3.1

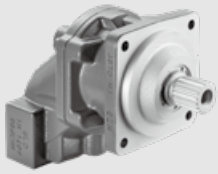
M60F SERIES

Bent-axial Piston
Fixed Displacement Motor

M60F series bent-axial piston fixed 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:	23	28	32	45	56	63	80	90	125*
Nominal pressure (bar):	400	400	400	400	400	400	400	400	400
Max pressure (bar):	450	450	450	450	450	450	450	450	450



Contents

Features

- Higher pressure and higher speed
- High activation efficiency
- Optimized power-weight ratio
- High torque and long service life
- Superior performance in low speed operation provides excellent controllability
- Suitable for engineering machinery and general industrial vehicles

Note: "*" indicates under development. Please stay tuned.

Technical Data

Feature		23	28	32	45	56	63	80	90	125
Max. Displacement (cc/rev)		22.9	28.1	32	44.9	56.1	63	79.8	90.5	125
Direction of rotation		Clockwise, Counter clockwise								
Rotation speed	Rated (rpm)	6300	6300	6300	5000	5000		4500		4000
	Max. (rpm)	6900	6900	6900	5500	5500		5000		4400
Rated pressure (bar)		400								
Max. pressure (bar)		450								
Casting pressure	Rated (bar)	6								
	Max. (bar) (Short-time peak pressure)	10								
Theoretical output torque (N·m)	@ΔP=400 bar	146	179	204	286	357	401	508	576	796
Max. Flow (L/min)	@n_{nom}	138	177	202	225	281	315	359	407	500
Moment of inertia ($kg \cdot m^2$)		0.0012	0.0012	0.0012	0.0033	0.0042	0.0042	0.0056	0.0058	0.0091
Weight (kg)		10.8	11.9	11.9	17	18		24.7		32.8
Volume in the case (L)		0.2	0.2	0.2	0.6	0.45		0.65		1.1
Oil viscosity (mm^2/s)		5 ~ 1600, Best range: 16~36								
Oil temperature (°C)		-25 ~ 103								
Oil cleanliness		ISO 4406 20/18/15								

Type Introduction

M60F	90	N	W	V	N4	D0	B	N	N	—	A
①	②	③	④	⑤	⑥	⑦	⑧	⑨	⑩		⑪

Product series

①	Bent-axial piston fixed displacement motor(Flange-mounted)	M60F
	Bent-axial piston fixed displacement motor (Cartridge-type)	M60FE

Size

②	Size	23	28	32	45	56	63	80	90	125

Oil Port Specifications

③	Port A, Port B		Drain ports T1 , T2	23	28	32	45	56	63	80	90	125	Code
	Flange port	Metric fastener threads	Metric threads	●	●	●	●	●	●	●	●	●	N1
			American standard threads	●	●	●							A1
		American Standard Threads	Metric threads					●	●				N2
			American standard threads							●	●		A2
	Threaded port	Metric threads	Metric threads	●	●	●							N3
		G thread	Metric threads	●	●	●							N4
			G thread							●	●		M1

Direction of rotation

④	Clockwise, Counter clockwise	W

Seals

⑤	Sealing at room temperature	V
	Sealing at low temperatures	N

Mounting flange

⑥	Mounting Flange (M60F)	23	28	32	45	56	63	80	90	125	Code
	ISO 3019-2 100-4	●	●	●							N3
	ISO 3019-2 125-4				●	●	●				N5
	SAE J744 127-4					●	●	●	●	●	N6
	ISO 3019-2 140-4							●	●		N4
	SAE J744 101.6-2 (Double hole)	●	●	●							N8
	Mounting Flange (M60FE)	23	28	32	45	56	63	80	90	125	Code
	ISO 3019-2 160-2					●	●				L1

Type Introduction

Input shaft

		23	28	32	45	56	63	80	90	125	Code
⑦	DIN 5480 W30×2×14×9g	●	●	●		●	●				D3
	DIN 5480 W35×2×16×9g				●	●	●				D0
	DIN 5480 W40×2×18×9g							●	●		D1
	ANSI B92.1 21T-16/32DP					●	●	●	●		D2
	DIN 5480 W25×1.25×30×18×9g	●	●	●							D4
	ANSI B92.1 14T-12/24DP					●	●	●	●		D6
	ANSI B92.1 13T-16/32DP	●	●	●							D7
	ANSI B92.1 23T-16/32DP									●	D8
	Parallel key ϕ32 10×8×60*							●	●		D5
	Parallel key DIN 6885 ϕ25 8×7×40	●	●	●							K1
	Parallel key DIN 6885 ϕ30 8×7×50					●	●				K2
	Parallel key DIN 6885 ϕ35 10×8×50					●	●	●	●		K3
	Parallel key SAE J744 ϕ31.75 C7.94×38.1							●	●		K4
	ANSI B92.1 17T-12/24DP							●	●		P1

Note: The "D5" axis is a non-standard customized version. If you need to select, please contact Hengli.

Port position

		23	28	32	45	56	63	80	90	125	Code
⑧	Same side	●	●	●		●	●	●	●		B
	Two sides	●	●	●	●	●	●	●	●	●	A

Control

⑨	Without	N

Speed sensor

⑩	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

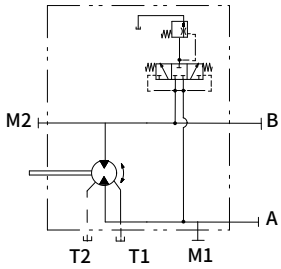
Note: Please refer to page 7/18 for specific parameters of the speed sensor.

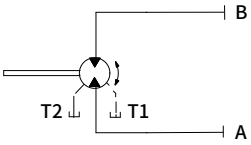
Standard / special version

⑪	Standard version								N
	Special version	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	I		
			10	D		35	J		
			14	E		40	K		
			17	F					

Remark: ● = Available; ○ = On request

Principle

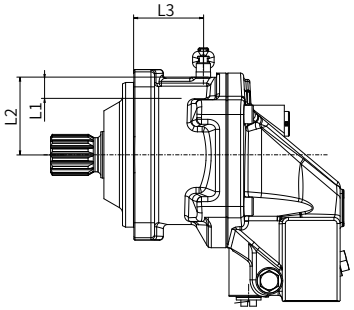




Speed sensor

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

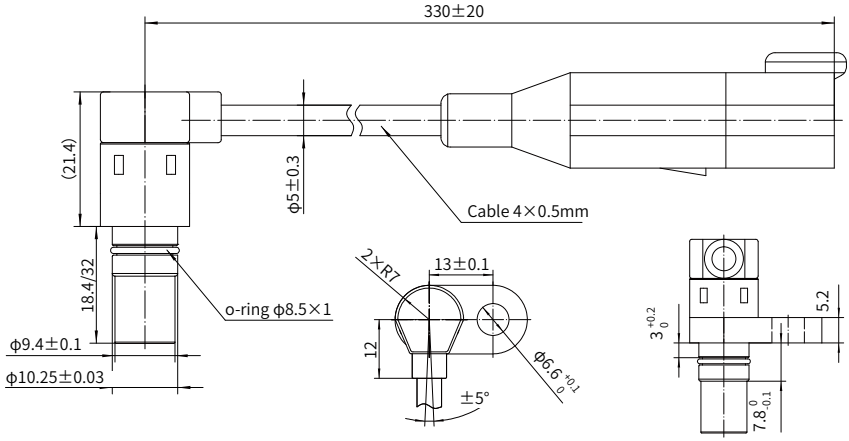
·M60V Installation diagram



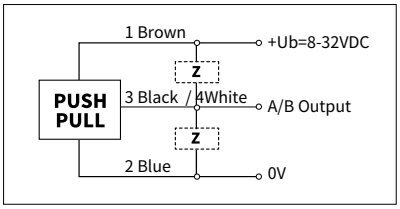
M60F **Displacement** cc/rev	23	28	32	56	63	80	90
Number of teeth in the speed ring	38	38	38	47	47	54	54
L1 (Probe length)mm	18.4	18.4	18.4	18.4	18.4	18.4	18.4
L2 (Sensor mounting surface to center axis) mm	57.9	57.9	57.9	69.9	69.9	75	75
L3 (Sensor to flange surface) mm	54.7	54.7	54.7	61.5	61.5	67.2	67.2
Gear module	2	2	2	2	2	2	2

Speed sensor

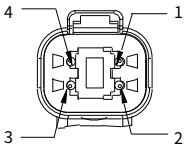
·Installation size



·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

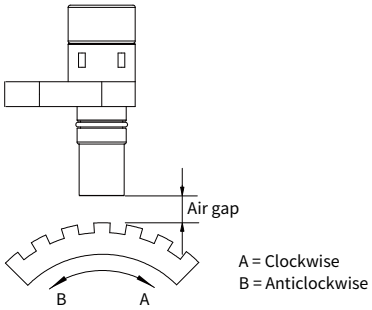
Note: “*” PIN3、 See 17/48 for the waveform diagram of output 4.

Speed sensor

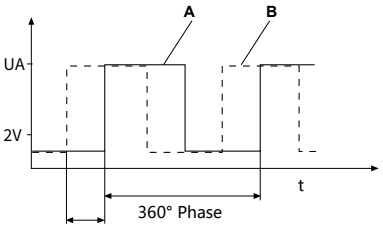
·Output signal

Reverse pulse output: Imax ⩽ 50mA

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

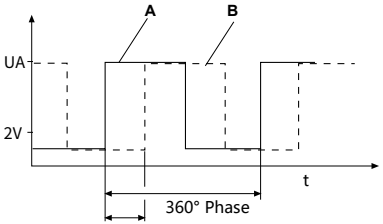


Rotate clockwise to output waveform



About 90°
Phase difference

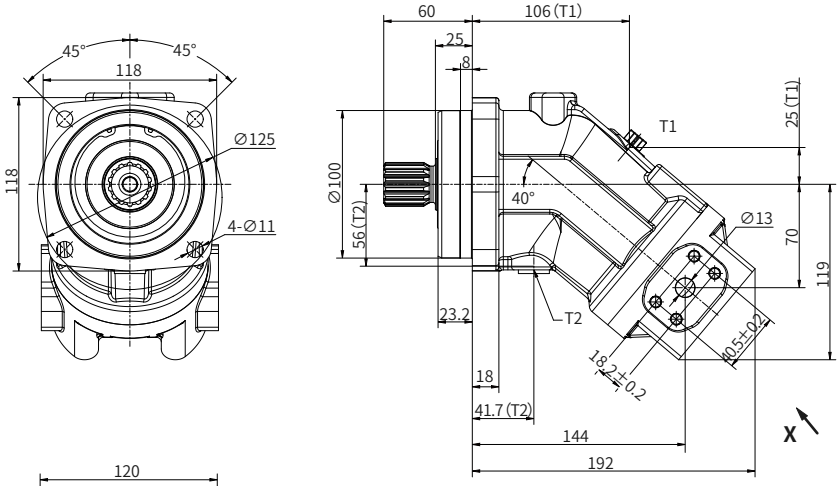
Rotate counterclockwise to output waveform



About 90°
Phase difference

Installation size

M60F 23/28/32 Installation size



X View

Installation size

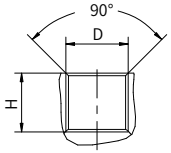
·M60F 23/28/32 Direction of rotation and oil flow direction

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

·M60F 23/28/32 Port details

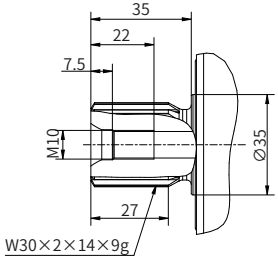
	Port name	Port size and description	Tightening torque (N·m)
A、B	Inlet port and Delivery port	SAE J518 DIN 13 1/2" M12×1.75 (depth 17mm)	32
TI、T2	Case drain port	DIN 3852 M18×1.5 (depth 12mm)	55

Port	H	D	M
T1	12	∅ 16	M16×1.5
T2	12	∅ 16	M16×1.5



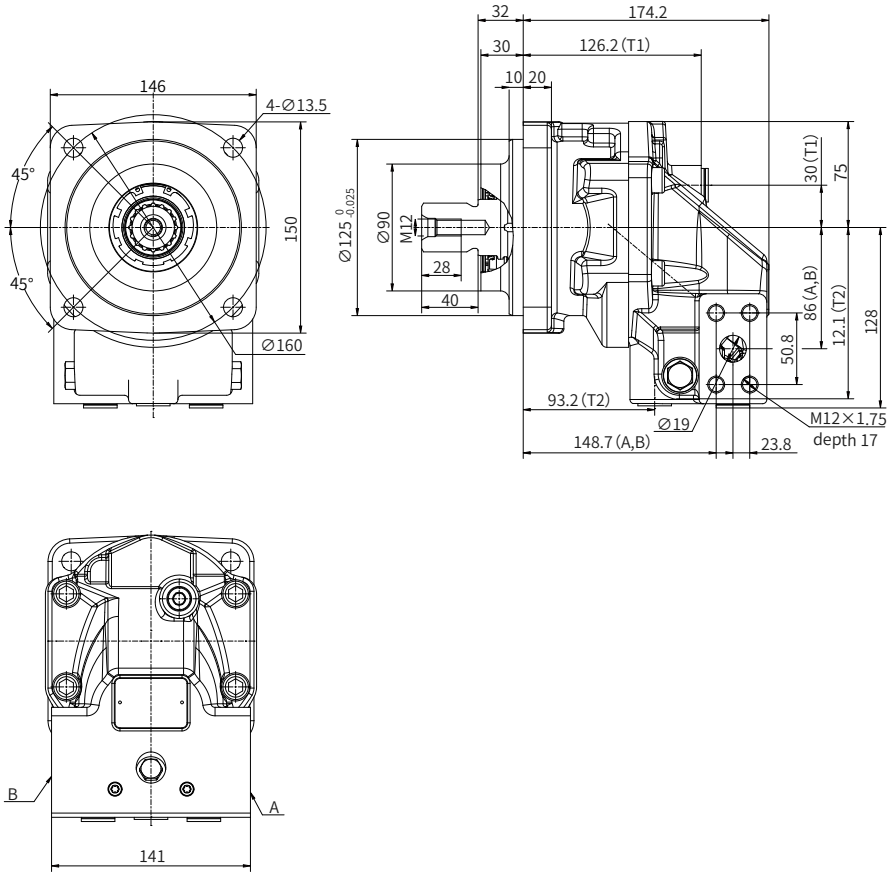
· M60F 23/28/32 Input shaft type

"D3" type shaft



Installation size

M60F 45 Installation size



Installation size

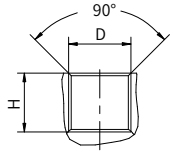
·M60F 45 Direction of rotation and oil flow direction

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

·M60F 45 Port details

	Port name	Port size and description	Tightening torque (N·m)
A、B	Inlet port and Delivery port	SAE J518 DIN 13 3/4" M12×1.75 (depth 17mm)	130
TI、T2	Case drain port	DIN 3852 M18×1.5 (depth 12mm)	60

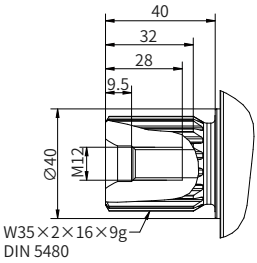
Port	H	D	M
T1	17	∅ 18	M18×1.5
T2	17	∅ 18	M18×1.5



03

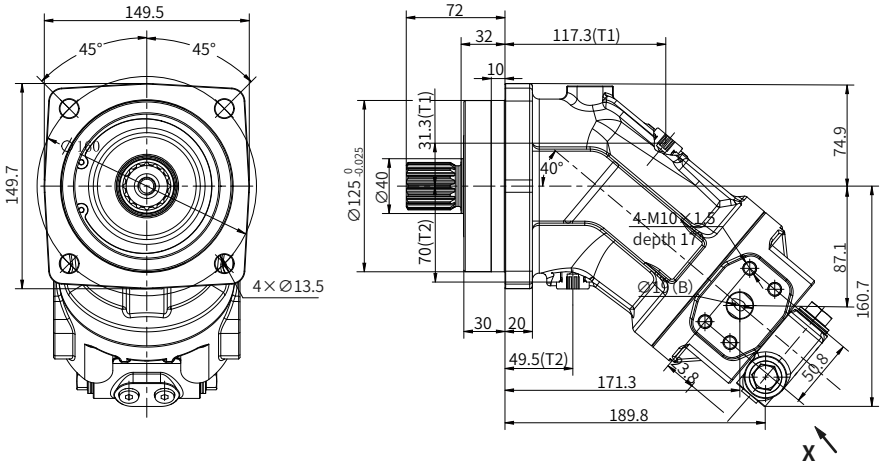
· M60F45 Input shaft type

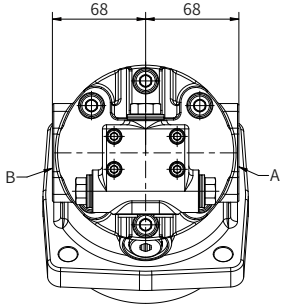
"D0" type shaft



Installation size

M60F 56/63 Installation size





X View

Installation size

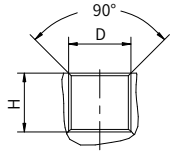
·M60F 56/63 Direction of rotation and oil flow direction

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

·M60F 56/63 Port details

	Port name	Port size and description	Tightening torque (N·m)
A、B	Inlet port and Delivery port	SAE J518 DIN 13 3/4" M12×1.75 (depth 17mm)	130
TI、T2	Case drain port	DIN 3852 M18×1.5 (depth 12mm)	60

Port	H	D	M
T1	17	∅ 18	M18×1.5
T2	17	∅ 18	M18×1.5



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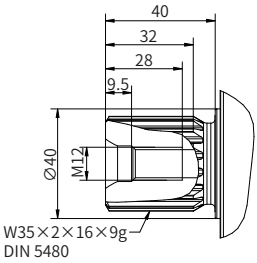
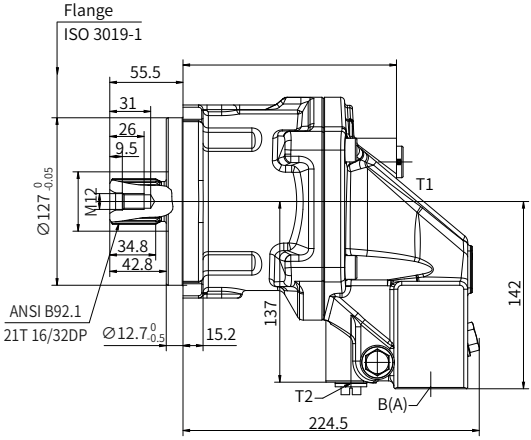
· M60F 56/63 Input shaft type

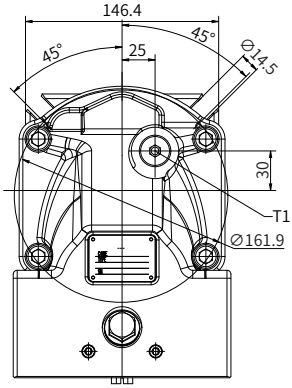
"D0" type shaft

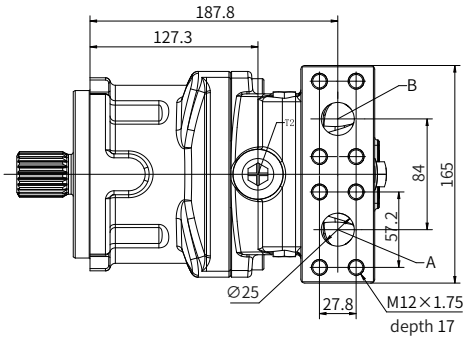


Installation size

M60F 80/90 Installation size







Installation size

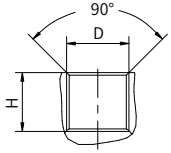
·M60F 80/90 Direction of rotation and oil flow direction

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

·M60F 80/90 Port details

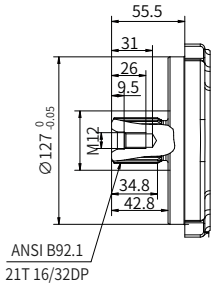
	Port name	Port size and description	Tightening torque (N·m)
A、B	Inlet port and Delivery port	SAE J518 DIN 13 1″ M12×1.75 (depth 17mm)	130
TI、T2	Case drain port	DIN 3852 M18×1.5 (depth 12mm)	60

Port	H	D	M
T1	17	∅ 18	M18×1.5
T2	17	∅ 18	M18×1.5



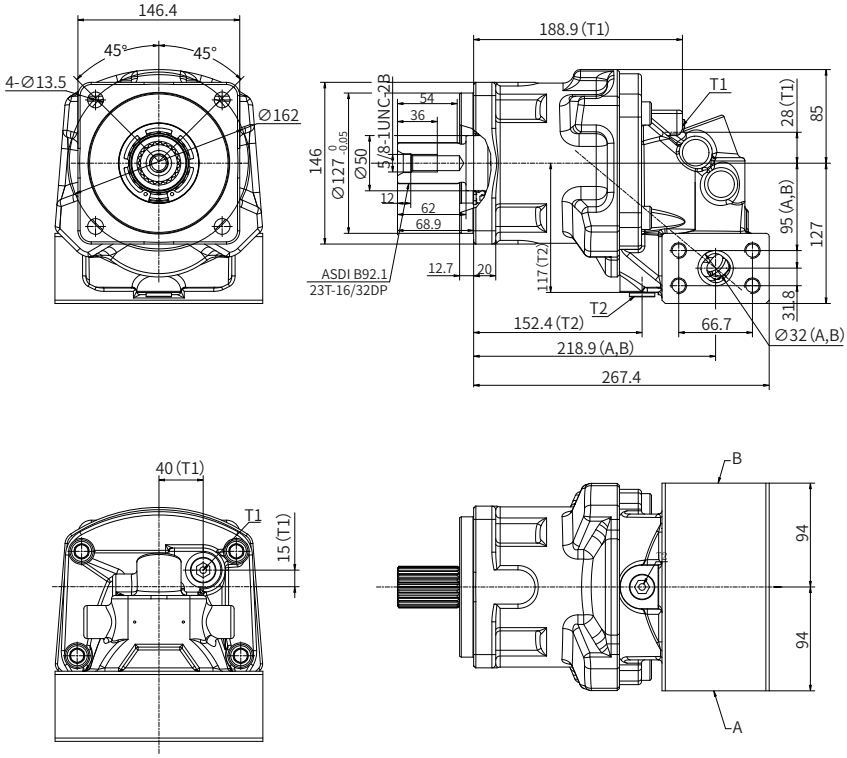
· M60F 80/90 Input shaft type

“D2” type shaft



Installation size

M60F 125 Installation size



Installation size

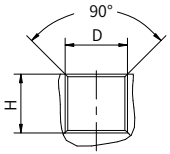
· M60F 125 Direction of rotation and oil flow direction

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

· M60F 125 Port details

	Port name	Port size and description
A、B	Inlet port and Delivery port	1 1/4 in M14×2.23（depth 23mm）
TI、T2	Case drain port	DIN 3852 M18×1.5 (depth 12mm)

Port	H	D	M
T1	17	∅ 18	M18×1.5
T2	17	∅ 18	M18×1.5



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· M60F 125 Input shaft type

"D8" type shaft