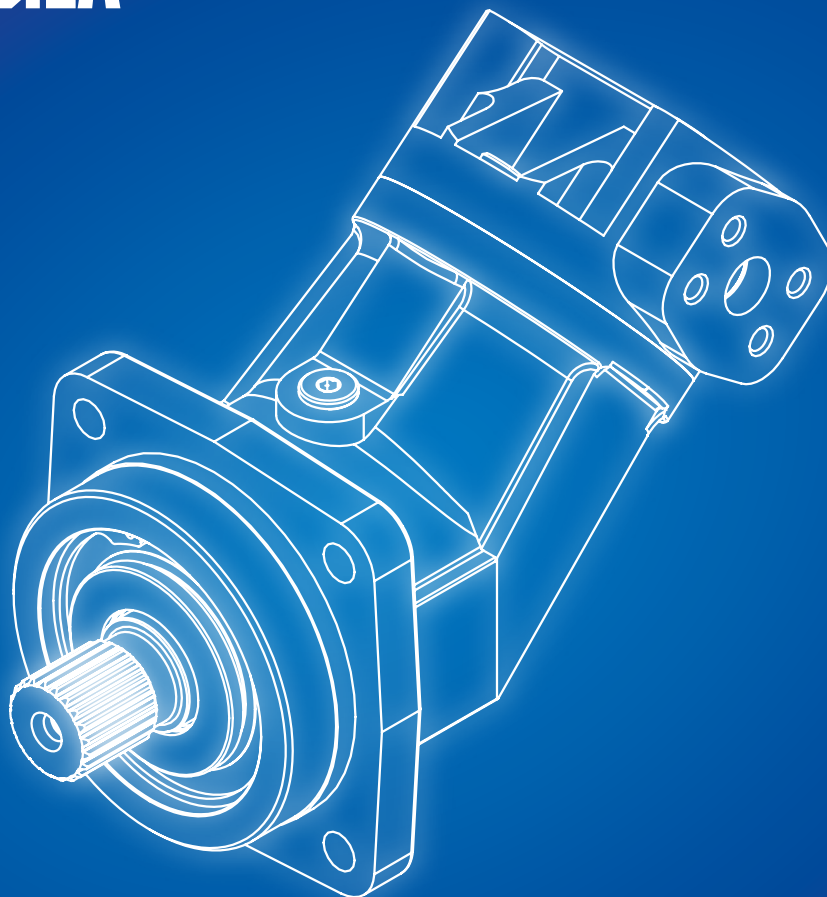




Axial piston bent-axis pumps and motors

series BF10/BF20/BF20T/BV10

CODING OF CATALOGUES

HS-AB-03/122021

HS	–	A	B	–	03	/	12	2021
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HYDROSILA

TYPE OF HYDRAULIC MACHINES	TYPE	SERIES
Gear pumps	GP	K
		T
Gear motors	GM	K
Axial piston machines for closed circuit	A	C
Axial piston machines for open circuit		O
Bent-axis axial piston machines		B
Control valves	V	-
In-line mounting hydraulic valves	LV	-
Hydraulic cylinders	C	-
Quick-release coupling	Q	-
Hydraulic components for truck applications	HCT	-
Quick-release coupling, Fitting, High pressure hoses	QFH	-

Nº EDITION

MONTH OF EDITION

YEAR OF EDITION

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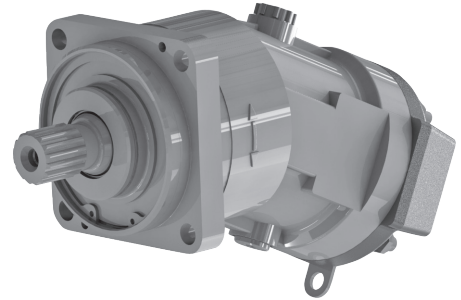
PBF10

PBF10 - series of axial piston fixed displacement pumps in bent-axis design. They have an aluminum alloy body and designed for hydraulic systems of mobile machines of different purposes.

The **PBF10** model range includes pumps with displacement 28, 56 and 112 cm³.

DESIGN FEATURES

- Open circuit.
- The angle of inclination the block cylinder 26 degrees.
- High hydromechanical efficiency.
- Tapered roller bearings, allow the pump shaft to withstand high radial and axial loads.
- Bimetallic block cylinder of unit has a high wear resistance.
- Resistant to corrosion durable and lightweight body with high strength aluminum alloy.
- Maximum pressure 400 bar.



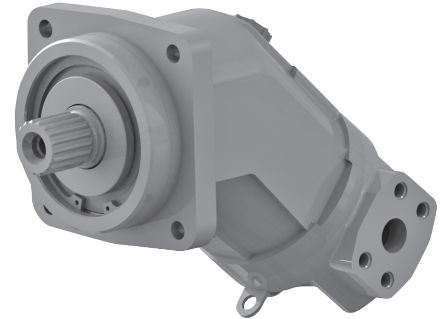
PBF20

PBF20 - series of axial piston fixed displacement pumps in bent-axis design. They have an cast iron body and designed for hydraulic systems of mobile machines operating in severe conditions.

The **PBF20** model range includes pumps with displacement 56, 80 and 107 cm³.

DESIGN FEATURES

- Open circuit.
- The angle of inclination the block cylinder 40 degrees.
- High hydromechanical efficiency.
- Tapered roller bearings, allow the pump shaft to withstand high radial and axial loads.
- Bimetallic block cylinder of unit has a high wear resistance.
- Conical plungers with compression rings.
- High cast iron body.
- Maximum pressure 450 bar.



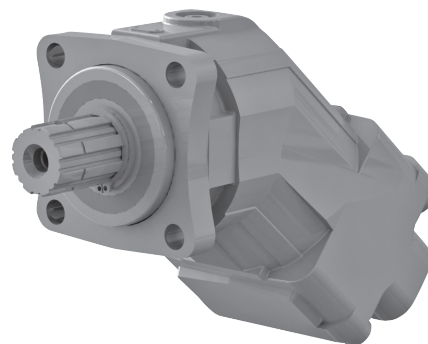
PBF20T, PBF20TH

PBF20T(TH) - series of axial piston fixed displacement pumps in bent-axis design. They have variants in aluminum alloy body (**PBF20T**) and cast iron body (**PBF20TH**) and designed for hydraulic systems of commercial vehicles and truck applications.

The **PBF20T(TH)** model range includes pumps with displacement 56, 63, 80 and 107 cm³.

DESIGN FEATURES

- Open circuit.
- The angle of inclination the block cylinder 40 degrees.
- High hydromechanical efficiency.
- Tapered roller bearings, allow the pump shaft to withstand high radial and axial loads.
- Bimetallic block cylinder of unit has a high wear resistance.
- Conical plungers with compression rings.
- Aluminum alloy or high cast iron body.
- Mounting flange acc. to ISO 7653-1985.
- Drive shaft acc. to DIN ISO 14.
- Maximum pressure 400 bar.



PBF10

FIXED DISPLACEMENT AXIAL PISTON PUMPS

Order code

PBF10	.	4	.	56	.	03	.	06	N			
-------	---	---	---	----	---	----	---	----	---	--	--	--

FIXED DISPLACEMENT BENT-AXIS
AXIAL PISTON PUMP

PBF10

MODEL ¹⁾

2*

4

●

●

DISPLACEMENT, CM³

CODE

28

●

28

56

●

56

112

●

112

SPECIAL FEATURES**

CODE

CLIMATIC VERSION

CODE

Temperate

N

Tropical

T

ROTATION	SHAFT OPTIONS	28	56	112	CODE
Clockwise	Splined shaft ΓOCT 6033-51	●	-	-	03
	Splined shaft ΓOCT 6033-80	-	●	●	
Counterclockwise	Splined shaft ΓOCT 6033-51	●	-	-	04
	Splined shaft ΓOCT 6033-80	-	●	●	
Clockwise	Keyed shaft ΓOCT 23360	●	●	●	05
Counterclockwise		●	●	●	06
Clockwise	Splined shaft ΓOCT 6033-80	●	-	-	08
Counterclockwise		●	-	-	09
Clockwise	Splined shaft ²⁾ DIN 5480	-	●	●	OG
Counterclockwise		-	●	●	OI
Clockwise	Splined shaft ³⁾ DIN 5480	-	●	●	OH
Counterclockwise		-	●	●	OJ

WORKING PORTS OPTION

28

56

112

CODE

Two threaded ports on the rear (at 25° to the shaft axis)

●

-

-

00

Two threaded ports on the rear (parallel to the shaft axis)

●

-

-

01

Two threaded ports on the rear (at 50° to the shaft axis)

●

-

-

02

Two threaded ports, one on the side, one on the rear

●

-

-

05

Two flanged ports on the rear

-

●

●

06

¹⁾ * 2 - with ball bearings and brass cylinder block (only for size 28)

4 - with cone bearings, bimetallic cylinder block

²⁾ side balanced³⁾ side balanced, reduced diameter

** Special option code - assigned if necessary after agreement of special conditions with the customer

Notes: ● Standart; ○ Optional; - Not available

PBF20

FIXED DISPLACEMENT AXIAL PISTON PUMPS

Order code

PBF20	.	107	/	R	-	B	A	B	05	N			
-------	---	-----	---	---	---	---	---	---	----	---	--	--	--

FIXED DISPLACEMENT BENT-AXIS AXIAL PISTON PUMP	PBF20
--	-------

DISPLACEMENT, CM ³		CODE
56,1	●	56
80,4	●	80
106,7	●	107

ROTATION	CODE
Clockwise	R
Counterclockwise	L

SEAL	56	80	107	CODE
NBR	●	●	●	B
FKM	○	○	○	F

SHAFT OPTIONS		56	80	107	CODE
Splined shaft DIN 5480	2)	●	●	●	A
	3)	●	●	●	Z
Splined shaft ГОСТ 6033	-	●	-	●	0
Keyed shaft DIN 6885	-	●	●	●	B
		●	●	●	P
Splined shaft SAE J744	-	-	●	●	C
		●	-	-	BB

SPECIAL FEATURES*	CODE

CLIMATIC VERSION	CODE
Temperate	N
Tropical	T

WORKING PORTS OPTION	56	80	107	CODE
Two flanged ports, one on the side, one on the rear	●	●	●	05

MOUNTING FLANGES	56	80	107	CODE
ISO 3019/2 4-holes	●	●	●	B

2) side balanced

3) side balanced, reduced diameter

* Special option code - assigned if necessary after agreement of special conditions with the customer

Notes: ● Standard; ○ Optional; - Not available

PBF20T

FIXED DISPLACEMENT AXIAL PISTON PUMPS

Order code

PBF20	T	.	63	/	R	E8	1	N			
-------	---	---	----	---	---	----	---	---	--	--	--

FIXED DISPLACEMENT BENT-AXIS
AXIAL PISTON PUMP

PBF20T

SERIES

CODE

Aluminum alloy body

T

Cast iron body

TH

DISPLACEMENT, CM³

CODE

56

●

56

63

●

63

80

●

80

107

●

107

ROTATION

CODE

Clockwise

R

Counterclockwise

L

SHAFT OPTIONS

CODE

Splined shaft to DIN ISO 14

●

E8

Splined shaft to DIN ISO 14 with coupling

○

C8

SPECIAL FEATURES*

CODE

CLIMATIC VERSION

CODE

Temperate

N

Tropical

T

WORKING PORTS OPTION

CODE

Two threaded ports on the rear

●

1

Two threaded ports on the rear with
suction branch pipe

○

2

SUCTION SLEEVE

CODE

Straight

0

Angle 45°

1

Angle 90°

2

* Special option code - assigned if necessary after agreement of special conditions with the customer

Notes: ● Standart; ○ Optional; - Not available

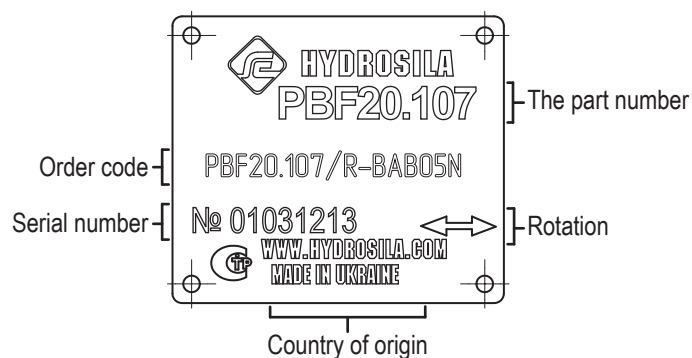
ORDERING EXAMPLE

PBF10.4.56.03.06N

PBF10 - fixed displacement bent-axis axial piston pump,
4 - pump with cone bearings and bimetallic cylinder block,
56 - displacement 56 cm³,
03 - with clockwise rotation and drive shaft - splined, acc. to GOST 6033-80,
06 - port: two rear flanged ports,
N - climate version: temperate.

PBF20.107/R-BAB05N

PBF20 - fixed displacement bent-axis axial piston pump,
107 - displacement 106,7 cm³,
R - clockwise rotation,
B - with seal material NBR,
A - shaft option: splind, acc. to DIN 5480,
B - mounting flange ISO 4 holes,
05 - two flanged ports, one on the side, one on the rear,
N - climate version: temperate.



ORDERING EXAMPLE

PBF20T.63/RE81N

PBF20 - fixed displacement bent-axis axial piston pump,

T - aluminum body,

63 - displacement 63 cm³,

R - clockwise rotation,

E8 - drive shaft: splined, acc. to DIN ISO 14,

1 - ports options,

N - climatic version - temperate.

PBF20TH.80/RE81N

PBF20 - fixed displacement bent-axis axial piston pump,

TH - cast iron body,

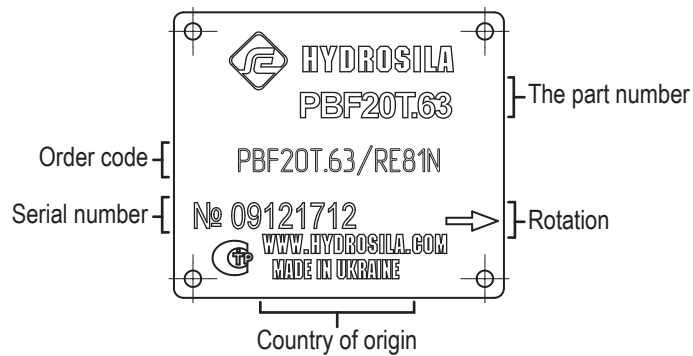
80 - displacement 80 cm³,

R - clockwise rotation,

E8 - drive shaft: splind, acc. to DIN ISO 14,

1 - ports options,

N - climatic version - temperate.



FIXED DISPLACEMENT AXIAL PISTON PUMPS

TECHNICAL SPECIFICATIONS

SIZE		PBF10.2.28	PBF10.4.56	PBF10.4.112	PBF20.56	PBF20.80	PBF20.107
Displacement, V _g	cm ³	28	56	112	56,1	80,4	106,7
Speed	min ⁻¹						
minimum		400					
rated, at inlet pressure P _{abs} =0,8 bar		1920	1800	1200	2000	1800	1600
maximum, at inlet pressure P _{abs} =1,0 bar		3000	2500	2000	3000	2680	2400
maximum, at inlet pressure P _{abs} =2,0 bar		4750	3750	3000	3750	3350	3000
Pressure, P	bar						
rated		200	250		400		
maximum, t≤6 sec		320	400		450		
Maximum drain pressure	bar	1	2,5				
Inlet pressure, P	bar						
minimum		0,8					
rated		1					
maximum		2					
Flow*, Q	l/min						
minimum		11	22	45	22	32	43
rated		54	101	134	112	145	171
maximum		84	140	224	168	215	256
limit		133	210	336	209	269	320
Input power*, N	kW						
rated		18	42	56	75	96	114
maximum		45	93	149	126	162	192
Efficiency							
hydromechanical		0,96					
volumetric		0,95					
Weight (without fluid), no more	kg	9	17	29	18	23	32

* Without efficiency

FORMULAS

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

$$\text{Input torque } T = \frac{V_g \cdot \Delta p}{20 \cdot \pi \cdot \eta_{mh}} = \frac{1.59 \cdot V_g \cdot \Delta p}{100 \cdot \eta_{mh}} \text{ [N·m]}$$

$$\text{Input power } P = \frac{2 \cdot \pi \cdot T \cdot n}{60000} = \frac{Q \cdot \Delta p}{600 \cdot \eta_t} \text{ [kW]}$$

V_g — displacement (cm³)

Δp — pressure drop (bar)

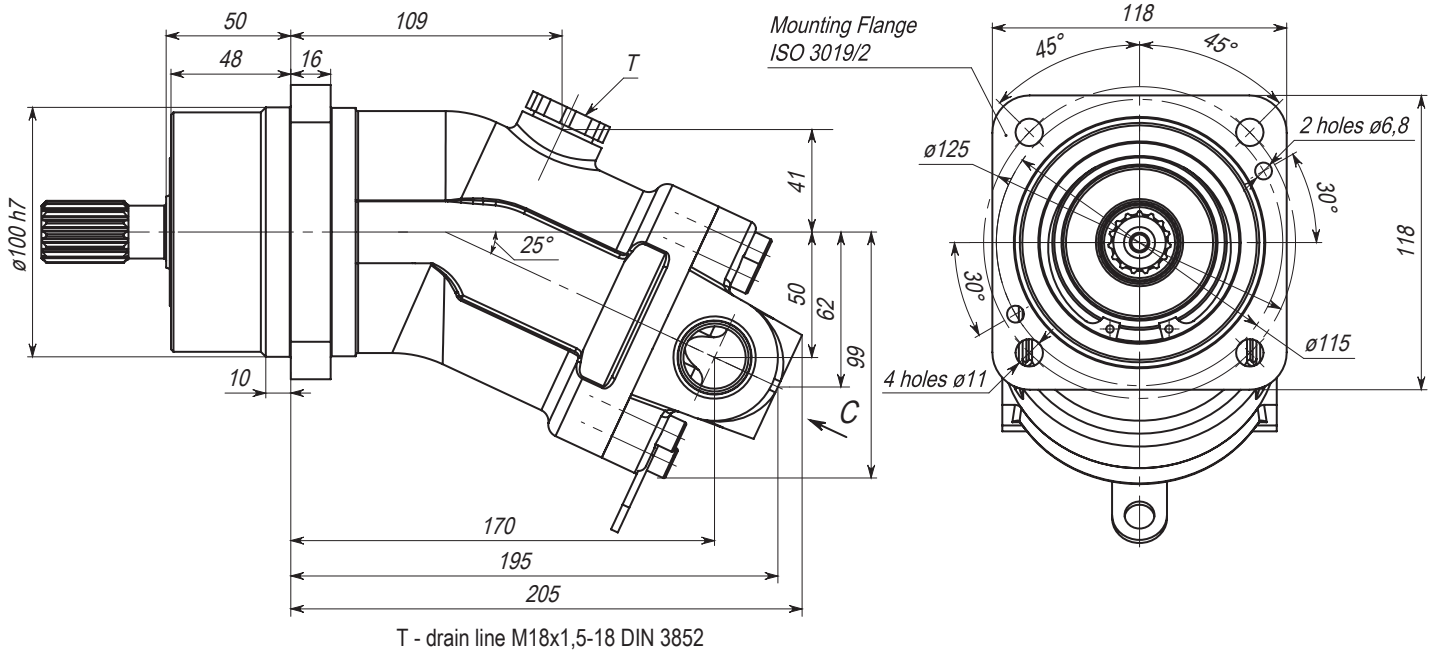
n — speed (min⁻¹)

η_v — volumetric efficiency

η_{mh} — hydromechanical efficiency

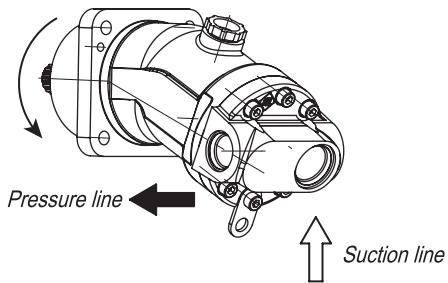
η_t — overall efficiency

PBF10 PUMPS DIMENSIONS, SIZE 28 CM³

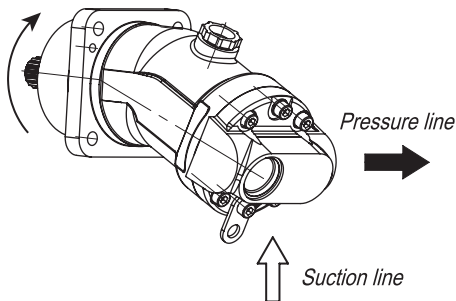


ROTATION

Clockwise



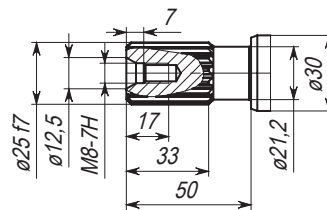
Counterclockwise



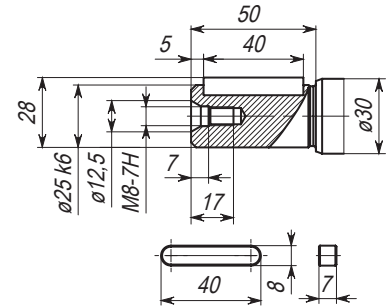
DRIVE SHAFTS

08; 09 | Splined shaft 25x7x1,5x9g
GOST 6033-80, z15

03; 04 | Splined shaft 25x1,5x16S X
GOST 6033-51, z16

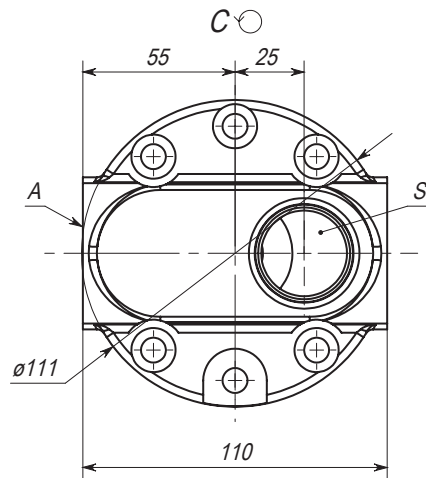
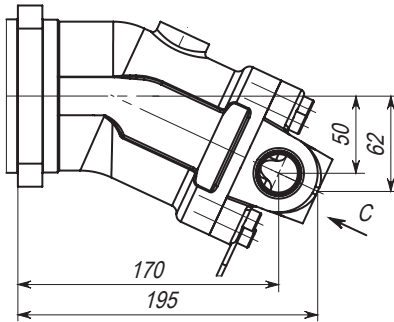


05; 06 | Keyed shaft 8x7x40
GOST 23360



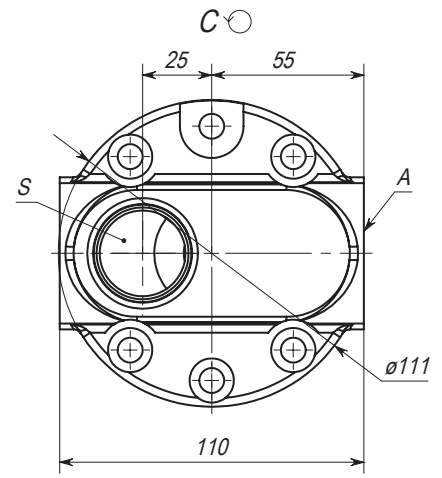
WORKING PORTS OPTION

05 | two threaded ports, one on the side, one on the rear



Clockwise

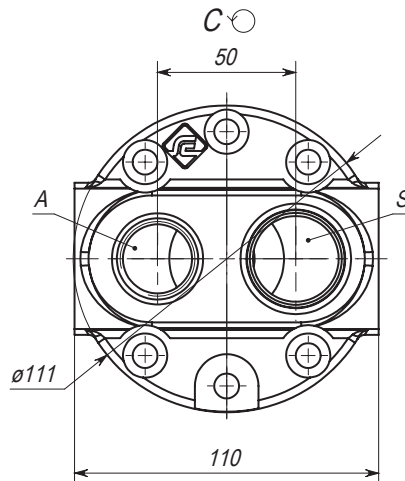
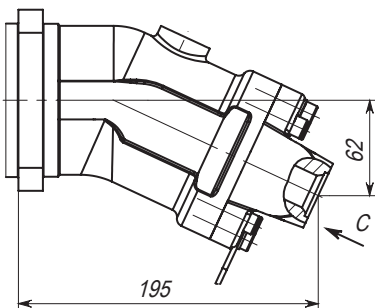
A - pressure line
M27x2-24 GOST 25065



Counterclockwise

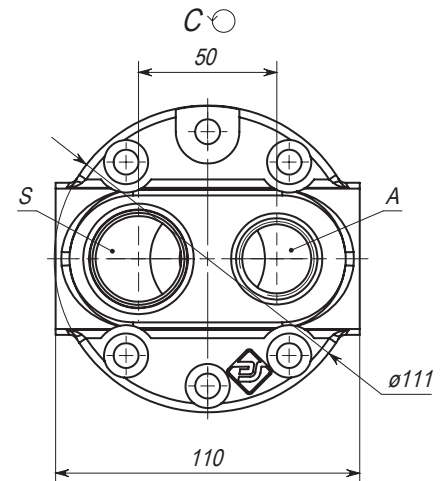
S - suction line
M33x2-24 GOST 25065

00 | two threaded ports on the rear (at 25° to the shaft axis)



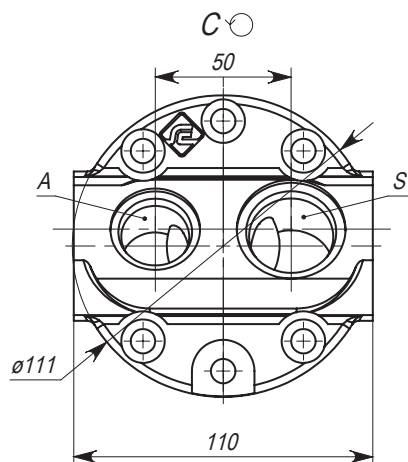
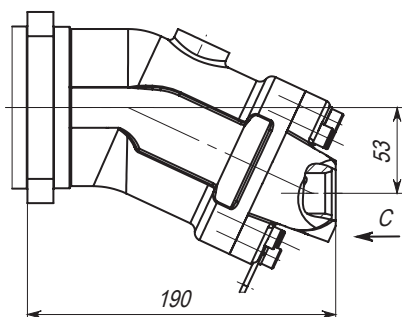
Clockwise

A - pressure line
M27x2-24 GOST 25065

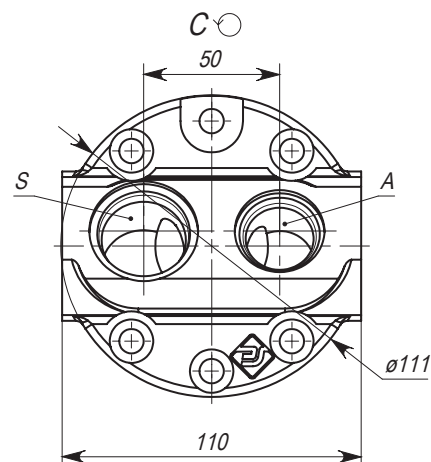


Counterclockwise

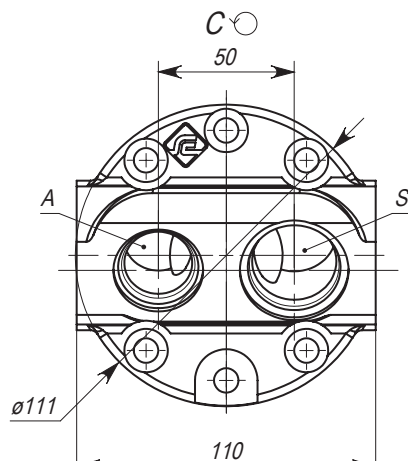
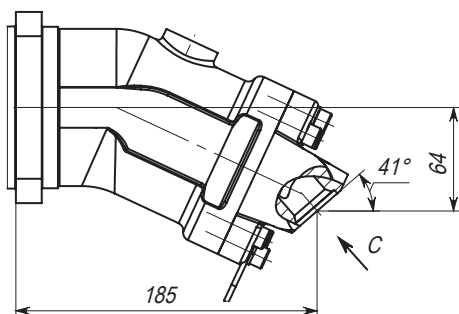
S - suction line
M33x2-24 GOST 25065

01 | two threaded ports on the rear (parallel to the shaft axis)

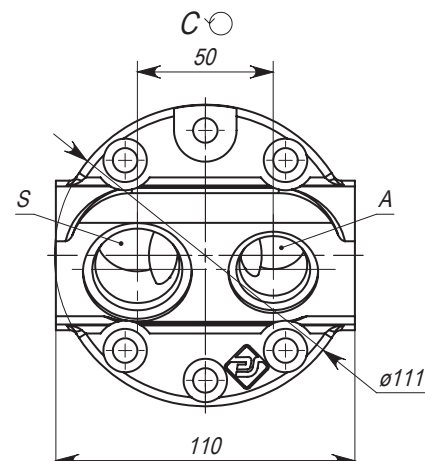
Clockwise

A - pressure line
M27x2-20 GOST 25065

Counterclockwise

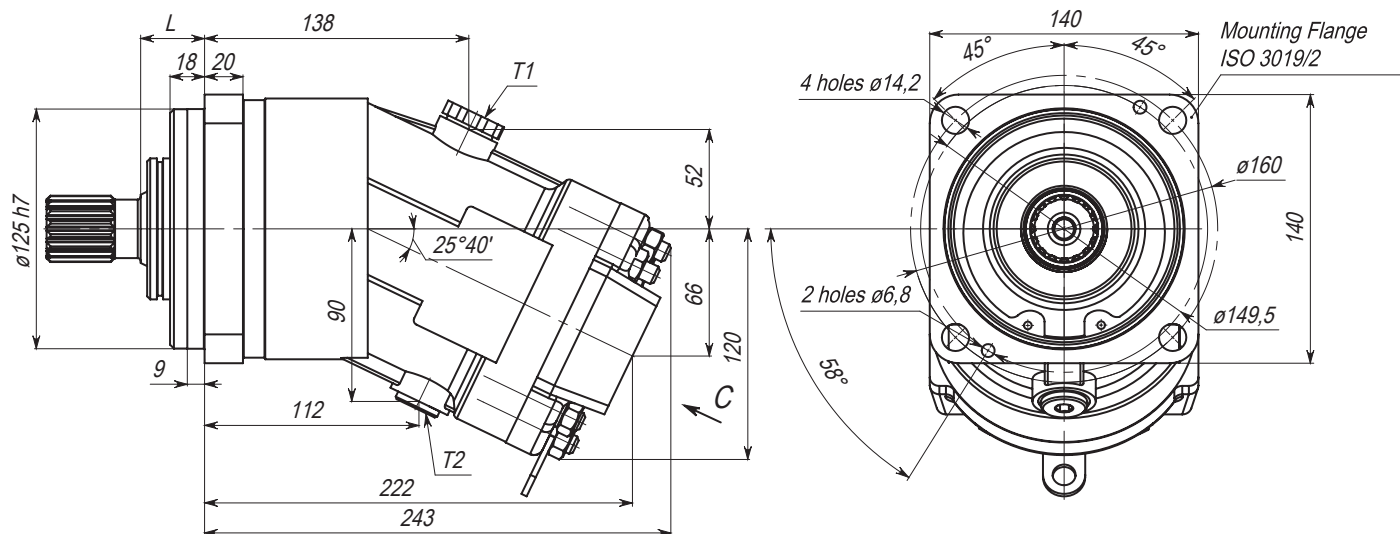
S - suction line
M33x2-20 GOST 25065**02** | two threaded ports on the rear (at 50° to the shaft axis)

Clockwise

A - pressure line
M27x2-20 GOST 25065

Counterclockwise

S - suction line
M33x2-20 GOST 25065

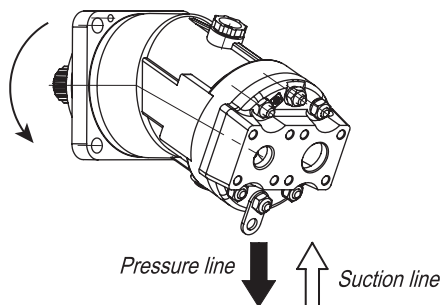
PBF10 PUMPS DIMENSIONS, SIZE 56 CM³


T1, T2 - drain line M18x1,5-18 DIN 3852

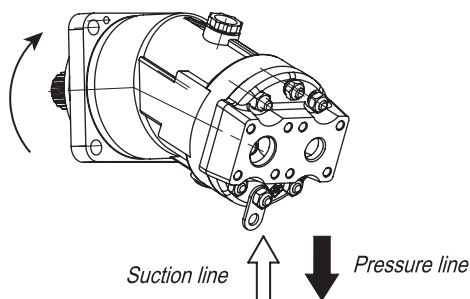
$L = 32$ mm for splined shafts according to DIN, for all other $L = 33,5$ mm

ROTATION

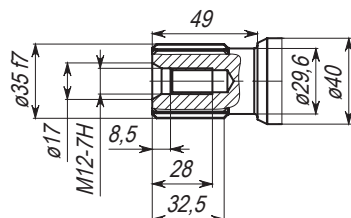
Clockwise



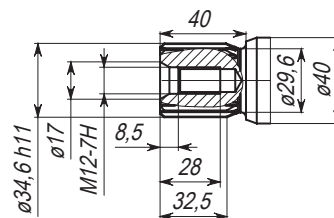
Counterclockwise


DRIVE SHAFTS

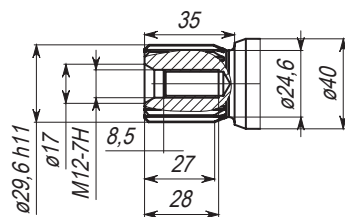
03; 04 | Splined shaft 35x7x2x9g
GOST 6033-80, z16



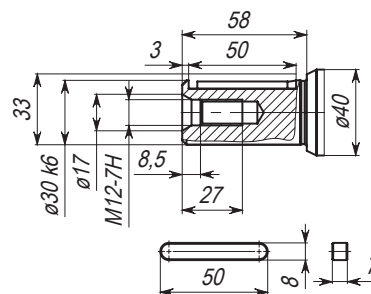
OG; OI | Splined shaft W35x2x30x16x9g
DIN5480, z16



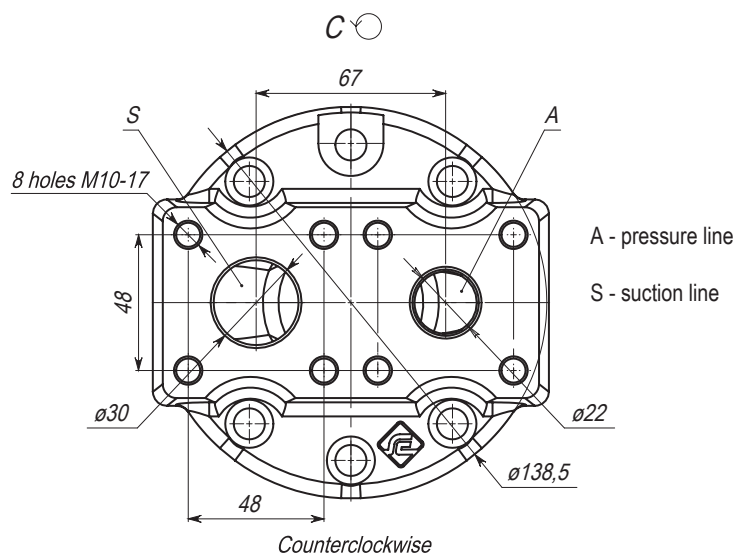
OH; OJ | Splined shaft W30x2x30x14x9g
DIN5480, z14



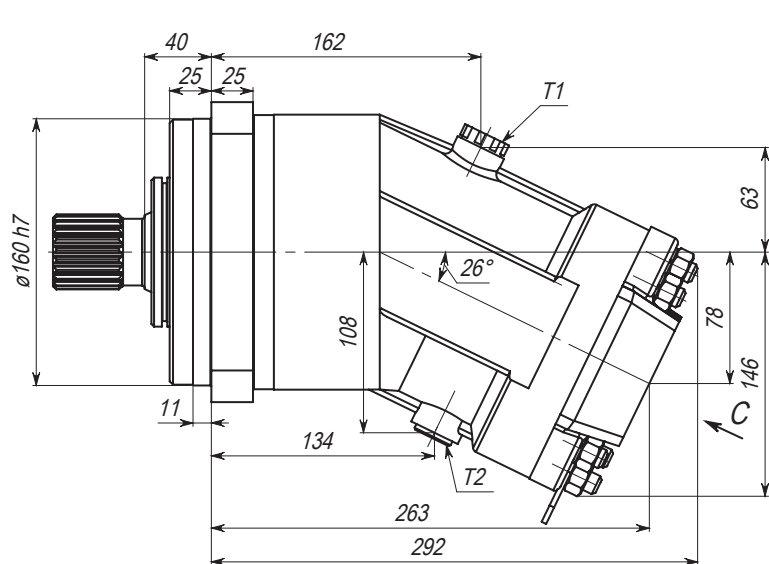
05; 06 | Keyed shaft 8x7x50
GOST 23360



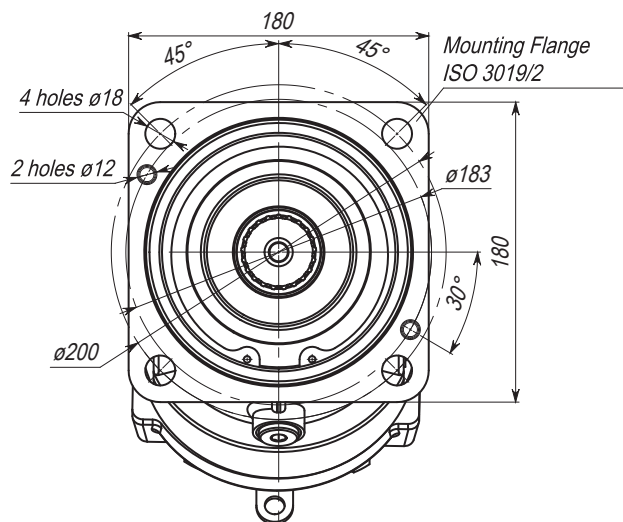
06 | two flanged ports on the rear



PBF10 PUMPS DIMENSIONS, SIZE 112 CM³

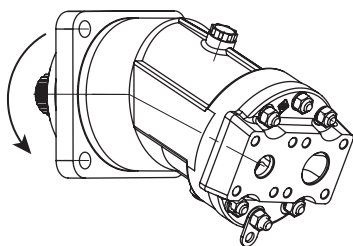


T1, T2 - drain line M18x1,5-18 DIN 3852



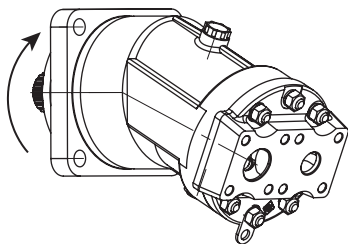
ROTATION

Clockwise



Pressure line ↓ ↑ Suction line

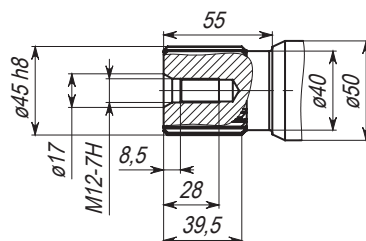
Counterclockwise



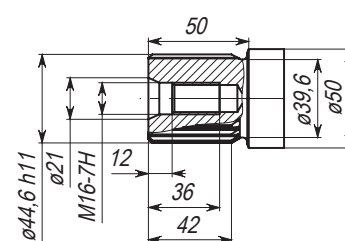
Suction line ↑ ↓ Pressure line

DRIVE SHAFTS

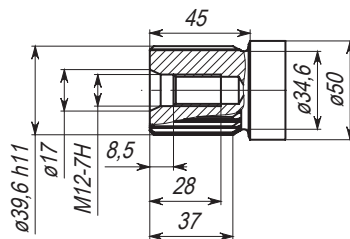
03; 04 | Splined shaft 45xh8x2x9g
GOST 6033-80, z21



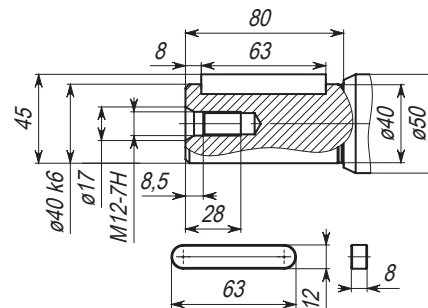
OG; OI | Splined shaft W45x2x30x21x9g
DIN5480, z21



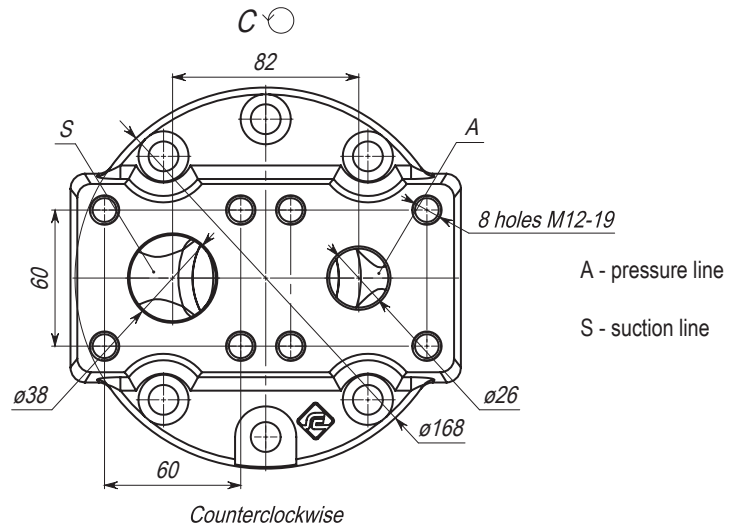
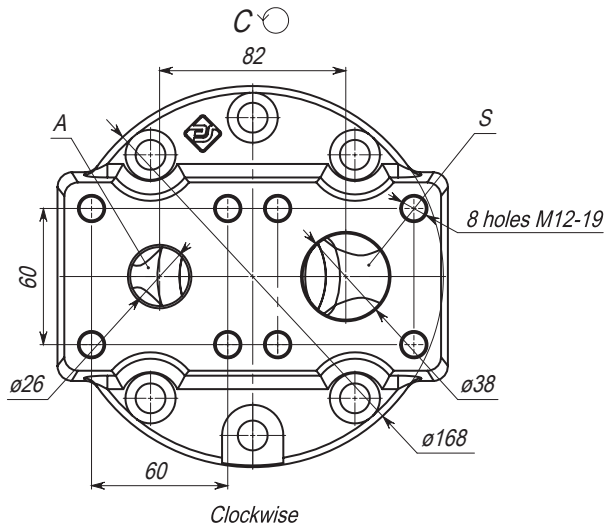
OH; OJ | Splined shaft W40x2x30x18x9g
DIN5480, z18

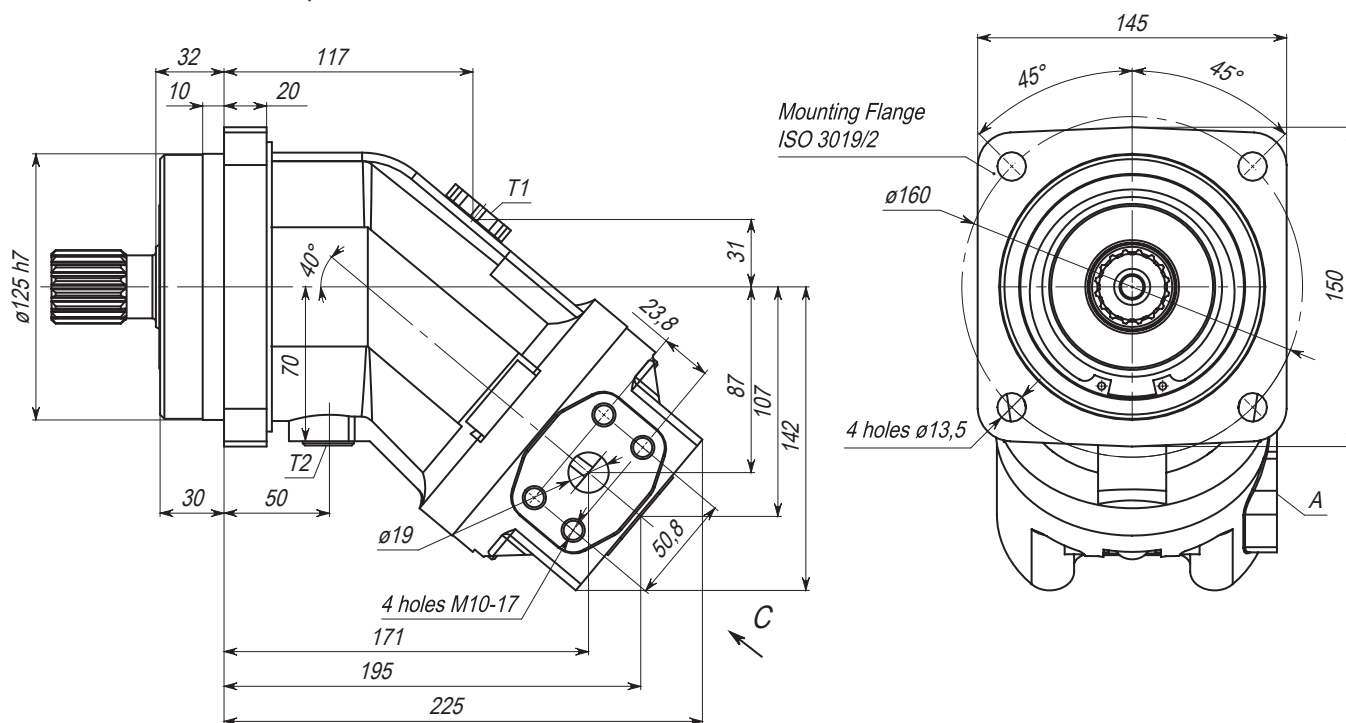


05; 06 | Keyed shaft 12x8x63
GOST 23360



WORKING PORTS OPTION

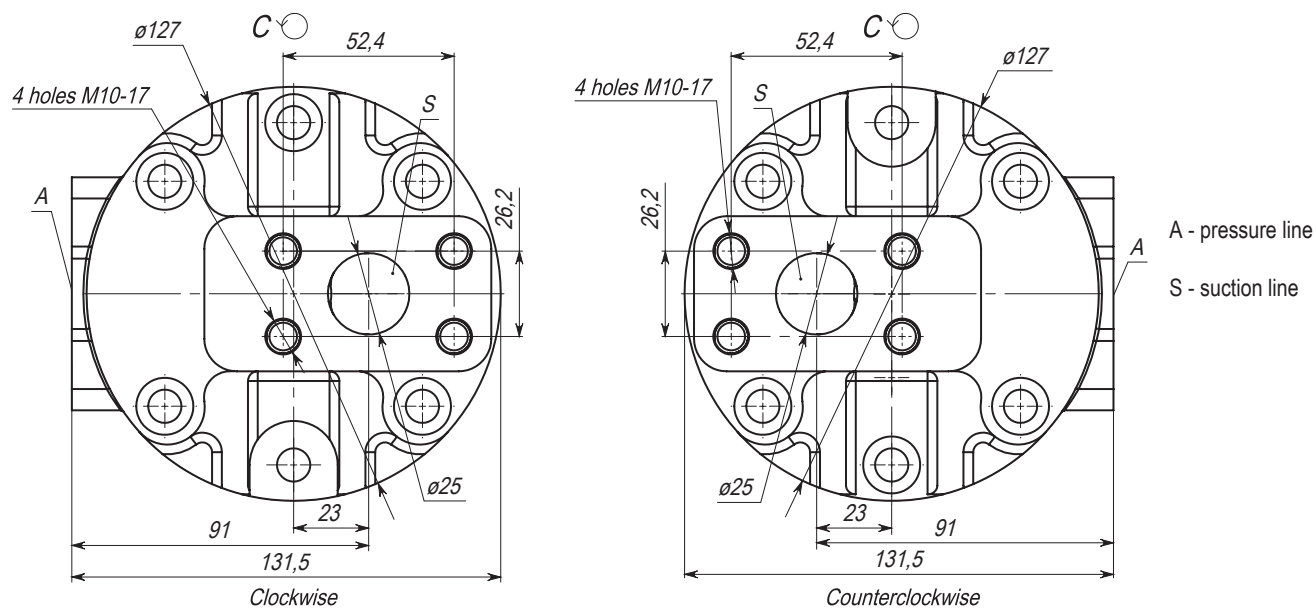
06 | two flanged ports on the rear

PBF20 PUMPS DIMENSIONS, SIZE 56 CM³


T1, T2 - drain line M18x1,5-12 DIN 3852

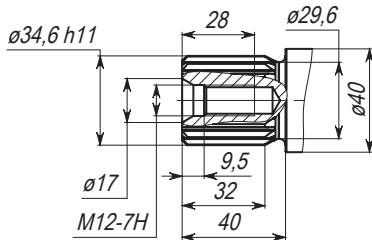
WORKING PORTS OPTION

05 | two flanged ports, one on the side, one on the rear

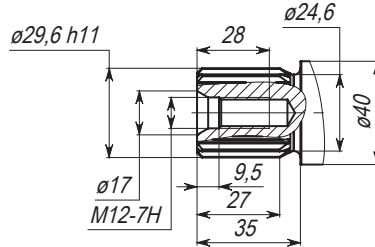


DRIVE SHAFTS

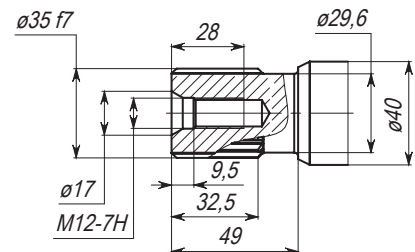
A | Splined shaft W35x2x30x16x9g
DIN 5480, z16



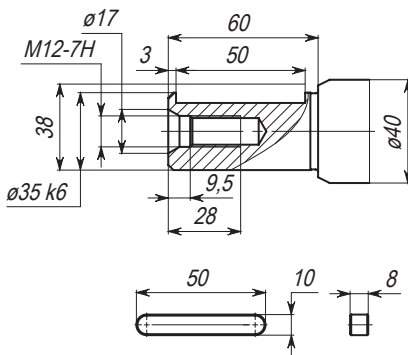
Z | Splined shaft W30x2x30x14x9g
DIN 5480, z14



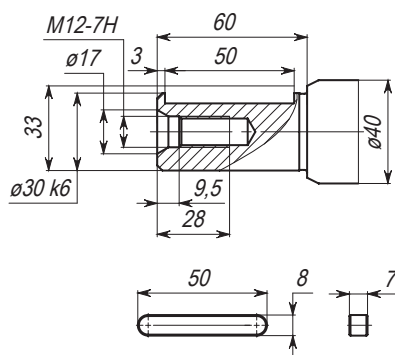
O | Splined shaft 35x7x2x9g
GOST 6033-80, z16



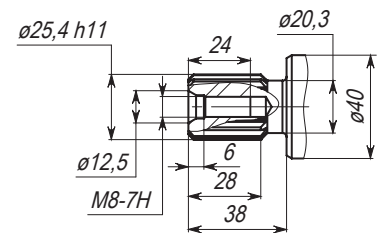
B | Keyed shaft 10x8x50
DIN 6885



P | Keyed shaft 8x7x50
DIN 6885

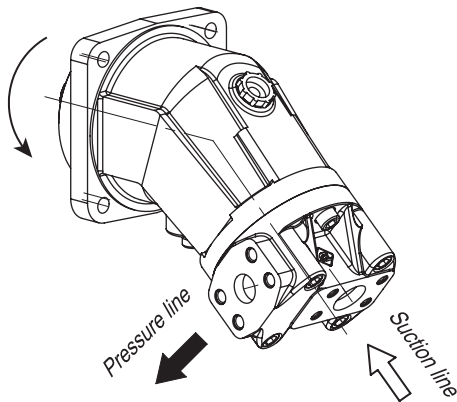


BB | Splined shaft 1 in 15T 16/32 DP
SAE J744-25-4(B-B), z14

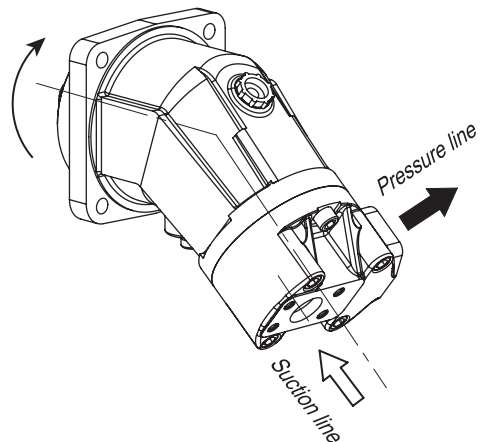


ROTATION

Clockwise



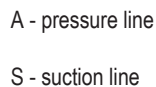
Counterclockwise



[illegible]

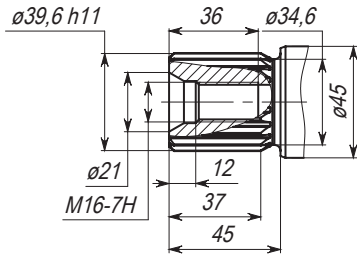
Technical drawing of the front view of a motor. The drawing shows a circular mounting flange with a diameter of 160 mm. The flange has four mounting holes, each with a diameter of 13.5 mm. The distance between the centers of opposite mounting holes is 165 mm. The flange is labeled "Mounting Flange ISO 3019/2". The motor body is labeled "A".

05 | two flanged ports, one on the side, one on the rear

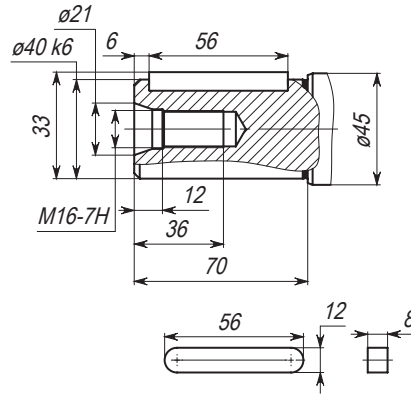


DRIVE SHAFTS

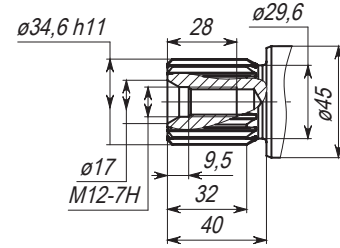
A | Splined shaft W40x2x30x18x9g
DIN 5480, z18



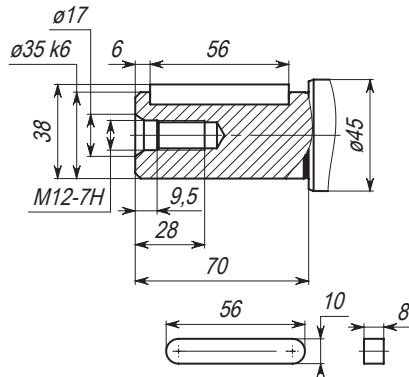
B | Keyed shaft 12x8x56
DIN 6885



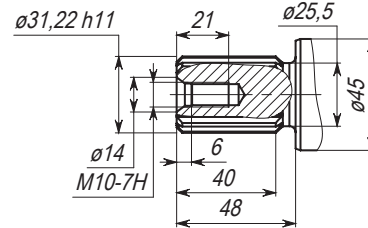
Z | Splined shaft W35x2x30x16x9g
DIN 5480, z16



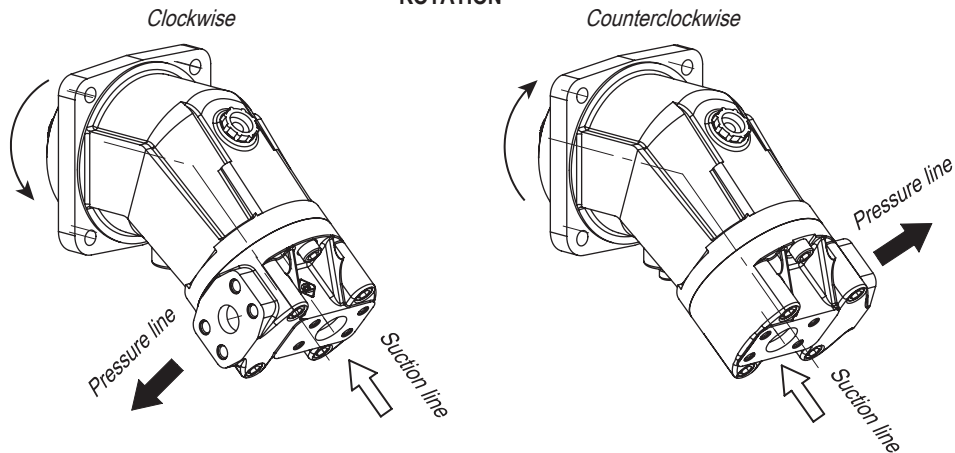
P | Keyed shaft 10x8x56
DIN 6885



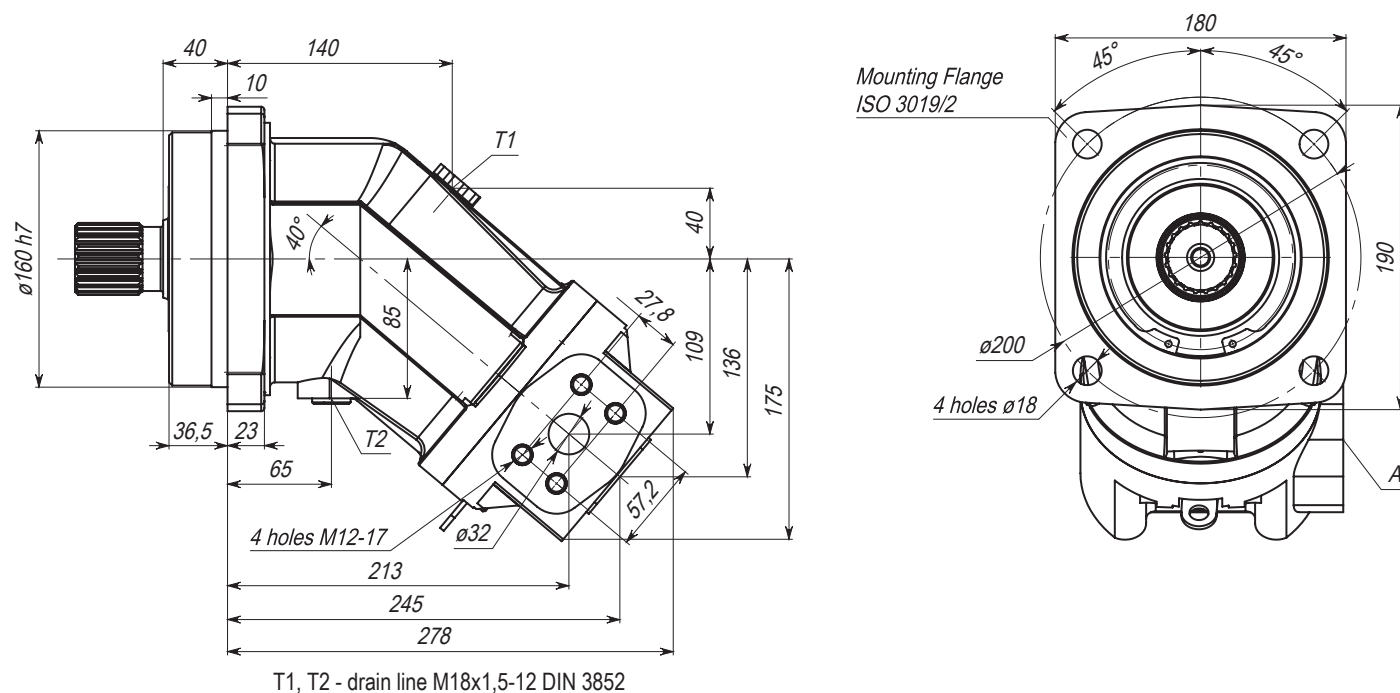
C | Splined shaft 1 1/4 in 14T 12/24 DP
SAE J744-25-4(C), z14



ROTATION

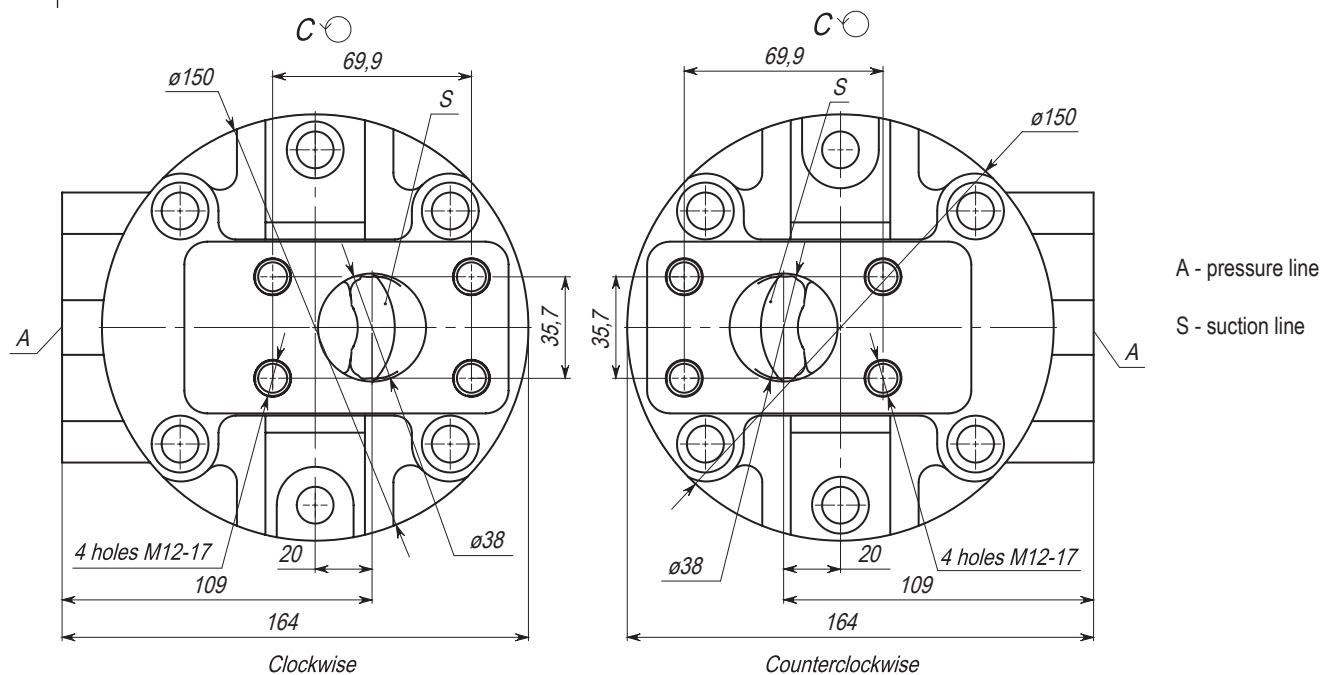


PBF20 PUMPS DIMENSIONS, SIZE 107 CM³



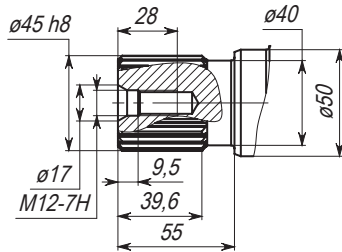
WORKING PORTS OPTION

05 | two flanged ports, one on the side, one on the rear

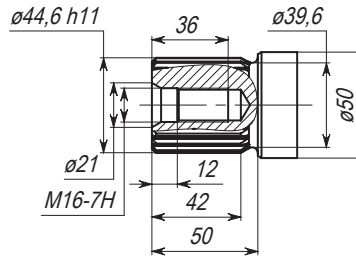


DRIVE SHAFTS

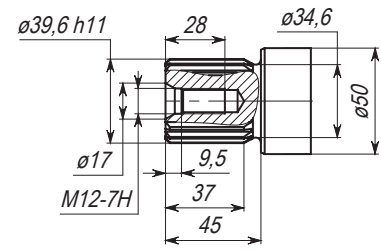
O | Splined shaft W45xh8x2x9g
GOST 6033-80, z21



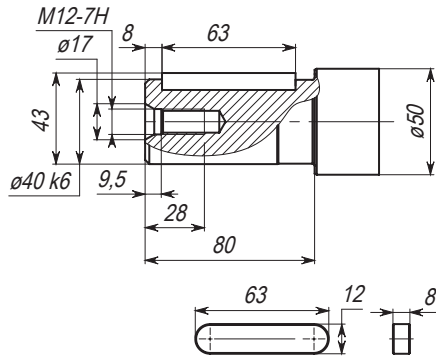
A | Splined shaft W45x2x30x21x9g
DIN 5480, z21



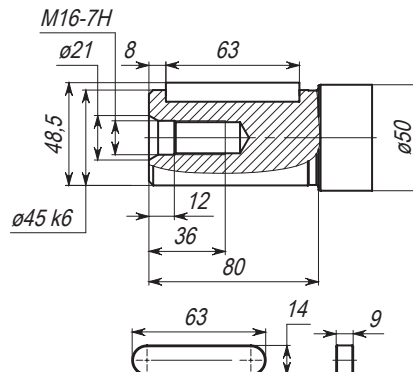
Z | Splined shaft W40x2x30x18x9g
DIN 5480, z18



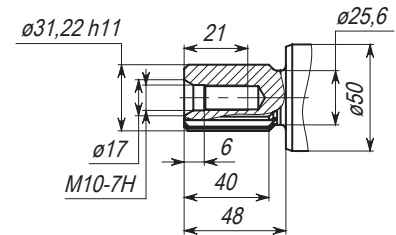
P | Keyed shaft 12x8x63
DIN 6885



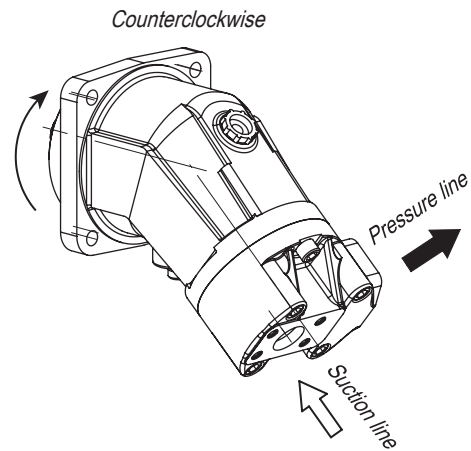
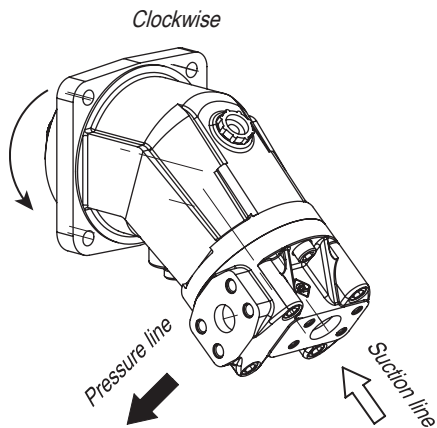
B | Keyed shaft 14x9x63
DIN 6885



C | Splined shaft 1 1/4 in 14T 12/24 DP
SAE J744-25-4(C), z14



ROTATION



FIXED DISPLACEMENT AXIAL PISTON PUMPS

TECHNICAL SPECIFICATIONS

SIZE		PBF20T.56	PBF20T.63	PBF20T.80	PBF20T.107
Displacement, V _g	cm ³	56,1	63	80,4	106,7
Speed	min ⁻¹				
minimum		500			
rated, at inlet pressure P _{abs} =0,8 bar		1870		1830	1700
maximum, at inlet pressure P _{abs} =1,0 bar		2200		2150	2000
maximum, at inlet pressure P _{abs} =2,0 bar		3200		3100	2800
Pressure, P	bar				
rated		300			
maximum, t≤6 sec		350			
Inlet pressure, P	bar				
minimum		0,8			
rated		1			
максимальное / maximum		2			
Flow*, Q	l/min				
minimum		28	32	40	53
rated		105	118	147	181
maximum		123	139	173	213
limit		180	202	249	299
Input power*, N	kW				
rated, at inlet pressure P _{abs} =0,8 bar and pressure drop Δp=300 bar		52	59	74	91
maximum, at inlet pressure P _{abs} =1,0 bar and pressure drop Δp=350 bar		72	81	101	124
Efficiency					
hydromechanical		0,96			
volumetric		0,95			
Weight (without fluid), no more	kg	8,2		10,6	15,0

* Without efficiency

FORMULAS

$$\begin{aligned}
 \text{Flow} \quad Q &= \frac{V_g \cdot n \cdot \eta_v}{1000} \text{ [l/min]} \\
 \text{Input torque} \quad T &= \frac{V_g \cdot \Delta p}{20 \cdot \pi \cdot \eta_{mh}} = \frac{1.59 \cdot V_g \cdot \Delta p}{100 \cdot \eta_{mh}} \text{ [N·m]} \\
 \text{Input power} \quad P &= \frac{2 \cdot \pi \cdot T \cdot n}{60000} = \frac{Q \cdot \Delta p}{600 \cdot \eta_t} \text{ [kW]}
 \end{aligned}$$

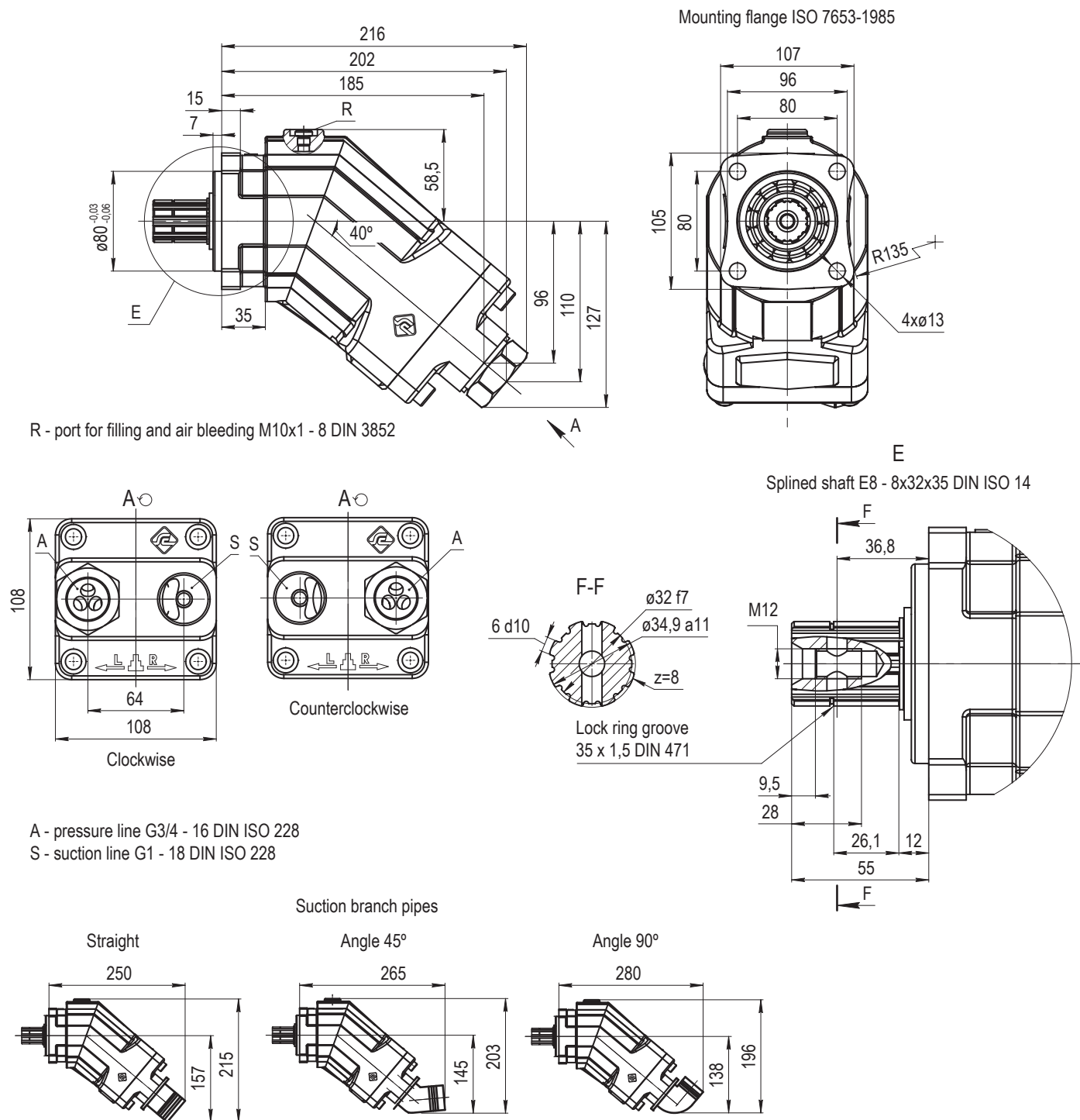
V_g — displacement (cm³)
 Δp — pressure drop (bar)
 n — speed (min⁻¹)
 η_v — volumetric efficiency
 η_{mh} — hydromechanical efficiency
 η_t — overall efficiency

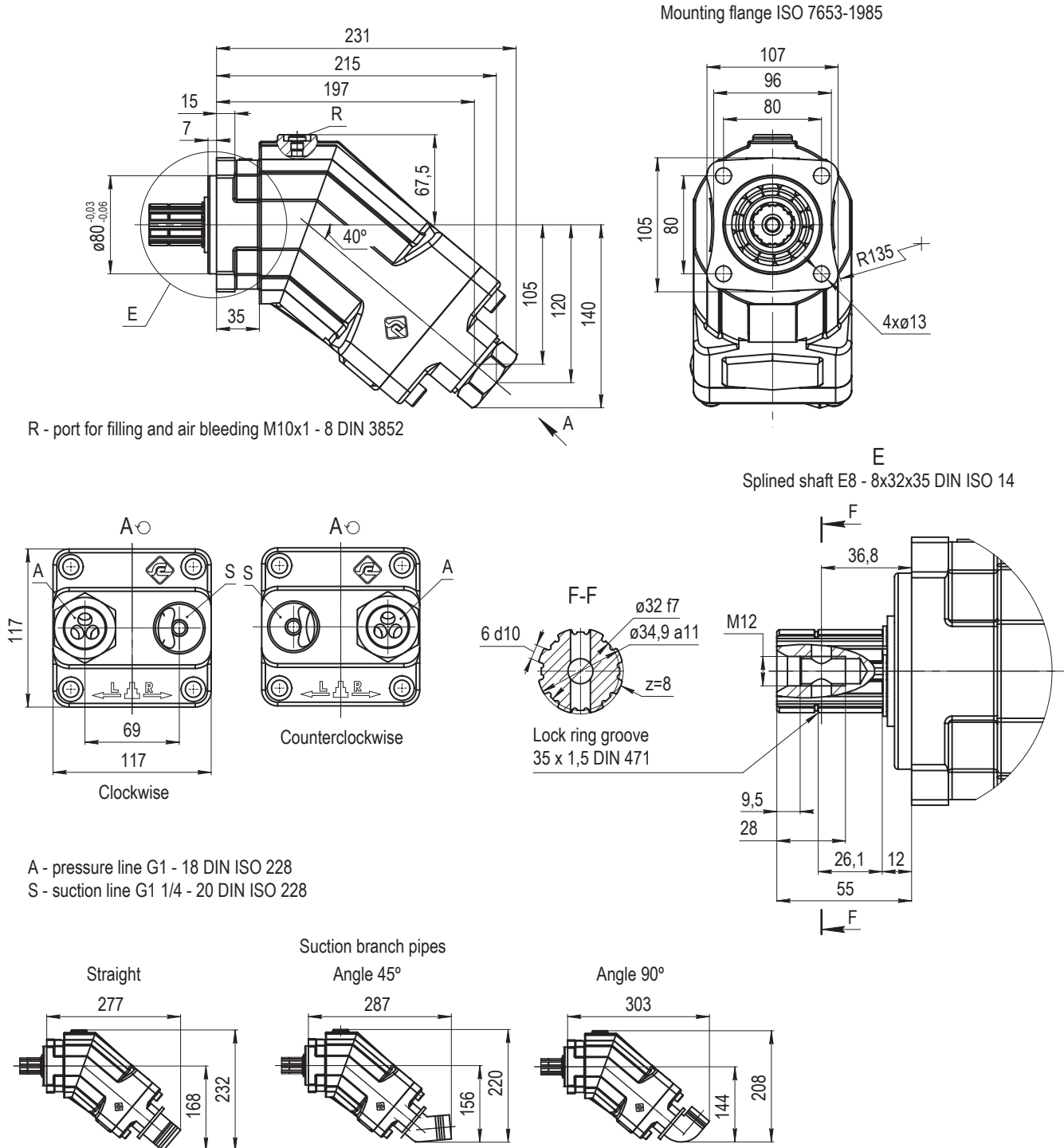
FIXED DISPLACEMENT AXIAL PISTON PUMPS

TECHNICAL SPECIFICATIONS

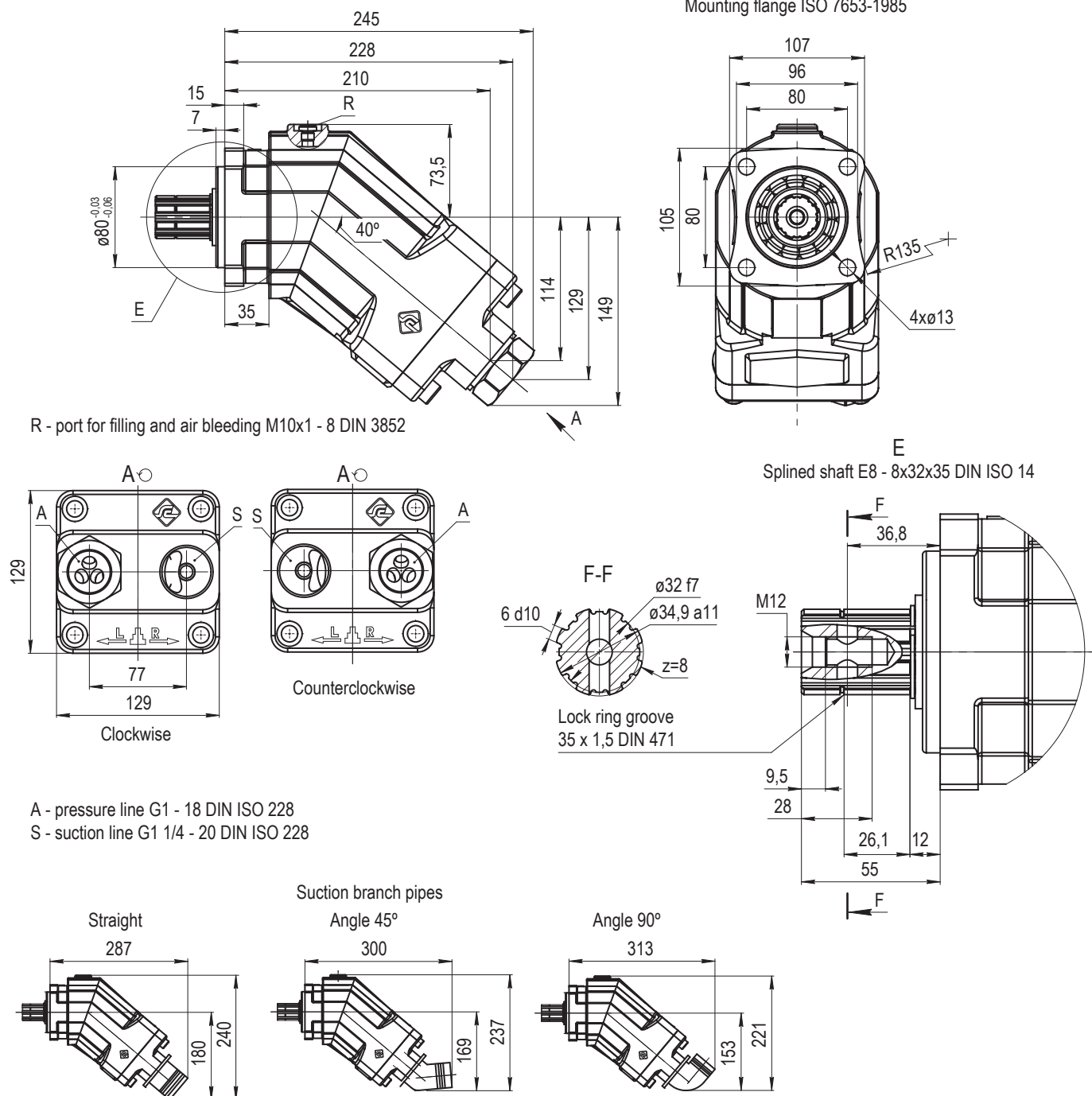
SIZE		PBF20TH.56	PBF20TH.63	PBF20TH.80	PBF20TH.107
Displacement, V_g	cm^3	56,1	63	80,4	106,7
Speed	min^{-1}				
minimum		500			
rated, at inlet pressure $P_{\text{abs}}=0,8$ bar		1870		1830	1700
maximum, at inlet pressure $P_{\text{abs}}=1,0$ bar		2200		2150	2000
maximum, at inlet pressure $P_{\text{abs}}=2,0$ bar		3200		3100	2800
Pressure, P	bar				
rated		350			
maximum, $t \leq 6$ sec		400			
Inlet pressure, P	bar				
minimum		0,8			
rated		1			
maximum		2			
Flow*, Q	l/min				
minimum		28	32	40	53
rated		105	118	147	181
maximum		123	139	173	213
limit		180	202	249	299
Input power*, N	kW				
rated, at inlet pressure $P_{\text{abs}}=0,8$ bar and pressure drop $\Delta p=350$ bar		61	69	86	106
maximum, at inlet pressure $P_{\text{abs}}=1,0$ bar and pressure drop $\Delta p=400$ bar		82	92	115	142
Efficiency					
hydromechanical		0,96			
volumetric		0,95			
Weight (without fluid), no more	kg	11		13,9	19,2

PBF20T(TH) PUMPS DIMENSIONS, SIZE 56 AND 63 CM³



PBF20T(TH) PUMPS DIMENSIONS, SIZE 80 CM³

PBF20T(TH) PUMPS DIMENSIONS, SIZE 107 CM³



ROTATION

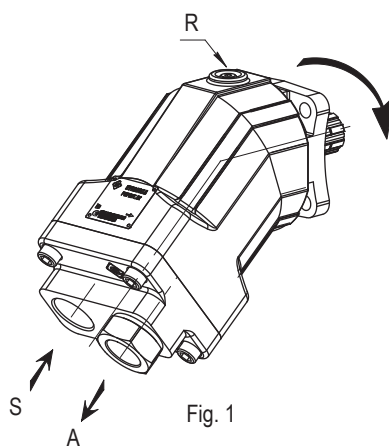
The rotation of the shaft is determined by the location of the pressure "A" and suction "S" lines. Adapter is located in the pressure line.

Changing the rotation of the pump shaft is done by reinstalling the pressure line adapter (line "A") from one port to another. For details of changing the direction of rotation see "Instruction for changing the direction of rotation of the pumps PBF20T, PBF20TH".

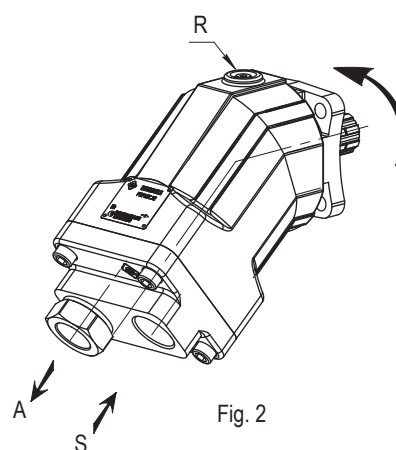
Tightening of threaded connections

	Air bleed R	Pressure line "A"		Suction line "S"
	M10x1	G3/4	G1	G1 ¼
Tightening torque, Nm	5	60	60	60

Counterclockwise rotation
(pressure line adapter on the right side)



Clockwise rotation
(pressure line adapter on the left side)



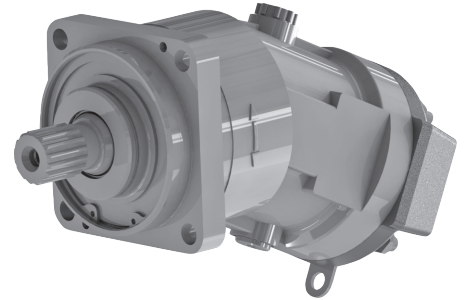
MBF10

MBF10 - series of axial piston fixed displacement motors in bent-axis design. They have an aluminum alloy body and designed for hydraulic systems of mobile machines of different purposes.

The **MBF10** model range includes motors with displacement 28, 56 and 112 cm³.

DESIGN FEATURES

- Open and closed circuits.
- The angle of inclination the block cylinder 26 degrees.
- Tapered roller bearings, allow the motor shaft to withstand high radial and axial loads.
- Bimetallic block cylinder of motor has a high wear resistance.
- Resistant to corrosion durable and lightweight body with high strength aluminum alloy.
- Hydraulic equipment optional.
- Maximum pressure 400 bar.



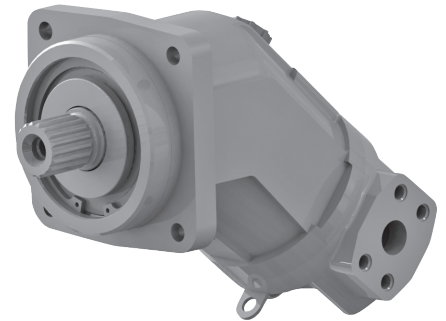
MBF20

MBF20 - series of axial piston fixed displacement motors in bent-axis design. They have an cast iron body and designed for hydraulic systems of mobile machines operating in severe conditions.

The **MBF20** model range includes motors with displacement 56, 80 and 107 cm³.

DESIGN FEATURES

- Open and closed circuits.
- The angle of inclination the block cylinder 40 degrees.
- High hydromechanical efficiency.
- Tapered roller bearings, allow the motor shaft to withstand high radial and axial loads.
- Bimetallic block cylinder of unit has a high wear resistance.
- Conical plungers with compression rings.
- High cast iron body.
- Hydraulic equipment optional.
- Maximum pressure 450 bar.



MBF10

FIXED DISPLACEMENT AXIAL PISTON MOTORS

Order code

MBF10 . 4 . 56 . 00 . 0 6 N

FIXED DISPLACEMENT BENT-AXIS AXIAL PISTON MOTOR	MBF10
--	-------

MODEL ¹⁾	2*	4
	●	●

DISPLACEMENT, CM ³		CODE
28	●	28
56	●	56
112	●	112

SHAFT OPTIONS	28	56	112	CODE
Splined shaft GOST 6033-80	-	●	●	00
Splined shaft GOST 6033-51	●	-	-	
Splined shaft GOST 23360	●	●	●	01
Splined shaft GOST 6033-80	●	-	-	07
Splined shaft DIN 5480 ²⁾	-	●	●	OE
Splined shaft DIN 5480 ³⁾	-	●	●	OF

BUILD-IN HYDRAULIC AND ELECTRICAL EQUIPMENT	28	56	112	CODE
Not available	●	●	●	0
Flushing valve	●	●	-	7
Speed sensor (no hydraulic equipment)	-	●	●	9

SPECIAL FEATURES**	CODE
Speed sensor (with build-in hydraulic equipment)	7

CLIMATIC VERSION	CODE
Temperate	N
Tropical	T

WORKING PORTS OPTION	28	56	112	CODE
Two threaded ports on the rear (at 25° to the shaft axis)	●	-	-	0
Two threaded ports on the rear (parallel to the shaft axis)	●	-	-	1
Two threaded ports on the rear (at 50° to the shaft axis)	●	-	-	2
Four threaded ports, two on the sides, two on the rear	●	●	-	3
Four threaded ports, two on the sides, two on the rear (M33x2)	-	●	-	D
Two flanged ports on the rear	-	●	●	6
Two flanged ports on the sides (only with flushing valve)	-	●	-	E
Two threaded ports on the sides (only with flushing valve)	●	-	-	9
Two flanged ports on the sides	-	●	-	F

¹⁾ * 2- with ball bearings and brass cylinder block (only for size 28)

4 - with cone bearings, bimetallic cylinder block

²⁾ side balanced

³⁾ side balanced, reduced diameter

** Special option code - assigned if necessary after agreement of special conditions with the customer

Notes:

● Standart; ○ Optional; - Not available

MBF20

FIXED DISPLACEMENT AXIAL PISTON MOTORS

Order code system

MBF20 . 107 / W - B A B 020 N

FIXED DISPLACEMENT BENT-AXIS AXIAL PISTON MOTOR	MBF20
---	-------

DISPLACEMENT, CM³		CODE
56,1	●	56
80,4	●	80
106,7	●	107

ROTATION	CODE
Reversible	W

SEAL	56	80	107	CODE
NBR	●	●	●	B
FKM	○	○	○	F

SHAFT OPTIONS		56	80	107	CODE
Splined shaft DIN 5480	2)	●	●	●	A
	3)	●	●	●	Z
Splined shaft GOST 6033	-	●	●	●	O
Splined shaft DIN 6885	-	●	●	●	B
		●	●	●	P
Splined shaft SAE J744	-	-	●	●	C
		●	-	-	BB

MOUNTING FLANGES	56	80	107	CODE
ISO 3019/2, 4 holes	●	●	●	B

SPECIAL FEATURES*	CODE
Speed sensor (with build-in hydraulic equipment)	7

CLIMATIC VERSION	CODE
Temperate	N
Tropical	T

WORKING PORTS OPTION	56	80	107	CODE
Two flanged ports on the rear	●	●	●	010
Two flanged ports on the sides	●	●	●	020
Two flanged ports on the sides (only with flushing valve)	●	●	●	027
Four threaded ports, two on the sides, two on the rear	●	-	-	040
Two flanged ports on the rear (at 90° to the shaft axis)	●	●	●	100
Two flanged ports on the rear (with manifold block)	●	-	-	191

* Special option code - assigned if necessary after agreement of special conditions with the customer

Notes:

● Standart; ○ Optional; - Not available

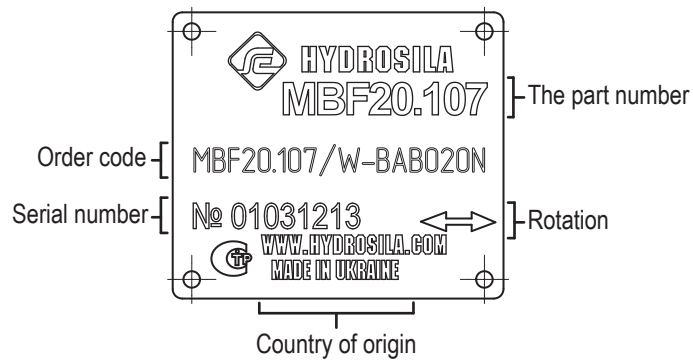
ORDERING EXAMPLE

MBF10.4.56.00.06N

MBF10 - fixed displacement bent-axis axial piston motor,
4 - with cone bearings and bimetallic cylinder block,
56 - displacement 56 cm³,
00 - with splined shaft, acc. to GOST 6033-80,
06 - two flanged ports on the rear,
N - climate version: temperate.

MBF20.107/W-BAB020N

MBF20 - fixed displacement bent-axis axial piston motor,
107 - displacement 106,7 cm³,
W - reversible,
B - with seal material NBR,
A - splined shaft, acc. to DIN 5480,
B - mounting flange acc. to ISO 3019/2, 4 holes,
020 - two flanged ports,
N - climate version: temperate.



FIXED DISPLACEMENT AXIAL PISTON MOTORS

TECHNICAL SPECIFICATIONS

SIZE		MBF10.2.28	MBF10.4.56	MBF10.4.112	MBF20.56	MBF20.80	MBF20.107
Displacement, Vg	cm³	28	56	112	56,1	80,4	106,7
Speed:	min ⁻¹						
minimum		50					
rated		1920	1800	1200	2000	1800	1600
maximum		4750	3750	3000	5000	4500	4000
Inlet pressure, P	bar						
rated		200	250		400		
maximum		320	400		450		
Outlet pressure, P	bar						
maximum		200			250		
rated					200		
Maximum drain pressure	bar	1	2,5				
Inlet flow*, Q	l/min						
minimum		1	3	6	3	4	5
rated		54	101	134	112	145	171
maximum		133	210	336	281	362	427
Torque*, T	Hm						
rated		89	223	446	357	512	680
maximum		143	357	713	402	576	765
Output power*, N	kW						
rated		18	42	56	75	96	114
maximum		71	140	224	210	271	320
Efficiency							
hydromechanical		0,95			0,94		
total efficiency		0,95					
Weight (without fluid)	kg	9	17	29	18	23	32

* Without efficiency

FORMULAS

Inlet flow

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

Torque

$$T = \frac{1.59 \cdot V_g \cdot \Delta p \cdot \eta_{mh}}{10} = \frac{V_g \cdot \Delta p \cdot \eta_{mh}}{20 \cdot \pi} \text{ [N·m]}$$

Power

$$P = \frac{T \cdot n}{9549} = \frac{2 \cdot \pi \cdot T \cdot n}{60000} = \frac{Q \cdot \Delta p \cdot \eta_t}{600} \text{ [kW]}$$

V_g — displacement [cm³]

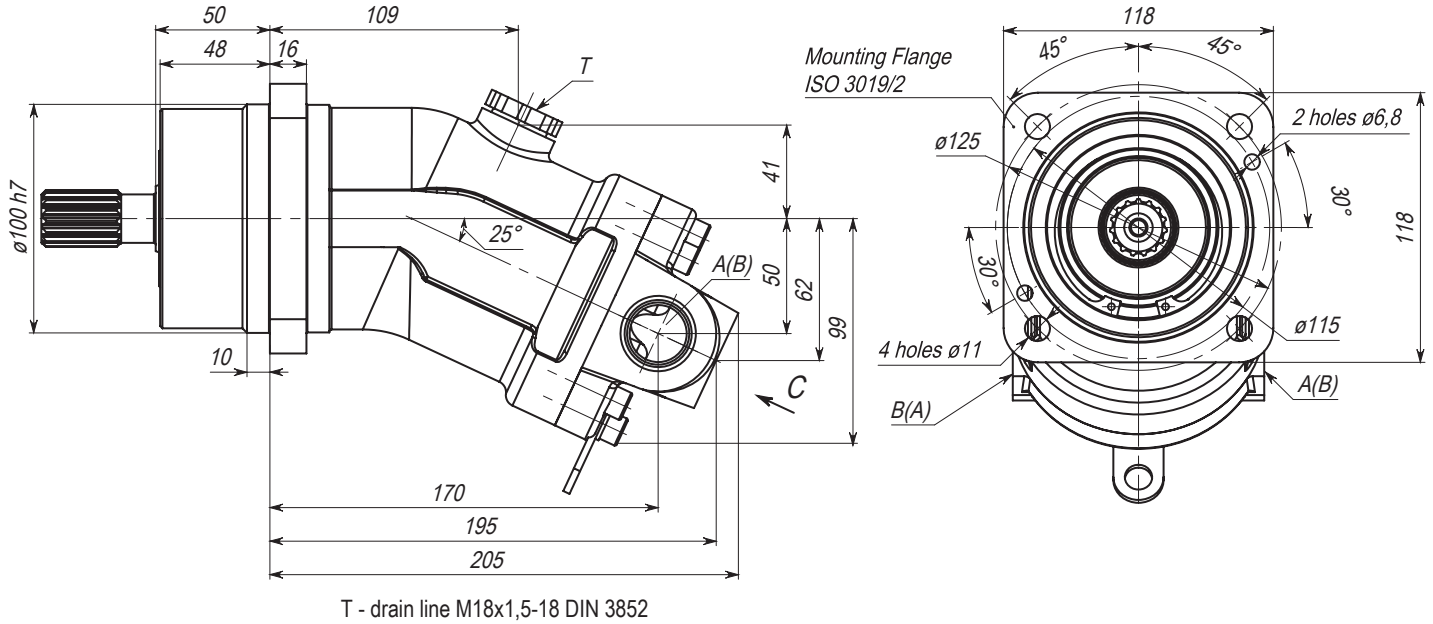
Δp — pressure drop [bar]

n — speed [min⁻¹]

η_v — volumetric efficiency

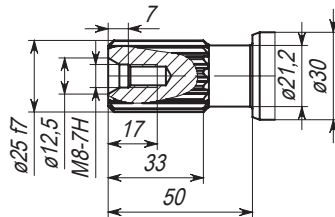
η_{hm} — hydromechanical efficiency

η_t — overall efficiency

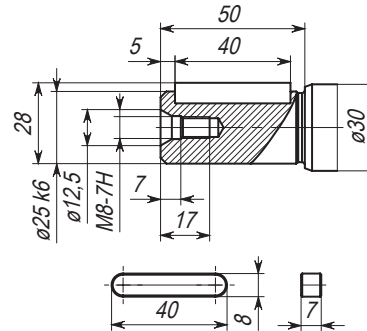
MBF10 MOTORS DIMENSIONS, SIZE 28 CM³**DRIVE SHAFTS**

07 | Splined shaft 25xf7x1,5x9g
GOST 6033-80, z15

00 | Splined shaft 25x1,5x16S X
GOST 6033-51, z16

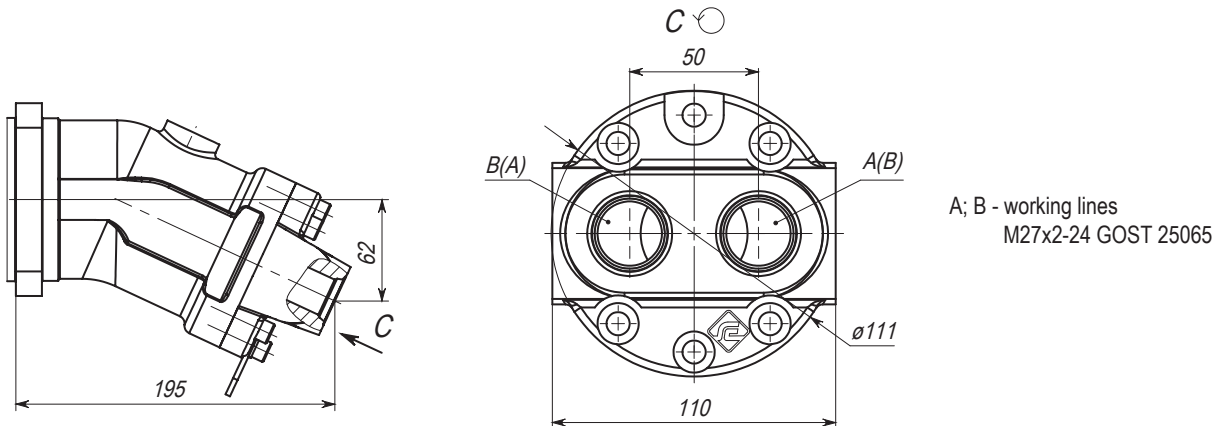


01 | Keyed shaft 8x7x40
GOST 23360

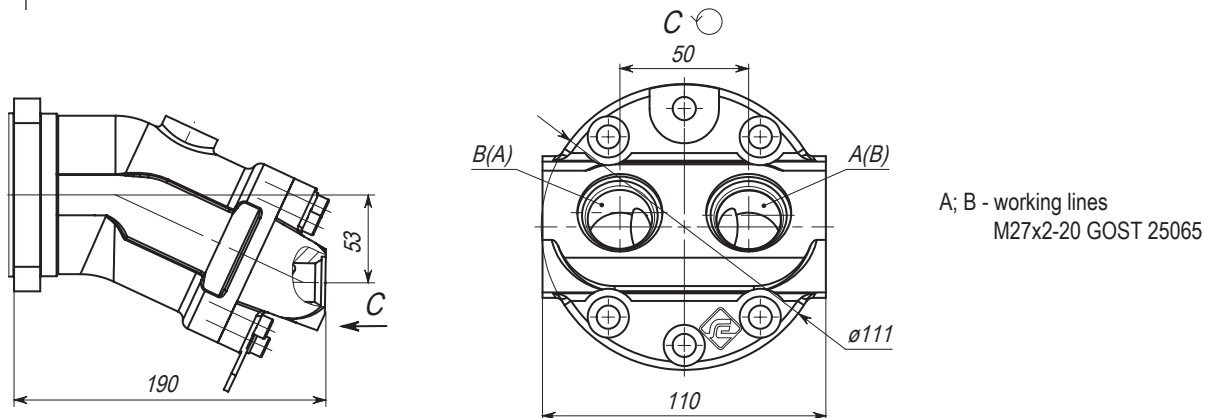


WORKING PORTS OPTION

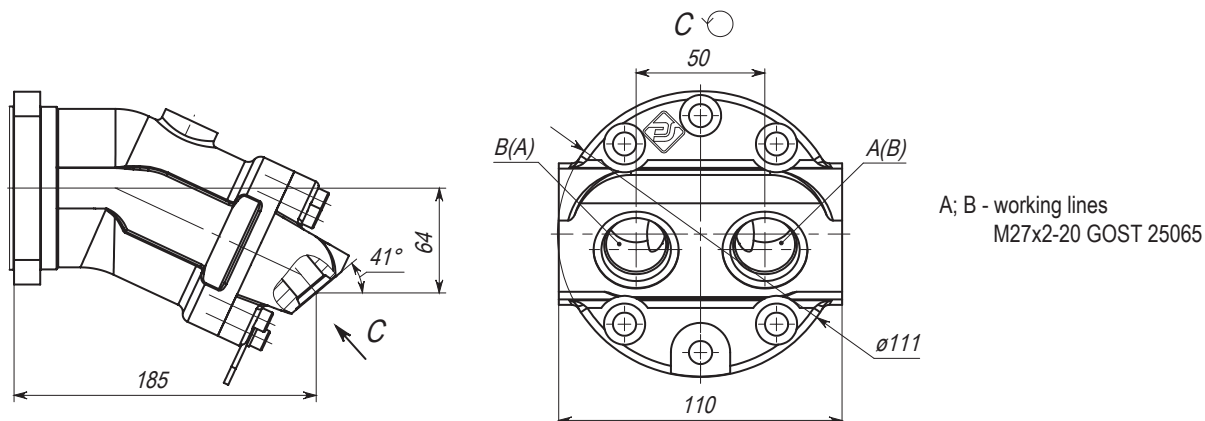
0 | two threaded ports on the rear (at 25° to the shaft axis)



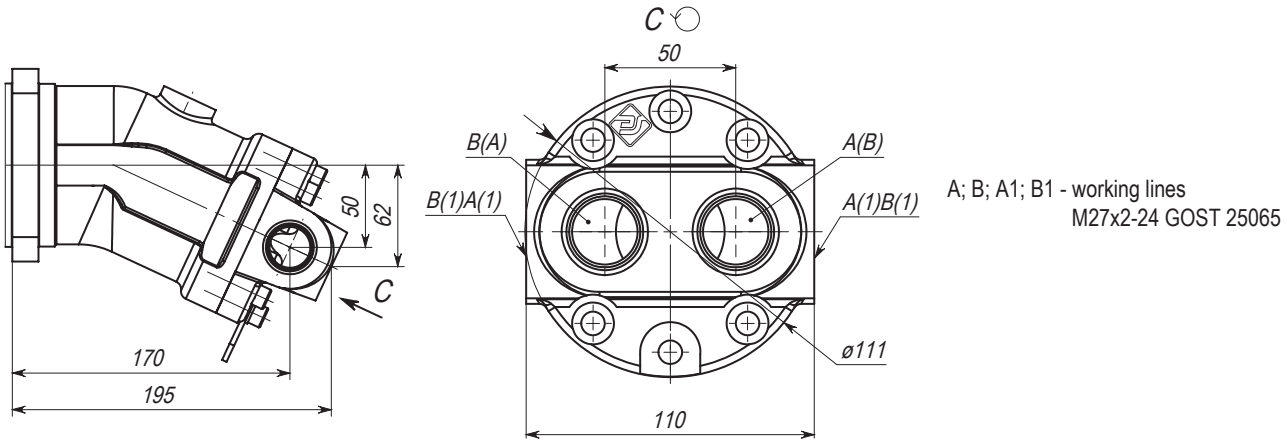
1 | two threaded ports on the rear (parallel to the shaft axis)



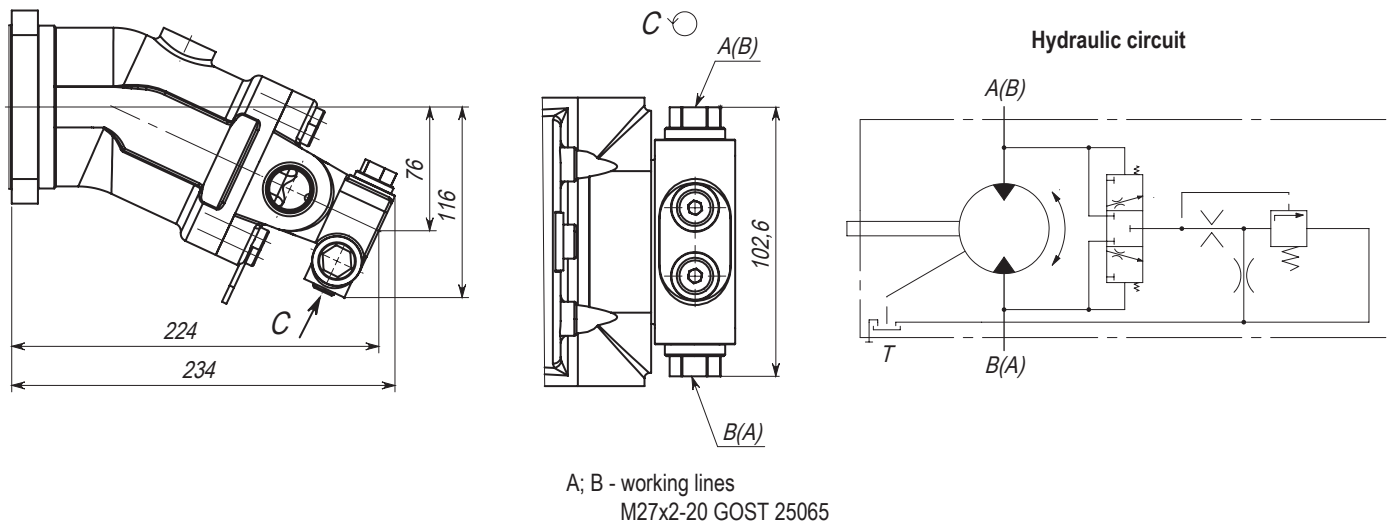
2 | two threaded ports on the rear (at 50° to the shaft axis)



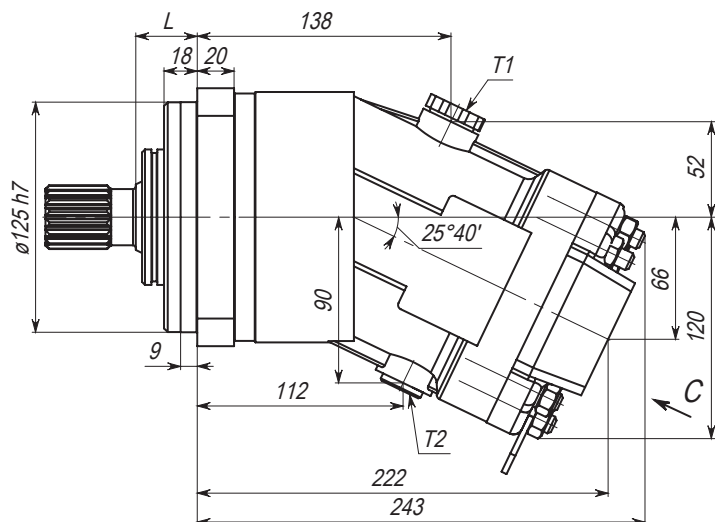
- 3 | four threaded ports, two on the sides, two on the rear



- 9 | two threaded ports on the sides (only with flushing valve)

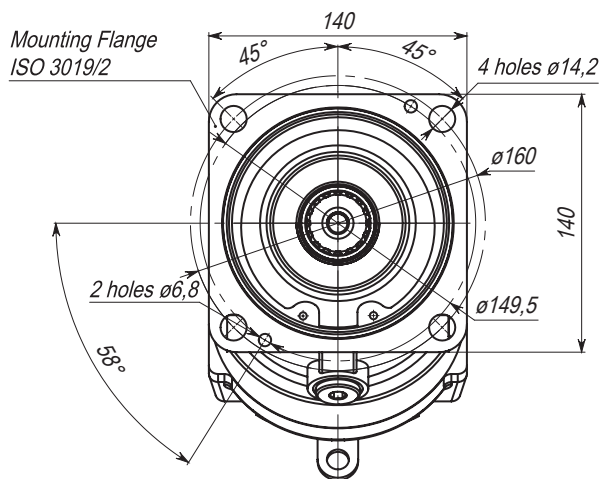


MBF10 MOTORS DIMENSIONS, SIZE 56 CM³



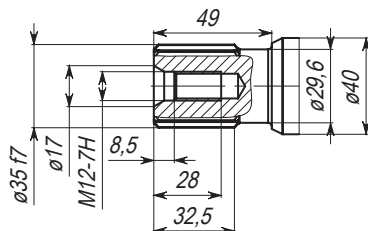
T1, T2 - drain line M18x1,5-18 DIN 3852

L = 32 mm for splined shafts according to DIN, for all other L = 33,5 mm

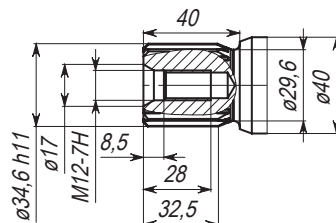


DRIVE SHAFTS

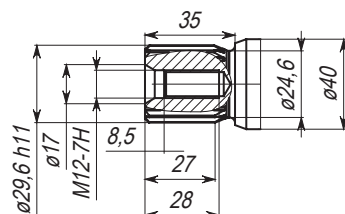
00 | Splined shaft 35x7x2x9g
GOST 6033-80, z16



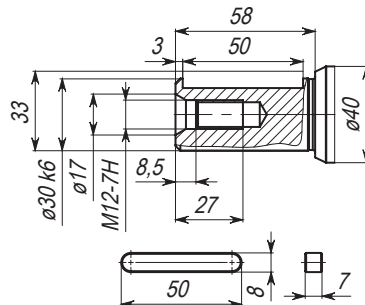
OE | Splined shaft W35x2x30x16x9g
DIN 5480, z16



OF | Splined shaft W30x2x30x14x9g
DIN 5480, z14

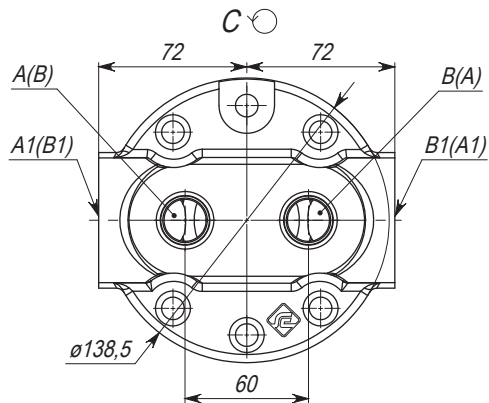
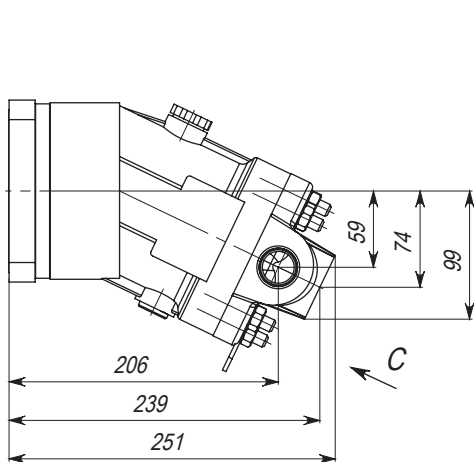


01 | Keyed shaft 8x7x50
GOST 23360



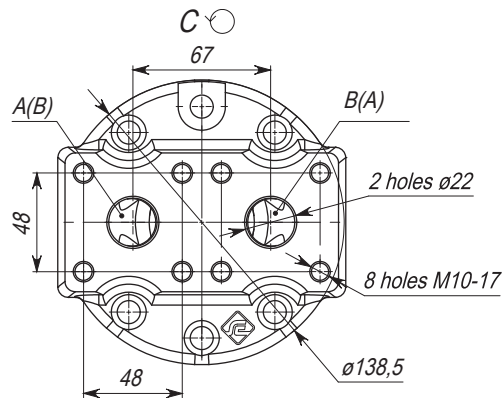
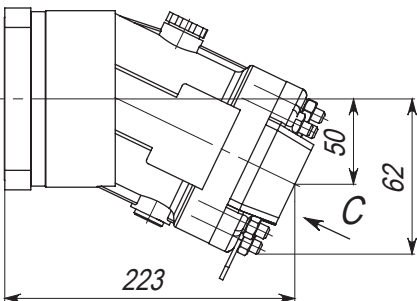
WORKING PORTS OPTION

3 four threaded ports, two on the sides, two on the rear



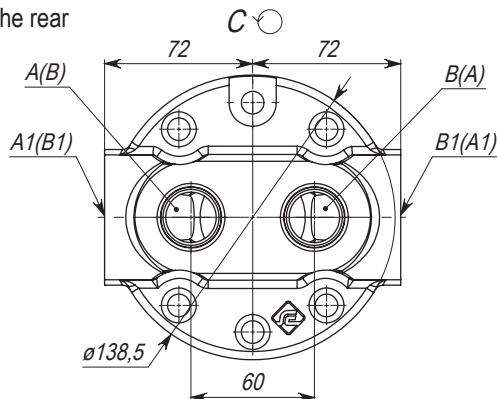
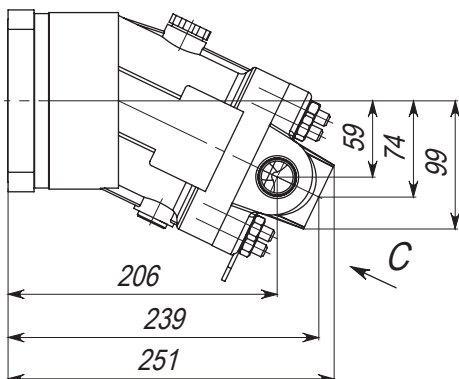
A; B; A1; B1 - working lines
M27x2-24 GOST 25065

6 two flanged ports on the rear



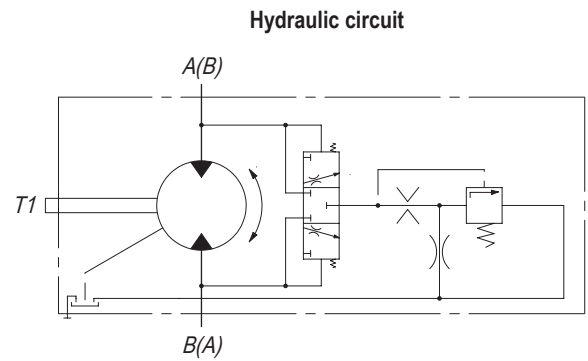
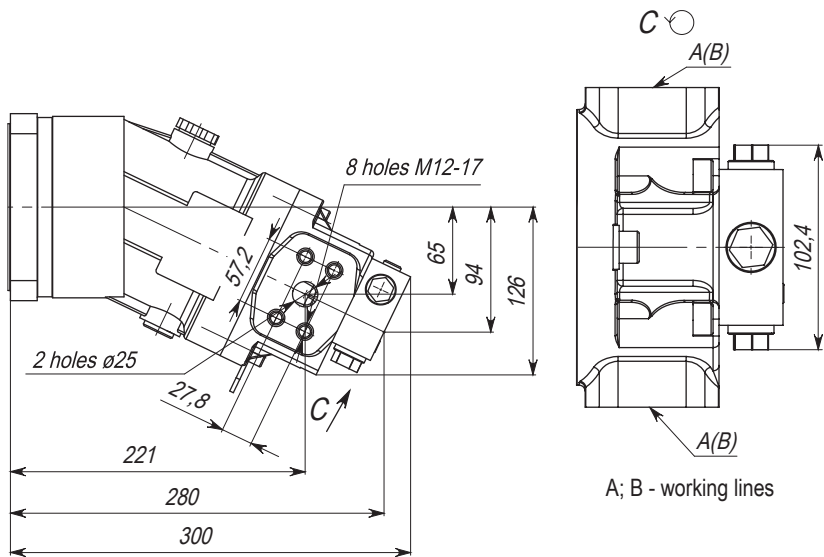
A; B - working lines

D four threaded ports, two on the sides, two on the rear



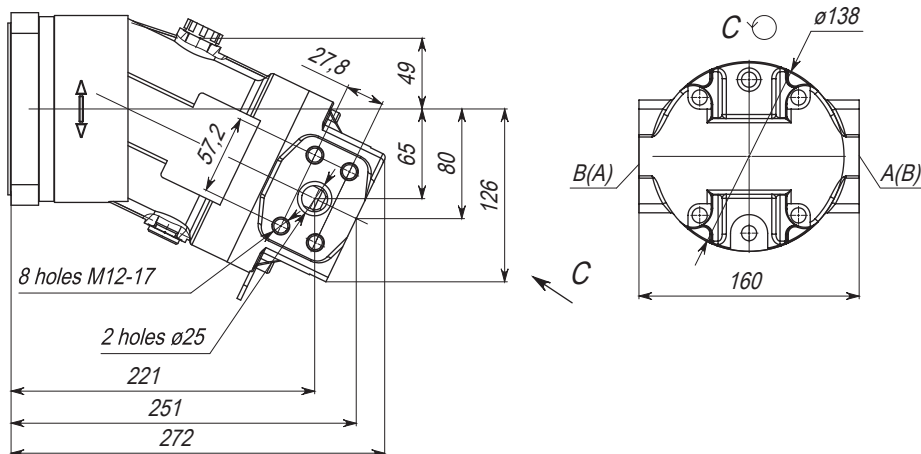
A; B; A1; B1 - working lines
M33x2-24 GOST 25065

E | two flanged ports on the sides (only with flushing valve)



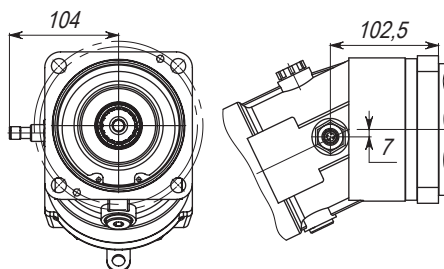
A; B - working lines

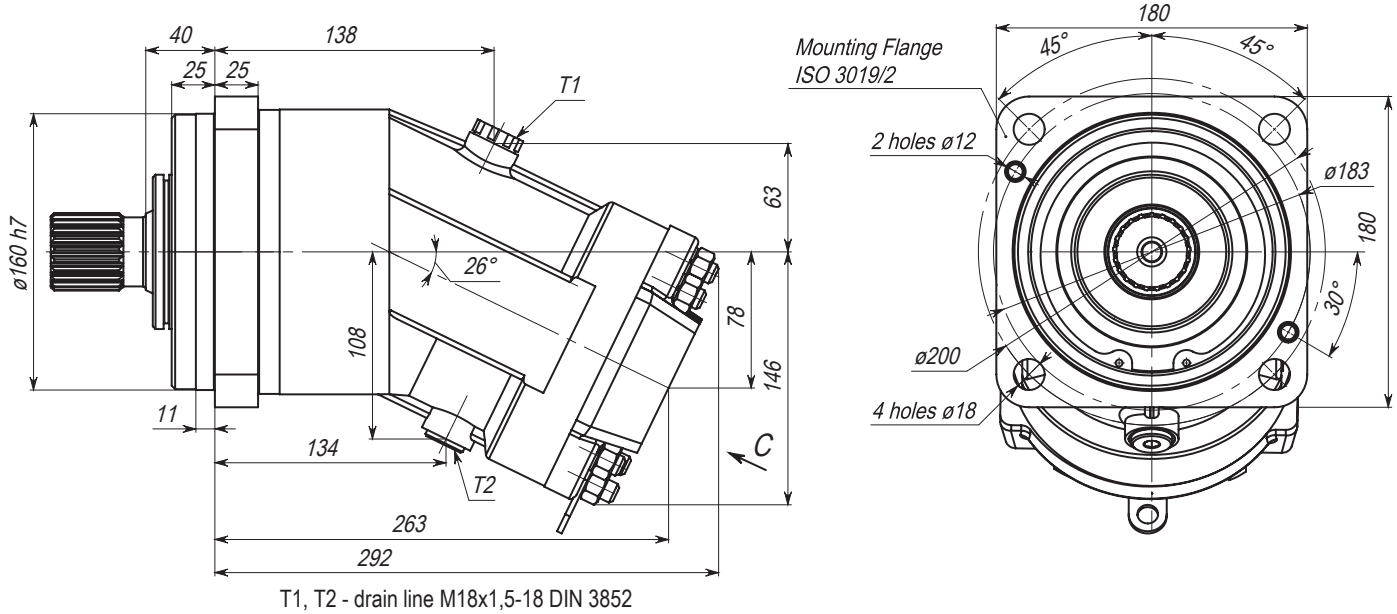
F | two flanged ports on the sides



A; B - working lines

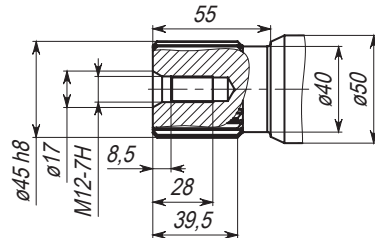
SPEED SENSOR LOCATION



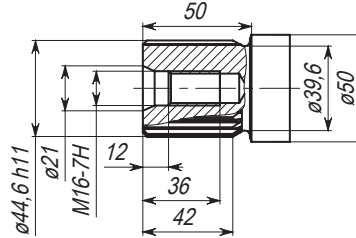
MBF10 MOTORS DIMENSIONS, SIZE 112 CM³

DRIVE SHAFTS

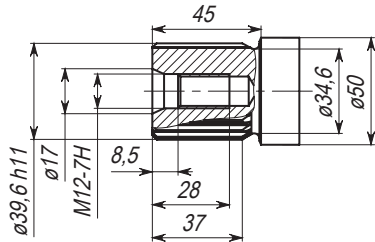
00 | Splined shaft 45xh8x2x9g
GOST 6033-80, z21



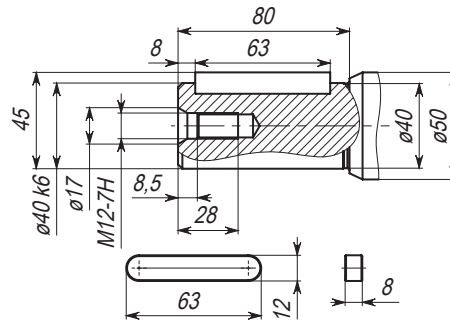
OE | Splined shaft W45x2x30x21x9g
DIN 5480, z21



OF | Splined shaft W40x2x30x18x9g
DIN 5480, z18

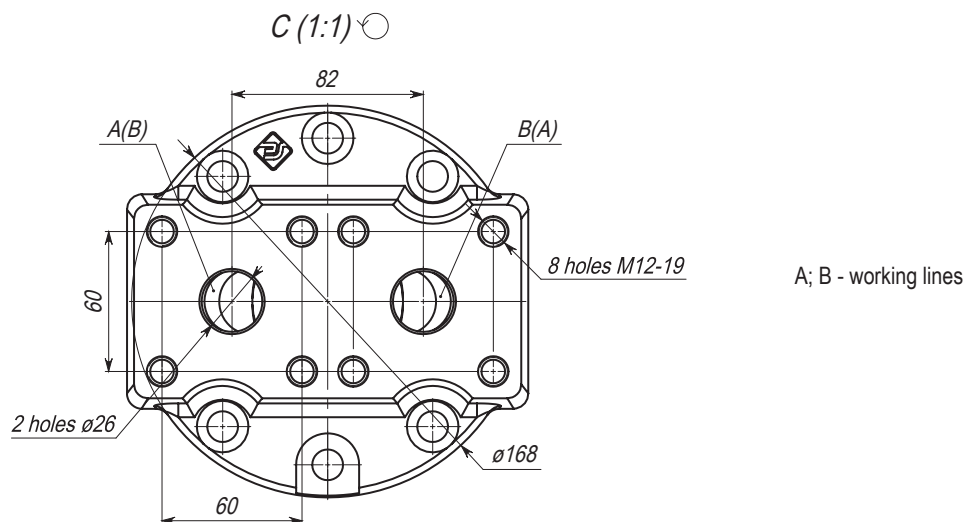
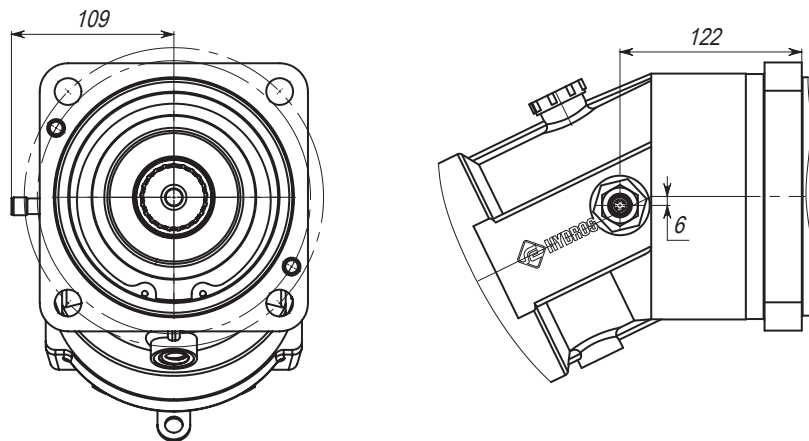


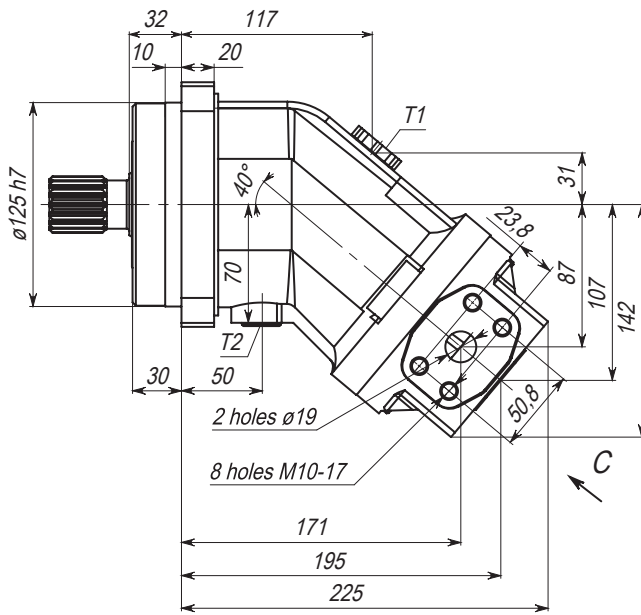
01 | Keyed shaft 12x8x63
GOST 23360



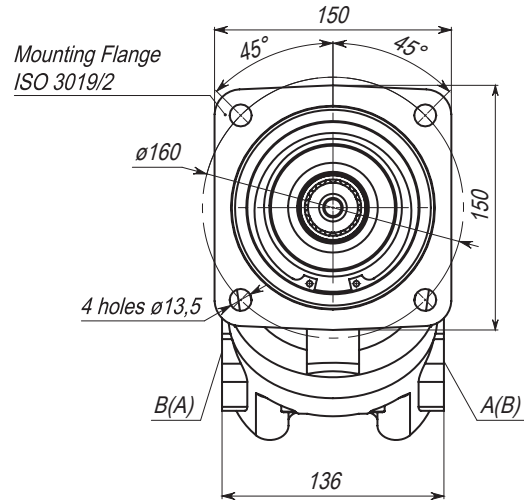
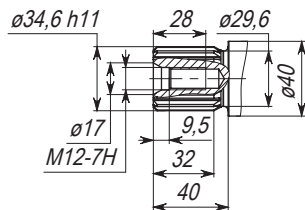
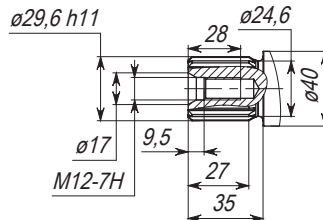
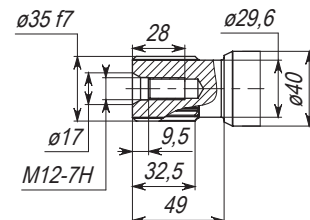
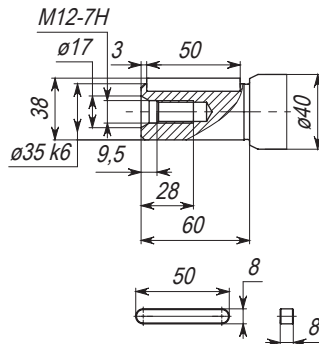
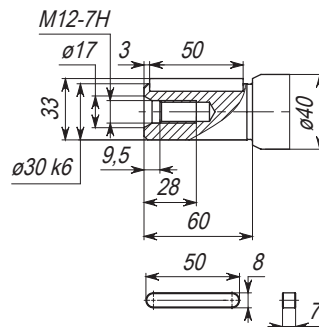
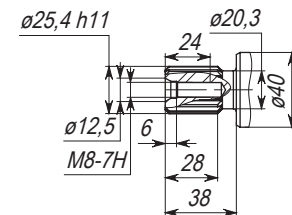
WORKING PORTS OPTION

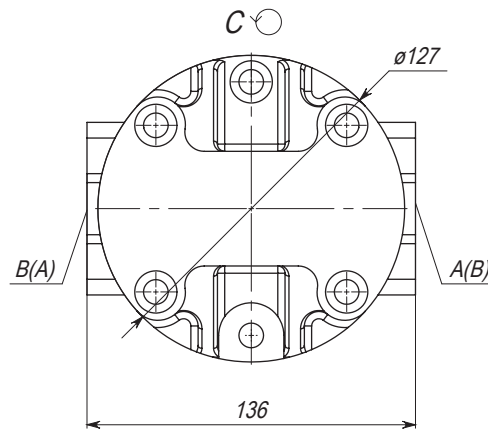
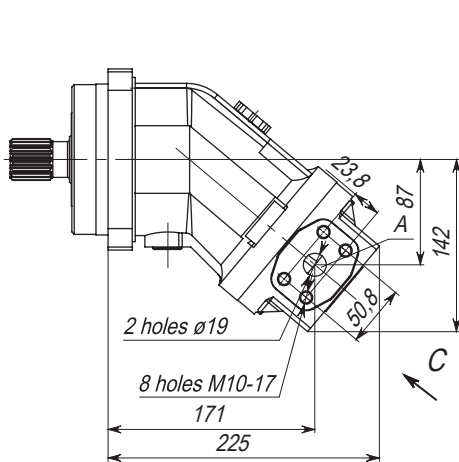
6 | two flanged ports on the rear


SPEED SENSOR LOCATION


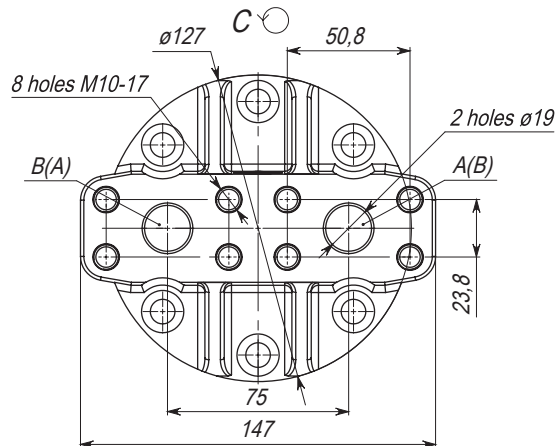
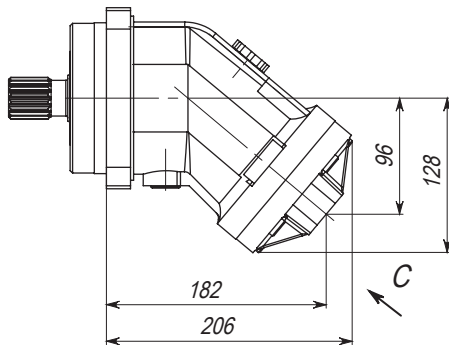
MBF20 MOTORS DIMENSIONS, SIZE 56 CM³

T1, T2 - drain line M18x1,5-12 DIN 3852

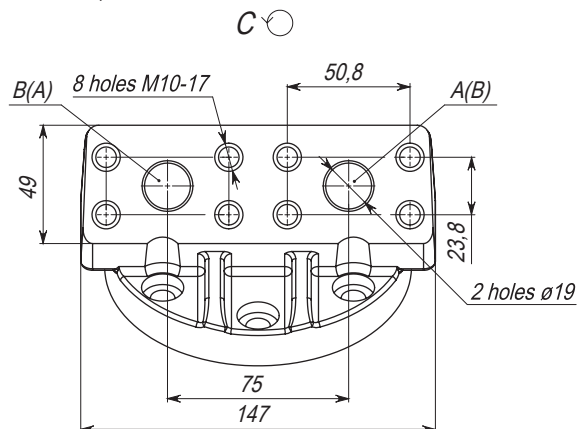
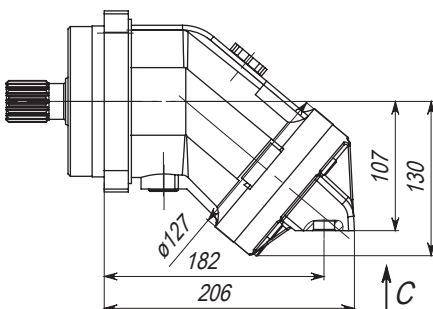
**DRIVE SHAFTS****A** | Splined shaft W35x2x30x16x9g
DIN 5480, z16**Z** | Splined shaft W30x2x30x14x9g
DIN 5480, z14**O** | Splined shaft 35xf7x2x9g
GOST 6033-80, z16**B** | Keyed shaft 10x8x50
DIN 6885**P** | Keyed shaft 8x7x50
DIN 6885**BB** | Splined shaft 1 in 15T 16/32 DP
SAE J744-25-4(B-B), z15

WORKING PORTS OPTION
020 | two flanged ports on the sides


A; B - working lines

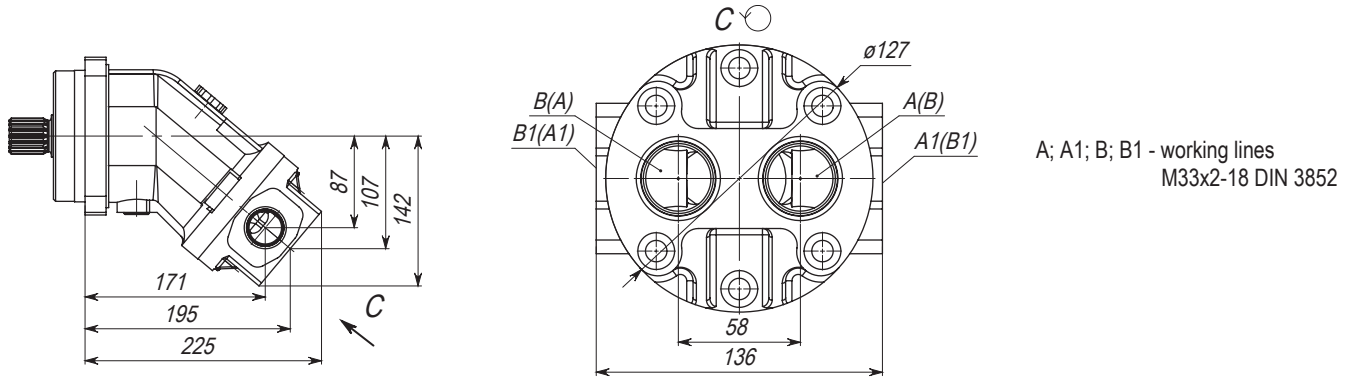
010 | two flanged ports on the rear


A; B - working lines

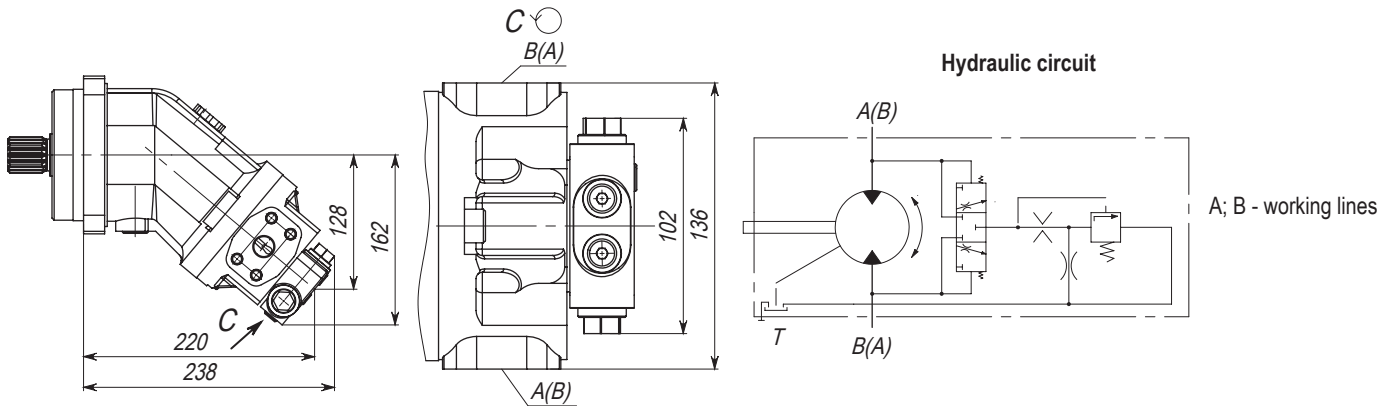
100 | two flanged ports on the rear (at 90° to the shaft axis)


A; B - working lines

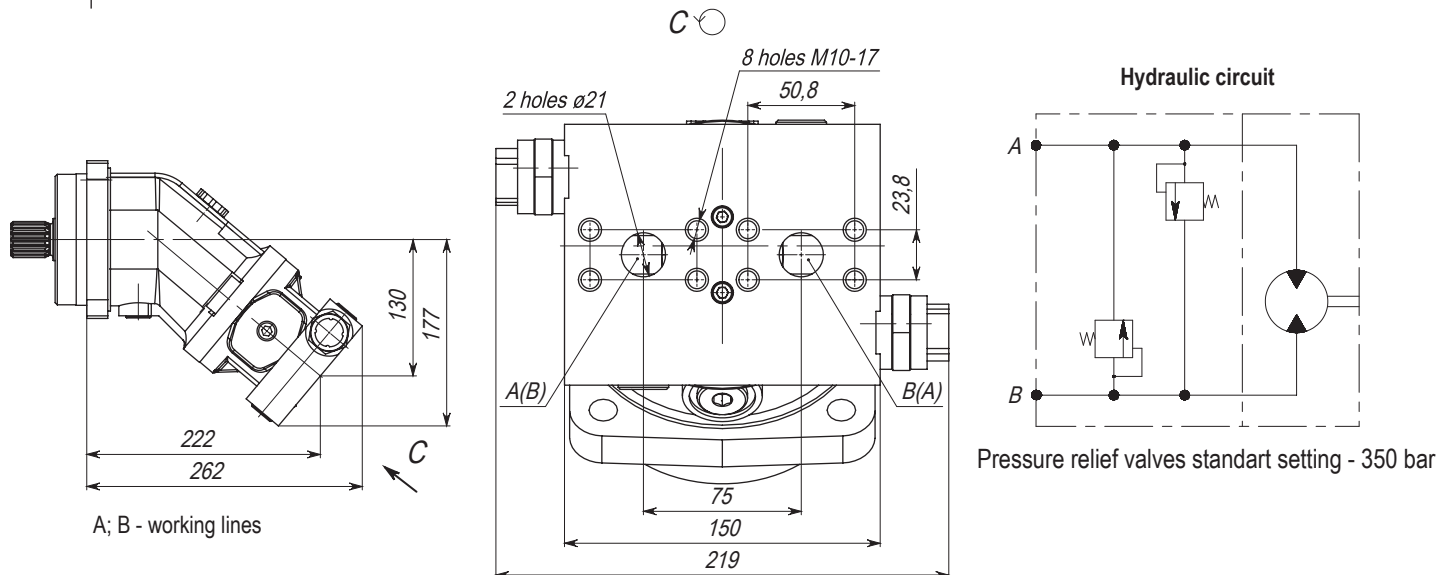
040 | four threaded ports, two on the sides, two on the rear

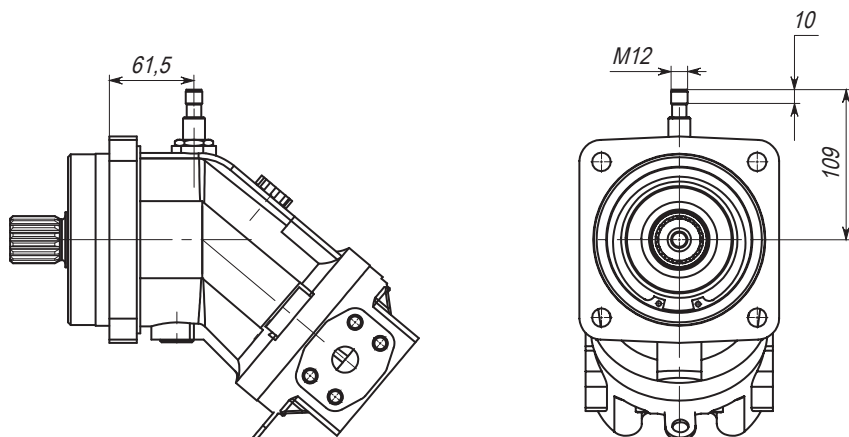


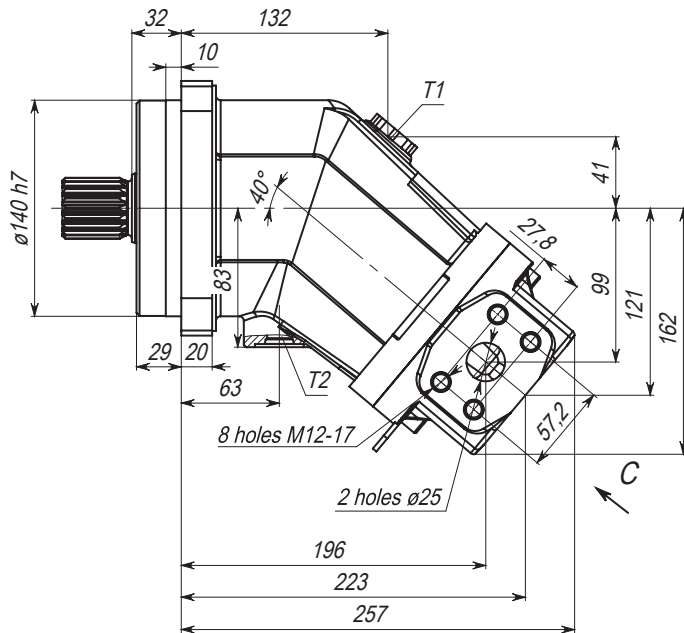
027 | two flanged ports on the sides (only with flushing valve)



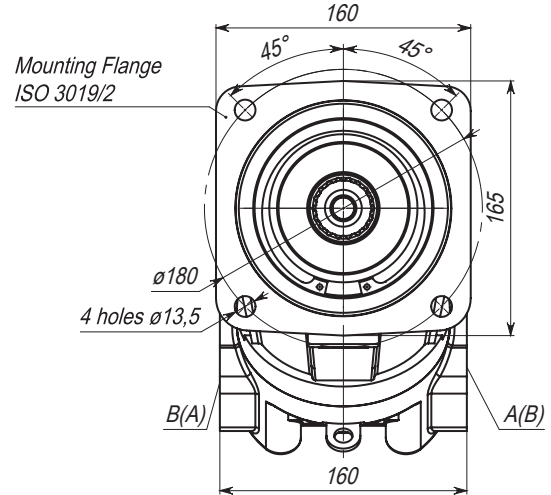
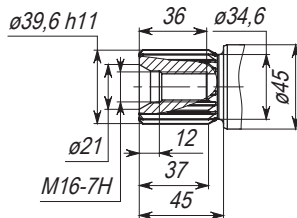
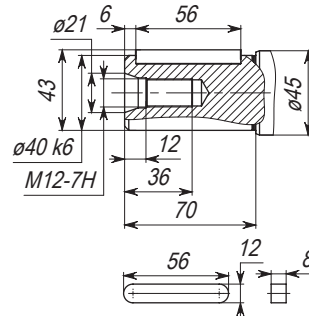
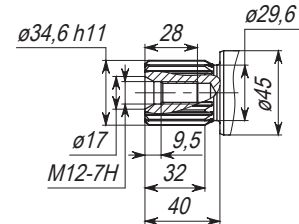
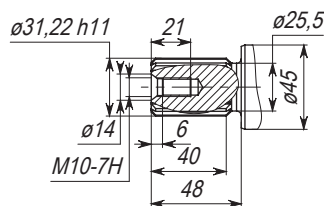
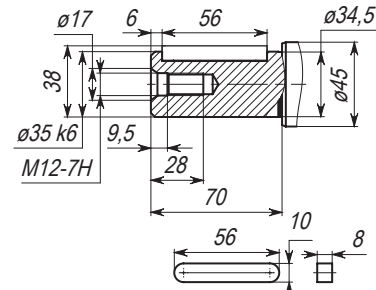
191 | two flanged ports on the rear (with manifold block)

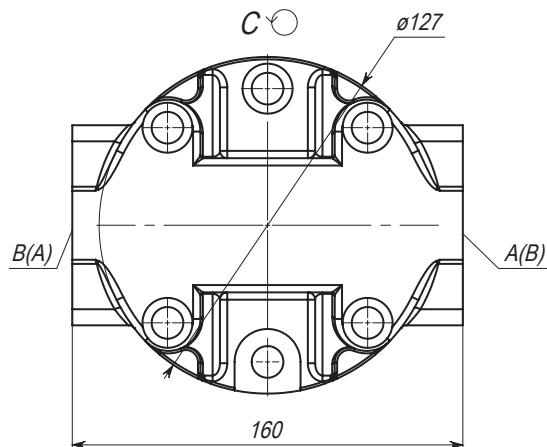
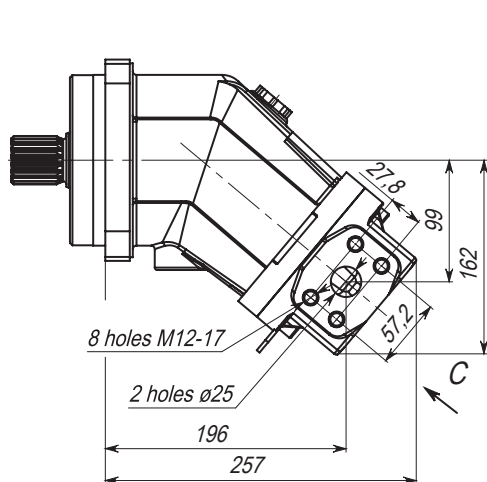


SPEED SENSOR LOCATION

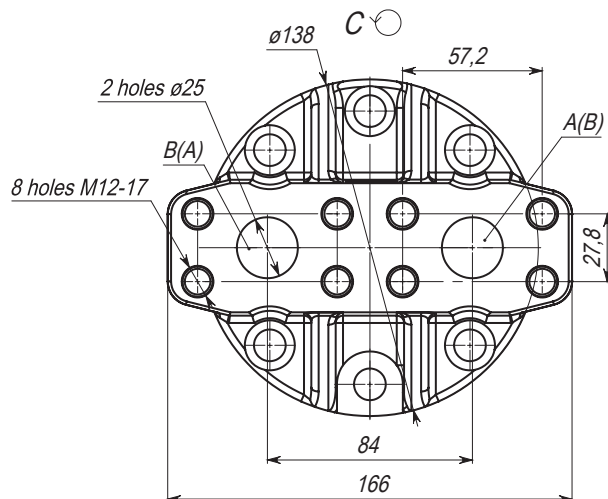
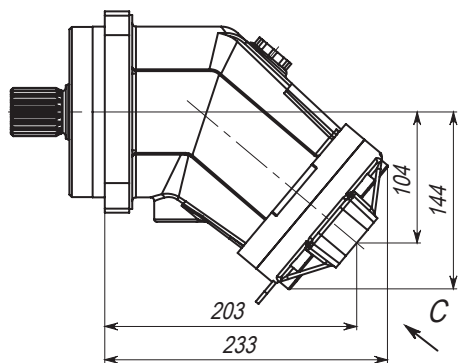
MBF20 MOTORS DIMENSIONS, SIZE 80 CM³

T1, T2 - drain line M18x1,5-12 DIN 3852

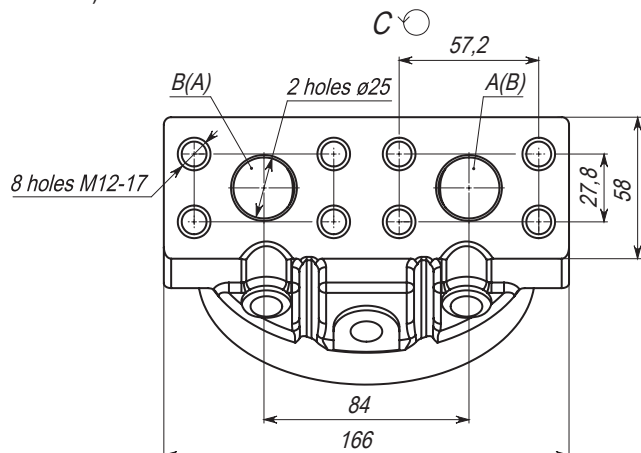
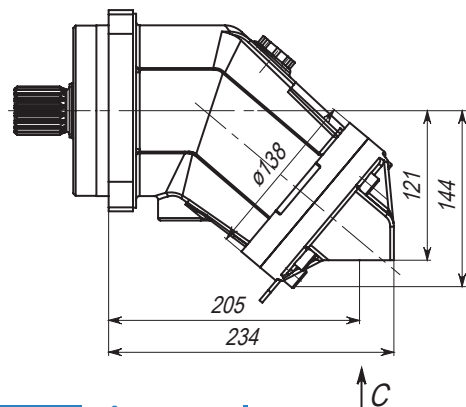
**DRIVE SHAFTS****A** | Splined shaft W40x2x30x18x9g
DIN 5480, z18**B** | Keyed shaft 10x8x50
DIN 6885**Z** | Splined shaft W35x2x30x16x9g
DIN 5480, z16**C** | Splined shaft 1 1/4 in 14T 12/24 DP
SAE J744-25-4(C), z14**P** | Keyed shaft 10x8x56
DIN 6885

WORKING PORTS OPTION
020 | two flanged ports on the sides


A; B - working lines

010 | two flanged ports on the rear


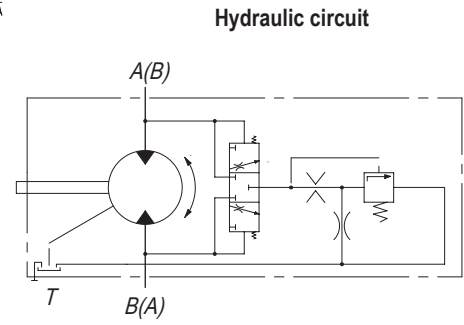
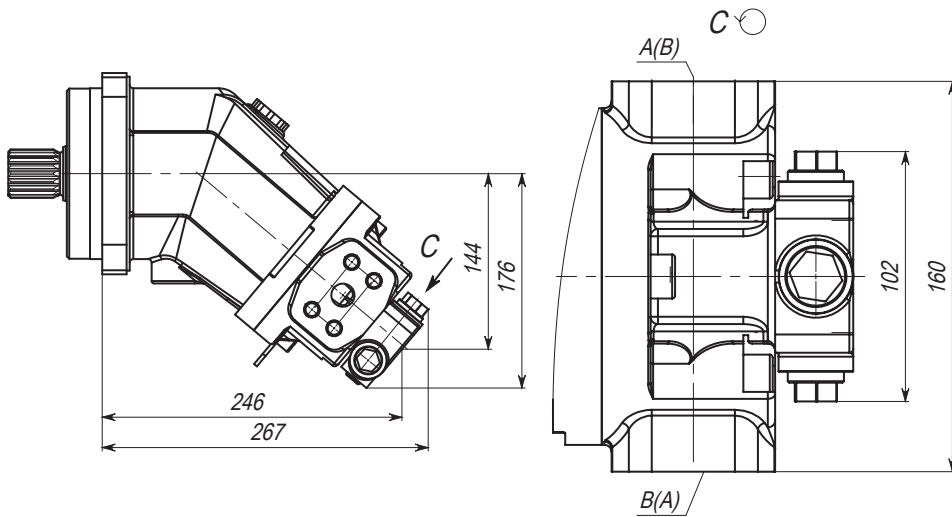
A; B - working lines

100 | two flanged ports on the rear (at 90° to the shaft axis)


A; B - working lines

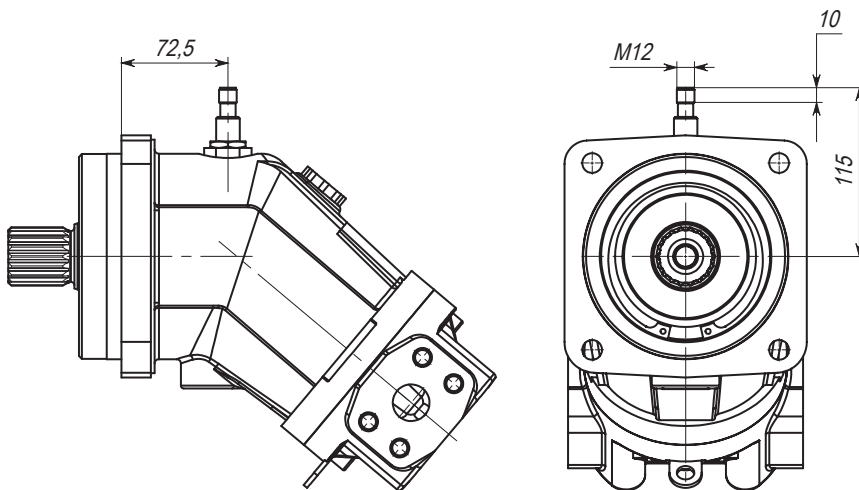
027

two flanged ports on the sides (only with flushing valve)



A; B - working lines

SPEED SENSOR LOCATION



Mounting Flange
ISO 3019/2

45° 45°

180

190

Ø200

4 holes Ø18

B(A)

A(B)

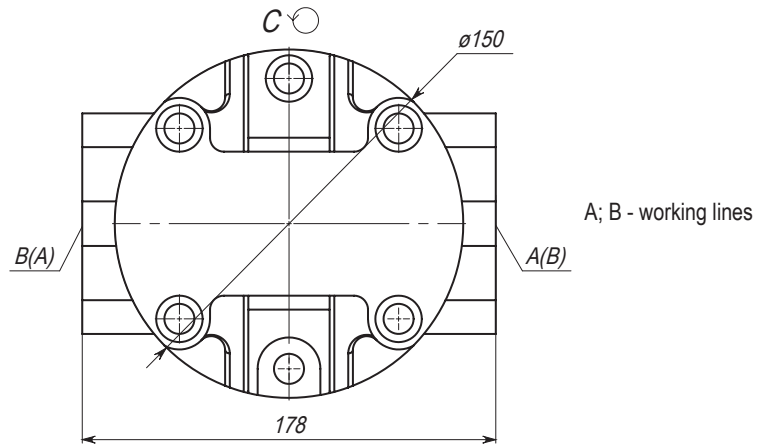
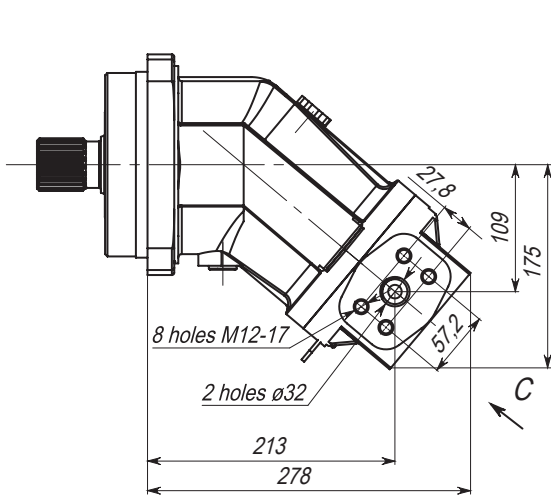
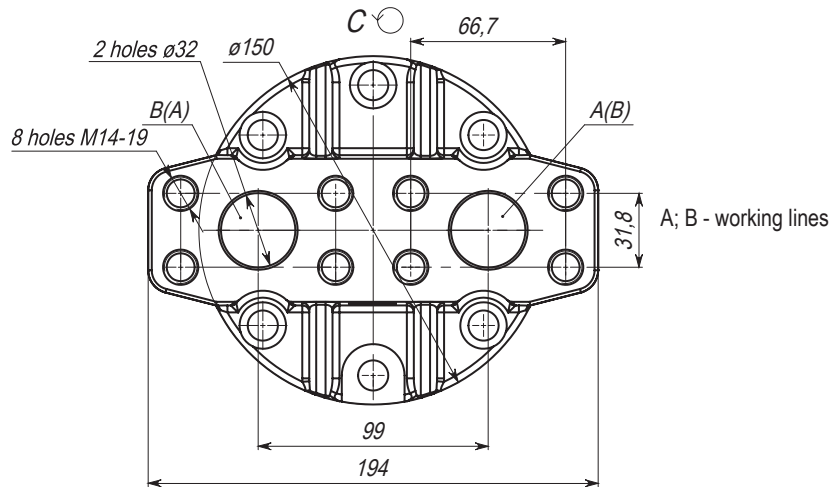
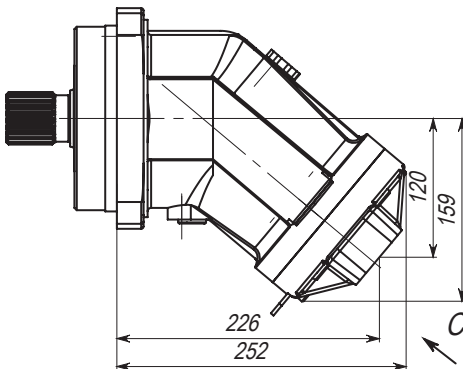
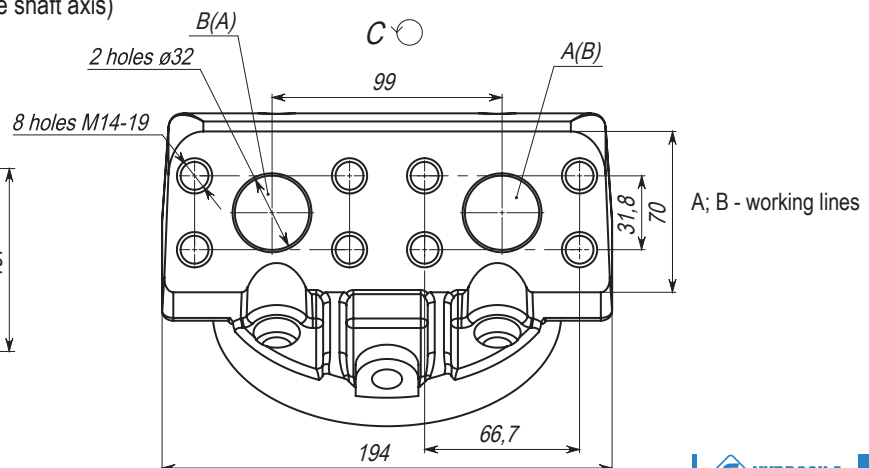
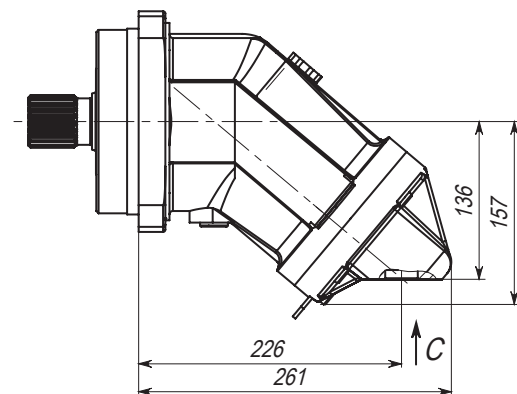
178

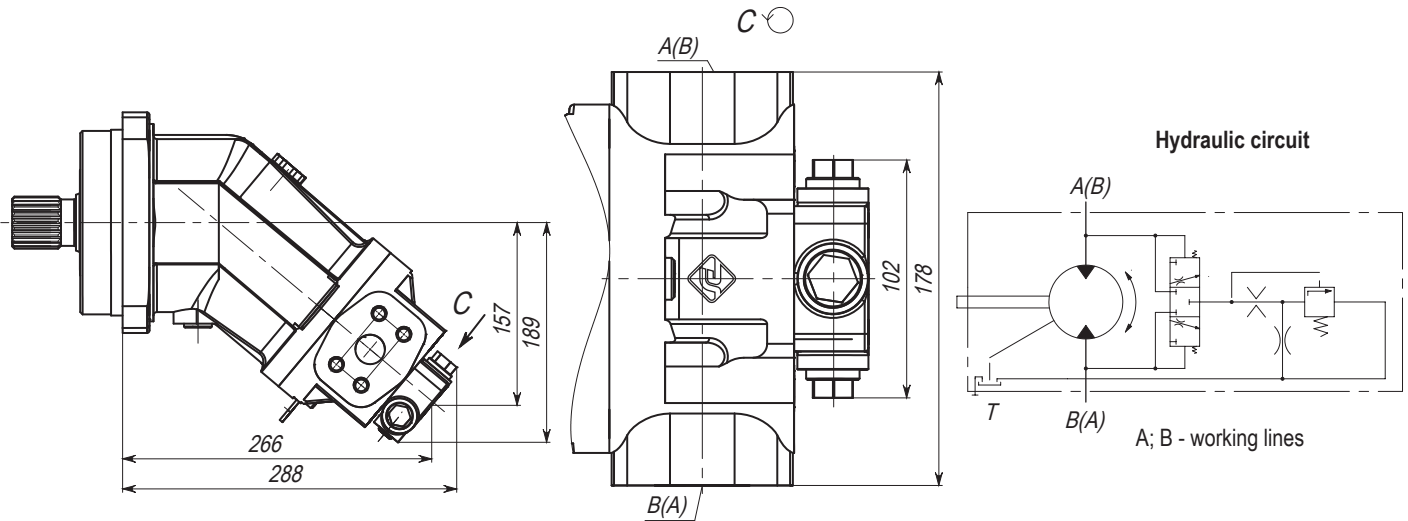
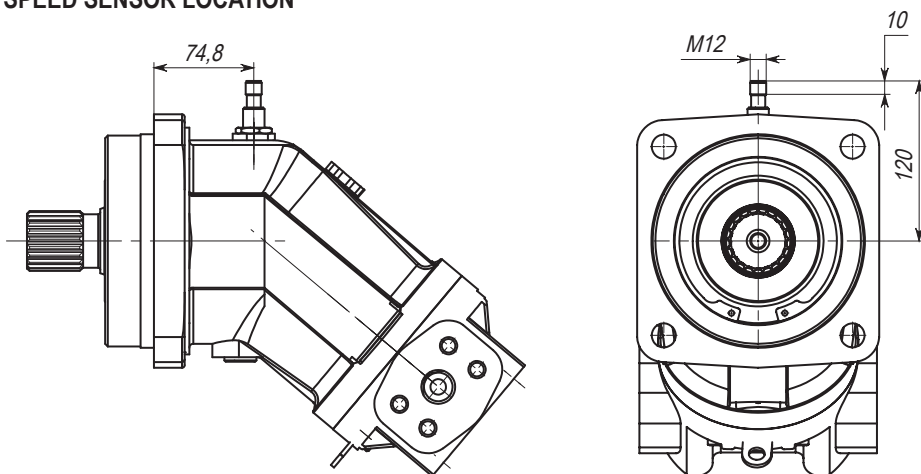
Technical drawing of a shaft assembly. The shaft has a diameter of $\varnothing 45\text{ f7}$ and a length of 55. It is fitted with a pulley with a diameter of $\varnothing 40$ and a width of 50. The pulley has a central hole with a diameter of $\varnothing 17$ and a thread of $M12-7H$. The distance from the left end of the shaft to the center of the pulley is 28. The distance from the center of the pulley to the right end of the shaft is 9,5. The distance from the left end of the shaft to the right end of the shaft is 39,6.

Technical drawing of a shaft-hub assembly. The shaft has a diameter of $\varnothing 39,6\ h11$ and a length of 45. The hub has an outer diameter of $\varnothing 50$ and an inner bore of $\varnothing 34,6$. The hub's total length is 37, with a shoulder width of 9,5. The shaft is secured with a lock nut and washer, labeled $M12-7H$ and $\varnothing 17$. The assembly is shown in a cross-sectional view.

Technical drawing of a shaft-hub assembly. The shaft has a diameter of $\varnothing 31,22$ h11. The hub has an outer diameter of $\varnothing 50$ and an inner bore diameter of $\varnothing 25,6$. The shaft is secured with a lock nut (M10-7H) and a lock washer (14). The assembly dimensions are: 21 (shaft length), 6 (lock washer thickness), 40 (lock nut length), and 48 (total assembly length).

WORKING PORTS OPTION

020 | two flanged ports on the sides**010** | two flanged ports on the rear**100** | two flanged ports on the rear (at 90° to the shaft axis)

027 | two flanged ports on the sides (only with flushing valve)

SPEED SENSOR LOCATION


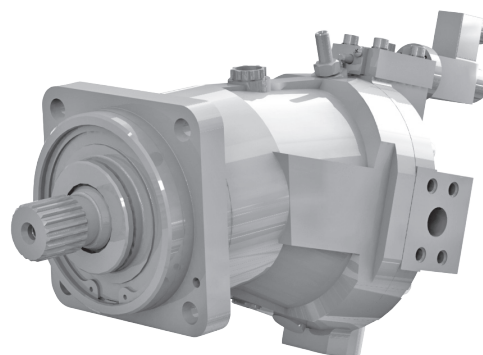
MBV10

MBV10 - series of axial piston variable displacement motors in bent-axis design. They have an aluminum alloy body and designed for hydraulic systems of mobile machines of different purposes.

The **MBV10** model range includes motors with displacement 112 cm³.

DESIGN FEATURES

- Open and closed circuits.
- The angle of inclination the block cylinder 26 degrees.
- Tapered roller bearings, allow the motors shaft to withstand high radial and axial loads.
- Less heat dissipation motor due to better heat dissipation through the housing and the improvement of the washing the bearing assembly.
- Bimetallic block cylinder of motor has a high wear resistance.
- Large variety of controls.
- Hydraulic equipment optional.
- Maximum pressure 400 bar.



MBV10

VARIABLE DISPLACEMENT AXIAL PISTON MOTORS

Order code

MBV10.4 . 112 / EZ6 S . 0 0 . 0 P4 0 5 . B N .

VARIABLE DISPLACEMENT BENT-AXIS AXIAL PISTON MOTOR	MBV10
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DISPLACEMENT, CM ³	CODE
112	● 112

CONTROL OPTIONS	112	CODE
Hydraulic proportional, positive	●	HP1
Hydraulic proportional, negative	●	HP5
Two-point electrical, negative, 24V	●	EZ6
Two-point electrical, positive, 24V	●	EZ3
Electrical proportional, negative, 24V	○	EP6
Electrical proportional, positive, 24V	○	EP2

CONNECTOR FOR SOLENOIDS	112	CODE
Without connector (for hydraulic control)	●	0
Connector DIN 43650	●	S
Connector DEUTSCH DT06-2S	○	P

BUILD-IN HYDRAULIC EQUIPMENT	112	CODE
None	●	0
Flushing valve	●	1
Manifold block	●	2

BUILD-IN ELECTRICAL EQUIPMENT	112	CODE
None	●	0
Speed sensor	●	1

SPECIAL FEATURES*	CODE

CLIMATIC VERSION	112	CODE
Temperate	●	N
Tropical	●	T
Marine	●	MJ

SHAFT SEALS	112	CODE
NBR	○	B
FKM	●	F

DISPLACEMENT RANGE SETTING	112	CODE
Without settings	●	0
V _{g min} setting	●	5
V _{g max} setting	●	7
V _{g min} and V _{g max} settings	●	9

WORKING PORTS OPTIONS	112	CODE
Two flanged ports on the sides	●	0
Four flanged ports, two on the sides, two on the rear	●	2

MOUNTING FLANGE	112	CODE
160-4 ISO 3019-2	●	P4

SHAFT OPTIONS	112	CODE
Splined shaft GOST 6033-80	●	0
Keyed shaft GOST 23360	●	1
Splined shaft DIN 5480 ¹⁾	●	7
Splined shaft DIN 5480 ²⁾	●	8

¹⁾ side balanced²⁾ side balanced, reduced diameter

* Special option code - assigned if necessary after agreement of special conditions with the customer

Notes: ● Standart; ○ Optional; - Not available

ORDERING EXAMPLE

MBV10.4.112/EZ6S.00.0P405.BN

MBV10.4 - variable displacement bent-axis axial piston motor,

112 - displacement 112 cmm,

EZ6 - two-point electrical control, negative, 24V,

S - connector for solenoid DIN 43650,

0 - without build-in hydraulic equipment,

0 - without build-in electrical equipment,

0 - drive shaft acc. to GOST 6033-80,

P4 - mounting flange 160-4 ISO 3019-2,

0 - with two flanged ports on the sides,

5 - minimum working volume (Vgmin) setting screw,

B - shaft seal material NBR,

N - climate version: temperate.



TECHNICAL SPECIFICATIONS

SIZE		MBV10.4.112
Displacement, V_g		
maximum	cm^3	112
minimum		31
Speed:		
minimum at $V_{g_{\max}}$	min^{-1}	50
rated at $V_{g_{\max}}$		1200
maximum at $V_{g_{\max}}$		3000
maximum at $V_{g_{\min}}$		4000
Inlet pressure, P		
rated	bar	200
maximum		400
Outlet pressure, maximum, P	bar	200
Maximum drain pressure	bar	2,5
Flow, Q		
minimum at $V_{g_{\max}}$	l/min	6
rated at $V_{g_{\max}}$		134
maximum at $V_{g_{\max}}$		336
maximum at $V_{g_{\min}}$		124
Torque, M		
rated	Hm	357
maximum		713
Input power, N		
rated	kW	56
maximum		224
Efficiency		
hydromechanical		0,95
volumetric		0,95
Weight (without fluid)	kg	38

FORMULAS

Flow

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

Torque

$$T = \frac{1.59 \cdot V_p \cdot \Delta p \cdot \eta_{mh}}{10} = \frac{V_g \cdot \Delta p \cdot \eta_{mh}}{2 \cdot \pi} \quad [\text{N} \cdot \text{m}]$$

Power

$$P = \frac{T \cdot n}{9549} = \frac{2 \cdot \pi \cdot T \cdot n}{60000} = \frac{Q \cdot \Delta p \cdot \eta_t}{600} \quad [\text{kW}]$$

V_g — displacement [cm^3]

Δp — pressure drop [bar]

n — speed [min^{-1}]

η_v — volumetric efficiency

η_{mh} — hydromechanical efficiency

η_t — overall efficiency

Technical drawing of the 359 series pump, showing side and front views with dimensions.

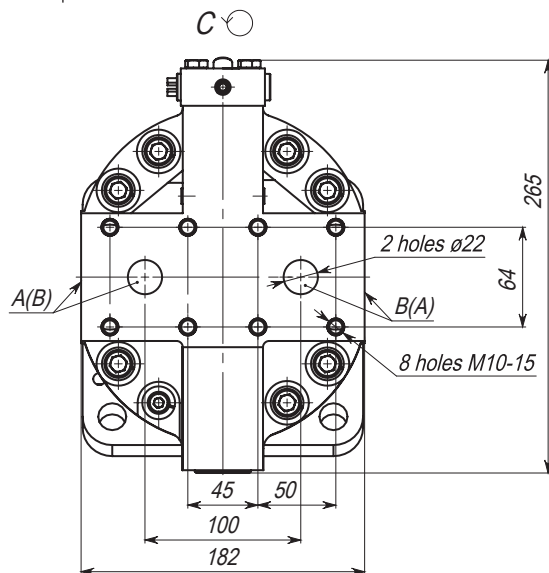
Side View Dimensions:

- Overall width: 359
- Overall height: 160 h7
- Mounting flange width: 40
- Flange thickness: 11
- Distance from flange to centerline: 143
- Distance from centerline to T1: 337
- Distance from centerline to T2: 265
- Distance from centerline to X: 27.8
- Distance from centerline to Z: 57.2
- Distance from centerline to 2 holes $\varnothing 25$: 48.5
- Distance from centerline to 8 holes M12-18: 174
- Distance from centerline to 2 holes $\varnothing 8$: 57
- Distance from centerline to 4 holes $\varnothing 18$: 180
- Distance from centerline to 2 holes $\varnothing 200$: 180
- Distance from centerline to 2 holes $\varnothing 183$: 180
- Distance from centerline to 2 holes $\varnothing 160$: 180
- Angle of T1: 16.5°
- Angle of T2: 16.5°
- Angle of X: 16.5°
- Angle of Z: 16.5°
- Angle of 2 holes $\varnothing 25$: 16.5°
- Angle of 8 holes M12-18: 16.5°
- Angle of 2 holes $\varnothing 8$: 16.5°
- Angle of 4 holes $\varnothing 18$: 16.5°
- Angle of 2 holes $\varnothing 200$: 16.5°
- Angle of 2 holes $\varnothing 183$: 16.5°
- Angle of 2 holes $\varnothing 160$: 16.5°

Front View Dimensions:

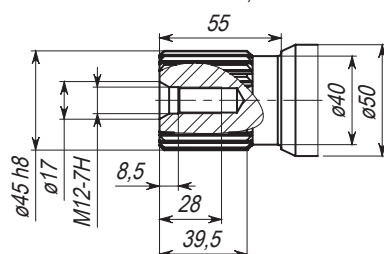
- Overall width: 180
- Overall height: 180
- Mounting flange ISO 3019/2
- 2 holes $\varnothing 8$
- 4 holes $\varnothing 18$
- 2 holes $\varnothing 200$
- 2 holes $\varnothing 183$
- 2 holes $\varnothing 160$
- Angle of 2 holes $\varnothing 8$: 45°
- Angle of 4 holes $\varnothing 18$: 45°
- Angle of 2 holes $\varnothing 200$: 45°
- Angle of 2 holes $\varnothing 183$: 45°
- Angle of 2 holes $\varnothing 160$: 45°

X - pilot line M12x1,5-74 DIN 3852

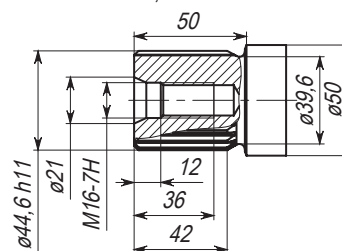


DRIVE SHAFTS

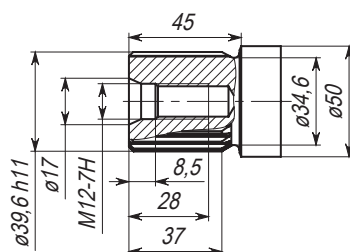
0 | Splined shaft 45xh8x2x9g
GOST 6033-80, z21



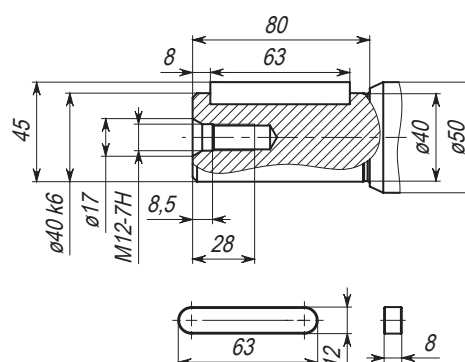
7 | Splined shaft 45x2x30x21x9g
DIN 5480, z21



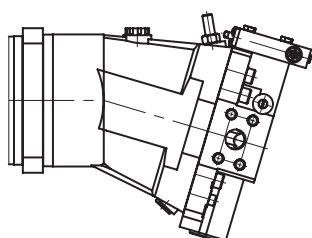
8 | Splined shaft 40x2x30x18x9g
DIN 5480, z18



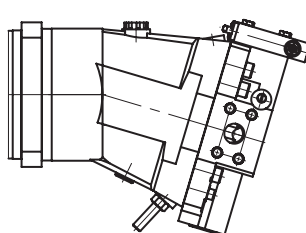
1 | Keyed shaft 12x8x63
GOST 23360


DISPLACEMENT RANGE SETTING

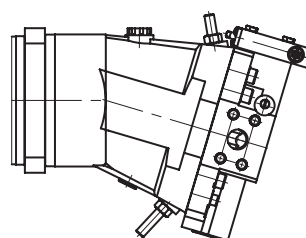
5 | $V_{g_{min}}$ setting



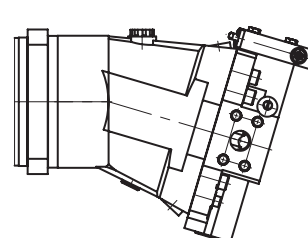
7 | $V_{g_{max}}$ setting



9 | $V_{g_{min}}$ and $V_{g_{max}}$ settings

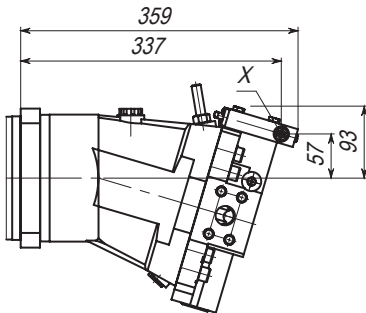


0 | Without settings



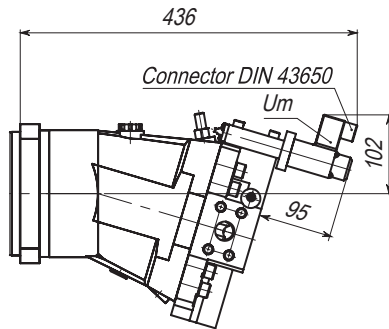
MBV10 MOTORS DIMENSIONS, SIZE 112 CM³

HP5 | motor with proportional hydraulic negative control



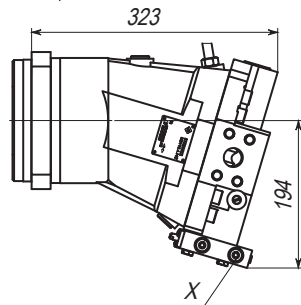
X - pilot line M12x1,5-74 DIN 3852

EZ6 | motor with two-point electric negative control



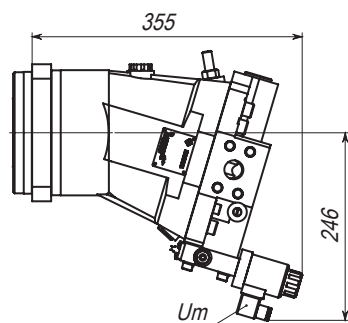
Um - solenoid

HP1 | motor with proportional hydraulic positive control



X - pilot line M12x1,5-74 DIN 3852

EZ3 | motor with two-point electric positive control



Um - solenoid

CONTROL SYSTEM

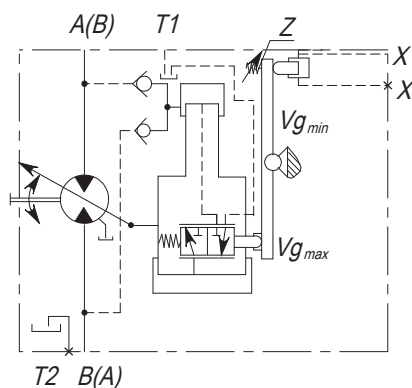
HYDRAULIC PROPORTIONAL NEGATIVE CONTROL

Hydraulic proportional negative control allows to change the displacement stepless from $V_{g_{max}}$ to $V_{g_{min}}$ proportional to the pilot pressure P_c applied to port **X**. With the maximum tilt angle of the cylinders block to the axis of the shaft and $P_c \leq P_{c_{min}}$ (P_c - pilot pressure, $P_{c_{min}}$ - minimum pilot pressure (see chart) motor is in the maximum displacement $V_{g_{max}}$, the speed is minimum n_{min} , and torque is maximum Mt_{max} . With the minimum tilt angle of the cylinders block to the axis of the shaft and $P_c \geq P_{c_{max}}$ ($P_{c_{max}}$ - maximum pilot pressure) hydraulic motor is in the minimum displacement $V_{g_{min}}$, and the speed is maximum n_{max} , and torque is minimum Mt_{min} .

NOTICE:

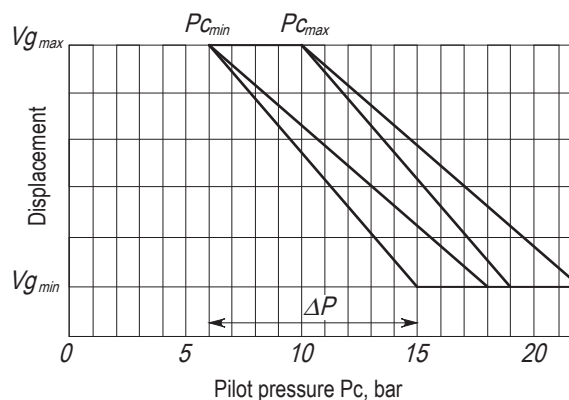
1. Regulation of the hydraulic motor provides by the working pressure in the hydraulic system.
 2. A minimum working pressure required for the regulator to operate - 30 bar, and a maximum pilot pressure - 50 bar.
 3. Increasing the cast pressure increases $P_{c_{min}}$ and causes a parallel changes of the characteristics.
 4. A range of $P_{c_{min}} = 6...10$ bar. The default value $P_{c_{min}} = 6...8$ bar, and the pilot pressure range $\Delta P_c = 9...12$ bar, range of $P_{c_{max}} = 15...20$ bar.
- By ordering hydraulic motors, specify the required values of the minimum displacement $V_{g_{min}}$ and the minimum pilot pressure $P_{c_{min}}$.

HYDRAULIC CIRCUIT



A, B - working lines
T1, T2 - drain lines
Z - P_c setting screw
X - pilot line

CONTROL CHART



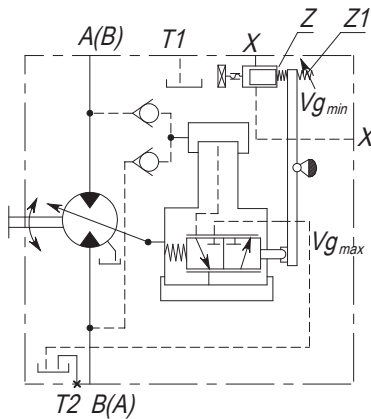
HYDRAULIC PROPORTIONAL POSITIVE CONTROL

Hydraulic proportional negative control allows to change the displacement stepless from Vg_{min} to Vg_{max} proportional to the pilot pressure P_c applied to port X. With the minimum tilt angle of the cylinders block to the axis of the shaft and $P_c \leq P_{cmin}$ (P_c - pilot pressure, P_{cmin} - minimum pilot pressure (see chart) motor is in the minimum displacement Vg_{min} , the speed is maximum n_{max} , and torque is minimum Mt_{min} . With the maximum tilt angle of the cylinders block to the axis of the shaft and $P_c \geq P_{cmax}$ (P_{cmax} - maximum pilot pressure) hydraulic motor is in the maximum displacement Vg_{max} , and the speed is minimum n_{min} , and torque is maximum Mt_{max} .

NOTICE:

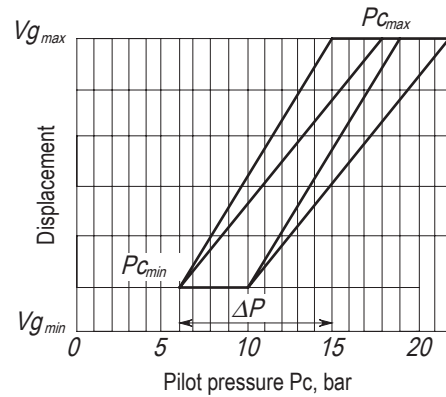
1. Regulation of the hydraulic motor provides by the working pressure in the hydraulic system.
 2. A minimum working pressure required for the regulator to operate - 30 bar, and a maximum pilot pressure - 50 bar.
 3. Increasing the cast pressure increases P_{cmin} , and causes a parallel changes of the characteristics.
 4. A range of $P_{cmin} = 6...10$ bar. The default value $P_{cmin} = 6...8$ bar, and the pilot pressure range $\Delta P_c = 9...12$ bar, range of $P_{cmax} = 15...20$ bar.
- By ordering hydraulic motors, specify the required values of the minimum displacement Vg_{min} and the minimum pilot pressure P_{cmin} .

HYDRAULIC CIRCUIT



A, B - working lines
T1, T2 - drain lines
Z - P_c setting screw
X - pilot line

CONTROL CHART



TWO-POINT ELECTRIC CONTROL

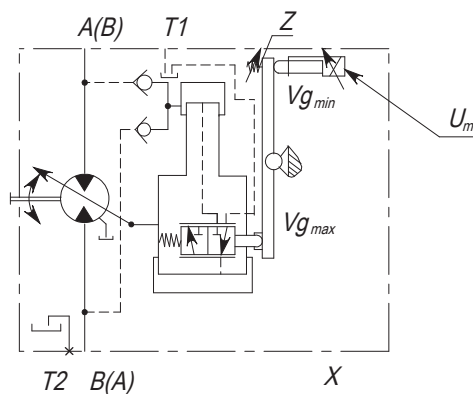
The two-point electric control allows the displacement to be set from Vg_{max} to Vg_{min} (negative control) or from Vg_{min} to Vg_{max} (positive control) by switching the electric current to the solenoid on or off. When the electromagnet is turned off, the displacement changes in the opposite direction.

CAUTION:

1. Regulation of the hydraulic motor provides by the working pressure in the hydraulic system.
2. A minimum working pressure required for the regulator to operate - 30 bar.
3. If you need to change the pilot pressure range, consult the manufacturer.

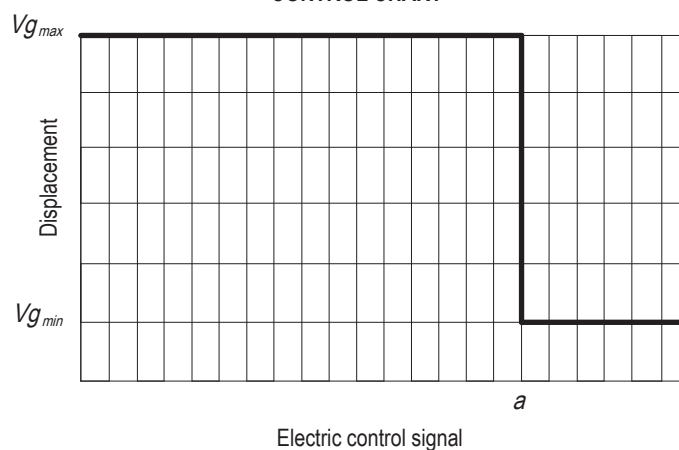
By ordering hydraulic motors, specify the required value of the minimum displacement Vg_{min} .

HYDRAULIC CIRCUIT



A, B - working lines
T1, T2 - drain lines
Z - Pc setting screw
 U_m - pilot current

CONTROL CHART



SOLENOID TECHNICAL DATA

Voltage	24 V
Position Vg_{min}	energized
Position Vg_{max}	de-energized
Pulling force	≥ 37 N
Stroke of the anchor, nominal	2,8 mm
Nominal resistance (at 20°C)	19,2 Ω
Nominal power	30 W
Duty cycle	100%
Protection class	IP67

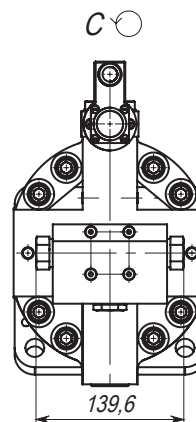
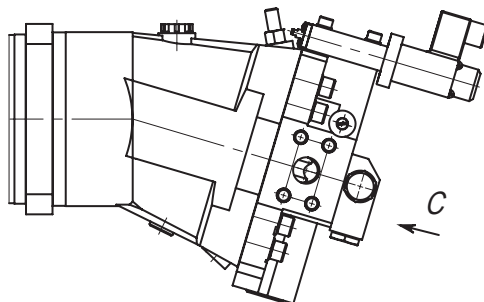
HYDRAULIC AND ELECTRICAL EQUIPMENT

HYDRAULIC MOTORS WITH FLUSHING VALVE

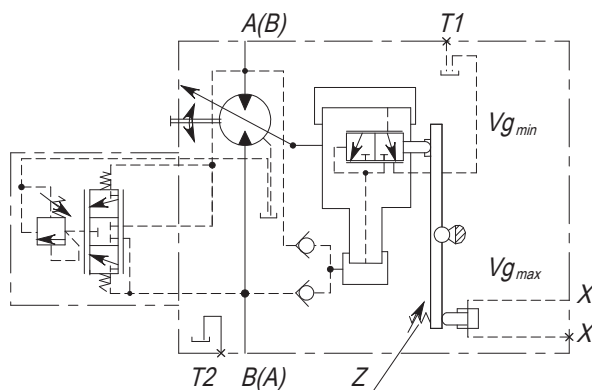
Hydraulic motors can be equipped with a flushing valve which is mounted directly on the motor. Hydraulic motors with flushing valves are used in closed circuits.

Flushing valve is designed for:

- remove heat from the hydraulic circuit. The heated hydraulic fluid removed to tank with the leakage through the line T1 (T2) and replaced by a cooled hydraulic fluid, from the charge pump;
- flushing the drainage cavity of the hydraulic motor to cool bearings and parts of the rotor;
- provide minimum charge pressure by setting the purge relief valve in the flushing valve.



HYDRAULIC CIRCUIT

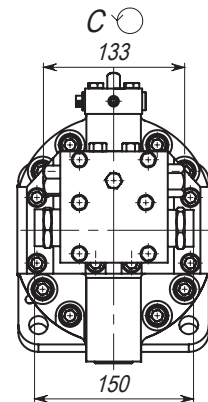
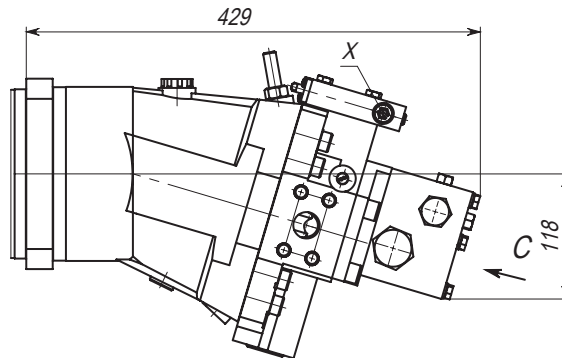


A, B - working lines
T1, T2 - drain lines
Z - Pc setting screw
X - pilot line

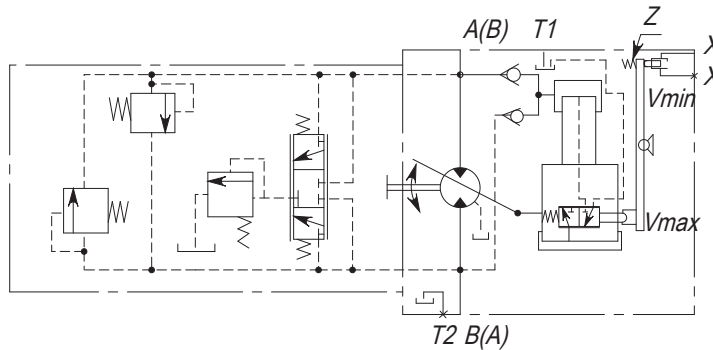
HYDRAULIC MOTORS WITH MANIFOLD BLOCK

Hydraulic motors can be equipped with a manifold block which is mounted directly on the motor. Hydraulic motors with manifold block are used in closed circuits. Manifold block is designed for:

- overload protection. Pressure relief valves standart setting - 350 bar;
- remove heat from the hydraulic circuit. The heated hydraulic fluid removed to tank with the leakage through the line T1 (T2) and replaced by a cooled hydraulic fluid, from the charge pump;
- flushing the drainage cavity of the hydraulic motor to cool bearings and parts of the rotor;
- provide minimum charge pressure by setting the purge relief valve.



HYDRAULIC CIRCUIT



- A, B - working lines
- T1, T2 - drain lines
- Z - Pc setting screw
- X - pilot line

HYDRAULIC MOTORS WITH BUILT-IN SPEED SENSOR

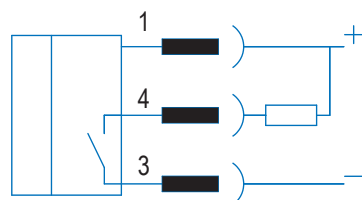
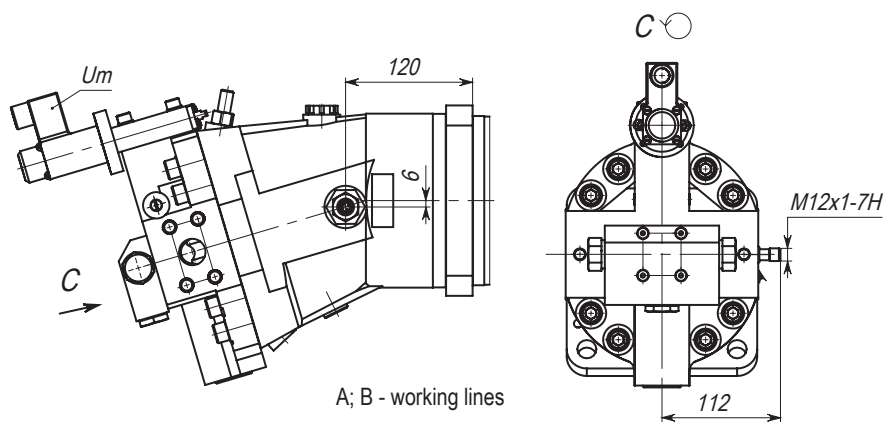
Hydraulic motors can be equipped with an inductive shaft speed sensor. The inductive speed sensor integrated in the housing is designed for non-contact speed measurement of the motor shaft. The operation of the sensor is based on the Hall effect.

$$\text{Switching frequency} \quad f = \frac{n \cdot z}{60} \text{ Гц}$$

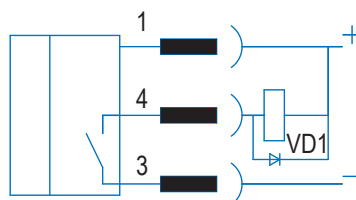
где n - speed

$z = 7$ - number of pistons

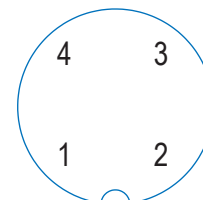
SPEED SENSOR SPECIFICATIONS	
Voltage, U_s	10...30 В
Operating current, I_w	≤ 250 mA DC
Voltage drop I_w	$\leq 2,5$ В
Switching frequency, $F_{\max}$	850 Гц
Operating temperature range	-25°C...+75°C
Protection class	IP68
Voltage ripple	$\leq 15\%$



Pic. 1 Wiring diagram for a resistive load

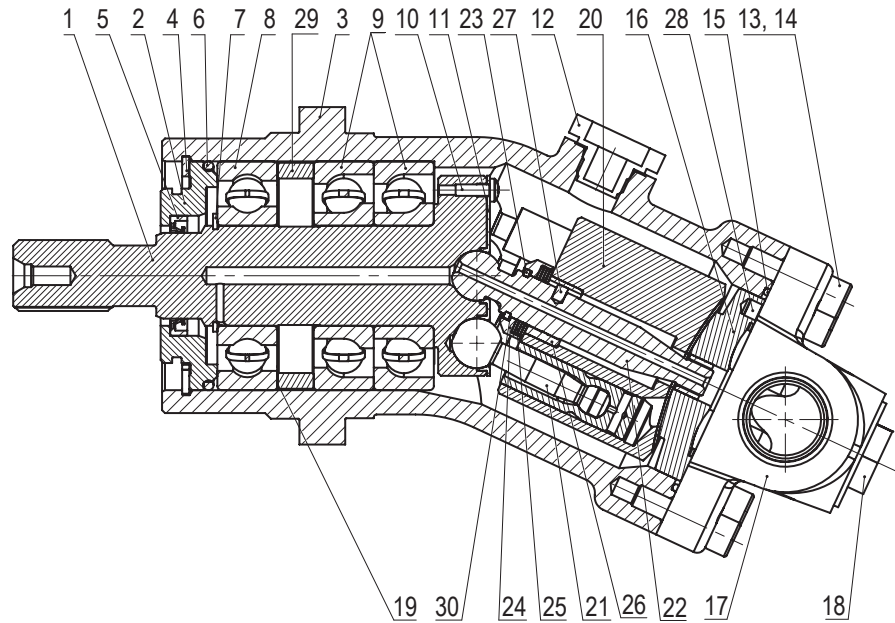


Pic. 2 Wiring diagram for inductive load



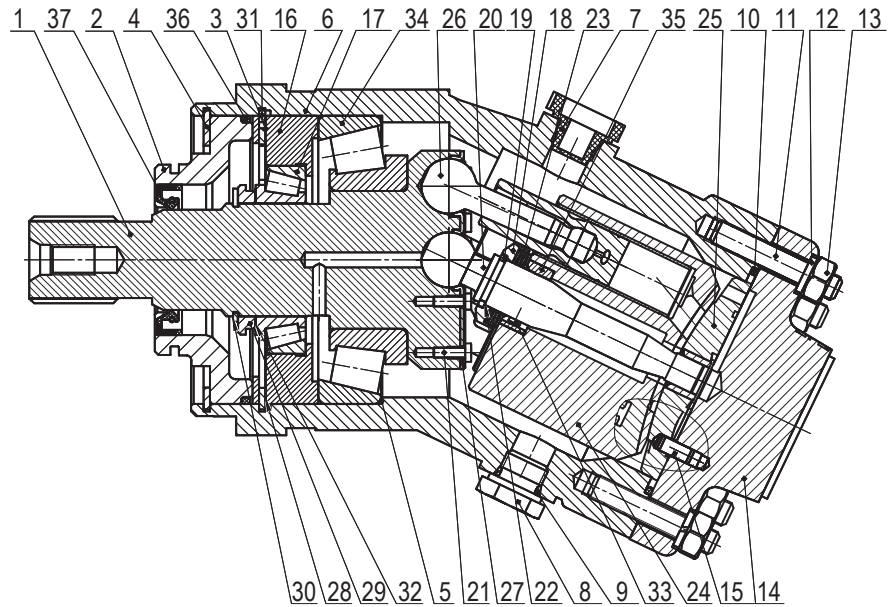
Pic. 3 Pinout of the speed sensor

PBF10 PUMPS AND MBF10 MOTORS LAYOUT, SIZE 28 CM³



BF10 (28 cm³)			
POSITION	NAME	POSITION	NAME
1	Shaft	16	Spreader
2	Radial seal housing	17	Rear cover
		18	Plug
3	Body	19, 30	Adjusting washer
4, 7	Lock ring		
5	Cuff	20	Cylinder block
6, 15	O-ring	21	Piston
8, 9	Bearing	22	Spike
10	Screw	23	Half ring
11	Separator (the pressure plate)	24	Bushing
		25	Dish-shaped spring
12	Transport plug	26	Cylinder block bushing
13	Screw	27, 28	Pin
14	Washer	29	Ring

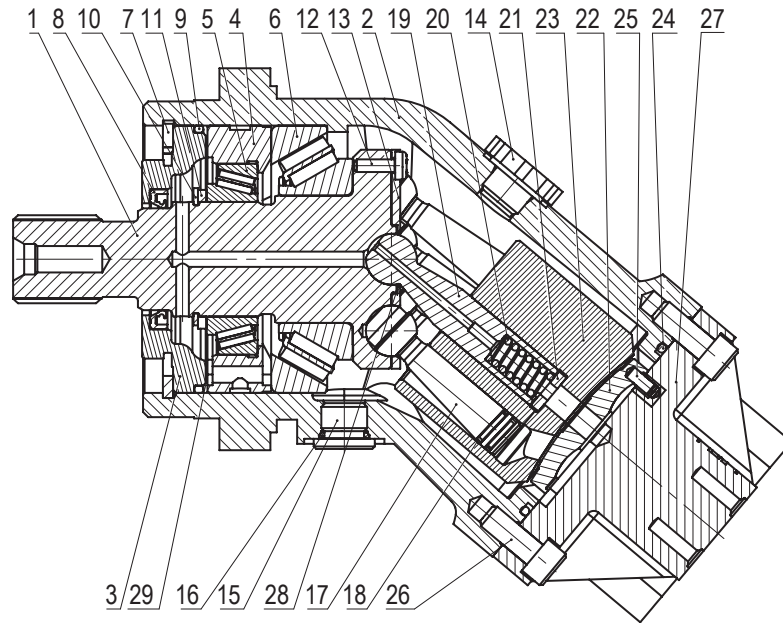
PBF10 PUMPS AND MBF10 MOTORS LAYOUT, SIZE 56, 112 CM³



BF10 (56, 112 cm³)

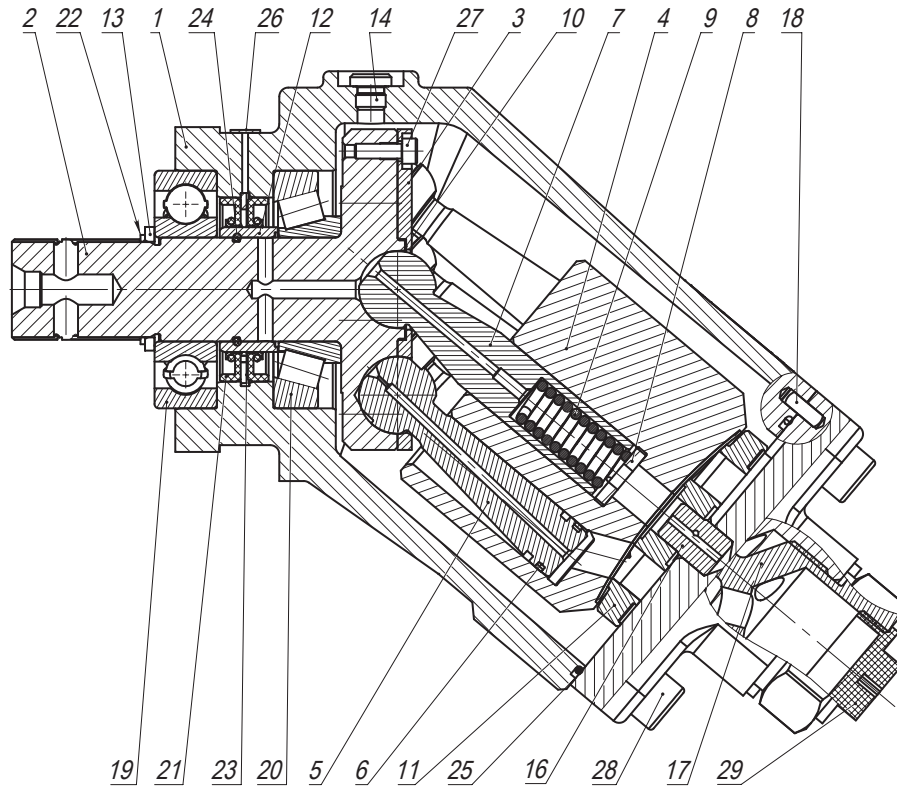
POSITION	NAME	POSITION	NAME
1	Shaft	17, 34	Bearing
2	Radial seal housing	18	Bushing
3, 5, 22, 28, 32	Adjusting washer	19	Half ring
4, 30, 31, 36	Lock ring	20	Spike
6	Body	21	Screw
7	Transport plug	23	Dish-shaped spring
8	Plug	24	Cylinder block
9, 10	O-ring	25	Spreader
11	Pin	26	Piston
12	Washer		
13	Nut	27	Separator
14	Rear cover	29	Bushing
15, 33	Pin	35	Bushing cylinder block
16	Bearing cup	37	Cuff

PBF20 PUMPS AND MBF20 MOTORS LAYOUT, SIZE 56, 80, 107 CM³



BF20 (56, 80, 107 cm ³)			
POSITION	NAME	POSITION	NAME
1	Shaft	15	Plug
2	Body	17	Piston
3	Radial seal housing	18	Compression ring
4	Bearing cup	19	Pin
5, 6	Bearing	20	Spring
7, 10	Lock ring	21	Support washer
8	Cuff	22	Spreader
9, 16, 24	O-ring	23	Cylinder block
11	Washer	25	Pin
12, 26	Screw	27	Cover
13	Separator	28, 29	Adjusting washer
14	Transport plug		

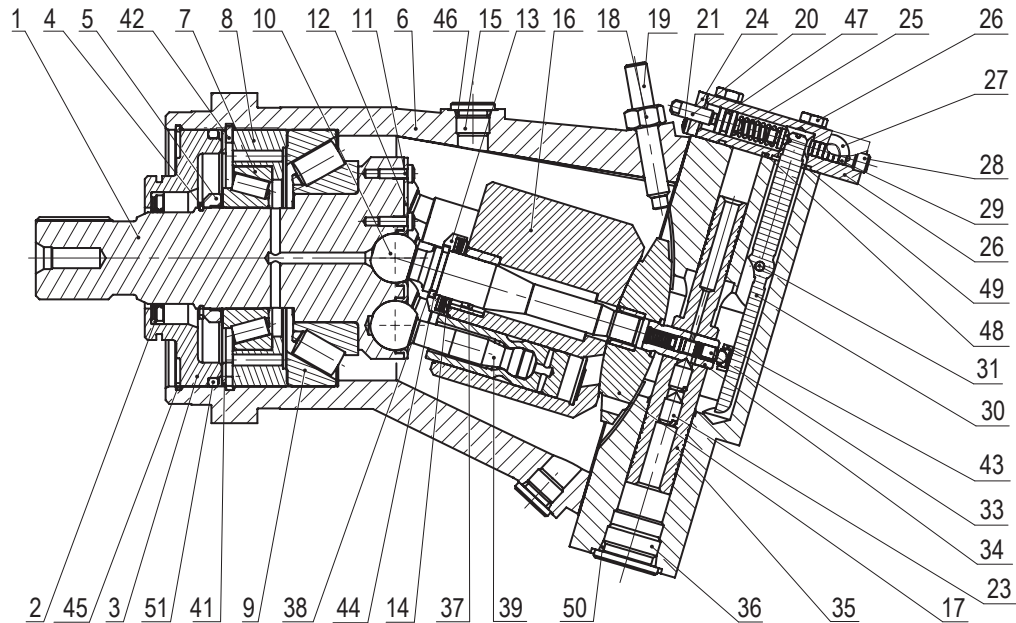
PBF20T AND PBF20TH PUMPS LAYOUT, SIZE 56, 63, 80, 107 CM³



PBF20T (TH) (56, 63, 80, 107 cm³)

POSITION	NAME	POSITION	NAME
1	Body	14	Plug
2	Shaft	15	Cover
3	Separator	16	Pin-orifice
4	Cylinder block	17	Pump adapter
5	Piston	18	Pin
6	Compression ring	19, 20	Bearing
7	Pin	21	Cuff
8	Cylindrical pin	22, 23	Lock ring
9	Spring	24, 25	O-ring
10, 13	Adjusting washer	26	Plate
11	Spreader	27, 28	Screw
12	Bushing	29	Transport plug

MBV10 MOTORS LAYOUT, SIZE 112 CM³



MBV10 (112 cm³)			
POSITION	NAME	POSITION	NAME
1	Drive shaft	24	Bracket
2	Cuff	25	Spring
3	Radial seal body	26	Body of controller
4, 45	Lock ring	27	Plug
5	Bushing	28	Cap
6	Body	29	Slide valve
7, 9	Bearing	30	Lever
8	Bearing cup	31	Axis
10	Spike	32	Bearing heel
11, 21, 22, 23	Screw	33	Spool with the fifth
12	Separator	34	Pin
13	Bushing	35	Piston
14	Belleville spring	37	Pin
15, 36	Transport plug	38	Semicircle
16	Cylinder block	39	Piston
17	Spreader	40, 41, 42, 43, 44	Adjusting washer
18	Nut	46, 47, 48, 49, 50, 51	Seal ring
19, 20	Adjusting screw		
21, 22, 23	Screw		

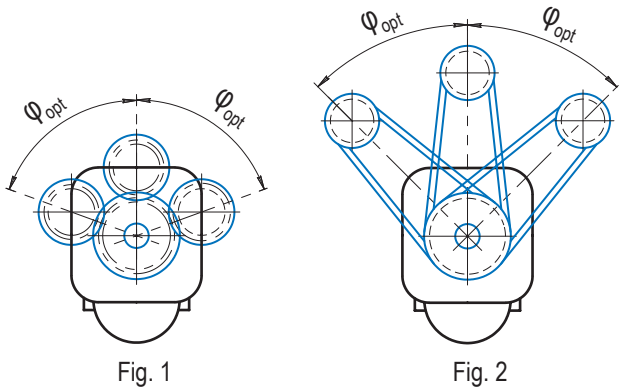
LOAD AND DURABILITY (FOR BF10, BF20, BV10 SERIES PUMPS AND MOTORS)



PERMISSIBLE AXIAL AND RADIAL FORCES ON THE DRIVE SHAFT						
Pumps / motors series	BF10, BV10			BF20		
Displacement, cm ³	28	56	112	56	80	107
A distance to force F from the shaft collar, a, mm	20	25	27,5	18	20	20
Maximum radial force F_{rad} , N	2748	8962	13610	9200	11500	13600
Maximum axial force (during standby, no pressure in hydraulic system), $-F_{ax}$, N	0					
Maximum axial force (during standby, no pressure in hydraulic system), $+F_{ax}$, N	315	500	900	800	1000	1250
Permissible axial force (per bar operating pressure), $\pm F_{ax}$, N/bar	4,6	7,5	11,3	8,7	10,6	12,9

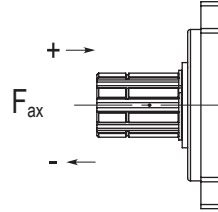
NOTE
 The direction of the maximum permissible axial force must be consider:
 at $-F_{ax}$ - bearing durability is reduced;
 at $+F_{ax}$ - bearing durability is increased.

The choice of the optimal direction of the radial force F_{rad} allows to reduce the load on the bearings and achieve an optimal lifetime. Optimal installation angle φ_{opt} for gear (fig. 1) and V-belt (fig. 2) transmission should match to the values in the table.



SERIES	V-BELT	GEAR
BF10	70°	45°
BF20	45°	70°

LOAD AND DURABILITY (FOR PBF20T AND PBF20TH SERIES PUMPS)



PERMISSIBLE AXIAL AND RADIAL FORCES ON THE DRIVE SHAFT

CHARACTERISTICS		56	63	80	107
A distance to force F from the shaft collar, a, mm		21,5			
Maximum axial force (during standby, no pressure in hydraulic system), F_{ax}	N	0			
Permissible axial force (per bar operating pressure), F_{ax}	$+F_{ax}$, N/bar	50	53	60	71
	$-F_{ax}$, N/bar	0			

NOTE

The direction of the maximum permissible axial force must be consider:

at $-F_{ax}$ - bearing durability is reduced;

at $+F_{ax}$ - bearing durability is increased.

HYDRAULIC FLUID

All parameters and characteristics of hydraulic units suggest that hydraulic system uses high quality hydraulic fluids and additives. They should have a number of properties: anticorrosive, antioxidant, anti-foam, and others. These fluids are high-quality turbine oils, API CD SAE J183 engine oil, automatic transmission fluids (ATF) and some specialty fluids.

Never mix different fluids.

HYDRAULIC FLUID CHOICE

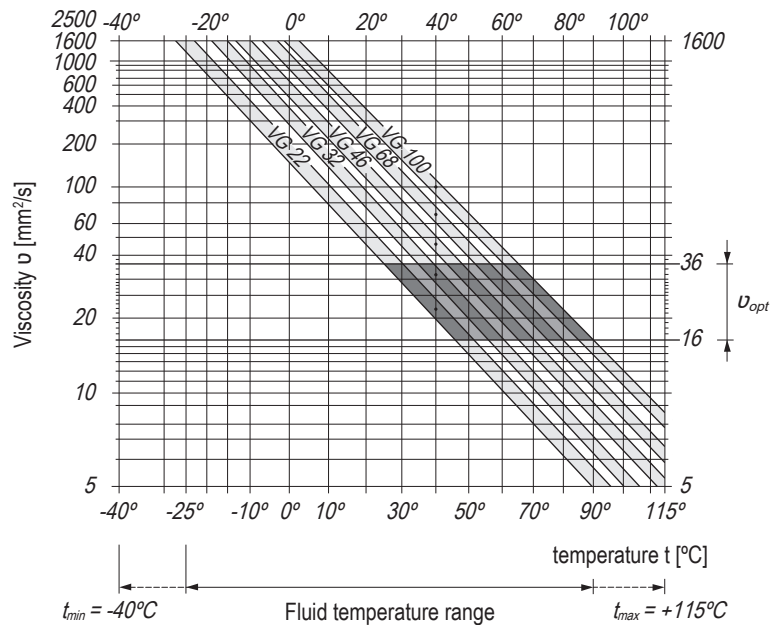
For the correct choice you need to know the working temperature of the fluid in the hydraulic tank (depending on the ambient temperature) and the viscosity of the fluid. The fluid must be selected so that the viscosity be within the allowable range (V_{opt}) at any temperature (t_{min} - t_{max}), (see diagram). It is recommended to select a higher temperature class of the working fluid.

EXAMPLE.

At an ambient temperature of $X^{\circ}\text{C}$, an operating temperature of 60°C is set. In the optimum working range of (V_{opt}) viscosity, this corresponds to classes VG 46 and VG 68. The right choice is VG 68. The temperature of fluid in the drain channel is always higher than the temperature in the tank. At any point in the hydraulic system fluid temperature should not exceed 90°C .

If it is not possible to comply with temperature conditions, consult for advice.

SELECTION DIAGRAM



TECHNICAL DATA

HYDRAULIC FLUID FILTRATION

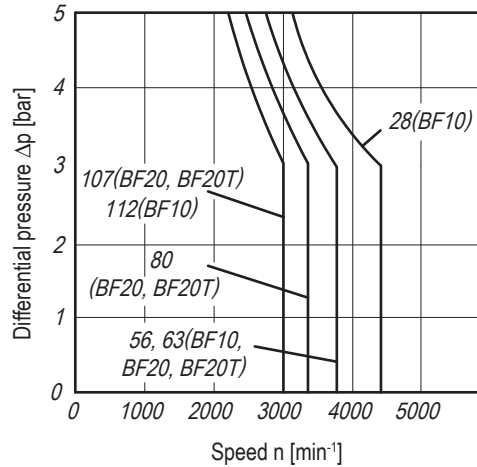
The better filtration provides the higher purity class of the working fluid, which in turn increases the axial piston unit lifetime. To ensure reliable operation of the axial piston unit, it is necessary to determine the working fluid purity according to ISO 4406. At very high temperatures of the working fluid (from 90°C to a maximum of 115°C), a purity class at least 19/17/14 according to ISO 4406 is required. If it is impossible to comply with the purity class, please consult.

VISCOSITY AND TEMPERATURE OF WORKING FLUID

CONDITIONS	VISCOSITY	TEMPERATURE	NOTES
Storage and transportation		$T_{\min} \geq -40^{\circ}\text{C}$ $T_{\text{opt}} = +5^{\circ}\text{C} \dots +20^{\circ}\text{C}$	Storage at the factory: Standard - up to 12 months; Long-term - up to 24 months
Cold start	$\nu_{\max} \leq 1600 \text{ mm}^2/\text{s}$	$T \geq -40^{\circ}\text{C}$	$t \leq 3 \text{ min}$, $n \leq 1000 \text{ min}^{-1}$, no load $P \leq 50 \text{ bar}$
Permissible temperature drop		$T \leq 25^{\circ}\text{C}$	The temperature difference between the axial piston pump and the working fluid in the system
Warm-up period	$\nu = 1600 \dots 400 \text{ mm}^2/\text{s}$	$T = -40^{\circ}\text{C} \dots -25^{\circ}\text{C}$	at $P \leq 0.7 \cdot P_{\text{nom}}$, $n \leq 0.5 \cdot n_{\text{nom}}$ $t \leq 15 \text{ min}$
Continuous operating mode	$\nu = 400 \dots 10 \text{ mm}^2/\text{s}$		In case of VG 46 corresponds to a temperature range of $+5^{\circ}\text{C}$ to $+85^{\circ}\text{C}$
		$\Delta T = 12^{\circ}\text{C}$ $T = -25^{\circ}\text{C} \dots +103^{\circ}\text{C}$	The temperature difference between the cuff, bearing and drainage Temperature in drain line
	$\nu_{\text{opt}} = 36 \dots 16 \text{ mm}^2/\text{s}$		Optimal viscosity range in operating mode
Short-term operating	$\nu_{\min} \geq 7 \text{ mm}^2/\text{s}$	$T = +103^{\circ}\text{C}$	$t < 3 \text{ min}$, $p < 0.3 \cdot P_{\text{nom}}$

SHAFT SEAL

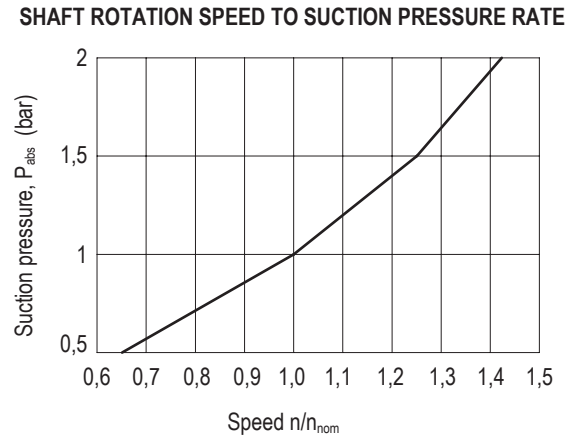
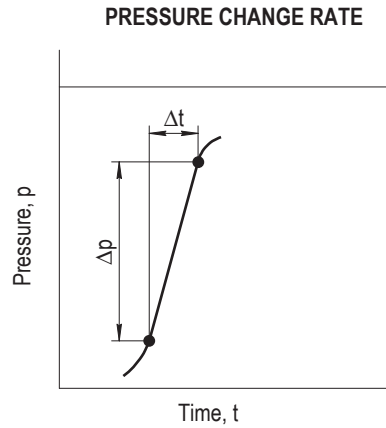
The shaft seal service life depends on the shaft speed and drain pressure. The diagram shows the dependence of the shaft speed on the case pressure that acts on the seal from the pump cavity. When the hydraulic unit is operating at the maximum allowable drain pressure, the shaft seal life is reduced. Short-term pressure ($t < 0,1$ sec) up to 10 bar is allowed, but with the increasing the pressure pulsation frequency the shaft seal service life is reduced. The case pressure must be equal to or higher than the ambient pressure.



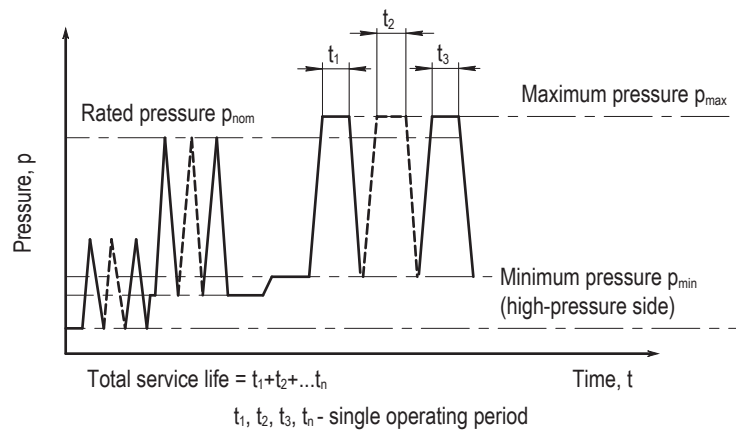
Maximum case pressure:

- 1 bar - for 28 cm³ series BF10
- 2,5 bar - 56 cm³ and 112 cm³ series BF10, BV10
- to 3 bar - 56 cm³, 63 cm³, 80 cm³, 107 cm³ series BF20, BF20T

SUCTION PRESSURE AT INCREASED SPEED



OPERATING PERIODS OF THE PUMP THROUGHOUT THE ENTIRE SERVICE LIFE



INSTALLATION INSTRUCTIONS

During commissioning and operation, the axial piston unit must be filled with hydraulic fluid and air bled. This must also be observed following a relatively long standstill as the axial piston unit may drain back to the reservoir via the hydraulic lines.

In case of "above reservoir" installation filling and air bleeding must be carried out completely as there is, for example, a danger of dry running.

The drain line to tank (T1, T2) should be located at the highest available level (for the PBF10, PBF20 series).

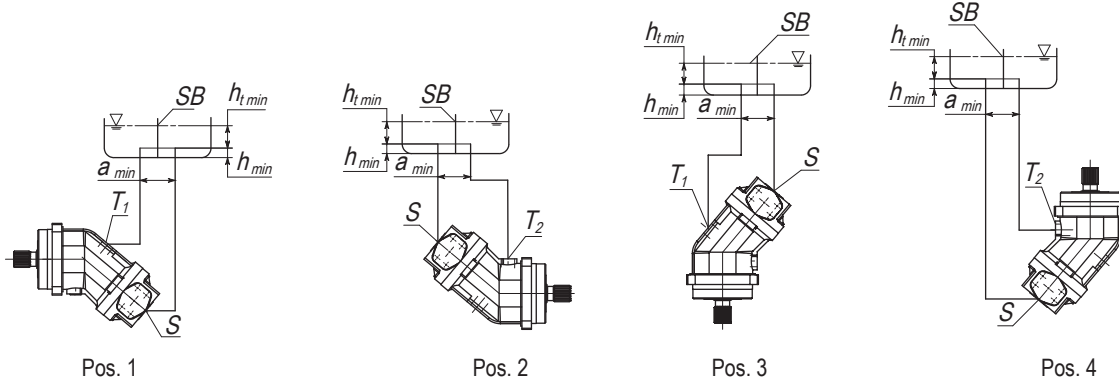
To achieve lower noise levels, connect all hydraulic lines using flexible hoses and avoid "above reservoir" installation.

In all operating conditions, the drain line must flow into the reservoir below the minimum fluid level. Maximum permissible suction height is 800 mm. The minimum pressure in the suction channel S must also not fall below 0.8 bar to absolute pressure (pabs) during the operation and cold start.

INSTALLATION POSITION FOR PUMPS PBF10, PBF20

Below-reservoir installation

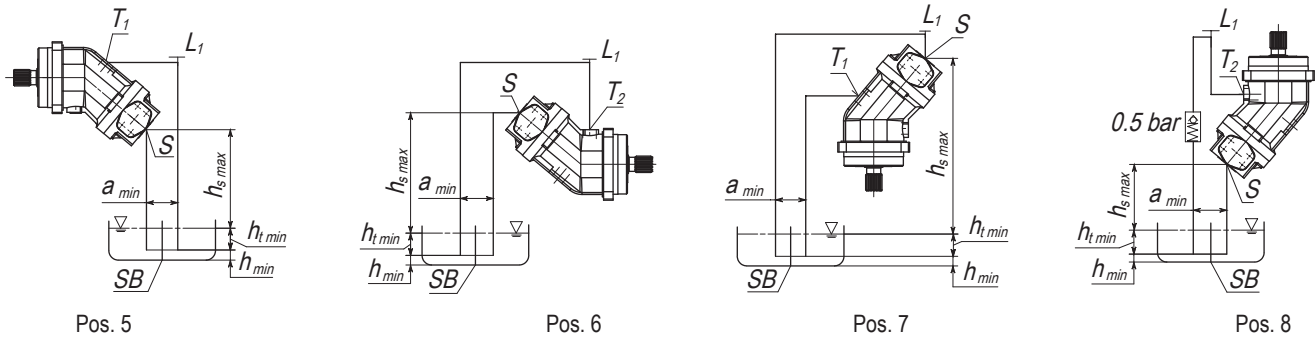
Below-reservoir installation means that the axial piston unit is installed outside of the reservoir below the minimum fluid level. **Installation in positions 1 and 2 is recommended.**



Above-reservoir installation

Above-reservoir installation means, that the axial piston unit is installed above the minimum fluid level.

Recommendation for installation position 8 (drive shaft upward): a check valve in the drain line (cracking pressure 0.5 bar) can prevent draining of the pump housing.



S Suction line

T₁, T₂ Drain line

SB Damping wall (panel)

h_{t min} Minimum required loading depth 200 mm

h_{min} The minimum required distance to the bottom of the tank 100 mm

L₁ Filling / air bleed

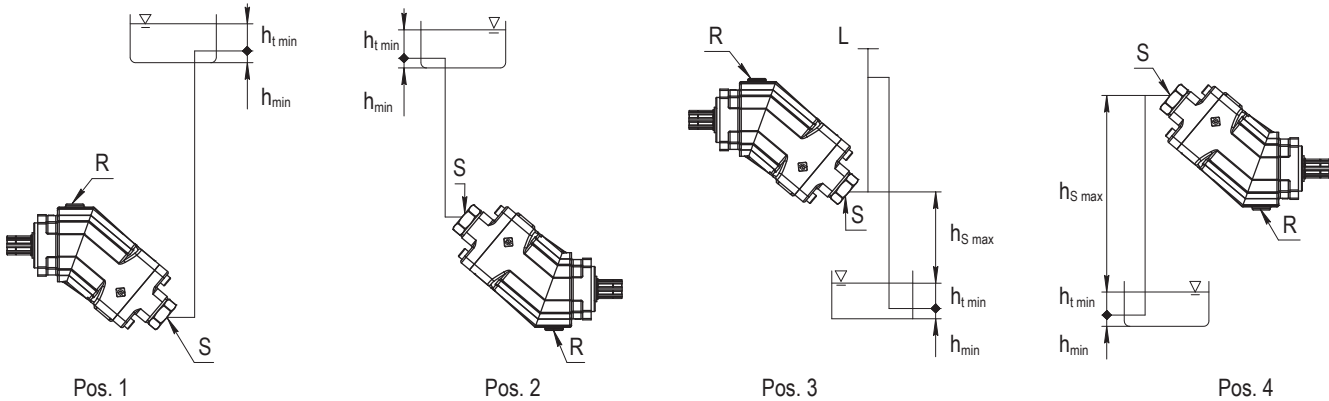
h_{s max} Maximum permissible suction height (800 mm)

a_{min} When selecting a tank, it is necessary to ensure a sufficient distance between the suction line and the drain line. This will prevent the absorption of heated fluid back into the suction line.

INSTALLATION POSITION FOR PUMPS PBF20T(TH)

Below-reservoir installation (pos. 1 and 2)

Below-reservoir installation means that the axial piston unit is installed outside of the reservoir below the minimum fluid level. **Installation in positions 1 and 2 is recommended.**



INSTALLATION POSITIONS	AIR BLEED	FILLING
Pos. 1	R	S
Pos. 2	-	S

Above-reservoir installation (pos. 3 and 4)

Above-reservoir installation means, that the axial piston unit is installed above the minimum fluid level.

INSTALLATION POSITIONS	AIR BLEED	FILLING
Pos. 3	R	L
Pos. 4	S	S

S Suction line

R Air bleed

L Filling

$h_{t\ min}$ Minimum required loading depth 200 mm

$h_{\min}$ The minimum required distance to the bottom of the tank 100 mm

$h_{s\ max}$ Maximum permissible suction height (800 mm)

HYDRAULIC TANKS REQUIREMENTS

1. Design of the tank should facilitate cooling of the working fluid, prevent access of air to the working fluid and foaming it, eliminates the ingress of contaminants from the environment and sucking sediment from the bottom of the tank to the hydraulic system.
2. The tank must be equipped with a level indicator, and if necessary, equipped with an automatic device that regulates the level of working fluid or signal when the predetermined level.
3. The tank must have a filler neck with a filter and a sealed cap with restraint. The design and installation of the filter should prevent damage during operation. The capacity of the filler neck with a filter must ensure filling the tank within the time stipulated by the technical documentation for specific types of hydraulic tanks.
4. It is desirable that the design of the hydraulic tank provide for a closed filling, in which the working fluid enters the tank through a pipeline hermetically connected to the tank from the filling station.
5. There should be an air bleeder at the top of the tank (for tanks design for operation in ambient pressure) with an air filter with a filter fineness corresponding to the required purity of the working fluid in the system.
The bandwidth of the bleeder should ensure the pressure drop in the tank at the maximum rate of change of the working fluid level does not exceed the value set in the documentation for specific hydraulic tanks. The leakage of the working fluid through the bleeder should be excluded during operation.
6. The design of the tank should ensure its convenient cleaning. Drains must be located in such places that the working fluid can be drained from the tank.
7. The surface of the tank must be protected against corrosion, resistant to the working fluid, causing no pollution.

Hydrosila
25006, Ukraine, Kropyvnytskyi
Phone/Fax: +38 0522 39-16-46
e-mail: info@hydrosila.com
www.hydrosila.com



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