



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



Contents

Technical Data	02
Type introduction	03-05
Hydraulic fluid	06-07
Principle	08-14
Speed sensor	15-17
Installation size	
· M60VE28	18-19
· M60V(E)60	20-23
· M60V(E)85	24-29
· M60V(E) 115	30-35
· M60V(E)160	36-37
· M60V(E) 170	38-41
· M60V(E) 200	42-43
· M60V(E) 215	44-45
· M60V 280	46-47

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.
- Wide control range (to an angle of 0°).
- High torque and long service life.
- Flush valve and high-pressure balance valves are optional.
- 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	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
	Rated	400	450	450	450	400	450	400	450	450
Pressure (bar)	Max.	450	530	530	530	450	530	450	530	500
	Rated (bar)	2	2	2	2	3 ^{*1}	3	3 ^{*1}	3	2
Casting pressure	Max. (bar) (Short-time peak pressure)	5	5	5	5	6 ^{*1}	6	6 ^{*1}	6	5
Max. output torque (N·m), ($\Delta P = 450\text{bar}$)		179 ($\Delta P = 400\text{bar}$)	444	610	828	1019 ($\Delta P = 400\text{bar}$)	1230	1273 ($\Delta P = 400\text{bar}$)	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

- 04
1. Higher pressure resistant oil seals are currently under development.
(Rated at 5bar and short-time peak pressure at 10bar.)

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	Product series	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

Displacement

②	Size	28	60	85	115	160	170	200	215	280
---	------	----	----	----	-----	-----	-----	-----	-----	-----

Sensor

③	Sensor	28	60	85	115	160	170	200	215	280	Code
	Electric proportional displacement control	positive characteristic, 12V	●	●	●	●	●	●	●	●	E1
		positive characteristic, 24V	●	●	●	●	●	●	●	●	E2
		negative characteristic, 12V	●	●	●	●	●	●	●	●	E5
		negative characteristic, 24V	●	●	●	●	●	●	●	●	E6
	Electric two-point control	positive characteristic, 12V	●	●	●	●	●	●	●	●	ET1
		positive characteristic, 24V	●	●	●	●	●	●	●	●	ET2
		negative characteristic, 12V	●	●	●	●	●	●	●	●	EW1
		negative characteristic, 24V	●	●	●	●	●	●	●	●	EW2
	Hydraulic proportional control	positive characteristic ($\Delta P=10\text{bar}$)	●	●	●	●	●	●	●	●	H1
		positive characteristic ($\Delta P=25\text{bar}$)	●	●	●	●	●	●	●	●	H2
		negative characteristic ($\Delta P=10\text{bar}$)	●	●	●	●	●	●	●	●	H5
		negative characteristic ($\Delta P=25\text{bar}$)	●	●	●	●	●	●	●	●	H6
	Hydraulic two-point control	positive characteristic	●	●	●	●	●	●	●	●	HT
		negative characteristic	●	●	●	●	●	●	●	●	HW
	Automatic control high-pressure related	$\Delta P \leq \text{approx}, 10\text{bar}$	●	●	●	●	●	●	●	●	V1
		$\Delta P=100\text{bar}$	●	●	●	●	●	●	●	●	V2

Type introduction

Pressure cut-off

(4)	With	D1
	Hydraulic remote control, proportional	T3
	Without	00

Speed sensor

(5)	With	S
	Without	N

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

Port position

(6)	Port position	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
	125-4 ISO 3019-2		●								M4
	127-4 SAE J744			●							C4
	140-4 ISO 3019-2			●							N4
	152-4 ISO 3019-1					●	●				D4
	160-4 ISO 3019-2				●						P4
	180-4 ISO 3019-2					●	●				R4
	200-4 ISO 3019-2							●	●	●	S4
(7)	Mounting flange (M60VE)	28	60	85	115	160	170	200	215	280	Code
	135-2 ISO 3019-2	●									L2
	160-2 ISO 3019-2		●								P2
	190-2 ISO 3019-2			●							Y2
	200-2 ISO 3019-2				●	●	●				S2
	260-4 ISO 3019-2							●	●		E4

Type introduction

Input shaft

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

Seal type

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

Seal Method

⑩	Normal	F
	Cryogenic seal	N

Balance valve

⑪	With balance valve, BVD	D
	With balance valve, BVE	E
	With balance valve, BVI	I
	Without	0

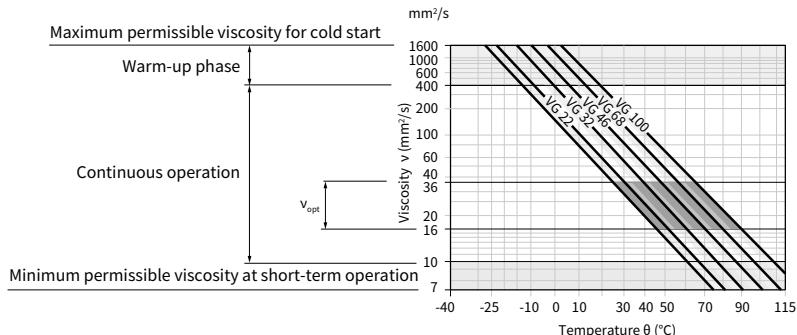
Standard / special version

⑫	Standard version	Second small displacement (optional only with balance valve)				N	
	Special version	With flush valve	Flushing flow (L/min)	Code	Flushing flow (L/min)	Code	Opening pressure 16bar, differential pressure $\Delta P=25$ bar
			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	$\theta_{St} \geq -40^\circ C$	$t \leq 3\text{min}$, 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 $45^\circ F$ ($25 K$).
		FKM	$\theta_{St} \geq -25^\circ C$	
Warm-up phase	$v = 7400 \dots 1850$ (1600 \dots 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	$v = 1850 \dots 60$ (400 \dots 10)	NBR	$\theta \leq +85^\circ C$	measured at port T
		FKM	$\theta \leq +110^\circ C$	
	$v_{\text{opt}} = 170 \dots 82$ (36 \dots 16)			Range of optimum operating viscosity and efficiency
Short-term operation	$v_{\min} = 60 \dots 49$ (10 \dots 7)	NBR	$\theta \leq +85^\circ C$	$t \leq 3\text{min}$, $p \leq 0.3 \times p_{\text{nom}}$, measured at port T
		FKM	$\theta \leq +110^\circ C$	

• 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.

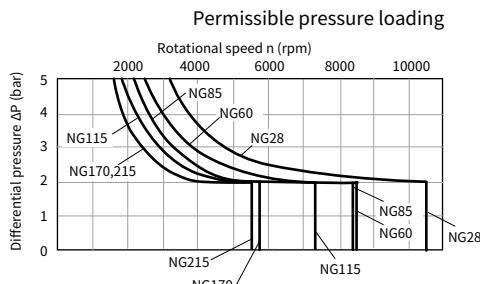
A cleanliness level of at least 20/18/15 is to be maintained according to ISO 4406.

At a hydraulic fluid viscosity of less than $10 \text{ mm}^2/\text{s}$ (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.

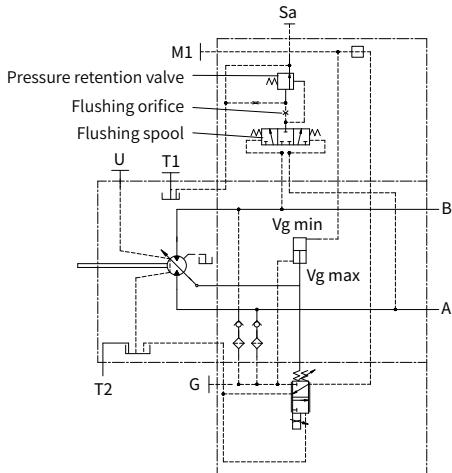


Principle

• 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.

E1, E2

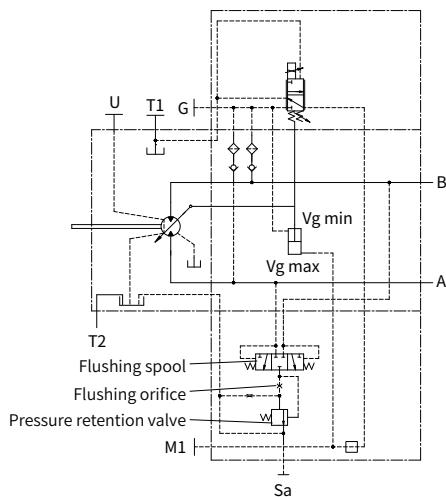


E1, E2 positive control

Beginning of control at Vg_{min}

End of control at Vg_{max}

E5, E6



E5, E6 negative control

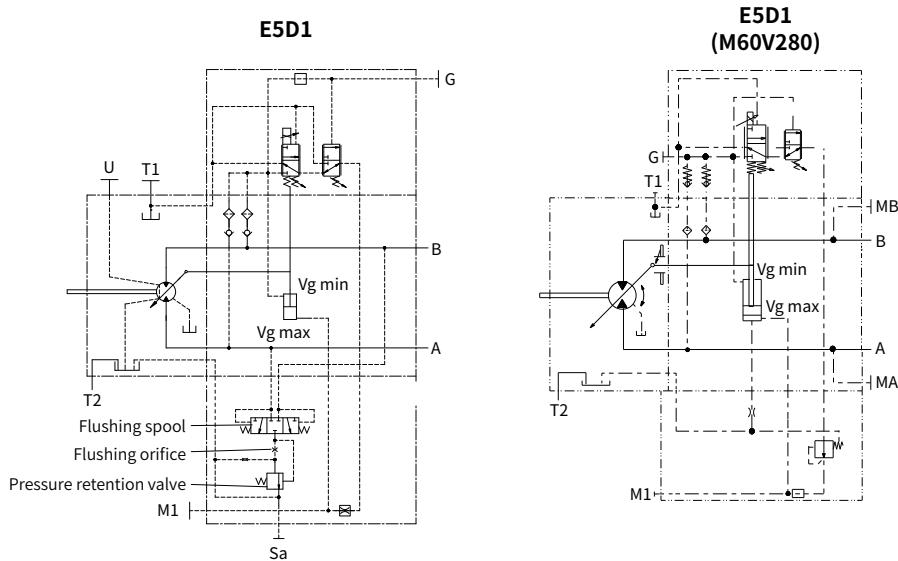
Beginning of control at Vg_{max}

End of control at Vg_{min}

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.

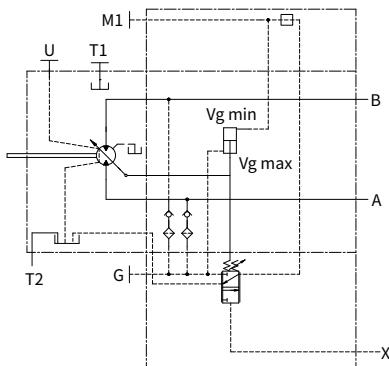
Technical data, solenoid	E1、E5	E2、E6
Voltage/V	12	24
Control current/mA	400~1200	200~600
Current limit/A	1.3	0.65
Nominal Resistance (20°C) /Ω	5.7±0.5	23.5±7

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.

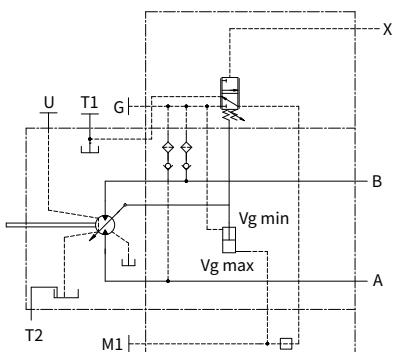
H1, H2



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.

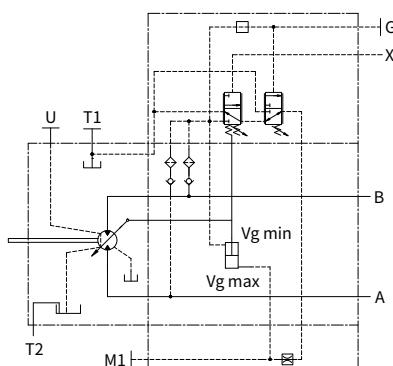
H6(negative control, increment of pilot pressure is 25 bar). Beginning of control at Vg max, End of control at Vg min. The motor displacement will increase from maximum to minimum when pilot pressure increases by 25 bar. Setting range of the displacement change point of pilot pressure is 5 to 35 bar.

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



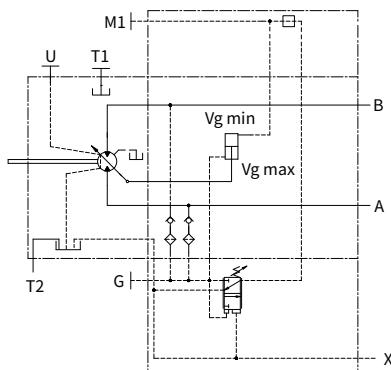
H5D1(negative control, increment of pilot pressure is 10 bar+Pressure control valve).

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 V_g min and V_g max depending on the load.

V1



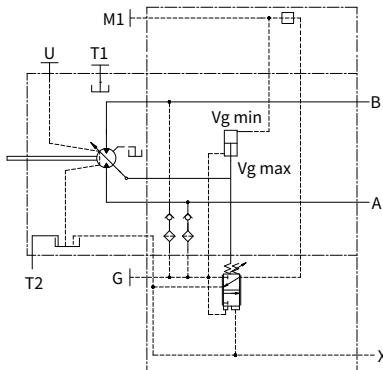
V1(Automatic high pressure related control, increment of working pressure $\Delta P \leq 10$ bar). Increment of working pressure $\Delta P \leq 10$ bar, The motor displacement will increase from minimum to maximum. Setting range of the setpoint of control valve pressure is 80 ~ 350bar.

Principle

• V-Automatic High Pressure Related Control

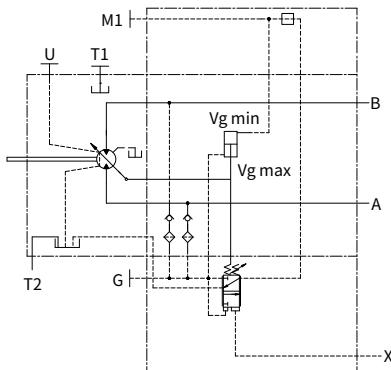
Automatic high pressure related control means the motor displacement will change automatically according to the working pressure, the pilot pressure of control valve is supplied by motor working pressure from A or B port, no external control pressure is required. When the working pressure reached the 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.

V2



V2(Automatic high pressure related control, increment of working pressure $\Delta P \approx 100$ bar). Increment of working pressure $\Delta P \approx 100$ 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 $\Delta P \approx 100$ 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.

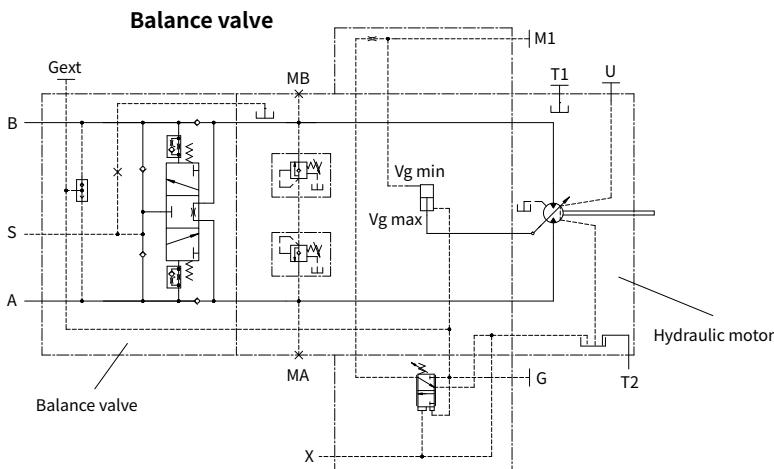
Principle (With Counter Balance Valve)

V1+BVD

(Automatic High Pressure Related Control + Counter Balance Valve)

V1+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 rotatory speed decreases slowly and finally stop. The high pressure relief valves play the role of motor overload protection.



Principle (With Counter Balance Valve)

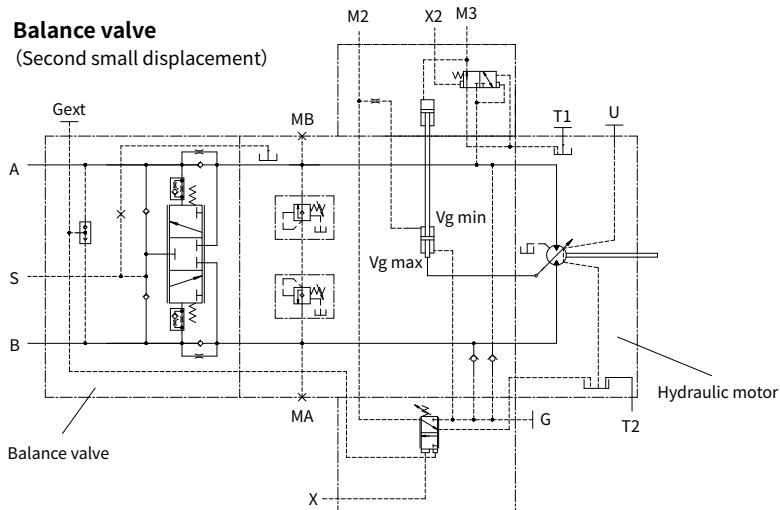
• HA2T3+BVD (Automatic High Pressure Related Control + Remote Pressure control + Counter Balance Valve)

HA2T3BVD(Automatic High Pressure Related Control + Remote pressure control + Counter Balance Valve + Second Small Displacement Control, increment of working pressure $\Delta P \approx 100$ 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 (< maximum displacement), preventing the motor from stalling and sucking out. The high pressure relief valves play the role of motor overload protection.

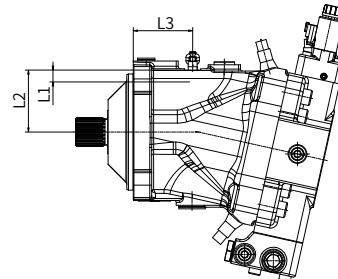
Balance valve
(Second small displacement)



Speed sensor

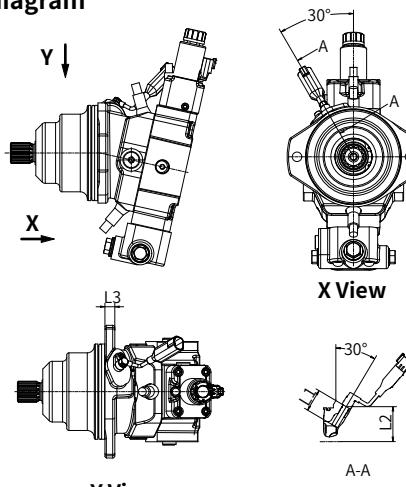
The speed sensor is installed on the motor, which can record the motor speed and detect the direction of rotation of the motor.

• 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 (Contact surface) mm	75	79	88	96	101	110.5
L3 mm	66.2	75.2	77.2	91.7	95.2	82
Gear module	2	2	2	2	2	2

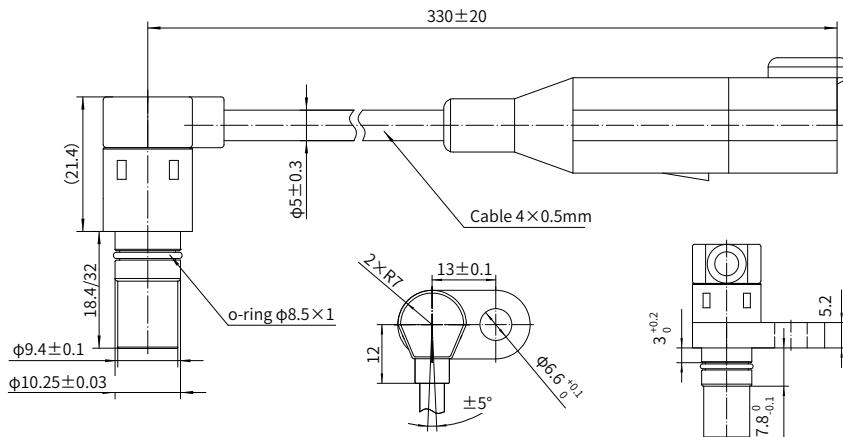
• M60VE Installation diagram



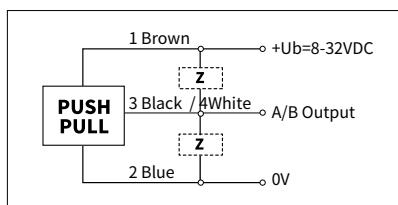
M60VE Displacement cc/rev	28	60	85	115	160/170	215
Number of teeth in the speed ring	40	54	58	67	75	80
L1 (Probe length) mm	32	32	32	32	32	32
L2 (Contact surface) mm	69.3	83.8	87.3	96.3	104.3	109.2
L3 mm	14	16	18.5	18	20	25
Gear module	2	2	2	2	2	2

Speed sensor

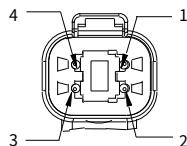
· Installation size



· Wiring diagram



Current consumption when unloaded	MAX.15mA
Maximum load current	50mA
Frequency range	0~20kHz
Temperature range for use	-40~125°C
Protection grade	IP67/IP69K
Output pulse count	Refer to the table for the number of teeth in the speed ring
Rotation recognition	Dual frequency output, 90 ° phase difference
Pressure resistance of measuring surface	10bar



DEUTSCH DT 04-4P	
PIN	function
1	VDC(8-32V)
2	GROUND
3*	Frequency signal A
4*	Frequency signal B

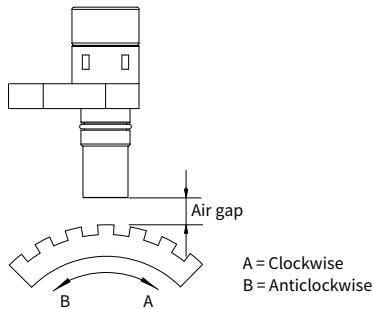
Note: “*” PIN3、 See 17/48 for the waveform diagram of output 4.

Speed sensor

• Output signal

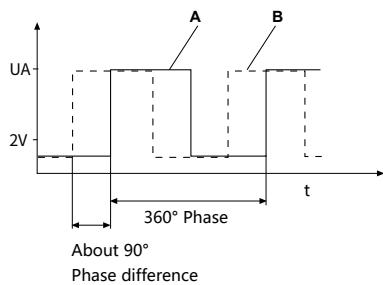
Reverse pulse output: $I_{max} \leq 50mA$

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

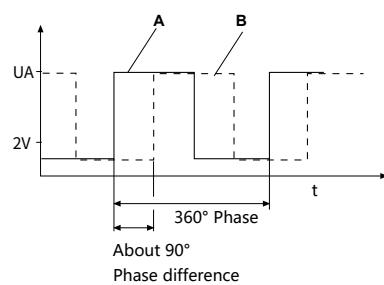


Gear Module	Air gap
Modulus2	0.2~2mm

↻ Rotate clockwise to output waveform



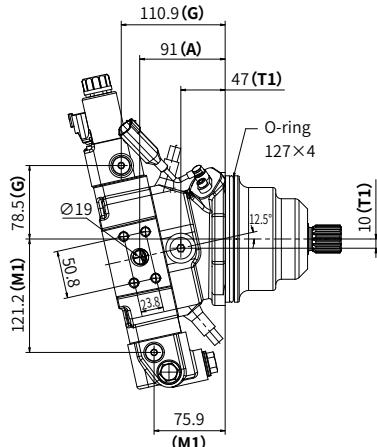
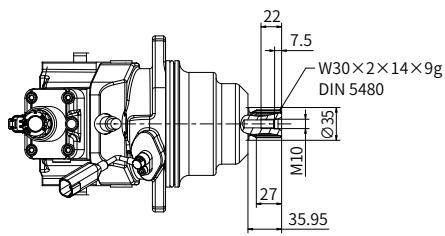
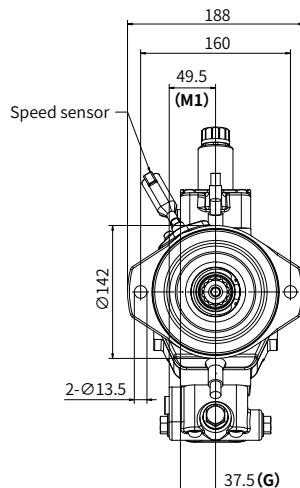
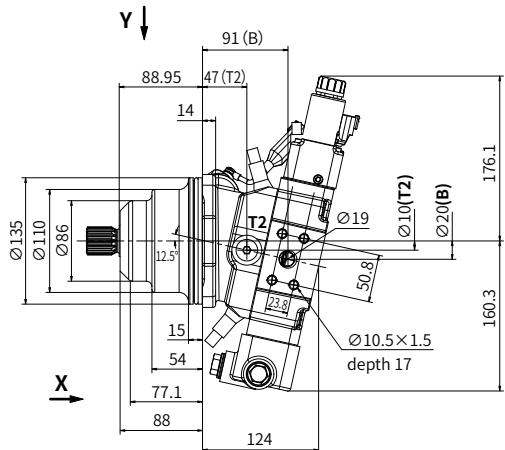
↻ Rotate counterclockwise to output waveform



Installation size

M60VE28 Installation size

Plug-in motor



Installation size

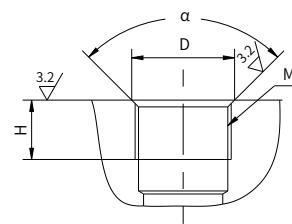
• M60VE28 Direction of rotation and oil flow direction

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

• M60VE28 Port details

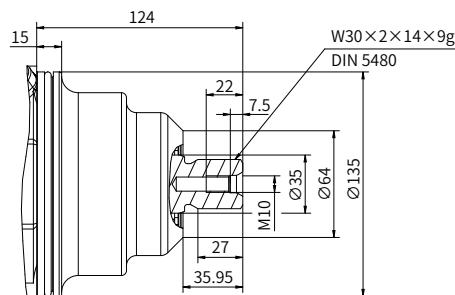
	Port name	Port size and description	Tightening torque (N·m)
A、B	Inlet port and Delivery port	SAE J518 3/4" M10×1.5 (depth17mm)	57
T1	Case drain port	ISO 9974 M18×1.5 (Through hole)	45
T2		ISO 9974 M18×1.5 (Through hole)	45
G	Measuring port pressure	ISO 9974 M14×1.5 (depth 11.5mm)	45
M1		ISO 9974 M14×1.5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

Port	H	M	D	α
T1	15	M18×1.5	Ø 18	90°
T2	15	M18×1.5	Ø 18	90°
G	15	M14×1.5	Ø 14	90°
M1	15	M14×1.5	Ø 14	90°



• M60VE28 Input shaft type

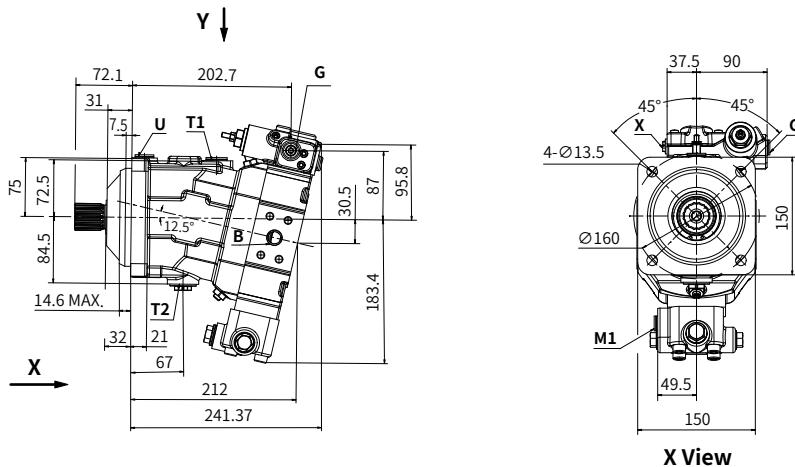
"B6" type shaft



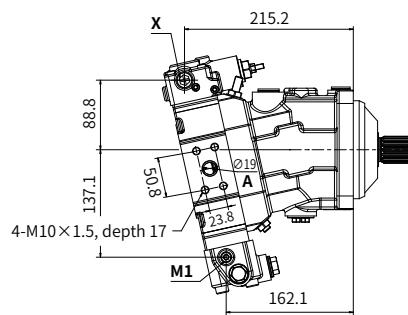
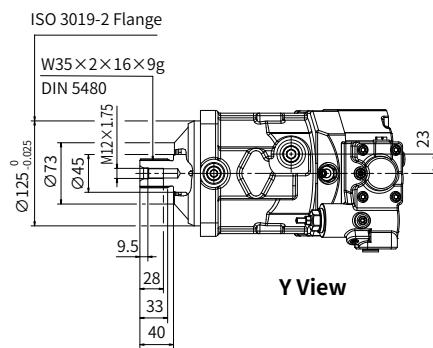
Installation size

M60V 60 Installation size

Flange-type motor



X View



Installation size

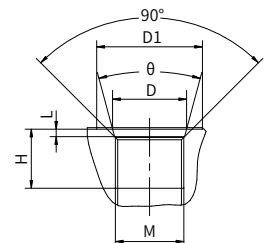
• M60V 60 Direction of rotation and oil flow direction

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

• M60V 60 Port details

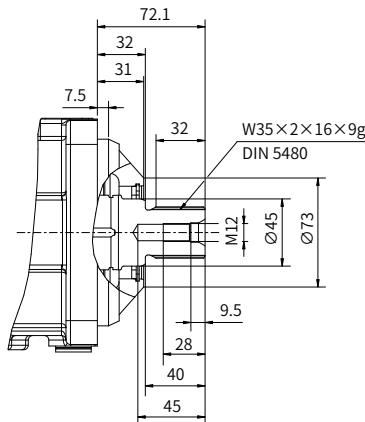
	Port name	Port size and description	Tightening torque (N·m)
A, B	Inlet port and Delivery port	SAE J518 3/4" M10×1.5 (depth 17mm)	57
T1	Case drain port	ISO 6149 M22×1.5 (depth 15.5mm)	100
T2		ISO 6149 M27×2 (depth 19mm)	- (Plastic plug)
G	Measuring port pressure	ISO 6149 M14×1.5 (depth 11.5mm)	45
U	Flushing 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	Ø 23.8	Ø 34	30°
T2	19	3.1	M27×2	Ø 29.4	Ø 35	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 26	30°
M1	11.5	2.4	M14×1.5	Ø 15.8	Ø 22	30°
Sa	16.5	2.4	M22×1.5	Ø 21.8	-	30°



• M60V 60 Input shaft type

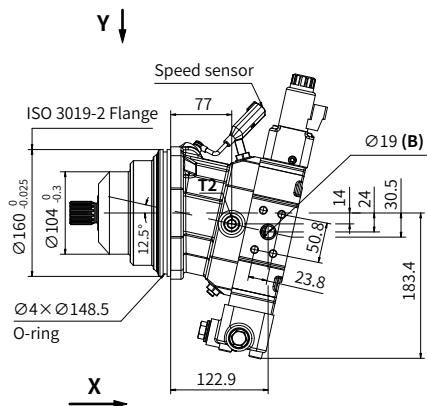
"B8" type shaft



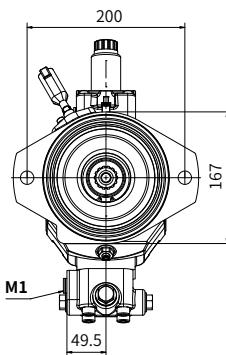
Installation size

M60VE60 Installation size

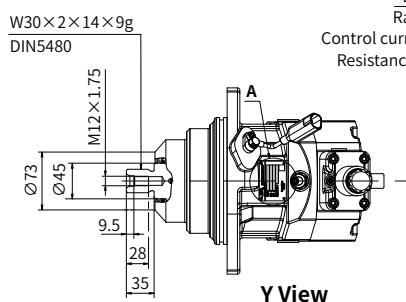
Plug-in motor



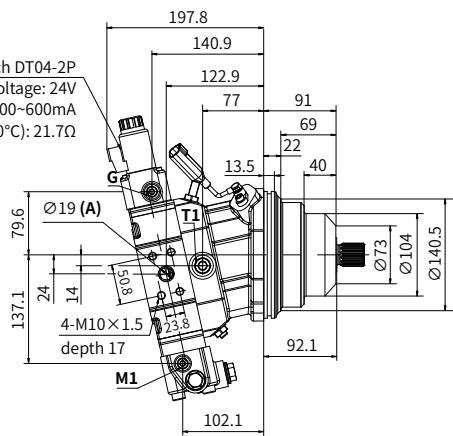
xView



xView



Y View



Installation size

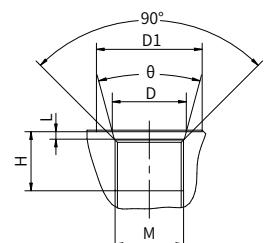
• M60VE60 Direction of rotation and oil flow direction

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

• M60VE60 Port details

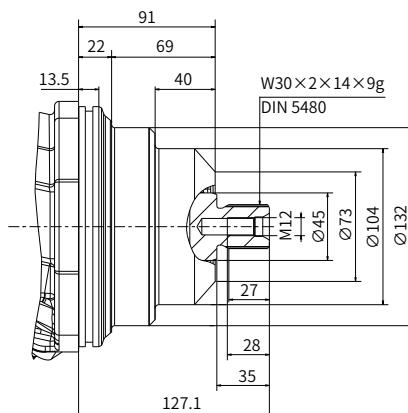
	Port name	Port size and description	Tightening torque (N·m)
A、B	Inlet port and Delivery port	SAE J518 3/4" M10×1.5 (depth 17mm)	57
T1	Case drain port	ISO 6149 M22×1.5 (Through hole)	100
T2		ISO 6149 M22×1.5 (Through hole)	100
G	Measuring port pressure	ISO 6149 M14×1.5 (depth 11.5mm)	45
M1		ISO 6149 M14×1.5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



• M60VE60 Input shaft type

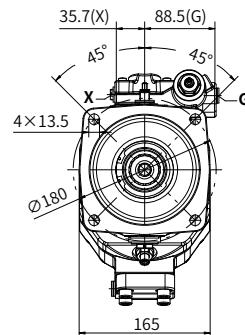
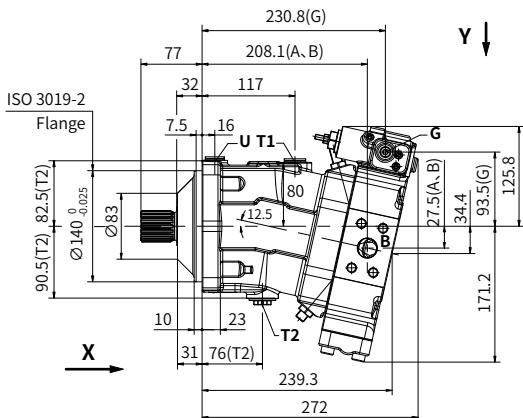
"B6" type shaft



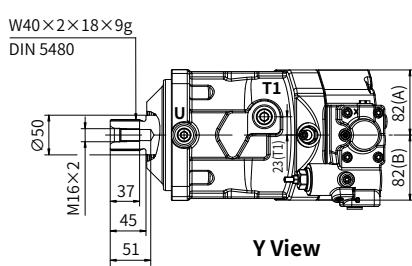
Installation size

M60V 85 Installation size

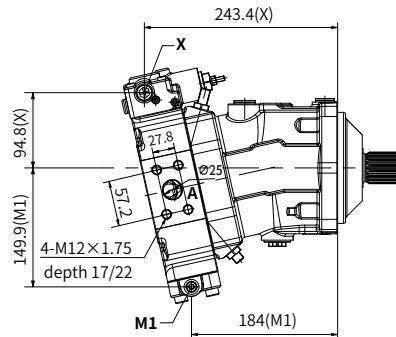
Flange-type motor



X View



Y View



Installation size

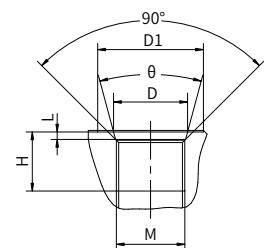
- #### **• M60V 85 Direction of rotation and oil flow direction**

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

- ## • M60V 85 Port details

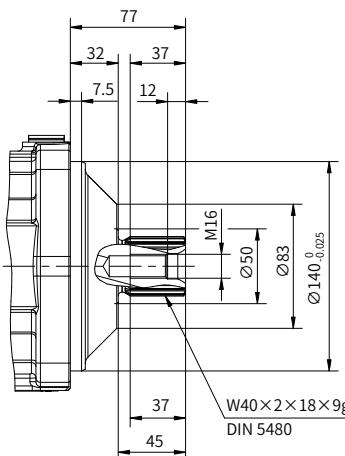
	Port name	Port size and description	Tightening torque (N·m)
A、B	Inlet port and Delivery port	SAE J518 1" M12×1.75 (depth 17mm)	98
TI	Case drain port	ISO 6149 M22×1.5 (depth 15.5mm)	45
T2		ISO 6149 M27×2 (depth 19mm)	210
G	Measuring port	ISO 6149 M14×1.5 (depth 11.5mm)	45
U	Flushing port	ISO 6149 M18×1.5 (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	\emptyset 23.8	\emptyset 30	30°
T2	19	3.1	M27×2	\emptyset 29.4	\emptyset 34	30°
G	11.5	2.4	M14×1.5	\emptyset 15.8	\emptyset 22	30°
U	14.5	2.4	M18×1.5	\emptyset 19.8	\emptyset 28	30°
X	11.5	2.4	M14×1.5	\emptyset 15.8	\emptyset 22	30°
M1	11.5	2.4	M14×1.5	\emptyset 15.8	-	30°



- #### • M60V 85 Input shaft type

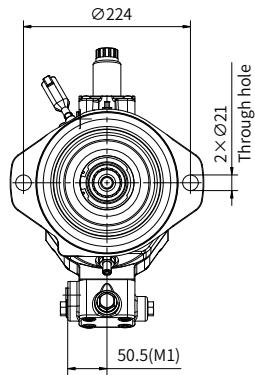
"B9" type shaft



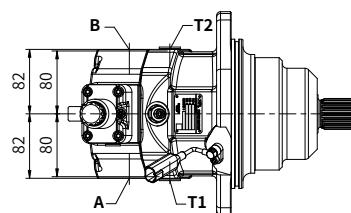
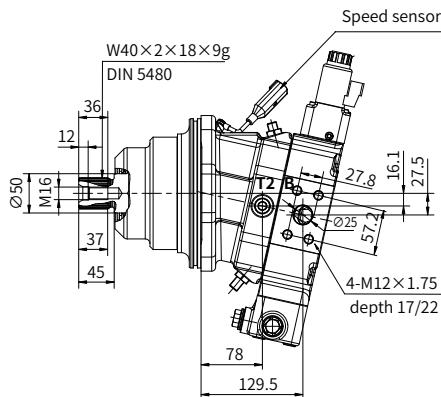
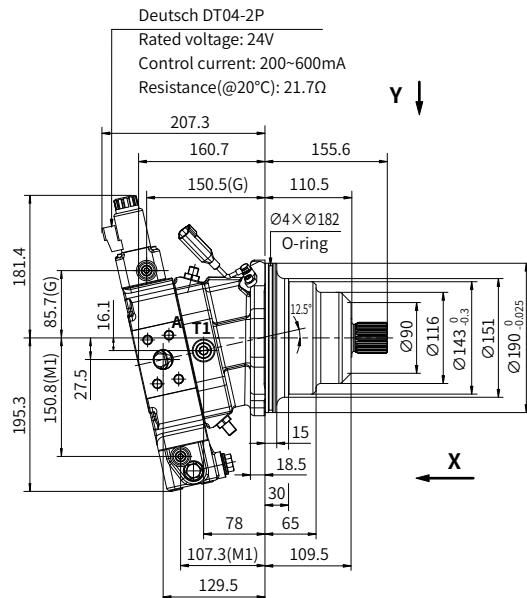
Installation size

M60VE85 Installation size

Plug-in motor



X View



Y View

Installation size

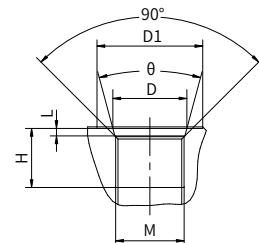
• M60VE85 Direction of rotation and oil flow direction

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

• M60VE85 Port details

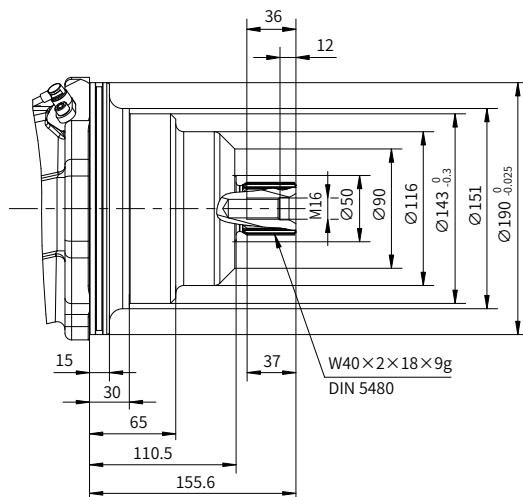
	Port name	Port size and description	Tightening torque (N·m)
A、B	Inlet port and Delivery port	SAE J518 1" M12×1.75 (depth 17mm)	98
T1	Case drain port	ISO 6149 M22×1.5 (depth 15.5mm)	45
T2		ISO 6149 M22×1.5 (depth 15.5mm)	45
G	Measuring port	ISO 6149 M14×1.5 (depth 11.5mm)	45
M1		ISO 6149 M14×1.5 (depth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

Port	H	L	M	D	D1	θ
T1	15.5	2.4	M22×1.5	Ø 23.8	Ø 29	30°
T2	15.5	2.4	M22×1.5	Ø 23.8	Ø 29	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°



• M60VE85 Input shaft type

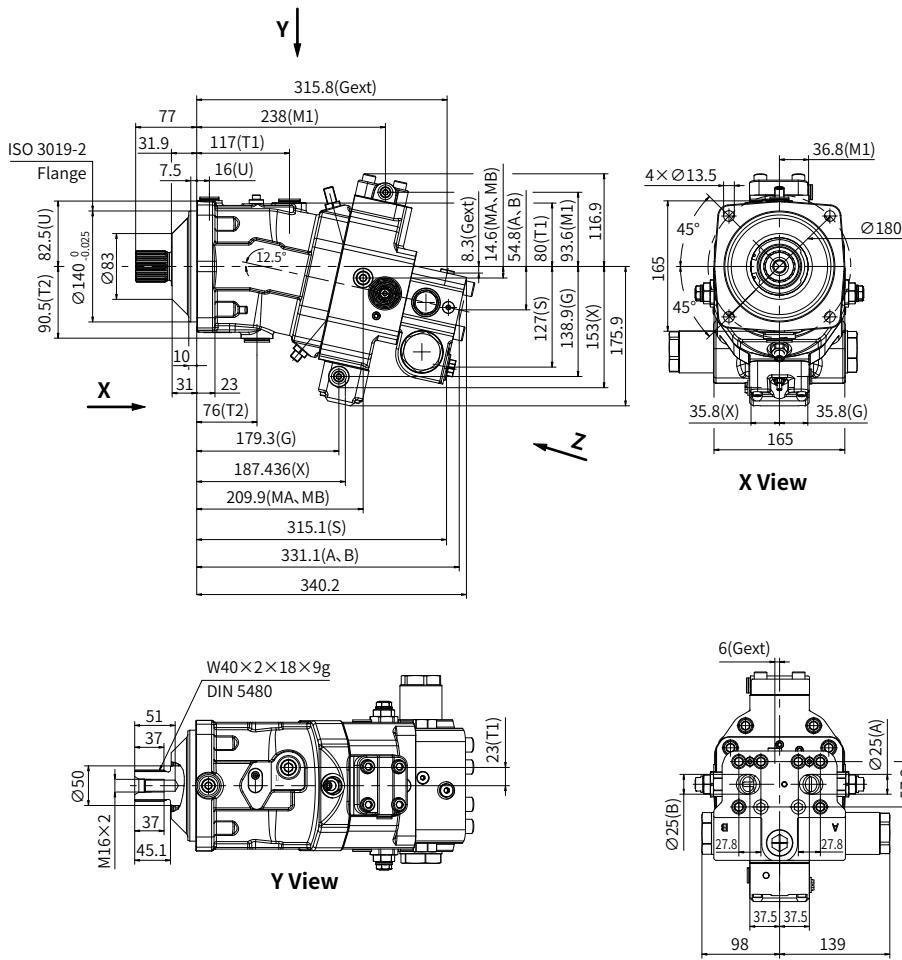
"B9" type shaft



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

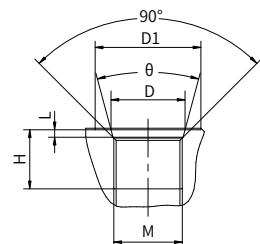
Counter-clockwise

Installation size

• M60V 85 Port details

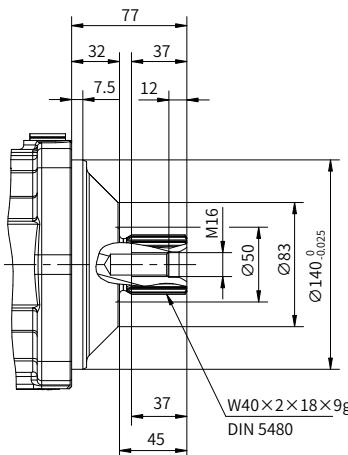
	Port name	Port size and description	Tightening torque (N·m)
A、B	Inlet port and Delivery port	SAE J518 1 in	98
U	Bearing flushing	ISO 6149 M18×1.5 (depth 14.5mm)	45
T1	Case drain port	ISO 6149 M22×1.5 (depth 15.5mm)	60
T2		ISO 6149 M27×2 (depth 19mm)	100
MA、MB	Measuring port	ISO 6149 M18×1.5 (depth 14.5mm)	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 realse 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	Ø 19.8	Ø 28	30°
T1	15.5	2.4	M22×1.5	Ø 23.8	Ø 30	30°
T2	19	3.1	M27×2	Ø 29.4	Ø 34	30°
MA、MB	14.5	2.4	M18×1.5	Ø 19.8	Ø 28	30°
M1	11.5	2.4	M14×1.5	Ø 15.8	-	30°
G	11.5	2.4	M14×1.5	Ø 15.8	Ø 22	30°
X	11.5	2.4	M14×1.5	Ø 15.8	Ø 22	30°
S	14	2.4	M22×1.5	Ø 23.8	Ø 30	30°
Gext	12.5	1.5	M12×1.5	Ø 13.8	Ø 19	30°



• M60V 85 Input shaft type

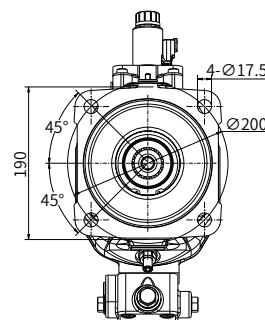
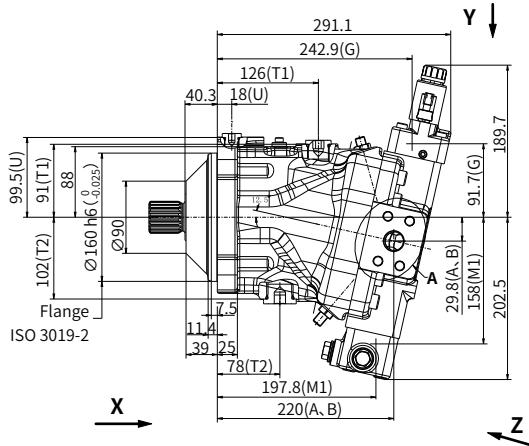
"B9" type shaft



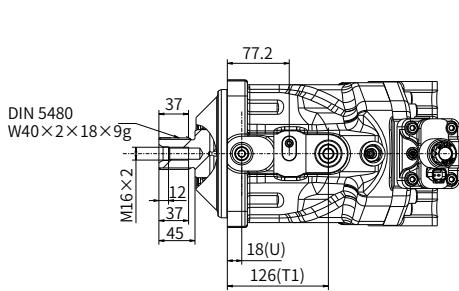
Installation size

M60V 115 Installation size

Flange-type motor

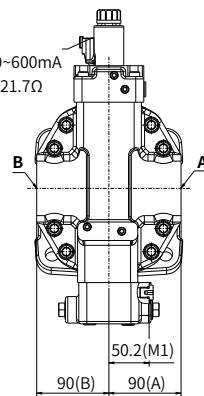


X View



Y View

Deutsch DT04-2P
Rated voltage: 24V
Control current: 200~600mA
Resistance(@20°C): 21.7Ω



Z View

Installation size

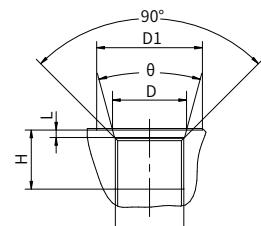
• M60V 115 Direction of rotation and oil flow direction

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

• M60V 115 Port details

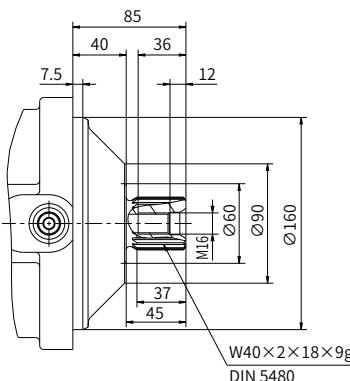
	Port name	Port size and description	Tightening torque (N·m)
A、B	Inlet port and Delivery port	SAE J518 1" M12×1.75 (depth 17mm)	98
T1	Case drain port	ISO 6149 M27×2 (depth 19mm)	90
T2		ISO 6149 M33×2 (depth 19mm)	120
G	Measuring port	ISO 6149 M14×1.5 (depth 11.5mm)	45
U	Flushing port	ISO 6149 M18×1.5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



• M60V 115 Input shaft type

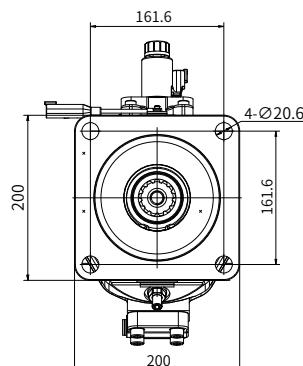
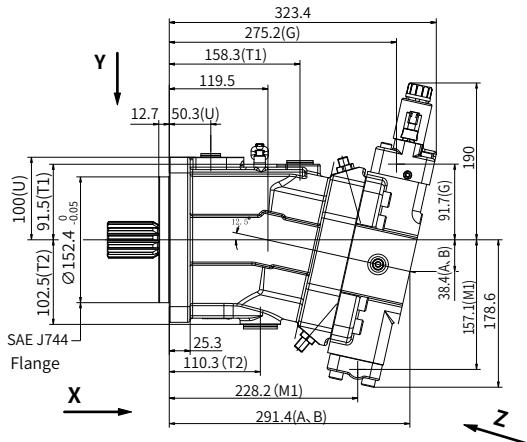
"B9" type shaft



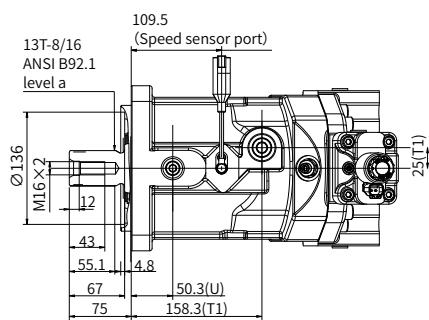
Installation size

M60V 115 Installation size

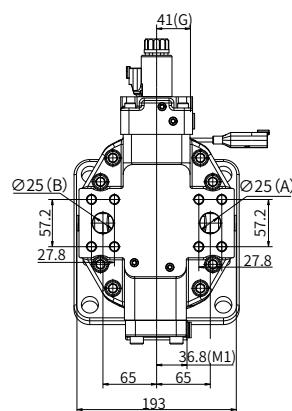
SAE Flange-type motor



X View



Y View



Z View

Installation size

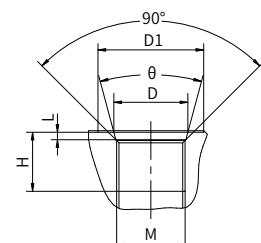
• M60V 115 Direction of rotation and oil flow direction

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

• M60V 115 Port details

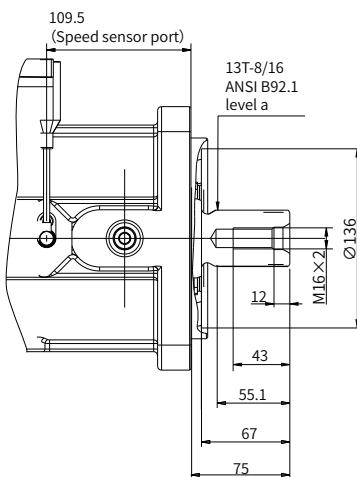
	Port name	Port size and description	Tightening torque (N·m)
A, B	Inlet port and Delivery port	SAE J518 1" M12×1.75 (depth 17mm)	98
TI	Case drain port	ISO 6149 M27×2 (depth 19mm)	90
T2		ISO 6149 M33×2 (depth 19mm)	120
G	Measuring port	ISO 6149 M14×1.5 (depth 11.5mm)	45
U	Flushing port	ISO 6149 M18×1.5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



• M60V 115 Input shaft type

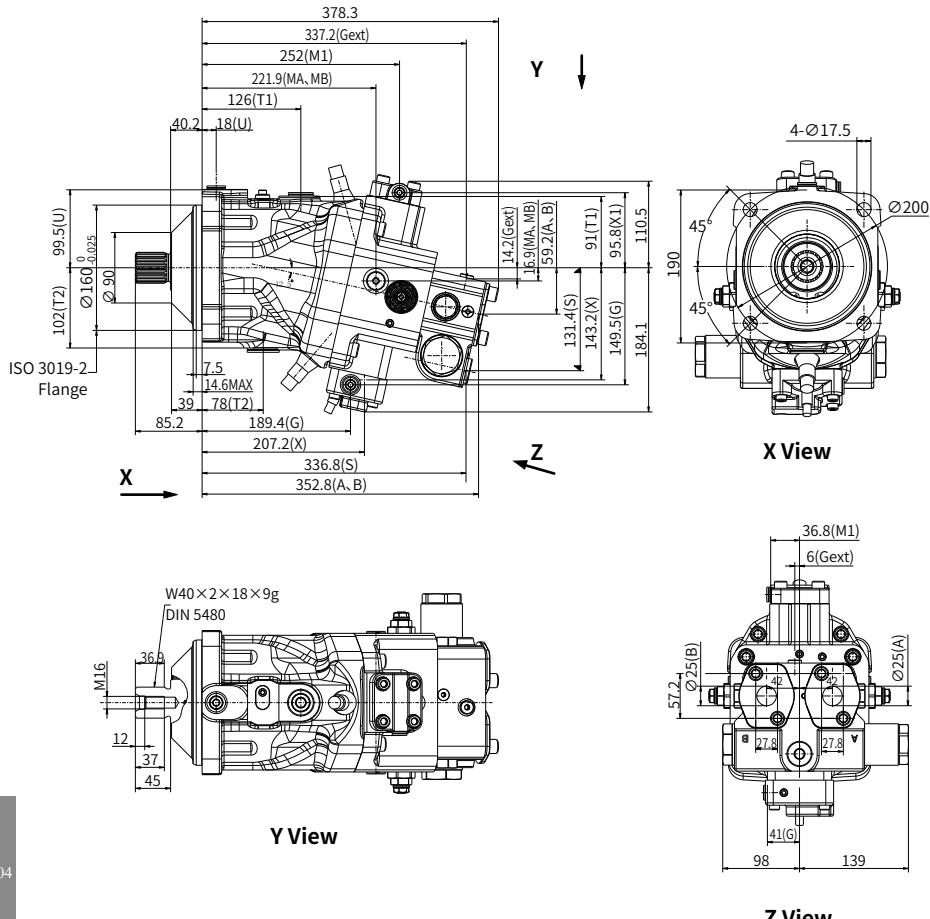
"A3" type shaft



Installation size

M60V 115 Installation size

Flange-type motor,
With balance valve



• Direction of rotation and oil flow direction

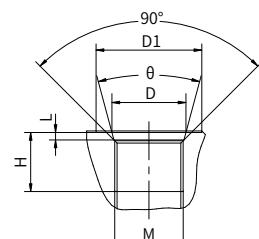
Installation	Rotation
Flow A → B	Clockwise
Flow B → A	Counter-clockwise

Installation size

• M60V 115 Port details

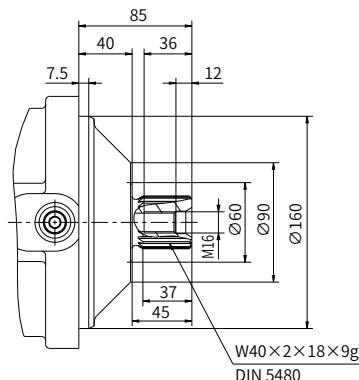
	Port name	Port size and description	Tightening torque (N·m)
A、B	Inlet port and Delivery port	SAE J518 1 in	98
U	Bearing flushing	ISO 6149 M18×1.5 (depth 14.5mm)	45
TI	Case drain port	ISO 6149 M27×2 (depth 19mm)	100
T2		ISO 6149 M33×2 (depth 19mm)	160
MA、MB	Measuring port	ISO 6149 M18×1.5 (depth 14.5mm)	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	Ø 19.8	Ø 28	30°
TI	19	3.1	M27×2	Ø 29.4	Ø 34	30°
T2	19	3.1	M33×2	Ø 35.4	Ø 43	30°
MA、MB	14.5	2.4	M18×1.5	Ø 19.8	Ø 28	30°
M2、M3	11.5	1	M10×1	Ø 11.1	Ø 16	24°
G	11.5	2.4	M14×1.5	Ø 19.8	Ø 28	30°
X、X2	11.5	2.4	M14×1.5	Ø 15.8	Ø 22	30°
S	16	3.1	M27×2	Ø 29.4	Ø 34	30°
Gext	12.5	1.5	M12×1.5	Ø 13.8	Ø 19	30°



• M60V 115 Input shaft type

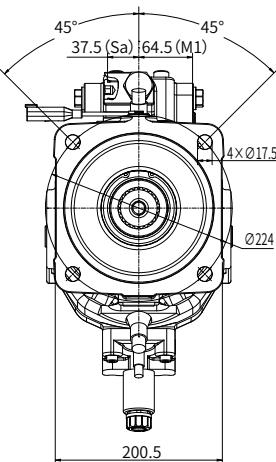
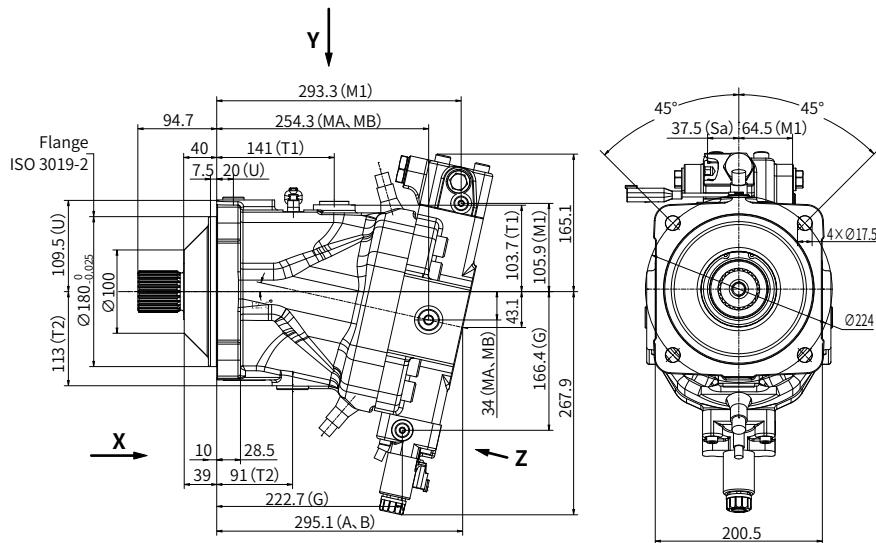
"B9" type shaft



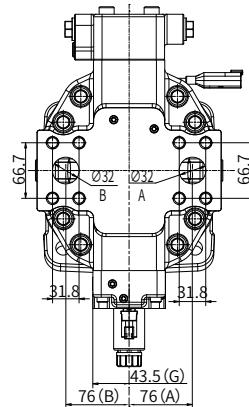
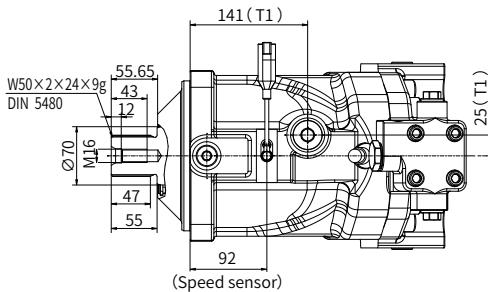
Installation size

M60V 160 Installation size

Flange-type motor



X View



Z View

Installation size

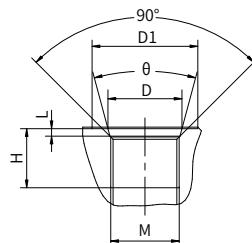
• M60V 160 Direction of rotation and oil flow direction

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

• M60V 160 Port details

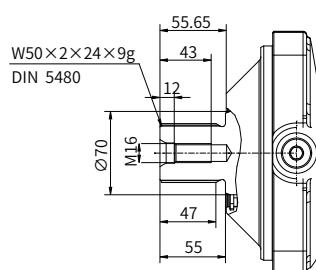
	Port name	Port size and description	Tightening torque (N·m)
A、B	Inlet port and Delivery port	SAE J518 1 1/4" M14×2 (depth 19mm)	-
T1	Case drain port	DIN 3852 M26×1.5 (depth 23mm ED seals)	110±10
T2		DIN 3852 M26×1.5 (depth 18mm ED seals)	110±10
G	Measuring port	DIN 3852 M14×1.5 (depth 15mm ED seals)	40±5
U	Flushing port	DIN 3852 M22×1.5 (depth 20mm ED seals)	45±5
GA、GB	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°
GA、GB	12	M14×1.5	Ø 14	90°



• M60V 160 Input shaft type

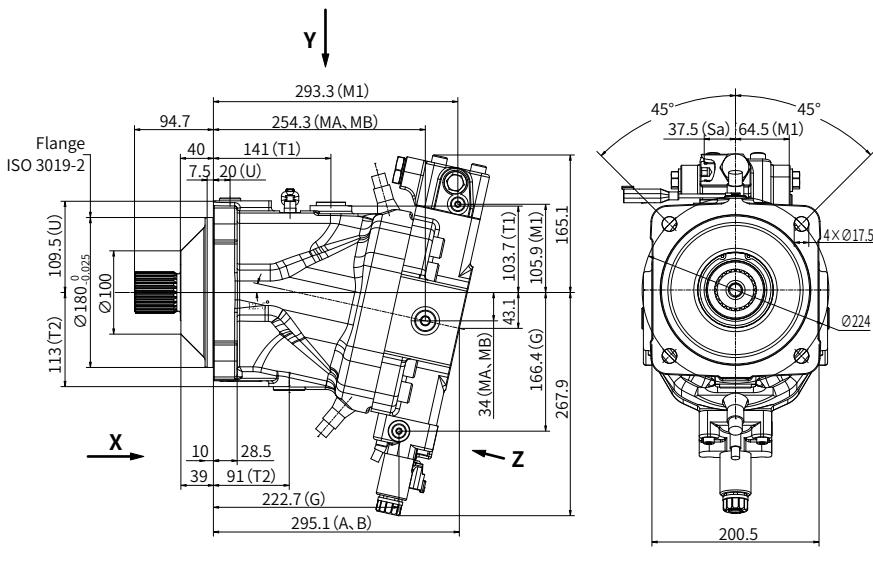
"A2" type shaft



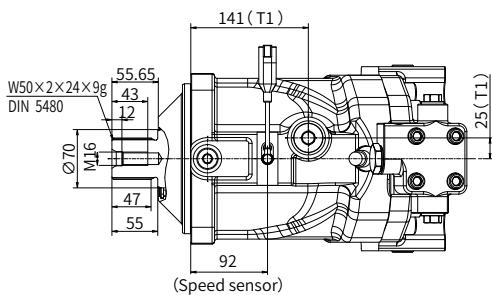
Installation size

M60V 170 Installation size

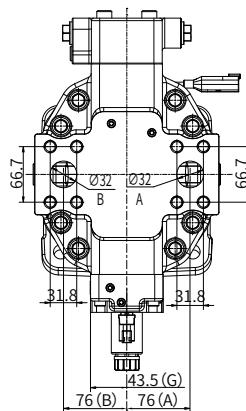
Flange-type motor



X View



Y View



Z View

Installation size

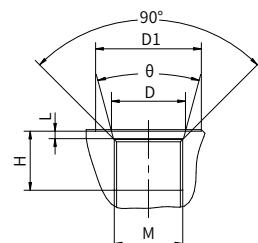
• M60V 170 Direction of rotation and oil flow direction

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

• M60V 170 Port details

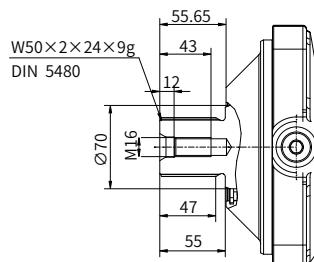
	Port name	Port size and description	Tightening torque (N·m)
A, B	Inlet port and Delivery port	SAE J518 1 1/4" M14×2 (depth 22mm)	157
T1	Case drain port	ISO 6149 M27×2 (depth 29mm)	210
		ISO 6149 M33×2 (depth 25.5mm)	215
G	Measuring port pressure	ISO 6149 M14×1.5 (depth 11.5mm)	45
U	Flushing port	ISO 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°



• M60V 170 Input shaft type

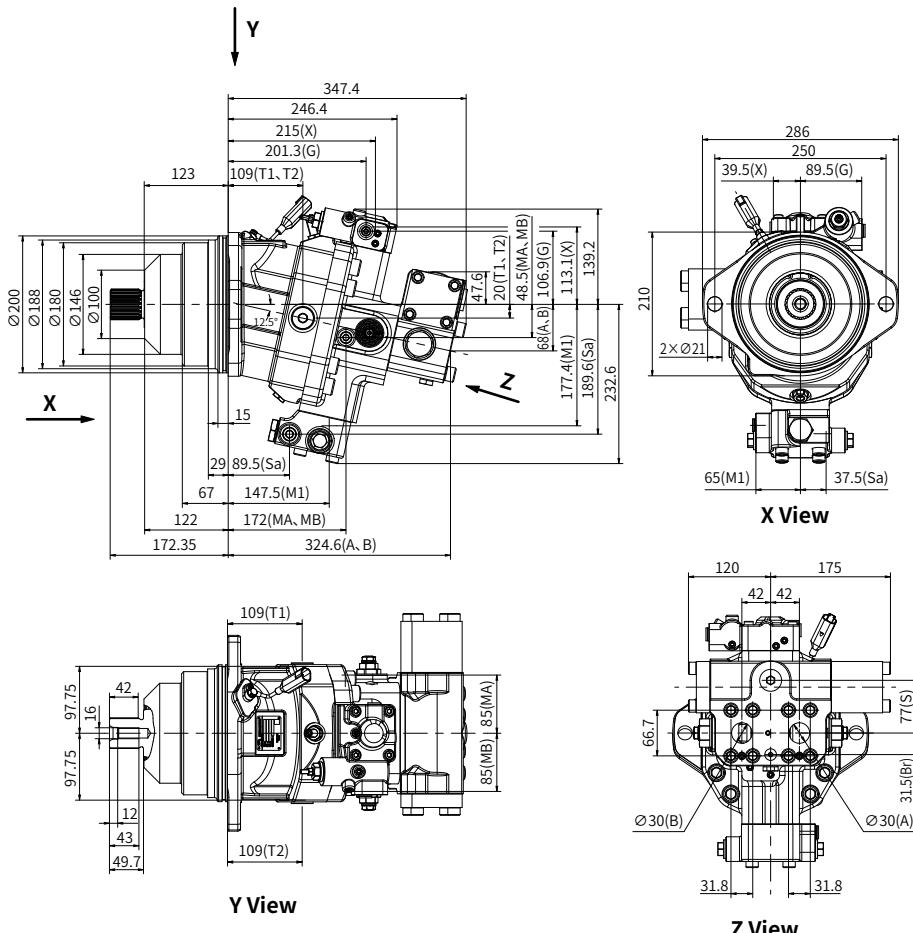
"A2" type shaft



Installation size

M60V 170 Installation size

Plug-in motor,
With balance valve



• Direction of rotation and oil flow direction

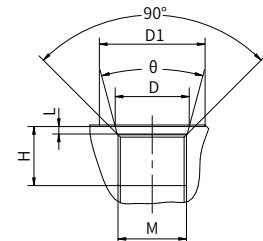
Installation	Rotation
Flow A → B	Clockwise
Flow B → A	Counter-clockwise

Installation size

• M60V 170 Port details

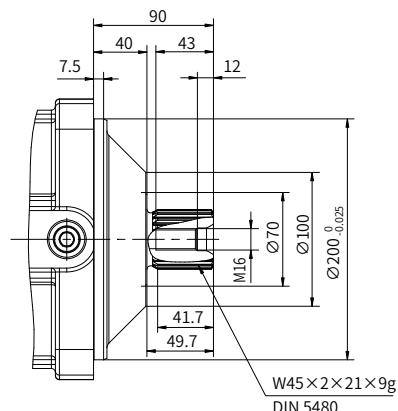
	Port name	Port size and description	Tightening torque (N·m)
A、B	Inlet port and Delivery port	SAE J518 1 1/4"	157
	Fastening thread	DIN 13 M14×2 (depth 19mm)	157
T1、T2	Case drain port	ISO 6149 M27×2 (depth 19mm)	100
MA、MB	Measuring port	ISO 6149 M18×1.5 (depth 14.5mm)	70
		ISO 6149 M14×1.5 (depth 11.5mm)	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 realse port	ISO 9974 M12×1.5 (depth 12mm)	22

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



• M60V 170 Input shaft type

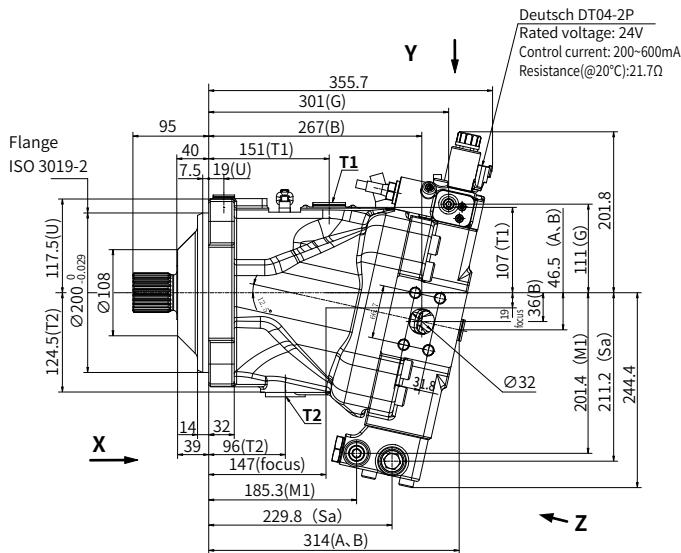
"A1" type shaft



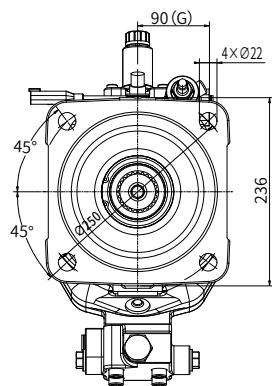
Installation size

M60V 200 Installation size

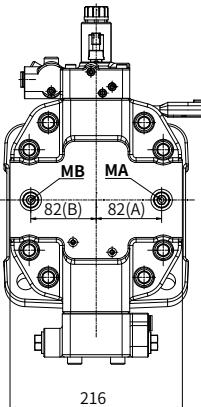
Flange-type motor



x View



Y View



Z View

Installation size

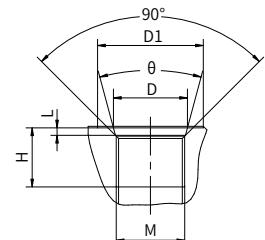
• M60V 200 Direction of rotation and oil flow direction

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

• M60V 200 Port details

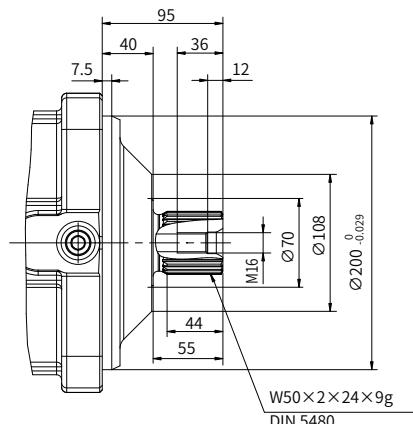
	Port name	Port size and description	Tightening torque (N·m)
A, B	Inlet port and Delivery port	SAE J518 1 1/4" M14×2 (depth 20mm)	157
T1	Case drain port	ISO 6149 M33×2 (depth 20mm)	215
T2		ISO 6149 M42×2 (depth 20mm)	330
G	Measuring port pressure	ISO 6149 M14×1.5 (depth 11.5mm)	45
U	Flushing port	ISO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



• M60V 200 Input shaft type

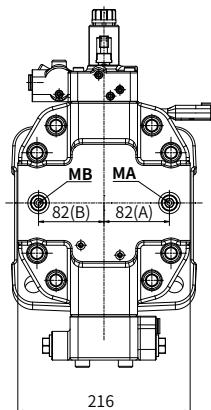
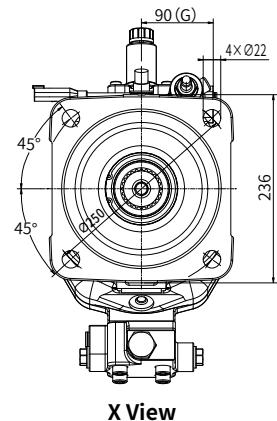
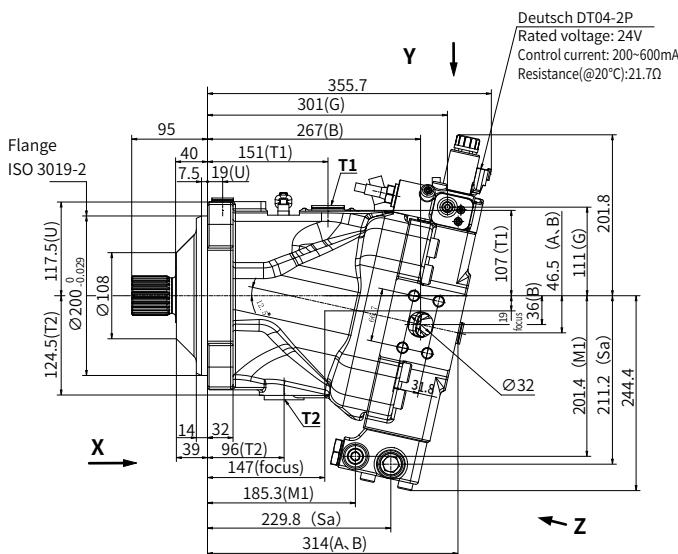
"A2" type shaft



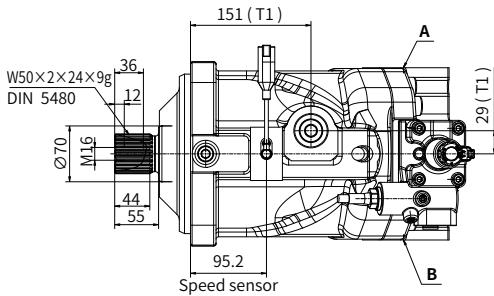
Installation size

M60V 215 Installation size

Flange-type motor



Y View



Z View

Installation size

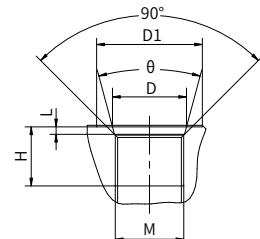
• M60V 215 Direction of rotation and oil flow direction

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

• M60V 215 Port details

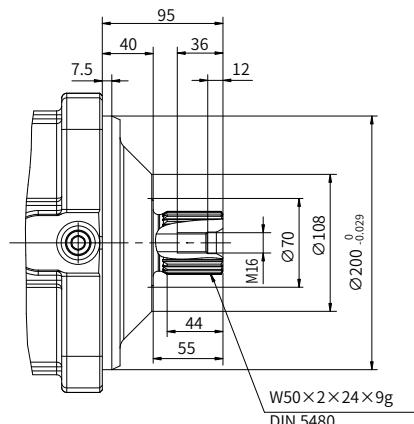
	Port name	Port size and description	Tightening torque (N·m)
A、B	Inlet port and Delivery port	SAE J518 1 1/4" M14×2 (depth 20mm)	157
T1	Case drain port	ISO 6149 M33×2 (depth 20mm)	215
T2		ISO 6149 M42×2 (depth 20mm)	330
G	Measuring port	ISO 6149 M14×1.5 (depth 11.5mm)	45
U	Flushing port	ISO 6149 M22×1.5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



• M60V 215 Input shaft type

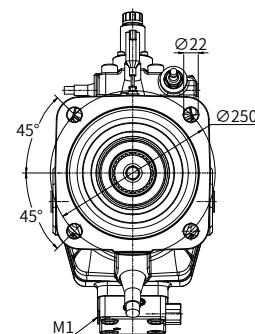
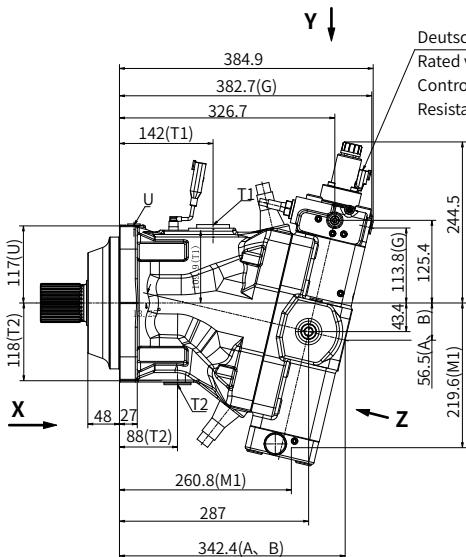
"A2" type shaft



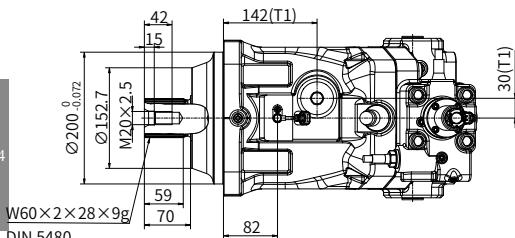
Installation size

M60V 280 Installation size

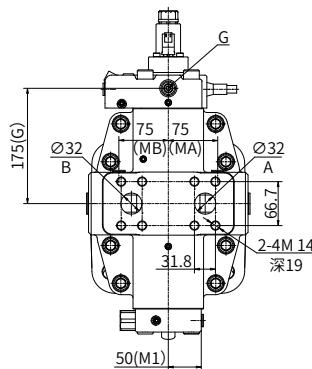
Flange-type motor



X View



Y View



Z View

Installation size

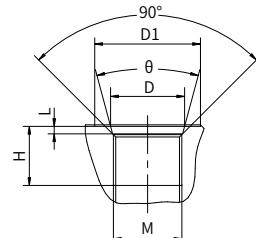
• M60V 280 Direction of rotation and oil flow direction

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

• M60V 280 Port details

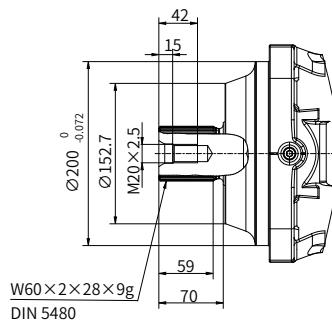
	Port name	Port size and description	Tightening torque (N·m)
A、B	Inlet port and Delivery port	SAE J518 1 1/4" M14×2 (depth 19mm)	187
T1		ISO 6149 M42×2 (depth 20mm)	330
T2	Case drain port	ISO 6149 M33×2 (depth 20mm)	215
G	Measuring port	ISO 6149 M14×1.5 (depth 11.5mm)	45
U	Flushing port	ISO 6149 M14×1.5 (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	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	M14×1.5	Ø 15.8	Ø 25	30°
M1	11.5	2.4	M14×1.5	Ø 15.8	Ø 25	30°



• M60V 280 Input shaft type

"A5" type shaft



China
+86 400 101 8889

America
+01 630 995 3674

Germany
+49 (30) 72088-0

Japan
+81 03 6809 1696



© This brochure can be reproduced, edited, reproduced or transmitted electronically without the authorization of Hengli Hydraulic Company. Due to the continuous development of the product, the information in this brochure is not specific to the specific conditions or applicability of the industry, thus, Hengli does not take any responsibility for any incomplete or inaccurate description.