2.2.3

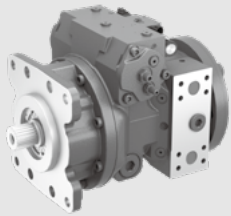
V40G SERIES

Swash-plate Type
Axial Piston Variable Displacement Pump

V40G series axial piston pump is a ultrahigh pressure closed circuit pump, which can meet the application requirements of customers for harsh working conditions such as high pressure, high rotational speed and frequent impact.

Suitable for a ultrahigh-pressure closed circuit

Size (cc/rev):	145	175	215	280
Rated pressure (bar):	450	450	450	450
Max. pressure (bar):	500	500	500	500



Contents

Features

- ◁ Variable axial piston pump of swashplate design for hydrostatic drives in closed circuit.
- ◁ Flow direction changes smoothly when the swashplate is moved through the neutral position.
- ◁ Two pressure relief valves are installed on the high-pressure side to prevent overload.
- ◁ The built-in charge pump acts as charge pump and control pump.
- ◁ The maximum charge pressure is limited by the built-in low pressure relief valve.
- ◁ New rotary components and bearings, make the transmission efficiency improved, and the input speed increased.
- ◁ The V40G pump adopts an integrated design at the rear of the housing to reduce leaking points.
- ◁ Optimized shell design to reduce vibration and noise.
- ◁ Electric proportional displacement control meets the application requirements of multiple industries.
- ◁ Various oil outlet connection methods help to optimize pipeline connection.
- ◁ V40G pump can be optionally equipped with a flush valve, which can be directly installed on the pump body.

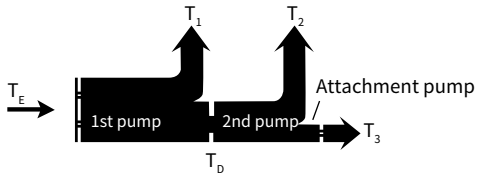
Technical data

Size		145	175	215	280
Displacement (cc/rev)		145.3	175.4	215.7	280
Speed	Rated (rpm)	2850	2650	2500	2400
	Max. (rpm)	3000	2800	2650	2550
	Min. (rpm)	500	500	500	500
Pressure	Rated (bar)	450	450	450	450
	Max. (bar)	500	500	500	500
	Minimum low loop pressure (bar) (Above charge pump)	10	10	10	10
Charge pump displacement (cc/rev)		32	26/39	47	60
Charge pressure (relative to Charge pump)	Max. (bar)	40	40	40	40
Casting pressure	Rated (bar)	2	2	2	2
	Max. (bar)(Short-time peak pressure)	5.0	5.0	5.0	5.0
Suction pressure (Absolute pressure)	Rated (bar) Oil viscosity ⩽ 30mm^2/s	0.8	0.8	0.5	0.8
	Max. (bar)	6	6	5	5
Oil viscosity (mm^2/s)		10~1000, Best range: 16~36			
Oil temperature (°C)		-20~95			
Oil cleanliness		ISO 4406 Class 20/18/15 or higher			
Weight (w/o auxiliary flange) (Kg)		110	115	146	179.4

Technical data

Permissible input and through-drive torques						
Size			145	175	215	280
Torque at $V_{g\,max}$ and Δp = 430 bar Nm		T	992	1197	1471	1916
Maximum input torque at drive shaft (Nm)						
ANSI B92.1b	1 3/4 in 13T 8/16 DP	$T_{E\,max}$	1640	1640		
	1 3/4 in 27T 16/32 DP	$T_{E\,max}$	1830			
	2 in 15T 8/16DP	$T_{E\,max}$	2670		2670	2670
	2 1/4 in 17T 8/16 DP	$T_{E\,max}$	4070	4070	4070	4070
	W50×2×24×9g	$T_{E\,max}$	3140	3140		
	W55×2×26×9gw	$T_{E\,max}$			4350	4350
Maximum through-drive torque (Nm)		$T_{D\,max}$	1760	1760	2641	2641

·Torque distribution



V40E	1st pump	T_1
	2nd pump	T_2
Attachment pump		T_3
Input torque		$T_E=T_1+T_2+T_3$
		$T_E < T_{E\,max}$
Through-drive torque		T_{D1}
		T_{D2}

Type introduction

V40	G	280	E1	A	D	/	R	N	E3	1	FD	D4	8	D	-	K
①	②	③	④	⑤	⑥		⑦	⑧	⑨	⑩	⑪	⑫	⑬	⑭		⑮

Product series

①	Variable piston pump of swashplate in closed circuit	V40

Nominal pressure

②	nominal pressure 450 bar	G

Displacement

③	Displacement cc/rev	145	175	215	280

Control mode

		145	175	215	280	Code
④	Proportional control, electric U = 12 V DC	●	●	●	●	E1
	Proportional control, electric U = 24 V DC	●	●	●	●	E2
	Hydraulic pilot proportional control	●	●	●	●	H2

DA control valve

		145	175	215	280	Code
⑤	Without swivel DA control valve	●	●	●	●	无
	Swivel DA control valve				●	A

Pressure cut-off

⑥	Without pressure cut-off	Blank
	Pressure cut-off	D

Rotation

⑦	Right hand (clockwise)	R
	Left hand (counter-clockwise)	L

Sealing material

⑧	NBR (nitrile rubber) Shaft seal in FKM (fluoroelastomer)	N

Type introduction

Mounting flangew and drive shaft

	Mounting flange	Drive shaft	145	175	215	280	Code
⑨	SAE D J744-152-2/4	ANSI B92.1b 1 3/4 in 13T 8/16 DP	●	●			D1
		ANSI B92.1b 1 3/4 in 27T 16/32 DP	●				D2
		ANSI B92.1b 2 in 15T 8/16 DP	●				D3
		ANSI B92.1b 2 1/4 in 17T 8/16 DP	●	●			D7
		DIN 5480 W50×2×24×9g	●	●			D6
	SAE E J744-165-4	ANSI B92.1b 1 3/4 in 13T 8/16 DP	●	●			E1
		ANSI B92.1b 1 3/4 in 27T 16/32 DP	●				E2
		ANSI B92.1b 2 in 15T 8/16DP	●		○	●	E3
		ANSI B92.1b 2 1/4 in 17T 8/16 DP	●	●	●	●	E4
		DIN 5480 W50×2×24×9g	●	●			E5
		DIN 5480 W55×2×26×9g			●	●	E6

Working port

	Working port	145	175	215	280	Code
⑩	Same-side SAE flange port A and B	●	●	●	●	1

02

Boost pump and rotary group configuration

	Standard rotary group, without boost pump					K
⑪	Standard rotary group, boost pump integrated	Charge pump displacement (cc/rev)	145	175	215	280	Code
		26		●			F7
		32	●				FA
		39		●			FB
		47			●		FC
		60				●	FD

Type introduction

Through drive

	Through drive		145	175	215	280	Code
⑫	Without through drive		●	●	●	●	Blank
	Flange	Splined shaft					
	SAE A J744-82-2	ANSI B92.1b 5/8 in 9T 16/32 DP	●	●	●	●	A1
		ANSI B92.1b 3/4 in 11T 16/32 DP	●	●			A2
	SAE B J744-101-2	ANSI B92.1b 7/8 in 13T 16/32DP	●	●	●	●	B1
		ANSI B92.1b 1 in 15T 16/32 DP	●	●	●	●	B3
	SAE C J744-127-4	ANSI B92.1b 1 1/4 in 14T 12/24 DP			●	●	C6
	SAE C J744-127-2/4	ANSI B92.1b 1 1/4 in 14T 12/24 DP	●	●			CC
		ANSI B92.1b 1 3/4 in 13T 8/16 DP	●	●	●	●	CD
	SAE D J744-152-2/4	ANSI B92.1b 1 3/4 in 13T 8/16 DP	●	●	●	●	D1
		DIN 5480 N40×2×18×9g			●	●	D4
	SAE E J744-165-4	ANSI B92.1b 1 3/4 in 13T 8/16 DP	●	●	●	●	E1
		ANSI B92.1b 2 in 15T 8/16DP			●	●	E3

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Relief valve

	Relief valve	Setting range Δp	145	175	215	280	Code
⑬	Direct-acting high-pressure relief valve, fixed setting	120~470bar, without a bypass	●	●	●	●	8

Filtration boost circuit/external boost pressure supply

	Filtration boost circuit/external boost pressure supply	145	175	215	280	Code
⑭	Filtration in the boost pump suction line	●	●	●	●	S
	Filtration in the boost pump pressure line (ports with external filter circuit)	●	●	●	●	D
	Filtration in the boost pump pressure line (with filter)			○	○	F
	Filtration in the boost pump pressure line (with filter, cold start valve, contamination indicator)			○	○	B

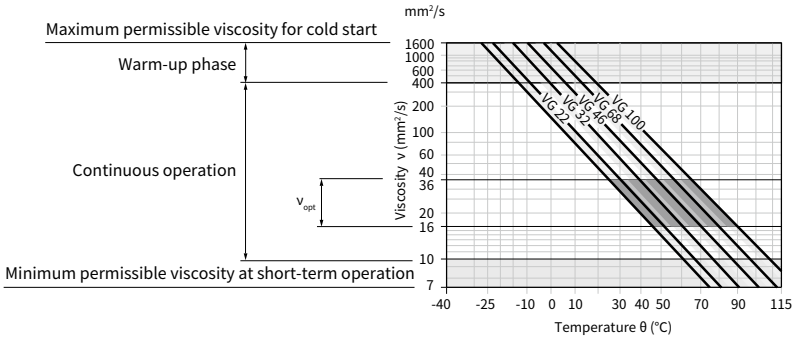
Standard / special version

	Standard / Special version		145	175	215	280	Code
⑮	Standard version		●	●	●	●	Blank
	Special version	Cryogenic seal	○	●	○	○	W
		High-speed slewing body	○	●			S

Remark: ● = Available; ○ = On request

Hydraulic fluid

·Selection diagram



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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 (vopt 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	$v_{max} \leqslant 7400$ (1600)	NBR	$\theta St \geqslant -40°C$	t ⩽ 3min, without load(p ⩽ 725psi(50bar), n ⩽ 1000rpm Permissible temperature difference between axial piston unit and hydraulic fluid in the system maximum 45 °F (25 K).
		FKM	$\theta St \geqslant -25$ °C	
Warm-up phase	v = 7400 ··· 1850 (1600 ··· 400)			t ⩽ 15min, p ⩽ 0.7×p_{nom} and n ⩽ 0.5×n_{nom}
Continuous operation	v = 1850 ··· 60 (400 ··· 10)	NBR	θ ⩽ +85 °C	measured at port T
		FKM	θ ⩽ +110°C	
	v_{opt} = 170 ··· 82 (36 ··· 16)			Range of optimum operating viscosity and efficiency
Short-term operation	v_{min} = 60 ··· 49 (10 ··· 7)	NBR	θ ⩽ +85°C	t ⩽ 3min, p ⩽ 0.3×p_{nom}, measured at port T
		FKM	θ ⩽ +110°C	

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·Filtration of the hydraulic fluid

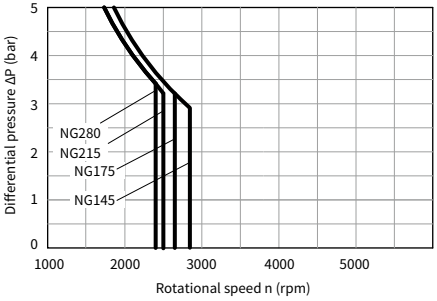
Finer filtration improves the cleanliness level of the hydraulic fluid, which increases the service life of the axial piston unit.

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 mm^2/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

Permissible pressure loading



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.

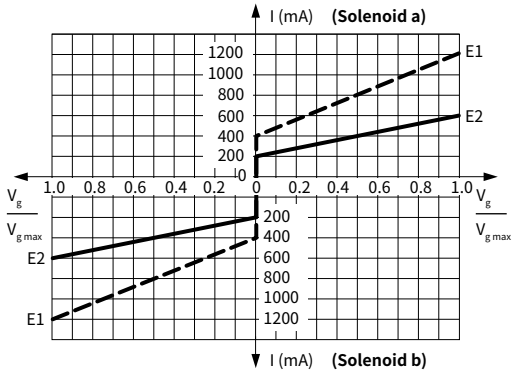
·The service life of the shaft seal decreases with increasing frequency of pressure peaks and increasing mean differential pressure.

·The case pressure must be greater than the ambient pressure.

E - Electrical displacement control

·Electrical displacement control principle

The output flow of the pump is infinitely variable between 0 and 100%, proportional to the electrical current sup-plied to solenoid a or b.
The electrical energy is converted into a force acting on the control spool.
This control spool then directs control oil into and out of the stroking cylinder to adjust pump displacement as required.
A feedback lever connected to the stroking piston main-tains the pump flow for any given current within the con-trol range.



Standard:

Proportional solenoid without manual emergency operation.

Supply as required:

Proportional solenoid with manual emergency operation and spring return.

02

Technical data, solenoid

Control		**E1**	**E2**
Voltage		12 V (±20%)	24 V (±20%)
Control current	Start of control at V_g=0	400 mA	200 mA
	End of control at $V_{g\,max}$	1200 mA	600 mA
Current limit		1540 mA	840 mA
Nominal resistance (at 68 °F (20°C)		5.5 Ω	21.7 Ω
Dither frequency		100Hz / 120Hz (120Hz only for the V40G175 closed pumps)	
Duty cycle		100%	
Type of protection		See connector version	

Note:

The spring-return device in the control module is not a safety device

The control module may be stuck in an uncertain position by internal impurities (hydraulic oil impurities, system component wear or sediment). As a result, the controller can no longer respond correctly to the instruction from the operator.

Check whether additional safety measures are required on your machine to move the drive actuator to a controlled safe position (emergency stop). When necessary, please ensure that these operations are implemented correctly.

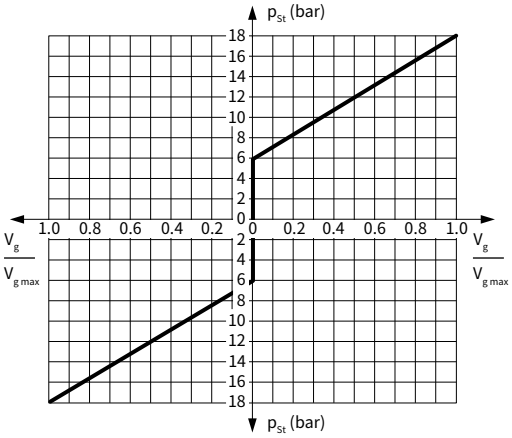
H2 - Proportional control, hydraulic, pilot-pressure related

·Hydraulic proportional control principle

The output flow of the pump is infinitely variable between 0 and 100%, proportional to the difference in pilot pres-sure applied to the two pilot pressure ports (Y1 and Y2). The pilot signal, coming from an external source, is a pressure signal. Flow is negligible, as the pilot signal acts only on the control spool of the control valve.

This control spool then directs control oil into and out of the stroking cylinder to adjust pump displacement as required.

A feedback lever connected to the stroking piston main-tains the pump flow for any given pilot signal within the control range.



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Displacement at Vg = pSt

Displacement at Vg max = pSt = 18bar

Pilot signal pSt = 6 to 18 bar (at port Y1, Y2)

Initial control value at 6 bar pressure

Control termination value when the pressure is 18 bar

(The maximum displacement Vg max)

Note:

In the neutral position, the HD control module must be unloaded to reservoir via the external pilot control device.

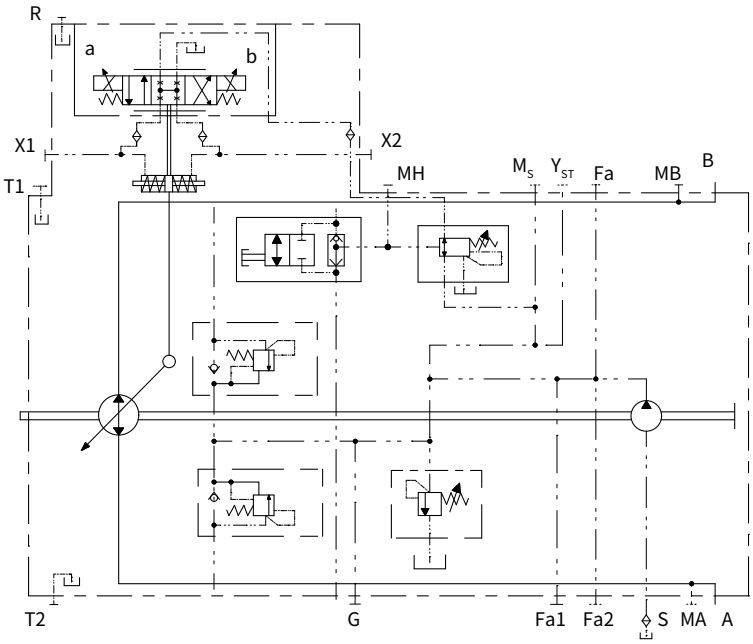
Note:

The spring-return device in the control module is not a safety device

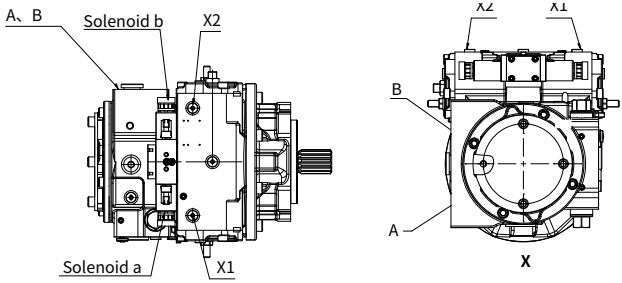
The control module may be stuck in an uncertain position by internal impurities (hydraulic oil impurities, system component wear or sediment). As a result, the controller can no longer respond correctly to the instruction from the operator.

Check whether additional safety measures are required on your machine to move the drive actuator to a controlled safe position (emergency stop). When necessary, please ensure that these operations are implemented correctly.

V40G 145 Control principle

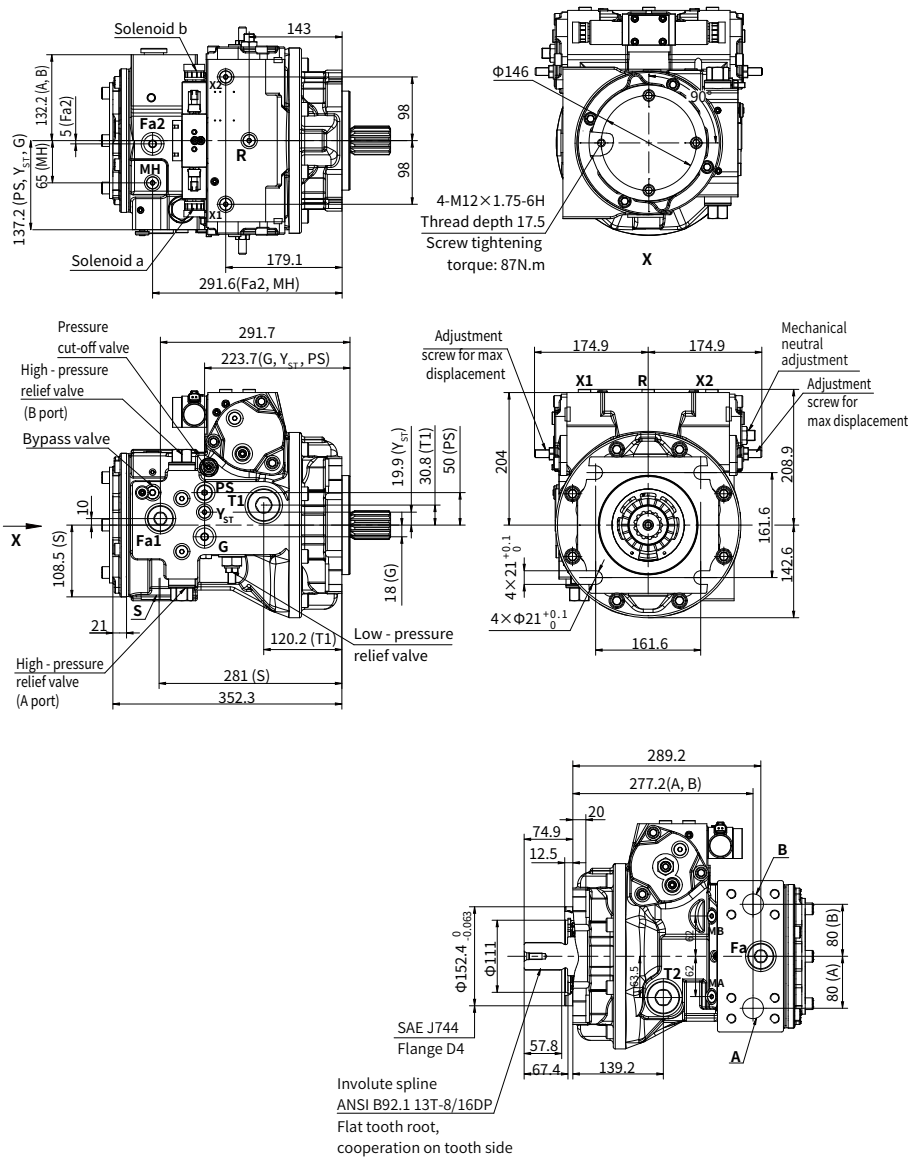


Direction of rotation	Clockwise		Counter-clockwise	
Actuation of proportional solenoid	a	b	a	b
Control pressure	X1	X2	X1	X2
Flow direction	B to A	A to B	A to B	B to A
Working pressure	MA	MB	MB	MA



Installation size

V40G 145 Installation size



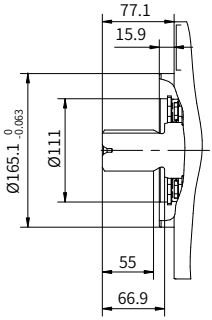
Installation size

·V40G 145 Port details

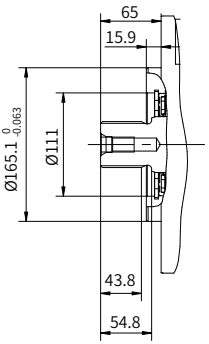
Port	Port Name	Standard	Oil Port Specification (thread depth)
A, B	Working port	SAE J518	1 1/4in
	Fastening thread	DIN 13	M14×2（depth 19mm）
S	Suction port	ISO 9974-1	M48×2（depth 24mm）
T1, T2	Drain port	ISO 9974-1	M42×2（depth 20mm）
R	Air bleed port	ISO 9974-1	M14×1.5（depth 14.1mm）
X1, X2	Control pressure port	ISO 9974-1	M14×1.5（depth 20mm）
G	Boost pressure port	ISO 9974-1	M22×1.5（depth 19mm）
P_S	Pilot pressure port inlet	ISO 9974-1	M18×1.5（depth 17mm）
Y_{ST}	Pilot pressure port outlet	ISO 9974-1	M14×1.5（depth 17.5mm）
MA, MB	Measuring port pressure A, B	ISO 9974-1	M14×1.5（depth 15.5mm）
MH	Measuring port, high pressure	ISO 9974-1	M14×1.5（depth 15mm）
Fa	Boost pressure port	ISO 9974-1	M33×2（depth 21mm）
Fa1	Boost pressure port	ISO 9974-1	M33×2（depth 15mm）
Fa2	Boost pressure port	ISO 9974-1	M22×1.5（depth 18.5mm）

Installation size

·V40G145 Shaft extension type



"E1" type spline shaft
ANSI B92.1b
1 3/4 in 13T-8/16 DP

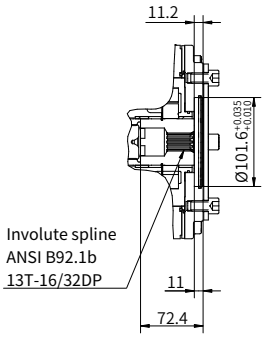


“E5” type spline shaft
DIN 5480
W50×2×24×9g

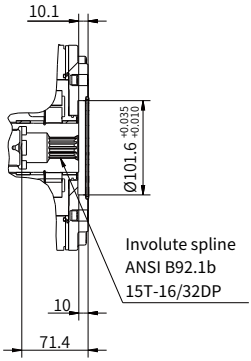
02

Installation size

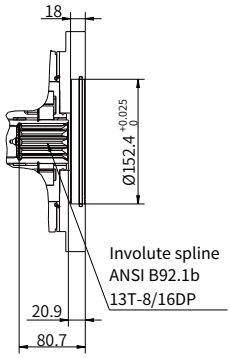
·V40G145 Through shaft drive



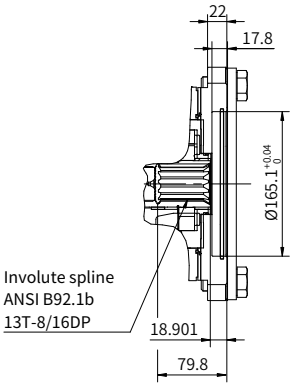
“B1”type through drive



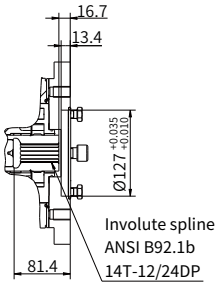
“B3”type through drive



“D1”type through drive

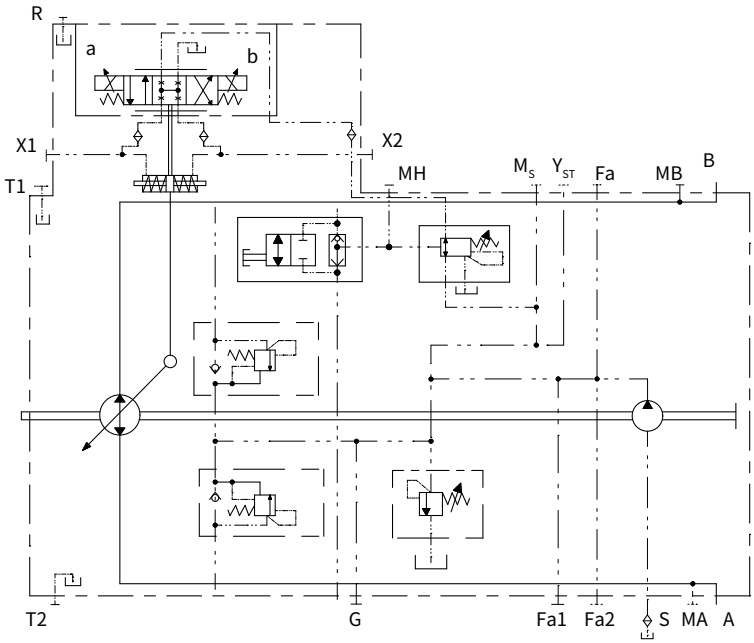


“E1”type through drive

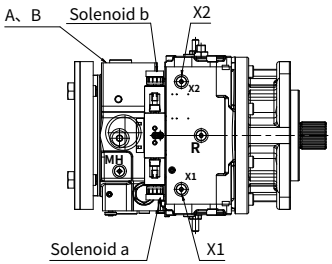


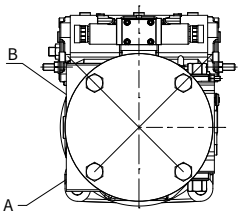
“CC”type through drive

V40G 175 Control principle



Direction of rotation	Clockwise		Counter-clockwise	
Actuation of proportional solenoid	a	b	a	b
Control pressure	X1	X2	X1	X2
Flow direction	B to A	A to B	A to B	B to A
Working pressure	MA	MB	MB	MA





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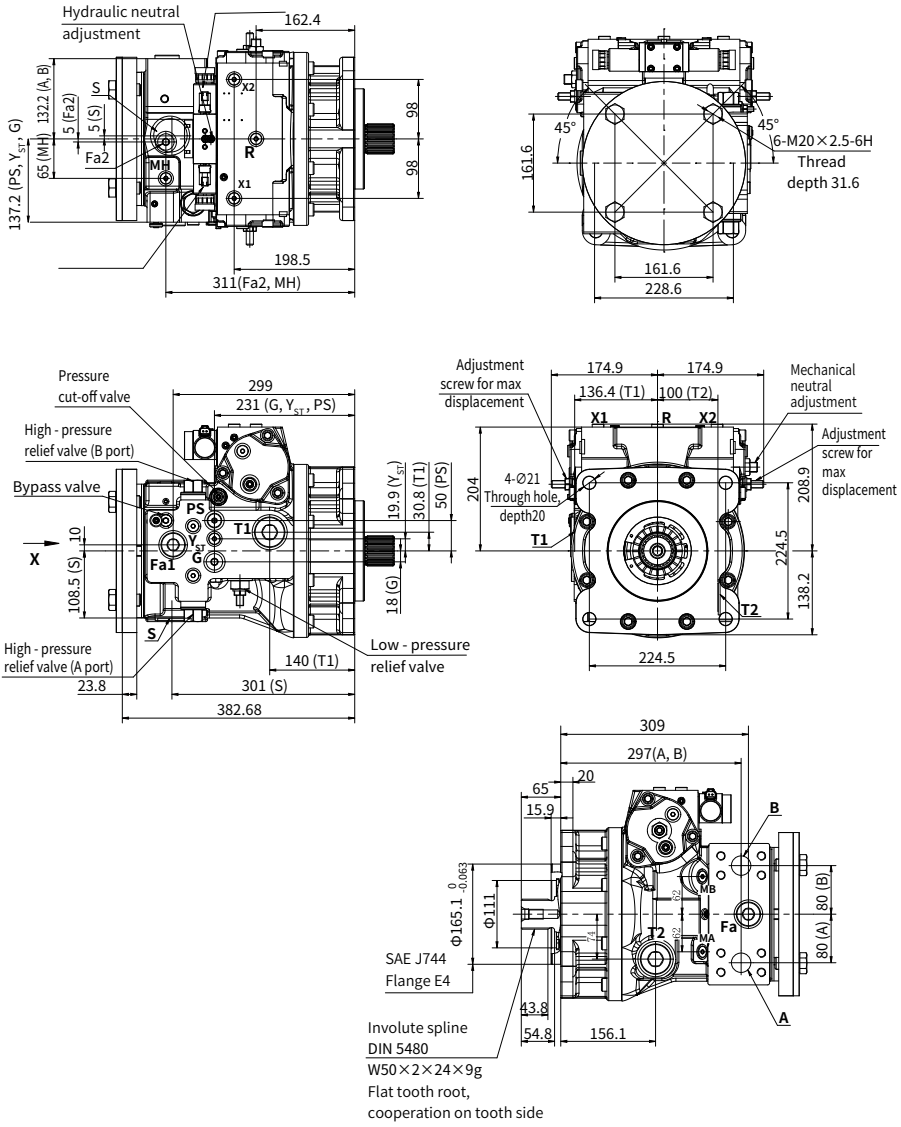
Installation size

V40G 175 Installation size



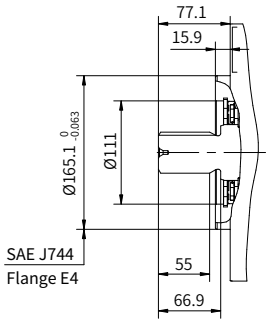
Installation size

·V40G 175 Port details

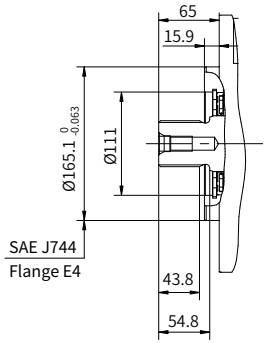
Port	Port Name	Standard	Oil Port Specification (thread depth)
A, B	Working port	SAE J518	1 1/4in
	Fastening thread	DIN 13	M14×2（depth 19mm）
S	Suction port	ISO 9974-1	M48×2（depth 24mm）
T1, T2	Drain port	ISO 9974-1	M42×2（depth 20mm）
R	Air bleed port	ISO 9974-1	M14×1.5（depth 14.1mm）
X1, X2	Control pressure port	ISO 9974-1	M14×1.5（depth 20mm）
G	Boost pressure port	ISO 9974-1	M22×1.5（depth 19mm）
P_S	Pilot pressure port inlet	ISO 9974-1	M18×1.5（depth 17mm）
Y_{ST}	Pilot pressure port outlet	ISO 9974-1	M14×1.5（depth 17.5mm）
MA, MB	Measuring port pressure A, B	ISO 9974-1	M14×1.5（depth 15.5mm）
MH	Measuring port, high pressure	ISO 9974-1	M14×1.5（depth 15mm）
Fa	Boost pressure port	ISO 9974-1	M33×2（depth 21mm）
Fa1	Boost pressure port	ISO 9974-1	M33×2（depth 15mm）
Fa2	Boost pressure port	ISO 9974-1	M22×1.5（depth 18.5mm）

Installation size

·V40G175 Shaft extension type



"E1" type spline shaft
ANSI B92.1b
1 3/4 in 13T-8/16 DP

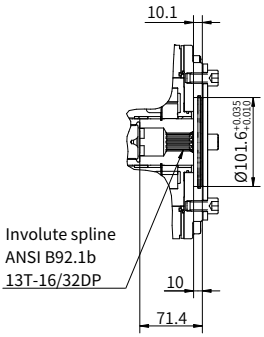


“E5” type spline shaft
DIN 5480
W50×2×24×9g

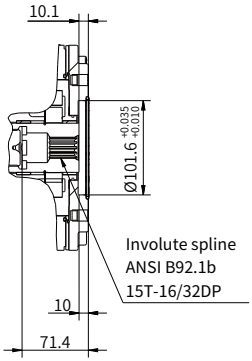
02

Installation size

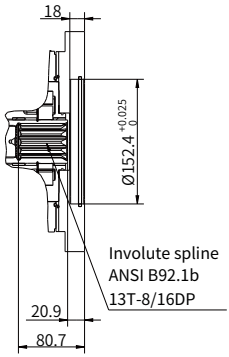
·V40G175 Through shaft drive



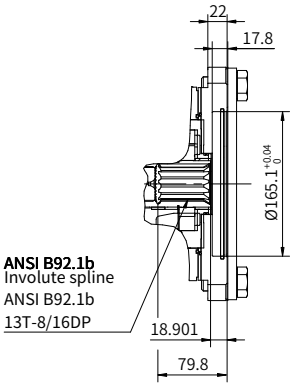
"B1" type through drive



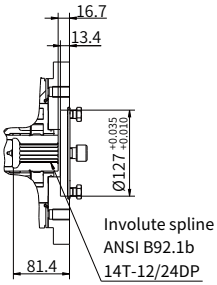
"B3" type through drive



"D1" type through drive

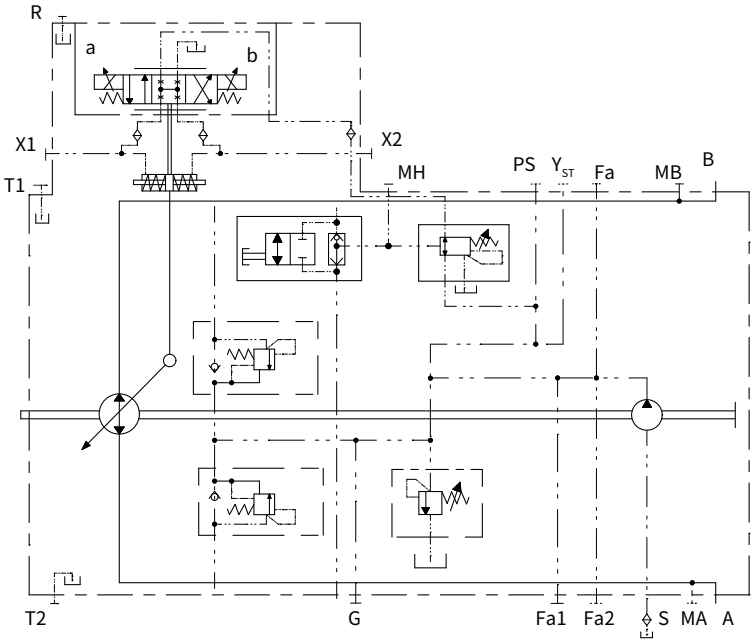


"E1" type through drive

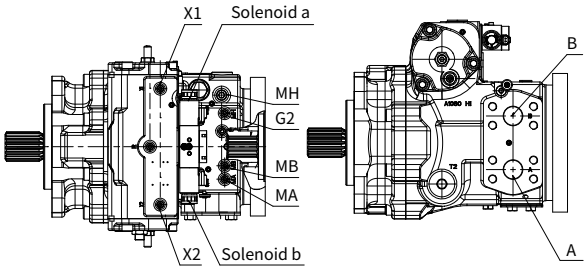


"CC" type through drive

V40G 215 Control principle

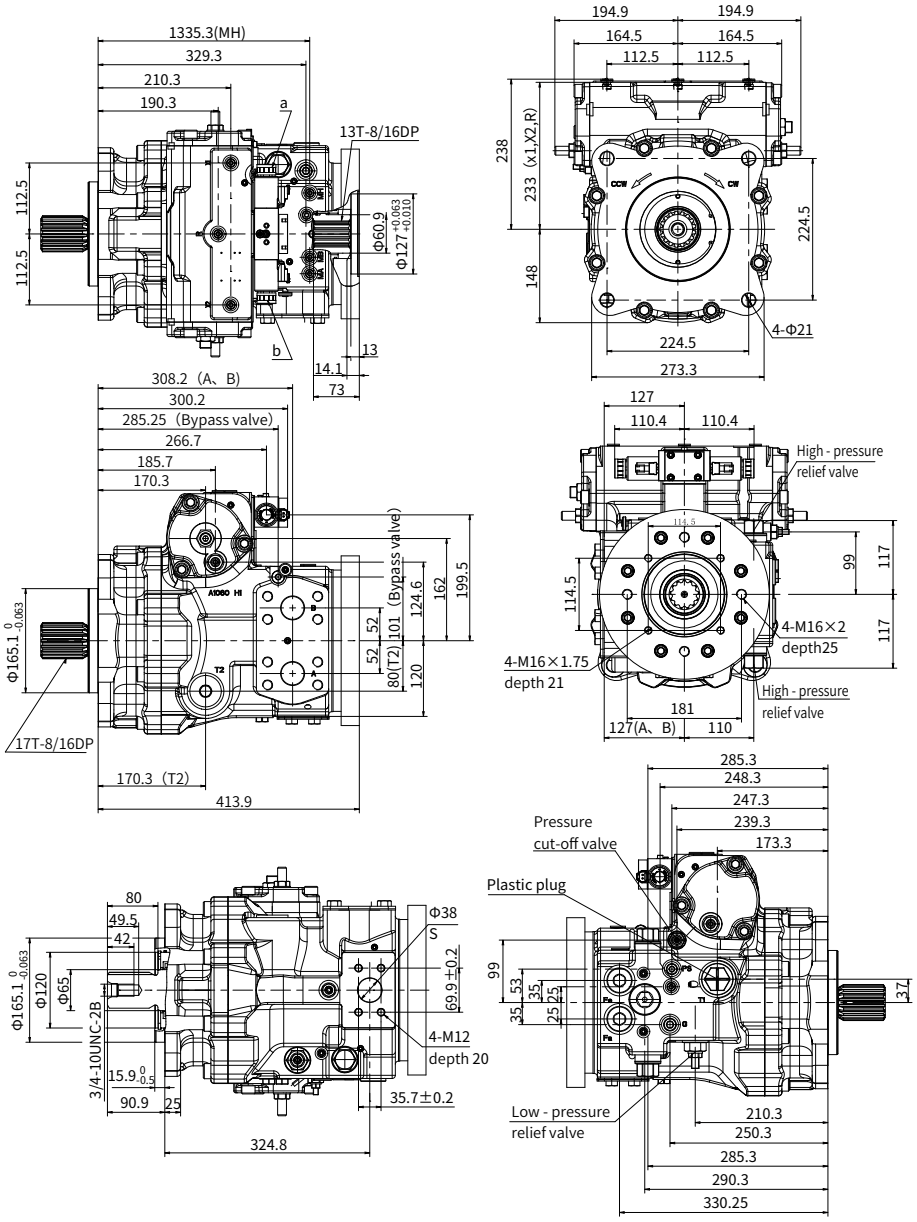


Direction of rotation	Clockwise		Counter-clockwise	
Actuation of proportional solenoid	a	b	a	b
Control pressure	X1	X2	X1	X2
Flow direction	B to A	A to B	A to B	B to A
Working pressure	MA	MB	MB	MA



Installation size

V40G 215Installation size

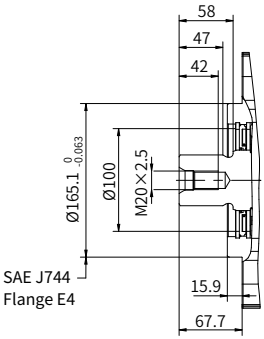


·V40G 215 Port details

Port	Port Name	Standard	Oil Port Specification (thread depth)
A, B	Working port	SAE J518	1 1/2"
	Fastening thread	DIN 13	M16×2 (depth 21)
S	Suction port	SAE J518	1 1/2"
	Fastening thread	DIN 13	M12×1.75 (depth 20)
T1, T2	Drain port	ISO 6149	M42×2 (depth 19.5)
R	Air bleed port	ISO 6149	M14×1.5 (depth 11.5)
X1, X2	Control pressure port	ISO 6149	M14×1.5 (depth 11.5)
G	Boost pressure port	ISO 6149	M22×1.5 (depth 15.5)
P_S	Pilot pressure port inlet	ISO 6149	M18×1.5 (depth 14.5)
Y_{ST}	Pilot pressure port outlet	ISO 6149	M14×1.5 (depth 11.5)
MA, MB	Measuring port pressure A, B	ISO 6149	M14×1.5 (depth 11.5)
MH	Measuring port, high pressure	ISO 6149	M14×1.5 (depth 11.5)
Fa	Boost pressure port	ISO 6149	M33×2 (depth 20)
Fa1	Boost pressure port	ISO 6149	M33×2 (depth 20)
Fa2	Boost pressure port	ISO 6149	M22×1.5 (depth 16.5)

Installation size

·V40G215 Shaft extension type



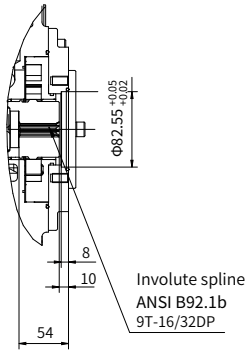
“E5” type spline shaft

DIN 5480

W55×2×26×9g

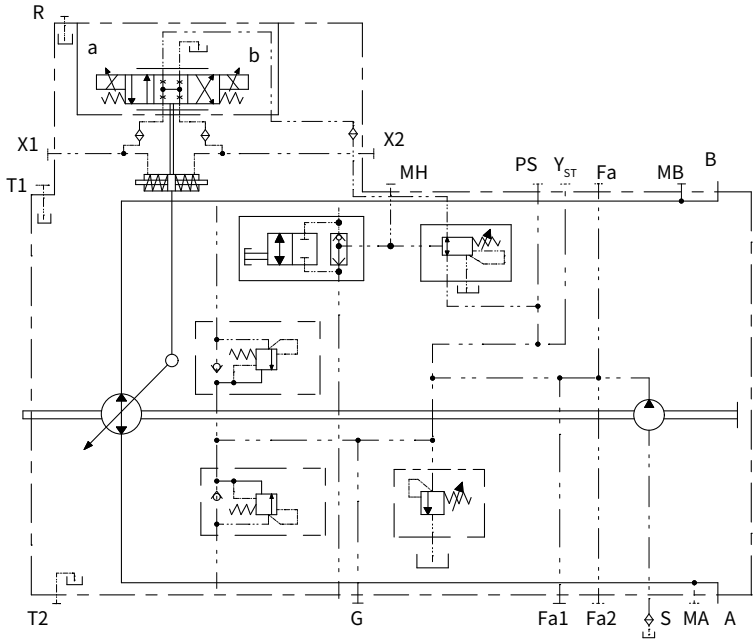
Installation size

·V40G215 Through shaft drive

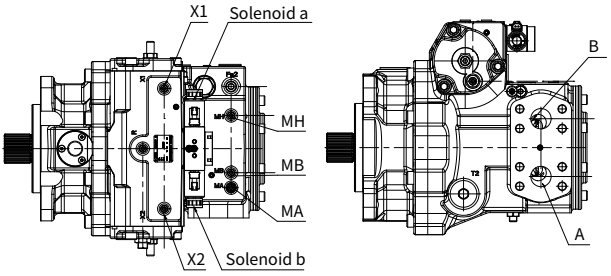


"A1" type
through drive

V40G 280 Control principle

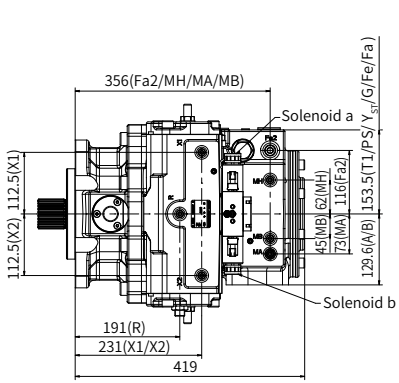


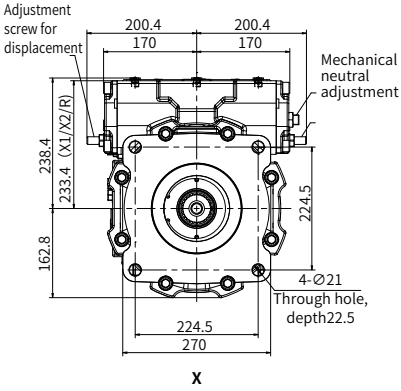
Direction of rotation	Clockwise		Counter-clockwise	
Actuation of proportional solenoid	a	b	a	b
Control pressure	X1	X2	X1	X2
Flow direction	B to A	A to B	A to B	B to A
Working pressure	MA	MB	MB	MA

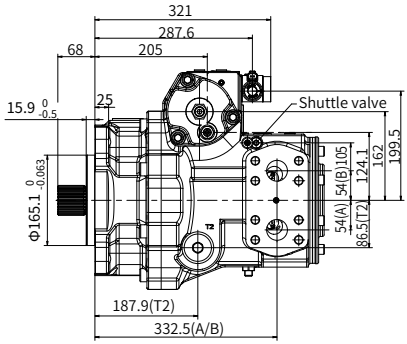


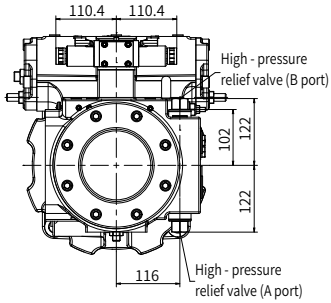
Installation size

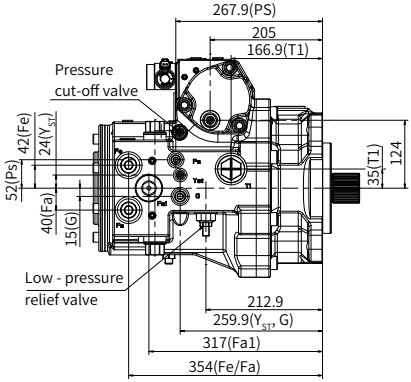
V40G 280 Installation size









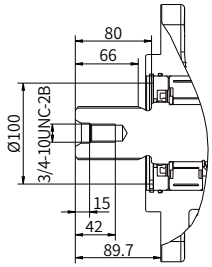


·V40G 280 Port details

Port	Port Name	Standard	Oil Port Specification (thread depth)
A, B	Working port	SAE J518	1 1/2"
	Fastening thread	DIN 13	M16×2 (depth 21)
S	Suction port	SAE J518	1 1/2"
	Fastening thread	DIN 13	M12×1.75 (depth 20)
T1, T2	Drain port	ISO 6149	M42×2 (depth 19.5)
R	Air bleed port	ISO 6149	M14×1.5 (depth 11.5)
X1, X2	Control pressure port	ISO 6149	M14×1.5 (depth 11.5)
G	Boost pressure port	ISO 6149	M22×1.5 (depth 15.5)
P_S	Pilot pressure port inlet	ISO 6149	M18×1.5 (depth 14.5)
Y_{ST}	Pilot pressure port outlet	ISO 6149	M14×1.5 (depth 11.5)
MA, MB	Measuring port pressure A, B	ISO 6149	M14×1.5 (depth 11.5)
MH	Measuring port, high pressure	ISO 6149	M14×1.5 (depth 11.5)
Fa	Boost pressure port	ISO 6149	M33×2 (depth 20)
Fa1	Boost pressure port	ISO 6149	M33×2 (depth 20)
Fa2	Boost pressure port	ISO 6149	M22×1.5 (depth 16.5)

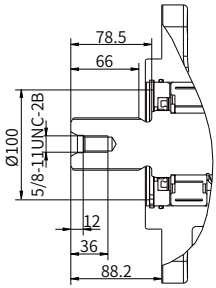
Installation size

·V40G280 Shaft extension type



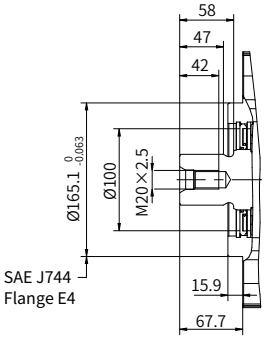
“E4” type spline shaft

ANSI B92.1b
2 1/4 in 17T-8/16DP



“E3” type spline shaft

ANSI B92.1b
2 in 15T-8/16DP

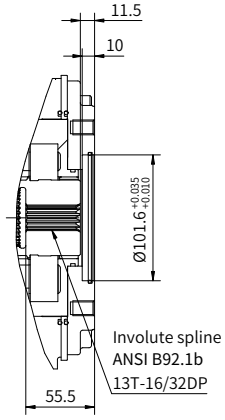


“E6” type spline shaft

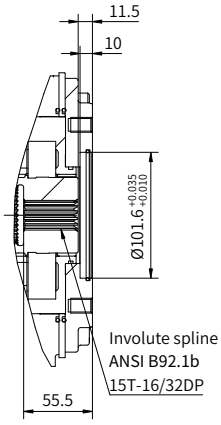
DIN 5480
W55×2×26×9g

Installation size

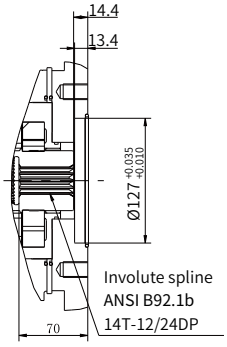
·V40G280 Through shaft drive



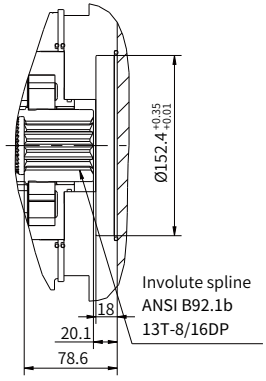
"B1" type through drive



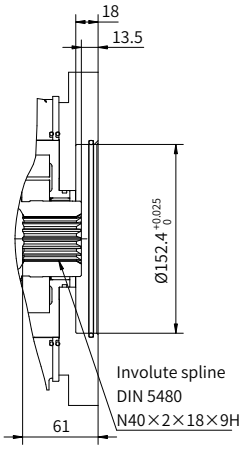
“B2” type through drive



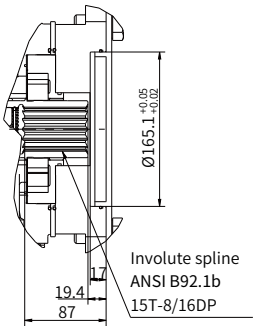
"C2" type through drive



"D1" type through drive



"D2" type through drive



“E3” type through drive

China
+86 400 101 8889

America
+01 630 995 3674

Germany
+49（30）72088-0

Japan
+81 03 6809 1696