2.2.1

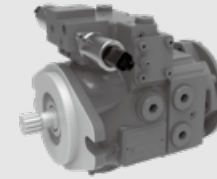
V40D SERIES

Swash-plate Type
Axial Piston Variable Displacement Pump

V40D series variable axial piston pump with swashplate design for hydrostatic drives in closed circuit, high pressure, high speed, high reliability, low noise, can be applied in engineering machinery, mobile machinery and agricultural machinery.

Applied in medium pressure closed circuit

Size:	23
Rated pressure (bar):	250
Max. pressure (bar):	300



Contents

Features

- Variable axial piston pump of swashplate design for hydrostatic drives in closed circuit.
- The flow is proportional to the drive speed and displacement. The flow increases as the angle of the swashplate is adjusted from zero to its maximum value.
- Flow direction changes smoothly when the swashplate is moved through the neutral position.
- Two pressure-relief valves are provided on the high pressure ports to protect the hydrostatic transmission (pump and motor) from overload.
- The integrated charge pump can provide system replenishing and cooling fluid flow.
- High reliability, long working lifetime
- Compact structure, high power density.

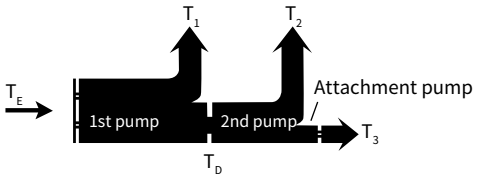
Technical data

Size		23
Displacement (cc/rev)		23
Speed	Rated (rpm)	3300
	Max. (rpm)	3600
	Min. (rpm)	500
Pressure	Rated (bar)	250
	Max. (bar)	300
	Minimum low loop pressure (bar) (Above charge pump)	10
Charge pump displacement (cc/rev)		5.3/9.4
Charge pressure (relative to Charge pump)	Max. (bar)	30
Casting pressure	Rated (bar)	1.5
	Max. (bar)(Short-time peak pressure)	2.5
Suction pressure (Absolute pressure)	Rated (bar) Oil viscosity $\leqslant 30mm^2/s$	0.8
	Max. (bar)	2
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)		15

Technical data

Permissible input and through-drive torques			
Size			23
Torque at $V_{g\,max}$ and Δp = 345 bar Nm		T	183
Maximum input torque at drive shaft (Nm)			
ANSI B92.1b	5/8 in 9T 16/32 DP	$T_{E\,max}$	70
	7/8 in 13T 16/32DP	$T_{E\,max}$	230
Maximum through-drive torque (Nm)		$T_{D\,max}$	70

·Torque distribution



V40D	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		$T_D=T_2+T_3$
		$T_D < T_{D\,max}$

Type introduction

V40	D	S	23	H5	A		/	R	N	A1	4	FF	A1	9	S	-	
①	②	③	④	⑤	⑥	⑦		⑧	⑨	⑩	⑪	⑫	⑬	⑭	⑮		⑯

Product series

①	Variable piston pump of swashplate in closed circuit	V40

Nominal pressure

②	nominal pressure 250 bar	D

Variable mechanism

		23	Code
③	With servo piston	●	Blank
	Without servo piston（manual variable）	●	S

Size

④	Size	23

Control mode

		23	Code
⑤	Proportional control (electric U = 12 V DC)	●	E1
	Proportional control (electric U = 24 V DC)	●	E2
	Hydraulic control direct operated – optimized for hydraulic control	●	H3
	Manual direct displacement control	●	H5

Remark: V40D23 when selecting without servo piston (manual variable), please choose manual direct variable control as the control method.

DA control valve

		23	Code
⑥	Without swivel DA control valve	●	Blank
	Swivel DA control valve	●	A

Pressure cut-off

		23	Code
⑦	Without pressure cut-off	●	Blank

Type introduction

Rotation

		23	Code
⑧	Right hand (clockwise)	●	R
	Left hand (counter-clockwise)	○	L

Oil port specifications and sealing

	Seals	A/B Port Specifications	S Port Specifications	Port Specifications (excluding A/B/S ports)	23	Code
⑧	Sealed at room temperature	ISO 1179	ISO 1179	ISO 1179	●	E

Mounting flange and input shaft

	Mounting flange	Input shaft	23	Code
⑩	SAE A J744-82-2	ANSI B92.1b 5/8 in 9T 16/32 DP	●	A1
	SAE B J744-101-2	ANSI B92.1b 7/8 in 13T 16/32DP	●	B1

Working port

	A/B Port Configuration	S Port Location	23	Code
⑪	A and B ports on the same side face right	S port is located at the bottom	●	1

Note: The control valve seat faces upward when viewed from the input shaft end.

Boost pump and rotary group configuration

⑫	Standard rotary group, without boost pump			K
	Standard rotary group, boost pump integrated	Charge pump displacement (cc/rev)	23	Code
		5.3	●	FF
		9.4	●	FG

Through drive option

	Through drive		23	Code
⑬	Without through drive		●	Blank
	Flange	Splined shaft		
	SAE A J744-82-2	ANSI B92.1b 5/8 in 9T 16/32 DP	●	A1

Relief valve

	Relief valve	Setting range Δp	23	Code
⑭	Direct-acting high-pressure relief valve, fixed setting	160~250bar, without a bypass	●	9

Type introduction

Filtration boost circuit/external boost pressure supply

		23	Code
⑮	No external oil supply pump	●	None
	Filtration in the boost pump suction line	●	S
	Filtration in the boost pump pressure line (ports with external filter circuit)	●	D

Standard / special version

		23	Code
⑯	Standard version	●	Blank

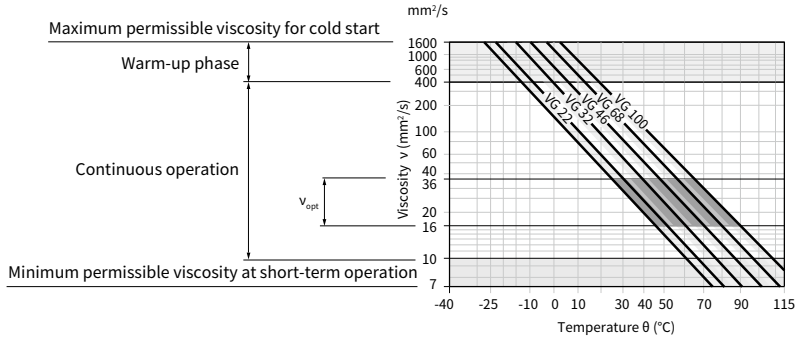
Remark: ● = Available; ○ = On request

Hydraulic fluid

Viscosity and temperature of the hydraulic fluid

	Viscosity(mm^2/s)	Oil seal	Temperature	Note
Cold start	$v_{max} \leqslant 1600$	NBR	$\theta_{St} \geqslant$ -40°C	t ⩽ 3 minutes, no load(p ⩽ 50bar), n ⩽ 1000rpm, Maximum permissible temperature difference between the rotating parts of the system and the hydraulic fluid 25° C.
		FKM	$\theta_{St} \geqslant$ -25 °C	
Warm-up phase	v = 1600 ⋯ 400			t ⩽ 15 minutes, p ⩽ 0.7×p_{nom}, n ⩽ 0.5×n_{nom}
Continuous operation	v = 400 ⋯ 10	NBR	θ ⩽ +85 °C	Measured at oil port T
		FKM	θ ⩽ +110°C	
	v_{opt} = 36 ⋯ 16			Optimum operating viscosity and efficiency range
Short-term operation	v_{min} = 10 ⋯ 7	NBR	θ ⩽ +85°C	t ⩽ 3 minutes, p ⩽ 0.3×p_{nom}, Measured at oil port T
		FKM	θ ⩽ +110°C	

Selection chart



Detailed information on the selection of hydraulic fluids

To select the hydraulic fluid correctly, it is necessary to know the operating temperature in relation to the ambient temperature: in closed circuits the oil circuit temperature.
When selecting a hydraulic fluid, the operating viscosity should be in the optimum range for the operating temperature range (v_{opt} see shaded area of the selection chart). We recommend selecting a higher viscosity grade in all cases.
Example: When the operating temperature in the circuit is 60° C, in the optimum operating viscosity range (shaded area of the v_{opt}), corresponding to viscosity grades VG46 or VG68; VG68 should be selected.

Caution

The case drain temperature (influenced by pressure and speed) may be higher than the oil line temperature or tank temperature.
However, the temperature of any part of the component must not exceed 100° C.

Hydraulic fluid

Filtration of hydraulic fluid

Finer filtration improves the cleanliness of the hydraulic fluid, thereby extending the life of rotating parts. A cleanliness of at least 20/18/15 (ISO 4406) should be maintained. When the viscosity of the hydraulic fluid is less than 10mm^2/s (e.g. due to high temperatures during short-term operation, a cleanliness level of at least 19/17/14 (ISO 4406) is required.

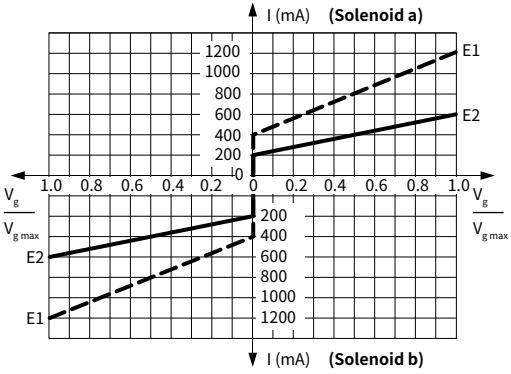
▲ Note

- When using mineral oil based hydraulic fluid, refer to the left diagram for the range of pressures used for oil seals, please contact us if other hydraulic fluids are used.
- The service life of the oil seal is affected by the rotational speed and the pressure difference between the inside and outside of the seal, in addition to the hydraulic oil and temperature.
- The pressure difference between the inside and outside of the seal must be greater than or equal to zero.

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 V40E175 closed pumps)	
Duty cycle		100%	
Type of protection		See connector version	

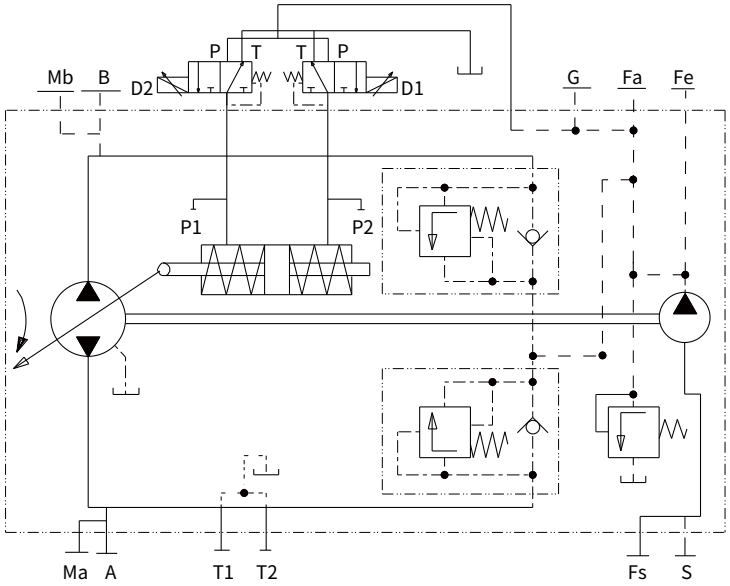
Note:

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.

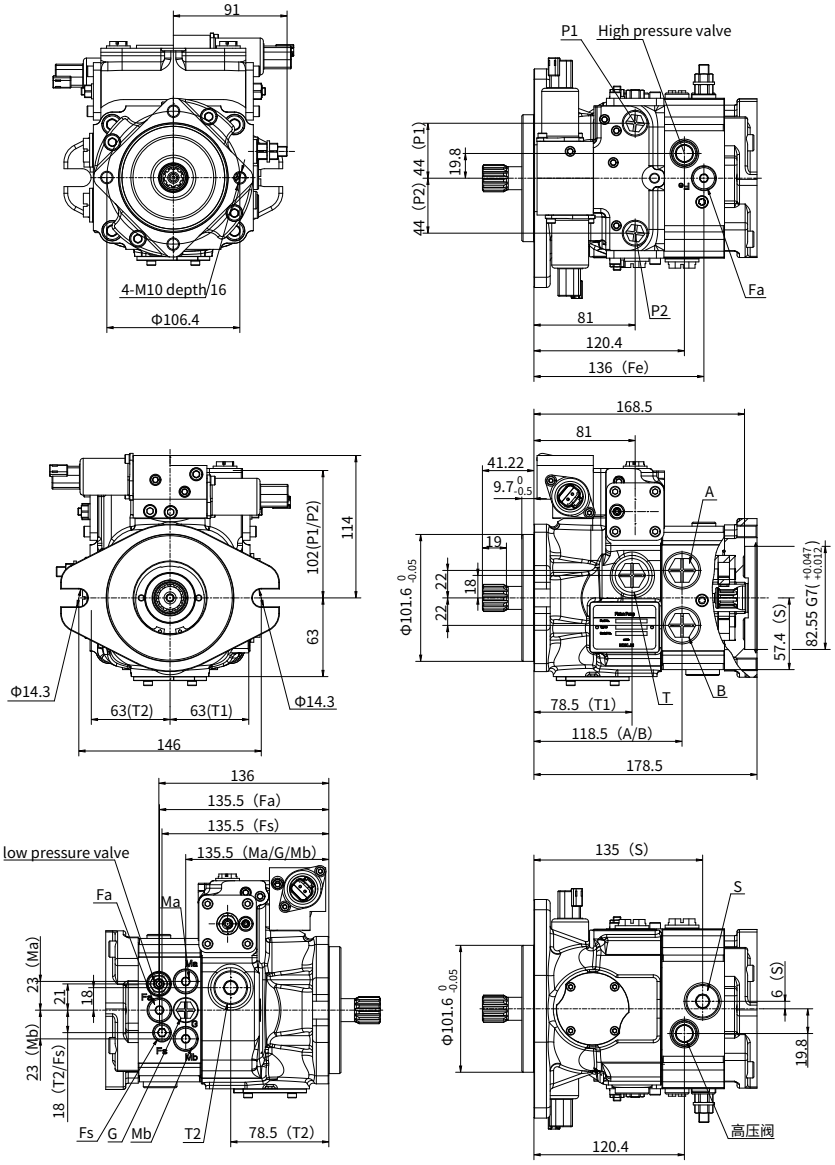
V40D23 Pump principle



Control and Flow		Start the electromagnet	Control pressure	High pressure	Low voltage
Rotation direction	Dextrorotation	D1	P2	A1	B1
		D2	P1	B1	A1
	Levorotation	D1	P2	B1	A1
		D2	P1	A1	B1

Installation size

V40D23 installation size



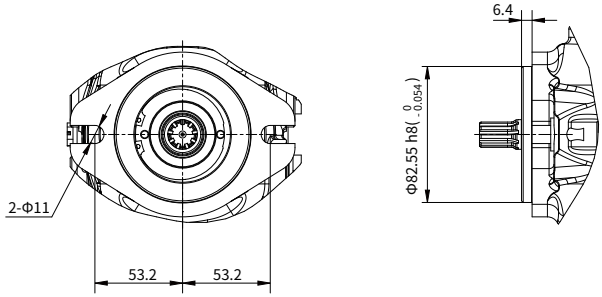
Installation size

·V40D23Port details

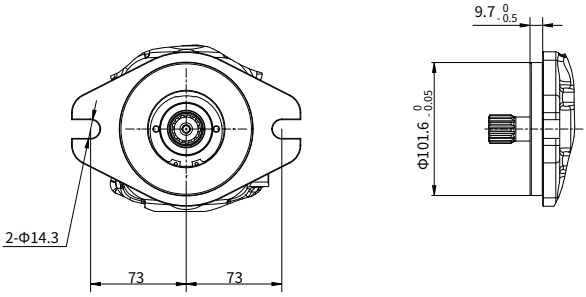
Port	Port Name	Port Size and Description	Tightening Torque(N.m)	Maximum pressure (bar)
A，B	Work lines	ISO 1179-1	G 1/2（depth 15）	250
Ma, Mb	Outlet pressure	ISO 1179-1	G 1/4（depth 12.5）	250
P1, P2	Control chamber pressure	ISO 1179-1	G 1/4（depth 12.5）	30
S	Oil suction line	ISO 1179-1	G 1/2（depth 15）	5
T1, T2	Oil drain line	ISO 1179-1	G 1/2（depth 15）	3
G	Top-up pressure	ISO 1179-1	G 1/4（depth 12.5）	30
Fe	Oil replenishment pressure outlet	ISO 1179-1	G 1/4（depth 12.5）	30
Fa	Oil replenishment pressure inlet	ISO 1179-1	G 1/4（depth 12.5）	30
Fs	Oil suction pressure	ISO 1179-1	G 1/8（depth 8）	3

Installation size

V40D23 Mounting Flange

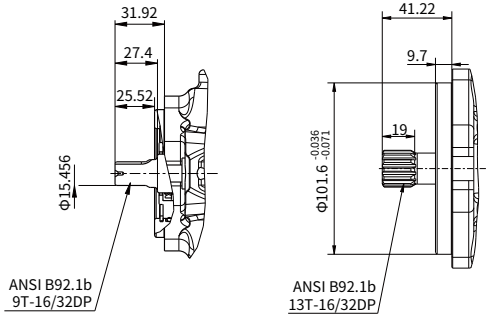


SAE "A1" type



SAE "B1" type

V40D23 Input Shaft type



"A1" type spline shaft "B1" type spline shaft