

Axial Piston Variable Pump HA4VTG

HA4VTG swashplate type axial piston variable pumps can realize efficient transmission and output of great torque through hydraulic pressure regulation, thus meeting customer's requirements in such severe working conditions as high speed and frequent shock.

Closed circuit

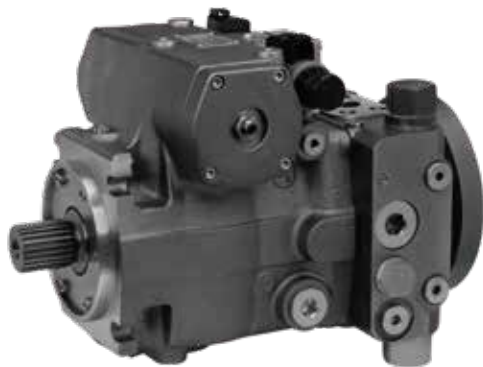
Size: 71/80/90/100 mL/r

Series: 15

Series: 39

Rated pressure: 32 MPa Rated pressure: 40 MPa

Max.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

Model Description

	A	B	D	E	F		J	K		M	N	P	R	S	T	U	V		Y
HA4VTG						/			—									—	

Axial piston unit

—	Swashplate type axial piston variable pump for closed circuit operations	HA4VTG
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Displacement

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

B	Hydraulic Control			71	80	90	100	
		Mechanical servo, hex shaft with lever (standard code with straight lever by default)		●	●	●	●	HW
		With neutral position switch		●	●	●	●	HWL
		With brake valve(NO)	U=12V DC	○	○	○	○	HWO1
			U=24V DC	●	●	●	●	HWO2
		With brake valve(NC)	U=12V DC	○	○	○	○	HWC1
			U=24V DC	●	●	●	●	HWC2
		With brake valve, NO&neutral position switch	U=12V DC	○	○	○	○	HWO1L
			U=24V DC	○	○	○	○	HWO2L
		With brake valve, NC&neutral position switch	U=12V DC	○	○	○	○	HWC1L
			U=24V DC	●	●	●	●	HWC2L
	Pilot pressure control	Without supply filter		●	●	●	●	HD1
		With supply filter		●	●	●	●	HD3
	Electric control	With proportional solenoids	Without supply filter	U=12V DC	●	●	●	EP1
				U=24V DC	●	●	●	EP2
			With supply filter	U=12V DC	●	●	●	EP3
				U=24V DC	●	●	●	EP4
		With switch solenoids	Without supply filter	U=12V DC	○	○	○	EZ1
				U=24V DC	○	○	○	EZ2
			With supply filter	U=12V DC	●	●	●	EZ3
				U=24V DC	●	●	●	EZ4

Pressure cut-off

D		71	80	90	100	
	Without pressure cut-off(No code)	●	●	●	●	
	With pressure cut-off	●	●	●	●	D

Stroke limiter - max. displacement regulation

E		71	80	90	100	
	Without stroke limiter(No code)	—	—	●	●	
	Mechanical stroke limiter, for regulation of max. displacement	●	●	●	●	M

Model Description

	A	B	D	E	F		J	K		M	N	P	R	S	T	U	V		Y
HA4VTG						/			—									—	

Stroking chamber pressure port (X3/X4)

F		71	80	90	100	
	Without port X3/X4(No code)	●	●	●	●	
	With port X3/X4	●	●	●	●	T

Series

J		71	80	90	100	
	Series 15	●	●	●	●	15
	Series 39	●	●	●	●	39

Direction of rotation (viewed on shaft end)

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

Sealing material

M		71	80	90	100	
	Nitrile rubber (NBR) seal, shaft seal in fluoroelastomer (FKM)	●	●	●	●	N
	Nitrile rubber (NBR) seal, shaft seal in nitrile rubber (NBR)	○	○	○	○	P
	Fluoroelastomer (FKM) seal, shaft seal in fluoroelastomer (FKM)	●	●	●	●	V

Shaft end (splined shaft (ANS I B92. 1–1970 Class 5))

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

Mounting flange

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

Working port (viewed on shaft end)

R		71	80	90	100	
	Opposite side	●	●	●	●	02
	Suction port downward	●	●	●	●	03
	Suction port upward	●	●	●	●	03
	Same side	●	●	●	●	10
	Suction port upward, working port rightward	●	●	●	●	10
	Suction port downward, working port leftward	●	●	●	●	13

Model Description

	A	B	D	E	F		J	K		M	N	P	R	S	T	U	V		Y
HA4VTG						/			—									—	

Auxiliary pump&through drive¹⁾

			71	80	90	100	
S	Integrated boost pump	Without through drive	●	●	●	●	F00
		Flange SAE J 774-82-2 (A)	●	●	●	●	F01
		Flange SAE J 774-101-2 (B)	●	●	●	●	F02
			●	●	●	●	F04
		Flange SAE J 774-127-2 (C)	●	●	●	●	F07
	Without integrated boost pump	Without through drive	●	●	●	●	N00
		Flange SAE J 774-82-2 (A)	●	●	●	●	K01
		Flange SAE J 774-101-2 (B)	●	●	●	●	K02
			●	●	●	●	K04
		Flange SAE J 774-127-2 (C)	●	●	●	●	K07

High pressure relief valve²⁾

		71	80	90	100	
T		●	●	●	●	
	Direct operated, without bypass valve (default standard pressure 40 MPa)	●	●	●	●	5
	Direct operated, with bypass valve (default standard pressure 40 MPa)	●	●	●	●	6

Filtration³⁾

		71	80	90	100	
U	Integrated filter, without cold start valve, without contamination indicator	●	●	●	●	A
	Integrated filter, with cold start valve, without contamination indicator	●	●	●	●	F*
	Integrated filter, without cold start valve, with contamination indicator	●	●	●	●	G
	Integrated filter, with cold start valve, with electrical signals contamination indicator, DEUTSCH connector	○	○	○	○	B*
	Integrated filter, with cold start valve, with contamination indicator	●	●	●	●	P*
	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 (optional, only for N00, K**)	●	●	●	●	E

Connector for solenoids

		71	80	90	100	
V		●	●	●	●	
	Without solenoids(No code)	●	●	●	●	
	DEUTSCH molded connector ⁴⁾	●	●	●	●	P

Special configuration

		71	80	90	100	
Y		●	●	●	●	
	Without special configuration (No code)	●	●	●	●	
	Customer special configuration	○	○	○	○	***

● Available ○ On request

— Not applicable

■ Recommended model

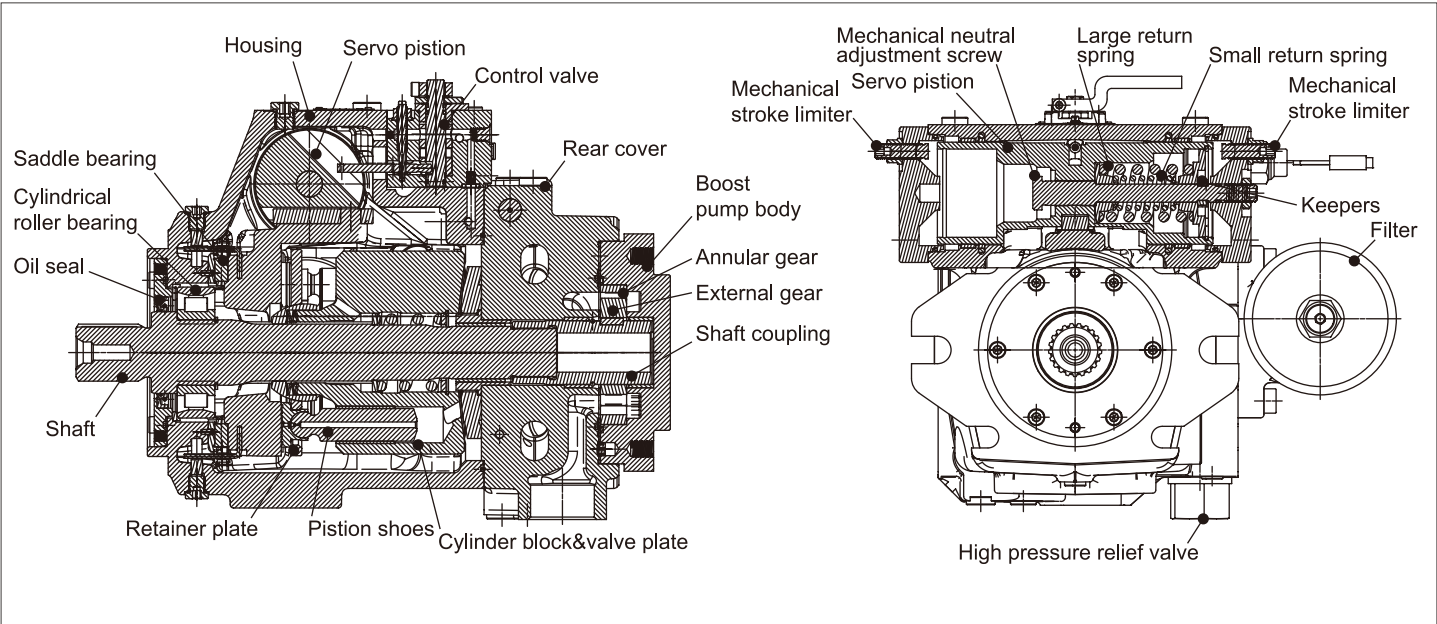
¹⁾ Spline standard ANSI B92.1-1970 Class 6; F07: a transitional step may be used to connect "SAE J744 C 4-hole (4*Φ14, Φ127h8 12.7) 1 1/4"14T 12/24DP spline sleeve".

²⁾ Available pressures of direct operated high pressure relief valve: 20/22/24/26/28/30/32/34/36/38/40/42, in MPa; a bypass valve may be provided for vehicle towing.

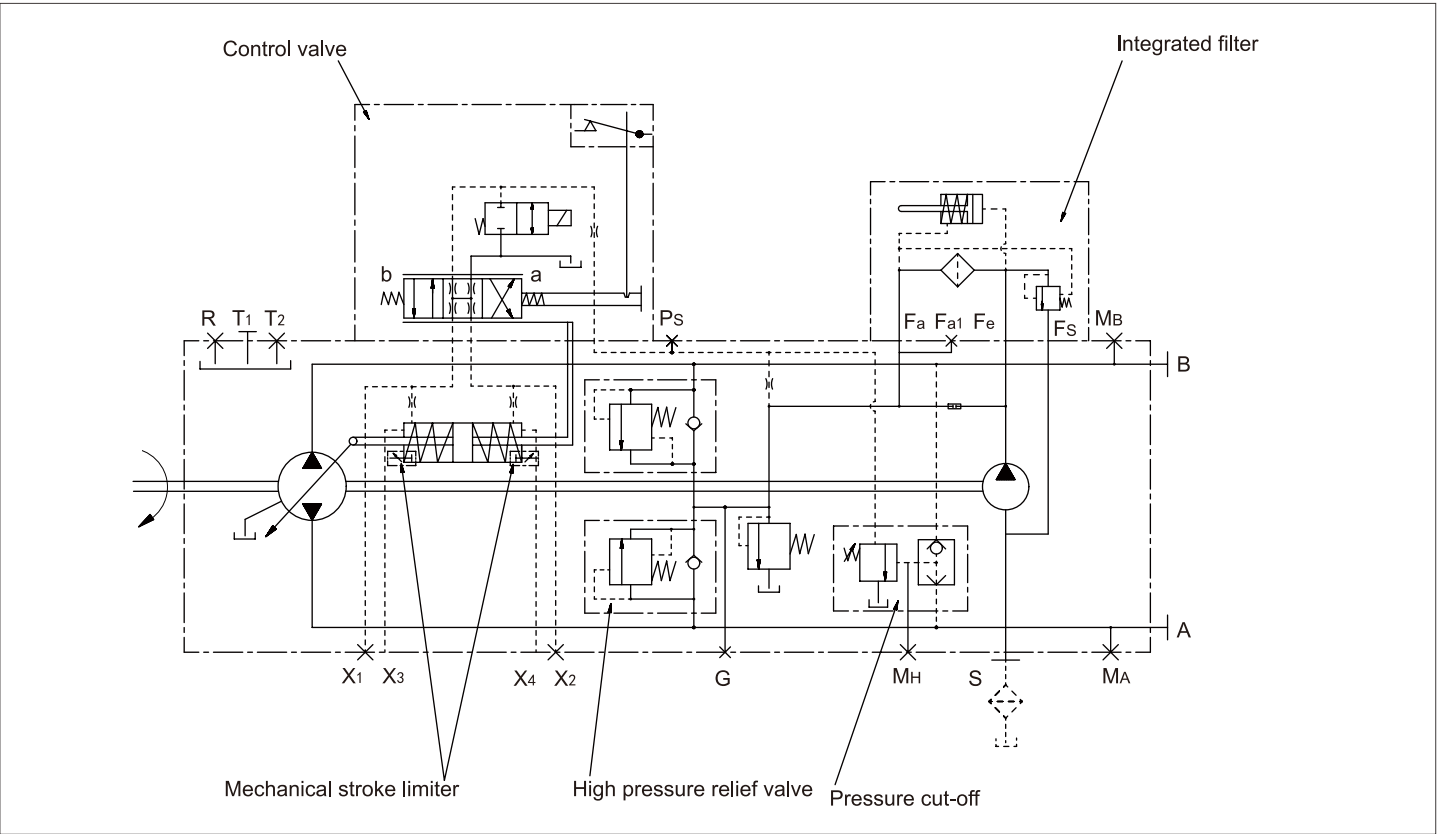
³⁾ Filter: F/B/P opposite ports are available

⁴⁾ 2-pin, without suppressor diode, DeutschDT04-2P connector, for HWC/O, EP, EZ control.

Product Mix



Hydraulic Schematic 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

$$V_{opt} = \text{optimum operating viscosity } 16 \cdots 36 \text{ mm}^2/\text{s}$$

depending on the closed circuit temperature.

> Limit Viscosity

Limit viscosity:

$$V_{min} = 5 \text{ mm}^2/\text{s}$$

Short-term ($t < 3 \text{ min}$)

Permissible max. temperature $t_{max} = +115^\circ\text{C}$

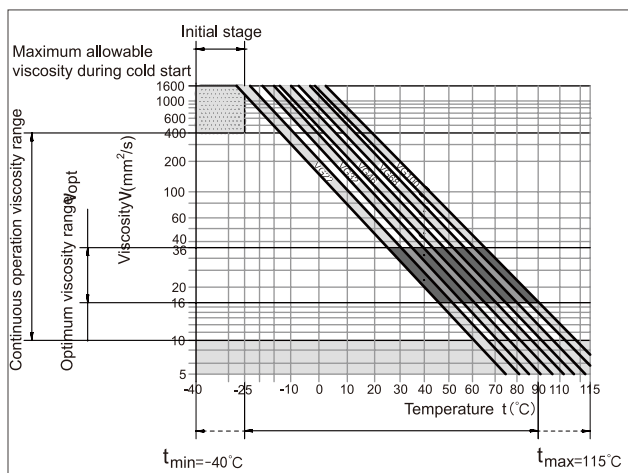
$$V_{max} = 1600 \text{ mm}^2/\text{s}$$

Short-term ($t < 3 \text{ min}$)

Cold start ($p \leq 3 \text{ Mpa}$, $n \leq 1000 \text{ rpm}$, $t_{min} = -40^\circ\text{C}$)

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°C at the ambient temperature of $X^\circ\text{C}$. 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 $+115^\circ\text{C}$.

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 $\beta_{15-20} \geq 75$

Suction and return filter $\beta_{35-45} \geq 75$

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

When the fluid temperature is high ($+90^\circ\text{C}$ to $+115^\circ\text{C}$), 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 ($n=1500 \text{ rpm}$) P_{sp} _____ 20bar

Boost pump:

Suction port $P_{s \min}$ ($v \leq 30 \text{ mm}^2/\text{s}$) _____ $\geq 0.8 \text{ bar absolute}$

Short-term, at cold start ($t < 3 \text{ min}$) _____ $\geq 0.5 \text{ bar absolute}$

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

> Shaft 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 ($t < 0.1 \text{ s}$) 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°C to $+115^\circ\text{C}$.

NBR shaft seal is intended for the case temperature range of -40°C to $+90^\circ\text{C}$.

Technical Data

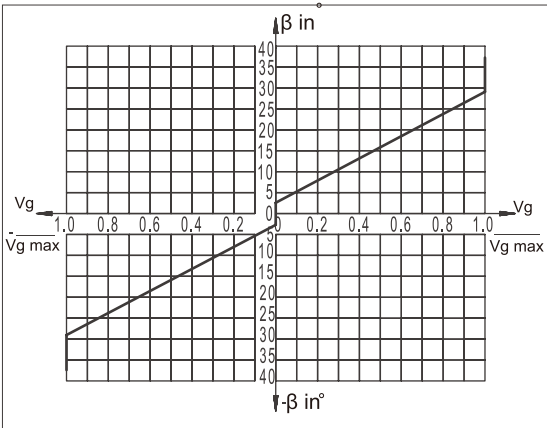
Spec.	Unit			71	80	90	100	
Displacement	Variable pump	$V_{g\max}$	mL/r	71	80	90	100	
	Boost pump ($\Delta p=20\text{bar}$)	$V_{g\text{ SP}}$	mL/r	19. 6 or 28. 3				
Rated pressure	Series 15		MPa	32				
	Series 39		MPa	40				
Max. pressure	Series 15		MPa	40				
	Series 39		MPa	45				
Speed	Max. speed at $V_{g\max}$	$n_{o\max\text{ sustain}}$	rpm	3050				
	Min. speed	n_{\min}	rpm	500				
Flow	At $n_{o\max\text{ sustain}}\&V_{g\max}$		$q_{v\max}$	L/min	217	244	275	305
Power	At $n_{o\max\text{ sustain}}, \Delta p=40\text{MPa}$		n_{\min}	KW	145	163	183	203
Torque	At $V_{g\max}, \Delta p=40\text{MPa}$		T_{\max}	Nm	452	510	573	637
Moment of inertia around drive shaft		J	Kg m^2	0. 0106				
Weight (standard)		m	KG	48				

Specification Calculation

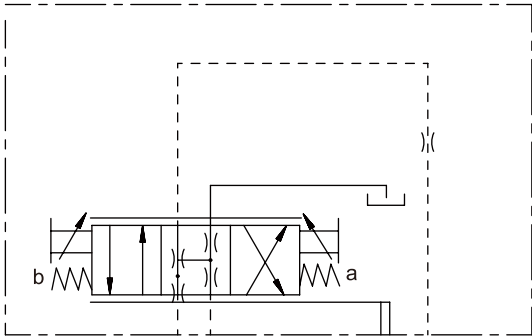
Flow	$q_v = \frac{V_g \cdot n \cdot \eta_v}{1000}$	[L/min]	V_g = Displacement	mL/r
			Δp = Differential pressure	MPa
Torque	$T = \frac{V_g \cdot \Delta p}{2 \cdot \pi \cdot \eta_{mh}}$	[Nm]	n = Rotational speed	rpm
			η_v = Volumetric efficiency	
			η_{mh} = Hydraulic-mechanical efficiency	
Power	$P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

➤ Mechanical Servo Control,HW

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:
 $\beta=3^{\circ}$ at start point of control
 $\beta=29^{\circ}$ at end point of control (max. displacement V_{gmax})
mechanical limit of lever: $\pm 39^{\circ}$



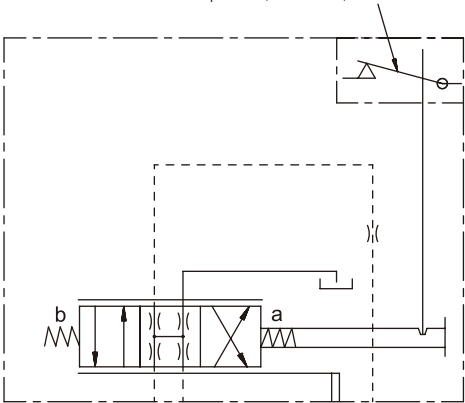
Variant I: with neutral position switch,HWL

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	Deutsch DJ7021-1, 8-20

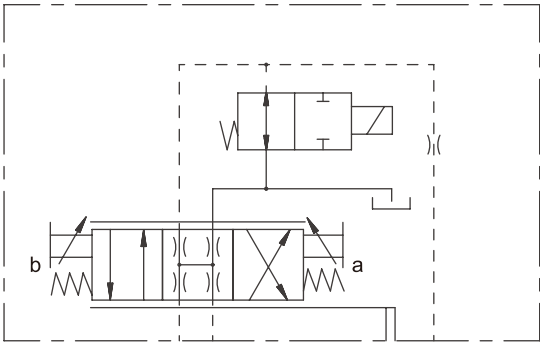
The resistance is zero at neutral position; otherwise, it is infinite.



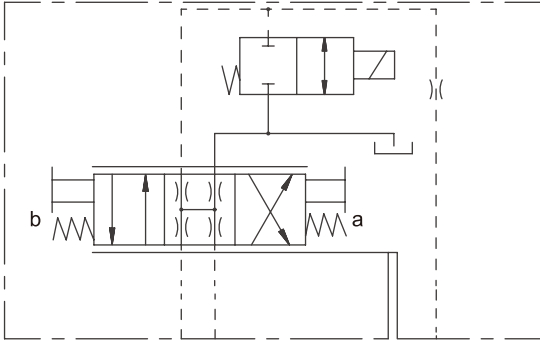
Variant II: with brake valve,HWO/HWC

Solenoid Specification	HWO(C)1	HWO(C)2
Voltage	12V DC (±1. 8V)	24V DC (±3. 6V)
Nominal resistance(20℃)	9 Ω	36 Ω
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



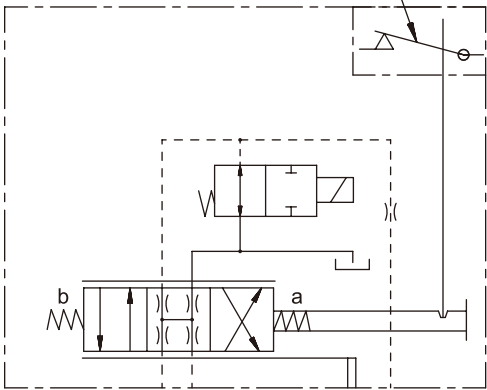
With NC brake valve,HWC,electric braking



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

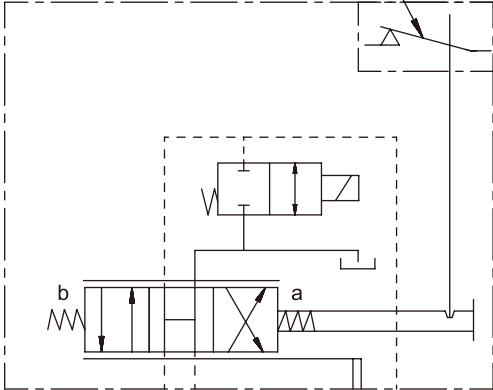
With NO brake valve and neutral position switch, HWOL

The resistance is zero at neutral position; otherwise, it is infinite.



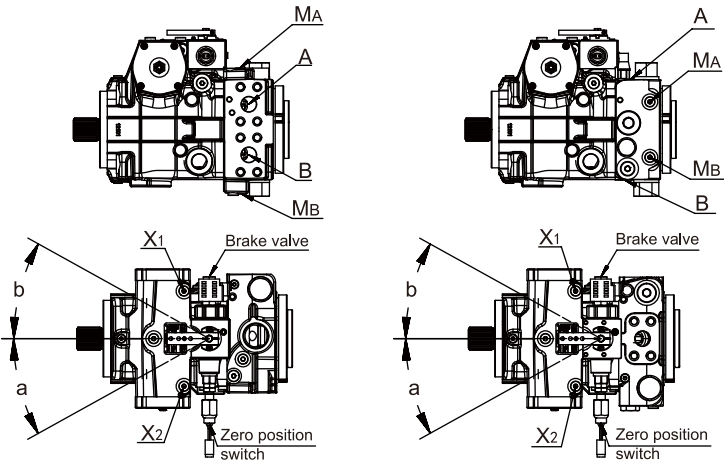
With NO brake valve and neutral position switch, HWCL

The resistance is zero at neutral position; otherwise, it is infinite.



Rotation of Direction of Rotation,Control and Flow Direction

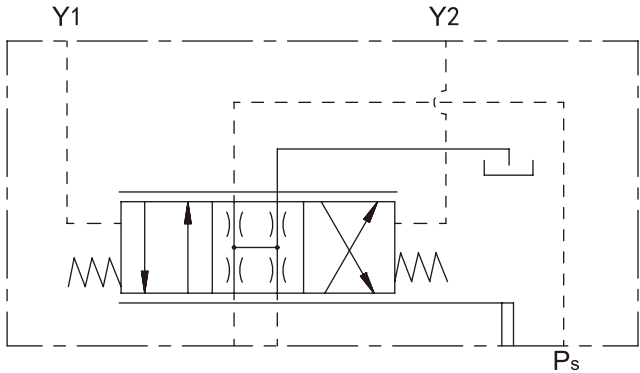
Direction of Rotation (viewed on shaft end)				
	CW		CCW	
Direction of control lever	a	b	a	b
Variable pressure	X2	X1	X2	X1
Flow direction	B→A	A→B	A→B	B→A
Working pressure	MA	MB	MB	MA



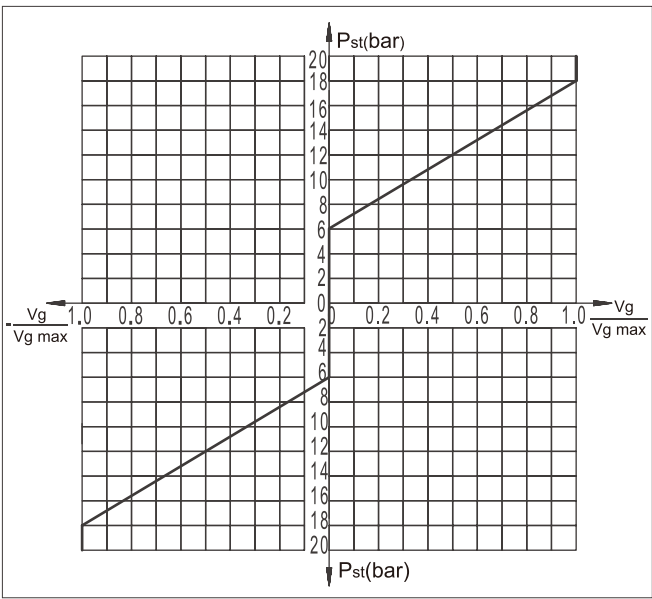
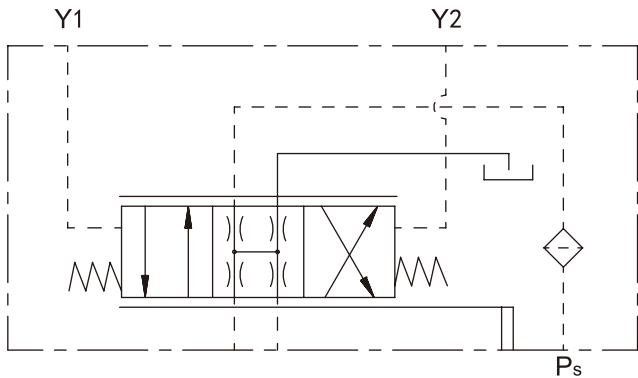
Pilot Pressure Control, HD

Depending on the difference between pilot pressures P_{st} (port Y1 and Y2) 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 $P_{st}=18\text{bar}$
- Pilot pressure at port Y1/Y2: $P_{st}=6\text{-}18\text{bar}$
- 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.

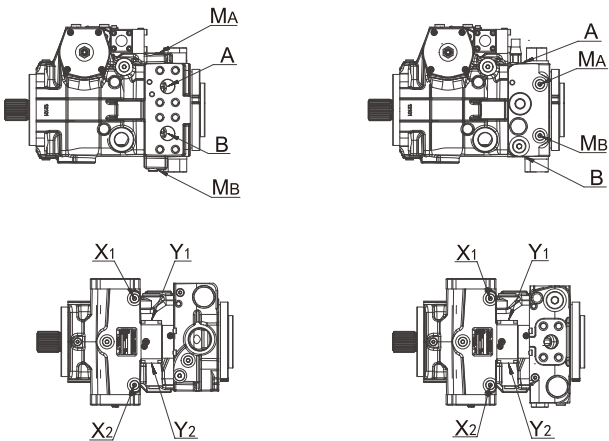
The spring at the center of the pilot control device is not a safety device.

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 ($< 90\ ^\circ\text{C}$) or 19/17/14 ($\geq 90\ ^\circ\text{C}$ or $< 115\ ^\circ\text{C}$) specified in ISO 4406.

Correlation of Direction of Rotation, Control and Flow Direction

Direction of Rotation (viewed on shaft end)				
	CW		CCW	
Pilot pressure	Y1	Y2	Y1	Y2
Variable pressure	X1	X2	X1	X2
Flow direction	A→B	B→A	B→A	A→B
Working pressure	M _B	M _A	M _A	M _B



➤ Electrical Control with Proportional Solenoids,EP

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.

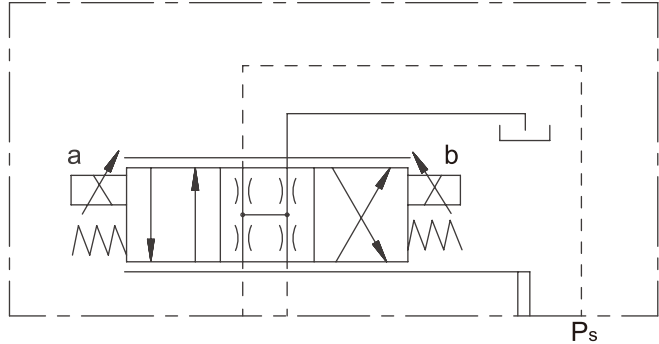
Solenoid specification	EP1/3	EP2/4
Voltage	12V DC (±20%)	24V DC (±20%)
Control current		
Control start point $V_g=0$	400mA	200mA
Control end point $V_g \text{ max}$	1200mA	600mA
Limit current	1.54A	0.77A
Nominal resistance(20°C)	5.5Ω	22.7Ω
Vibration frequency	100Hz	
Working time	100%	
Protection rating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

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.

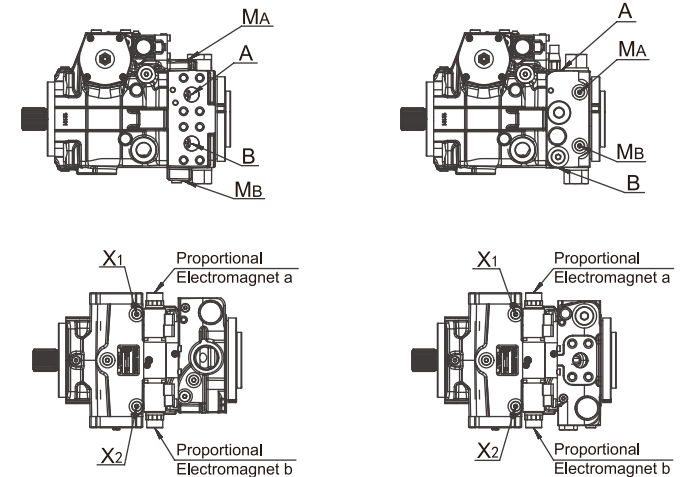
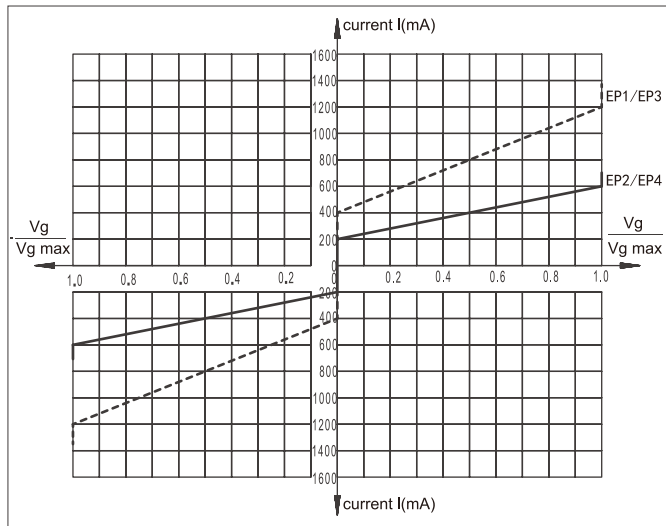
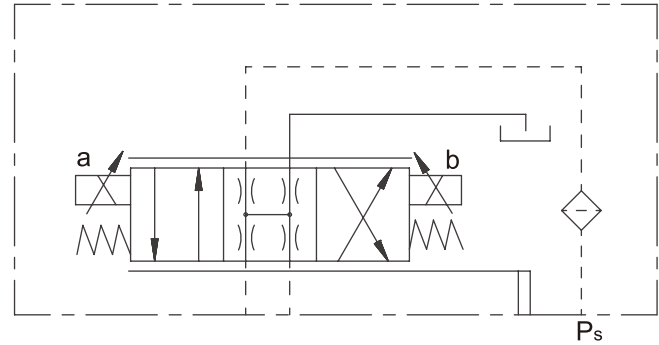
Correlation of Direction of Rotation,Control and Flow Direction

Direction of Rotation (viewed on shaft end)				
	CW		CCW	
Solenoid actuation	a	b	a	b
Variable pressure	X1	X2	X1	X2
Flow direction	A→B	B→A	B→A	A→B
Working pressure	MB	MA	MA	MB

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



EP3/4: with supply filter (standard)

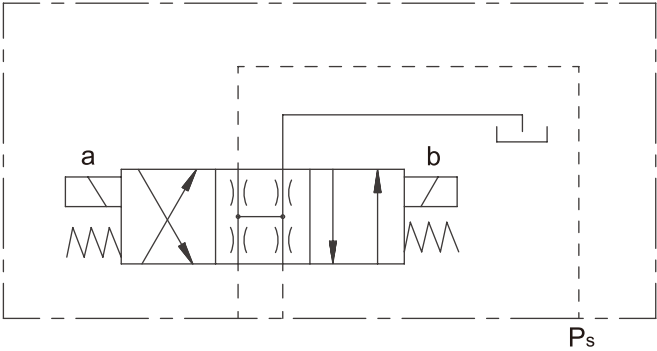


Electrical Control with Switching Solenoids,EZ

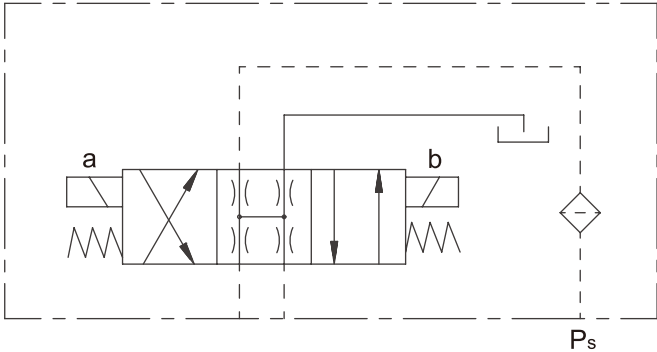
Depending on on-off conditions of the switching solenoid (a or b) at both ends of the valve, the variable cylinder of the pump obtains control pressure through the EZ control so that the swashplate moves and regulates the displacement within the range of $V_g=0$ to V_{gmax} . Each solenoid corresponds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

Solenoid specification	EZ1/3	EZ2/4
Neutral position $V_g=0$	OFF	OFF
Position $V_g\ max$	ON	ON
Nominal resistance(20°C)	5.5 Ω	21.7 Ω
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!)

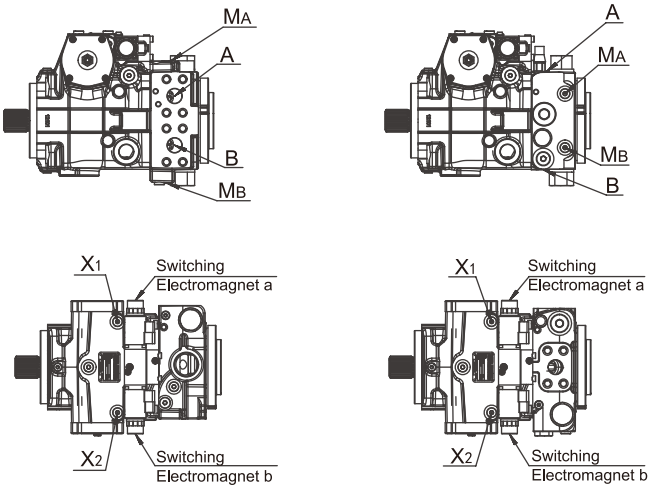


EZ3/4: with supply filter (standard)



Correlation of Direction of Rotation,Control and Flow Direction

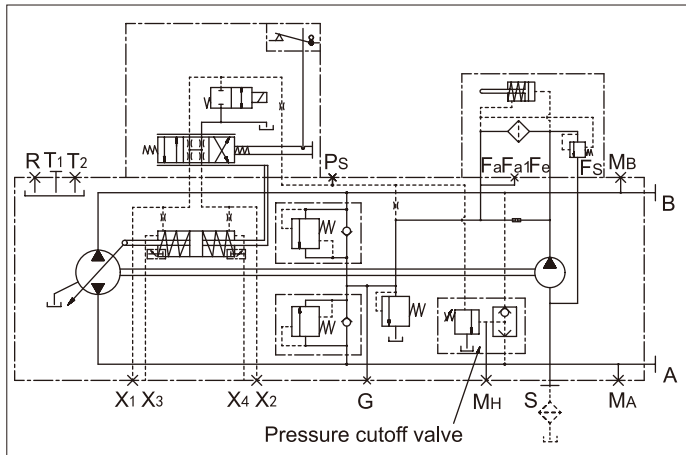
Direction of Rotation (viewed on shaft end)				
	CW		CCW	
Solenoid actuation	a	b	a	b
Variable pressure	X2	X1	X2	X1
Flow direction	B→A	A→B	A→B	B→A
Working pressure	MA	MB	MB	MA



➤ Pressure Cut-off,D

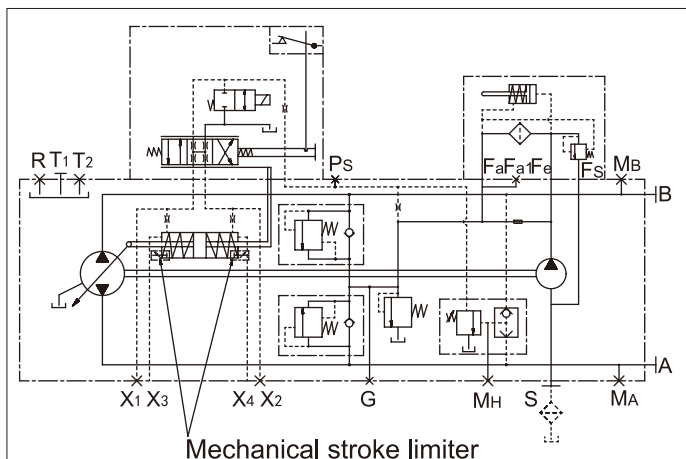
Pressure cut-off is a pressure regulation function. The pump displacement is adjusted to $V_{g\ min}$ when the set pressure is reached, thus preventing action of the high pressure relief valve at acceleration or deceleration.

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.

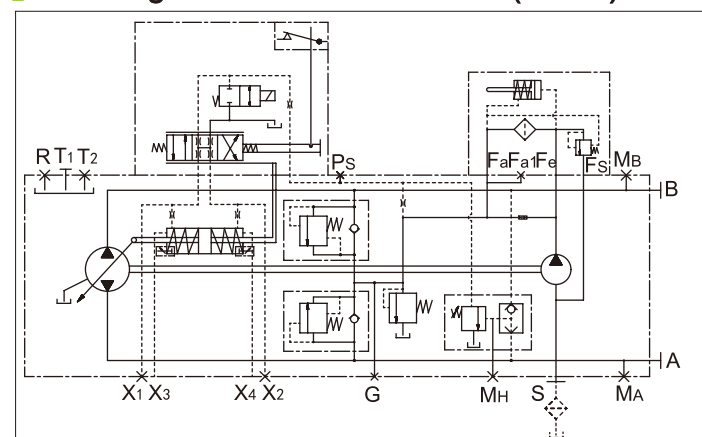


➤ Mechanical Stroke Limiter

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.

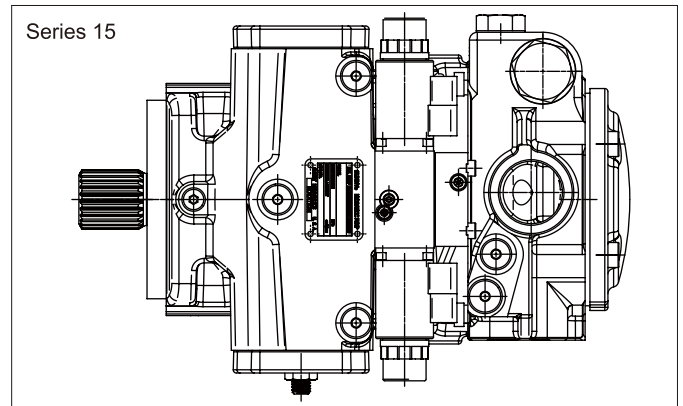


➤ Stroking Chamber Pressure Port(X3/X4)

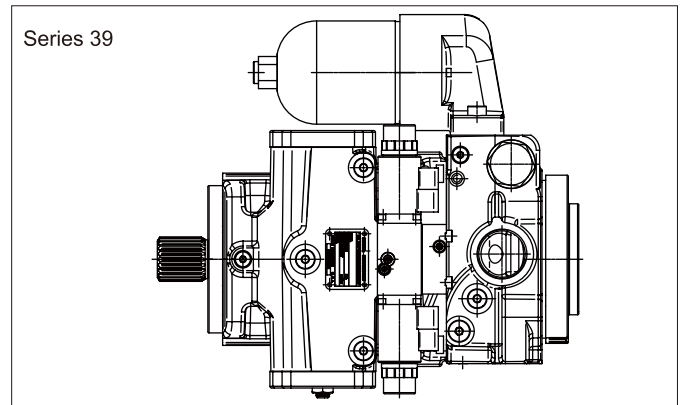


➤ Series

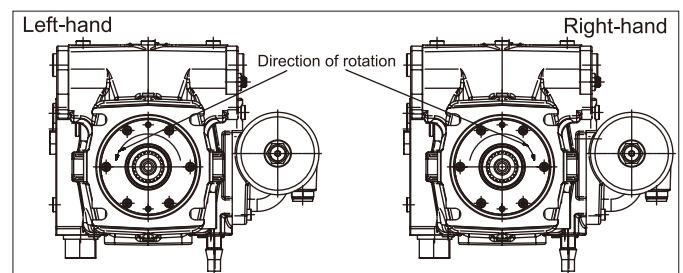
Series 15-Low pressure rating; rated pressure: 32MPa, integrated filters and high pressure cut-off valves are not optional. At present, this series is only available at the same side oil port.



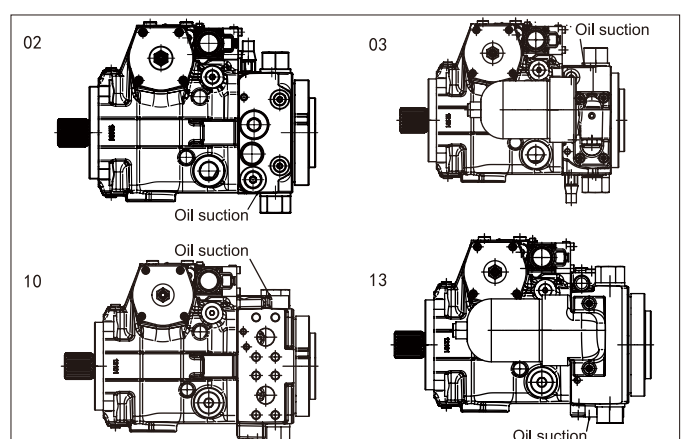
Series 39-High voltage withstand, 40MPa rated pressure; it is recommended to choose this series for harsh operation conditions.



➤ Direction of Rotation

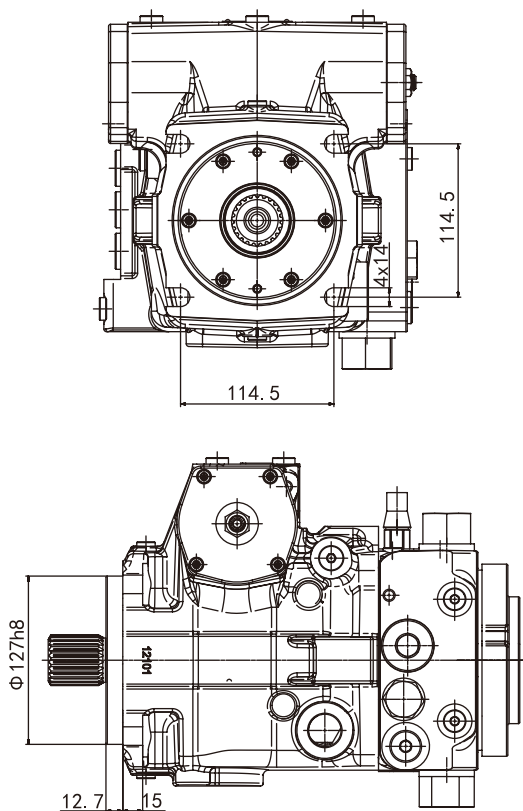


➤ Working Port

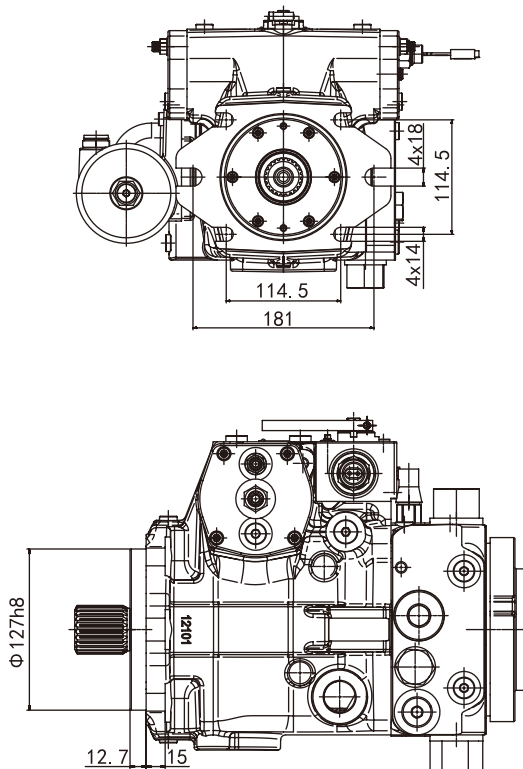


Mounting Flange

Four-hole flanges



Six-hole flanges



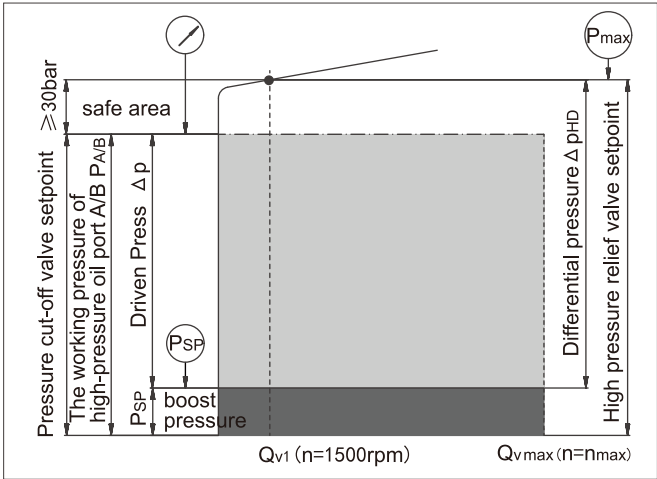
High Pressure Relief Valve

Setting range

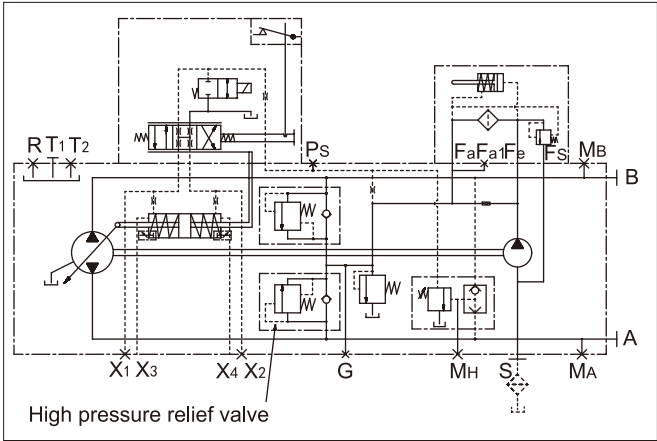
Direct operated	In: MPa
	20
	22
	24
	28
	30
	32
	34
	36
	38
	40
	42

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, and the bypass valve is intended for vehicle towing.

Setting Diagram



Pressure setting diagram



Filter

Standard: in suction line of boost pump, S

Standard model (preferred)

Type of filter: Filter without bypass valve

Recommendation: With contamination indicator

Filter liquid resistance:

$v=30\text{mm}^2/\text{s}$, $n=n_{\text{max}}$ $\Delta p \leq 0.1\text{bar}$

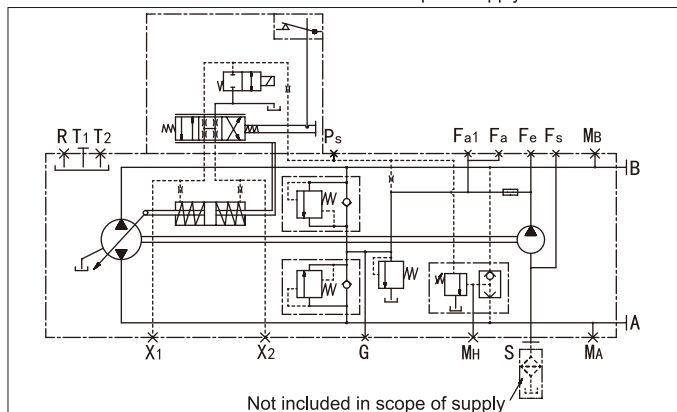
$v=1000\text{mm}^2/\text{s}$, $n=n_{\text{max}}$ $\Delta p \leq 0.3\text{bar}$

Pressure at boost pump port S:

$v=30\text{mm}^2/\text{s}$, $n=n_{\text{max}}$ $\Delta p \geq 0.8\text{bar}$

In cold start, $v=1600\text{mm}^2/\text{s}$, $n \leq 1000\text{rpm}$ $\Delta p \geq 0.5\text{bar}$

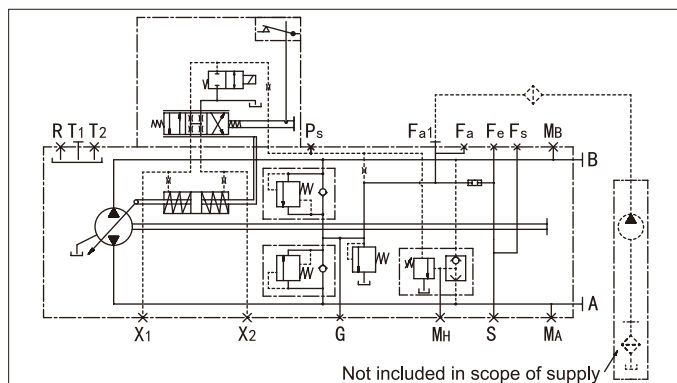
Note: Filters of this kind are not included in our scope of supply.



Variant I: external supply, E

This variant is used for models without integrated boost pump such as N00 or K... Port S is blocked and fluid is supplied through port Fa or Fa1.

Filter arrangement: Scattered arrangement is intended to ensure functional stability. Make sure of fluid cleanliness at port Fa or Fa1 (see "Technical Data - Filter").



Variant II: in pressure line of charge pump, with external charge line filter port, D

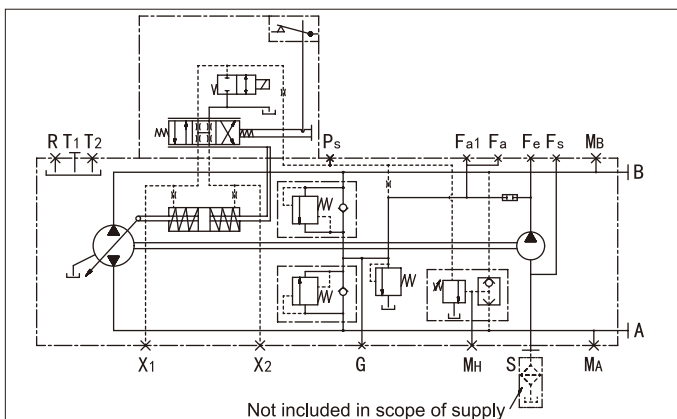
Filter inlet: port Fe

Filter outlet: port Fa

Filter type: 1. Filter with bypass valve is not recommended.

2. Filter with contamination indicator is recommended.

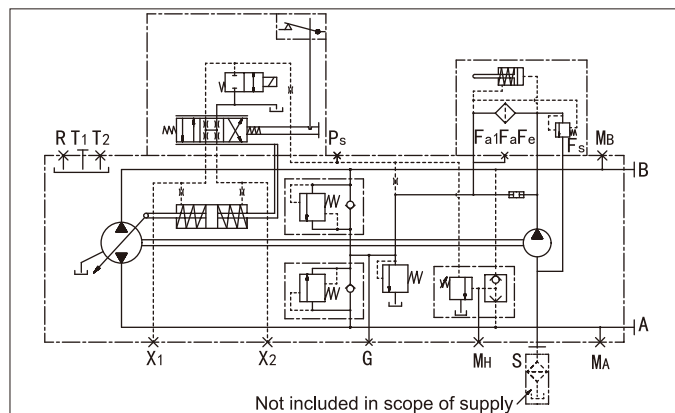
Note: Filters of this kind are not included in our scope of supply.



Variant III: in pressure line of boost pump, with cold start valve filter and luminous contamination indicator, P

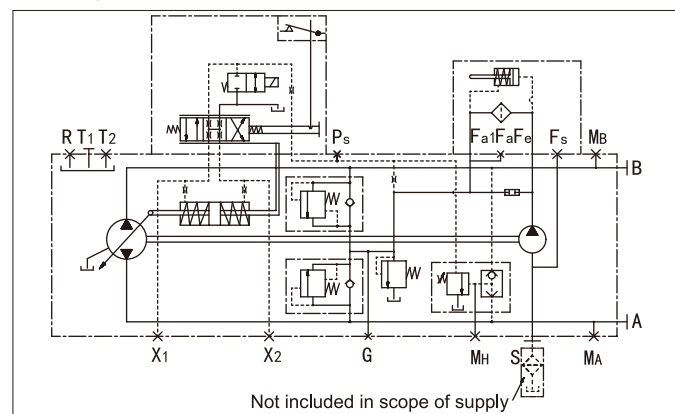
Pressure difference (switching pressure) $\Delta p = 5\text{bar}$

Note: Only opposite side oil port

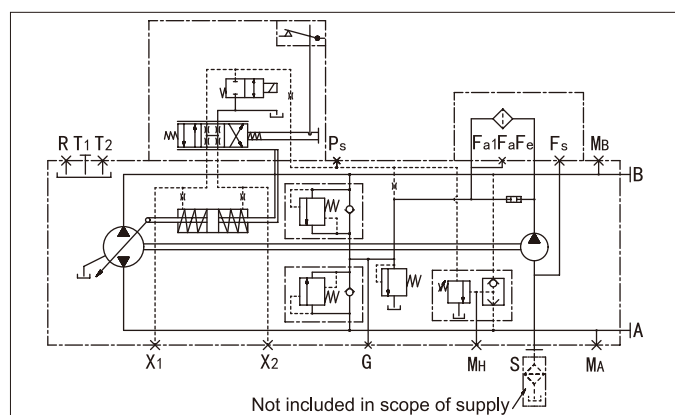


Variant IV: in pressure line of boost pump, with filter and luminous contamination indicator, B

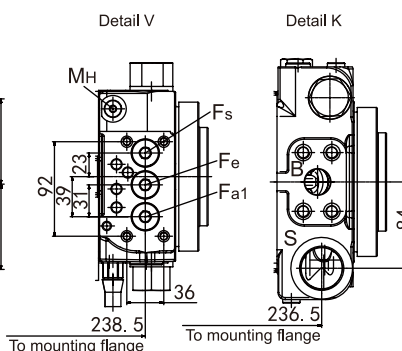
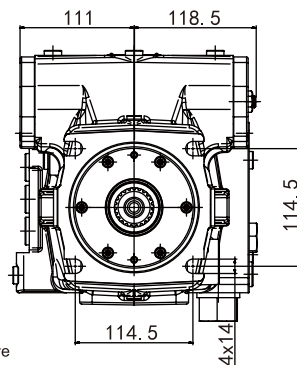
Note: Only opposite side oil port



Variant V: in pressure line of boost pump, with filter, A



Series 39
Opposite side oil port 02



Technical drawing of the 4WEH 63/OF3 solenoid valve, showing front, top, side, and detail views with dimensions and labels.

Front View (Top Left): Shows the main body with dimensions: 207 (total width), 86.3 (top flange width), 12.7 (top flange thickness), 114.5 (bottom flange width), 118.5 (top flange outer width), 111 (top flange inner width), 110.8 (bottom flange outer width), 84 (A) (bottom flange inner width), 84 (B) (bottom flange inner width), 110.8 (bypass function 150), 126.5 (bottom flange thickness), 152.5 (bottom flange inner width), 157.3 (bottom flange inner width), 207 (total width), 238.5 (total width), 244.5 (total width). Labels: Mechanical neutral adjustment, High pressure relief valve, T₁, P_s, MH, F_s, F_e, F_{a1}, T₂, Pressure cut-off, K.

Top View (Bottom Left): Shows the top of the valve with dimensions: 15, 35.2, 2x Ø 25, 79, 79, 232.5, 236.5, 27.8, 119.5, 84, 57.2, 212 To mounting flange, 213.5 To mounting flange. Labels: X₁, X₂, S, A, B.

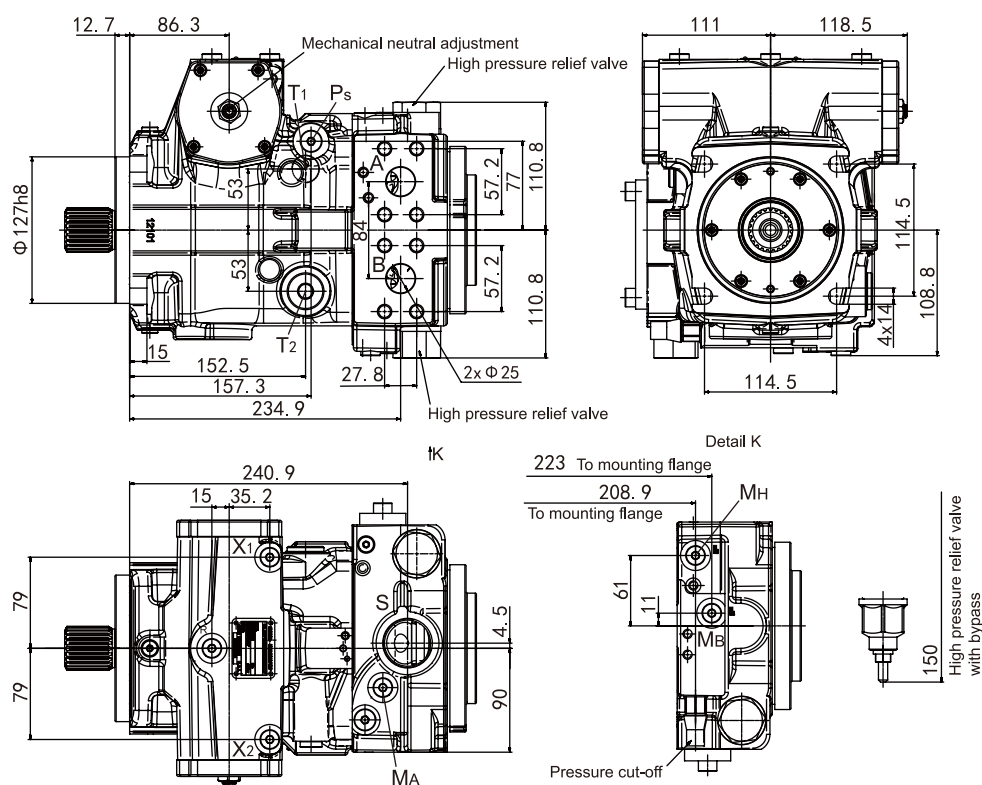
Detail V (Bottom Right): Shows the boost-pressure relief valve with dimensions: 29.5, 65, 213.5 To mounting flange. Labels: MB, MA, G, Boost-pressure relief valve.

Detail K (Bottom Right): Shows the pressure cut-off with dimensions: 76, 239.5 To mounting flange. Labels: T_a, B, G.

Installation Dimensions

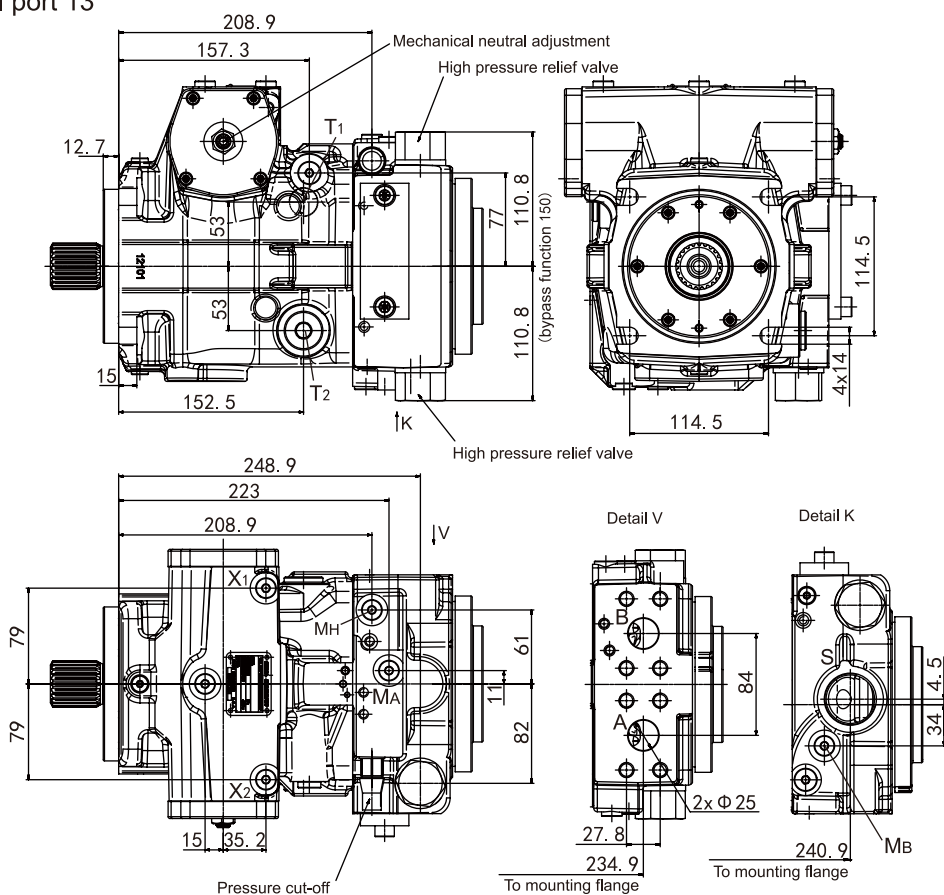
Series 39

Same side oil port 10



Series 39

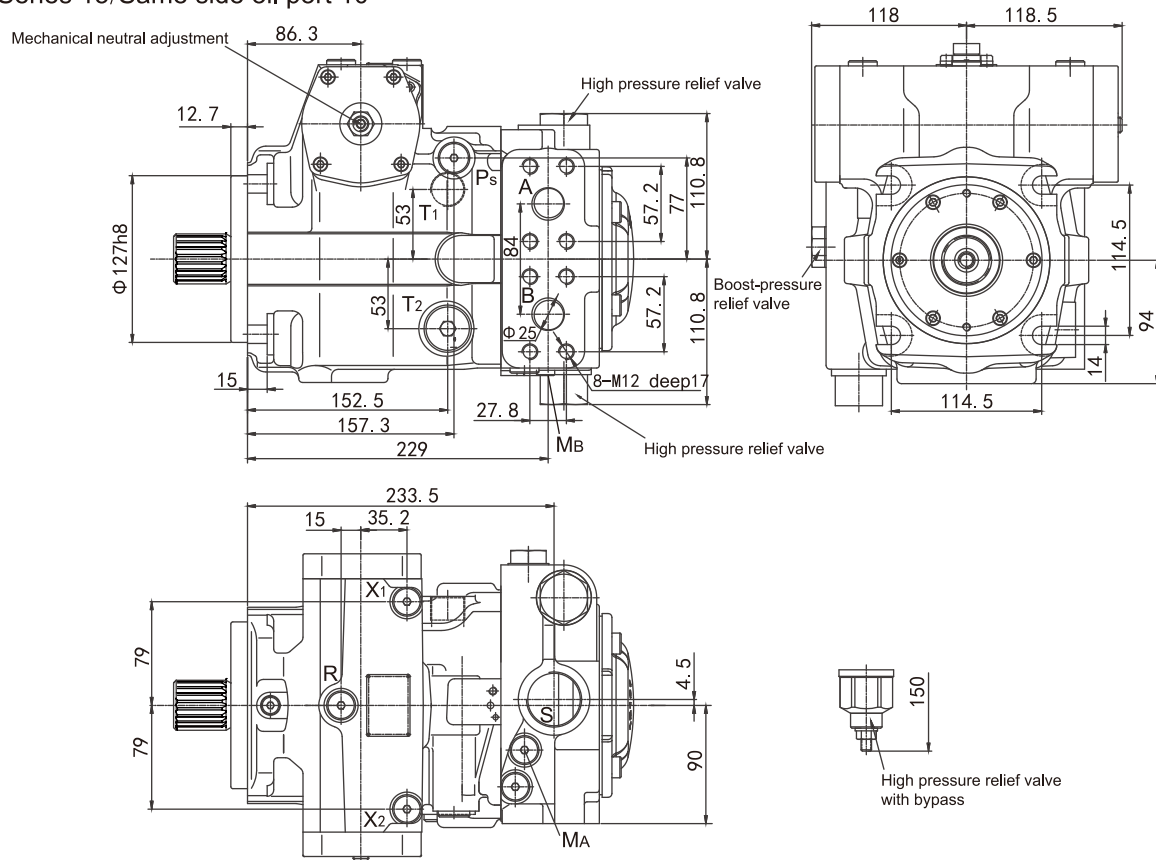
Same side oil port 13



Installation Dimensions

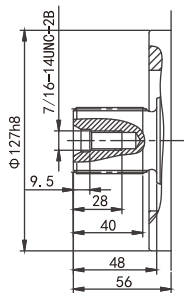
Without control valve, without Integrated filter

Series 15/Same side oil port 10

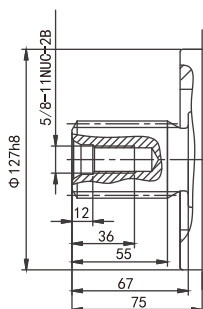


Shaft end

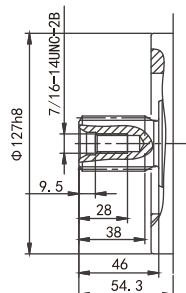
S: max. output torque 1200Nm
Splined shaft 1½ in
ANSIB92.1-1970 tolerance class 6
23T 16/32DP 30° pressure angle



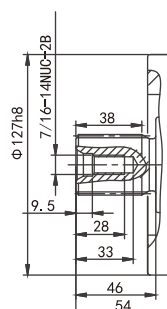
W: max. output torque 1640Nm
Splined shaft 1 $\frac{3}{4}$ in
ANSI B92.1-1970 tolerance class 6
13T 8/16DP 30° pressure angle



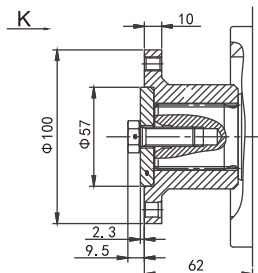
U: max. output torque 522Nm
Splined shaft 1¼ in
ANSIB92.1-1970 tolerance class 6
14T 12/24DP 30° pressure angle



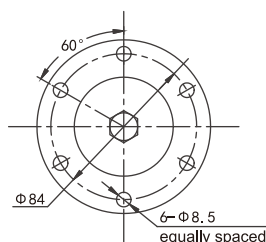
R: max. output torque 970Nm
Splined shaft 1 $\frac{3}{8}$ in
ANSIB92.1-1970 tolerance class 6
21T 16/32DP 30° pressure angle



L
Splined shaft SAE1½ in
23T 16/32DP 30°pressure angle
with connecting flange



Detail K



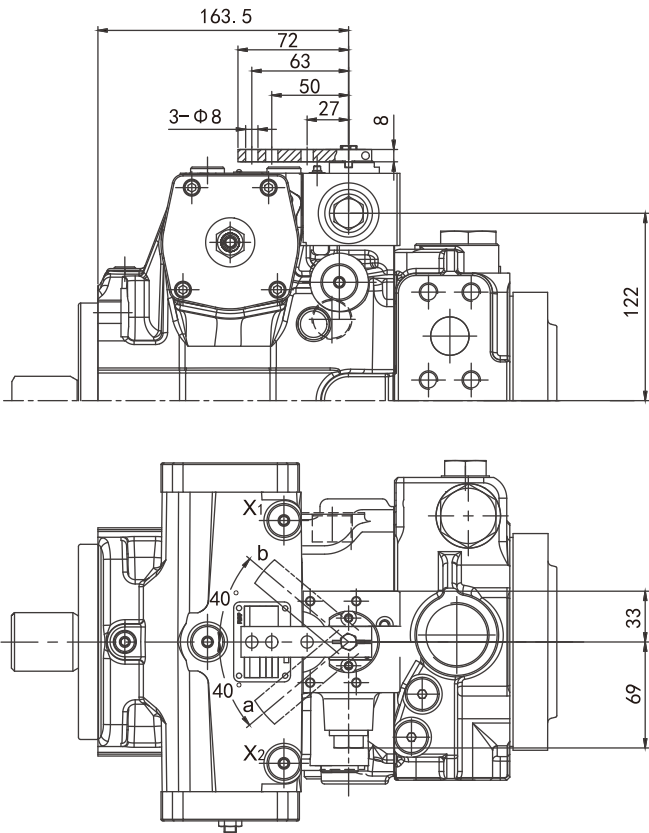
Port dimensions

Port		Size	Pmax [bar]
A/B	Pressure port	SAE1"	500
	Fixing thread	M12×1.75; 17 deep	
S	Suction port	M42×2; 18 deep	5
T1/T2	Drain port	M26×1.5; 16 deep	3
R	Air bleed post	M12×1.5; 12 deep	3
X1/X2	Control pressure port	M12×1.5; 12 deep	40
X3/X4	Chamber pressure port	M12×1.5; 12 deep	40
Ps	Inlet of pilot pressure port	M14×1.5; 12 deep	40
G	Auxiliary line pressure port	M18×1.5; 12 deep	40
MA/MB	Measuring post, pressure A/B	M12×1.5; 12 deep	500
MH	Measuring post, high pressure	M12×1.5; 12 deep	500
Fa	Filter outlet (opposite side)	M26×1.5; 16 deep	40
Fa1	Filter outlet (same side)	Φ 19	40
	Filter auxiliary outlet	M22×1.5; 16 deep	40
Fe	Filter outlet (same side)	Φ 19	40
	Filter outlet (opposite side)	M22×1.5; 16 deep	40
Fs	Cold start port	M22×1.5; 16 deep	5

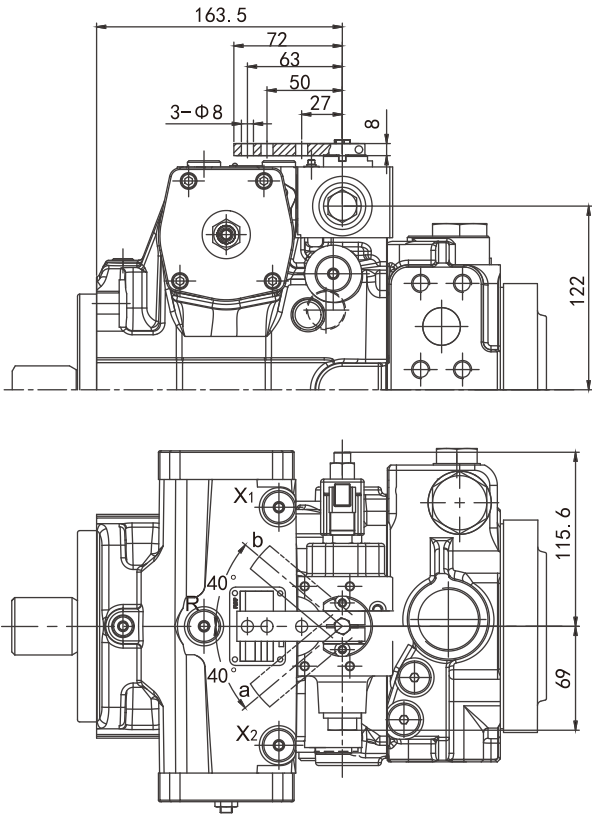
Note: Not all configurations are provided with such port.
Please consult us for details.

Installation Dimensions

Control Valve-Mechanical servo control,HW

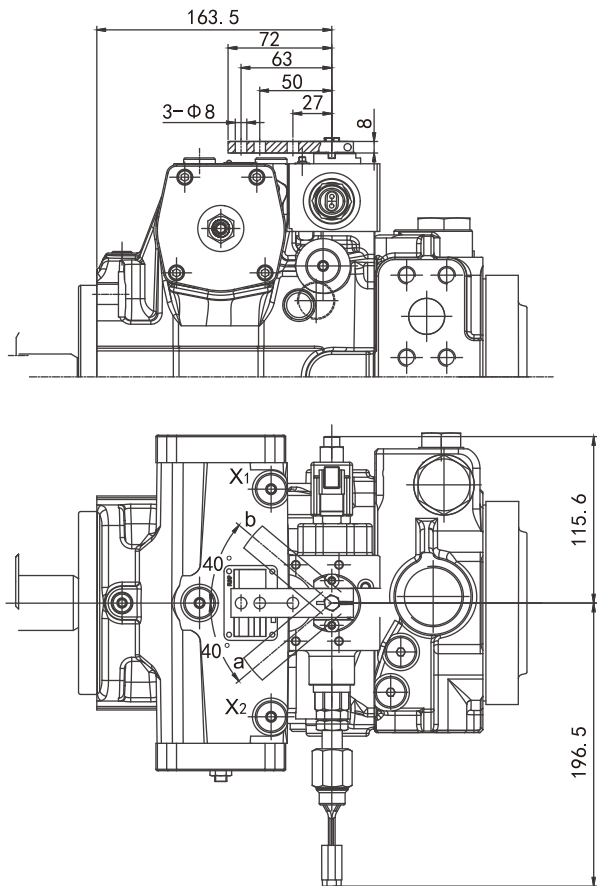


Control Valve-With brake valve,HW (O/C)

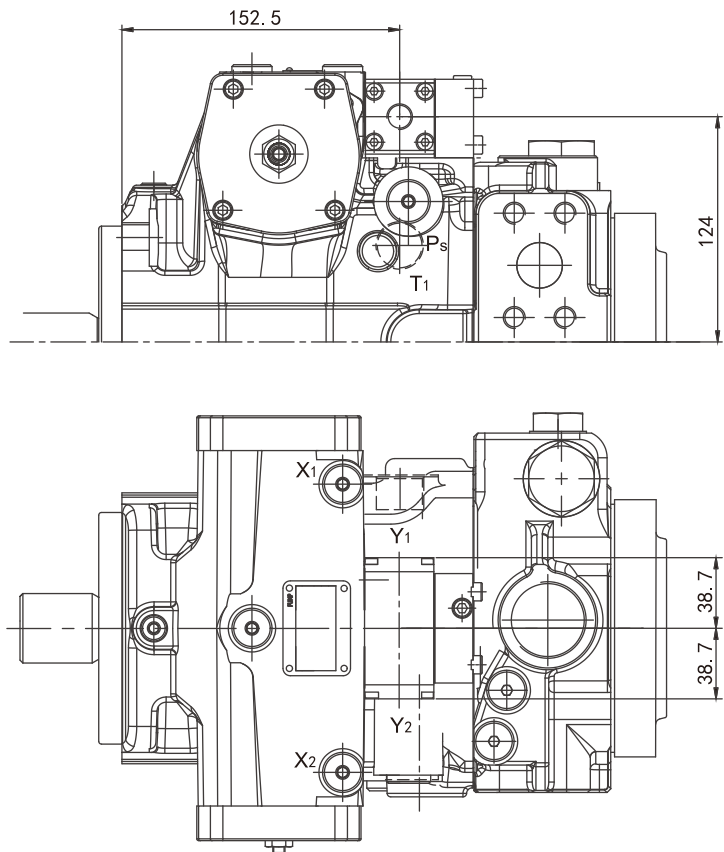


Installation Dimensions

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

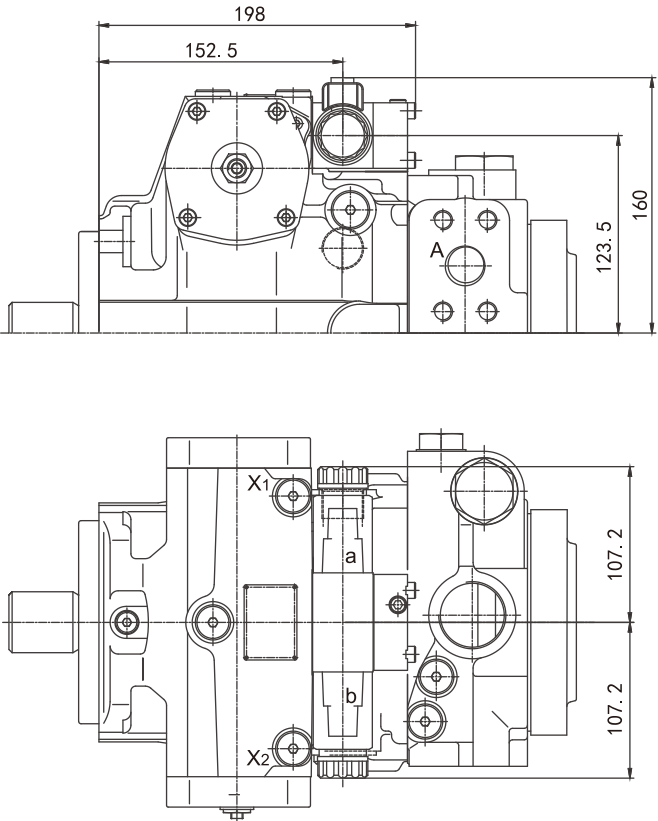


Control Valve-Pilot pressure control,HD

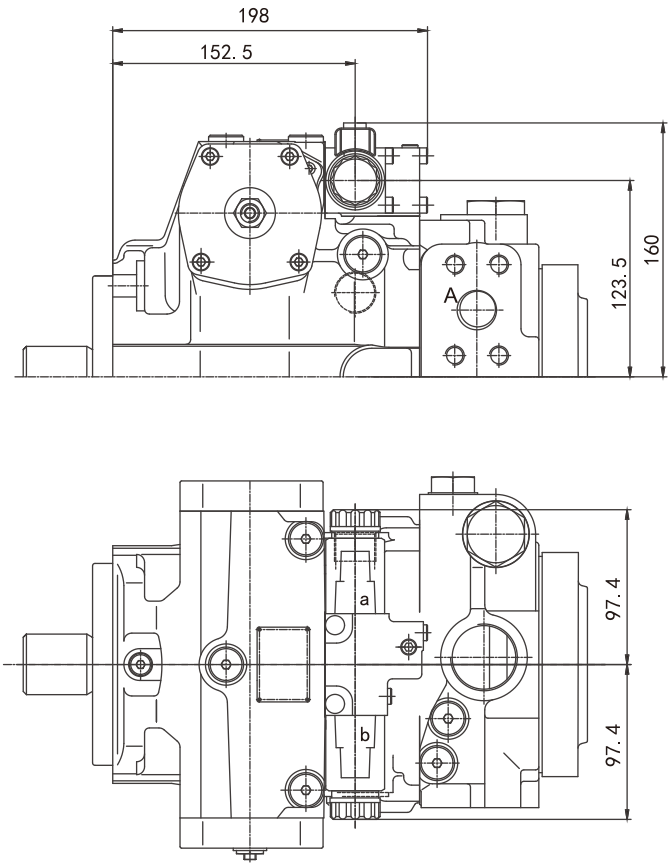


Installation Dimensions

Control Valve-Electric control with proportional solenoids, EP

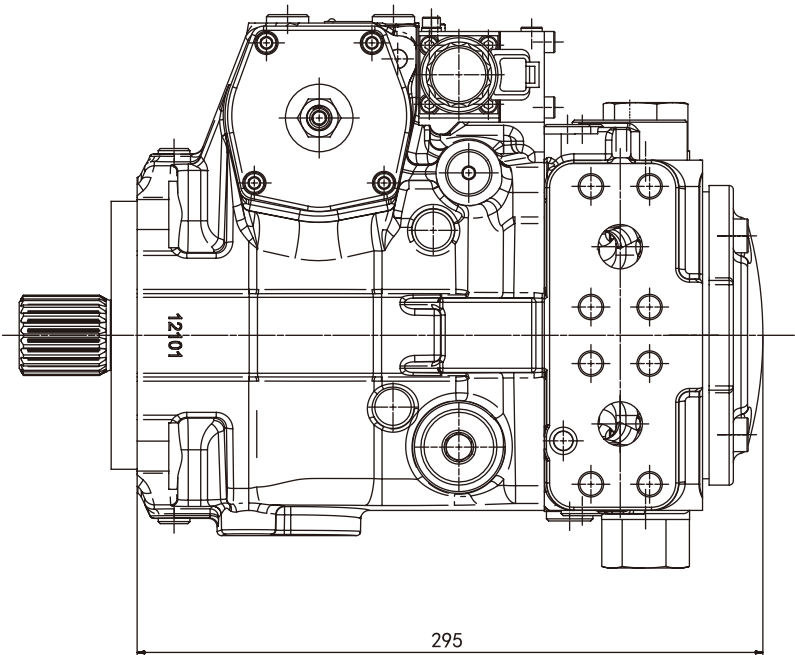


Control Valve-Electric control with switching solenoids,EZ

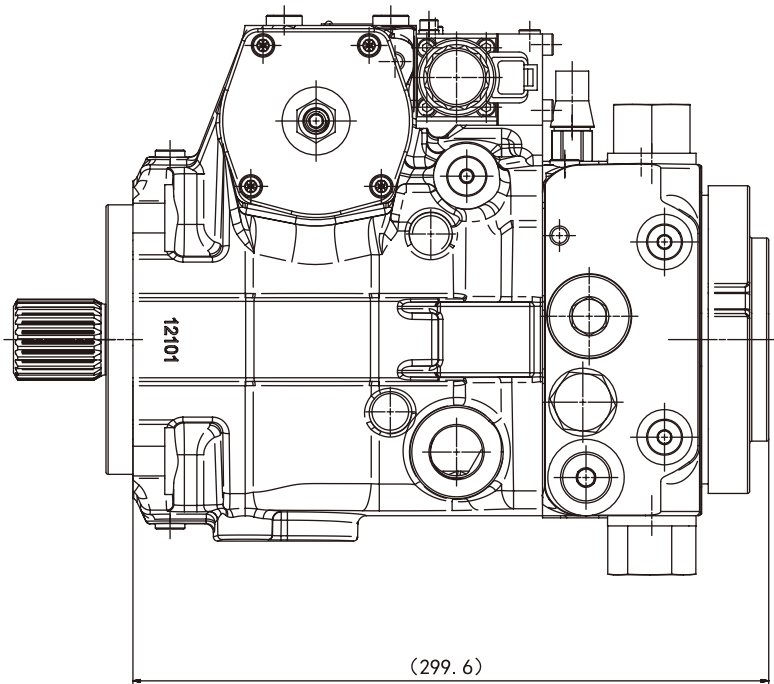


Installation Dimensions

Without through drive-F00/N00



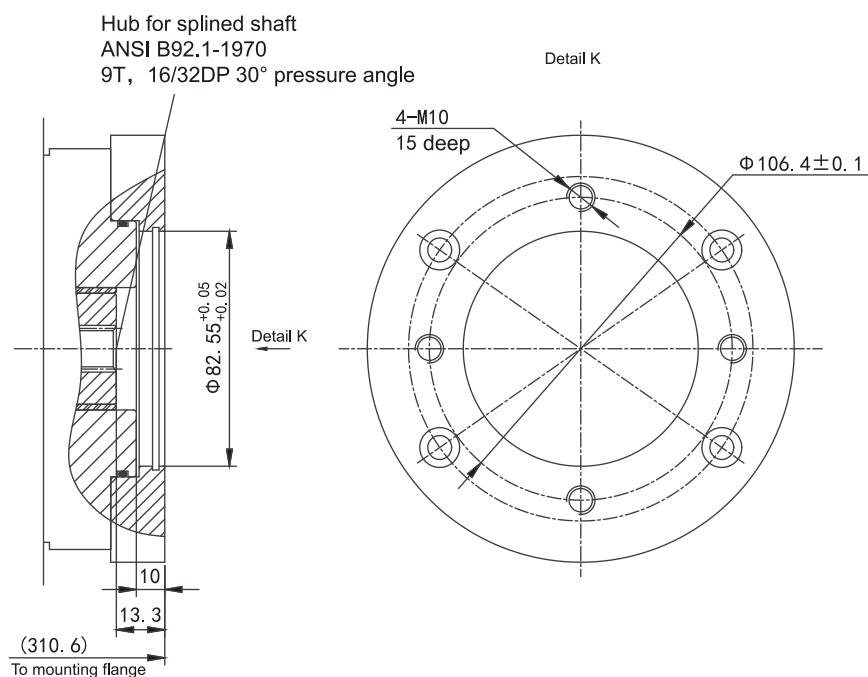
Series 15



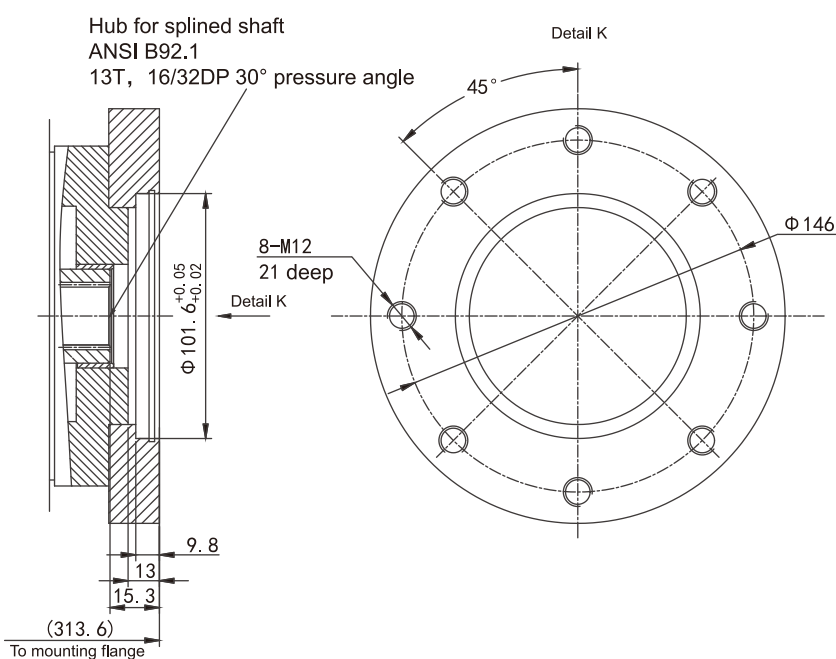
Series 39

Installation Dimensions

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

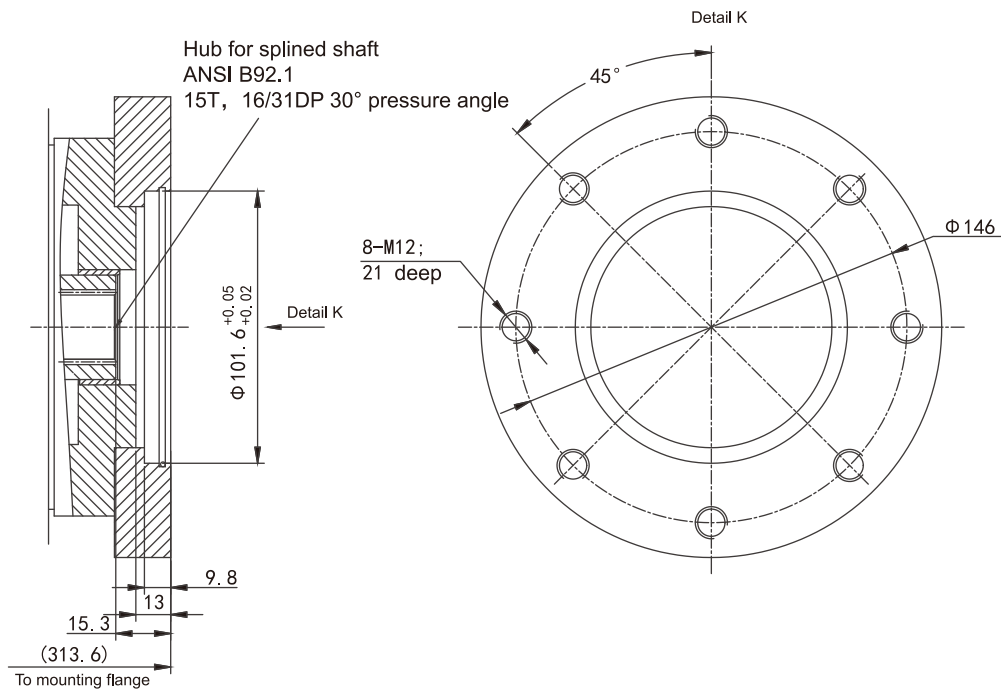


With through drive-F02/K02
Flange SAE J 744-101-2 (B)

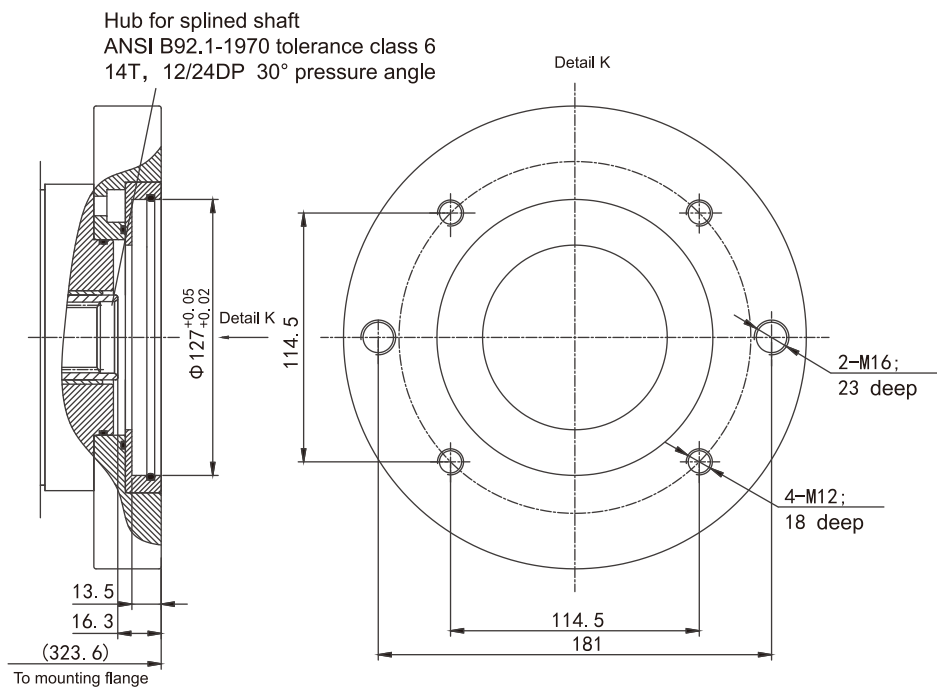


Installation Dimensions

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

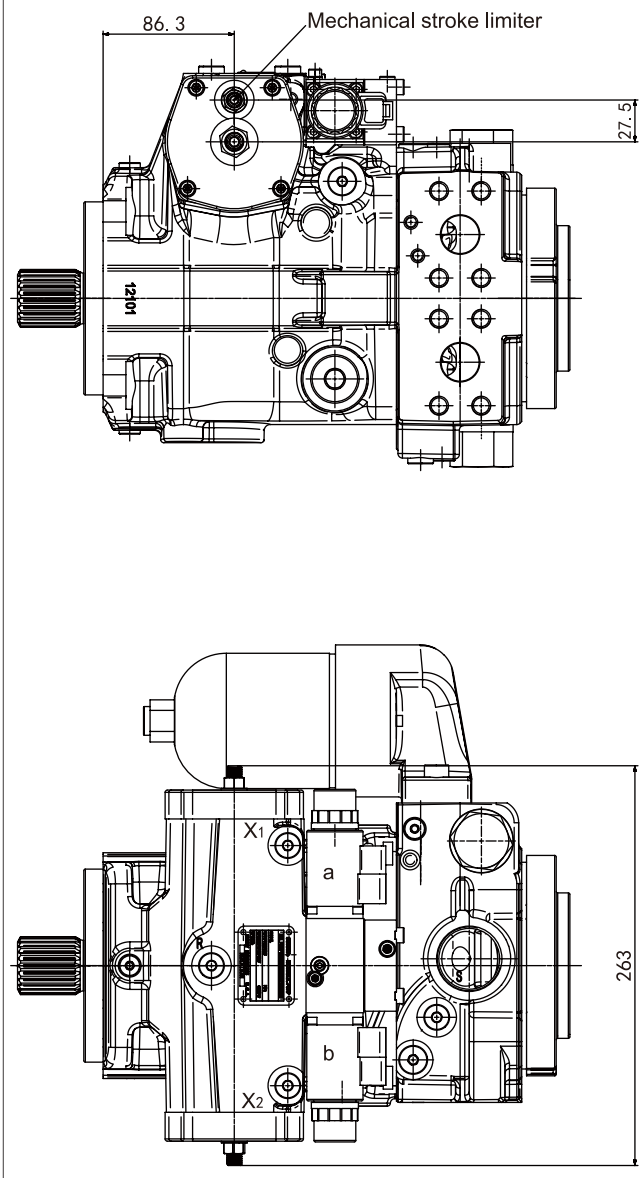


With through drive-F07/K07
Flange SAE J 744-127-2/4 (A)

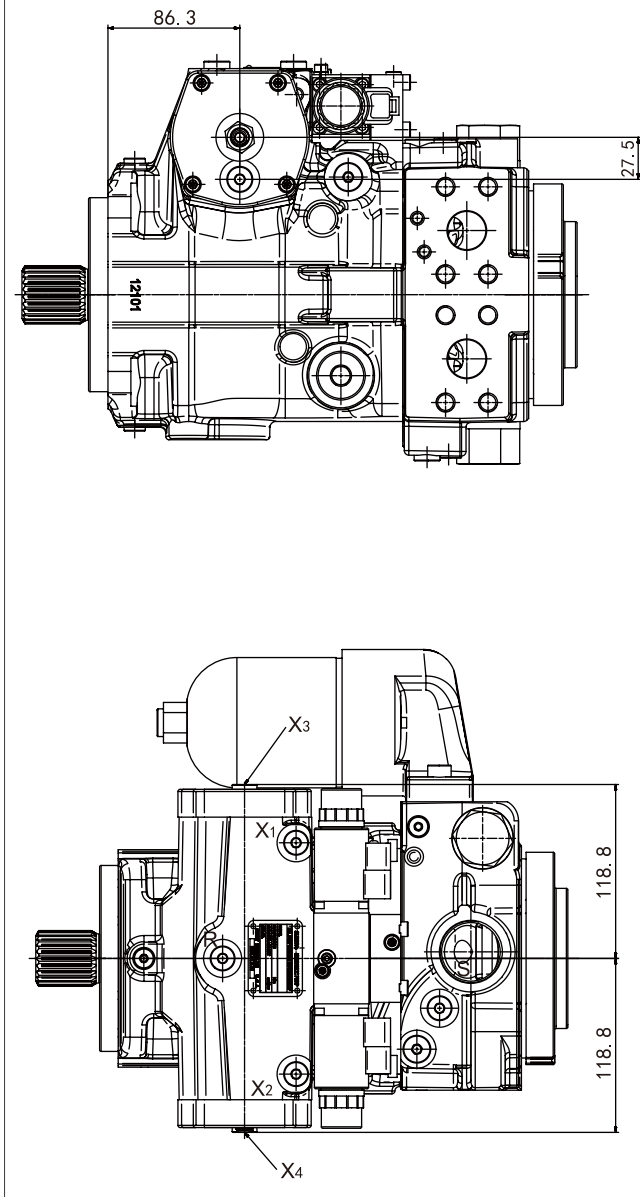


Installation Dimensions

Mechanical stroke limiter

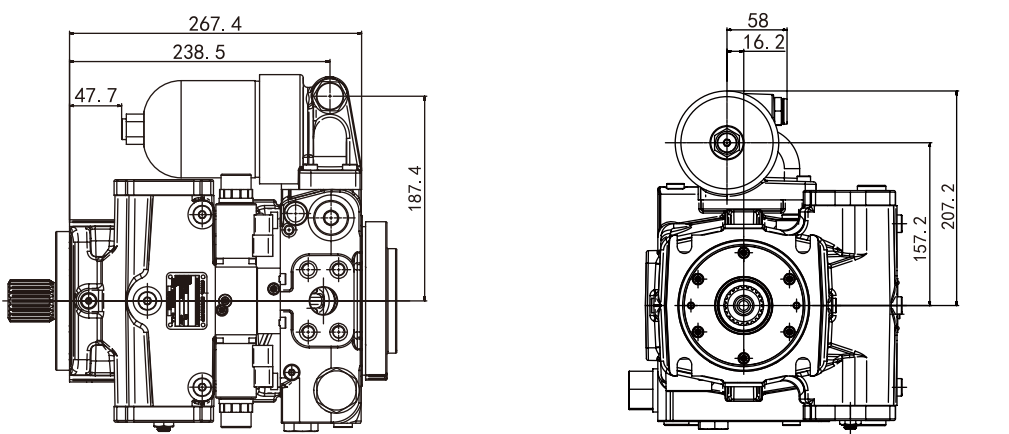


Stroking chamber pressure port (X3/X4)

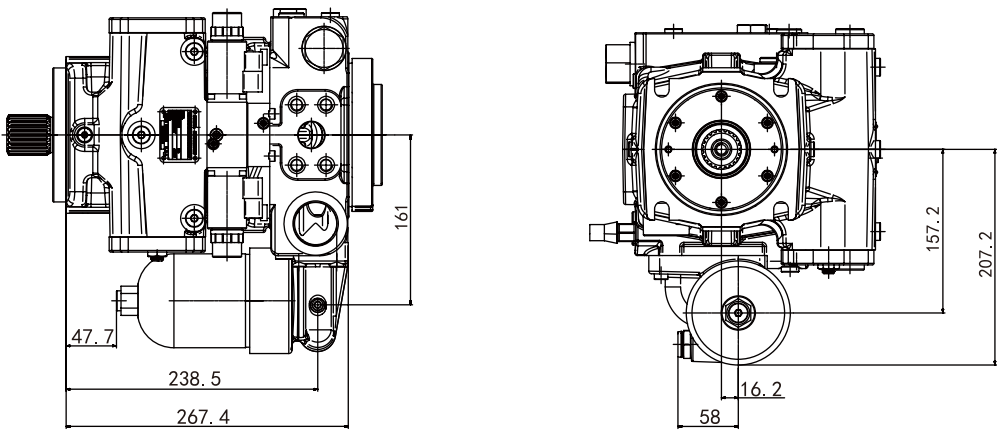


Installation Dimensions

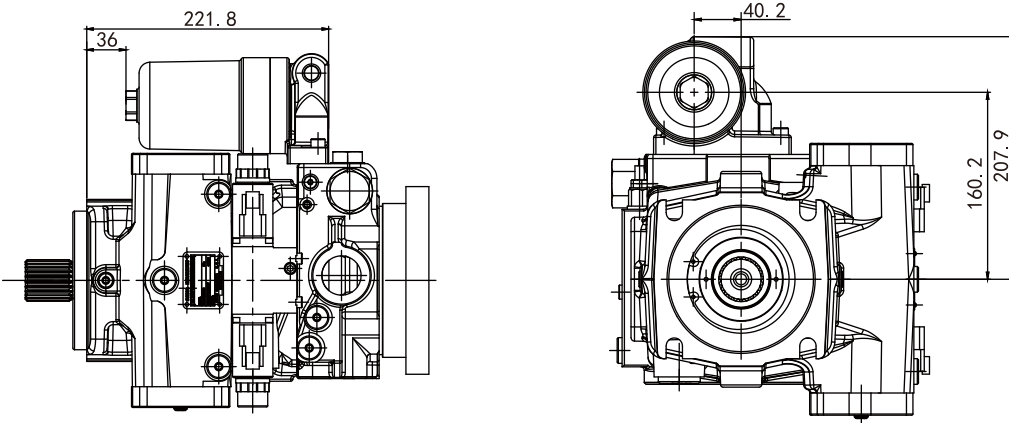
Filter
Opposite side
oil port 02



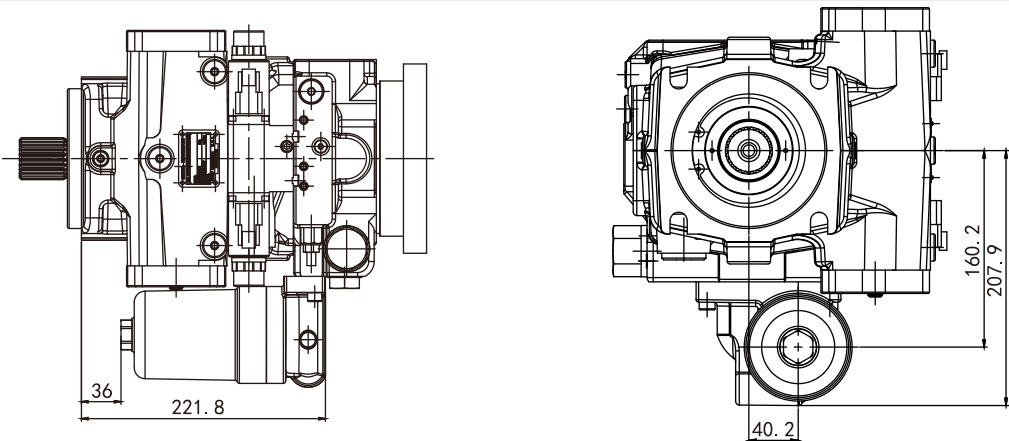
Filter
Opposite side
oil port 03



Filter
Same side
oil port 10



Filter
Same side
oil port 13



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.

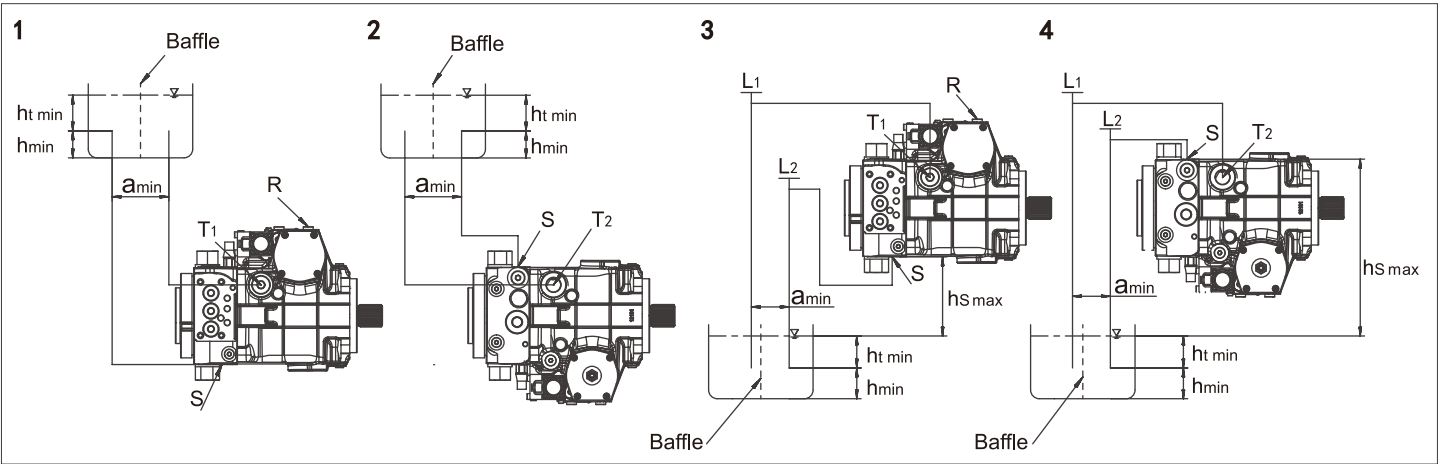
Note: Describe the “shaft orientation” in the order.

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 $h_{S\max}=800\text{mm}$.



$h_{S\max}=800\text{mm}$, $h_{t\min}=200\text{mm}$, $h_{\min}=100\text{mm}$

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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