

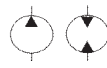


PSM HYDRAULICS

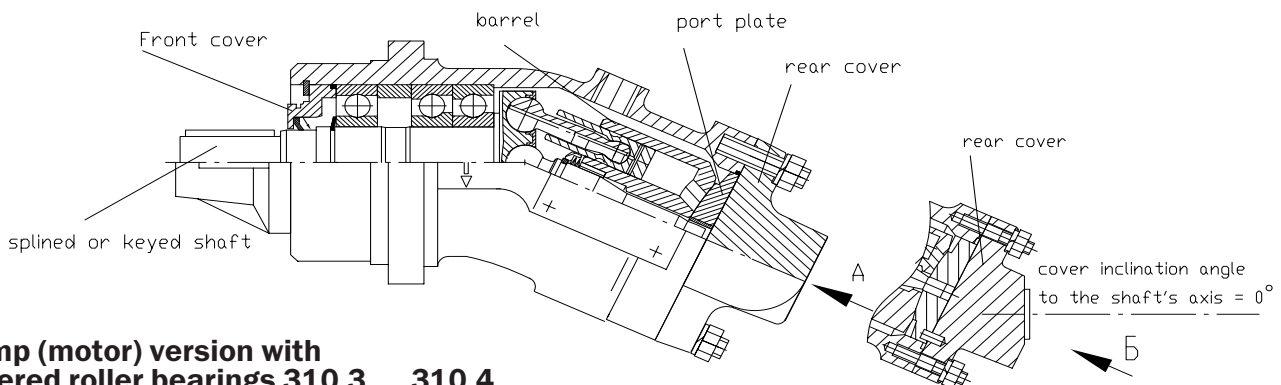
FIXED DISPLACEMENT HYDRAULIC MOTORS AND PUMPS



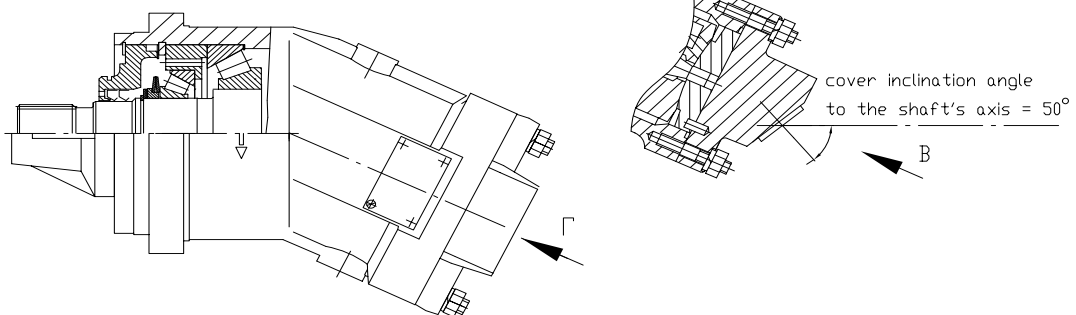
SECTION 2



Pump (motor) version with angular ball bearings 310.2. ...



Pump (motor) version with tapered roller bearings 310.3..., 310.4. ... (310.4... – with bimetal cylinder blocks)



See views A, B, B and Г in the table “Back cover design variants”

Fixed displacement pumps and hydraulic motors 310 series consist of a pumping unit mounted in the body and a cover.

The pumping unit consists of a distributor and a hydraulic assemble including a shaft, bearings (tapered roller bearings or radial thrust ball bearings), and a cylinder block. The cylinder block contacts with the distributor through a spherical surface.

The pumps are produced with splined and keyed shafts, both with counterclockwise and with clockwise rotation as well as with different back cover designs.

Designation example for fixed displacement pump on ordering 310.3.56.04.06,

where 310 - fixed displacement pump

3 - version with tapered roller bearings

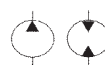
56 - displacement, cm³

0 - mounting flange with 4 holes

4 - counterclockwise shaft rotation, splined shaft

0 - no valve

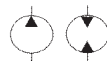
6 - pipes connection - 2 flanges at the rear end



Designation structure diagram for fixed displacement pumps and hydraulic motors

310																													
Bent-axis fixed displacement hydraulic machines 310, 210														NBR		Climatic version													
Model: 0, 1, 2, 3, 4														FKM															
Displacement, cm ³ : 12, 28, 56, 80, 112, 160, 250														Pineline connections/directions															
Mounting flange 4 holes ISO 3019/2														0				0				2 threaded connections on end (outlet channel at 25° to shaft axis)							
Hydraulic machine		Shaft rotation*		Shaft design										1		2 threaded connections on end (outlet channel parallel to shaft axis)													
hydraulic motor		reversible		splined		0								2		2 threaded connections on end (outlet channel at 50° to shaft axis)													
hydraulic motor		reversible		keyed		1								3		2 threaded connections on each side 2 threaded connections on end													
hydraulic motor		reversible		shaft-gear		2								4		1 threaded connection sideways 1 flange on end													
pump		clockwise		Splined		3								5		1 threaded connection sideways 1 threaded connection on end													
pump		counterclockwise		splined		4								6		2 flanges on end													
pump		clockwise		keyed		5								7		1 flange sideways 1 flange on end													
pump		counterclockwise		keyed		6								8		2 flanges on each side													
hydraulic motor		reversible		with pitch splines		A								9		2 threaded connections on each side													
				1 " 23T 16/32 DP ANSI B 92.1a																									
														Valve:															
														0				absent											
														1				adjustable safety valve (on the Nleft*)											
														2				adjustable safety valve (on the right*)											
														3				Nonadjustable safety valve (on the left*)											
														4				Nonadjustable safety valve (on the right*)											
														5				docked block of check safety valves											
														6				docked block of check safety valves and flushing valve											
														7				docked block of rinsing valves											

* -shaft rotation and valve location – as viewed from the shaft end



Back cover design variants

Articles	Left pump	Right pump	Hydraulic motor
310.12 210.12 310.2.28 (View A)			
210.12 310.12 (View B)			
210.12 310.12 (View B)			
310.2.28 (View B)			
310.2.28 (View B)			
310...56 310...80 310...160 310...112 310...250 (View Г)			
310...160 310...250 (View Г)			
Hydraulic motors 310.12 210.12 (View A)			



In the pump operating mode, the shaft is set in rotation by the engine. Pistons mounted in the cylinder block turn on the cylinder block axis and reciprocate at the same time, with the piston sucking working fluid in one half revolution and pumping it into hydraulic system in another half revolution.

The output pressure is determined by working member load and limited by hydraulic system safety valve

The feed is determined by the rotation frequency of the pump shaft and working displacement of the pump.

In the motor operating mode, working fluid delivered from hydraulic system through openings in the cover and through a groove in the distributor

enters the cylinder block where it sets the pistons in motion.

The pistons transfer the force to a spherical joint. As the shaft axis and cylinder block axis are at an angle, the force acting on the joint is resolved into an axial and a tangential component.

The axial load is taken up by bearings while the tangential one develops a torque at the hydraulic motor shaft.

This shaft torque is directly proportional to the motor displacement (V) and pressure difference (p), its value is limited by the safety valve.

The rotational speed (n) is direct proportional to working fluid supply and inversely proportional to the displacement

Technical data

210, 310.2, 310.3 series

310.4 series

Max operating pressure (bar):

- | | | |
|--------------|-----|-----|
| • Continuous | 280 | 400 |
| • Peak | 350 | 450 |

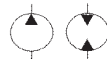
Technical data of pumps

Size			12	28	56	80	112	160	250
Displacement	Vgmax	cm ³	11,6	28	56	80	112	160	250
Rotation speed at p= 0,2MPa	nmax	min -1	6000	4750	3750	3350	3000	2650	2100
Delivery at nmax	QV max	l/min	70	133	210	268	336	424	525
Rated power consumed at Δp=450 bar* at Δp=400 bar at Δp=350 bar at Δp=250 bar	N max	kW	49	93	147	187	235	296	367
			43	83	130	166	209	263	326
			38	72	114	146	183	230	285
			27	52	81	104	130	165	204
Torque at Δp=450 bar* at Δp=400 bar at Δp=350 bar at Δp=250 bar	M max	Nm	70	187	373	534	747	1067	1667
			69	166	332	474	664	948	1482
			60	145	290	415	581	830	1297
			43	104	207	296	415	593	926
Fixed displacement pump weight	m max	kg	4	9,5	17	19,2	29	45	65

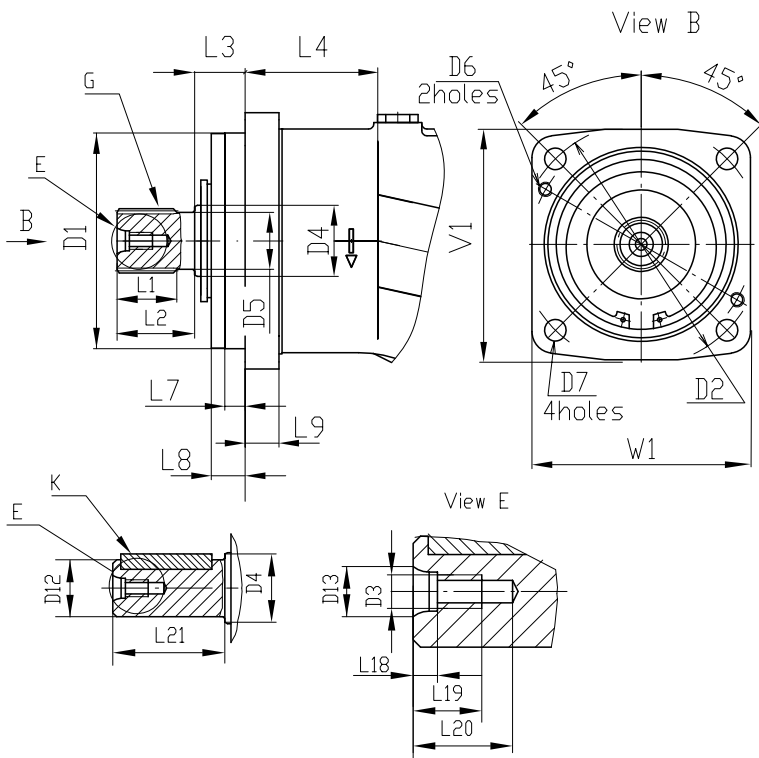
Technical data of motors

Size			12	28	56	80	112	160	250
Displacement	Vg	cm ³	11,6	28	56	80	112	160	250
Rotation speed at p= 0,2MPa	nmax	min -1	6000	4750	3750	3350	3000	2650	2100
Consumed flow	QV max	l/min	70	133	210	268	336	424	525
Torque at Δp=450 bar at Δp=400 bar at Δp=350 bar at Δp=250 bar	M max	Nm	74	179	358	511	715	1022	1597
			66	159	318	454	636	909	1420
			58	139	278	397	556	795	1242
			41	99	199	284	397	568	887
Weight	m max	kg	4	9,5	17	19,2	29	45	65

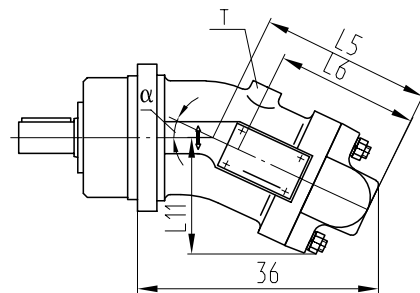
* - to be considered while calculating drive motor overload



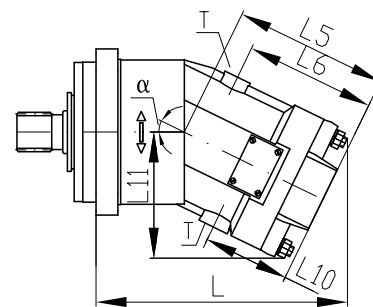
Mounting dimensions of hydraulic machines



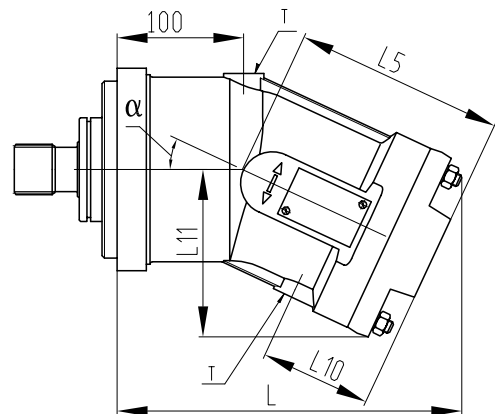
210.12, 310.12, 310.2.28



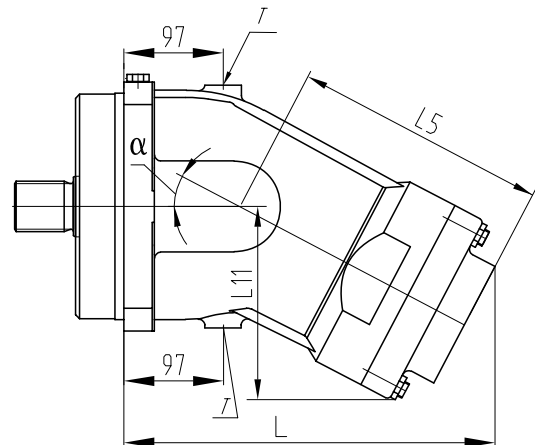
310...56, 310...112, 31...160



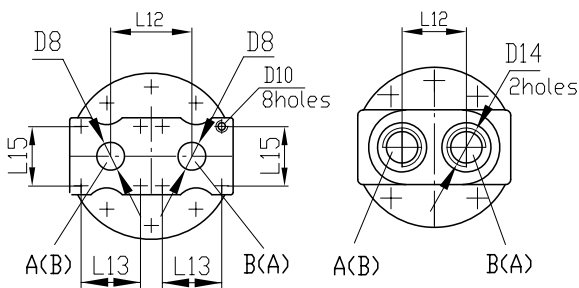
310...80



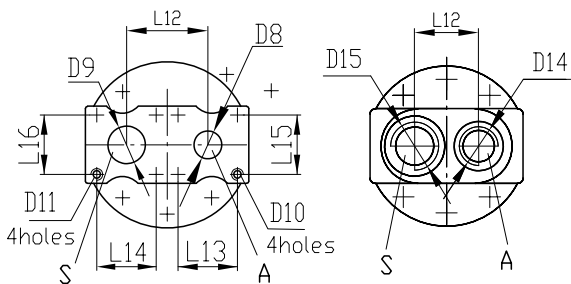
310...250

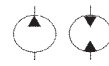


Hydraulic motors



Pumps



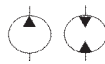


Size	210.12	310.12	310.2.28	310.3.56, 310.4.56	310.3.80 310.4.80	310.3.112 310.4.112	310.3.160 310.4.160	310.3.250 310.4.250
G spline DIN 5480	WA20x1,5x30x12x f7x9g *W20-1,5x30x15x 9g		WA25x1,5x30x15x f7x9g *W25-1,5x30x15x 9g	WA35x2x30x16x 7x9g *W35- 2x30x16x9g	WA40x2x30x18x f7x9g *W40- 2x30x18x9g	WA45x2x30x21xh8x9g *W45-2x30x21x9g		WA50x2x30x24x h8x9g *W50-2x30x24 x9g
K key DIN 6885	AS 6x6x32		AS 8x7x40	AS 8x7x50 AS 10x8x50*	AS 10x8x56	AS 12x8x63	AS 14x9x70	AS 14x9x80
D1	80 h7		100 h7	125 h7	140 h7	160 h7	180 h7	224 h7
D2	100		125	160	180	200	224	280
D3	M6-7H		M8-7H	M12-7H	M12-7H	M12-7H	M16-7H	M16-7H
D4	25h8		30h8	40 h8	45 h8	50 h8	50 h8	55 h8
D5	16,6		21,2	30 h11	35 h11	40 h11	40 h11	45 h11
D6			M8-7H	M8-7H	M10-7H	M10-7H	M12-7H	M12-7H
D7	9		11	14	14	18	18	22
D8				22	22	28	32	32
D9				30	30	38	42	62
D10				M10	M10	M12	M14	M16
D11				M10	M10	M12	M12	M16
D12	20k6		25k5	30k6 (32h6)**	35k6	40k6	45k6	50k6
D13	11		12,5	17	17	17	21	21
D1	M22x1,5		M27x2					
D15	M27x2		M33x2					
L	160	192	196	244	275	290	320	367
L1	23,5		33	32,5	34,5	39,5	39,5	43,5
L2	40		50	49	50	55	55	58
L3	40	9	50	33,5	32	40	40	50
L4	50	81	62	85	99	101	108,5	162
L5	113		147	153	166	177	210	251,2
L6	93		122	128		150	190	
L7	9	5,5	10	9	10	11	10	9
L8	38	7	48	18	12	25	34	48
L9	13		16	20	23	25	28	30
L10				90	88	100	118	
L11	81		99	120	135	145	165	191
L12	36		50	67	67	82	99	102
L13				48	48	60	66,7	75
L14				48	48	60	69,9	75
L15				48	48	60	31,8	75
L16				48	48	60	35,7	75
L18	5,5		7	8,5	8,5	8,5	8,5	9
L19	14		17	24	24	25	36	36
L20	19		23	35	35	35	46	46
L21	40		50	58	70	80	90	82
V1	90		118	140	160	180	200	246
W1	90		118	140	160	180	200	246
a	25°		25°	25°	25°	26°	25°	27°
T ***	M12x1,5		M18x1,5	M18x1,5	M18x1,5	M18x1,5	M22x1.5	M22x1.5

* - sizes at special order

** - size for 310.3.56 with keyed shaft 10x8x50

*** - joint leakproofness by rubber rings



Mounting dimensions for rebuilt products formerly manufactured

Size	310.2.56	310.2.112
G spline	DIN 5480-WA35x2x30x16x f7x9g *DIN 5480-W35-2x30x16x9g	DIN 5480- WA45x2x30x21xh8x9g *DIN 5480-W45x2x30x21x9g
D1	125 h7	160 h7
D2	160	200
D3	M12-7H	M12-7H
D4	40h8	50h8
D5	30 h11	40 h11
D6	M12-7H	M12-7H
D7	14	18
D8	22	28
D9	30	38
D10	M10	M12
D11	M10	M12
D13	17	17
L1	32,5min	42min
L2	49	54,5
L3	64	80
L4	77	90
L7	10	10
L8	60	76
L9	20	25
L18	8.5	8.5
L19	24	24
L20	35	35
V1	145	180
W1	145	180

* - sizes at special order



Structural designation diagram of fixed displacement hydraulic pump 411 series

411									
Fixed displacement hydraulic pump 411 = series									
Hydraulic pump version 0 = basic hydraulic machine									
Working displacement 056 = 56 cc/rev. 107 = 107 cc/rev.									
Rotation direction L = counterclockwise R = clockwise									
Shaft version		56	107						
A1 = splined W30x2x30x14x9g DIN5480		F	-						
A2 = splined W35x2x30x16x9g DIN5480		M	-						
A3 = splined W40x2x30x18x9g DIN5480		-	F						
A4 = splined W45x2x30x21x9g DIN5480		-	M						
A5									
A6									
Z1 = keyed 30k6 A8x7x50 DIN 6885		F	-						
Z2 = keyed 40k6 A12x8x63 DIN 6885		-	F						
Climatic version and disposition category		56	107						
NBR		M	M						
FKM		F	F						
Special functions		56	107						
NN = absent *		M	M						
Working channels mounting		56	107						
F1 0 2 flanges on end		F	F						
F2 0 2 flanges on each side		F	F						
F3 0 2 flanges sideways		F	F						
F4 0 1 flange on end, 1 - on end		M	M						
Mounted in hydraulic valve equipment									
0 = absent									

M – basic version

F – the version is not manufactured

- - the version is not manufactured

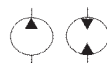
*** – not to be filled in at order of these versions**

Pumps technical parameters

Max input working pressure:

- continuous 400 bar
- peak 450 bar

Size			56	107
Working displacement	$V_{g_{max}}$	cm ³	56,1	106,7
Max rotation speed at $p_{ax} = 0,2\text{MPa}$	n_{max}	min ⁻¹	3750	3000
Feed at n_{max}	$Q_{V_{max}}$	l/min	210	320
Power at $\Delta p = 450\text{ bar}$ at $\Delta p = 400\text{ bar}$	N_{max}	kW	141 125	214 190
Torque at $p = 450\text{ bar}$ at $p = 400\text{ bar}$	M_{max}	Nm	358 319	682 606
Weight	m_{max}	kg	18	32



Structural designation diagram of fixed displacement hydraulic motor 410 series

410									
Fixed displacement hydraulic motor									
410 = series									
Hydraulic pump version		56	107						
0 = basic hydraulic machine		M	M						
1 = mounted in hydraulic motor 1)		F	F						
Working displacement									
056 = 56 cc/rev.									
107 = 107 cc/rev									
Rotation direction									
W = reversible									
Shaft version		56	107						
A1 = splined W30x2x30x14x9g DIN5480		F	-						
A2 = splined W35x2x30x16x9g DIN5480		M	-						
A3 = splined W40x2x30x18x9g DIN5480		-	F						
A4 = splined W45x2x30x21x9g DIN5480		-	M						
A5									
A6									
Z1 = keyed 30k6 A8x7x50 DIN 6885		F	-						
Z2 = keyed 40k6 A12x8x63 DIN 6885		-	F						
Climatic version and disposition category		56	107						
NBR		M	M						
FKM		F	F						
Special functions		56	107						
NN = absent*		M	M						
Working channels mounting		56	107						
F1	0 = 2 flanges on end	M	M						
F2	0 = 2 flanges on each side	F	F						
F2	1 = 2 flanges on each side	F	F						
F3	2 = 2 flanges sideways	F	F						
F3	3 = 2 flanges sideways	F	F						
F3	4 = 2 flanges sideways	F	F						
F3	5 = 2 flanges sideways	F	F						
Mounted in hydraulic valve equipment									
0 = absent									
1 = rinsing block									
2 = check safety valves									
3 = check safety valves and by pass valve									
4 = check safety valves, charge valves and by pass valve									
5 = check safety valves, charge valves									

M – basic version

F – possible version

- - the version is not manufactured

* - not to be filled in at order of these versions

1) – hydraulic motor with sloping mounting flange

Hydraulic motor technical parameters

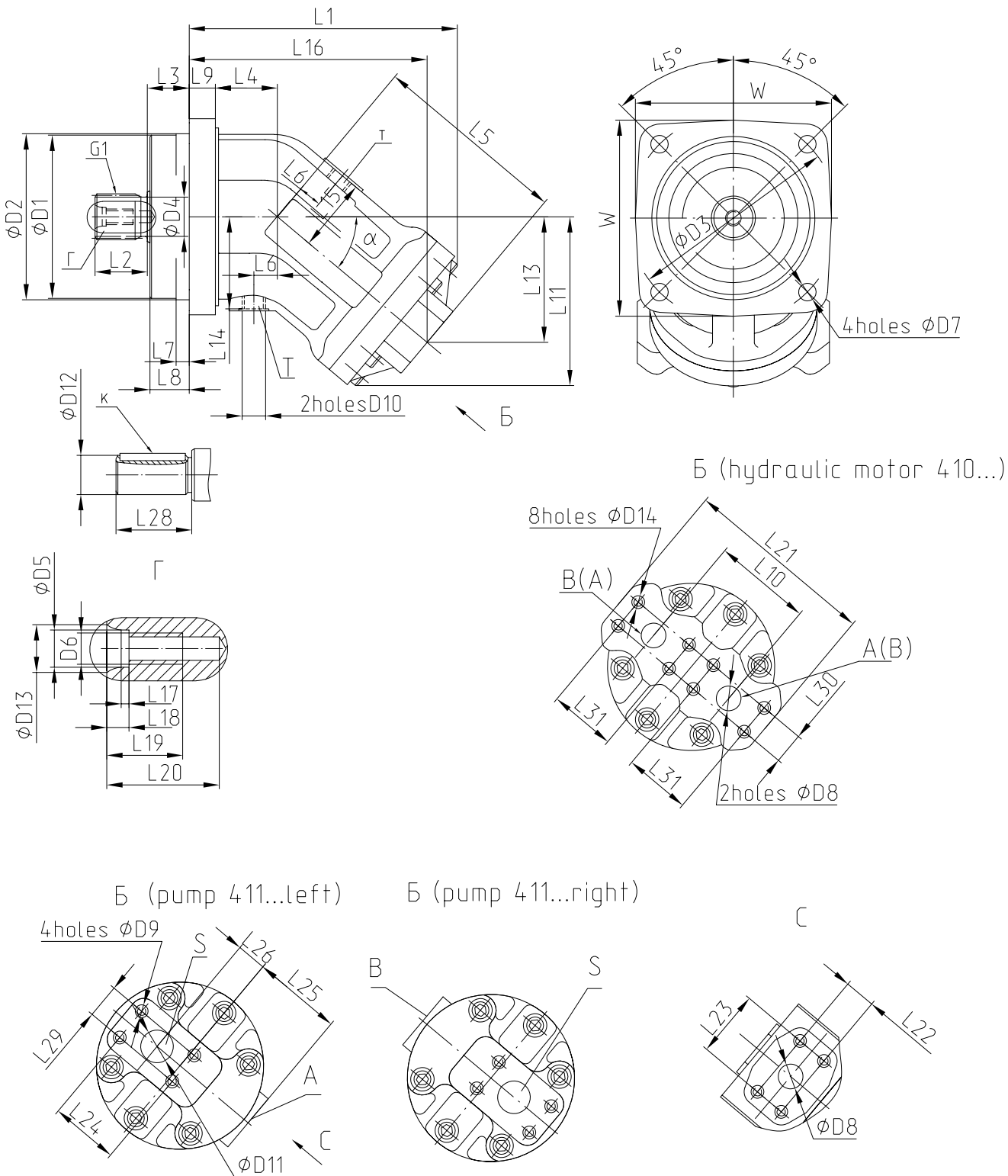
Max input working pressure:

- continuous 400 bar
- peak 450 bar

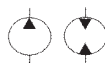
Size		56	107	
Working displacement	$V_{g_{max}}$	cm ³	56,1	106,7
Max rotation speed	n_{max}	min ⁻¹	3750	3000
Consumed flow	$Q_{V_{max}}$	l/min	280	320
Torque	M_{max}	Nm	358	684
at $\Delta p=450$ bar			318	608
at $\Delta p=400$ bar				
Weight	m_{max}	kg	18	32



Mounting dimensions of hydraulic pump 411 series and motor 410

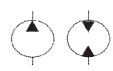


A,B – connecting points of operating lines
S – connecting point of a suction line
T – drain
R – air evacuation



Size Table (mm)

Size Designation	Sizes for hydraulic pump 411 series and motor 410 series with working displacements,	
	56	107
G1	W35x2x30x16x9g DIN 5480	W45x2x30x21x9g DIN 5480
K	A8x7x50 DIN6885	A12x8x63 DIN6885
D1	124,8	159 max
D2	125 h6	160 h6
D3	160	200
D4	29.6 h11	39.6 h11
D5	13	13
D6	M12-7H	M12-7H
D7	13,5	17,5
D8	19	32
D9	M10-6Hx17	M12-6Hx20
D10	M18x1,5 DIN 910	M18x1,5 DIN 910
D11	25	38
D12	30k6	40k6
D13	17	17
D14	M10-6Hx17	M14-6Hx19
L1	206	252
L2	40	50
L3	32	40
L4	67,5	59,8
L5	149,5	186,5
L6	18	18
L7	10	10
L8	30	36,5
L9	20	23
L10	75	99
L11	130	159
L13	96	120
L14	70	87
L15	56	69
L16	182	226
L17	3	3
L18	8,5	8,5
L19	28	36
L20	43	56
L21	147	194
L22	23,8	31,8
L23	50,8	57,2
L24	52,4	69,9
L25	68	89
L26	23	20
L27	49	55
L28	60	80
L29	25	35,7
L30	23,8	31,8
L31	50,8	66,7
T	M18x1,5 DIN 910	M18x1,5 DIN 910
W	150	190
a	40°	40°



Versions of hydraulic motor 410 series

