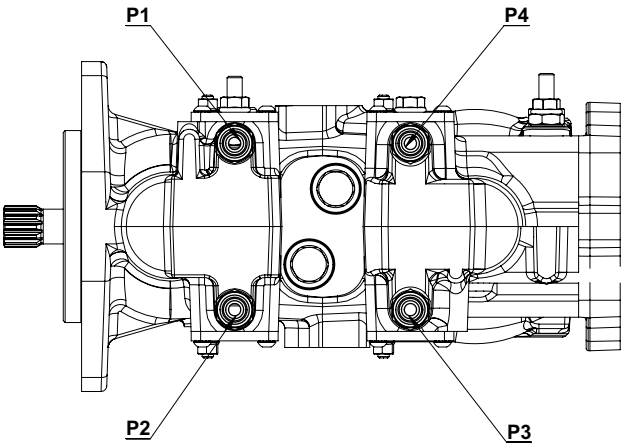
SHI

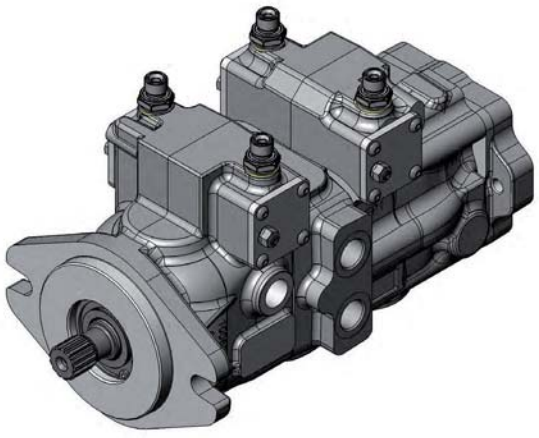
HYDRAULIC SERVO CONTROL

The pump displacement variation is obtained by adjusting the pressure on P1-P2-P3-P4 servo control ports by means of a hydraulic proportional joystick (with integrated pressure reducing valves).
The servo control supply can be obtained by taking pressure from the boost pump (G port), see pag. 56.
The servo control return 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 directions, goes from 0,4 to 1,8 MPa (tolerance (± 5 %).
The adjusting curve of the hydraulic joystick has to be a little wider (0,3 ÷ 1,9 MPa).







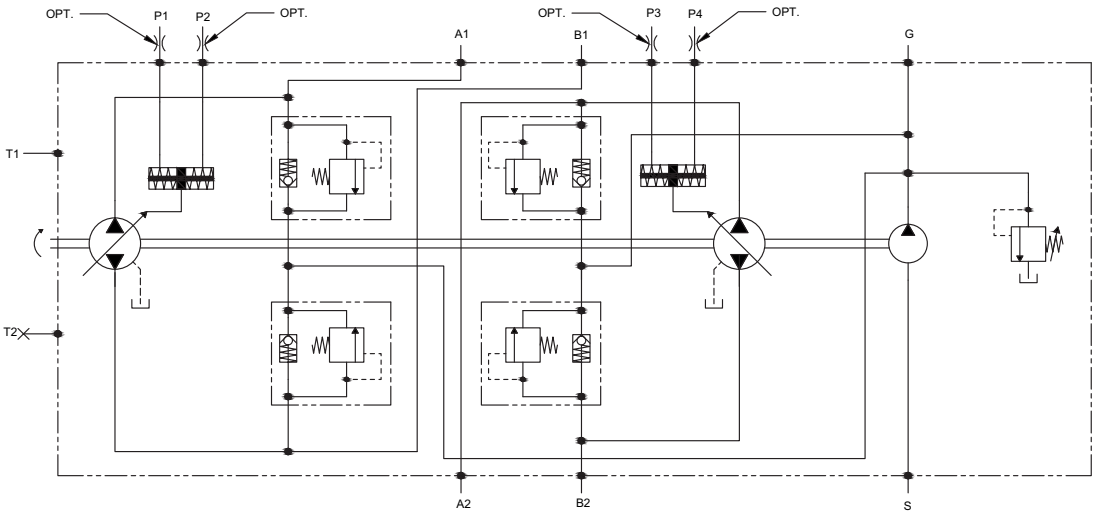


(continued)

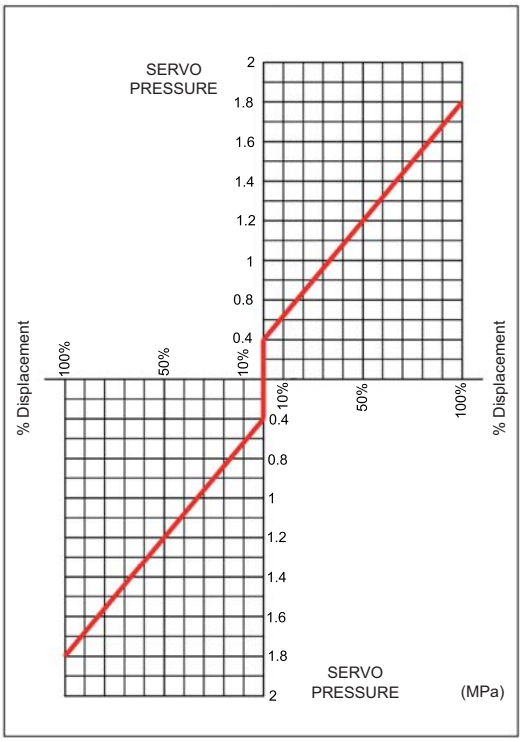
SHI

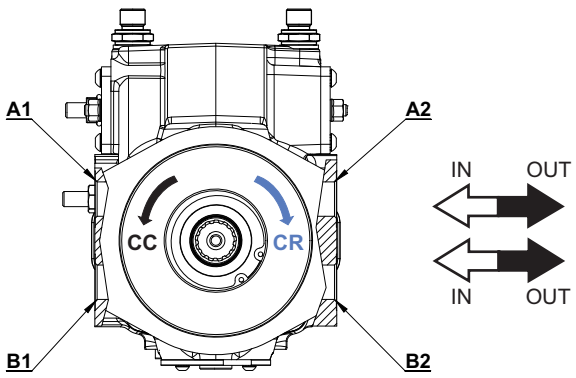
COMPACT HYDRAULIC SERVO CONTROL

HYDRAULIC DIAGRAM



SERVO PRESSURE - DISPLACEMENT GRAPHIC





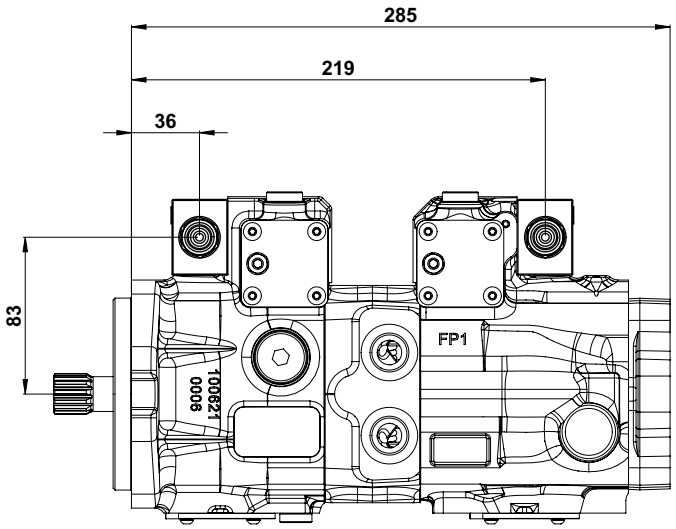
FLOW DIRECTION	PRIMARY PUMP			SECONDARY PUMP		
Rotation	Port	OUT	IN	Port	OUT	IN
Clockwise (CR)	P_1 P_2	B_1 A_1	A_1 B_1	P_3 P_4	A_2 B_2	B_2 A_2
Counter clockwise (CC)	P_1 P_2	A_1 B_1	B_1 A_1	P_3 P_4	B_2 A_2	A_2 B_2

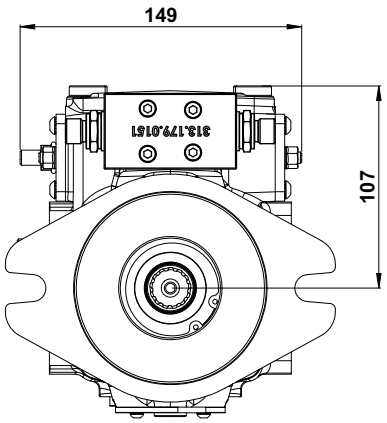
SHIC

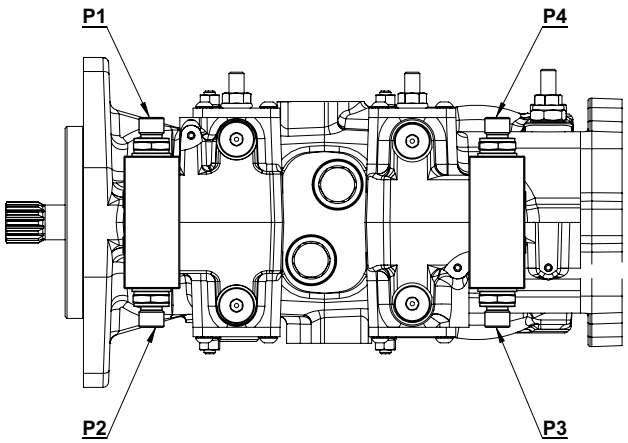
COMPACT HYDRAULIC CONTROL

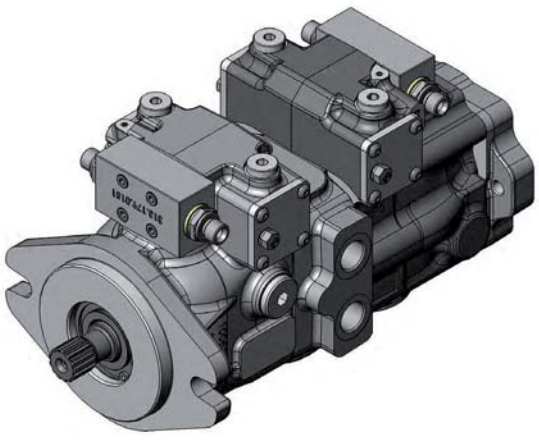
(with side pilot ports)

The pump displacement variation is obtained by adjusting the pressure on P1-P2-P3-P4 servo control ports by means of a hydraulic proportional joystick (with integrated pressure reducing valves).
The servo control supply can be obtained by taking pressure from the boost pump (G port), see pag. 56.
The servo control return time can be adjusted by inserting a restrictor on the P1 and P2 ports on the pump (0,5 ÷ 1,2 mm).
The servo control operation curve, in both directions, goes from 0,4 to 1,8 MPa (tolerance (± 5 %).
The adjusting curve of the hydraulic joystick has to be a little wider (0,3 ÷ 1,9 MPa).









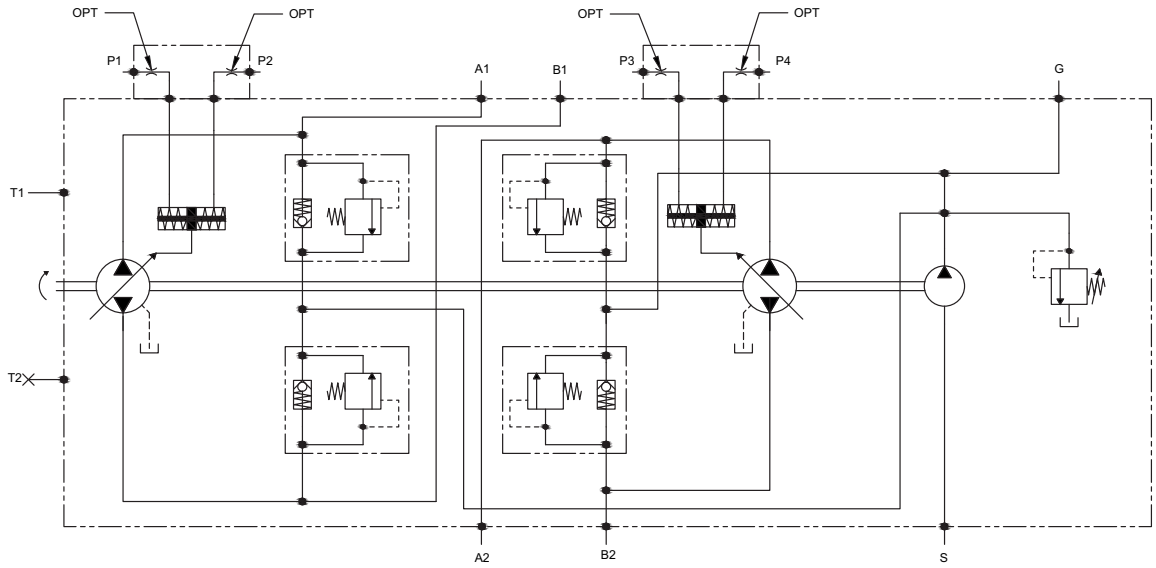
(continued)

SHIC

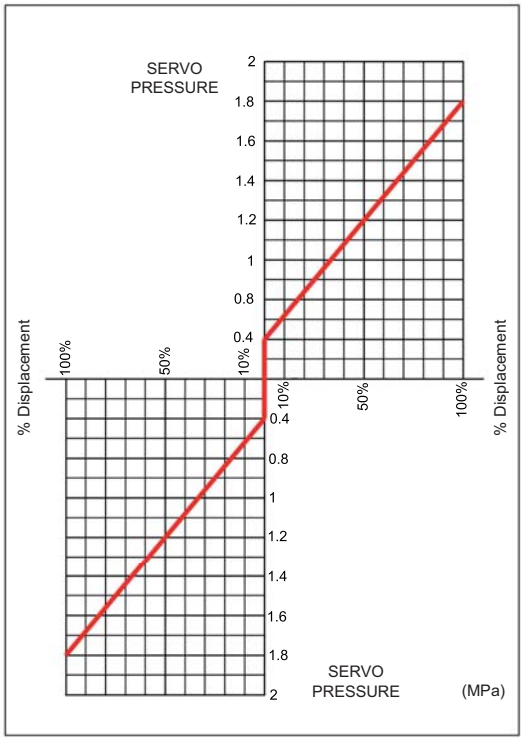
COMPACT HYDRAULIC CONTROL

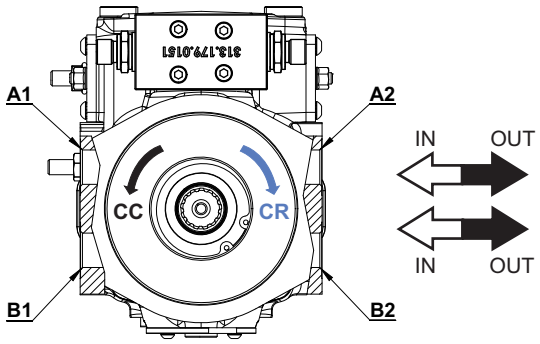
(with side pilot ports)

HYDRAULIC DIAGRAM



SERVO PRESSURE - DISPLACEMENT GRAPHIC





FLOW DIRECTION	PRIMARY PUMP			SECONDARY PUMP		
Rotation	Port	OUT	IN	Port	OUT	IN
Clockwise (CR)	P_1 P_2	B_1 A_1	A_1 B_1	P_3 P_4	A_2 B_2	B_2 A_2
Counter clockwise (CC)	P_1 P_2	A_1 B_1	B_1 A_1	P_3 P_4	B_2 A_2	A_2 B_2

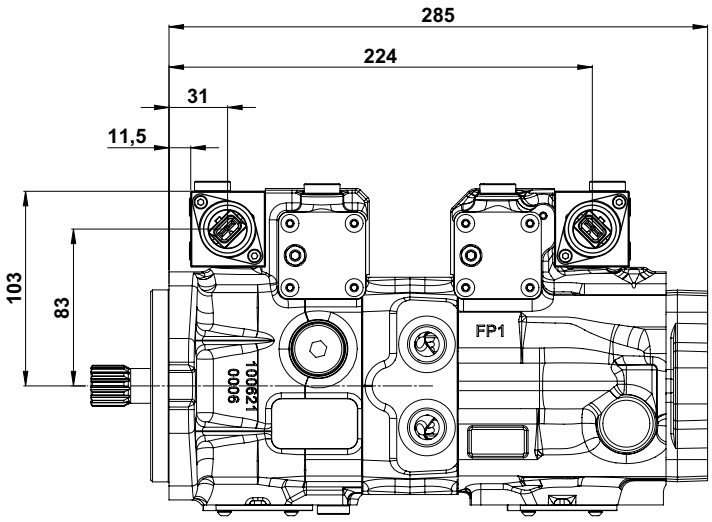
SEI 1.3 (12V DC)
SEI 2.3 (24V DC)

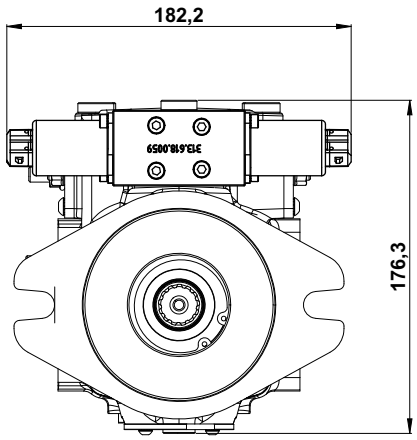
ELECTRO-PROPORTIONAL SERVO CONTROL

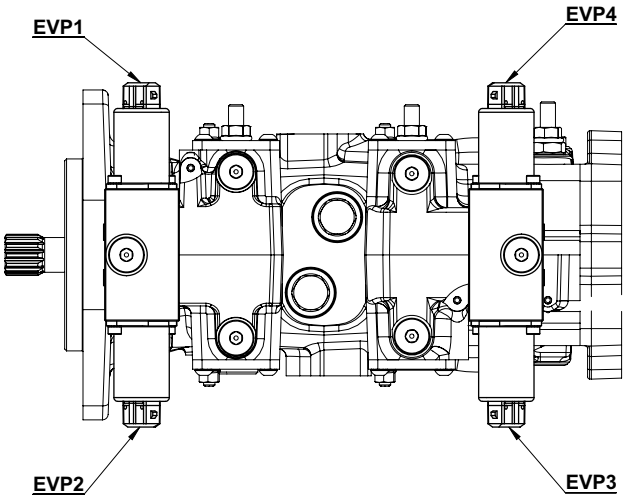
(AMP junior timer connector)

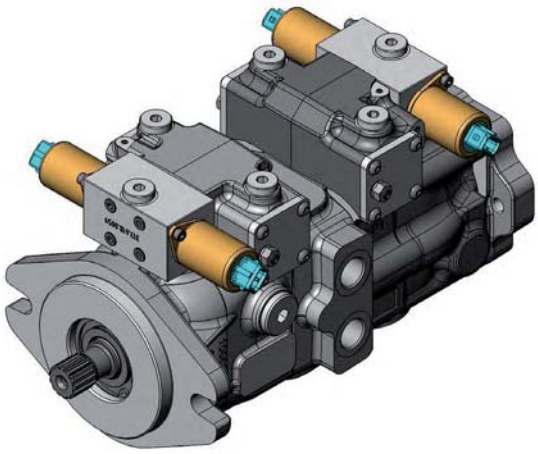
The pump displacement variation is obtained by an electric signal that goes from:

- 0 to 750 mA (24V DC voltage)
- 0 to 1500 mA (12V DC voltage)









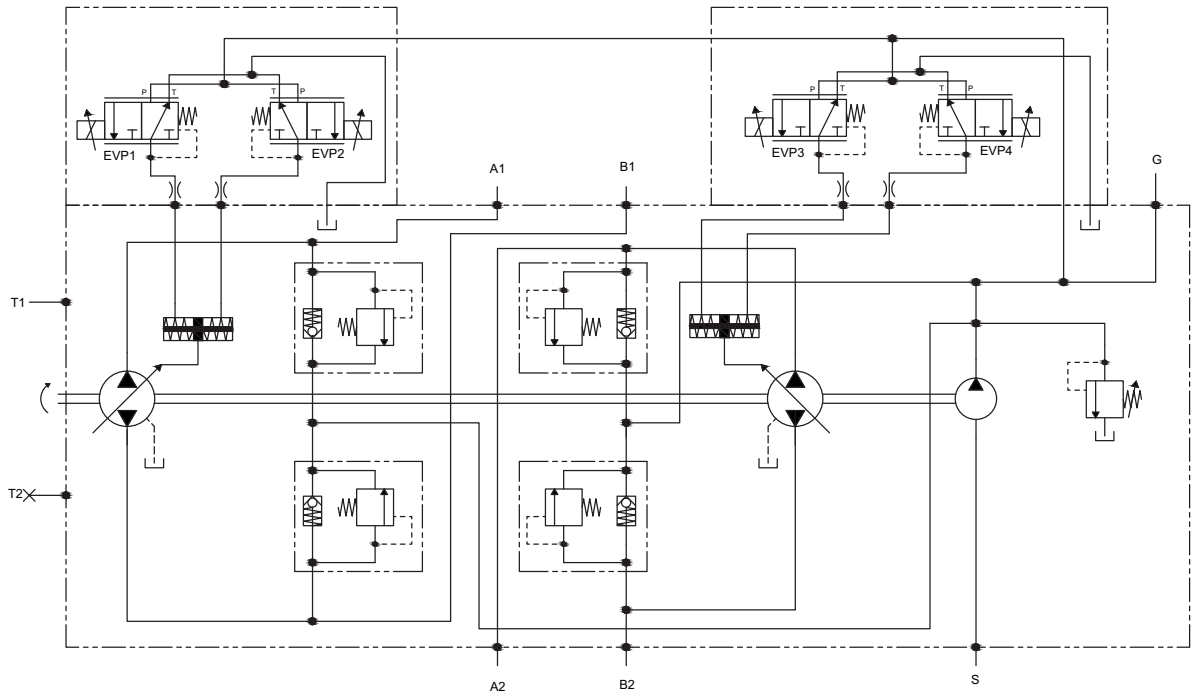
(continued)

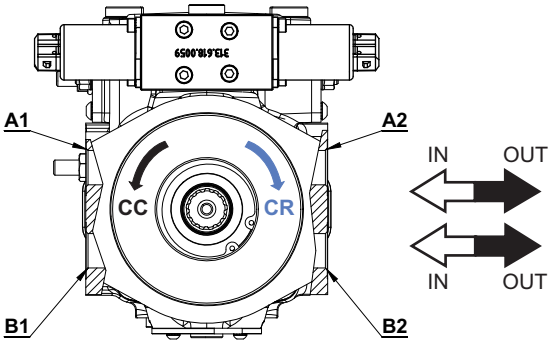
SEI 1.3 (12V DC)
SEI 2.3 (24V DC)

ELECTRO-PROPORTIONAL SERVO CONTROL

(AMP junior timer connector)

HYDRAULIC DIAGRAM





FLOW DIRECTION	PRIMARY PUMP			SECONDARY PUMP		
Rotation	EVP	OUT	IN	EVP	OUT	IN
Clockwise (CR)	EVP1 EVP2	B_1 A_1	A_1 B_1	EVP3 EVP4	A_2 B_2	B_2 A_2
Counter clockwise (CC)	EVP1 EVP2	A_1 B_1	B_1 A_1	EVP3 EVP4	B_2 A_2	A_2 B_2

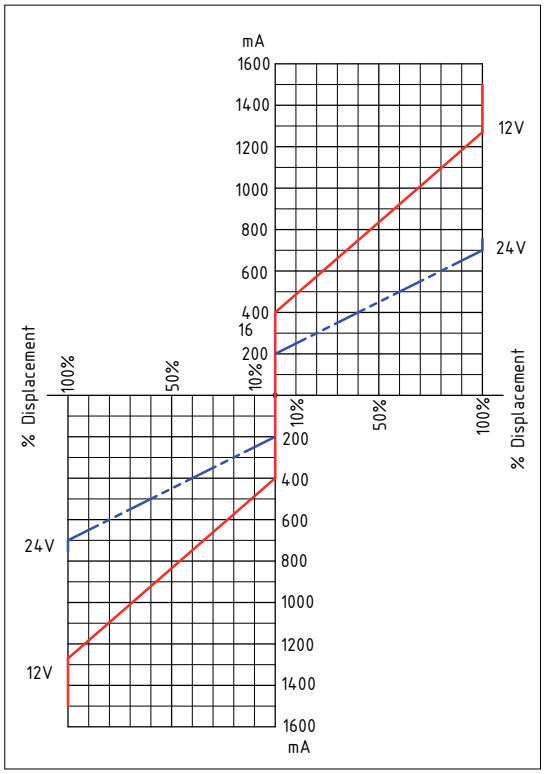
(continued)

SEI 1.3 (12V DC)
SEI 2.3 (24V DC)

ELECTRO-PROPORTIONAL SERVO CONTROL

(AMP junior timer connector)

CURRENT-DISPLACEMENT GRAPHIC



ELECTRICAL FEATURES		
Voltage	12 V DC	24 V DC
Electric current	1500 mA	750 mA
Load resistence	4,72 Ω ± 5%	20,8 Ω ± 5%
Type of control	Current control	
	PWM 100 Hz (suggested)	
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 -20 to +90°C

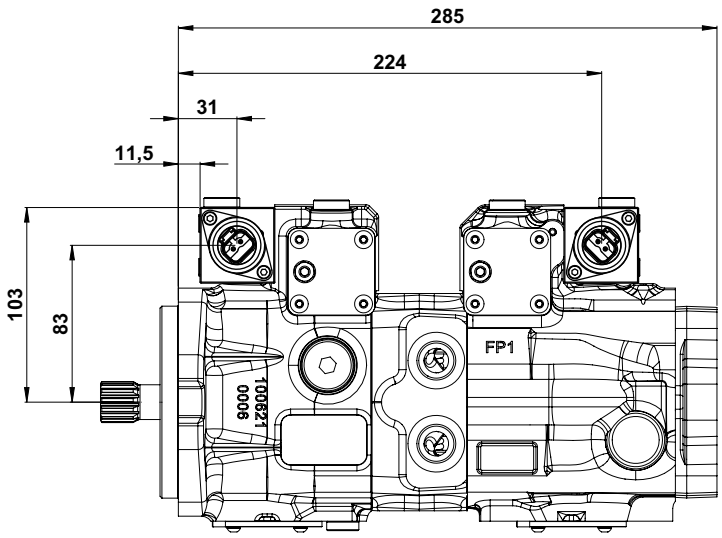
SEI 1.3D (12V DC)
SEI 2.3D (24V DC)

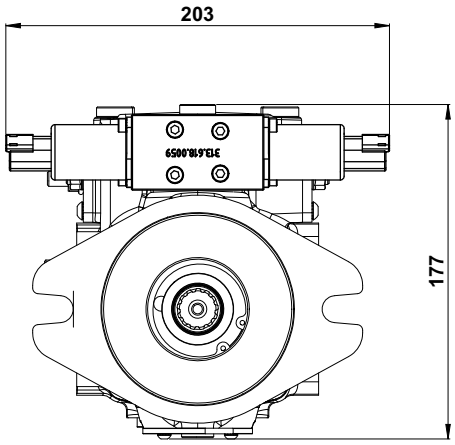
ELECTRO-PROPORTIONAL SERVO CONTROL

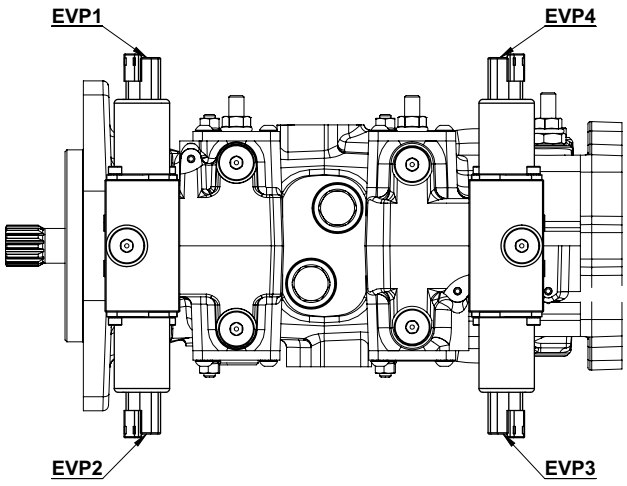
(Deutsch connector)

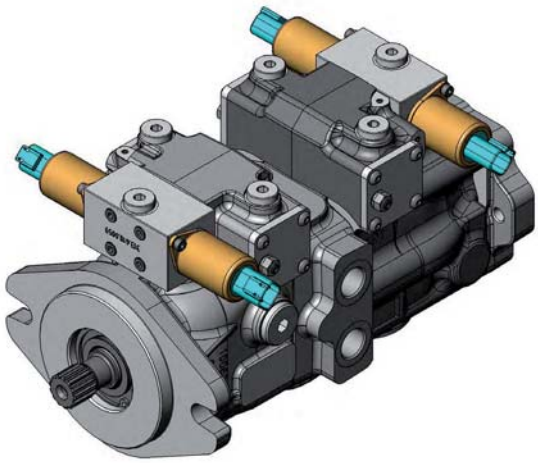
The pump displacement variation is obtained by an electric signal that goes from:

- 0 to 750 mA (24V DC voltage)
- 0 to 1500 mA (12V DC voltage)









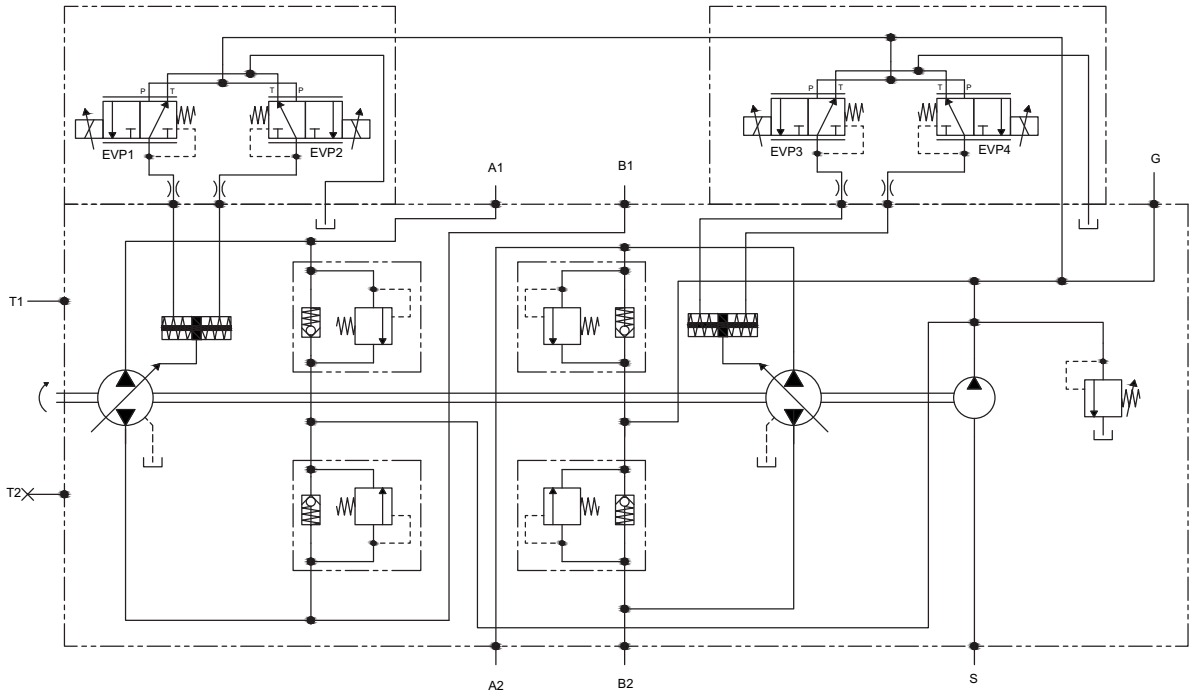
(continued)

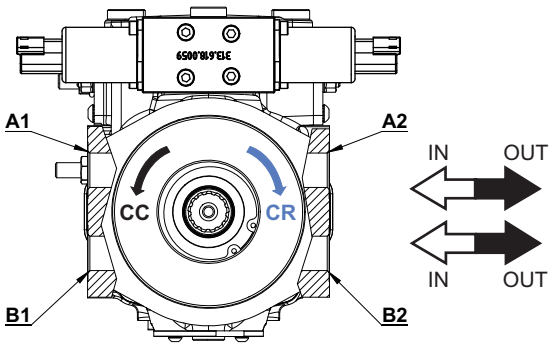
SEI 1.3D (12V DC)
SEI 2.3D (24V DC)

ELECTRO-PROPORTIONAL SERVO CONTROL

(Deutsch connector)

HYDRAULIC DIAGRAM





FLOW DIRECTION	PRIMARY PUMP			SECONDARY PUMP		
Rotation	EVP	OUT	IN	EVP	OUT	IN
Clockwise (CR)	EVP1 EVP2	B_1 A_1	A_1 B_1	EVP3 EVP4	A_2 B_2	B_2 A_2
Counter clockwise (CC)	EVP1 EVP2	A_1 B_1	B_1 A_1	EVP3 EVP4	B_2 A_2	A_2 B_2

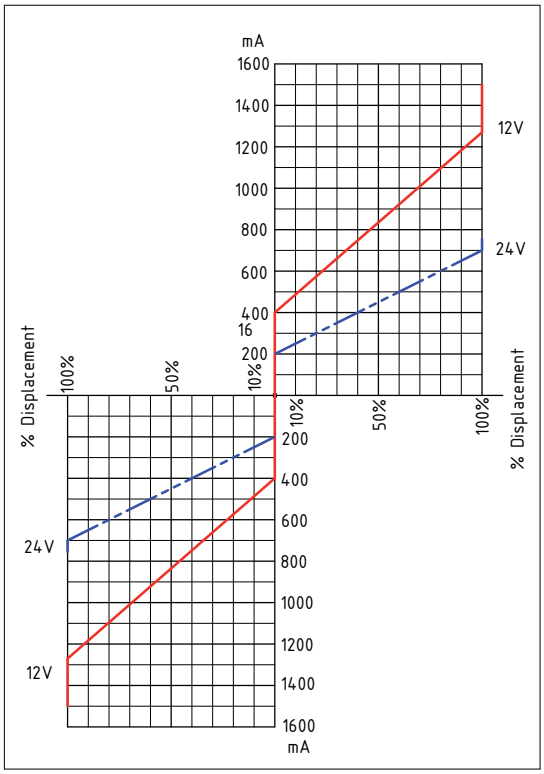
(continued)

SEI 1.3D (12V DC)
SEI 2.3D (24V DC)

ELECTRO-PROPORTIONAL SERVO CONTROL

(Deutsch connector)

CURRENT-DISPLACEMENT GRAPHIC



ELECTRICAL FEATURES		
Voltage	12 V DC	24 V DC
Electric current	1500 mA	750 mA
Load resistence	4,72 Ω ± 5%	20,8 Ω ± 5%
Type of control	Current control	
	PWM 100 Hz (suggested)	
Type of connection	DEUTSCH DT 04-2P	
Protection class	Until IP6K6 / IPX9K	

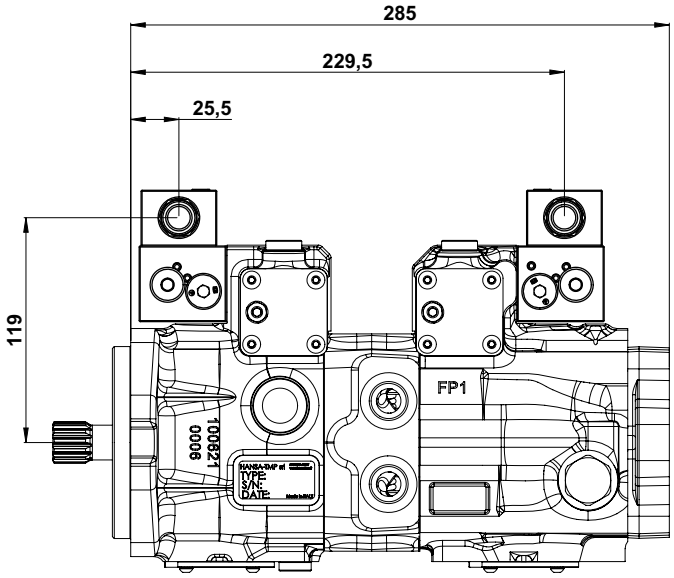
HYDRAULIC FEATURES	
Max. pressure (P, T)	pP= 5 MPa, pT= 3 MPa
Hysteresis (w/PWM)	<0,07 MPa (pA=2,0)
	<0,1 MPa (pA=2,5)
	<0,15 MPa (pA=3,5)
Filtration ratio	125 µm
Oil contamination level	Min. filtration ratio: 20/18/15
	According ISO 4406
	Hydraulic oil DIN 51524
Min./max. oil temperature	From -20 to +90°C

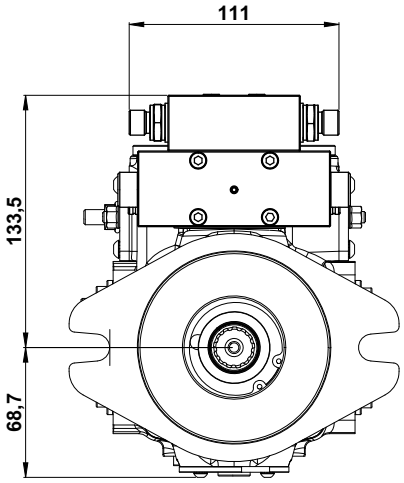
SHIX

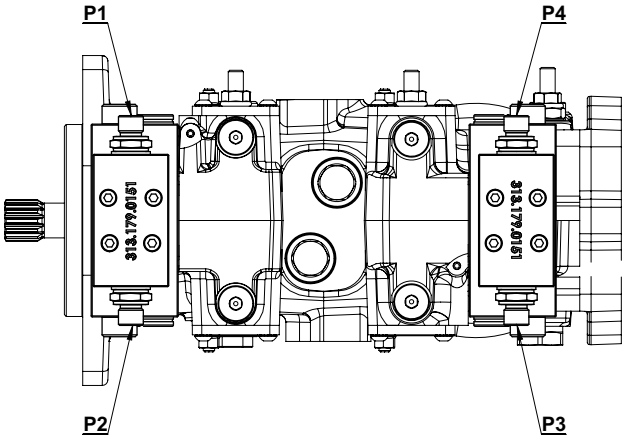
HYDRAULIC SERVO CONTROL WITH FEED BACK

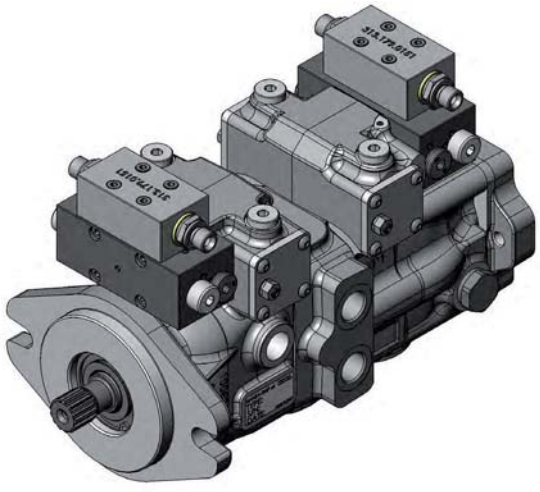
The pump displacement variation is obtained by adjusting the pressure on P1-P2-P3-P4 servo control ports by means of a hydraulic proportional joystick (with integrated pressure reducing valves).
The servo control supply can be obtained by taking pressure from the boost pump (G port), see pag. 56.
The servo control return 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 directions, goes from 0,4 to 1,8 MPa (tolerance (± 5 %).
The adjusting curve of the hydraulic joystick has to be a little wider (0,3 ÷ 1,9 MPa).







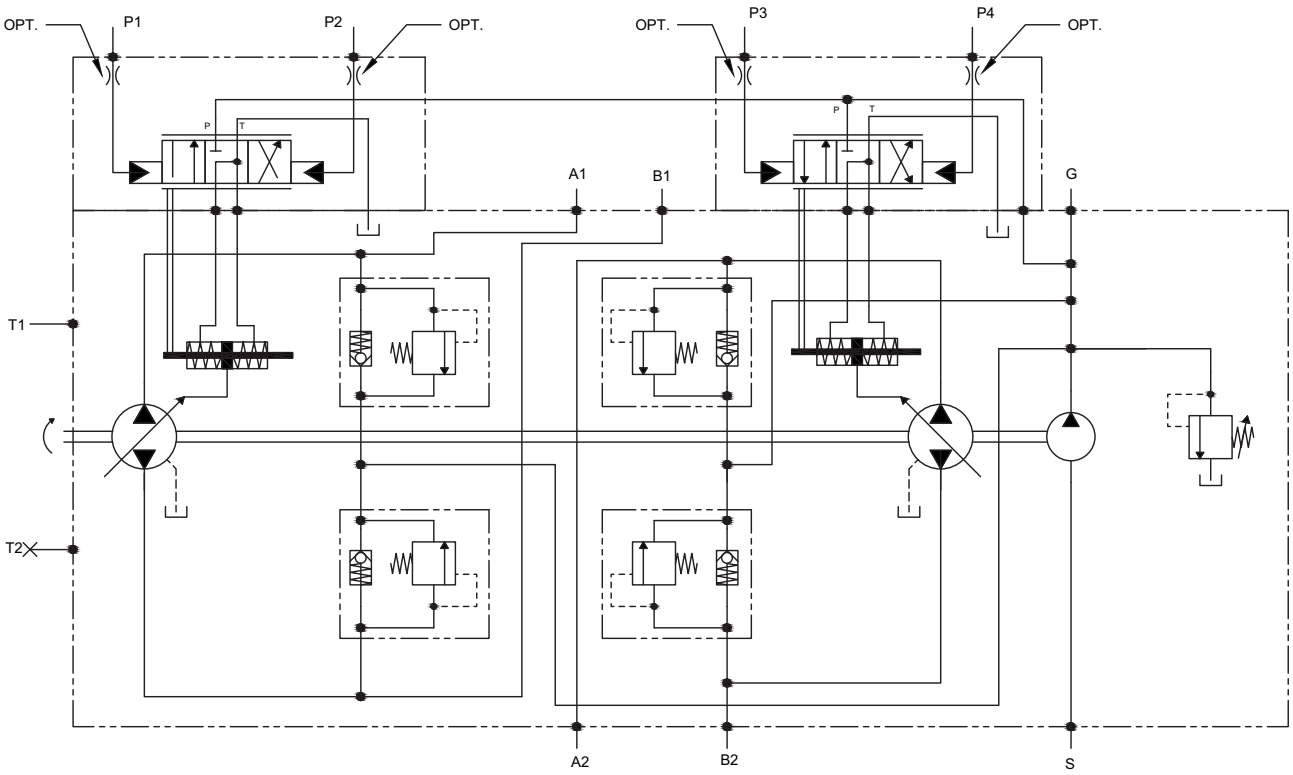


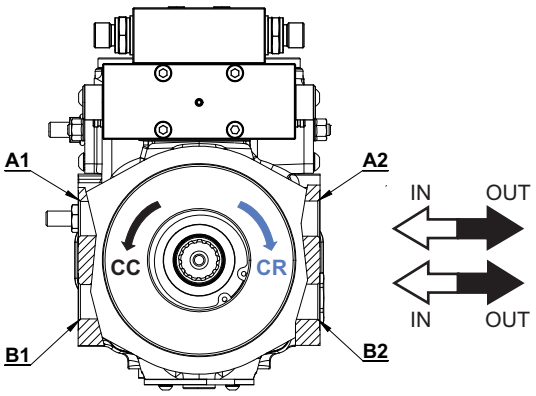
(continued)

SHIX

HYDRAULIC SERVO CONTROL WITH FEED BACK

HYDRAULIC DIAGRAM



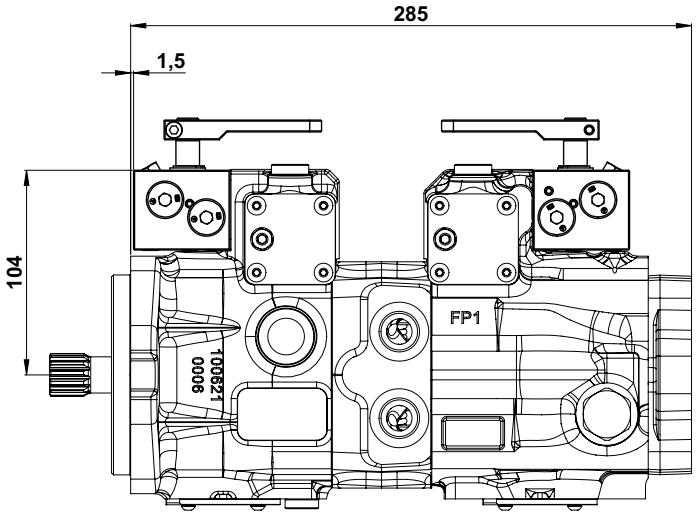


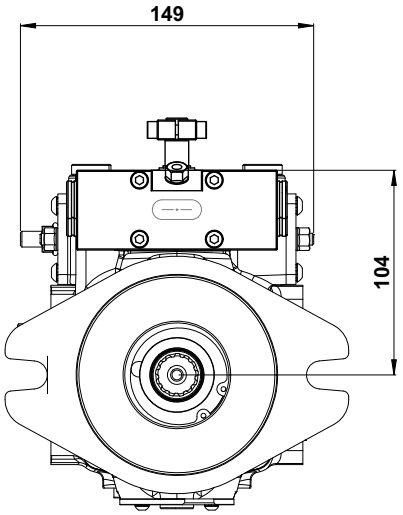
FLOW DIRECTION	PRIMARY PUMP			SECONDARY PUMP		
Rotation	Port	OUT	IN	Port	OUT	IN
Clockwise (CR)	P_1 P_2	A_1 B_1	B_1 A_1	P_3 P_4	B_2 A_2	A_2 B_2
Counter clockwise (CC)	P_1 P_2	B_1 A_1	A_1 B_1	P_3 P_4	A_2 B_2	B_2 A_2

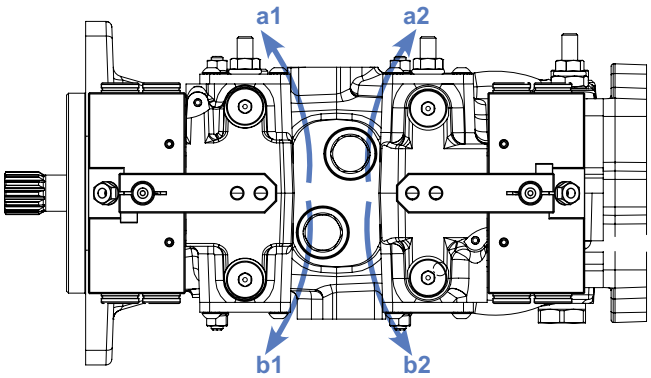
SMIX

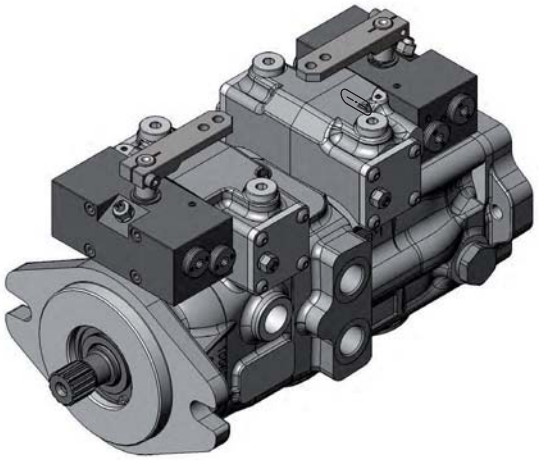
MANUAL LEVER CONTROL WITH FEED BACK

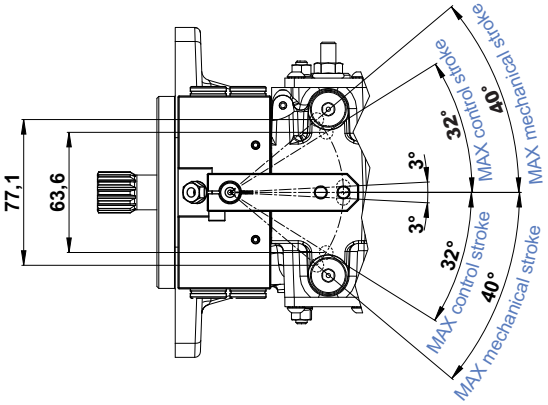
The pump displacement variation is directly related to the angle position of the lever.









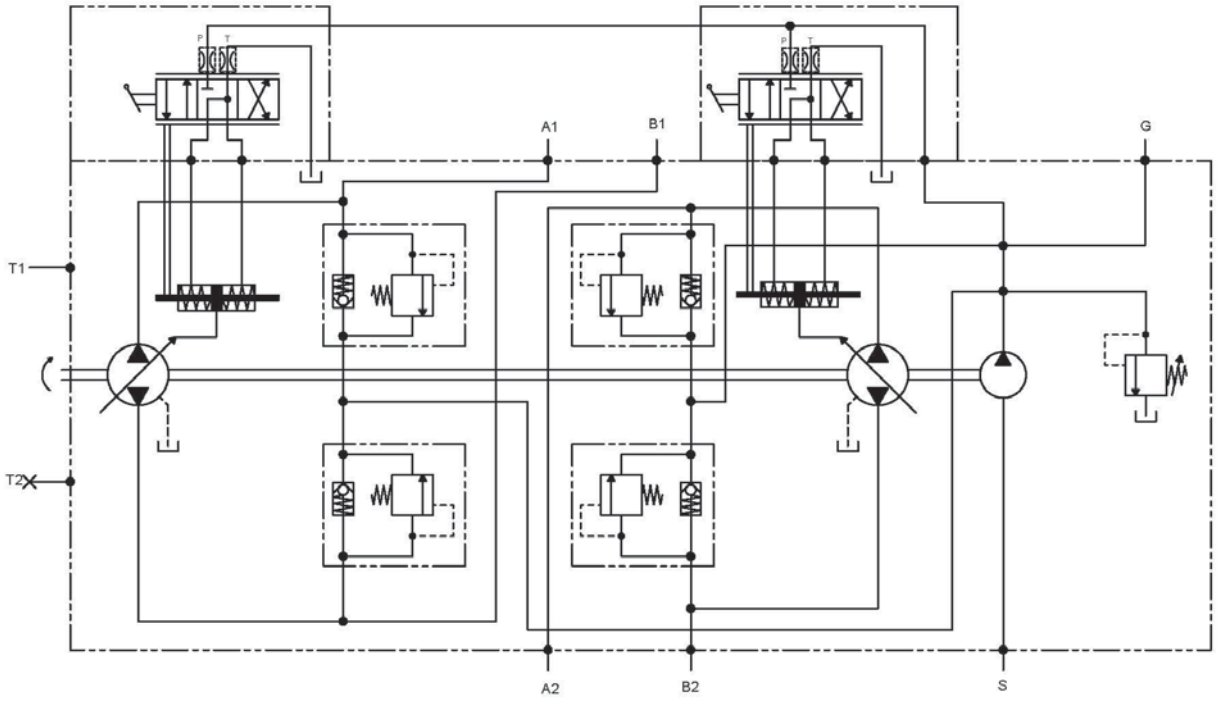


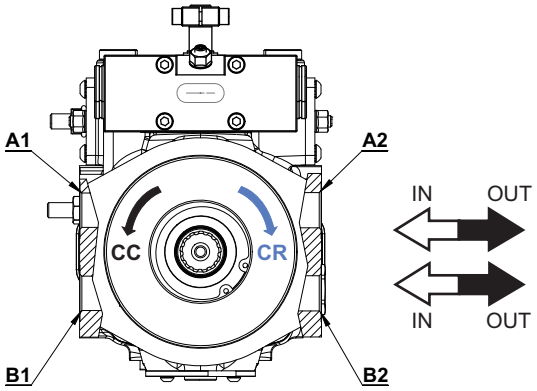
(continued)

SMIX

MANUAL LEVER CONTROL WITH FEED BACK

HYDRAULIC DIAGRAM





FLOW DIRECTION	PRIMARY PUMP			SECONDARY PUMP		
Rotation	Port	OUT	IN	Port	OUT	IN
Clockwise (CR)	a_1 b_1	B_1 A_1	A_1 B_1	a_2 b_2	A_2 B_2	B_2 A_2
Counter clockwise (CC)	a_1 b_1	A_1 B_1	B_1 A_1	a_2 b_2	B_2 A_2	A_2 B_2

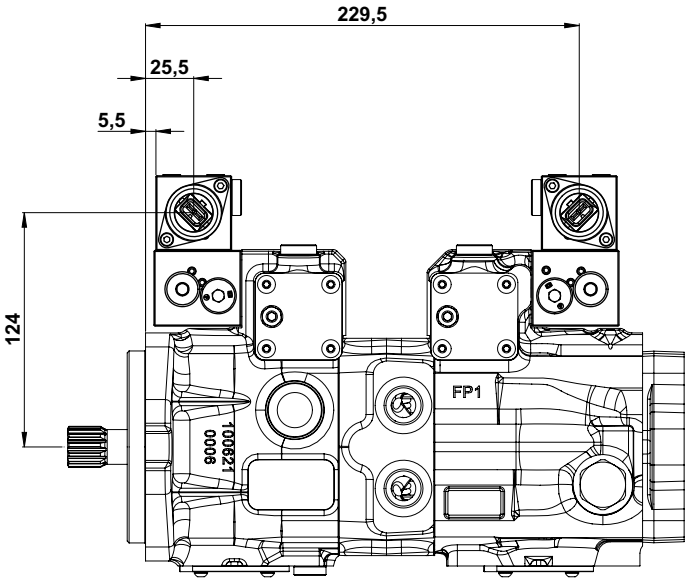
SEIX 1.3 (12V DC)
SEIX 2.3 (24V DC)

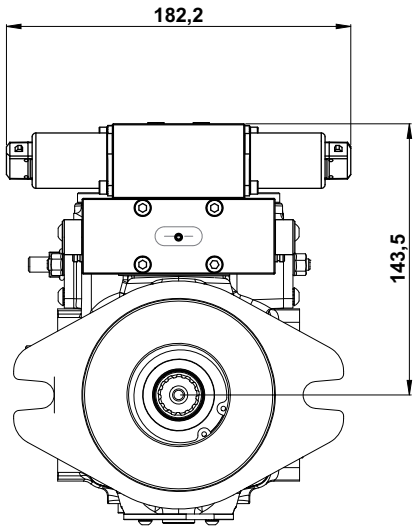
ELECTRO-PROPORTIONAL SERVO CONTROL WITH FEED BACK

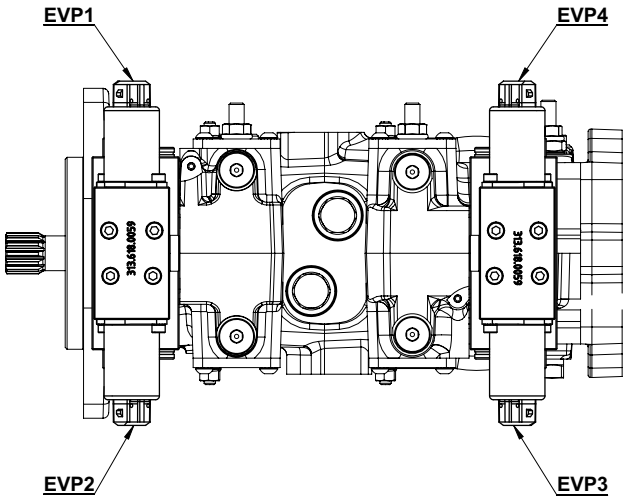
(AMP junior timer connector)

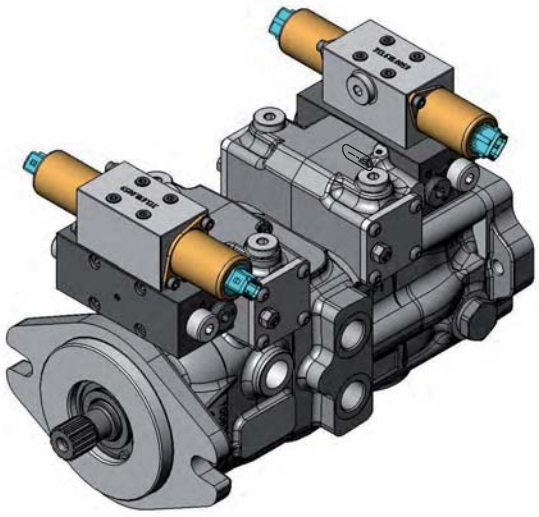
The pump displacement variation is obtained by an electric signal that goes from:

- 0 to 750 mA (24V DC voltage)
- 0 to 1500 mA (12V DC voltage)









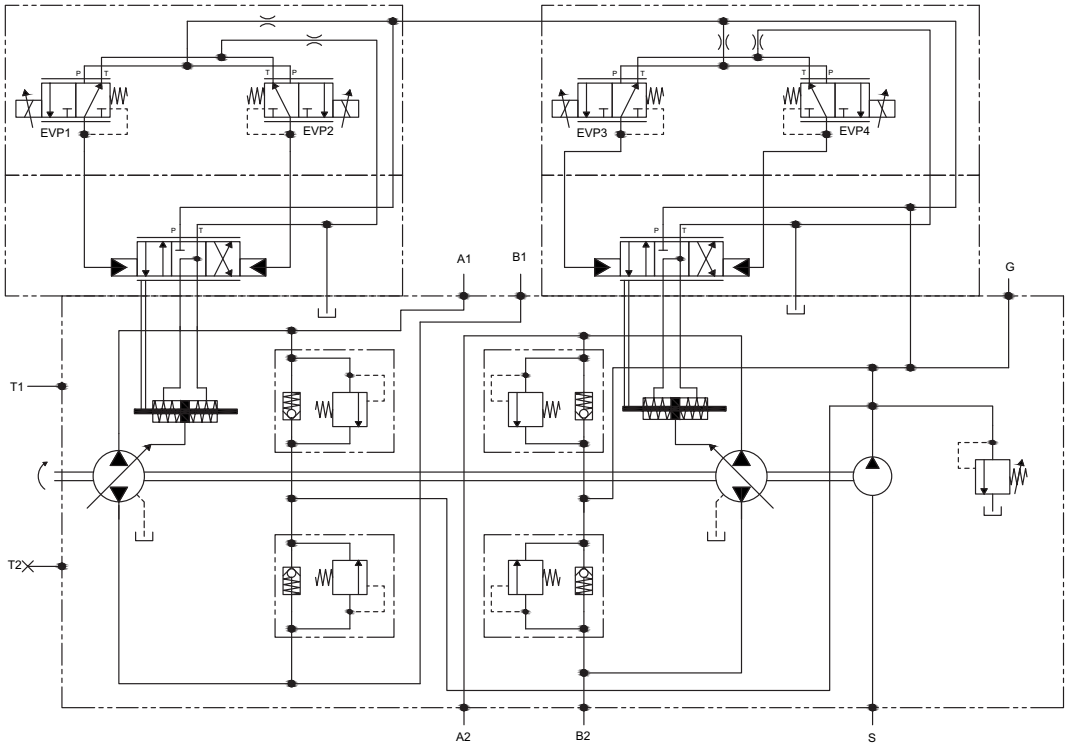
(continued)

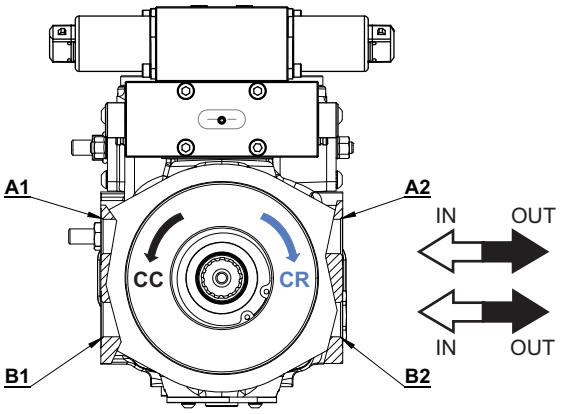
SEIX 1.3 (12V DC)
SEIX 2.3 (24V DC)

ELECTRO-PROPORTIONAL SERVO CONTROL WITH FEED BACK

(AMP junior timer connector)

HYDRAULIC DIAGRAM





FLOW DIRECTION	PRIMARY PUMP			SECONDARY PUMP		
Rotation	EVP	OUT	IN	EVP	OUT	IN
Clockwise (CR)	EVP1 EVP2	A_1 B_1	B_1 A_1	EVP3 EVP4	B_2 A_2	A_2 B_2
Counter clockwise (CC)	EVP1 EVP2	B_1 A_1	A_1 B_1	EVP3 EVP4	A_2 B_2	B_2 A_2

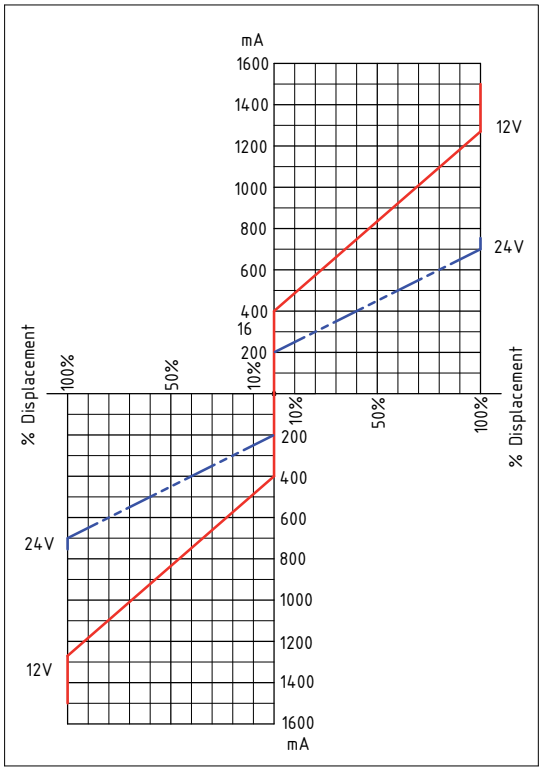
(continued)

SEIX 1.3 (12V DC)
SEIX 2.3 (24V DC)

ELECTRO-PROPORTIONAL SERVO CONTROL WITH FEED BACK

(AMP junior timer connector)

CURRENT-DISPLACEMENT GRAPHIC



ELECTRICAL FEATURES		
Voltage	12 V DC	24 V DC
Electric current	1500 mA	750 mA
Load resistence	4,72 Ω ± 5%	20,8 Ω ± 5%
Type of control	Current control	
	PWM 100 Hz (suggested)	
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 -20 to +90°C

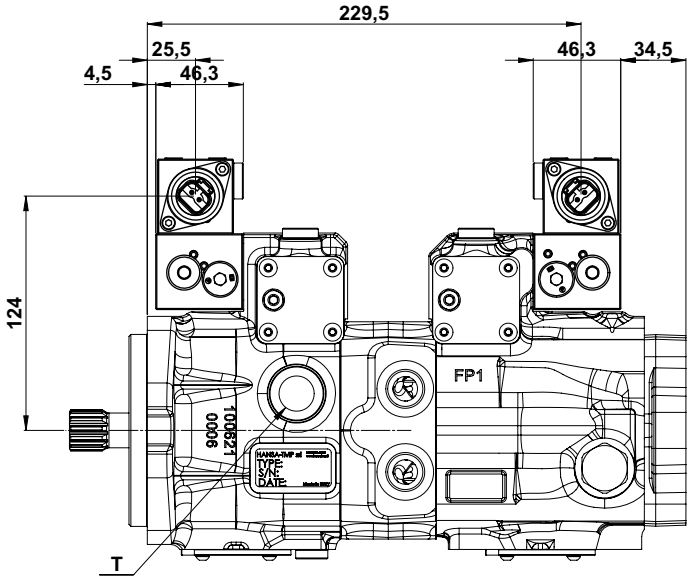
SEIX 1.3D (12V DC)
SEIX 2.3D (24V DC)

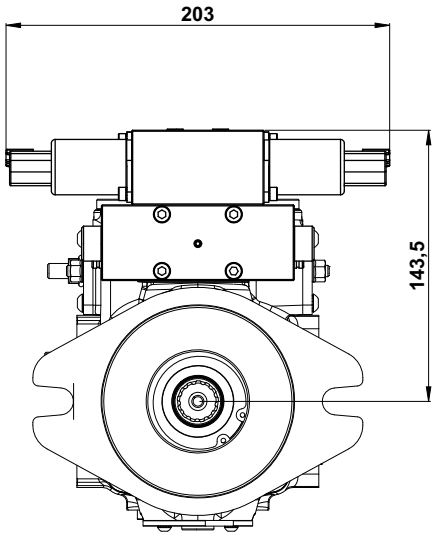
ELECTRO-PROPORTIONAL SERVO CONTROL WITH FEED BACK

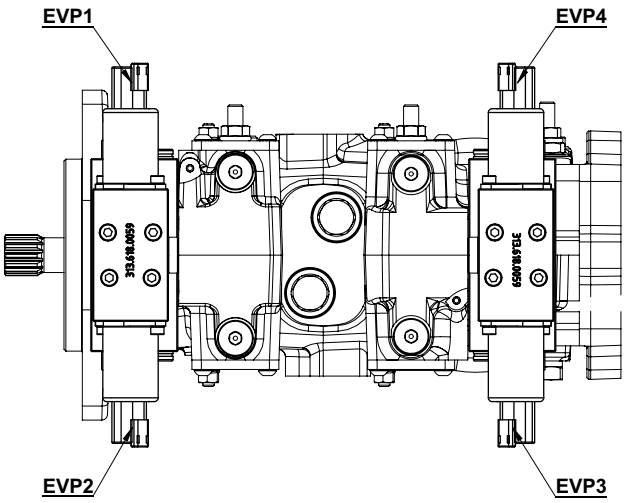
(Deutsch connector)

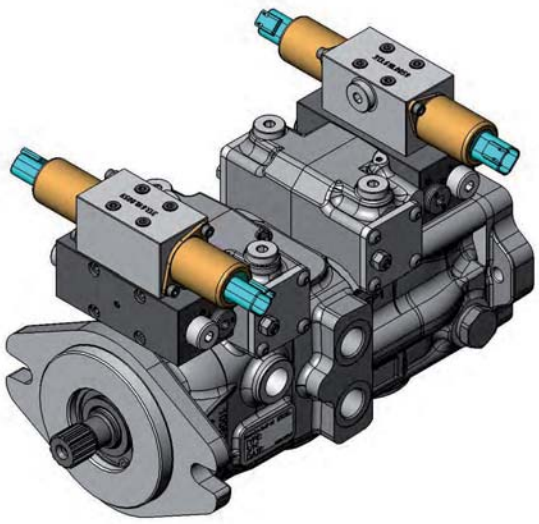
The pump displacement variation is obtained by an electric signal that goes from:

- 0 to 750 mA (24V DC voltage)
- 0 to 1500 mA (12V DC voltage)









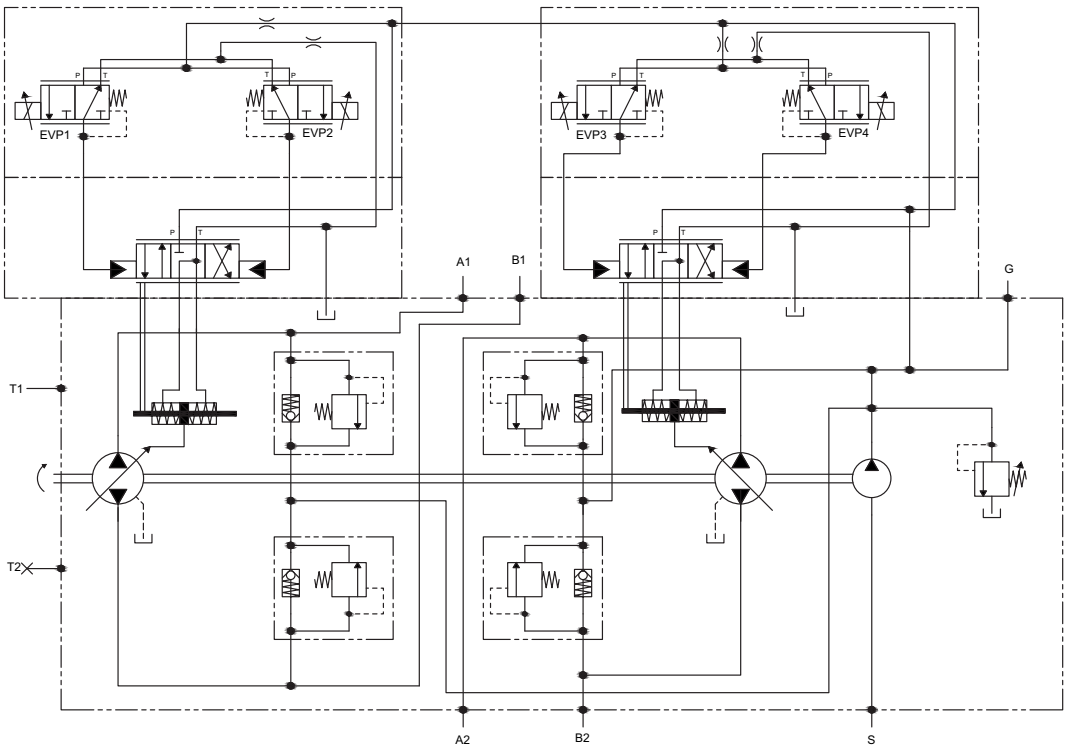
(continued)

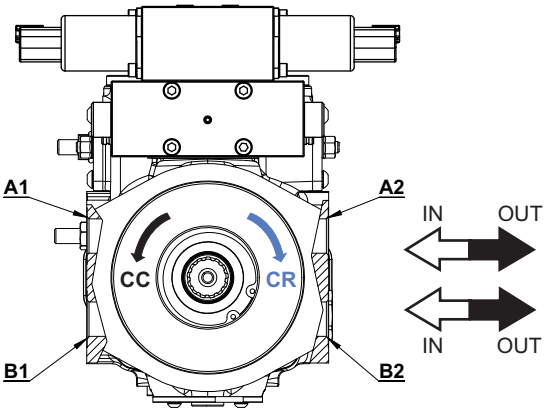
SEIX 1.3D (12V DC)
SEIX 2.3D (24V DC)

ELECTRO-PROPORTIONAL SERVO CONTROL WITH FEED BACK

(Deutsch connector)

HYDRAULIC DIAGRAM





FLOW DIRECTION	PRIMARY PUMP			SECONDARY PUMP		
Rotation	EVP	OUT	IN	EVP	OUT	IN
Clockwise (CR)	EVP1 EVP2	A_1 B_1	B_1 A_1	EVP3 EVP4	B_2 A_2	A_2 B_2
Counter clockwise (CC)	EVP1 EVP2	B_1 A_1	A_1 B_1	EVP3 EVP4	A_2 B_2	B_2 A_2

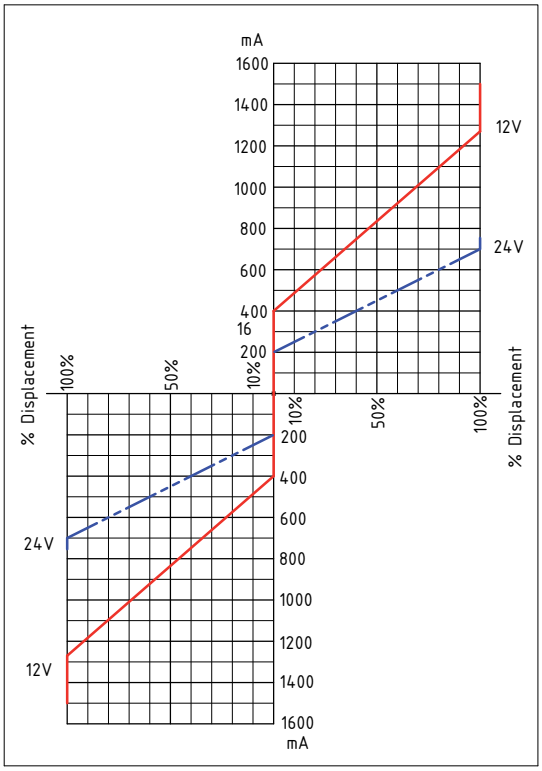
(continued)

SEIX 1.3D (12V DC)
SEIX 2.3D (24V DC)

ELECTRO-PROPORTIONAL SERVO CONTROL WITH FEED BACK

(Deutsch connector)

CURRENT-DISPLACEMENT GRAPHIC



ELECTRICAL FEATURES		
Voltage	12 V DC	24 V DC
Electric current	1500 mA	750 mA
Load resistence	4,72 Ω ± 5%	20,8 Ω ± 5%
Type of control	Current control	
	PWM 100 Hz (suggested)	
Type of connection	DEUTSCH DT 04-2P	
Protection class	Until IP6K6 / IPX9K	

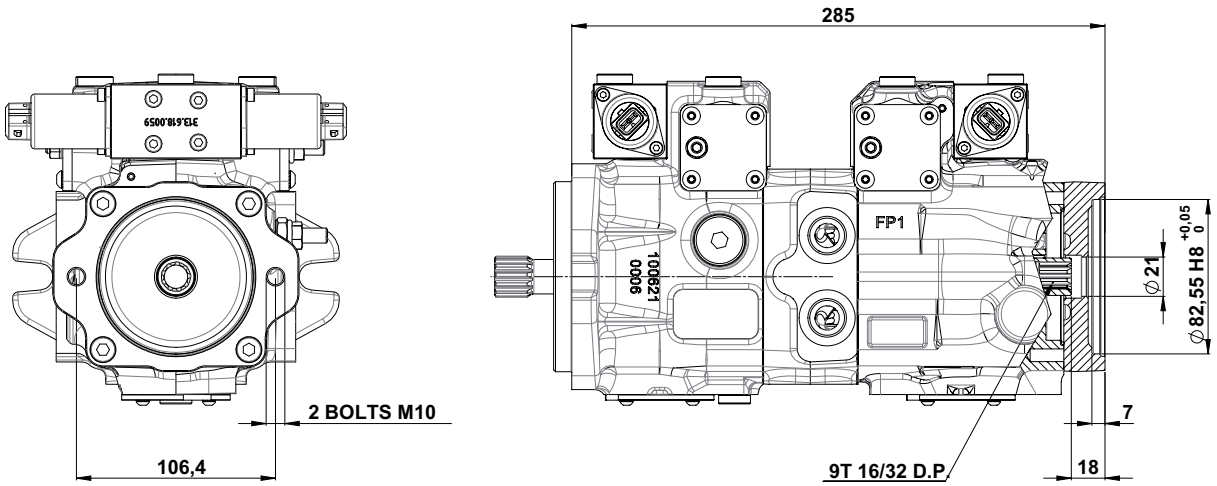
HYDRAULIC FEATURES	
Max. pressure (P, T)	pP= 5 MPa, pT= 3 MPa
Hysteresis (w/PWM)	<0,07 MPa (pA=2,0)
	<0,1 MPa (pA=2,5)
	<0,15 MPa (pA=3,5)
Filtration ratio	125 µm
Oil contamination level	Min. filtration ratio: 20/18/15
	According ISO 4406
	Hydraulic oil DIN 51524
Min./max. oil temperature	From -20 to +90°C

THROUGH DRIVE OPTIONS

SAE A - R

FLANGE SAE A - 2 BOLTS

ISO 3019-7
Max. torque = 120 Nm

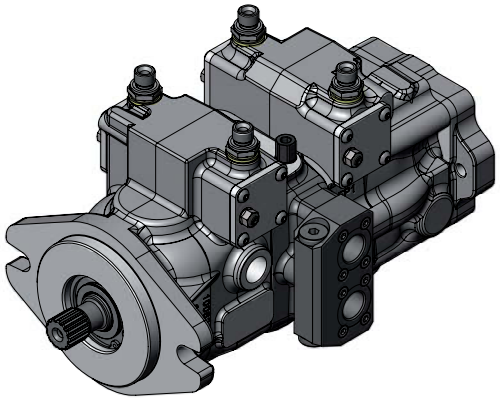


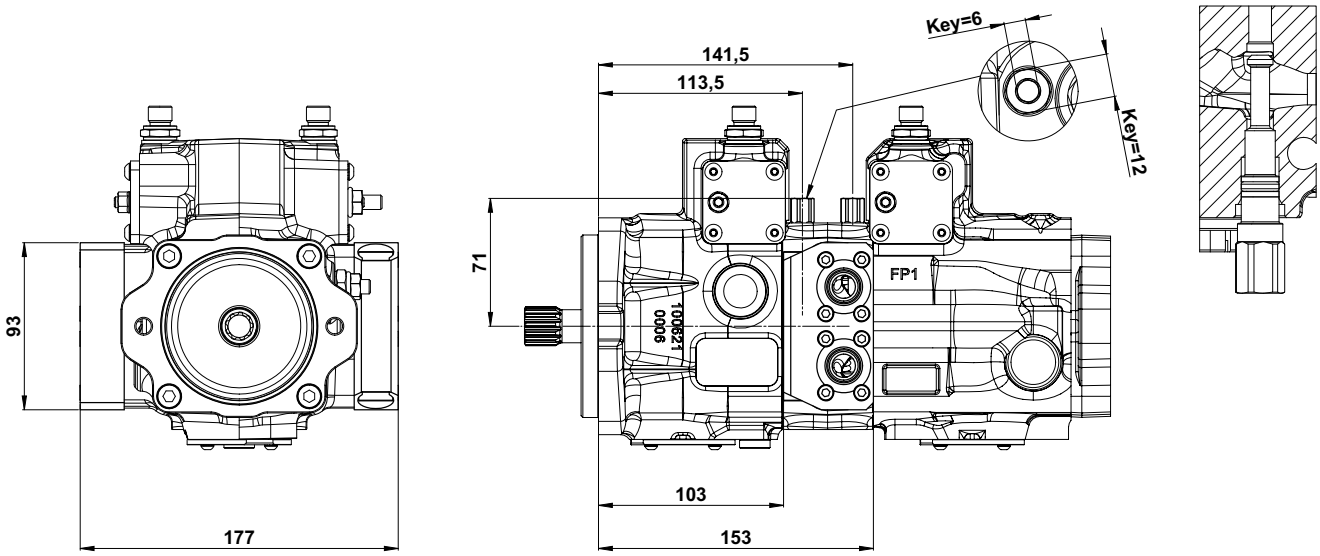
ANSI B92.1-1970 CLASS 7 SAE B

OPTIONAL VS-SB

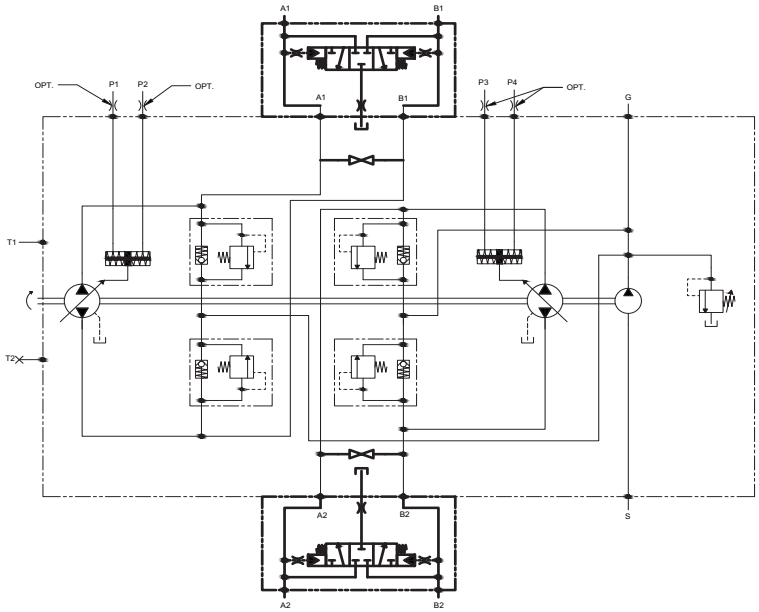
PURGE VALVE WITH SCREW BY-PASS

For the pump TPV-TPVTC 1500 an integrated purge valve (loop flushing) is available.
The valve consists of a spring centered shuttle spool connecting automatically the low pressure line (boost) with the reservoir removing heat from the system.
The quantity of the flushing oil is a function of the low system pressure (boost) and the size of the orifice on the valve (different orifices are available referred to the system pressure). The spool shifts at a differential pressure of about 0,8 MPa (116 PSI).





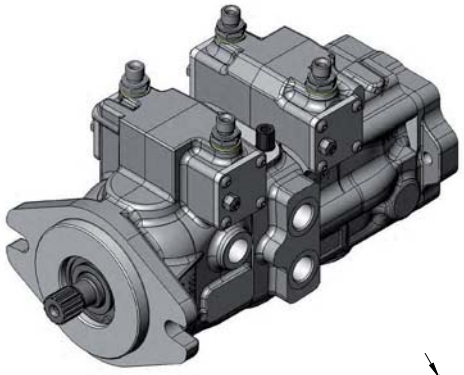
HYDRAULIC DIAGRAM

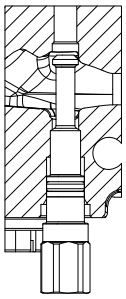


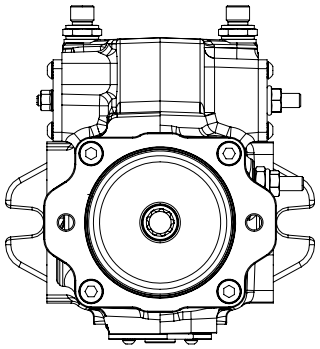
OPTIONAL SB

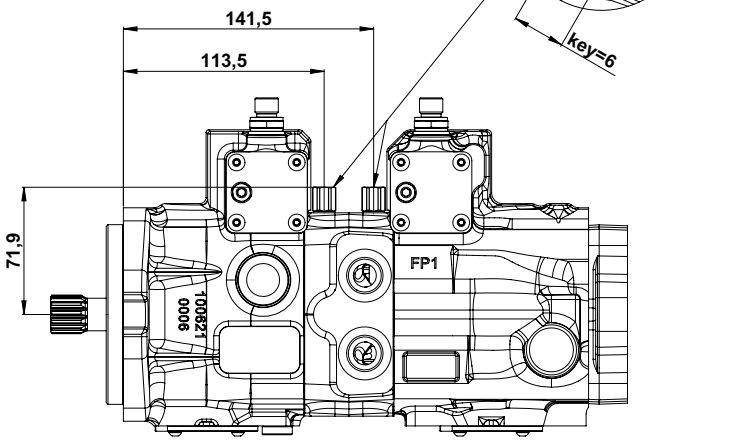
SCREW BY- PASS

To by pass the oil flow from one direction to the other, with the pump not running or in emergency condition a by pass screw can be actuated to connect the 2 lines of the hydraulic system. The orifice is completely open after 4 counter-clockwise rotations of the screw.

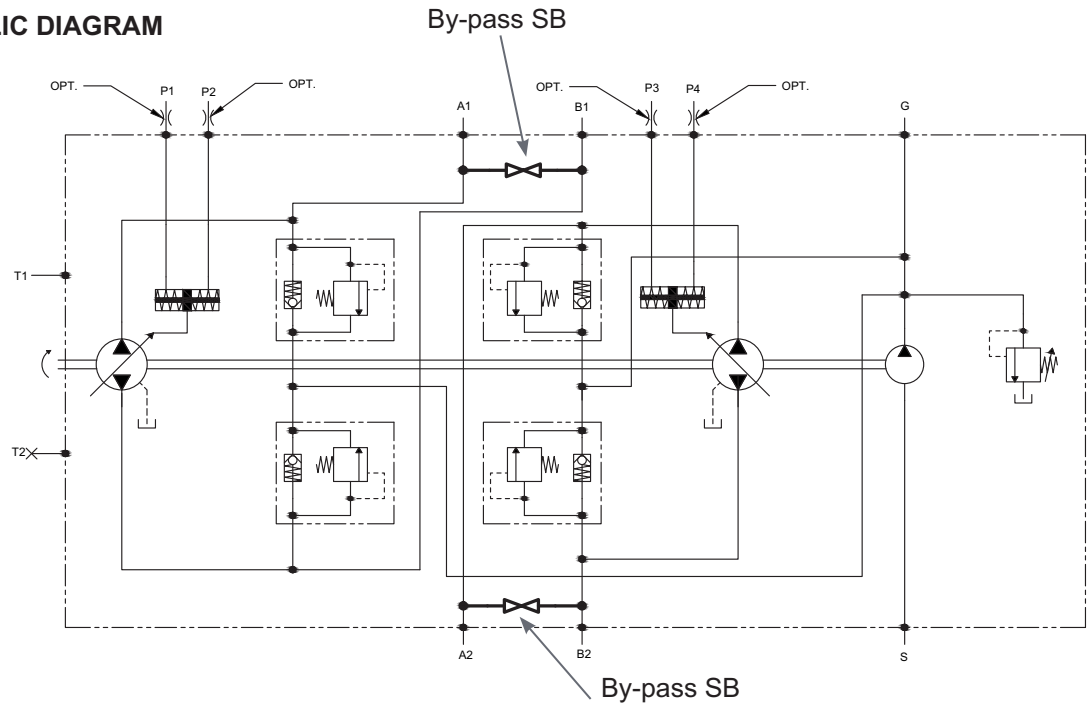








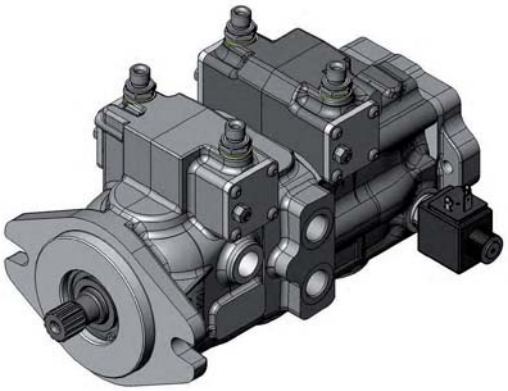
HYDRAULIC DIAGRAM

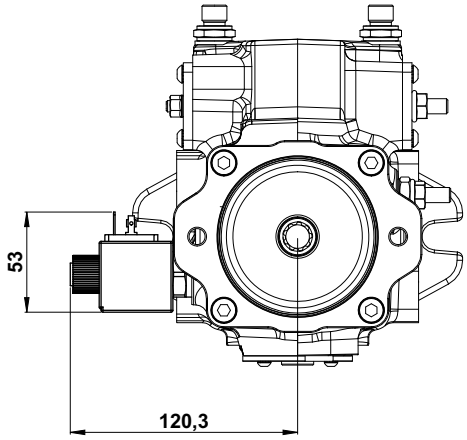


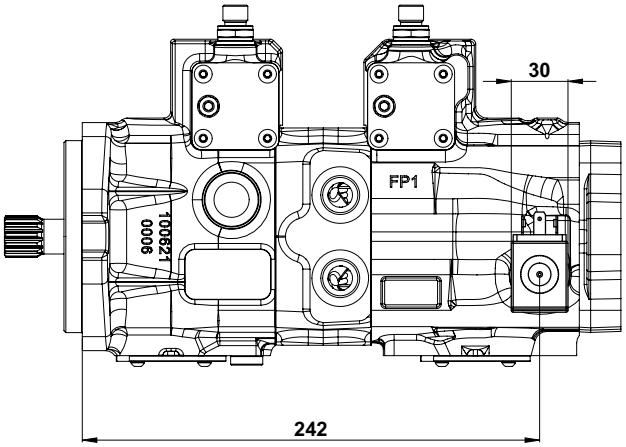
OPTIONAL MOB

MAN ON BOARD

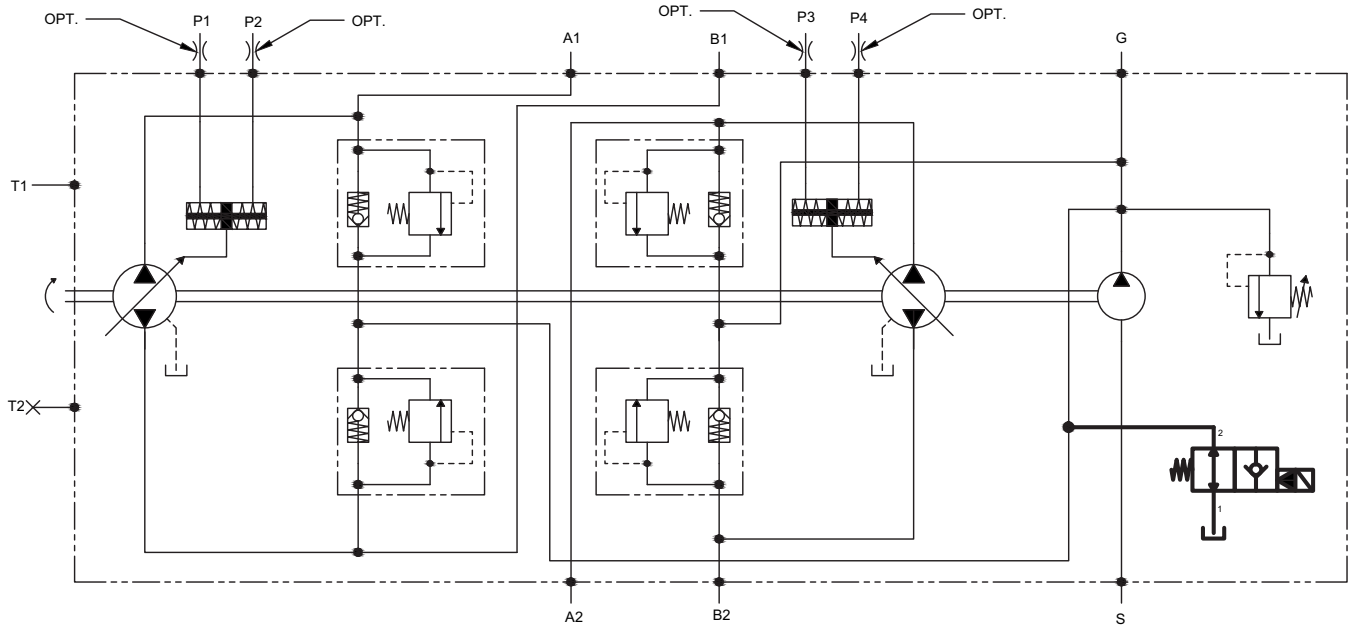
On the pump a normally open electrical operate valve can be fitted. The valve allow the flow delivery only when energized. This function is used to increase the safety of the machine. The solenoid valve is available for 12V or 24V DC voltage.







HYDRAULIC DIAGRAM



(continued)

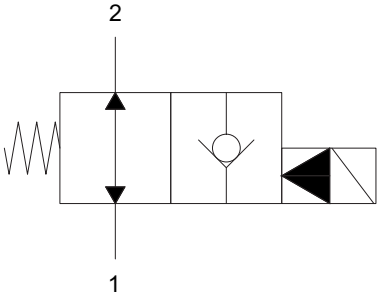
OPTIONAL MOB

MAN ON BOARD

TECHNICAL FEATURES

VALVE MOB - Hydraulic characteristics	
Max. operating pressure	30 MPa
Max. flow	40 lt/min.
Internal leakage	max. 5 drops/min. at 30 MPa
Response time	energized 20 ms
De-energized	30 ms
Temperature range	from -20°C to 90°C

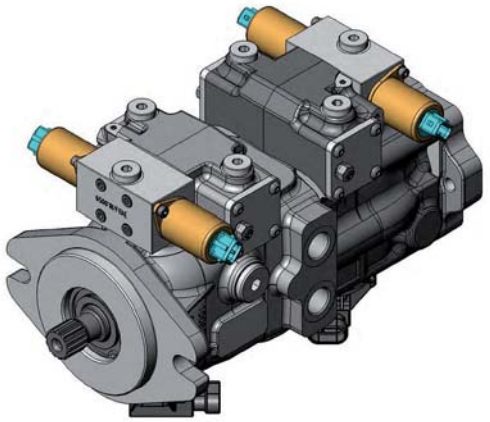
VALVE MOB - Electrical characteristics	
Power	18 W
Various voltage options available	(AC/DC)
Wire insulation	Class H
Duty factor	ED 100%
Supply power tolerance	+ 10%, - 15% (DC)
Ambient temperature	from -30°C to 60°C
Several connection options available	

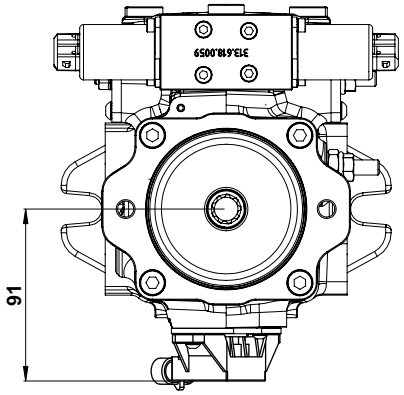


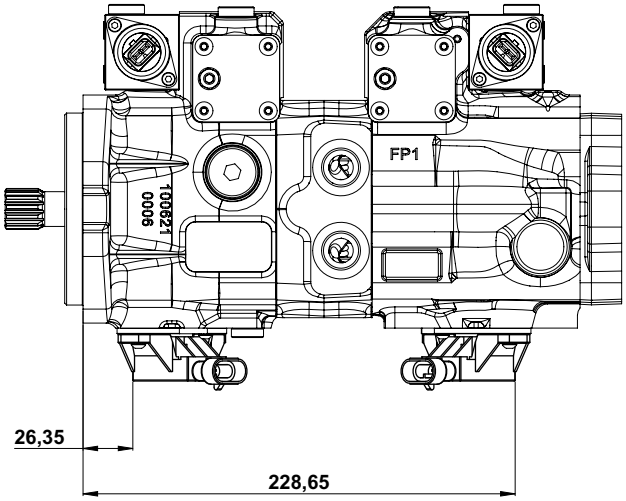
OPTIONAL RS

ANGLE SENSOR

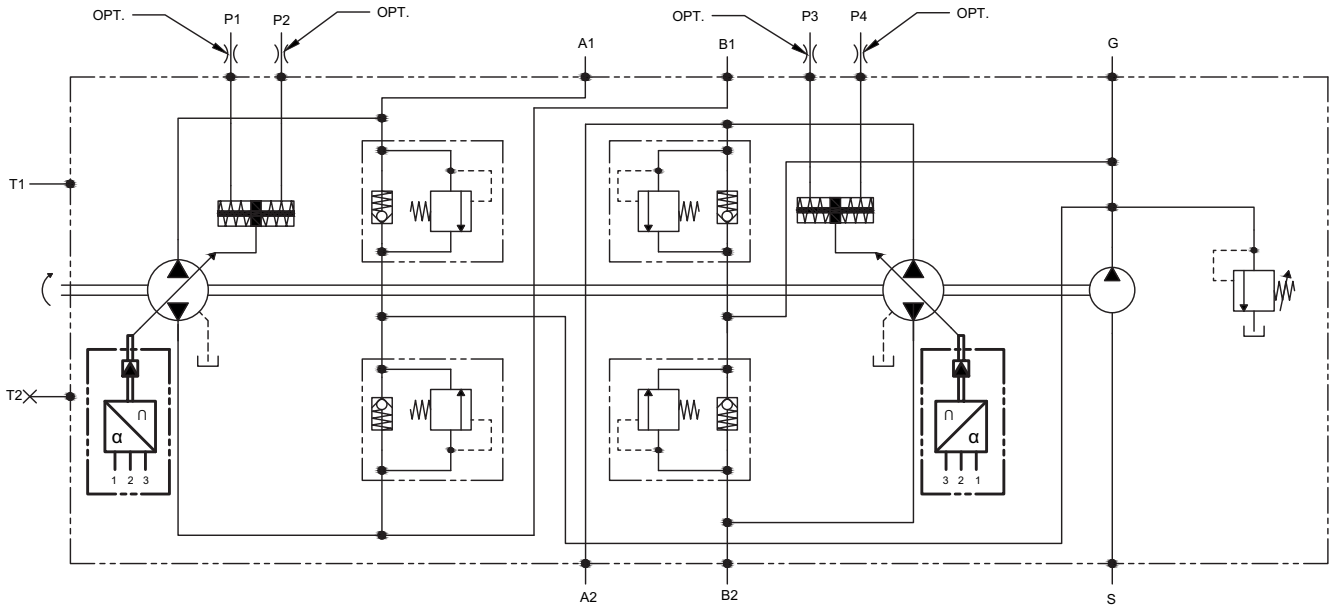
An electronic angle sensor, to measure the swash plate position, is available for the TPV-TPVTC 1500.
The electronic signal can be used for a remote control of the pump performance. The technical features of the sensor are shown on page 84.







HYDRAULIC DIAGRAM



(continued)

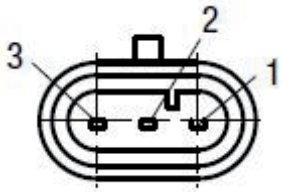
OPTIONAL RS

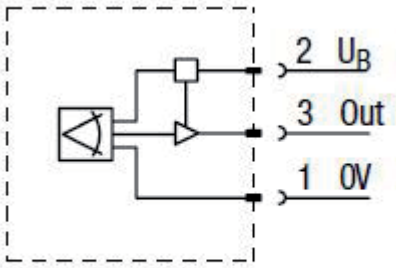
ANGLE SENSOR

TECHNICAL FEATURES

Operating voltage: 10-30 V DC
Output signal: 0.5-4.5 V
Current consumption: 12 V -> 10mA
Angular range: ± 25°
Resolution (20°C): 0.1°
Linearity error (20°C): ±0.4°
Load resistance: > 20 kΩ
Centre position: 2.5 V
Reverse connection protected: yes
Delay time of output signal: approx. 3 ms
Temperature range: -40 / +85°C

Offset temperature drift:
0.3 mV/°C - 1.2 µA/°C
IP protection class: IP 67

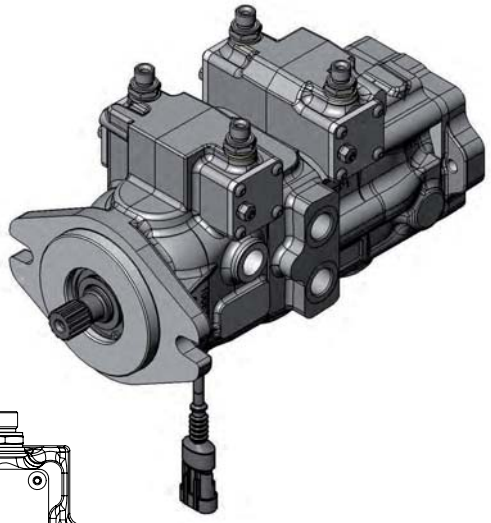


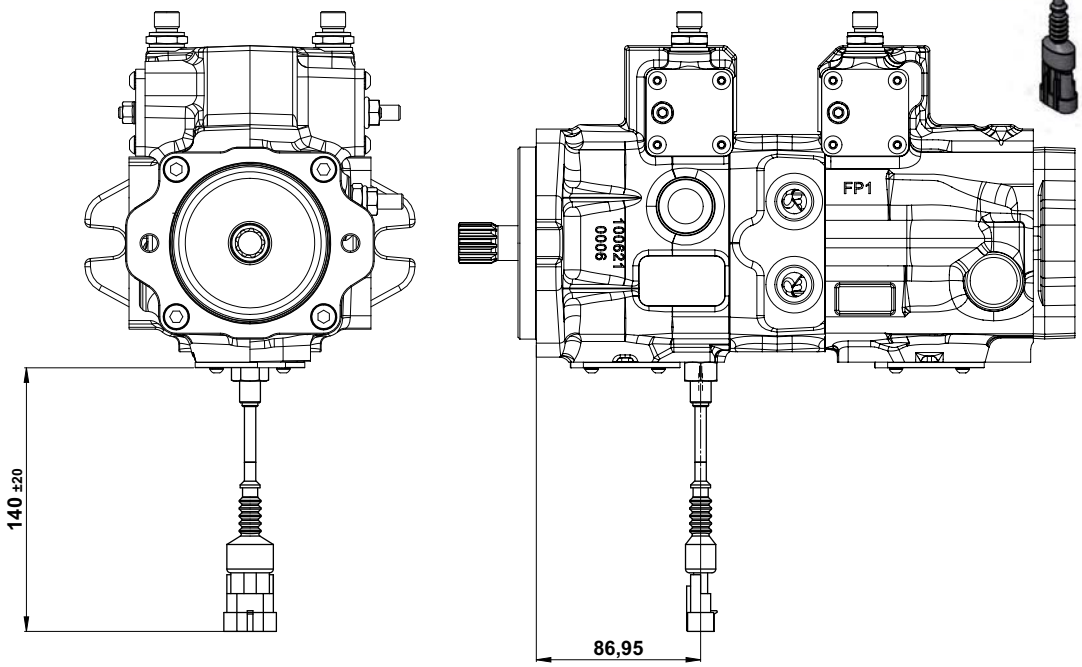


OPTIONAL REV.S

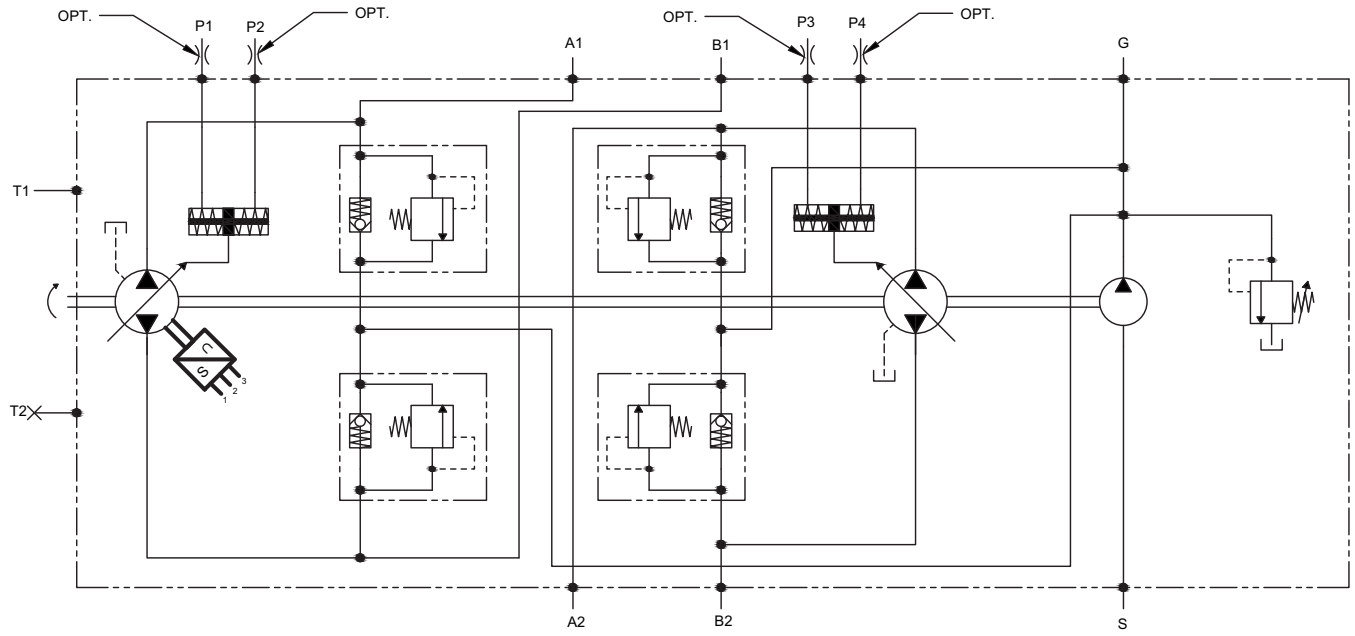
SPEED SENSOR

A speed sensor is available to monitor the pump shaft revolution speed. The technical features are shown on page 86.





HYDRAULIC DIAGRAM



(continued)

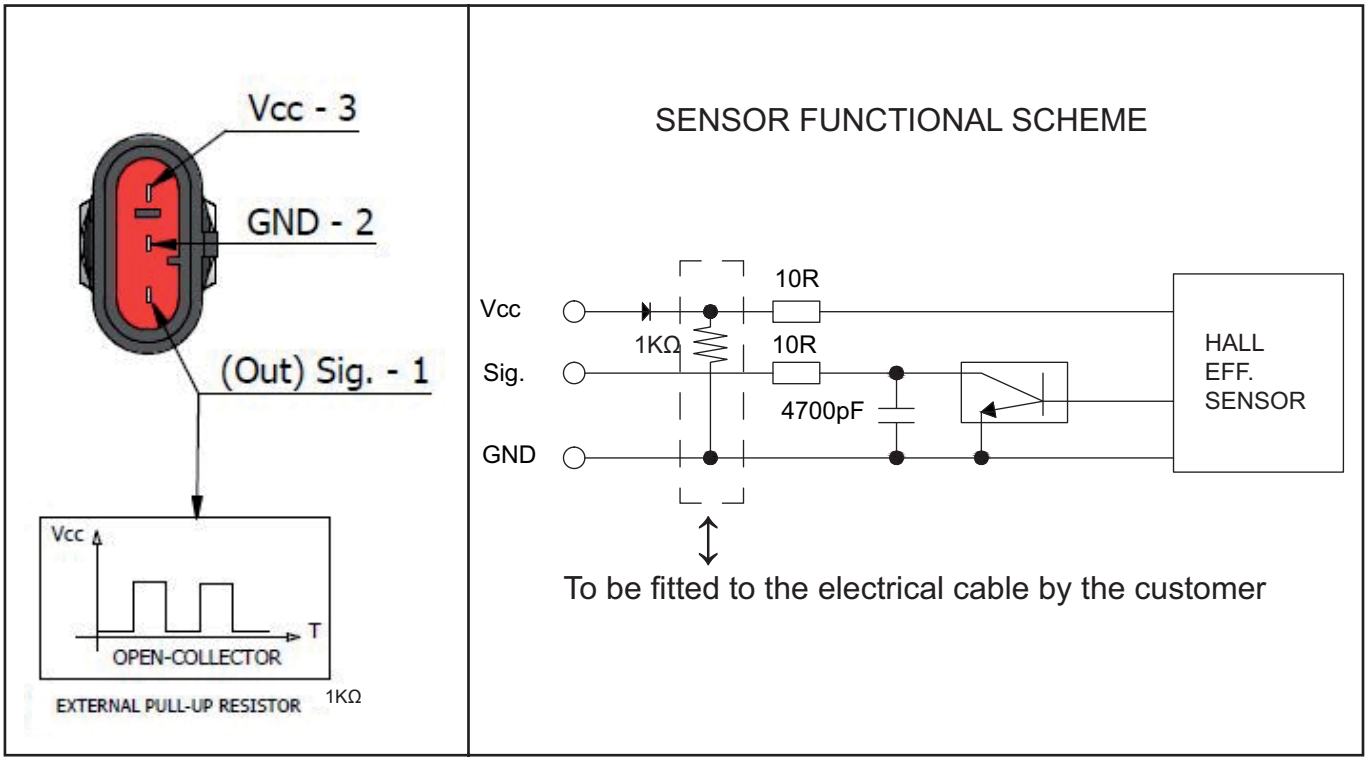
OPTIONAL REV.S

SPEED SENSOR

TECHNICAL FEATURES

Operating voltage: 4.5-30 V DC
Output current: max 25 mA
Maximum target: 15 kHz
Internal resistance: 140 ±30 Ω
Insulation resistance: 145 MΩ (500 V)
Protected by polarity inversion: yes
Output signal (freq): open collector (NPN)
Mechanical shock: 4 g (1mm/80Hz)
Electro magnetic compatibility: B.C.I.
-Class "C" 100 mA, 1÷400 MHz
Reverse polarity protection: -30 Vdc for 1h
Overload protection: 30 mA for 5'
Overvoltage protection: 35 V for 5'
Short circuit protection: to ground for 5'
to Vcc for 5'
Output transite voltage protection: V_{BR} min 31,35 max 34,65

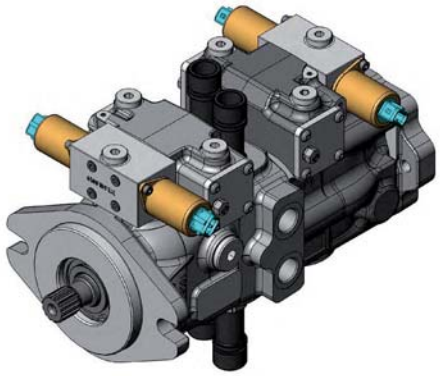
Temperature range: -40 / +150°C
Protection class: IP 67
Tightening torque: 25 Nm
Output pins are protected against 2000 V electrostatic discharge according to HMB
Output signal/revolution = 1

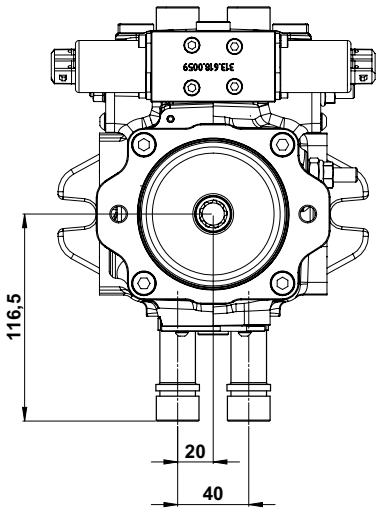


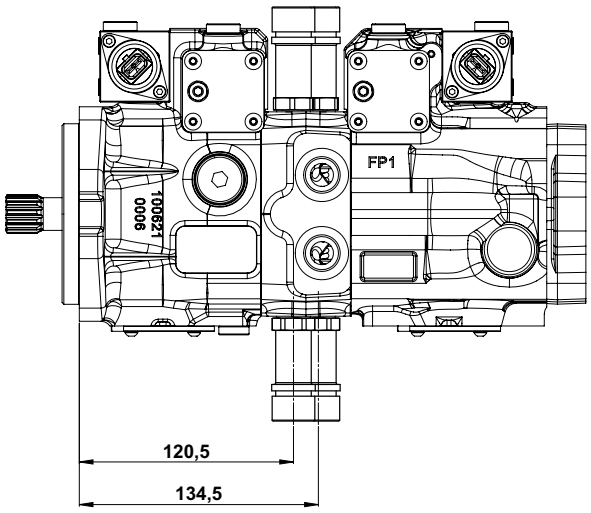
OPTIONAL PRS

PRESSURE SENSOR

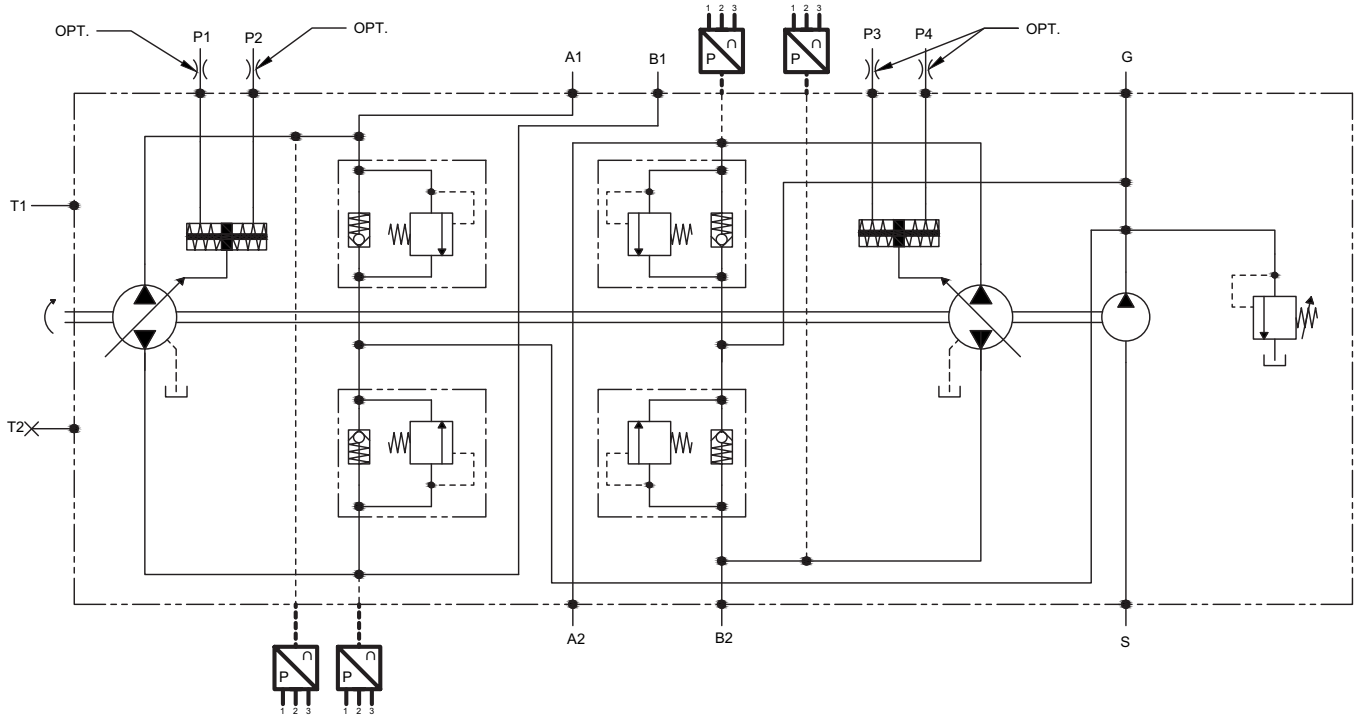
The TPV-TPVTC 1500 can fit a pressure sensor to monitor the working pressure. These information sent and processed by an electronic remote system allow a continuous remote control of the pump performance.The technical features are shown on page 88.







HYDRAULIC DIAGRAM



(continued)

OPTIONAL PRS

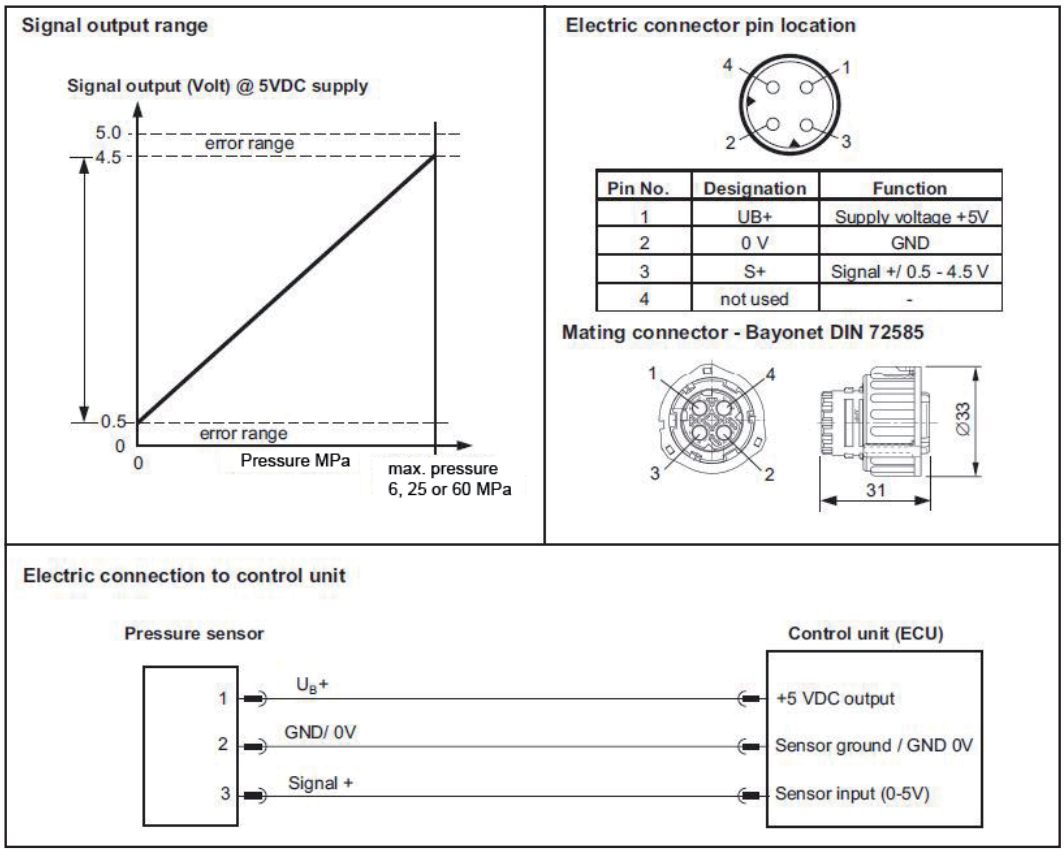
PRESSURE SENSOR

TECHNICAL FEATURES

Pressure range: 0-60 MPa
Over pressure, max permitted: 120 MPa
Burst pressure: 240 MPa
Power supply U_B: 5.0± 0.5 Volt DC
Signal output, ratiometric @5V: min. 0.5 - max. 4.5 Volt DC
Error levels, signal output: < 0.5 V and > 4.5 Volt
Response time: < 2 ms
Accuracy (IEC 61298-2): better than 1%, incl. non-linearity, hysterisis, repeatability, zero point & full scale error
Max load, R_A: > 4.5 kOhm
Temperature range:
- ambient, operating from -20 to +90°C
- hydraulic oil inlet from -20 to +90°C
- storage from -20 to +90°C

CE conformity acc. to: 89/336/EEC; EN 61326

Mechanical shock: 500 g (IEC60068-2-27)
Vibration resonance: 20 g (IEC60068-2-6)
IP protection class: IP 69K
Weight: 70 gr
Electric connector: O-ring sealed bayonet 4-way, DIN 72585 97/23/EG
Hydraulic connection: G1/4, DIN 3852-E, sealing ring 16.5x11.6x1.5



TROUBLE SHOOTING

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 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 relief valves.	Check - adjust the setting of relief valves.

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.

HANSA · TMP srl

HYDRAULIC COMPONENTS
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