Axial Piston Variable Pump
HA4VTG Series 39

Size：71/80/90/100 mL/r
Rated pressure：40 MPa
Max.pressure：45 MPa

Features

- Axial piston variable pump with swashplate design for hydraulic transmission in closed circuits
- Flow directly proportional to drive speed and displacement can realize stepless speed regulation
- Increase of output flow from zero to the maximum value along with the swivel angle of the swashplate
- Smooth change in flow direction when the swashplate passes the neutral position
- Multiple compatible control valves realize various control and adjustment functions
- Cartridge type high pressure relief valve protects the pump and the motor against overload
- Built-in auxiliary pump featuring small size and high efficiency serves as the boost and control pump
- Cartridge type boost-pressure relief valve limits the maximum boost pressure
- Optional built-in pressure cutoff and filter

Contents

	c	A	B	C	D	E	F	G		I	K		M	N	P	R	S	T	U	X		Z
HA4VT	G								/	39		-									-	

Axial Piston Unit

-	Swashplate design, variable closed circuits	HA4VT

Operation

		71	80	90	100	
c	Closed circuit	●	●	●	●	G

Displacement

		71	80	90	100	
A	Geometric displacement, in mL/r	71	80	90	100	

Variable Control Method

					71	80	90	100	
B	Hydraulic control	Pilot pressure control	Without inlet filtration		●	●	●	●	HD1
			With inlet filtration		●	●	●	●	HD3
		Mechanical servo			●	●	●	●	HW
	Electric control	With proportional solenoid	Without inlet filtration	U=12V DC	●	●	●	●	EP1
				U=24V DC	●	●	●	●	EP2
			With inlet filtration	U=12V DC	●	●	●	●	EP3
				U=24V DC	●	●	●	●	EP4
		With switching solenoid	Without inlet filtration	U=12V DC	●	●	●	●	EZ1
				U=24V DC	●	●	●	●	EZ2
			With inlet filtration	U=12V DC	○	○	○	○	EZ3
				U=24V DC	○	○	○	○	EZ4

Brake Valve

				71	80	90	100	
C	Without brake valve (without code)			●	●	●	●	
	Only for HW control valve on the HW valve body	NO	U=12V DC	○	○	○	○	O1
			U=24V DC	●	●	●	●	O2
		NC	U=12V DC	○	○	○	○	C1
			U=24V DC	●	●	●	●	C2
	All control valve on the back cover	NO	U=12V DC	—	—	—	—	O3
			U=24V DC	—	—	—	—	O4
		NC	U=12V DC	—	—	—	—	C3
			U=24V DC	—	—	—	—	C4

Model Code

	c	A	B	C	D	E	F	G		I	K		M	N	P	R	S	T	U	X		Z
HA4VT	G								/	39		-									-	

Neutral Position Switch(only for HW control)

		71	80	90	100	
D	Without neutral position switch (without code)	●	●	●	●	
	With neutral position switch (without code)	●	●	●	●	L

Pressure Cut-Off Valve

		71	80	90	100	
E	Without pressure cut-off valve (without code)	●	●	●	●	
	With pressure cut-off valve	●	●	●	●	D

Stroke Limiter

		71	80	90	100	
F	Without mechanical stroke limiter (without code)	—	—	●	●	
	With mechanical stroke limiter, externally adjustable	●	●	●	●	M

Stroking Chamber Pressure Port(X3/X4)

		71	80	90	100	
G	Without port X3/X4 (without code)	●	●	●	●	
	With port X3/X4	●	●	●	●	T

Series

		71	80	90	100	
I	Series 39	●	●	●	●	39

Direction of Rotation (viewed on drive shaft)

		71	80	90	100	
K	CW (right-hand)	●	●	●	●	R
	CCW (left-hand)	●	●	●	●	L

Sealing Material

		71	80	90	100	
M	NBR seal + FKM Shaft seal	●	●	●	●	N
	NBR seal + NBR Shaft seal	●	●	●	●	P
	FKM seal + FKM Shaft seal	●	●	●	●	V

Model Code

	c	A	B	C	D	E	F	G		I	K		M	N	P	R	S	T	U	X		Z
HA4VT	G								/	39		-									-	

Drive Shaft

			71	80	90	100	
N	SAE 1 1/4″ 14T 12/24DP		●	●	●	●	U
	SAE 1 3/8″ 21T 16/32DP		●	●	●	●	R
	SAE 1 1/2″ 23T 16/32DP	Without connecting flange	●	●	●	●	S
		With connecting flange	●	●	●	●	L
	SAE 1 3/4″ 13T 8/16DP		●	●	●	●	T

Mounting Flange

		71	80	90	100	
P	SAE J7444-4 hole(127-4)	●	●	●	●	D
	SAE J744-4 hole+2 hole(127-2/4)	●	●	●	●	F

Working Ports (viewed on drive shaft)

			71	80	90	100	
R	Opposite side	Suction port downwards	●	●	●	●	02
		Suction port upwards	●	●	●	●	03
	Same side	Suction port upwards，working port rightwards	●	●	●	●	10
		Suction port downwards，working port leftwards	●	●	●	●	13

Boost Pump and Through Drive[1)]

				71	80	90	100	
S	Integrated boost pump	Without through drive		●	●	●	●	F00
		Flange SAE J 774-82-2(A)	Splined shaft 5/8″ 9T 16/32DP	●	●	●	●	F01
			Splined shaft 3/4″ 11T 16/32DP	●	●	●	●	F52
		Flange SAE J 774-101-2(B)	Splined shaft 7/8″ 13T 16/32DP	●	●	●	●	F02[2)]
			Splined shaft 7/8″ 13T 16/32DP	●	●	●	●	F68
			Splined shaft 1″ 15T 16/32DP	●	●	●	●	F04
		Flange SAE J 774-117-2/4(C)	Splined shaft 1 1/4″ 14T 12/24DP	●	●	●	●	F07
	Without integrated boost pump	Without through drive		●	●	●	●	N00
		Flange SAE J 774-82-2(A)	Splined shaft 5/8″ 9T 16/32DP	●	●	●	●	K01
			Splined shaft 3/4″ 11T 16/32DP	●	●	●	●	K52
		Flange SAE J 774-101-2(B)	Splined shaft 7/8″ 13T 16/32DP	●	●	●	●	K02
			Splined shaft 7/8″ 13T 16/32DP	●	●	●	●	K68
			Splined shaft 1″ 15T 16/32DP	●	●	●	●	K04
		Flange SAE J 774-127-2(C)	Splined shaft 1 1/4″ 14T 12/24DP	●	●	●	●	K07

1) Splined shaft standard ANSI B92.1-1970 Level 6,
F07 can be connected in series by adding a transition spigot“SAE J744 C 4 hole(4*Φ14,Φ127h8 12.7)，Splined shaft 1 1/4″ 14T 12/24DP”.

2) The sealing method of this transition plate is radial sealing, while all others employ axial sealing.Should you have specific sealing requirements, please contact our company.

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HA4VT	G								/	39		-									-	

High-Pressure Relief Valve[3)]

		71	80	90	100	
T	Direct operated,Without bypass(Standard Pressure 40MPa)	●	●	●	●	5
	Direct operated,With bypass(Standard Pressure 40MPa)	●	●	●	●	6

Filtration[4)]

		71	80	90	100	
U	Integrated filter, without cold start valve, without contamination indicator	●	●	●	●	A
	Integrated filter, without cold start valve, with contamination indicator	○	○	○	○	G
	Integrated filter,with cold start valve, without contamination indicator	○	○	○	○	F
	Integrated filter,with cold start valve, with contamination indicator	○	○	○	○	P
	Integrated filter, with cold start valve, with electrical signals contamination indicator	○	○	○	○	B
	Integrated filter, With bypass function,with electrical signals contamination indicator	○	○	○	○	M
	External suction filter (not included in delivery, to be selected by customer)	●	●	●	●	S
	External pressure filter (not included in delivery, to be selected by customer)	●	●	●	●	D
	External fluid supply (only for N00, K**)	●	●	●	●	E

Solenoid Connector

		71	80	90	100	
X	Without solenoid (without code)	●	●	●	●	O
	DEUTSCH molded connector, 2-pin, without suppressor diode[5)]	●	●	●	●	P

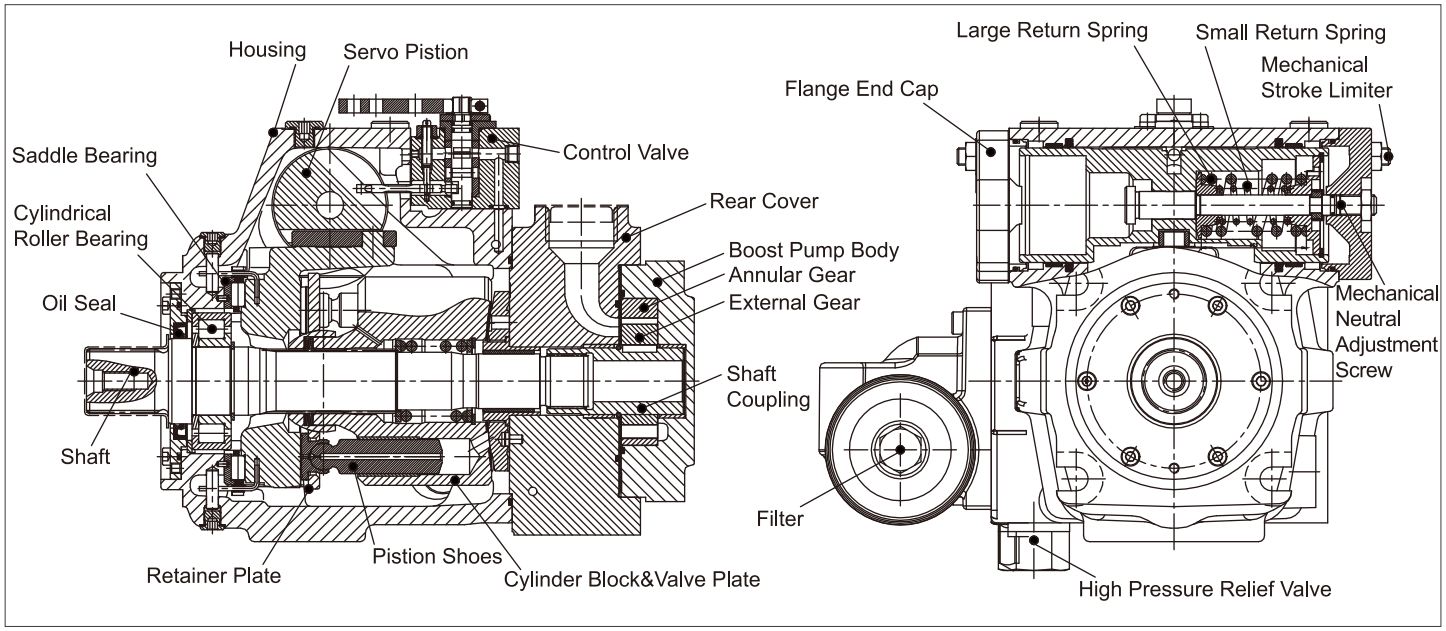
Special Configuration[6)]

		71	80	90	100	
Z	Without special configuration(without code)	●	●	●	●	
	Special configuration	●	●	●	●	***

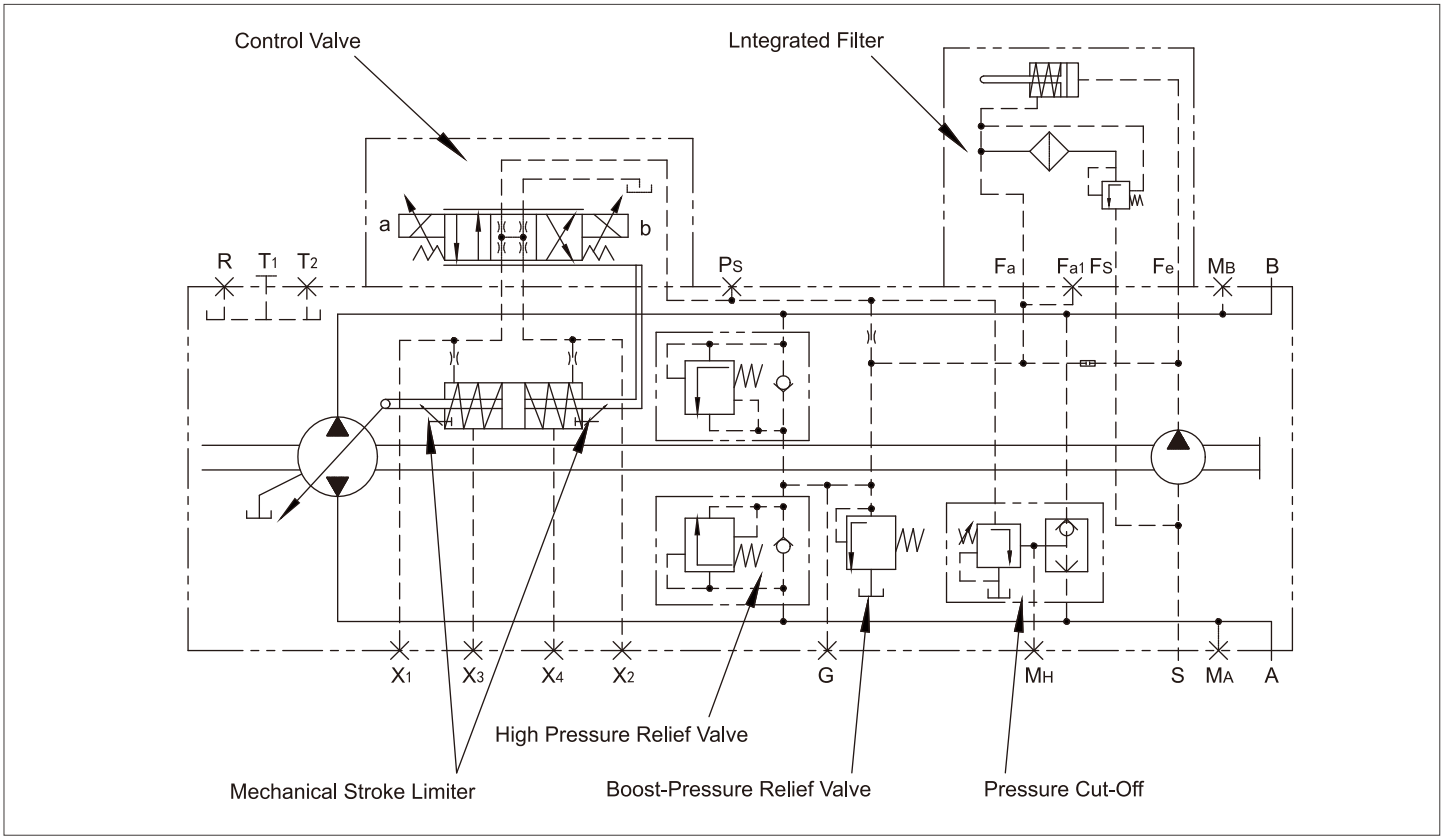
● Available ○ On request — Not available ▭ Recommended model

3) The optional pressures for the direct-acting high-pressure relief valve are: 20/22/～/40/42，in MPa；with a bypass function for vehicle towing.
4) Filtration: F/P/B opposite side ports are available; E same side ports are not available.
5) For HWO/HWC/EP/EZ control,model:DeutschDT04-2P.
6) For specific special configurations, please contact our company.

Structure



Circuit Diagram



Hydraulic Fluid

Mineral oil

Working Viscosity

In order for the optimum efficiency and service life,select the working viscosity at recommended working temperature within the range of

v_{opt}= optimum operating viscosity 16…36mm^2/s

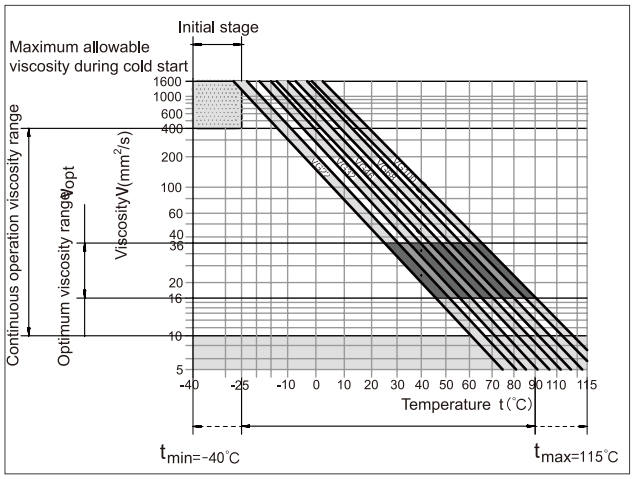
depending on the closed circuit temperature.

Limit Viscosity

Limit viscosity:
V_{min}=5mm^2/s
Short-term(t＜3min)
Permissible max. temperature t_{max}=+115℃

V_{max}=1600mm^2/s
Short-term(t＜3min)
Cold start(p≤3Mpa，n≤1000rpm，t_{min}=-40℃)
Only for start in unloaded condition; it must reach the optimal working temperature within 15 min.

Selection Diagram



Instructions on Selection of Hydraulic Fluid

The hydraulic fluid should be selected so that the operating viscosity in the operating temperature range is within the optimum range (v_{opt} ;see selection diagram).

Example: The working temperature of the circuit is 50 ℃ at the ambient temperature of X ℃. The corresponding viscosity grade within the optimal working viscosity range (v_{opt} ;see selection diagram) is VG46 or VG68, and VG68 should be selected.

Note:The case drain temperature depends on the pressure and speed, and it is always higher than the circuit temperature. The temperature at any point within the system should not exceed +115 ℃.
Please consult us if the above conditions cannot be maintained in extreme working parameters.

Filtration

The finer the filtration is the cleaner the fluid and the longer the service life of axial piston unit. To ensure normal operation of the axial piston unit, the fluid cleanliness should at least reach

ISO4406 code 20/18/15

On the system and application:

Discharge filter $\beta_{15-20} \geqslant 75$
Suction and return filter $\beta_{35-45} \geqslant 75$

β should not fall when differential pressure of the filter element rises.

When the fluid temperature is high(+90 ℃ to +115℃), the cleanliness should at least reach

ISO 4406 code 19/17/14

Please consult us if the above grade cannot be maintained. See “Mounting Connection Dimensions - Filter” for the filter model.

Working Pressure Range

Input

Variable pump(with external boost pump):
HD、HW、EZ&EP
Boost pressure (n=1500rpm) P_{sp} _____ 20bar

Boost pump:
Suction port $P_{s\,min}$ ($v \leqslant 30mm^2/s$) _____ ⩾0. 8bar absolute
Short-term,at cold start (t＜3min) _____ ⩾0. 5bar absolute

Output

Variable pump:
Pressure at port A or B
Nominal pressure P_{nom} _____ 400bar
Max. pressure P_{max} _____ 420bar
Total pressure (pressure A + pressure B)P_{max} _____ 700bar

Boost pump:
Max. pressure $P_{sp\,max}$ _____ 40bar

Oil Seal

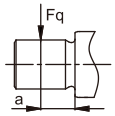
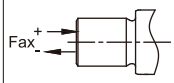
Allowable pressure load
The life of the shaft seal depends on pump speed and case drain pressure. The average persistent case drain pressure at the recommended working temperature should not exceed 3 bar absolute (the max. allowable case drain pressure is 6 bar when the speed falls), and the short-term (t<0.1 s) allowable peak absolute is max. 10 bar. The more frequent the occurrences of peak pressure, the shorter the life of the shaft seal.

Temperature range
FKM shaft seal is used within the case temperature range of -25 ℃ to +115 ℃.
NBR shaft seal is intended for the case temperature range of -40 ℃ to +90 ℃.

Technical Data

Size				71	80	90	100
Displacement	Variable pump	$V_{g\,max}$	mL/r	71	80	90	100
	Boost pump (△p=20bar)	$V_{g\,SP}$	mL/r	19. 6/28. 3			
Rated pressure			MPa	40			
Max. pressure			MPa	45			
Speed	Max. speed at $V_{g\,max}$	$n_{o\,max\,sustain}$	rpm	3050			
	Min. speed	n_{min}	rpm	500			
Flow	At $n_{o\,max\,sustain}$&$V_{g\,max}$	$q_{v\,max}$	L/min	217	244	275	305
Power	At $n_{o\,max\,sustain}$, △p=40MPa	n_{min}	KW	145	163	183	203
Torque	At $V_{g\,max}$, △p=40MPa	T_{max}	Nm	452	510	573	637
Moment of inertia around drive shaft		J	Kgm^2	0. 0106			
Weight (standard)		m	KG	48			

The permissible radial and axial forces on the drive shaft comply with the ANSI B92.1a splined shaft standard

Size		NG		71	80	90	100
Drive Shaft				1 1/4″	1 3/8″	1 1/2″	1 3/4″
Maximum radial force at distance a (shaft spacing)[1]		$F_{q\,max}$	N	7100	7100	7100	6600
		a	mm	24	24	24	33. 5
Maximum axial force		$+F_{ax\,max}$	N	4330	4330	4330	4330
		$-F_{ax\,max}$	N	2670	2670	2670	2670

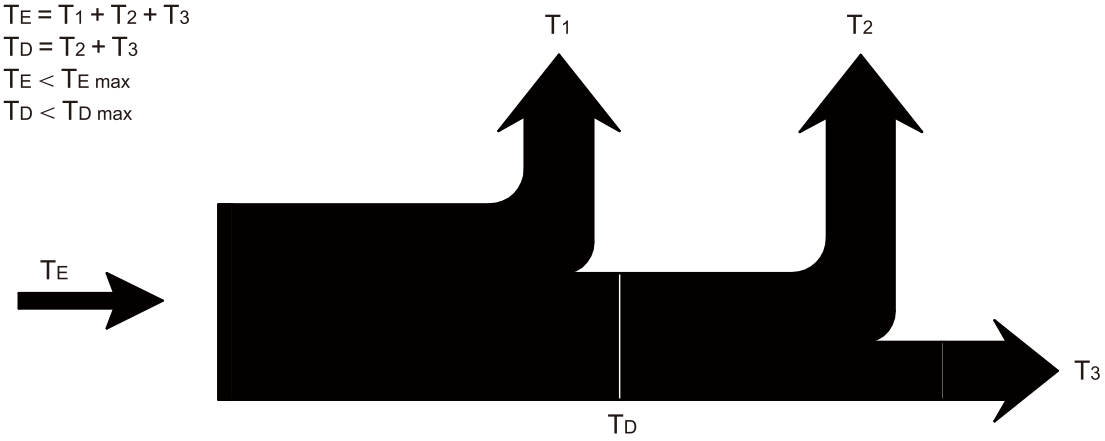
Permissible input torque and through-shaft drive torque

Size		NG		71	80	90	100
Torque($V_{g\,max}$, △p=400bar)[2]		T	Nm	452	510	573	637
Maximum input torque of the drive shaft[3]							
ANSI B92.1a(SAE J744)	U	$T_{E\,max}$	Nm	1 1/4″	1 1/4″	1 1/4″	–
				602	602	602	–
	R	$T_{E\,max}$	Nm	1 3/8″	1 3/8″	1 3/8″	1 3/8″
				970	970	970	970
	S/L	$T_{E\,max}$	Nm	1 1/2″	1 1/2″	1 1/2″	1 1/2″
				1350	1350	1350	1350
	T	$T_{E\,max}$	Nm	1 3/4″	1 3/4″	1 3/4″	1 3/4″
				1640	1640	1640	1640
Maximum through-shaft drive torque[4]		$T_{D\,max}$	Nm	660	660	660	660

1) No-load condition Note: Please contact us when using belt drives and universal joint shafts.
2) Efficiency not considered.
3) Applies to drive shafts without radial force.
4) Note the maximum input torque of the drive shaft.

Torque Distribution

T_E&T_E:
$T_E = T_1 + T_2 + T_3$
$T_D = T_2 + T_3$
$T_E < T_{E\,max}$
$T_D < T_{D\,max}$

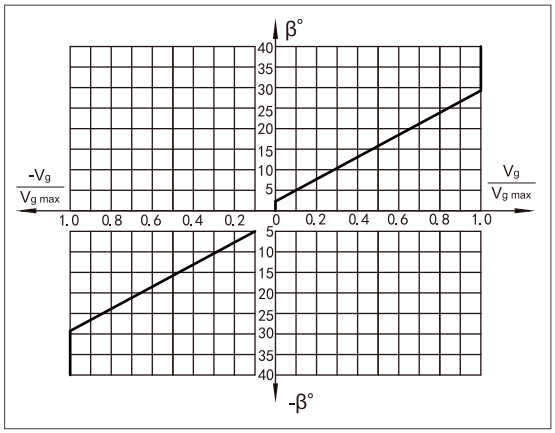


Specification Calculation

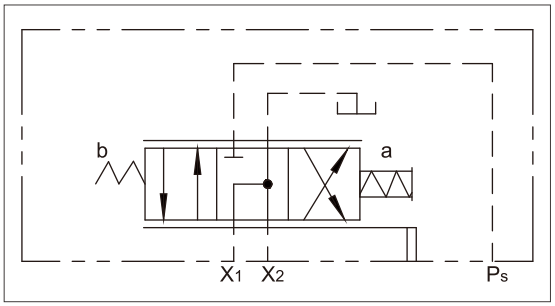
Flow	$q_v = \frac{V_g \cdot n \cdot \eta_v}{1000}$	[L/min]	V_g = Displacement,mL/r Δp = Differential pressure,MPa n = Rotational speed,rpm η_v = Volumetric efficiency η_{mh} = Hydraulic-mechanical efficiency η_t = Total efficiency
Torque	$T = \frac{V_g \cdot \Delta p}{2 \cdot \pi \cdot \eta_{mh}}$	[Nm]	
Power	$P = \frac{2\pi \cdot T \cdot n}{60000} = \frac{q_v \cdot \Delta p}{60 \cdot \eta_t}$	[KW]	

HW-Mechanical Servo Control

Depending on the moving direction (a or b) of the control lever, the variable cylinder of the pump obtains control pressure through the HW control so that the swashplate moves and realizes stepless displacement regulation. Each direction of the control lever corresponds to one flow direction.



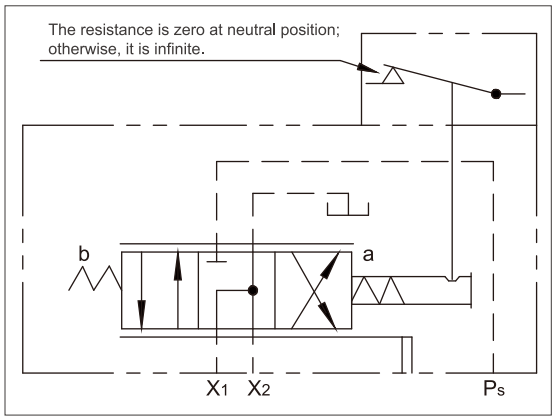
β,swivel angle at the control lever:
β=3° at start point of control
β=29° at end point of control (max. displacement V_{gmax})
mechanical limit of lever: ±40°



Variant I: with neutral position switch,HWL

With the control lever of the HW control valve in its neutral position, the neutral position switch is off; when the lever of the control valve turns to any side away from the neutral position, the switch is on.
The neutral position switch is intended to protect the system that needs to keep zero flow in certain conditions, such as start of engine.

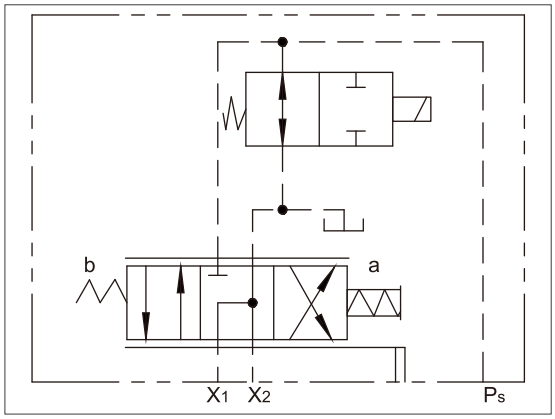
Neutral Position Switch Specification	
Switching capacity	5A/12V&3A/24V
Connector version	DJ7021-1.8-20



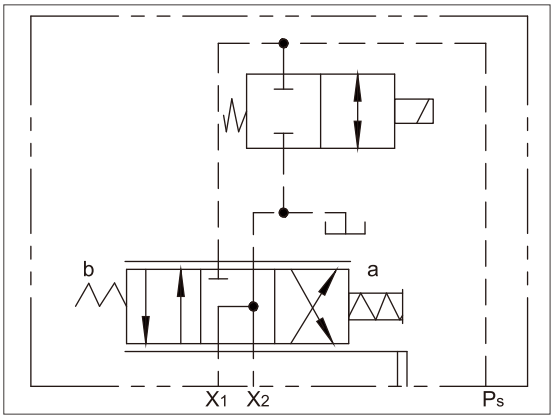
Variant II: with brake valve,HWO/HWC

Solenoid Specification	HWO(C)1	HWO(C)2
Voltage	12V DC(±1.8V)	24V DC(±3.6V)
Nominal resistance(20°C)	9Ω	36Ω
Rated power	18W	18W
Required min. current	1.5A	0.75A
Working time	100%	
Protection rating	IP67	

With NO brake valve,HWO,power loss braking

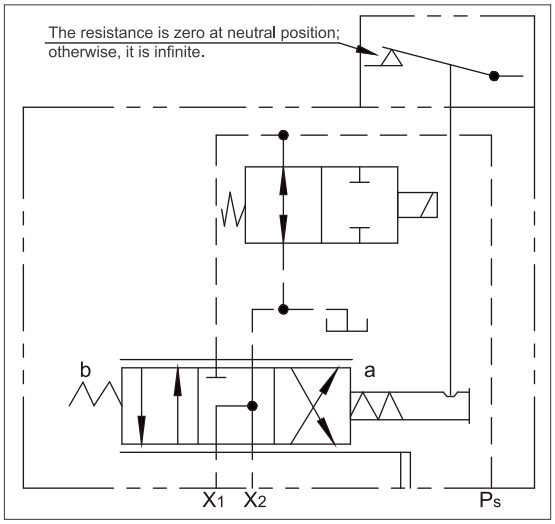


With NC brake valve,HWC,electric braking

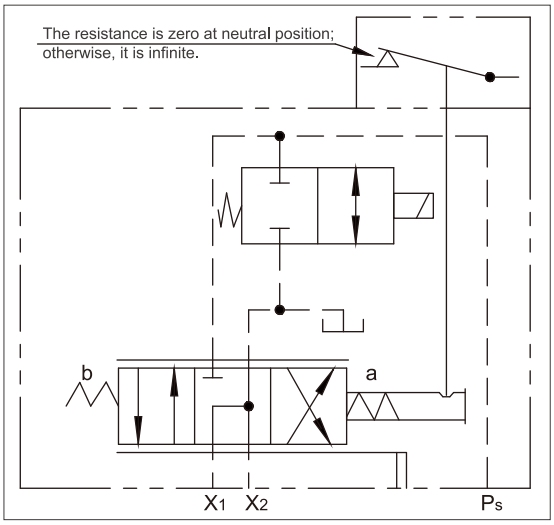


Variant III: with brake valve and neutral position switch, HWOL/HWCL

With NO brake valve and neutral position switch, HWOL

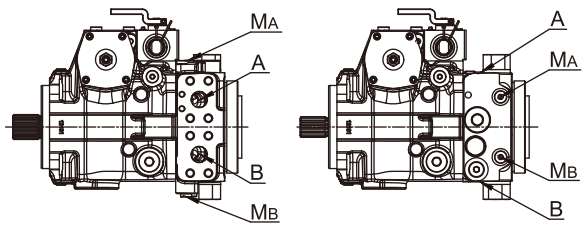


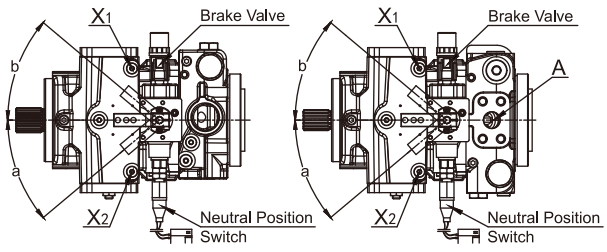
With NO brake valve and neutral position switch, HWCL



Rotation of Direction of Rotation,Control and Flow Direction

Direction of Rotation (viewed on shaft end)				
	CW		CCW	
Direction of control lever	a	b	a	b
Variable pressure	X_2	X_1	X_2	X_1
Flow direction	B→A	A→B	A→B	B→A
Working pressure	M_A	M_B	M_B	M_A

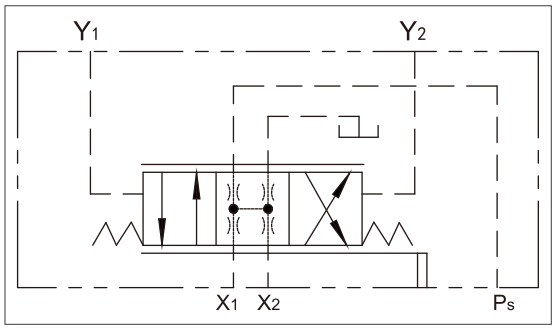




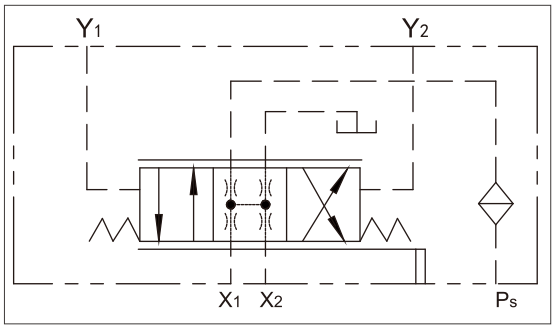
HD-Pilot Pressure Control

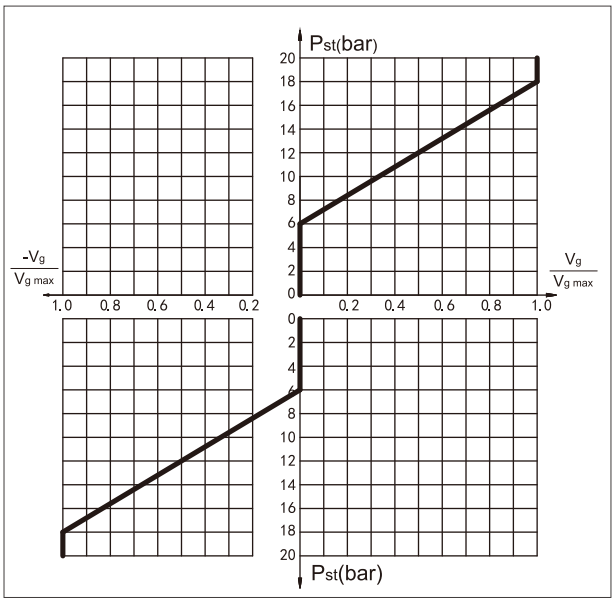
Depending on the difference between pilot pressures P_{st} (port Y_1 and Y_2) of two control lines, the variable cylinder of the pump obtains control pressure through the HD control so that the swashplate moves and realizes stepless displacement regulation. Each control line corresponds to one flow direction.

HD1：without supply filter (N/A to new project!)



HD3：with supply filter (standard)





V_g Displacement at P_{St-}

$V_{g\,max}$ Displacement at P_{St}=18bar

Pilot pressure at port Y_1/Y_2:P_{St-}=6-18bar

Control start point:6bar

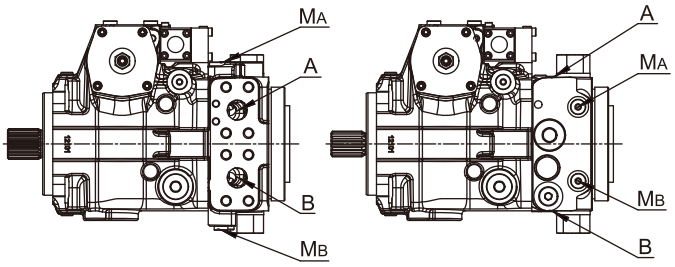
Control end point: 18 bar (max. displacement $V_{g\,max}$)

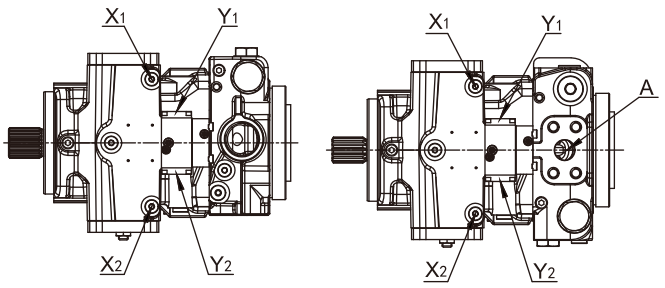
Precautions

HD control must be released to zero with the external pilot control device on the reservoir.
The spring at the center of the pilot control device is not a safety device.
The valve spool may get stuck in any position due to contamination of the control device by pollutants in the hydraulic fluid, wear debris, particulate matters from outside the system, etc. In this case, the pump flow can no longer be controlled with the operator's command.
- Make sure the driven machine can be moved to a safe state (e.g. stop) promptly with the emergency stop.
- Always observe the cleanliness code 20/18/15 (＜90 ℃) or 19/17/14 (≥90 ℃ or ＜115 ℃) specified in ISO 4406.

Correlation of Direction of Rotation,Control and Flow Direction

Direction of Rotation (viewed on shaft end)				
	CW		CCW	
Pilot pressure	Y_1	Y_2	Y_1	Y_2
Variable pressure	X_1	X_2	X_1	X_2
Flow direction	A→B	B→A	B→A	A→B
Working pressure	M_B	M_A	M_A	M_B



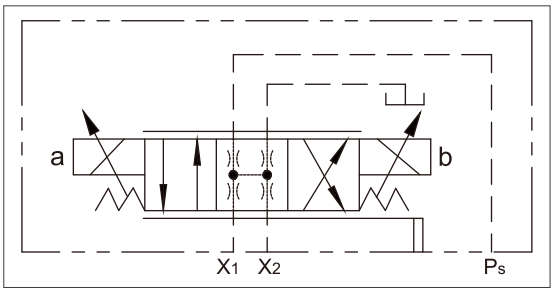


EP-Electrical Control with Proportional Solenoids

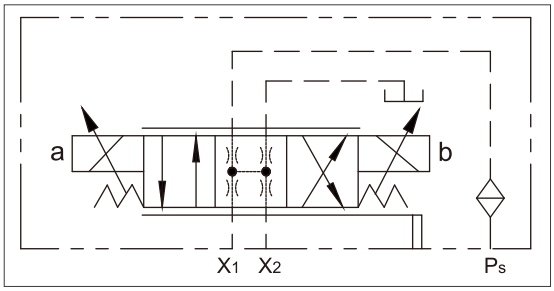
Depending on the preset current I of proportional solenoids (a and b) on both ends of the valve, the variable cylinder of the pump obtains control pressure through the EP control so that the swashplate moves and realizes stepless displacement control. Each proportional solenoid corresponds to one flow direction.

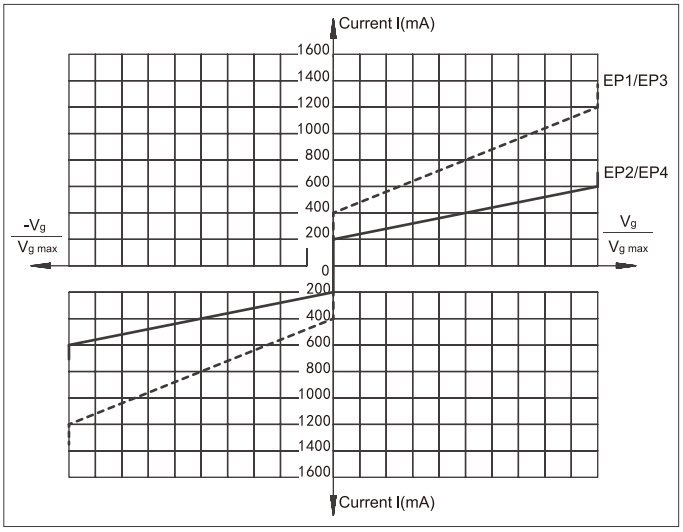
Solenoid specification	EP1/3	EP2/4
Voltage	12V DC(±20%)	24V DC(±20%)
Control current		
Control start point V_g=0	400mA	200mA
Control end point $V_{g\ max}$	1200mA	600mA
Limit current	1.54A	0.77A
Nominal resistance(20℃)	5.5Ω	22.7Ω
Vibration frequency	100Hz	
Working time	100%	
Protection rating	IP67	

EP1/2：without supply filter (N/A to new project!)



EP3/4：with supply filter (standard)





Precautions

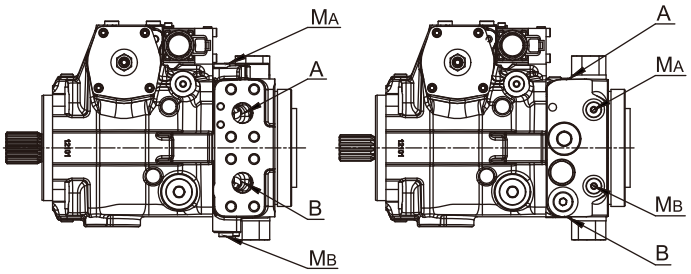
The spring at the center of the pilot control device is not a safety device.

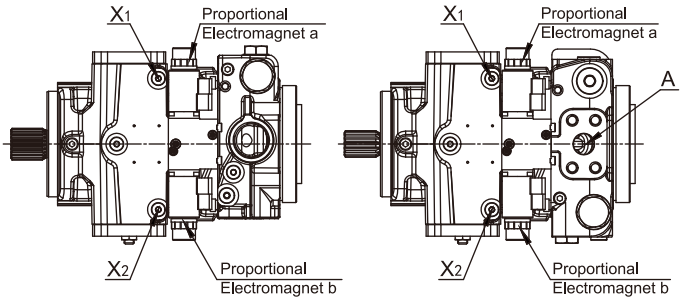
The valve spool may get stuck in any position due to contamination of the control device by pollutants in the hydraulic fluid, wear debris, particulate matters from outside the system, etc. In this case, the pump flow can no longer be controlled with the operator's command.

- Make sure the driven machine can be moved to a safe state (e.g. stop) promptly with the emergency stop.
- Always observe the cleanliness code 20/18/15 (＜90 ℃) or 19/17/14 (≥90 ℃ or ＜115 ℃) specified in ISO 4406.

Correlation of Direction of Rotation,Control and Flow Direction

Direction of Rotation (viewed on shaft end)				
	CW		CCW	
Solenoid actuation	a	b	a	b
Variable pressure	X_1	X_2	X_1	X_2
Flow direction	A→B	B→A	B→A	A→B
Working pressure	M_B	M_A	M_A	M_B



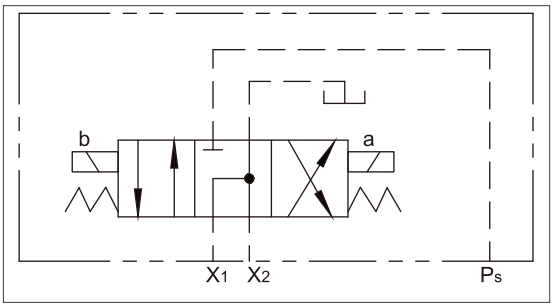


EZ-Electrical Control with Switching Solenoids

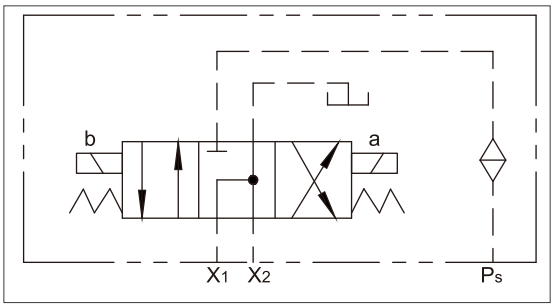
Depending on on-off conditions of the switching solenoid (a or b) at both ends of the valve, the variable cylinder of the pump obtains control pressure through the EZ control so that the swashplate moves and regulates the displacement within the range of V_g=0 to V_{gmax}.
Each solenoid corresponds to one flow direction.

Solenoid specification	EZ1/3	EZ2/4
Voltage	12V DC(±1.8V)	24V DC(±3.6V)
Neutral position V_g=0	OFF	OFF
Position $V_{g\ max}$	ON	2[illegible]Ω
Nominal resistance(20°C)	5.5Ω	
Rated power	26.2W	26.5W
Required min. current	1.32A	0.67A
Working time	100%	
Protection rating	IP65	

EZ1/2：without supply filter (N/A to new project!)

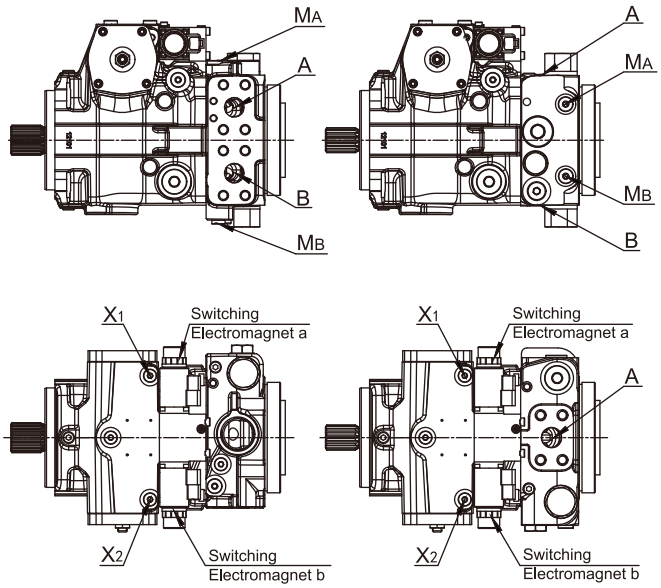


EZ3/4： with supply filter (standard)



Correlation of Direction of Rotation,Control and Flow Direction

Direction of Rotation (viewed on shaft end)				
	CW		CCW	
Solenoid actuation	a	b	a	b
Variable pressure	X_2	X_1	X_2	X_1
Flow direction	B→A	A→B	A→B	B→A
Working pressure	M_A	M_B	M_B	M_A

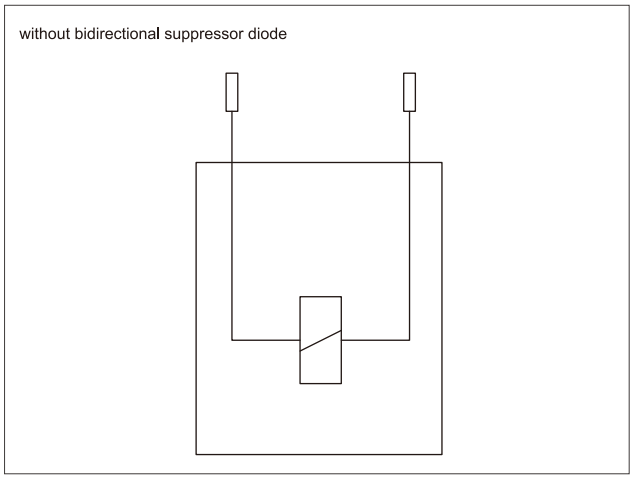


Connector for Solenoids

DEUTSCH DT04-2P-EP04，2-pin
Molded，without bidirectional suppressor diode_____P

The following type of protection ensues with the installed mating connector:
IP67(DIN EN 60520)
IP69K(DIN 60050-9)

Switching Symbol

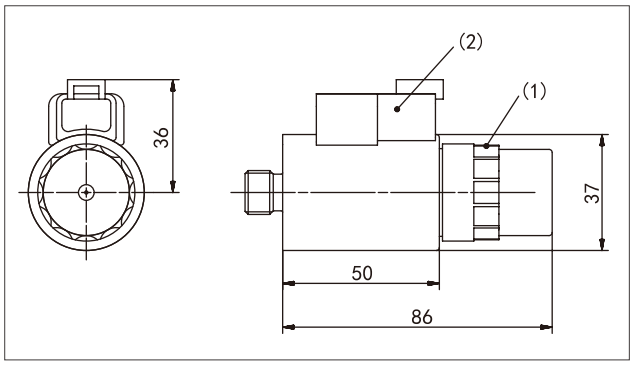


Mating Connector
DEUTSCH DT06-2S-EP04

Consisting of	DT
1 housing	DT06-2S-EP04
1 wedge	W2S
2 sockets	0462-201-16141

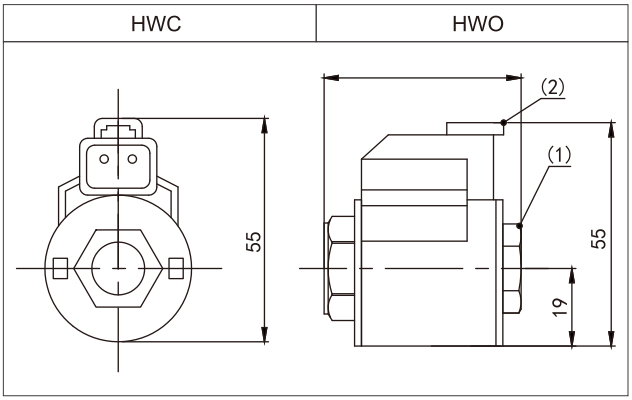
The mating connector is not included in the scope of delivery.

With emergency start and spring reset for Solenoid(EP/EZ)

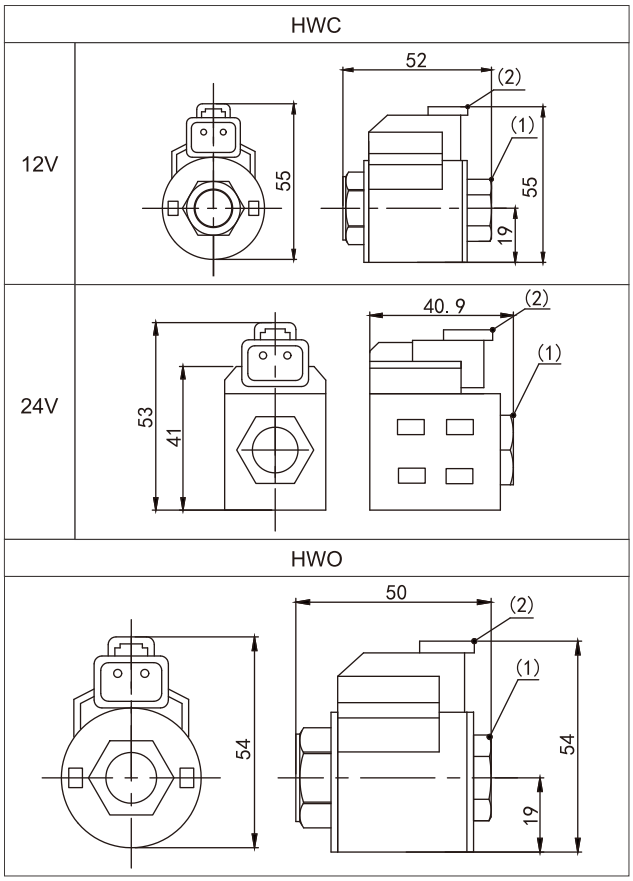


Brake Valve Solenoid (HWC/O)

Application of Construction Machinery



Application of Agricultural Machinery



Notice

Manual emergency operation (emergency start) can be used in case of electrical system failure.
If necessary, you can change the position of the connector by turning the solenoid.
The position of the connectors varies of delivery.

High Pressure Relief Valve

Two high-pressure relief valves are used to prevent overload of the hydrostatic drive (pump and motor).
They limit the maximum pressure in each high-pressure line and simultaneously function as anti-cavitation valves.
The high-pressure relief valves are not operational valves, they are solely suitable for handling pressure peaks or high rates of pressure change.

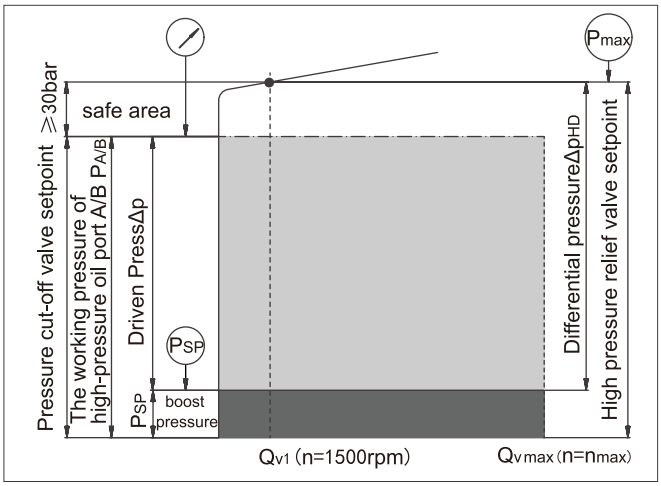
Setting Range

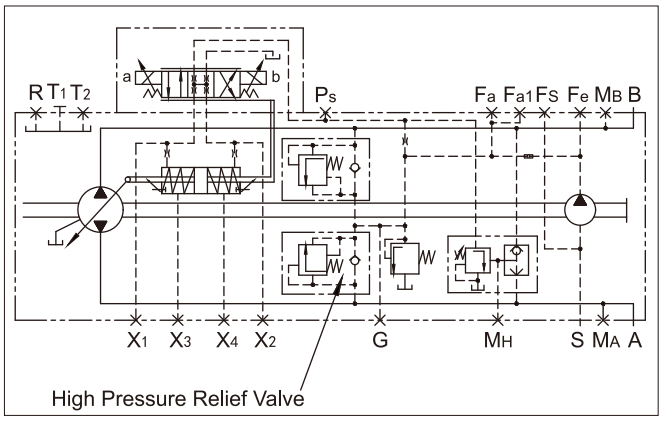
Direct Operated	MPa
	20
	22
	24
	28
	30
	32
	34
	36
	38
	40
	42

The factory setting of high pressure relief valve is 40 MPa and the boost-pressure relief valve is set to 2.0 MPa.
Please specify other requirements, if any.
Direct-acting valves without bypass (5) and with bypass (6) are available.

Bypass function
The bypass function allows the two high-pressure channels A and B to be connected (e.g., for towing the machine).

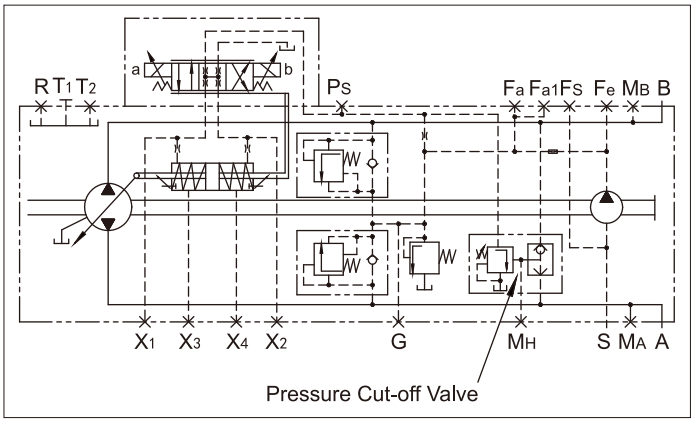
Setting Diagram





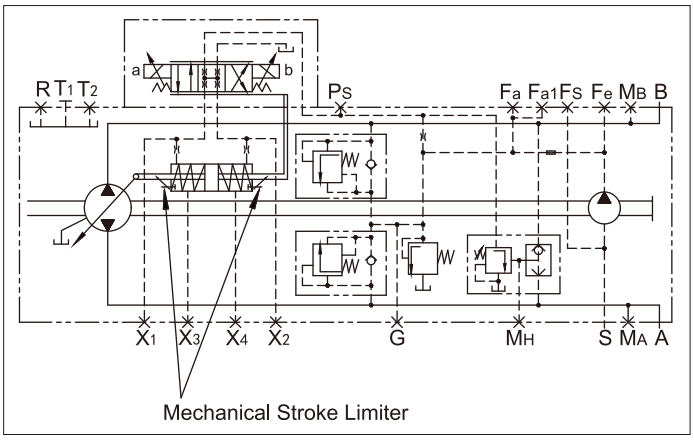
Pressure Cut-off,D

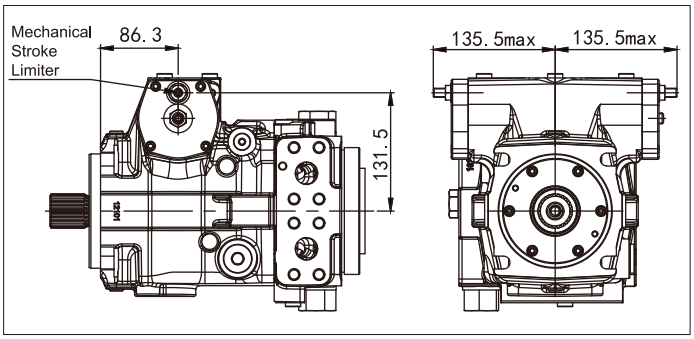
Pressure cut-off is a pressure regulation function. The pump displacement is adjusted to $V_{g\,min}$ when the set pressure is reached, thus preventing action of the high pressure relief valve at acceleration or deceleration.
The high pressure relief valve offers protection at peak pressure and the maximum system pressure during rapid oscillation of the swashplate. The setting range of pressure cutoff may be any range within the overall working pressure range, but it must be lower than the high pressure relief valve setting of 20-30 bar.



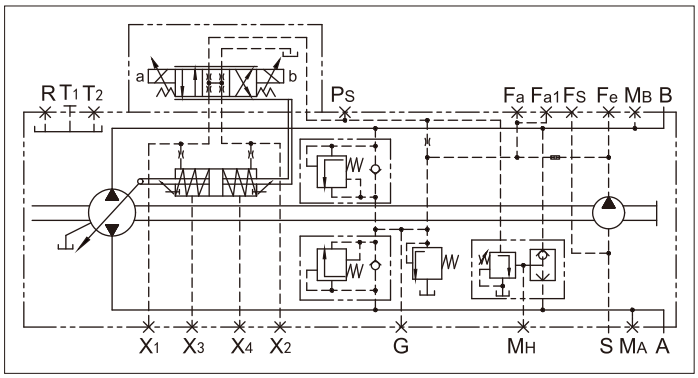
Mechanical Stroke Limiter

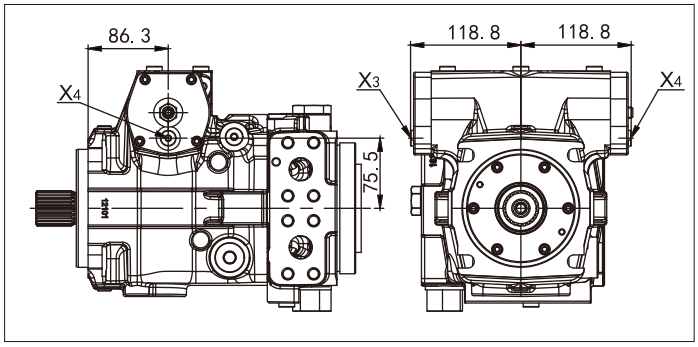
The mechanical stroke limiter is one of the auxiliary functions, used to limit the maximum displacement of the pump to meet the needs of different displacements.it is independent of the flow control valve and flow control method used.





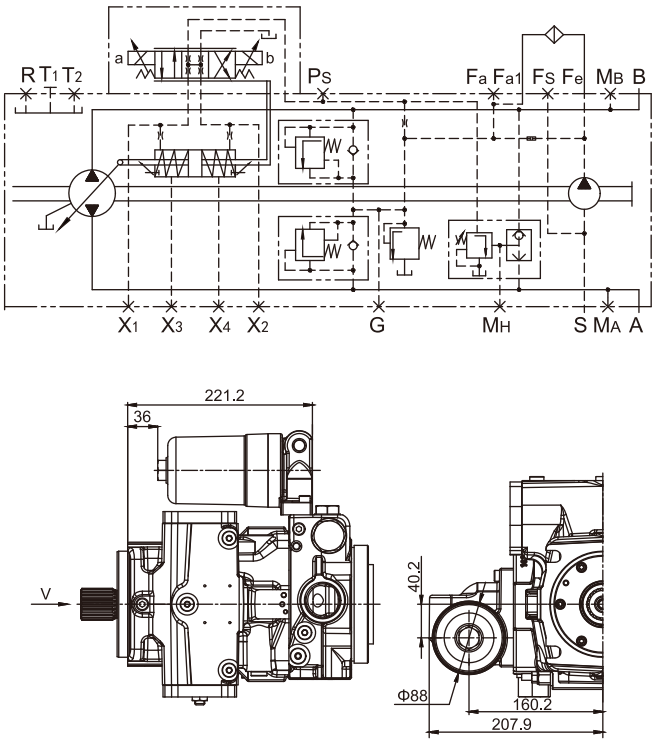
Stroking Chamber Pressure Port((X3/X4)



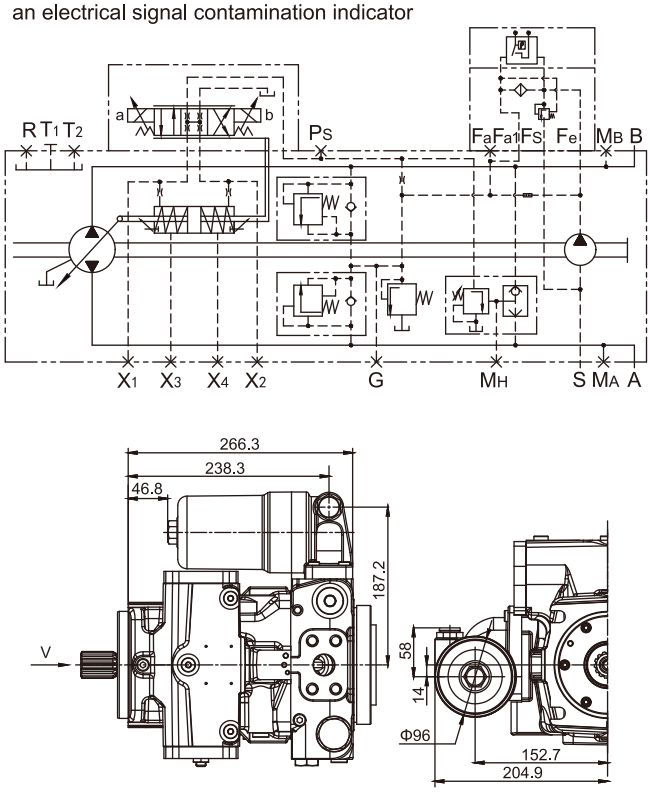


Filter

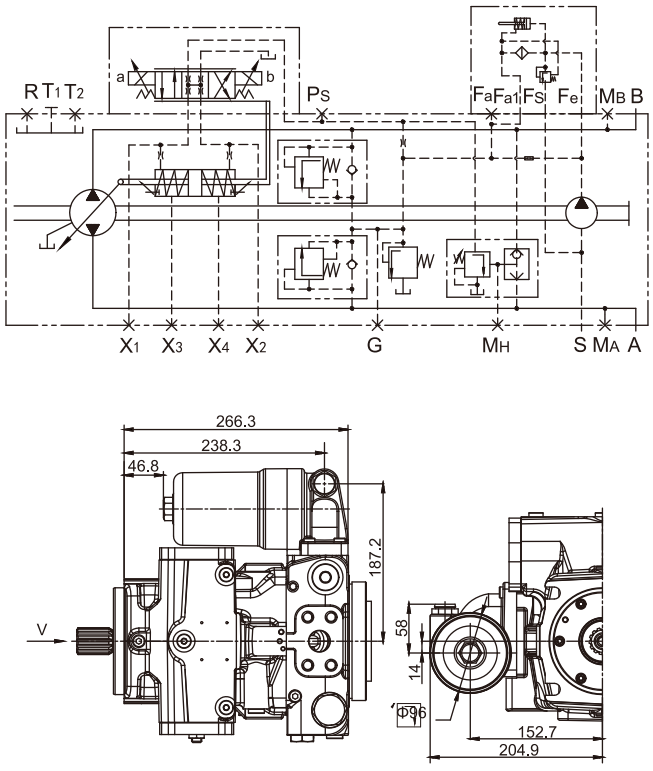
Model A: Filtration in the charge pump pressure line with a filter installed



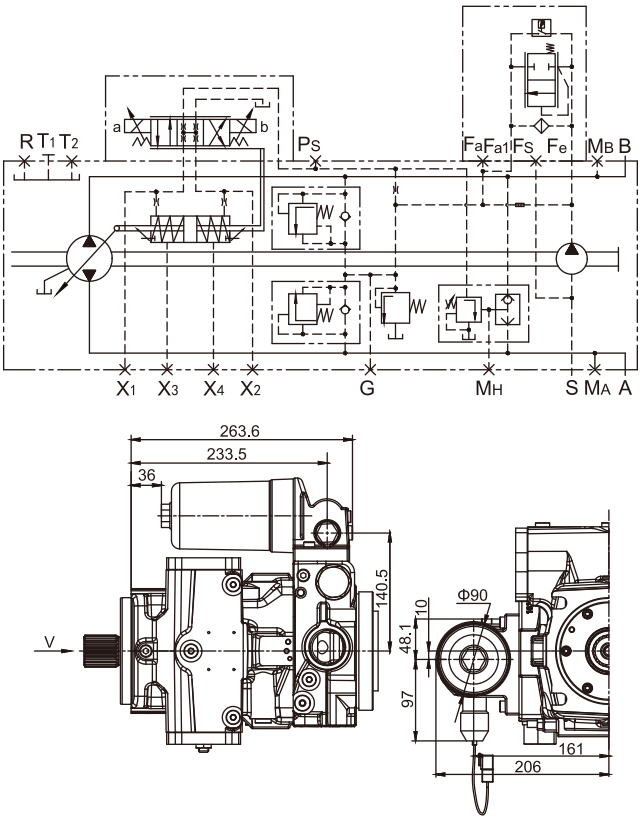
Model B:Filtration in the charge pump pressure line with a filter installed, equipped with a cold start valve and an electrical signal contamination indicator



Model P:Filtration is provided in the charge pump pressure line with an installed filter, equipped with a cold start valve and a visual contamination indicator
Indicator: Green/Red viewing window
Differential pressure (cracking pressure) Δp = 5bar

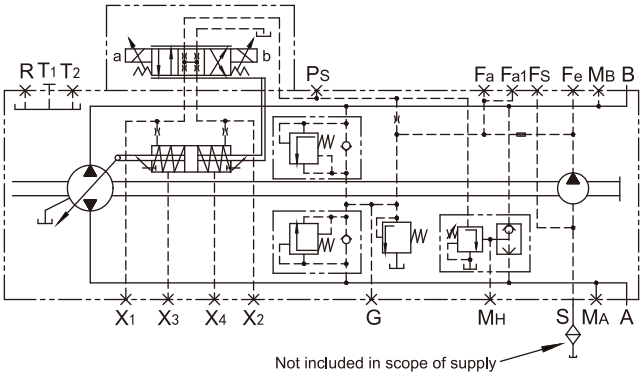


Model M:Filtration in the charge pump pressure line with an installed filter, equipped with a bypass valve and an electronic contamination transmitter (Deutsch connector)
Differential pressure (cracking pressure) Δp = 5bar

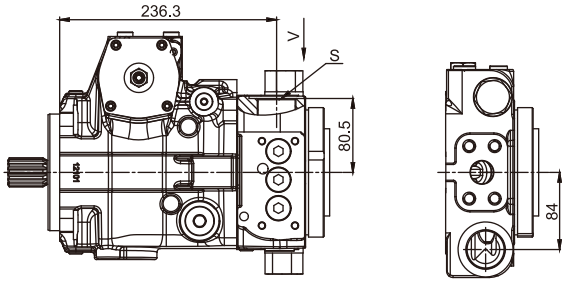


Filter

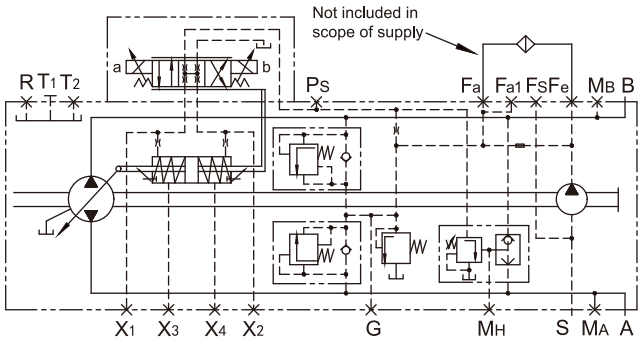
Model S:Filtration in the suction line of the charge pump
Standard configuration (preferred option)
Filter type: without bypass valve
Recommended: with contamination indicator
Filter element pressure drop:
v=30mm²/s, n=nmax Δp≤0.1bar
v=1000mm²/s, n=nmax Δp≤0.3bar
Pressure at charge pump port S:
v=30mm²/s, n=nmax Δp≥0.8bar
Cold start
v=1600mm²/s, n≤1000rpm Δp≥0.5bar



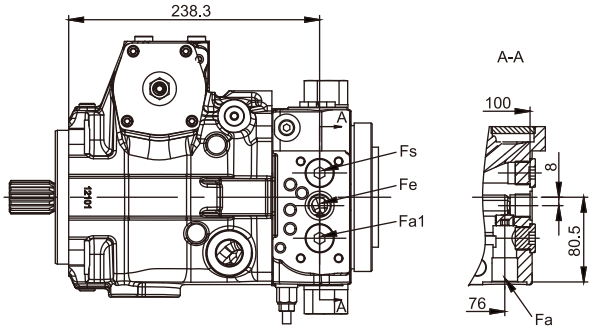
Note: Filters for this configuration are not included in our company's supply scope



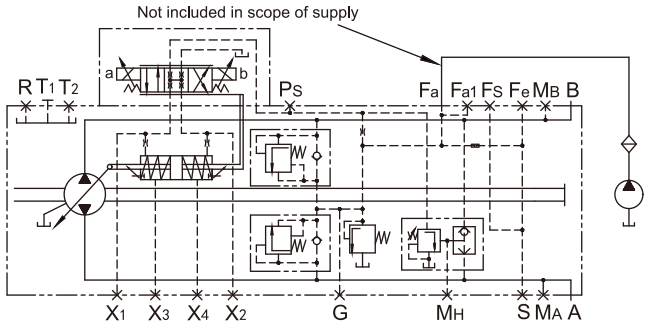
Model D:Filtration in the pressure line of the charge pump
with ports for external charge circuit filter
Filter inlet: Port Fe
Filter outlet: Port Fa, Fa1
Filter type:
1.Filter with bypass valve is not recommended
2.Contamination indicator is recommended



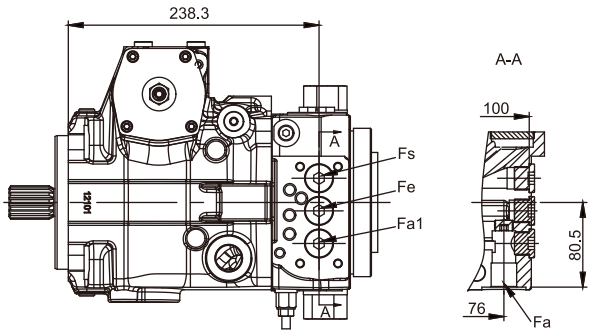
Note: Filters for this configuration are not included in our company's supply scope



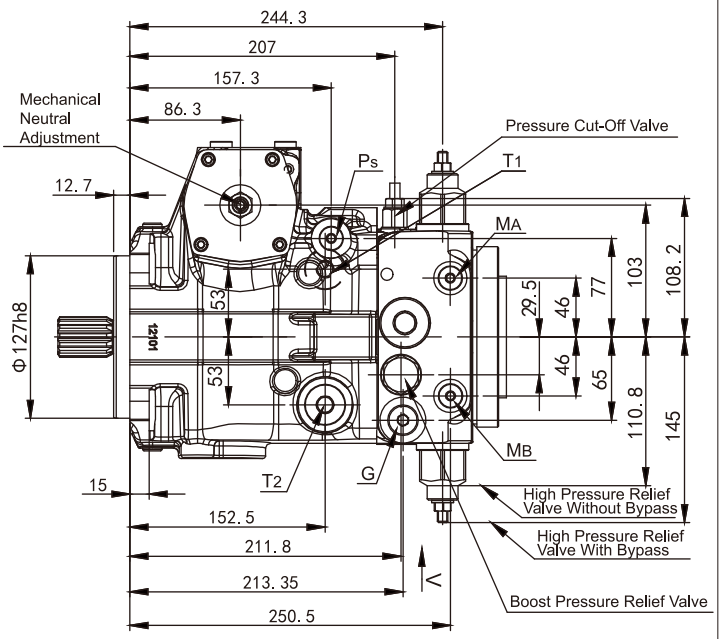
Model E:External oil supply filtration
This variant is used for configurations without an integrated charge pump, such as types N00 or K...
Port S is blocked, and the oil supply comes from port Fa or Fa1.
Filter arrangement:
For functional reliability, the filter should be installed separately.
The cleanliness level of the charge oil at port Fa or Fa1 must be ensured (refer to "Technical Parameters - Filtration").



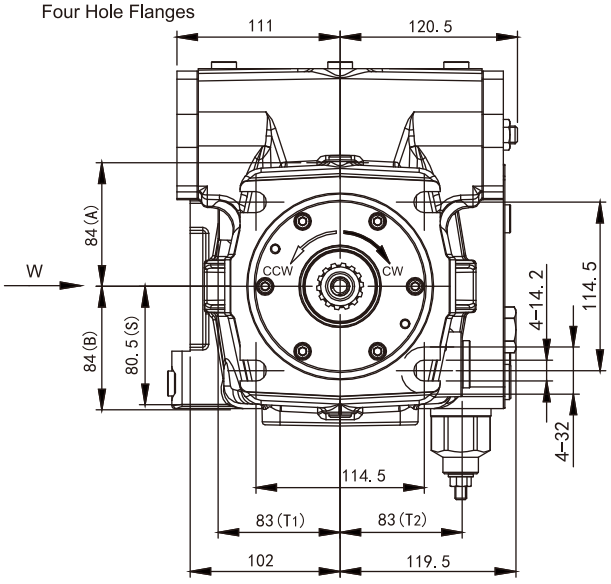
For filter models S/D/E, port dimensions refer to "Installation Connection Dimensions - Port Sizes"

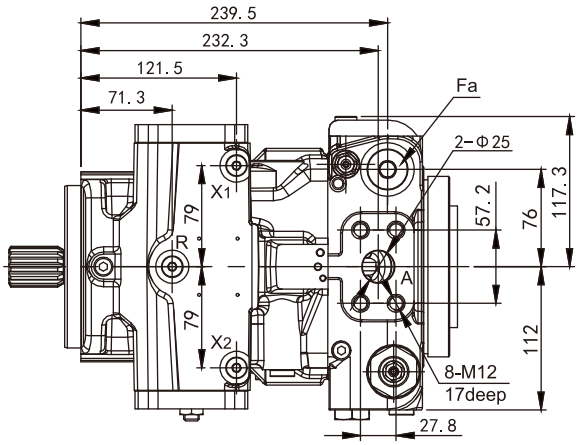


Installation Dimensions-Opposite side oil port 02

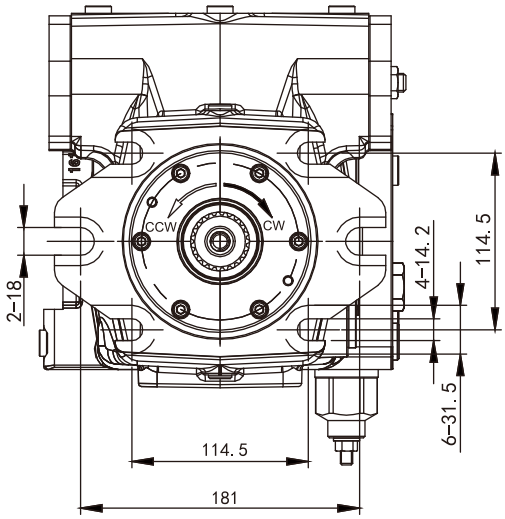


Four Hole Flanges

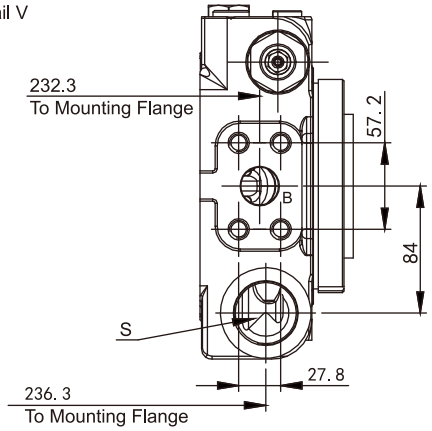




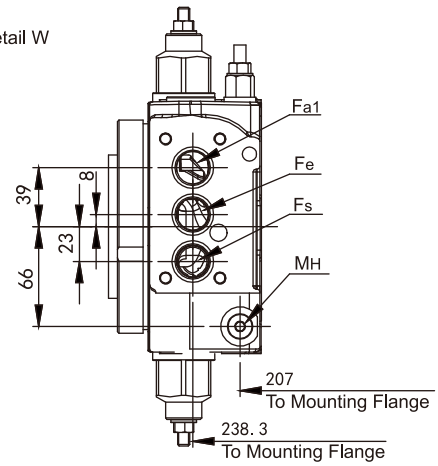
Six Hole Flanges



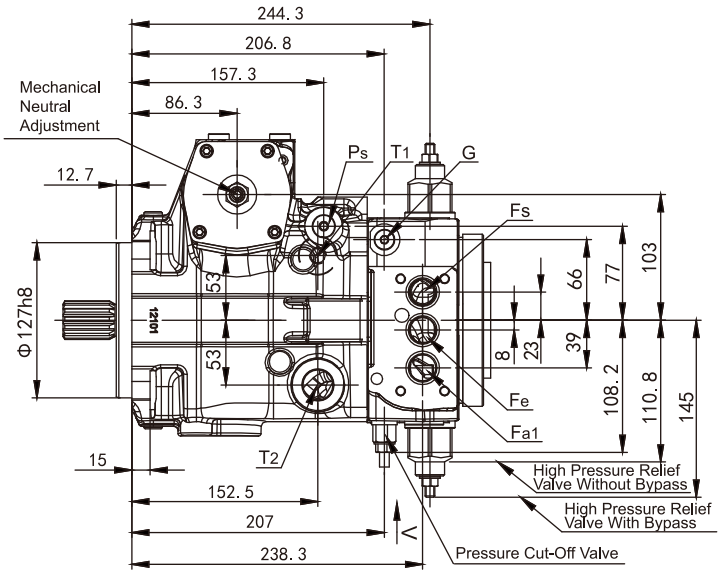
Detail V



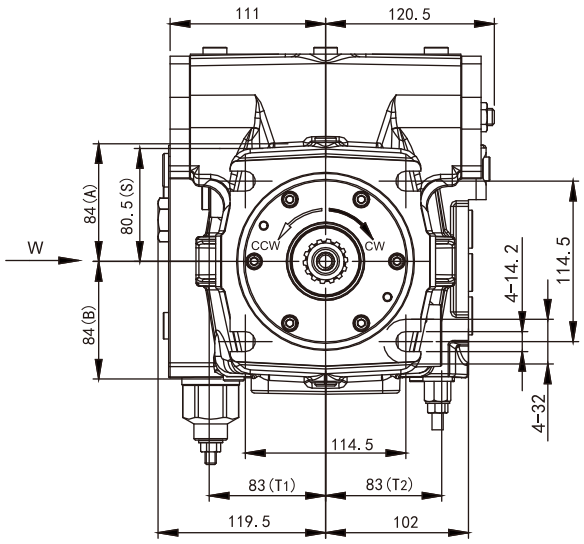
Detail W

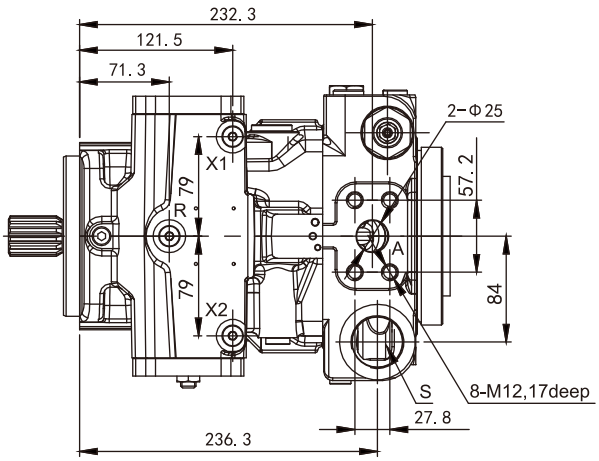


Installation Dimensions-Opposite side oil port 03

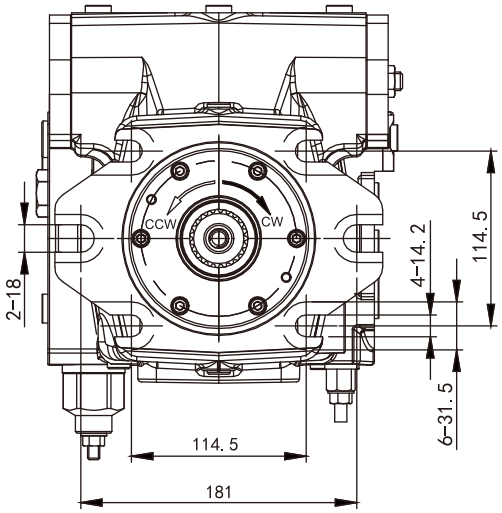


Four Hole Flanges

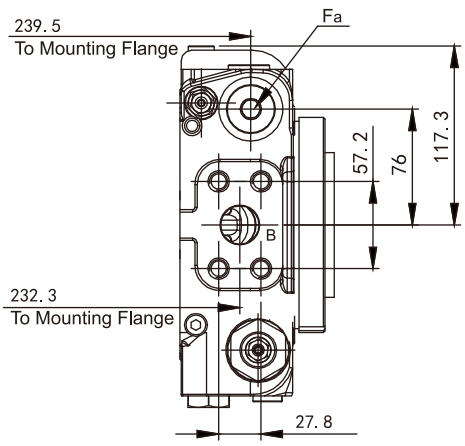




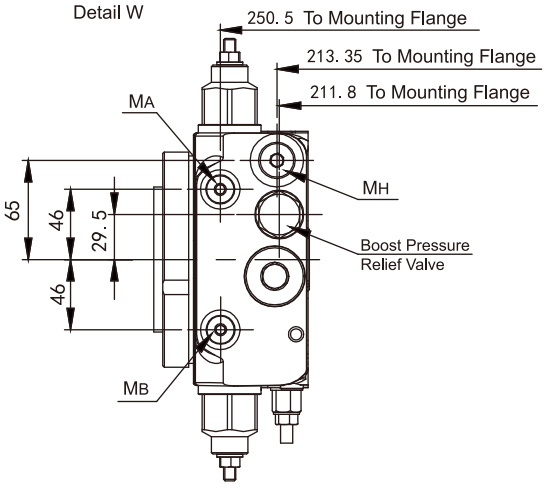
Six Hole Flanges



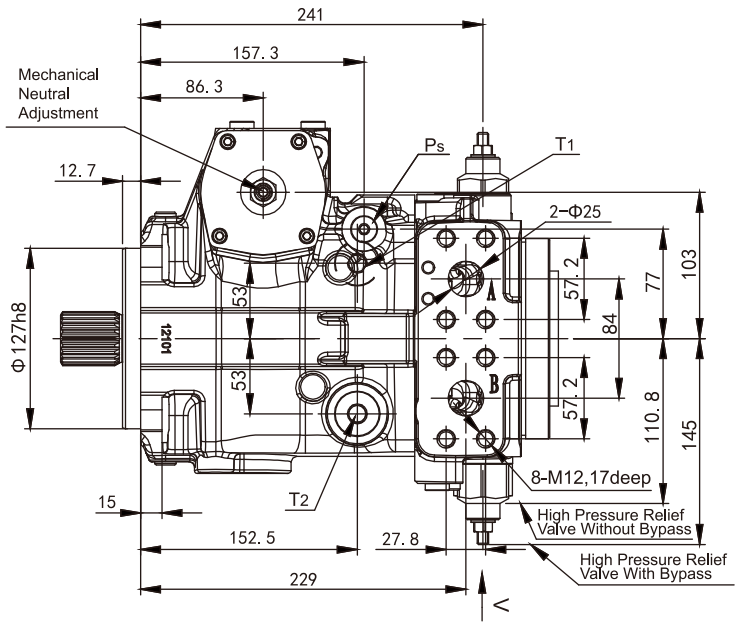
Detail V



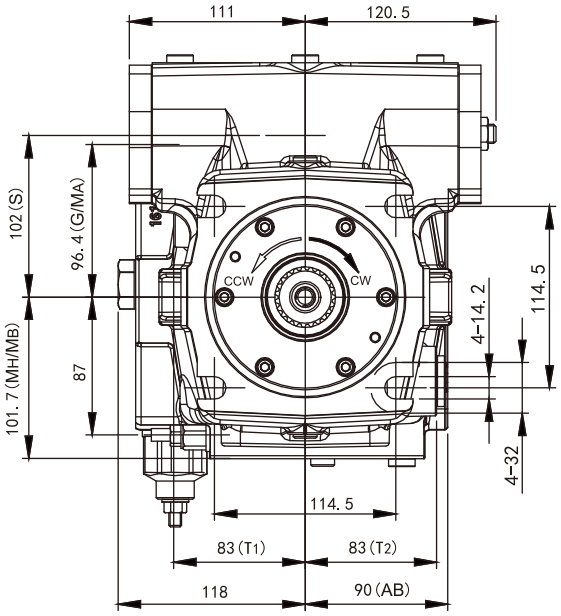
Detail W

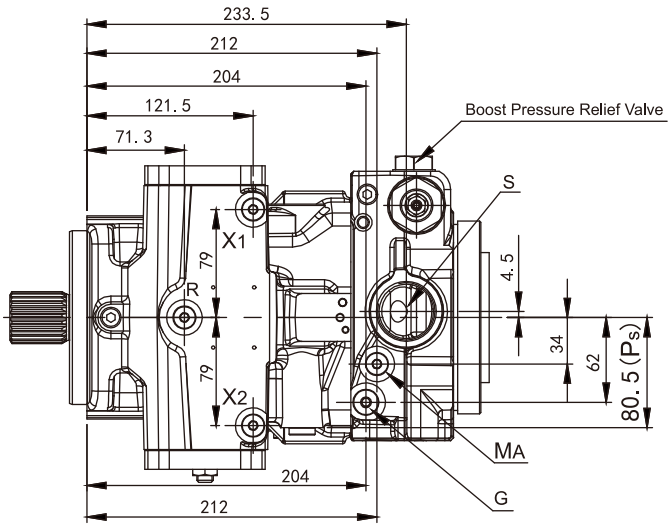


Installation Dimensions-Same side oil port 10

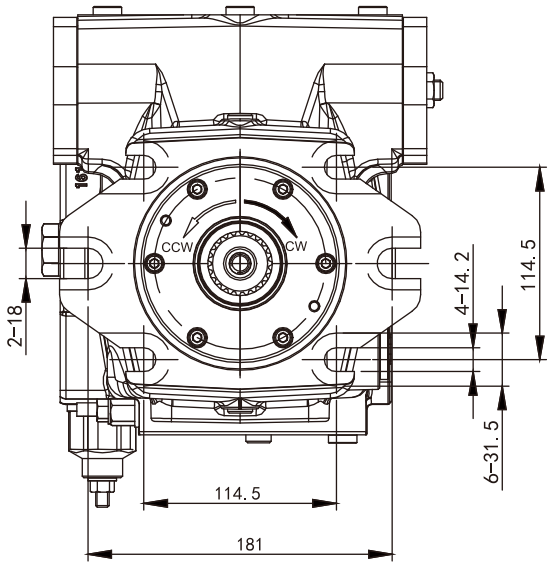


Four Hole Flanges

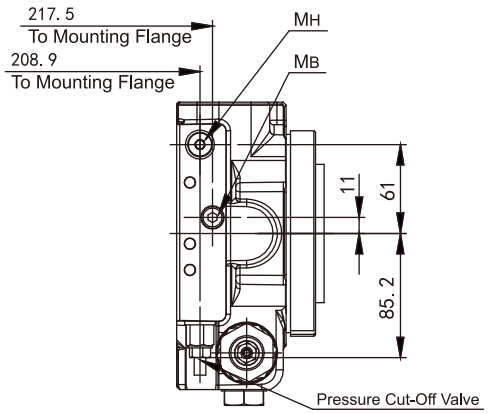




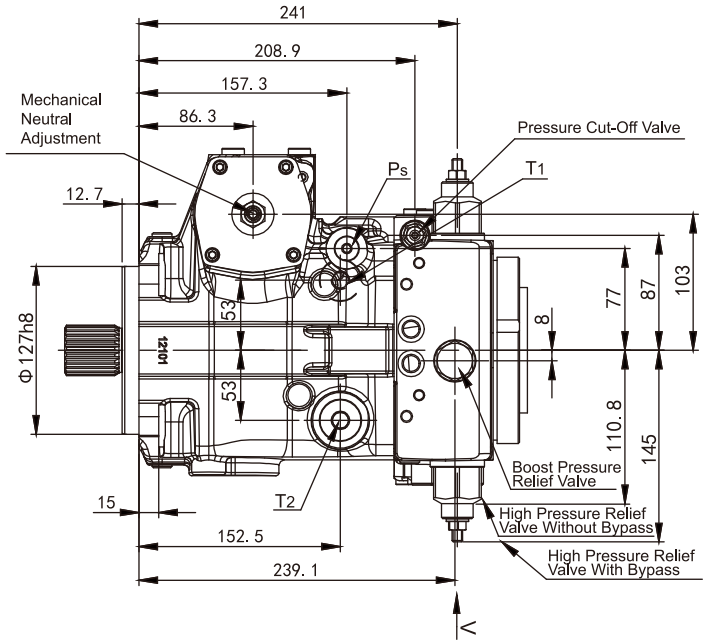
Six Hole Flanges



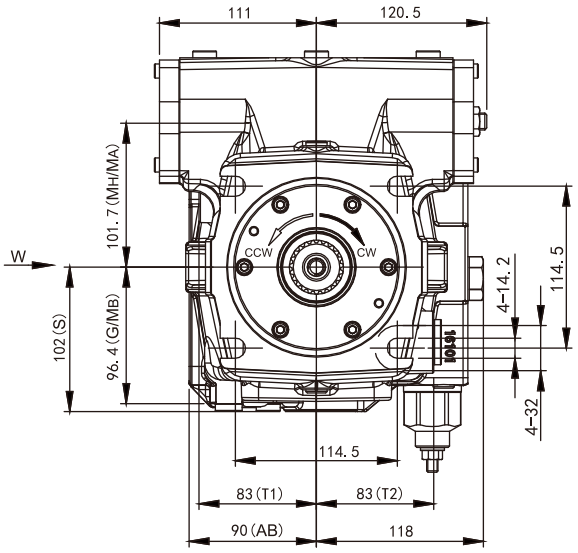
Detail V

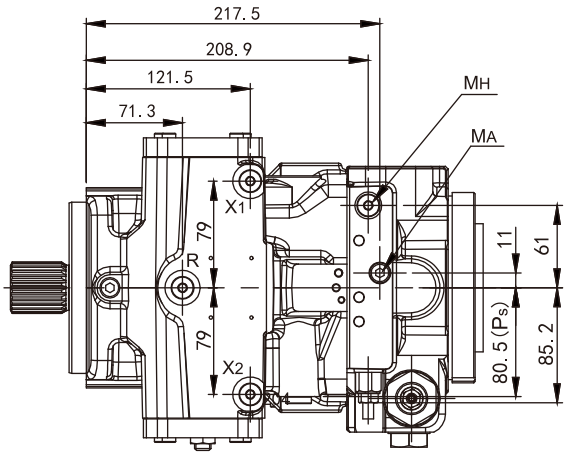


Installation Dimensions-Same side oil port 13

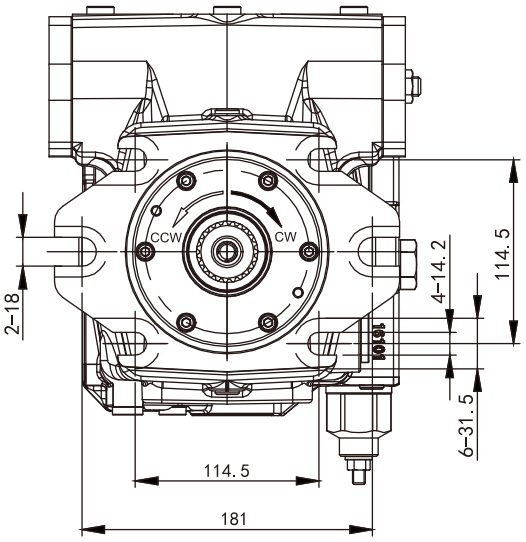


Four Hole Flanges

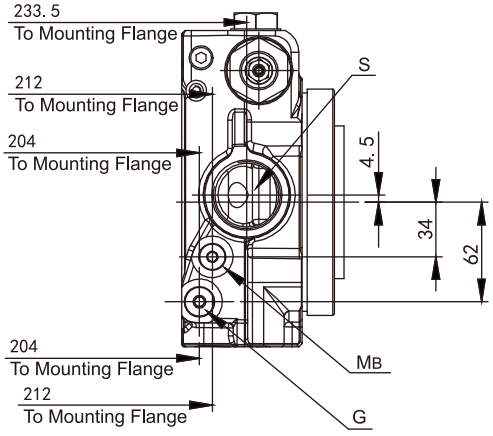




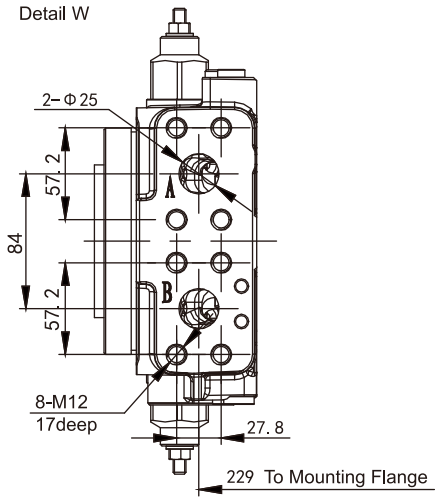
Six Hole Flanges



Detail V

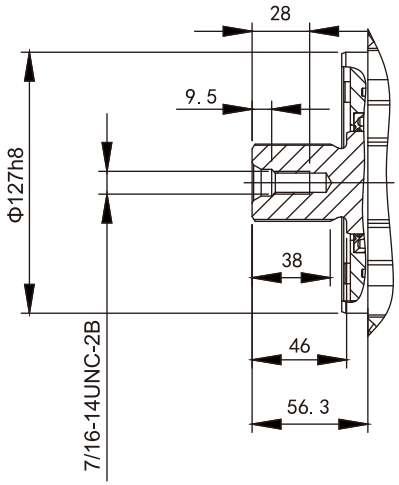


Detail W

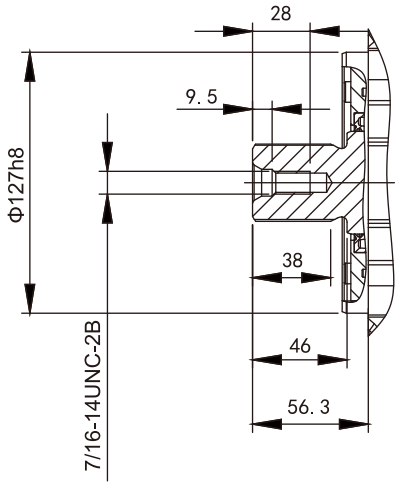


Installation Dimensions-Drive shaft

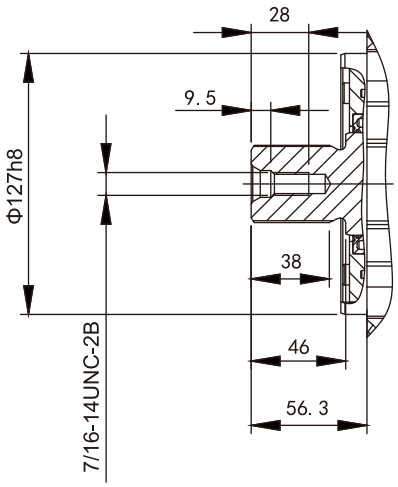
Drive shaft U:
Max. output torque 602Nm
Splined shaft 1 1/4″ ANSIB92.1-1970 6
14T 12/24DP pressure angle 30°



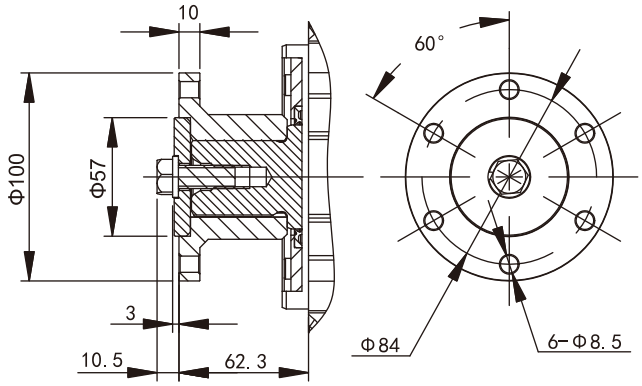
Drive shaft R:
Max. output torque 970Nm
Splined shaft 1 3/8″ ANSIB92.1-1970 6
21T 16/32DP pressure angle 30°



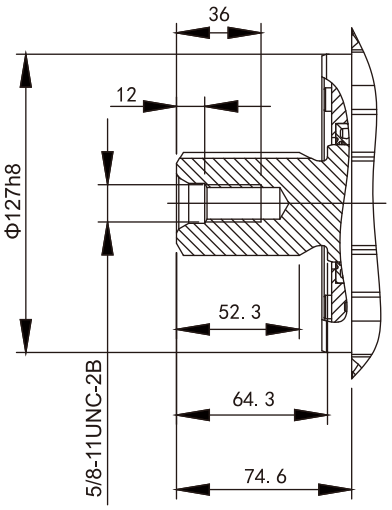
Drive shaft S:
Max. output torque 1305Nm
Splined shaft 1 1/2″ ANSIB92.1-1970 6
23T 16/32DP pressure angle 30°



Drive shaft L:
Max. output torque 1305Nm
Splined shaft 1 1/2″ ANSIB92.1-1970 6
23T 16/32DP pressure angle 30° With connecting flange



Drive shaft T:
Max. output torque 1640Nm
Splined shaft 1 3/4″ ANSIB92.1-1970 6
13T 8/16DP pressure angle 30°



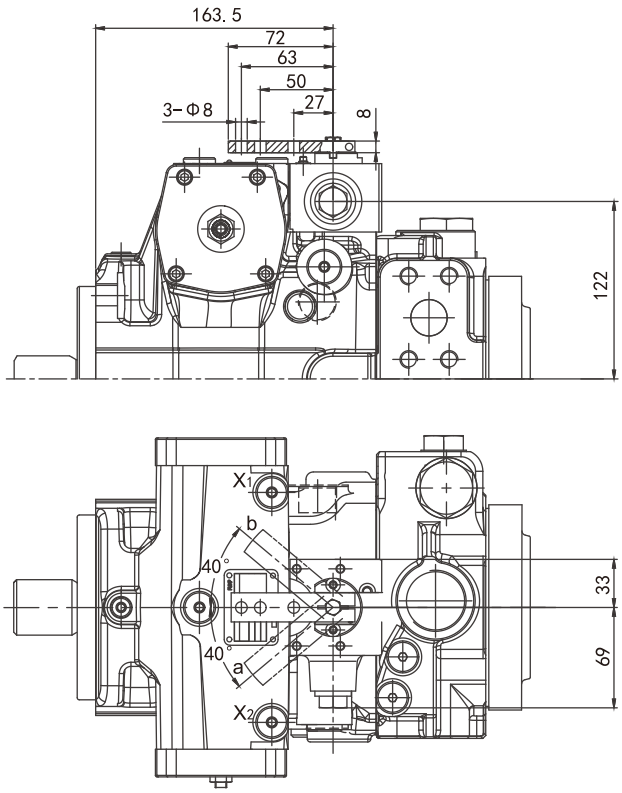
Installation Dimensions-Port

Port		Standard	Size	P_{max}(bar)	Torque(Nm)	Status[3]
A/B	Working port	SAE J518	SAE1"	500	–	◯
	Fastening thread	DIN 13	M12×1.75；17deep	–	5	
S	Suction port	DIN 3852	M42 ×2；18deep	5	5	◯
T_1[1]	Drain port		M26×1.5；16deep	5	5	◯
T_2	Drain port		M26×1.5；16deep	5	120	
R	Air bleed post		M12×1.5；12deep	3	30	
X_1/X_2	Control pressure port		M12×1.5；12deep	40	30	
X_3/X_4	Chamber pressure port		M12×1.5；12deep	40	30	
P_S	Inlet of pilot pressure port		M14×1.5；12deep	40	35	
G	Auxiliary line pressure port		M14×1.5；12deep	40	35	
M_A/M_B[2]	Pressure measuring oil port for working port		M12×1.5；12deep	500	30	╳
M_H	Balance high-pressure port		M12×1.5；12deep	500	30	
F_e	Filter inlet(same side)	–	Φ12	40	–	
	Filter inlet(opposite side)	DIN 3852	M22×1.5；14deep	40	80	
F_a	Filter outlet(same side)	–	Φ12	40	–	
	Filter outlet(opposite side)	DIN 3852	M26×1.5；18deep	40	120	
F_{a1}	Filter auxiliary outlet(opposite side)		M22×1.5；14deep	40	80	
F_S	Cold start port(opposite side)		M22×1.5；14deep	5	80	
Y_1/Y_2	Pilot signal port(only HD)		M14×1.5；10deep	40	5	◯

1）The drain port can be provided in different specifications. Please contact our company for details.
2）Same side oil port, rear cover with pressure cutoff function, pressure measurement ports are M12×1.5 and M10×1.5.
3）Status description: O=Must be connected (plugged upon delivery); X= (during normal operation).

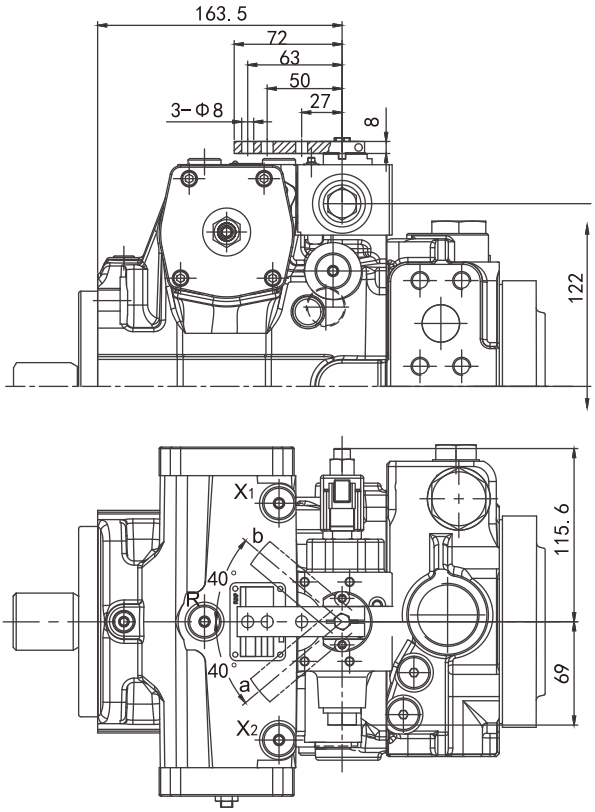
Installation Dimensions-Control valve

Mechanical Servo Control-HW[1)]

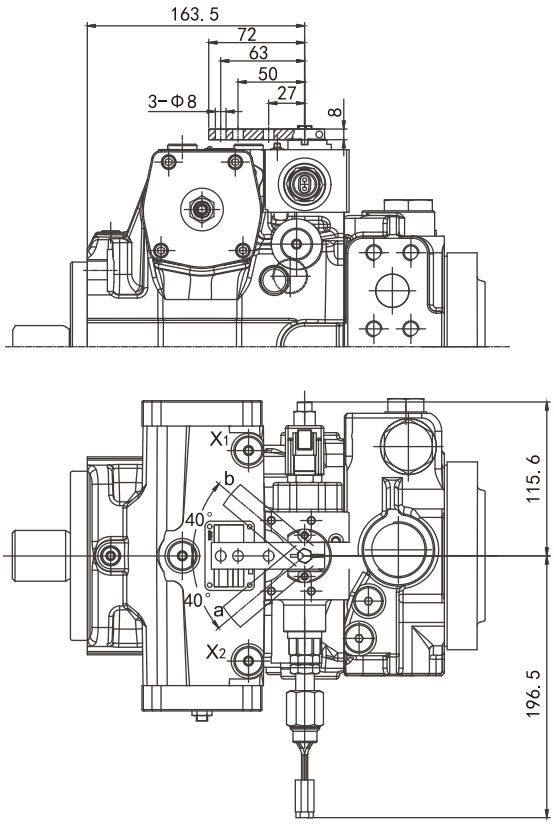


1)Does not show all mechanical handle models. Please contact us for specific models.

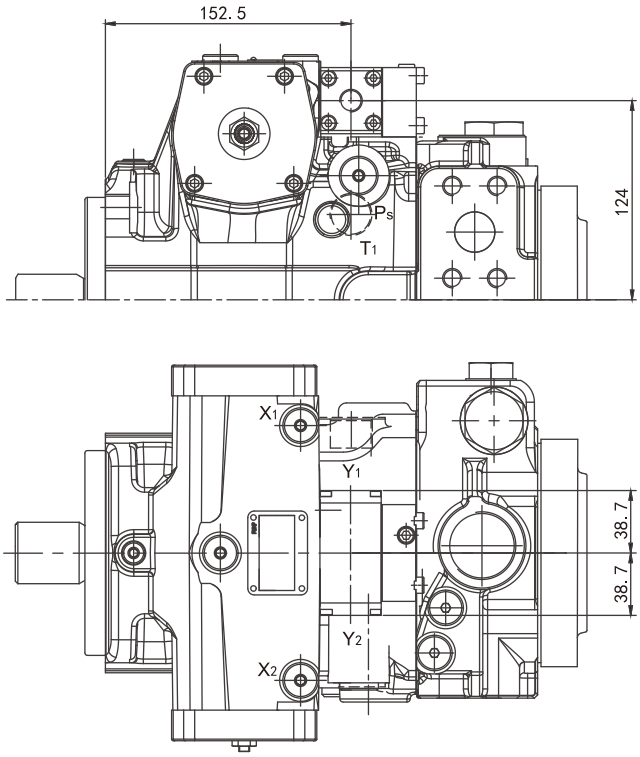
With brake valve-HW(O/C)



With brake valve and neutral position switch-HW(C/O)L



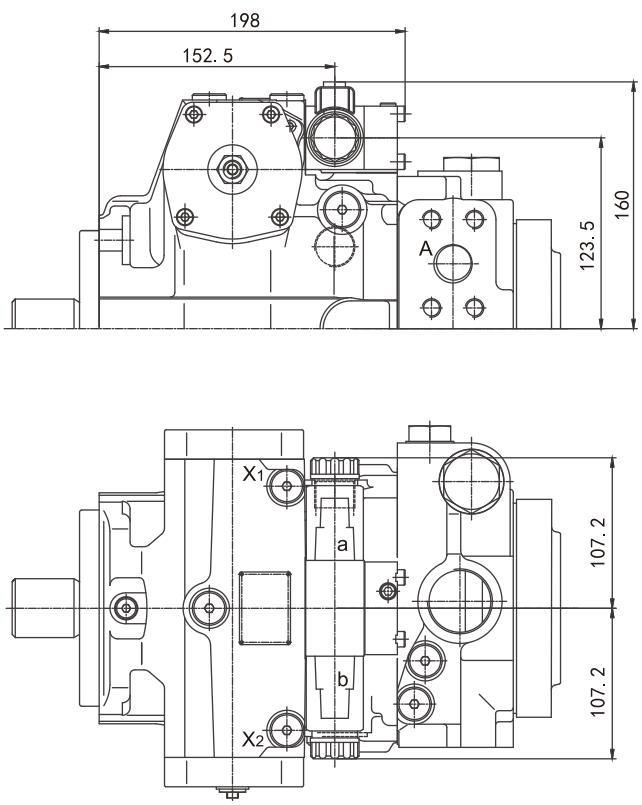
Pilot Pressure Control-HD[2)]



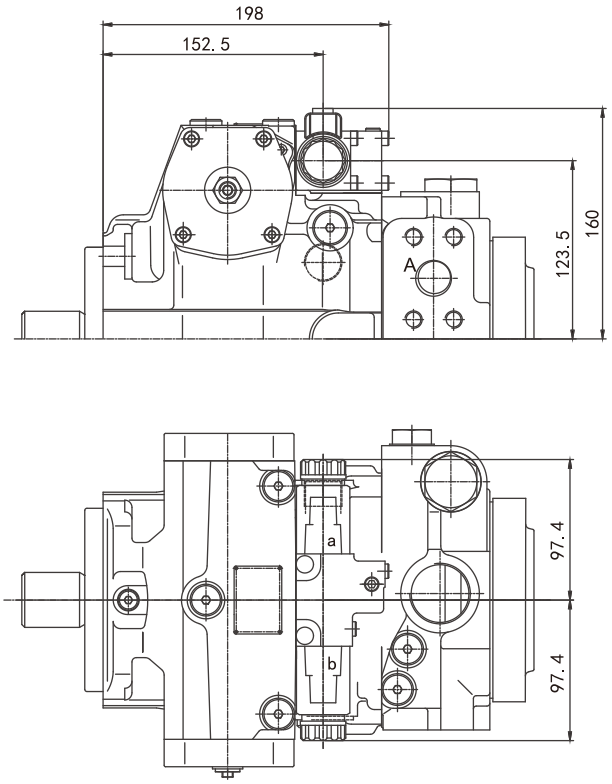
2)The size specifications for Y1/Y2 oil ports are detailed in the Oil Port Size Specifications Table.

Installation Dimensions-Control valve

Electrical Control with Proportional Solenoids-EP

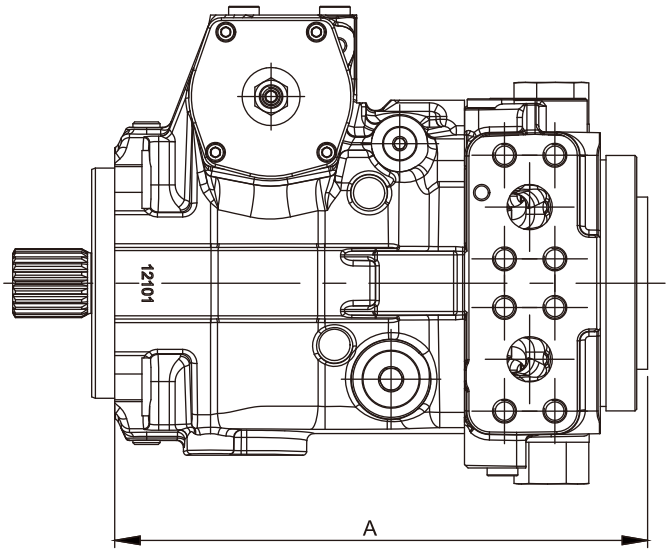


With brake valve-HW(O/C)



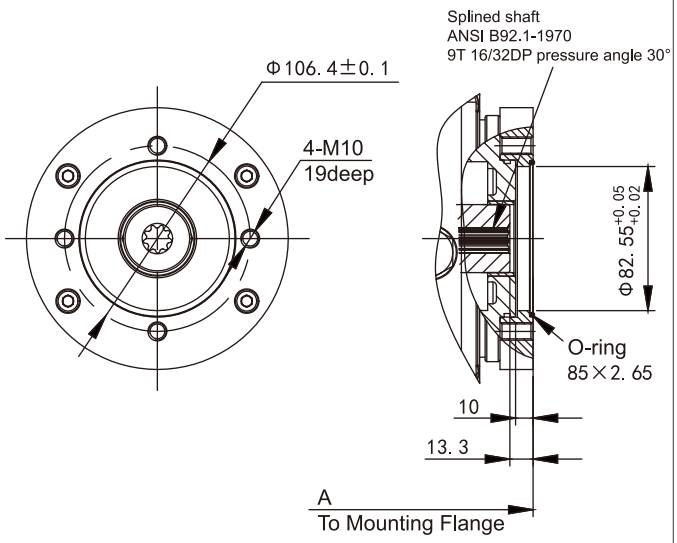
Installation Dimensions-Through drive shaft

Without through drive shaft-F00/N00

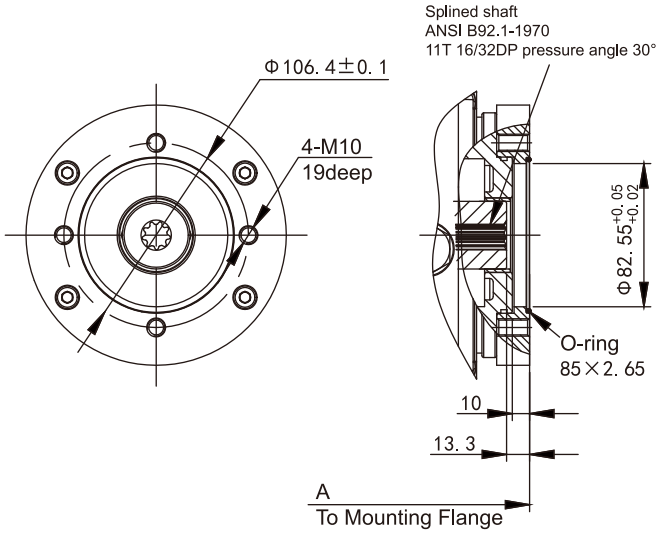


A		Replenishing displacement	
		19. 6	28. 3
F/K	00	294. 1	304. 6
	01	298. 6	311. 6
	52	298. 6	311. 6
	02	300. 6	313. 6
	68	300. 6	313. 6
	04	300. 6	313. 6
	07	310. 6	323. 6

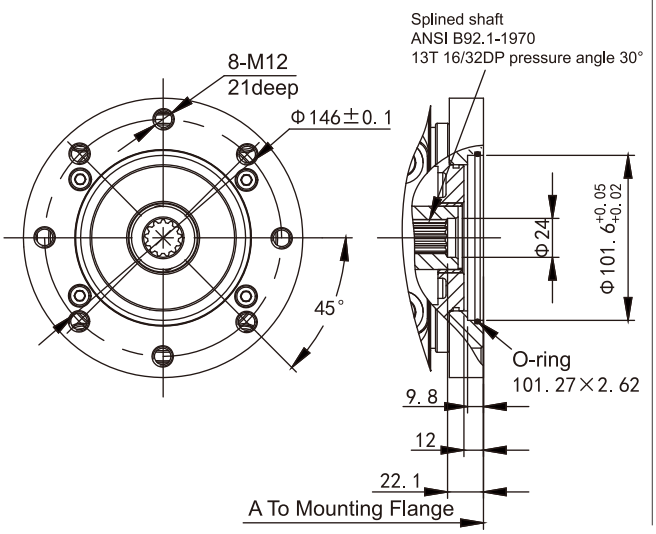
F01/K01 Flange SAE J 744-82-2(A)



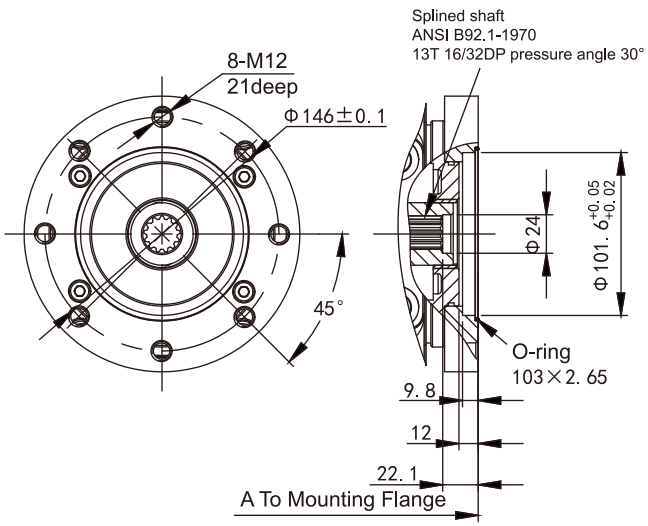
F52/K52 Flange SAE J 744-82-2(A)



F02/K02 Flange SAE J 744-101-2(B)

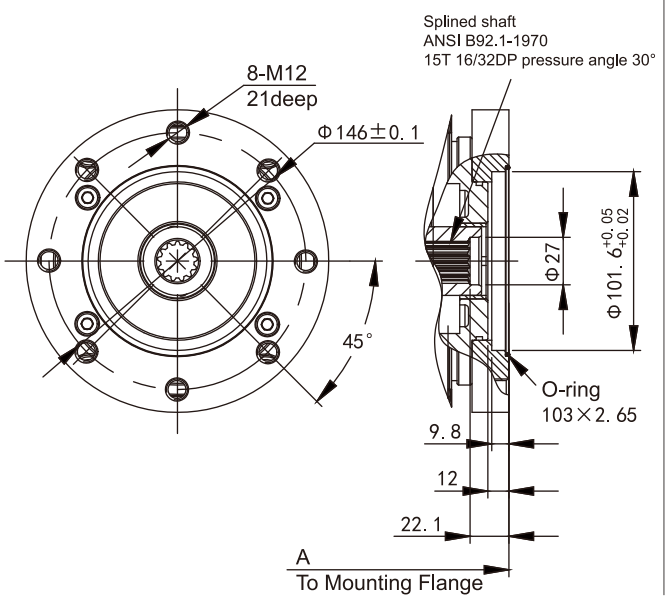


F68/K68 Flange SAE J 744-101-2(B)

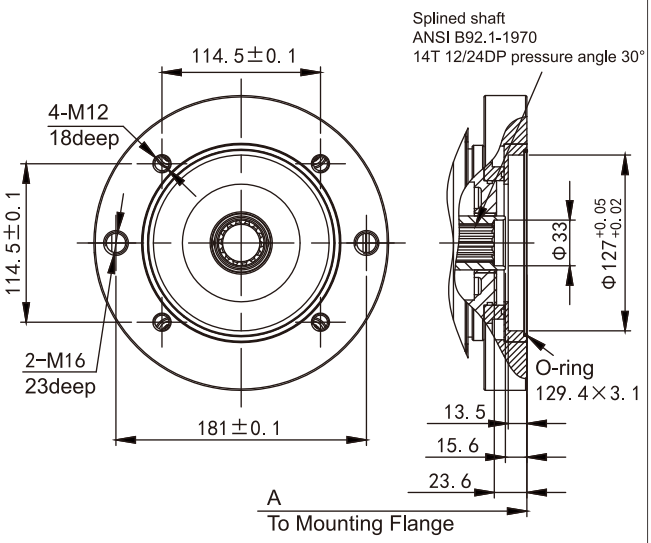


Installation Dimensions-Through drive shaft

F04/K04 Flange SAE J 744-101-2(B)



F07/K07 Flange SAE J 744-127-2/4(C)



Installation Instructions

General

The axial piston unit must be filled with hydraulic fluid and the air completely exhausted during commissioning and normal operation. Fluid filling and air bleeding are required after long-term shutdown as the hydraulic line of the system may leaks.

The case drain fluid in the case interior must be directed to the reservoir via the highest case drain port. The minimum suction pressure at the suction port must be no less than 0.8bar absolute, and it is no less than 0.5bar absolute at cold start.

The suction line and case drain line must be led into the tank below the lowest level of the tank in the selected working mode.

Installation position

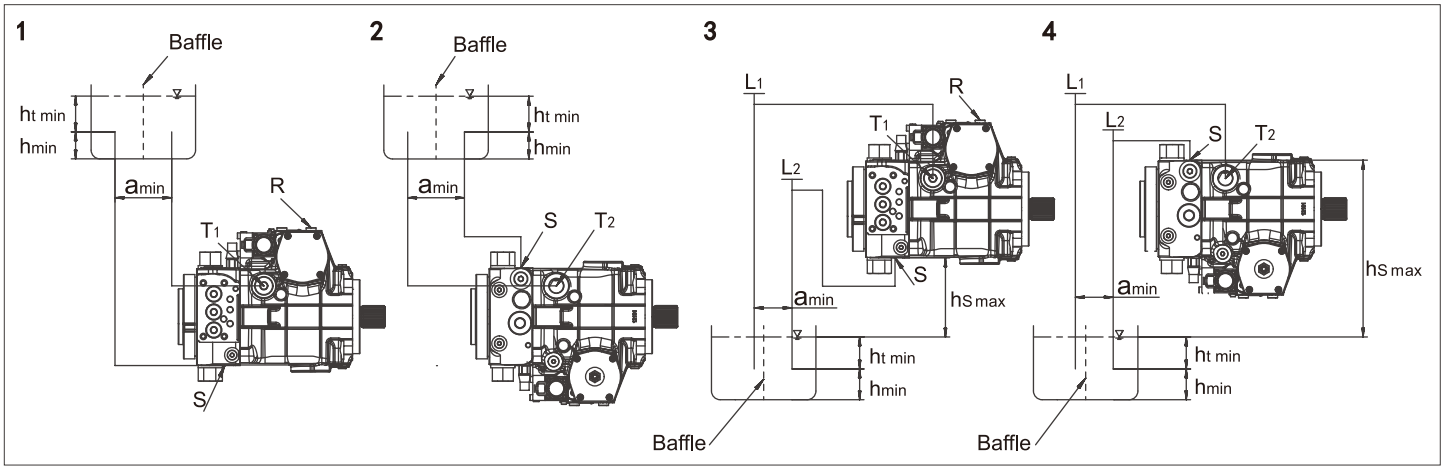
See the examples below. Other installation positions are available upon request.
Note: Describe the “shaft orientation” in the order.

Below-reservoir installation

The pump is installed below the minimum level of the reservoir. Recommended installation positions: 1 and 2.

Above-reservoir installation

The pump is installed above the minimum level of the reservoir, but it does not exceed the maximum allowable suction height h_{max}=800mm.



$h_{S\,max}$=800mm，$h_{t\,min}$=200mm，h_{min}=100mm
When designing the fuel tank, it should be ensured that there is sufficient space before the suction and discharge pipelines a_{min}, to prevent the heated return oil flow from being directly sucked back into the oil suction pipeline.

Installation Position	Air Bleeding	Filling	Installation Position	Air Bleeding	Filling
1	R	S+T_1	3	L_2(S)+R	L_2(S)+L_1
2	T_2	S+T_2	4	L_2+L_2(T_2)	L_2+L_1(T_2)

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HYTEK POWER CO.,LTD.

No.156,West Yuele Street,Lucheng District,Wenzhoucity 325029,Zhejiang,CHINA
Email: globalsales@hytek.cn

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