

Joint-Stock Company "GIDROPRIVOD"



Axial-Piston pumps of variable displacement  
Type HA

### **Purpose of the item.**

Axial-piston pumps (type HA) of variable displacement and constant direction of operational liquid flow is meant for usage in general engineering in hydraulic drives.

The pumps are to operate on mineral oils of 21 to 265 mm<sup>2</sup>/s (sSt) viscosity, at oil temperature from + 10 to + 50 °C and medium temperature from + 0 to + 50 °C.

The recommended operational liquids are mineral oils of the type ВНИИ НП-403 ГОСТ 16728-78, ИГП-30, ИГП-38 according to ТУ 38 101413-78. Nominal filtering capacity is 40 microns. Operational liquid cleanliness level is 14 according to ГОСТ 17216 –71.

### **Order example:**

Axial-piston pump with variable displacement with manual delivery control, fastening on feet, right-hand rotation, with operational volume of 224 cm<sup>3</sup>, version УХЛ4.

**НАР74М-224/32**

The same with flange fastening

**НАРФ74М-224/32**

The same with left-hand rotation of drive shaft

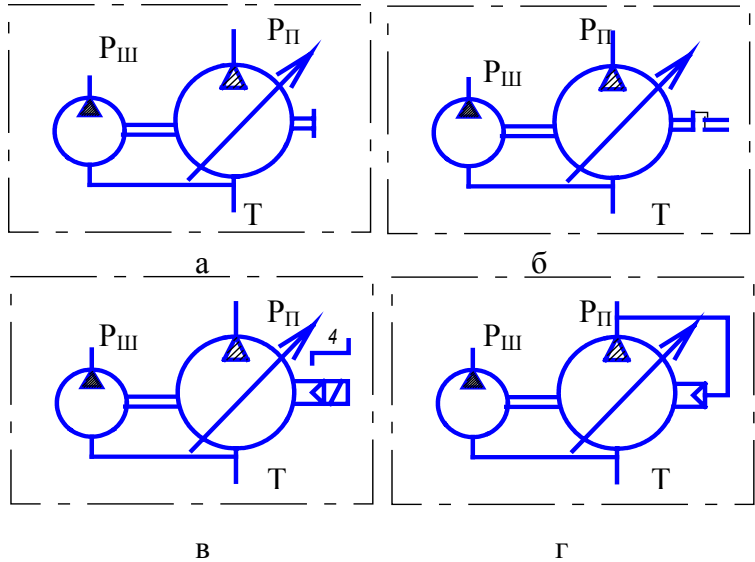
**НАРФЛ74М-224/32**

The same with general climatic construction.

**НАРФЛ74М-224/32 О4**

1.1.2 Conventional graphic symbol of the pumps is given at drawing 1.

1.1.3 Constructions of delivery change mechanisms are given in the table 1.



a – HAP; б – HAC; в – HAM; г – HAДI

**Drawing 1 – Conventional graphic symbol of the pumps.**

**Table 1 – Construction of delivery change mechanisms.**

Construction of delivery change mechanisms	Designation of delivery change mechanism	Characteristics of delivery change mechanism construction
With following delivery change mechanism	HAC	The pump provides operation at any delivery, which is in the range from nominal to zero. Setting of delivery is performed with driving device (for example, with cam, master cam or some other)
With manual delivery change mechanism	HAP	The pump provides operation at any delivery, which is in the range from nominal to zero. Setting of delivery is manual.

With power regulator	НАД1	The pump provides operation in the mode of constant power. The delivery setting is automatic, depends on operational pressure at pump outlet.
With electro-magnet delivery change mechanism	НАМ	The pump provides operation at any of four deliveries from nominal to minimal. Delivery setting is provided by electro-magnet switching-on, switching-on sequence of every of four fixed deliveries is random.

### **Technical data**

Main technical data and pump parameters at operation with mineral oil of  $30+^5 \text{ mm}^2/\text{s}$  (sSt) viscosity, at nominal revolution speed and outlet pressure are given in the table 2.

Overall and joint dimensions are given on the drawings 2, 3, 4 and in the table 3.

The allowed duration of maximal pressure continuous action should be not more than 40 seconds with load bread of not less than four seconds. At these modes 90% of life time is 1200 hours.

Uninterrupted duration at delivery less than minimal should not be more than 30 minutes.

**Table 2 – Main technical data of the pumps.**

Parameter name	Parameter value		
	45	90	224
1 Nominal operational volume of the pump, cm <sup>3</sup> :			
a) axial-piston;	45	90	224
b) gear	28	28	28
2 Revolution speed, s <sup>-1</sup> :			
- nominal;	25	25	16,6
- maximal;	25	25	25
- minimal	8,3	8,3	8,3
3 Pump delivery, l/min:			
a) axial-piston:			
- nominal;	57	122	200
- minimal	5,7	12	20,0
b) gear	33	33	22

*Table 2. (continuation)*

Parameter name	Parameter value		
	45	90	224
4 Pressure at pump outlet, MPa:			
a) axial-piston:			
- nominal;		32	
- maximal		40	
b) gear:			
- nominal;		2,5	
- maximal		3	
5 Pressure at pump inlet, MPa:			
- maximal;		+0,05	
- minimal		-0,02	
6 Pump delivery factor, not less than:			
a) axial-piston;	0,92	0,94	
b) gear		0,87	

7 Pump efficiency, not less than	0,77	0,89	
8 Pump weight (without operational liquid) kg, not more than:			
- HAP and HAC;	128	182	342
- HAM;	135	189	356
- HAД1	137	190	358
9 Pump power, kW	40,5	73	118,5
10 Operational range of delivery adjustment	0,1÷1,0		
11 Adjustment data	According to table 4		
12 Full 90% life time, hours	7250		
13 90% operation until failure, hours	3900		
Note			
1 Delivery dependence on pressure for the pumps HAД1 is shown on the drawing 5. 2 Dependence of delivery factor and pump efficiency on delivery is shown on the drawings 6,7.			
3 Power of the pumps of the type HAД1 depending on pressure, is shown on the drawing 8.			

**Table 3 – Overall and joint dimensions**

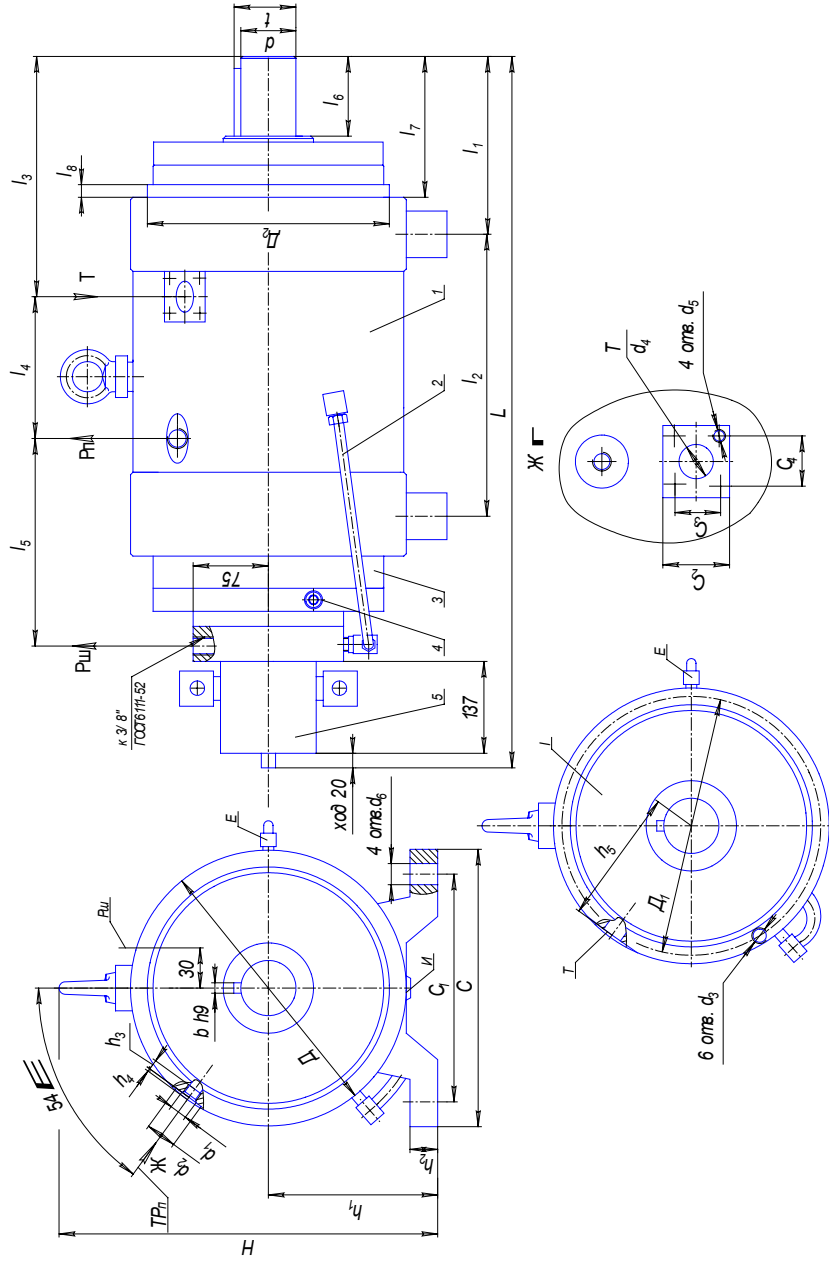
Pump designation	L	l <sub>1</sub>	l <sub>2</sub>	l <sub>3</sub>	l <sub>4</sub>	l <sub>5</sub>	l <sub>6</sub>	l <sub>7</sub>	l <sub>8</sub>	H	h <sub>1</sub>	h <sub>2</sub>	h <sub>3</sub>	h <sub>4</sub>	h <sub>5</sub>	C
HAР74M-90/32	698	179	280	246	130	210	82	-	-	368	160	32	23	3	129	315
HAC74M-90/32	708															
HAM74M-90/32	760															
HAД174M-90/32	785															
HAРΦ74M-90/32	698	-	-	246	130	210	82	140	7	345	-	-	-	-	-	-
HACΦ74M-90/32	708															
HAMΦ74M-90/32	760															
HAД1Φ74M-90/32	785															

НАР74М- 224/32	797																	
НАС74М- 224/32	807	205	350							-	-	455	200	37				380
НАМ74М- 224/32	859																	
НАД174М- 224/32	884																	
НАРФ74М- 224/32	797					298	154	233	105							32	4	168
НАСФ74М- 224/32	807																	
НАМФ74М- 224/32	859	-	-							156	5	433	-	-				-
НАД1Ф74М- 224/32	864																	

$C_1$	$C_2$	$C_3$	$C_4$	$D$	$D1$	$D2$	$d$	$d_1$	$d2$	$d3$	$d4$	$d5$	$d6$	$b$	$t$
270				-	-	-									
	66	40	60				55h6	M36×2-6H	45		45	M10-7H×15-18		18	
-				275	250	230h6				M12-7H×15-22			-	16	59

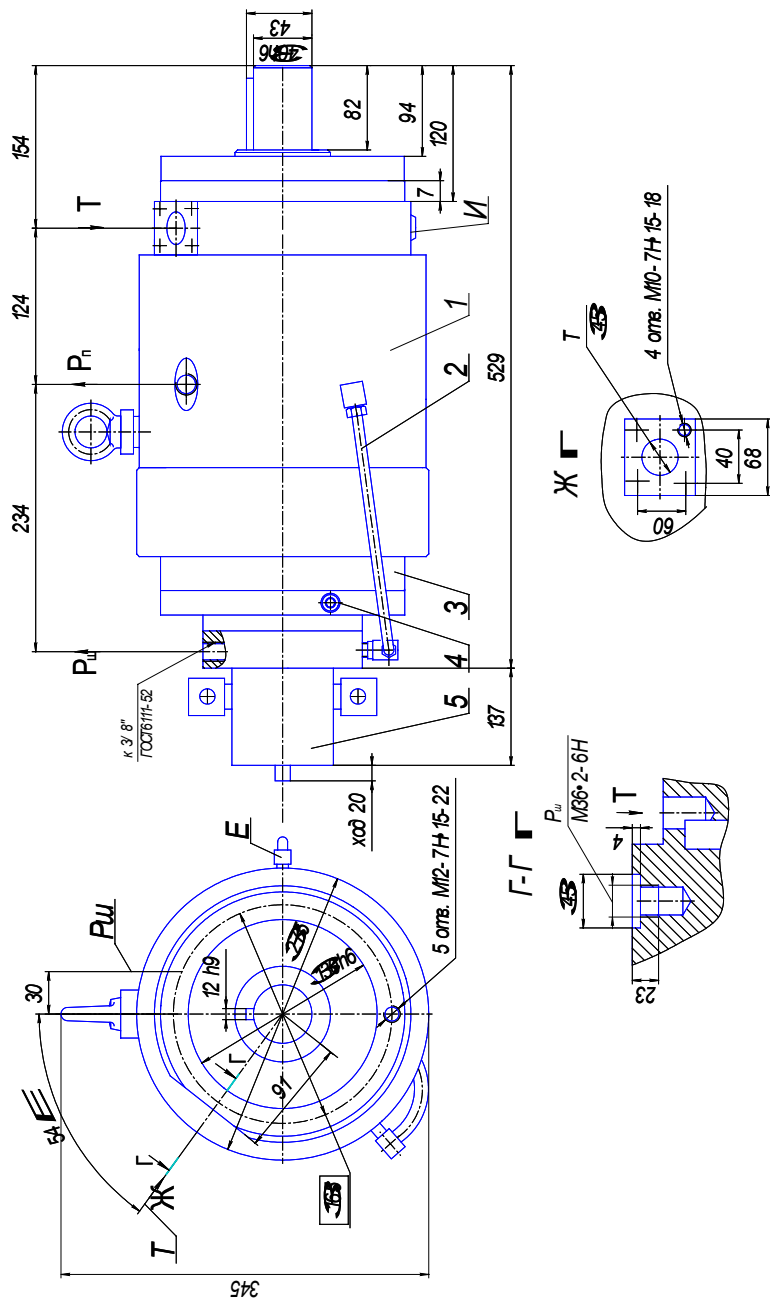
330				-	-	-										
	87	64	90				70h6	M48x2-6H	59		62	M10-7Hx17-24	28		20	74,5
-				362	324	270h6			M12-7Hx15-22				-			



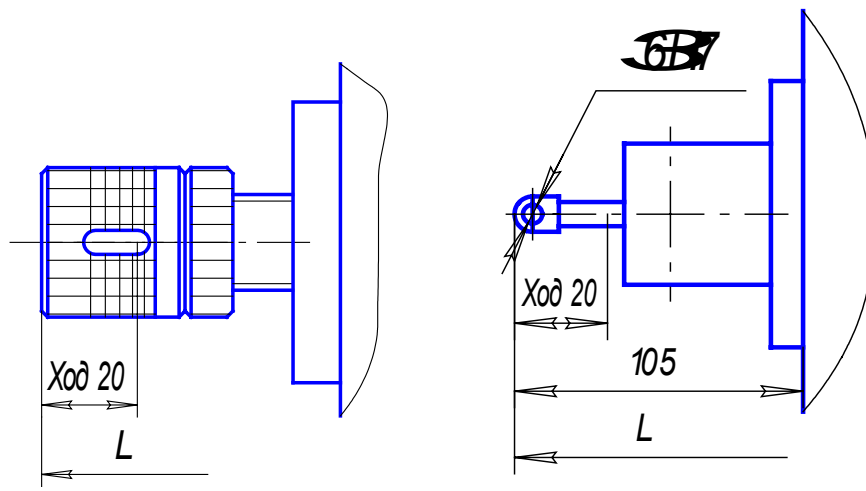


1 – piston pump; 2 – pipe-line; 3 – gear pump; 4 – safety valve; 5 – Electro-magnetic delivery change mechanism; T – axle of pump suction hole; P<sub>II</sub> – axle of piston pump supercharging hole; P<sub>III</sub> – axle of gear pump supercharging hole; E – pipe-line for pumps HAДI и HAДIФ; ИI – plug for oil drain from the pump.

Drawing 2 – Overall and joint dimensions of pumps with electro-magnetic delivery change mechanism.

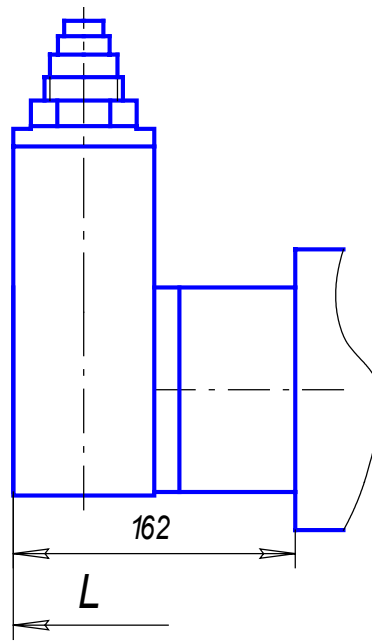


1 – piston pump; 2 – pipe-line; 3 – gear pump; 4 – safety valve; 5 – Electro-magnetic delivery change mechanism; T – axle of pump suction hole; P<sub>п</sub> – axle of piston pump supercharging hole; P<sub>ш</sub> – axle of gear pump supercharging hole; E – pipe-line for pumps HA/II и HA/II Ф; И – plug for oil drain from the pump.  
 Drawing 3 – Overall and joint dimensions of pumps HAMΦ 45/35c with electro-magnetic delivery change mechanism.



a

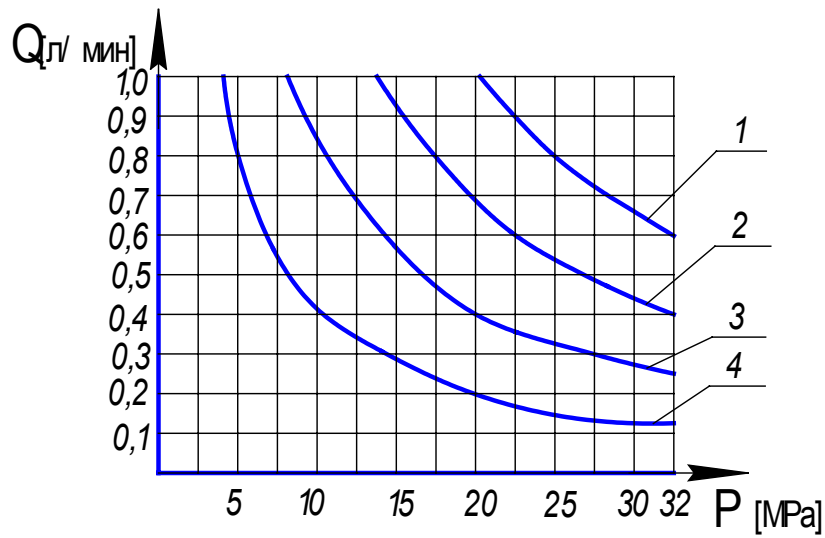
б



в

**Drawing 4 –Delivery change mechanisms**

a – manual control HAP; б – following control HAC; в – power regulator of the type HAD1

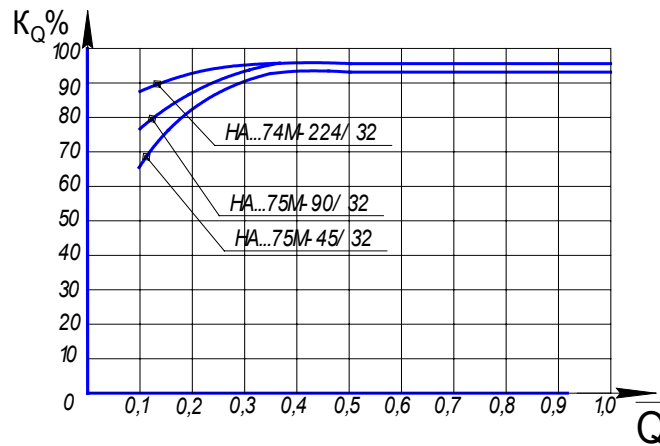


$$Q = \frac{Q}{Q_H}$$

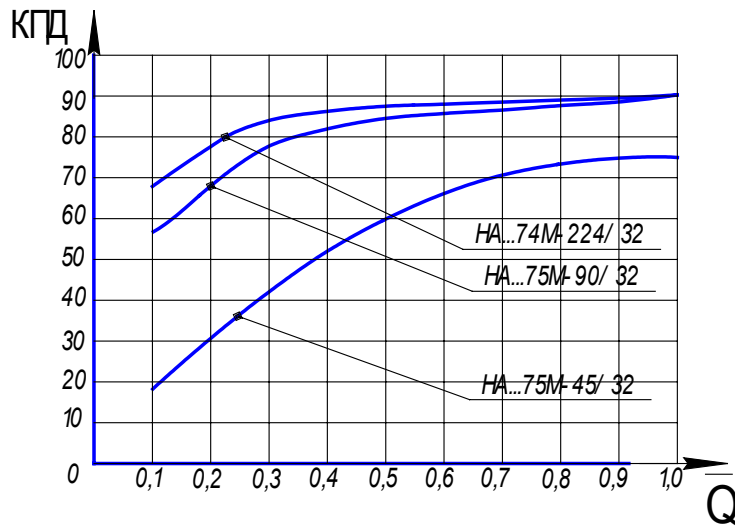
where  $Q$  is pump delivery,  $Q_H$  is nominal pump delivery

1 – corresponds to regulator adjustment at maximal power; 2 and 3 – intermediate power value; 4 – minimal power

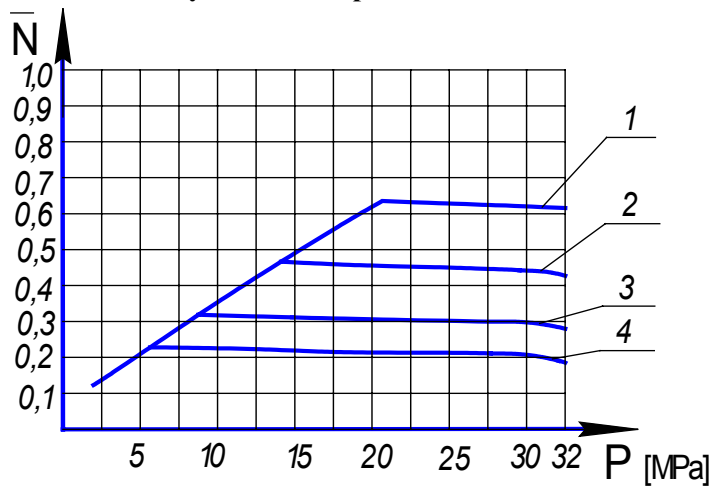
Drawing five – Delivery of axial-piston pump of the type HAД1 depending on pressure for given modes of adjustment:



**Drawing 6 – Dependence of delivery factor ( $K_Q$ ) of axial-piston pumps on delivery at nominal pressure**



Drawing 7 – Dependence of axial-piston pumps efficiency from the delivery at nominal pressure



$$N = \frac{N}{N_H}$$

where  $N$  – pump power, kW,  $N_H$  – nominal pump power

1 – maximal power of regulator adjustment; 2 and 3 – possible intermediate modes of regulator adjustment; 4 – minimal power of regulator adjustment

Drawing 8 – Power of axial-piston pump of the type HAД1 depending on pressure for given modes of adjustment:

Table 4 – Adjustment parameter

Mechanism type	Parameter name	Parameter value
Manual	Torque, H·cm, not more than	25
	Nut turn number, not more than	11
	Direction of nut turn for delivery increase	Clockwise
Following	Strengthening of exit rod of mechanism on delivery increase, moving to the pump side, N, not more than	170
	Working stroke of mechanism rod, mm, not more than	20
	Allowed number of switching per minute	40
Electro-magnetic	Quantity of adjustment delivery	4
	Allowed number of switching per minute	40
	Time of delivery change from minimal to nominal and vice versa, seconds, not more than	0,2
	Power consumption by electro-magnet, W	26
Power regulator	Allowed amount of operations per minute	40
	Accuracy of the given mode of adjustment setting.	±10%
	Accuracy of support of set power value	±15%
	Allowed rate of pressure change at pump outlet MPa/s, not more than	350

Pump content

Pump content is given in the table 5.

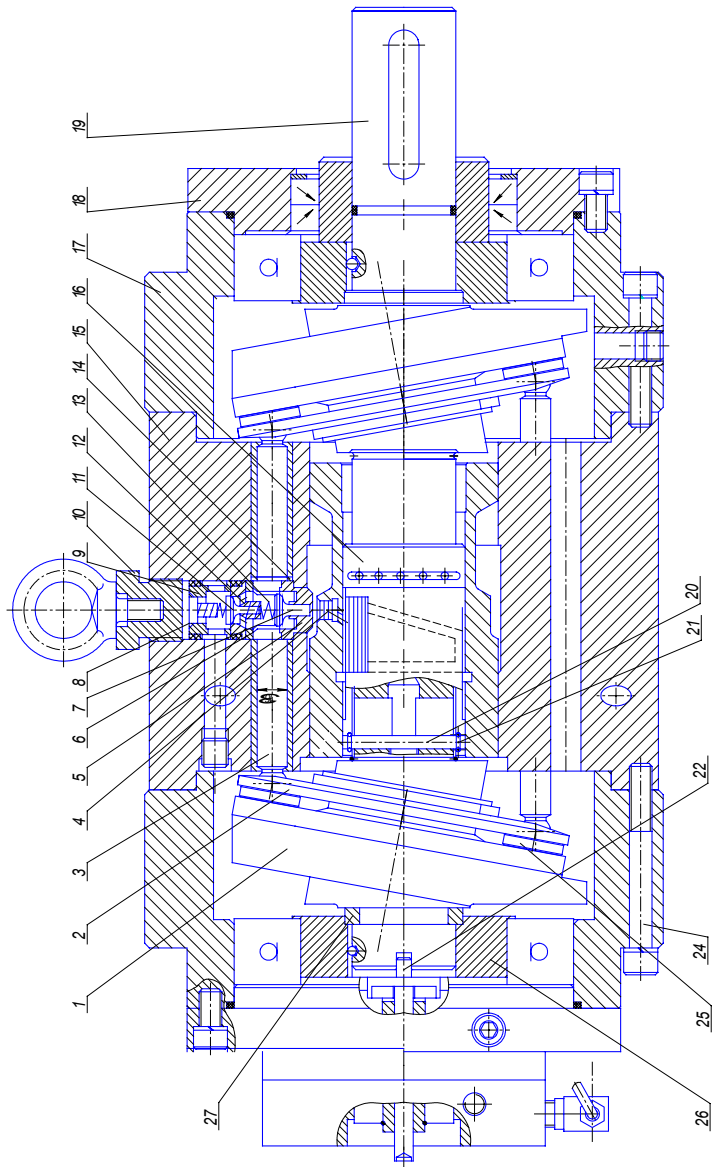
**Table 5 – Pump content**

Pump type	Pump content
HAP	Piston pump Gear pump Manual delivery change mechanism
HAC	Piston pump Gear pump Following delivery change mechanism

*Table continuation 5*

Pump type	Pump content
HAM	Piston pump

	Gear pump Electro-magnetic delivery change mechanism
НАД1	Piston pump Gear pump Power regulator Pipe-line



Drawing 9 – Axial-piston pump