PSM HYDRAULICS

Fixed displacement axial piston pumps and motors 310 series

TECHNICAL CATALOGUE

PSM-HYDRAULICS

2011

Contents

Ordering Code

A				B		C				D	E		F	G		H		I			
			.		.				.			.			.		.				

● = standart program
o = optional
- = not available

A - series

code	description	12	28	56	80	112	160	250
310	310 series	●	●	●	●	●	●	●
210	210 series	●	-	-	-	-	-	-

B - product version

code	description	12[1)]	28[1)]	56	80	112	160	250
2	ball bearing, bronze cylinder block	●	●	●[2)]	-	●[2)]	-	-
3	tapered roller bearing, bronze cylinder block	-	-	●	●	●	●	●
4	tapered roller bearing, steel cylinder block	-	-	●	●	●	●	●

C - displacement

code	description	12	28	56	80	112	160	250
12	12 ccm/rev	●	-	-	-	-	-	-
28	28 ccm/rev	-	●	-	-	-	-	-
56	56 ccm/rev	-	-	●	-	-	-	-
80	80 ccm/rev	-	-	-	●	-	-	-
112	112 ccm/rev	-	-	-	-	●	-	-
160	160 ccm/rev	-	-	-	-	-	●	-
250	250 ccm/rev	-	-	-	-	-	-	●

D - mounting flange

code	description	12	28	56	80	112	160	250
0	ISO 3019/2, 4 hole	●	●	●	●	●	●	●

E - product type, rotation and shaft end

code	type	rotation	shaft end	12	28	56	80	112	160	250
0	motor	reverse	splined shaft GOST 6033-51	-	●	-	-	-	-	-
			splined shaft GOST ГОСТ 6033-80	●	-	●	●	●	●	●
1	motor	reverse	parallel keyed shaft	●	●	●	●	●	●	●
2	motor	reverse	gear end	-	-	●	-	-	-	-
3	pump	right	splined shaft GOST 6033-51	-	●	-	-	-	-	-
			splined shaft GOST 6033-80	●	-	●	●	●	●	●
4	pump	left	splined shaft GOST 6033-51	-	●	-	-	-	-	-
			splined shaft GOST 6033-80	●	-	●	●	●	●	●
5	pump	right	parallel keyed shaft	●	●	●	●	●	●	●
6	pump	left	parallel keyed shaft	●	●	●	●	●	●	●
7	motor	reverse	splined shaft GOST 6033-80	-	●	-	-	-	-	-
8	pump	right	splined shaft GOST 6033-80	-	●	-	-	-	-	-
9	pump	left	splined shaft GOST 6033-80	-	●	-	-	-	-	-
A	motor	reverse	splined shaft 1 1/2" 23T 16/32DP ANSI B92.1a	-	-	-	-	●	-	-
B	motor	reverse	splined shaft 1 3/8" 21T 16/32DP ANSI B92.1a	-	-	-	-	●	-	-
C	pump	right	splined shaft 22x1,25x9g GOST 6033-80	-	●	-	-	-	-	-
D	pump	left	splined shaft 22x1,25x9g GOST 6033-80	-	●	-	-	-	-	-
E	motor	reverse	splined shaft DIN 5480 [3)]	-	-	●	●	●	●	-
F	motor	reverse	splined shaft DIN 5480 [4)]	-	-	●	●	●	●	●
G	pump	right	splined shaft DIN 5480 [3)]	-	-	●	●	●	●	-
H	pump	right	splined shaft DIN 5480 [4)]	-	-	●	●	●	●	●
I	pump	left	splined shaft DIN 5480 [3)]	-	-	●	●	●	●	-
J	pump	left	splined shaft DIN 5480 [4)]	-	-	●	●	●	●	●
K	motor	reverse	parallel keyed shaft DIN 6885	-	-	-	●	-	-	-
L	pump	right	parallel keyed shaft DIN 6885	-	-	-	●	-	-	-
M	pump	keft	parallel keyed shaft DIN 6885	-	-	-	●	-	-	-

F - valves and sensors

code	description	12	28	56	80	112	160	250
0	none	●	●	●	●	●	●	●
1	adjustable pressure-relief valve - left[5]	●	-	-	-	-	-	-
2	adjustable pressure-relief valve - right[5]	●	-	-	-	-	-	-
3	non-adjustable pressure-relief valve - left[5]	●	-	-	-	-	-	-
4	non-adjustable pressure-relief valve - right[5]	●	-	-	-	-	-	-
5	pressure-relief valves (PRV)	-	-	-	-	-	-	-
6	pressure-relief valves (PRV), flushing valve (FV)	-	-	●	-	-	-	-
7	flushing valve (FV)	-	-	-	●	●	-	-
8	pressure-relief valves (PRV), check valves (CK)	-	-	-	-	-	●	-
9	speed sensor	o	o	-	-	o	-	-
A	pressure-relief valves (PRV), check valves (CK), "OR"-valve (OR), by-pass valve (BP)	-	-	o	-	o	-	-

G - end cap options

code	description	12	28	56	80	112	160	250
0	2 threaded ports at rear side (under 25^0 to a shaft axis)	●	●	-	-	-	-	-
1	2 threaded ports at rear side (tap in parallel a shaft axis)	●	●	-	-	-	-	-
2	2 threaded ports at rear side (under 50^0 to a shaft axis)	●	●	-	-	-	-	-
3	2 threaded ports at opposite side, 2 threaded ports at rear side	●	●	●	-	-	-	-
4	1 threaded port at side, 1 flange port at rear side	o	o	-	-	-	-	-
5	1 threaded port at side, 1 threaded port at rear side	●	●	-	-	-	-	-
6	flange ports at rear side	-	-	●	●	●	●	●
7	1 flange port at side, 1 flange port at rear side	-	-	-	-	-	●	●
8	SAE 6000psi 2 flange ports at opposite side (for 310.4.112 - SAE 3000psi)	-	-	●	o	●	-	o
9	2 threaded ports at opposite side	-	-	●	-	-	-	-
A	SAE flange ports at rear side	-	-	-	-	●	-	-
B	SAE 6000psi flange ports at opposite side / flushing valve (FV)	-	-	-	-	●	-	-
C	2 threaded ports at rear side (under 25^0 to a shaft axis)	●	-	-	-	-	-	-
D	2 threaded ports at opposite side, 2 threaded ports at rear side, M33x2	-	-	●	-	-	-	-

H – shaft seals

code	description	12	28	56	80	112	160	250
B[6]	NBR	●	●	●	●	●	●	●
F	FKM	●	●	●	●	●	●	●

I - climatic version and category af desposition

code	description	12	28	56	80	112	160	250
Y1[6]	temperate climate, placing on open air	●	●	●	●	●	●	●
TB1	tropical climate, placing on open air	●	●	●	●	●	●	●
OM1	maritime climate, placing on open air	●	●	●	●	●	●	●

[1] - omitted in designation of hydraulic units with displacement: 12 cm^3 and 28 cm^3
[2] - not for new project
[3] - side fit
[4] - side fit, smaller size
[5] - from shaft side view
[6] - standart program, can be omitted

Technical characteristics.

Fixed displacement axial piston pumps

Size	12	28	56	80	112	160	250
Displacement V_g, ccm/rev	11,6	28	56	80	112	160	250
Shaft speed n, rpm							
- min n_{min}	400	400	400	400	400	400	400
- nom n_{nom}	2400	1920	1800	1500	1200	1200	960
- max n_{max}, at input pressure 0.8bar	4000	3000	2500	2240	2000	1750	1500
- peak n_{peak}, at input pressure 2bar	6000	4750	3750	3350	3000	2650	2100
Flow Q, l/min							
- min Q_{min}	4,64	11,20	22,40	32,00	44,80	64,00	100,00
- nom Q_{nom}	27,84	53,76	84,00	120,00	134,40	192,00	240,00
- max Q_{max}	46,40	84,00	140,00	179,20	224,00	280,00	375,00
- peak Q_{peak}	69,60	133,00	210,00	268,00	336,00	424,00	525,00
Working pressure P, bar							
- nom P_{nom}	200	200	200	200	200	200	200
- max working P_{max} for pumps 210, 310.3 series	320	320	350	350	350	350	350
- max working P_{max} for pumps 310.4 series	-	-	400	400	400	400	400
Power N, kW							
- nom N_{nom} (at n_{nom}, P_{nom})	15,46	28,00	46,66	59,73	74,66	93,33	125,00
- max N_{nom} (at n_{nom}, P_{nom}) for pumps 210, 310.3 series	24,74	44,80	81,66	104,56	130,66	163,33	218,75
- max N_{max} (at n_{max}, P_{max}) for pumps 310.4 series	-	-	93,33	119,46	149,33	186,66	250,00
Torgue T, Nm							
- nom T_{nom} (at P_{nom})	38,86	93,82	187,63	278,58	375,27	536,10	837,65
- max T_{max} (at P_{max}) for pumps 210, 310.3 series	62,19	150,11	328,36	469,08	656,73	938,18	1465,91
- max T_{max} (at P_{max}) for pumps 310.4 series	-	-	375,38	536,10	750,54	1072,20	1675,32
Volune efficiency	0,95	0,95	0,95	0,95	0,95	0,95	0,95
Weight, kg	4	9	17	19	29	45	65

Fixed displacement axial piston motors

Size	12	28	56	80	112	160	250
Displacement V_g, ccm/rev	11,6	28	56	80	112	160	250
Shaft speed n, rpm							
- min n_{min}	50	50	50	50	50	50	50
- nom n_{nom}	2400	1920	1800	1500	1200	1200	960
- max n_{max}	6000	4750	3750	3350	3000	2650	2100
Flow Q, l/min							
- min Q_{min}	0,58	1,40	2,80	4,00	5,60	8,00	12,50
- nom Q_{nom}	27,84	53,76	84,00	120,00	134,40	192,00	240,00
- max Q_{max}	69,60	133,00	210,00	268,00	336,00	424,00	525,00
Input pressure P, bar							
- nom P_{nom}	200	200	200	200	200	200	200
- max working P_{max} for motors 210, 310.3 series	320	320	350	350	350	350	350
- max working P_{max} for motors 310.4 series	-	-	400	400	400	400	400
Power N, kW							
- nom N_{nom} (at n_{nom}, P_{nom})	9,28	17,92	33,60	40,00	44,80	64,00	80,00
- max N_{max} (at n_{max}, P_{max}) for motors 210, 310.3 series	14,84	28,67	58,80	70,00	78,4	112,00	140,00
- max N_{max} (at n_{max}, P_{max}) for motors 310.4 series	-	-	67,20	80,00	89,60	128,00	160,00
Case drain pressure, bar	1	1	2	2	2	2	2
Torgue T, Nm							
- nom T_{nom} (at P_{nom})	35	84,6	169,3	241,8	338,7	483,8	756
- max T_{max} (at P_{max}) for motors 210, 310.3 series	56,1	135,5	296,3	423,3	592,7	846,7	1323
- max T_{max} (at P_{max}) for motors 310.4 series	-	-	338,8	483,8	677,4	967,7	1512
Volume efficiency	0,95	0,95	0,95	0,95	0,95	0,95	0,95
Weight, kg	4	9	17	19	29	45	65

Torgues shown at Volume efficiency=0.95
All other values - theoretical

Determination of the nominal size range of the pump.

$$\text{Flow } Q = \frac{V_g \cdot n \cdot \eta_v}{1000} \quad \text{l/min}$$

$$\text{Torque } T = \frac{V_g \cdot \Delta P}{20 \cdot \pi \cdot \eta_{mh}} \quad \text{N•m}$$

$$\text{Power } N = \frac{Q \cdot \Delta P}{612 \cdot \eta_t} \quad \text{kW}$$

where:

Q – flow, l/min
T – torque, N•m
N – power, kW
V_g – displacement, ccm/rev
n – shaft speed, rpm
ΔP – pressure difference, bar
η_v – volume efficiency
η_{mh} – hydraulic mechanical efficiency
$\eta_t = \eta_v \cdot \eta_{mh}$ – full efficiency coefficient

Determination of the nominal size range of the motor.

$$\text{Flow } Q = \frac{V_g \cdot n}{1000 \cdot \eta_v} \quad \text{l/min}$$

$$\text{Torque } T = \frac{V_g \cdot \Delta P \cdot \eta_{mh}}{20 \cdot \pi} \quad \text{N•m}$$

$$\text{Effective power } N = \frac{Q \cdot \Delta P \cdot \eta_t}{612} \quad \text{kW}$$

$$\text{Shaft speed } n = \frac{Q \cdot 1000 \cdot \eta_v}{V_g} \quad \text{rpm}$$

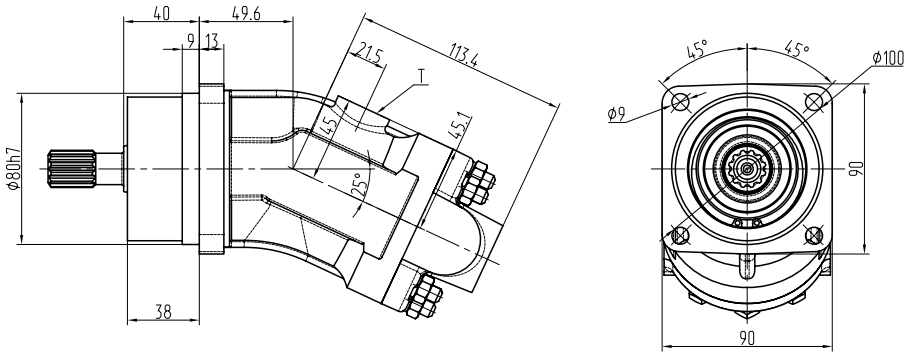
where:

Q – flow, l/min
T – torque, N•m
N – power, kW
V_g – displacement, ccm/rev
n – shaft speed, rpm
ΔP – pressure difference, bar
η_v – volume efficiency
η_{mh} – hydraulic mechanical efficiency
$\eta_t = \eta_v \cdot \eta_{mh}$ – overall efficiency

Requirements for working fluids.

Working fluid temperature:	
max constant in hydraulic tank	+85°C
max peak (output from drain hole)	+100°C
min short-term (at cold start)	- 40°C
kinematic viscosity of working fluid:	
optimal (constant)	20-35 mm^2/s (cSt)
max starting	1500 mm^2/s (cSt)
min short-term	10 mm^2/s (cSt)
Working fluid fineness:	not lower than class 12 as per GOST 17216-71 not lower than class 18/15 as per ISO/DIN 4406

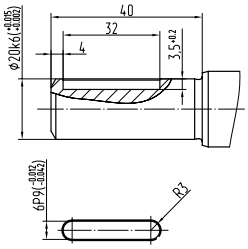
210.12 Overall dimensions



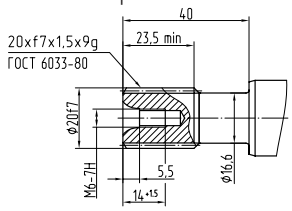
T - case drair port M12x1,5-12 ISO 6149-1

Shaft ends

Parallel keyed shaft

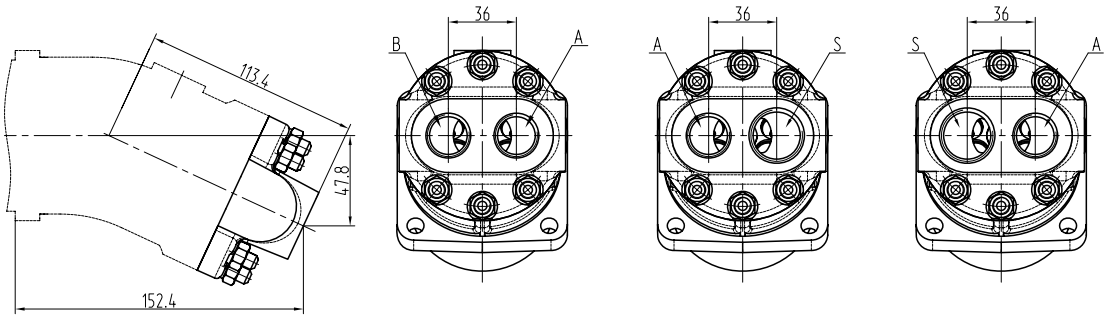


Splined shaft



End cap options

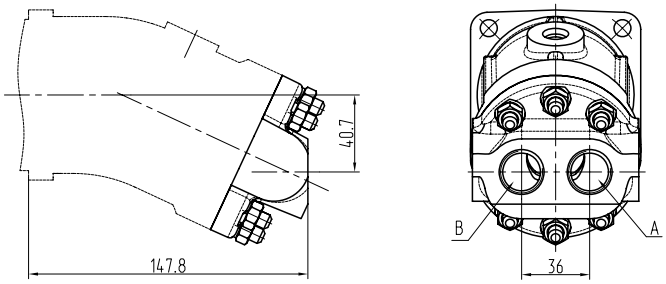
210.12.0[].00 - 2 threaded port at rear side (under 25° to a shaft axis)



motor pump right pump left

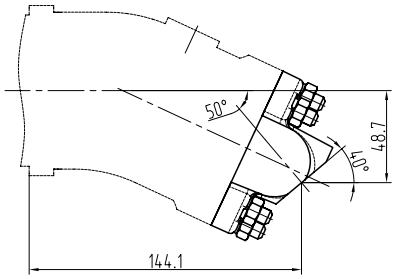
A, B - operating pressure ports M22x1.5-16, ISO 6149-1;
S - inlet port M27x2-16, ISO 6149-1

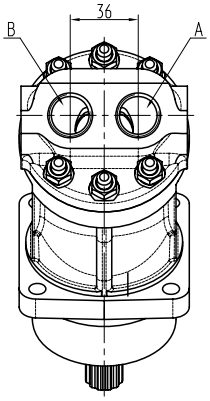
210.12.0[].01 - 2 threaded ports at rear side (tap in parallel a shaft axis)



A, B - operating pressure ports M22x1.5-16, ISO 6149-1

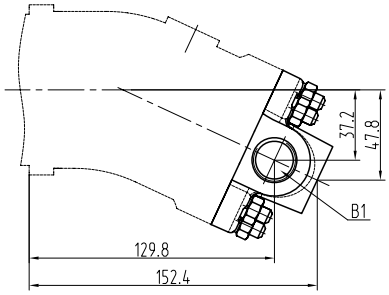
210.12.0[].02 - 2 threaded ports at rear side (under 50° to a shaft axis)

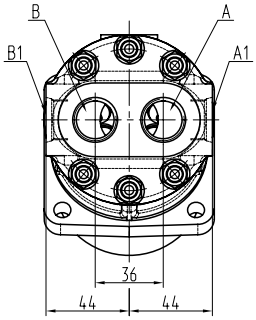




A, B - operating pressure ports M22x1.5-16, ISO 6149-1

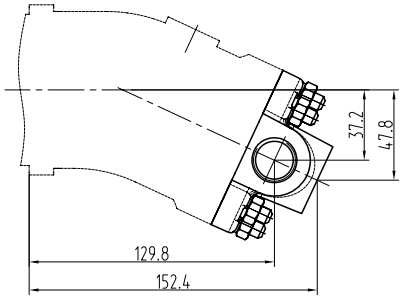
210.12.0[].03 - 2 threaded ports at opposite side, 2 threaded ports at rear side

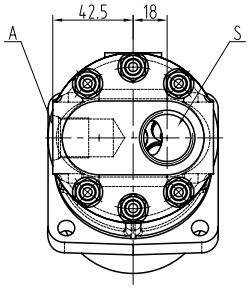


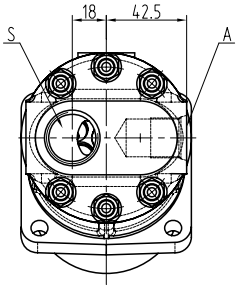


A, A1, B, B1 - operating pressure ports M22x1.5-16, ISO 6149-1

210.12.0[].05 - 1 threaded port at side, 1 threaded port at rear side





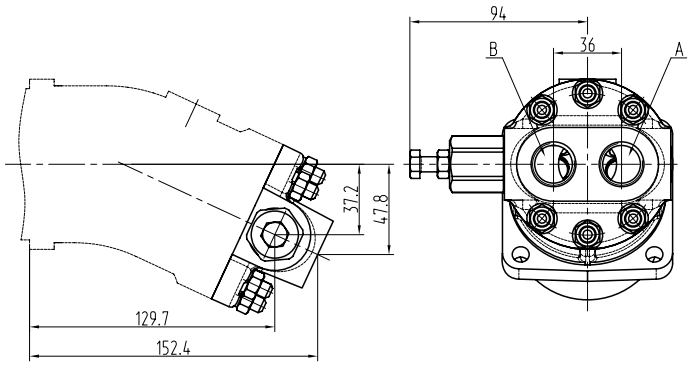


pump right pump left

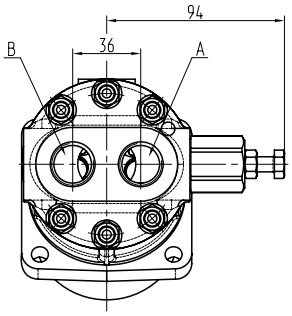
A - high pressure port M22x1.5-16, ISO 6149-1
S - inlet port M27x2-16, ISO 6149-1

2 threaded ports at rear side, adjustable pressure-relief valve

210.12.0[].20



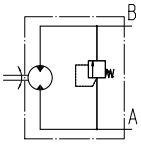
210.12.0[].10



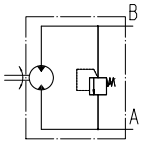
A, B - operating pressure ports M22x1.5-16, ISO 6149-1

Hydraulic circuit

210.12.0[].20

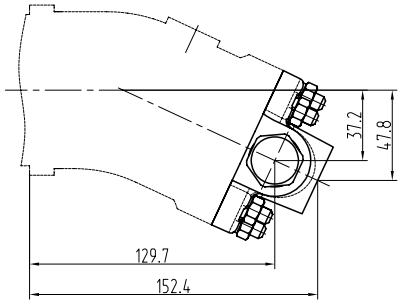


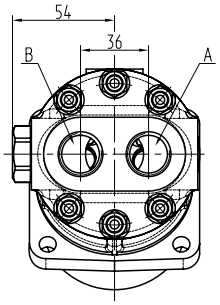
210.12.0[].10



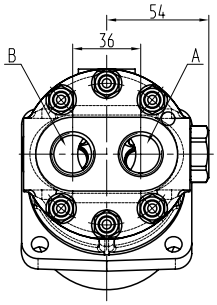
2 threaded ports at rear side, non-adjustable pressure-relief valve

210.12.0[].40





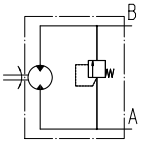
210.12.0[].30



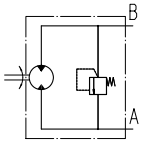
A, B - operating pressure ports M22x1.5-16, ISO 6149-1

Hydraulic circuit

210.12.0[].40

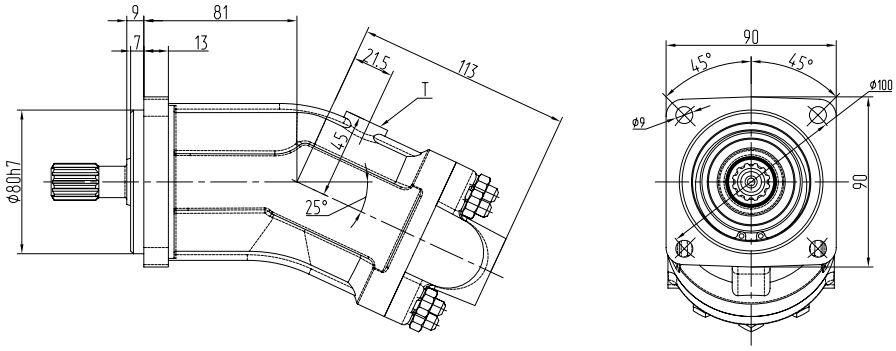


210.12.0[].30



Notes

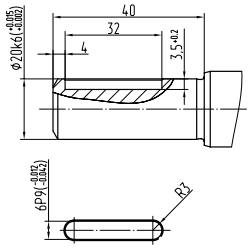
310.12 Overall dimensions



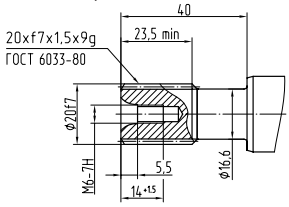
T - case drain ports M12x1,5-12 ISO 6149-1

Shaft ends

Parallel keyed shaft

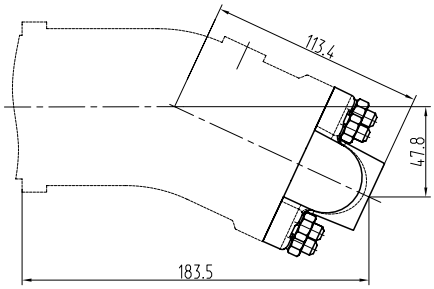


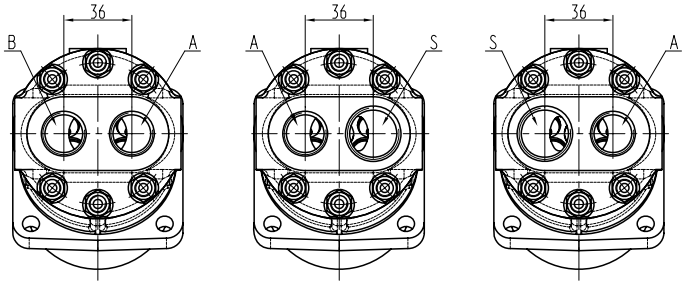
Splined shaft



End cap options

310.12.0[].00 - 2 threaded ports at rear side (under 25° to a shaft axis)

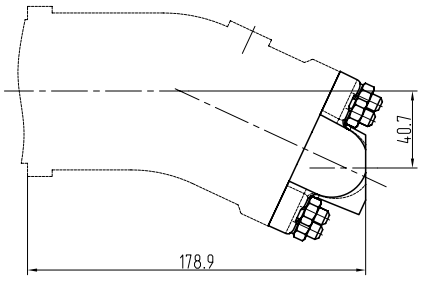


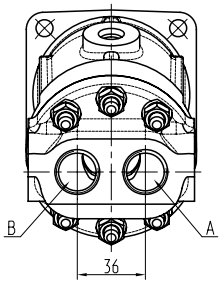


motor pump right pump left

A, B	- operating pressure ports	M22x1.5-16, ISO 6149-1
S	- inlet port	M27x2-16, ISO 6149-1

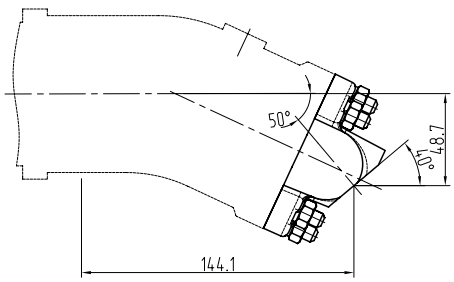
310.12.0[].01 - 2 threaded ports at rear side (tap in parallel a shaft axis)

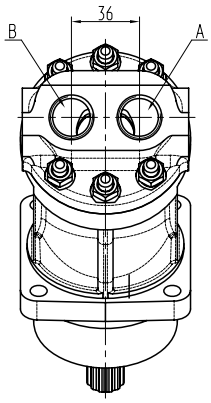




A, B - operating pressure ports M22x1.5-16, ISO 6149-1

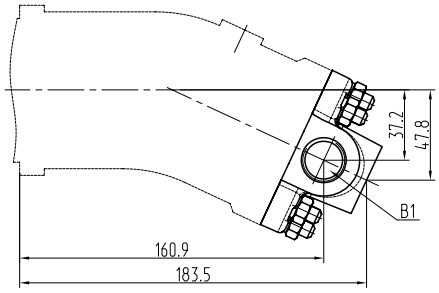
310.12.0[].02 - 2 threaded ports at rear side (under 50° to a shaft axis)

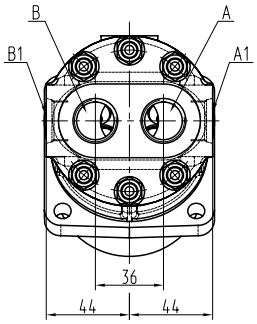




A, B - operating pressure ports M22x1.5-16, ISO 6149-1

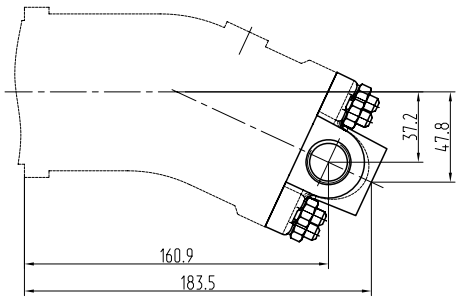
310.12.0[].03 - 2 threaded ports at opposite side, 2 threaded ports at rear side

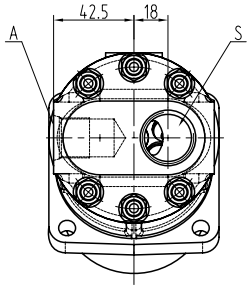


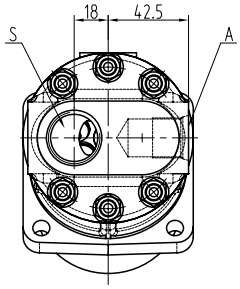


A, A1, B, B1 - operating pressure ports M22x1.5-16, ISO 6149-1

310.12.0[].05 - 1 threaded port at side, 1 threaded port at rear side





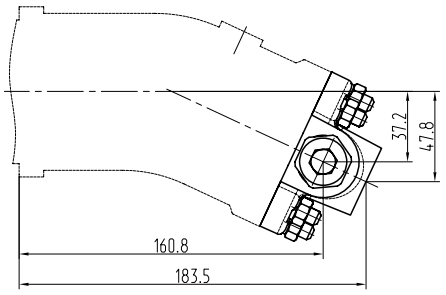


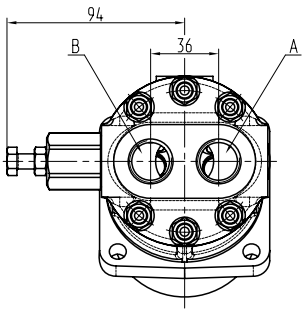
pump right pump left

A - high pressure port M22x1.5-16, ISO 6149-1
S - inlet port M27x2-16, ISO 6149-1

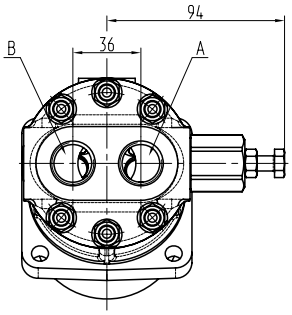
2 threaded ports at rear side, adjustable pressure-relief valve

310.12.0[].20





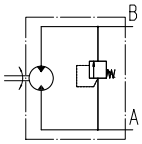
310.12.0[].10



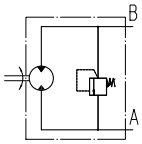
A, B - operating pressure ports M22x1.5-16, ISO 6149-1

Hydraulic circuit

310.12.0[].20

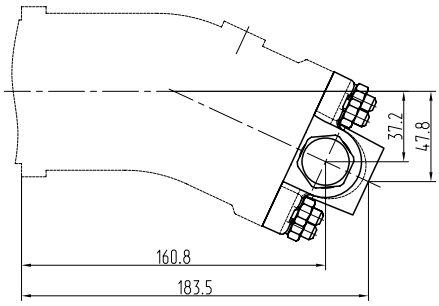


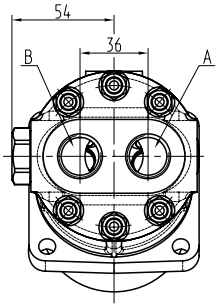
310.12.0[].10



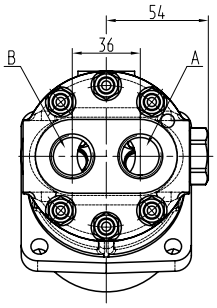
2 threaded ports at rear side, non-adjustable pressure-relief valve

310.12.0[].40





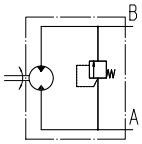
310.12.0[].30



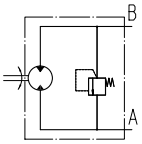
A, B - operating pressure ports M22x1.5-16, ISO 6149-1

Hydraulic circuit

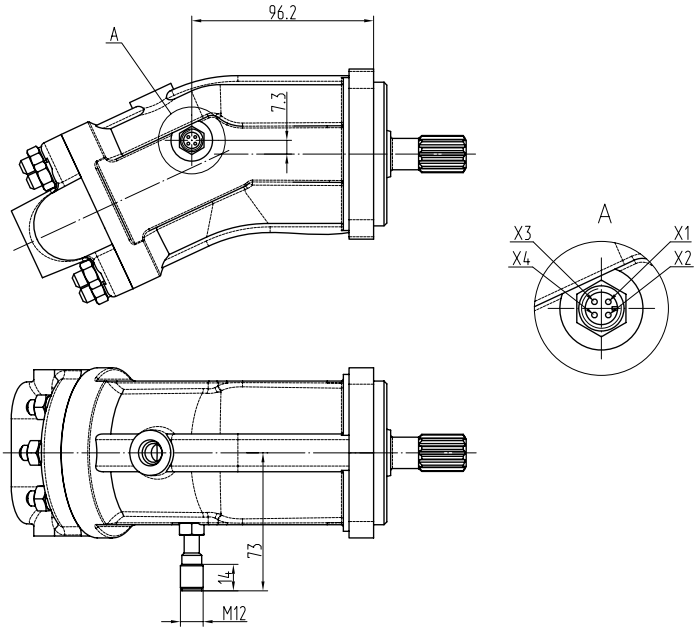
310.12.0[].40



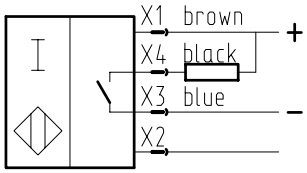
310.12.0[].30



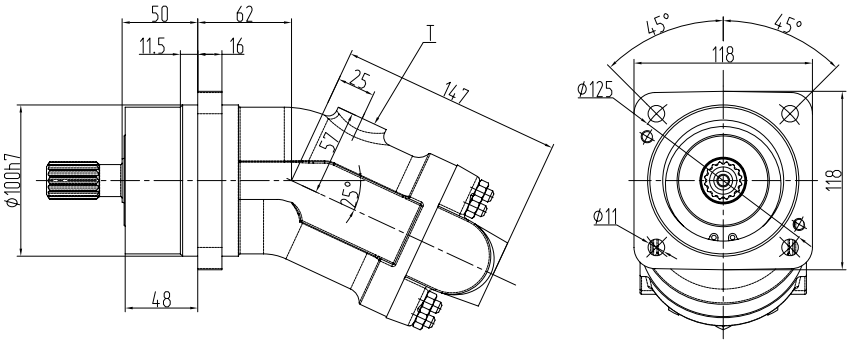
310.12.0[].90 - 2 threaded ports at rear side (under 25° to a shaft axis), integrated speed sensor



Connection



310.2.28 Overall dimensions

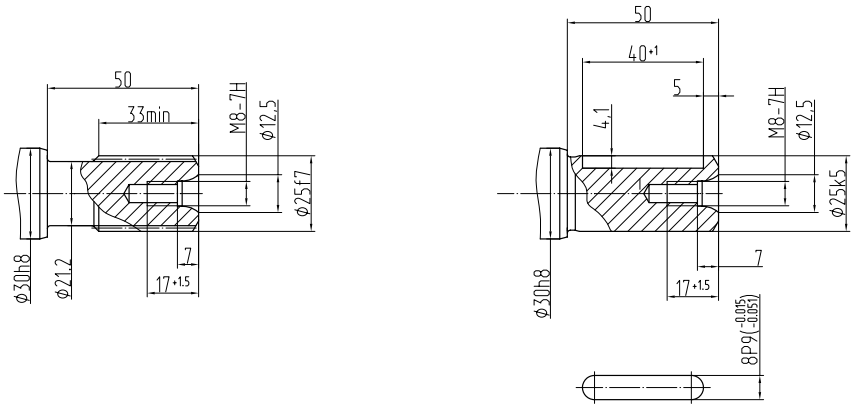


T - case drain port M18x1,5-18 ISO 6149-1

Shaft ends

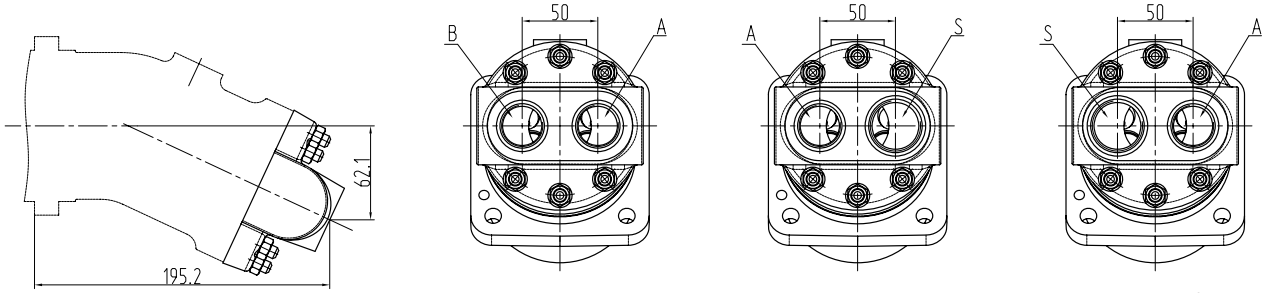
Splined shafts 25xf7x1,5x9g GOST 6033-80
Эв.25x1,5x16S_{3a}X GOST 6033-51

Parallel keyed shaft



End cap options

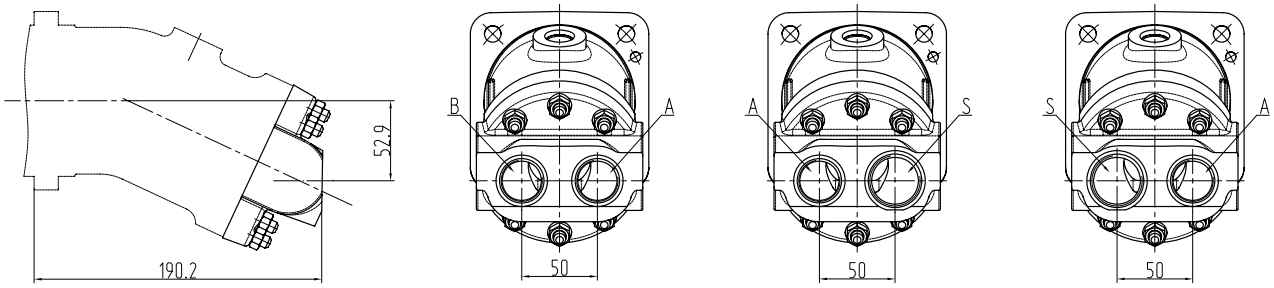
310.2.28.0[].00 - 2 threaded ports at rear side (under 25° to a shaft axis)



motor pump right pump left

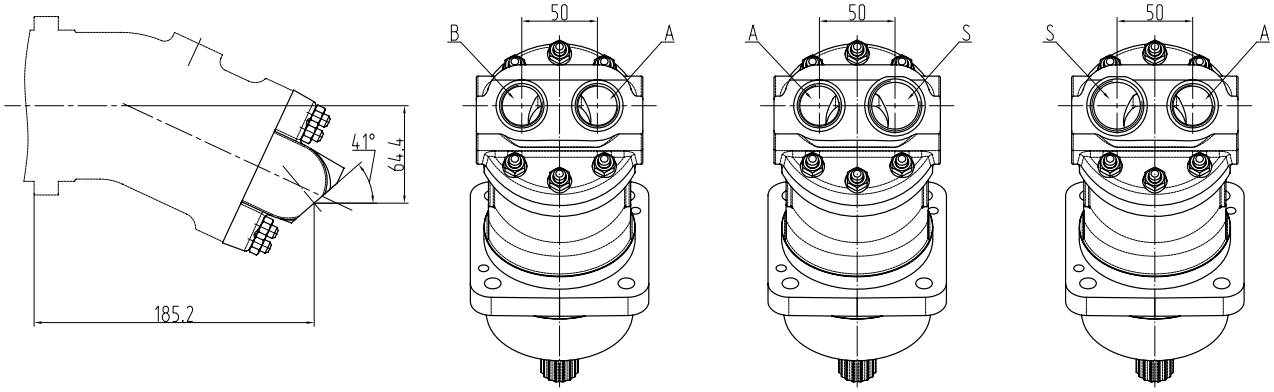
A, B	- operating pressure ports	M27x2-24, ISO 6149-1
S	- inlet port	M33x2-24, ISO 6149-1

310.2.28.0[].01 - 2 threaded ports at rear side (tap in parallel a shaft axis)



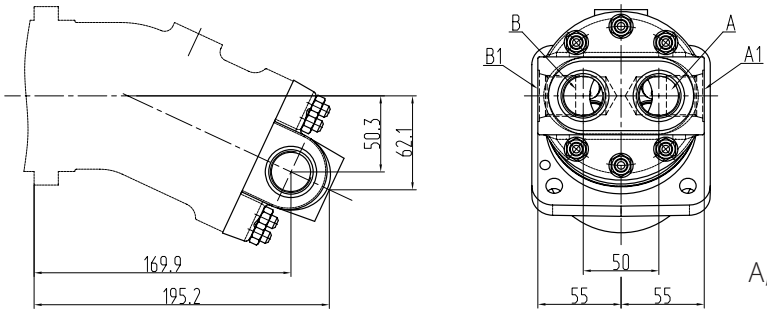
motor	pump right	pump left
A, B	- operating pressure ports	M27x2-20, ISO 6149-1
S	- inlet port	M33x2-20, ISO 6149-1

310.2.28.0[].02 - 2 threaded ports at rear side (under 50° to a shaft axis)



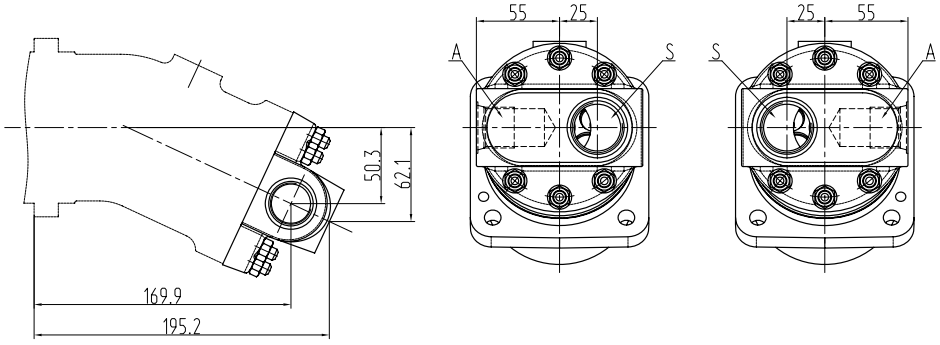
motor	pump right	pump left
A, B	- operating pressure ports	M27x2-20, ISO 6149-1
S	- inlet port	M33x2-20, ISO 6149-1

310.2.28.0[].03 - 2 threaded ports at opposite side, 2 threaded ports at rear side



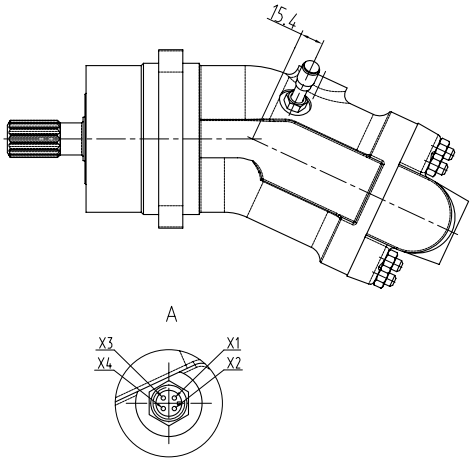
A, A1, B, B1 - operating pressure ports M27x2-24, ISO 6149-1

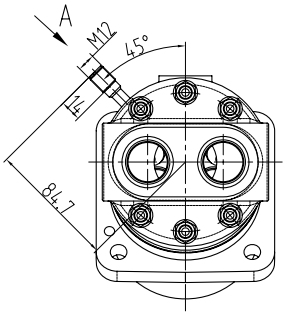
310.2.28.0[].05 - 1 threaded port at side, 1 threaded port at rear side



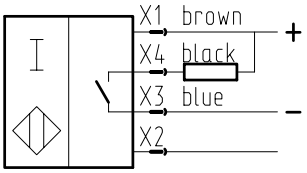
pump right	pump left
A - operating pressure ports	M27x2-24, ISO 6149-1
S - inlet port	M33x2-24, ISO 6149-1

310.2.28.0[].90 - 2threaded ports at rear side (under 25° to a shaft axis), integrated speed sensor



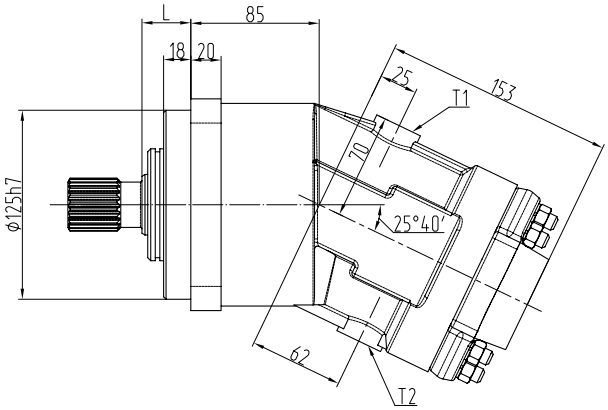


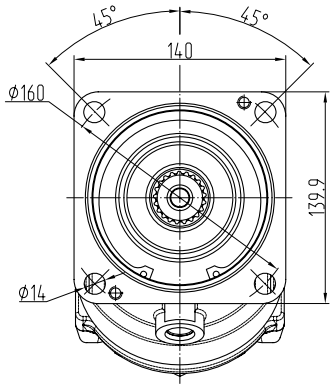
Connection



Notes

310.3(4).56 Overall dimensions

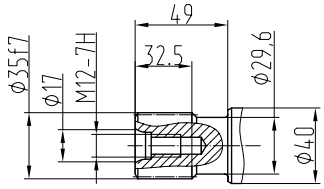




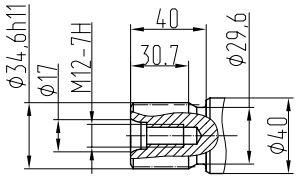
L = 32 mm for DIN splined shafts, for other splined shafts L = 33,5 mm
T1, T2 - case drain ports M18x1,5-18 ISO 6149-1

Shaft ends

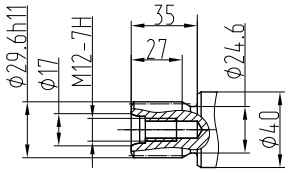
35xf7x2x9g GOST6033



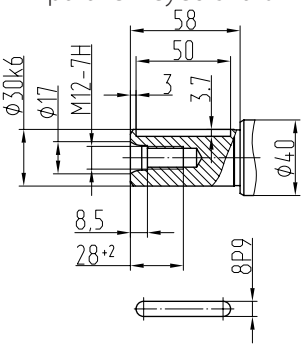
W35x2x30x16x9g DIN5480



W30x2x30x14x9g DIN5480

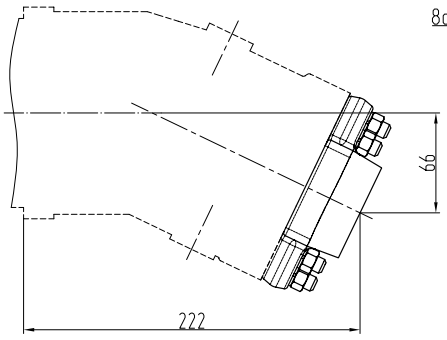


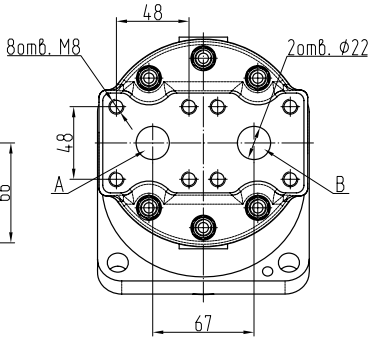
parallel keyed shaft



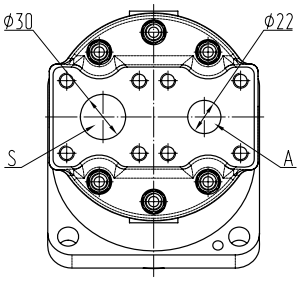
End cap options

310.3(4).56.0[].06 - 2 flange at rear side

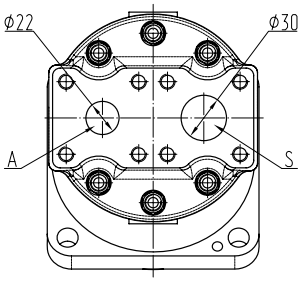




motor

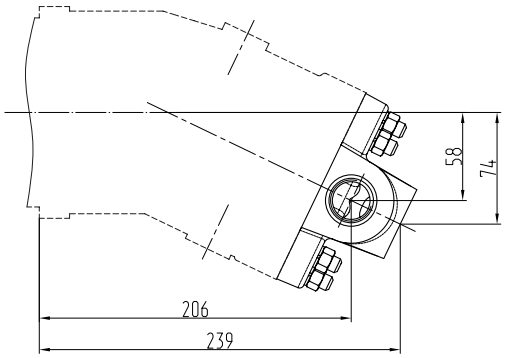


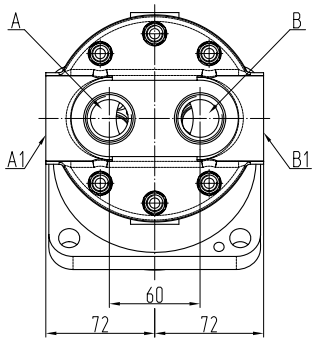
pump right



pump left

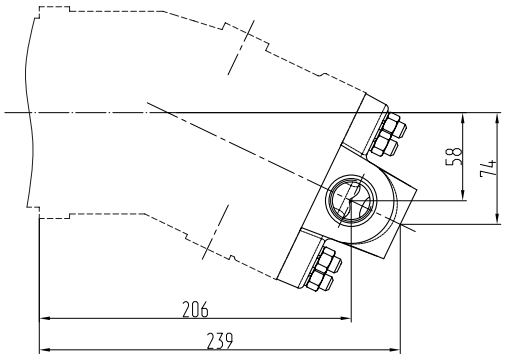
310.3(4).56.0[].03 - 2 threaded ports at opposite side, 2 threaded ports at rear side

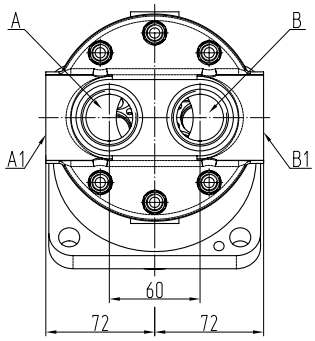




A, A1, B, B1 - operating pressure ports M27x2-24, ISO 6149-1

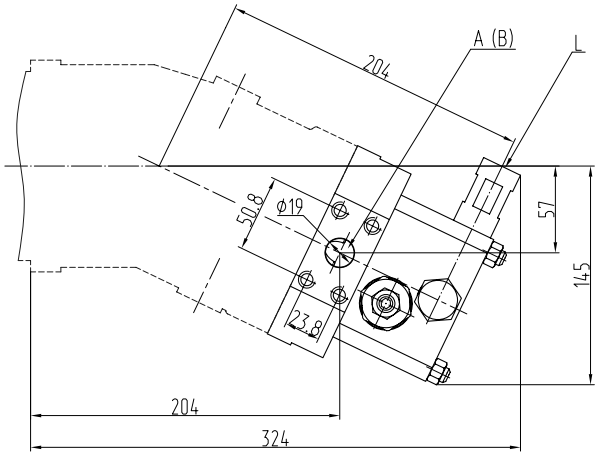
310.3(4).56.0[].0D - 2 threaded ports at opposite side, 2 threaded ports at rear side

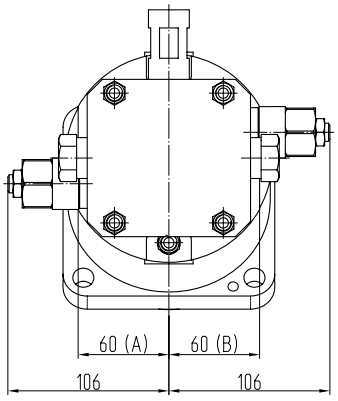




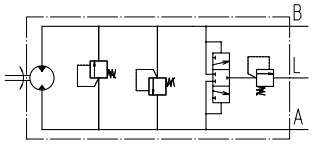
A, A1, B, B1 - operating pressure ports M33x2-24, ISO 6149-1

310.3(4).56.0[].68 - 2 SAE flanges at opposite side, pressure-relief valves, sludhing valve

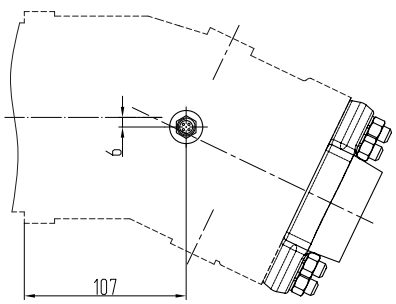


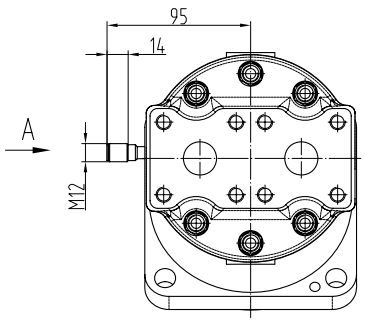


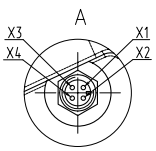
Hydraulic circuit



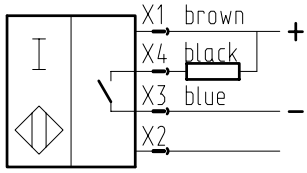
310.2.28.0[].90 - 2 flanges at rear side, integrated speed sensor



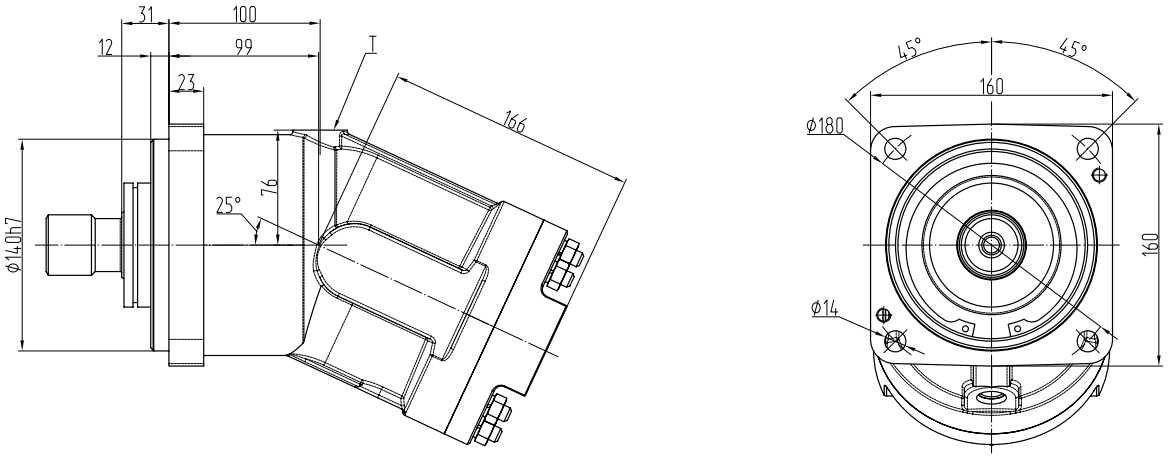




Connection



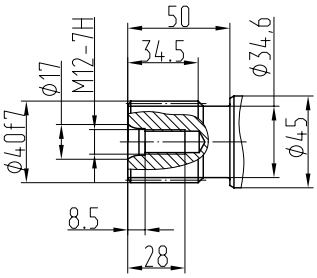
310.3(4).80 Overall dimensions



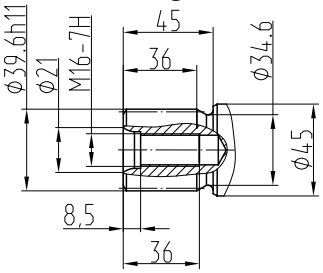
T - case drain port M18x1,5-18 ISO 6149-1

Shaft ends

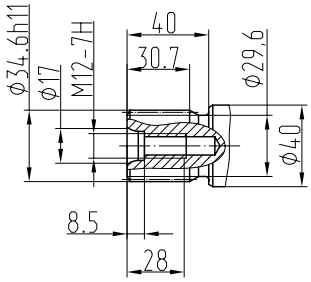
40xf7x2x9g GOST6033



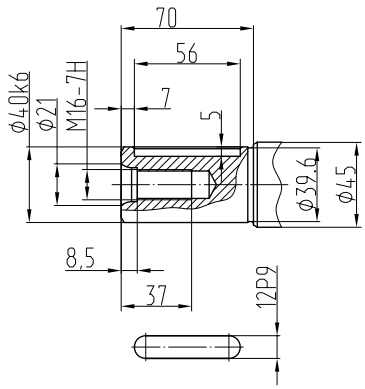
W40x2x30x18x9g DIN5480

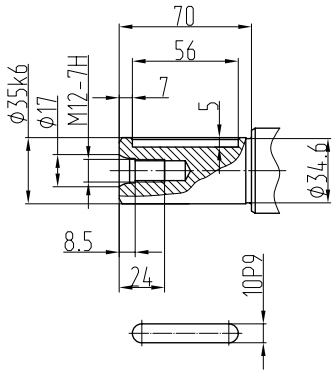


W35x2x30x16x9g DIN5480



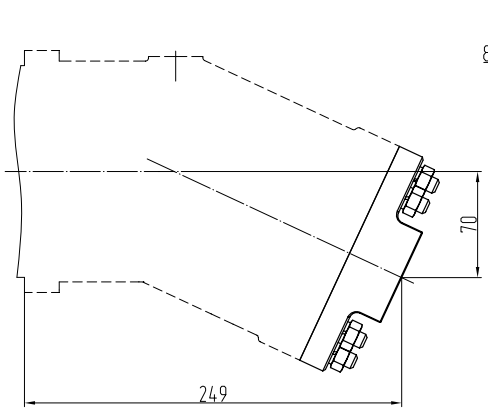
Parallel keyed shafts

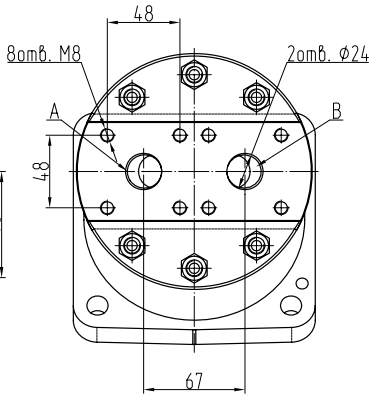




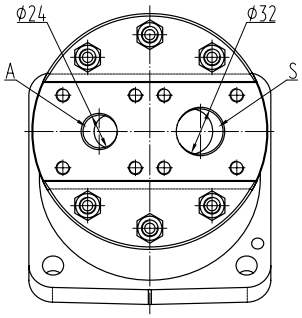
End cap options

310.3(4).80.0[].06 - 2 flange at rear side

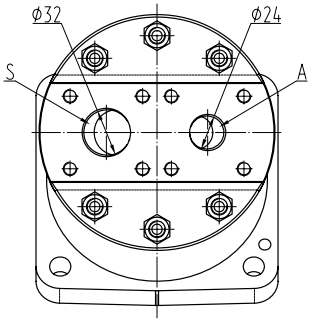




motor

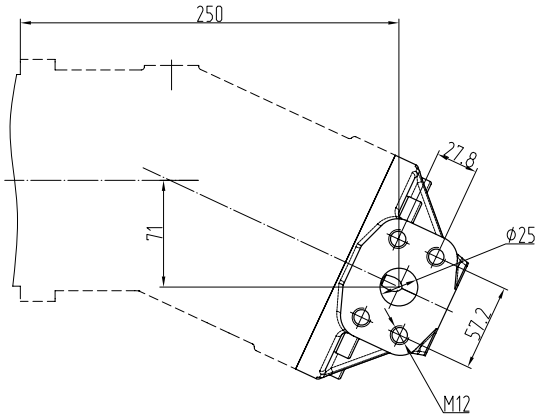


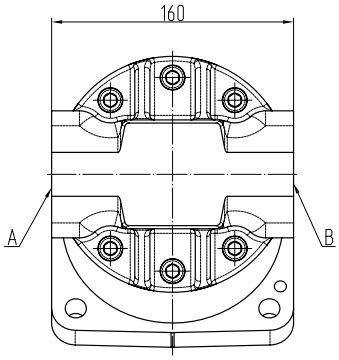
pump right



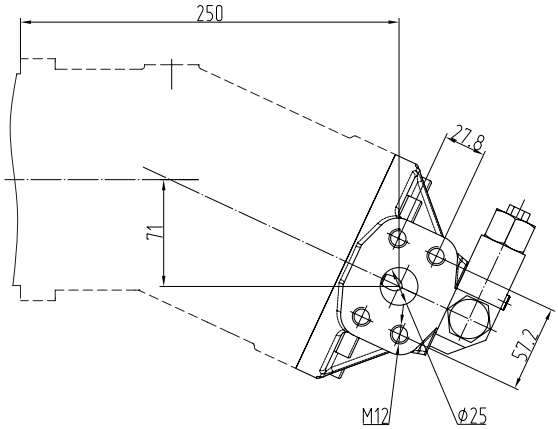
pump left

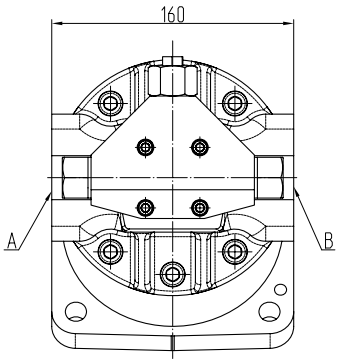
310.3(4).80.0[].08 - 2 SAE flanges at opposite sides



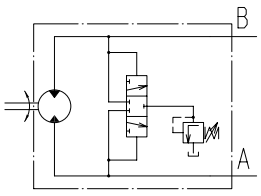


310.3(4).80.0[].78 - 2 SAE flanges at opposite side, flushing valve

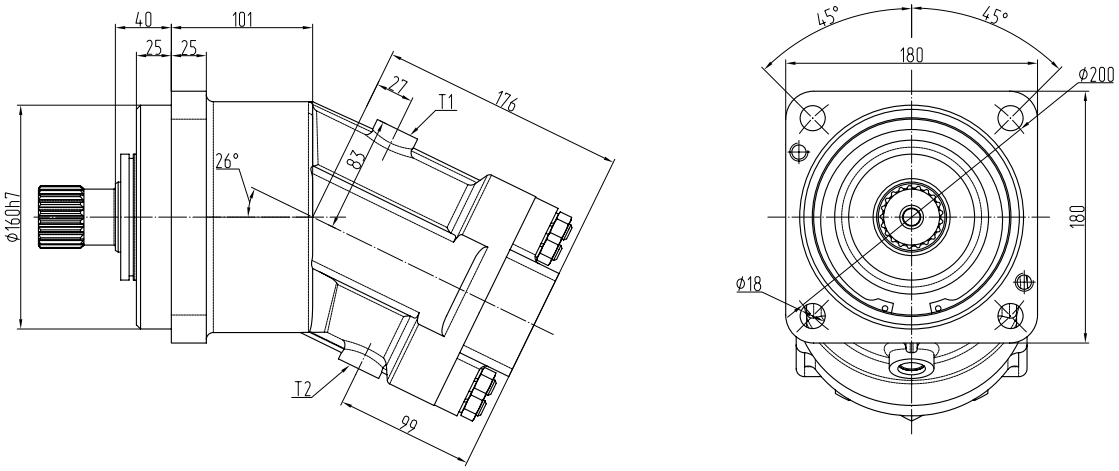




Hydraulic circuit



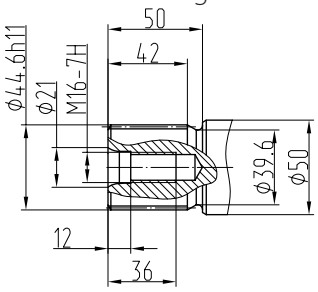
310.3(4).112 Overall dimensions



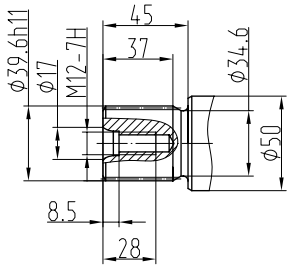
T1, T2 - case drain ports M18x1,5-18 ISO 6149-1

Shaft ends

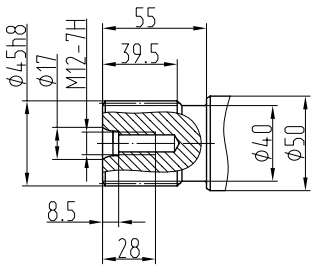
W45x2x30x21x9g DIN5480



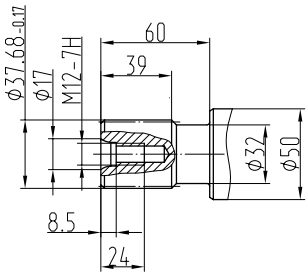
W40x2x30x18x9g DIN5480



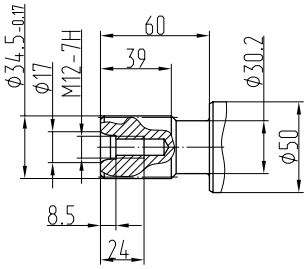
45xh8x2x9g ГОСТ6033



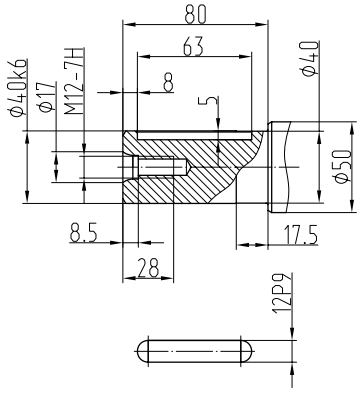
1 1/2' 23T 16/32DP ANSI B92



1 3/8' 21T 16/32DP ANSI B92

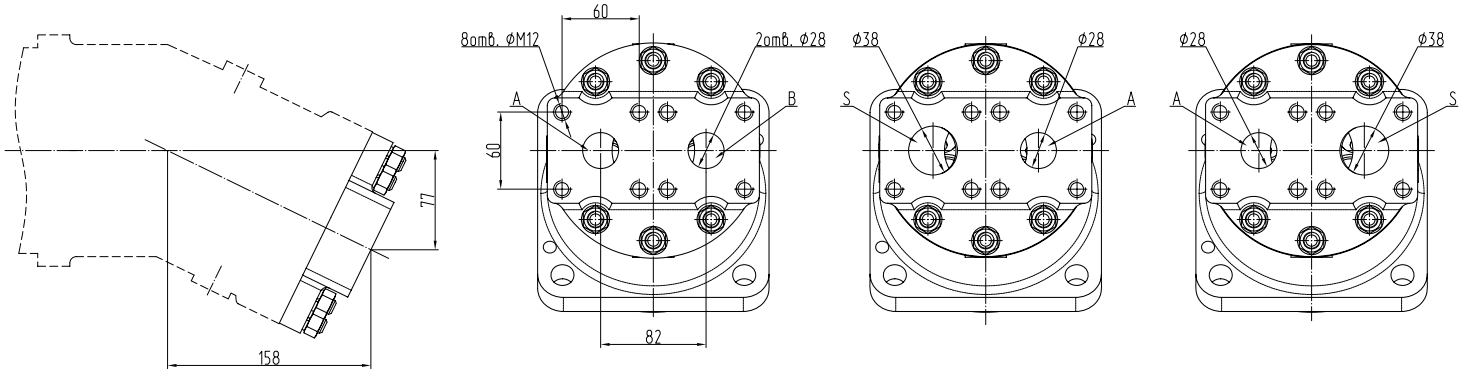


parallel keyed shaft



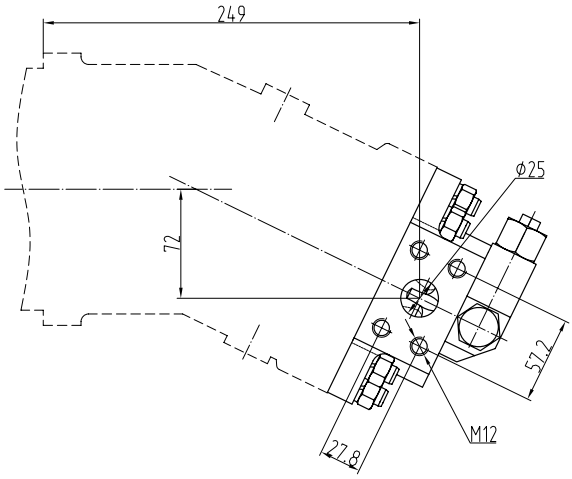
End cap options

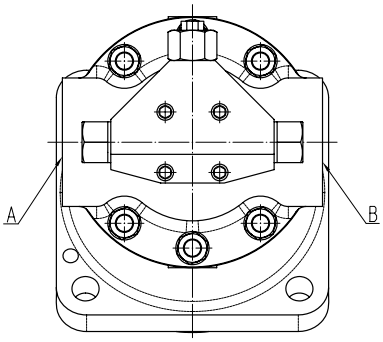
310.3(4).112.0[].06 - 2 flange at rear side



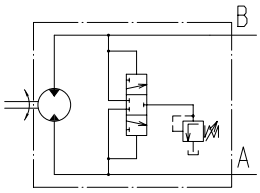
motor pump right pump left

310.3(4).112.0[].78 - 2 SAE flanges at opposite side, flushing valve

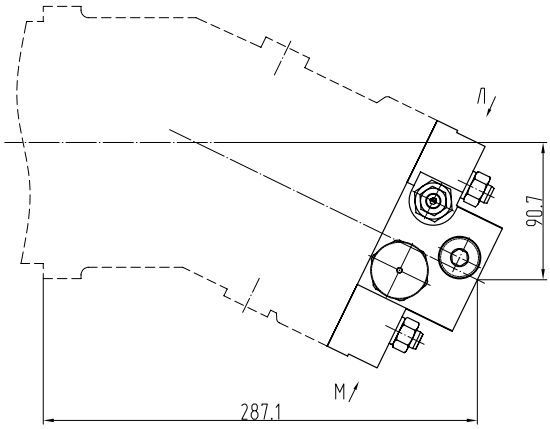


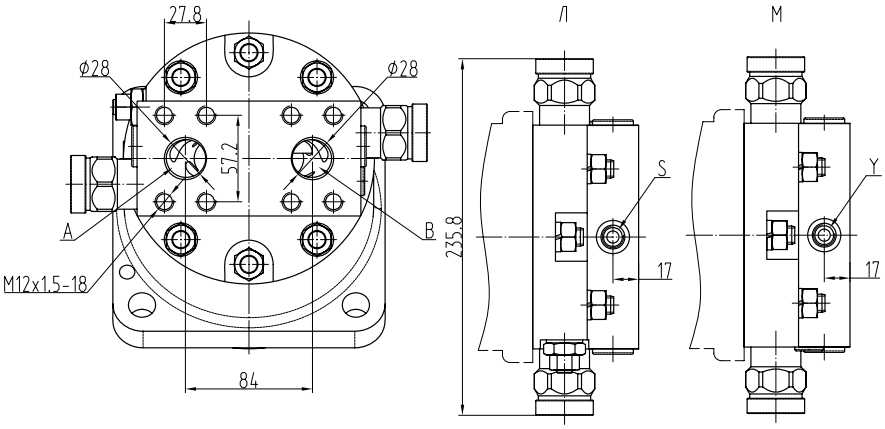


Hydraulic circuit



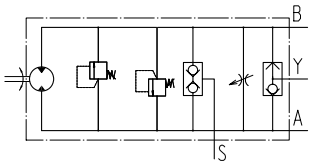
310.3(4).112.0[].AA - 2 SAE flanges at rear side, pressure-relief valves, chack valves



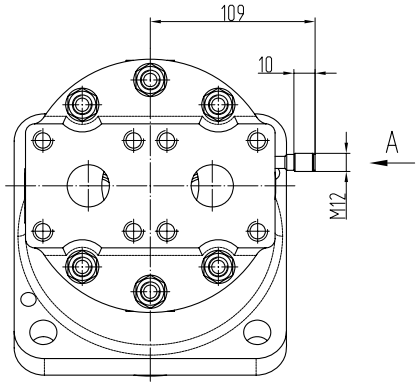


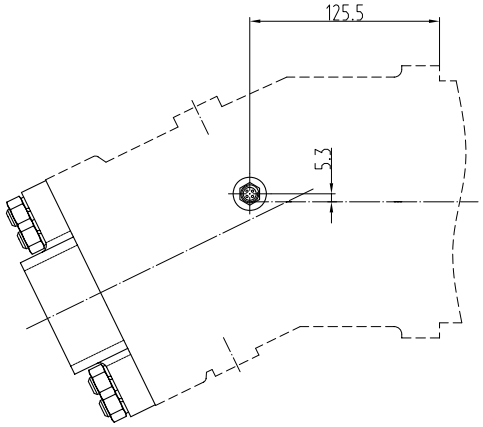
S - charge pressure port M14x1.5-14, ISO 6149-1
Y - "OR" valve port M14x1.5-14, ISO 6149-1

Hydraulic circuit

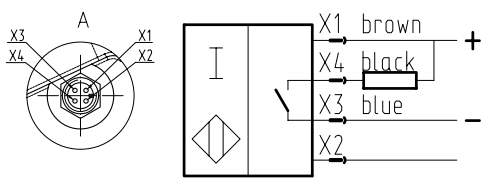


310.3(4).112.0[].96 - 2 flanges at rear side, integrated speed sensor

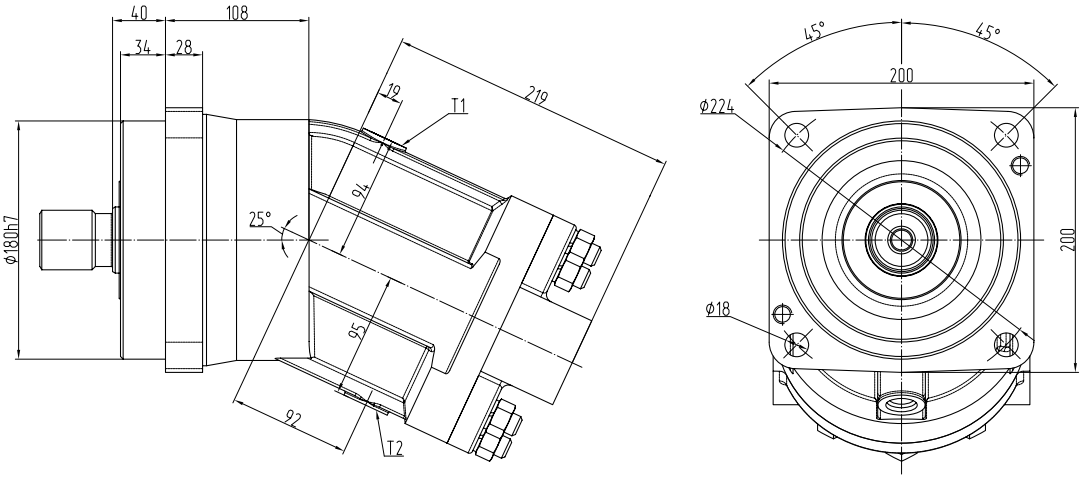




Connection



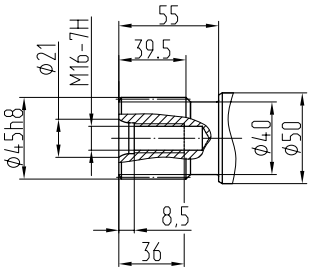
310.3(4).160 Overall dimensions



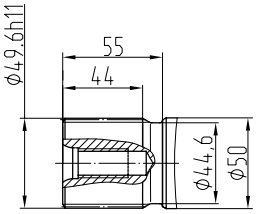
T1, T2 - case drain ports M22x1,5-18 ISO 6149-1

Shaft ends

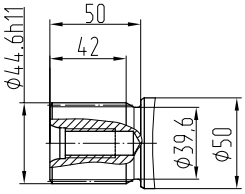
45xh8x2x9g GOST6033-80



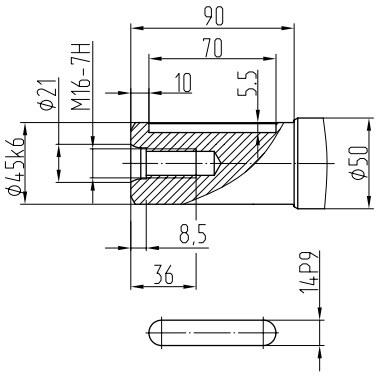
W50x2x30x24x9g DIN5480



W45x2x30x21x9g DIN5480

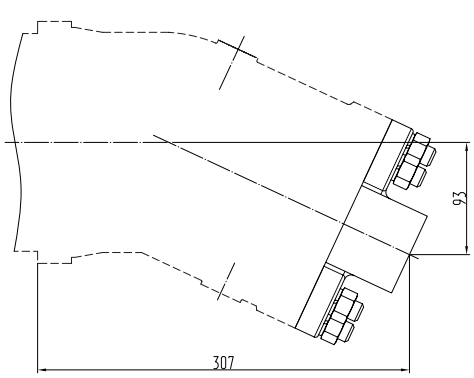


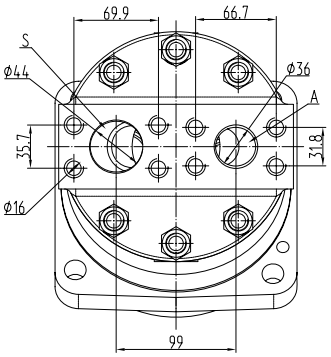
parallel keyed shaft



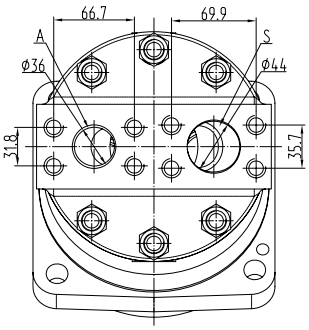
End cap options

310.3(4).160.0[].06 - 2 flanges at rear side

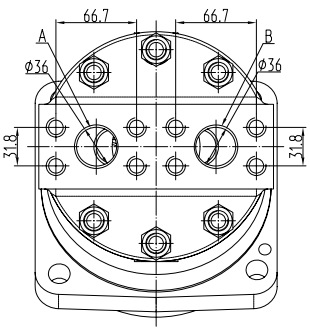




pump left

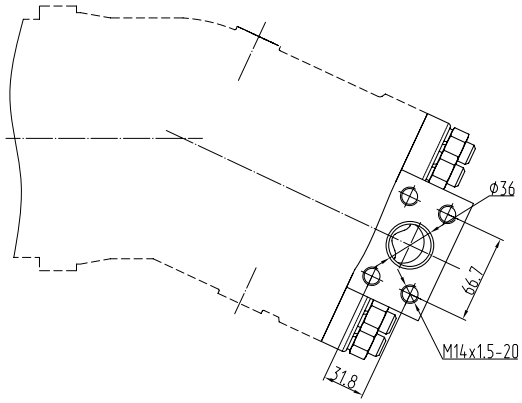


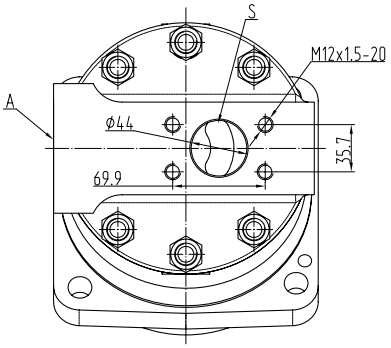
pump right



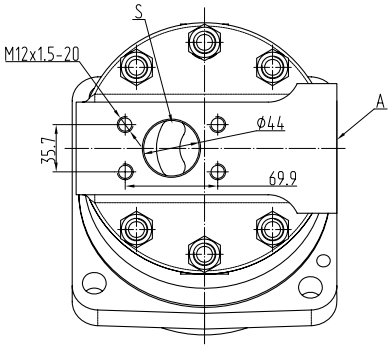
motor

310.3(4).160.0[].07 - 1 flange at side, 1 flange at rear side



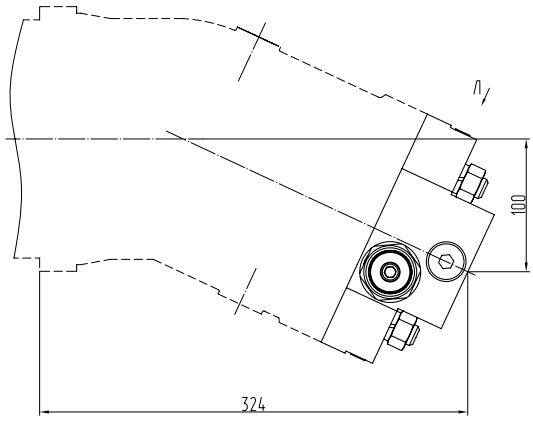


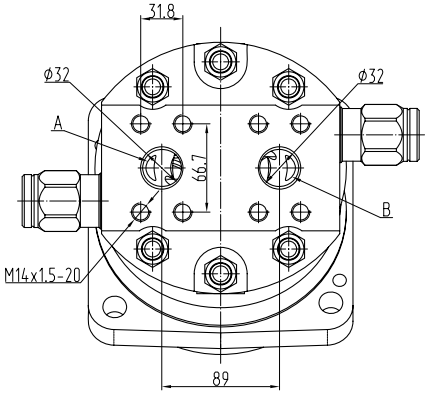
pump right

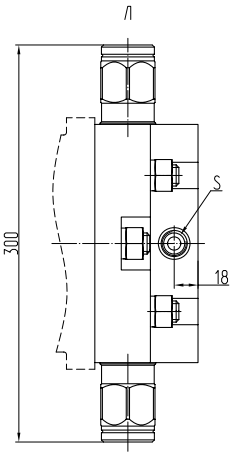


pump left

310.3(4).160.0[].8A - 2 SAE flanges at rear side, pressure-relief valves, check valves

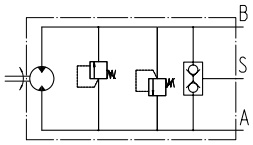




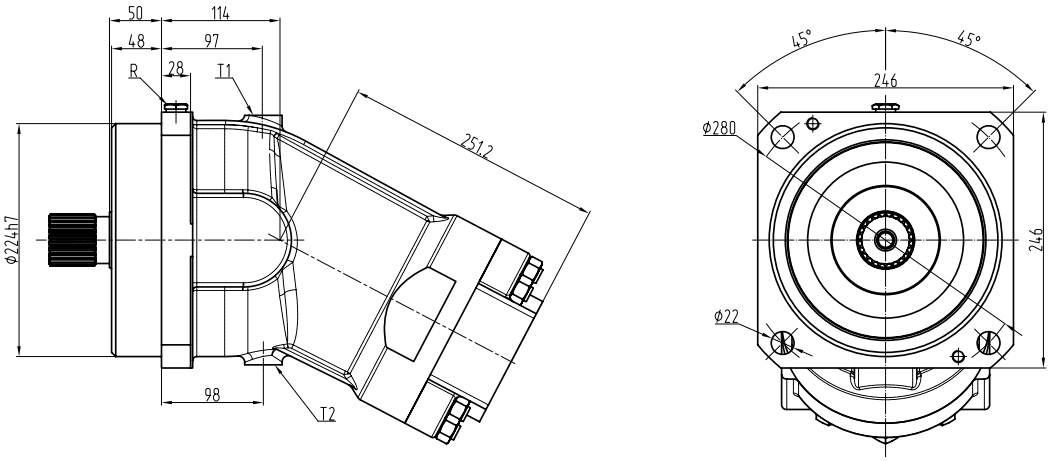


S - charge pressure port M18x1.5-12, ISO 6149-1

Hydraulic circuit



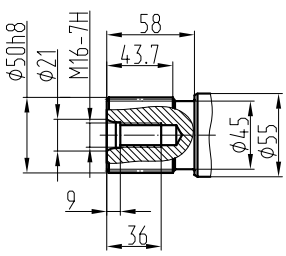
310.3(4).250 Overall dimensions



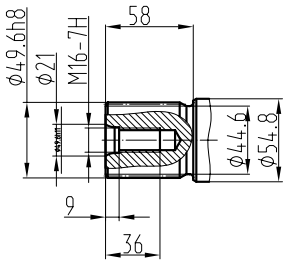
T1, T2 - case drain ports M22x1,5-18 ISO 6149-1
R - air bleed M14x1,5-15 ISO 6149-1

Shaft ends

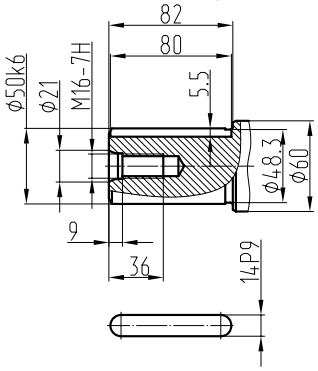
50xh8x2x9g ГОСТ6033



W50x2x30x24x9g DIN5480

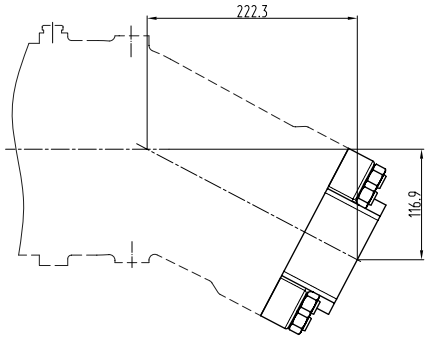


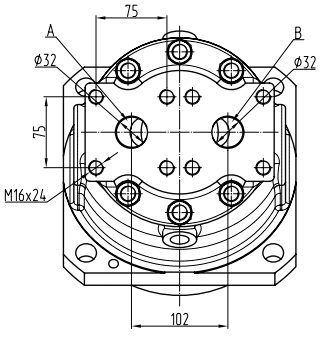
parallel keyed shaft

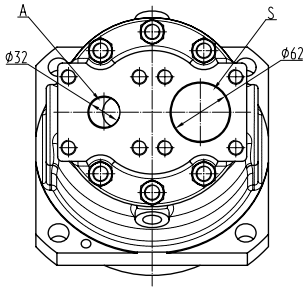


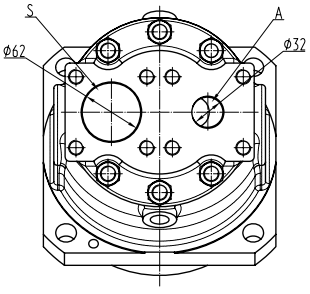
End cap options

310.3(4).250.0[].06 - 2 flange at rear side



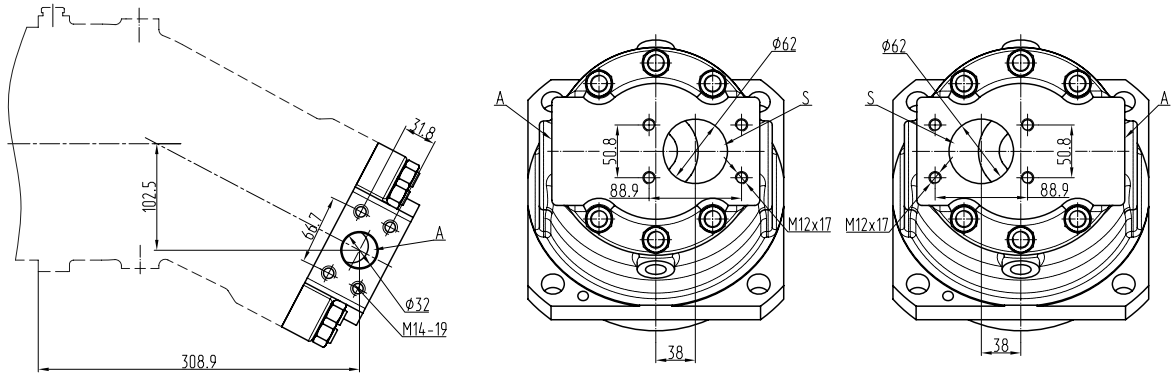






... motor pump right pump left

310.3(4).250.0[].07 - 1 flange at side, 1 flange at rear side



pump right pump left

310.3(4).250.0[].0A - 2 SAE flanges at rear side