

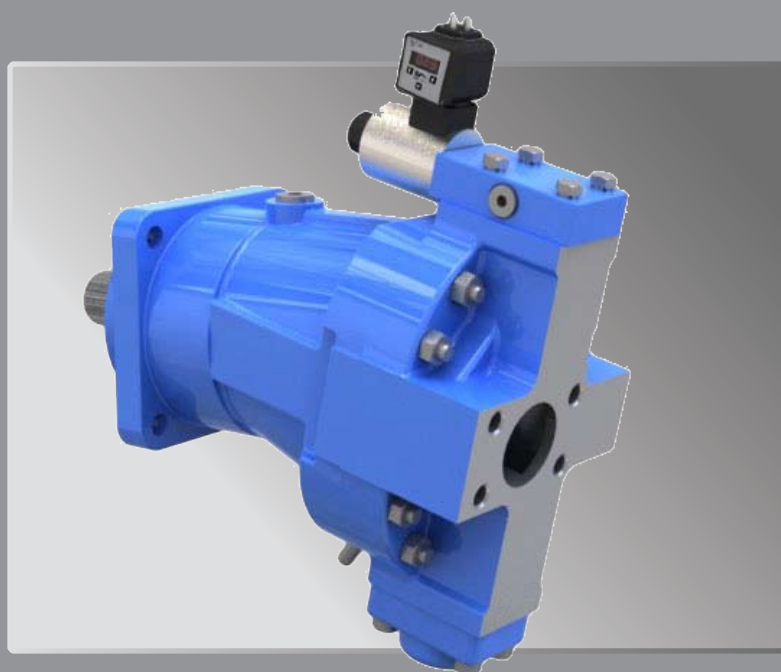


**PSM** HYDRAULICS  
ОАО ПНЕВМОСТРОЙМАШИНА

# 313 series

Variable Displacement  
Axial Piston Pumps  
Proportional Electro Control

Technical Information



PSM-Hydraulics

Ekaterinburg, Russia  
10/2009

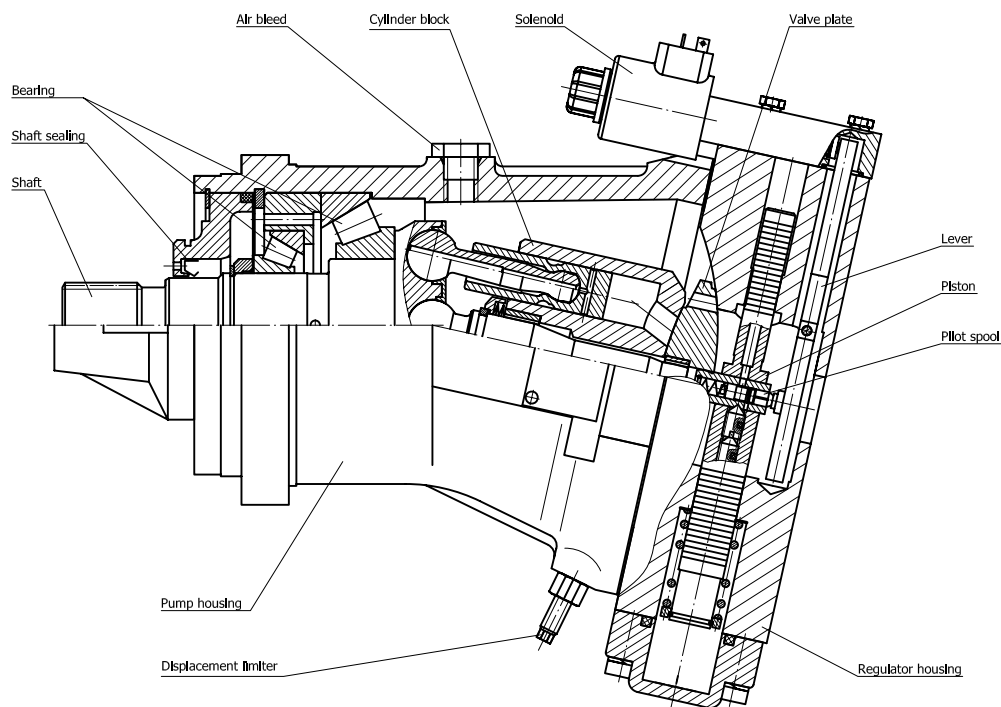
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## General information

Design details	<p>Hydraulic pumps 313 series are designed to convert mechanical power of the shaft rotation to the power of the working fluid.</p> <p>The pumps provide a continuous change in working fluid supply from zero to a maximum value.</p> <p>The pumps 313 series have high power density.</p> <p>The design of pumps is based on the bent-axis axial-piston pattern.</p> <p>The design includes a steel bronze cylinders block, which enables to increase the working pressure and its lifetime.</p> <p>Characteristics</p>
Displacements	<p>Working displacements of hydraulic motors is presented in three versions:</p> <p>313.4.55 – 55 ccm</p> <p>313.4.107 – 107 ccm</p> <p>313.4.160 – 160 ccm</p> <p>The following displacements are under development:</p> <p>313.2.28 – 28 ccm</p> <p>313.4.80 – 80 ccm</p> <p>313.4.250 – 250 ccm</p>
Advanced technologies	<p>High power density.</p> <p>Easy installation.</p> <p>Low maintenance costs.</p>
High functional performance	<p>Shaft rotation speed up to 3750 rpm.</p> <p>Working pressure up to 450 bar.</p> <p>High volumetric efficiency.</p> <p>High overall efficiency.</p> <p>Low noise level.</p> <p>Low response time.</p>
Reliability	<p>40 years experience in design and manufacture in accordance with the world standards, with the use of powerful modeling tools.</p> <p>Laboratory and full-scale tests.</p> <p>Series production in accordance with the international quality standards.</p>
Multi-application product	<p>Designed for the global market.</p> <p>Product identity on all markets.</p> <p>Designed for use in mobile and stationary units.</p>

## Pump design



Bent-axis axial-piston hydraulic pumps for open circuit.

The pump capacity depends on the working displacement and shaft rotation speed of the pump.

In the initial state the working displacement (capacity) of the pump is equal to zero.

Pump displacement depends on the changing of cylinders block inclination angle to the axis of the drive shaft.

The regulator built into the back cover is designed for changing the cylinders block inclination angle (and hence the change of working displacement and pump capacity).

The regulator consists of a stepped piston mounted in the back cover, a pin, a retention screw, a valve spool with two throttling orifices with a shoe and thrust bearing, a double-armed lever and a cover with built-in proportional electromagnet.

The cylinder chamber of the piston with smaller diameter is constantly connected with the high pressure channel.

The chamber under the cylinder with greater diameter can be connected to the drain line or high pressure line through the openings in the pin, valve spool land and opening in the screw.

On supplying the control signal to the proportional electromagnet mounted in the cover, the electromagnet changes the ratio of moments at the lever and a valve spool position relative to the pin.

In a neutral position the valve spool ensures a balance of forces acting on the piston regulator.

Displacement of the valve spool to the right or to the left from the neutral position causes changing pressure in the piston chamber of greater diameter and displacement of piston.

Displacement of a stepped piston connected with pumping unit through a spherical pin head causes changes in cylinder block inclination angle and hydraulic pump displacement.

## Technical characteristics

Type	313.4.55	313.4.107	313.4.160
Displacement, cc/rev			
- minimum	0	0	0
- maximum	55	107	160
Shaft rotation speed, rpm			
- minimum	400	400	400
- rated	1500	1200	1200
- maximum at inlet pressure 0,08MPa	2500	2000	1750
- maximum peak at inlet pressure 0,2MPa	3750	3000	2650
Flow, l/min			
- rated	82,5	128,4	192,0
- maximum	137,5	214,0	280,0
- peak	206,2	321,0	424,0
Working pressure, MPa			
- rated	20	20	20
- maximum	40	40	40
- peak	45	45	45
Power, kW			
- rated	34,4	42,8	64,0
- maximum	137,5	214,0	282,7
Regulation starting pressure, MPa	0,3	0,3	0,3
Weight, kg	24	40	55

## Environment

Climatic version according to GOST 15150-71

Moderate and cold climate design (MCC)

– moderate and cold climate

– ambient temperature (during operation) -40°C, +40°C

– rubber material - based on butadiene-nitrile rubber

Tropical climate design (T)

- tropical climate

- ambient temperature (during operation) -20°C, +60°C

- rubber material - based on fluorinated rubber

Placement category - 1, for outdoor service.

## Definitions

### Speed modes

Rated speed is a maximum speed recommended for maximum power mode at which rated resource is achieved.

Rated speed is defined for a level of absolute inlet pressure of 1 bar and all other operating parameters (i.e. working fluid viscosity, its temperature etc.) shall be maintained in the recommended limits.

Maximum speed is the maximum recommended operating speed, beyond which the article's resource is reduced or a risk of premature failure and loss of hydraulic power is arisen. To achieve maximum speed it is recommended to reduce the pump flow and / or to deliver the liquid at the inlet under pressure.

### Pressure levels

Pressure in the system is the main operating parameter which determines the article's resource.

Maximum (peak) pressure is the highest permitted pressure which is maintained in the system using the pressure relief valve. This pressure is determined by the maximum operational load. Exceeding this value leads to a reduction in the pump's lifetime.

Nominal pressure is an average regular pressure which guarantees a normal article's lifetime.

## Options

### Input shafts

Hydraulic pumps 313 series are supplied with different splined and cylindrical shafts.

	splined	cylindrical
313.4.55	W35x2x30x14x9g DIN 5480	Ø30k6, key 8x7x50 GOST 23360
313.4.107	W40x2x30x18x9g DIN 5480	Ø40k6, key 12x8x63 GOST 23360
313.4.160	W45x2x30x21x9g DIN 5480	Ø45k6, key 14x9x70 GOST 23360

### Maximum displacement limiter

Hydraulic pumps 313 series have the option of mechanical maximum displacement limitation.

The maximum displacement can be limited up to 50%.

Hydraulic pumps are supplied with the mounted displacement adjusting screw. The settings are to be specified during the order.

### Minimum displacement limiter

Minimum displacement limitation function is not available.

### Air outlet

### Important!

After the hydraulic pump installation and working lines accession, pump body chamber should be filled with pure working fluid.

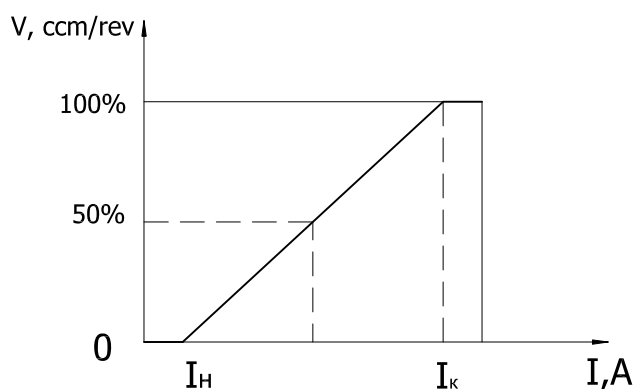
Let the air out from the drain chamber of hydraulic pump by turning off a plug of the air outlet.

## Control system

Hydraulic pumps are manufactured with proportional electric control.

The proportional electric control system is based on a patented system for regulating displacements of bent-axis axial-piston hydraulic machines.

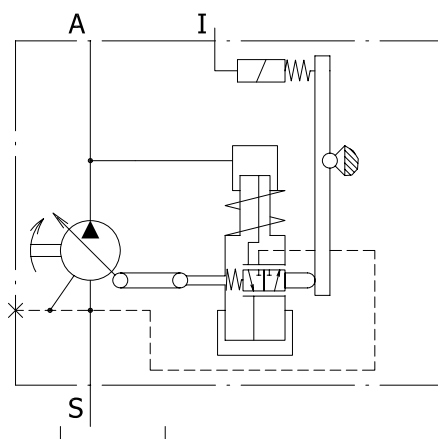
### Control Diagram



Proportional electromagnet provides a constructive opportunity to set the rotation around its axis at  $\pm 90^\circ$ .

Displacement	55	107	160
Control range at $U=12V$ , A	0,4-1,8		
Control range at $U=24V$ , A	0,2-0,8		
PWM frequency, Hz	50-200		

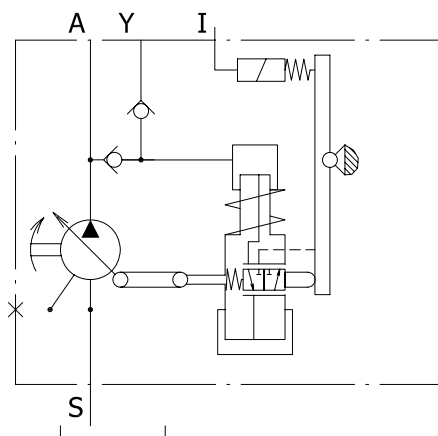
### Hydraulic Circuit



### Outer charge of regulator

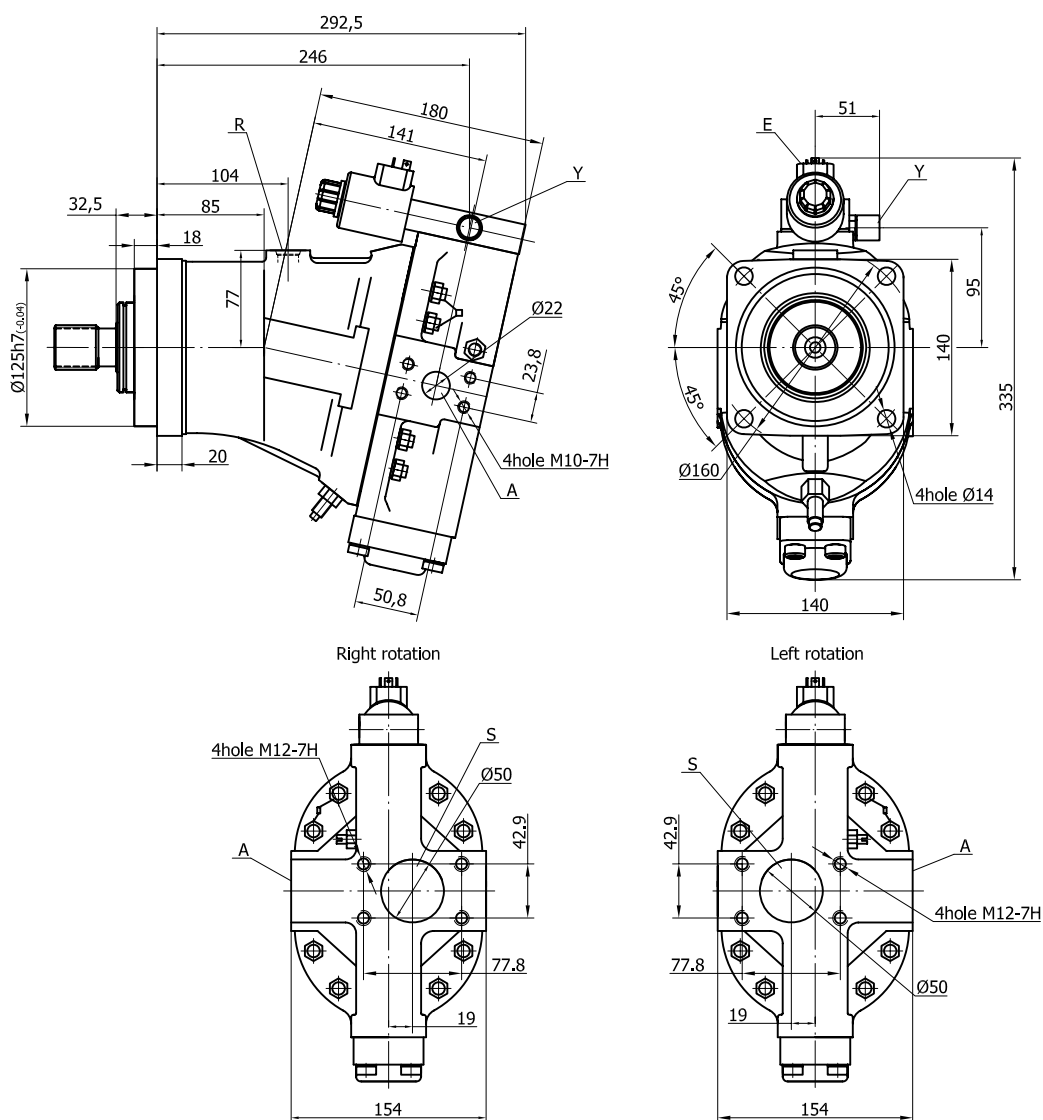
Optionally pumps can be supplied with function of external power supply to the regulator.

External power supply is necessary when it is not possible to provide pressure more than 0.2MPa in the working line of the pump. This may be due to unique properties of each hydraulic system.



## Overall dimensions

Displacement 55 ccm/rev



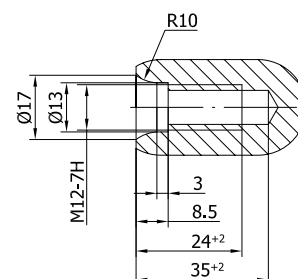
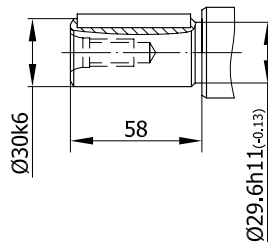
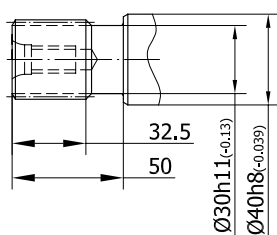
A	High pressure port	SAE 3/4" 6000psi
S	Suction line port	SAE 2" 3000psi
R	Air bleed	M18x1,5-12
Y	Regulator external charge port	M16x1,5-7H
E	Solenoid connector	DIN 43650

## Shaft ends

W35x2x30x14x9g DIN 5480

key 8x7x50 GOST 23360

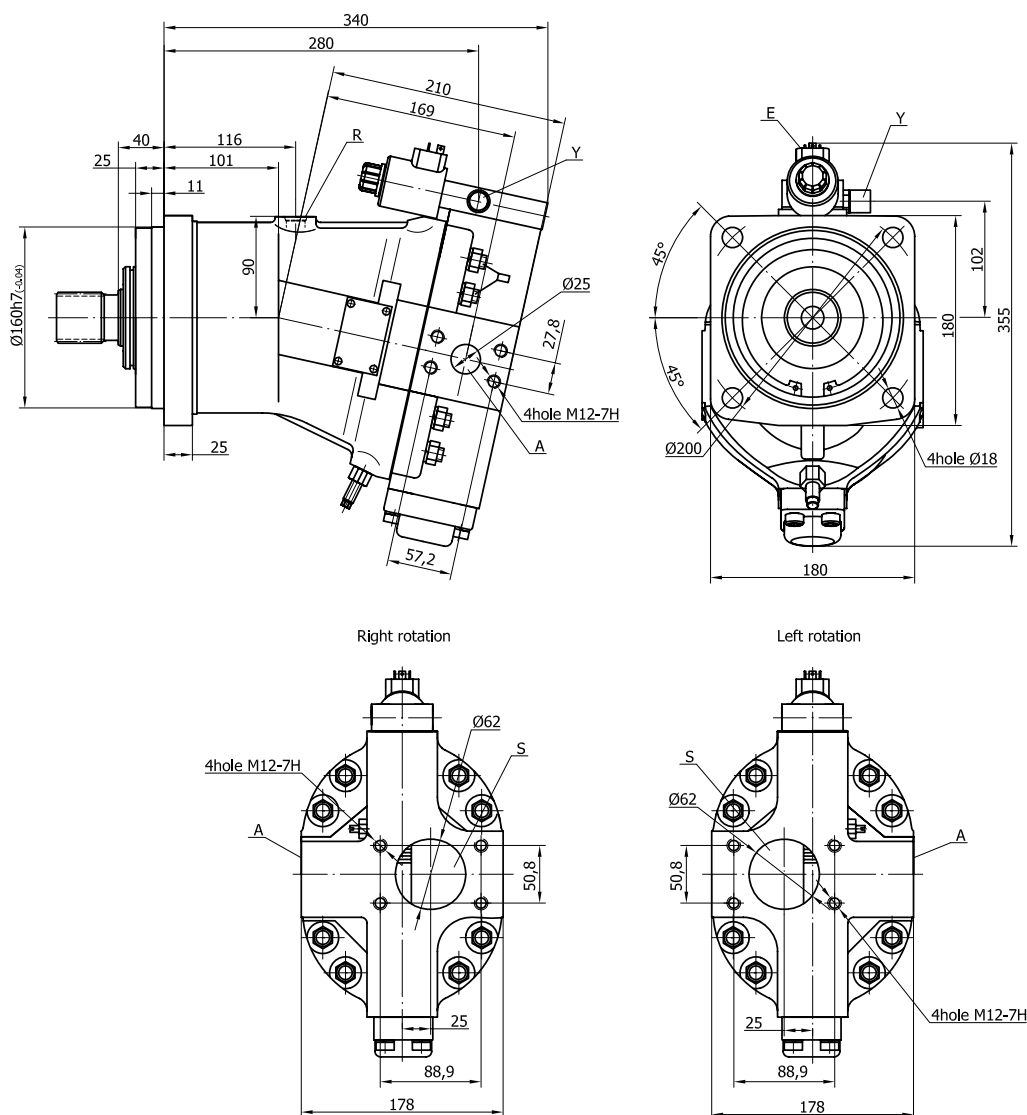
shaft threaded hole





## Overall dimensions

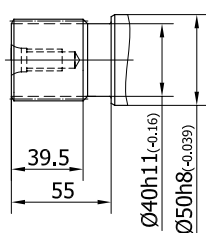
Displacement 107 ccm/rev



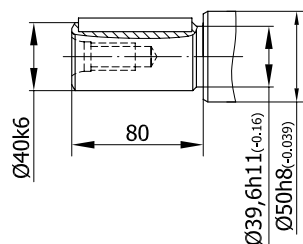
A	High pressure port	SAE 1" 6000psi
S	Suction line port	SAE 2 1/2" 2500psi
R	Air bleed	M18x1,5-12
Y	Regulator external charge port	M16x1,5-7H
E	Solenoid connector	DIN 43650

## Shaft ends

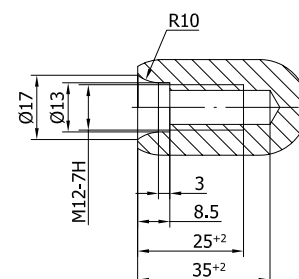
W40x2x30x18x9g DIN 5480



key 12x8x63 GOST 23360

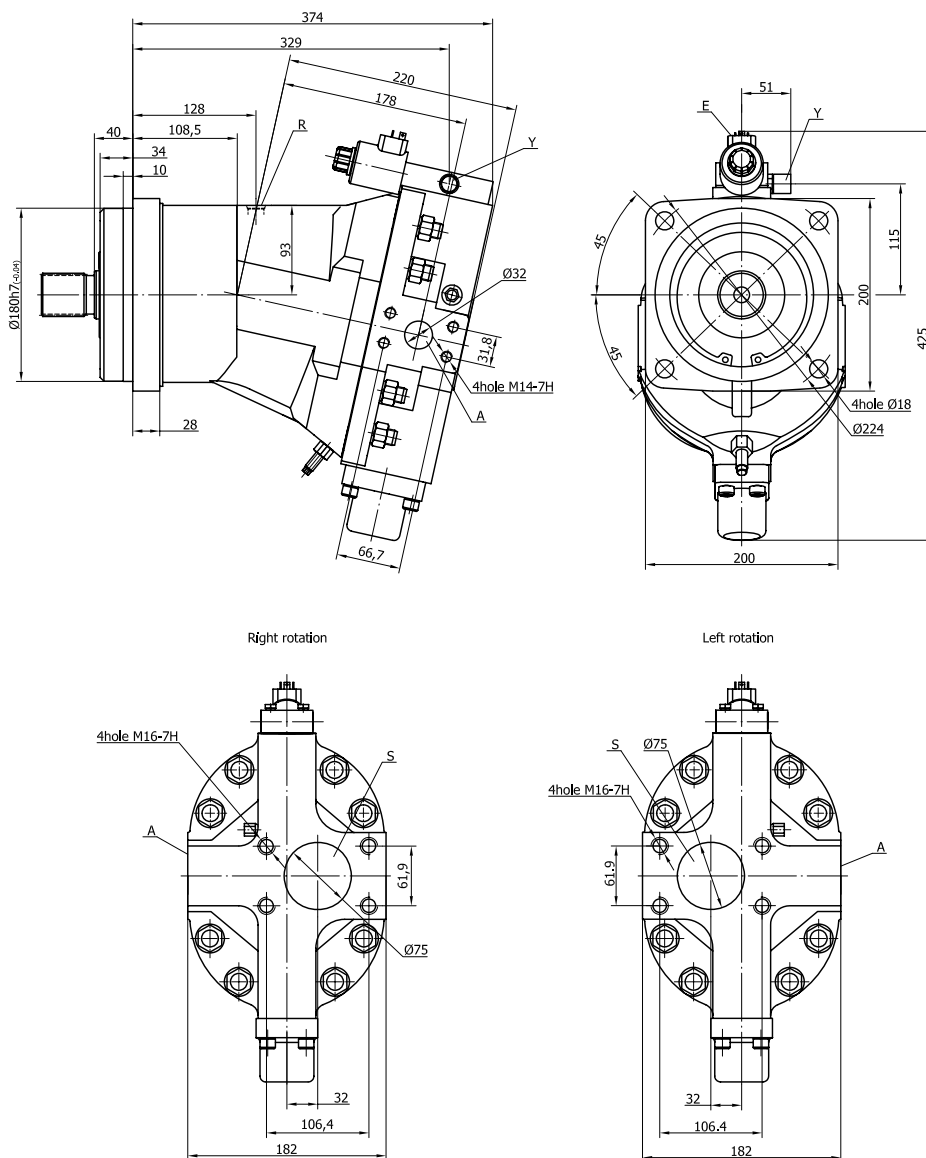


shaft threaded hole



## Orevall dimensions

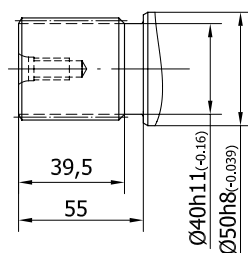
Displacement 160 ccm/rev



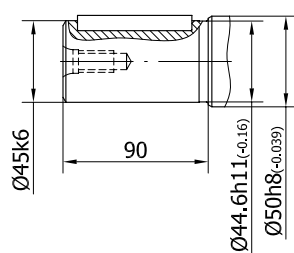
A	High pressure port	SAE 1 1/4" 6000psi
S	Suction line port	SAE 3" 2000psi
R	Air bleed	M22x1,5-12
Y	Regulator external charge port	M16x1,5-7H
E	Solenoid connector	DIN 43650

## Shaft ends

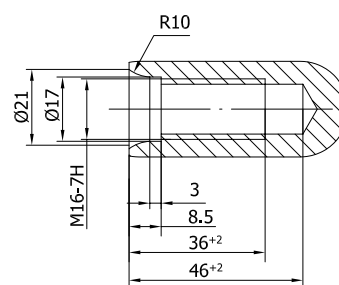
W45x2x30x21x9g DIN 5480



key 14x9x70 GOST 23360



shaft threaded hole



## Preferred Types

	Type	Direction of rotation	Regulator external charge	Shaft design	U
1	313.4.55.07D.700.00	right		splined	12V
2	313.4.55.07D.800.00	left	not available		
3	313.4.55.07D.703.00	right	available		
4	313.4.55.07D.803.00	left			
5	313.4.55.07D.500.00	right	not available	keyed	
6	313.4.55.07D.600.00	left			
7	313.4.55.07D.503.00	right	available		
8	313.4.55.07D.603.00	left			
9	313.4.55.07E.700.00	right	not available	splined	24V
10	313.4.55.07E.800.00	left	available		
11	313.4.55.07E.703.00	right			
12	313.4.55.07E.803.00	left	not available		
13	313.4.55.07E.500.00	right	available	keyed	
14	313.4.55.07E.600.00	left			
15	313.4.55.07E.503.00	right	not available		
16	313.4.55.07E.603.00	left	available		
17	313.4.107.07D.700.00	right	not available	splined	12V
18	313.4.107.07D.800.00	left			
19	313.4.107.07D.703.00	right	available		
20	313.4.107.07D.803.00	left			
21	313.4.107.07D.500.00	right	not available	keyed	
22	313.4.107.07D.600.00	left	available		
23	313.4.107.07D.503.00	right			
24	313.4.107.07D.603.00	left	not available		
25	313.4.107.07E.700.00	right	not available	splined	24V
26	313.4.107.07E.800.00	left	available		
27	313.4.107.07E.703.00	right			
28	313.4.107.07E.803.00	left	not available		
29	313.4.107.07E.500.00	right	available	keyed	
30	313.4.107.07E.600.00	left			
31	313.4.107.07E.503.00	right	not available		
32	313.4.107.07E.603.00	left	available		
33	313.4.160.07D.700.00	right	not available	splined	12V
34	313.4.160.07D.800.00	left			
35	313.4.160.07D.703.00	right	available		
36	313.4.160.07D.803.00	left			
37	313.4.160.07D.500.00	right	not available	keyed	
38	313.4.160.07D.600.00	left	available		
39	313.4.160.07D.503.00	right			
40	313.4.160.07D.603.00	left	not available		
41	313.4.160.07E.700.00	right	not available	splined	24V
42	313.4.160.07E.800.00	left	available		
43	313.4.160.07E.703.00	right			
44	313.4.160.07E.803.00	left	not available		
45	313.4.160.07E.500.00	right	available	keyed	
46	313.4.160.07E.600.00	left			
47	313.4.160.07E.503.00	right	not available		
48	313.4.160.07E.603.00	left	available		

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