



4.1

M60V(E) SERIES

Bent-axial Piston Variable Displacement Motor

The M60V & M60VE series bent-axial piston variable displacement motor is used in an open or closed circuit. The bent-axial structure ensures a larger displacement and a more compact structure under the same volume.

Apply to open or close circuit

Size:	28	60	85	115	160	170	200	215	280
Nominal pressure (bar):	400	450	450	450	400	450	400	450	450
Max. pressure (bar):	450	530	530	530	450	530	450	530	500



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Features

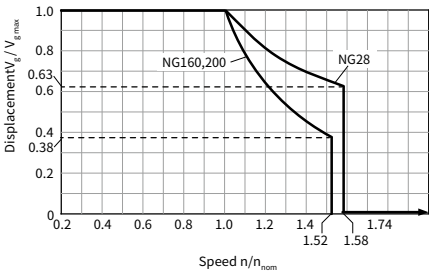
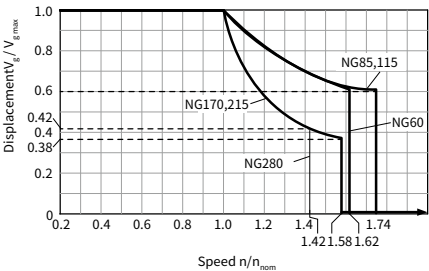
- Flange and plug-in designs are optional to meet different installation methods.
- Higher pressure and higher speed
- Superior performance in low speed operation provides excellent controllability.
- High activation efficiency.
- Various controllers are optional.
- Wider operating range
(Theoretically capable of swinging to 0°)
- High torque and long service life.
- Flush valve, high-pressure relief valve, and balancing valve options available
- Suitable for engineering machinery and general industrial vehicles, especially rotary drilling rigs and cranes.

Technical Data

Size		28	60	85	115	160	170	200	215	280
Max displacement (cc/rev)		28.1	62	85.2	115.6	160	171.8	200	216.5	280.1
Min displacement (cc/rev)		0								
Direction of rotation		Clockwise, Counter clockwise								
Rotation speed (rpm) (Not at min. displacement)	Rated	5550	4450	3900	3550	3100	3100	2900	2900	2500
	Max.	8750	7200	6800	6150	4900	4900	4600	4800	3550
Rotation speed (rpm) (At min. displacement)	Max.	10450	8400	8350	7350	5500	5750	5100	5500	3550
Pressure (bar)	Rated	400	450	450	450	400	450	400	450	450
	Max.	450	530	530	530	450	530	450	530	500
Casting pressure ^{*1}	Rated (bar)	6								
	Max. (bar) (Short-time peak pressure)	10								
Max. output torque (N·m), (ΔP=450bar)		179 (ΔP = 400bar)	444	610	828	1019 (ΔP = 400bar)	1230	1273 (ΔP = 400bar)	1550	2006
Weight (Kg) (Approximate value)		21.5	31	39	46	67	62	78	78	101
Oil viscosity (mm ² /s)		10~1000, Best range: 16~36								
Oil Temperature (°C)		-25 ~ 103								
Oil Cleanliness		ISO 4406 20/18/15								
Moment of inertia (kg·m ²)		0.0014	0.0043	0.0072	0.0110	0.0253	0.0213	0.0353	0.0303	0.0479

1. Low-temperature rated at 3 bar, with an instantaneous peak of 6 bar.

Permitted displacement & RPM



Type Introduction

M60V	200	E6	D1	N	R	S4	A2	A	F	E	J	-
①	②	③	④	⑤	⑥	⑦	⑧	⑨	⑩	⑪	⑫	

Product series

①		28	60	85	115	160	170	200	215	280	Code
	Bent-axial Variable Piston Motor (Flange-type motor)	○	●	●	●	●	●	●	●	●	M60V
	Bent-axial Variable Piston Motor (Plug-in motor)	●	●	●	●	●	●	●	●		M60VE

Size

②	Size	28	60	85	115	160	170	200	215	280
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Control type

③			28	60	85	115	160	170	200	215	280	Code
	Electric proportional displacement control	positive characteristic*	12V	●	●	●	●	●	●	●	●	E1
			24V	●	●	●	●	●	●	●	●	E2
		negative characteristic	12V	●	●	●	●	●	●	●	●	E5
			24V	●	●	●	●	●	●	●	●	E6
	Electric two-point control	positive characteristic*	12V	●	●	●	●	●	●	●	●	ET1
			24V	●	●	●	●	●	●	●	●	ET2
		negative characteristic	12V	●	●	●	●	●	●	●	●	EW1
			24V	●	●	●	●	●	●	●	●	EW2
	Hydraulic proportional control	positive characteristic*	(ΔP=10bar)		●	●	●	●	●	●		H1
			(ΔP=25bar)		●	●	●	●	●	●		H2
		negative characteristic	(ΔP=10bar)		●	●	●	●	●	●		H5
			(ΔP=25bar)		●	●	●	●	●	●		H6
	Hydraulic two-point control	positive characteristic*		●	●	●	●	●	●	●	●	HT
		negative characteristic		●	●	●	●	●	●	●	●	HW
	Automatic control high-pressure related	ΔP ≤ approx, 10bar		●	●	●	●	●	●	●		V1
		ΔP ≤ approx, 50bar		●								V3
		ΔP ≤ approx, 100bar		●	●	●	●	●	●	●		V2
	DA control						●	●	●	●		DA1

Note: “*” indicates cannot be selected with pressure cutoff (D1) in Table ④

Type introduction

Pressure cut-off

④		28	60	85	115	160	170	200	215	280	Code
	Pressure cut-off	●	●	●	●	●	●	●	●	●	D1
	Second pressure cut-off				●	●	●	●	●		D2
	Proportional remote pressure control	●	●	●	●	●	●	●	●		T3
	Without	●	●	●	●	●	●	●	●	●	00

Speed sensor

⑤	Without speed sensor	N
	With speed sensor (supply voltage 4.5~8VDC)	M
	With speed sensor (supply voltage 8~32VDC)	P
	Installation of reserved speed sensor	A

Note: Please refer to page 15/48 for specific parameters of the speed sensor.

Port position

⑥		28	60	85	115	160	170	200	215	280	Code
	Rear	●	●	●	●	●	●	●	●	●	R
	Side	●	●	●	●	●	●	●	●	●	A

Mounting flange

⑦	Mounting flange (M60V)	28	60	85	115	160	170	200	215	280	Code
	ISO 3019-2 125-4		●								M4
	SAE J744 127-4			●							C4
	ISO 3019-2 140-4			●							N4
	SAE J744 152-4				●	●	●				D4
	ISO 3019-2 160-4				●						P4
	SAE J744 165-4									●	T4
	180-4 ISO 3019-2					●	●	●	●		R4
	200-4 ISO 3019-2							●	●	●	S4
	Mounting flange (M60VE)	28	60	85	115	160	170	200	215	280	Code
	ISO 3019-2 135-2	●									L2
	ISO 3019-2 160-2		●								P2
	ISO 3019-2 190-2			●							Y2
	ISO 3019-2 200-2				●	●	●				S2
	ISO 3019-2 260-4							●	●		E4

Type introduction

Input shaft

	Drive shaft (M60V/M60VE)	28	60	85	115	160	170	200	215	280	Code
⑧	W30×2×14×9g DIN 5480	●	●								B6
	W35×2×16×9g DIN 5480		●	●							B8
	W40×2×18×9g DIN 5480			●	●						B9
	W45×2×21×9g DIN 5480				●	●	●				A1
	W50×2×24×9g DIN 5480					●	●	●	●	●	A2
	W60×2×28×9g DIN 5480									●	A5
	13T-8/16 ANSI B92.1				●	●	●	●	●		A3
	14T-12-24 ANSI B92.1			●							S7
	21T-16/32 ANSI B92.1				●						B1
	27T-16/32 ANSI B92.1				●		●		●		B4

Seal type

⑨	O ring seal (ISO 6149)	A
	Elastomeric sealing (ISO 9974)	E

Seal Material

⑩	FKM (Viton rubber: DIN ISO 1629)	F
	NBR (Nitrile rubber: DIN ISO 1629)	N

Note: Please refer to page 7/48 for the temperature range.

Balance valve

		28	60	85	115	160	170	200	215	280	Code
⑪	With balance valve, BVD			●	●	●	●				D
	With balance valve, BVE										E
	With balance valve, BVI					●					I
	Without	●	●	●	●	●	●	●	●	●	0

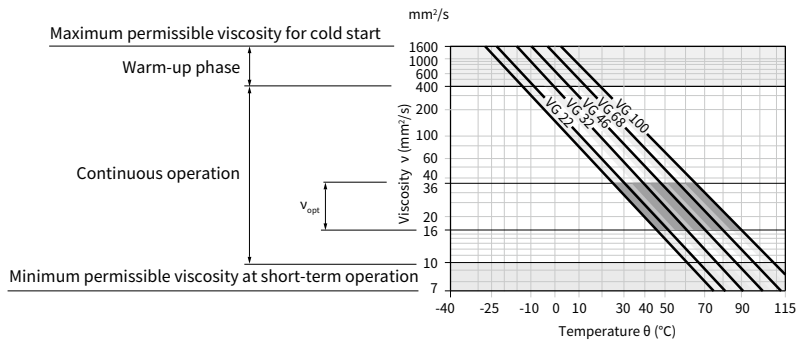
Standard / special version

⑫	Standard version							N	
	Special version	Second small displacement (optional only with balance valve)							V
		With flush valve	Flushing flow (L/min)	Code		Flushing flow (L/min)	Code	Opening pressure 16bar, differential pressure ΔP=25bar	
			3.5	A		20	G		
			5	B		25	H		
			8	C		30	M		
			10	D		35	J		
			14	E		40	K		
			17	F					

Remark: ● = Available; ○ = On request

Hydraulic fluid

• Selection diagram



Notes on selection of hydraulic fluid:

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

Notice:

At no point of the component may the temperature be higher than 115 °C. The temperature difference specified in the table is to be taken into account when determining the viscosity in the bearing. Please contact us if the above conditions cannot be met due to extreme operating parameters.

Hydraulic fluid

•Viscosity and temperature of hydraulic fluids

	Viscosity (mm ² /s)	Shaft seal	Temperature	Comment
Cold start	$v_{\max} \leq 7400$ (1600)	NBR	$\theta_{St} \geq -40^{\circ}\text{C}$	$t \leq 3\text{min}$, without load($p \leq 725\text{psi}(50\text{bar})$), $n \leq 1000\text{rpm}$ Permissible temperature difference between axial piston unit and hydraulic fluid in the system maximum 45°F (25 K).
		FKM	$\theta_{St} \geq -25^{\circ}\text{C}$	
Warm-up phase	$v = 7400 \cdots 1850$ (1600 $\cdots$ 400)			$t \leq 15\text{min}$, $p \leq 0.7 \times p_{\text{nom}}$ and $n \leq 0.5 \times n_{\text{nom}}$
Continuous operation	$v = 1850 \cdots 60$ (400 $\cdots$ 10)	NBR	$\theta \leq +85^{\circ}\text{C}$	measured at port T
		FKM	$\theta \leq +110^{\circ}\text{C}$	
	$v_{\text{opt}} = 170 \cdots 82$ (36 $\cdots$ 16)			Range of optimum operating viscosity and efficiency
Short-term operation	$v_{\min} = 60 \cdots 49$ (10 $\cdots$ 7)	NBR	$\theta \leq +85^{\circ}\text{C}$	$t \leq 3\text{min}$, $p \leq 0.3 \times p_{\text{nom}}$, measured at port T
		FKM	$\theta \leq +110^{\circ}\text{C}$	

• Filtration of the hydraulic fluid

Finer filtration improves the cleanliness level of the hydraulic fluid, which increases the service life of the axial piston unit.

A cleanliness level of at least 20/18/15 is to be maintained according to ISO 4406.

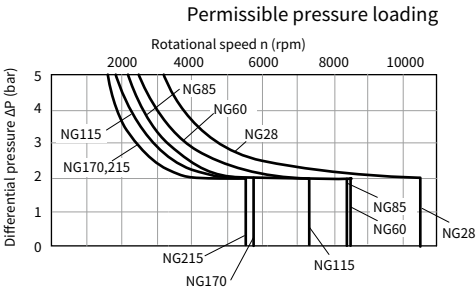
At a hydraulic fluid viscosity of less than 10 mm²/s (e.g. due to high temperatures during short-term operation) at the drain port, a cleanliness level of at least 19/17/14 according to ISO 4406 is required.

• Shaft seal

Notice

•Working pressure range valid when using hydraulic fluids based on mineral oils. Please contact us for values for other hydraulic fluids.

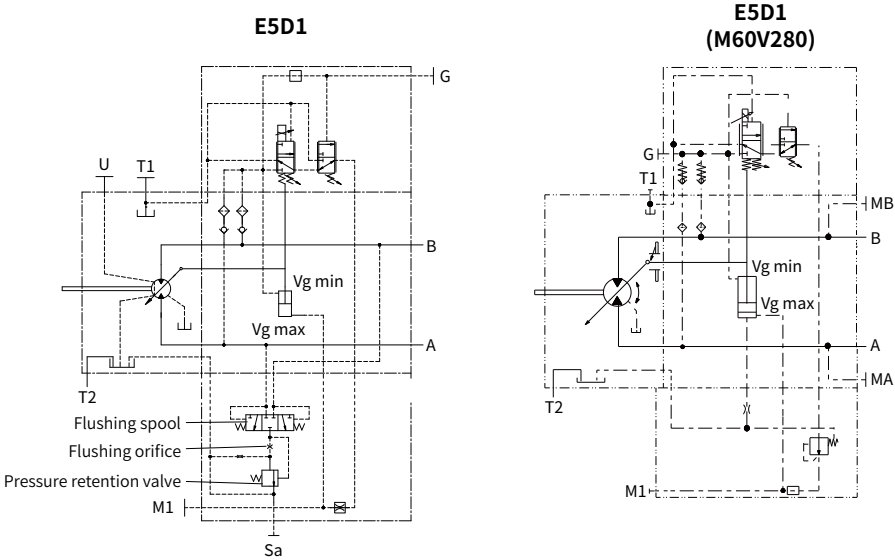
•In addition to the hydraulic fluid and the temperature, the service life of the shaft seal is influenced by the rotational speed of the axial piston unit and the case pressure.



Principle

• E-Electric Proportional Control

The electric proportional displacement control valve is installed on the motor. The motor displacement is proportional to the electric control current applied to the solenoid.



E5 is negative electric proportional control with 12v solenoid, D1 is pressure control, If the load torque or a reduction in motor swivel angle causes the system pressure to reach the setpoint value of the pressure control, the motor will swivel towards a larger displacement. Setting range of the pressure control valve 80 to 450 bar.

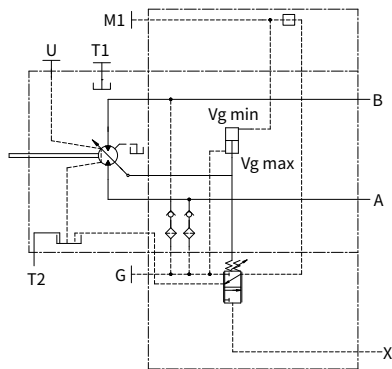
Technical data, solenoid	E1、 E5	E2、 E6
Voltage/V	12	24
Control current/mA	400~1200	200~600
Current limit/A	1.3	0.65
Nominal Resistance (20°C) /Ω	5.7±0.5	23.5±7%

Principle

• H-Hydraulic Proportional Control

The hydraulic proportional displacement control valve is installed on the motor. The motor displacement is proportional to the pilot pressure, X is pilot pressure port.

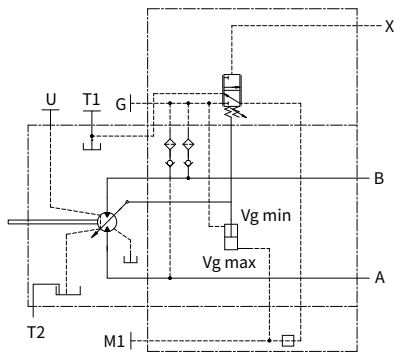
H1、H2



H1(positive control, increment of pilot pressure is 10 bar). Beginning of control at Vg min, End of control at Vg max. The motor displacement will increase from minimum to maximum when pilot pressure increases by 10 bar.Setting range of the displacement change point of pilot pressure is 2 to 20 bar.

H2(positive control, increment of pilot pressure is 25 bar). Beginning of control at Vg min, End of control at Vg max. The motor displacement will increase from minimum to maximum when pilot pressure increases by 25 bar.Setting range of the displacement change point of pilot pressure is 5 to 35 bar.

H5、H6



H5(negative control, increment of pilot pressure is 10 bar). Beginning of control at Vg max, End of control at Vg min. The motor displacement will increase from maximum to minimum when pilot pressure increases by 10 bar.Setting range of the displacement change point of pilot pressure is 2 to 20 bar.

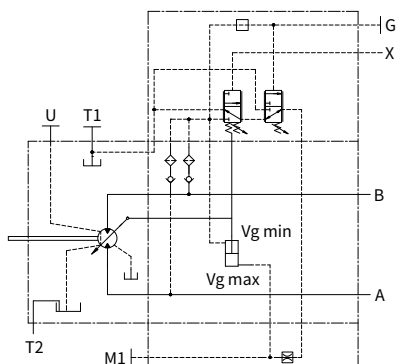
H6(negative control, increment of pilot pressure is 25 bar). Beginning of control at Vg max, End of control at Vg min. The motor displacement will increase from maximum to minimum when pilot pressure increases by 25 bar.Setting range of the displacement change point of pilot pressure is 5 to 35 bar.

Principle

•H-Hydraulic Proportional Control

The hydraulic proportional displacement control valve is installed on the motor. The motor displacement is proportional to the pilot pressure, X is pilot pressure port.

H5D1/H6D1



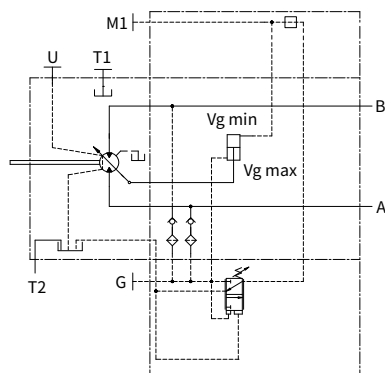
H5D1(negative control, increment of pilot pressure is 10 bar+Pressure control valve).

The hydraulic proportional displacement control valve and the pressure control valve are installed on the motor at the same time. H5 is negative hydraulic proportional control with 10 bar increment of pilot pressure, D1 is pressure control, If the load torque or a reduction in motor swivel angle causes the system pressure to reach the setpoint value of the pressure control, the motor will swivel towards a larger displacement. Setting range of the pressure control valve 80 to 450 bar.

•V-Automatic High Pressure Related Control

Automatic high pressure related control means the motor displacement will change automatically according to the working pressure, the pilot pressure of control valve is supplied by motor working pressure from A or B port, no external control pressure is required. When the working pressure reached the setpoint valve of control valve, the motor will swivel towards a larger displacement. The displacement is modulated between Vg min and Vg max depending on the load.

V100



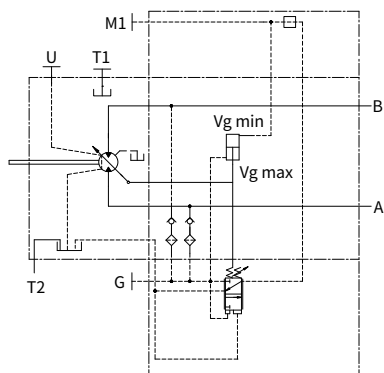
V100(Automatic high pressure related control, increment of working pressure $\Delta P \leq 10$ bar). Increment of working pressure $\Delta P \leq 10$ bar, The motor displacement will increase from minimum to maximum. Setting range of the setpoint of control valve pressure is 80 ~ 350bar.

Principle

·V-Automatic High Pressure Related Control

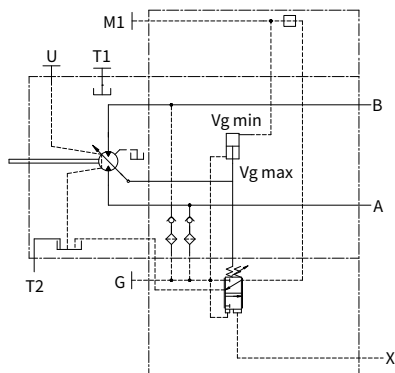
Automatic high pressure related control means the motor displacement will change automatically according to the working pressure, the pilot pressure of control valve is supplied by motor working pressure from A or B port, no external control pressure is required. When the working pressure reached the setpoint valve of control valve, the motor will swivel towards a larger displacement. The displacement is modulated between $V_g \min$ and $V_g \max$ depending on the load.

V200



V200(Automatic high pressure related control, increment of working pressure $\Delta P \approx 100\text{bar}$). Increment of working pressure $\Delta P \approx 100\text{bar}$, The motor displacement will increase from minimum to maximum. Setting range of the setpoint of control valve pressure is 80 ~ 350bar.

V2T3



V2T3(Automatic high pressure related control+remote pressure control, increment of working pressure $\Delta P \approx 100\text{bar}$). For the V2T3 control mode, in spite of working pressure from A or B port will provide the control valve pressure, the beginning of control can be influenced by applying a pilot pressure to port X. The beginning of control is reduced by 17 bar per 1 bar pilot pressure.

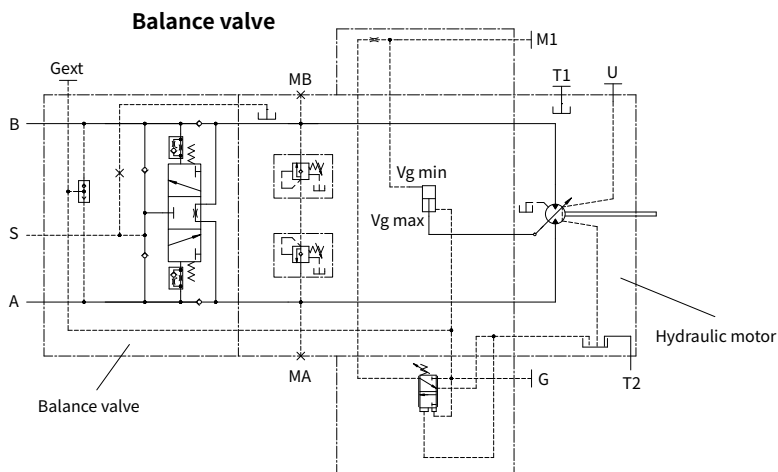
Principle (With Counter Balance Valve)

•V100+BVD

(Automatic High Pressure Related Control + Counter Balance Valve)

V100+BVD(Automatic High Pressure Related Control + Counter Balance Valve, increment of working pressure $\Delta P \leq 10$ bar, Spool of balance valve with internal orifice, control system has high pressure relief valves.)

S port is boost port, boost hydraulic fluid can reduce the risk that motor vacuums during braking. When the motor is working (fluid flows from port B to port A), balance valve opened, hydraulic fluid flows out of port A through the balance valve, when the hydraulic system is standby, no fluid flows into port B, balance valve closed, motor will continue to rotate because of the load inertia, hydraulic fluid circulates through the motor by internal orifice of balance valve, the rotatry speed decreases slowly and finally stop. The high pressure relief valves play the role of motor overload protection.



Principle (With Counter Balance Valve)

·V1T3+BVD (Automatic High Pressure Related Control + Remote Pressure control + Counter Balance Valve)

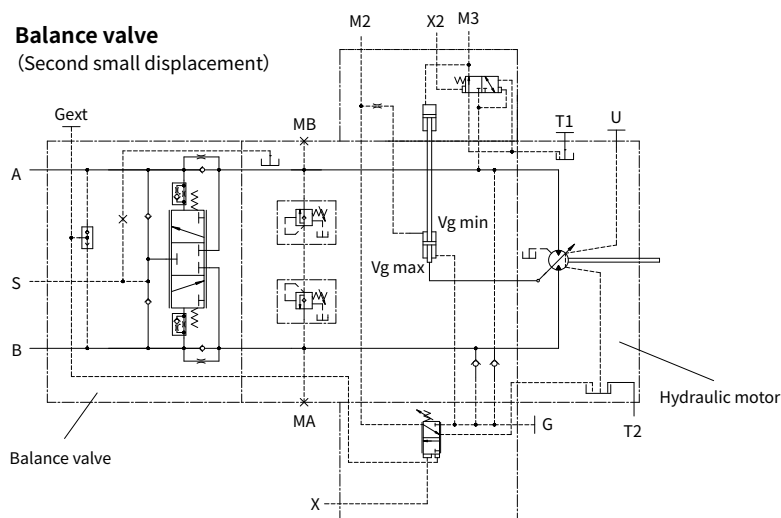
V1T3BVD(Automatic High Pressure Related Control + Remote pressure control + Counter Balance Valve + Second Small Displacement Control, increment of working pressure $\Delta P \leq 10\text{bar}$, Spool of balance valve without internal orifice, control system has high pressure relief valves.)

For the HA2T3 control mode, in spite of working pressure from A or B port will provide the control valve pressure, the beginning of control can be influenced by applying a pilot pressure to port X. The beginning of control is reduced by 17 bar per 1 bar pilot pressure.

S port is boost port, boost hydraulic fluid can reduce the risk that motor vacuums during braking. When the motor is working (fluid flows from port B to port A), balance valve opened, hydraulic fluid flows out of port A through the balance valve, when the hydraulic system is standby, no fluid flows into port B, balance valve closed, second small displacement control valve opened, hydraulic fluid pushes the piston of second small displacement control, motor displacement changes from the minimum to the larger displacement ($< \text{maximum displacement}$), preventing the motor from stalling and sucking out. The high pressure relief valves play the role of motor overload protection.

Balance valve

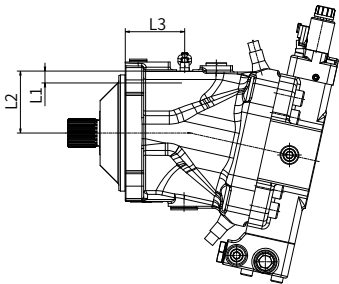
(Second small displacement)



Speed sensor

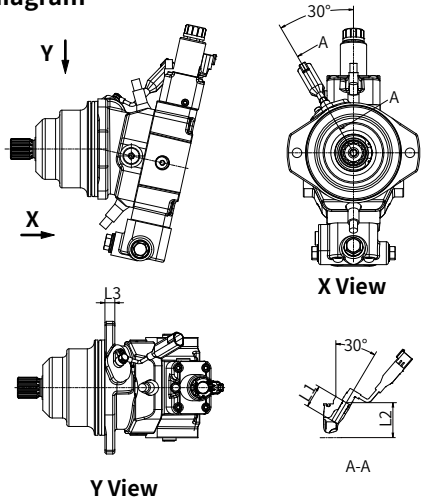
The speed sensor is installed on the motor, which can record the motor speed and detect the direction of rotation of the motor.

• M60V Installation diagram



M60V Displacement cc/rev	60	85	115	160/170	200/215	280
Number of teeth in the speed ring	54	58	67	75	80	78
L1 (Probe length)mm	18.4	18.4	18.4	18.4	18.4	32
L2 (Sensor mounting surface to center axis) mm	75	79	88	96	101	110.5
L3 (Sensor to flange surface) mm	66.2	75.2	77.2	91.7	95.2	82
Gear module	2	2	2	2	2	2

• M60VE Installation diagram



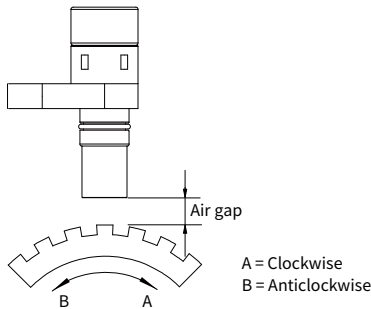
M60V Displacement cc/rev	28	60	85	115	160/170	215
Number of teeth in the speed ring	40	54	58	67	75	80
L1 (Probe length)mm	32	32	32	32	32	32
L2 (Sensor mounting surface to center axis) mm	69.3	83.8	87.3	96.3	104.3	109.2
L3 (Sensor to flange surface) mm	14	16	18.5	18	20	25
Gear module	2	2	2	2	2	2

Speed sensor

• Output signal

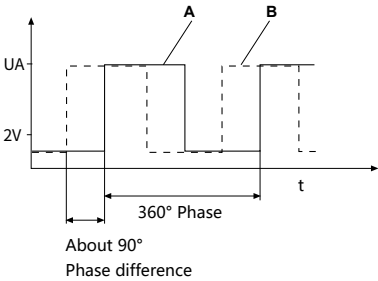
Reverse pulse output: $I_{max} \leq 50\text{mA}$

The frequency signal can be measured within the range of 0Hz to 20kHz.

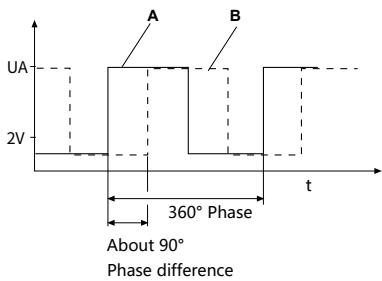


Gear Module	Air gap
Modulus2	0.2~2mm

⌚ Rotate clockwise to output waveform



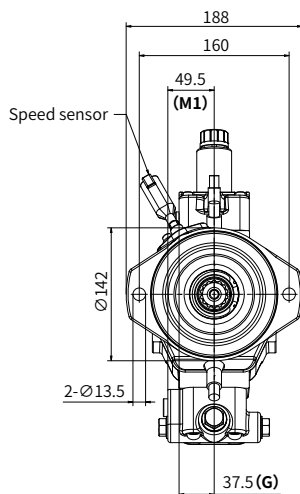
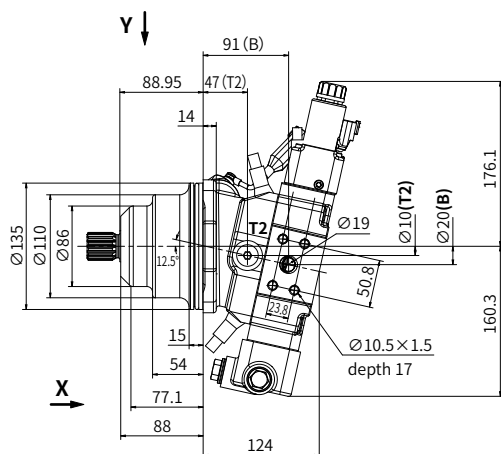
⌚ Rotate counterclockwise to output waveform



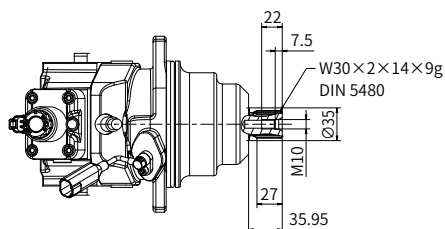
Installation size

M60VE28 Installation size

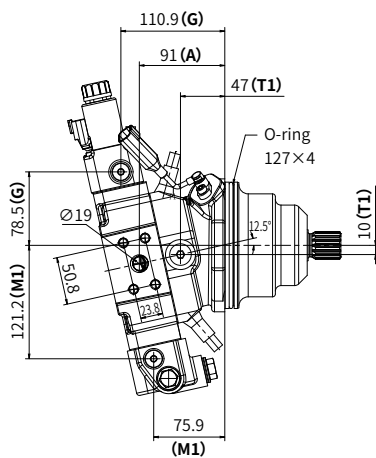
Plug-in motor



X View



Y View



Installation size

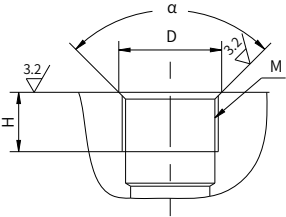
• M60VE28 Direction of rotation and oil flow direction

Installation	Rotation
Flow A → B	Clockwise
Flow B → A	Counter-clockwise

• M60VE28 Port details

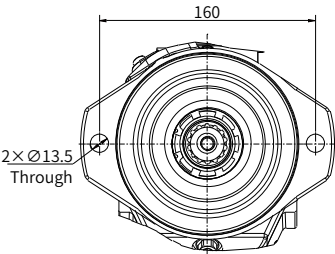
	Port name	Port size and description	Tightening torque (N·m)
A、B	Inlet port and Delivery port	SAE J518 3/4" M10×1.5 (depth17mm)	57
T1	Case drain port	ISO 9974 M18×1.5 (Through hole)	45
T2		ISO 9974 M18×1.5 (Through hole)	45
G	Measuring port pressure	ISO 9974 M14×1.5 (depth 11.5mm)	45
M1		ISO 9974 M14×1.5 (depth 11.5mm)	45

Port	H	M	D	α
T1	-	M18×1.5	Ø 18	90°
T2	-	M18×1.5	Ø 18	90°
G	11.5	M14×1.5	Ø 14	90°
M1	11.5	M14×1.5	Ø 14	90°

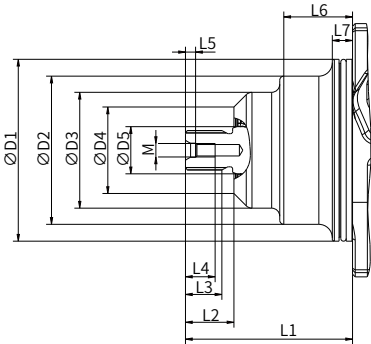


Installation size

M60VE28 Mounting Flange and Input Shaft Dimensions



“L2” Type Flange
ISO 3019-2 135-2



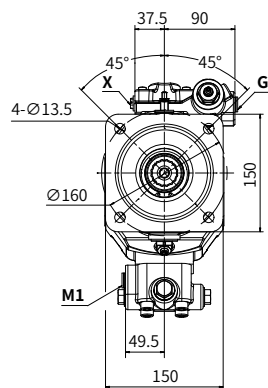
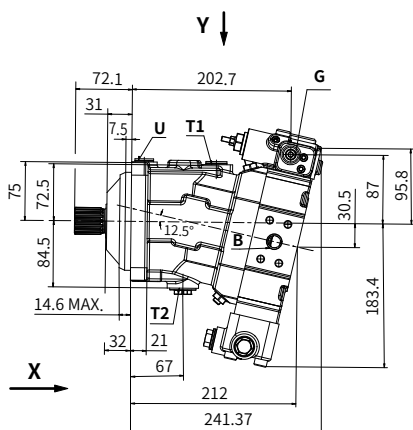
Type “B” Input Shaft

Code	D1	D2	D3	D4	D5	M	L1	L2	L3	L4	L5	L6	L7
B6	135	110	86	64.2	35	M10	124	35.95	27	22	7.5	51	15

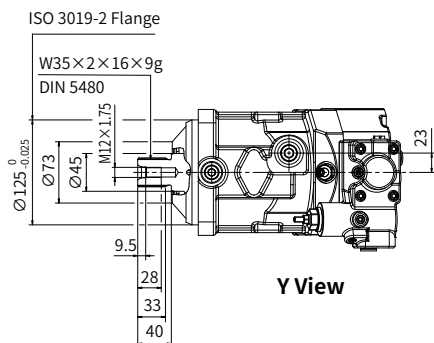
Installation size

M60V 60 Installation size

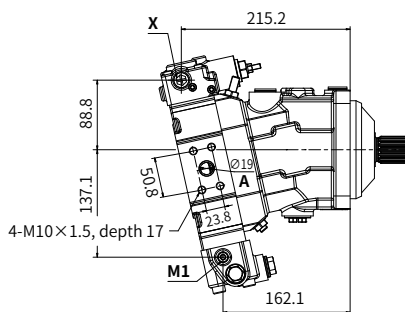
Flange-type motor



X View



Y View



Installation size

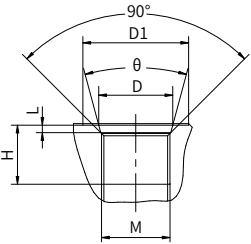
• M60V 60 Direction of rotation and oil flow direction

Installation	Rotation
Flow A → B	Clockwise
Flow B → A	Counter-clockwise

• M60V 60 Port details

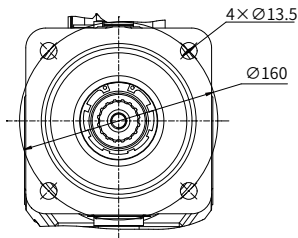
	Port name	Port size and description	Tightening torque (N·m)
A、B	Inlet port and Delivery port	SAE J518 3/4" M10×1.5 (depth 17mm)	57
T1	Case drain port	ISO 6149 M22×1.5 (depth 15.5mm)	100
T2		ISO 6149 M27×2 (depth 19mm)	- (Plastic plug)
G	Measuring port pressure	ISO 6149 M14×1.5 (depth 11.5mm)	45
U	Flushing port	ISO 6149 M18×1.5 (depth 14.5mm)	70
M1	Measuring port pressure	ISO 6149 M14×1.5 (depth 11.5mm)	45
Sa	External flushing port	ISO 6149 M22×1.5 (depth 16.5mm)	80

Port	H	L	M	D	D1	θ
T1	15.5	2.4	M22×1.5	∅ 23.8	∅ 34	30°
T2	19	3.1	M27×2	∅ 29.4	∅ 35	30°
G	11.5	2.4	M14×1.5	∅ 15.8	∅ 22	30°
U	14.5	2.4	M18×1.5	∅ 19.8	∅ 26	30°
M1	11.5	2.4	M14×1.5	∅ 15.8	∅ 22	30°
Sa	16.5	2.4	M22×1.5	∅ 21.8	-	30°

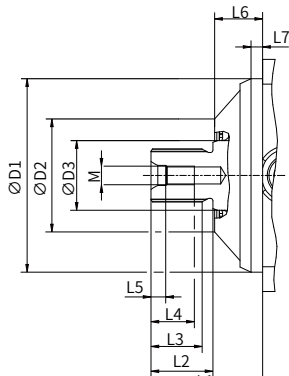


Installation size

• M60V 60 Mounting Flange and Input Shaft Dimensions



“M4” Type Flange
ISO 3019-2 125-4



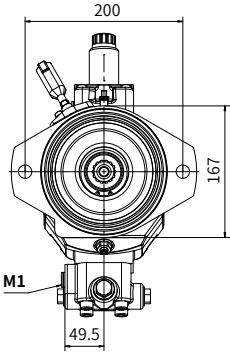
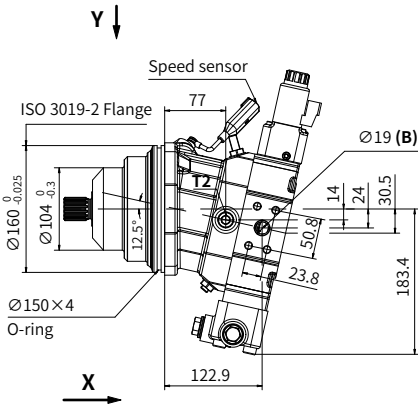
Type “B” Input Shaft

Code	D1	D2	D3	M	L1	L2	L3	L4	L5	L6	L7
B8	125	73	45	M12	72.1	40	33	28	9.5	31	7.5

Installation size

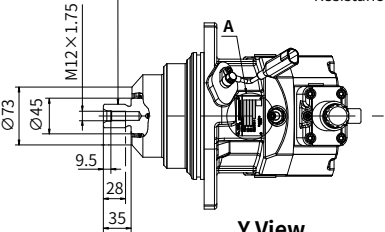
M60VE60 Installation size

Plug-in motor



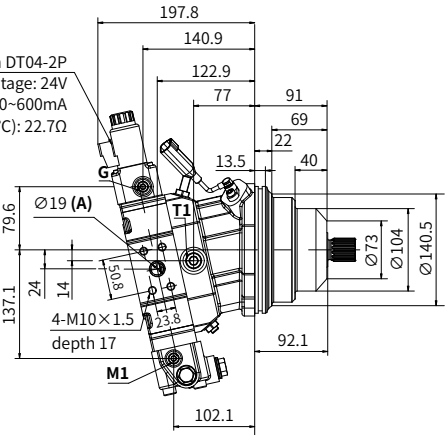
X View

W30×2×14×9g
DIN5480



Y View

Deutsch DT04-2P
Rated voltage: 24V
Control current: 200~600mA
Resistance (@20°C): 22.7 Ω



Installation size

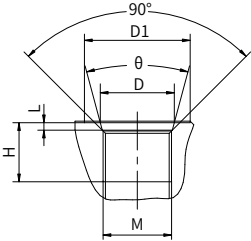
• M60VE60 Direction of rotation and oil flow direction

Installation	Rotation
Flow A → B	Clockwise
Flow B → A	Counter-clockwise

• M60VE60 Port details

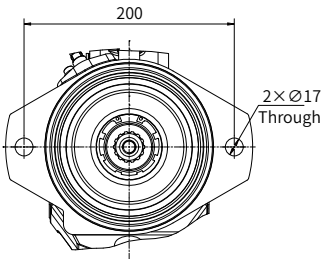
	Port name	Port size and description	Tightening torque (N · m)
A、B	Inlet port and Delivery port	SAE J518 3/4" M10×1.5 (depth 17mm)	57
T1	Case drain port	ISO 6149 M22×1.5 (Through hole)	100
T2		ISO 6149 M22×1.5 (Through hole)	100
G	Measuring port pressure	ISO 6149 M14×1.5 (depth 11.5mm)	45
M1		ISO 6149 M14×1.5 (depth 11.5mm)	45

Port	H	L	M	D	D1	θ
T1	19	2.4	M22×1.5	Ø 23.8	Ø 34	30°
T2	19	2.4	M22×1.5	Ø 23.8	Ø 34	30°
G	11.5	2.4	M14×1.5	Ø 15.8	Ø 22	30°
M1	11.5	2.4	M14×1.5	Ø 15.8	Ø 22	30°

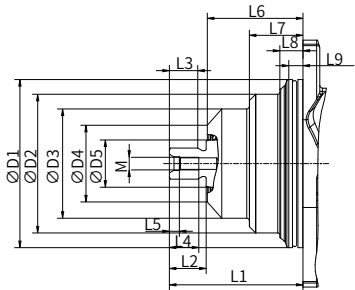


Installation size

M60VE60 Mounting Flange and Input Shaft Dimensions



“P2” Type Flange
ISO 3019-2 160-2



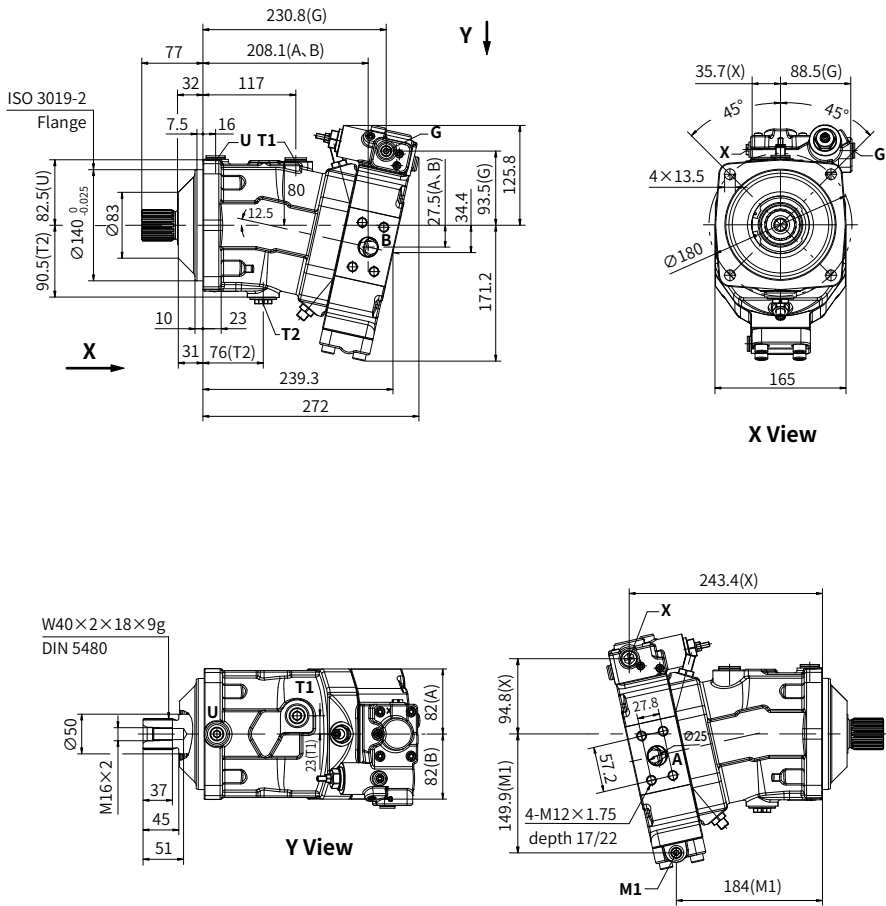
Type “B” Input Shaft

Code	D1	D2	D3	D4	D5	M	L1	L2	L3	L4	L5	L6	L7	L8	L9
B6	160	132	104	73	45	M12	127.1	35	27	28	9.5	91	51	22	13.5

Installation size

M60V 85 Installation size

Flange-type motor



Installation size

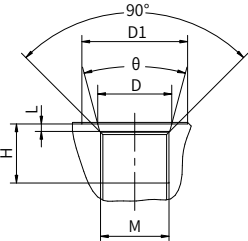
• M60V 85 Direction of rotation and oil flow direction

Installation	Rotation
Flow A → B	Clockwise
Flow B → A	Counter-clockwise

• M60V 85 Port details

	Port name	Port size and description	Tightening torque (N·m)
A、B	Inlet port and Delivery port	SAE J518 1" M12×1.75 (depth 17mm)	98
T1	Case drain port	ISO 6149 M22×1.5 (depth 15.5mm)	45
T2		ISO 6149 M27×2 (depth 19mm)	210
G	Measuring port	ISO 6149 M14×1.5 (depth 11.5mm)	45
U	Flushing port	ISO 6149 M18×1.5 (depth 14.5mm)	45
X	Pilot port	ISO 6149 M14×1.5 (depth 11.5mm)	45
M1	Measuring port	ISO 6149 M14×1.5 (depth 11.5mm)	45

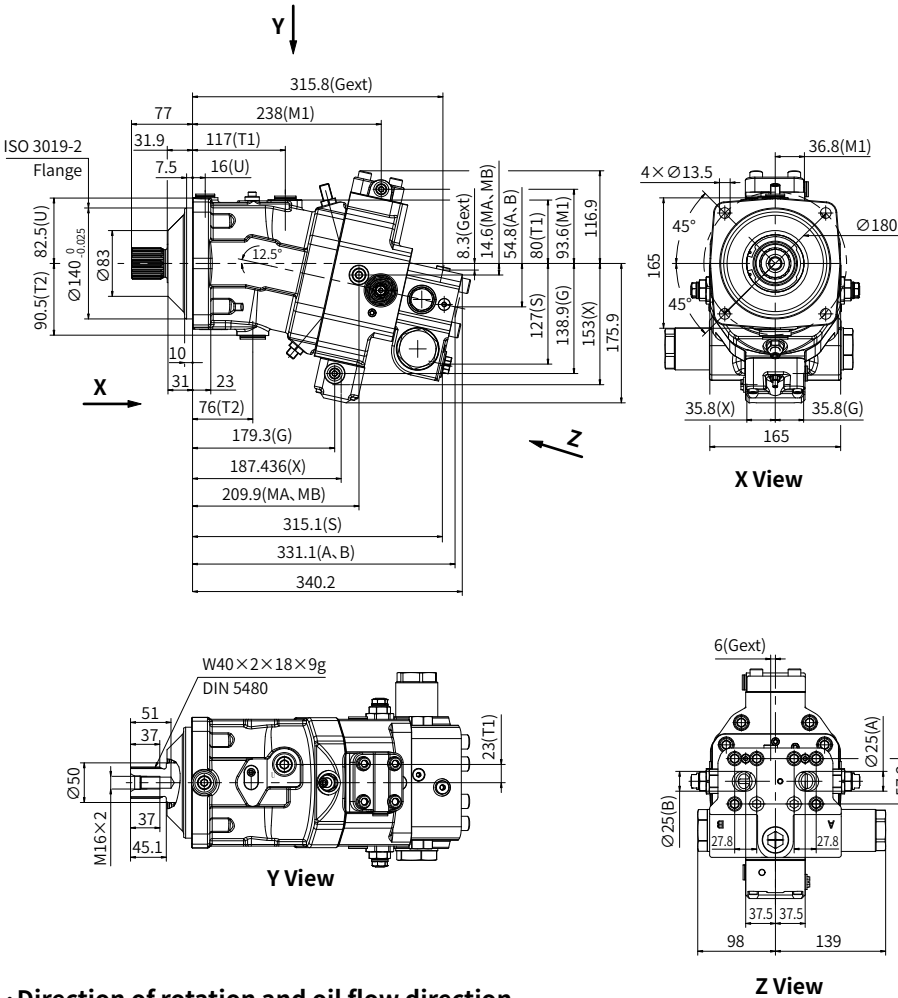
Port	H	L	M	D	D1	θ
T1	15.5	2.4	M22×1.5	∅ 23.8	∅ 30	30°
T2	19	3.1	M27×2	∅ 29.4	∅ 34	30°
G	11.5	2.4	M14×1.5	∅ 15.8	∅ 22	30°
U	14.5	2.4	M18×1.5	∅ 19.8	∅ 28	30°
X	11.5	2.4	M14×1.5	∅ 15.8	∅ 22	30°
M1	11.5	2.4	M14×1.5	∅ 15.8	-	30°



Installation size

M60V 85 Installation size

Flange-type motor,
With balance valve



Direction of rotation and oil flow direction

Installation

Flow A → B

Flow B → A

Rotation

Clockwise

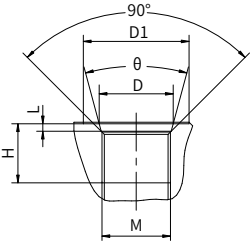
Counter-clockwise

Installation size

• M60V 85 Port details

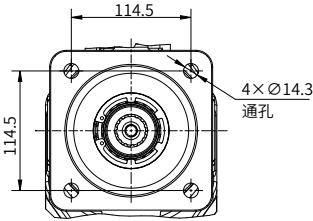
	Port name	Port size and description	Tightening torque (N · m)
A、B	Inlet port and Delivery port	SAE J518 1 in	98
U	Bearing flushing	ISO 6149 M18×1.5 (depth 14.5mm)	45
TI	Case drain port	ISO 6149 M22×1.5 (depth 15.5mm)	60
T2		ISO 6149 M27×2 (depth 19mm)	100
MA、MB	Measuring port	ISO 6149 M18×1.5 (depth 14.5mm)	70
M1		ISO 6149 M14×1.5 (depth 11.5mm)	45
G	Synchronous control	ISO 6149 M14×1.5 (depth 11.5mm)	45
X	Pilot port	ISO 6149 M14×1.5 (depth 11.5mm)	45
S	Charge port	DIN 3852 M22×1.5 (depth 14mm)	100
Gext	Brake release port	DIN 3852 M12×1.5 (depth 12.5mm)	22

Port	H	L	M	D	D1	θ
U	14.5	2.4	M18×1.5	∅ 19.8	∅ 28	30°
T1	15.5	2.4	M22×1.5	∅ 23.8	∅ 30	30°
T2	19	3.1	M27×2	∅ 29.4	∅ 34	30°
MA、MB	14.5	2.4	M18×1.5	∅ 19.8	∅ 28	30°
M1	11.5	2.4	M14×1.5	∅ 15.8	-	30°
G	11.5	2.4	M14×1.5	∅ 15.8	∅ 22	30°
X	11.5	2.4	M14×1.5	∅ 15.8	∅ 22	30°
S	14	2.4	M22×1.5	∅ 23.8	∅ 30	30°
Gext	12.5	1.5	M12×1.5	∅ 13.8	∅ 19	30°

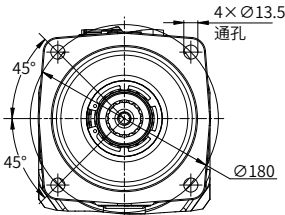


Installation size

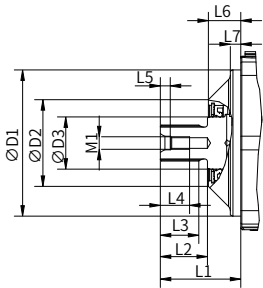
M60V85Mounting Flange and Input Shaft Dimensions



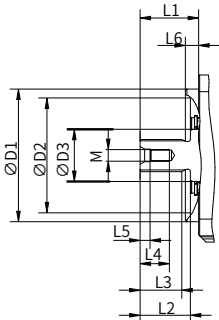
“C4” Type Flange
SAE J744 127-4



“N4” Type Flange
ISO 3019-2 140-4



Type “B” Input Shaf



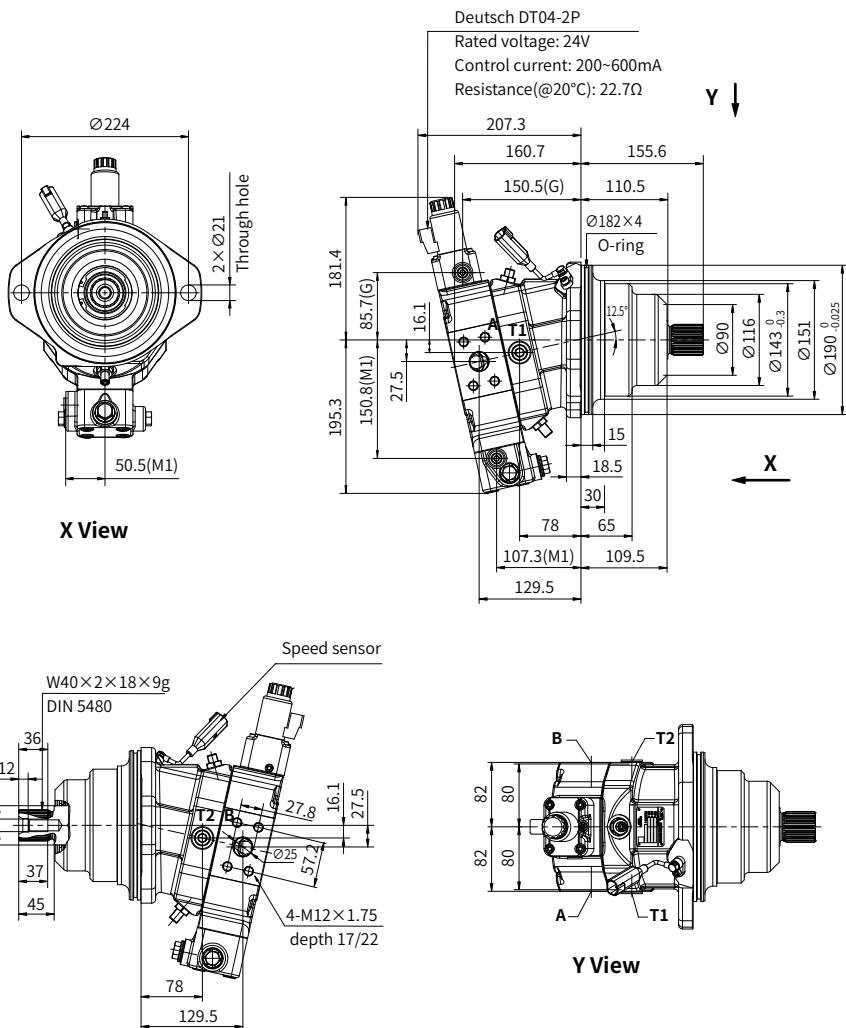
Type “S” Input Shaf

Code	D1	D2	D3	M	L1	L2	L3	L4	L5	L6	L7
B8	140	83	50	M12	77	45	37	28	9.5	31	10
B9				M16				36	12		
S7	127	110	50	7/16-14UNC-2B	56	48.1	39.9	28	9.5	12.7	-

Installation size

M60VE85 Installation size

Plug-in motor



Installation size

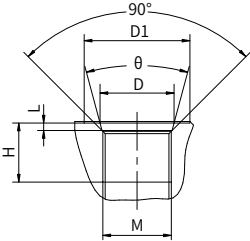
• M60VE85 Direction of rotation and oil flow direction

Installation	Rotation
Flow A → B	Clockwise
Flow B → A	Counter-clockwise

• M60VE85 Port details

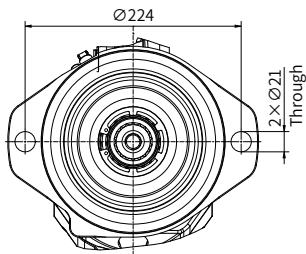
	Port name	Port size and description	Tightening torque (N · m)
A、B	Inlet port and Delivery port	SAE J518 1" M12×1.75 (depth 17mm)	98
T1	Case drain port	ISO 6149 M22×1.5 (depth 15.5mm)	45
T2		ISO 6149 M22×1.5 (depth 15.5mm)	45
G	Measuring port	ISO 6149 M14×1.5 (depth 11.5mm)	45
M1		ISO 6149 M14×1.5 (depth 11.5mm)	45

Port	H	L	M	D	D1	θ
T1	15.5	2.4	M22×1.5	∅ 23.8	∅ 29	30°
T2	15.5	2.4	M22×1.5	∅ 23.8	∅ 29	30°
G	11.5	2.4	M14×1.5	∅ 15.8	∅ 22	30°
M1	11.5	2.4	M14×1.5	∅ 15.8	∅ 22	30°

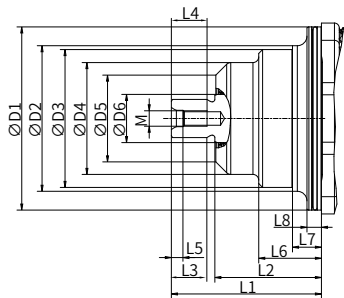


Installation size

M60VE85Mounting Flange and Input Shaft Dimensions



“Y2” Type Flange
ISO 3019-2 190-2



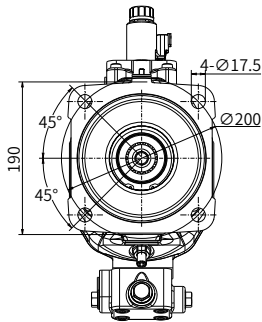
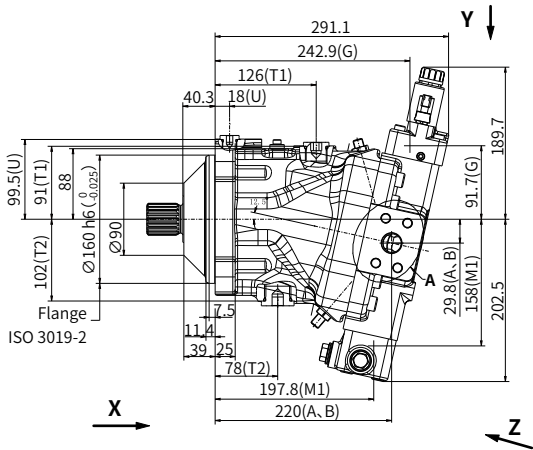
“B” Type Input Shaft

Code	D1	D2	D3	D4	D5	D6	M	L1	L2	L3	L4	L5	L6	L7	L8
B9	190	151	143	116	90	50	M16	155.6	110.5	37	36	12	65	30	15

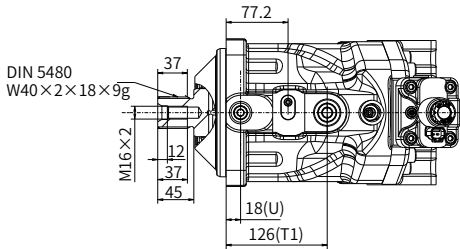
Installation size

M60V 115 Installation size

Flange-type motor

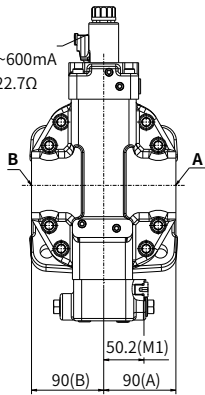


X View



Y View

Deutsch DT04-2P
Rated voltage: 24V
Control current: 200~600mA
Resistance(@20°C): 22.7Ω



Z View

Installation size

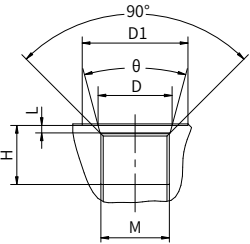
• M60V 115 Direction of rotation and oil flow direction

Installation	Rotation
Flow A → B	Clockwise
Flow B → A	Counter-clockwise

• M60V 115 Port details

	Port name	Port size and description	Tightening torque (N · m)
A、B	Inlet port and Delivery port	SAE J518 1" M12×1.75 (depth 17mm)	98
T1	Case drain port	ISO 6149 M27×2 (depth 19mm)	90
T2		ISO 6149 M33×2 (depth 19mm)	120
G	Measuring port	ISO 6149 M14×1.5 (depth 11.5mm)	45
U	Flushing port	ISO 6149 M18×1.5 (depth 14.5mm)	45
X	Pilot port	ISO 6149 M14×1.5 (depth 11.5mm)	45
M1	Measuring port	ISO 6149 M14×1.5 (depth 11.5mm)	45

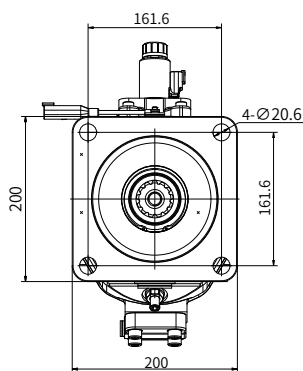
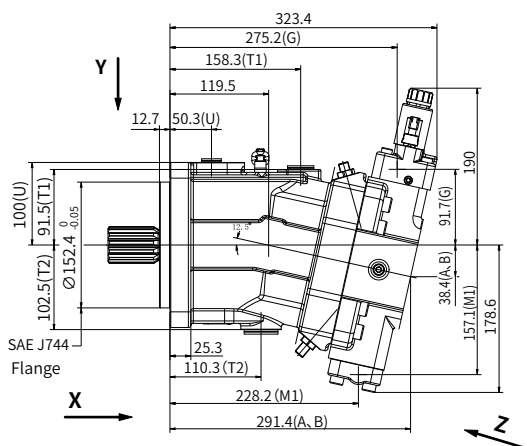
Port	H	L	M	D	D1	θ
T1	19	3.1	M27×2	Ø 29.4	Ø 34	30°
T2	19	3.1	M33×2	Ø 35.4	Ø 43	30°
G	11.5	2.4	M14×1.5	Ø 15.8	Ø 22	30°
U	14.5	2.4	M18×1.5	Ø 19.8	Ø 28	30°
X	11.5	2.4	M14×1.5	Ø 15.8	Ø 22	30°
M1	11.5	2.4	M14×1.5	Ø 15.8	Ø 22	30°



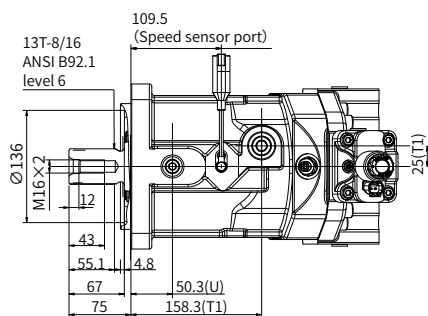
Installation size

M60V 115 Installation size

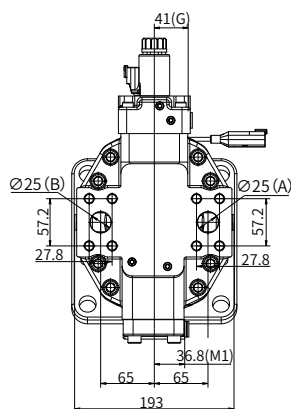
SAE Flange-type motor



X View



Y View



Z View

Installation size

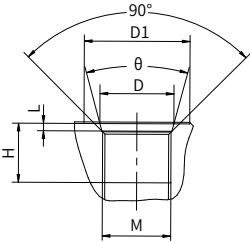
• M60V 115 Direction of rotation and oil flow direction

Installation	Rotation
Flow A → B	Clockwise
Flow B → A	Counter-clockwise

• M60V 115 Port details

	Port name	Port size and description	Tightening torque (N·m)
A、B	Inlet port and Delivery port	SAE J518 1" M12×1.75 (depth 17mm)	98
T1	Case drain port	ISO 6149 M27×2 (depth 19mm)	90
T2		ISO 6149 M33×2 (depth 19mm)	120
G	Measuring port	ISO 6149 M14×1.5 (depth 11.5mm)	45
U	Flushing port	ISO 6149 M18×1.5 (depth 14.5mm)	45
X	Pilot port	ISO 6149 M14×1.5 (depth 11.5mm)	45
M1	Measuring port	ISO 6149 M14×1.5 (depth 11.5mm)	45

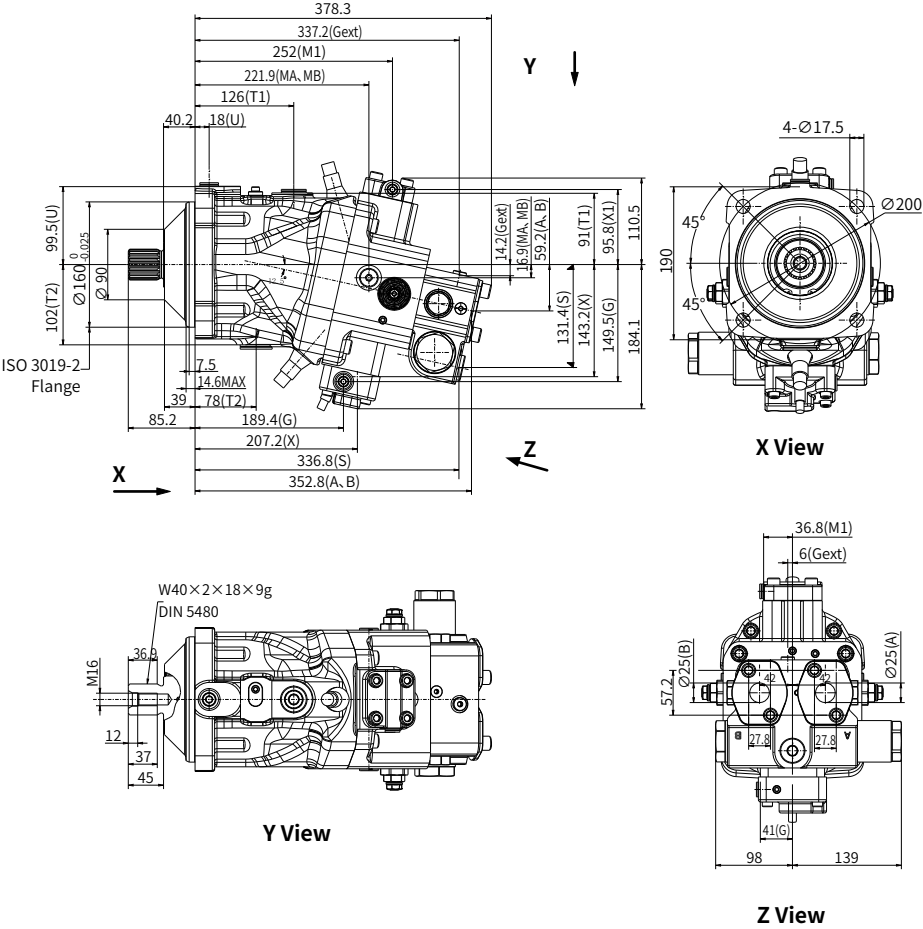
Port	H	L	M	D	D1	θ
T1	19	3.1	M27×2	∅ 29.4	∅ 34	30°
T2	19	3.1	M33×2	∅ 35.4	∅ 43	30°
G	11.5	2.4	M14×1.5	∅ 15.8	∅ 22	30°
U	14.5	2.4	M18×1.5	∅ 19.8	∅ 28	30°
X	11.5	2.4	M14×1.5	∅ 15.8	∅ 22	30°
M1	11.5	2.4	M14×1.5	∅ 15.8	∅ 22	30°



Installation size

M60V 115 Installation size

Flange-type motor,
With balance valve



• Direction of rotation and oil flow direction

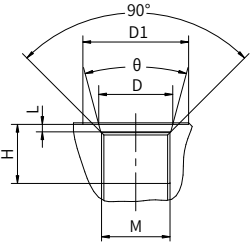
Installation	Rotation
Flow A → B	Clockwise
Flow B → A	Counter-clockwise

Installation size

• M60V 115 Port details

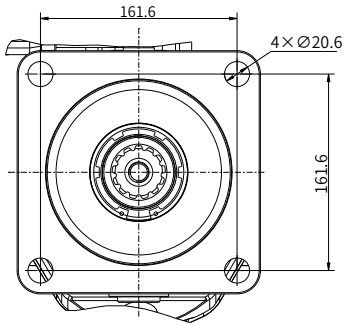
	Port name	Port size and description	Tightening torque (N · m)
A、B	Inlet port and Delivery port	SAE J518 1 in	98
U	Bearing flushing	ISO 6149 M18×1.5 (depth 14.5mm)	45
TI	Case drain port	ISO 6149 M27×2 (depth 19mm)	100
T2		ISO 6149 M33×2 (depth 19mm)	160
MA、MB	Measuring port	ISO 6149 M18×1.5 (depth 14.5mm)	70
M2、M3		ISO 6149 M10×1 (depth 11.5mm)	15
G	Synchronous control	ISO 6149 M14×1.5 (depth 11.5mm)	45
X、X2	Pilot port	ISO 6149 M14×1.5 (depth 11.5mm)	45
S	Charge port	ISO 9974 M27×2 (depth 16mm)	170
Gext	Brake realse port	ISO 9974 M12×1.5 (depth 12.5mm)	22

Port	H	L	M	D	D1	θ
U	14.5	2.4	M18×1.5	∅ 19.8	∅ 28	30°
TI	19	3.1	M27×2	∅ 29.4	∅ 34	30°
T2	19	3.1	M33×2	∅ 35.4	∅ 43	30°
MA、MB	14.5	2.4	M18×1.5	∅ 19.8	∅ 28	30°
M2、M3	11.5	1	M10×1	∅ 11.1	∅ 16	24°
G	11.5	2.4	M14×1.5	∅ 19.8	∅ 28	30°
X、X2	11.5	2.4	M14×1.5	∅ 15.8	∅ 22	30°
S	16	3.1	M27×2	∅ 29.4	∅ 34	30°
Gext	12.5	1.5	M12×1.5	∅ 13.8	∅ 19	30°

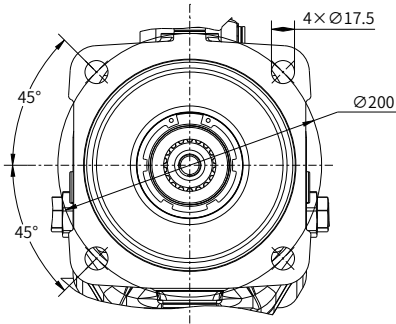


Installation size

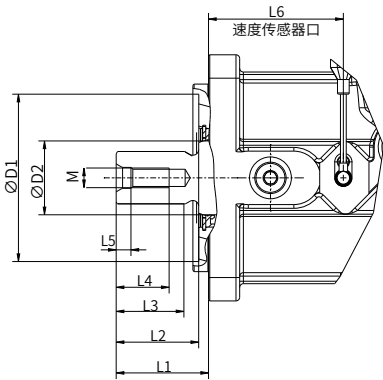
M60V115 Mounting Flange and Input Shaft Dimensions



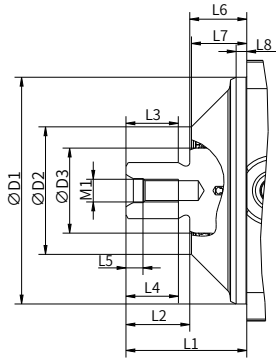
“D4” Type Flange
ISO 3019-1 152-4



“P4” Type Flange
ISO 3019-2 160-4



“A3” Type Input Shaft



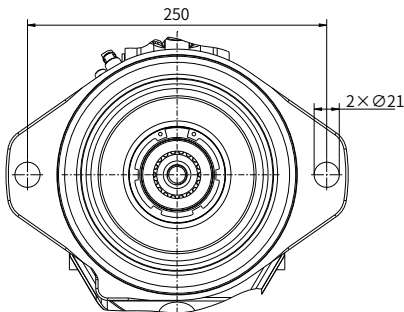
“B9” “A1” “B1” “B4”
Type Input Shaft

Code	D1	D2	D3	M	L1	L2	L3	L4	L5	L6	L7	L8
A3	136	60	-	M12×12	75	67	55	43	12	109.5	-	-

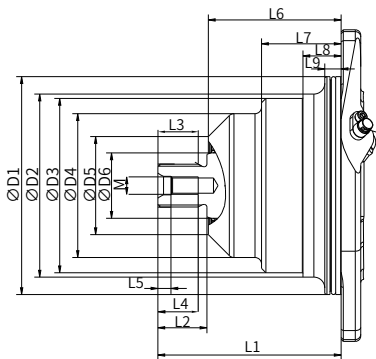
B9	160	90	60	M16	85	45	36.9	37	12	40	39	7.5
A1					90	49.7	41.7	43	12			
B1				M12	85	45	36.9	26	9.5			
B4				M16	102	61.65	52.3	43	12			

Installation size

M60VE115 Mounting Flange and Input Shaft Dimensions



“S2” Type Flange
ISO 3019-2 200-2



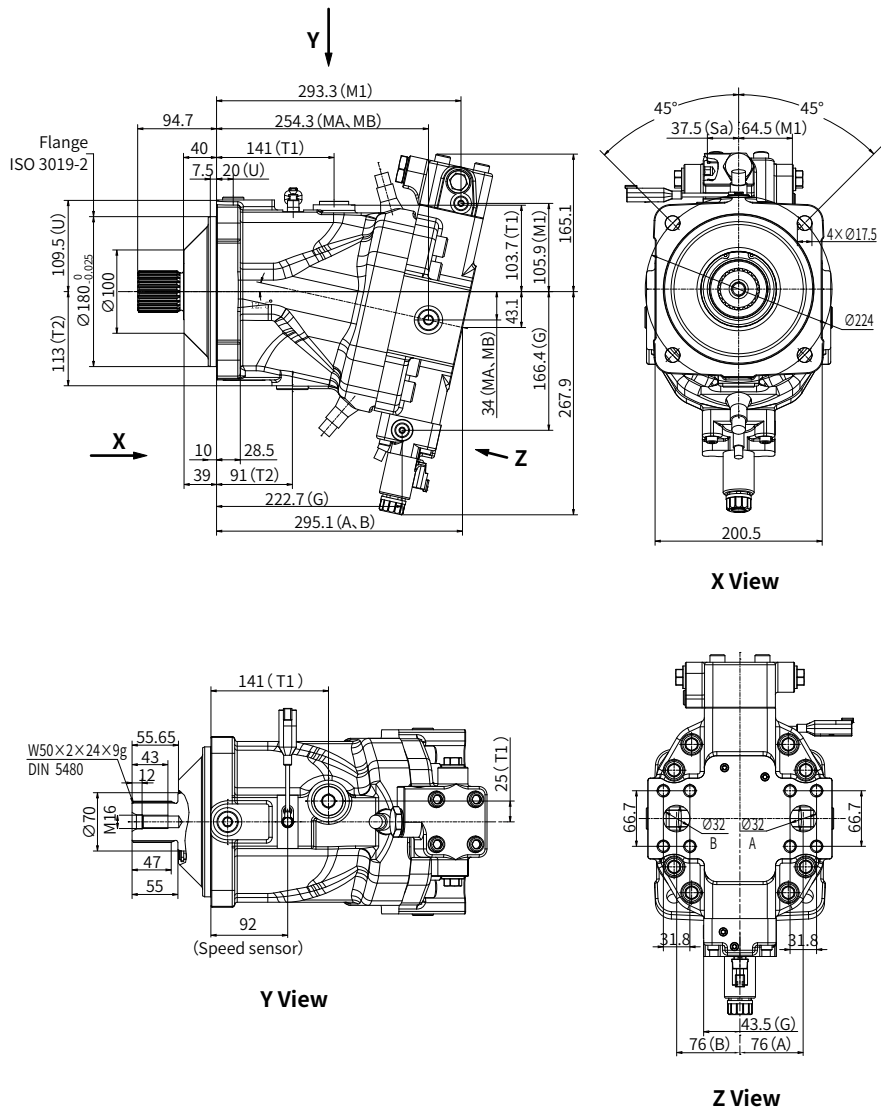
“B” Type Input Shaft

Code	D1	D2	D3	D4	D5	D6	M	L1	L2	L3	L4	L5	L6	L7	L8	L9
B9	200	168	160	132	90	60	M16	168	45	36.9	37	12	121.8	73	35	15

Installation size

M60V 160 Installation size

Flange-type motor



Installation size

• M60V 160 Direction of rotation and oil flow direction

Installation	Rotation
Flow A → B	Clockwise
Flow B → A	Counter-clockwise

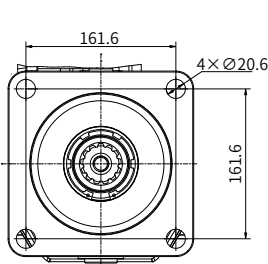
• M60V 160 Port details

	Port name	Port size and description	Tightening torque (N·m)
A、B	Inlet port and Delivery port	SAE J518 1 1/4" M14×2 (depth 19mm)	-
T1	Case drain port	DIN 3852 M26×1.5 (depth 23mm ED seals)	110±10
T2		DIN 3852 M26×1.5 (depth 18mm ED seals)	110±10
G	Synchronous control port	DIN 3852 M14×1.5 (depth 15mm ED seals)	40±5
U	Flushing port	DIN 3852 M22×1.5 (depth 20mm ED seals)	45±5
MA、MB	Measuring port	DIN 3852 M14×1.5 (depth 12mm ED seals)	40±5

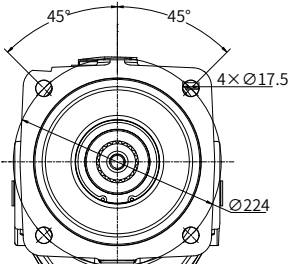
Port	H	M	D	α
T1	23	M26×1.5	Ø 26	90°
T2	18	M26×1.5	Ø 26	90°
G	15	M14×1.5	Ø 14	90°
U	20	M22×1.5	Ø 22	90°
MA、MB	12	M14×1.5	Ø 14	90°

Installation size

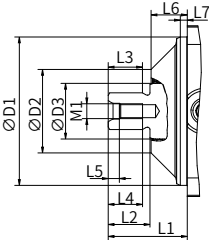
M60V160 Mounting Flange and Input Shaft Dimensions



“D4” Type Flange
SAE J744 152-4



“R4” Type Flange
ISO 3019-2 180-4

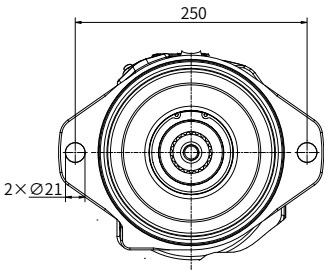


“A” Type Input Shaft

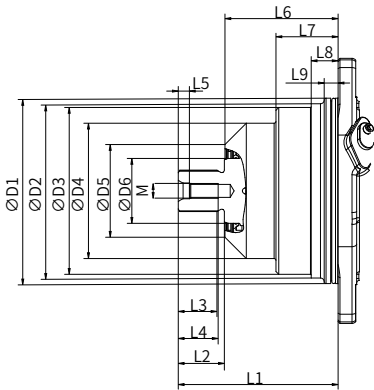
代码	D1	D2	D3	M	L1	L2	L3	L4	L5	L6	L7
A1	180	100	70	M16	88.9	49.7	41.7	43	12	39	7.5
A2					94.65	55	47				
A3					103.9	64.2	54.8				

Installation size

M60VE160 Mounting Flange and Input Shaft Dimensions



“S2” Type Flange
ISO 3019-2 200-2



“A” Type Input Shaft

Code	D1	D2	D3	D4	D5	D6	M	L1	L2	L3	L4	L5	L6	L7	L8	L9
A1	200	188	180	146	100	70	M16	172.35	49.7	41.7	43	12	122	67	29	15

Installation size

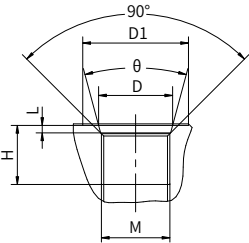
• M60V 170 Direction of rotation and oil flow direction

Installation	Rotation
Flow A → B	Clockwise
Flow B → A	Counter-clockwise

• M60V 170 Port details

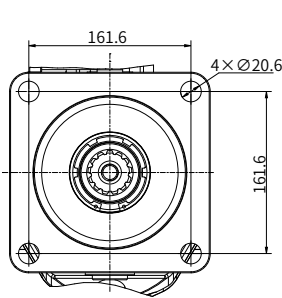
	Port name	Port size and description	Tightening torque (N·m)
A、B	Inlet port and Delivery port	SAE J518 1 1/4" M14×2 (depth 22mm)	157
T1	Case drain port	ISO 6149 M27×2 (depth 29mm)	210
T2		ISO 6149 M33×2 (depth 25.5mm)	215
G	Measuring port pressure	ISO 6149 M14×1.5 (depth 11.5mm)	45
U	Flushing port	ISO 6149 M22×1.5 (depth 20mm)	45
M1	Measuring port pressure	ISO 6149 M14×1.5 (depth 12.5mm)	45
Sa	External flushing port	ISO 6149 M22×1.5 (depth 16mm)	100

Port	H	L	M	D	D1	θ
T1	29	3.1	M27×2	Ø 29.4	Ø 34	30°
T2	25.5	3.1	M33×2	Ø 35.4	Ø 43	30°
G	11.5	2.4	M14×1.5	Ø 15.8	Ø 25	30°
U	20	2.4	M22×1.5	Ø 23.8	Ø 29	30°
M1	12.5	2.4	M14×1.5	Ø 15.8	Ø 22	30°
Sa	16	2.4	M22×1.5	Ø 23.8	Ø 30	30°

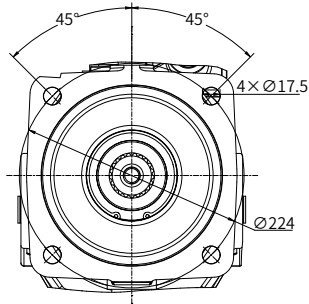


Installation size

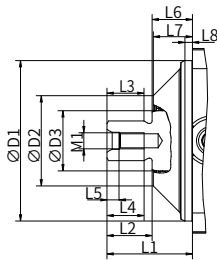
M60V170 Mounting Flange and Input Shaft Dimensions



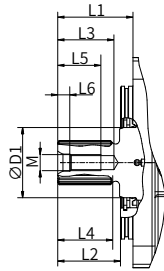
“D4” Type Flange
SAE J744 152-4



“R4” Type Flange
ISO 3019-2 180-4



“A” Type Input Shaft



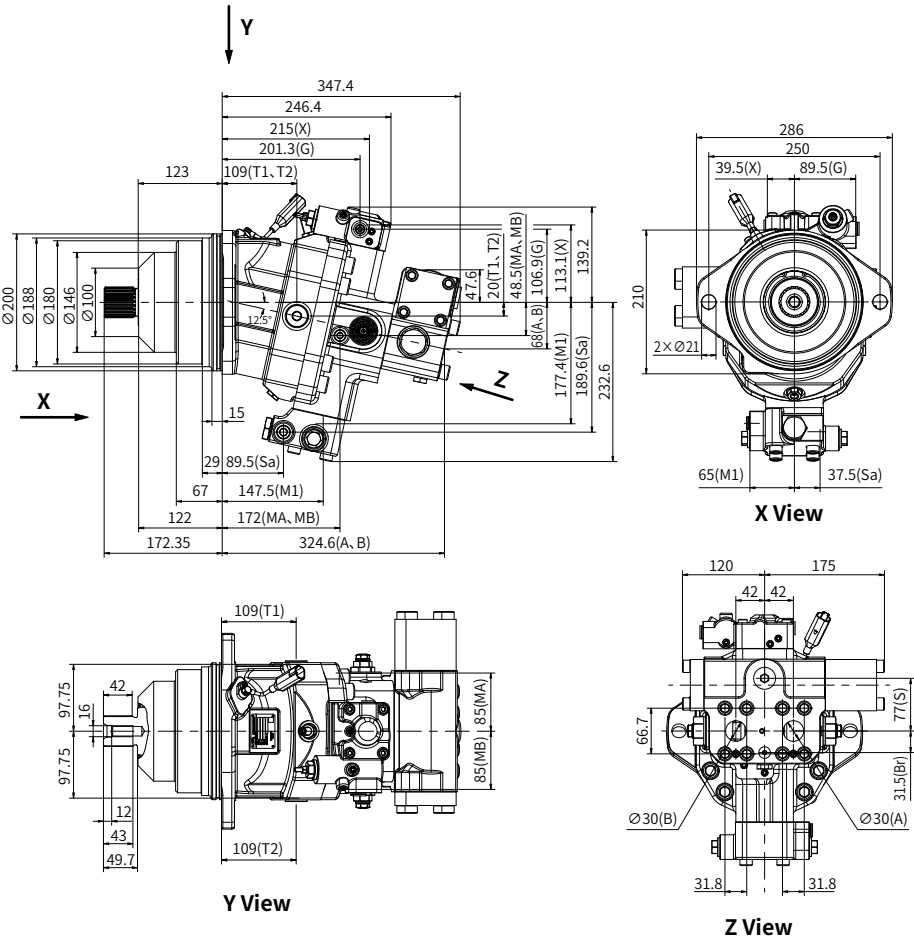
“B” Type Input Shaft

Code	D1	D2	D3	M	L1	L2	L3	L4	L5	L6	L7	L8
A1	180	100	70	M16	88.9	49.7	41.7	43	12	40	39	7.5
A2					94.65	55	47					
A3					103.9	64.2	54.8					
B4	70	-	-	M16	75	62.6	56	54.8	43	12	-	-

Installation size

M60V 170 Installation size

Plug-in motor,
With balance valve



· Direction of rotation and oil flow direction

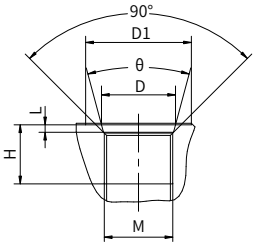
Installation	Rotation
Flow A → B	Clockwise
Flow B → A	Counter-clockwise

Installation size

• M60V 170 Port details

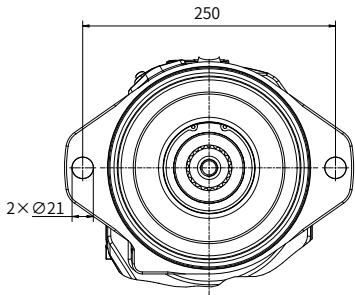
	Port name	Port size and description	Tightening torque (N·m)
A、B	Inlet port and Delivery port	SAE J518 1 1/4"	157
	Fastening thread	DIN 13 M14×2 (depth 19mm)	157
T1、T2	Case drain port	ISO 6149 M27×2 (depth 19mm)	100
MA、MB	Measuring port	ISO 6149 M18×1.5 (depth 14.5mm)	70
M1		ISO 6149 M14×1.5 (depth 11.5mm)	45
G	Synchronous control	ISO 6149 M14×1.5 (depth 11.5mm)	45
X	Pilot port	ISO 6149 M14×1.5 (depth 11.5mm)	45
Sa	Flushing port	ISO 6149 M22×1.5 (depth 16.5mm)	100
S	Charge port	ISO 9974 M27×2 (depth 16mm)	170
Br	Brake release port	ISO 9974 M12×1.5 (depth 12mm)	22

Port	H	L	M	D	D1	θ
T1、T2	19	3.1	M27×2	∅ 29.4	∅ 34	30°
MA、MB	14.5	2.4	M18×1.5	∅ 19.8	∅ 28	30°
M1	11.5	2.4	M14×1.5	∅ 15.8	∅ 25	30°
G	11.5	2.4	M14×1.5	∅ 15.8	∅ 25	24°
X	11.5	2.4	M14×1.5	∅ 15.8	∅ 25	30°
Sa	16.5	2.4	M22×1.5	∅ 23.8	∅ 30	30°
S	16	3.1	M27×2	∅ 29.4	∅ 34	30°
Br	12	1.5	M12×1.5	∅ 13.8	∅ 19	30°

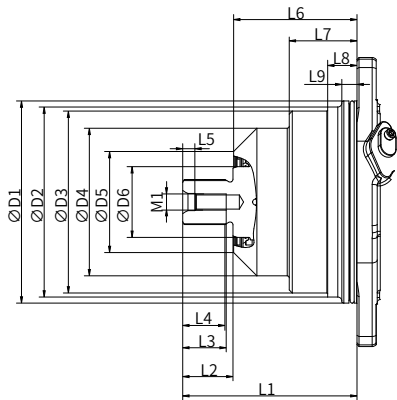


Installation size

M60VE170 Mounting Flange and Input Shaft Dimensions



“S2” Type Flange
ISO 3019-2 200-2



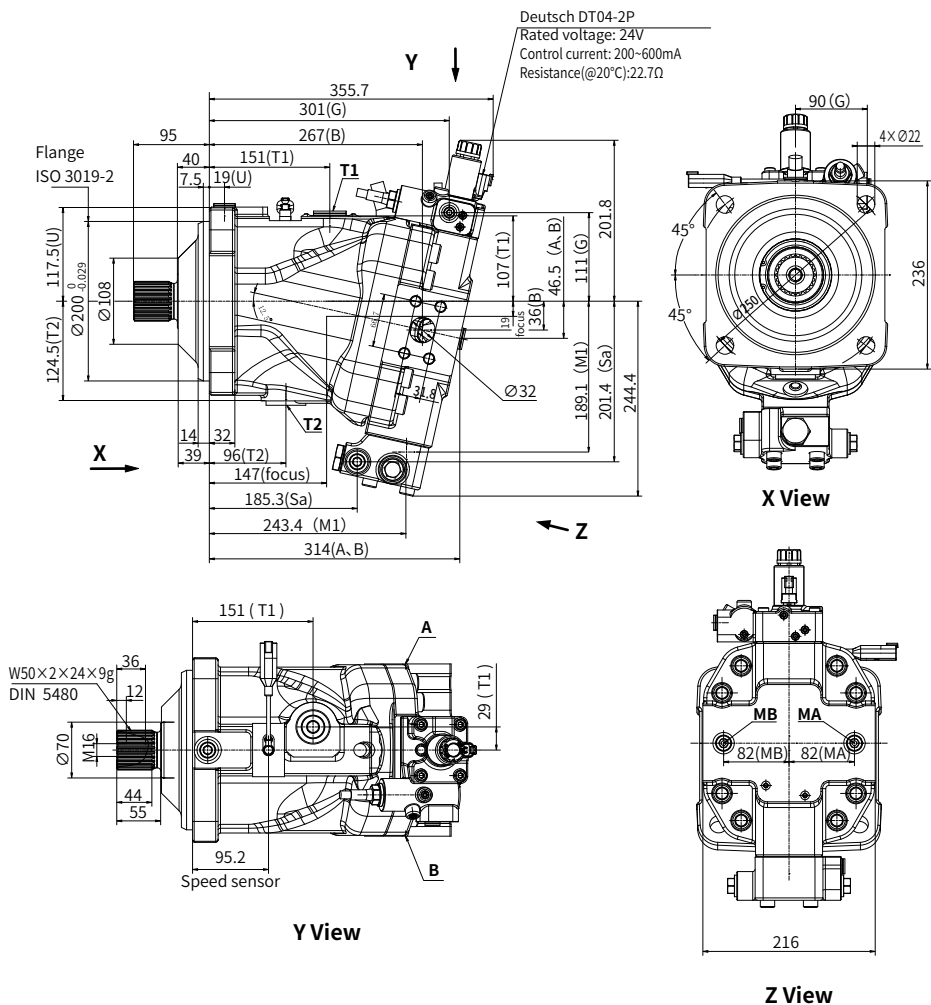
“A” Type Input Shaft

Code	D1	D2	D3	D4	D5	D6	M	L1	L2	L3	L4	L5	L6	L7	L8	L9
A1	200	188	180	146	100	70	M16	172.35	49.7	43	41.7	12	122	67	29	15
A2							M16	177.65	55.65	43	47					

Installation size

M60V 200 Installation size

Flange-type motor



Installation size

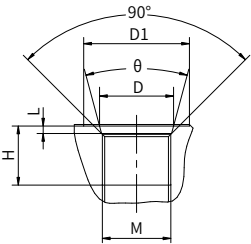
• M60V 200 Direction of rotation and oil flow direction

Installation	Rotation
Flow A → B	Clockwise
Flow B → A	Counter-clockwise

• M60V 200 Port details

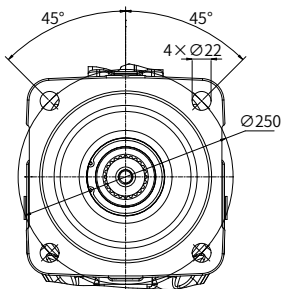
	Port name	Port size and description	Tightening torque (N·m)
A, B	Inlet port and Delivery port	SAE J518 1 1/4" M14×2 (depth 20mm)	157
T1	Case drain port	ISO 6149 M33×2 (depth 20mm)	215
T2		ISO 6149 M42×2 (depth 20mm)	330
G	Measuring port pressure	ISO 6149 M14×1.5 (depth 11.5mm)	45
U	Flushing port	ISO 6149 M22×1.5 (depth 11.5mm)	45
M1	Measuring port pressure	ISO 6149 M14×1.5 (depth 11.5mm)	45

Port	H	L	M	D	D1	θ
T1	20	3.1	M33×2	Ø 35.4	Ø 43	30°
T2	20	3.1	M42×2	Ø 44.4	Ø 52	30°
G	11.5	2.4	M14×1.5	Ø 15.8	Ø 25	30°
U	11.5	2.4	M22×1.5	Ø 23.8	Ø 34	30°
M1	11.5	2.4	M14×1.5	Ø 15.8	Ø 25	30°

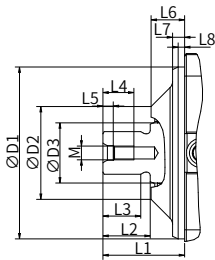


Installation size

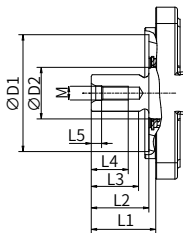
M60V200 Mounting Flange and Input Shaft Dimensions



“S4” Type Flange
ISO 3019-2 200-4



“A2” Type Input Shaft

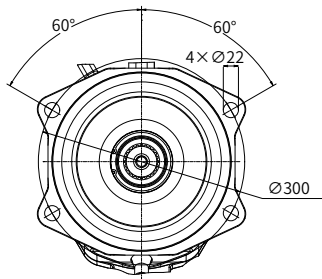


“A3” Type Input Shaft

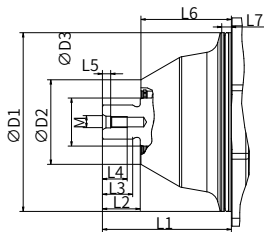
Code	D1	D2	D3	M	L1	L2	L3	L4	L5	L6	L7	L8
A2	200	108	70	M16	95	55	44	36	12	39	17	7.5
A3	136	60	-	M16×2	75	67	55	43	12	-	-	-

Installation size

M60VE200 Mounting Flange and Input Shaft Dimensions



“E4” Type Flange
ISO 3019-2 260-4



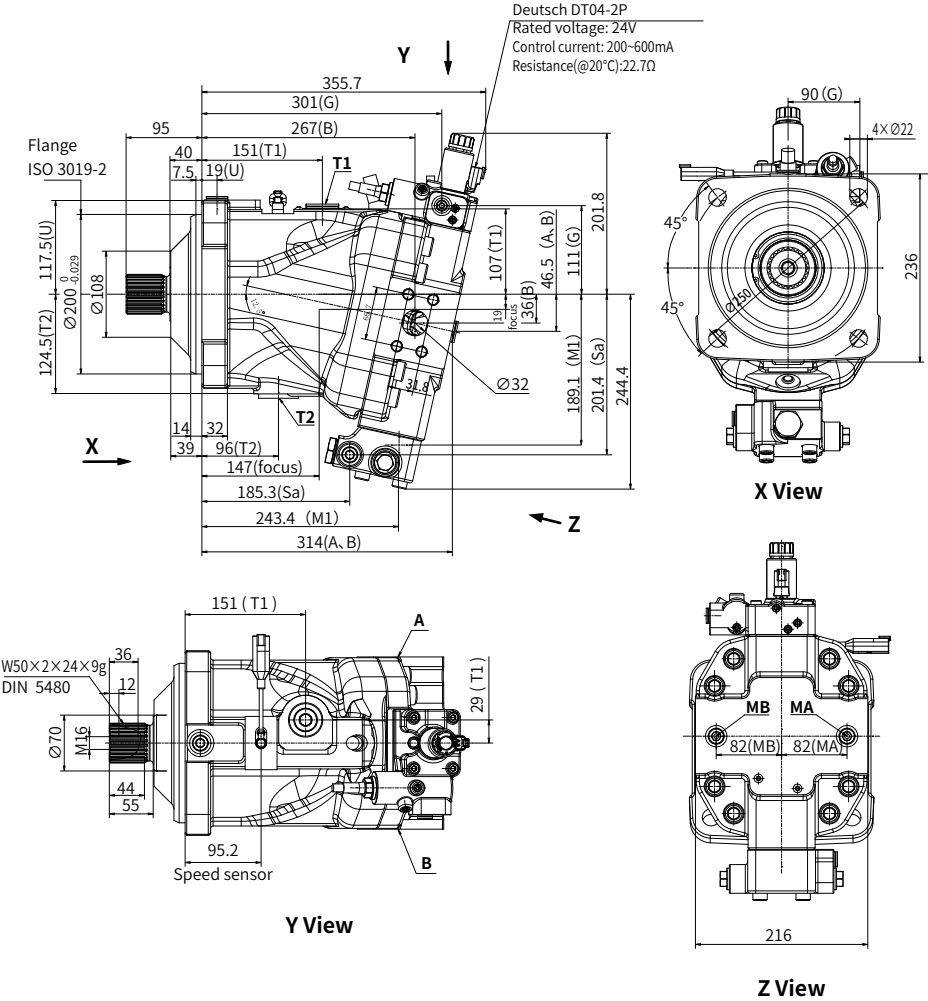
“A” Type Input Shaft

Code	D1	D2	D3	M	L1	L2	L3	L4	L5	L6	L7
A2	260	123	70	M16	187.5	55	44	36	12	131.5	14

Installation size

M60V 215 Installation size

Flange-type motor



Installation size

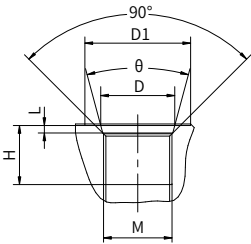
• M60V 215 Direction of rotation and oil flow direction

Installation	Rotation
Flow A → B	Clockwise
Flow B → A	Counter-clockwise

• M60V 215 Port details

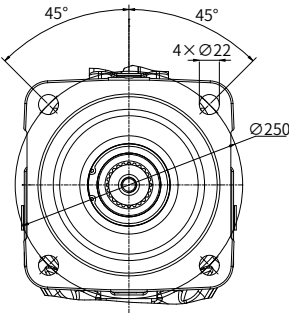
	Port name	Port size and description	Tightening torque (N · m)
A、B	Inlet port and Delivery port	SAE J518 1 1/4" M14×2 (depth 20mm)	157
T1	Case drain port	ISO 6149 M33×2 (depth 20mm)	215
T2		ISO 6149 M42×2 (depth 20mm)	330
G	Measuring port	ISO 6149 M14×1.5 (depth 11.5mm)	45
U	Flushing port	ISO 6149 M22×1.5 (depth 11.5mm)	45
M1	Measuring port	ISO 6149 M14×1.5 (depth 11.5mm)	45

Port	H	L	M	D	D1	θ
T1	20	3.1	M33×2	∅ 35.4	∅ 43	30°
T2	20	3.1	M42×2	∅ 44.4	∅ 52	30°
G	11.5	2.4	M14×1.5	∅ 15.8	∅ 25	30°
U	11.5	2.4	M22×1.5	∅ 23.8	∅ 34	30°
M1	11.5	2.4	M14×1.5	∅ 15.8	∅ 25	30°

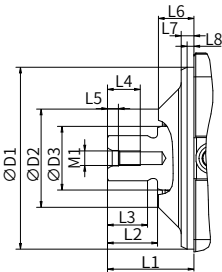


Installation size

M60V215 Mounting Flange and Input Shaft Dimensions



“S4” Type Flange
ISO 3019-2 200-4

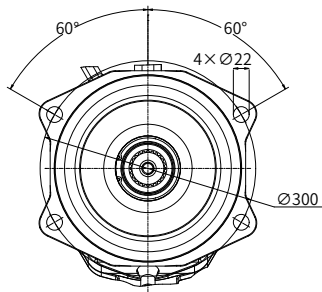


“A2” “A3” “B4”
Type Input Shaft

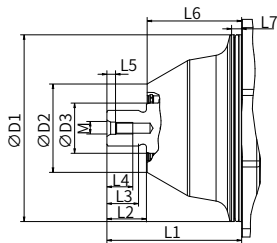
Code	D1	D2	D3	M	L1	L2	L3	L4	L5	L6	L7	L8
A2	200	108	70	M16	95	55	44	36	12	39	14	7.5
A3								43				
B4								36				

Installation size

M60VE215 Mounting Flange and Input Shaft Dimensions



“E4” Type Flange
ISO 3019-2 260-4



“A2” Type Input Shaft

Code	D1	D2	D3	M	L1	L2	L3	L4	L5	L6	L7
A2	260	123	70	M16	187.5	55	44	36	12	131.5	14

Installation size

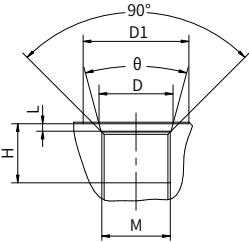
• M60V 280 Direction of rotation and oil flow direction

Installation	Rotation
Flow A → B	Clockwise
Flow B → A	Counter-clockwise

• M60V 280 Port details

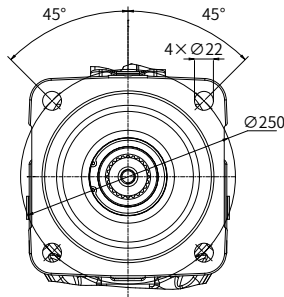
	Port name	Port size and description	Tightening torque (N·m)
A、B	Inlet port and Delivery port	SAE J518 1 1/4" M14×2 (depth 19mm)	187
T1	Case drain port	ISO 6149 M42×2 (depth 20mm)	330
T2		ISO 6149 M33×2 (depth 20mm)	215
G	Measuring port	ISO 6149 M14×1.5 (depth 11.5mm)	45
U	Flushing port	ISO 6149 M14×1.5 (depth 11.5mm)	45
M1	Measuring port	ISO 6149 M14×1.5 (depth 11.5mm)	45

Port	H	L	M	D	D1	θ
T1	20	3.1	M33×2	∅ 35.4	∅ 43	30°
T2	20	3.1	M42×2	∅ 44.4	∅ 52	30°
G	11.5	2.4	M14×1.5	∅ 15.8	∅ 25	30°
U	11.5	2.4	M14×1.5	∅ 15.8	∅ 25	30°
M1	11.5	2.4	M14×1.5	∅ 15.8	∅ 25	30°

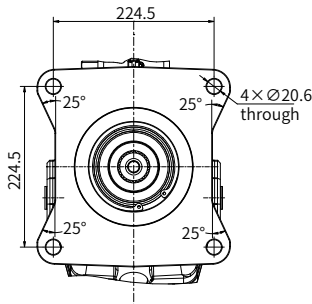


Installation size

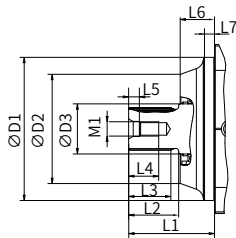
M60V280 Mounting Flange and Input Shaft Dimensions



“S4” Type Flange
ISO 3019-2 200-4



“T4” Type Flange
SAE J744 165-4



“A” Type Input Shaft

Code	D1	D2	D3	M	L1	L2	L3	L4	L5	L6	L7
A2	200	152.7	70	M16	105	55	44	36	12	48	14
A5				M20	120	72	59	42	15		



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