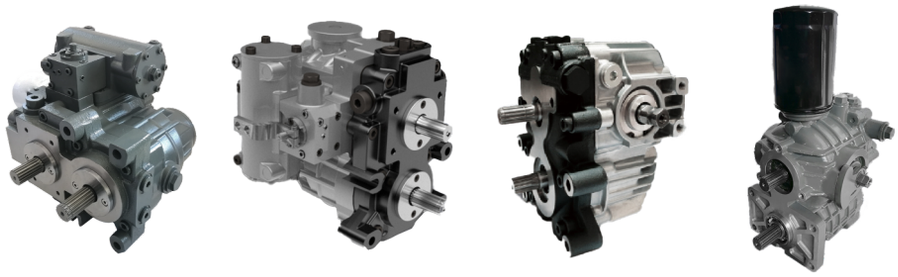
THM HYDRAULICS

Hydrostatic Transmission Control Unit



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HST Assembly Display

Product Features

WHPVMF HST consist of variable piston pump, bi-direction piston motor, Cycloid boost pump, valve assy, oil filters and other components.

Work Principle

Power device drive the piston pump to convert mechanical energy into hydraulic energy, then hydraulic energy converts into mechanical energy through piston motor to provide torque for executive component. Piston pump and motor constitute closed loop, leaked oil be supplied by cycloid boost pump. Piston motor output shaft drive the running device to realize the machine's forward, stop, back functions.

Features

- Operate easily: WHPVMF can fulfill retreat, commutation and stable any speed change only by operating a lever.
- Uesfully： WHPVMF products are doing all-in-one right with a very small weight. It not only can easily to realize all-wheel drive, power output and pulse width modulation, but also can add variety of electronic control device to achieve electrification, improving machines performance.
- Flexibility: Machine with the WHPVMF can move in a very small turning radius with a very slowly speed, it can turn or go in and out a site flexbility.
- High efficiency: WHPVMF's unique design reduce the weight, shorten pipeline, lower power consumption, improve the efficiency, its overall efficiency is up to 80%.According to different conditions, load and unload, WHPVMF can Change oblique the plate angle, adjusts the flow and the output torque to make machine operate more efficiently.

Calculate Technical Data

Flow $q_v = \frac{Vg \cdot n \cdot \eta_v}{1000}$

Driving torgue $T = \frac{Vg \cdot \triangle P}{20 \cdot \pi \cdot \eta_{mh}} = \frac{1.59 \cdot Vg \cdot \triangle P}{100}$

Power $P = \frac{2\pi \cdot T \cdot n}{6000} = \frac{q_v \cdot \triangle P}{600 \cdot \eta_t} = \frac{T \cdot n}{9549}$

L/min $Vg =$ Displacent per revolution in cm^3

$\triangle P =$ Differential pressure in bar

$n =$ Speed in rpm

Nm $\eta_v =$ Volumetric efficency

$\eta_{mh} =$ Mechanical hydraulic efficiency

Kw $\eta_t =$ Total efficiency

Technical Data

Hydraulic Fluid

Before starting project planning, please refer to standard Gb11118. 1-2011.For detailed information regarding the choice of hydraulic fluid and application conditions..
HM68 hydraulic fluid is suitable for WHPVMF

Viscosity range of operating oil

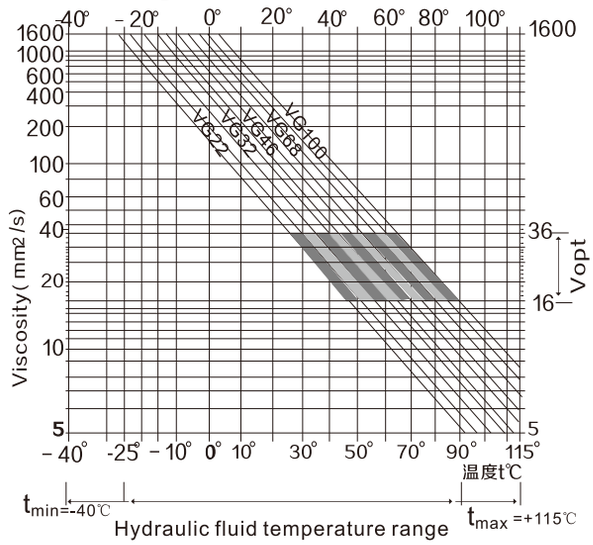
For get Optimal service life, we recommend that the working viscosity (at operating temperature) be selected in the following range:
Vopt=Optimum working viscosity 16.....36mm2/s
Depends on the tank's temperature (closed circuit).

Viscosity limit range

The viscosity limit values are as follows:

Vmin= 5mm/s	Vmax= 1600mm/s
Short time (t<3 min)	Short time (t<3 min)
Maximum allowable	Cold start (p≤30bar, n≤
temperature tmax=+115°C	1000tin=≤-40 C) rpm

Selection Diagram



The above is only applicable to no load start and can reaching the best working viscosity in about 15 minutes.
Please note, The maximum allowable hydraulic oil's temperature of 115° should not be exceeded even locally (such as the bearing area). Bearing's temperature base on pressure and speed, it is up to 5K higher than the average shell drain temperature. When the temperature is between -25 ° C to -40 ° C (choke lever), Please contact us with it for get the special measures .
Operating temperature range (see selection in below).

Viscosity and temperature of hydraulic fluid

Viscosity[mm^2/s]	Temperature	Comment
Transport and storage at anbient temperature	Tmin≥-50℃ Top=+5℃ to +20℃	Factory preservation:up to 12months with standard, up to 24 months with long-term
(Cold) start-up[1] Vmax=1600	Tst≥-40℃	t≤3 min,without load(p≤50 bar),n≤1000 rpm
Permissible temperature difference	ΔT≤25K	between axial piston unit and hydraulic fluid
Warm-up phase v<1600 to400	T=-40℃ to-25℃	at p≤0.7•P nom,n≤0.5•n_{nom} andt≤15min
Operating phase		
Temperature difference Maximum temperature	ΔT=approx.5K 115℃ 110℃	between hydraulic fluid in the bearing and at portT in the bearing measured at portT
Continuous operation V=400 to 10 Vopt=36 to 16	T=-25℃ to+90℃	measured at port T, no restriction within the permissible data
Short-term operation V_{min}≥7	Tmax=+110℃	measured at port T,t<3min,p<0.3•p_{nom}
Shaft seal[1]	T≤+115℃	see below"Shaft seal"

At temperatures below-25℃,an NBR shaft seal is required(permissible temperature range:-40℃to+90℃).

Details regarding the choice of hydraulic fluid

The correct choice of hydraulic fluid requires knowledge of the operating temperature in relation to the ambient temperature: in a closed circuit, the circuit temperature.
The hydraulic fluid should be chosen so that the operating viscosity in the operating temperature range is within the optimum, range (Vopt see shaded area of the selection diagram). We recommended that the higher viscosity class be selected in each case.
Example: At an ambient temperature of X°C, an operating temperature of 60°C is set in the circuit. In the optimum operating viscosity range (Vopt, shaded area), this corresponds to the viscosity classes VG 46 and VG 68; to be selected: VG 68.
Note: The case drain temperature, which is affected by pressure and speed, can be higher than the circuit temperature. At no point of the component may the temperature be higher than 115°C.

Filtration of the hydraulic fluid

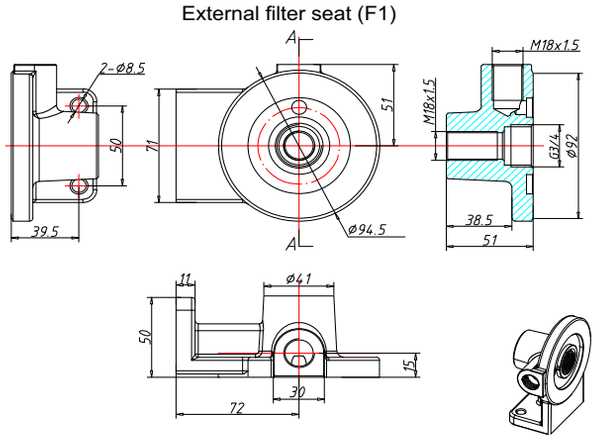
Finer filtration improves the cleanliness level of the hydraulic fluid, which increases the service life of the axial piston unit. To ensure the functional reliability of the axial piston unit, a gravimetric analysis of the hydraulic fluid is necessary to determine the amount of solid contaminant and to determine the cleanliness level according to ISO 4406.
A cleanliness level of at least 20/18/15 is to be maintained.
Depending on the system and the application, for the WHPVMF, we recommend filter's filtering precision should within 10μm.With an increasing differential pressure at the filter cartridges, the filtering precision of fliter must not deteriorate.
At very high hydraulic fluid temperatures(90℃ to maximum 115℃),a cleanliness level of at least 19/17/14 according to ISO 4406 is necessary.
The case pressure must be equal to or higher than the ambient pressure.

Shaft Seal

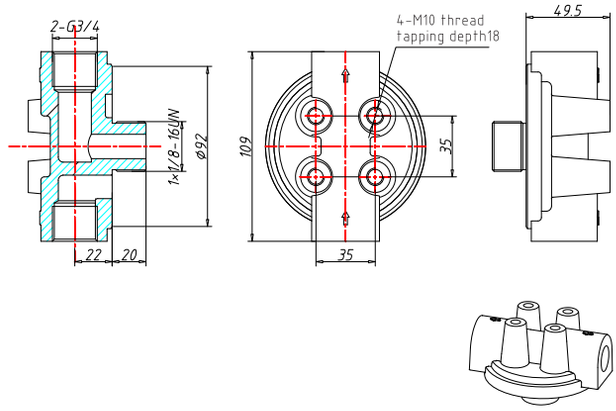
Permissible pressure loading
The service life of the shaft seal is influenced by the speed of the axial piston unit and the case drain pressure. We suggest the average of the persistent case drain pressure must not exceed 0.28 Mpa absolute pressure. When the speed decreases, the maximum permissible case drain pressure is 0.6Mpa under operating temerature. Momentary pressure spikes(t<0.1s)of up to 1Mpa are permitted. The service life the shaft seal decreases with an increase in the frequency of pressure spikes.

Filter (Dimensions in mm)

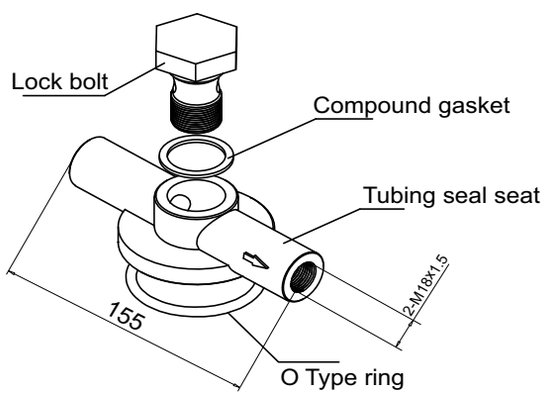
External filter seat (F1)

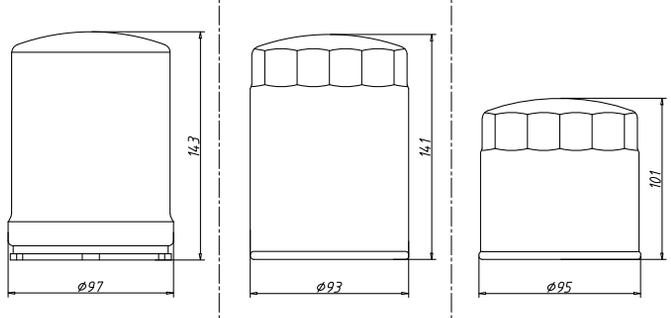


External filter seat (F2)



Pipeline seat: Suited to WHPVMF, WHPM-10, WHPM-20 series





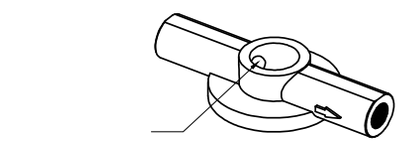


Diagram of oil circuit

Ordering code details : WHPV

Swashplate design,Variable pump = WHPV

Swashplate design,Fixed motor = MF

Displacement (mL/r): 28, 32, 37, 42, 47

Rotation:
Pump: Clockwise = R
Pump: Counter-Clockwise = L
Motor: Bi-directional

Filter:
Without filter = 01
With filter = 02

Filter Location :
Install on the pump's side = A
Install on the rear of pump = B
Install connect adapter = C

Positioner:
Without = No code
Choice positioner (It can precisely control the parking system and help simplify installation and adjustment.) = Z

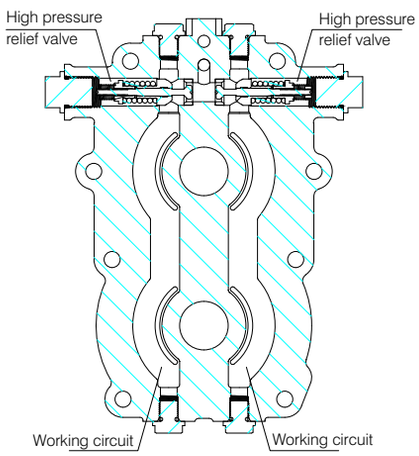
Control Hand Location:
Control hand in the left = M
Control hand in the right = N

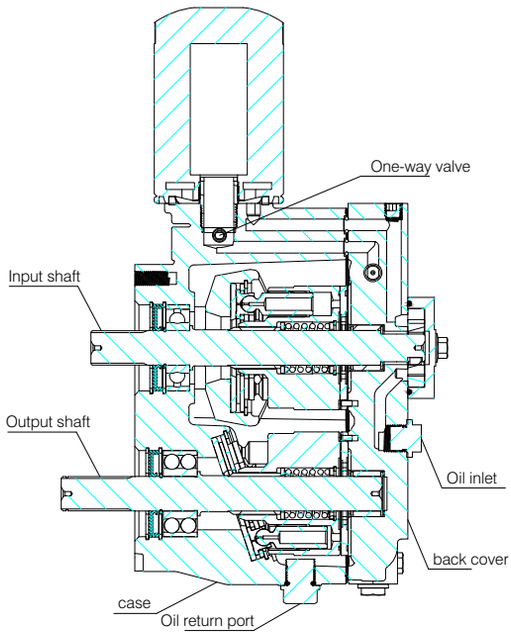
External Dimension:
Standard type = No code
Circular flange = S
Square flange = F

Technical Data

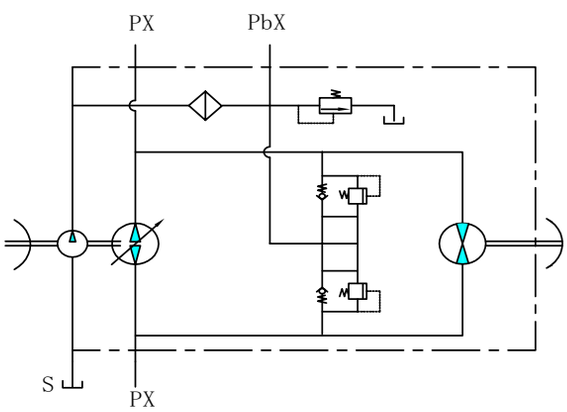
Size		28	32	37	42	47
Displacement	Pump Vg max ml/r	28	32	37	42	47
	Motor Vg max ml/r	28	32	37	42	47
	Boost Pump Vg max ml/r	7	7.2	7.3	10	10
Rotation	Input n max r/min	3000				
	Output n max r/min	0-3000				
Flow(Max)	When n max L/min	84	96	111	126	141
	When n=1500 L/min	42	48	55.5	63	70.5
Torque(Max)	When Vg max ΔP=28Mpa	124.7	142.5	164.7	186.9	209.2
	When Vg max ΔP=10Mpa	44.5	50.9	58.8	66.8	74.7
Power(Max)	Pmax power KW at n max (when n in max)	39.2	44.8	51.8	58.7	65.7
	At n=1500r/min Pmax power KW (When m=1500rpm)	19.6	22.4	25.9	29.4	32.9
Case volume	L	0.8	0.81	0.84	0.85	0.88
Weight	Kg	22.5	23	27.5	28	29.5

Hydraulic Principle Diagram

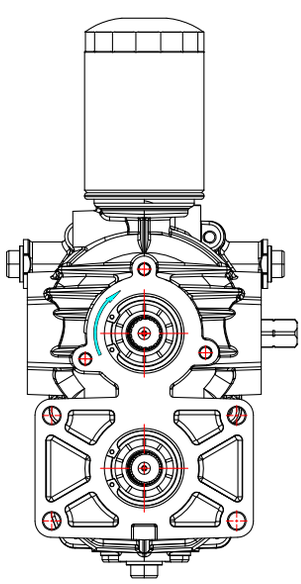




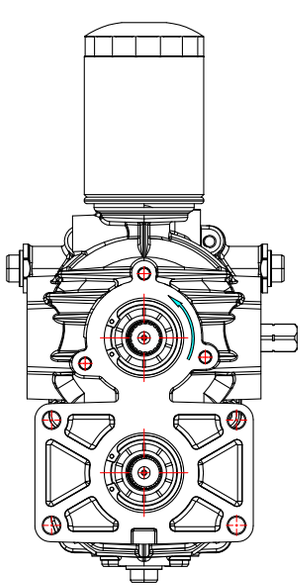
Hydraulic Schematic Diagram



Rotation Definition



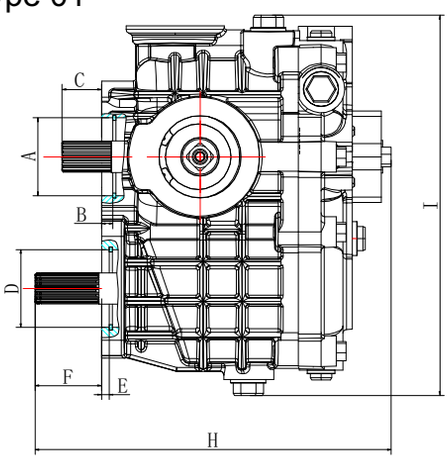
Input direction: Clockwise Marked as: R



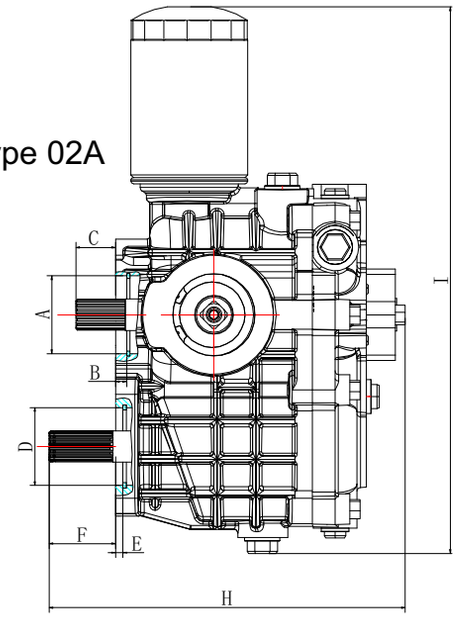
Input direction: Counterclockwise Marked as: L

Filter Location & Dimensions

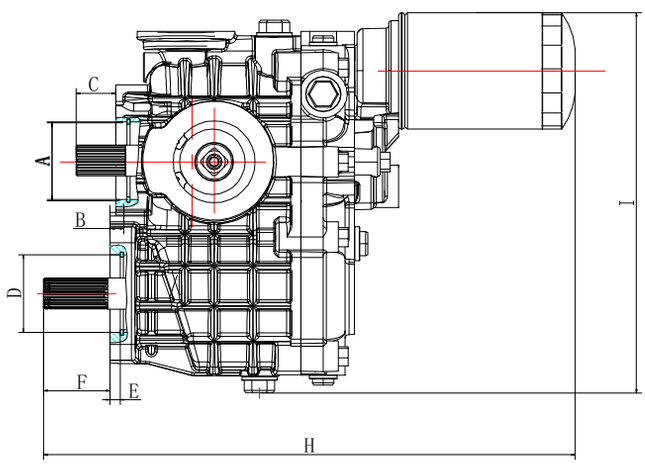
Type 01



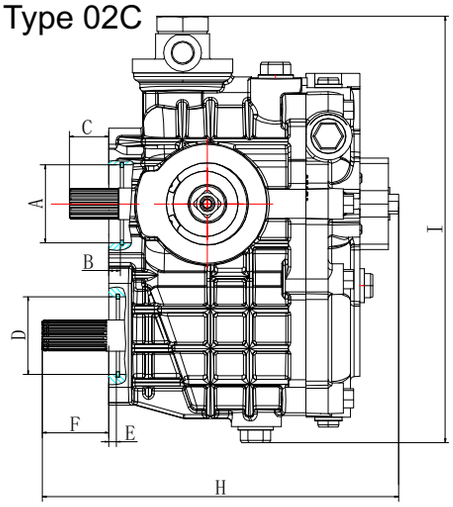
Type 02A



Type 02B

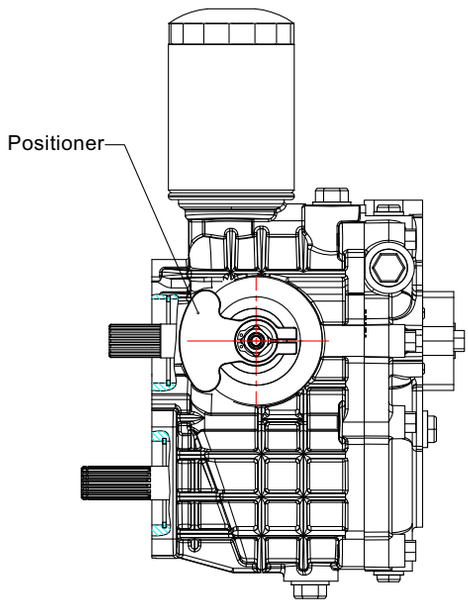


Type 02C

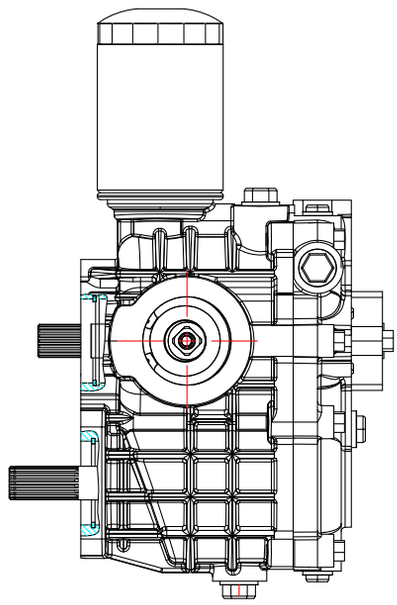


Displacement	Model	Pump flange's diameter and depth (AxB)	Pump shaft long (C)	Motor flange's diameter and depth (DxE)	The motor shaft's length (F)	Total height and total length (HxI)	Total width
28 32	01	Φ62H7*6	31.5	Φ62H7*4	53	274.5*300.5	216
	02A					274.5*430.5	
	02B					422*302.5	
	02C					274.5*332.5	
37	01	Φ62H7*11	31.5	Φ62H7*8	53	278*301	216
	02A					278*431	
	02B					425*303	
	02C					278*333	
	02A-S					288*431	
	02A-F						233
42 47	01	Φ62H7*11	31.5	Φ62H7*8	53	288*308	216
	02A					288*438	
	02B					431*309.5	
	02C					288*340	

Positioner

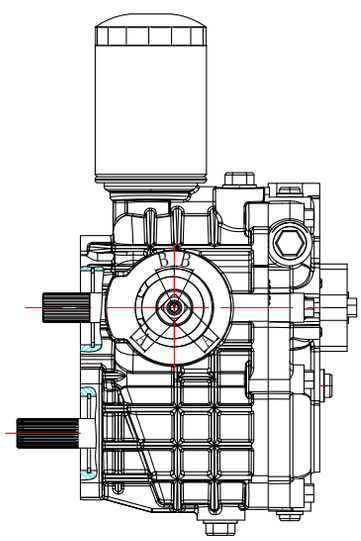


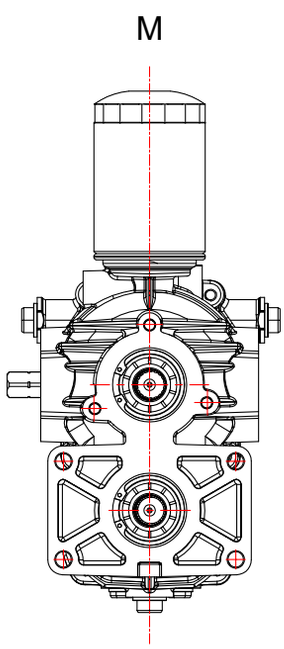
With Mark:Z



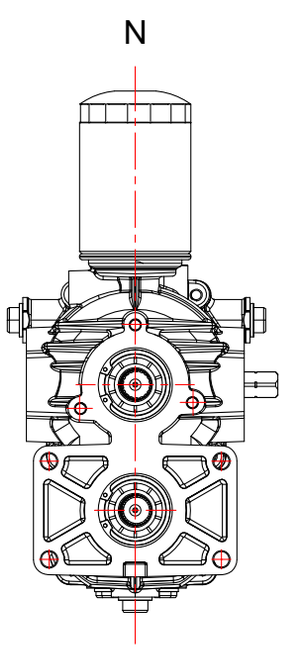
Without Mark : None

Control Hand Location





Control Hand in the left Mark:M

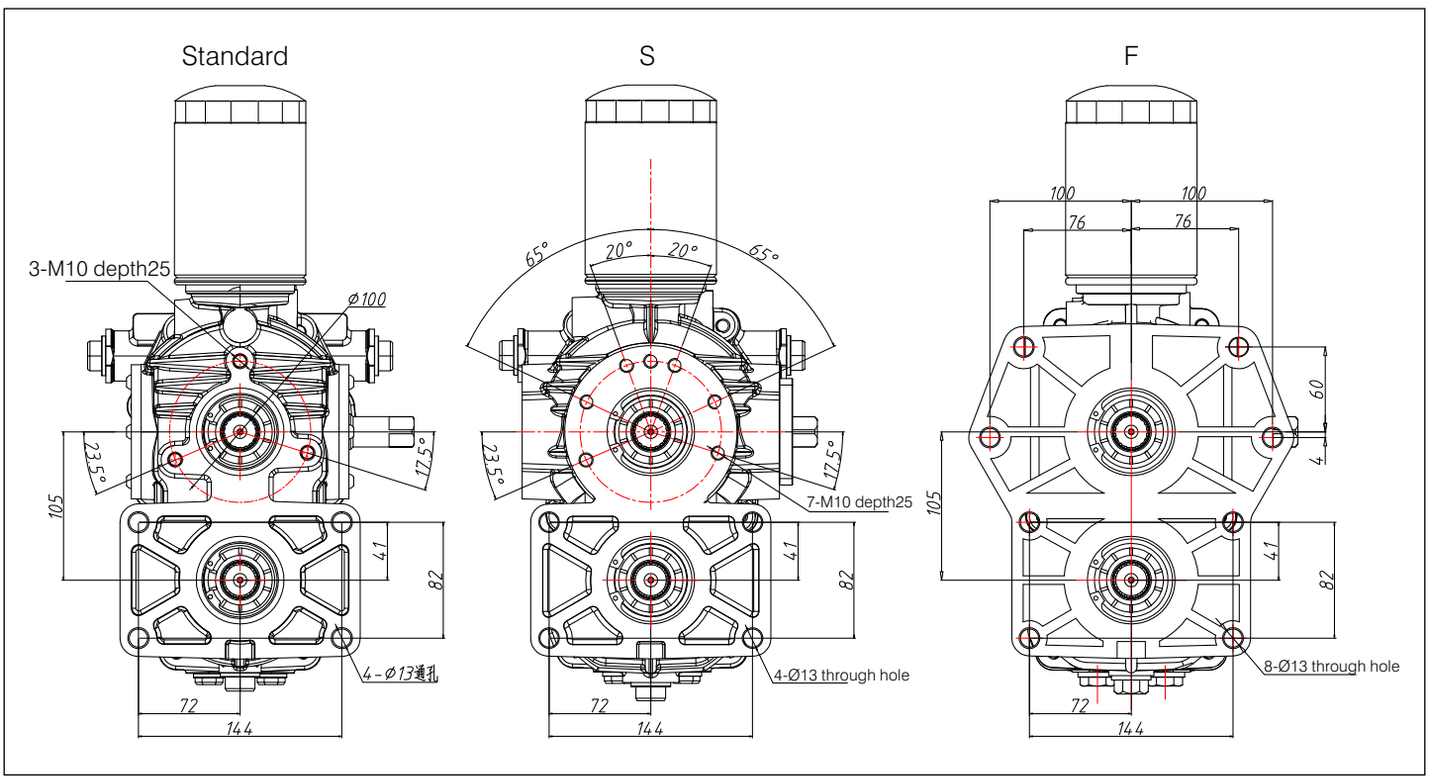


Control Hand in the right Mark:N

Control Hand's dimension and rotation angle

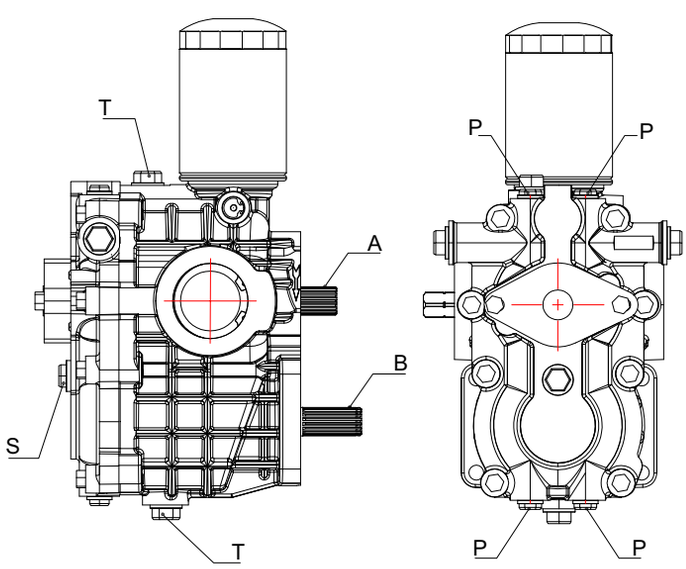
Code Name / Displacment	28	32	37	42	47
Control hand's dimension A	17*17				
Rotation angle B	±20°	±20°	±18°	±20°	±20°

External Dimension



Port Code & Spline Parameters

Port		Size
Test port	P	G1/4
Return port	T	G1/2 (G3/4 optional)
Inlet port	S	3/4-16UNF
Drive shaft A, B Involute spline parameters		
Number of teeth	Z	18
Modulus	m	1.25
Pressure angle	α	20°
Standard pitch diameter	D	Ø22.5
Major Diameter	Dri	$Ø24.6\ ^{-0}_{-0.1}$
Minor Diameter	Di	$Ø22\ ^{-0}_{-0.21}$
Modification Coefficient	X	0.8
Cross test teeth	n	3
Common normal	We	$10.15^{-0.02}_{-0.06}$



Ordering details: WHPM

Swashplate design,Variable pump = WHP

Swashplate design,Fixed motor = M

Displacement (mL/r): 47, 52, 58

Series
Model no. 10, 20, 30

Rotation:
Pump: Clockwise = R
Pump: Counter-Clockwise = L
Motor: Bi-directional

Input/output Shaft

Input	18 teeth; Φ24.6 Spindle distance table 59	OPT, Only 10	T1
Output	18 teeth; Φ24.6 Spindle distance table 56		
Input	18 teeth; Φ24.6 Spindle distance table 50	OPT, Only 20	T2
Output	18 teeth; Φ24.6 Spindle distance table 56		
Input	18 teeth; Φ24.6 Spindle distance table 50		T2B
Output	18 teeth; Φ24.6 Spindle distance table 37		
Input	18 teeth; Φ24.6 Spindle distance table 32.3	OPT, Only 30	T3
Output	18 teeth; Φ24.6 Spindle distance table 56		
Input	18 teeth; Φ24.6 Spindle distance table 32.3		T4
Output	18 teeth; Φ24.6 Spindle distance table 40.3		
Input	18 teeth; Φ24.6 Spindle distance table 32.3		T5
Output	18 teeth; Φ19.73 Spindle distance table 91.1 (with thread M12*1.25)		

Input / Output flange dimension:
Detail Check P15 = DT1, DT2, DT3, DT4, DT5, DT6

Control Hand Location:
Control hand in the left = M
Control hand in the right = N

Control Mode:
Machinery control = MC
Machinery servo control = HW
Electric proportional control
U=12VDC = EP3
U=24VDC = EP4

Filter:
None filter = N
With filter = A
External filter = C

Hydraulic system design requirements

1. Considering the working environment of the main engine, closed fuel tank should be used and air filter should be installed. At the same time, the system oil tank shall be reasonably set to ensure that the inlet pressure is not less than 0.08mpa, otherwise the oil pump will be empty. The minimum cleanliness level is IS0440616/19.
2. Set the cooler reasonably, so that when the main engine is working continuously, the working oil temperature of the system does not exceed the maximum allowed oil temperature of the product 80℃.
3. Reasonable design of system pipeline, so that the oil return pressure of the shell does not exceed 0.15mpa.

Installation and use

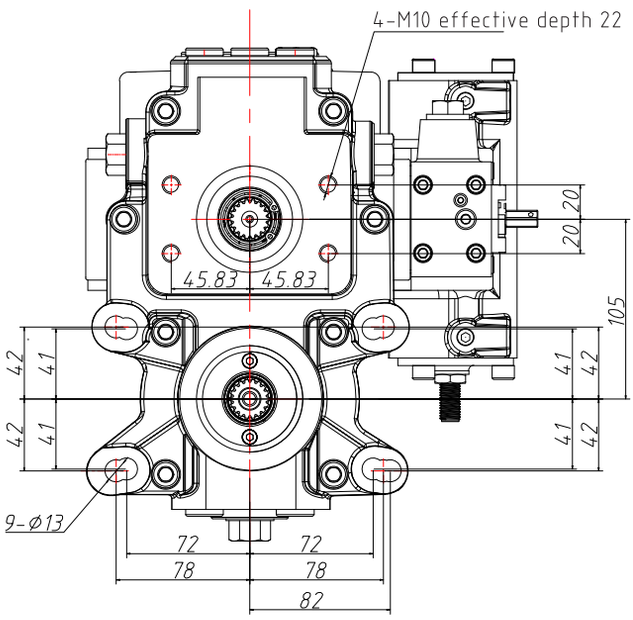
1. The coaxiality error between the output drive shaft and the pump input shaft should be less than φ 0.05, and installation size of the motor output shaft and the pump input shaft should be 105±0.025.
2. All pipe joints, plugs and measuring joints connected with the hydraulic system must be kept clean to avoid any particle impurities entering the hydraulic system.
3. Before the main engine starts, each pipe in the system should be filled with hydraulic oil. Otherwise, the product will be damaged due to poor lubrication.
4. When the main engine is operating, forward, backward and reversing should be stable to reduce impact and improve service life. If there are abnormal phenomena in the use of the main engine, such as ineffective operation, weak walking, screaming, etc., it should be stopped immediately and checked until the fault is removed.

Maintain

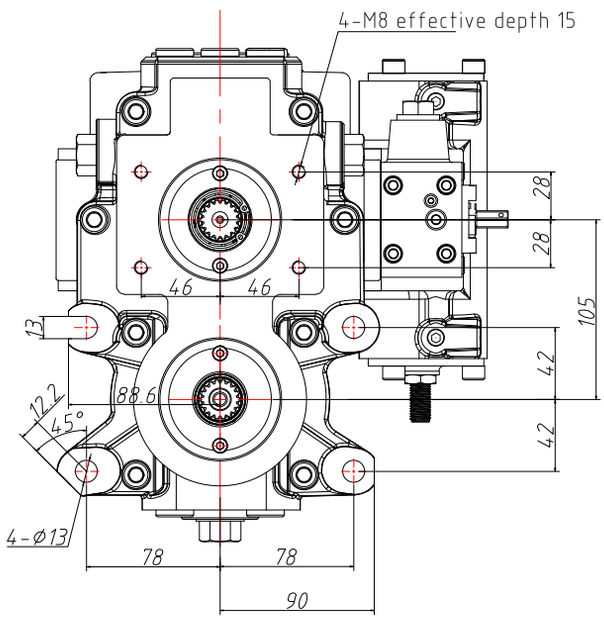
1. Hydraulic oil: It is recommended to use VA46 # antibody hydraulic oil, the oil pollution level is not lower than NAS16389. The working oil temperature is -20 C-+80 C, and the replacement period is generally 600 hours. If the hydraulic oil is polluted by water or other external substances or suffers abnormal operation, the hydraulic oil should be replaced in time according to the specific situation.
2. Filter: If the filter with belt is selected, it is recommended to replace it after 100 hours of first use, and it is recommended to replace it once after 600 hours.
3. Radiator: The maximum output power can be obtained when the oil temperature is normal. Therefore, it is necessary to regularly check whether the outside of the system radiator is blocked and clean it.

Edition

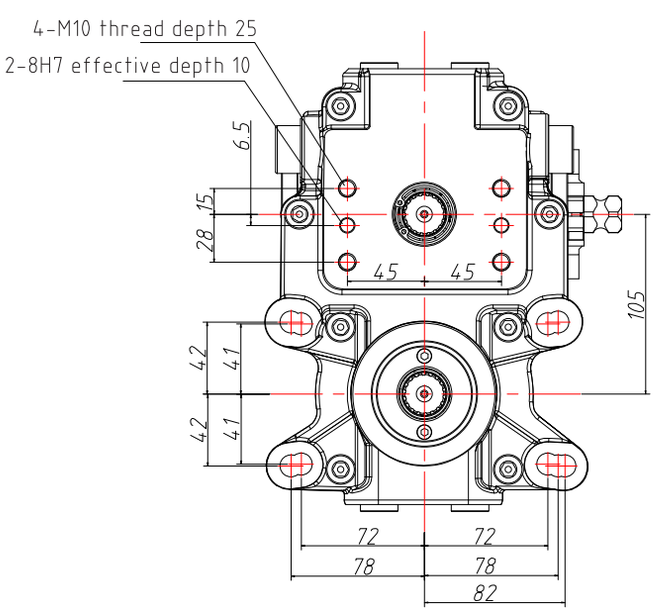
Edition 10



Edition 20

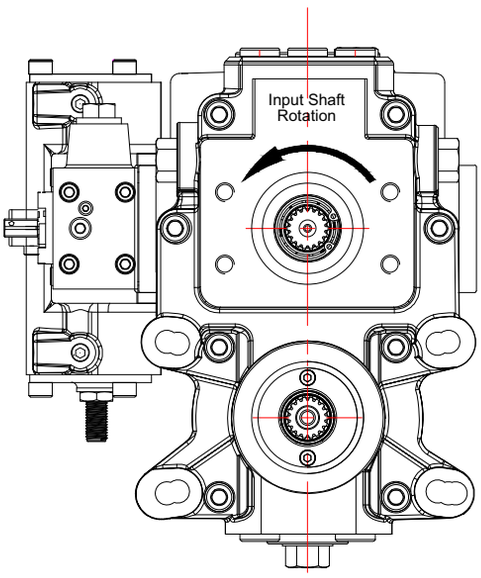


Edition 30

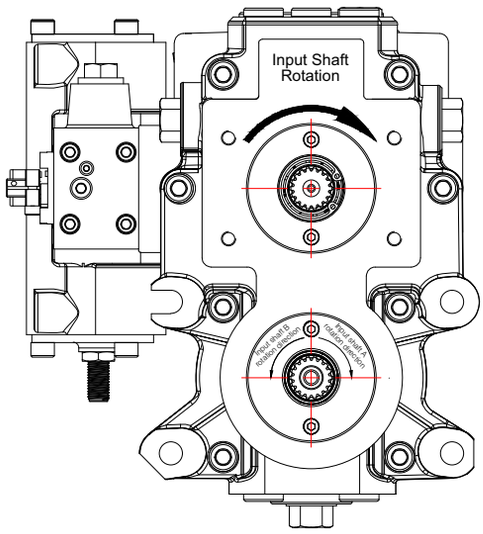


Rotation

10/20Edition

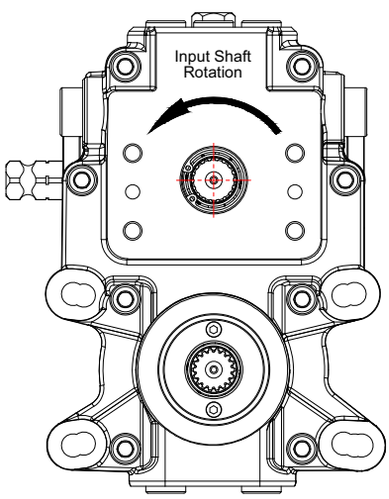


Input Rotation (CCW) Mark (L)

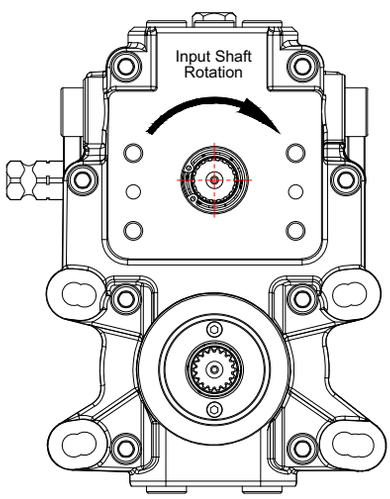


Input Rotation (CW) Mark (R)

30 Edition



Input Rotation (CCW) Mark (L)

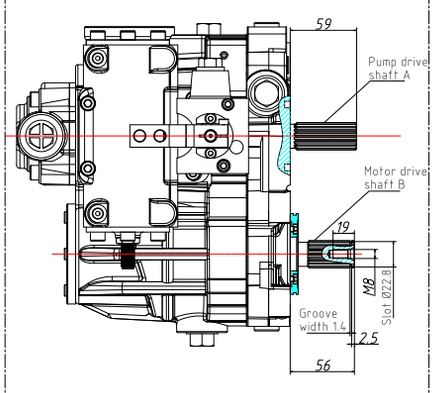


Input Rotation (CW) Mark (R)

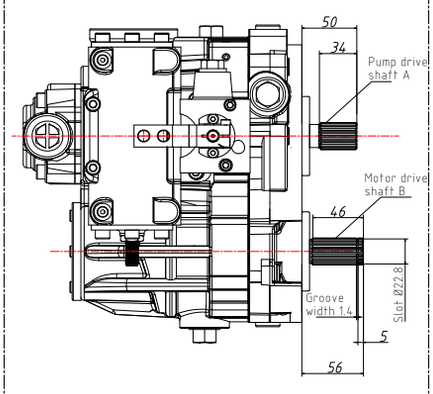
Input/output Shaft

Involute spline parameters		Pump drive shaft A	Motor drive shaft B	Motor drive shaft C
Number of teeth	Z	18	18	18
Modulus	m	1.25	1.25	1.05833
Pressure angle	a	20°	20°	25°
Standard pitch diameter	D	Ø22.5	Ø22.5	Ø18
Major diameter	Dri	$Ø24.6-^{0}_{0.1}$	$Ø24.6-^{0}_{0.1}$	Ø19.37±0.05
Minor diameter	Di	$Ø22-^{0}_{0.21}$	$Ø22-^{0}_{0.21}$	$Ø17.5-^{0}_{0.21}$
Modification coefficient	X	0.8	0.8	0.7
Cross-test teeth	n	3	3	3
Common normal	We	$10.15^{-0.02}_{-0.06}$	$10.15^{-0.02}_{-0.06}$	8.1±0.02

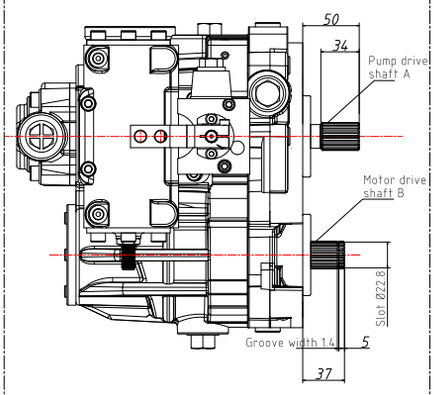
T1



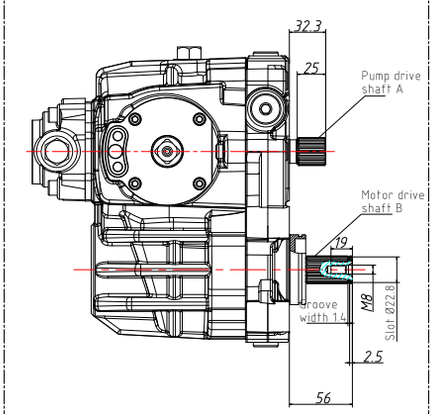
T2



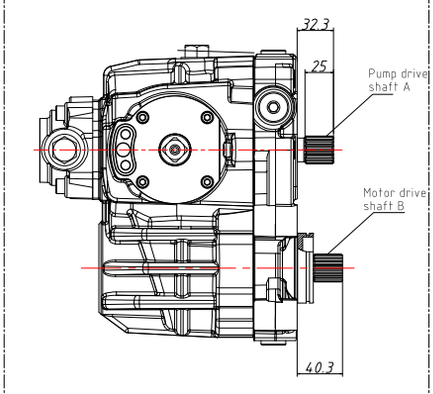
T2B



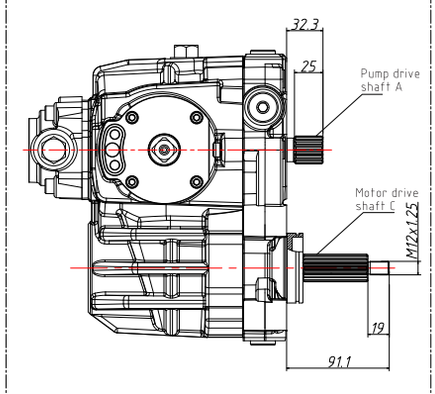
T3



T4

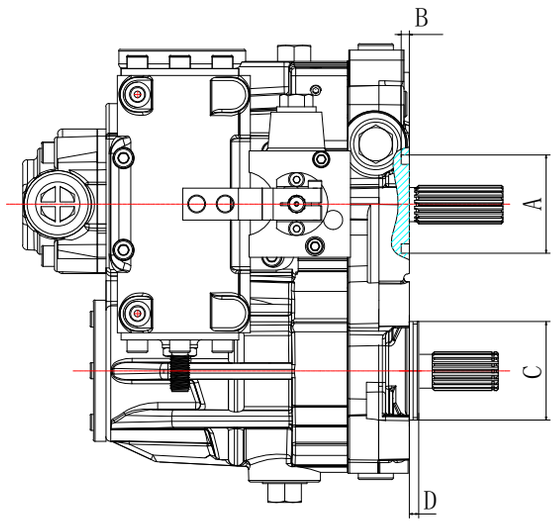


T5



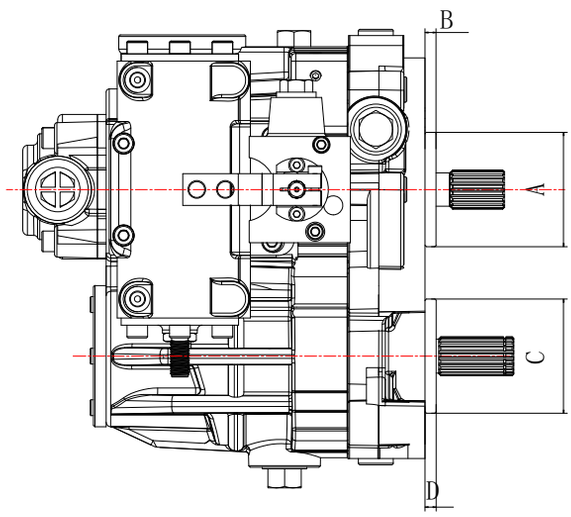
Input / Output flange dimension

Edition 10 - T1				
Select flange type	Pump shaft flange diameter A	Pump shaft flange thickness B	Motor drive shaft flange the diameter of the C	Motor drive shaft flangeThe thickness of the D
DT1	Dent Inside Ø50 * Outside Ø62	Depth 5	Ø62	6
DT2				11.5
DT3				14
DT4			Ø72	7
DT6				9



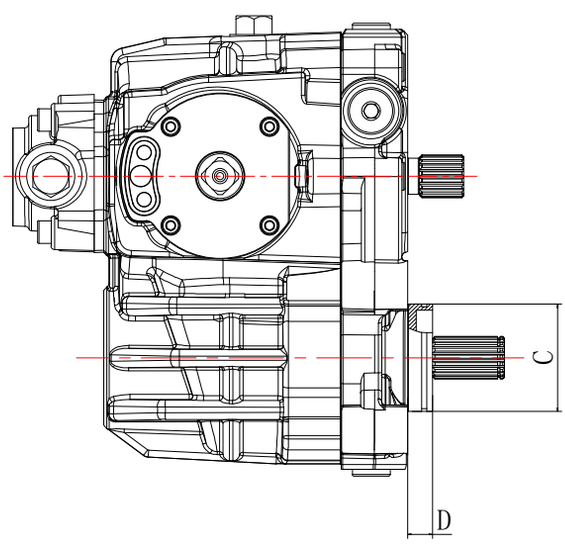
Edition 10 - T1

Edition 20 - T2, T2B				
Select flange type	Pump shaft flange diameter A	Pump shaft flange thickness B	Motor drive shaft flange the diameter of the C	Motor drive shaft flange the thickness of the D
DT5	Ø72	7	Ø72	7



Edition 20 - T2、T2B

Edition 30 - T3, T4, T5		
Select flange type	Motor drive shaft flange the diameter of the C	Motor drive shaft flange the thickness of the D
DT1	Ø62	6
DT2		11.5
DT3		14
DT4	Ø72	7
DT6		9

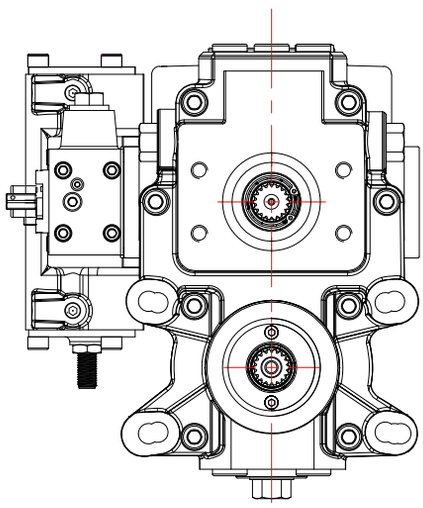


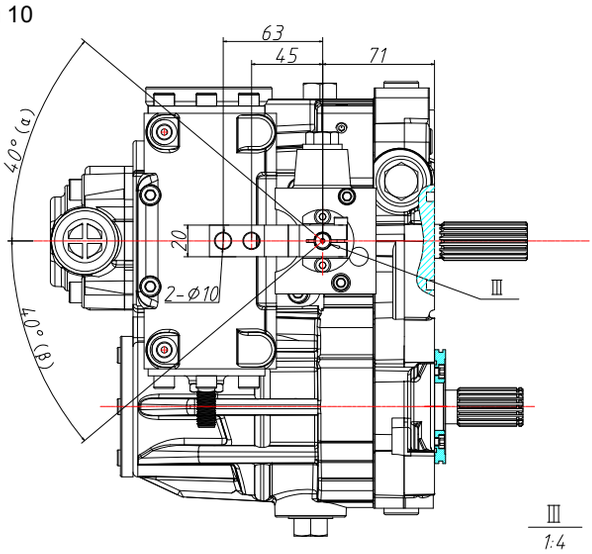
Edition 30 - T3、T4、T5

Control Hand Location

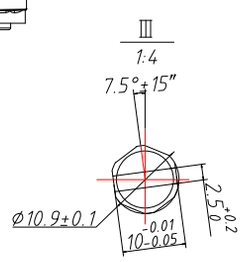
Input Rotation	Choice Positioner	α	β	Remark
L	M	CW	CCW	Match the output shaft's rotation
	N	CCW	CW	
R	M	CCW	CW	
	N	CW	CCW	

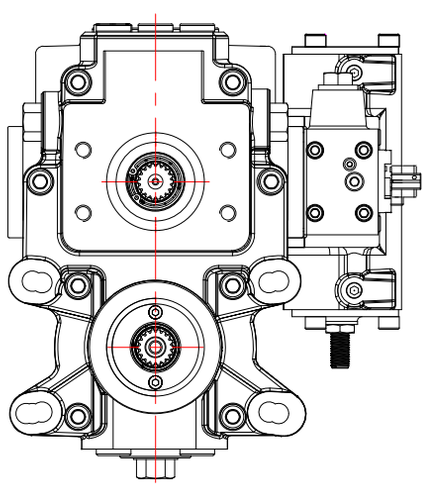
Edition 10

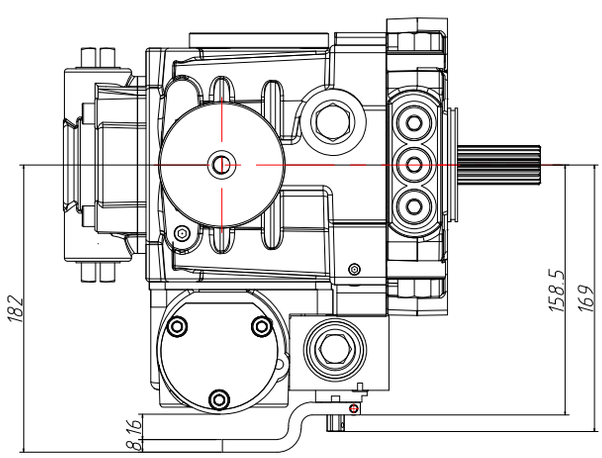




Control Hand in the left Mark:M



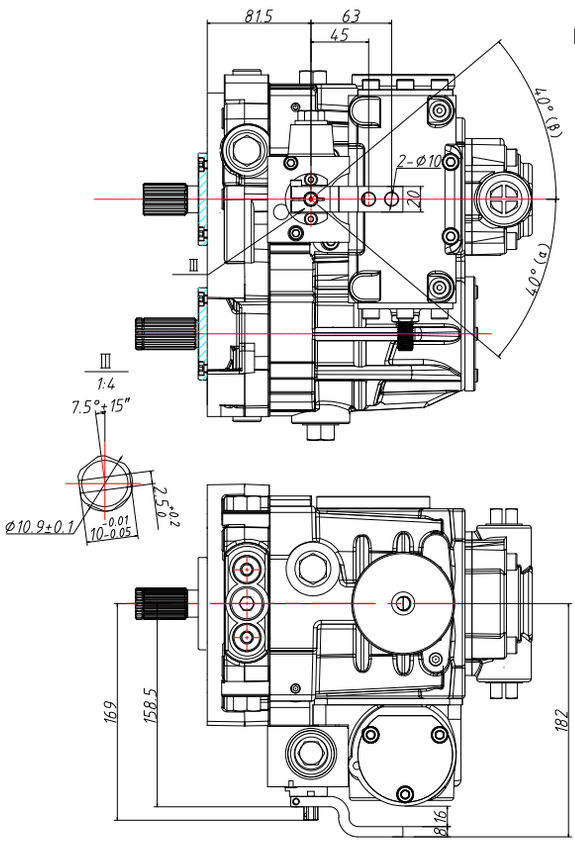


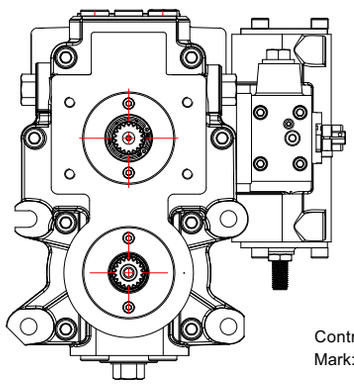


Control Hand in the right Mark:N

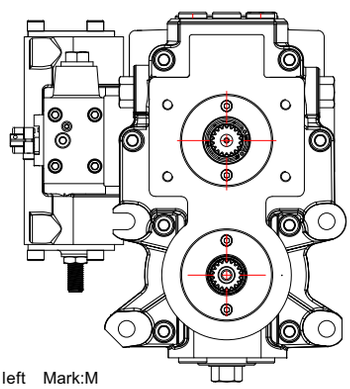
Control Hand Location

Edition 20



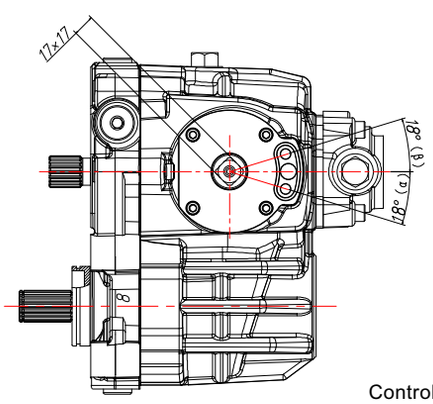


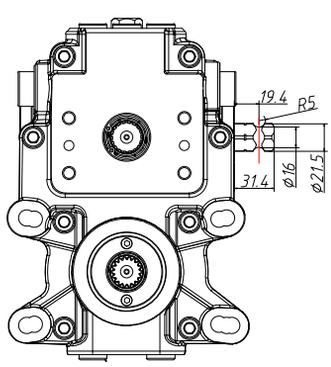
Control Hand in the right
Mark:N



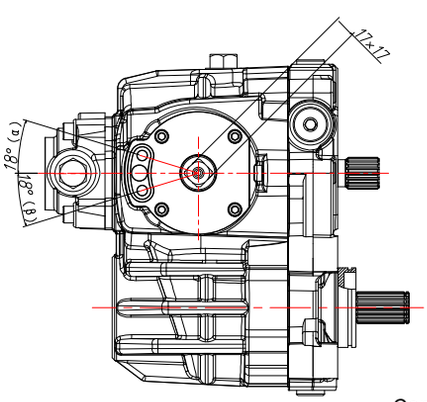
Control Hand in the left Mark:M

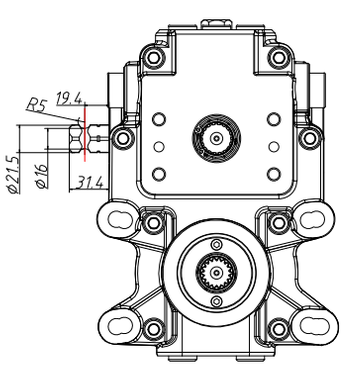
Edition.30





Control Hand in the right Mark:N

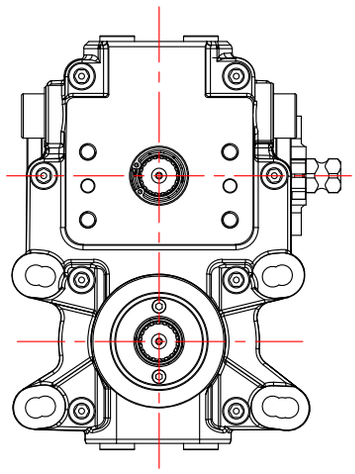


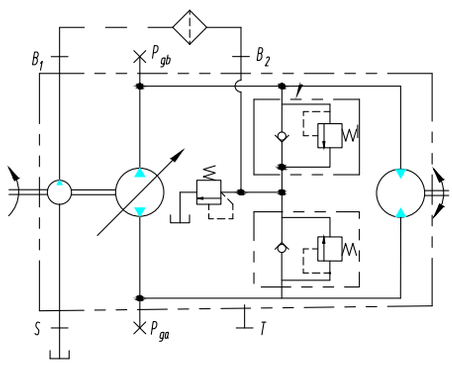


Control Hand in the left Mark:M

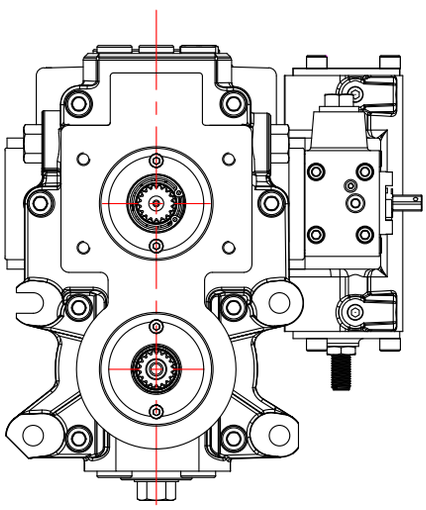
Control Mode

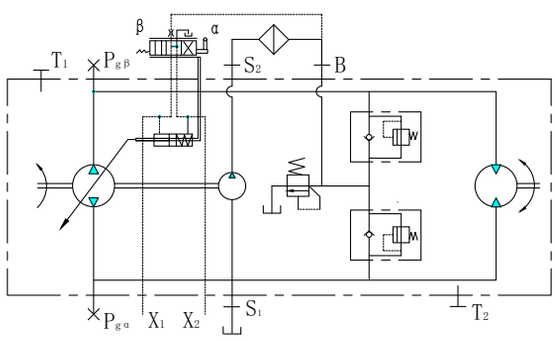
MC



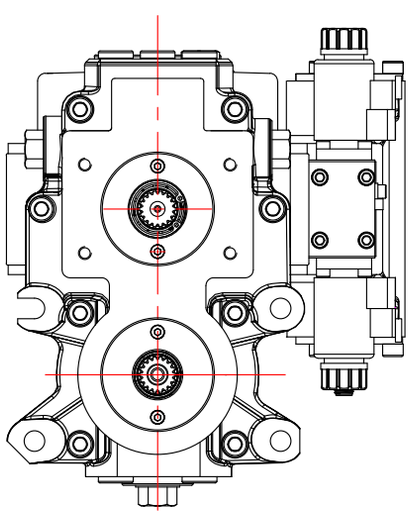


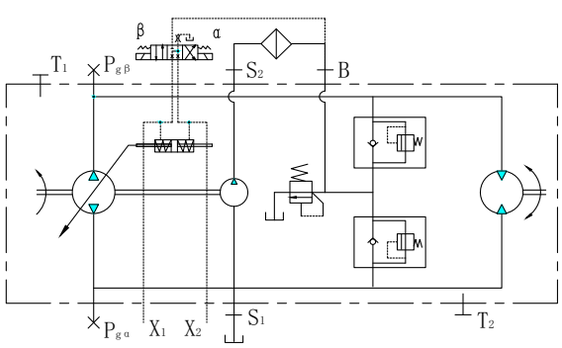
HW



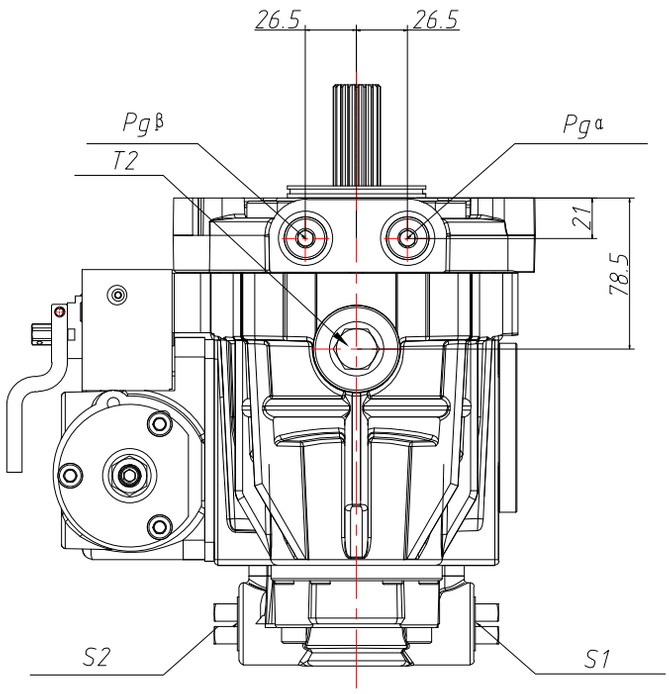


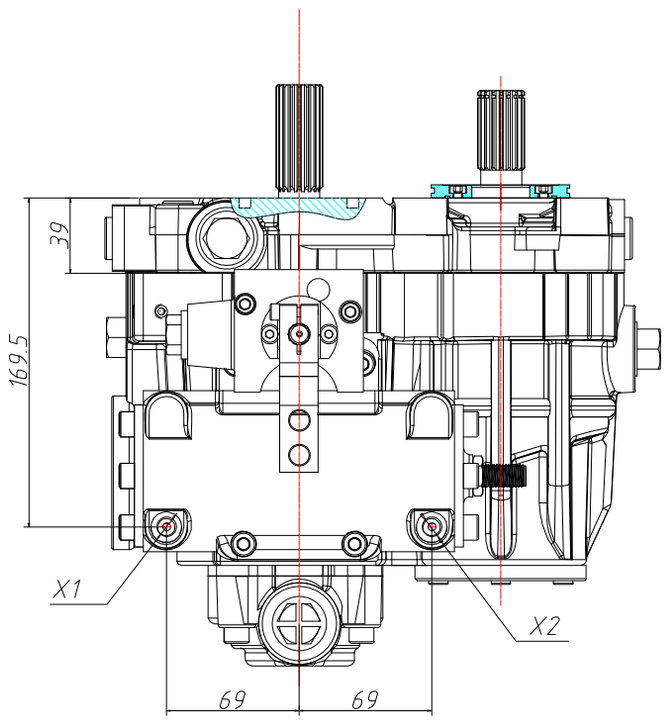
EP3/EP4



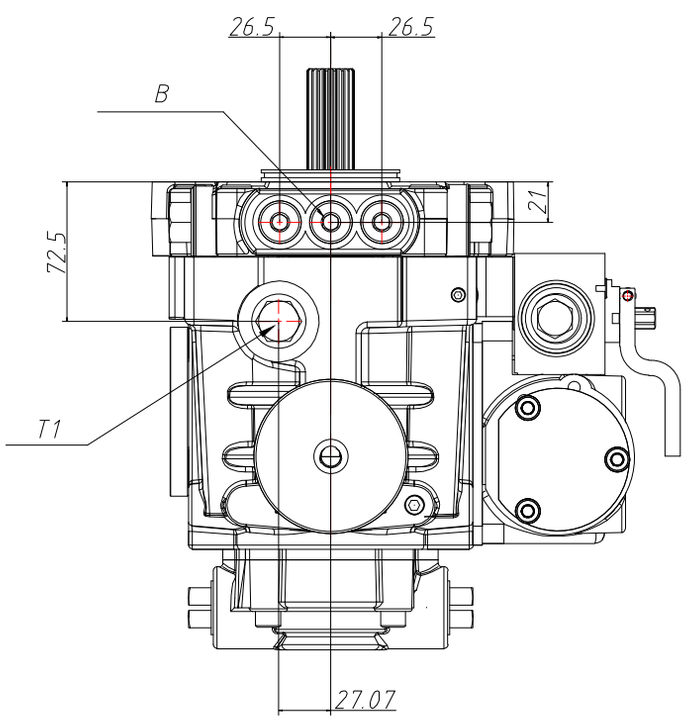


Port size: Edition 10





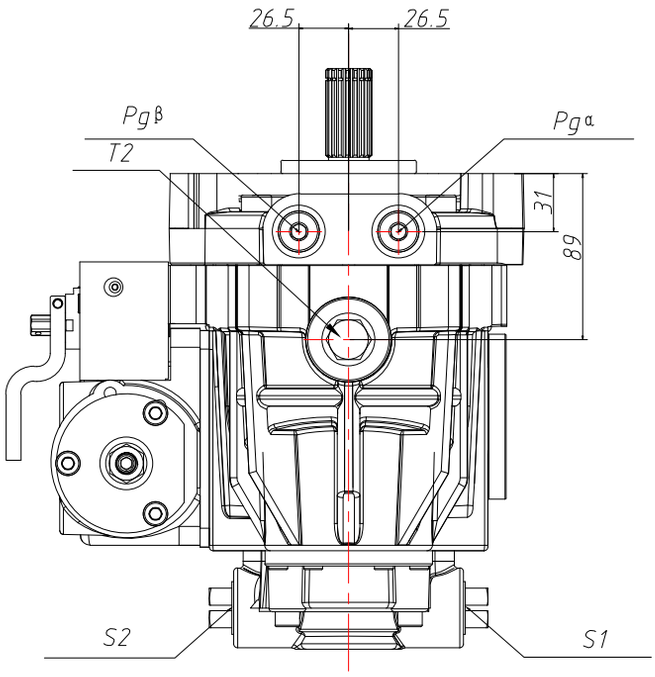
Ps: This diagram is only used for the structure of the external filter, Other structures are shown in the table on the right.

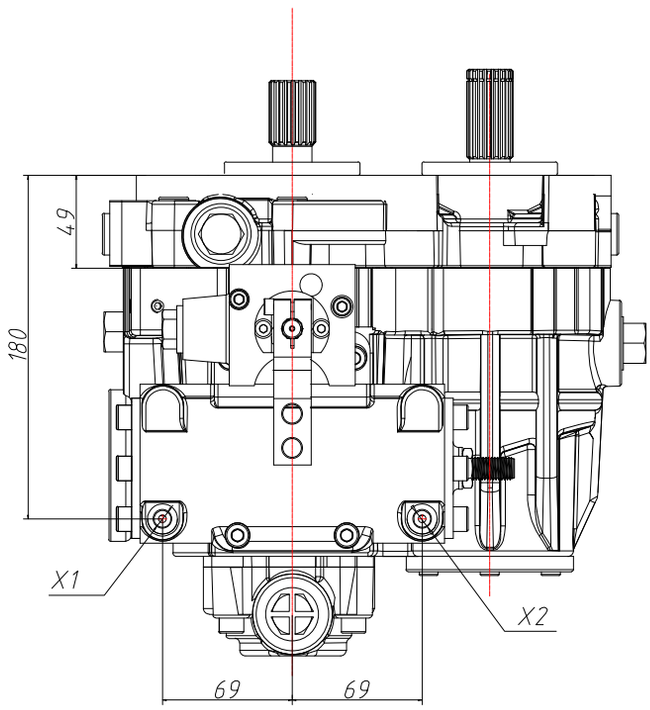


The relationship between Filter structure and Charge pump's direction (Edition 10 and 20)				
Filter	Rotation	Control hand	Charge pump inlet	Charge pump outlet
External	L/R	N/M	S1	S2
Overall		N	S2	
		M	S1	

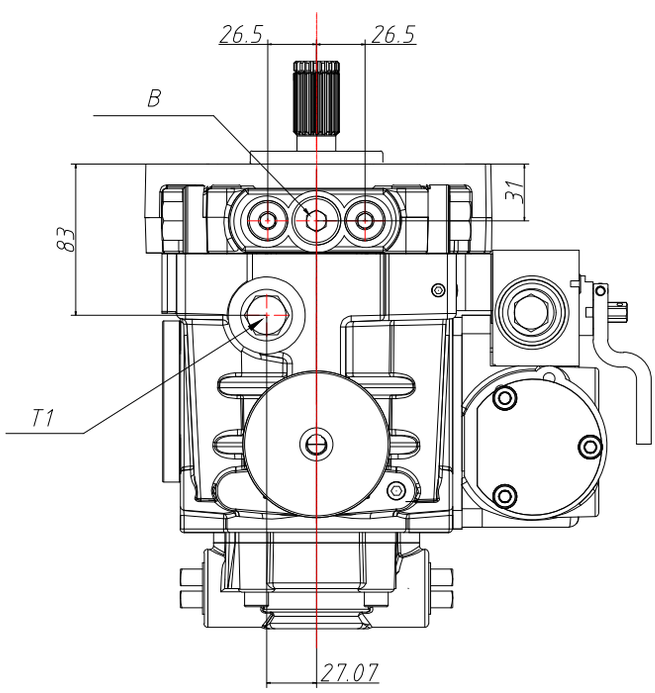
Specification for Screw Jack Dimensions (Edition 10 and 20)		
Code	Name of oil port	Specifications and Interface Standard Indicates the interface name
S1	Feed pump inlet	G3/4" 0-RING BOSS (JIS B2351)
S2	Feed pump outlet	G1/2" 0-RING BOSS (JIS B2351)
B	Valve body low pressure oil inlet	G3/8" 0-RING BOSS (JIS B2351)
P_{ga} ,$P_{g\beta}$	Pressure detection port	G3/8" 0-RING BOSS (JIS B2351)
T_1,T_2	Drainage port	G3/4" 0-RING BOSS (JIS B2351)
X_1,X_2	Hydraulic brake interface	M10x1(thread length 10) flat seal

Port size: Edition 20





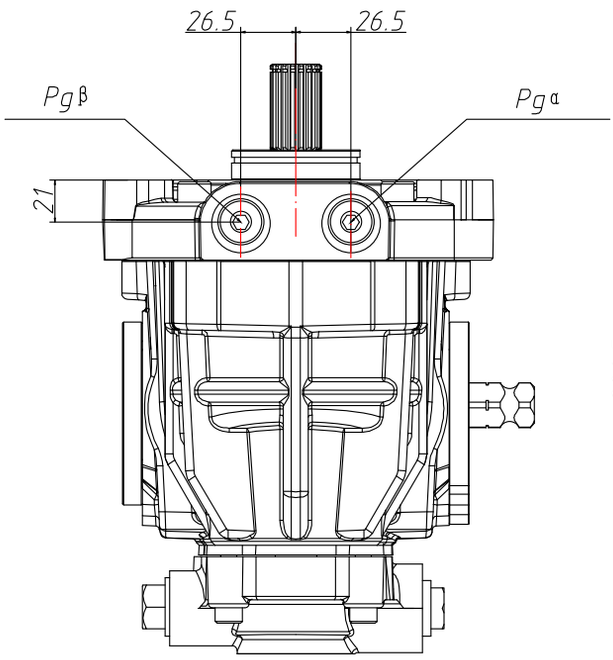
Ps: This diagram is only used for the structure of the external filter, Other structures are shown in the table on the right.

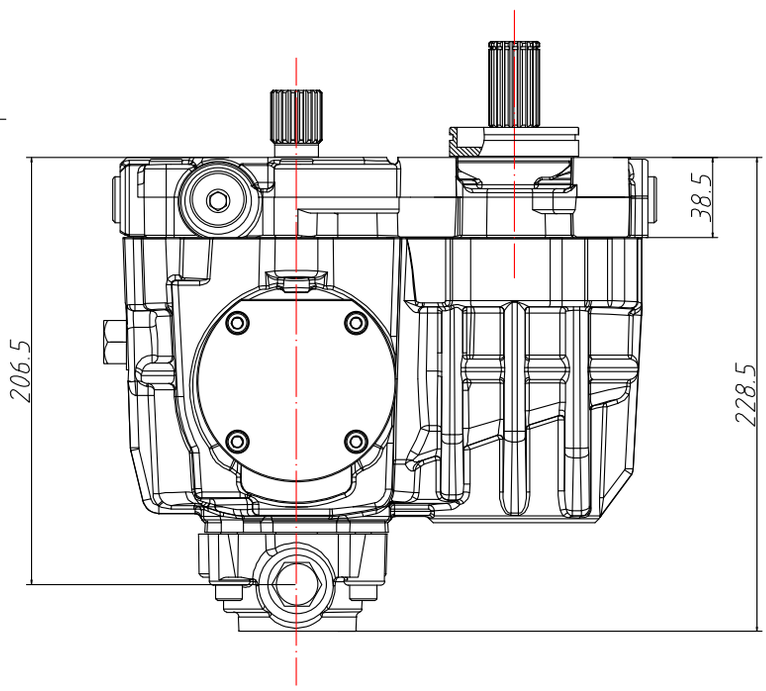


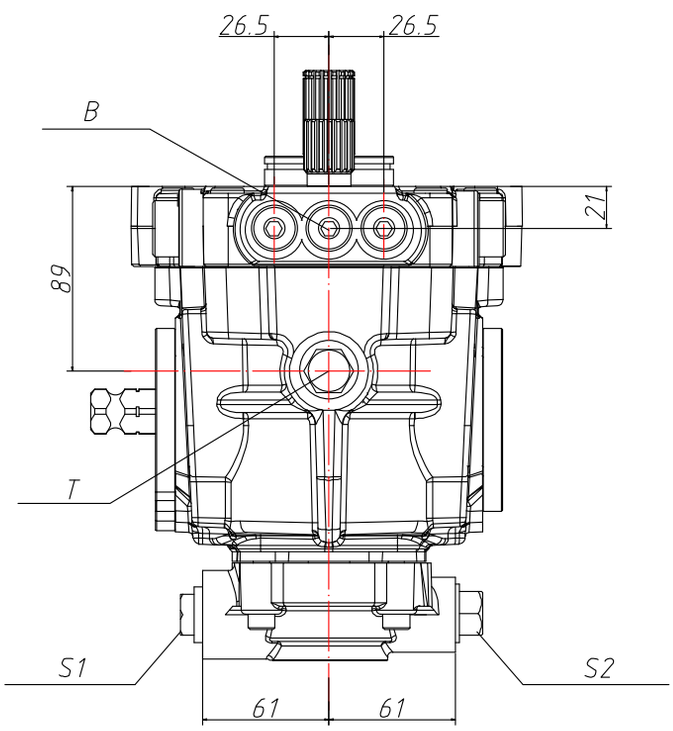
The relationship between Filter structure and Charge pump's direction (Edition 10 and 20)				
Filter	Rotation	Control hand	Charge pump inlet	Charge pump outlet
External	L/R	N/M	S1	S2
Overall		N	S2	
		M	S1	

Specification for Screw Jack Dimensions (Edition 10 and 20)		
Code	Name of oil port	Specifications and Interface Standard Indicates the interface name
S1	Feed pump inlet	G3/4" 0-RING BOSS (JIS B2351)
S2	Feed pump outlet	G1/2" 0-RING BOSS (JIS B2351)
B	Valve body low pressure oil inlet	G1/2" 0-RING BOSS (JIS B2351)
$P_{g\alpha}$,$P_{g\beta}$	Pressure detection port	G3/8" 0-RING BOSS (JIS B2351)
T_1,T_2	Drainage port	G3/4" 0-RING BOSS (JIS B2351)
X_1,X_2	Hydraulic brake interface	M10x1(thread length 10) flat seal

Port size: Edition 30







Specification for Screw Jack Dimensions (Edition 30)		
Code	Name of oil port	Specifications and Interface Standard Indicates the interface name
S1	Feed pump inlet	G3/4" 0-RING BOSS (JIS B2351)
S2	Feed pump outlet	G1/2" 0-RING BOSS (JIS B2351)
B	Valve body low pressure oil inlet	G3/8" 0-RING BOSS (JIS B2351)
$P_{g\alpha}$,$P_{g\beta}$	Pressure detection port	G3/8" 0-RING BOSS (JIS B2351)
T	Drainage port	G1/2" 0-RING BOSS (JIS B2351)

Ordering details: WHU

Swashplate design,Variable pump = WH

Swashplate design,Fixed motor = U

Displacement (mL/r): 20

Rotation:
Pump: Clockwise = R
Pump: Counter-Clockwise = L
Motor: Bi-directional

Input/output Shaft

Input	Internal spline 9 teeth; root Φ12.89, depth 21	Charge pump (P1) is available option	T1
	Shaft outer diameter: 22, flat key: A6*36		
Output	14 teeth; Φ19.7 end face distance 37		
Input	14 teeth; Φ19.7 end face distance 45.5	Charge pump are not available option	T2
	Shaft outer diameter: 22, flat key: A6*36		
Output	14 teeth; Φ19.7 end face distance 37		
Input	14 teeth; Φ19.7 end face distance 45.5	Standard with Charge pump(P2)	T3
	Shaft outer diameter: 22, flat key: A6*36		
Output	14 teeth; Φ19.7 end face distance 37		
Input	14 teeth; Φ19.7 end face distance 45.5	Standard with Charge pump(P2)	T4
Output	14 teeth; Φ19.7 end face distance 37		

Charge Pump:
None = N
Charge pump (option only for T1 shaft) = P1
Charge pump (option only for T3 or T4 shaft) = P2

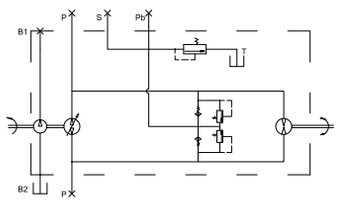
Control Hand Location:
Control hand in the left = M
Control hand in the right = N

Technical Data									
Displacement		Charge pump disp.	Input speed		System pressure		Factory set pres.	Charge pump pres.	Weight
Pump Vg max mL/r	Motor Vg max mL/r	mL/r	Rated n max r/min	Maximum n max r/min	Rated n max Mpa	Maximum n max Mpa	Mpa	Mpa	Kg
0~21	20	3.5	3400	3800	30	34.5	30	3.5 max	14

Mounting Dimension

Port	Size
T	3/4 - 16UNF
S	9/16 - 18UNF
B1,B2	NPT3/8

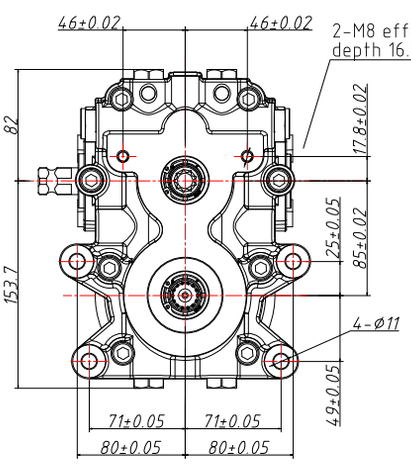
Hydraulic schematic diagram

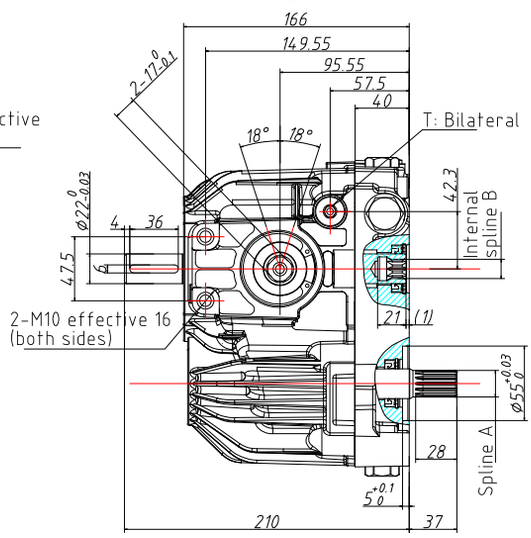


Drive shaft A involute spline parameters		
Number of teeth	Z	14
Modulus	m	1.25
Pressure angle	α	20°
Standard pitch dia.	D	Ø17.5
Major diameter	Dri	Ø19.7-0.1
Minor diameter	Di	Ø17-0.1
Modification coefficient	X	0.65
Cross-test teeth	n	3
Common normal	We	10.04±0.02

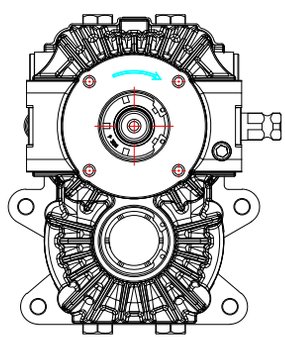
B Parameter table of internal spline	
Number of teeth	9
Diameter pitch	16/32
Modulus	1.5875/0.79375
Pressure angle	30°
Base diameter	Ø12.373
Reference circle	Ø14.288
Addendum circle	Ø17.526 MAX
Compression diameter	15.977
Root circle	12.890

No Charge Pump:N

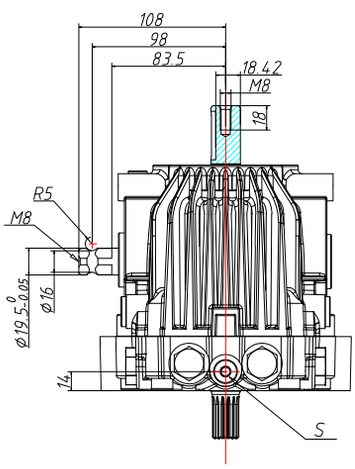




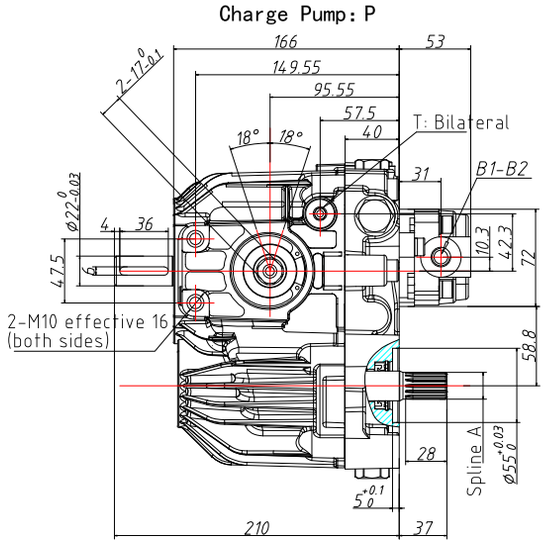
Rotation:R



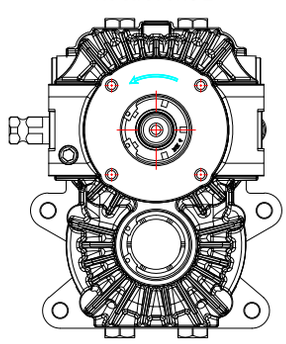
Control hand on the right side through shaft side Φ22 Mark:N



Charge Pump: P

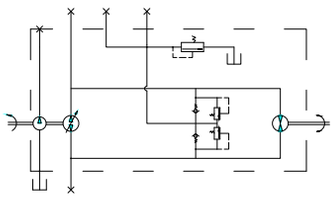


Rotation:L



Control hand on the left side through shaft side Φ22 Mark:M

Mounting Dimension

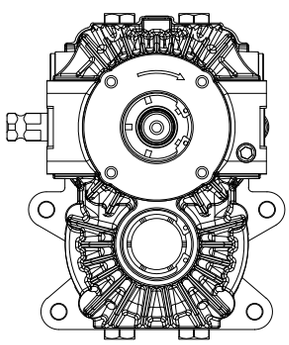


Hydraulic schematic diagram

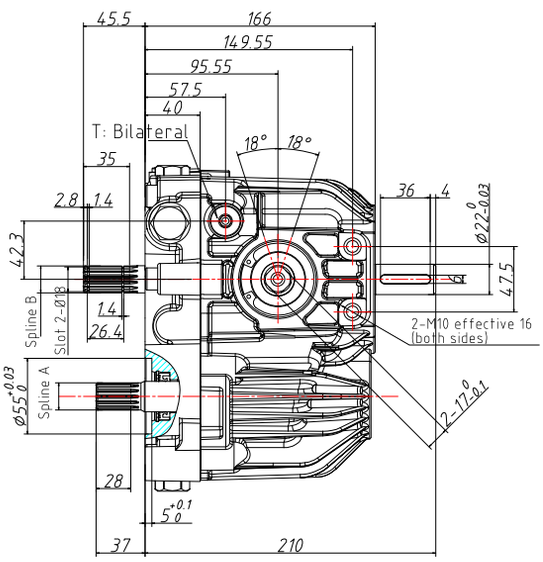
Port	Size
T	3/4 - 16UNF
S	9/16 - 18UNF

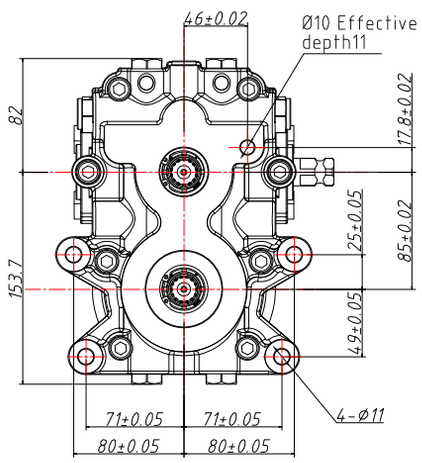
Drive shaft A, B involute spline parameters		
Number of teeth	Z	14
Modulus	m	1.25
Pressure angle	α	20°
Standard pitch dia.	D	Ø17.5
Major diameter	Dri	Ø19.7-0.1
Minor diameter	Di	Ø17-0.1
Modification coefficient	X	0.65
Cross-test teeth	n	3
Common normal	We	10.04±0.02

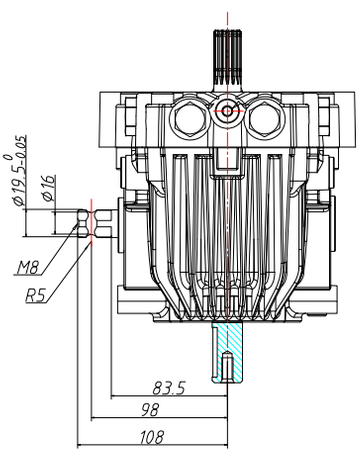
Rotation: R

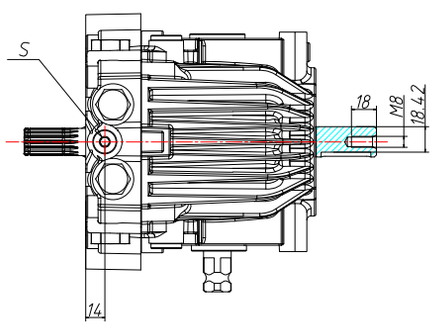


Control hand on the left side
through shaft side Ø22 Mark: M

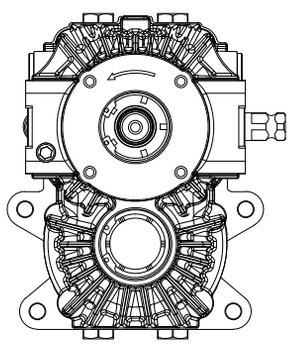








Rotation: L

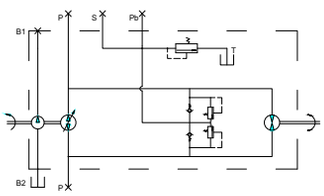


Control hand on the right side
through shaft side Ø22 Mark: N

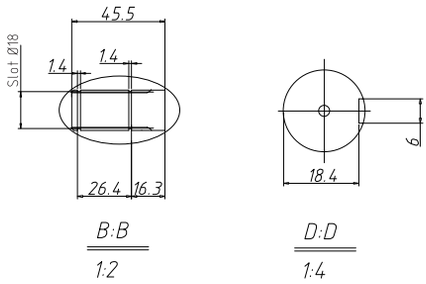
Mounting Dimension

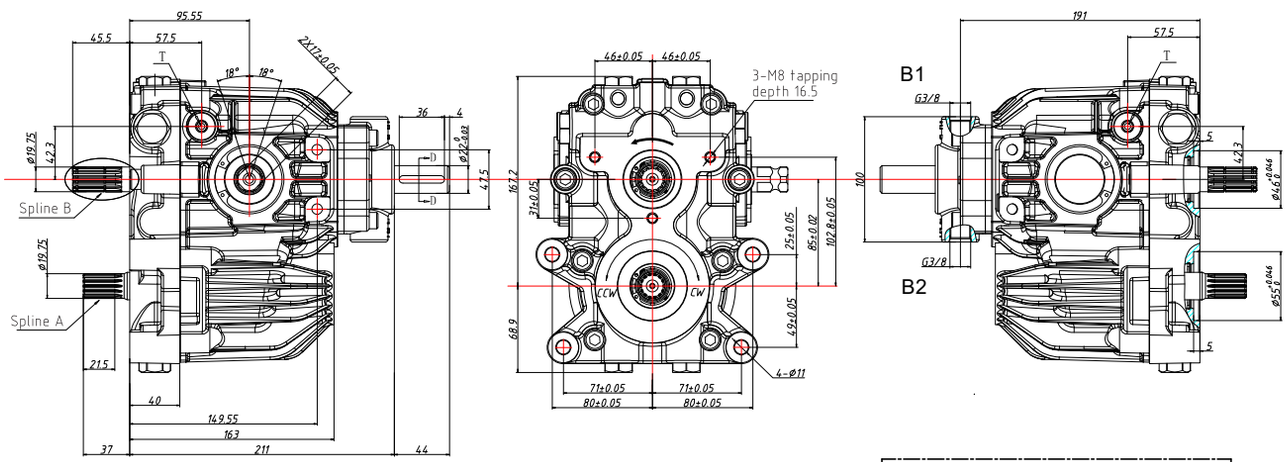
Port	Size
T	3/4 - 16UNF
S	9/16 - 18UNF
B1, B2	G3/8

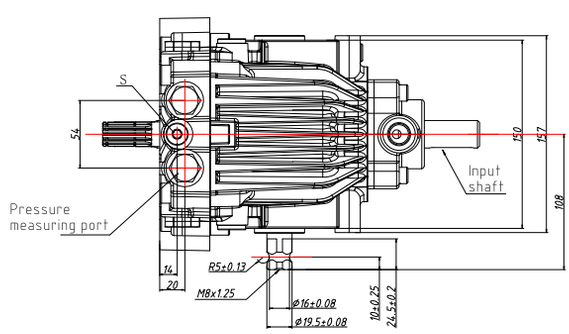
Drive shaft A involute spline parameters		
Number of teeth	Z	14
Modulus	m	1.25
Pressure angle	α	20°
Standard pitch dia.	D	Ø17.5
Major diameter	Dri	Ø19.7-$^{0}_{0.1}$
Minor diameter	Di	Ø17-$^{0}_{0.1}$
Modification coefficient	X	0.65
Cross-test teeth	n	3
Common normal	We	10.04±0.02



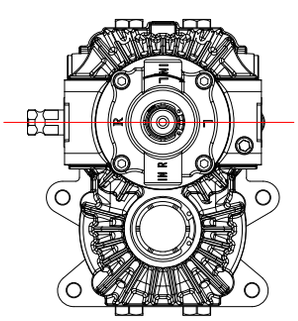
Hydraulic schematic diagram





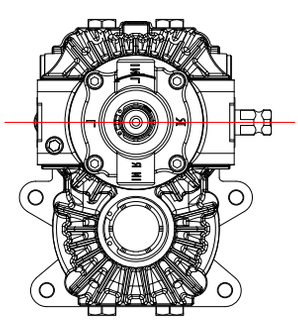


Rotation: R



Control hand on the left side through shaft side Φ22 Mark: M

Rotation: L

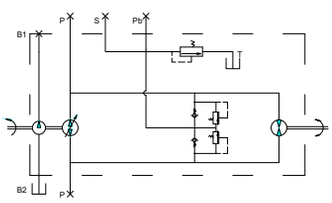


Control hand on the right side through shaft side Φ22 Mark: N

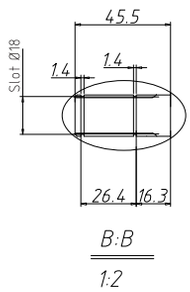
Mounting Dimension

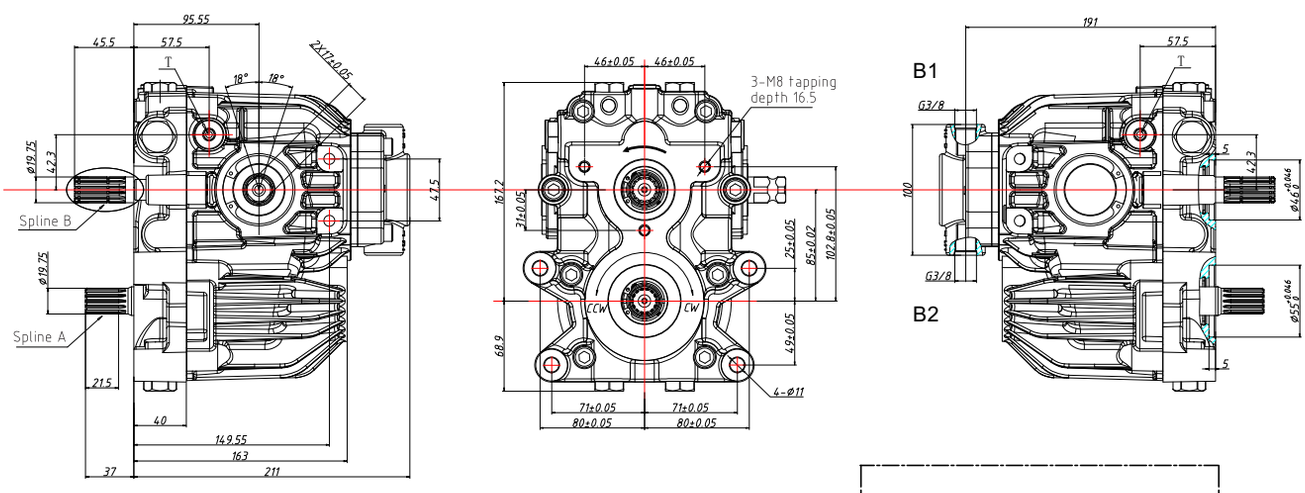
Port	Size
T	3/4 - 16UNF
S	9/16 - 18UNF
B1, B2	G3/8

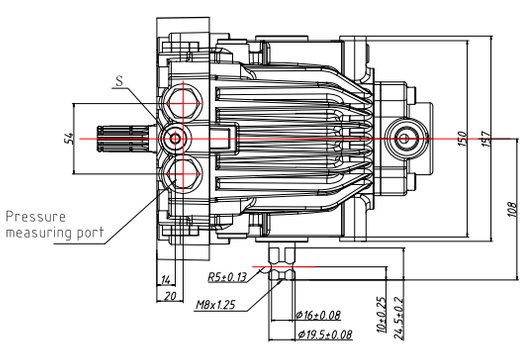
Drive shaft A involute spline parameters		
Number of teeth	Z	14
Modulus	m	1.25
Pressure angle	α	20°
Standard pitch dia.	D	Ø17.5
Major diameter	Dri	Ø19.7-0.1
Minor diameter	Di	Ø17-0.1
Modification coefficient	X	0.65
Cross-test teeth	n	3
Common normal	We	10.04±0.02



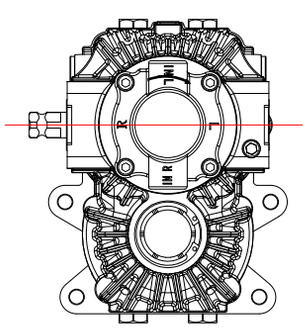
Hydraulic schematic diagram





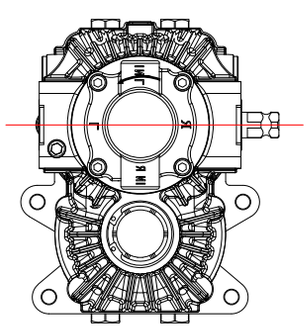


Rotation：R



From this direction the control hand is on the left side Mark: M

Rotation: L



From this direction the control hand is on the right side Mark: N

Ordering details: WHPV

Swashplate design,Variable pump = WHPV

Swashplate design,Fixed motor = U

Displacement (mL/r): 37, 42

Rotation:
Pump: Clockwise = R
Pump: Counter-Clockwise = L

Filter:
None: = 01
With: = 02

Positioner:
None: = blank
Choice zero controller: = Z

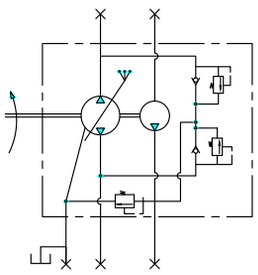
Control Hand Location:
Control hand in the left = M
Control hand in the right = N

If order double pumps, please use a plus sign to distinguish the two pump modles = +

Technical Data

Size		37S	37D	42S	42D
Displacement	Pump Vg max ml/r	37	2*37	42	2*42
	Boost Pump Vg max ml/r	10	2*10	10	2*10
Rotation	Input n max r/min	3000			
	Output n max r/min	0---3000			
Flow(Max)	When n max (L/min)	111	2*111	126	2*126
	When n =1500 (L/min)	55.5	2*55.5	63	2*63
Presssure (Max)	Nominal pressure	21	21	21	21
	Max pressure	33	33	35	35
Power (Max)	When n in max (KW)	61	2*61	73.5	2*73.5
	When n=1500r/min (KW)	30.5	2*30.5	36.75	2*36.75
Weight	KG	21	43	25	51

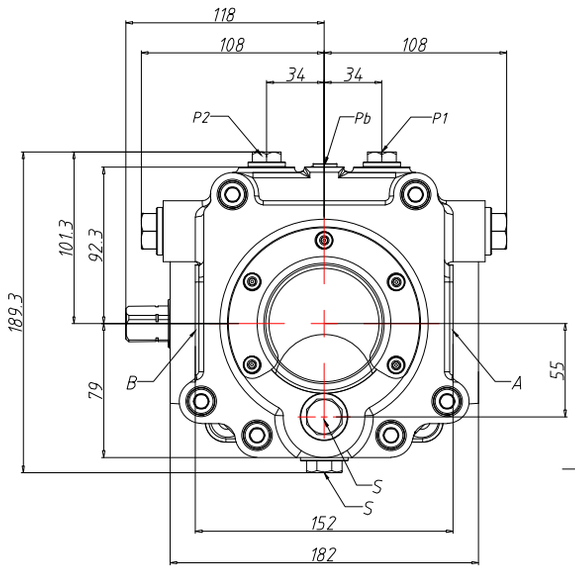
Mounting Dimension

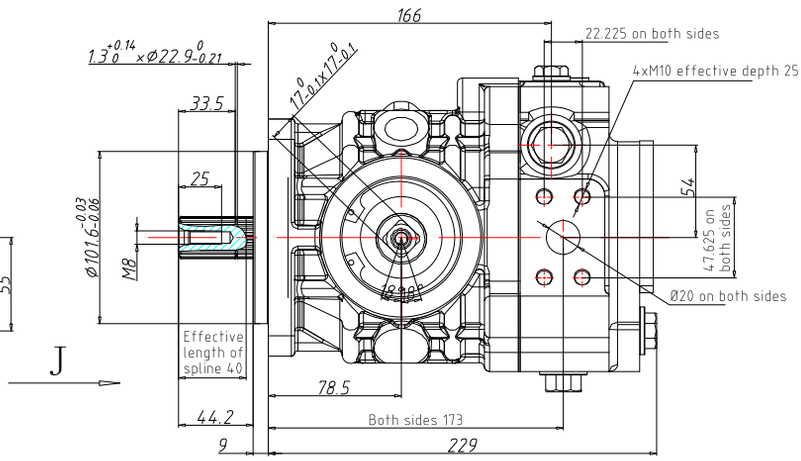


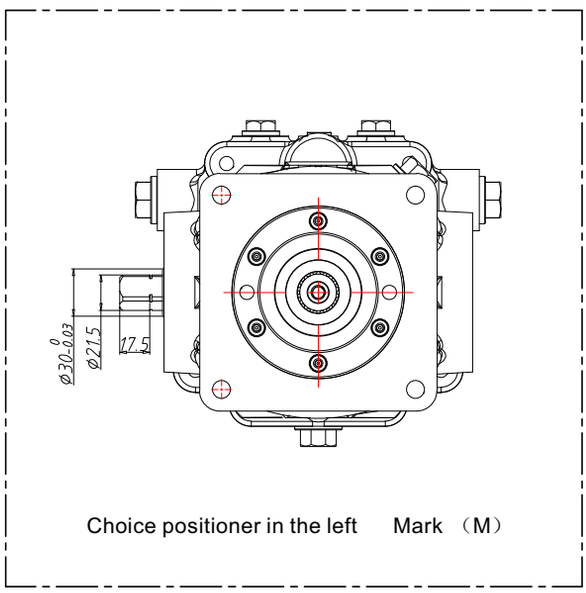
Hydraulic schematic diagram

Port		Size
Pressure measuring port of oil refill pump	Pb	M10
Main pump pressure port	P1, P2	G1/4
Return port	T	G1/2
Inlet opening	S	G1/2

Drive shaft A, B involute spline parameters		
Number of teeth	Z	18
Modulus	m	1.25
Pressure angle	α	20°
Standard pitch dia.	D	Ø22.5
Major diameter	Dri	Ø24.6-$^{0}_{0.1}$
Minor diameter	Di	Ø22-$^{0}_{0.21}$
Modification coefficient	X	0.8
Cross-test teeth	n	3
Common normal	We	10.15-$^{0.02}_{0.06}$

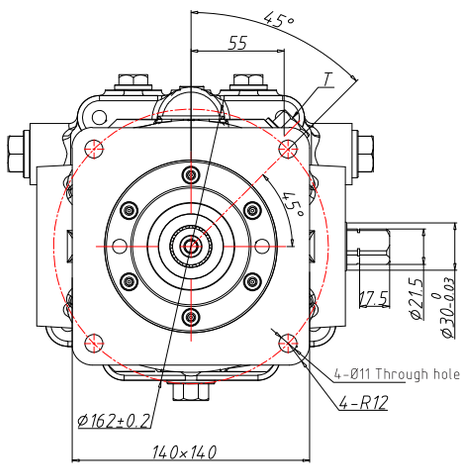






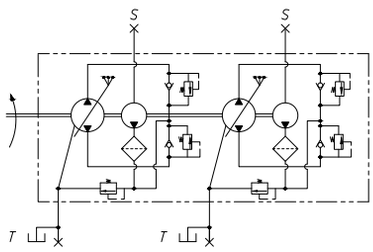
Choice positioner in the left Mark （M）

J direction



Choice positioner in the right Mark （N）

Mounting Dimension

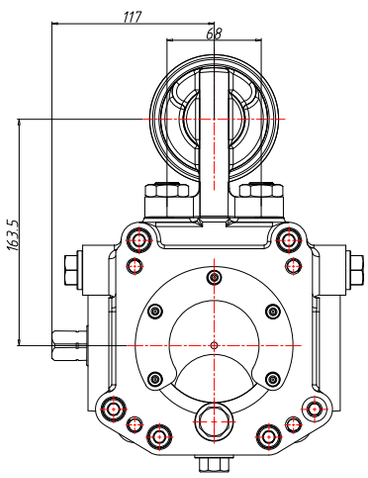


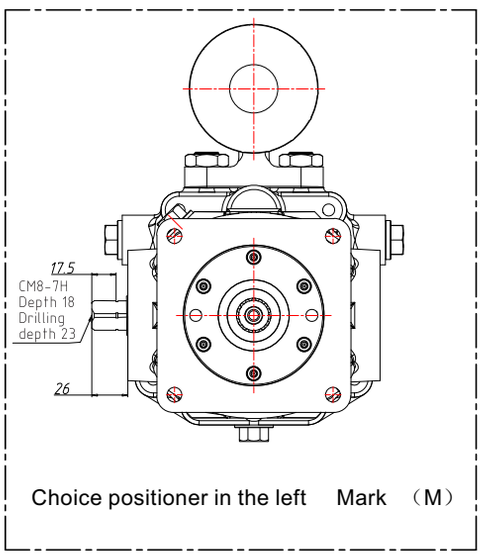
Hydraulic schematic diagram

Port		Size
Return port	T	G1/2
Inlet opening	S	G1/2

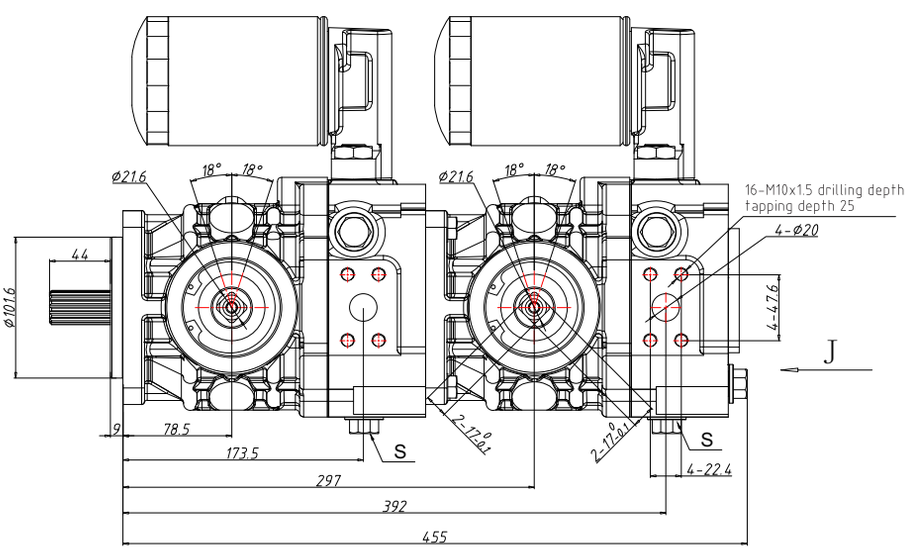
Drive shaft involute spline parameters		
Number of teeth	Z	15
Modulus	m	1.5875
Pressure angle	α	20°
Standard pitch dia.	D	Ø23.7
Major diameter	Dri	Ø24.68
Minor diameter	Di	Ø21.8
Cross-test teeth	n	3
Common normal	We	11.85±0.02

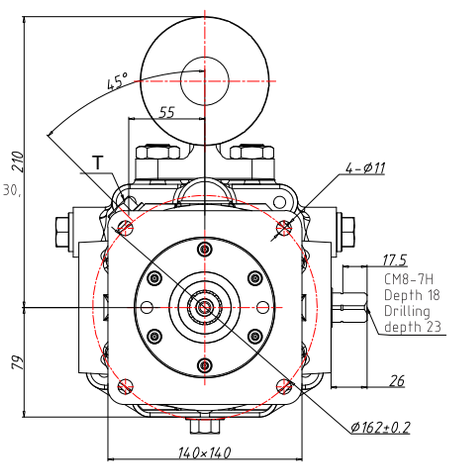
J direction





Choice positioner in the left Mark （M）





Choice positioner in the right Mark N

Ordering details: WHM

Bent aixs design,Fixed motor = WHM

Displacement (mL/r): 47, 52

Series
Model no. 10

Rotation:
Motor Bi-directional = W

Seals
Fluorine rubber (FKM) = F
Standard nitrile rubber (NBR) = N

Shaft End
Splined Shaft, DIN 5480 = T1
Parallel Keyed Shaft, DIN 6885 = T2

Mouting Flange:
Detail Check P28 = B
Comply with ISO3019-2 4 hole

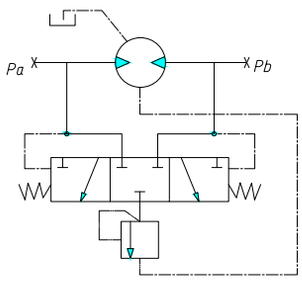
Flange Port
Opposite side threaded oil port: M27*2 = 01

Optional Features:
None = N
Flush Valve = F

Technical Data

Data value (Theoretical value, not considering coefficients and tolerances; approximate value)				
Specification	NG		47	52
Displacement	vg	cm^3	47.4	52.1
Speed	n_{nom}	rpm	2800	2800
	n_{max}	rpm	3000	3000
Input flow n_{nom} & vg	q_v	l/min	131.6	145.6
Vg and torque	ΔP=300	Bar	224.2	248.0
	ΔP=350	Bar	261.6	289.4
Quality (Approximate value)	m	KG	12	12.5

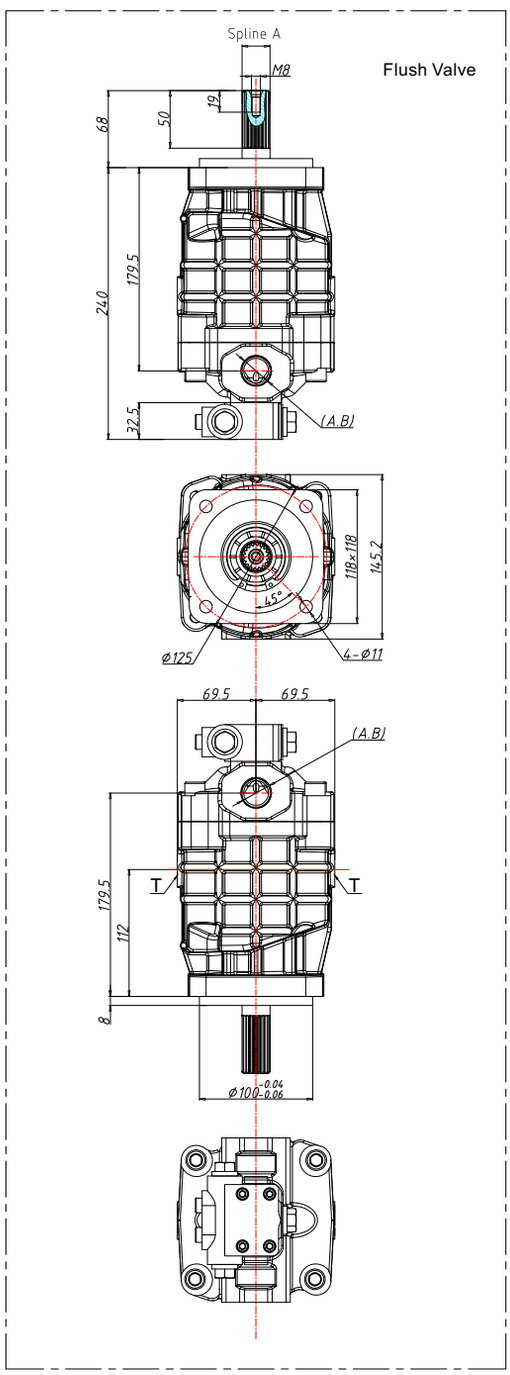
Mounting Dimension

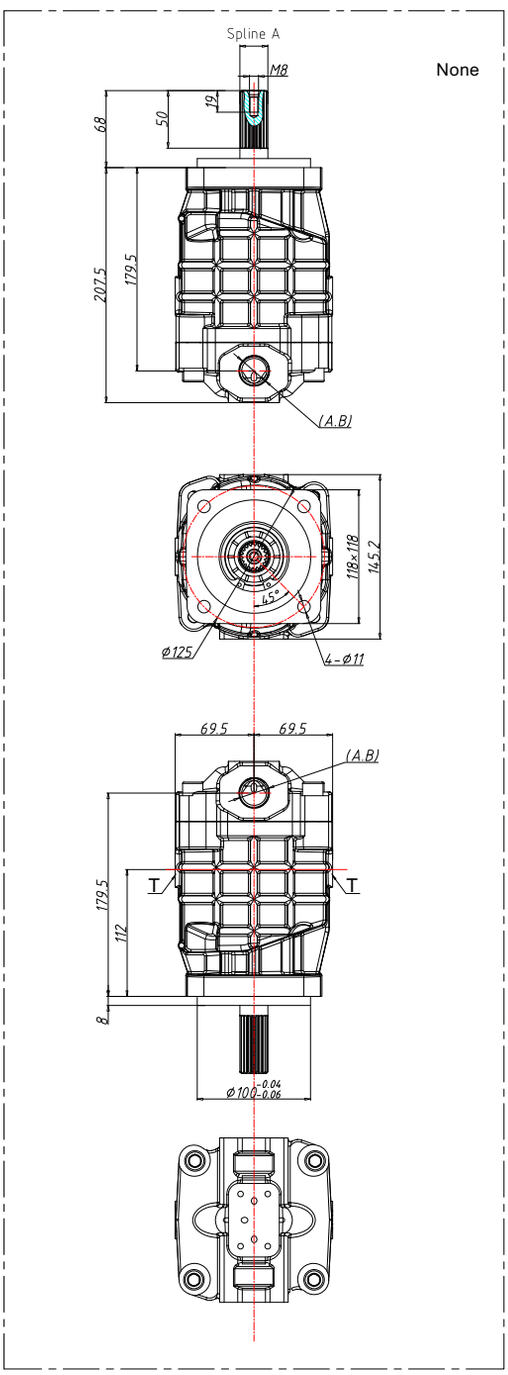


Hydraulic schematic diagram

Port		Size
Return port	T	G1/2
Ps：Only choice one of “T” ports.		
Inlet/outlet port	A	M27
	B	

Drive shaft A involute spline parameters		
Number of teeth	Z	18
Modulus	m	1.25
Pressure angle	α	30°
Standard pitch dia.	D	Ø22.5
Major diameter	Dri	Ø24.75-$^{0}_{0.1}$
Minor diameter	Di	Ø22.25-$^{0}_{0.21}$
Modification coefficient	X	0.45
Cross-test teeth	n	4
Common normal	We	13.513$^{-0.02}_{-0.06}$





The specified data is for product description purposes only and may not be deemed to be guaranteed unless expressly confirmed in the contract.

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