Product Catalog

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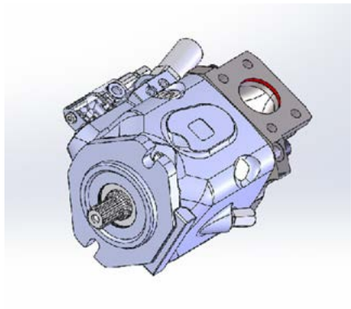
Swashplate design Axial Piston Variable pump
TFA10VSO/31 Series

TAIFENG



- Size: 18 to 140
- Series: 31
- Nominal pressure 280bar
- Maximum pressure 350 bar
- Open circuit

Features

- Design for open circuit
- Pump flow is proportional to the drive speed and displacement. The flow can be infinitely varied by adjusting the swashplate angle.
- Flange port comply with SAE J518.
- 2 case drain ports
- Excellent suction function
- Low noise level
- Long service life
- The drive shaft can withstand axial and radial loads
- High power density.
- Varies of flow control devices
- Quick response
- Through drive for multiple pump systems

Contents

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Ordering Code

Axial piston unit	**18..140**		
Swashplate design, variable, nominal pressure 280 bar, maximum pressure 350 bar	•	TFA10VS	
Operation mode			
Pump, open circuit		O	
Size			
Geometric displacement $V_{g\,max}$ (cm^3)	18 28 45 71 100 140		
Control device	**18 28 45 71 100 140**		
Pressure control	DR • • • • • •		DR
	DR G • • • • • •		DRG
emote control			
Pressure and flow control	DFR • • • • • •		DFR
	DFR 1 • • • • • •		DFR1
X-T closed			
remotely operated	- • • • • •		DFLR
Flow control relative to pilot pressure, with pressure control	- ○ ○ ○ ○ ○		FHD
Electro-hydraulic pressure control	○ ○ ○ ○ ○ ○		ED
with flow and differential pressure control, electrically variable	○ ○ ○ ○ ○ ○		EF
Series			
			31
Direction of rotation			
Viewed on drive shaft		clockwise	R
		counter clockwise	L
Seals			
Nitrile rubber			p
FKM (Fluor rubber)			V
Drive shaft comply with SAE J744	18 28 45 71 100 140		
reduced diameter, not for through drive [in]			U
standard shaft [in]	3/4 7/8 1 11/4 11/2 13/4		S
similar to shaft "S" however for higher input torque [in]			R
same as "U", higher torque; not for through drive [in]	- - 7/8 - 11/4 -		W

●=available ○=please consult before ordering - =not available

TFA10VS	O			/	31		-					

Axial piston pump
Operation mode
Size (NG)
Control device
Series
Direction of rotation
Seals
Drive shaft

Mounting flange SAE J744	**18**	**28**	**45**	**71**	**100**	**140**	
2-hole	•	•	•	•	•	-	C
4-hole	-	-	-	-	-	•	D

Service line port	**18**	**28**	**45**	**71**	**100**	**140**		
pressure port B SAE flange ports at rear intake port S metric fastening thread	-	○	○	○	○	○	11	Port plate only, 11 and 61 no through drive
pressure port B SAE flange ports on opposite side intake port S metric fastening thread	•	•	•	•	•	•	12	
pressure port B SAE flange ports at rear intake port S UNC fastening thread	-	○	○	○	○	○	61	
pressure port B SAE flange ports on opposite side intake port S UNC fastening thread	•	•	•	•	•	•	62	

Through drive				**18**	**28**	**45**	**71**	**100**	**140**	
without through drive				•	•	•	•	•	•	N00
with through drive < port plate 12>										
	Flange	drive coupling shaft	seal							
	82-2(A)	16-4(A)	axial	•	•	•	•	•	•	K01
	82-2(A)	19-4(A)	axial	•	•	•	•	•	•	K52
	101-2(B)	22-4(B)	radial	-	•	•	•	•	•	K02
	101-2(B)	22-4(B)	axial	-	•	•	•	•	•	K68
	101-2(B)	25-4 (B-B)	axial	-	-	•	•	•	○	K04
	127-2(C)	32-4(C)	axial	-	-	-	•	•	•	K07
	127-2(C)	38-4 (C-C)	axial	-	-	-	-	•	•	K24
	152-4(D)	44-4(D)	axial	-	-	-	-	-	•	K17

Technical Data

Hydraulic fluid

Before starting project planning, please understand and choose the appropriate hydraulic oil. In order to ensure the service life of the piston pump, please use standard mineral hydraulic oil. If you need to use environment-friendly or HF hydraulic oil, please contact us.

Operating viscosity range

For optimum efficiency and service life we recommend that the operating viscosity（at operating temperature） be selected in the range.

V_{opt} = opt. operating viscosity 16 ... 36 mm^2/s

referred to reservoir temperature（open circuit）

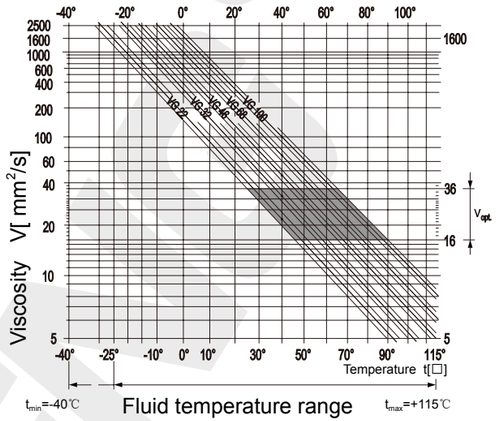
Limits of viscosity range

For critical operating conditions the following values apply:

V_{min}=10mm^2/s

Short-term（t ≤ 1 min）， at max perm. case drain temperature of 115 °C .

Selection diagram



Depending on the installation situation, special measures are necessary at temperatures between -25°C and -10°C. Please contact us.

For operating temperatures between +90°C and 115°C, FKM seals should be used (type designation V).

Notice：

Please also ensure that the max. case drain temperature of 115 °C is not exceeded in localized areas（for instance, in the bearing area）. The fluid temperature in the bearing area is approx. 5K higher than the average case drain temperature.

V_{max}=16000mm^2/s

Short-term（t ≤ 1 min）,on cold start（p ≤ 30 bar, n ≤ 1000 rpm, t_{min} =-25°C）

Filtration of the hydraulic fluid

The finer the filtration the better the cleanliness level of the hydraulic fluid and the longer the service life of the axial piston unit. In order to guarantee the functional reliability of the axial piston unit it is necessary to carry out a gravimetric evaluation of the hydraulic fluid to determine the particle contamination and the cleanliness level according to ISO 4406. A cleanliness level of at least 20/18/15 must be maintained. At very high hydraulic fluid temperatures（90°C to maximum 115°C）, a cleanliness level of at least 19/17/14 according to ISO 4406 is necessary.If the above cleanliness levels cannot be maintained, please contact us.

Seal

FKM shaft seals can be used under the condition of case drain oil temperature from -25°C to +115°C.

Notice

If it is applied below -25°C, a NUR shaft seal is required（allowable temperature range: -40°C to +90°C）. Please contact us.

Operating pressure range

Pressure at suction port S （inlet）

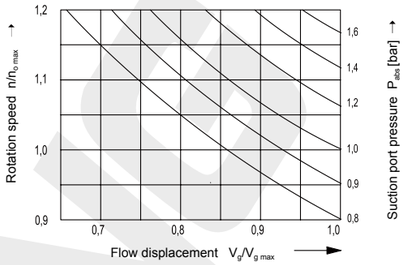
$P_{abs\ min}$ 0.08Mpa
$P_{abs\ max}$ 3Mpa

Pressure at service line port B

Nominal pressure P_n 28Mpa
Maximum pressure P_{max} 35Mpa

When the intermittent work is 10% of the load time, the pressure can reach 31.5Mpa.

The relationship between the suction pressure Pabs of the suction port S and the reduction of the displacement when the rotating speed increases



Case drainage pressure

Maximum permissible case drain pressure （at port L, L1）
Maximum 0.05 Mpa higher than the inlet pressure at port S, however not higher than 0.2Mpa absolute.
direction of flow S to B
table of value （theoretical values, without η_{mh} andη_v: values rounded）

Size NG			18	28	45	71	100	140
Geometrical displacement per revolution								
	$V_{g\ max}$	ml/r	18	28	45	71	100	140
Maximum speed (1)								
at $V_{g\ max}$	n_{no}	rpm	3300	3000	2600	2200	2000	1800
at $V_g < V_{g\ max}$	$n_{no\ max}$	rpm	3900	3600	3100	2600	2400	2100
Flow								
at n_{no} and $V_{g\ max}$	$q_{v\ max}$	L/min	59.4	84	117	156	200	252
at n_E = 1500 rpm and $V_{g\ max}$	$q_{vE\ max}$	L/min	27	42	68	107	150	210
Power								
at n_{no}, and $V_{g\ max}$	$P_{o\ max}$	KW	27.7	39	55	73	93	118
at n_E = 1500 rpm and $V_{g\ max}$	$P_{E\ max}$	KW	12.6	20	32	50	70	98
Torque								
at $V_{g\ max}$ and Δp = (28Mpa)	T_{max}	Nm	80.1	125	200	316	445	623
at $V_{g\ max}$ and Δp = (10Mpa)	T	Nm	28.6	45	72	113	159	223
Moment of inertia on drive shaft	J_{GR}	kgm^2	0.00093	0.0017	0.0033	0.0083	0.0167	0.0242
Filling capacity	V	L	0.4	0.7	1.0	1.6	2.2	3.0
Weight (without through drive) approx.	m	kg	12	15	21	33	45	60
Drive shaft allowable load								
Maximum axial load	$F_{ax\ max}$	N	700	1000	1500	2400	4000	4800
Maxium radial load	$F_{q\ max}$	N	350	1200	1500	1900	2300	2800

（1）The values are applicable for an absolute pressure pabs = 15 psi (1 bar) at suction port S,Speed can be increased with reduced displacement or increased inlet pressure.

Technical data

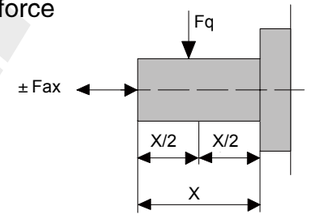
Calculation of characteristics

Flow $q_v = \dfrac{v_g \cdot n \cdot \eta_v}{1000}$ [L/min]

Torque $q_v = \dfrac{1.59 \cdot v_g \cdot \Delta P}{1000 \cdot \eta_{mh}} = \dfrac{v_g \cdot \Delta P}{20 \cdot \varpi \cdot \eta_{mh}}$ [Nm]

Power $q_v = \dfrac{T \cdot n}{9549} = \dfrac{2\varpi \cdot T \cdot n}{60000} = \dfrac{q_v \cdot \Delta P}{600 \cdot \eta_t}$ [kW]

force



V_g= Displacement per revolution in cm^3 [ml/r]
Δp = Pressure differential in bar [bar]
n = Speed in rpm [rpm]

η_V = Volumetric efficiency
η_{mh} = Mechanical-hydraulic efficiency
η_t = Total efficiency （$\eta_t = \eta_V \cdot \eta_{mh}$）

Performance Curves for Pump with Pressure Control DR

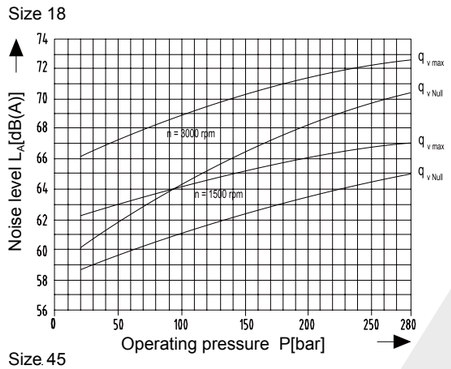
Noise level

Measured in an anechoic chamber

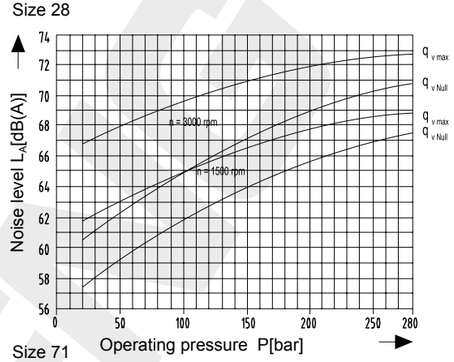
Distance from microphone to pump = 1 m.Measuring error: ± 2 dB (A)

（Fluid: hydraulic oil ISO-VG46 DIN 51519，t=50˚C）

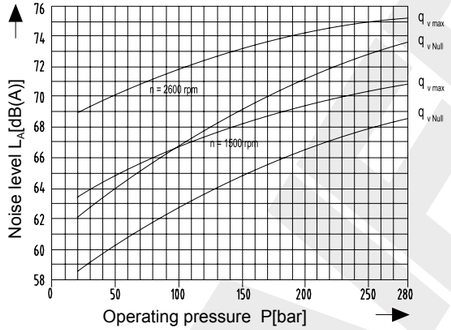
Size 18



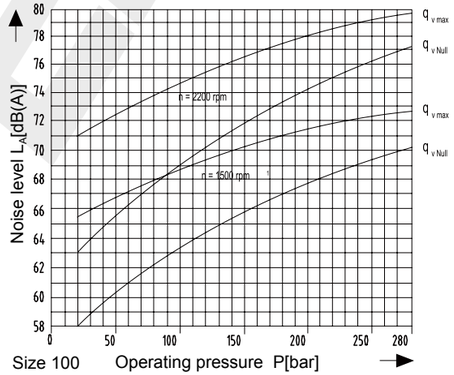
Size 28



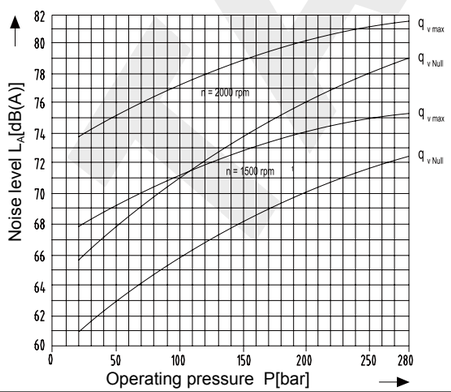
Size 45



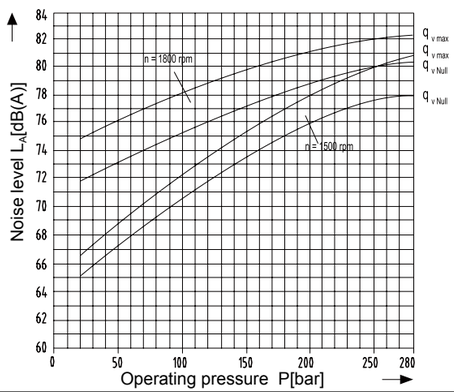
Size 71



Size 100



Size 100

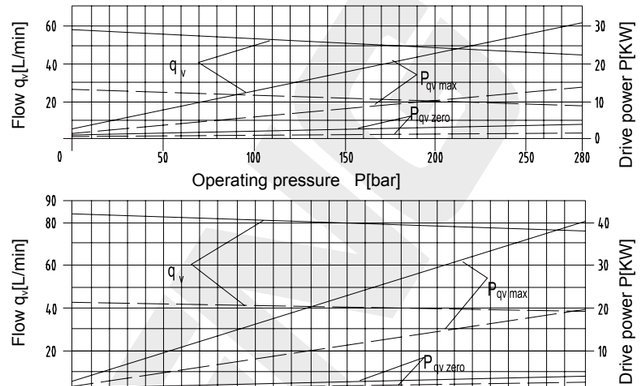


Drive power and output flow

Fluid: hydraulic oil ISO-VG46 DIN 51519，t=50˚C

Size 18

- - - - n=1500 rpm
—— n=3300 rpm

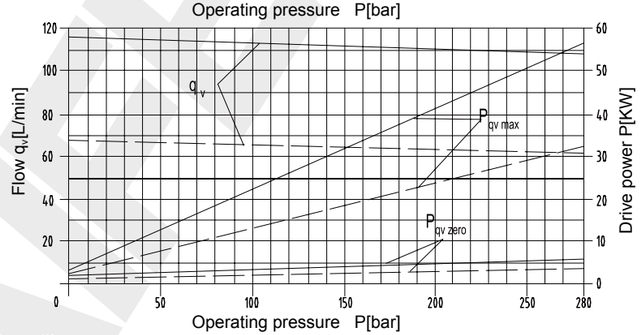


Size 28

- - - - n=1500 rpm
—— n=3000 rpm

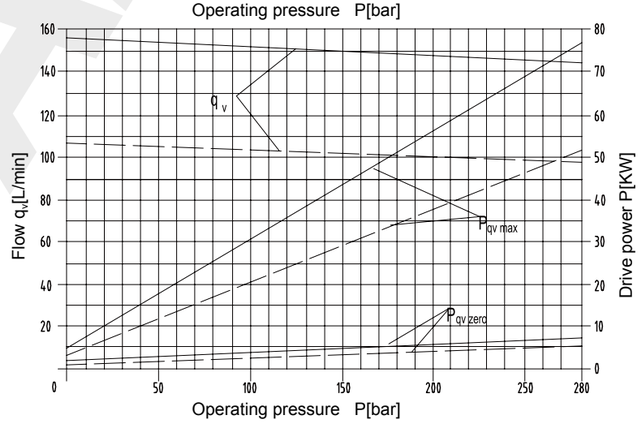
Size 45

- - - - n=1500 rpm
—— n=2600 rpm



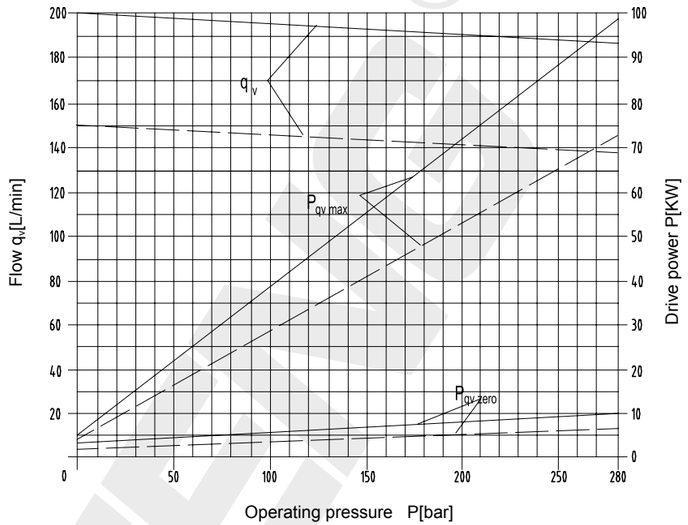
Size 71

- - - - n=1500 rpm
—— n=2200 rpm



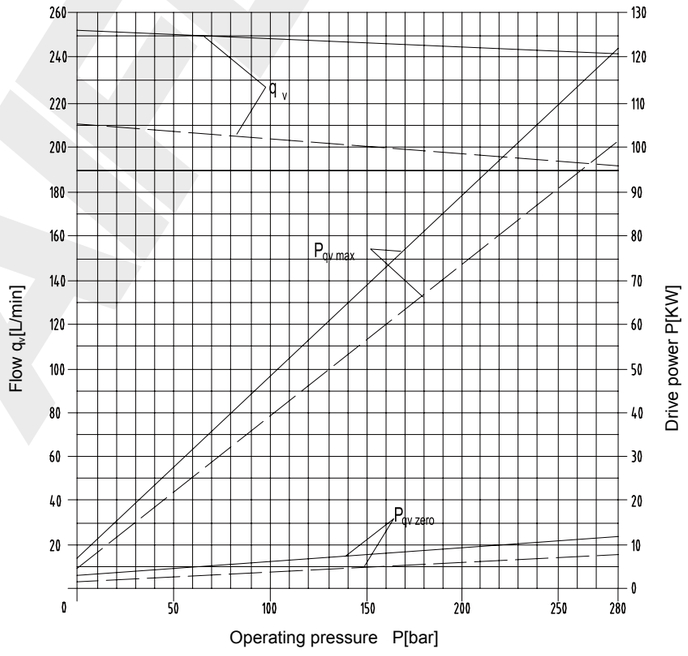
Size 100

- - - - n=1500 rpm
——— n=2000 rpm



Size 100

- - - - n=1500 rpm
——— n=1800 rpm



overall efficiency

$$\eta_t = \frac{q_v \bullet p}{P_{vqv\ max} \bullet 600}$$

volume efficiency

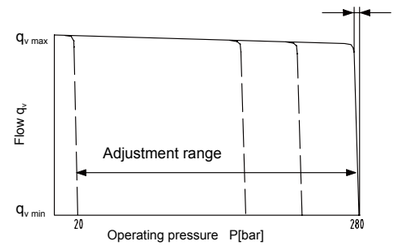
$$\eta_v = \frac{q_v}{q_{v\ theor}}$$

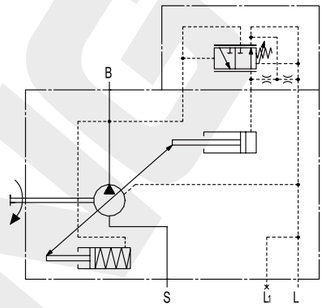
DR–Pressure control

The pressure controller serves to maintain a constant pressure in a hydraulic system within the control range of the pump. The pump therefore supplies only the amount of hydraulic fluid required by the system. Pressure may be steplessly set at the control valve.

Static characteristic

(at n_1=1500 rpm; t_{oil}=50ºC) Hysteresis / pressure rise $_{\Delta}$P





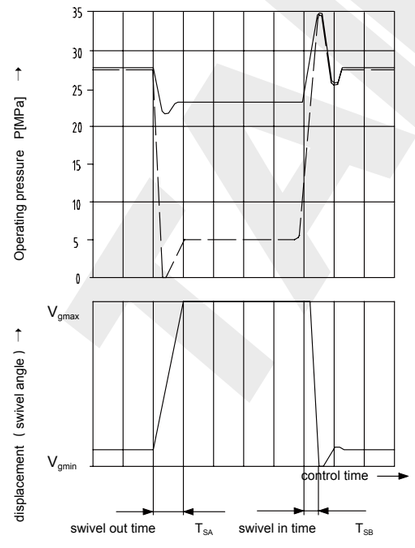
Dynamic characteristics

The operating curves are mean values measured under test conditions.

conditions: n=1500rpm
t_{oil}=50˚C

The main relief valve is set at 35MPa

Load steps were obtained by suddenly opening and closing the pressure line with a pressure relief valve as load valve 1 m from the output flange of the pump.



Port

B	pressure port
S	suction port
L、L_1	case drain port (L_1 plugged)

control data

Hysteresis and repeatability $_{\Delta}$p _____ maximum 0.3Mpa
Pressure rise,maximum.

size		18	28	45	71	100	140
$_{\Delta}$P	MPa	0.4	0.4	0.6	0.8	1.0	1.2

control flow consumption max.approx. 3L/min

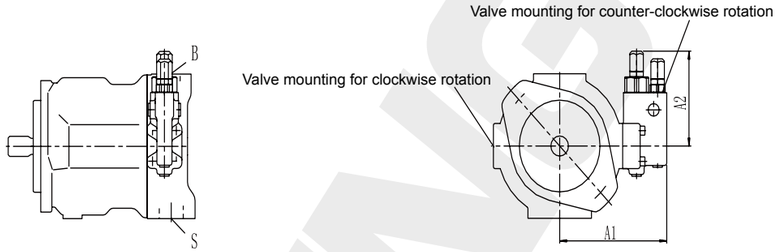
control flow

size	t_{SA}(ms) 5MPa	t_{SA}(ms) 22MPa	t_{SA}(ms) 28MPa
18	50	20	20
28	60	30	20
45	80	40	20
71	100	50	25
100	125	90	30
140	130	110	30

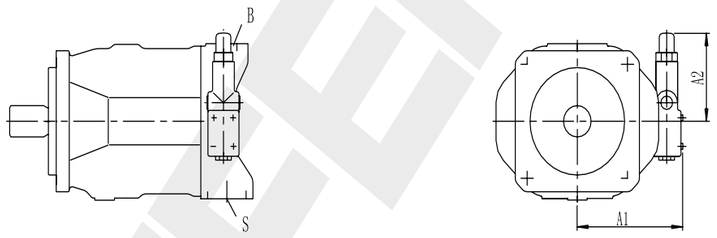
DR–Pressure control mounting dimensions

type 12N00, oil port on the side

Size 28...100



Size 140



Size	A1	A2
18	126	105
28	136	106
45	146	106
17	160	106
100	165	106
140	169	127

On sizes 28 to 100 the DFR valve used has the flow control spool blocked in the factory and is not tested.

DRG – Pressure control, remotely operated

The function and device of constant pressure control are the same as DR

A pressure relief valve can be externally piped to port X for remote setting of pressure.

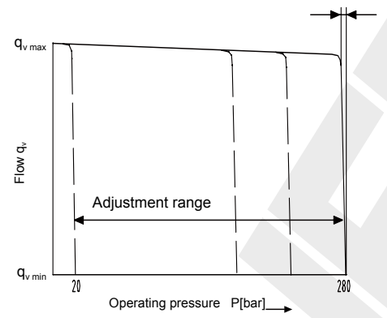
This relief valve is not included in the delivery contents of the DRG control.

The differential pressure at the DRG control valve is set as standard to 2 MPa. This results in a pilot oil flow to the relief valve of approx. 1.5 l/min at port X. If another setting is required, please state in clear text. We recommend to use one of the following as a separate relief valve: DBD6 (hydraulic control) , or DBETR-S0381 with orifice in P (electric control) .

The max. length of piping should not exceed 2m.

Static characteristic

(at n_1=1500 rpm; t_{oil}=50ºC) Hysteresis / pressure rise $_{\Delta}$P



control data

Hysteresis and repeatability $_{\Delta}$p _____ maximum 0.3Mpa

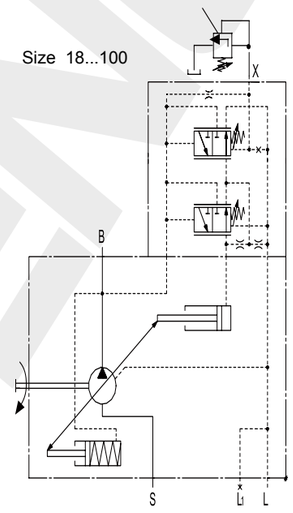
Pressure rise, maximum

size		18	28	45	71	100	140
$_{\Delta}$P	MPa	0.4	0.4	0.6	0.8	1.0	1.2

Control fluid consumption _____ max. approx. 4.5 l/min

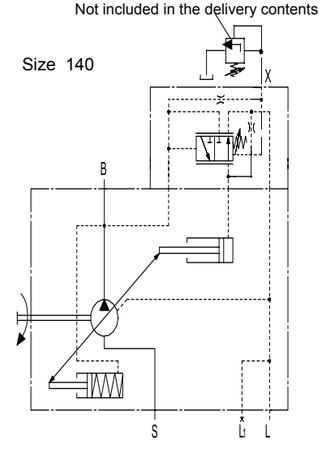
Not included in the delivery contents

Size 18...100



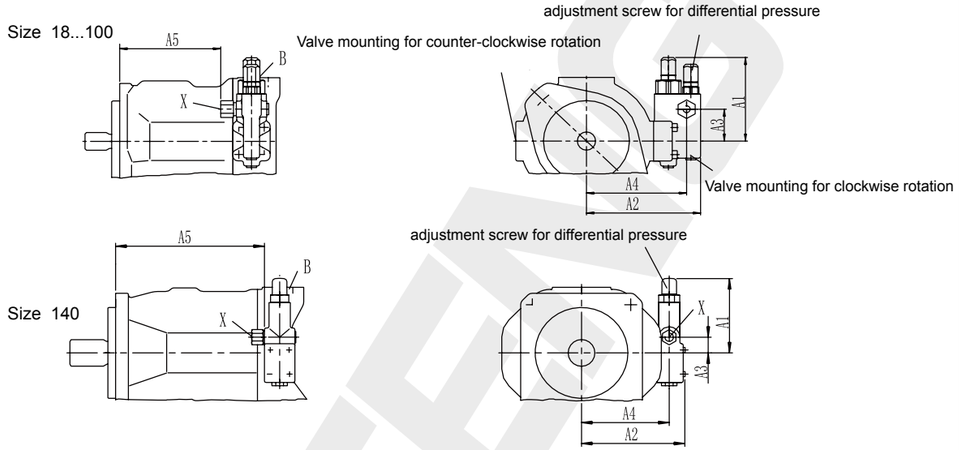
Not included in the delivery contents

Size 140



Dimensions of DRG – Pressure control, remotely operated

type 12N00, oil port on the side



Size	A1	A2	A3	A4	A5	X
18	105	126	40	109	109	M14×1.5;deep12
28	106	136	40	119	119	M14×1.5;deep12
45	106	146	40	129	134	M14×1.5;deep12
71	106	160	40	143	162	M14×1.5;deep12
100	106	165	40	148	229	M14×1.5;deep12
140	127	169	27	143	244	M14×1.5;deep12

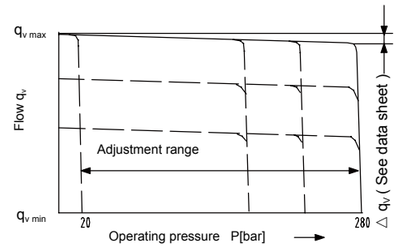
DFR/DFR1 – Pressure and flow control

In addition to the pressure control function, the pump flow may be varied by means of a differential pressure over an orifice or valve spool, installed in the service line. The pump flow is equal to the actual required flow by the actuator.

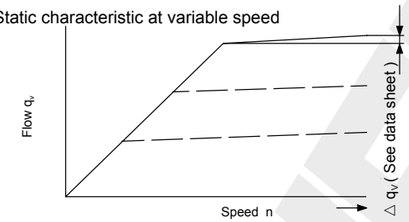
On DFR1 models, the orifice between port X and oil tank is plugged.

Static characteristic

(at n_1=1500 rpm; toil=50°C)

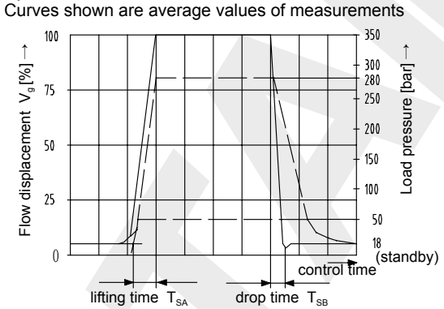


Static characteristic at variable speed



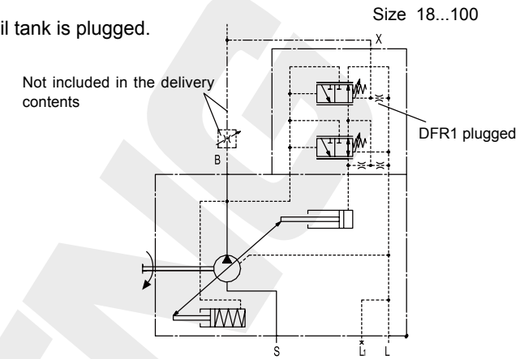
Dynamic characteristic curve of flow control

Curves shown are average values of measurements

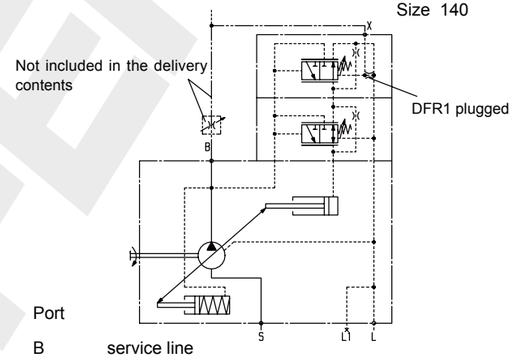


size	t_{SA}(ms) standby 280bar	t_{SA}(ms) standby 280bar	t_{SA}(ms) standby 250bar
18	40	15	40
28	40	20	40
45	50	25	50
71	60	30	60
100	120	60	120
140	130	60	130

Size 18...100



Size 140



Port

B	service line
S	suction port
L、L_1	case drain port (L_1 plugged)

Differential pressure △p

Standard setting:14 bar.If a different setting is required please indicate in clear text.

When port X is unloaded to tank, a "zerostroke pressure" of p=18±2 bar ("stand by") results (dependent on △p).

control data

See page 11 for pressure control specifications.

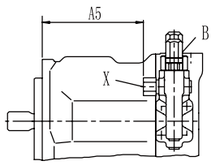
Maximum flow deviation measured at drive speed n=1500 rpm.

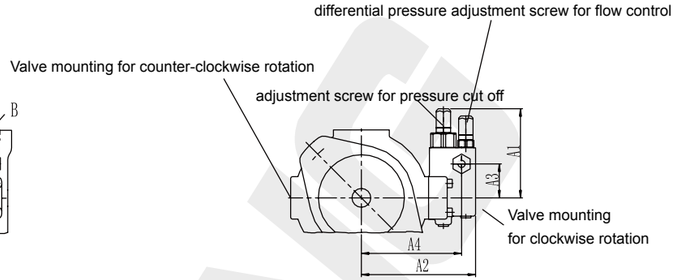
size	18	28	45	71	100	140
△q_{vmax} L/min	0.9	1.0	1.8	2.8	4.0	6.0

Dimensions of DFR/DFR1 – Pressure and flow control

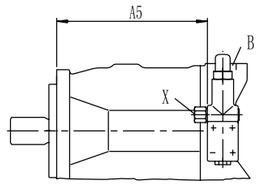
type 12N00, oil port on the side

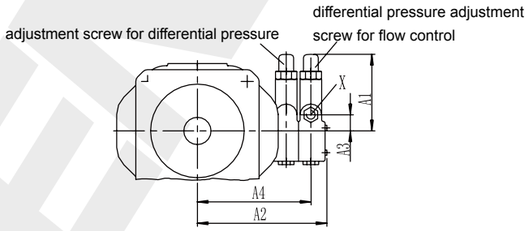
Size 18...100





Size 140





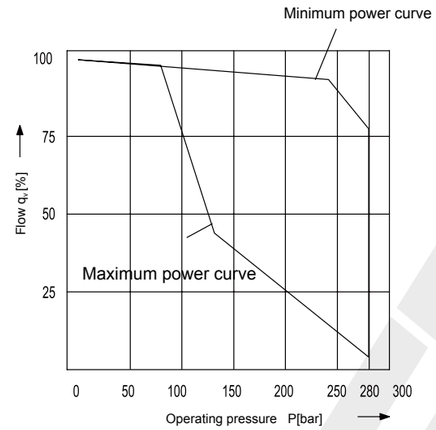
Size	A1	A2	A3	A4	A5	X
18	105	126	40	109	109	M14×1.5;deep12
28	106	136	40	119	119	M14×1.5;deep12
45	106	146	40	129	134	M14×1.5;deep12
71	106	160	40	143	162	M14×1.5;deep12
100	106	165	40	148	229	M14×1.5;deep12
140	127	209	27	183	244	M14×1.5;deep12

DFLR – Pressure, flow and power control

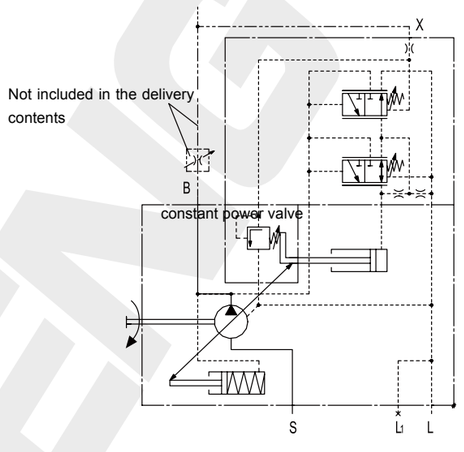
In order to achieve a constant drive torque with varying operating pressures, the swivel angle and with it the output flow from the axial piston pump is varied so that the product of flow and pressure remains constant.

Flow control is possible below the power control curve.

Static characteristic



The power characteristic is set in the factory; when ordering, please state in clear text, e.g. 20 KW at 1500 rpm.



Port

B	service line
S	suction port
L、L_1	case drain port （ L_1 plugged ）
X	pilot pressure

Control data

For pressure control DR data, see page 11

For flow control FR data, see page 15

Beginning of control ——8MPa

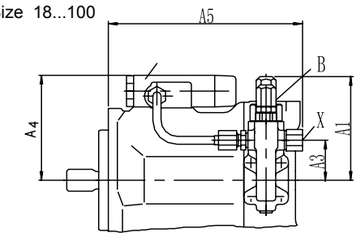
Control fluid consumption—— maximum approx. 5.5 l/min

Flow loss at $q_{v\,max}$, see page 8 and 9

Dimensions of DFLR – Pressure, flow and power control

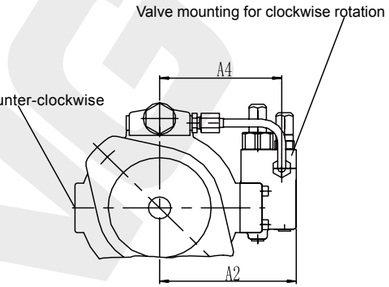
type 12N00, oil port on the side

Size 18...100

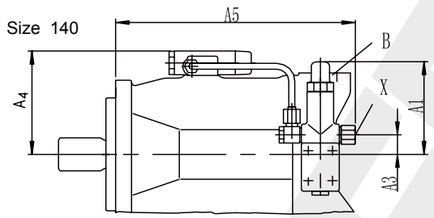


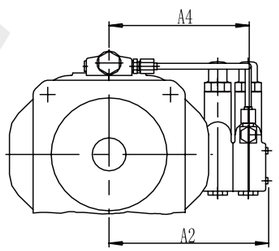
Valve mounting for counter-clockwise rotation

Valve mounting for clockwise rotation



Size 140

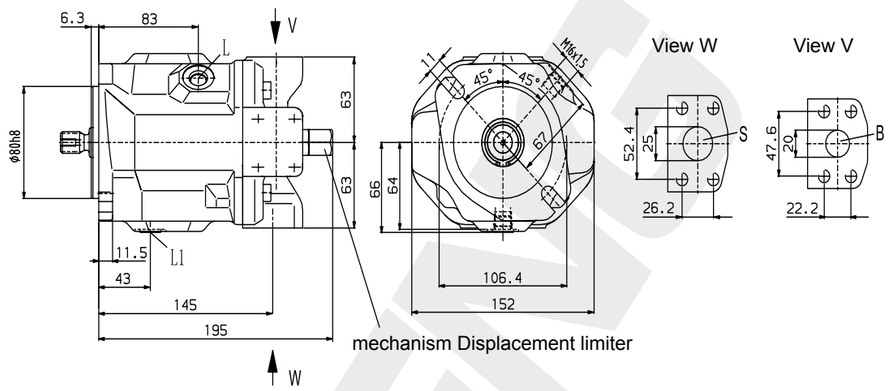




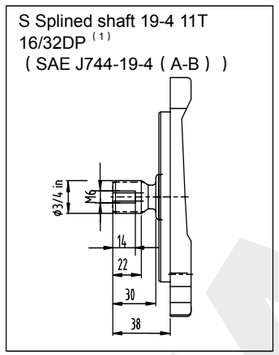
Size	A1	A2	A3	A4	A5	X
28	106	136	40	119	197	M14×1.5;deep12
45	106	146	40	129	212	M14×1.5;deep12
71	106	160	40	143	240	M14×1.5;deep12
100	106	165	40	148	307	M14×1.5;deep12
140	127	209	26	183	314	M14×1.5;deep12

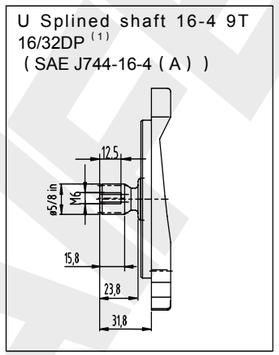
Dimensions size 18

type 12N00, oil port on the side, no through shaft drive （no control valve）



Drive shaft （SAE J744 OCT83）



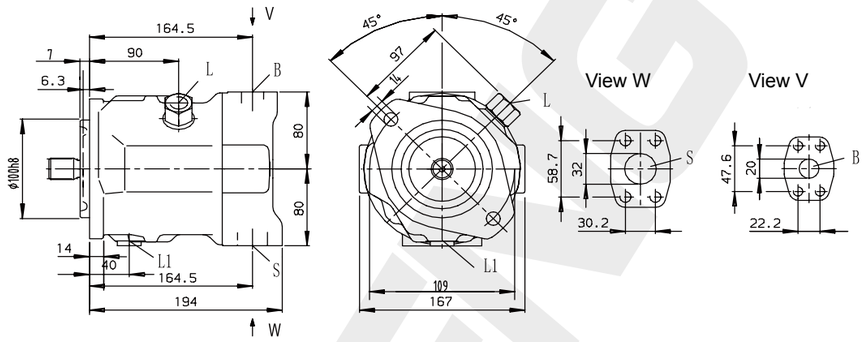


Port					Max. tighten torque
B	service line（standard pressure range）	SAE	J518	3/4 in	
	fastening thread	DIN	13	M10×1.5；Depth 17	60Nm
S	suction line（standard pressure range）	SAE	J518	1 1/4 in	
	fastening thread	DIN	13	M10×1.5；Depth 17	60Nm
L/L_1	case drain	DIN	3852-1	M18×1.5	140Nm

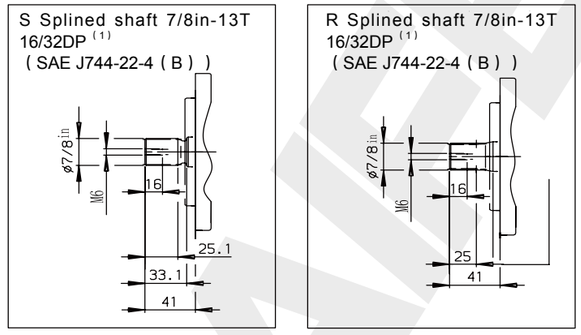
（1）ANSI B92.1a, 30° pressure angle, flat root, side fit, tolerance class 5

Dimensions size 28

type 12N00, oil port on the side, no through shaft drive （ no control valve ）



Drive shaft （ SAE J744 OCT83 ）

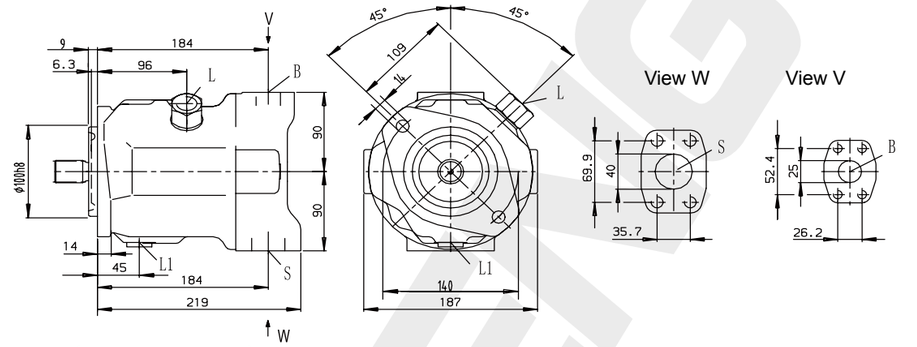


Port					Max. tighten torque
B	service line （ standard pressure range ）	SAE	J518	3/4 in	
	fastening thread	DIN	13	M10×1.5；Depth 17	60Nm
S	suction line （ standard pressure range ）	SAE	J518	1 1/4 in	
	fastening thread	DIN	13	M10×1.5；Depth 17	60Nm
L	case drain	DIN	3852-1	M18×1.5	140Nm
L_1	case drain (plugged)	DIN	3852-1	M18×1.5	140Nm

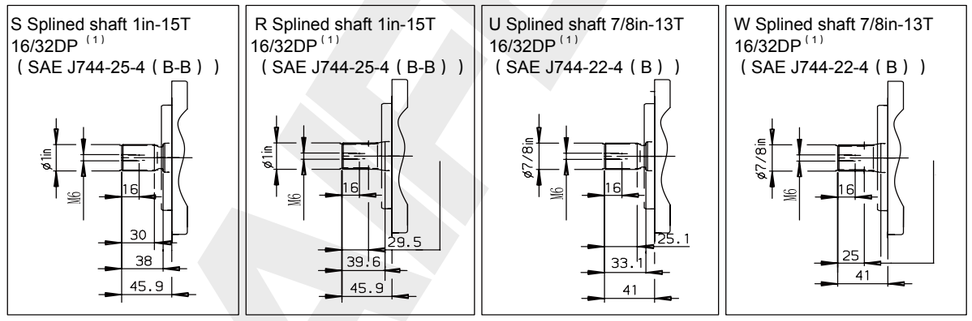
（ 1 ）ANSI B92.1a, 30° pressure angle, flat root, side fit, tolerance class 5

Dimensions size 45

type 12N00, oil port on the side, no through shaft drive （ no control valve ）



Drive shaft （ SAE J744 OCT83 ）

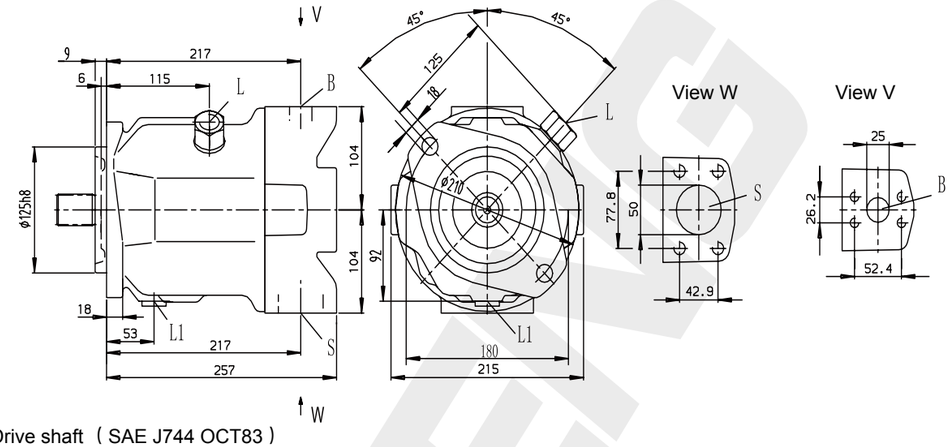


Port					Max. tighten torque
B	service line （ standard pressure range ）	SAE	J518	1 in	
	fastening thread	DIN	13	M10×1.5；Depth 17	60Nm
S	suction line （ standard pressure range ）	SAE	J518	1 1/2 in	
	fastening thread	DIN	13	M12×1.75；Depth 20	130Nm
L	case drain	DIN	3852-1	M22×1.5	210Nm
L_1	case drain (plugged)	DIN	3852-1	M22×1.5	210Nm

（ 1 ）ANSI B92.1a, 30° pressure angle, flat root, side fit, tolerance class 5

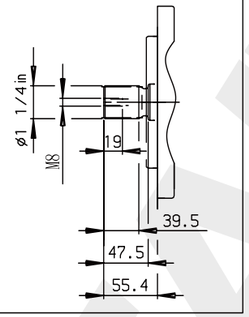
Dimensions size 71

type 12N00, oil port on the side, no through shaft drive （ no control valve ）

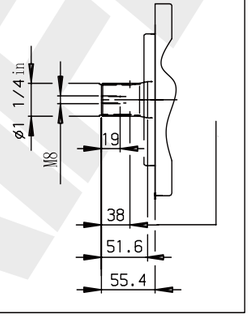


Drive shaft （ SAE J744 OCT83 ）

S splined shaft 1 1/4in-14T
12/24DP(1)
（ SAE J744-32-4 (C) ）



R splined shaft 1 1/4in-14T
12/24DP(1)
（ SAE J744-32-4 (C) ）



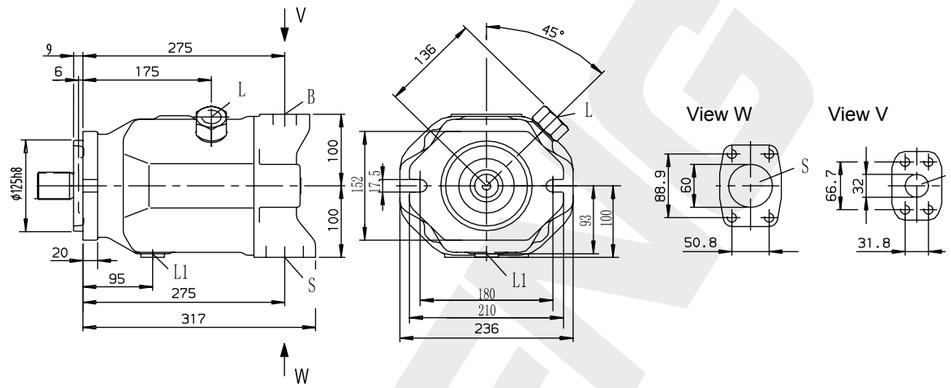
Port

					Max. tighten torque
B	service line （ standard pressure range ）	SAE	J518	1 in	
	fastening thread	DIN	13	M10×1.5；Depth 17	60Nm
S	suction line （ standard pressure range ）	SAE	J518	1 1/2 in	
	fastening thread	DIN	13	M12×1.75；Depth 20	130Nm
L	case drain	DIN	3852-1	M22×1.5	210Nm
L_1	case drain (plugged)	DIN	3852-1	M22×1.5	210Nm

（ 1 ）ANSI B92.1a, 30° pressure angle, flat root, side fit, tolerance class 5

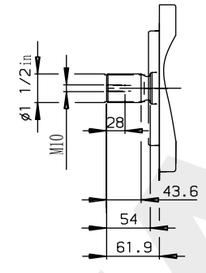
Dimensions size 100

type 12N00, oil port on the side, no through shaft drive （ no control valve ）

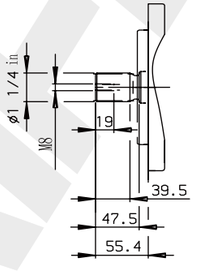


Drive shaft （ SAE J744 OCT83 ）

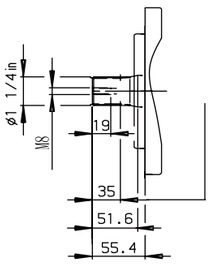
S splined shaft 1 1/2in-17T
12/24 DP(1)
（ SAE J744-38-4 (C-C) ）



U splined shaft 1 1/4in-14T
12/24 DP(1)
（ SAE J744-32-4 (C) ）



W splined shaft 1 1/4in-14T
12/24 DP(1)
(SAE J744-32-4 (C))



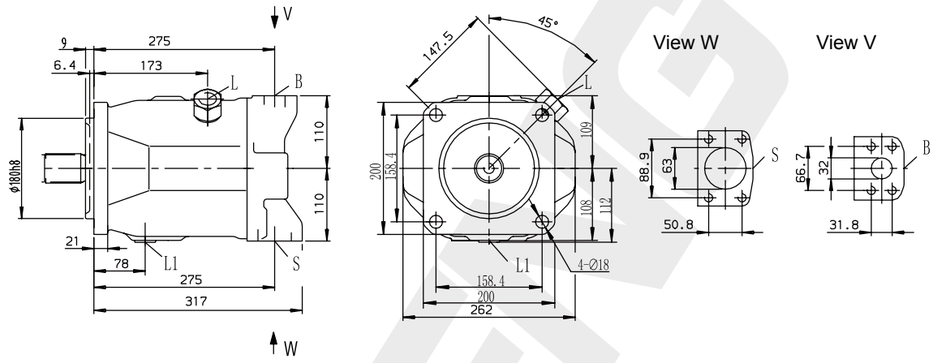
Port

					Max. tighten torque
B	service line （ standard pressure range ）	SAE	J518	1 1/4 in	
	fastening thread	DIN	13	M14×2；Depth 19	205Nm
S	suction line （ standard pressure range ）	SAE	J518	2 1/2 in	
	fastening thread	DIN	13	M12×1.75；Depth 17	130Nm
L	case drain	DIN	3852-1	M27×2	330Nm
L_1	case drain (plugged)	DIN	3852-1	M27×2	330Nm

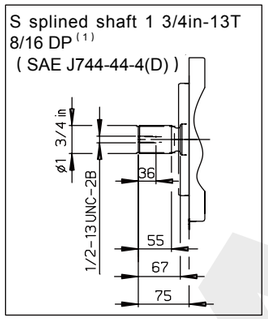
（ 1 ）ANSI B92.1a, 30° pressure angle, flat root, side fit, tolerance class 5

Dimensions size 140

type 12N00, oil port on the side, no through shaft drive （no control valve）



Drive shaft （SAE J744 OCT83）



Port					Max. tighten torque
B	service line （standard pressure range）	SAE	J518	1 1/4 in	
	fastening thread	DIN	13	M14×2；Depth 19	205Nm
S	suction line （standard pressure range）	SAE	J518	2 1/2 in	
	fastening thread	DIN	13	M12×1.75；Depth 17	130Nm
L	case drain	DIN	3852-1	M27×2	330Nm
L_1	case drain (plugged)	DIN	3852-1	M27×2	330Nm

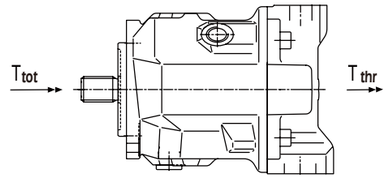
（1）ANSI B92.1a, 30° pressure angle, flat root, side fit, tolerance class 5

Though drive

The A10VSO pump can be supplied with through drive in accordance with the type code on page 2. The through drive version is designated by the code numbers (K01-K24). If no other pumps are fitted by the manufacturer, the simple type designation is sufficient.

In this case, the delivery package comprises:Hub, fixing screws, seal and, if necessary, an adaptor flange.

Maximum allowable torque of input and through drive



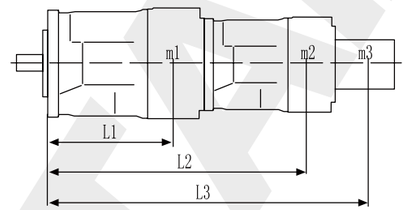
The split in torque between pump 1 and 2 is optional. The max permissible input torque T_{tot} as well as the max. permissible through drive torque T_{thr} may not be exceeded.

Size			18	28	45	71	100	140
Maximum permissible input and through drive torque								
at pump 1 with shaft"S"	T_{tot}	Nm	100	198	319	626	1104	1620
at pump 1 with shaft"R"	T_{tot}	Nm	143	225	400	644	-	-
Max. permissible through-drive torque Tthr								
at pump 1 with shaft"S"	T_{tot}	Nm	80	160	319	492	778	1266
at pump 1 with shaft"R"	T_{tot}	Nm	80	176	365	548	-	-

Max. permissible input torque at pump 1

Max. permissible through-drive torque at through-drive to splined shaft

Permissible moment of inertia



m_1,m_2,m_3 Pump mass (m)

L_1,L_2,L_3 Distance to center of gravity (Nm)

$M_{mper}=(m_1 \bullet L_1+m_2 \bullet L_2+m_3 \bullet L_3) \bullet \frac{1}{102}$ (kg) Nm

Size			18	28	45	71	100	140
Permissible moment of inertia	M_{mper}	Nm	500	880	1370	2160	3000	4500
at dynamic mass acceleration 10g 98,1 m/s^2	M_{mper}	Nm	50	88	137	216	300	450
Mass	m	kg	12	15	21	33	45	60
To center of gravity	L_1	mm	90	110	130	150	160	160

Dimensions: Combination Pumps TFA10VSO+TFA10VSO

TFA10VSO First pump	TFA10VSO Second pump																							
	TFA10VSO 18				TFA10VSO 28				TFA10VSO 45				TFA10VSO 71				TFA10VSO 100				TFA10VSO 140			
	A1	A2	A3	A4	A1	A2	A3	A4	A1	A2	A3	A4	A1	A2	A3	A4	A1	A2	A3	A4	A1	A2	A3	A4
TFA10VSO 18	145	182	327	377	165	204	349	399	184	229	374	424	217	267	412	462	275	388	483	533	275	350	495	545
TFA10VSO 28	-	-	-	-	165	204	369	398	184	229	394	423	217	267	432	461	275	338	503	532	275	350	515	544
TFA10VSO 45	-	-	-	-	-	-	-	-	184	229	413	448	217	267	451	486	275	338	522	557	275	350	534	569
TFA10VSO 71	-	-	-	-	-	-	-	-	-	-	-	-	217	267	484	524	275	338	555	595	275	350	567	607
TFA10VSO 100	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	275	338	631	664	275	350	625	679
TFA10VSO 140	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	275	350	625	688

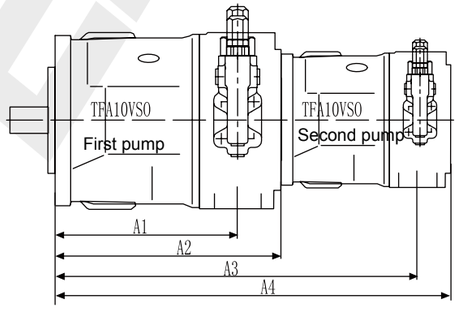
Combination pump

By building on further pumps it is possible to obtain independent circuits:

1.If the combination pump consists of 2 A10VSO and if these are to be supplied assembled then the two order codes should be linked by means of a "+" sign.

Ordering example:

TFA10VS0100DR/31R-PSC12K07+TFA10VS-071DR/31R-PSC12N00



Installation instructions

The installation location is optional. The pump case must be filled with oil during commissioning and operation.

In order to reduce the operating noise level, all connecting lines (suction, pressure and case drain lines) must be de-coupled from the tank, using flexible elements.

Check valves must be avoided in case drain lines.

Under high altitude working conditions, the drain port must be installed with the largest pipe in the standard product according to the oil port specification.

1.Vertical installation（(shaft end pointing upwards)）

The following installation conditions must be considered:

1.1：Installation into the reservoir

Before installation, the pump body is filled with hydraulic oil in a horizontal position.

a）If the minimum fluid level is at or above the pump mounting surface

Close port "L" and open "L1" and "S" to connect to the suction line (see Figure 1).

b）If the minimum oil level is lower than the pump mounting surface: Piping ports "L" and "S" as shown in Fig. 2. Close oil port "L" under the conditions of 1.2.1.

Note: In order to avoid damage to the pump, all connected accessories (such as protective caps, covers, etc.) must be removed before installation.

1.2：Installation outside the reservoir

Before installation, fill the pump case with oil in a horizontal position.

Mounted above the reservoir see figure 2.

Conditions:

A minimum pump inlet pressure (suction pressure) of 0,8 bar is necessary.

Avoid mounting above the reservoir in order to reduce the noise level. Allowable fluid absorption height h is determined by total pressure loss, but not higher than hmax=800mm (immersion depth h tmin=200mm).

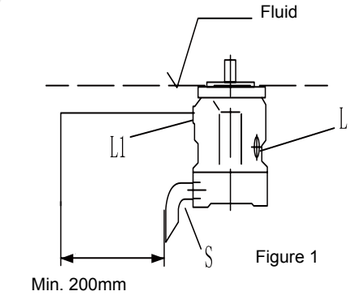


Figure 1

Min. 200mm

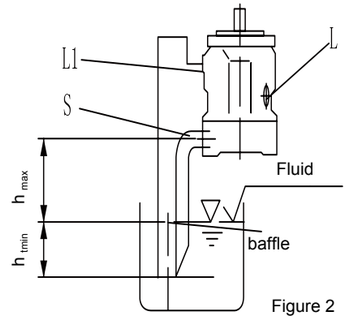


Figure 2

Installation instructions

overall pressure lose $\triangle P_{Ges}=\triangle P_1+\triangle P_2+\triangle P_3 \leq (1-P_{abs\ min})=0.2bar$.

Pipeline pressure loss due to acceleration of fluid

$$\triangle P1=\frac{\rho \bullet L \bullet d_v}{d_t} \times 10^{-5}(bar)$$

ρ=fluid viscosity (kg/m^3)

L=pipe length (m)

d_v/d_t=fluid velocity change rate (m/s^2)

$\triangle P_2$:Pressure loss due to hydrostatic head

$\triangle P_2=h \bullet \rho \bullet g \bullet 10^{-5}$ (bar)

$\triangle P_3$=Pressure loss due to piping (elbows, etc.)

h=height (m)

ρ=fluid viscosity (kg/m^3)

g=acceleration of gravity=9.81m/s^2

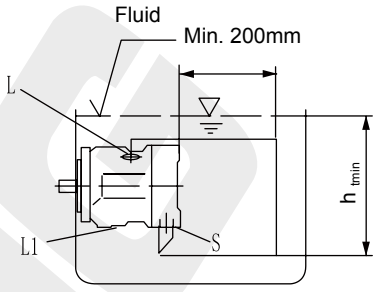


Figure 3

1. Horizontal installation

When installed, port "L" or "L_1" is in the upward position.

2.1: installed in the reservoir

a) If the lowest fluid level is higher than the upper surface of the pump: block "L_1", open "L" and "s", connect the suction pipe to the suction port S, and the "L" pipe should be at least 200mm away from the suction pipe. (See Figure 3):

b) If the minimum fluid level is at or below the upper surface of the pump: ports "L" and "S" be piped as shown in Figure 4. block "L_1". The conditions meet 1.2.1.

Note: In order to avoid damage to the pump, all connected accessories (such as protective caps, covers, etc.) must be removed before installation.

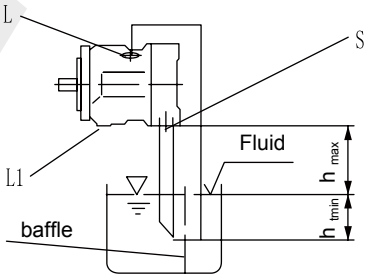


Figure 4

2.2 installed outside of the reservoir

Fill the pump before working start.

Piping port “S” and piping case drain port “L” and “L_1” which in the highest position.

a) Installation above the reservoir, figure 4

conditions meet 1.2.1.

b) Installation below the reservoir

As figure 5, piping port “S” and “L_1”, block “L”.

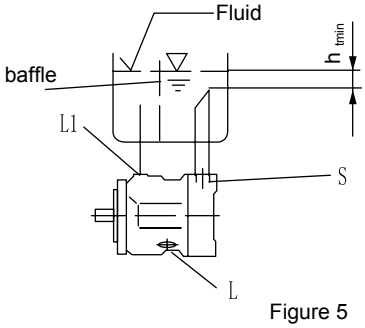


Figure 5

High Pressure Axial Piston Pump
TFA10V/53 Series

TAIFENG

- Size: 18 to 125
- Series: 53
- Rated Pressure: 25 MPa
- Max. pressure: 31.5 Mpa

Features

- Axial piston swashplate design for hydrostatic drives in an open circuit
- The flow is proportional to the drive speed and the displacement, steplessly varied by adjustment of swashplate angle.
- Powerful bearing guarantees long service life.
- High speed rotation allowed
- Favorable power/weight ratio, small size
- Low noise level
- Excellent suction ability
- Drive shaft can bear axial and radial loading.
- Flow and pressure control
- Power control
- Short response time

Contents

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E0 Electric proportional power control 39
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TAIFENG®

Ordering code

01	02	03	04		05	06	07		08	09	10	11	12
TFA10V	O		LA5DS	/	5	3	R	-	V	S	C	12	N00

Axial piston unit

01	Variable pump,swashplate design,used for mobile machinery Rated pressure 25Mpa Max.pressure 31.54Mpa	TFA10V

Operation mode

02	Pump,open circuit	o

Size

03	Displacement(ml/r)	18	28	45	63	72	76	85	105	125	

Operation mode

			18	28	45	63	72	76	85	105	125	
04	Pressure control		●	●	●	●	●	●	●	●	●	DR
	With flow,hydraulic	X-T port open	○	○	○	○	○	○	○	○	○	DFR
		X-T port close	●	●	●	●	●	●	●	●	●	DFR1
	With remote pressure control		○	○	○	○	○	○	○	○	○	DRG
	With flow and pressure constant power control,X-Tport close											
	Min.adjustment pressure	3.6-7.0Mpa LA6DS	●	●	●	●	●	●	●	●	●	LA6DS
		7.1-10.5Mpa LA7DS	●	●	●	●	●	●	●	●	●	LA7DS
		10.6-14.0Mpa LA8DS	●	●	●	●	●	●	●	●	●	LA8DS
		14.1-23.0Mpa LA9DS	●	●	●	●	●	●	●	●	●	LA9DS
	Electrical proportional power control 24V proportional relief valve		○	○	○	○	○	●	●	●	●	E0
		12V proportional relief valve	○	○	○	○	○	●	●	●	●	E1

Series

05		5

Index

06		3

Direction of rotation

			18-125	
07	Viewed on drive shaft	clockwise	●	R
		counter clockwise	○	L

Seals

08	FKM (fluor-caoutchouc)	V
	NBR (nitrile rubber)	P

Drive shaft

09	Splined shaft SAE J744 standard shaft	S
	Similar to shaft"S" however for higher input torque	R
	Splined shaft SAE J744 reduced diameter, not for through drive	U
	Similar to shaft"U" ,higher torque, not for through drive	W

Mounting flange

10	SAE 2 hole	C
	SAE 4 hole	D

Service line port

11	SAE flange ports at rear, metric thread	11
	SAE flange ports on side--opposite side, metric thread	12

Through drive

12	Without through drive	N00

Hydraulic fluid

Mineral oil

Operating viscosity range

For optimum efficiency and service life we recommend that the operating viscosity(at operating temperature) be selected in the range

V_{opt}=Opt. operating viscosity 16...36mm^2/s relating to reservoir temperature (open circuit)

Limits of viscosity range

The limit of viscosity is:

V_{min}=10mm^2/s

Short-term (t ≤ 1 min) ,at max perm. case drain temperature of 115 ℃.

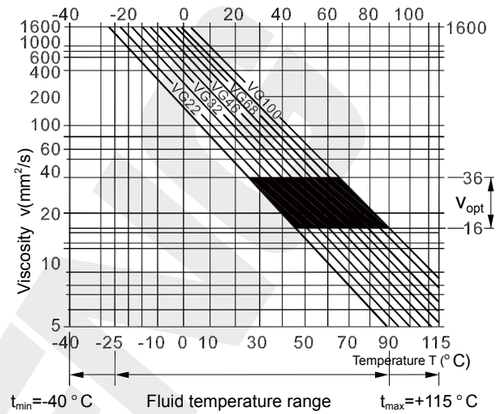
Please also ensure that the max. case drainage temperature of 115℃ is not exceeded in localized areas(for instance, in the bearing area). The fluid temperature in the bearing area is approx. 5K higher than the average case drain temperature.

V_{max}=1600mm^2/s

Short-term (t ≤ 1 min), on cold start (p ≤ 3MPa, n ≤ 1000 rpm, t_{min}= -25 ℃)

Depending on the installation situation, special measures are necessary at temperatures between -40 ℃ and -25 ℃. Please contact us for more information.

Selection diagram



Notes on the selection of hydraulic fluid

In order to select the correct hydraulic fluid, it is necessary to know the operating temperature in the reservoir (open circuit) in relation to the ambient temperature.

The hydraulic fluid should be selected so that within the operating temperature range, the viscosity lies within the optimum range (Vopt), see shaded section of the selection diagram. We recommend to select the higher viscosity grade in each case.

Example: At an ambient temperature of X °C, the operating temperature is 60 °C. In the optimum operating viscosity range (Vopt ,shaded area) this corresponds to viscosity grades VG 46 resp.VG 68, VG 68 should be selected.

Important:

The case drain temperature is influenced by pressure and input speed and is always higher than the reservoir temperature. However, at no point in the component may the temperature exceed 115 °C.

If the above conditions cannot be met, due to extreme operating parameters or high ambient temperature, please contact us.

Filtration of the hydraulic fluid

The finer the filtration the better the cleanliness level of the hydraulic fluid and the longer the service life of the axial piston unit.

In order to guarantee the functional reliability of the axial piston unit ,the minimum cleanliness level is ISO/DIS 4406 20/18/15.

At very high hydraulic fluid temperatures (90 °C-115°C) ,the minimum cleanliness level is ISO/DIS 4406 19/17/14.

If the above cleanliness levels cannot be maintained, please contact us.

High Pressure Axial Piston Pump
TFA10V/53 Series
TAIFENG

Technical data

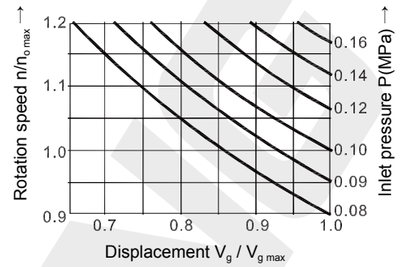
Operation pressure range–inlet side

Absolute pressure at S port (inlet)

$P_{abs\ min}$ ---------- 0.8Mpa

$P_{abs\ max}$ ---------- 0.5Mpa

Increase inlet pressure P_{abs} at suction port or reduce allowed speed of the pump at maximum displacement



Operation pressure range–outlet side

Pressure at port B

Rated pressure P_n ---------- 25Mpa

Rated pressure P_{max} ---------- 31.5Mpa

Case drainage pressure

Drainage (L, L1/2) max. permitted pressure can be max. 0.05Mpa higher than inlet pressure of S port,but cannot be higher than 0.2 Mpa.

Flow direction

From port S to B

Table of values

Size				18	28	45	63/72	76/85	105/125
Max. displacement		$V_{g\ max}$	ml/r	18	28	45	63/72	76/85	105/125
Max. speed 1)	at $V_{g\ max}$	$n0_{max}$	rpm	3300	3000	2700	2600	2400	2200
	at V_g<$V_{g\ max}$	$n0_{max\ zul}$	rpm	3960	3600	3250	3140	3000	2600
Flow	at $n0_{max}$	$q_{vo\ max}$	L/min	59	84	117	169	182	231
	at nE=1500rpm	$q_{vE\ max}$	L/min	27	42	68	95	114	157
Max.power	at $n0_{max}$	$p_{0\ MAX}$	kw	25	35	55	69	75	96
	at nE=1500rpm	$p_{E\ MAX}$	kw	11	18	32	40	47	65
Max.torque	at $V_{g\ max}$ ($\triangle$P=25Mpa)	T_{max}	Nm	71	111	200	242	302	417
	at $V_{g\ max}$ ($\triangle$P=10Mpa)	T	Nm	29	45	72	97	121	167
Filling capacity		V	L	0.25	0.3	0.6	0.8	0.8	1
		m	kg	13	18	24	28	28	45

1) Values are applicable for an absolute pressure at suction port s be 0.1Mpa

Technical data

Calculation of characteristics

Flow $qv=V_g \times n \times \eta_v /1000$ (L/min)

Drive torque $T=1.59 \times V_g \times \triangle P /1000 \times \eta_{mh} = V_g \times \triangle P /20 \times \pi \times \eta_{mh}$ (Nm)

Power $P=2\pi \times T \times n/60000 = qv \times \triangle P /600 \times \eta t$ (KW)

V_g= Displacement per revolution (ml/r)

$\triangle P$= Pressure differential (bar)

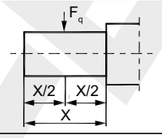
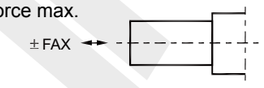
n= Speed (rpm)

η_v Volumetric efficiency

η_{mh} Mechanical-hydraulic efficiency

η_t Total efficiency ($\eta_t = \eta_v \times \eta_{mh}$)

Permissible radial and axial loading on the drive shaft

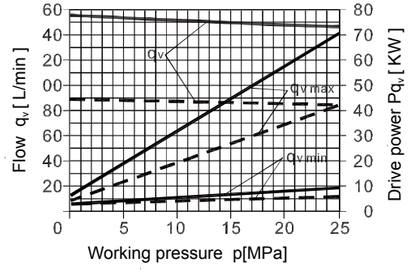
Size					63
Radial force max.		X/2	$F_{q\,max}$	N	1700
Axial force max.			F_{ax}	N	2000

Working curve of pump with pressure control

Drive power and flow (Mineral oil VG46,t=50℃)

----------n= 1500rpm

——————n= 2700rpm

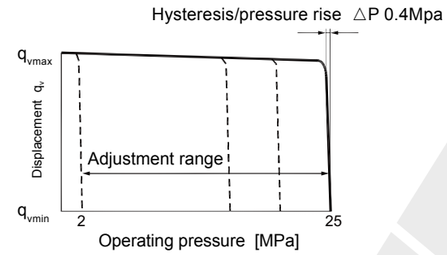


DR–Pressure control

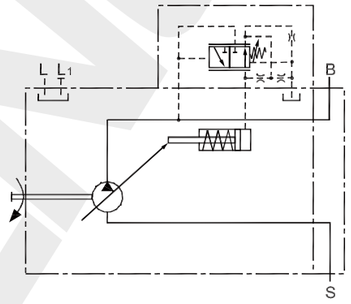
The pressure(constant pressure) control keeps system pressure constant within the pump control range. The pump only supplies as much hydraulic fluid as is required by the consumers.The pressure can be set steplessly at the pilot valve.

Static characteristic

(at n_1=1500rpm;t_{fluid}=50°C)



Circuit diagram



Dynamic characteristic

This curve describe the average test value for inside-reservoir installation.

Working parameters

n= 1500rpm

t_{fluid}=50°C

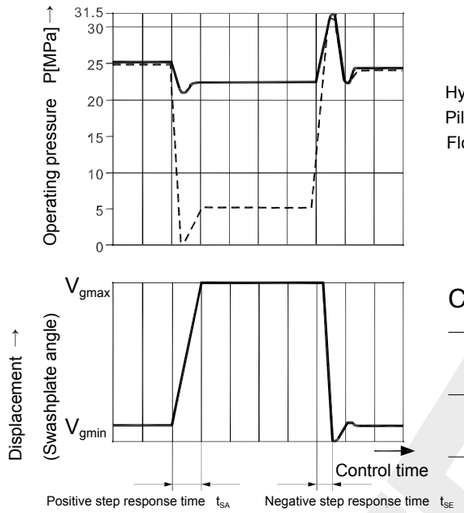
Pipe circuit drain pressure 31.5 MPa

Increase circuit pressure progressively through relief valve 1m from pump pressured oil outlet

Port

B	Service line port
S	Suction line port
L,L_1	Case drain(L_1 plugged)

Control parameter



Hysteresis/repetition accuracy P-------Max.0.3Mpa
Pilot oil flow requirement ----------Max.about 3l/min
Flow loss q_{max} See page 6

Control time

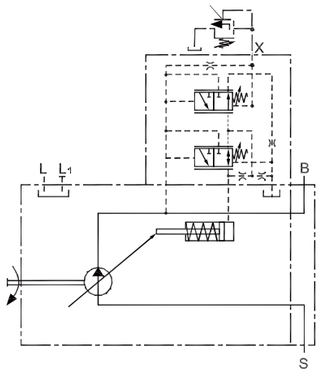
Size	t_{sa}(ms) at 5Mpa	t_{sa}(ms) at 22Mpa	t_{SE}(ms) at 25Mpa
63	100	80	30

DRG ––Pressure control, remotely operated

The DRG control valve can set the max. outlet pressure of pump remotely below the DR control valve spool set value. A pressure relief valve can be externally piped to port X for remote setting of pressure. This relief valve is not included in the delivery contents.

The differential pressure at the DRG control valve is set as standard to 2Mpa). This results in a approx.1.5 l/min pilot oil flow. If other setting is required (range from 1~2.2Mpa), please state in clear text.

Not included in the delivery contents



Port

B Service line port
S Suction line port
L,L_1 Case drain(L_1 plugged)

Control parameter

See DR control page 7

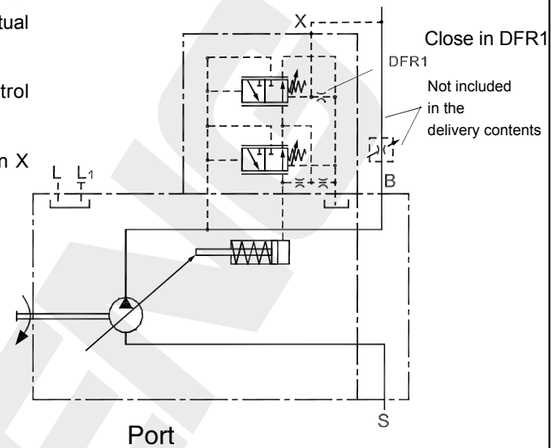
DFR/DFR1 Pressure/flow control

In addition to the pressure control function, the pump flow to the actuator may be varied by means of a differential pressure over an adjustable orifice (e.g. directional valve). The pump flow is equal to the actual required flow by the actuator.

The pressure control overrides the flow control function.

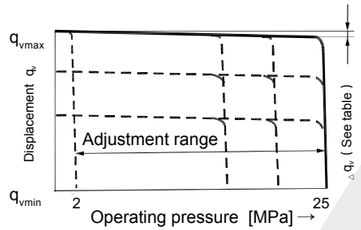
The DFR1 version has no connection between X and the case.

Circuit diagram



Static characteristic

(at $_{n1}$=1500rpm;t_{fluid}=50°C)



Port

B Service line port
S Suction line port
L,L_1 Case drain(L_1 plugged)
X Pilot oil port

Dynamic flow control working curve

This curve describes the average test value for inside-reservoir installation.

Step response time

Size	t_{sa}(ms) at 5Mpa	t_{sa}(ms) at 22Mpa	t_{SE}(ms) at 25Mpa
63	90	30	75

See page 6 for pressure control parameter

Maximum flow deviation (hysteresis and increase) measured with drive speed n = 1500 rpm.

$\triangle q_{vamx}$	L/min	2.5

Pressure difference △P

Standard setting: 1.4MPa. If another setting is required, please state in clear text.

Relieving the load on port X to the reservoir(outlet port B close) results in a zero stroke ("standby") pressure which lies about 1.8±0.2MPa，depending on the setting of $_{\triangle}$P.

Control fluid consumption DFR....max. approx. 3~4.5L/min
Control fluid consumption DFR1 .....max. approx. 3L/min

LA...Pressure, flow and power control

In order to achieve a constant drive torque with varying operating pressures, the swivel angle and with it the output flow from the axial piston pump is varied so that the product of flow and pressure remains constant.

Flow control is possible within the range of power control curve.

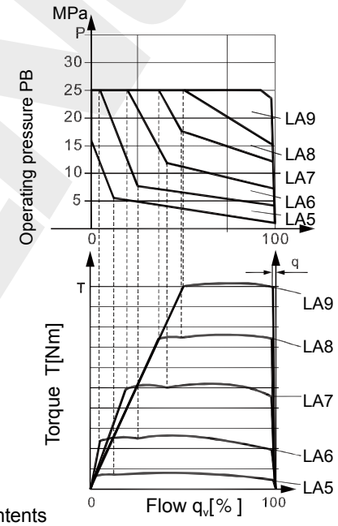
Control data

See page 7 the pressure control date

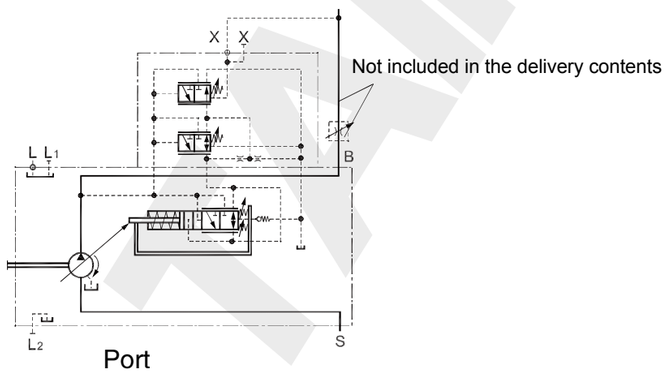
See page 9 the pressure and flow control date

Max. Consumption of control fluid approx. 3.0L/min

Beginning of control(Mpa)	Torque(Nm)	Ordering code
1.0~3.5	15~43	LA5
3.6~7.0	43.1~83	LA6
7.1~10.5	83.1~119	LA7
10.6~14.0	119.1~157	LA8
14.1~23.0	157.1~265	LA9



Circuit diagram



Port

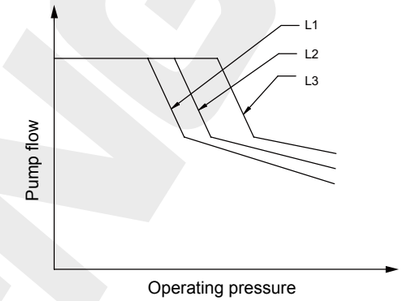
B	Service line port
S	Suction line port
L,L_1	Case drain(L_1 plugged)
X	Pilot oil port

E0 Electro proportional power control

The pump output torque can be controlled by different current input to solenoid.Torques required by various operation modes can be fulfilled for excavator.

Coil parameters

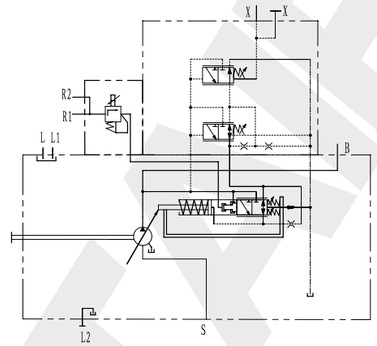
(V)	(A)	(Ω)	
12	0.80	7.3 ± 10%(20℃)	H(180℃)
24	0.75	21.2 ± 10%	UP to IP6K6/IPX9K



Connector (deutsh or Amp)

DEUTSCH:DT04-2P-E005
AMP:174354-2、173706-1

Circuit diagram



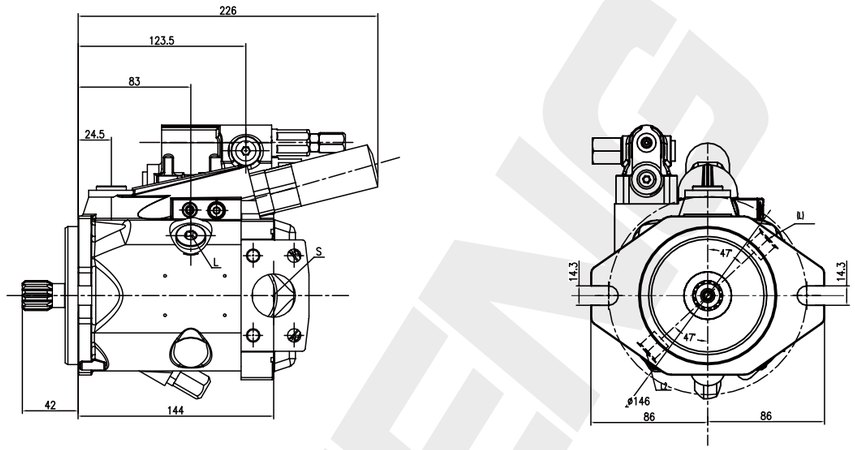
Port

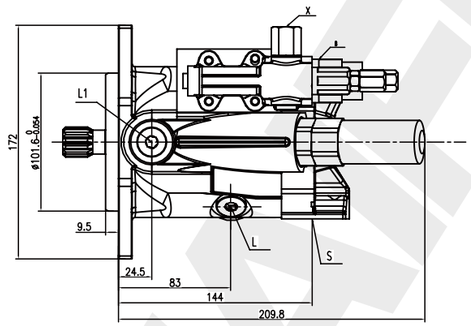
B	Service line port
S	Suction line port
L,L_1	Case drain(L_1 plugged)
X,R1,R2	Pilot oil port

Mounting dimensions

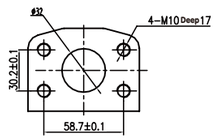
Dimensions 18

Mounting flange “ C ”

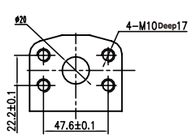




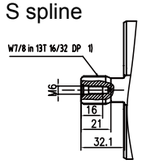
S Suction line port



B Service line port



S spline



Port

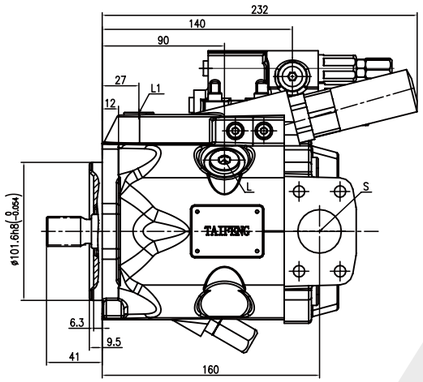
B	Service line port,SAE flange fastening thread	SAE J518C	Φ20 M10;Deep17
S	Suction line port,SAE flange fastening thread	SAE J518C	Φ32 M10;Deep17
$L/L_1/L_2$	Case drain	ISO 11926	3/4-16UNF-2B Deep 12
X	Pilot oil port	ISO 11926	7/16-20UNF-2B Deep 11.5

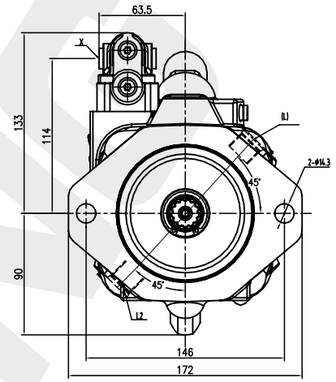
1)SAE J744 Spline: ANSI B91.1a-1976,30° pressure angle, flat root, side fit,tolerance class 5

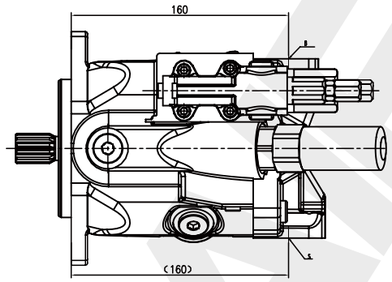
Mounting dimensions

Dimensions 28

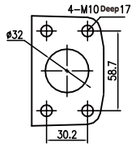
Mounting flange “ C ”



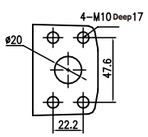




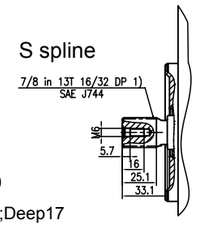
S Suction line port



B Service line port



S spline



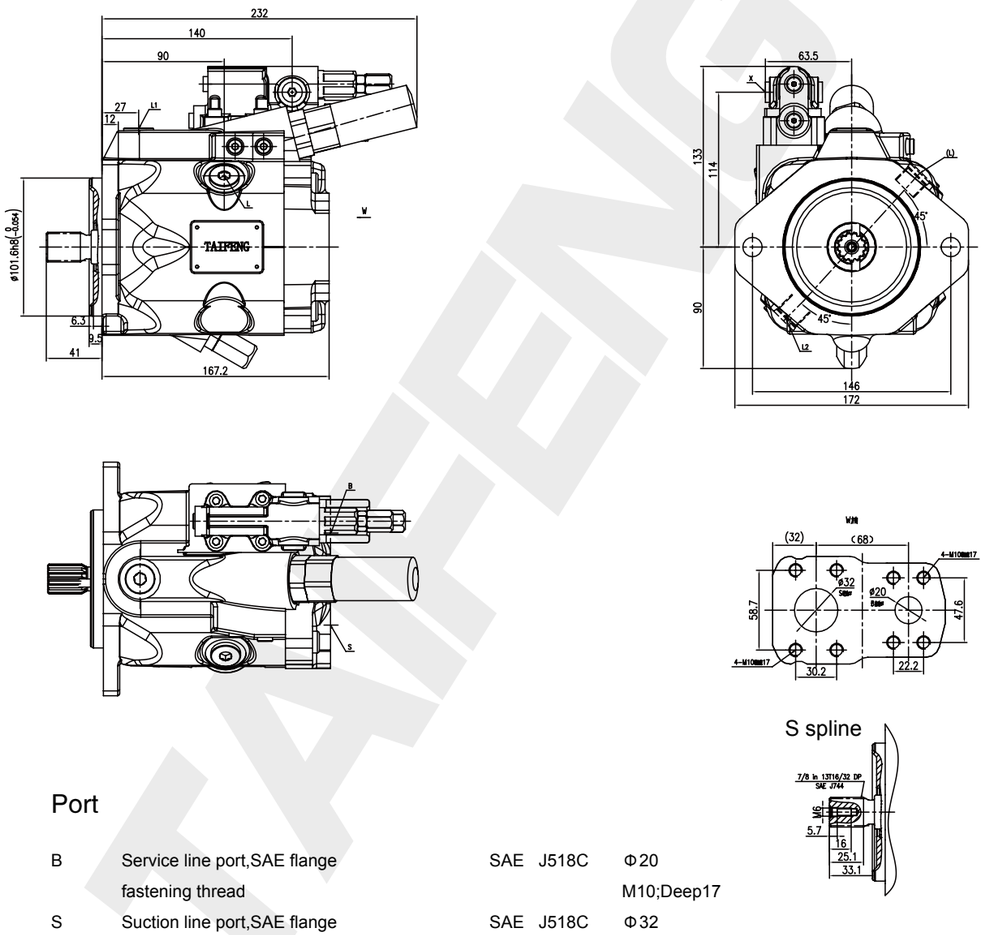
Port

B	Service line port,SAE flange fastening thread	SAE J518C	Φ20 M10;Deep17
S	Suction line port,SAE flange fastening thread	SAE J518C	Φ32 M10;Deep17
$L/L_1/L_2$	Case drain	ISO 11926	3/4-16UNF-2B Deep 12
X	Pilot oil port (blocked during DR control)	ISO 11926	7/16-20UNF-2B Deep 11.5

1)SAE J744 Spline: ANSI B91.1a-1976,30° pressure angle, flat root, side fit,tolerance class 5

Mounting dimensions

Dimensions 28 port at rear side
Mounting flange “ C ”



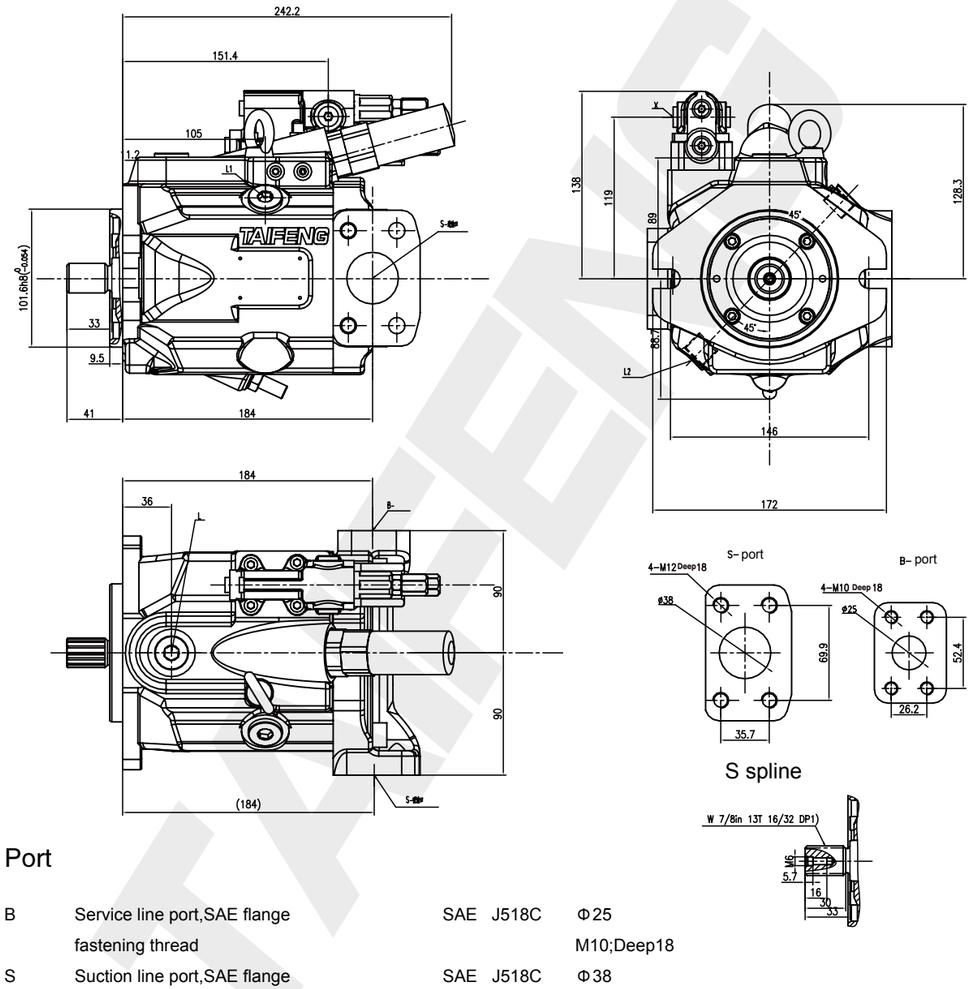
Port

B	Service line port,SAE flange fastening thread	SAE J518C	Φ20 M10;Deep17
S	Suction line port,SAE flange fastening thread	SAE J518C	Φ32 M10;Deep17
$L/L_1/L_2$	Case drain	ISO 11926	3/4-16UNF-2B Deep 12
X	Pilot oil port (blocked during DR control)	ISO 11926	7/16-20UNF-2B Deep 11.5

1)SAE J744 Spline: ANSI B91.1a-1976,30° pressure angle, flat root, side fit,tolerance class 5

Mounting dimensions

Dimensions 45
Mounting flange “ C ”



Port

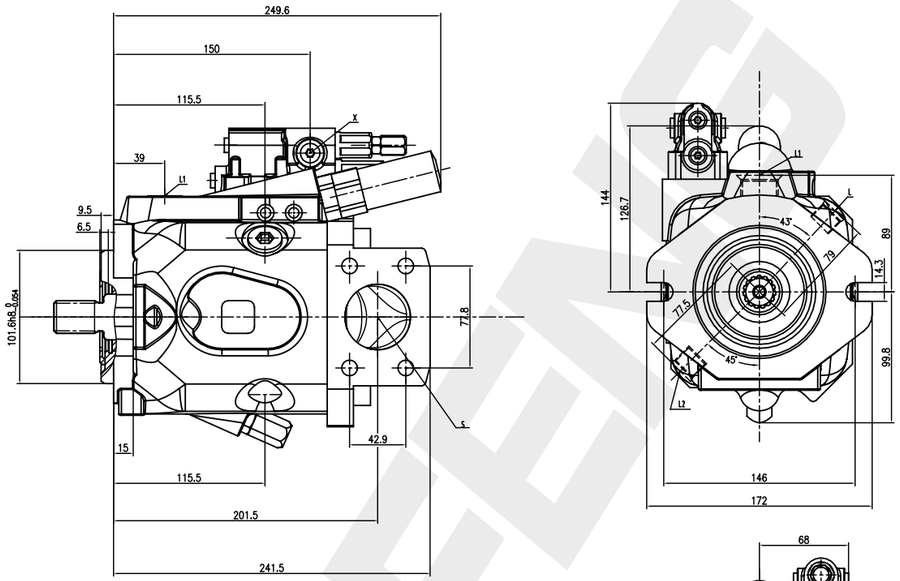
B	Service line port,SAE flange fastening thread	SAE J518C	Φ25 M10;Deep18
S	Suction line port,SAE flange fastening thread	SAE J518C	Φ38 M12;Deep18
$L/L_1/L_2$	Case drain	ISO 11926	7/8-14UNC-2B Deep 13
X	LS Pilot oil port	ISO 11926	7/16-20UNF-2B Deep 11.5

1)SAE J744 Spline: ANSI B91.1a-1976,30° pressure angle, flat root, side fit,tolerance class 5

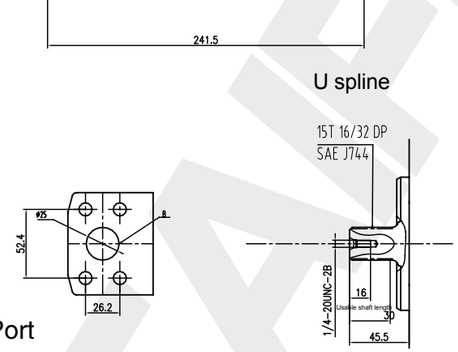
Mounting dimensions

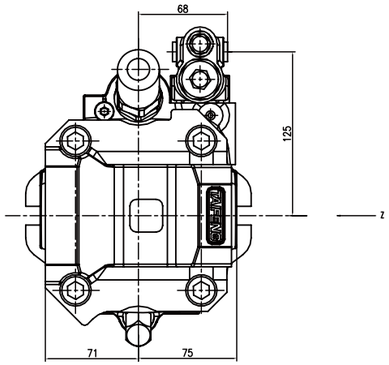
Dimensions 63/72

Mounting flange “ C ”



U spline





Port

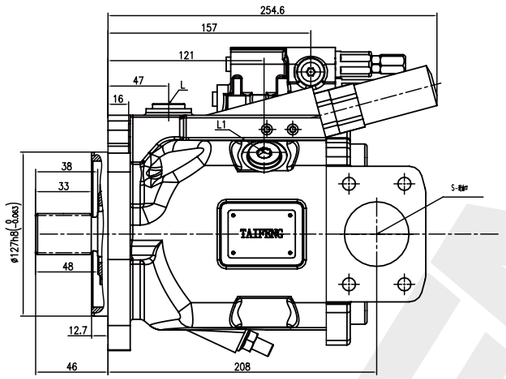
B	Service line port,SAE flange fastening thread	SAE J518C	Φ25 M10;Deep17 60N·m
S	Suction line port,SAE flange fastening thread	SAE J518C	Φ50 M12;Deep20 130N·m
$L/L_1/L_2$	Case drain (L_1/L_2 blocked)	ISO 11926	7/8-14UNF-2B 240N·m
X	Pilot oil port (blocked during DR control)	ISO 11926	7/16-20UNF-2B Deep 11.5 40N·m

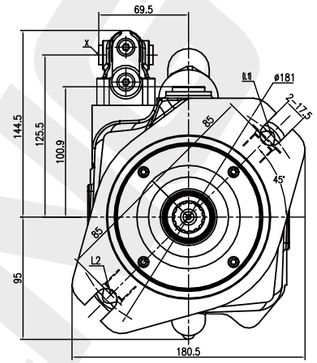
1)SAE J744 Spline: ANSI B91.1a-1976,30° pressure angle, flat root, side fit,tolerance class 5

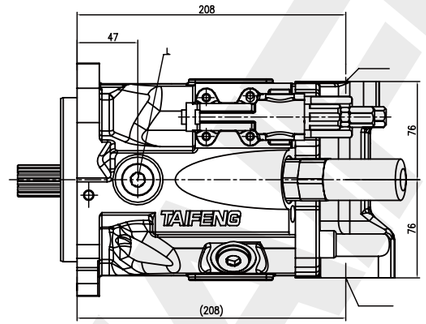
Mounting dimensions

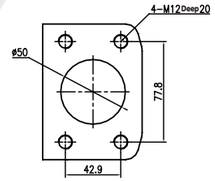
Dimensions 76/85

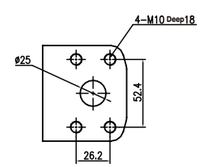
Mounting flange “ C ”



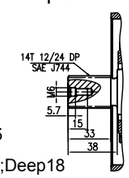




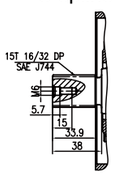




S spline



U spline



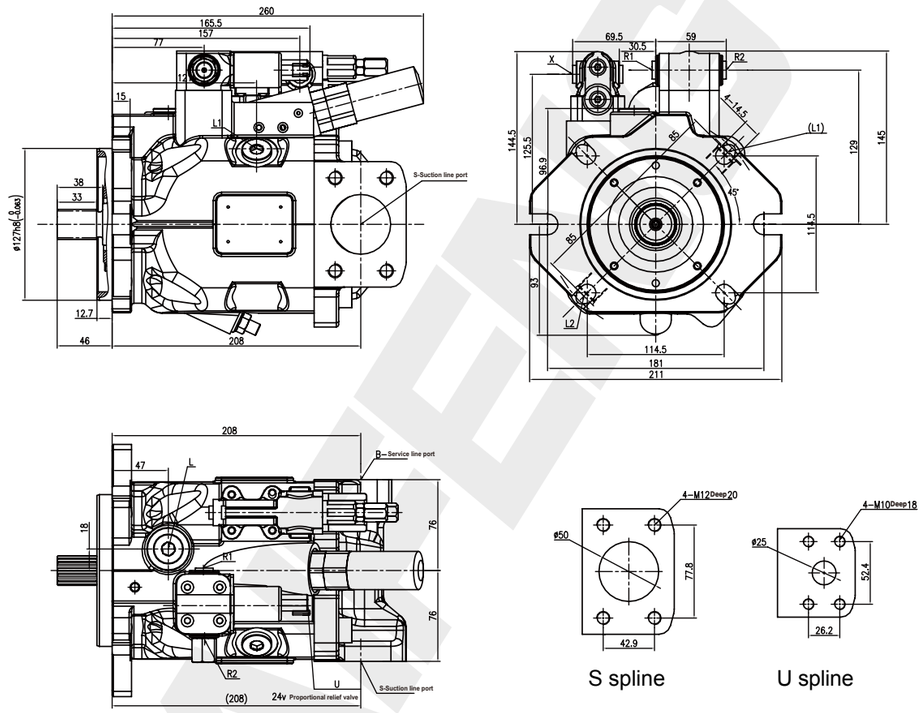
Port

B	Service line port,SAE flange fastening thread	SAE J518C	Φ25 M10;Deep18
S	Suction line port,SAE flange fastening thread	SAE J518C	Φ50 M12;Deep20
$L/L_1/L_2$	Case drain	ISO 11926/1	3/4-16UNC-2B Deep 16
X	LS Pilot oil port	ISO 11926/1	7/16-20UNF-2B Deep 11.5

1)SAE J744 Spline: ANSI B91.1a-1976,30° pressure angle, flat root, side fit,tolerance class 5

Mounting dimensions

Dimensions 76/85 Electrical control power
Mounting flange “ D ”



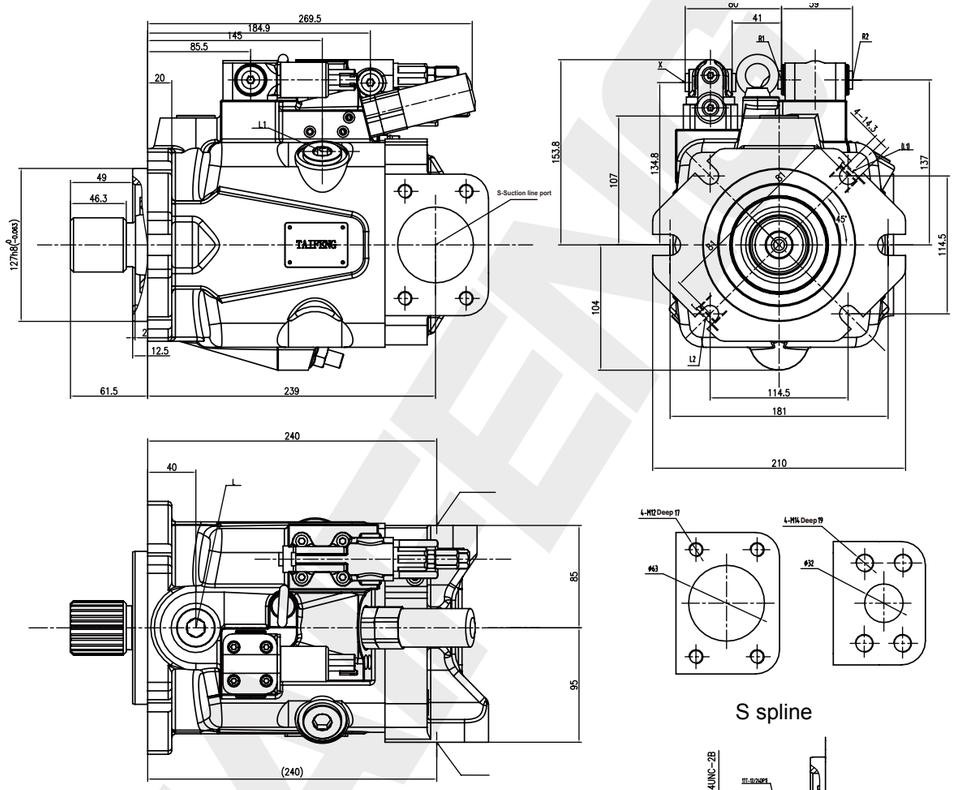
Port

B	Service line port,SAE flange fastening thread	SAE J518C	Φ25 M10;Deep18
S	Suction line port,SAE flange fastening thread	SAE J518C	Φ50 M12;Deep20
$L/L_1/L_2$	Case drain	ISO 11926/1	3/4-16UNF-2B Deep 16
X	LS Pilot oil port	ISO 11926/1	7/16-20UNF-2B Deep 11.5
R_1/R_2		ISO 11926/1	7/16-20UNF-2B Deep 11.5

1)SAE J744 Spline: ANSI B91.1a-1976,30° pressure angle, flat root, side fit,tolerance class 5

Mounting dimensions

Dimensions 105/125 Electrical control power
Mounting flange “ D ”



Port

B	Service line port,SAE flange fastening thread	SAE J518C	Φ32 M14;Deep19
S	Suction line port,SAE flange fastening thread	SAE J518C	Φ63 M12;Deep17
$L/L_1/L_2$	Case drain	ISO 11926	1/16-12UN-2B Deep 15
X	LS Pilot oil port	ISO 11926	7/16-20UNF-2B Deep 11.5

1)SAE J744 Spline: ANSI B91.1a-1976,30° pressure angle, flat root, side fit,tolerance class 5

Installation instructions

Select any installation position. The axial piston unit must be filled with hydraulic fluid during commissioning and operation.

To achieve favorable noise values, decouple all connections between ports(suction port,service port, pilot oil port and drain port) and reservoir using elastic elements.

A check valve in the case drain line must be avoided.

For high altitude areas, drainage port must be connected with the max.size pipeline selected from standard products of each port size.

1.Vertical installation (shaft extension up)

The following requirements must be observed.

1.1 Inside–reservoir installation

Fill the pump with hydraulic fluid in horizontal position before installation.

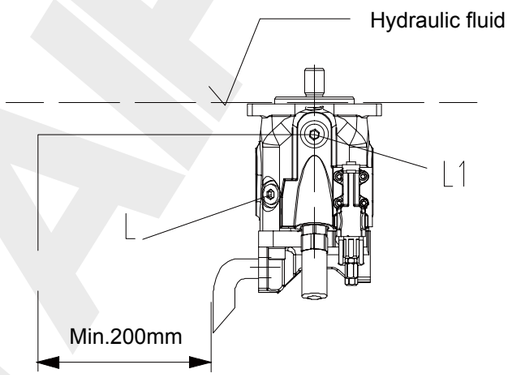
a) when the minimum fluid level is equal to or above pump mounting face

Close port“L”,open “L1”and “S”to connect with suction line. See picture 1.

b) when the minimum fluid level below the mounting face, see picture 2

Pipe port “L” and “S”. Close port “L” in the condition of 1.2.1.

Note: To avoid damage of pump, all connecting accessories(e.g. protection cover,cap) must be removed before installation.



picture 1

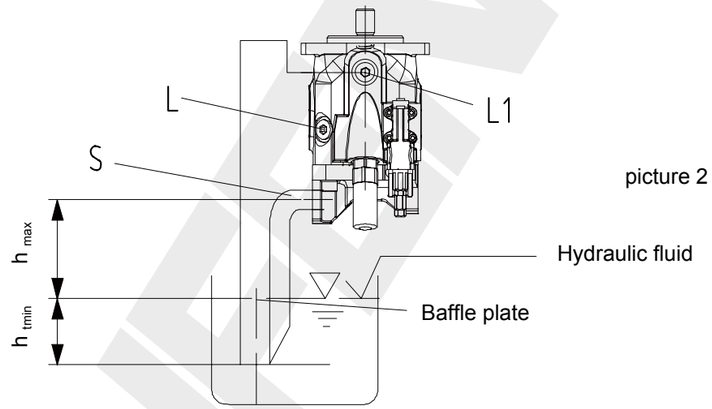
1.2 Out–reservoir installation

Fill the pump with hydraulic fluid before installation and keep in horizontal position. Above-reservoir installation see picture 2.

Restrictions

1.2.1The minimum suction pressure must not fall below $P_{abs\ min}$=0.8bar for static or dynamic loading.

Note: To achieve favorable noise values,try to avoid above-reservoir installation.The permissible suction height results from the total pressure loss. However, it must not be higher than h_{max}=800mm(immersion depth h_{tmin}=200mm)



picture 2

Total pressure loss $\triangle P_{Ges} = \triangle P_1 + \triangle P_2 + \triangle P_3 \leq (1 - P_{abs\ min}) = 0.2bar$

$\triangle P_1$:Pipeline pressure loss due to oil acceleration

$$\triangle P_1 = \frac{\rho \cdot L \cdot dv}{dt} \times 10^{-5} (bar)$$

ρ= Fluid viscosity (kg/m^3)
L =Pipe length (m)
dv/dt = Fluid speed change rate(m/s^2)

$\triangle P_2$:Pressure loss due to static head

$\triangle P_2$: =h•ρ•g•10^{-5} (bar)

$\triangle P_3$:Pipeline pressure loss (bend, etc.)

h = Height (m)
ρ= Fluid viscosity (kg/m^3)
g = Gravitational acceleration=9.81m/s^2

2.Horizontal installation

Port “L”or “L_1”is in up position during installation.

2.1 Inside–reservoir installation

a)when the minimum fluid level is above pump upper face

Close port“L_1”,open “L”and “S”,connect suction pipe with suction port S.The distance between “L” and suction pipe should be no less than 200mm. See picture 3.

b) when the minimum fluid level is equal to or below the pump upper face, see picture 4 the piping of “L”and “S”port,close “L_1”.Conform to 1.2.1

Note: To avoid damage of pump, all connecting accessories(e.g. protection cover,cap) must be removed before installation.

2.2 Out–reservoir installation

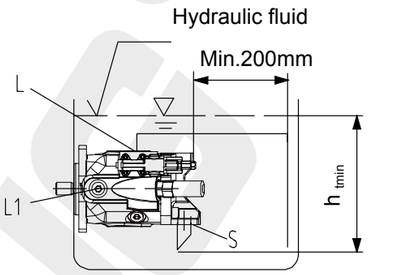
Fill the pump with hydraulic fluid before start.

Pipe port “S”and the highest drainage port “L”or “L_1”.

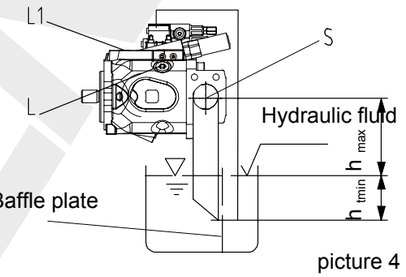
a)Above-reservoir installation see picture 4.Conform to 1.2.1.

b)Below-reservoir installation

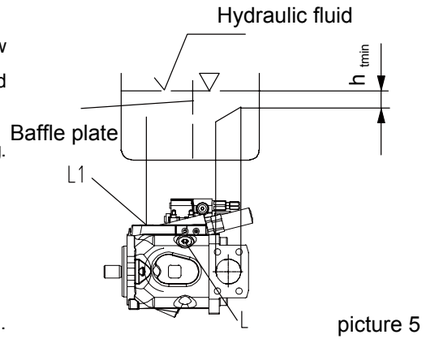
See picture 5, pipe port “L1”and “S”port,close “L”.



picture 3



picture 4



picture 5

Safety instructions

The TFA10VSO pump is designed to be used in open circuit.

Project planning, installation and commissioning of the axial piston unit require the involvement of qualified personnel.

Before operating the axial piston unit, please read the appropriate instruction manual thoroughly and completely. If necessary, request these from Shandong Taifeng.

During and shortly after operation, there is a risk of burns on the axial piston unit and especially on the solenoids.Take appropriate safety measures (e.g. by wearing protective clothing).

Depending on the operating conditions of the axial piston unit (operating pressure, fluid temperature), the characteristics may shift.

Service line ports:

The ports and fastening threads are designed for the specified maximum pressure. The machine or system manufacturer must ensure that the connecting elements and lines correspond to the specified application conditions (pressure, flow, hydraulic fluid,temperature) with the necessary safety factors.

The service line ports and function ports are only designed to accommodate hydraulic lines.

The data and notes contained herein must be adhered to.

Before completing the final design, ask for the installation diagrams which must be adhered to.

Not every model of this series products is approved for ISO13849 required safety function. Please contact Shandong Taifeng person in charge for the reliability date(e.g. MTTFd) relates to function safety.

Pressure control does not provide security against pressure overload. A separate pressure relief valve should be installed in the hydraulic system.

The following tightening torques apply:

Fittings:

Observe the manufacturer’s instruction regarding the tightening torques of the fittings used.

Mounting bolts:

For mounting bolts with metric ISO thread according to DIN 13 or thread according to ASME B1.1, we recommend checking the tightening torque individually according to VDI 2230.

Female threads in axial piston unit:

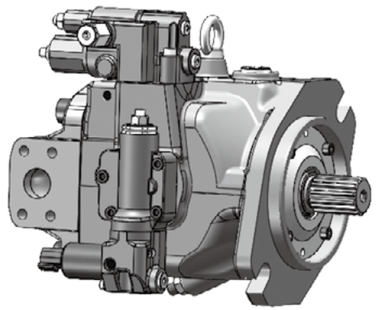
The maximum permissible tightening torques MG max are maximum values for the female threads and must not be exceeded.

Threaded plugs:

For the metal threaded plugs supplied with the axial piston unit,the required tightening torques of the threaded plugs MV apply.

High Pressure Axial Piston Pump
TFA10V/54 Series

TAIFENG



- Size: 18 to 125
- Series: 54
- Rated pressure: 28Mpa
- Max.pressure: 31.5Mpa

Features

- Axial piston swashplate design for hydrostatic drives in an open circuit.
- The flow is proportional to the drive speed and the displacement, steplessly varied by adjustment of swashplate angle.
- Powerful bearing guarantees long service life.
- High speed rotation allowed
- Favorable power/weight ratio, small size
- Low noise level
- Excellent suction ability
- Drive shaft can bear axial and radial loading.
- Flow and pressure control
- Power control
- Short response time

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DRG-Pressure control, remotely operated ··· 58
DFR/DFR1-Pressure and flow control ····· 59
LAS Pressure, flow and power control ····· 60
E0 Electric proportional power control ····· 61
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High Pressure Axial Piston Pump
TFA10V/54 Series

TAIFENG

Ordering code

01	02	03	04		05	06	07		08	09	10	11	12
TFA10V	0		LADS	/	5	4	R	–	V	S	C	12	N00

Ordering code

01	Variable pump, swashplate design, used for mobile machinery Rated pressure 25Mpa Max.pressure 31.54Mpa	TFA10V

Operation mode

02	Pump, open circuit	0

Size

03	Displacement(mL/r)	18	28	45	63	72	76	85	105	125

Operation mode

			18	28	45	63	72	76	85	105	125	
04	Pressure control		○	○	○	○	○	●	●	○	○	DR
	With flow,hydraulic	X-T port open	○	○	○	○	○	○	○	○	○	DFR
		X-T port close	○	○	○	○	○	●	●	○	○	DFR1
	With remote pressure control		○	○	○	○	○	●	●	○	○	DRG
	With flow and pressure constant power control, X-Tport close											
			○	○	○	○	○	●	●	○	○	LADS
	Electrical proportional power control	24V proportional relief valve	○	○	○	○	○	●	●	○	○	E0
		12V proportional relief valve	○	○	○	○	○	●	●	○	○	E1

Series

05		5

Index

06		4

Direction of rotation

				18-125
07	Viewed on drive shaft	Count clockwise	●	R
		Clockwise	○	L

Seals

08	FKM (fluor-caoutchouc)	V
	NBR (nitrile rubber)	P

Drive shaft

09	Splined shaft SAE J744 standard shaft	S
	Similar to shaft"S" however for higher input torque	R
	Splined shaft SAE J744 reduced diameter, not for through drive	U
	Parallel key shaft DIN 6885	P

Mounting flange

10	ISO 2 holes	A
	SAE 2 holes	C
	SAE 4 holes	D

Service line port

11	SAE flange ports at rear, metric thread	11
	SAE flange ports on side--opposite side, metric thread	12

Through drive

12	Without through drive	N00

Fluid

Hydraulic fluid

Mineral oil

Operating viscosity range

For optimum efficiency and service life we recommend that the operating viscosity(at operating temperature) be selected in the range:

V_{opt}=Opt.operating viscosity 16...36mm^2 /s relating to reservoir temperature (open circuit)

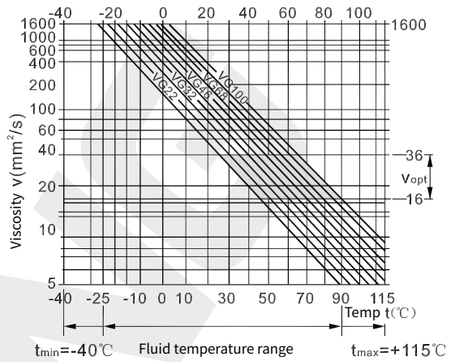
Limits of viscosity range

The limit of viscosity is: V_{min}=10mm²/s

Short-term (t ≤ 1 min), at max perm. case drain temperature of 115℃ :

Please also ensure that the max. case drainage temperature of 115℃ is not exceeded in localized areas(for instance, in the bearing area). The fluid temperature in the bearing area is approx.5K higher than the average case drain temperature.

Selection diagram



V_{max}=1600mm^2/s short-term (t ≤ 1 min), on cold start (p ≤ 3MPa, n ≤ 1000 rpm, t_{min}= -25 ℃)

Depending on the installation situation, special measures are necessary at temperatures between -40℃ and -25℃ . Please contact us for more information.

Notes on the selection of hydraulic fluid

In order to select the correct hydraulic fluid, it is necessary to know the operating temperature in the reservoir (open circuit) in relation to the ambient temperature.

The hydraulic fluid should be selected so that within the operating temperature range, the viscosity lies within the optimum range (V_{opt}), see shaded section of the selection diagram. We recommend to select the higher viscosity grade in each case.

Example: At an ambient temperature of X℃ , the operating temperature is 60℃ . In the optimum operating viscosity range (V_{opt} ,shaded area) this corresponds to viscosity grades VG 46 resp.VG 68, VG 68 should be selected.

Note: The case drain temperature is influenced by pressure and input speed and is always higher than the reservoir temperature. However, at no point in the component may the temperature exceed 115 ℃ .

If the above conditions cannot be met, due to extreme operating parameters or high ambient temperature, please contact us.

Filtration of the hydraulic fluid

The finer the filtration the better the cleanliness level of the hydraulic fluid and the longer the service life of the axial piston unit.

In order to guarantee the functional reliability of the axial piston unit ,the minimum cleanliness level is ISO/DIS 4406 20/18/15.

At very high hydraulic fluid temperatures 90℃ -115℃ ,the minimum cleanliness level is ISO/DIS 4406 19/17/14.

If the above cleanliness levels cannot be maintained, please contact us.

Technical data

Operation pressure range-inlet side

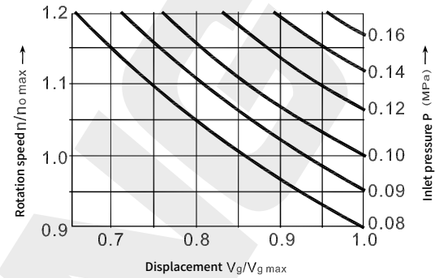
Absolute pressure at S port (inlet)

$P_{abs\ min}$----------0.8Mpa

$P_{abs\ max}$----------0.5Mpa

Check the diagram on the right for the minimum required inlet pressure Pabs of port S, or the displacement reduction at higher input speeds.

Increase the inlet pressure P_{abs} at suction port S, or reduce the maximum displacement of the pump to raise the permissible speed.



Operation pressure range-outlet side

Pressure at port B

Rated pressure P_n----------28Mpa

Rated presusure P_{max}----------31.5Mpa

(Pressure in accordance with DIN 24312)

Case drainage pressure

Drainage (L, L_1/$_2$) max. permitted pressure can be 0.05Mpa higher than inlet pressure of port S,but cannot be higher than 0.2Mpa.

$P_{L\ abs\ max}$----------2bar

Table of values

Size				18	28	45	63/72	76/85	105/125
Max. displacement		$V_{g\ max}$	mL/r	18	28	45	63/72	76/85	105/125
Max. speed 1)	at $V_{g\ max}$	n_{nom}	rpm	3300	3000	2700	2600	2400	2200
	at $V_g < V_{g\ max}$	n_{max}	rpm	3960	3600	3250	3140	3000	2600
Flow	at n_0 max	$q_{vo\ max}$	L/min	59	84	117	169	182	231
	at n_E=1500rpm	$q_{vE\ max}$	L/min	27	42	68	95	114	157
Max. power	at n_0 max	$p_{0\ max}$	kW	25	35	55	69	75	96
	at n_E=1500rpm	$p_{E\ max}$	kW	11	18	32	40	47	65
Max. torque	at $V_{g\ max}$ ($\triangle p$=25Mpa)	T_{max}	Nm	71	111	200	242	302	417
	at $V_{g\ max}$ ($\triangle p$=10Mpa)	T	Nm	29	45	72	97	121	167
Filling capacity		V	L	0.25	0.3	0.6	0.8	0.8	1
Weight (without oil)		m	kg	13	18	24	28	28	45

1) Values are applicable for an absolute pressure at suction ports be 0.1Mpa.

Technical data

Calculation

Flow $qv = \frac{V_g \cdot n \cdot \eta_v}{1000}$ (L/min)

Drive torque $T = \frac{1.59 \cdot V_g \cdot \triangle P}{1000 \cdot \eta_{mh}} = \frac{Vg \cdot \triangle P}{20 \cdot \Pi \cdot \eta_{mh}}$ (Nm)

Power $P = \frac{2\Pi \cdot T \cdot n}{60000} = \frac{qv \cdot \triangle P}{600 \cdot \eta t}$ (KW)

V_g= Displacement per revolution (ml/r)

$\triangle$ P= Pressure differential (bar)

n= Speed (rpm)

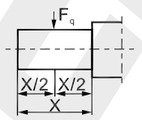
η_v=Volumetric efficiency

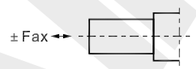
η mh=Mechanical-hydraulic efficiency

η_t=Total efficiency ($\eta_t = \eta_v \times \eta_{mh}$)

Permissible radial and axial loading on the drive shaft

Size			63
Max. radial force	at X/2	$F_{q\,max}$	N 1700
Max. axial force		F_{ax}	N 2000





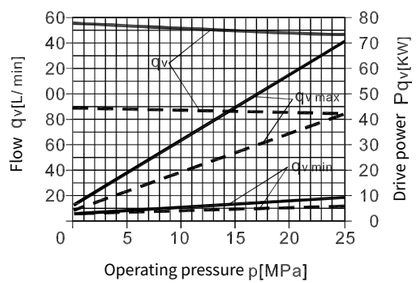
Working Curve of pump with pressure control

Drive power and flow

(mineral oi VG46，t=50℃)

----------n=1500rpm

————n=2700rpm

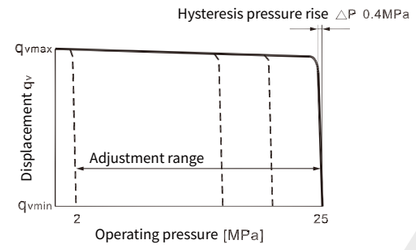


DR–Pressure control

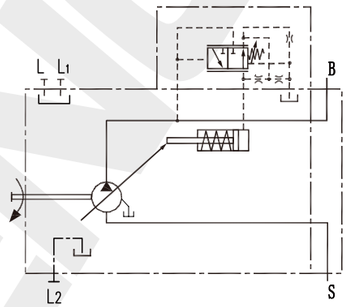
The pressure (constant pressure) control keeps system pressure constant within the pump control range. The pump only supplies as much hydraulic fluid as is required by the consumers.The pressure can be set steplessly at the pilot valve.

Static characteristic

(at n_1 =1500rpm； t_{fuid}=50℃)



Circuit diagram



Dynamic characteristic

This curve describe the average test value for inside-reservoir installation.

Working parameters： n=1500rpm

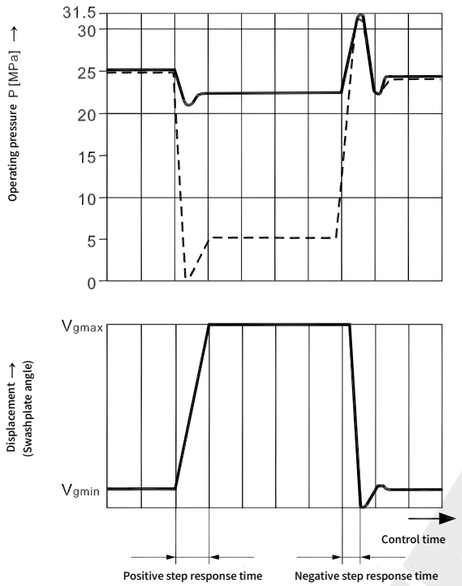
t_{fuid}=50℃

Pipe circuit drain pressure 31.5 MP

Increase circuit pressure progressively through relief valve 1m from pump pressured oil outlet.

Port

B	Service line port
S	Suction line port
L,L_1，L_2	Case drain(L1 plugged)



Control parameters

Hysteresis/repetition accuracy P-------Max.0.3Mpa

Pilot oil flow requirement ----------Max.about 3l/min

Flow loss q_{max} See page

Control time

Size	t_{sa} (ms) at 5Mpa	t_{sa} (ms) at 22Mpa	t_{SE} (ms) at 25Mpa
63	100	80	30

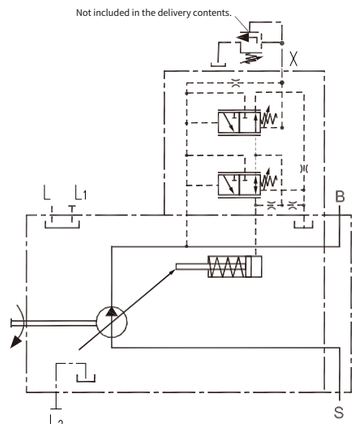
DRG ––Pressure control, remotely operated

The DRG control valve can set the max. outlet pressure of pump remotely below the DR control valve spool set value. A pressure relief valve can be externally piped to port X for remote setting of pressure. This relief valve is not included in the delivery contents.

The differential pressure at the DRG control valve is set as standard to 2Mpa. This results in a approx.1.5 l/min pilot oil flow. If other setting is required (range from1~2.2Mpa), please state in clear text.

Control parameter

See DR control concent



Port

B Service line port

S Suction line port

L,L_1,L_2 Case drain (L_1, L_2 plugged)

DFR/DFR1 Pressure/flow control

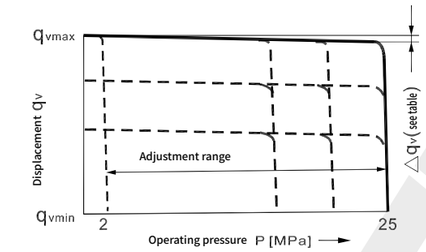
In addition to the pressure control function, the pump flow to the actuator may be varied by means of a differential pressure over an adjustable orifice (e.g. directional valve). The pump flow is equal to the actual required flow by the actuator

The pressure control overrides the flow control function.

The DFR1 version has no connection between X and the case.

Static characteristic

at n1 =1500rpm；tfluid=50℃)



Dynamic flow control working curve

This curve describes the average test value for inside-reservoir installation.

Step response time

Size	t_{sa} (ms) at 5Mpa	t_{sa} (ms) at 22Mpa	t_{SE} (ms) at 25Mpa
63	90	30	75

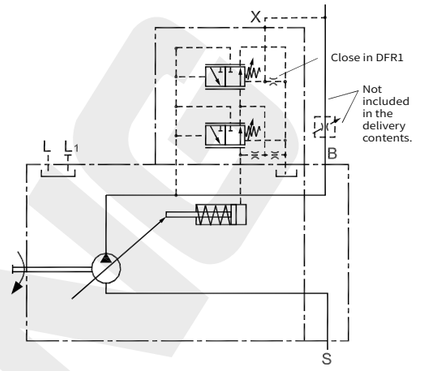
Control parameters

See page 5 for pressure control parameter

Maximum flow deviation (hysteresis and increase) measured with drive speed n=1500 rpm.

$\triangle q_{vmax}$	L/min	2.5

Circuit diagram



Port

B	Service line port
S	Suction line port
L,L1，L2	Case drain (L2 plugged)
X	Pilot oil port

Pressure difference $\triangle P$

Standard setting: 1.4MPa. If another setting is required, please state in clear text.

Relieving the load on port X to the reservoir (outlet port B close) results in a zero stroke (standby) pressure which lies about 1.8 ± 0.2MPa, depending on the setting of $\triangle P$.

Control fluid consumption DFR....max. approx. 3~4.5L/min

Control fluid consumption DFR1 .....max. approx. 3L/min

The flow loss at $q/_{vmax}$ is shown on Page 60.

LADS pressure, flow and power control

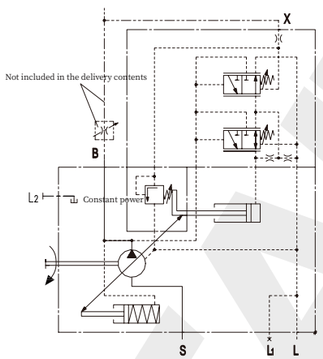
In order to achieve a constant drive torque with varying operating pressures, the swivel angle and with it the output flow from the axial piston pump is varied so that the product of flow and pressure remains constant. Flow control is possible within the range of power control curve.

Control parameters

See page 3 for the pressure control parameters
See page 5 for the pressure and flow control parameters
Max. consumption of control fluid approx. 3.0L/min

Beginning of control (Mpa)	Torque (Nm)	Ordering code
1.0~3.5	15~43	LA5
3.6~7.0	43.1~83	LA6
7.1~10.5	83.1~119	LA7
10.6~14.0	119.1~157	LA8
14.1~23.0	57.1~265	LA9

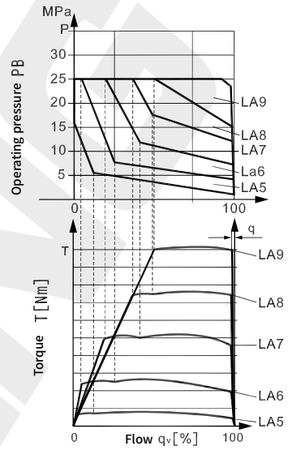
Circuit diagram



Port

B	Service line port
S	Suction line port
L,L_1,L_2	Case drain (L_1, L_2 plugged)
X	Pilot oil port

Static characteristics and torque curve



LADS E0/E1 Electro proportional power control

The pump output torque can be controlled by different current input to solenoid. Torques required by various operation modes can be fulfilled for excavator.

Control parameters

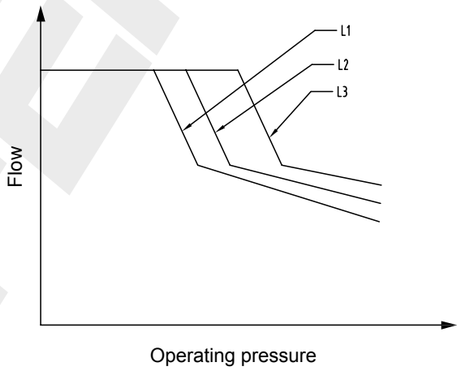
See page 58 for the pressure control parameters
See page 60 for the pressure and flow control parameters

Coil parameters

Voltage (V)	Current (A)	Resistance (Ω)	Insulation Class
12	0.80	7.3±10% (20℃)	H(180℃)
24	0.75	21.2±10%	UP to IP6K6/IPX9K

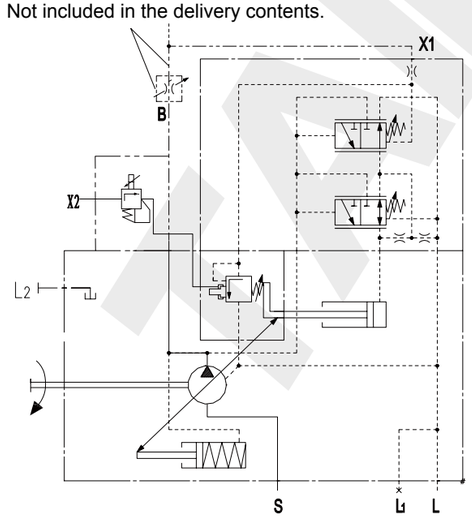
Connector (deutsh)

DEUTSCH: DT04-2P



Circuit diagram

Not included in the delivery contents.

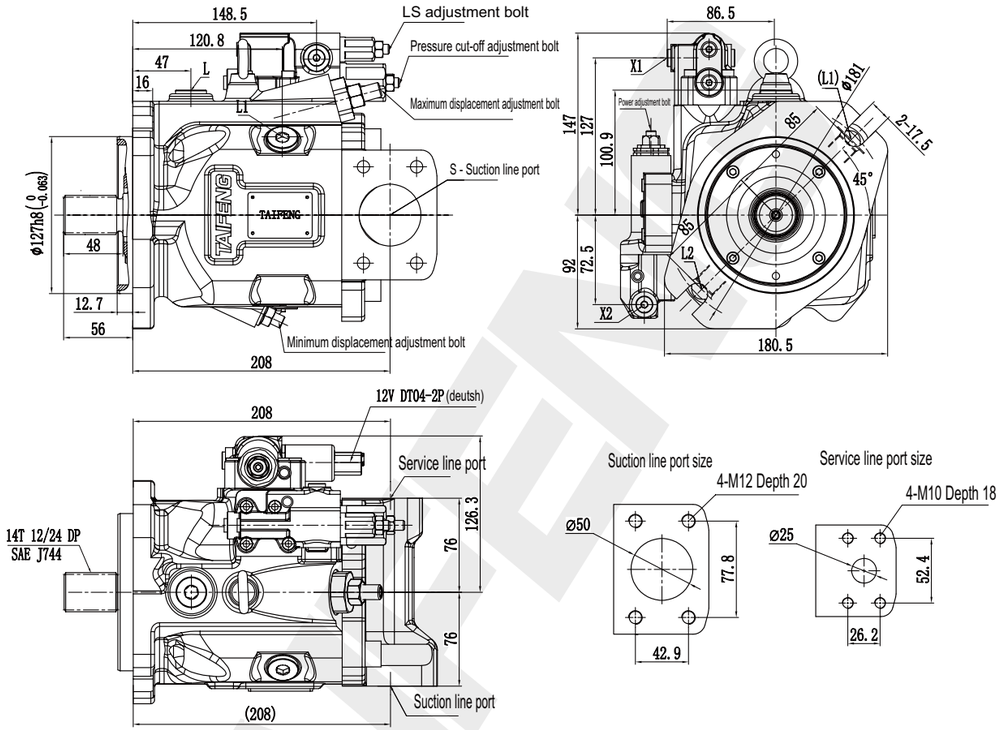


Port

B	Service line port
S	Suction line port
T_1 ,T_2,T_3	Case drain
X_1,X_2	Pilot oil port

Mounting dimensions 76/85

Mounting flange "C"



Port

B	Service line port, SAE flange	SAE J518C	Φ25
	Fastening thread		M10 Depth18
S	Suction line port, SAE flange	SAE J518C	Φ50
	Fastening thread		M12 Depth20

$L/L_1/L_2$ Case drain SAE J1926/1 7/8-14UNF-2B Depth 16

X_1 LS Control hole SAE J1926/1 7/16-20UNF-2B Depth 11.5

X_2 Electric or hydraulic control pilot port SAE J1926/1 7/16-20UNF-2B Depth 11.5

SAE J744 Spline: ANSI B91.1a-1976,30° pressure angle, flat root, side fit, tolerance class 5.

Installation instructions

Select any installation position. The axial piston unit must be filled with hydraulic fluid during commissioning and operation.

To achieve favorable noise values, decouple all connections between ports(suction port,service port, pilot oil port and drain port) and reservoir using elastic elements.

A check valve in the case drain line must be avoided.

For high altitude areas, drainage port must be connected with the max.size pipeline selected from standard products of each port size.

1.Vertical installation (shaft extension up)

The following requirements must be observed.

1.1 Inside-reservoir installation

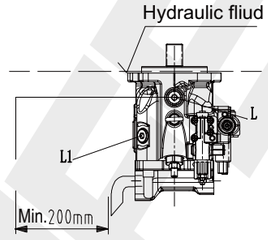
Fill the pump with hydraulic fluid in horizontal position before installation.

a)When the minimum fluid level is equal to or above pump mounting face:

Close port “L”, open “L_1” and “S” to connect with suction line. See picture 1.

b) When the minimum fluid level below the mounting face, see picture 2 to pipe port “L” and “S”. Close port “L” in the condition of 1.2.1.

Note: To avoid damage of pump, all connecting accessories (e.g. protection cover, cap) must be removed before installation.



Picture 1

1.2 Out-reservoir installation

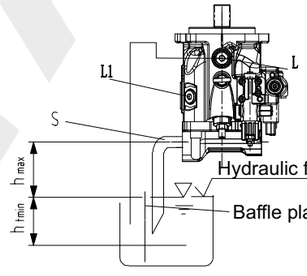
Fill the pump with hydraulic fluid before installation and keep in horizontal position.

Above-reservoir installation see picture 2.

Restrictions

1.2.1 The minimum suction pressure must not fall below Pabs min=0.8bar for static or dynamic loading.

Note: To achieve favorable noise values, try to avoid above-reservoir installation. The permissible suction height results from the total pressure loss. However, it must not be higher than hmax=800mm(immersion depth h tmin=200mm)



Picture 2

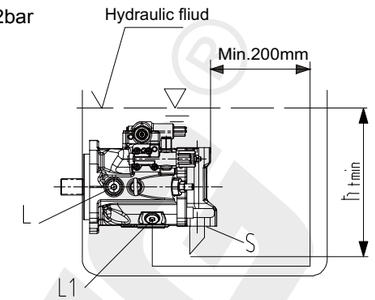
Total pressure loss $\triangle P_{Ges} = \triangle P_1 + \triangle P_2 + \triangle P_3 \leq (1-P_{abs\ min}) = 0.2bar$

$\triangle P1$: Pipeline pressure loss due to oil acceleration

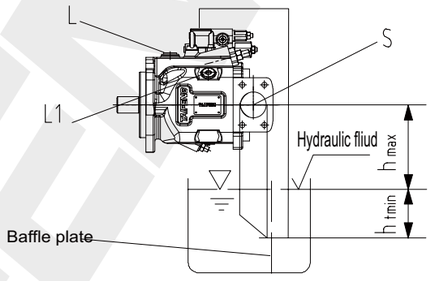
$$\triangle P = \frac{P \cdot L \cdot dv}{dt} \times 10^{-5} \quad (bar)$$

ρ = Fluid viscosity (kg/m^3)
L= Pipe length (m)
dv/dt= Fluid speed change rate (m/s^2)

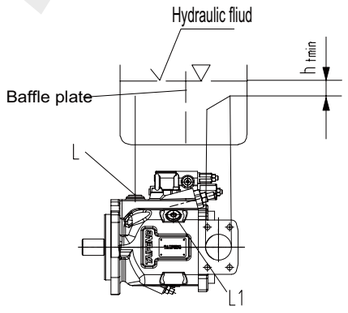
$\triangle P_2$: Pressure loss due to static head
$\triangle P_2$: $h \cdot p \cdot g \cdot 10^{-5}$ (bar)
$\triangle P_3$: Pipeline pressure loss (bend, etc.)
h=Height (m)
ρ =Fluid viscosity (kg/m^3)
g= Gravitational acceleration=$9.81m/s^2$
1.Horizontal installation
Port "L" or "L_1" is in up position during installation.
2.1 Inside-reservoir installation
a) When the minimum fluid level is above pump upper face: Close port "L_1" ,open "L" and "S", connect suction pipe with suction port S. The distance between "L" and suction pipe
should be no less than 200mm. See picture 3.
b) When the minimum fluid level is equal to or below the pump upper face: See picture 4 for the piping of "L" and "S" port, close "L_1". Conform to 1.2.1.
Note: To avoid damage of pump, all connecting accessorie s(e.g. protection cover, cap) must be removed before installation.



Picture 3



Picture 4



Picture 5

2.2 Out-reservoir installation
Fill the pump with hydraulic fluid before start.
Pipe port "S" and the highest drainage port "L" or "L_1".
a)Above-reservoir installation see picture 4. Conform to 1.2.1.

b)Below-reservoir installation see picture 5, pipe port "L_1" and "S" port, close "L".

Safety Instructions

The TFA10VSO pump is designed to be used in open circuit.

Project planning, installation and commissioning of the axial piston unit require the involvement of qualified personnel.

Before operating the axial piston unit, please read the appropriate instruction manual thoroughly and completely. If necessary, request these from Shandong Taifeng.

During and shortly after operation, there is a risk of burns on the axial piston unit and especially on the solenoids. Take appropriate safety measures (e.g. by wearing protective clothing).

Depending on the operating conditions of the axial piston unit (operating pressure, fluid temperature), the characteristics may shift.

Service line ports:

-The ports and fastening threads are designed for the specified maximum pressure. The machine or system manufacturer must ensure that the connecting elements and lines correspond to the specified application conditions (pressure, flow, hydraulic fluid, and temperature) with the necessary safety factors.

-The service line ports and function ports are only designed to accommodate hydraulic lines.

The data and notes contained herein must be adhered to.

Before completing the final design, ask for the installation diagrams which must be adhered to.

Not every model of this series products is approved for ISO13849 required safety functions. Please contact Shandong Taifeng person in charge for the reliability date(e.g. MTTFd) relates to function safety.

Pressure control does not provide security against pressure overload. A separate pressure relief valve should be installed in the hydraulic system.

The following tightening torques apply:

-Fittings: Following the manufacturer's instruction regarding the tightening torques of the fittings used.

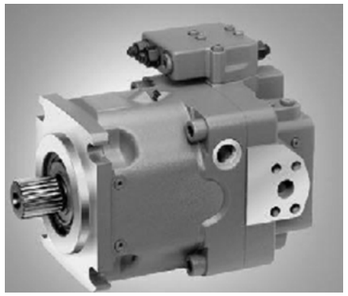
-Mounting bolts: For mounting bolts with metric ISO thread according to DIN 13 or thread according to ASME B1.1, we recommend checking the tightening torque individually according to VDI 2230.

-Threaded holes in axial piston unit: The maximum permissible tightening torques MG max are maximum values for the female threads and must not be exceeded.

-Threaded plugs:

For the metal threaded plugs supplied with the axial piston unit,the required tightening torques of the threaded plugs MV apply.

Axial Piston Variable Displacement Pump TFA11VO Series



- Sizes 40-260
- Series 1
- Nominal pressure 350 bar
- Peak pressure 400 bar
- Open circuit

Features

- Variable displacement axial piston pump of swashplate design for hydrostatic drives in open circuit hydraulic system
- Designed primarily for use in mobile applications
- The pump operates under self-priming conditions, with tank pressurization, or with an optional built-in charge pump (impeller)
- A comprehensive range of control options is available matching any application requirement
- Power control option is externally adjustable, even when the pump is running
- The through drive is suitable for adding gear pumps and axial piston pumps, i.e. 100% through drive
- The output flow is proportional to the drive speed and infinitely variable between maximum and zero

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DR-Pressure control ····· 81
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Through drive dimension ····· 98
Installation Instructions ····· 99
Safety instructions ····· 102

Ordering code

01	02	03	04	05		06	07		08	09	10	11	12
TFA11V		O			/	11		-	N				

1.Axial piston pump

Swashplate design, variable displacement, nominal pressure 350bar, maximum pressure 400bar	TFA11V

2.Charge pump(impeller)

	40	60	75	95	130	145	190	260	
without charge pump (no code)	○	●	●	●	●	●	○	○	
with charge pump	-	-	-	-	●	●	●	○	L

3.Running mode

pump, open circuit	O

4.Size

Displacement V_{gmax}(ml/r)	40	60	75	95	130	145	190	260

5.Control

			40	60	75	95	130	145	190	260	
Constant power control with pressure control and stroke limit											
Electrical proportional regulation	positive control	U=12V	○	○	○	○	○	○	●	○	LRDU1
Electrical proportional regulation	positive control	U=24V	○	○	○	●	●	●	●	○	LRDU2
Hydraulic proportional regulation	positive control	△ P=2.5MPa	○	○	○	○	○	○	●	○	LRDH2
Control pressure	positive control	△ P=1.0MPa	○	○	○	○	○	○	●	○	LRDH6
Constant power control with pressure and load sensing			○	●	●	●	●	●	●	○	LRDS
Constant power control with override and load sensing											
Electrical regulation	negative control	U=12V	○	○	○	○	○	○	●	○	LE1S
Electrical regulation	negative control	U=24V	○	○	○	○	○	○	●	○	LE2S
Pressure control with load sensing			○	●	●	●	●	●	●	○	DRS

6.Series

	11

7.Direction of rotation

viewed on shaft end	clockwise	R
	counter-clockwise	L

8.Seals

NBR(nitrile-caoutchouc),FKM shaft seal(fluorine rubber)	N

01	02	03	04	05		06	07		08	09	10	11	12
TFA11V		O			/	11		-	N				

9.Shaft end

	40	60	75	95	130	145	190	260	
Splined shaft DIN 54180 for single and combi pump	○	●	●	●	●	●	●	○	Z
Cylindrical shaft with key DIN 6885	○	●	●	●	●	●	●	○	P
Splined shaft ANSI B92.1a-1976 for single pump	○	●	●	●	●	●	●	○	S
for combination pump	○	●	●	_1)	_1)	_1)	●	○	T

10.Mounting flange SAEJ744

	40	60	75	95	130	145	190	260	
SAE J744-2 hole	●	●	-	-	-	-	-	-	C
SAE J744-4 hole	-	-	●	●	●	●	●	●	D

11.Service line ports

SAE pressure and suction port on (opposite) sides, with metric fastening threads	12

12.Through drive

	40	60	75	95	130	145	190	260	
No through drive	●	●	●	●	●	●	●	○	N00
through drive see next page									K※※

Axial Piston Variable Displacement Pump
TFA11VO Series
TAIFENG

Through drive

Flange SAE J744[3]		Splined shaft coupler		40	60	75	95	130	145	190	260	
82-2 (A)	5/8in	9T 16/32DP	(A)	○	●	●	●	●	●	●	○	K01
	3/4in	11T 16/32DP	(A-B)	○	●		●	●	●		○	K52
101-2 (B)	7/8in	13T 16/32DP	(B)	○	●	●	●	●	●	●	○	K02
	1 in	15T 16/32DP	(B-B)	○	●	●	●	●	●	●	○	K04
	W35	2×30×16×9g		○	●	●	●	●	●	●	○	K79
127-2 (C)[4]	1 1/4in	14T 12/24DP	(C)	–	●	●	●	●	●	●	○	K07
	1 1/2in	17T 12/24DP	(C-C)	–	–	–	●	●	●	●	○	K24
	W30	2×30×14×9g		–	●	●	●	●	●	●	○	K80
	W35	2×30×16×9g		–	●	●	●	●	●	●	○	K61
152-4 (D)	1 1/4in	14T 12/24DP	(C)	–	–	●	●	●	●	●	○	K86
	1 3/4in	13T 8/16DP	(D)	–	–	–	–	●	●	●	○	K17
	W40	2×30×18×9g		–	–	●	●	●	●	●	○	K81
	W45	2×30×21×9g		–	–	–	●	●	●	●	○	K82
	W50	2×30×24×9g		–	–	–	–	●	●	●	○	K83
165-4 (E)	1 3/4in	13T 8/16DP	(D)	–	–	–	–	–	–	●	○	K72
	W50	2×30×24×9g		–	–	–	–	–	–	●	○	K84
	W60	2×30×28×9g		–	–	–	–	–	–	–	○	K67

● = available ○ = in preparation - unavailability

1)S-shaft suitable for combination pump

Technical data

Hydraulic fluid

Please understand and select hydraulic fluids before starting project planning.In order to ensure the service life of the piston pump, pls use mineral hydraulic fluid. If you need to use environmentally friendly or HF hydraulic oil, pls contact us.

Viscosity range

We recommend you to choose the operating viscosity(at the operating temperature) in the optimum range of viscosity and useful life of

V_{opt} = opt. operating viscosity 16...36 mm^2/s

Related to the tank temperature (open circuit).

Limit viscosity range

Limit viscosity range as follows：V_{min}=5mm^2/s

Temporary ((t≤3 min)

Max. Perm. Temperature 115℃

Note that the max. hydraulic fluid temperature of 115℃ may not be exceeded even locally (e.g. in the bearing area).The temperature at the bearing area is about 5K higher than the average drain temperature.

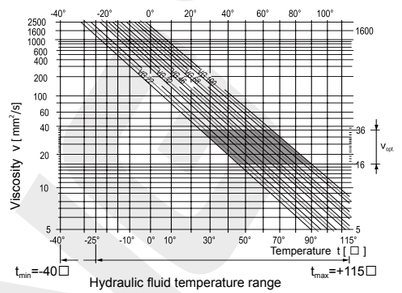
V_{max}=16000mm^2/s

Temporary ((t≤3 min)

at cold start (p≤30bar,n≤1000r/min,t_{min}=-40℃)

Special measures are necessary in the temperature range from -40℃ to -25℃, please ask.

Selection diagram



Explanation of selection of the hydraulic fluid knowledge of the operating temperature in the tank (open circuit) depending on the ambient temperature is a prerequisite for the correct choice of hydraulic fluid. The hydraulic fluid should be selected so that the operating viscosity is in the optimum range (ν opt) in the operating temperature range, see selection diagram, shaded area. We recommend you to choose the respective higher viscosity class.

Example: At an ambient temperature of X°C an operating temperature of 60°C is set in the circuit. In the optimum operating viscosity range (ν opt; shaded area) this corresponds to the viscosity classes VG 46 or VG 68; to be selected: VG 68.

Note: The leakage oil temperature, influenced by pressure and speed, is always above the tank temperature. The temperature may not be higher than 115℃ at any point in the machine.

If the above conditions cannot be satisfied in the case of extreme operating parameters or high ambient temperatures, please ask.

Filtration

The finer the filtration the better the cleanliness class of hydraulic fluid reached, the longer the life of the axial piston unit. To ensure functional reliability of the axial piston unit, the hydraulic fluid must be measured total volume analysis to determine the amount of sationary contaminants and determine whether their cleanliness conforms to ISO 4406 standard.

20/18/15 in accordance with ISO 4406 is necessary for the hydraulic fluid. At very high hydraulic fluid temperatures (90℃ to max. 115℃) at least cleanliness class 19/17/14 in accordance with ISO 4406 is required.If the above classes cannot be achieved, pls contact us.

Shaft seal

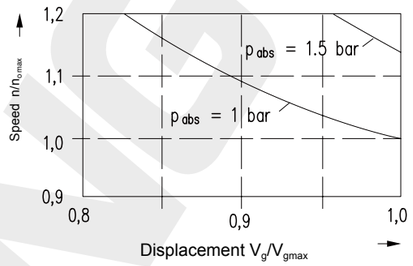
The FKM shaft seal ring is permissible for housing temperatures of -25°C to +115°C.

Note:

For applications below -25°C, an NBR shaft seal is necessary as a special version (permissible temperature range: -40°C to +90°C).

Maximum permissible speed (speed limit)

The inlet pressure Pabs increases through the oil suction port and when $V_g \leq V_{g\ max}$, the corresponding allowable speed.



Operating pressure range

Absolute pressure at port S (suction port)

$P_{abs\ min}$ ---------- 0.08Mpa

$P_{abs\ max}$ ---------- 3Mpa

If the pressure ＞ 0.5MPa, pls ask.

Version with charge pump

$P_{abs\ min}$ ---------- 0.06Mpa

$P_{abs\ max}$ ---------- 0.2Mpa

Absolute pressure at port B (outlet port)

rated pressure P_n 35Mpa

rated pressure P_{max} 40Mpa

Housing drain pressure

at the ports T1 and T2 the permissible drain pressure P_t _____0.2MPa, separate return to reservoir.

Flushing the housing

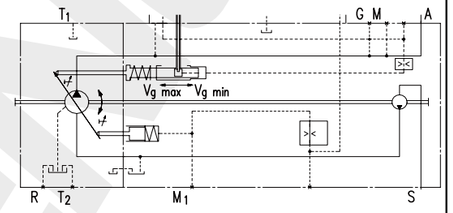
If a variable displacement pump with control device EP, HD, DR or stroke limiter (H., U.) is operated over a long period (t > 10 min) with flow zero or operating pressure < 15 bar, flushing of the housing via ports "T_1", "T_2" or "R" is necessary.

Size	40	60	75	95	130	145	190	260
$Flush_{qv}$(L/min)	2	3	3	4	4	4	5	6

The housing flushing is unnecessary in versions with charge pump (A11VLO), since a part of the charge flow is directed to the housing.

Charge pump (impeller)

The charge pump is a circulating pump with which the A11VLO (size 190...260) is filled and therefore can be operated at higher speeds. This also simplifies cold starting at low temperatures and high viscosity of the hydraulic fluid. Tank charging is therefore unnecessary in most cases. A tank pressurization of a max. 2 bar is permissible with charge pump.



Value table (theoretical values, without efficiencies and tolerances; values rounded)

Size	TFA11VO		40	60	75	95	130	145		
	TFA11VO(with charge pump)								190	260
Displacement	$V_{g\ max}$	ml/r	42	58.5	74	93.5	130	145	193	260
	$V_{g\ min}$	ml/r	0	0	0	0	0	0	0	0
Speed maximum at $V_{g\ max}$ 1	n_{max}	rpm	3000	2700	2550	2350	2100	2200	2500	2300
maximum at $V_g \leq V_{g\ max}$	n_{max}	rpm	3500	3250	3000	2780	2500	2500	2500	2300
Flow at n_{max} and $V_{g\ max}$	$q_{v\ max}$	L/min	126	158	189	220	273	319	483	598
Power at q_{vmax} and $\triangle P$= 35Mpa	P_{max}	KW	74	92	110	128	159	186	281	349
Torque at v_{gmax} and $\triangle P$ = 35Mpa	T_{max}	Nm	234	326	412	521	724	808	1075	1448
Mass moment of inertia around drive axis	J_{GR}	kgm^2	0.0048	0.0082	0.0115	0.0173	0.0318	0.0341	0.0577	0.0895
Filling volume	V	L	1.1	1.35	1.85	2.1	2.9	2.9	3.8	4.6
Weight (approx.)	m	kg	32	40	45	53	66	76	95	125

1) The values apply at absolute pressure (P_{abs}) =1 bar at the suction port S and mineral hydraulic fluid.

2) The values apply at absolute pressure (P_{abs}) of at least 0.8 bar at the suction port S and mineral hydraulic fluid.

3) The values apply at $V_g \leq V_{g\ max}$ or in case of an increase in the inlet pressure p_{abs} at the suction port S .

Determining the nominal value

Flow $q_v = \frac{V_g \cdot n \cdot \eta_v}{1000}$ [L/min]

Torque $T = \frac{1.59 \cdot V_g \cdot \triangle P}{1000 \cdot \eta_{mh}} = \frac{V_g \cdot \triangle P}{20 \cdot \pi \cdot \eta_{mh}}$ [Nm]

Power $P = \frac{T \cdot n}{9549} = \frac{2\pi \cdot T \cdot n}{60000} = \frac{q_v \cdot \triangle P}{600 \times \eta_t}$ [Kw]

V_g = Displacement per revolution [ml/r]
$\triangle P$ = Differential pressure [bar]
n = speed [rpm]
η_v = volumetric efficiency
η_{mh} = mechanical-hydraulic efficiency
η_t = overall efficiency($\eta_t = \eta_v \cdot \eta_{mh}$)

LR Power Control

The power control regulates the displacement of the pump depending on the operating pressure so that a given drive power is not exceeded at constant drive speed.

$P_B \cdot V_g$ = constant

P_B = operating pressure

V_g = displacement

The precise control with a hyperbolic control characteristic provides an optimum utilization of available power.

The operating pressure acts on a rocker via a piston.An externally adjustable spring force counteracts this,it determines the power setting.

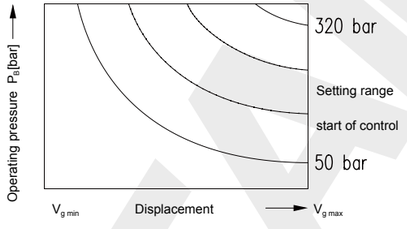
If the operating pressure exceeds the set spring force , the control valve is actuated by the rocker, the pump swivels back(direction $V_{g\ min}$). The lever length at the rocker is shortened and the operating pressure can increase at the same rate as the displacement decreases without the drive powers being exceeded ($p_B \cdot V_g$ = constant).

The output power (characteristic) is influenced by the effciency of the pump.

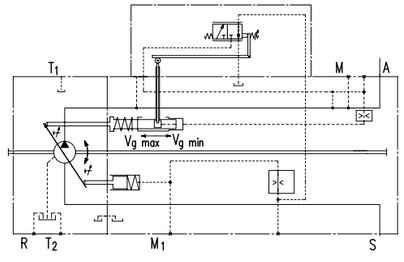
State in clear text in the order:

- drive power P in [kW]
- drive speedn in [rpm]
- max. flow $q_{V\ max}$ in [L/min]

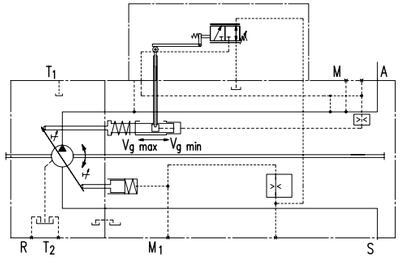
▼ LR Characteristic



Size 40-145: LR



Size 190-260: LR



LR–Power Control

LE1/2 Electrical Override (negative control)

The power controller adjusts the displacement of the pump according to the working pressure, so as not to exceed the specified drive power at a constant transmission speed. Contrary to hydraulic power control override, the basic power setting is reduced by an electrical pilot current applied to a proportional solenoid. The resulting force acts on the mechanical power control of the regulating spring.

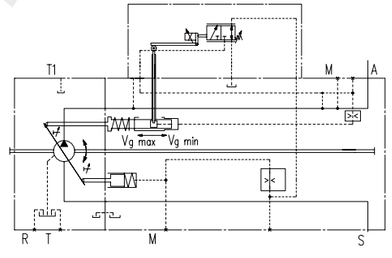
Increase in current = decrease in power

If the pilot current signal is adjusted by a load limiting control, the power consumption of all mechanical and hydraulic actuators is decreasing the A11VO power setting to match the remaining available power from the engine. A 12V (LE1) or 24V (LE2) supply is required for the control of the proportion solenoid.

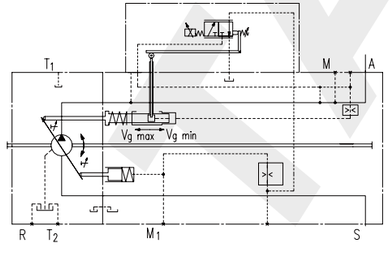
Technical data of solenoids

	LE1	LE2
Voltage	12V DC (±20%)	24V DC (±20%)
Control current		
Start of control	400mA	200mA
End of control	1200mA	600mA
Limiting current	1.54A	0.77A
Nominal resistance	5.5Ω	22.7Ω
Dither frequency	100Hz	100Hz
Duty cycle	100%	100%
Type of protection	IP65	

Size 190-260



Size 40-145: LE1/2

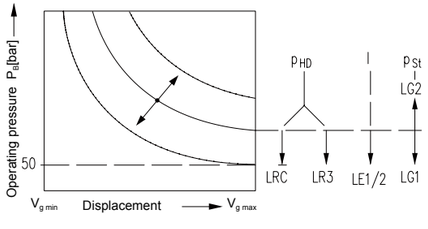


Overview of power overrides

Effect of power overrides at rising pressure or current

Overview of power overrides

Effect of power overrides at rising pressure or current



LR–Power Control

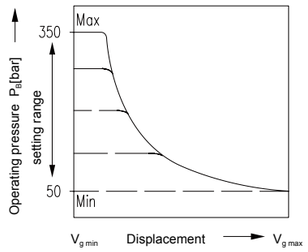
LRD Power control with pressure cut-off

Pressure cut-of is a pressure control that adjusts the pump displacement back towards Vg min when a preset pressure value is reached. This function overrides the power control, i.e. below the preset pressure value, the power function is effective.

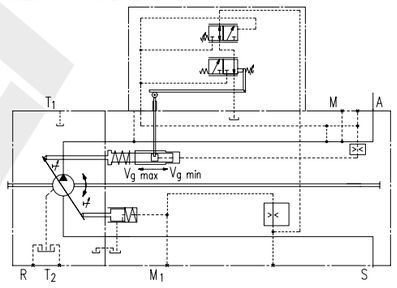
The pressure cut-off function is integrated into the pump control module and is preset to a specified value at the factory.

Setting range from 5 to 35Mpa

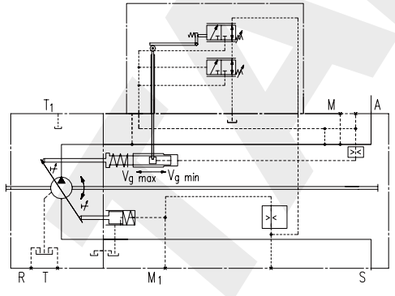
▼ Characteristic: LRD



Size 40-145: LRD



Size 190 ... 260



LR–Power Control

LRDS Power control with pressure cut-off and load sensing

The load-sensing control is a flow control option that operates as a function of the load pressure to regulate the pump displacement to match the actuator flow requirement.

The flow depends here on the cross section of the external sensing orifice (1) fitted between the pump outlet and the actuator. The flow is independent of the load pressure below the power curve and the pressure cut-off setting and within the control range of the pump.

The sensing orifice is usually a separately arranged load sensing directional valve (control block). The position of the directional valve piston determines the opening cross section of the sensing orifice and thus the flow of the pump.

The load-sensing control compares pressure before and after the sensing orifice and maintains the pressure drop across the orifice - and therefore the pump flow - constant as a function of the orifice size.

If the differential pressure $_{\Delta}P$ increases, the pump is swivelled back towards $V_{g\,min}$ and, if the $_{\Delta}P$ decreases, the pump is swivelling out towards $V_{g\,max}$ until the pressure drop across the sensing orifice in the valve is restored.

$_{\Delta}P_{orifice} = P_{pump} - P_{actuator}$

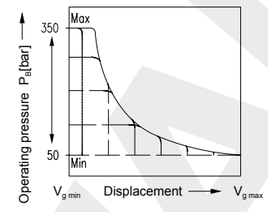
The setting range for ΔP is between 1.4MPa and 2.5MPa.

The standard differential pressure setting 1.8MPa. (Please state in clear text when ordering).

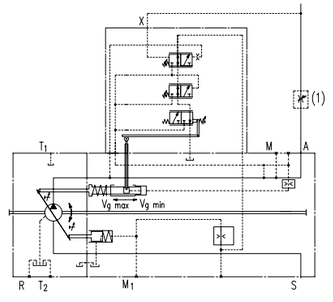
The stand-by pressure in zero stroke operation (sensing orifice plugged) is slightly above the $_{\Delta}P$ setting.

(1) The sensing orifice (control block) is not included in the pump supply.

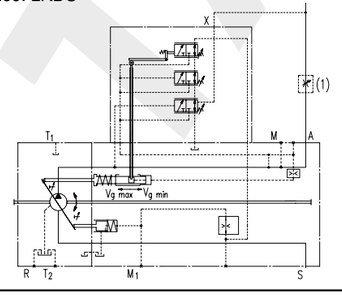
▼ Characteristic: LRDS



Size 40-145: LRDS



Size 190-260: LRDS



LR–Power Control

LR... Power control with stroke limiter

The stroke limiter can be used to vary or limit the displacement of the pump continuously over the whole control range. The displacement is set in LRH with the pilot pressure P_{St} (max. 40 bar) applied to port Y or in LRU by the control current applied to the proportional solenoid. A DC current of 12V (U1) or 24V (U2) is required to control the proportional solenoid. The power control overrides the stoke limiter control, i.e. below the hyperbolic power characteristic, the displacement is controlled by the control current or pilot pressure. When exceeding the power characteristic with a set flow or load pressure, the power control overrides and reduces the displacement following the hyperbolic characteristic.

To permit operation of the pump displacement control from its starting position Vg max to Vg min, a minimum control pressure of 3MPa is required for the electrical stroke limiter LRU1/2 and the hydraulic stroke limiter.

The required control oil is taken either from the load pressure, or from the externally applied control pressure at the G port.

To ensure functioning of the stroke limiter at low operating pressure as well, the port G must be supplied with external control pressure of approx. 3MPa.

Note: If no external control pressure is connected at G, the shuttle valve must be removed.

LR Power control with stroke limiter

Control from$V_{g\ min}$ to $V_{g\ max}$

With increasing pilot pressure the pump swivels to a smaller displacement.

Start of control (at $V_{g\ max}$), settable _____from 0. 4 – 1.0 MPa

Please state start of control value, when ordering.

Starting position without control signal (pilot pressure)

---Operating pressure and external control pressure $<$ 3MPa: $V_{g\ max}$

---Operating pressure and external control pressure $>$ 3MPa: $V_{g\ min}$

The spring return device in the controller is not a safety device.

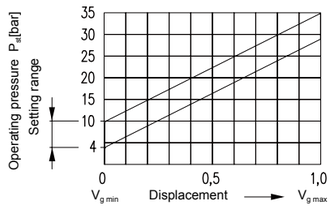
The spool valve in the controller may become stuck in an uncertain position by internal foreign matter (hydraulic fluid impurities, wear and tear on system components, or sediment). As a result, the axial plunger element cannot supply the flow rate specified by the operator.

Check if you need to take action on your machine to move the drive actuator to a safe location (emergency shutdown).

Characteristic H2

Increase in pilot pressure

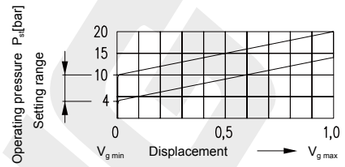
($V_{g\ min}$—$V_{g\ max}$) _____△ P=2.5MPa



Characteristic H6

Increase in pilot pressure

($V_{g\ min}$—$V_{g\ max}$) _____△ P=1MPa

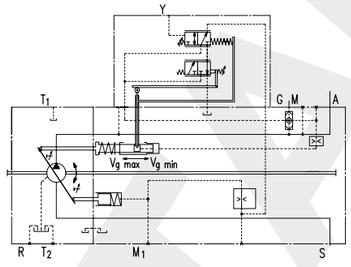


The spring return device in the controller is not a safety device.

The spool valve in the controller may become stuck in an uncertain position by internal foreign matter (hydraulic fluid impurities, wear and tear on system components, or sediment). As a result, the axial plunger element cannot supply the flow rate specified by the operator.

Check if you need to take action on your machine to move the drive actuator to a safe location (emergency shutdown).

Size 40-145: LRD



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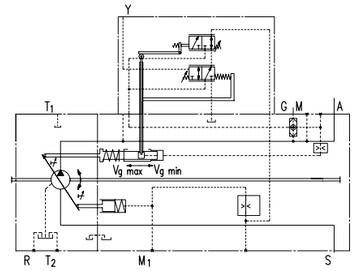


LR–Power control

Electrical stroke limiter (positive characteristic)

Control from $V_{g\,min}$ to $V_{g\,max}$

With increasing control current the pump swivels to a higher displacement.

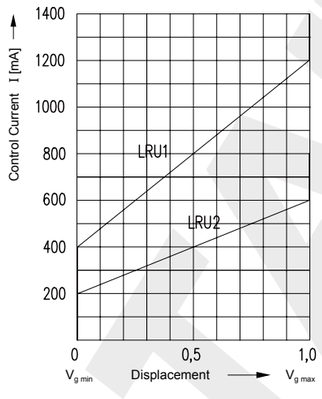
Technical data of solenoids		
	LRU1	LRU2
Voltage	12V DC (±20%)	24V DC (±20%)
Control current		
Start of control	400mA	200mA
End of control	1200mA	600mA
Limiting current	1.54A	0.77A
Nominal resistance (20˚C)	5.5Ω	22.7Ω
Dither frequency	100Hz	100Hz
Duty cycle	100%	100%
Protection class	IP65	

Starting position without control signal (control current):

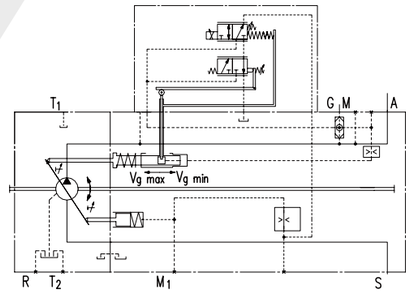
– at operating pressure and external control pressure < 3MPa: $V_{g\,max}$

– at operating pressure and external control pressure > 3MPa: $V_{g\,min}$

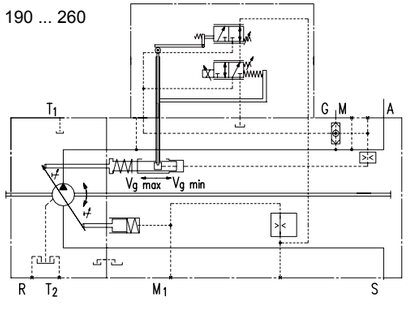
▼ Characteristic LRU1/2



Size 40-145: LRU1/2



Size 190 ... 260



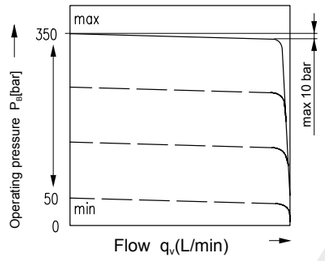
DR Pressure Control

The pressure control keeps the pressure in a hydraulic system constant within its control range even under varying flow conditions. The variable displacement pump only moves as much hydraulic fluid as is required by the actuators. If the operating pressure exceeds the set point set at the integral pressure control valve, the pump displacement is automatically swivelled back until the pressure deviation is corrected.

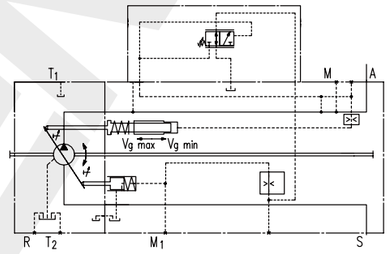
The start position of the decompression: $V_{g\,max}$

Setting range from 5 to 35Mpa

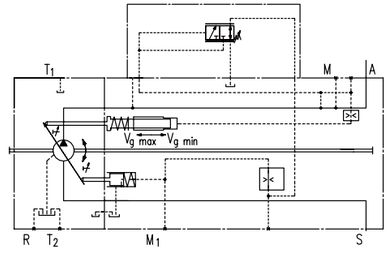
▼ DR Characteristic



Size 40-145 LRU1/2



Size 190 ... 260



DR Pressure Control

DRS Pressure control with load sensing

The load-sensing control is a flow control option that operates as a function of the load pressure to regulate the pump displacement to match the actuator flow requirement.

The flow depends here on the cross section of the external sensing orifice (1) fitted between the pump outlet and the actuator. The flow is independent of the load pressure below the pressure cut-off setting and within the control range of the pump.

The sensing orifice is usually a separately arranged load sensing directional valve (control block).The position of the directional valve piston determines the opening cross section of the sensing orifice and thus the flow of the pump.

The load-sensing control compares pressure before and after the sensing orifice and maintains the pressure drop across the orifice - and therefore the pump flow - constant as a function of the orifice size.

If the differential pressure $_{\Delta}$P increases, the pump is swivelled back towards Vg min and if the $_{\Delta}$P decreases, the pump is swivelling out towards Vg max until the pressure drop across the sensing orifice in the valve is restored.

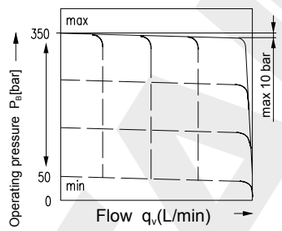
ΔPorifice = Ppump – Pactuator

The setting range for $_{\Delta}$P is between 1.4MPa and 2.5MPa.The standard differential pressure setting is 1.8 MPa. (Please state in clear text when ordering).

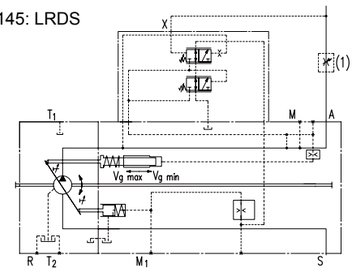
The stand-by pressure in zero stroke operation (sensing orifice plugged) is slightly above the $_{\Delta}$P setting.

(1) The sensing orifice (control block) is not included in the pump supply.

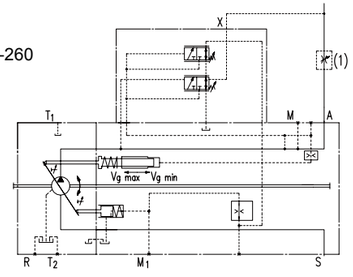
▼ Characteristic: DRS



Size 40-145: LRDS



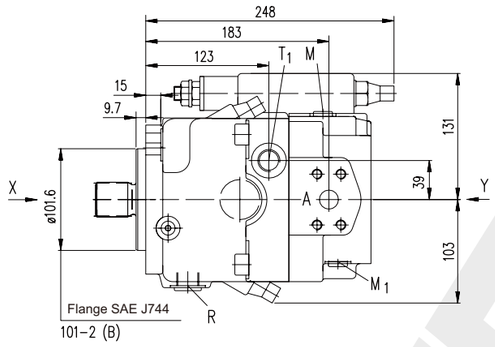
Size 190-260

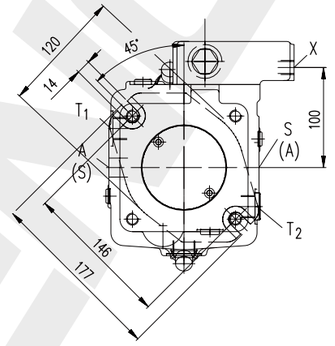


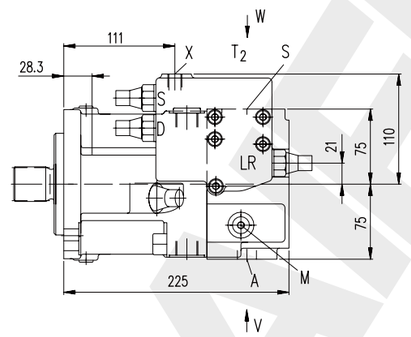
Unit Dimensions, Size 40

Type N00 LRDS control

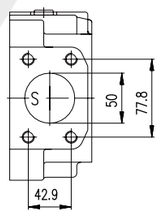
View Y
clockwise rotation
anti-clockwise rotation



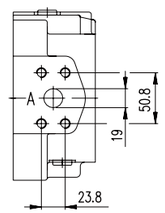




Detail W



Detail V



Ports

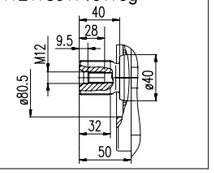
A	Service ports (high pressure series)	SAE J518	3/4in
	fastening thread		M10；Depth 17
S	Suction port (standard series)	SAE J518	2 in
	fastening thread		M12；Depth 20
T_1/T_2	Bleeding, tank	DIN 3852-1	M22X1.5；Depth 14
R	Bleeding, oil drain	DIN 3852-1	M22X1.5；Depth 14
M1	Measuring position, positioning chamber	DIN 3852-1	M12X1.5；Depth 12
M	Measuring position, service port	DIN 3852-1	M12X1.5；Depth 12
X	Pilot pressure port	DIN 3852-1	M14X1.5；Depth 12

1) ANSI B92.1a-1976, 30° pressure angle, flat root side fit, tolerance class 5

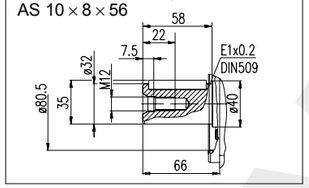
Unit Dimensions, Size 40

Shaft end

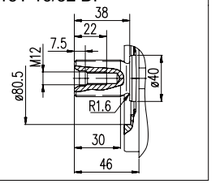
Z splined shaft DIN 5480
W35×2×30×16×9g



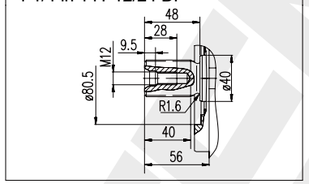
P cyl. shaft with key DIN 6885
AS 10×8×56



S splined shaft SAE J744
1 in 15T 16/32 DP[1)]

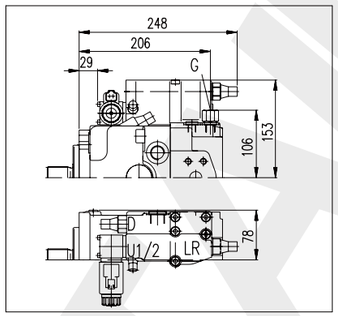


T splined shaft SAE J744
1 1/4 in 14T 12/24 DP[1)]



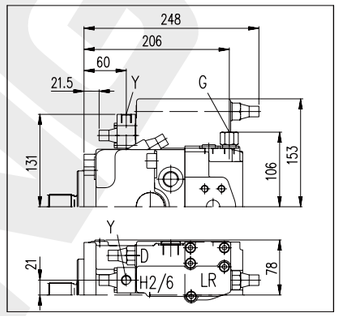
LRDU1/LRDU2

Power control with pressure cut-off and electrical stroke limiter (positive characteristic)



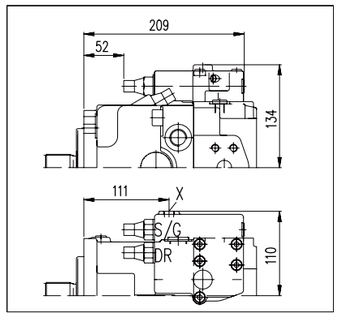
LRDH2/LRDH6

Power control with pressure cut-off and hydraulic stroke limiter (positive characteristic)



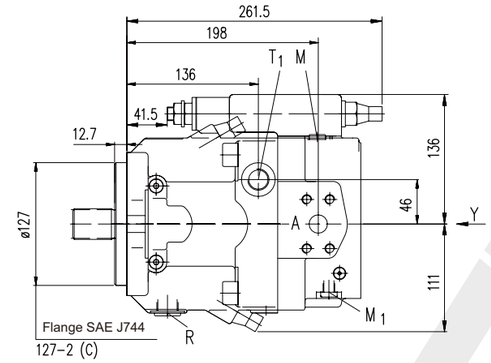
DRS

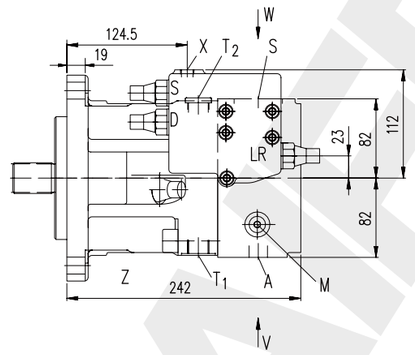
Pressure control with load sensing control



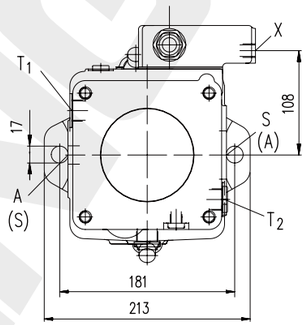
Unit Dimensions, Size 60

Type N00 LRDS control

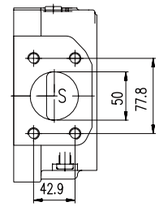




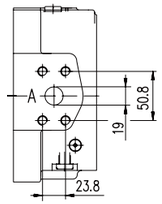
View Y
clockwise rotation
anti-clockwise rotation



Detail W



Detail V



Ports

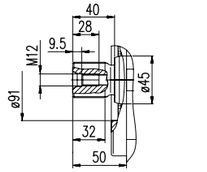
A	Service ports (high pressure series)	SAE J518	3/4in
	fastening thread		M10；Depth 17
S	Suction port (standard series)	SAE J518	2 in
	fastening thread		M12；Depth 20
T_1/T_2	Bleeding, tank	DIN 3852-1	M22X1.5；Depth 14
R	Bleeding, oil drain	DIN 3852-1	M22X1.5；Depth 14
M1	Measuring position, positioning chamber	DIN 3852-1	M12X1.5；Depth 12
M	Measuring position, service port	DIN 3852-1	M12X1.5；Depth 12
X	Pilot pressure port	DIN 3852-1	M14X1.5；Depth 12

1) ANSI B92.1a-1976, 30° pressure angle, flat root side fit, tolerance class 5

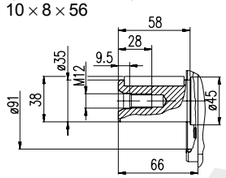
Unit Dimensions, Size 60

Shaft end

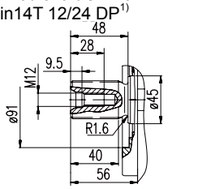
Z splined shaft DIN 5480
W35×2×30×16×9g



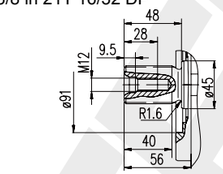
P cyl. shaft with key DIN 6885
AS 10×8×56



S splined shaft SAE J744
1 1/4 in14T 12/24 DP[1)]

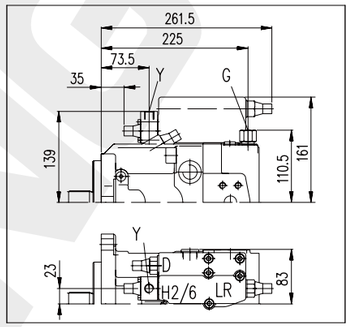


T splined shaft SAE J744
1 3/8 in 21T 16/32 DP[1)]



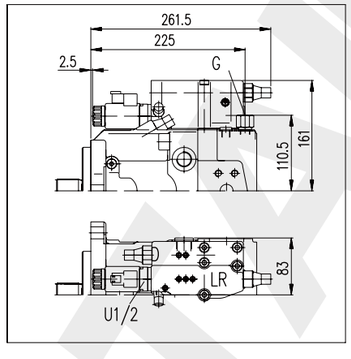
LRDH2/LRDH6

Power control with pressure cut-off and hydraulic stroke limiter (positive characteristic)



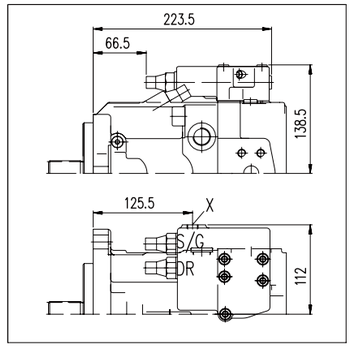
LRDU1/LRDU2

Power control with pressure cut-off and electrical stroke limiter (positive characteristic)



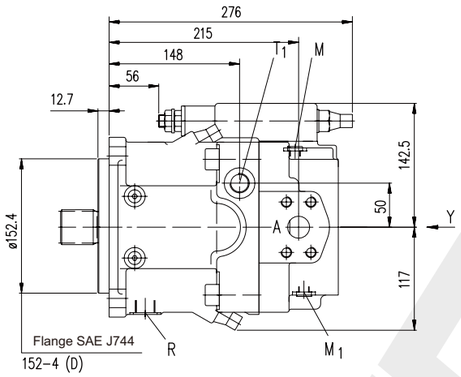
DRS

Pressure control with load sensing control

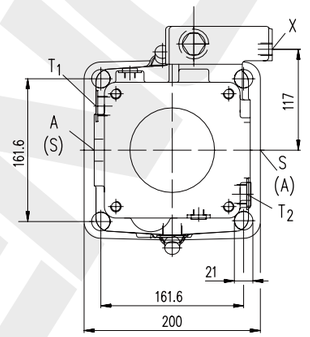


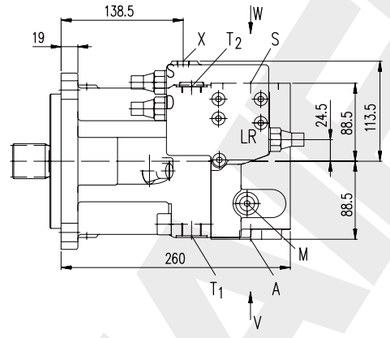
Unit Dimensions, Size 75/85

Type N00 LRDS control

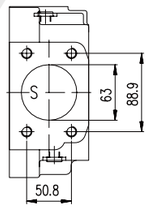


View Y
clockwise rotation
anti-clockwise rotation

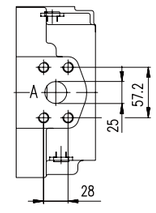




Detail W



Detail V



Ports

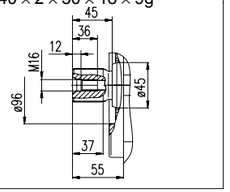
A	Service ports (high pressure series)	SAE J518	3/4in
	fastening thread		M10；Depth 17
S	Suction port (standard series)	SAE J518	2 1/2in
	fastening thread		M12；Depth 17
T_1/T_2	Bleeding, tank	DIN 3852-1	M22X1.5；Depth 14
R	Bleeding, oil drain	DIN 3852-1	M22X1.5；Depth 14
M1	Measuring position, positioning chamber	DIN 3852-1	M12X1.5；Depth 12
M	Measuring position, service port	DIN 3852-1	M12X1.5；Depth 12
X	Pilot pressure port	DIN 3852-1	M14X1.5；Depth 12

1) ANSI B92.1a-1976, 30° pressure angle, flat root side fit, tolerance class 5

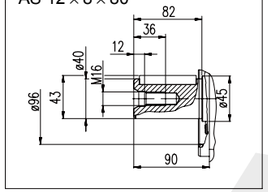
Unit dimensions, Size: 75/85

Shaft ends

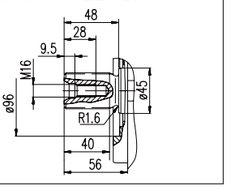
Z splined shaft DIN 5480
W40 × 2 × 30 × 18 × 9g



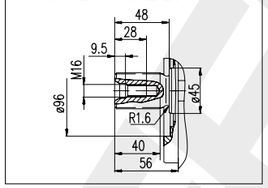
P cyl. shaft with key DIN 6885
AS 12 × 8 × 80



S splined shaft SAE J744
1 1/4 in14T 12/24 DP[1)]

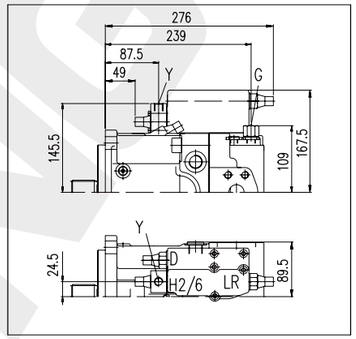


T splined shaft SAE J744
1 3/8 in 21T 16/32 DP[1)]



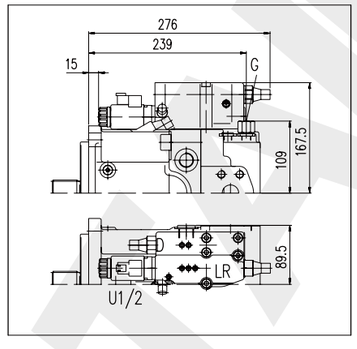
LRDH2/LRDH6

Power control with pressure cut-off and hydraulic stroke limiter (positive characteristic)



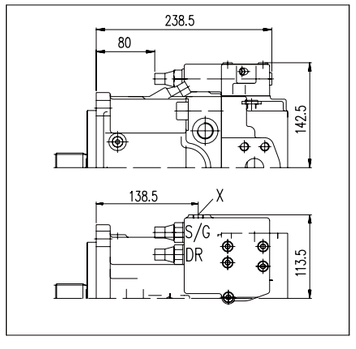
LRDU1/LRDU2

Power control with pressure cut-off and electrical stroke limiter (positive characteristic)



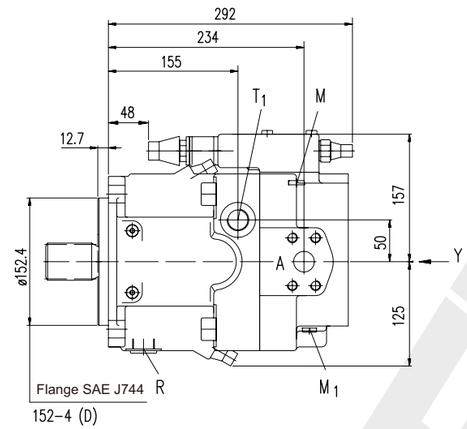
DRS

Pressure control with load sensing control

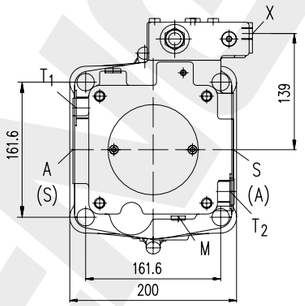


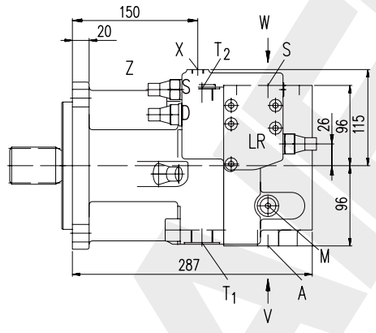
Unit dimensions, size: 95/115

Type N00 LRDS control

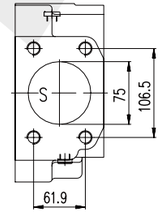


View Y
clockwise rotation
anti-clockwise rotation

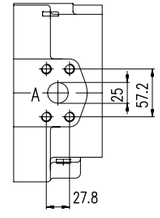




Detail W



Detail V



Ports

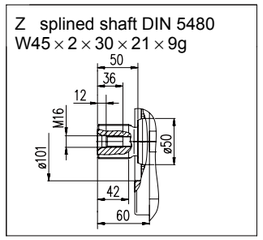
A	Service ports (high pressure series)	SAE J518	1 in
	fastening thread		M10；Depth 17
S	Suction port (standard series)	SAE J518	3 in
	fastening thread		M16；Depth 17
T_1/T_2	Bleeding, tank	DIN 3852-1	M26X1.5；Depth 16
R	Bleeding, oil drain	DIN 3852-1	M26X1.5；Depth 16
M1	Measuring position, positioning chamber	DIN 3852-1	M12X1.5；Depth 12
M	Measuring position, service port	DIN 3852-1	M12X1.5；Depth 12
X	Pilot pressure port	DIN 3852-1	M14X1.5；Depth 12

1) ANSI B92.1a-1976, 30° pressure angle, flat root side fit, tolerance class 5

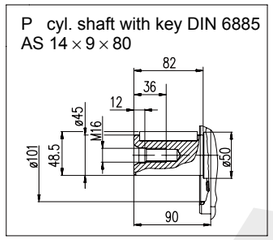
Unit dimensions, Size: 95/115

Shaft ends

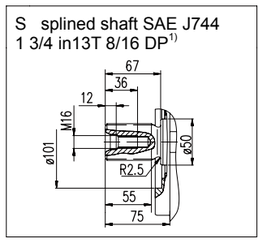
Z splined shaft DIN 5480
W45×2×30×21×9g



P cyl. shaft with key DIN 6885
AS 14×9×80

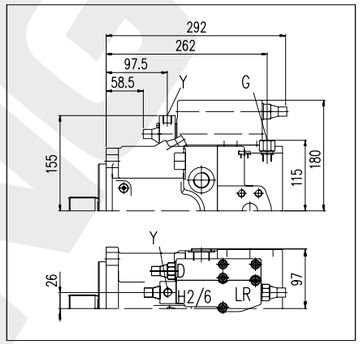


S splined shaft SAE J744
1 3/4 in13T 8/16 DP[1)]



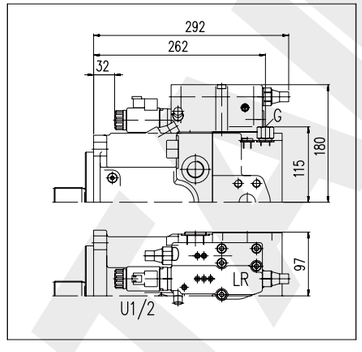
LRDH2/LRDH6

Power control with pressure cut-off and hydraulic stroke limiter(positive characteristic)



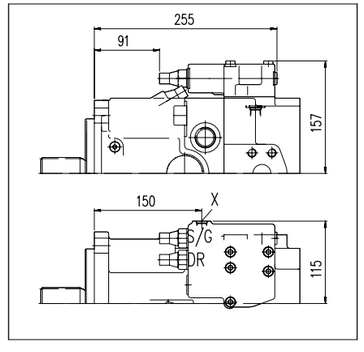
LRDU1/LRDU2

Power control with pressure cut-off and electrical stroke limiter (positive characteristic)



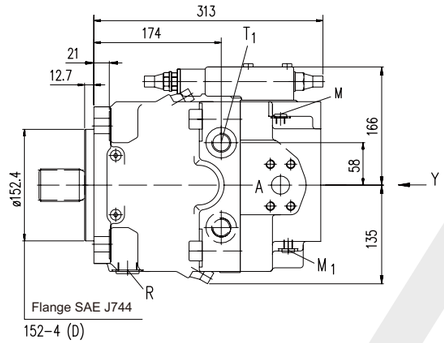
DRS

Pressure control with load sensing control



Unit Dimensions, Size 130/145

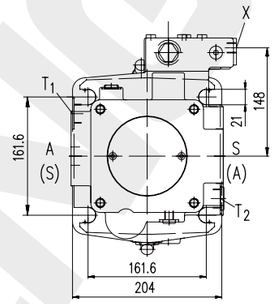
Type N00 LRDS control



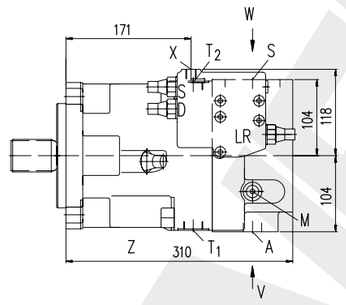
View Y

clockwise rotation

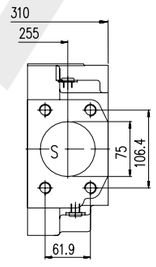
anti-clockwise rotation



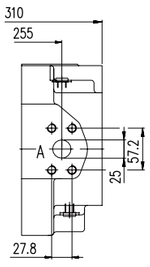
without charge pump



Detail W



Detail V



Ports

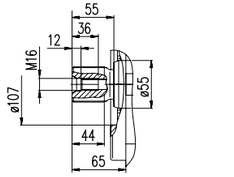
A	Service ports (high pressure series) fastening thread	SAE J518	1 in M12；Depth 17
S	Suction port (standard series) fastening thread	SAE J518	3 in M16；Depth 24
T_1/T_2	Bleeding, tank	DIN 3852-1	M26X1.5；Depth 16
R	Bleeding, oil drain	DIN 3852-1	M26X1.5；Depth 16
M1	Measuring position, positioning chamber	DIN 3852-1	M12X1.5；Depth 12
M	Measuring position, service port	DIN 3852-1	M12X1.5；Depth 12
X	Pilot pressure port	DIN 3852-1	M14X1.5；Depth 12

1) ANSI B92.1a-1976, 30° pressure angle, flat root side fit, tolerance class 5

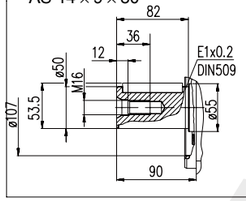
Unit dimensions, Size: 130/145

Shaft ends

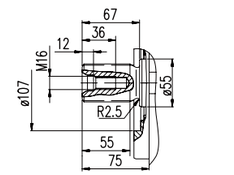
Z splined shaft DIN 5480
W50 × 2 × 30 × 24 × 9g



P cyl. shaft with key DIN 6885
AS 14 × 9 × 80

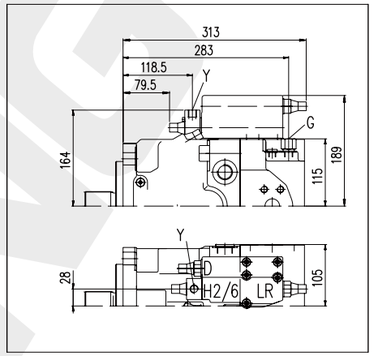


S splined shaft SAE J744
1 3/4 in13T 8/16 DP[1)]



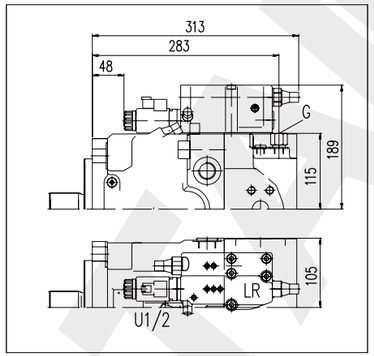
LRDH2/LRDH6

Power control with pressure cut-off and hydraulic stroke limiter (positive characteristic)



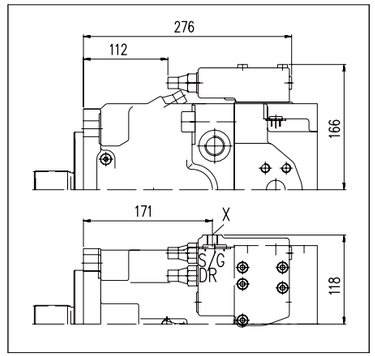
LRDU1/LRDU2

Power control with pressure cut-off and electrical stroke limiter (positive characteristic)



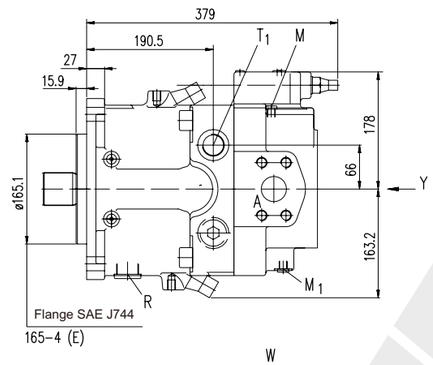
DRS

Pressure control with load sensing control

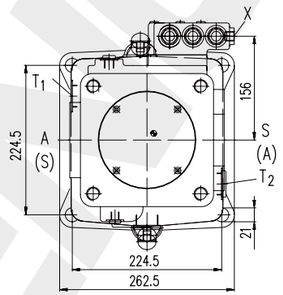


Unit dimensions, size: 190

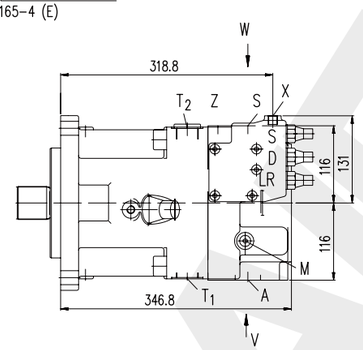
Type N00 LRDS control



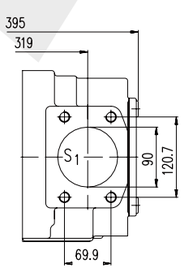
View Y
clockwise rotation
anti-clockwise rotation



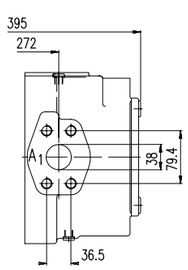
with charge pump



Detail W



Detail V



Ports

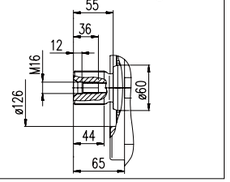
A	Service ports (high pressure series) fastening thread	SAE J518	1 1/2 in M16；Depth 21
S	Suction port (standard series) fastening thread	SAE J518	3 1/2 in M16；Depth 24
T_1/T_2	Bleeding, tank	DIN 3852-1	M33X2；Depth 16
R	Bleeding, oil drain	DIN 3852-1	M33X2；Depth 16
M1	Measuring position, positioning chamber	DIN 3852-1	M12X1.5；Depth 12
M	Measuring position, service port	DIN 3852-1	M12X1.5；Depth 12
X	Pilot pressure port	DIN 3852-1	M14X1.5；Depth 12

1) ANSI B92.1a-1976, 30° pressure angle, flat root side fit, tolerance class 5

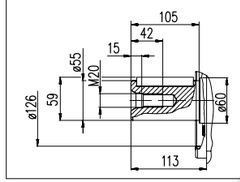
Unit dimensions, Size: 190

Shaft ends

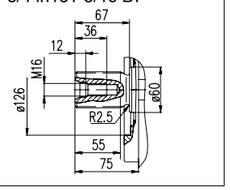
Z splined shaft DIN 5480
W50 × 2 × 30 × 24 × 9g



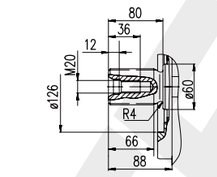
P cyl. shaft with key DIN 6885
AS 16 × 10 × 100



S splined shaft SAE J744
1 3/4 in13T 8/16 DP[1)]

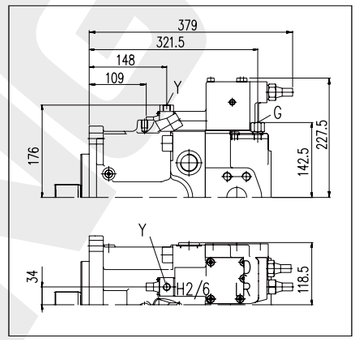


T splined shaft SAE J744
2 in 15T 8/16 DP[1)]



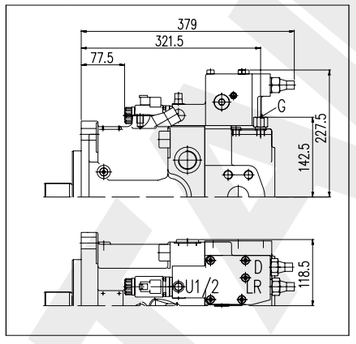
LRDH2/LRDH6

Power control with pressure cut-off and hydraulic stroke limiter (positive characteristic)



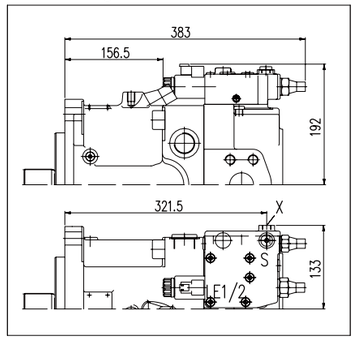
LRDU1/LRDU2

Power control with pressure cut-off and electrical stroke limiter (positive characteristic)



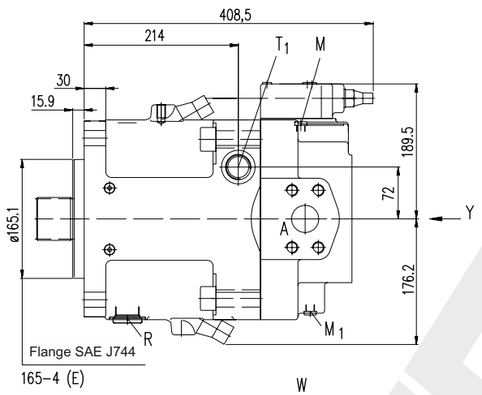
LE1S/LE2S

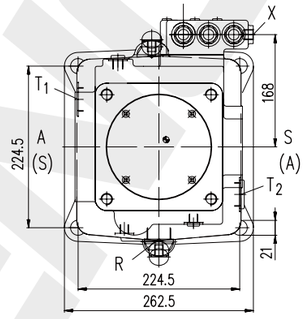
Power control with electrical override (negative characteristic) and load sensing control

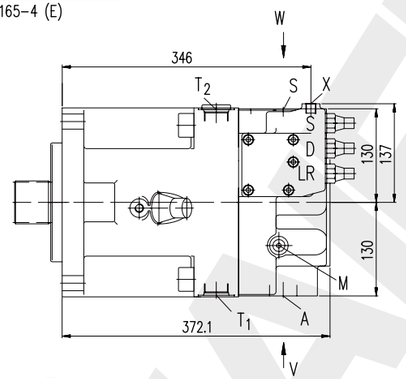


Unit dimensions, size: 260

Type N00 LRDS control

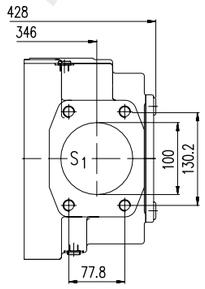




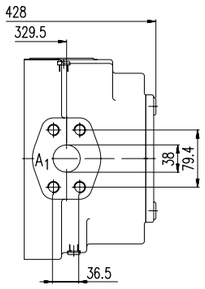


with charge pump

Detail W



Detail V



Ports

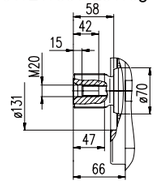
A	Service ports (high pressure series) fastening thread	SAE J518	1 1/2 in M16；Depth 21
S	Suction port (standard series) fastening thread	SAE J518	4 in M16；Depth 21
T_1/T_2	Bleeding, tank	DIN 3852-1	M33X2；Depth 16
R	Bleeding, oil drain	DIN 3852-1	M33X2；Depth 16
M1	Measuring position, positioning chamber	DIN 3852-1	M12X1.5；Depth 12
M	Measuring position, service port	DIN 3852-1	M12X1.5；Depth 12
X	Pilot pressure port	DIN 3852-1	M14X1.5；Depth 12

1) ANSI B92.1a-1976, 30° pressure angle, flat root side fit, tolerance class 5

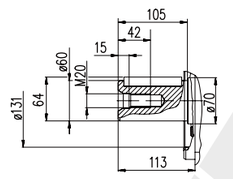
Unit dimensions, Size: 260

Shaft ends

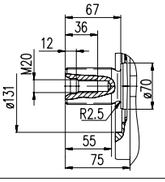
Z splined shaft DIN 5480
W60 × 2 × 30 × 28 × 9g



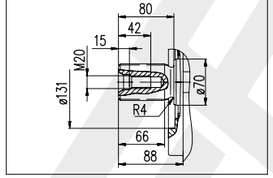
P cyl. shaft with key DIN 6885
AS 18 × 11 × 100



S splined shaft SAE J744
1 3/4 in13T 8/16 DP[1)]

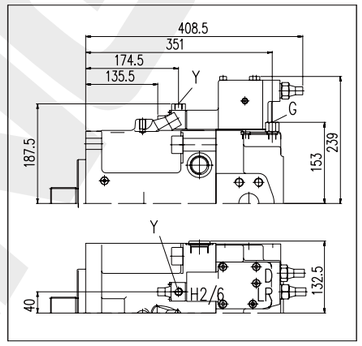


T splined shaft SAE J744
2 1/4 in 17T 8/16 DP[1)]



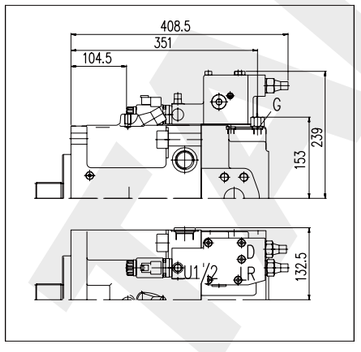
LRDH2/LRDH6

Power control with pressure cut-off and hydraulic stroke limiter (positive characteristic)



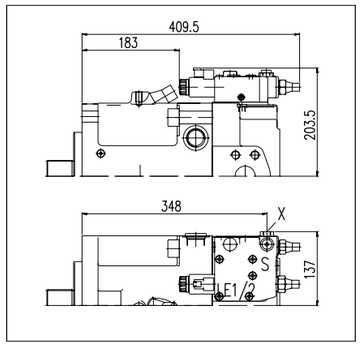
LRDU1/LRDU2

Power control with pressure cut-off and electrical stroke limiter (positive characteristic)



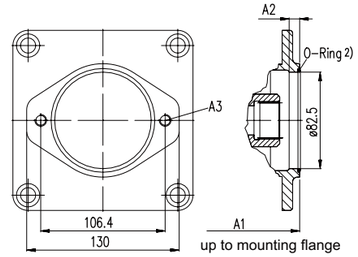
LE1S/LE2S

Power control with electrical override (negative characteristic) and load sensing control



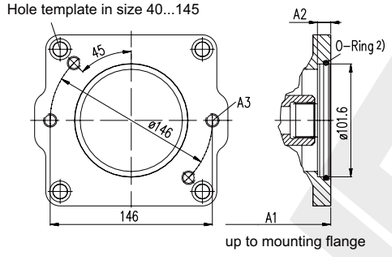
Through drive dimensions

Flange SAE J744-82-2(A)
Coupler for splined shaft according to ANSI B92.1a-1976



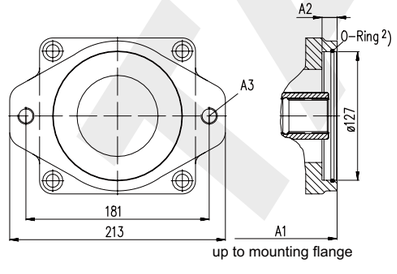
Flange SAE J744-101-2(B)
Coupler for splined shaft according to ANSI B92.1a-1976
Coupler for splined shaft according to DIN 5480

Hole template in size 40...145



In size 190 to 260, the hole template is turned 45°counter clockwise

Flange SAE J744-127-2(C)
Coupler for splined shaft according to ANSI B92.1a-1976
Coupler for splined shaft according to DIN 5480



5/8 in 9T 16/32DP[1)] (SAE J744-16-4(A)) K01
3/4 in 11T 16/32DP[1)] (SAE J744-19-4(A-B)) K52

size	A1 K01	A1 K52	A2	
40	240	240	8	M10;depth15
60	257	257	-	M10;depth15
75	275	275	-	M10;depth15
95	306	306	-	M10;depth12.5
130/145	329	329	-	M10;depth12.5
130/145*	363	363	-	M10;depth12.5
190*	394	394	-	M10;depth13
260*	427.3	427.3	-	M10;depth13

※with charge pump

7/8 in 13T 16/32DP[1)] (SAE J744-22-4(A)) K02
1 in 15T 16/32DP[1)] (SAE J744-25-4(B-B)) K02

W35X2X30X16X9g K79

size	A1 K02	A1 K04	A1 K79	A2	A3
40	244	244		10	M12;depth19
60	261	261	261	10	M12;depth19
75	279	279		10	M12;depth19
95	303	303	303	10	M12;depth16
130/145	326	326	326	10	M12;depth16
130/145*	360	360	360	10	M12;depth16
190*	404	404	394	-	M12;depth15
260*	437.5	437.5	437.5	-	M12;depth15

※with charge pump

1 1/4 in 14T 12/24DP[1)] (SAE J744-32-4(C)) K07
1 1/2 in 17T 12/24DP[1)] (SAE J744-28-4(C-C)) K24

W30X2X30X14X9g K80

W35X2X30X16X9g K61

size	A1 K07	A2 K24	A3 K80	K61		
60	272	-	265	265	13	M16;depth20
75	290	-	283	283	13	M16;depth20
95	318	318	318	318	13	M16;depth20
130/145	330	330	330	330	13	M16;depth20
130/145*	364	364	364	364	13	M16;depth20

※with charge pump

Note: All through drive flanges can be turned 90°

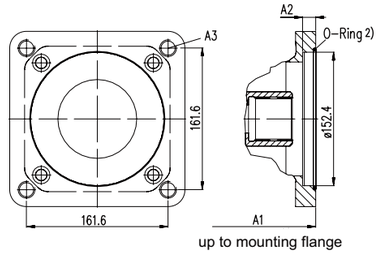
Please state in clear text if required.

1) Pressure angle 30°, flat root side fit, tolerance class 5

2) O-ring seal is included in the supply

Through drive dimensions

Flange SAE J744-152-4(D)
Coupler for splined shaft according to ANSI B92.1a-1976
Coupler for splined shaft according to DIN 5480



up to mounting flange

1 1/4 in 14T 12/24DP[1)] (SAE J744-32-4(C)) K86
1 3/4 in 13T 8/16DP[1)] (SAE J744-44-4(D)) K17

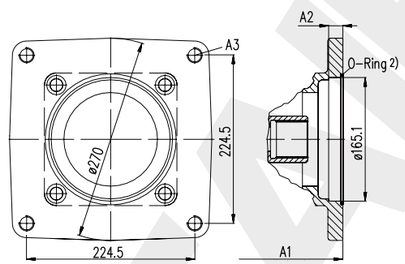
W40X2X30X18X9g K81
W45X2X30X21X9g K82
W50X2X30X24X9g K83

size	A1					A2	A3
	K86	K17	K81	K82	K83		
75	290	-	290	-	-	13	M20;depth28
95	317	327	317	317	-	30	M20;depth25
130/145	340	350	340	340	340	30	M20;depth25
130/145*	374	384	374	374	374	30	M20;depth25
190*	424	424	424	424	424	13	M20;depth22
260*	459	459	459	459	459	13	M20;depth22

1 3/4 in 13T 16/32DP (SAE J744-32-4(C)) K72

W50X2X30X24X9g K84
W60X2X30X28X9g K67

Flange SAE J744-101-2(E)
Coupler for splined shaft according to ANSI B92.1a-1976
Coupler for splined shaft according to DIN 5480



up to mounting flange

	A1			A2	A3
	K72	K84	K67		
190*	409	409	-	19	M20;depth25
260*	459	442.5	442.5	19	M20;depth25
※with charge pump					

Note: All through drive flanges can be turned 90°
Please state in clear text if required.
1) Pressure angle 30°, flat root side fit, tolerance class 5
2) O-ring seal is included in the supply

Installation and Commissioning Instructions

The pump housing must be filled with hydraulic fluid during and discharged with air commissioning and before operation (filling of housing case).

Commissioning must take place at low speed and without load until the system has been bled completely.

In long periods at standstill the housing can empty via the service lines.

The case drain for the pump housing cavity must be drained into the tank through the highest leakage oil port (T1,T2). The minimum suction pressure at port S of 0.8 bar absolute (without charge pump) or 0.6 bar (with charge pump) may not be dropped below of.

Installation position:

Installation below tank

The pump is below the minimum oil level of the tank.

Recommended installation positions :1 and 2.

Installation above the tank

The pump is above the minimum oil level of the tank.

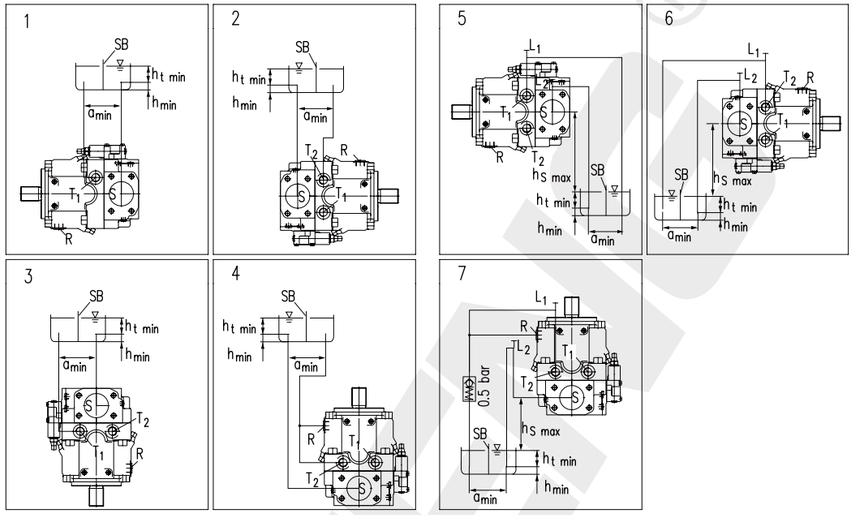
Comply with the maximum allowable suction height hs max=800mm.

A11VLO (with charge pump) is not designed to be mounted above the tank.

Recommended installation position 7 (shaft facing up): The check valve (opening pressure 0.5bar) in the drain line of the housing can prevent internal discharge of the housing.

For control options with pressure controls, displacement limiter, HD, and EP controls, the minimum displacement setting must be Vg ≥Vg max.

Installation Instructions



$h_{s\,max}$=800mm,$h_{t\,min}$=200mm,$h_{t\,min}$=100mm,SB=muffler plate(baffle)

When designing the tank, ensure that there is sufficient space q_{min} between the suction line and the tank drain line to prevent heated return hydraulic fluid from being sucked directly from the rear.

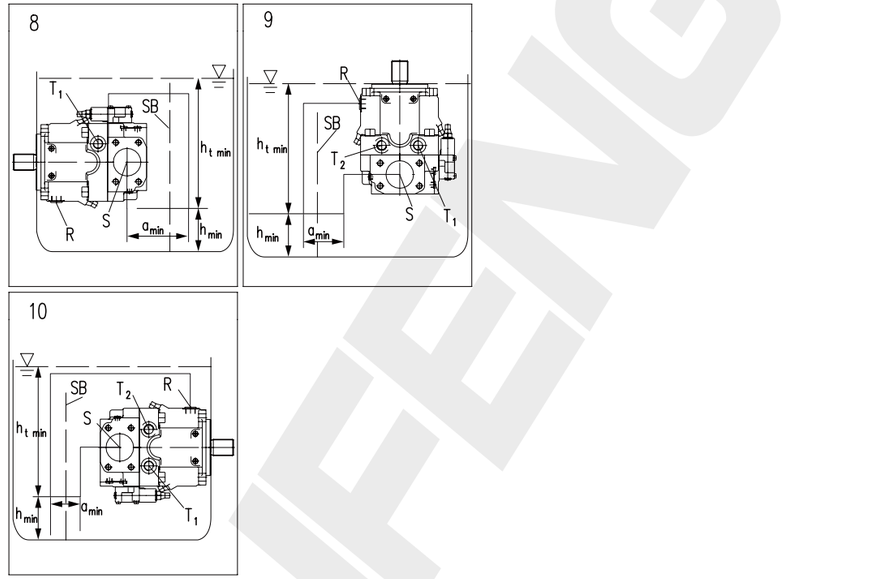
Installation position	Exhaust	Oil filling
1	T_1	S+T_1
2	R	S+T_2
3	T_1/T_2	S+T_1/T_2
4	R	S+T_1/T_2

Installation position	Exhaust	Oil filling
5	L_1+L_2	L_2(S)+L_1(T_1)
6	R+L_2	L_2(S)+L_1(T_2)
7	L_1+L_2	L_2(S)+L_1(T_1/T_2)

Installation Instructions

Tank installation

The pump below the minimum oil level of the tank.



$h_{s\,max}$=800mm,$h_{t\,min}$=200mm,$h_{t\,min}$=100mm,SB=muffler plate(baffle)

When designing the tank, ensure that there is sufficient q_{min} between the suction line and the tank drain line to prevent heated return hydraulic fluid from being sucked directly from the rear.

Installation position	Exhaust	Oil filling
8	T_1	Through all the opening ports T_1,T_2, R and S oil ports
9	R	Automatic operation, below hydraulic oil level
10	R	

Safety Instructions

The pump A11VO is designed for using in an open circuit.

Configuration, assembly, commissioning of the pump must be performed by trained and qualified personnel.

Please read the corresponding instruction manual thoroughly before using the axial piston pump. If necessary, can be obtained from Shandong Taifeng.

There is a danger of burns from the pump and especially the solenoids during and shortly after operation. Appropriate safety measures should be taken (e.g. wearing protective clothing).

The characteristic of axial piston pumps may change in respond to different working conditions (working pressure, oil temperature).

Operation line ports

- Oil orifice and fixed thread are designed for maximum specified pressure. The manufacturer of the machine or system must ensure that the safety number of connecting components and piping meets the specified operating conditions (pressure, flow, hydraulic fluid, temperature).

- The operating and function ports are designed exclusively for connecting hydraulic lines.

You must follow the data and instructions included here.

Ask for installation drawings that you must follow before completing the final design.

Not all models of this product are approved for the safety features required by ISO13849. If you need reliability parameters related to functional safety (such as MTTFd), please consult the responsible contact person of Shandong Taifeng.

The pressure controller is not a backup device in case of pressure overload. A separate relief valve should be installed in the hydraulic system.

Use the following fastening torque.

- Connector

Follow manufacturer's specifications for all joint fastening torques.

Bolt installation

For DIN 13 fastening screws we recommend checking the tightening torque individually according to VDI 2230 Edition 2003.

- Threaded holes for axial piston pump

The maximum allowable tightening torque MG max for threaded holes shall not be exceeded. Please refer to the table below for the values.

- Locking screw:

For metal locking screws supplied with the axial piston pump, the tightening torque MV required for the locking screw shall be used. See the table below for the values.

threaded dimension		maximum alloable tightening torque of the internal threaded hole MG_{max}	tightening torque MV required by the locking screw MV	WAT sockets
M12 × 1.5	DIN3852	50Nm	25Nm	6mm
M14 × 1.5	DIN3852	80Nm	35Nm	6mm
M22 × 1.5	DIN3852	210Nm	80Nm	10mm
M26 × 1.5	DIN3852	230Nm	120Nm	12mm
M33 × 2	DIN3852	540Nm	310Nm	17mm

Axial Piston Variable Pump
A7VO/63 Series

TAIFENG

- Sizes 55 to160
- Nominal pressure 350 bar
- Maximum pressure 400 bar
- Open circuit

Features

- Variable pump with axial tapered piston rotary group of bent-axis design, for hydrostatic drives in open circuit
- For use in mobile and stationary applications
- Flow is proportional to the drive speed and displacement.
- The flow can be steplessly changed by adjusting the bent axis
- Wide selection of control devices
- Compact, robust pump with a long service life

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Axial Piston Variable Pump
A7VO/63 Series

TAIFENG

Ordering code

01	02	03	04		05	06		07	08	09	10	11	12
A7V	**O**			**/**	**63**		**-**	**V**		**B**	**01**		

Axial piston unit

01	Bent-axis design, variable, nominal pressure 350 bar, maximum pressure 400 bar	A7V

Operating mode

02	Pump, open circuit	O

Size （NG）

03	Geometric displacement Vg (cm3), see “Technical data” on page 7	55	65	80	107	160

Control device

			55	65	80	107	160	
	Power controller without power override		●	●	○	○	○	LR
	with pressure cut-of		●	●	○	○	○	LRD
	with stroke limiter	negative control Δp = 25 bar	○	○	○	○	○	LRH1
	with pressure cut-off and stroke limiter	negative control Δp = 25 bar	○	○	○	○	○	LRDH1
	with pressure cut-off and load sensing		●	●	○	○	○	LRDS
	Power controller with hydraulically proportional power override (only available for clockwise rotation and with port plate 02)							
04	with load sensing		○	○	○	-	-	LA1S
	with load sensing and hydraulically proportional LS-override		○	○	○	-	-	LA1S5
	Pressure controller		●	●	○	○	○	DR
	remotely controlled		○	○	○	○	○	DRG
	with load sensing		●	●	○	○	○	DRS
	Proportional control hydraulic	Positive control Δp = 10 bar	○	○	○	○	○	HD1
	with pressure cut-off, remotely controlled	Positive control Δp = 10 bar	○	○	○	○	○	HD1G
	Proportional control electrical	Positive control U = 24 V	○	○	○	○	○	EP2

Series

05	Series 6, index 3			63

Direction of rotation 55-160

06	Viewed on drive shaft	clockwise	○	R
		counter-clockwise	●	L

Sealing material

07	NBR (nitrile -butadiene rubber)			N

Drive shaft 55-160

08	Splined shaft DIN 5480		●	Z
	Parallel keyed shaft according to DIN 6885		○	P

Mounting flange

09	ISO 3019-2; 4-hole			B

Port plate for working lines

10	SAE flange ports A and S at rear (metric fastening thread)	01
	SAE flange ports A and S at side (available for power controllers LA1S and LA1S5 only, metric fastening thread)	02

●=available ○=please consult before ordering - =not available

Ordering code

01	02	03	04		05	06		07	08	09	10	11	12
A7V	**O**			**/**	**63**		**-**	**V**		**B**	**01**		

Connector for solenoids[1]		
11	Without connector （with electromagnet）	H
	DEUTSCH molded connector, 2-pin – without suppressor diode	P
Standard / special version		
12	Standard version (without code)	
	Special version	-S

●=available ○=plaese consult before ordering - =not available

1)Connectors for other electric components may differ

Notice:

•Note the project planning notes on page 19!

•Preservation:

- Up to 12 months as standard
- Up to 12 months as standard

(state in plain text when ordering)

Axial Piston Variable Pump
A7VO/63 Series
TAIFENG

Hydraulic fluids

The A7VO variable pump is designed for operation with HLP mineral oil according to DIN 51524.

Details regarding the 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).

Note

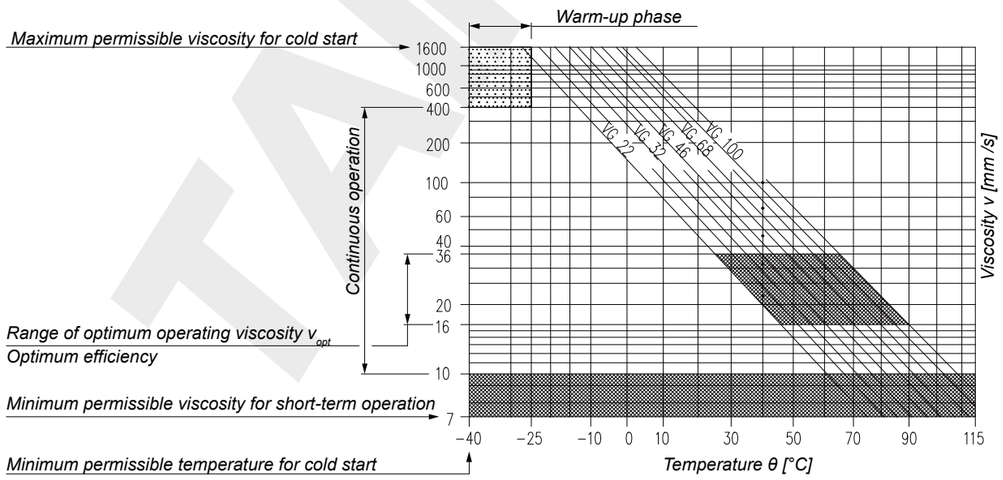
At no point of the component may the temperature be higher than 115 °C. The temperature difference specified in the table is to be taken into account when determining the viscosity in the bearing.

If it is not possible to maintain the conditions above due to extreme operating parameters, we recommend flushing the case at port U.

Viscosity and temperature of hydraulic fluids

	Viscosity	Temperature	Comment
Cold start	$v_{max} \leq 1600$ mm²/s	$\theta_{St} \geq -40$ °C	t ≤ 3 min, n ≤ 1000 rpm, without load p ≤ 50 bar
Permissible temperature difference		ΔT ≤ 25 K	between axial piston unit and hydraulic fluid in the system
Warm-up phase	v < 1600 to 400 mm²/s	θ = -40 °C to -25 °C	at p ≤ 0.7 × p_{nom}, n ≤ 0.5 × n_{nom} and t ≤ 15 min
Continuous operation	v = 400 to 10 mm²/s		This corresponds, for example on the VG 46, to a temperature range of +5 °C to +85 °C (see selection diagram)
		θ = -25 °C to +103 °C	measured at port R1/R2 Note the permissible temperature range of the shaft seal (ΔT = approx. 12 K between the bearing/shaft seal and port R1/R2)
	v_{opt} = 36 to 16 mm²/s		Range of optimum operating viscosity and efficiency
Short-term operation	$v_{min} \geq 7$ mm²/s		t < 3 min, p < 0.3 × p_{nom}

Selection diagram



Filtration of the hydraulic fluid

Finer filtration improves the cleanliness level of the hydraulic fluid, which in turn 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 very high hydraulic fluid temperatures (90 °C to maximum 115°C, measured at port R1/R2) a cleanliness level is necessary of at least 19/17/14 according to ISO 4406.

Leakage

The case interior is connected to the suction chamber. A separate case drain line from the case to the reservoir is therefore not required (both R ports are plugged).

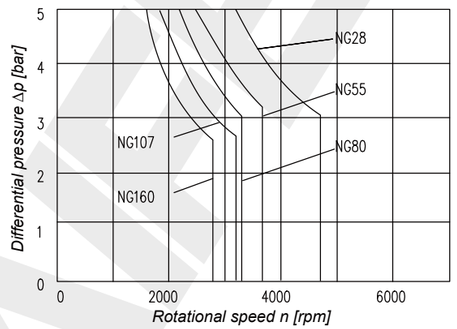
Exception: For versions with pressure controller or pressure cut-off, a drain line is needed to relieve port T1 to the reservoir

Shaft seal ring

Permissible pressure loading

The service life of the shaft seal is influenced by the speed of the axial piston unit and the leakage pressure in the housing (case pressure). Momentary pressure spikes (t < 0.1 s) up to 10 bar are allowed. The service life of the shaft seal decreases with increasing frequency of pressure spikes and increasing mean differential pressure.

The case pressure must be equal to or higher than the ambient pressure.



The FKM shaft seal ring may be used for leakage temperatures from -25 °C to +115 °C. For application cases below -25 °C, an NBR shaft seal is required (permissible temperature range: -40 °C to +90 °C).

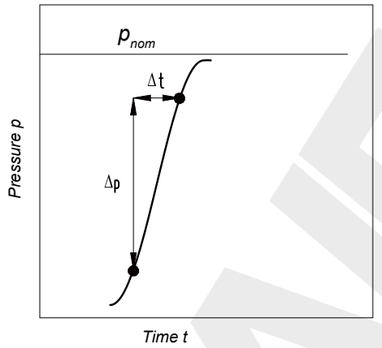
Flow direction

Direction of rotation, viewed on drive shaft	
clockwise	counter-clockwise
S to B	S to A

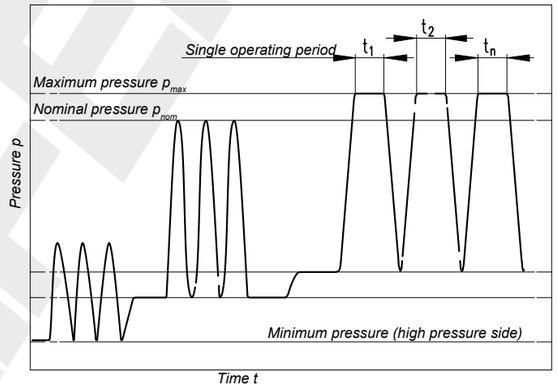
Operating pressure range

Pressure at working port A or B (high-pressure side)		Definition
Nominal pressure p_{nom}	350 bar absolute	The nominal pressure corresponds to the maximum design pressure.
Maximum pressure p_{max}	400 bar absolute	The maximum pressure corresponds the maximum operating pressure within the single operating period. The sum of the single operating periods must not exceed the total operating period.
Single operating period	10 s	
Total operating period	300 h	
Minimum pressure (high-pressure side)	10 bar absolute	Minimum pressure on high-pressure side (A or B) required to prevent damage to the axial piston unit.
Rate of pressure change $R_{A\,max}$	16000 bar/s	Maximum permissible rate of pressure build-up and reduction during a pressure change over the entire pressure range.
Pressure at suction port S (Inlet)		
Minimum pressure $p_{S\,min}$	0.8 bar absolute	Minimum pressure at suction port S (inlet) that is required to avoid damage to the axial piston unit. The minimum required pressure is dependent on the speed and displacement of the axial piston unit (see diagram on page 7).
Maximum pressure $p_{S\,max}$	2 bar absolute	

▼ *Rate of pressure change $R_{A\,max}$*



▼ *Pressure definition*



Total operating period = $t_1 + t_2 + ... + t_n$

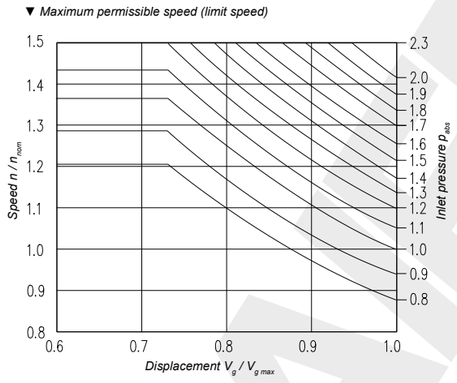
Note

Operating pressure range valid when using hydraulic fluids based on mineral oils. Values for other hydraulic fluids, please contact us.

Technical data

Size				55	65	80	107	160
Displacement, geometric, per revolution		$V_{g\,max}$	cm^3	54.8	65	80	107	160
Maximum rotational speed[1)]	At $V_{g\,max}$	n_{nom}	rpm	2500	2500	2240	2150	1900
	At $V_g < 0.74 \times V_{g\,max}$	n_{max1}	rpm	3400	3400	3000	2900	2560
Maximum rotational speed[2)]		n_{max2}	rpm	3750	3750	3350	3200	2850
Flow	At $V_{g\,max}$ and n_{nom}	q_v	l/min	137	162	179	230	304
Power	At $V_{g\,max}$, n_{nom} and $_{\Delta}p$ = 350 bar	P	kW	80	95	105	134	177
Torque	At $V_{g\,max}$ and $_{\Delta}p$ = 350 bar	T	Nm	305	362	446	596	891
Rotary stiffness	$V_{g\,max}$ to $V_g/2$	c_{min}	kNm/rad	10	12	16	21	36
	$V_g/2$ to 0 (interpolated)	c_{max}	kNm/rad	32	38	49	67	104
Moment of inertia rotary group		J_{GR}	kgm^2	0.0042	0.0042	0.0080	0.0127	0.0253
Maximum angular acceleration		α	rad/s^2	31600	31600	24200	19200	15300
Case volume		V	l	0.75	0.75	1.2	1.5	2.4
Weight (approx.)		m	kg	25	25	40	49	71

▼ *Maximum permissible speed (limit speed)*



Determining operating characteristics

Flow $q_v = \dfrac{V_g \times n \times \eta_v}{1000}$ [l/min]

Torque $T = \dfrac{V_g \times {}_{\Delta}p}{20 \times \pi \times \eta_{mh}}$ [Nm]

Power $P = \dfrac{2\,\pi \times T \times n}{60000} = \dfrac{q_v \times {}_{\Delta}p}{600 \times \eta_t}$ [kW]

Key

V_g = Displacement per revolution [cm^3]

$_{\Delta}p$ = Differential pressure [bar]

n = Rotational speed [rpm]

η_v = Volumetric efficiency

η_{mh} = Mechanical-hydraulic efficiency

η_t = Total efficiency ($\eta_t = \eta_v \times \eta_{mh}$)

Notes

- Theoretical values, without efficiency and tolerances; values rounded
- Operation above the maximum values or below the minimum values may result in a loss of function, a reduced service life or in the destruction of the axial piston unit.

1) The values are valid:
- At absolute pressure p_{abs} = 1 bar at suction port S
- For the optimal viscosity range of v_{opt} = 36 to 16 mm^2/s
- For hydraulic fluid based on mineral oils.

2) Maximum rotational speed (speed limit) for increased inlet pressure pabs at suction port S and $V_g < V_{g\,max}$, see diagram.

Permissible radial and axial forces of the drive shaft

Size			NG		55	65	80	107	160
drive shaft			Ø	mm	30	30	35	40	45
maximum radial force[1)] at distance a (from shaft collar)			$F_{q\,max}$	N	7581	7581	10266	13758	18278
			a	mm	17.5	17.5	20.0	22.5	25
	Maximum torque at $F_{q\,max}$		$T_{q\,max}$	Nm	281	281	444	681	1019
	Maximum differential pressure at $V_{g\,max}$ and $F_{q\,max}$		$\Delta p_{q\,max}$	bar	322	322	349	400	400
Maximum axial force at standstill or pressurefree operation	F_{ax} ±		+ $F_{ax\,max}$	N	0	0	0	0	0
			− $F_{ax\,max}$	N	500	500	710	900	11250
Permissible axial force per bar operating pressure			$+F_{ax\,perm}$/bar	N/bar	7.5	7.5	9.6	11.3	15.1

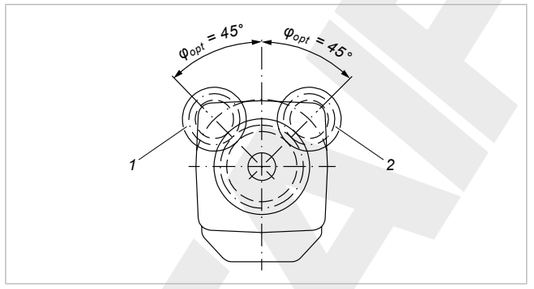
Effect of radialforce F_q on the service life of bearings

By selecting a suitable direction of radial force F_q, the load on the bearings, caused by the internal rotary group forces can be reduced, thus optimizing the service life of the bearings. Recommended position of mating gear is dependent on direction of rotation. Example:

Note

- The permissible axial force in direction (F_{ax}) is to be avoided, because thereby the bearing life is reduced.
- Special requirements apply in the case of belt drives, please contact us.

▼ *Gear drive*



1 *"Clockwise" rotation, pressure at port B*

2 *"Counter-clockwise" rotation, pressure at port A*

LR – Power controller without power override

The power controller regulates the displacement of the pump depending on the operating pressure so that a given drive power is not exceeded at constant drive speed.

The precise control with a hyperbolic control characteristic, provides an optimum utilization of available power.

The operating pressure acts on a rocker via a measuring spool which moves with the control. An externally adjustable spring force counteracts this, it determines the power setting.

If the operating pressure exceeds the set spring force, the control valve is actuated by the rocker and the pump swivels back from the initial position $V_{g\,max}$ toward $V_{g\,min}$. When doing this, the lever length at the rocker shortens and the operating pressure may rise in the same proportion as the displacement reduces without the drive power being exceeded ($p_B \times V_g$ = constant; p_B = operating pressure; V_g = displacement).

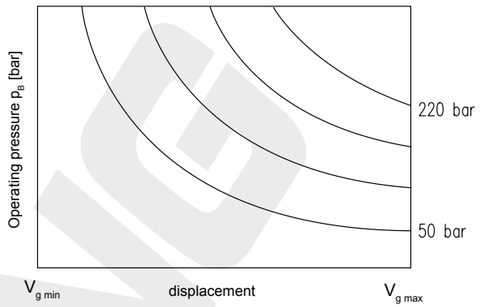
When depressurized, the pump is swiveled to its initial position to $V_{g\,max}$ by a return spring.

The hydraulic output power (characteristic LR) is influenced by the efficiency of the pump.

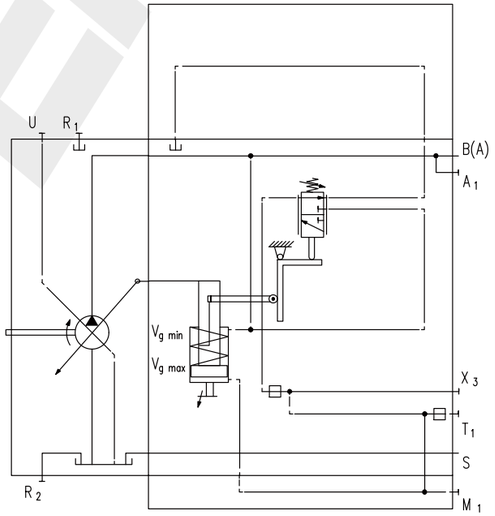
Beginning of control, setting range 50 to 220 bar When ordering, state in plain text:

- Drive power P [kW]
- Drive speed n [rpm]
- Maximum flow $q_{v\,max}$ [l/min]

▼ Characteristic curve LR



▼ Schematic LR



LRD – Power controller with pressure cut-off

The pressure cut-off is a pressure control which adjusts the displacement of the pump back to $V_{g\,min}$ after reaching the set pressure command value.

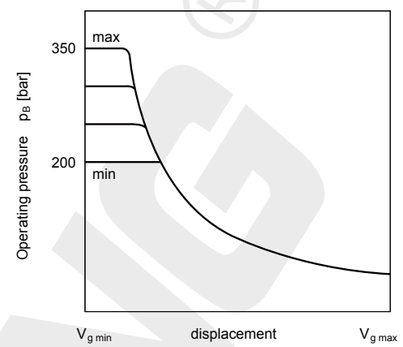
This function overrides the power controller, i.e. the power control function is executed below the pressure command value.

Pressure cut-off is preset to a pressure command value at the factory.

• Setting range 200 to 350 bar

When ordering, state the setting in plain text.

▼ Characteristic curve LRD



Notes

•The pressure setting of the pressure cut-off must be at least a factor of 5 higher than the beginning of control of power control.

Example:

– Beginning of control of the power controller: 50 bar

– Minimum setting of pressure cut-off:

5 × 50 = 250 bar

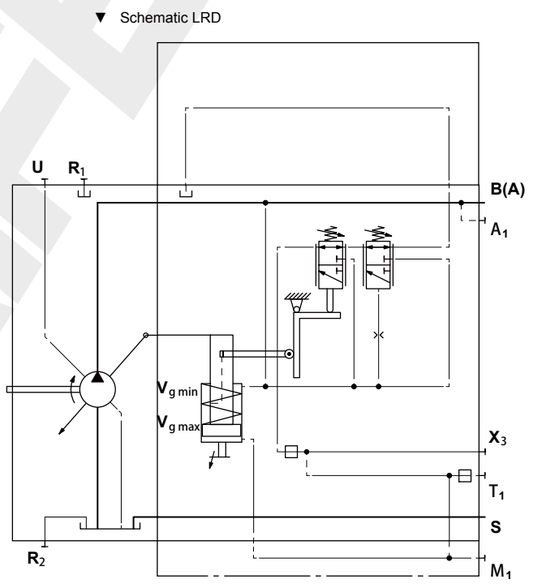
Higher settings of the pressure cut-off are always possible.

•For versions with pressure cut-off, a drain line is needed from port T1 to the reservoir.

When port T1 is plugged and ttank ≤ 50 °C, this results in a permissible pressure cut-off of ≤ 2 min.

•Any pressure-relief valve included in the system to limit the maximum pressure must have its start of opening at least 20 bar above the pressure cut-off setting.

▼ Schematic LRD



LR – Power controller without power override

LR… – Power controller with stroke limiter

Due to the hydraulic stroke limiter, it is possible to change or limit the displacement of the pump continuously across the entire control range. The displacement is set proportionally using the pilot pressure p_{St} applied to port X1 (maximum of 40 bar).

The power control overrides the hydraulic stroke limiter, i.e. below the power characteristic (hyperbolic characteristic), the displacement is controlled in dependence on the pilot pressure. If the set flow or operating pressure exceeds thepower control characteristic, the power control over-ridesand reduces the displacement along the hyperbolic characteristic.

A control pressure of 40 bar is needed to swivel the pump from its initial position $V_{g\,max}$ to $V_{g\,min}$.

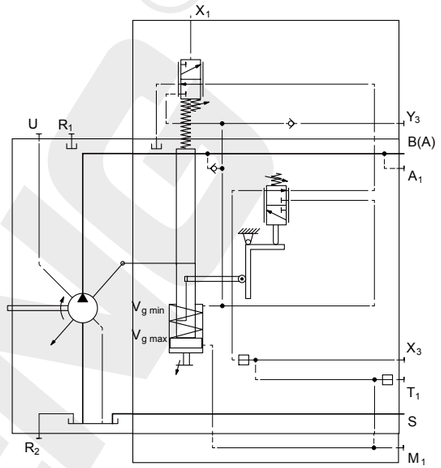
The necessary control power is taken from the operating pressure or the external control pressure applied to port Y3.

To ensure that the stroke limiter functions at a low operating pressure of < 40 bar, port Y3 must be supplied with an external control pressure of about 40 bar.

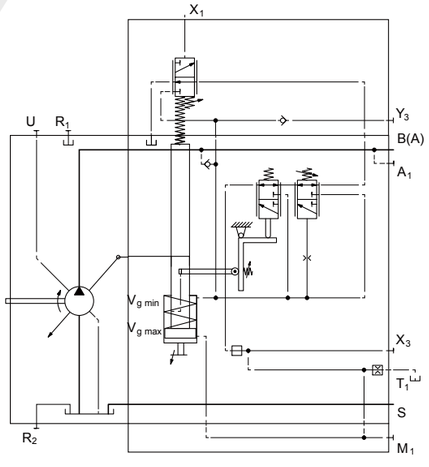
LRH1 – Hydraulic stroke limiter (negative control)

- Control from $V_{g\,max}$ to $V_{g\,min}$ As the pilot pressure increases, the pump swivels to a smaller displacement.
- Start of control (at $V_{g\,max}$) can be set to 4 to 15 bar When ordering, state the start of control in plain text.
- Initial position without pilot signal (pilot pressure): $V_{g\,max}$

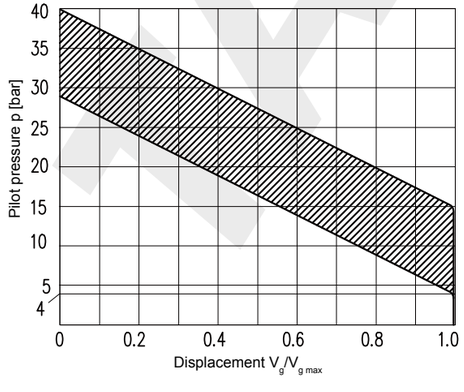
▼ Schematic LRH1



▼ Schematic LRDH1



▼ Characteristic curve LRH1
control pressure increase ($V_{g\,max} - V_{g\,min}$) Δp = 25 bar



LR – Power controller without power override

LRDS – Power control with pressure cut-off and load sensing

The load sensing controller works as a load-pressure controlled flow controller and adjusts the displacement of the pump to the volume required by the consumer. The flow of the pump is then dependent on the cross section of the external measuring orifice (1), which is located between

the pump and the consumer. Below the power curve and the setting of the pressure cut-off and within the control range of the pump, the flow is independent of the load pressure.

The measuring orifice is usually a separately located load sensing directional valve (control block). The position of the directional valve spool determines the opening crosssection of the measuring orifice and thus the flow of the pump.

The load sensing controller compares pressure before and after the orifice and keeps the pressure drop (differential pressure $_{\Delta}p$) across the orifice – and therefore the flow – constant.

If the differential pressure Δp at the measuring orifice rises, the pump is swiveled back (toward $V_{g\,min}$). If the differential pressure $_{\Delta}p$ drops, the pump is swiveled out (toward $V_{g\,max}$) until equilibrium at the measuring orifice is restored.

$_{\Delta}p_{measuring\ orifice} = p_{pump} - p_{consumer}$

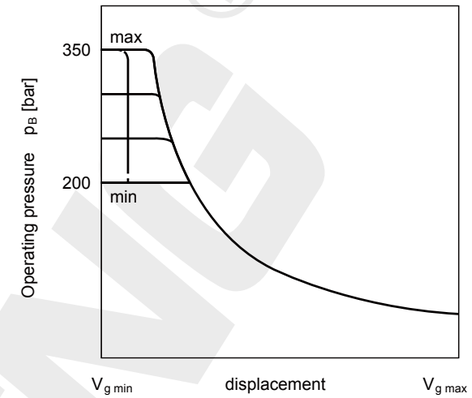
- Setting range for $_{\Delta}p$ 14 to 25 bar
- Default setting 18 bar

When ordering, state the setting in plain text.

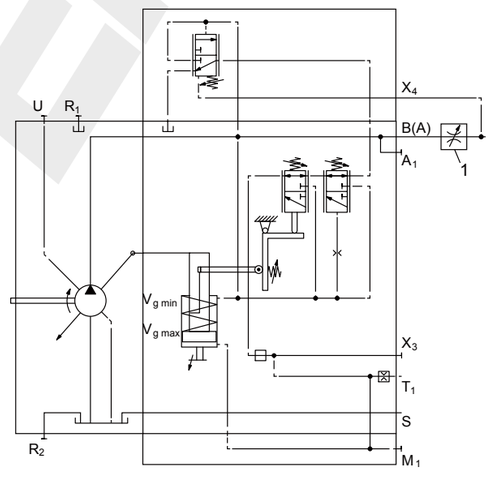
The stand-by pressure in zero-stroke mode (metering orifice closed) is slightly higher than the $_{\Delta}p$ setting.

In an LUDV system, the pressure cut-off is integrated in the flow sharing control block (LUDV).

▼ Characteristic curve LRDS



▼ Schematic LRDS



The measuring orifice (control block) (1) is not included in the scope of delivery.

LA1 – Power controller with hydraulic proportional power override

LA1S5 – Power controller with load sensing and hydraulically proportional LS-override

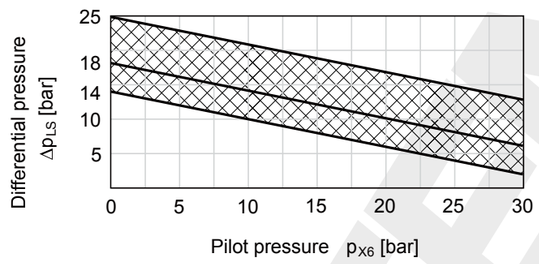
By connecting an external pilot pressure at port X6, it is possible to override proportionally the differential pressure Δp of the load sensing control.

Increasing pilot pressure = lower Δp setting.

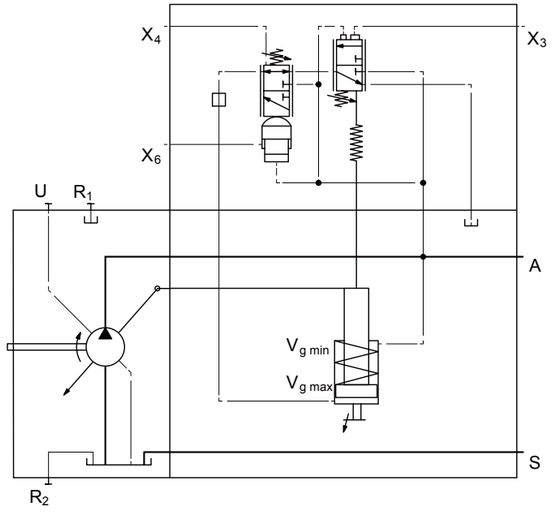
An example of this is shown in the characteristic curve below.

Please consult us before carrying out project planning.

▼ Characteristic curve LA1S5



▼ Schematic LA1S5



DR – Pressure controller

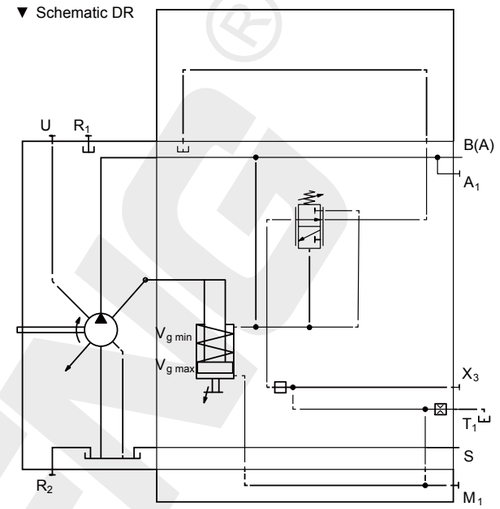
The pressure control limits the maximum pressure at the pump outlet within the control range of the variable pump.

The variable pump only delivers as much hydraulic fluid as is required by the consumers. If the operating pressure exceeds the setpoint value set at the integrated pressure valve, the pump control will shift toward a smaller displacement and the control deviation will decrease. When depressurized, the pump is swiveled to its initial position $V_{g\,max}$ by an adjustment spring.

•Setting range of pressure control 50 to 350 bar

When ordering, state the setting in plain text.

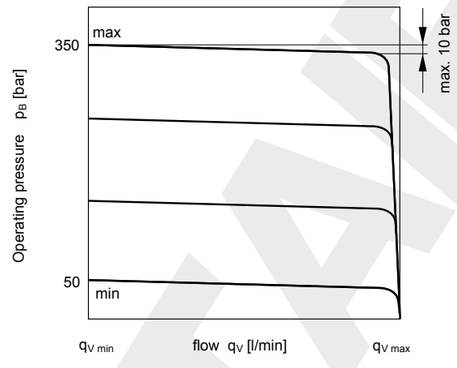
▼ Schematic DR



Notes

- For versions with controller DR, a drain line is needed from port T1 to the reservoir.
- Any pressure-relief valve included in the system to limit the maximum pressure must be set to a cracking pressure at least 20 bar above the controller setting

▼ Characteristic curve DR

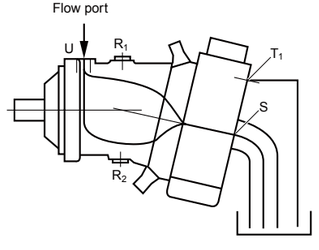


Zero-stroke operation

The standard pump unit is designed for intermittent constant pressure operation. Short-term zero-stroke operation

(< 1 min.) is permissible up to an operating pressure pmax = 315 bar at a reservoir temperature of ≤ 50 °C.

In the case of longer zero-stroke operation (> 1 min), bearing flushing should be carried out via flushing port U.



Flushing flow (recommended)

NG		28	55	80	107	160
$q_{V\,flush}$	l/min	3	4	6	8	12

Temperature of flushing fluid ≤ reservoir temperature

EP – Proportional electric control

The proportional electric control, type EP, provides continuous control of the displacement. Control is proportional to the electric control current applied to the solenoid.

• Control from $V_{g\,min}$ to $V_{g\,max}$ (positive control)

As the pilot pressure increases, the pump swivels to a larger displacement.

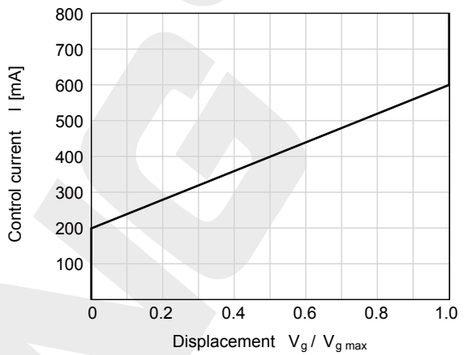
A control pressure of 40 bar is needed to swivel the pump from its initial position $V_{g\,min}$ to $V_{g\,max}$.

The necessary control power is taken from the operating pressure or the external control pressure applied to port Y_3.

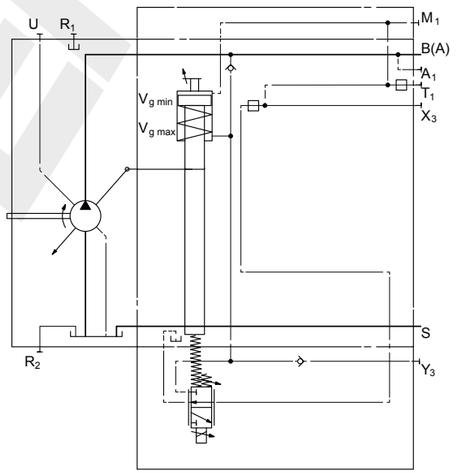
To ensure that control is guaranteed at a low operating pressure of < 40 bar too, port Y_3 must be supplied with an external control pressure of about 40 bar.

Technical data, solenoid	EP2
Voltage	24 V (±20%)
Control current	
Start of control	200 mA
End of control	600 mA
Current limit	0.77 A
Nominal resistance (at 20°C)	22.7 Ω
Dither frequency	100 Hz
Duty cycle	100%

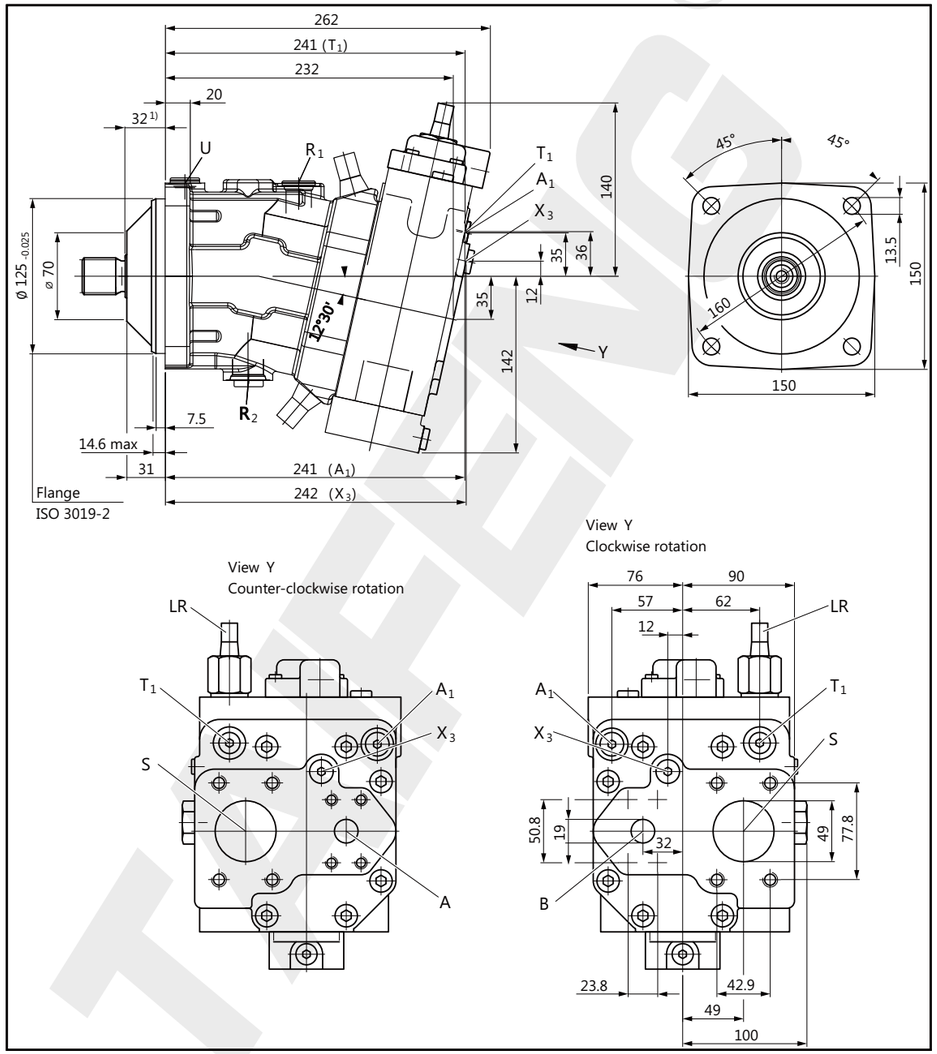
▼ Characteristic curve EP2 positive control



▼ Schematic EP2

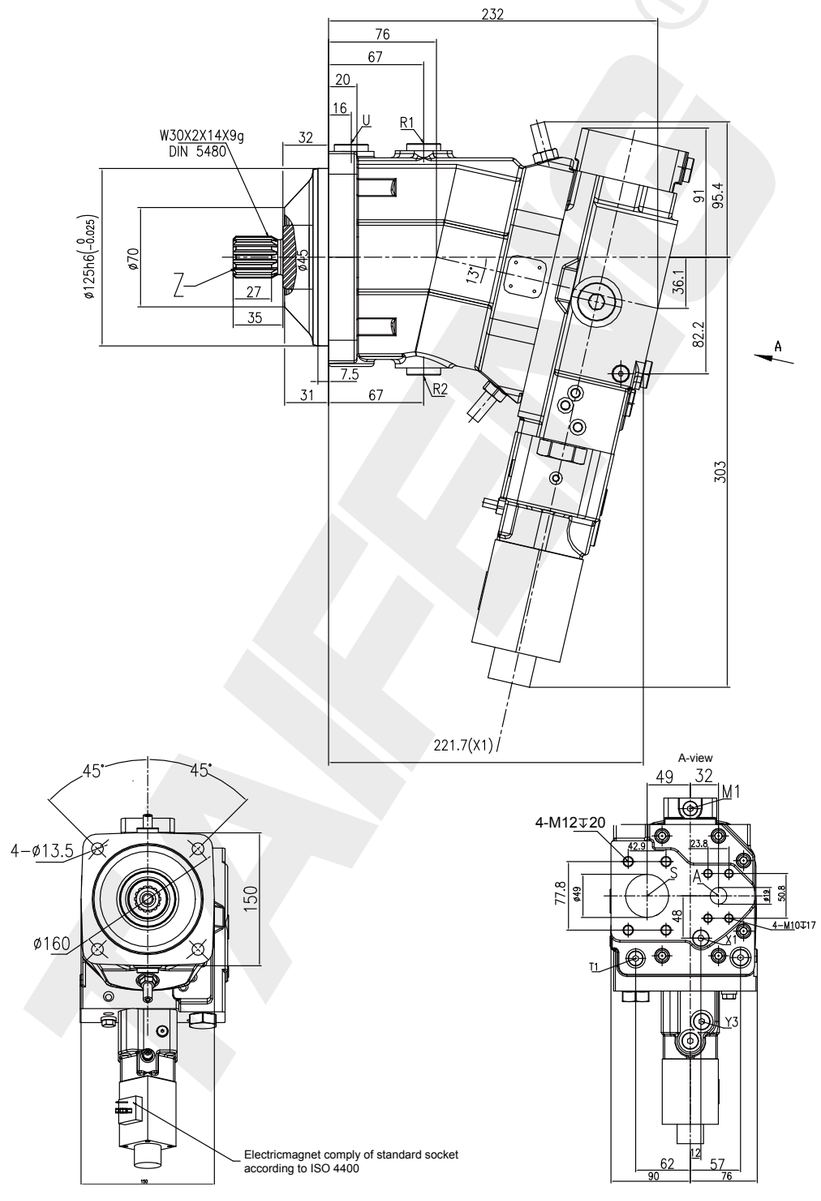


Dimensions, size 55



1) To shaft collar

Dimensions, size 55/65 electirc proportional



Installation instructions

General

At commissioning and during operation, the axial piston unit must be filled with hydraulic fluid and air bled. This must also be observed following a long standstill as theaxial piston unit can empty via the hydraulic lines.

Particularly in the installation position "drive shaft upwards", filling and air bleeding must be carried out completely as there is, for example, a danger of dry running.The pump housing is internally connected to the suction chamber. A separate drain line from the case to the reservoir is not needed. Exception: For versions with pressure controller or pressure cut-off, a drain line is needed to relieve port T1 to the reservoir.

To achieve favorable noise values, decouple all connecting lines using elastic elements.

In all operating conditions, the suction line and the drain line must flow into the reservoir below the minimum fluid level. The minimum suction pressure at port S must not fall below 0.8 bar absolute during operation either.

When designing the reservoir, ensure that there is adequate spacing between the suction line and the drain line. This minimizes oil turbulence and carries out degassing, which prevents the heated hydraulic fluid from being sucked directly back in again.

Notes

- Axial piston units with electric components (e.g. electric controls, sensors) must not be installed in a reservoir below the fluid level.
- In certain installation conditions, an influence on the control characteristic curves can be expected. Gravity, dead weight and case pressure can cause minor shifts in characteristics and changes in response time.

Key	
R_1/R_2	Air bleed port
U	Bearing flushing
S	Suction port
T_1	Control fluid drain
$h_{t\,min}$	Minimum required immersion depth (200 mm)
h_{min}	Minimum required spacing to reservoir base (100 mm)
SB	Baffle (baffle plate)

Installation position

See the following examples 1 to 4.

Additional installation positions are available upon equest.

Recommended installation position: 1 and 2

Installation position	Air bleeding	Filling
1	R_1	S
2	R_2	S
3	T_1	S
4	U	S

Project planning notes

- The A7VO pump is designed to be used in open circuits.
- Project planning, installation and commissioning of the axial piston units requires the involvement of skilled personnel.
- Before using the axial piston unit, please read the corresponding instruction manual thoroughly and completely. If necessary, request them from Bosch Rexroth.
- Before finalizing your design, request a binding installation drawing.
- The specified data and notes must be observed.
- Pressure controllers are no protection from pressure overload. A separate pressure relief valve is to be provided in the hydraulic system.
- Depending on the operating condition of the axial piston unit (operating pressure, fluid temperature), the characteristic may shift.
- Not all versions of the product are approved for use in a safety function pursuant to ISO 13849. Please consult the responsible contact person at Bosch Rexroth if you require reliability parameters (e.g. MTTFd) for functional safety.
- Working ports:
  – The ports and fastening threads are designed for the specified maximum pressure. The machine or system manufacturer must ensure that the connecting elements and lines correspond to the specified operating conditions (pressure, flow, hydraulic fluid, temperature) with the necessary safety factors.
  – The working ports and function ports can only be used to accommodate hydraulic lines.

Safety instructions

- During and shortly after operation, there is a risk of burns on the axial piston unit and especially on the solenoids. Take appropriate safety measures (e.g. by wearing protective clothing).
- Moving parts in control and regulation systems (e.g. valve spools) may in certain circumstances become stuck in an undefined position due to contamination (e.g. contaminated hydraulic fluid, abrasion or residual dirt from components). As a result, the hydraulic fluid flow or build-up of torque of the axial piston unit will no longer respond correctly to the operator's commands. Even the use of different filter cartridges (external or internal inlet filter) will not rule out a fault but merely minimize the risk. The machine/system manufacturer must test whether remedial measures are needed on the machine for the application concerned in order to set the consumer being driven to a safe position (e.g. safe stop) and if necessary to ensure it is properly implemented.

Swashplate Axial Piston Variable Pump
TFA7VO/11 Series

TAIFENG

- Size: 28 to 250
- Nominal pressure 350 bar
- Maximum pressure 400 bar
- Open circuit

Features

- Design for open circuit
- Pump flow is proportional to the drive speed and displacement. The flow can be infinitely varied by adjusting the swashplate angle.
- Flange port comply with SAE J518.
- 2 case drain ports
- Excellent suction function
- Low noise level
- Long service life
- The drive shaft can withstand axial and radial loads
- High power density.
- Varies of flow control devices
- Quick response
- Through drive for multiple pump systems

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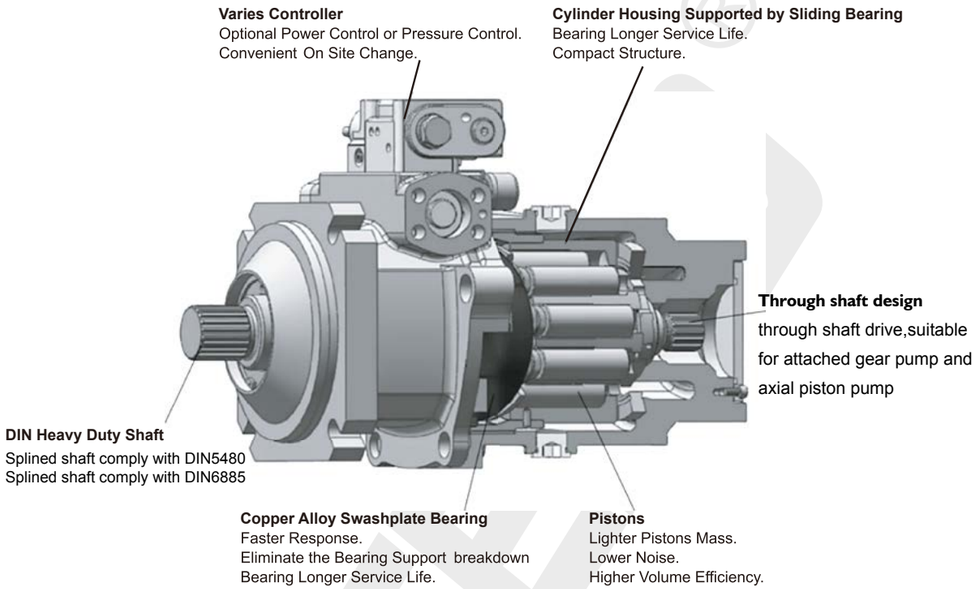
TAIFENG®

Features



Inside the pump housing, numbers of pistons are disposed in same one cylinder barrel circumference, and the center line of pistons are parallel with the center line of cylinder barrel, pistons reciprocate inside piston barrel. Piston barrel connect to drive shaft via spline, piston end is spherical joint, installed inside shoe, and shoe closely on the surface of swashblock. Swash-block is moveable, though an adjustment mechanism to adjust tilt angle.

As a motor go through drive shaft to rotate the piston barrel, caused by swashblock action, pistons reciprocating inside cylinder barrel, and go through the holes in diverter disk execute oil suction and press out. If change the tilt angle of swashblock, the distance of piston stroke can be changed, that is to change piston pump displacement.

Regarding to the control of oil, that is go through the crescent shaped groove in diverter disk to input and output oil. Diverter disk installed inside the pump housing, the pistons move out-ward the cylinder barrel, suction oil from diverter disk groove which connect to oil tank, and the others pistons move in-ward the cylinder barrel push the oil to pump pressure port. It always has one piston in transition area either pistons move from suction side to pressure side or from pressure side to suction side.

Swashplate Axial Piston Variable Pump
TFA7VO/11 Series
TAIFENG

Ordering code

TFA7V	O			/	11	-			
1	2	3	4		5		6	7	8

1.Axial Piston Pump.								
Swash plate Design,Variable displacement,Nominal Pressure 350 bar,Maximum Pressure 400 bar								TFA7V
2.Operating Mode.								
Hydraulic Pump,Open Circuit,Without charge pump.								O
3.Displacement.(ml/r)								
	28	55	80	107	160	250		
4.Control	28	55	80	107	160	250		
Constant Power Control	○	○	○	○	●	●		LR
Constant Pressure Control	○	○	○	○	●	●		DR
Electric-proportional displacement control	○	○	○	○	●	●		E2
Two points electric control	○	○	○	○	●	●		E6
Fixed	○	○	○	○	●	●		M
5.Series Number								
Design Series 10								10
6. Oil Port Connecting type	28	55	80	107	160	250		
Suction Port and Outlet Port — Thread Connecting	—	—	—	—	—	—		M
Suction Port and Outlet Port — SAE Flange Connecting	○	○	○	○	●	●		L
7.Directions of Rotation	28	55	80	107	160	250		
View from Shaft end — Clockwise	○	○	○	○	●	●		R
View from Shaft end — Counter-clockwise	○	○	○	○	○	○		L
8.Drive Shaft	28	55	80	107	160	250		
comply with DIN 5480 splined shaft — W25×0.25×18×9g	○	—	—	—	—	—		A0
comply with DIN 5480 splined shaft — W30×2×14×9g	—	○	—	—	—	—		A1
comply with DIN 5480 splined shaft — W35×2×16×9g	—	—	○	—	—	—		A2
comply with DIN 5480 splined shaft — W40×2×18×9g	—	—	—	○	—	—		A3
comply with DIN 5480 splined shaft — W45×2×21×9g	—	—	—	—	●	—		A4
comply with DIN 5480 splined shaft — W50×2×24×9g	—	—	—	—	—	●		A5
Cylindrical shaft with key — ∅25	○	—	—	—	—	—		B0
Cylindrical shaft with key — ∅30	—	○	—	—	—	—		B1
Cylindrical shaft with key — ∅35	—	—	○	—	—	—		B2
Cylindrical shaft with key — ∅40	—	—	—	○	—	—		B3
Cylindrical shaft with key — ∅15	—	—	—	—	●	—		B4
Cylindrical shaft with key — ∅50	—	—	—	—	—	●		B5

●= Available ○=Consult Taifeng before Order —=Not Available

Hydraulic fluid

To ensure piston pump service life, please operate with mineral oil. Please contact us, if operate with environmentally fluid or HF hydraulic fluid.

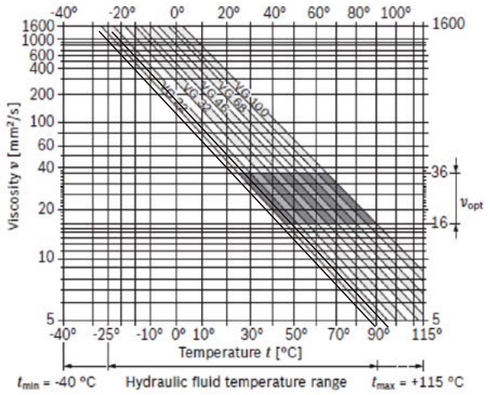
Details regarding the selection of hydraulic fluid

The correct selection of hydraulic fluid reguires knowledge of the operating temperature in relation to the ambient temperature, that is in an open circuit the reservoir temperature.

The hydraulic fluid should be selected so that the operating viscosity in the operating temperature range is within the optimum range (v_{opt} see shaded area of the selection diagram). We recommended that the higher viscosity class be selected in each case.

Example: At an ambient temperature of X℃, an operating temperature of 60℃ is set in the circuit. In the optimum operating viscosity range (v_{opt}, shaded area), this corresponds to the viscosity classes VG 46 or VG 68: VG 68 should be selected.

▼ Selection diagram



Note:
The case drain temperature (affected by pressure and rotation speed) can be higher than the oil tank temperature. At no point of the component's temperature can be higher than 115℃ . The temperature difference specified below should be considered as determining the viscosity in bearing.
If the above conditions cannot be maintained due to extreme operating parameters, please contact us.

Filtration of the Hydraulic Fluid

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

For ensure the functional reliability of the piston pump, it has to execute contamination measurement to the hydraulic fluid, to determine the cleanliness level at least 20/18/15 according to ISO 4406 to be maintained.

At very high hydraulic fluid temperatures (90℃ to maximum 115℃), a cleanliness level at least 19/17/14 according to ISO 4406 is necessary.

Shaft Seal

The FKM shaft seal can be used for case drain temperatures between - 25℃ to +115℃ .

Note:
For application below -25℃ , an NBR shaft seal is required (permissible temperature range -40℃ to +90℃); Please contact us.

Technical Data

Size				28	55	80	107	160	250
Displacement (per revolution)		V_{gmax}	cm^3	28	55	80	107	160	250
		V_{gmin}	cm^3	0	0	0	0	0	0
Maximum Speed[1]	At $V_{g\,max}$	n_{nom}	rpm					1500	1500
	At $V_g \leqslant V_{g\,max}$	n_{max}	rpm					2000	1500
Flow	At V_{nom} and $V_{g\,max}$	q_v	L/min					288	375
Power	At V_{nom} &$V_{g\,max}$ while $_{\Delta}p$=350 bar	P	KW					177	214
Torque	At $V_{g\,max}$ and $_{\Delta}p$=350bar[2]	T	Nm					896	1400
Drive Shaft Rotary Stiffness		C	KNm/rad					340	531
Moment of Inertia Rotational component of		JGR	KGm^2					0.04	0.16
Maximum angular acceleration		α	Rad/s^2					5970	4592
Case Volume		V	L					2.5	4
Weight (without Through Shaft) approx.		M	Kg					82	121

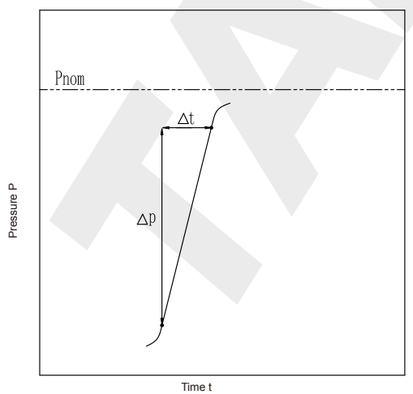
1) The Value applicable to V_{opt} = 16 – 36 mm^2/s optimum viscosity range, operate with hydraulic fluid based on mineral oil, and at suction port S the absolute pressure P_{abs} = 1 bar.

2) Maximum Speed (rotating speed limited), increase the inlet pressure P_{abs} at suction port S, and $V_g < V_{gmax}$.

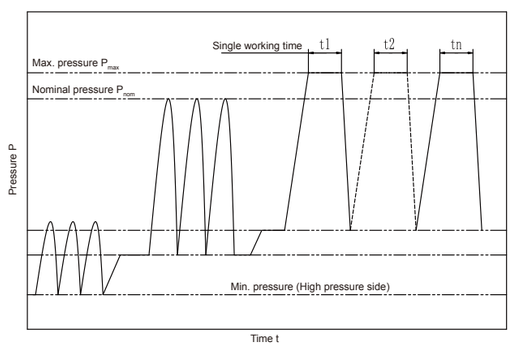
Working Pressure Range

Pressure at working port A		Definition
Nominal pressure,Pnom	350 bar	The nominal pressure corresponds to the max. design pressure
Maximum pressure,Pmax	400 bar	The max. pressure corresponds to the max. working pressure within the single operating period. The sum of the single operating period must not exceed the total operating period.
Single operating period	10 s	
Total operating period	300 h	
Minimum pressure Pa abs **(high-pressure side)**	15 bar	Minimum pressure on the high-pressure side (A) which is required in order to prevent damage axial piston pump.
Rate of pressure change Ra max	16000 bar/s	Maximum permissible speed of pressure build-up and reduction during a pressure change across the entire pressure range.
Pressure at suction port S		
Pressure minimum P s min	≧ 0.8 bar abs	Mininum pressure at suction port S (inlet) required to prevent damage to the axial piston unit. The minimum pressure depends on the speed and displacement of the axial piston unit.
Pressure maximum P s max	≦ 30 bar abs	
Case drain pressure at port T_1, T_2 and T_3.		
Maximum pressure PL max	4 bar abs	Maximum 1.2 bar higher than inlet pressure at port S. If higher than PL max, a case drain line to oil tank is required.

Rate of pressure change $R_{A\ max}$



Defination of working pressure



Total overpressure working time = $t_1+t_2+.....+t_n$

Constant Power Controller

LR-Power controller, fixed setting

The power controller regulates the displacement of the pump depends on the operating pressure so that a given drive power is not exceeded at constant drive speed.

The precise control with a hyperbolic control characteristic, provides an optimum utilization of available power.

The operating pressure acts on a rocker via a measuring spool which moves with the control. An externally adjustable spring force counteracts this, it determaines the power setting. The depressurized basic position is $V_{g\ max}$.

If the operating pressure exceeds the set spring force, the control valve will be actuated by the rocker and the pump will swivel back from the basic positon $V_{g\ max}$ toward $V_{g\ min}$.

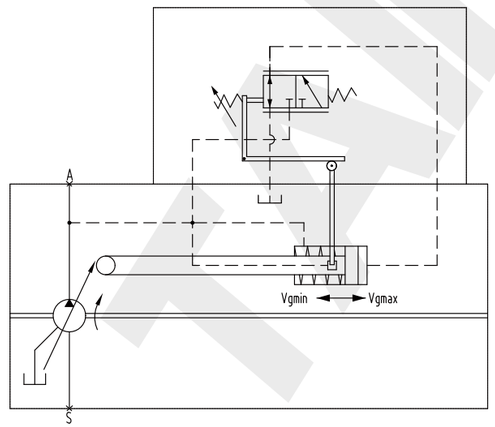
The hydraulic output power (Characteristic LR) is influenced by the efficiency of the pump.

Setting range for beginning of control is 50 to 350 bar. (lower value can be applied according to require ment.)

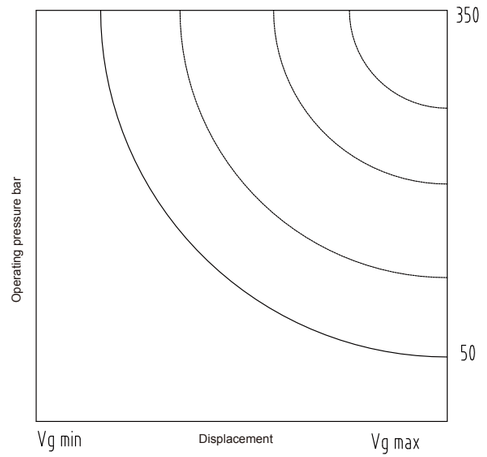
When ordering, state in plain text:

- Drive power $_{\triangle}P$ [KW]
- Drive speed $_{\triangle}n$ [rpm]
- Maximum flow $_{\triangle}q_{V\ max}$ [l/min]

Function Control Schematic



LR Characteristic



Pressure Controller

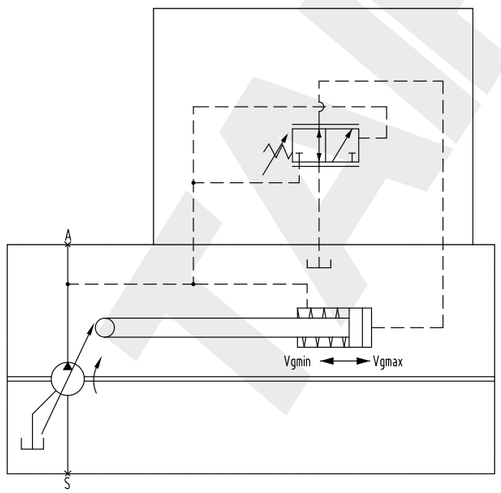
DR-pressure controller, with one-sided swing function, fixed setting

The pressure controller limit the pressure of outlet port in the control range of variable pump. The variable pump just provides hydraulic fluid comply with actuators.
If the operating pressure exceeds the setting value at the controller pressure valve, the pump will regulate to a minimum displacement to reduce control deviation.

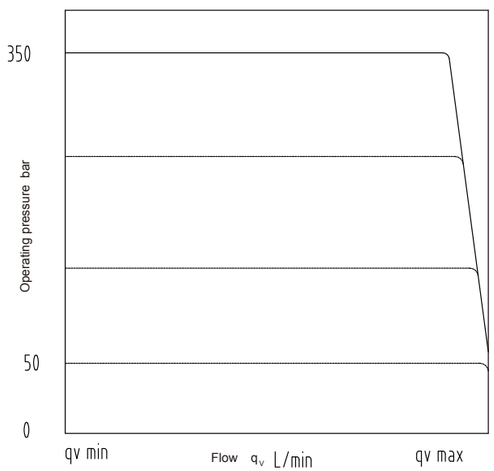
Basic position in unloading state : $V_{g\,max}$.
The setting range of pressure control: 50-350 bar. standard setting is 350 bar.

When ordering, please state in plain text:
The pressure setting of DR pressure controller P [bar]

Function Control Schematic



DR Characteristic



Stroke Controller

E6-Stroke controller, Electric proportional control (positive control)

With the electric two-point stroke control with switching solenoid, the displacement of the pump is adjusted between $V_{g\,min}$ and $V_{g\,max}$.

Basic setting without current is $V_{g\,min}$. This includes the mechanically depressurized basic setting $V_{g\,min.}$

When the solenoid is energized, the pump swivels from $V_{g\,min}$ to $V_{g\,max}$.

The required control power is taken from the working pressure or the external control pressure applied to port P. To enable the pump to be adjusted from the basic setting $V_{g\,min}$ or from a low working pressure, port P must be supplied with an external control pressure of at least 30bar, maximum 50bar.

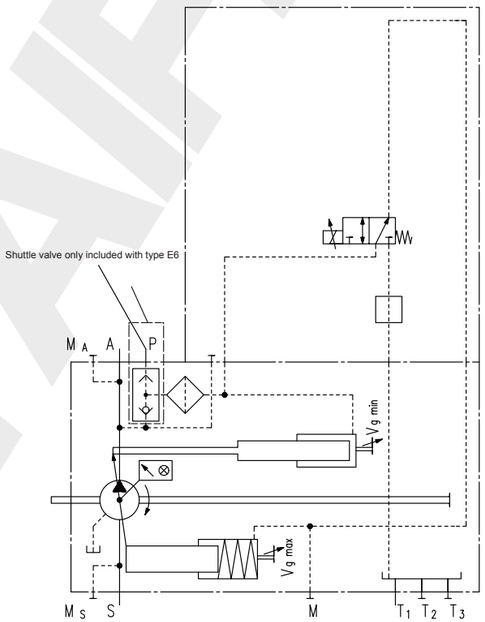
Notice:

The spring feedback in the controller is not a safety device.

The controller can stick in an undefined position due to internal contamination (contaminated hydraulic fluid, abrasion or residual contamination from system components). As a result, the flow in the axial piston unit will no longer respond correctly to the operator's specifications.

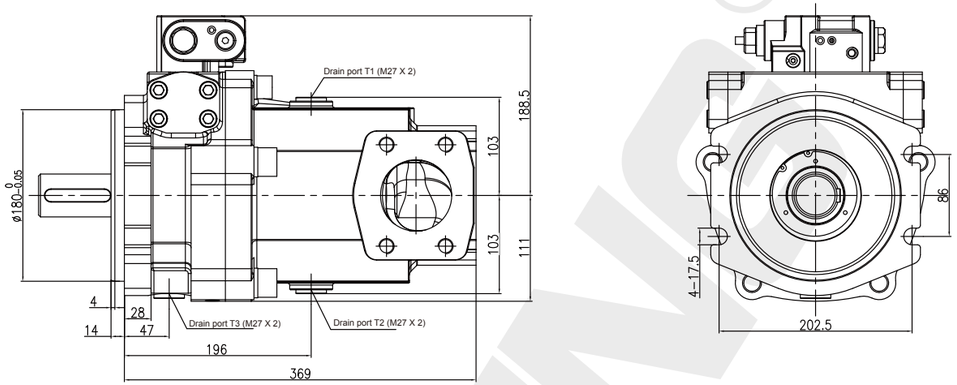
Check whether your application requires that remedial measures be taken on your machine in order to bring the driven consumer into a safe position (e.g. immediate stop). If necessary, make sure these are appropriately implemented.

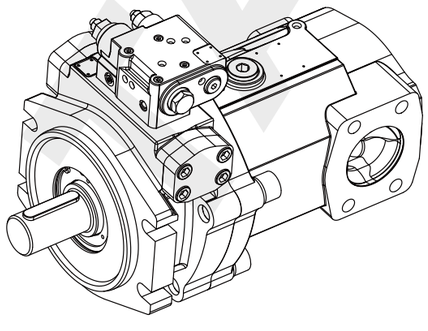
E6 Function Control Schematic



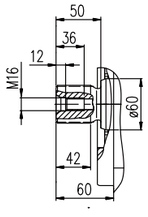
Size 160

Power control, with pressure control, clockwise rotation

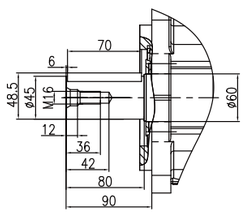




DIN 5480 Splined shaft
W45x2x30x21x9g



Cylindrical shaft with key
GB/T 1096-A14X9X70

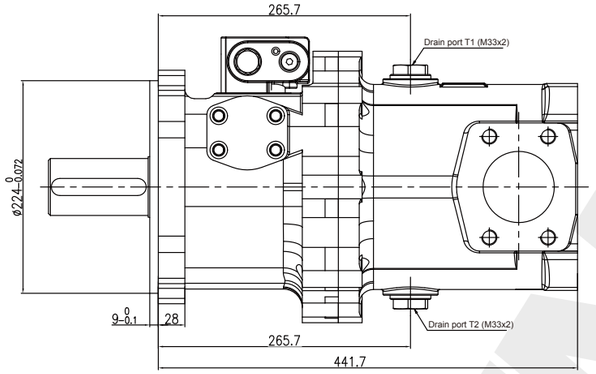


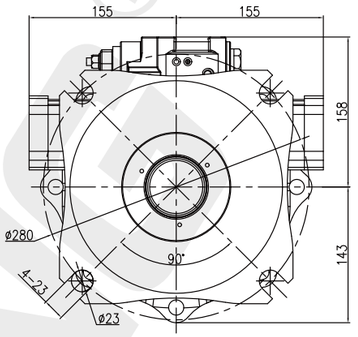
NOTE:

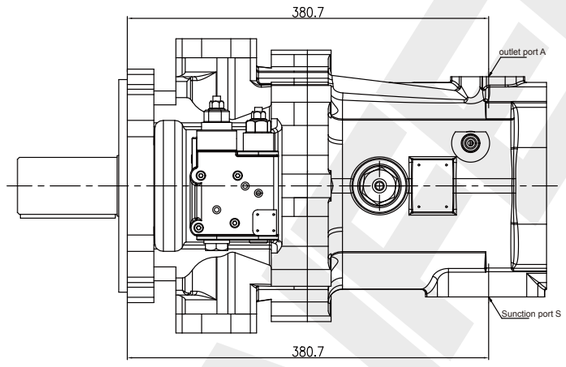
1. Flanges of Port A, port S are not included in the scope of delivery
2. Mounting screws are not included in the scope of delivery
3. Drain ports T_1, T_2 and T_3 all connected to the inside of the housing, please select the highest drain port to connect to the reservoir according to the installation instruction.

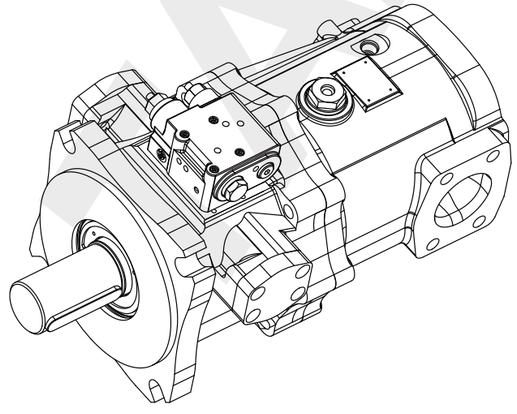
Size 250

Power control, with pressure control, clockwise rotation

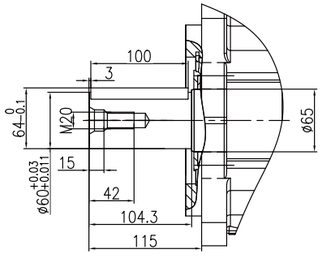








Cylindrical shaft with key GB/T 1096-A18X11X100



Note:

1. Flange of port A, port S are not included in the scope of delivery.
2. Mounting screws are not included in the scope of delivery
3. Drain ports T_1 & T_2 are connected to the inside of the housing, please select the highest drain port to connect to the reservior according to installation instruction.

Installation Instruction

The pumps of displacement of 100ml/r and above are not allowed to be installed above the reserior, others can installed on the reserior, but must make sure the reserior cover has enough rigidity.

The accuracy of drive shaft connect with motor (concentricity, verticality) ≦ 0.05mm.

Before commissioning, pump housing must be fullfilled fluid, and maintain full when operating.

For reduce noise and improve system reliability, suggest do your best to install all pumps under oil tank, suction, pressure and drain ports' connecting lines diameter should not small than pump original designed diameter.

The suction line is not allow to install filter generally , it is suggested that the system select pressure line or return line filtration; if it is necessary to install filter in suction port, recommend select net type filter, and pump displacement should not over 100ml/r, please refer model WU800x100 or WU630x180.

Vertical Installation (Shaft end Upwards)

1. Installation inside the oil tank.

   i. When the minimum fluid level is equal or above the pump mounting flange area, blocked Drain Port 2, open Drain Port 1, suggest piping according Fig. 1.

   ii. When the minimum fluid level is lower than the pump mounting flange area, blocked Drain Port 2; piping Drain Port 1 and pump suction port, see Fig. 2.

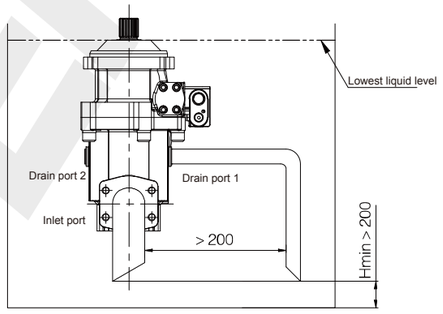


Fig. 1

2. Installation outside the oil tank.

   i. Install pump on the top of oil tank, in both static and dynamic situation the pump suction pressure should > 0.8 bar. see Fig. 2.

   ii. In such installation, the max. high of the suction port Hmax = 500 mm; the actual Hmax depends on the loss of resistance in suction pipe line. As bigger the loss of resistance as lower the high of suction port, the min. depth immersed of suction port Ht = 200 mm.

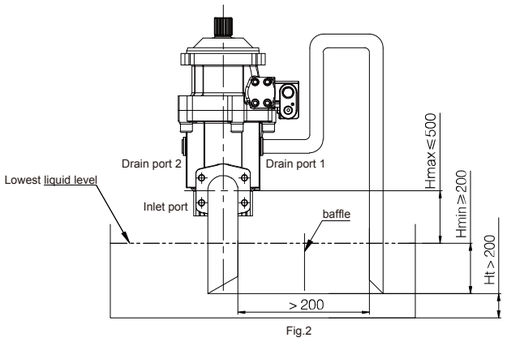


Fig.2

Horizontal Installation

Insure pump Drain Port 1 towards top.

1.Installation inside the oil tank.

i. When the minimum fluid level is above the pump top, blocked Drain Port 2, piping Drain Port 1 and pump suction port, see Fig. 3.

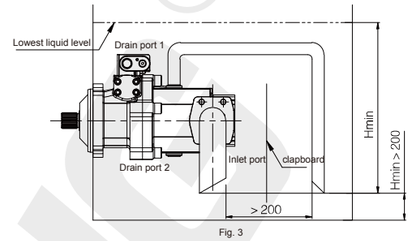


Fig. 3

ii. When the minimum fluid level is lower than the pump top, blocked Drain Port 2, the requested piping for Drain Port 1 and pump suction port, refer Fig. 4. Note: H_{tmin} = 200 mm.

2.Installation outside the oil tank.

i. Mounting above the oil tank, see Fig. 4

ii. When install under oil tank, blocked Drain Port 2, piping Drain Port 1 and pump suction port, according Fig. 5.

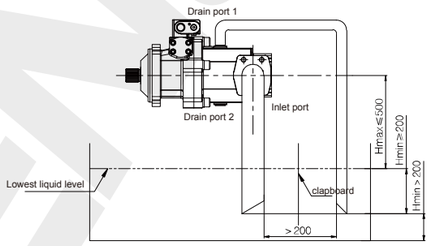


Fig. 4

Installation refer Fig. 6, should note the followings :

i. The distance between oil tank minimum fluid level and pump center ≧ 300 mm, pump can free suction at small angle.

ii. Inlet ports' connecting lines diameter should not small than pump original designed diameter, the diameter of shut off valve should big more one size than inlet pipe;

iii. The length of pump inlet pipe L ≦ 2500 mm, pipe elbows should not over two pieces, the distance between inlet pipe end and oil tank side wall H1 ≧ 3D, the distance to bottom of oil tank ≧ 2D.

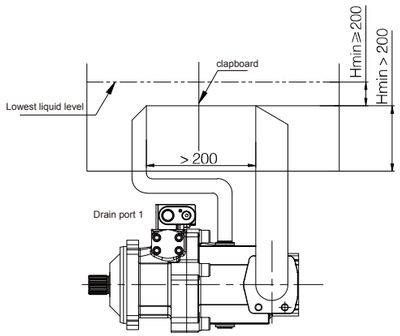


Fig. 5

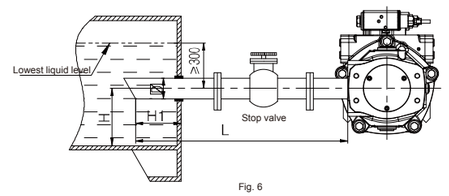


Fig. 6

Installation Accuracy Testing

1. Bracket Installation

The bracket installation accuracy detection for motor shaft and bracket, refer Fig. 7 and Fig. 8.

In Fig.7, Concentricity allowance ≦ Φ0.05 ;

In Fig.8,Verticality pulsate ≦ 0.05R

(R is distribution circle radius of pump mounting screw holes).

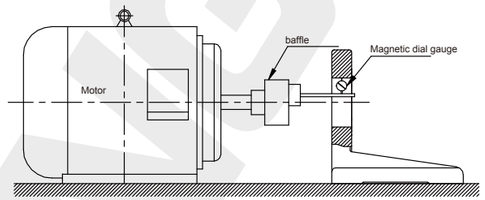


Fig. 7

2. Flange Installation

In this style of installation, if between motor & pump use coupling to connect, then the installation accuracy detection refer Fig. 7 and Fig. 8.

If pump shaft direct slip-in motor shaft, then the installation accuracy detection refer Fig. 9.

In Fig.9, concentricity allowance ≦ Φ0.05 ;

Verticality pulsate ≦ 0.05R

(R is distribution circle radius of pump mounting screw holes).

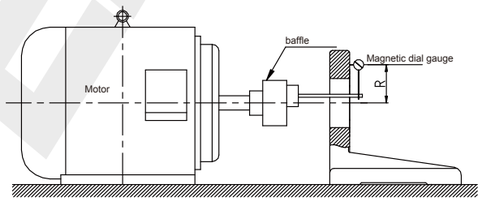


Fig. 8

3. When pump connect with motor the concentricity is bad, easy to cause noise, bearing and shaft seal damaged. Between pump and motor drive shaft has better to connect by elastic coupling. Recommend to use internal gear style elastic coupling, to avoid pump bearing undertake radial force. After motor and hydraulic pump installed, check coupling whether has appropriate axial allowance, if without axial allowance would cause pump bearing undertake axial force, caused bearing damaged.

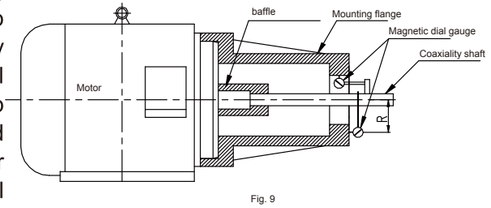


Fig. 9

4. Recommend install shock absorber to motor and bracket.

Installation Instruction

During commissioning and operation, the axial piston pump must always be filled with hydraulic oil and emptied of air. The above considerations must also be taken after a relatively long period of inactivity. Because the axial piston pump may discharge the hydraulic oil back into the oil tank through the oil suction line, especially in an "upward drive shaft", it must be filled with oil and completely exhaust the air, otherwise, there will be dangers such as oil-free operation. The pump Drain oil from the case must be directed to the reservoir through the highest available drain port (T_1 , T_2).

When combining multiple units, each pump must have its own housing drain line. If a common oil return line is used, ensure that the housing pressure in each pump is not exceeded. When there is a differential pressure at the drain ports of the equipment, the common drain line must be replaced so that the minimum permissible housing pressure of all connected equipment is not exceeded in any housing. If this is not possible, a separate drain line should be laid if necessary.

Avoid mounting above the reservoir in order to reduce the noise level, and all connecting lines should be decoupled with elastic elements.

Under all conditions, the suction and drain lines must lead below the minimum oil level in the reservior. The allowable oil suction height hs is affected by the total pressure loss, but it should not be higher than h_{smax}=800mm. During operation and during cold start, the minimum oil suction pressure out of port S must not be lower than 0.8 bar absolute pressure.

When designing the reservior, ensure that there is sufficient space between the suction and return lines, this prevents the heated return flow from being sucked back directly into the suction line.

Notice:

Certain mounting locations can have some effect on the control characteristics. Gravity, net weight, and case pressure can cause slight variations in control characteristics and variations in response time .

Swashplate Axial Piston Variable Pump
TFA7VO/11 Series

TAIFENG

Safety Instruction

Designed for open circuit use.

Project planning, installation and commissioning of axial piston pumps require the involvement of skilled personnel.

Before using the axial piston pump, please read the corresponding instruction manual completely Available upon request.

The characteristics of axial piston pumps may vary due to different operating conditions (pressure, oil temperature),

Working line ports:

Ports and mounting threads are designed for the maximum specified pressure. The machine or system manufacturer must ensure that the safety factor of the connecting elements and lines meets the specified operating conditions (pressure, flow, hydraulic oil, temperature).

Work line ports and function ports are for hydraulic lines only.

The data and instructions contained herein must be followed.

Before proceeding with the final design, please ask for the installation drawing that have to be complied with. Not all models of this product have ISO13849 requirements and safety functions. If you need reliability parameters (such as MTTFd) related to functional safety, please consult us.

The pressure controller is not a backup device in case of pressure overload, a separate relief valve should be installed in the hydraulic system.

Variable Pump in Axial Piston Swashplate Design
TFC15V/10 Series

TAIFENG

- Size: 32 to 355
- Nominal pressure: 350 bar
- Max. Pressure: 420 bar
- Open circuit

Features

- Variable pump with axial piston rotary group in swashplate design for hydrostatic drives in open circuit.
- The flow can be infinitely varied by adjusting the swashplate.
- Auto suck or by charge pump.
- Comprehensive control device have very high adaptability to achieve various control and adjustment function.
- The through drive is suitable for adding gear pumps and axial piston pumps up to the same size, i.e., 100% through drive.
- Compact design, favorable power/weight ratio.
- High efficiency.
- Low noise level.

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Ordering code

01	02	03		04	05	06		07	08	09
TFC15V	SO		/		10	M	-			

1.Axial Piston Pump

Swashplate design,variable displacement,nominal pressure 350bar, max.pressure 420bar	TFC15V

2.Operation mode

	32	71	110	145	180	212	280	355	
Hydraulic pump,open circuit, without charge pump	○	○	○	○	●	○	●	○	SO
Hydraulic pump,open circuit, with charge pump	○	○	○	○	○	●	●	○	LO

3.Displacement(ml/r)

	32	71	110	145	180	212	280	355	

4.Control device

	32	71	110	145	180	212	280	355	
Power controller	○	○	○	●	●	●	●	○	LR
Displacement controller-- electric proportional control	○	○	○	●	●	●	●	○	E2
Displacement controller--two point, electric proportional control	○	○	○	●	●	●	●	○	E6
Displacement controller--hydraulic proportional control	○	○	○	●	●	●	●	○	H6
Pressure controller	○	○	○	●	●	●	●	○	DR
Pressure controller--hydraulic remote control	○	○	○	●	●	●	●	○	DG
Pressure controller-- pressure controller with load sensing function	○	○	○	●	●	●	●	○	DRSO
Fixed flow	○	○	○	●	●	●	●	○	M

5.Design code

Design series is 10	10

6.Port and fasten bolt

Metric connection standard	M

7.Port connection type

		32	71	110	145	180	212	280	355	
Inlet and outlet port	Thread connection	○	–	–	–	–	–	–	–	M
	SAE Flange connection	○	○	○	●	●	●	●	○	L

8.Rotation direction

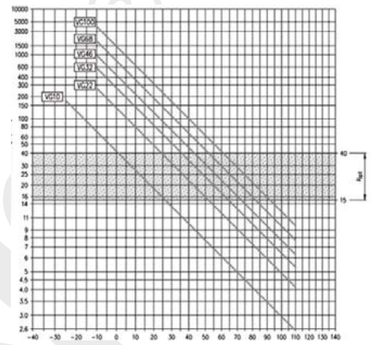
		32	71	110	145	180	212	280	355	
viewed on shaft end	Clockwise	○	○	○	●	●	●	●	○	R
	Counter clockwise	○	○	○	○	●	○	●	○	L

9.Drive shaft

		32	71	110	145	180	212	280	355	
Splined shaft	W40×2×18×9g	–	○	–	–	–	–	–	–	A0
	W45×2×21×9g	–	–	–	–	–	–	–	–	A1
	W50×2×24×9g	–	–	–	●	●	●	–	–	A2
	W60×2×28×9g	–	–	–	–	–	–	●	–	A3
	W70×3×22×9g	–	–	–	–	–	–	–	○	A4
Paraller key shaft	Φ40	–	○	–	–	–	–	–	–	B0
	Φ45	–	–	–	–	–	–	–	–	B1
	Φ50	–	–	–	●	●	●	–	–	B2
	Φ60	–	–	–	–	–	–	●	–	B3
	Φ70	–	–	–	–	–	–	–	○	B4

● = available ○ = In R&D, consult before order —— = N/A

Hydraulic fluid



To ensure the service life of piston pump, please use mineral hydraulic fluid. If need environment friendly or HF hydraulic fluid, please contact us.

Detailed instruction on the selection of hydraulic fluid：

In order to select the correct hydraulic fluid, it is necessary to know the operating temperature in relation to the ambient temperature(i.e. the reservoir temperature in open circuit).

The hydraulic fluid should be selected so that within the operating temperature range, the viscosity lies within the optimum range (V_{opt}16-36mm^2/s), see shaded section of the selection diagram. We recommend to select the higher viscosity grade in each case.

Example: At an ambient temperature of X ℃, the operating temperature is set to 60℃. In the optimum operating viscosity range (V_{opt} ; shaded area) this corresponds to viscosity grades VG 46 resp. VG 68; VG 68 should be selected.

Important:

The case drain temperature is influenced by pressure and input speed and is always higher than the reservoir temperature. However, at no point in the component may the temperature exceed 115 ℃. The temperature difference is to be taken account when determining the viscosity in the bearing.

If the above conditions cannot be met, due to extreme operating parameters , please contact us.

Filtration of the hydraulic fluid

The finer the filtration the better the cleanliness level of the hydraulic fluid and the longer the service life of the axial piston unit. In order to guarantee the functional reliability of the axial piston unit it is necessary to carry out an evaluation of the hydraulic fluid to determine the particle contamination and the cleanliness level according to ISO 4406. A cleanliness level of at least 20/18/15 must be maintained.

At very high hydraulic fluid temperatures (90℃-115℃) , the minimum cleanliness level is lower than ISO4406 19/17/14 at least.

Shaft seal

FKM shaft seal can be used for case drain temperature between -25℃ and 115℃.

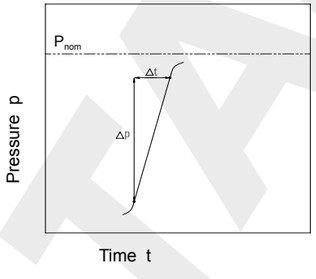
Important:

NBR shaft seal(permitted temperature range:-40℃ —— +90℃) must be used for temperature under -25℃ condition. Please contact us

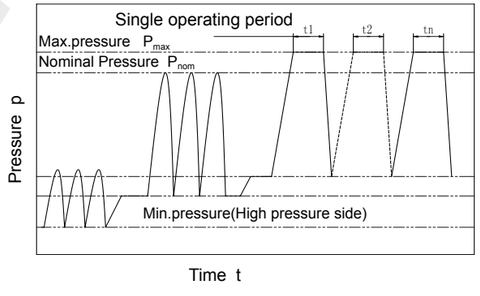
Operating pressure range

Pressure at service line port A		Definition
Nominal Pressure P_{nom}	350bar	The nominal pressure corresponds to the max.design pressure
Max.pressure P_{max}	Absolute pressure420bar	The maximum pressure corresponds to the maximum operating pressure within the single operating period. The total of the single operating periods must not exceed the total operating period.
Single operating period	10s	
Total operating period	300h	
Min.pressure$P_{A\,abs}$(High pressure side	15bar	Minimum pressure in the high-pressure side (port A) that is required in order to prevent damage to the axial piston unit. Please contact us if need low pressure running.
Rate of pressure change$R_{A\,max}$	16000bar/s	Maximum permissible pressure build-up and pressure reduction speed with a pressure change over the entire pressure range.
Pressure at suction port S(inlet)		
Pump without charge pump		
Min.pressure $P_{s\,min}$	≥0.8bar Absolute pressure	Minimum pressure in the suction port S that is required in order to prevent damage to the axial piston unit. The minimum pressure depends on the speed and displacement of the axial piston unit.
Max.pressure $P_{s\,max}$	≤30bar Absolute pressure	
Pump with charge pump		
Min.pressure $P_{s\,min}$	≥0.7bar Absolute pressure	
Max.pressure $P_{s\,max}$	≤2bar Absolute pressure	
Case drain pressure at port T1,T2,T3		
Max.pressure $P_{L\,max}$	4bar Absolute pressure	Maximum 1.2 bar higher than the inlet pressure at port S, however not higher than PI-max. A case drainage pipe connection needed to the reservoir.

Rate of pressure change $R_{A\,max}$



The definition of operating pressure



Total over-pressure operating time=$t_1+t_2+...t_n$

Technical data

Without charge pump (A15VSO)

size			**NG**		**110**	**145**	**175**	**212**	**280**
Displacement per revolution			$V_{g\,max}$	cm^3	110	145	175	212	280
			$V_{g\,min}$	cm^3	0	0	0	0	0
Max speed [1]	at $V_{g\,max}$ [2]		n_{nom}	rpm	2400	2300	2150	2100	1800
	at $V_g \le V_{g\,max}$		n_{max}	rpm	2800	2600	2500	2500	2300
Flow	at n_{nom} and $V_{g\,max}$		q_V	L/min	264	334	376	441	504
Power	at n_{nom}, $v_{g\,max}$ and △P=350 bar		P	KW	154	195	219	257	294
Torque	at $V_{g\,max}$ and △P=350 bar		T	Nm	613	808	975	1170	1560
Rotary stiffness, drive shaft	W45×2×21×9g	A1	c	kNm/rad	242	-	-	-	-
	W50×2×24×9g	A2	c	kNm/rad	-	334	357	381	-
	W60×2×28×9g	A4	c	kNm/rad	-	-	-	-	645
	φ45	B1	c	kNm/rad	236	-	-	-	-
	φ50	B2	c	kNm/rad	-	337	349	372	-
	φ60	B4	c		-	-	-	-	620
Moment of inertial rotary group			J_{GR}	kgm^2	0.022	0.035	0.045	0.06	0.097
Angular acceleration, Max			α	rad/s^2	7465	6298	5609	5014	4200
Filling capacity			V	L	2.2	2.7	3.6	4	6.5
Weight(without through drive) aprrox.			m	kgm^2	64	79	97	111	143

With charge pump (A15VLO)

size			**NG**		**145**	**175**	**212**	**280**
Displacement per revolution			$V_{g\,max}$	cm^3	145	175	212	280
			$V_{g\,min}$	cm^3	0	0	0	0
Max speed [1]	at $V_{g\,max}$ [2]		n_{nom}	rpm	2600	2500	2500	2300
	at $V_g \le V_{g\,max}$		n_{max}	rpm	2600	2500	2500	2300
Flow	at n_{nom} and $V_{g\,max}$		q_V	L/min	377	438	525	644
Power	at n_{nom}, $V_{g\,max}$ and △P=350 bar		P	KW	220	255	306	376
Torque	at $V_{g\,max}$ and △P=350 bar		T	Nm	808	975	1170	1560
Rotary stiffness, drive shaft	W45×2×21×9g	A1	c	kNm/rad	-	-	-	-
	W50×2×24×9g	A2	c	kNm/rad	334	357	381	-
	W60×2×28×9g	A4	c	kNm/rad	-	-	-	645
	φ45	B1	c	kNm/rad	-	-	-	-
	φ50	B2	c	kNm/rad	337	349	372	-
	φ60	B4	c	kNm/rad	-	-	-	620

Technical data

Moment of inertial rotary group		J_{GR}	kgm^2	0.035	0.047	0.063	0.097
Angular acceleration, Max		α	rad/s^2	6298	5609	5014	4200
Filling capacity		V	L	2.9	3.6	3.7	5.6
Weight(without through drive) approx.		m	kgm^2	92	110	125	148
Permissible input torque and through drive torque							
Size		**NG**		**110**	**145**	**175**	**212**	**280**
Torque ($V_{g\,max}$ and $\triangle P$=350 bar[4])		T_{max}	Nm	610	808	975	1170	1560
Max. input torque A1	W45	$T_{E\,max}$	Nm	2190	-	-	-	-
A2	W50	$T_{E\,max}$	Nm	-	3140	3140	3140	-
A4	W60	$T_{E\,max}$	Nm	-	-	-	-	5780
B1	φ45	$T_{E\,max}$	Nm	1050	-	-	-	-
B2	φ50	$T_{E\,max}$	Nm	-	1500	1500	1500	-
B4	φ60	$T_{E\,max}$	Nm	-	-	-	-	2800
Max.through drive torque		T_{Dmax}	Nm	960	1110	1340	1915	2225

1)The values are applicable:

- within the optimum viscosity range from V_{opt} = 36 to 16 mm^2/s.
- for mineral-oil based hydraulic fluid.

2)The value is for an absolute pressure P_{abs} = 1 bar at suction port S.

3)The values are applicable for the speed between the minimum necessary speed and the maximum permissible drive speed.Valid for external excitation (e.g. diesel engine 2 to 8-fold rotary frequency,cardan shaft 2-fold rotary frequency). The limit value is only valid for single pump.The loading capacity of the connecting parts must be taken into account.

4)Efficiency not being considered.

5)Applicable for drive shaft without radial force.

Power Controller

LR-- Power controller, fix set

Constant power controller adjusts pump displacement according to operating pressure so that the set drive power will not be exceeded at constant drive speed.The available power maximized utilization is achieved by precision control with hyperbola characteristic.

Operation pressure apply to connecting rod through a slide valve. This slide valve acts through the controller.External adjustable spring force counterbalance it to determine power setting. Depressurize basic position is $V_{g\,max}$.

If operating pressure exceeds the spring force set value, the control valve will be activated by connecting rod, displacement mechanism swivels from basic position $V_{g\,max}$ to $V_{g\,min}$ .At this time, connecting rod gets shorten, operating pressure rises proportionally with the reduction of displacement.(PB*Vg=-constant, PB=operating pressure,Vg=displacement)

Hydraulic output efficiency(LR characteristic) is affected by pump efficiency.

Initial control range set is 50bar(lower value can be set according to requirement) to 350bar.

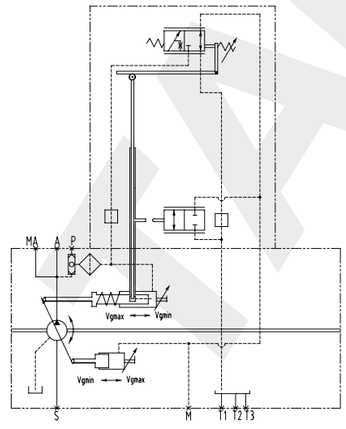
Please state in clear text when ordering:

Drive power P [kw]

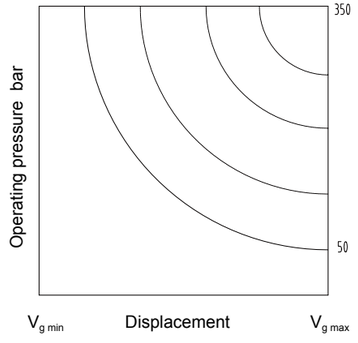
Drive speed n [rpm]

Max. flow $q_{v\,max}$ [L/min]

Function control schematic



LR Characteristic



Displacement controller–Electrical proportional E2

E2-Stroke controller, electrical proportional adjustment(positive control)

By the electrical stroke controller with proportional solenoid,the pump displacement varies steplessly and proportionally with solenoid currents.

The basic position without control signal is $V_{g\,min}$ This includes mechanical load relief basic position $V_{g\,min}$(see ordering code No.08,A).

Pump swivels to bigger displacement(from $V_{g\,min}$ to $V_{g\,max}$) , following the increase of control current.

Necessary control flow is acquired from operating pressure or external control pressure applying to port P. In order to push pump move from basic zero position or low operating pressure, external control pressure(min.30bar, max.50bar) must be provided to port P.

The following amplifiers are recommended for industrial application. They are also suitable for controlling proportional solenoid.

Analog amplifier VT-VSPA1-1
Analog amplifier module VT-MSPA1
Digital amplifier VT-VSPD-1

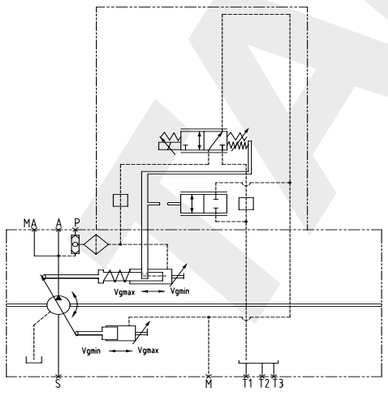
Technical date, magnetic solenoid	E2
Voltage	24V(±20%)
Control current	
Initial control value at $V_{g\,min}$	200mA
Finial control value at $V_{g\,max}$	600mA

Note:Vg max position may need control pressure up to 650mA because of control hysteresis.

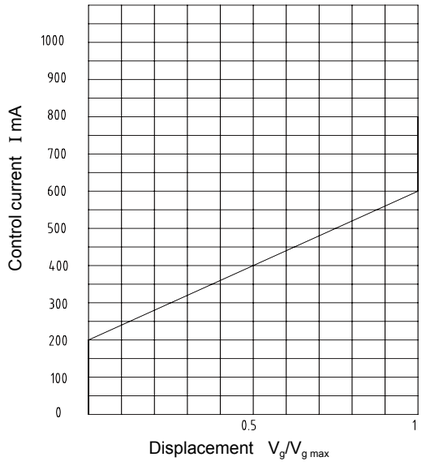
Limit current	0.77A
Nominal resistance (at 20 ℃)	22.7Ω
Flutter frequency	100Hz
Duty ratio	100%

See fitting design for protection type

Function control schematic



E2 Characteristic



Displacement controller–Electrical proportional E6

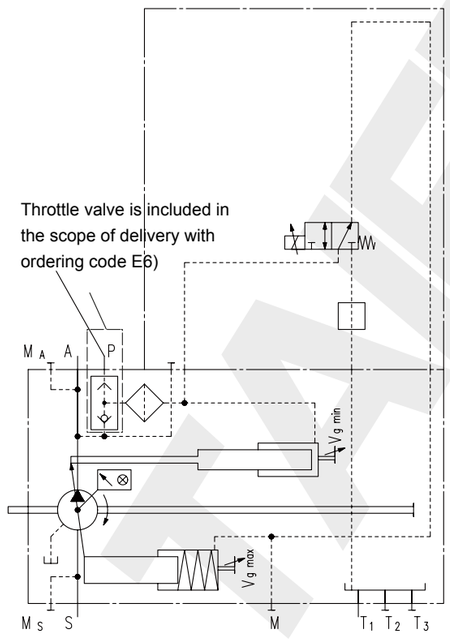
By the electrical displacement controller with proportional solenoid, the pump displacement varies from $V_{g\,min}$ to $V_{g\,max}$.

The basic position without control signal is $V_{g\,min}$. This includes mechanical load relief basic position $V_{g\,min}$.

When the solenoid is activated, pump swivels from $V_{g\,min}$ to $V_{g\,max}$.

Necessary control flow is acquired from operating pressure or external control pressure applying to port P. In order to push pump move from basic zero position or low operating pressure, external control pressure (min.30bar, max.50bar) must be provided to port P.

▼ E6 Schematic



Important:

The spring return device in the controller is not a safety equipment.

The controller may get stuck in position as a result of contamination (e.g. contaminated hydraulic fluid, abrasion, or residual dirt from components).As a result,the hydraulic fluid flow in the axial piston unit can no longer respond correctly to the operator's specifications.

The machine/system manufacturer should test whether additional measures are required on the machine for the relevant application in order to bring the driven consumer into a safe position (e.g. safe stop) and make sure any measures are properly implemented.

Displacement controller–Electrical proportional H6

By the controlling relates to pressure control,the pump displacement varies proportionally with the pressure applying to port H6 .

The basic position without control signal is $V_{g\,min}$. This includes mechanical load relief basic position $V_{g\,min}$.

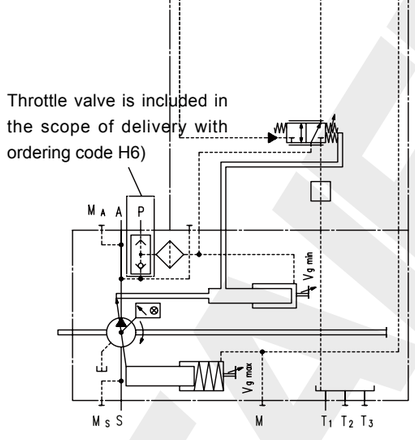
Max.permissible control pressure $P_{st\,max}$=100bar.

Pump swivels from $V_{g\,min}$ to bigger displacement $V_{g\,max}$,following the increase of control pressure.

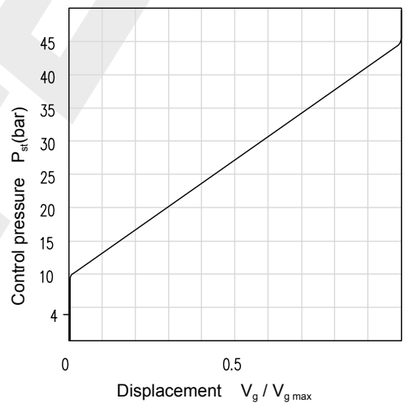
Initial control value(at $V_{g\,min}$) is 10 bar.

Necessary control flow is acquired from operating pressure or external control pressure applying to port P. In order to push pump move from basic zero position or low operating pressure, external control pressure (min.30bar, max.50bar) must be provided to port P.

▼ H6 Schematic



▼ H6 characteristic positive control



Important:

The spring return device in controller is not a safety equipment.

The controller may get stuck in position as a result of contamination (e.g. contaminated hydraulic fluid, abrasion, or residual dirt from components).As a result,the hydraulic fluid flow in the axial piston unit can no longer respond correctly to the operator’s specifications.

The machine/system manufacturer should test whether additional measures are required on the machine for the relevant application in order to bring the driven consumer into a safe position (e.g. safe stop) and make sure any measures are properly implemented.

Constant pressure controller

DR-Constant pressure controller, with unilateral swivel function, fix set

The pressure controller limits the maximum pressure at the pump outlet within the control range of the variable pump. The variable pump only supplies as much hydraulic fluid as is required by the consumers.

If the working pressure exceeds the pressure command value at the pressure valve,the pump will regulate to a smaller displacement to reduce the control differential.

Basic position in depressurized state: $V_{g\,max}$.

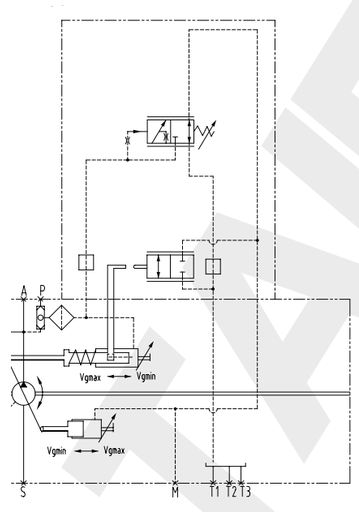
Setting range for pressure control 50 to 350 bar. Standard setting is 350bar.

Hydraulic $V_{g\,min}$ stop

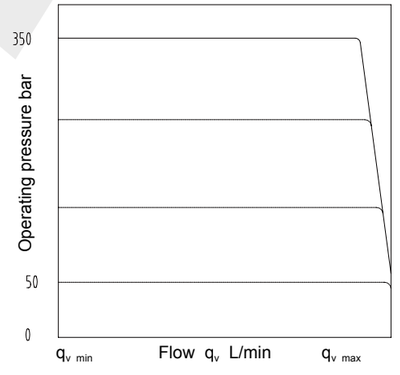
When the hydraulic Vg min stop reach to the lowest position, hydraulic $V_{g\,min}$ stop open the outlet port of case drain chamber thus to damping the controller and reduce overshoot. This will piping the high pressure or external control pressure to case drain chamber through controller and hydraulic $V_{g\,min}$ stop, thus to damping the controller and reduce overshoot.

When ordering, please state clearly in text: Constant pressure DR pressure setting P [bar].

▼ Function control schematic



▼ DR Characteristic



DR–Pressure controller, with unilateral swivel function, hydraulic remote control(positive control)

Remote pressure controller has set fixed △P value. The remote control is realized through a separately connected relief valve(1) at port X.

- ► △p set range is 14 to 25bar.
- ► 20bar is recommend(standard set)
- ► X position control flow: about 1.6L/min (static) when △P is 20bar.

Besides,a separately equipped two-way two-position direction valve(2) can also be operated to start the pump by a relatively lower operating pressure (standby pressure).

The separately equipped valve is not included in delivery.

We recommend DBD.6 for separate overflow valve(1).

Hydraulic $V_{g\,min}$ stop

When the hydraulic Vg min stop reaches to the lowest position, hydraulic Vg min stop open the outlet port of case drain chamber thus to damping the controller and reduce overshoot. This will piping the high pressure or external control pressure to case drain chamber through controller and hydraulic Vg min stop.

Operating pressure P(DG test pressure) (bar)
Pressure difference △P (bar)
Drive speed n (rpm)
Max. flow q_{vmax}(L/min)

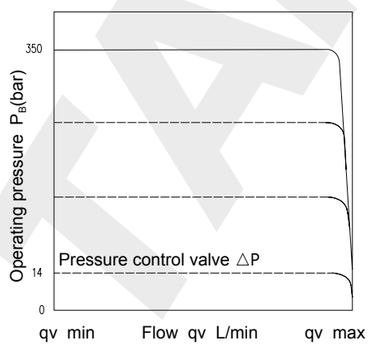
Remote pressure control set instruction

To determine pressure control level by external overflow valve setting and the differential pressure at pressure control valve.

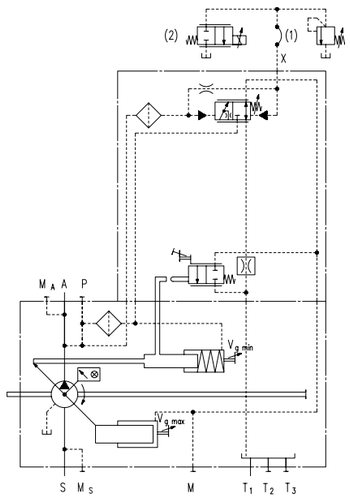
Example:

External overflow valve	330bar
Differential pressure at pressure control valve	20bar
Pressure control level	330+20=350bar

▼ DG Characteristic



▼ DG Schematic



DG schematic

1.Overflow valve(in the scope of delivery)

2.Two-way two-position direction valve (not in the scope of delivery)

DRSO –– Pressure controller with load sensing function

The load sensing controller plays the role of the load pressure controlling flow controller and adjusts the displacement to the value required by the actuator.

In this way,the pump flow depends on the cross section of the external sensing throttle valve (1) located between the pump and the actuator. When it is lower than the setting of the pressure controller and within the control range of the pump,the flow is independent to the load pressure.

Generally, the sensing throttle valve is a separately installed load sensing directional valve (multi-way valve). The position of the direction valve piston determines the cross section opening of the load sensing throttle valve,thus determines the pump flow.

The load sensing controller compares the pressure before and after the sensing throttle valve and keeps the pressure drop (pressure difference △P) of the entire throttle valve constant, thus keeps the flow constant.

Hydraulic $V_{g\,min}$ stop

When the hydraulic Vg min stop reaches to the lowest position, hydraulic $V_{g\,min}$ stop opens the outlet port of case drain chamber thus to damping the controller and reduce overshoot. This will piping the high pressure or external control pressure to case drain chamber through controller and hydraulic $V_{g\,min}$ stop.

If the differential pressure △P at the sensing throttle increases,the pump swivels back towards $V_{g\,min}$.If the differential pressure △P at the sensing throttle decreases, the pump swivels back towards $V_{g\,max}$ until the sensing throttle gets balanced.

△P sensing throttle valve=P_{pump}-$P_{consumer}$

△P setting range 14-30bar (please state in clear text)

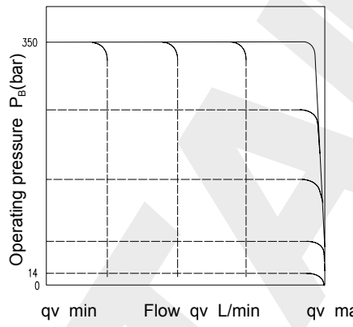
Standard setting is 14bar.

Zero stroke operation (load sensing throttle valve close) standby pressure is slightly higher than △P setting value.

DRSO characteristics

Operating pressure PB (bar)

Flow qv (L/min)

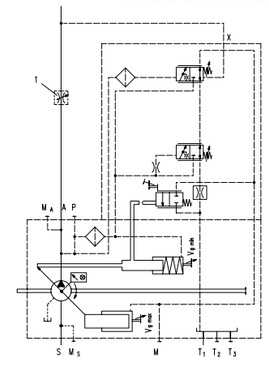


When ordering, please state clearly in text:

Pressure controller DR pressure set P (bar)

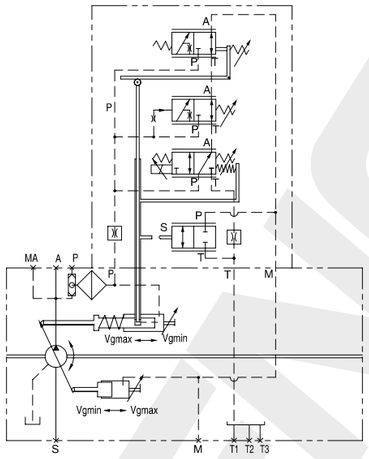
Load sensing controller differential pressure at S0 △P (bar)

▼ DRSO Schematic



1.Load sensing throttle valve is not in the scope of delivery

Displacement control mechanism schematic



1.Original position: Due to the action of small variable piston spring force and the absence of hydraulic pressure on the large variable piston, the swashplate is at the maximum swing angle and the flow rate is maximum.

2.As the working port A is continuously loaded (between 10 bar and 30 bar), the pressure at M increases continuously. When the pressure in the large variable piston chamber exceeds the sum of the small variable piston spring force and the small variable piston chamber pressure, the swashplate begins to swing towards a small swing angle, and the flow rate begins to decrease.

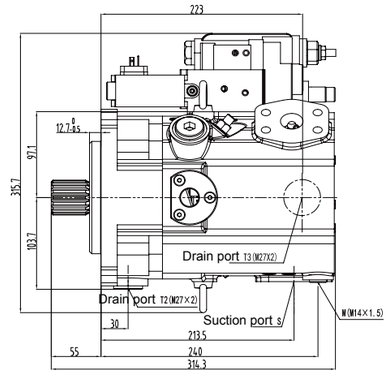
3.To obtain a larger flow rate, it is necessary to increase the swashplate swing angle. At this time, only by adjusting the electric proportional flow valve can the effect be achieved, while adjusting other valves does not work. The electric ratio is positive proportional flow. As the current continues to increase, the pump output flow will increase in positive proportion, which means that the swashplate swing angle is increasing.

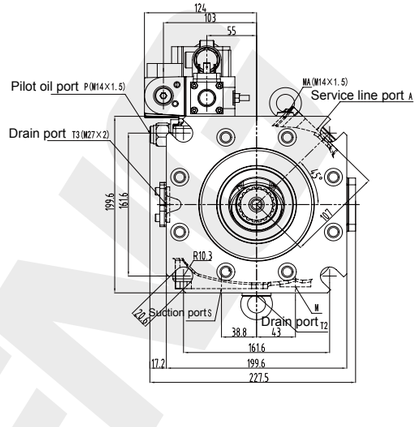
4.Adjust the constant pressure spring to a certain value to reach a maximum pressure value, which cannot be exceeded no matter how much pressure is applied thereafter. Within this pressure range, adjusting the constant power spring force will change the pressure value at which it starts to vary. The greater the pressure, the smaller the flow rate. This will make the product of pressure and flow reach a constant value, that is, constant power.

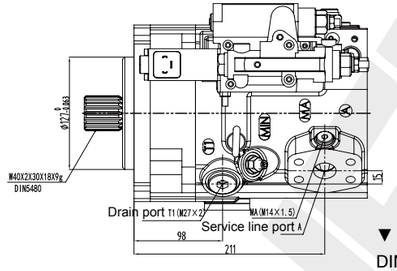
5.The hydraulic $V_{g\ min}$ stop can be said to be a protection. When the swashplate reaches the minimum setting position and the contact rod S of the stop touches the variable rod, Port P communicates with Port T,and the pressure oil at Port M returns to the oil tank through Port T.The pressure in the large variable piston chamber gradually decreases,and the swashplate angle no longer decreases due to the small variable piston spring force.

Size 71

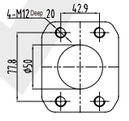
Power control,with pressure control and electric proportional control, clockwise rotation



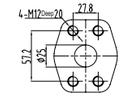




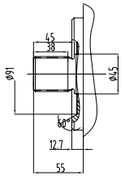
Suction port S section view



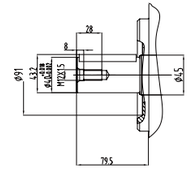
Service line port A section view

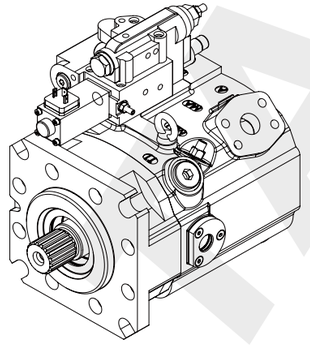


▼ Splined shaft conforms to DIN5480 A0–W40X2X30X18X9g



▼ Parallel keyed shaft conforms to DIN6885 B0–Ø 40 A 12X8X63



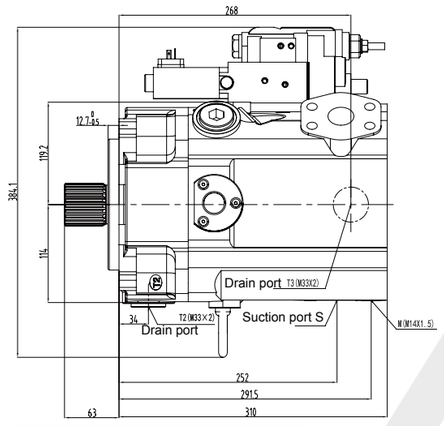


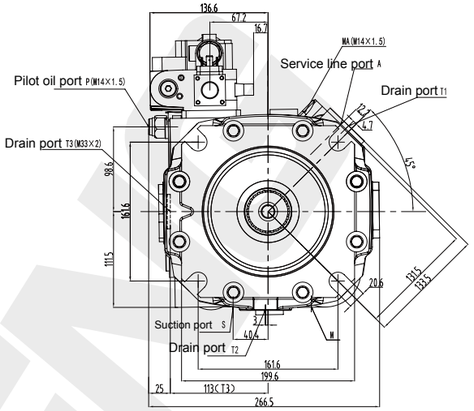
Note:

1. The flanges of oil ports A and S are not included in the scope of delivery.
2. Installation and fixing screws are not included in the scope of delivery.
3. The oil drain ports T_1, T_2, and T_3 all pass through the inside of the housing. Please select the highest oil drain port to connect to the oil tank according to the installation method of the pump body.

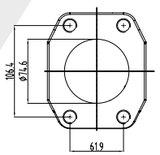
Size 145

Power control,with pressure control and electric proportional control, clockwise rotation

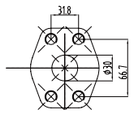


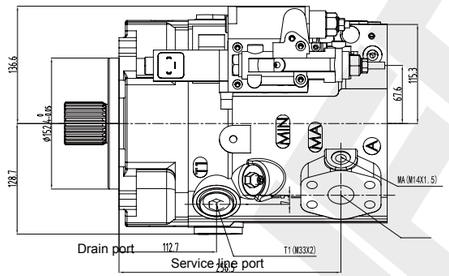


Suction port S section view

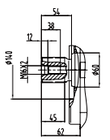


Service line port A section view

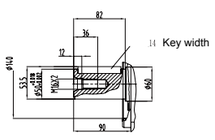


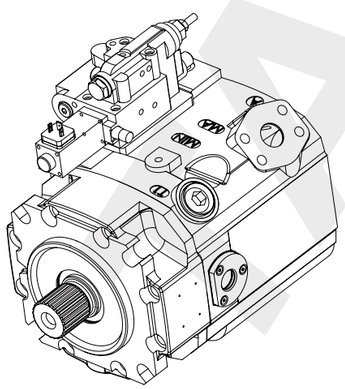


▼ Splined shaft conforms to DIN5480 A2–W50X2X24X9g



▼ Parallel keyed shaft conforms to DIN6885 B2–Ø50 A 14X9X80

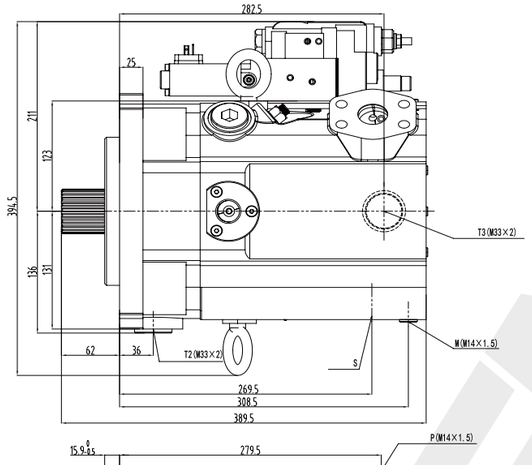


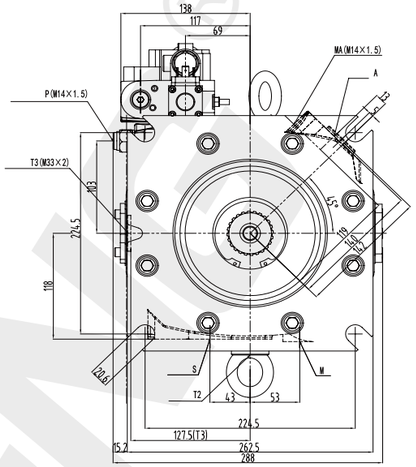


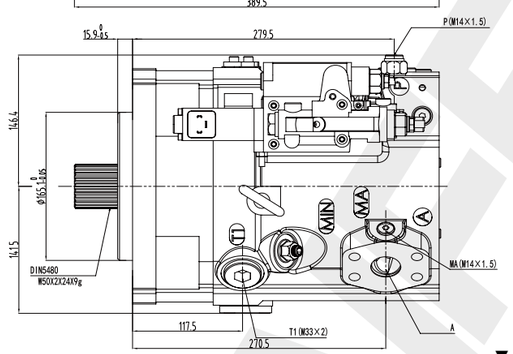
Note:

1. The flanges of oil ports A and S are not included in the scope of delivery.
2. Installation and fixing screws are not included in the scope of delivery.
3. The oil drain ports T_1, T_2, and T_3 all pass through the inside of the housing. Please select the highest oil drain port to connect to the oil tank according to the installation method of the pump body.

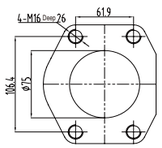
Size 180



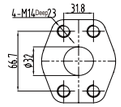




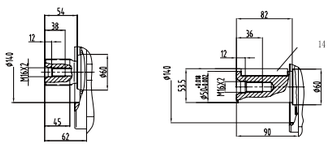
Suction port S section view



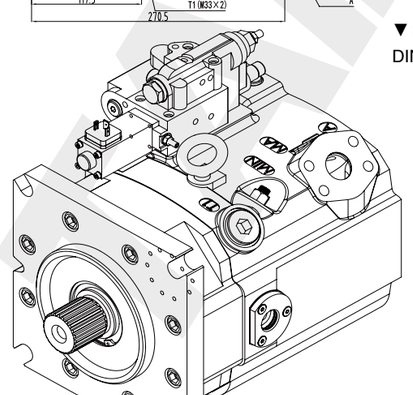
Service line port A section view



▼ Splined shaft conforms to DIN5480 A2–W50X2X24X9g

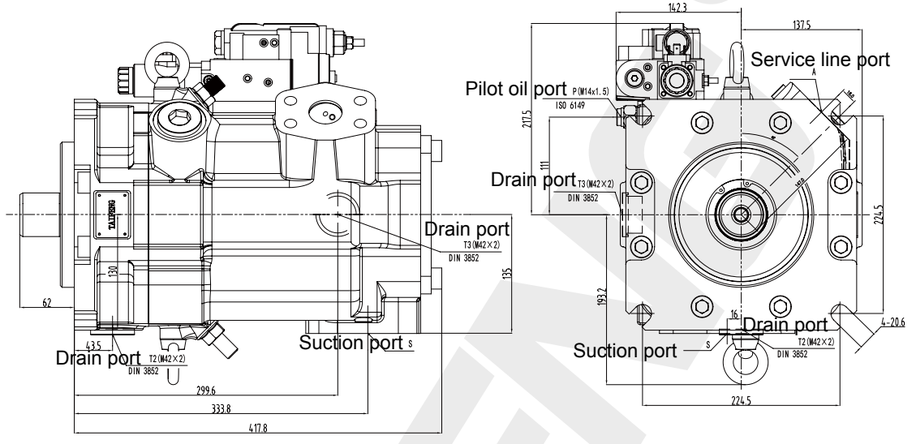


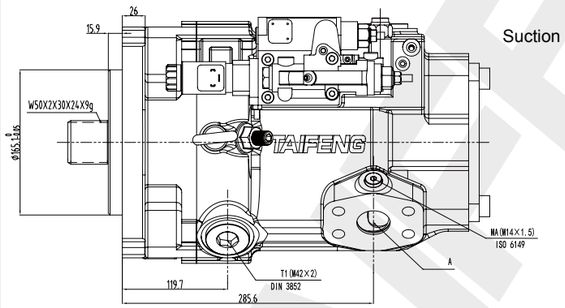
▼ Parallel keyed shaft conforms to DIN6885 B2–Ø 50 A 14X9X80



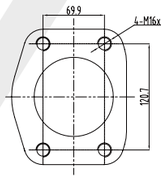
Size 212(with charge pump)

Power control,with pressure control and electric proportional control,
clockwise rotation

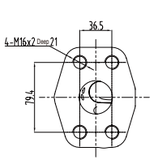




Suction port S section view

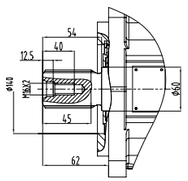


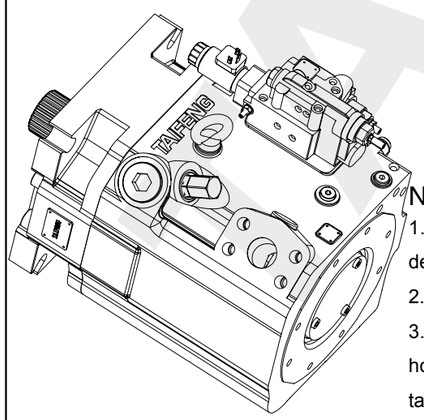
Service line port A section view



Splined shaft，Z-axis

DIN 5480
W50X2X30X24X9g



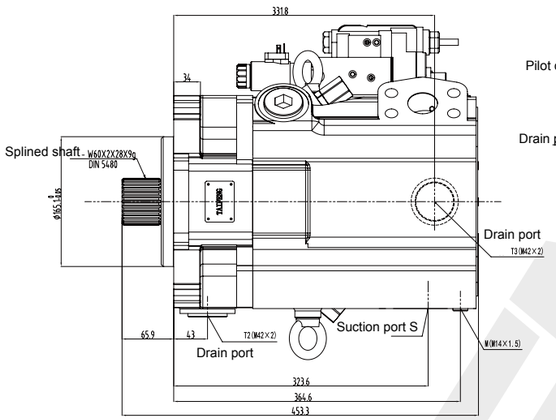


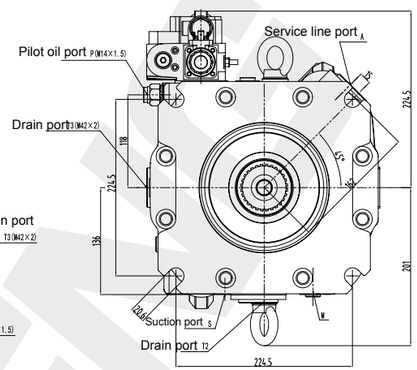
Note:

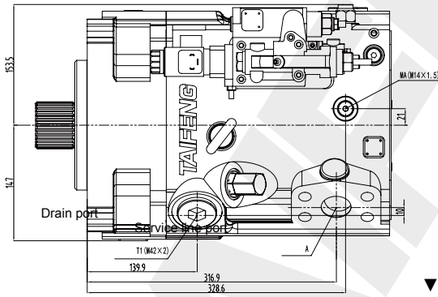
1. The flanges of oil ports A and S are not included in the scope of delivery.
2. Installation and fixing screws are not included in the scope of delivery.
3. The oil drain ports T_1, T_2, and T_3 all pass through the inside of the housing. Please select the highest oil drain port to connect to the oil tank according to the installation method of the pump body.

Size 280

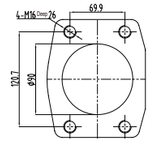
Power control,with pressure control and electric proportional control,
clockwise rotation



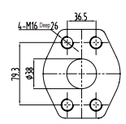




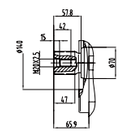
Suction port S section view



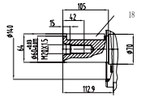
Service line port A section view

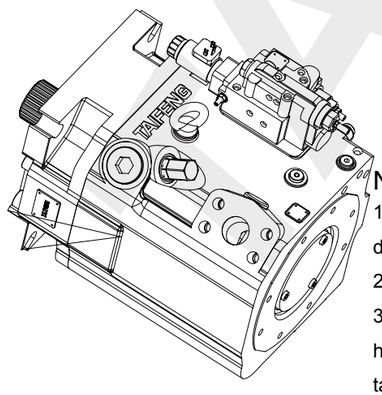


▼ Splined shaft conforms to DIN5480 A3–W60X2X28X9g



▼ Parallel keyed shaft conforms to DIN6885 B3–Ø60 A18X11X100



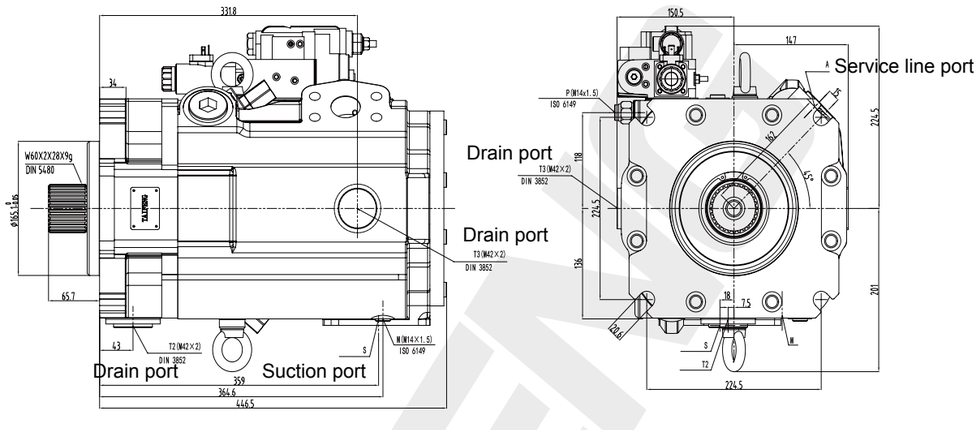


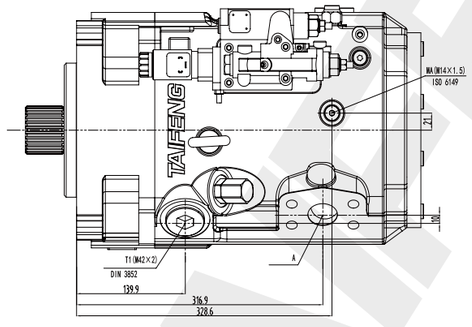
Note:

1. The flanges of oil ports A and S are not included in the scope of delivery.
2. Installation and fixing screws are not included in the scope of delivery.
3. The oil drain ports T_1, T_2, and T_3 all pass through the inside of the housing. Please select the highest oil drain port to connect to the oil tank according to the installation method of the pump body.

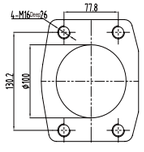
Size 280(with charge pump)

Power control,with pressure control and electric proportional control, clockwise rotation



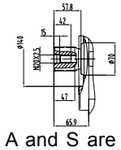


Suction port S section view

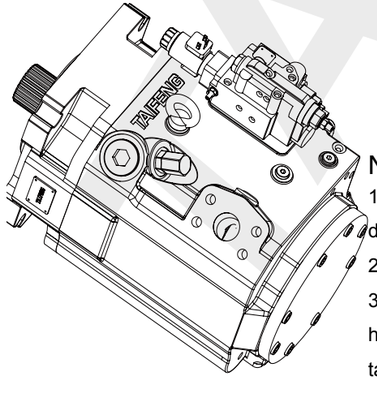


Service line port A section view

▼ Splined shaft conforms to DIN5480 A3–W60X2X28X9g



▼ Parallel keyed shaft conforms to DIN6885 B3–Ø60 A18X11X100

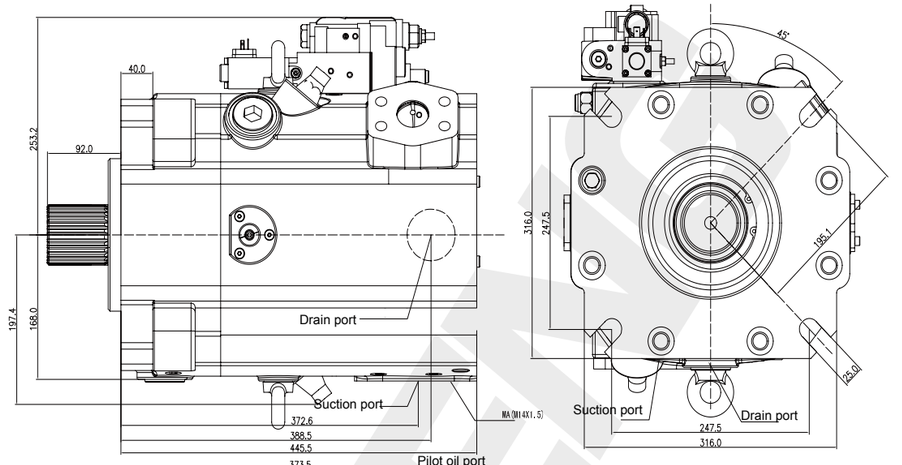


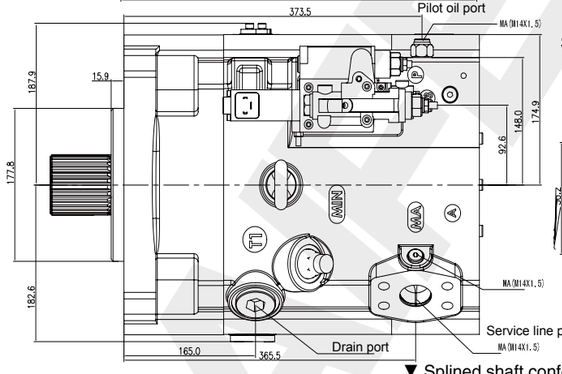
Note:

1. The flanges of oil ports A and S are not included in the scope of delivery.
2. Installation and fixing screws are not included in the scope of delivery.
3. The oil drain ports T_1, T_2, and T_3 all pass through the inside of the housing. Please select the highest oil drain port to connect to the oil tank according to the installation method of the pump body.

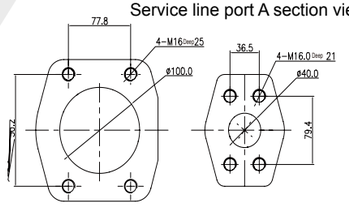
Size 355

Power control,with pressure control and electric proportional control, clockwise rotation



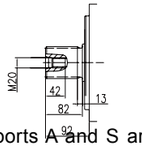


Suction port S section view

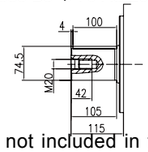


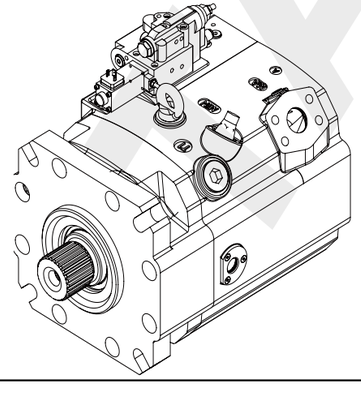
Service line port A section view

▼ Splined shaft conforms to DIN5480 A5–W70X3X22X9g



▼ Parallel keyed shaft conforms to DIN6885 B5–Ø 70 AS 20X12X100





Note:

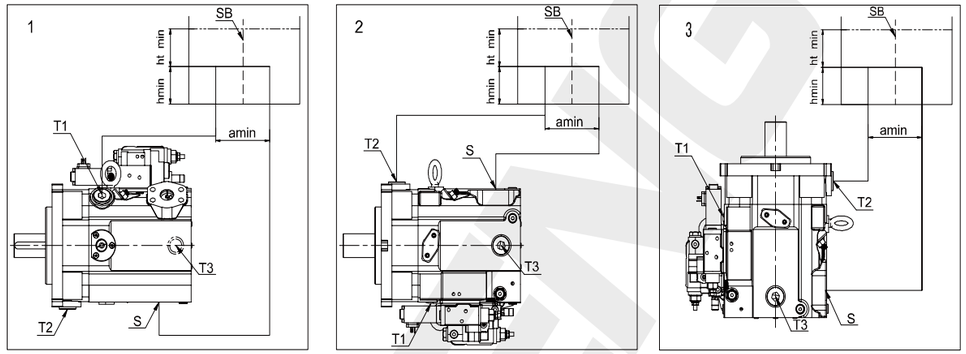
1. The flanges of oil ports A and S are not included in the scope of delivery.
2. Installation and fixing screws are not included in the scope of delivery.
3. The oil drain ports T_1, T_2, and T_3 all pass through the inside of the housing. Please select the highest oil drain port to connect to the oil tank according to the installation method of the pump body.

Installation position

Recommend installation position: 1 and 2

1.Below–reservoir installation(standard)

Below-reservoir installation means that piston pump is installed outside of reservoir, below the lowest oil level.

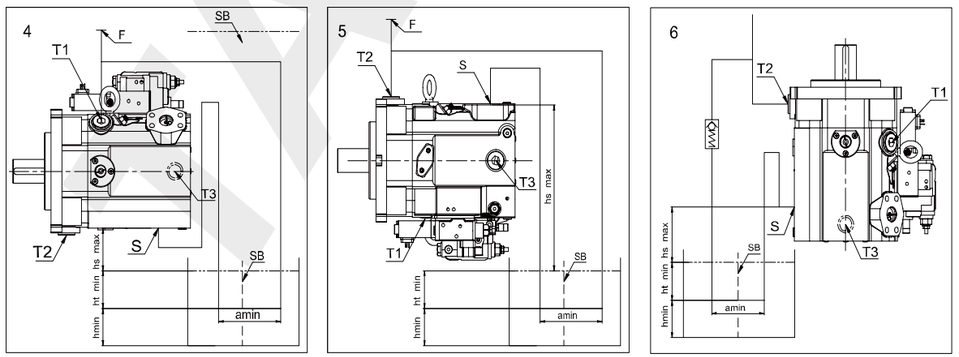


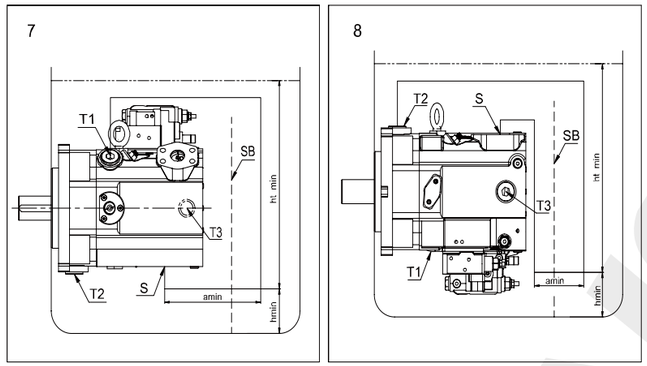
2.Above–reservoir installation

Above-reservoir installation means that piston pump is installed above the lowest oil level.

The maximum permissible sucking height $H_{s\ max}$=800mm requirement must be obeyed.

To prevent the piston pump drain at installation position 6, a checking valve(open pressure 0.5bar) should be installed at drainage pipeline.





Installation position	Bleeding port	Oil filling
1	T_1	S+T_1
2	T_2	S+T_2
3	T_2	S+T_2
4	F	T_1(F)
5	F	T_2(F)
6	F	T_2(F)
7	T_2	T_2
8	T_2	T_2
9	T_2	T_2

Installation position

3.In–reservoir installation

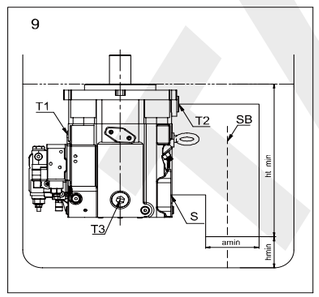
In-reservoir installation means that piston pump is installed in the reservoir,below the minimum oil level.

If the minimum oil level is equal to or lower than the upper edge of the pump, refer to the section “Above-reservoir installation”.

Piston pumps with electrical components (such as electrical controllers, sensors) must not be installed below the oil level in the reservoir.

Port standard	Thread size	Maximum allowable tightening torque for female threaded holes MG_{max}	Required tightening torque MV for the locking screw	Width across flats of hexagon screw
ISO6149	M14 x 1.5	80Nm	45Nm	6mm
	M18 x 1.5	140Nm	70Nm	8mm
	M33 x 2	540Nm	310Nm	17mm
	M42 x 2	720Nm	330Nm	22mm

Table1



F	Filling/air bleeding
S	Suction port
$T_1/T_2/T_3$	Case drain port
SB	Baffle plate
ht min	Minimum necessary immersion depth
hmin	Minimum necessary spacing to reservoir bottom
hs max	Maximum permissible suction height
a_{min}	Distance between the suction line and the case drain line

When designing the reservoir, ensure that there is sufficient distance between the suction line and the case drain line to prevent the heated return hydraulic oil from being drawn directly back into the suction line.

Installation accuracy testing

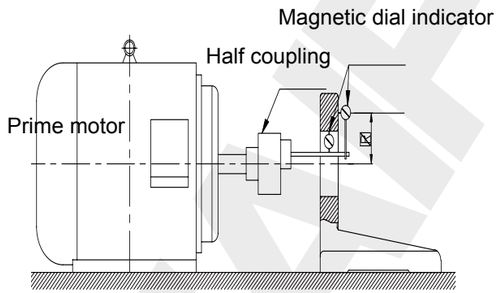
It is recommended to install the bell cover

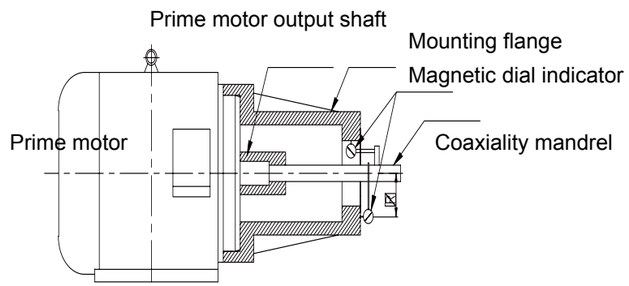
1. Bracket installation: See Figure 1 for the inspection method for the installation accuracy of the prime motor output shaft and bracket;

2. Installation of bell cover: In this installation form,if the prime motor and pump are connected by a coupling, the installation accuracy inspection method is the same as Figure 1.If the pump shaft is directly inserted into the output shaft of the prime motor, the installation accuracy inspection method is shown in Figure 2.In Figure 1 and Figure 2,the coaxiality tolerance is ≤Φ0.05,and the perpendicularity runout is ≤Φ0.05 (R is the radius of the pump mounting screw hole distribution circle).

3.The poor concentricity of the pump and prime motor can easily cause noise and damage to the bearings and frame oil seals. Elastic couplings should be used for connection between the pump and the drive shaft of the prime motor as much as possible.Internal toothed elastic couplings are recommended to avoid radial forces on the pump bearings. After installing the motor and oil pump,check whether there is an appropriate axial clearance between the coupling.If there is no axial clearance, the bearing of the oil pump will bear radial force,causing damage to the bearing.

4.It is recommended to install shock absorbers for the motor and bracket.





Installation instruction

The axial piston unit must be filled with hydraulic fluid and air bled during commissioning and operation. This must also be observed following a longer standstill as the axial piston unit may empty via the hydraulic lines. Particularly with the “drive shaft up” installation position,

Filling and air bleeding must be carried out completely as there is, for example, a danger of dry running. The leakage in the housing area must be directed to the reservoir via the highest available drain port (T_1,T_2,T_3).

For combination pumps, the leakage must be drained off at each single pump.

If a shared drain line is used for several units, make sure that the respective case pressure in each unit is not exceeded. When there is pressure difference between leakage ports of units, the shared drain line must be dimensioned to ensure that the maximum permissible case pressure of all connected units is not exceeded in any operating condition. If this is not possible, separate drain lines must be laid if necessary.

To prevent the transmission of structure-borne noise,use elastic elements to decouple all connecting lines from all vibration-capable components and avoid above reservoir installation. Pipe sizes of inlet, outlet and drain should be no less than design nominal sizes of pump.In principle, it is not allowed to install filters in the oil inlet pipeline. It is recommended that the system use oil outlet or return pipelines for filtering.If a filter must be installed in inlet pipeline, net filter is recommend and pump displacement should be no more than 100ml/r, refer to type WU800*100 or WU630*180.

Under all operating conditions, the suction lines and the drain lines must flow into the reservoir below the minimum fluid level. The permissible suction height hS results from the total pressure loss. However, it must not be higher than hS max = 800mm. During operation and cold start, the minimum suction pressure at port S should not be lower than 0.8bar absolute pressure(without charge pump) or 0.7bar absolute The minimum suction pressure (with charge pump).

For the reservoir design,ensure that there is an adequate distance between the suction line and the drain line. This can prevent the heated return oil flow from being directly sucked back into the oil suction pipeline. Before filling the oil reservoir, the oil reservoir and pipeline must undergo acid cleaning or phosphating treatment.The entire system should be cleaned. During filling, an oil filter should be used to filter the oil.

Note:

For certain mounting locations, the impact on control characteristics can be expected. Gravity, net weight, and case pressure can cause slight changes in control characteristics and change response time.

Variable Pump in Axial Piston Swashplate Design
TFC15V/10 Series

TAIFENG

Safety instruction

The TFC15VSO and TFC15VLO pumps are designed to be used in open circuit.

Project planning, installation and commissioning of the axial piston unit require the involvement of qualified personnel.

Before operating the axial piston unit,please read the appropriate instruction manual thoroughly and completely. If necessary, request these from Shandong Taifeng.

During and shortly after operation, there is a risk of burns on the axial piston unit and especially on the solenoids.Take appropriate safety measures (e.g. by wearing protective clothing).

Depending on the operating conditions of the axial piston unit (operating pressure, fluid temperature), the characteristics may shift.

Service line ports:

The ports and fastening threads are designed for the specified maximum pressure. The machine or system manufacturer must ensure that the connecting elements and lines correspond to the specified application conditions (pressure, flow, hydraulic fluid, temperature) with the necessary safety factors.

The service line ports and function ports are only designed to accommodate hydraulic lines.

Pressure controller do not provide security against pressure overload. A separate pressure relief valve should be installed in the hydraulic system.

The following tightening torques apply:

Fittings:

Observe the manufacturer's instruction regarding the tightening torques of the used fittings.

Mounting bolts:

For mounting bolts with metric ISO thread according to DIN 13 or thread according to ASME B1.1, we recommend checking the tightening torque individually according to VDI 2230.

Female threads in axial piston unit:

The maximum permissible tightening torques MG max are maximum values for the female threads and must not be exceeded. For values, see the following table.

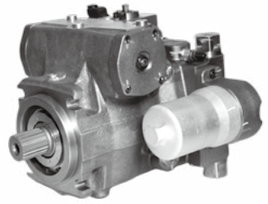
Threaded plugs:

For the metal threaded plugs supplied with the axial piston unit, the required tightening torques MV of the threaded plugs apply. For values, see the following table.

Port standard	Thread size	Maximum allowable tightening torque for female threaded holes MGmax	Required tightening torque MV for the locking screw	Width across flats of hexagon screw
ISO6149	M14 x 1.5	80Nm	45Nm	6mm
	M18 x 1.5	140Nm	70Nm	8mm
	M33 x 2	540Nm	310Nm	17mm
	M42 x 2	720Nm	330Nm	22mm

Axial Piston Variable Pump
TFA4V(T)G Series

TAIFENG



- Series 32 and 33
- Size 28 to 135
- Nominal pressure 400 bar
- Maximum pressure 450 bar
- Closed circuit

Features

- Variable displacement axial piston pump, swashplate design for hydrostatic transmission in closed circuits.
- Infinitely variable flow proportional to drive speed and displacement.
- Flow increases with swashplate swivel angle from 0 to its maximum.
- Flow direction changes smoothly when the swashplate moving through the neutral position.
- Equipped with cartridge-type high-pressure relief valves to protect the pump and motor from overloading.

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Type code

1	2	3	4	5	6	7	8	9		10	11		12	13	14	15	16	17	18	19	20
									/			—									

1	Swashplate design variable displacement piston pump , closed circuit											TFA4V	
			28	40	56	63	71	80	90	100	125	135	
2	Same side ports		○	—	—	—	●	●	●	●	—	—	TG
	Opposite side ports		—	○	●	●	—	—	—	—	○	○	G
	Displacement		28	40	56	63	71	80	90	100	125	135	
3	Geometric displacement, unit : mL/r		○	○	●	●	●	●	●	●	○	○	×××
	Control		28	40	56	63	71	80	90	100	125	135	
4	Pilot -pressure, with inlet filtration		○	○	●	●	●	●	●	●	○	○	HD3
	Hydraulic control, direct operated		○	○	●	●	●	●	●	●	○	○	DG
	Proportional	Mechanical servo,hydraulic control	○	○	●	●	●	●	●	●	○	○	HW
		Proportional to the swivel angle of the control lever U=12V	○	○	○	○	○	○	○	○	○	○	HW1
		U=24V	○	○	●	●	●	●	●	●	○	○	HW2
	Proportional electronic control	With manual override to neutral U=12V	○	○	●	●	●	●	●	●	○	○	EP3
		U=24V	○	○	●	●	●	●	●	●	○	○	EP4
	Automatic control, speed related	U=12V	○	○	●	●	●	●	●	●	○	○	DA1
		U=24V	○	○	●	●	●	●	●	●	○	○	DA2
	Pressure cut-off		28	40	56	63	71	80	90	100	125	135	
5	Pressure cut-off, default		○	○	●	●	●	●	●	●	○	○	D
	Without pressure cut-off		○	○	●	●	○	○	○	○	○	○	0
	Neutral position switch												
6	Without neutral position switch		○	○	●	●	●	●	●	●	○	○	0
	Mechanical servo, with neutral position switch(only for HW control)		○	○	●	●	●	●	●	●	○	○	L
	Mechanical stroke limiter												
7	Without mechanical stroke limiter		○	○	●	●	●	●	●	●	○	○	0
	Mechanical stroke limiter, externally adjustable		○	○	●	●	●	●	●	●	○	○	M
	Stroking chamber pressure port												
8	Without stroking chamber pressure port		○	○	●	●	●	●	●	●	○	○	0
	Stroking chamber pressure port X_3, X_4		○	○	●	●	●	●	●	●	○	○	T

	DA control valve			NV	HD	HW	DG	DA	EP	EZ	
9	Without DA control valve			●	●	●	●	—	●	●	1
	DA control valve, fixed setting			—	○	○	○	○	○	—	2
	DA control valve, mechanically adjustable, with position lever	Direction of actuation	Clockwise	—	○	○	○	○	○	—	3R
			Counter-clockwise	—	○	○	○	○	○	—	3L
	DA control valve, fixed setting, hydraulic inch valve mounted, control with hydraulic fluid	As per ISO4925, non-petroleum-base fluids		—	—	—	—	○	—	—	4
		Mineral oil-based fluids		—	—	—	—	○	—	—	8
	DA control valve, fixed setting, with ports for pilot control			—	○	○	○	○	○	—	7

	Size			28	40	56	63	71	80	90	100	125	135	
10	Same side working ports			○	—	—	—	●	●	●	●	—	—	/33
	Opposite side working ports			—	○	●	●	—	—	—	—	○	○	/32
	Direction of rotation													
11	Viewed on drive shaft	Clockwise	Right rotation											R
		Counter-clockwise	Left rotation											L
	Sealing material													—
12	NBR(nitrile rubber), shaft seal FKM(flurocarbon rubber)			○	○	●	●	●	●	●	●	○	○	N
	FKM(flurocarbon rubber), shaft seal FKM(flurocarbon rubber)			○	○	●	●	●	●	●	●	○	○	F

									TG	TG	TG	TG			
	Drive shaft				28	40	56	63	71	80	90	100	125	135	
13	DIN5480	M10	W25×1.25×18×9g		○(Z)	—	—	—	—	—	—	—	—	—	W25
		M10	W30×2×14×9g		—	○(Z)	○(Z)	○(Z)	—	—	—	—	—	—	W30
		M12	W35×2×16×9g		—	○(A)	○(A)	○(A)	●(Z)	●	●(Z)	●	—	—	W35
		M16	W40×2×18×9g		—	—	—	—	●(A)	—	—	—	○(Z)	○	W40
		M16	W45×2×21×9g		—	—	—	—	●	●	●(A)	●	○(A)	○	W45
	ANSI B 92.1 a	1 in	15T 16/32DP		○(U)	○(U)	—	—	—	—	—	—	—	—	S15
		1 3/8 in	21T 16/32DP		—	—	●(T)	●(T)	●(T)	●	●	●	—	—	S21
		1 1/2 in	23T 16/32DP		—	—	—	—	●	●	●	●	—	—	S23
		1 3/4 in	13T 8/16DP		—	—	—	—	○	○	○(S)	○	○(S)	○	T13
		2 in	15T 8/16DP		—	—	—	—	—	—	—	—	○(T)	○	T15
		1 3/4 in	27T 16/32DP		—	—	—	—	—	—	—	—	—	○	S27
		2 1/4in	17T 8/16DP		—	—	—	—	—	—	—	—	—	○	T17
	For combination pump	1 1/4 in	14T 12/24DP		○(S)	○(S)	●(S)	●(S)	●(S)	●	●(U)	●	—	○	U14

Type code

	Mounting flange			28	40	56	63	71	80	90	100	125	135	
14	SAE J744	2(101.6)		○	—			—	—	—	—	—	—	B2
		2 hole (127)		—	○	●	●	—	—	—	—	—	—	C2
		4 hole (127)		—	—	—	—	●	●	●	●	—	—	C4
		4+2 hole (127)		—	—	—	—	●	●	●	●	○	○	C6
		4+2 hole (152.4)		—	—	—	—	—	—	—	—	●	●	D6
	Drive shaft			28	40	56	63	71	80	90	100	125	135	
15	Without connection flange			○	○	●	●	●	●	●	●	○	○	
	With connection flange			○	○	●	●	●	●	●	●	○	○	C
	Working port(viewed on drive shaft)			28	40	56	63	71	80	90	100	125	135	
16	SAE working port A and B	A、B Opposite side	Port S bottom	—	○	●	●	○	○	○	○	●	●	0
		A、B Opposite side	Port S at top	—	—	—	—	—	—	—	—	—	—	5
		A、BSame side, left	Port S bottom	—	—	—	—	●	●	●	●	—	—	1
		A、BSame side, right	Port S at top	—	—	—	—	●	●	●	●	—	—	2
		A、BSame side, right	Port S at top	○	—	—	—	—	—	—	—	—	—	3
		A、BSame side, left		—	—	—	—	—	—	—	—	—	—	4
	Boost pump, without through drive			28	40	56	63	71	80	90	100	125	135	
17	Integrated boost pump	Boost pump displacement	6.1	○	—	—	—	—	—	—	—	—	—	G06
			8.6	—	○	—	—	—	—	—	—	—	—	G08
			11.6	—	—	●	—	—	—	—	—	—	—	G11
			13.8	—	—	—	●	—	—	—	—	—	—	G13
			19.6	—	—	—	—	●	●	●	—	—	—	G20
			28.3	—	—	—	—	—	—	●	●	○	○	G28

	Through drive, serial installation			28	40	56	63	71	80	90	100	125	135	
18	Flange	Hub for splined shaft												
	Without through drive			●	●	●	●	●	●	●	●	●	●	F00
	82-2(A)	5/8 in	9T 16/32DP	○	○	●	●	●	●	●	●	○	○	F01
	82-2(A)	3/4 in	11T 16/32DP	○	○	●	●	●	●	●	●	○	○	F52
	101-2(B)	7/8 in	13T 16/32DP	○	○	●	●	—	—	—	—	○	○	F02
	101-2(B)	1 in	13T 16/32DP+	○	○	—	—	●	●	●	●	○	○	F03
	101-2(B)	1 in	15T 16/32DP+	○	○	●	●	●	●	●	●	○	○	F04
	127-2(C)	1 in	15T 16/32DP	—	—	●	—	—	—	—	—	○	○	F09
	127-2(C)	1 1/4 in	14T 12/24DP	—	—	—	●	—	—	—	—	—	—	F07
	127-2/4(C)	1 1/4 in	14T 12/24DP	—	—	—	—	●	●	●	●	○	○	
	152-2/4(C)	1 3/4 in	13T 8/16DP	—	—	—	—	—	—	—	—	○	○	F69

	High-pressure relief valve Setting range With bypass			28	40	56	63	71	80	90	100	125	135	
19	Pilot operated	100bar-420bar , with bypass		○	○	○	○	○	○	○	○	○	○	1
	Direct operated, fixed setting	250bar-420bar , without bypass		○	○	●	●	●	●	●	●	○	○	3
		250bar-420bar , with bypass		○	○	●	●	●	●	●	●	○	○	5
		100bar-250bar , without bypass		○	○	○	○	○	○	○	○	—	—	4
		100bar-250bar , with bypass		○	○	○	○	○	○	○	○	—	—	6
		450bar , without bypass		○	○	○	○	○	○	○	○	○	○	7
	Filtration boost circuit/external boost pressure supply			28	40	56	63	71	80	90	100	125	135	
20	Filtration in the boost pump suction line			○	○	●	●	○	○	○	○	○	○	S
	Filtration in the boost pump pressure line	Ports for external boost circuit filtration		○	○	○	○	○	○	○	○	○	○	D
		Attachment filter without cold start valve		○	○	●	●	●	●	●	●	○	○	T
		Attachment filter with cold start valve		○	○	●	●	○	○	○	○	○	○	F
		Attachment filter with cold start valve and contamination indicator		○	○	●	●	○	○	○	○	○	○	P
		Attachment filter with cold start valve and electric contamination indicator, function normally open		○	○	●	●	○	○	○	○	○	○	B
	External boost pressure supply(without integrated boost pump)			○	○	○	○	○	○	○	○	○	○	E
	Swivel angle sensor			28	40	56	63	71	80	90	100	125	135	
20	Without swivel angle sensor			○	○	●	●	●	●	●	●	○	○	
	With designated swivel angle sensor			○	○	●	●	●	●	●	●	○	○	R
	Others													
21	Customer code	Customer' s abbreviation(4-6 letter initials)— Two-digit identification code												-XXXXYY

● = Available ○ = On request - = Not available

If the housing needs painting, please specify clearly in the order. Otherwise, pump will keep its casting color.

Technical data

Size		NG	Unit	28	40	56	63	71	80	90	100	125	135
Geometric displacement	variable pump	V_{gmax}	mL/r	28	40	56	63	71	80	90	100	125	135
	boost pump($\triangle$ p=20bar)	V_{gsp}	mL/r	6.1	8.6	11.6	13.8	19.6	19.6	19.6	28.3	28.3	28.3
Rotational speed	rated speed	n		4250	4000	3600	3600	3300	3200	3050	3250	2850	2800
	maximum speed	n_{max}		4500	4200	3900	3900	3300	3200	3300	3250	3250	3200
	minimum speed	n_{min}		500	500	500	500	500	500	500	500	500	500
Flow	at n_{nom}, $v_{g\,max}$, and $\triangle$ p=0 bar			119	160	202		234		275		356	
Power	at n_{nom}, $v_{g\,max}$, and $\triangle$ p=400 bar			79	107	134		156		183		238	
Torque	at n_{nom}, $v_{g\,max}$, and $\triangle$ p=400 bar			178	255	357		452		573		796	
	at n_{nom}, $v_{g\,max}$, and $\triangle$ p=100 bar			45	64	89		113		143		199	
Case volume		V	L	0.9	1.1	1.5	1.4	1.5	1.5	1.5	1.3	2.1	1.8
Weight				29	31	38	39	50	50	54	54	80	82

Note: Theoretical values, without efficiency and tolerances; values rounded.

Determination of the operating characteristics

Flow $q_v = \frac{V_g \times n \times \eta_v}{1000}$ [L/min]

Torque $M = \frac{V_g \times \Delta p}{20 \times \pi \times \eta_{hm}}$ [Nm]

Power $P = \frac{2\pi \times M \times n}{60000} = \frac{q_v \times \Delta p}{600 \times \eta_t}$ [kW]

Key

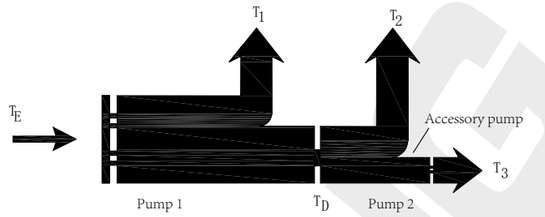
V_g: Displacement per revolution cm^3, Δp: Differential pressure bar, n: Rotational speed rpm,
η_v: Volumetric efficiency, η_{hm}: Hydraulic-mechanical efficiency, η_t: Total efficiency $\eta_t = \eta_v \times \eta_{hm}$

Input and output torque

Size		28	40	56	63	71	80	90	100	125	135
Torque Nm (Maximum displacement, 40MPa)	M	178	255	357	401	452	510	573	636	796	859
Maximum input torque on drive shaft Nm											
W25 × 1.25 × 18 × 9g	W25	352									
W30 × 2 × 14 × 9g	W30		522	522							
W35 × 2 × 16 × 9g	W35		912	912	912	912	912	912	912		
W40 × 2 × 18 × 9g	W40				1460	1460	1460	1460	1460	1460	1460
W45 × 2 × 21 × 9g	W50					2190	2190	2190	2190	2190	2190
15T 16/32DP	S15	272	272								
21T 16/32DP	S21			970	970	970	970	970	970		
23T 16/32DP	S23					1305	1305	1305	1305		
13T 8/16DP	T13								1500	1640	1640
15T 8/16DP	T15								_	2670	2670
14T 12/24DP	U14				630	630	630	630	630		4070
27T 16/32DP	S27										1830
17T 8/16DP	T17										
Maximum through–drive torque		231	314	521		660		822	822	1110	

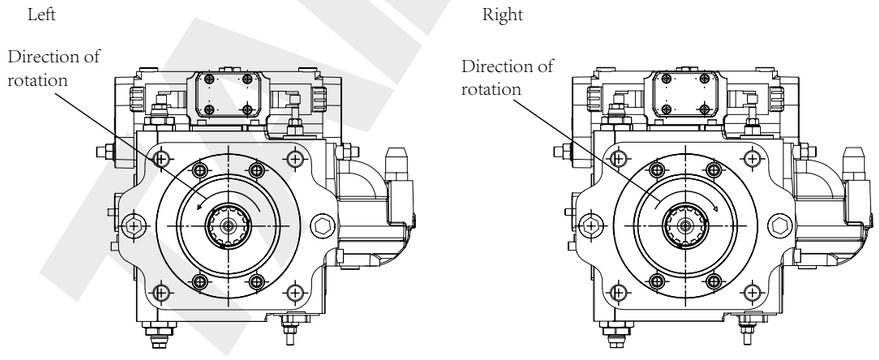
Distribution of torques

Starting from the power input side, the pumps are arranged as Pump 1, Pump 2 and Pump 3 successively. The engine torque, rotational speed and input rotational speed of each pump shall be acquired in advance for calculation.



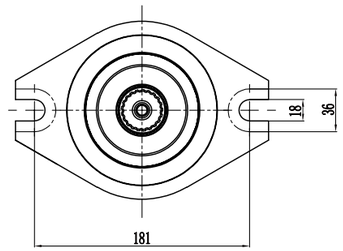
TFA4V(T)G	Pump 1	T_1
	Pump 2	T_2
Accessory pump		T_3
Input torque		$T=T_1+T_2+T_3$
		$T < T_{E\ max}$
Output torque		$T_D=T_2+T_3$
		$T_D < T_{D\ max}$

Direction of rotation

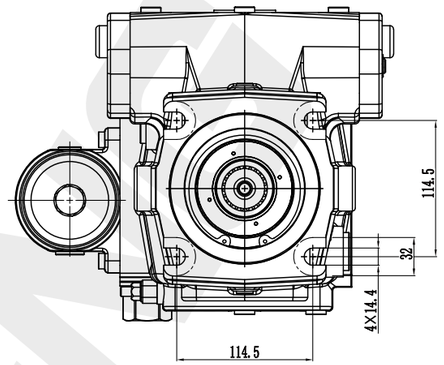


Mounting flange

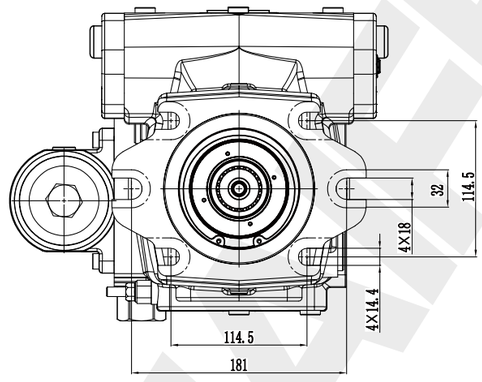
2-hole flange C2



4-hole flange C4



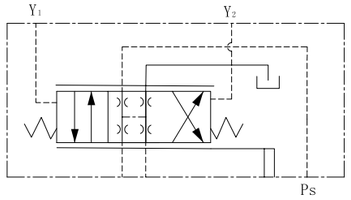
6-hole flange C6(C2+C4 combination)



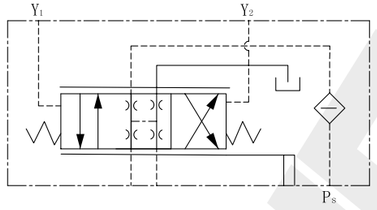
HD, pilot pressure control

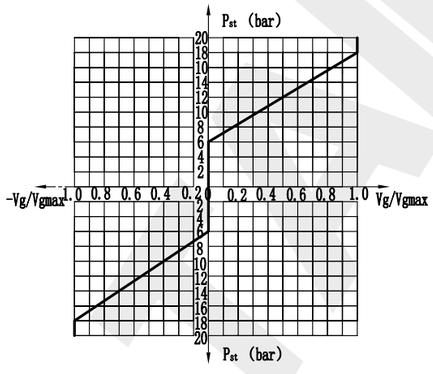
The stroking cylinder is actuated by the HD control assembly. The swashplate angle and thus the output flow of the pump is infinitely variable, depending on pilot pressure difference P_s at side Y_1 and Y_2. Each control line corresponds to one fluid flow direction.

Without supply oil filter (Not available for new projects !)



With supply oil filter (Standard version)





V_g: Displacement to p_{st}
$V_{g\ max}$: Displacement at P_{st}=18 bar
P_{st}: Pilot pressure signal at port Y_1 , Y_2
Start of control: 6 bar ($V_{g\ 0}$)
End of control: 18 bar ($V_{g\ max}$)

Notice

The HD controller must use external pilot pressure and be held at neutral position. The spring feedback in the controller is not a safety device. Contamination inside the control assembly, such as abrasive particles from hydraulic oil, debris from other systems, etc., may cause the spool to stick at any position.

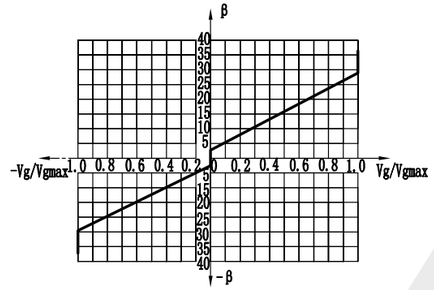
- In such cases, the pump flow will not respond correctly to operator commands.

- The pump emergency stop function can promptly shut down machine operation to a safe state (e.g shutdown conditions). The hydraulic fluid cleanliness shall always comply with ISO 4406 standard:

Class: 20/18/15 (< 90 ℃) or 19/17/14 (≥90℃ or < 115 ℃)

HW, Mechanical Servo Control

Depending on the operation direction a or b of the control lever, the pump stroking piston receives control pressure through the HW control device, enabling infinite adjustment of the swashplate displacement. Each operation direction of the control lever corresponds to one fluid flow direction.

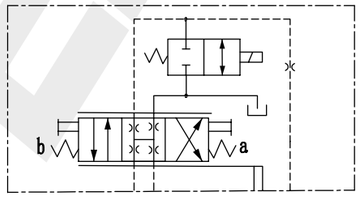


Control lever swivel angle : β
Control start point β = 3°
Control end point β = 29°
(maximum displacement V_{gmax})
Mechanical limitation: ± 39°

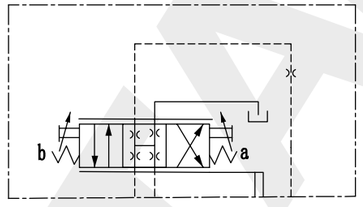
Option 1: With emergency brake valve, HW1/2

Technical date	HW1	HW2
Voltage	12VDC (±1.8V)	24VDC (±3.6V)
Rated Power(20 C)	90	36Q
Duty cycle	18W	18W
Protection Level	1.5A	0.75A
Connector	DEUTSCH DT04-2P-EP04	
Duty cycle	100%	
Protection level	IP67	

With normally closed brake valve, HW1/HW2, braking when energized



Circuit diagram

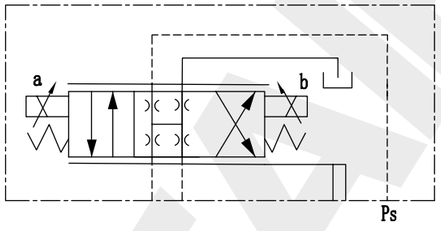


EP， Proportional control, electric

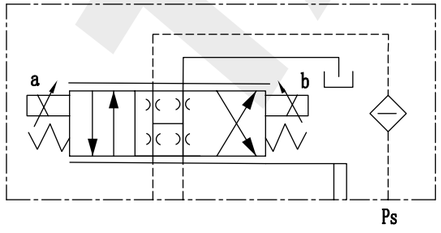
The stroking cylinder is actuated by the EP controller. The swashplate angle and thus the output flow of the pump is infinitely variable, depending on the control current of proportional solenoid side a or b. Each solenoid corresponds to one fluid flow direction.

Technical date	EP1/3	EP2/4
Voltage	12V DC(±20%	24V DC(±20%)
Control current		
Start of control Vg=0	400mA	200mA
End of control Vg max	1200mA	600mA
Current limit	1.54A	0.77A
Nominal resistance(20℃)	5.5Q	22.7Ω
Connector	DEUTSCH DT04-2P-EP04	
Dither frequency	100Hz	
Duty cycle	100%	
Protection Level	IP67	

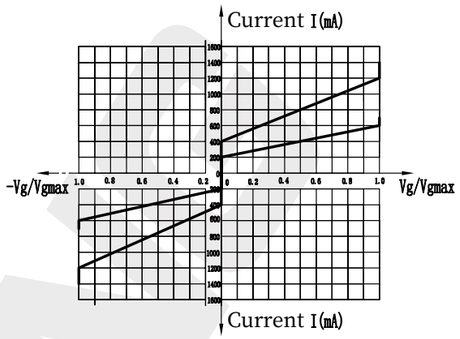
Without supply oil filter (Not available for new projects !)



With supply oil filter (Standard version)



Displacement against control current



Notice

The spring feedback in the controller is not a safety device. Contamination inside the control assembly, such as abrasive particles from hydraulic oil, debris from other systems, etc., may cause the spool to stick at any position.

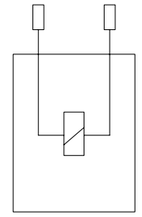
- In such cases, the pump flow will not respond correctly to operator commands.

- The pump emergency stop function can promptly shut down machine operation to a safe state (e.g shutdown conditions). The hydraulic fluid cleanliness shall always comply with ISO 4406 standard:

Class: 20/18/15 (＜ 90 ℃) or 19/17/14 (≥90℃ or ＜ 115 ℃)

EP, Proportional control, electric

Without bidirectional suppressor diode



The mating connector is not included in the scope of delivery.

Solenoid with emergency start and spring return (EP/EZ)

Mating connector: DEUTSCH DT06-2S-EP04

Consisting of	DT designation
1 Housing	DT06-2S-EP04
1 Wedge	W2S
2 Sockets	0462-201-16141

Solenoid Valve connector

Model: DEUTSCH DT04-2P-EP04 (2-pin molded, without bidirectional suppressor)
Protection type:
IP67 (DIN EN 60520)
IP69K (DIN 60050-9)

Notice

Manual emergency operation (emergency start) can be used in case of electrical system failure. Not allowed for continuous operation !

Change connector position

If necessary, the connector position can be changed by rotating the solenoid. To do this, follow these steps:

1.Loosen the solenoid's fixing nut (1) by turning it counterclockwise one full turn.

2.Rotate the solenoid body (2) to the desired position.

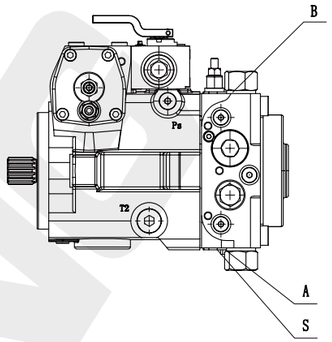
3.Retighten the fixing nut. Tightening torque:

At delivery, the connector position may differ from that shown in the manual or diagram. The position can be specified in the order drawing.

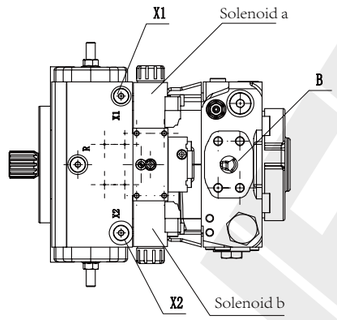
Correlation of direction of rotation, control and flow direction

Ports, direction of rotation, flow direction

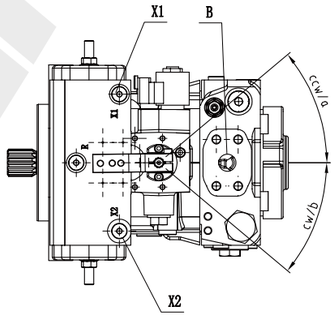
Ports	2			
Ports description	Viewed on the drive shaft, the suction port is located at the bottom; Port A and B are opposite			
Direction of rotation, viewed on the drive shaft	Clockwise		Counter–clockwise	
Pilot pressure	Y_2	Y_1	Y_2	Y_1
Lever direction (HW)	a	b	a	b
Proportional control, electric (EP)	b	a	b	a
Stroking piston pressure	X_2	X_1	X_2	X_1
Flow direction	B to A	A to B	A to B	B to A
Working pressure	MA	MB	MB	MA



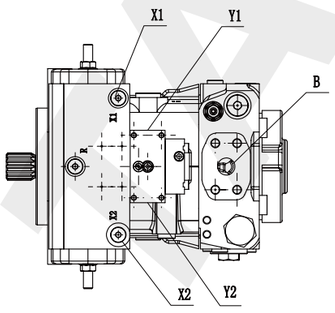
EP



HW



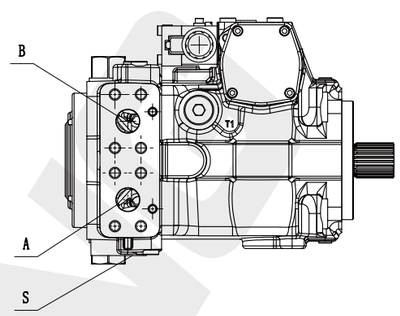
HD



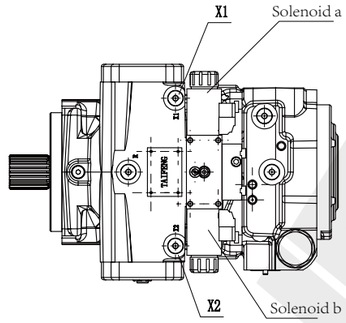
Correlation of direction of rotation, control and flow direction

Ports, direction of rotation, flow direction

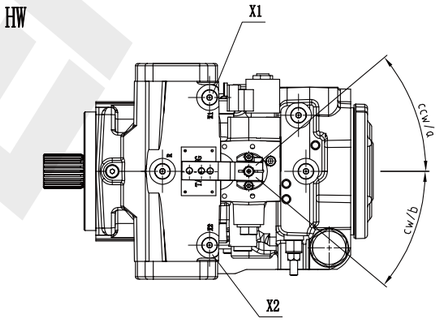
Ports	1			
Ports description	Viewed on the drive shaft, the suction port is located at the bottom; Port A and B are same side			
Direction of rotation, viewed on the drive shaft	Clockwise		Counter–clockwise	
Pilot pressure	Y_2	Y_1	Y_2	Y_1
Lever direction (HW)	a	b	a	b
Proportional control, electric (EP)	b	a	b	a
Stroking piston pressure	X_2	X_1	X_2	X_1
Flow direction	A to B	B to A	B to A	A to B
Working pressure	MB	MA	MA	MB



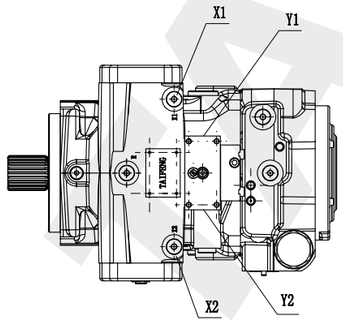
EP



HW



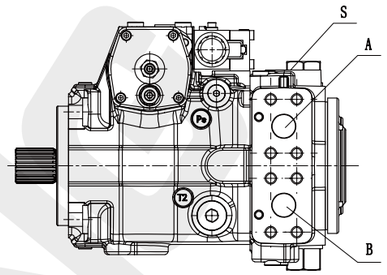
HD



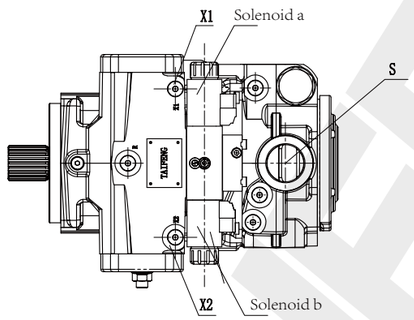
Correlation of direction of rotation, control and flow direction

Ports, direction of rotation, flow direction

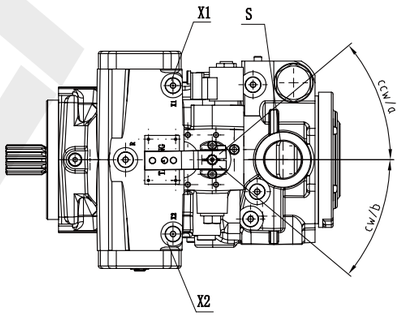
Ports	0			
Ports description	Viewed on the drive shaft, the suction port is located at the top; Port A and B are same side			
Direction of rotation, viewed on the drive shaft	Clockwise		Counter–clockwise	
Pilot pressure	Y_1	Y_2	Y_1	Y_2
Lever direction (HW)	b	a	b	a
Proportional control, electric (EP)	a	b	a	b
Stroking piston pressure	X_1	X_2	X_1	X_2
Flow direction	A to B	B to A	B to A	B to A
Working pressure	MB	MA	MA	MA



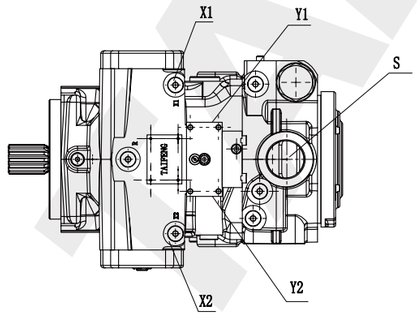
EP



HW

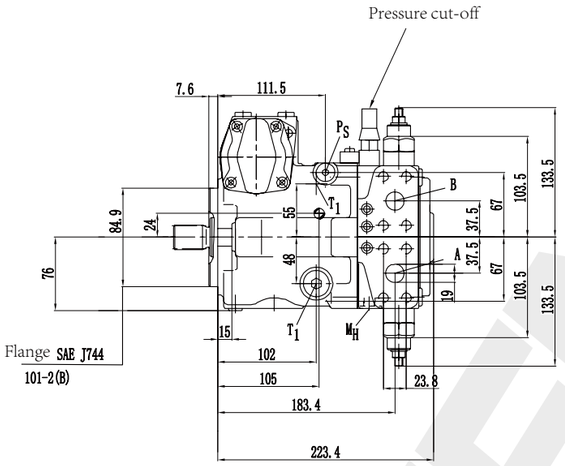


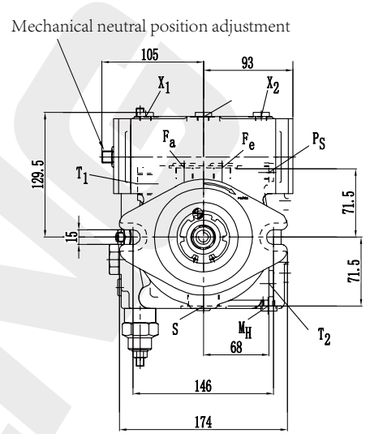
HD

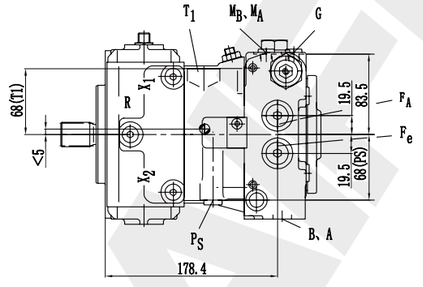


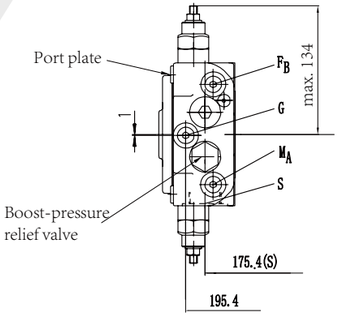
Dimensions, Size 28

A4VG28 Without control module





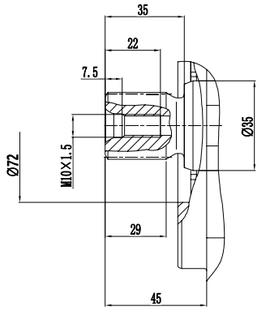




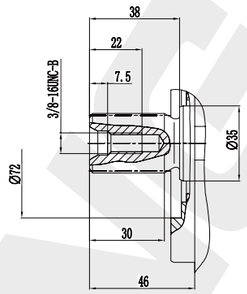
Dimensions, Size 28

A4VG28 Shaft

Shaft DIN5480
W25-W25 × 1.25 × 18 × 9g



Shaft ANSI B 92.1 a
S15-15T 16/32DP



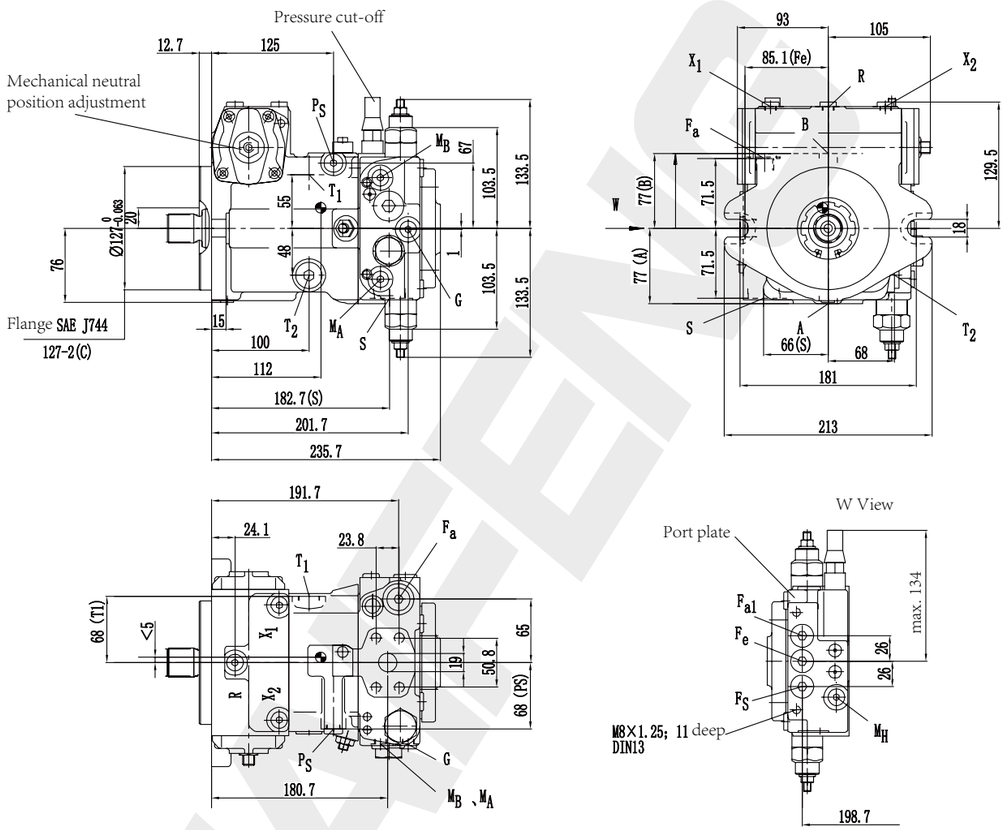
A4VG28 ports

Port	Port name	Standard	Size	P_{max}, bar	State
A/B	Working port fastening thread A/B	SAE J518 DIN13	3/4 in M10×1.5，17 deep	450	O
S	Suction port	DIN 3852	M33×2，18 deep	5	O
T_1	Drain port	DIN 3852	M22×1.5，14 deep	3	O [1]
T_2	Drain port	DIN 3852	M22×1.5，14 deep	3	× [1]
R	Air bleed port	DIN 3852	M12×1.5，12 deep	3	×
X_1/X_2	Control pressure port (upstream of orifice)	DIN 3852	M12×1.5，12 deep	40	×
X_1/X_2	Control pressure port (upstream of orifice, DG only)	DIN 3852	M12×1.5，12 deep	40	O
X_3/X_4	Stroking chamber pressure port	DIN 3852	M12×1.5，12 deep	40	×
G	Boost pressure port inlet	DIN 3852	M12×1.5，12 deep	40	×
P_s	Pilot pressure port, inlet	DIN 3852	M14×1.5，12 deep	40	×
P_s	Pilot pressure port (DA..7 only)	DIN 3852	M14×1.5，12 deep	40	O
Y	Pilot pressure port (DA..7 only)	DIN 3852	M14×1.5，12 deep	40	O
M_A/M_B	Measuring port pressure A, B	DIN 3852	M12×1.5，12 deep	450	×
M_H	Measuring port, high pressure	DIN 3852	M12×1.5，12 deep	450	×
Fa	Boost pressure port inlet	DIN 3852	M18×1.5，12 deep	40	×
Fe	Boost pressure port outlet	DIN 3852	M18×1.5，12 deep	40	×
Y_1/Y_2	Pilot pressure port (pilot signal HD only)	DIN 3852	M14×1.5，12 deep	40	O
Z	Inch signal (DA..4 and DA..8 only)	DIN 3852	M10×1，8 deep	40	×

Note: Either T1 or T2 is for case drain cooling. It is forbidden to share the return line with other return circuits of the hydraulic system, to prevent damage induced by elevated case pressure. The port for cooling should be specified and sealed by a plastic plug upon delivery.

Dimensions, Size 40

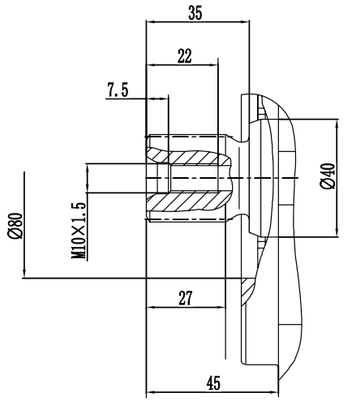
A4VG40 Without control module



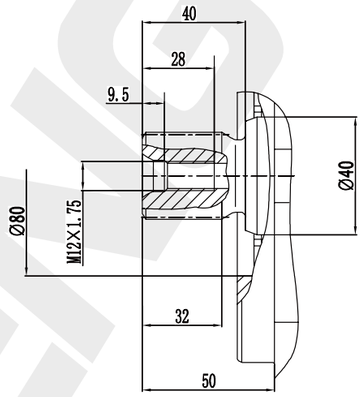
Dimensions, Size 40

A4VG40 Shaft

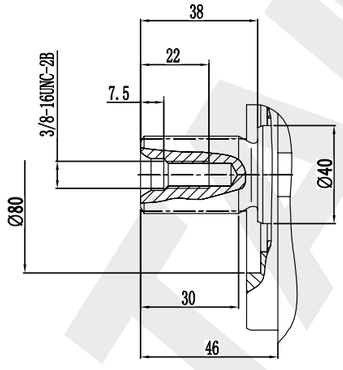
Shaft DIN5480
W30-W30×2×14×9g



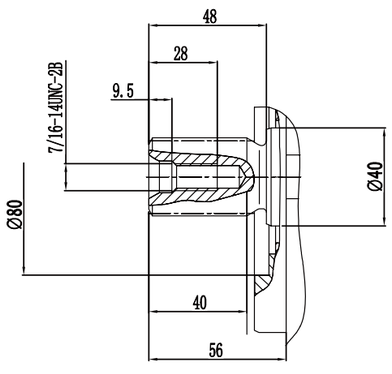
Shaft DIN5480
W35-W35×2×16×9g



ANSI B 92.1 a
S15-15T 16/32DP



ANSI B 92.1 a
U14-14T 12/24DP



Dimensions, Size 40

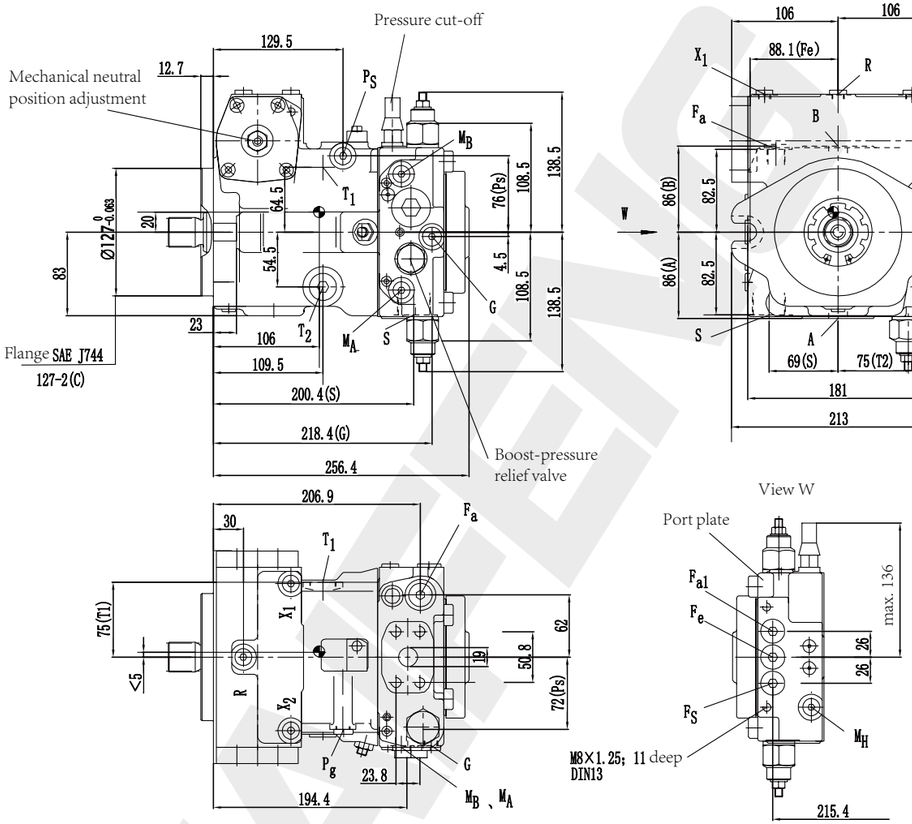
A4VG40 ports

Port	Port name	Standard	Size	P_{max}, bar	State
A/B	Working port fastening thread A/B	SAE J518 DIN13	3/4 in M10×1.5 , 17 deep	450	O
S	Suction port	DIN 3852	M33×2 , 18 deep	5	O
T_1	Drain port	DIN 3852	M22×1.5 , 14 deep	3	O [1)]
T_2	Drain port	DIN 3852	M22×1.5 , 14 deep	3	× [1)]
R	Air bleed port	DIN 3852	M12×1.5 , 12 deep	3	×
X_1/X_2	Control pressure port (upstream of orifice)	DIN 3852	M12×1.5 , 12 deep	40	×
X_1/X_2	Control pressure port (upstream of orifice, DG only)	DIN 3852	M12×1.5 , 12 deep	40	O
X_3/X_4	Stroking chamber pressure port	DIN 3852	M12×1.5 , 12 deep	40	×
G	Boost pressure port inlet	DIN 3852	M12×1.5 , 12 deep	40	×
P_s	Pilot pressure port, inlet	DIN 3852	M14×1.5 , 12 deep	40	×
P_s	Pilot pressure port (DA..7 only)	DIN 3852	M14×1.5 , 12 deep	40	O
Y	Pilot pressure port (DA..7 only)	DIN 3852	M14×1.5 , 12 deep	40	O
M_A/M_B	Measuring port pressure A, B	DIN 3852	M12×1.5 , 12 deep	450	×
M_H	Measuring port, high pressure	DIN 3852	M12×1.5 , 12 deep	450	×
Fa	Boost pressure port inlet	DIN 3852	M18×1.5 , 12 deep	40	×
Fa1	Boost pressure port inlet (attachment filter)	DIN 3852	M18×1.5 , 12 deep	40	×
Fe	Boost pressure port outlet	DIN 3852	M18×1.5 , 12 deep	40	×
Fs	Line from filter to suction port (cold start)	DIN 3852	M18×1.5 , 12 deep	40	×
Y_1/Y_2	Pilot pressure port (pilot signal HD only)	DIN 3852	M14×1.5 , 12 deep	40	O
Z	Inch signal (DA..4 and DA..8 only)	DIN 3852	M10×1 , 8 deep	40	×

Note: Either T_1 or T_2 is for case drain cooling. It is forbidden to share the return line with other return circuits of the hydraulic system, to prevent damage induced by elevated case pressure. The port for cooling should be specified and sealed by a plastic plug upon delivery.

Dimensions, Size 56/63

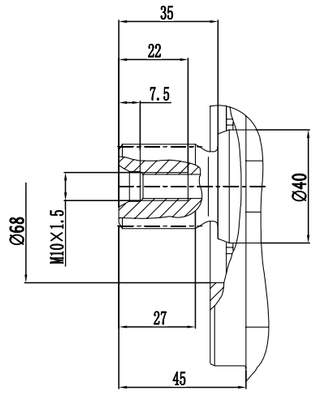
A4VG56/63 Without control module



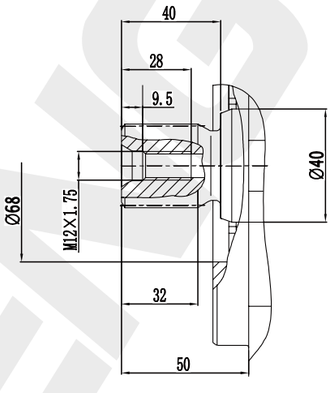
Dimensions, Size 56/63

A4VG56/63 Shaft

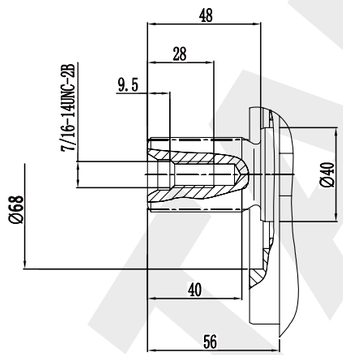
Shaft DIN5480
W30-W30×2×14×9g



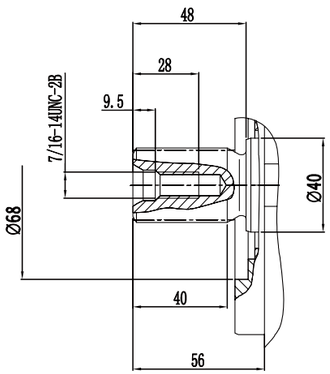
Shaft DIN5480
W35-W35×2×16×9g



ANSI B 92.1 a
S21-21T 16/32DP



ANSI B 92.1 a
U14-14T 12/24DP



Dimensions, Size 56/63

A4VG56/63 ports

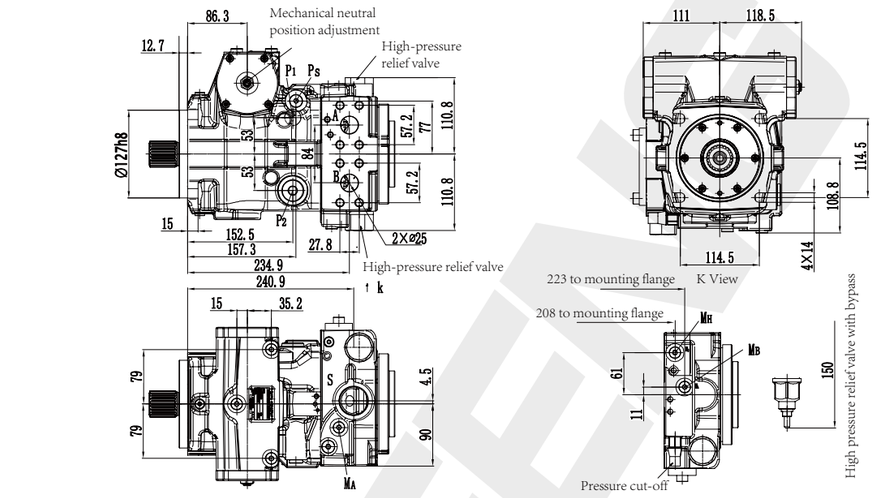
Port	Port name	Standard	Size	P_{max}, bar	State
A/B	Working port fastening thread A/B	SAE J518 DIN13	3/4 in M10×1.5 , 17 deep	450	O
S	Suction port	DIN 3852	M33×2 , 18 deep	5	O
T_1	Drain port	DIN 3852	M22×1.5 , 14 deep	3	O [1)]
T_2	Drain port	DIN 3852	M22×1.5 , 14 deep	3	× [1)]
R	Air bleed port	DIN 3852	M12×1.5 , 12 deep	3	×
X_1/X_2	Control pressure port (upstream of orifice)	DIN 3852	M12×1.5 , 12 deep	40	×
X_1/X_2	Control pressure port (upstream of orifice, DG only)	DIN 3852	M12×1.5 , 12 deep	40	O
X_3/X_4	Stroking chamber pressure port	DIN 3852	M12×1.5 , 12 deep	40	×
G	Boost pressure port inlet	DIN 3852	M12×1.5 , 12 deep	40	×
P_s	Pilot pressure port, inlet	DIN 3852	M14×1.5 , 12 deep	40	×
P_s	Pilot pressure port (DA..7 only)	DIN 3852	M14×1.5 , 12 deep	40	O
Y	Pilot pressure port (DA..7 only)	DIN 3852	M14×1.5 , 12 deep	40	O
M_A/M_B	Measuring port pressure A, B	DIN 3852	M12×1.5 , 12 deep	450	×
M_H	Measuring port, high pressure	DIN 3852	M12×1.5 , 12 deep	450	×
Fa	Boost pressure port inlet	DIN 3852	M18×1.5 , 12 deep	40	×
Fa1	Boost pressure port inlet (attachment filter)	DIN 3852	M18×1.5 , 12 deep	40	×
Fe	Boost pressure port outlet	DIN 3852	M18×1.5 , 12 deep	40	×
Fs	Line from filter to suction port (cold start)	DIN 3852	M18×1.5 , 12 deep	40	×
Y_1/Y_2	Pilot pressure port (pilot signal HD only)	DIN 3852	M14×1.5 , 12 deep	40	O
Z	Inch signal (DA..4 and DA..8 only)	DIN 3852	M10×1 , 8 deep	40	×

Note: Either T_1 or T_2 is for case drain cooling. It is forbidden to share the return line with other return circuits of the hydraulic system, to prevent damage induced by elevated case pressure. The port for cooling should be specified and sealed by a plastic plug upon delivery.

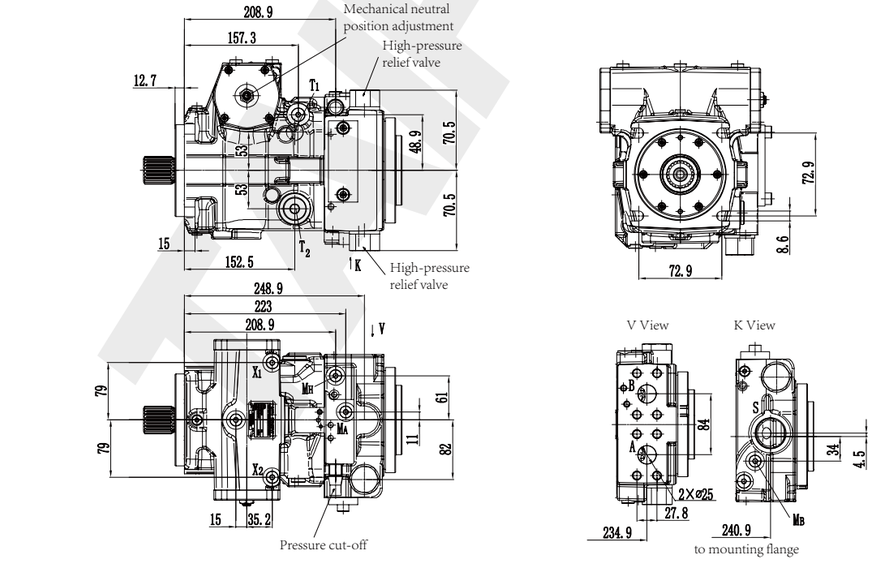
Dimensions, Size 71/80/90/100

A4VTG71/80/90/100 Without control module

Port 2

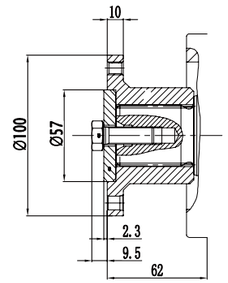


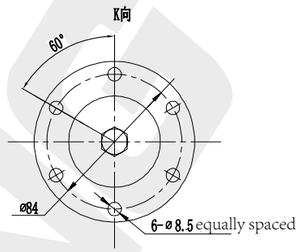
Port 1



Dimensions, Size 71/80/90/100

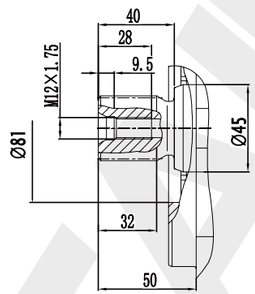
A4VTG71/80/90/100 Shaft with flange



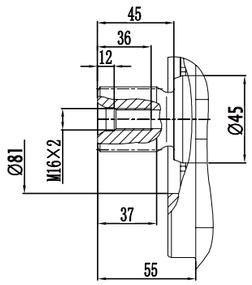


71/80/90/100 Shaft

Shaft DIN5480
W35-W35 × 2 × 16 × 9g



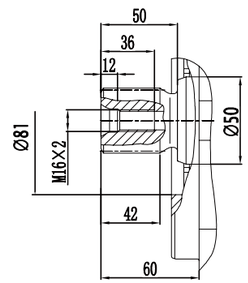
Shaft DIN5480
W40 × 2 × 18 × 9g



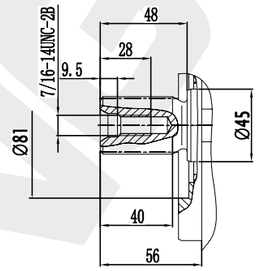
Dimensions, Size 71/80/90/100

A4VTG71/80/90/100 Shaft

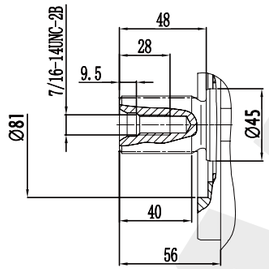
Shaft DIN5480
W45 × 2 × 21 × 9g



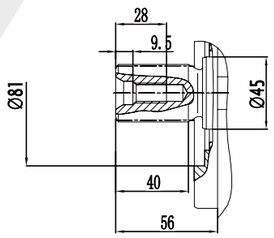
Shaft ANSI B 92.1 a
S21-21T 16/32DP



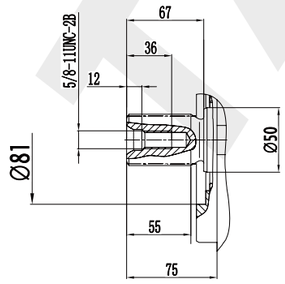
Shaft ANSI B 92.1 a
S23-23T 16/32DP



Shaft ANSI B 92.1 a
U14-14T 12/24DP



Shaft ANSI B 92.1 a
T13-13T 8/16DP



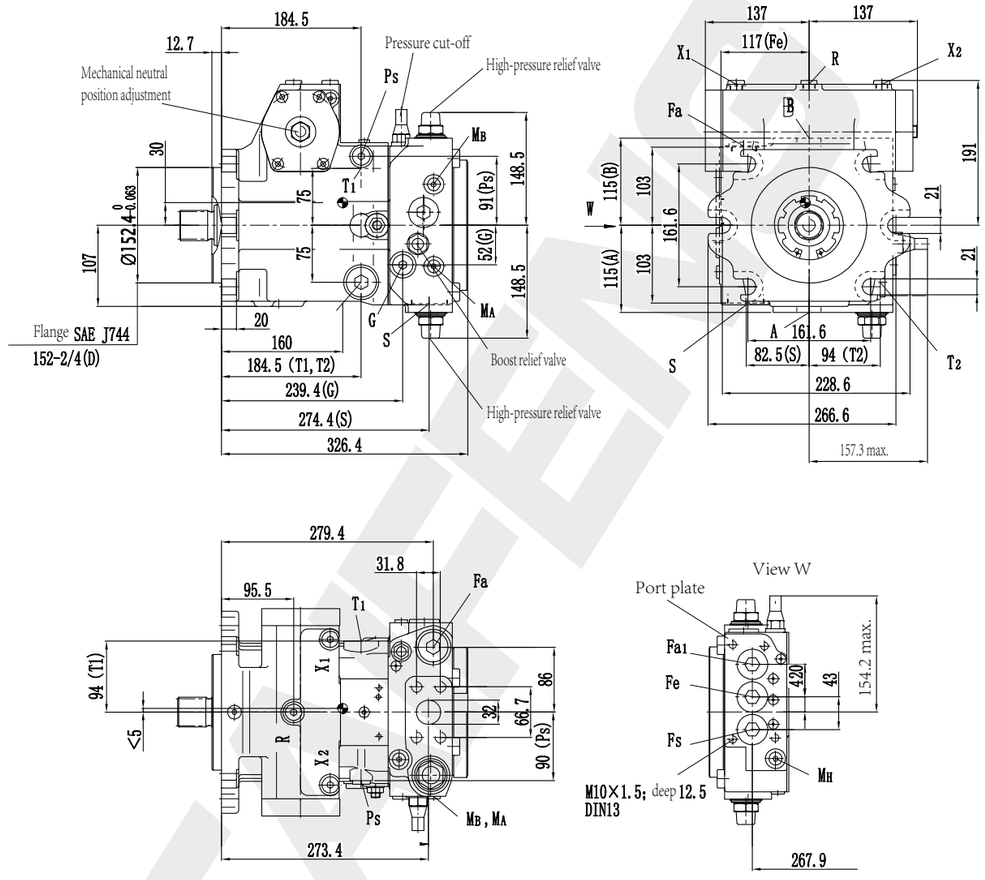
A4VTG71/80/90/100 ports

Port	Port name	Standard	Size	P_{max}, bar	State
A/B	Working port fastening thread A/B	SAE J518 DIN13	1 in M12×1.75，17 deep	450	O
S	Suction port	DIN 3852	M42×2，20 deep	5	O
T_1	Drain port	DIN 3852	M26×1.5，16 deep	3	O [1)]
T_2	Drain port	DIN 3852	M26×1.5，16 deep	3	× [1)]
R	Air bleed port	DIN 3852	M12×1.5，12 deep	3	×
X_1/X_2	Control pressure port (upstream of orifice)	DIN 3852	M12×1.5，12 deep	40	×
X_3/X_4	Stroking chamber pressure port	DIN 3852	M12×1.5，12 deep	40	×
Ps	Pilot pressure port, inlet	DIN 3852	M14×1.5，12 deep	40	×
M_A/M_B	Measuring port pressure A, B	DIN 3852	M12×1.5，12 deep	450	×

Note: Either T_1 or T_2 is for case drain cooling. It is forbidden to share the return line with other return circuits of the hydraulic system, to prevent damage induced by elevated case pressure. The port for cooling should be specified and sealed by a plastic plug upon delivery.

Dimensions, Size 125/135

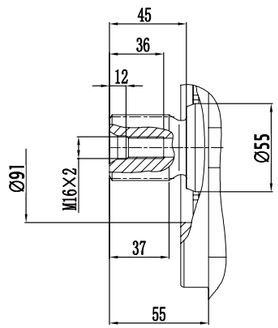
A4VTG125/135 Without control valve, without integrated filtration



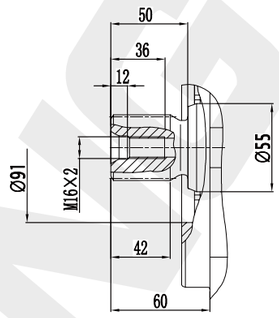
Dimensions, Size 125/135

A4VTG125/135 Shaft

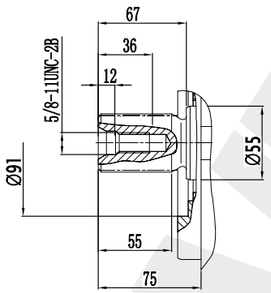
Shaft DIN5480
W40 × 2 × 18 × 9g



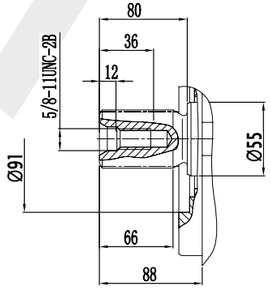
Shaft DIN5480
W45 × 2 × 21 × 9g



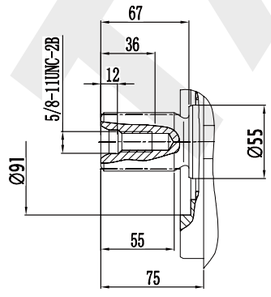
Shaft ANSI B 92.1 a
T13-13T 8/16DP



Shaft ANSI B 92.1 a
T15-15T 8/16DP



Shaft ANSI B 92.1 a
T17-17T 8/16DP



Dimensions, Size 125/135

A4TG125/135 ports

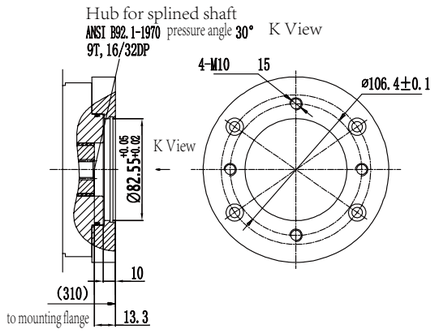
Port	Port name	Standard	Size	P_{max}, bar	State
A/B	Working port fastening thread A/B	SAE J518 DIN 13	1 1/4 in M14×2，19 deep	450	O
S	Suction port	DIN 3852	M48×2，22 deep	5	O
T_1	Drain port	DIN 3852	M33×3，18 deep	3	O [1)]
T_2	Drain port	DIN 3852	M33×2，18 deep	3	× [1)]
R	Air bleed port	DIN 3852	M16×1.5，12 deep	3	×
X_1/X_2	Control pressure port (upstream of orifice)	DIN 3852	M16×1.5，12 deep	40	×
X_1/X_2	Control pressure port (upstream of orifice, DG only)	DIN 3852	M16×1.5，12 deep	40	O
X_3/X_4	Stroking chamber pressure port	DIN 3852	M12×1.5，12 deep	40	×
G	Boost pressure port inlet	DIN 3852	M22×1.5，14 deep	40	×
P_s	Pilot pressure port, inlet	DIN 3852	M18×1.5，12 deep	40	×
P_s	Pilot pressure port (DA..7 only)	DIN 3852	M18×1.5，12 deep	40	O
Y	Pilot pressure port (DA..7 only)	DIN 3852	M18×1.5，12 deep	40	O
M_A/M_B	Measuring port pressure A, B	DIN 3852	M12×1.5，12 deep	450	×
M_H	Measuring port, high pressure	DIN 3852	M12×1.5，12 deep	450	×
Fa	Boost pressure port inlet	DIN 3852	M33×2，18 deep	40	×
Fa1	Boost pressure port inlet (attachment filter)	DIN 3852	M33×2，18 deep	40	×
Fe	Boost pressure port outlet	DIN 3852	M33×2，18 deep	40	×
Fs	Line from filter to suction port (cold start)	DIN 3852	M33×2，18 deep	40	×
Y_1/Y_2	Pilot pressure port (pilot signal HD only)	DIN 3852	M14×1.5，12 deep	40	O
Z	Inch signal (DA..4 and DA..8 only)	DIN 3852	M10×1，8 deep	40	×

Note: Either T_1 or T_2 is for case drain cooling. It is forbidden to share the return line with other return circuits of the hydraulic system, to prevent damage induced by elevated case pressure. The port for cooling should be specified and sealed by a plastic plug upon delivery.

Through drive dimension

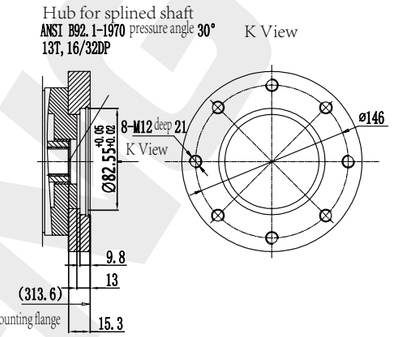
Through drive dimension -F01/K01

Flange SAEJ744-82-2(A)



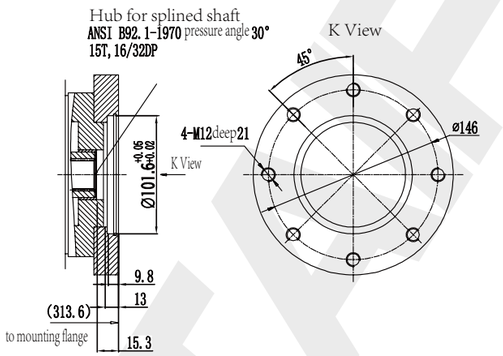
Through drive dimension -F02/K02

Flange SAE J744-101-2(B)



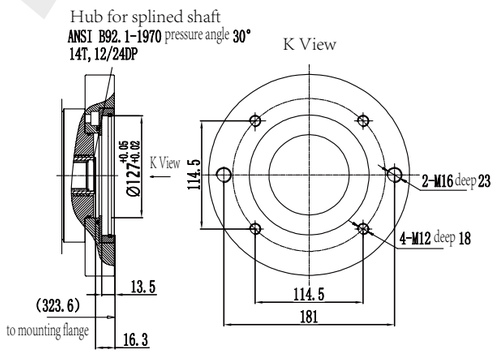
Through drive dimension-F04/K04

Flange SAE J744-101-2(B)



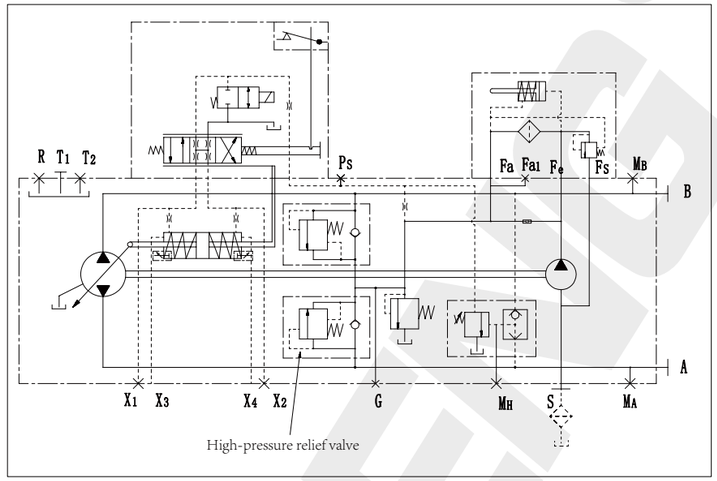
Through drive dimension-F07/K07

Flange SAE J744-127-2/4(C)

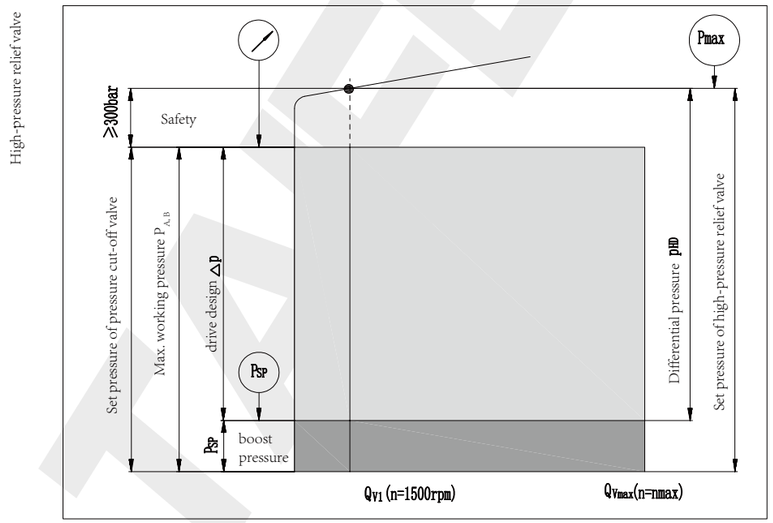


High–pressure relief valve

The set pressure of high-pressure relief valve is 42 MPa, please specify if other requirements are needed.



Setting diagram



Setting diagram

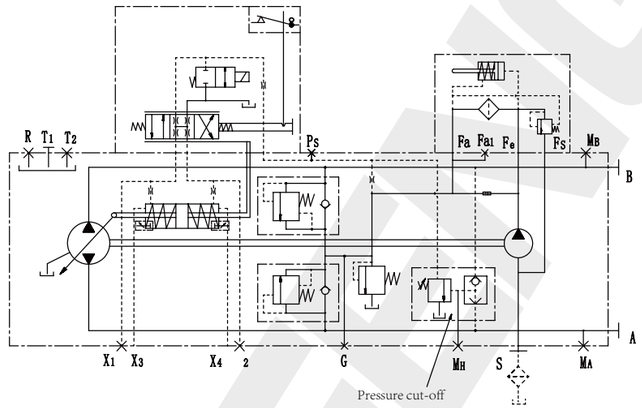
Setting range

Setting range includes:20, 22, 24, 28, 30, 32, 34, 36, 38, 40, 42, 45.

Pressure cut–off

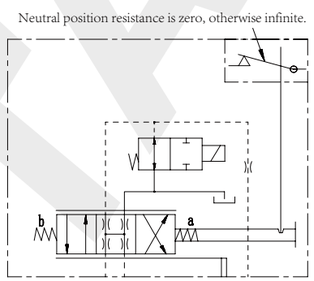
The pressure cut-off is a pressure control which, after reaching the set pressure, adjusts the displacement of pump back to $V_{g\,min}$, prevents the high-pressure relief valve from responding during acceleration or deceleration.

The high-pressure relief valves protect the system from high-pressure peaks during the fast swivel of swashplate until the control dynamics of the pressure cut-off ensure the intended maximum working pressure. The setting range of the pressure cut-off may be anywhere within the entire working pressure range. However it must be set 20-30 bar lower than the setting value of the high-pressure relief valves.



Neutral position switch

The switch contact in the neutral position switch is closed when the control lever on the HW control module is in its neutral position. The switch opens when the control lever is moved out of the central position in either direction. The neutral position switch provides a safety function for the system that requires zero flow during certain operating conditions(e.g. starting engine).

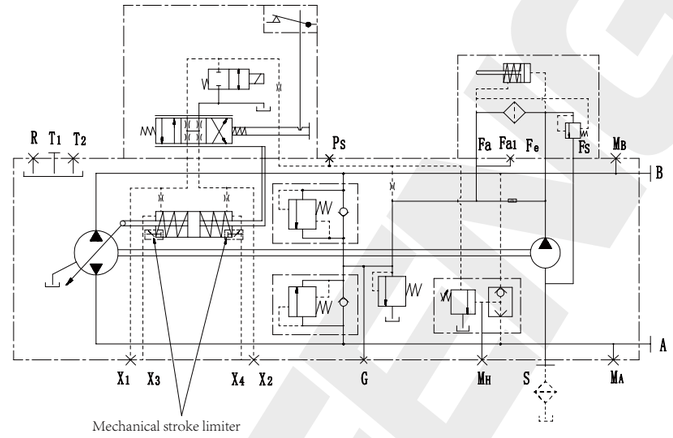


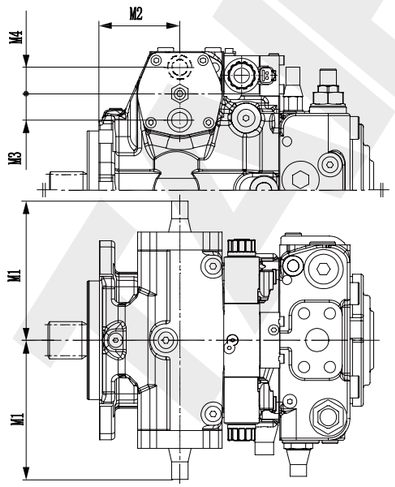
Neutral position switch	Technical parameters
Type	5A/12V&3A/24V
Connector	DJ7021-1.8-20

Mechanical stroke limiter

The mechanical stroke limiter is an auxiliary function allowing the maximum displacement of the pump to be limited for different displacement requirements regardless of the control module used.

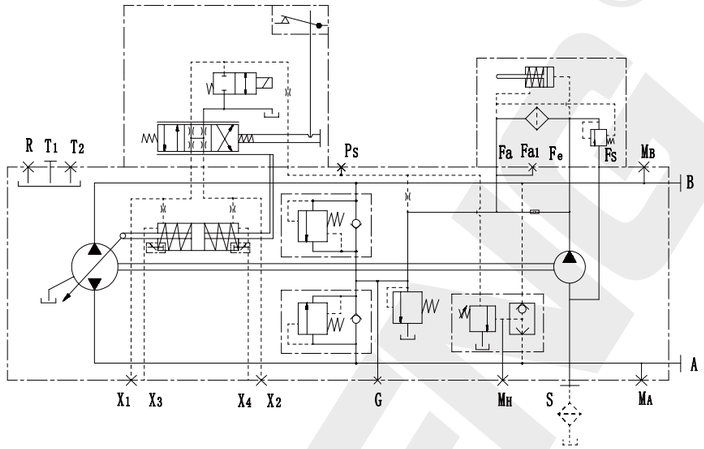
By means of two threaded pins, the stroke of the stroking piston and thus the maximum swivel angle of the pump can be limited.

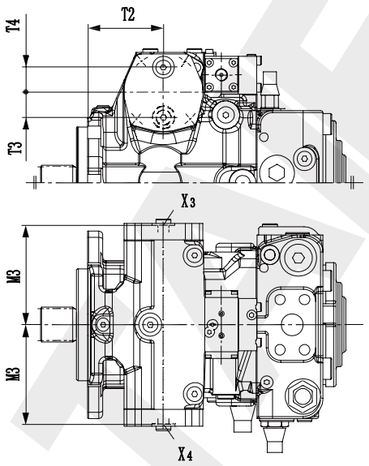




NG	M_1	M_2	M_3	M_4
28	125.5	40.1	24	——
40	125.5	38.1	24	——
56	141.5	44	25.5	——
71	151	86.3	——	28.5
90	155	95.7	31.5	——
125	177.5	104.5	——	35.5

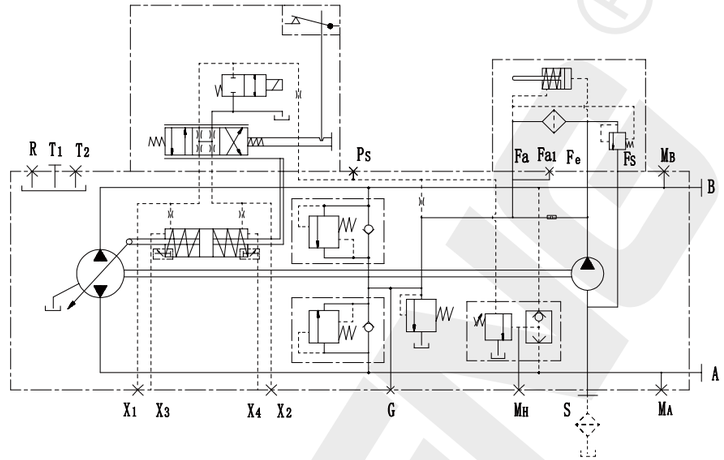
Stroking chamber pressure port(X_3/X_4)

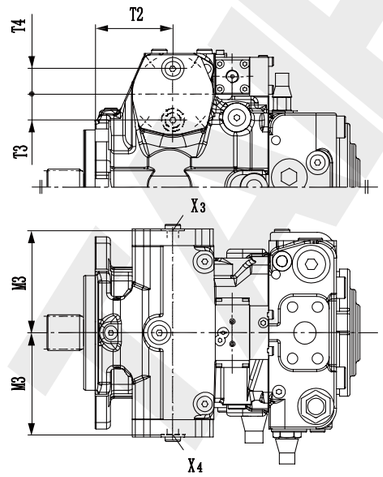




NG	T_1	T_2	T_3	T_4
28	92	40.1	——	24
40	92	38.1	——	24
56	104.5	44	——	25
71	113.5	86.3	28	——
90	111.5	95.7	——	30
125	136	104.5	34	——

Stroking chamber pressure port (X_3/X_4)





NG	T_1	T_2	T_3	T_4
28	92	40.1	——	24
40	92	38.1	——	24
56	104.5	44	——	25
71	113.5	86.3	28	——
90	111.5	95.7	——	30
125	136	104.5	34	——

Filtration and external boost pressure supply

Version S

Filtration in the boost pump suction line

Filter version: without bypass

Recommendation: with contamination indicator

Filter element flow resistance:

At v=300mm²/s, n=n_{max}, △p≤0.1 bar

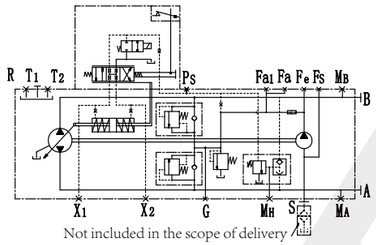
At v=1000mm²/s, n=n_{max}, △p≤0.3 bar

Pressure at suction port S:

At v=300mm²/s, n=n_{max}, △p≥0.8 bar

At cold start, v=1600mm²/s, n≤1000rpm, △p≥0.5 bar

Note: The suction filter is not included in the scope of delivery.



Version D

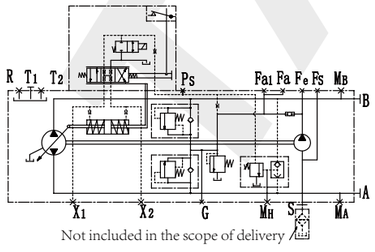
Filtration in the boost pump pressure line, with ports for external boost circuit filtration.

Filtration inlet: F_e

Filtration outlet: F_a

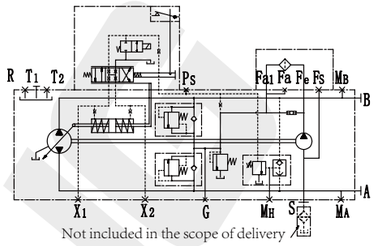
Filter version: 1. Filter with bypass valve is not recommended. 2. Contamination indicator is recommended.

Note: The boost filter is not included in the scope of delivery.



Version F

Filtration in the boost pump pressure line, attachment filter with cold start valve

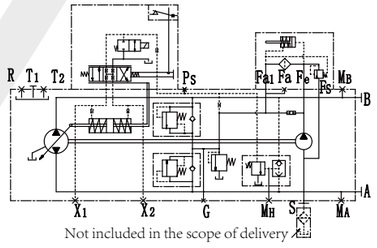


Version P

Filtration in the boost pump pressure line, attachment filter with cold start valve and visual contamination indicator

Version B

Filtration in the boost pump pressure line, attachment filter with cold start valve and electric contamination indicator

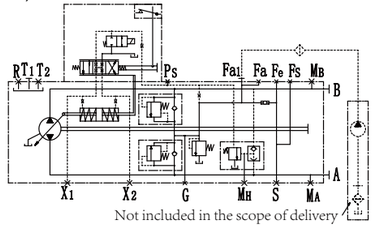


Version E

This variation should be used in versions without integrated boost pump (N00 and/or K).

Port S is plugged, the boost pressure supply comes from port F_a or F_{a1}.

The filter should be installed separately. To ensure the functional reliability, maintain the required cleanliness level for boost fluid fed in at port F_a or F_{a1} (see “ Technical date - Filtration”).

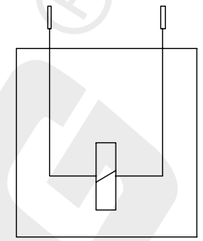


Connector for solenoids

Connector for solenoids

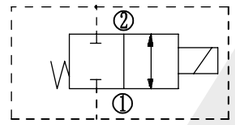
DEUTSCH DT04-2P-EP04 , 2-pin molded, without bidirectional suppressor

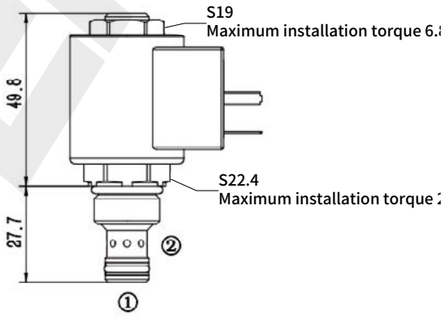
The following type of protection ensures with the installed mating connector: DIN EN 60529, IP67 and IP69K



Emergency Brake Solenoid Valve

Schematic Symbol

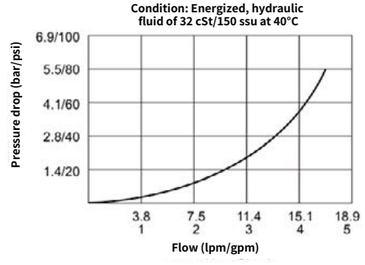




Electromagnetically actuated, 2-position normally closed spool valve, threaded cartridge type, for bidirectional check in hydraulic circuits.

- Rated Pressure: 210 bar
- Rated Flow: Refer to performance curve
- Max. Pressure: 350 bar
- Cavity: VC08-2
- Maximum Installation Torque: 27.2 Nm
- Weight: 0.1 kg
- Operating Temperature Range: -40 ~ 120℃ (NBR seal)
- Internal Leakage: Max. 82 mL/min @ 210 bar
- Filtration Requirement for Hydraulic Medium: 20/18/14 (minimum)
- Coil Type: E type

Performance Curve



Axial Piston Variable Pump
TFA4V(T)G Series

TAIFENG

Installation instructions

The axial piston unit must be filled with hydraulic fluid and air bled during commissioning and operation.

This must also be observed following a longer standstill as the axial piston unit may empty via the hydraulic lines. The leakage in the housing area must be directed to the reservoir via the higher drain port (T_1/T_2).

For combination pumps, the leakage must be drained off at each single pump. If a shared drain line is used for several units, make sure that the respective case pressure in each unit is not exceeded. The shared drain line must be designed to ensure that the maximum permissible case pressure of all connected units is not exceeded in any operating condition. If this is not possible, separate drain line must be laid, if necessary.

The suction line and drain line must flow into the reservoir below the minimum fluid level under all operating conditions. The permissible suction height h_S results from the total pressure loss. However, it must not be higher than $h_{S\,max}$ = 800 mm. The minimum suction pressure at port S must not fall below the minimum value of 0.8 bar absolute during operation and cold start.

When designing the reservoir, ensure that there is adequate distance between the suction line and the drain line. This prevents the heated return flow from being drawn directly back into the suction line.

Notice

In certain installation positions, an influence on the adjustment or control can be expected. Gravity, dead weight and case pressure can cause minor characteristic shifts and changes in actuating time.

- The pump is intended to be used in closed circuits.
- The project planning, installation and commissioning of the axial piston unit requires the involvement of skilled personnel.
- The service ports and function ports are only designed to accommodate hydraulic lines.
- During operation and shortly after, the axial piston unit (especially the solenoid) may present a risk of burns. Appropriate safety measures must be taken (e.g., wearing protective clothing).
- Depending on the operating conditions of the axial piston unit (working pressure, fluid temperature), the characteristic curve may shift.
- Pressure port:

The ports and fastening threads are designed for the maximum permissible pressures of the respective ports. The machine or system manufacturer must ensure that the connecting elements and lines correspond to the specified application conditions (pressure, flow, hydraulic fluid, temperature) with the necessary safety factors.

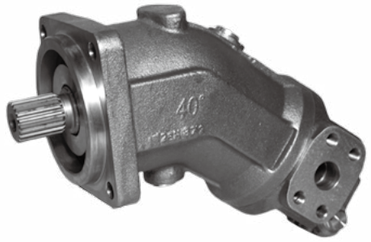
- The data and instructions contained herein must be followed.
- Use the following tightening torques:

-Threaded holes of axial piston components: The maximum permissible tightening torque MG max is the upper limit for threaded holes and must not be exceeded. Refer to the drawings for relevant values.

- Fittings: For the tightening torque of the fittings used, please refer to the manufacturer's instructions.
- Fixing screws: For fixing screws conforming to DIN 13, we recommend checking their tightening torque separately in accordance with VDI 2230.
- Locking screws: For the metal locking screws supplied with the axial piston unit, apply the tightening torque MV required for the locking screws. Refer to the table below for relevant values.
- This product is not certified as a component that meets the general machine safety concept requirements of DIN EN ISO 13849.

High-pressure Fixed Displacement Piston Motor
TFA2FM 6X Series

TAIFENG



- General high pressure motor
- Size 5 ... 1000
- Nominal pressure up to 400bar
- Max. Pressure up to 450bar
- Open and closed circuit
- Metric models

Features

- A wide range of norminal specs are available. Accurate adjustment can be done according to application.
- Favourable power / weight ratio
- Optimum efficiency
- High starting efficiency
- SAE flange or a threaded working port.
- Integrated pressure relief valve can be chosen
- Optional pre-installed additional valves: Motion control valve (BVD/BVE), flushing and boost pressure relief valve
- Bent axis design

Contents

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Dimensions, Size 10 ... 16 ····· 214
Size 23 ... 180 ····· 218
Ports ····· 223
Installation and Commissioning Guidelines ····· 235
Safety instructions ····· 237

Ordering code

	0	1	2	3	4		5	6	7		8	9	10	11	12	13	14
TF				M		/	6	1	W	—							

0	Mineral oil and HFD, HFD applying for sizes 250...1000 (only in connection with drive shaft bearings "L") (no code)		
	HFB, HFC hydraulic fluid	Sizes 5...200 (no code)	
		Sizes 250 ... 1000(only in connection with drive shaft bearings "L")	E

	HFB, HFC hydraulic fluid		5	10	12	16	23	28	32	45	56	63	80	90	107	125	160	180	
1	Bent axis design, fixed displacement	SAE	—	○	○	○	○	○	○	○	○	●	●	●	○	○	○	○	A2F
		ISO	—	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	

	Drive shaft bearings	5	10	12	16	23	28	32	45	56	63	80	90	107	125	160	180	
2	Mechanical bearings (no code)	—	○	○	○	○	○	○	○	○	●	●	●	○	○	○	○	
	Long-Life bearings	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	L

	Mode of operation	
3	Motor	M

	Displacement	5	10	12	16	23	28	32	45	56	63	80	90	107	125	160	180	
4	≈ Max. displacement , cm^3	5	10	12	16	23	28	32	45	56	63	80	90	107	125	160	180	

	Size	5	10	12	16	23	28	32	45	56	63	80	90	107	125	160	180	
5	Series	—	○	○	○	○	○	○	○	○	●	●	●	○	○	○	○	6

	Index	
6	Index code, size 10 ... 180	1

	Direction of rotation	
7	viewed on shaft end alternating	W

Seals

8	NBR（Nitrile rubber），FKM（Fluorine rubber）Shaft seal material	N
	FKM（Fluorine rubber）	V

Transmission shaft

			5	10	12	16	23	28	32	45	56	63	80	90	107	125	160	180	
9	SAE,AA2FM			10	12	16	23	28	32	45	56	63	80	90	107	125	160	180	
	7/8 in	13T 16/32DP		S	S	S													S13
	1 1/4 in	14T 12/24DP					S	S	S	S	S	S	Q	Q					U14
	1 3/8 in	21T 16/32DP									T	T	U	U					S21
	1 1/2 in	23T 16/32DP											S	S	U	U			S23
	1 3/4 in	13T 8/16DP													S	S	S	S	T13
	DIN5480		10	10	12	16	23	28	32	45	56	63	80	90	107	125	160	180	
	M6	W20×1.25×14×9g	Z	Z	Z														W20
	M10	W25×1.25×18×9g	A	A	A	A													W25
	M10	W30×2×14×9g					A	A	A	Z	Z								W30
	M12	W32×2×14×9g								A									W32
	M12	W35×2×16×9g									A	A	Z						W35
	M16	W40×2×18×9g											A	A	Z				W40
	M16	W45×2×21×9g													A	A	Z		W45
	M16	W50×2×24×9g															A	A	W50
	DIN 6885,AA2FM,A2FM		10	10	12	16	23	28	32	45	56	63	80	90	107	125	160	180	
	Diameter 20	AS6x6x32	P	P	P														P1
	Diameter 25	AS8x7x32	B	B	B	B													B1
	Diameter 25	AS8x7x40					P	P											P2
	Diameter 30	AS8x7x40					B	B	B										B2
	Diameter 30	AS8x7x50								P	P								P3
	Diameter 35	AS10x8x50									B	B							B3
	Diameter 35	AS10x8x56											P						P4
	Diameter 40	AS12x8x56											B	B					B4
	Diameter 40	AS12x8x63													P				P5
	Diameter 45	AS14x9x63													B	B			B5
	Diameter 45	AS14x9x70															P		P6
	Diameter 50	AS14x9x70															B	B	B6

Ordering code

	Mounting flange			10	10	12	16	23	28	32	45	56	63	80	90	107	125	160	180	
10	SAE J744 ISO 3019-1	101.6-2(146)	2hole	○	○	○	○	—	—	—	—	—	—	—	—	—	—	—	—	C
		127-4(162)	4hole	—	—	—	—	○	○	○	○	○	●	●	●	—	—	—	—	D
		152.4-4(228.6)	4hole	—	—	—	—	—	—	—	—	—	—	—	—	●	●	○	○	D
	ISO 3019-2 (A2FM)		4hole	○	○	○	○	○	○	○	○	○	●	●	●	●	●	○	○	B

	Port plate				10	10	12	16	23	28	32	45	56	63	80	90	107	125	160	180	
11	SAE flange ports Metric thread	Ports A and B at the rear end	01	0	—	—	—	—	○	○	○	○	○	○	○	○	○	○	○	○	010
				7	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	017
	SAE flange ports Metric thread	ports A and B at side, opposite side	02	0	—	—	—	—	○	○	○	○	○	○	○	○	○	○	○	○	020
				7	—	—	—	—	—	—	—	—	—	●	●	●	○	○	○	○	027
	DIN3852 port	ports A and B at side, opposite side	03	0	○	○	○	○	○	○	○	○	○	—	—	—	—	—	—	—	030
				7	—	—	—	—	○	○	○	○	○	○	—	—	○	○	○	○	037
	DIN3852 port	ports A and B at side, or rear end	04	0	○	○	○	○	○	○	○	—	—	—	—	—	—	—	—	—	040
	SAE flange ports, Metric thread	Ports A and B at bottom	10	0	—	—	—	—	○	○	○	○	○	○	○	○	○	○	○	○	100
	SAE flange ports, American thread	Ports A and B at the rear end	51	0	—	—	—	—	○	○	○	○	○	○	○	○	○	○	○	○	510
				7	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	517
	SAE flange ports, American thread	Ports A and B at side, opposite side	52	0	—	—	—	—	○	○	○	○	○	○	○	○	○	○	○	○	520
				7	—	—	—	—	—	—	—	—	—	○	○	○	○	○	○	○	527
	ISO11926 port	Ports A and B at side, opposite side	53	0	○	○	○	○	○	○	○	○	○	○	—	—	—	—	—	—	530
				7	—	—	—	—	○	○	○	○	○	○	—	—	—	—	—	—	537
	ISO11926 port	Ports A and B at side, or rear end	54	0	○	○	○	○	○	○	○	—	—	—	—	—	—	—	—	—	540
	SAE flange ports, American thread	Ports A and B at bottom	60	0	—	—	—	—	○	○	○	○	○	○	○	○	○	○	○	○	600
	port plate with press. relief valve and built-on motion control valve	BVD	17	1	—	—	—	—	—	—	—	—	—	—	—	—	○	○	—	—	171
				8	—	—	—	—	—	—	—	—	—	—	—	—	○	○	—	—	178
		BVE	18	1	—	—	—	—	—	○	○	○	○	○	○	○	○	○	○	○	181
				8	—	—	—	—	—	○	○	○	○	○	○	○	○	○	○	○	188
	Port plate with pressure relief valve		19	1	—	—	—	—	—	○	○	○	○	○	○	○	○	○	○	○	191
				2	—	—	—	—	—	○	○	○	○	○	○	○	○	○	○	○	192

Valve	
Without valves	0
With pressure relief valves (without pressure boost)	1
With pressure relief valves (with pressure boost)	2
With flushing and boost valve	7
BVD and BVE	8

	Speed Sensor	10	10	12	16	23	28	32	45	56	63	80	90	107	125	160	180	
12	Without Speed Sensor (No Symbol)	○	○	○	○	○	○	○	○	○	●	●	●	○	○	○	○	
	Applicable for HDD Speed Sensor	—	—	—	—	○	○	○	○	○	○	○	○	○	○	○	○	F
	HDD Speed Sensor Installed	—	—	—	—	○	○	○	○	○	○	○	○	○	○	○	○	H
	Applicable for DSA Speed Sensor	—	—	—	—	○	○	○	○	○	○	○	○	○	○	○	○	U
	DSA Speed Sensor Installed	—	—	—	—	○	○	○	○	○	○	○	○	○	○	○	○	V

Special Model

13	Standard Model (No Symbol)	
	Special Model of Slew Drive Unit	-J

Special/Standard Model

14	Standard Model (no symbol)		
	Customer Differentiation Code	Customer Name Abbreviation (4-6 initial letters) - 2-digit Differentiation ID	-XXXXYY

Technical data

Size			5	10	12	16	23	28	32	45	56	63	80
Displacement (per revolution)	V_g	cm^3	4.93	10.3	12	16	22.9	28.1	32	45	56	63	80
Nominal pressure	p_{nom}	bar	315	400	400	400	400	400	400	400	400	400	400
Maximum pressure	p_{max}	bar	350	450	450	450	450	450	450	450	450	450	450
Maximum rotation speed	n_{nom} [1)]	rpm	10000	8000	8000	8000	6300	6300	6300	5600	5000	5000	4500
	n_{max} [2)]	rpm	11000	8800	8800	8800	6900	6900	6900	6200	5500	5500	5000
Input flow at n_{nom}	qV	l/min	49	82	96	128	144	177	202	255	281	315	362
Torque at p_{nom}	M	Nm	24.7	66	76	102	146	179	204	290	357	401	512
Torsional Stiffness	c	kNm/rad	0.63	0.92	1.25	1.59	2.56	2.93	3.12	4.18	5.94	6.25	8.73
Moment of inertia of about drive axis	JTW	$kg \cdot m^2$	0.00006	0.0004	0.0004	0.0004	0.0012	0.0012	0.0012	0.0024	0.0042	0.0042	0.0072
Maximum angular Acceleration	α	rad/s^2	5000	5000	5000	5000	6500	6500	6500	14600	7500	7500	6000
Case volume	V	l		0.17	0.17	0.17	0.2	0.2	0.2	0.33	0.45	0.45	0.55
Weight (approximate)	m	kg	2.5	5.4	5.4	5.4	9.5	9.5	9.5	13.5	18	18	23

Size			90	107	125	160	180	200	250	355	500	710	1000
Displacement (per revolution)	Vg	cm^3	90	106.7	125	160.4	180	200	250	355	500	710	1000
Nominal pressure	p_{nom}	bar	400	400	400	400	400	400	350	350	350	350	350
Maximum pressure	p_{max}	bar	450	450	450	450	450	450	400	400	400	400	400
Maximum rotation speed	n_{nom} [1)]	rpm	4500	4000	4000	3600	3600	2750	2700	2240	2000	1600	1800
	n_{max} [2)]	rpm	5000	4400	4400	4000	4000	3000					
Input flow at nnom	qV	l/min	405	427	500	577	648	550	675	795	1000	1136	1600
Torque at pnom	M	Nm	573	679	796	1021	1146	1273	1393	1978	2785	3955	5570
Torsional Stiffness	c	kNm/rad	9.14	11.2	11.9	17.4	18.2	57.3	73.1	96.1	144	270	324
Moment of inertia of about drive axis	JTW	$kg \cdot m^2$	0.0072	0.0116	0.0116	0.022	0.022	0.0353	0.061	0.102	0.178	0.55	0.55
Maximum angular Acceleration	α	rad/s^2	6000	4500	4500	3500	3500	11000	10000	8300	5500	4300	4500
Case volume	V	l	0.55	0.8	0.8	1.1	1.1	2.7	2.5	3.5	4.2	8	8
Weight (approximate)	m	kg	23	32	32	45	45	66	73	110	155	325	336

1) These values are valid under the following conditions:

- Within the optimal viscosity range ν_{opt}=36 to 16 mm^2/s
- Using mineral oil-based hydraulic fluid

2) Maximum intermittent speed: for overspeed during unloading and maintenance, t<5 s and Δp<150 bar

3) Input flow limitation via counterbalance valve

4) Torque without radial forces / with radial forces, see table "Permitted radial and axial forces on the drive shaft"

Note

The values in the table are theoretical values, and do not take efficiency and tolerances into account. These values have been rounded.

Exceeding the permitted maximum values or falling below the permitted minimum values may result in loss of function, reduced service life, or complete destruction of the axial piston unit. For other permitted limit values, such as speed changes, angular acceleration as a negative function of frequency, and the permitted angular acceleration during start-up (less than the maximum angular acceleration), please refer to data sheet 90261.

Speed Range

There is no minimum speed n_{min}. If constant-speed operation is required, the speed must not be lower than 50 rpm.

Determination of Operating Characteristics	
Input flow	$q_v = \frac{V_g \times n}{1000 \times \eta_v}$ [l/min]
Speed	$n = \frac{q_v \times 1000 \times \eta_v}{V_g}$ [rpm]
Torque	$M = \frac{V_g \times \Delta p \times \eta_{hm}}{20 \times \pi}$ [Nm]
Power	$P = \frac{2\pi \times M \times n}{60000} = \frac{q_v \times \Delta p \times \eta_t}{600}$ [kW]

Key

V_g displacement per revolution [cm^3]

Δp differential pressure [bar]

n rotational speed [rpm]

η_v volumetric efficiency

η_{hm} hydraulic-mechanical efficiency

η_t total efficiency ($\eta t = \eta v \cdot \eta_{hm}$)

Hydraulic fluid

The axial piston unit is suitable for use with mineral oil HLP in accordance with DIN 51524.

Before starting project planning, first obtain the application notes and requirements for hydraulic oil from the following samples:

- 90220: Mineral oil-based hydraulic fulid and related hydrocarbons
- 90221: Environmentally compatible hydraulic oils
- 90222: Fire-resistant anhydrous hydraulic fluids (HFDR, HFDU)
- 90223: Fire-resistant water-containing hydraulic fluids (HFAE, HFAS, HFB, HFC)
- 90225: Restrictive technical data for operation with fire-resistant hydraulic fluids

Hydraulic Oil Viscosity and Temperature

	Viscosity	Shaft seals	Temperature[1)]	Note
Cold Start	$\nu_{max} \leq 1600 mm^2/s$	NBR[2)]	$\theta St \geq -40℃$	t ≤ 3min, no load (p ≤ 50bar), n ≤ 1000rpm (sizes 5 to 200), n ≤ 0.25 n_{nom} (sizes 250 to 1000). The maximum permissible temperature difference between the axial piston unit and the hydraulic oil is 25 K.
		FKM	$\theta St \geq -25℃$	
Warm-up Phase	$\nu = 400 \cdots 1600 mm^2/s$			t ≤ 15min, $p \leq 0.7 \cdot p_{nom}$, $n \leq 0.5 \cdot n_{nom}$
Continuous Operation	$\nu = 10 \cdots 400 mm^2/s$ [3)]	NBR[2)]	$\theta \leq +78℃$	Measured at port T
		FKM	$\theta \leq +103℃$	
	$\nu_{opt} = 16 \cdots 36 mm^2/s$			Optimum operating viscosity and efficiency range
Short-term operation	$\nu_{min} = 7 \cdots 10 mm^2/s$	NBR[2)]	$\theta \leq +78℃$	t ≤ 3min, $p \leq 0.3 \cdot p_{nom}$ Measured at port T
		FKM	$\theta \leq +103℃$	

1) If the specified temperature cannot be maintained due to extreme operating parameters, please contact us. 2) For special models, please contact us. 3) For example, for VG 46, this corresponds to a temperature range of +5℃ to +85℃ (see selection diagram)

Note

To reduce high hydraulic fluid temperatures in the axial piston unit, the use of a flushing and charging valve is recommended (see chapter "Extended Functions and Models").

Depending on the unit size, case flushing at port U is available as an option.

Hydraulic Fluid Selection

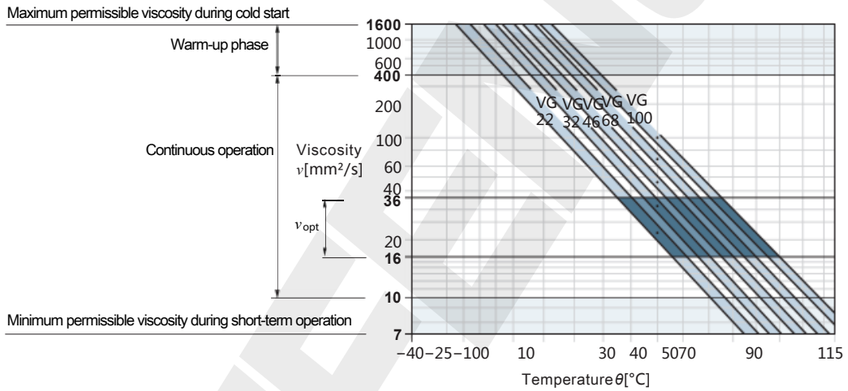
Bosch Rexroth evaluates hydraulic fluids based on hydraulic oil ratings in accordance with Technical Data Sheet 90235.

The following Technical Data Sheets provide hydraulic oils with positive ratings in hydraulic oil evaluations:

● 90245: Bosch Rexroth fluid list for Rexroth hydraulic components (pumps and motors)

When selecting hydraulic oil, ensure that the operating viscosity within the working temperature range is within the optimum range (ν_{opt}; see selection diagram).

Selection Diagram



Hydraulic Oil Filtration

Fine filtration improves the cleanliness level of the hydraulic fluid, thereby extending the service life of the axial piston unit.

A cleanliness level of at least 20/18/15 according to ISO 4406 must be maintained. If the hydraulic fluid viscosity at the drain port is less than 10 mm²/s (e.g., due to high temperatures during short-term operation), the cleanliness level must be at least 19/17/14 according to ISO 4406.

For example, a viscosity of 10 mm²/s under the following conditions:

● HLP 32 at 73℃

● HLP 46 at 85℃

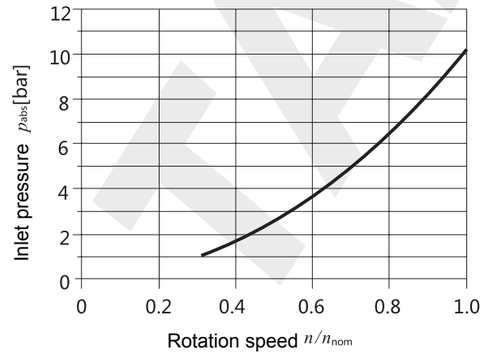
Operating Pressure Range

Pressure at work port A or B (high–pressure side)			Definition
Nominal pressure	p_{nom}	Please refer to the technical data table.	Nominal pressure corresponds to the maximum design pressure.
Maximum pressure	p_{max}	Please refer to the technical data table.	Maximum pressure corresponds to the maximum operating pressure within the single operating time. The total of the single operating times must not exceed the total operating time.
Single operating time		10s	
Total operating time		300h	
Minimum pressure	p_{HPmin}	25bar	Minimum pressure on the high–pressure side (port A or B) specified to prevent damage to the axial piston unit.
Minimum pressure at the inlet port (pump operating mode).	p_{Emin}	Pls see the chart	To prevent damage to the axial piston motor during pump operation (when the high–pressure side changes without changing the direction of rotation, e.g. during braking), the minimum pressure at the work port (inlet port) must be ensured. The minimum pressure depends on the speed and displacement of the axial piston unit.
Total pressure	p_{Su}	700bar	Combined pressure is equal to the sum of the pressures at work ports A and B.
Pressure change rate			Definition
With integrated pressure relief valve	R_{Amax}	9000bar/s	The maximum permissible rate of pressure increase and decrease during pressure changes across the entire pressure range.
Pressure relief valve	R_{Amax}	16000bar/s	
Case pressure at port T			Definition
Continuous pressure difference	Δp_{Tcont}	2bar	Maximum average pressure difference at the shaft seal (case pressure vs. ambient pressure).
Pressure peak	p_{Tpeak}	10bar	t<0.1s

Note

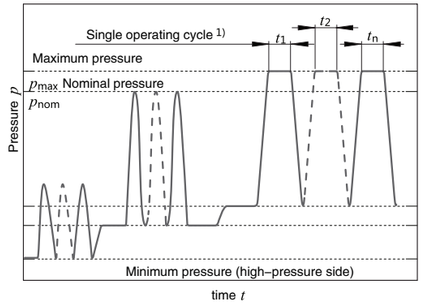
The operating pressure range is only valid when using mineral oil-based hydraulic fluids. For values related to other hydraulic fluids, please contact us.

Minimum pressure at the inlet (pump operating mode)



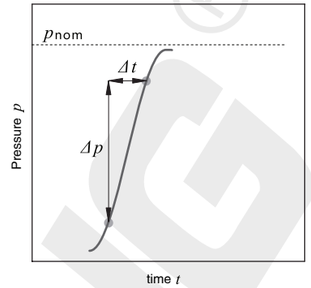
This diagram is only valid for the optimal viscosity range: v_{opt} = 16 to 36 mm²/s. If the above conditions cannot be met, please contact us.

Pressure Definition

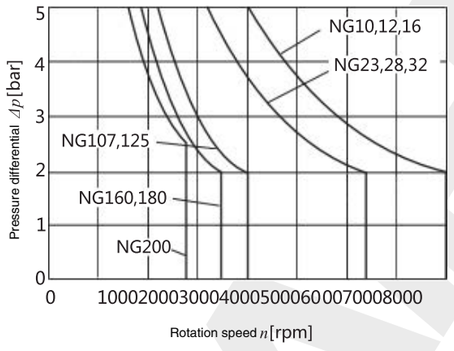


1) Total operating time $=t_1 + t_2 + ... + t_n$

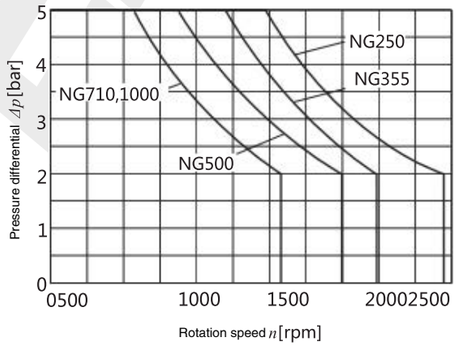
Pressure Change Rate



Maximum pressure differential at shaft seal, sizes 10 … 200



Maximum pressure differential at shaft seal, sizes 250 … 1000



Note:

The service life of shaft seals is also affected by the rotational speed of the axial piston unit and the case pressure.

Service life decreases as the average pressure differential between the case pressure and ambient pressure rises, and as the frequency of pressure peaks increases.

The case pressure must be equal to or higher than the ambient pressure.

Flow Direction

Direction of rotation (viewed on drive shaft)	
Clockwise	Counter - clockwise
A to B	B to A

Permissible Radial and Axial Forces on the Drive Shaft

Size			5	10		12		16	23		28		32
Drive Shaft	Code		B,C	Z,P	A,B	Z,P	A,B	A,B	Z,P	A,B	Z,P	A,B	A,B
			12	20	25	20	25	25	25	30	25	30	30
Maximum radial force at distance a (from shaft shoulder)	Fq_{max}	kN	1.6	3	3.2	3	3.2	3.2	5.7	5.4	5.7	5.4	5.4
			12	16	16	16	16	16	16	16	16	16	16
Permissible torque at Fq_{max}	Tq_{max}	Nm	24.7	66	66	76	76	102	146	146	179	179	204
Permissible maximum pressure differential at Fq_{max}	Δpq_{max}	bar	315	400	400	400	400	400	400	400	400	400	400
Maximum axial force under standstill or non–pressurized conditions	$+Fax_{max}$	N	0	0	0	0	0	0	0	0	0	0	0
	$-Fax_{max}$	N	180	320	320	320	320	320	500	500	500	500	500
Permissible axial force per bar of operating pressure	$+Fax_{max}$	N/bar	1.5	3	3	3	3	3	5.2	5.2	5.2	5.2	5.2

Size			45	56	63	80	90	107		125	160		180
Drive Shaft	Code							Z,P	A,B	A,B	Z,P	A,B	A,B
			30	30	35	35	40	40	45	45	45	50	50
Maximum radial force at distance a (from shaft shoulder)	Fq_{max}	kN	7.6	7.8	9.1	11.6	11.4	13.6	14.1	14.1	18.1	18.3	18.3
			18	18	20	20	20	20	20	25	25	25	
Permissible torque at Fq_{max}	Tq_{max}	Nm	290	357	401	512	573	679	679	796	1021	1021	1146
Permissible maximum pressure differential at Fq_{max}	Δpq_{max}	bar	400	400	400	400	400	400	400	400	400	400	400
Maximum axial force under standstill or non–pressurized conditions	$+Fax_{max}$	N	0	0	0	0	0	0	0	0	0	0	0
	$-Fax_{max}$	N	630	800	800	1000	1000	1250	1250	1250	1600	1600	1600
Permissible axial force per bar of operating pressure	$+Fax_{max}$	N/bar	7	8.7	8.7	10.6	10.6	12.9	12.9	12.9	16.7	16.7	16.7

Size			200	250	355	500	710	1000
Drive Shaft	Code		A,B	Z,P	Z,P	Z,P	Z,P	Z,P
			50	50	60	70	90	90
Maximum radial force at distance a (from shaft shoulder)	Fq_{max}	kN	20.3	1.2 1)	1.5 1)	1.9 1)	3 1)	2.6 1)
			41	52.5	52.5	67.5	67.5	
Permissible torque at Fq_{max}	Tq_{max}	Nm	1273					
Permissible maximum pressure differential at Fq_{max}	Δpq_{max}	bar	400					
Maximum axial force under standstill or non–pressurized conditions	$+Fax_{max}$	N	0	0	0	0	0	0
	$-Fax_{max}$	N	1600	2000	2500	3000	4400	4400
Permissible axial force per bar of operating pressure	$+Fax_{max}$	N/bar	16.7					

1) At standstill or when the axial piston unit operates under non-pressurized conditions. Higher forces are permitted under pressurized conditions; please contact us.

General Notes

The specified values are maximum values and are not intended for continuous operation.Axial forces in the F_{ax} direction should be avoided, as they reduce the service life of the bearings.Special requirements apply when using belt drives. Please contact us.

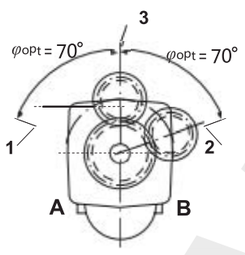
Notes for Sizes 250…1000

The performance data is only valid under limited radial force conditions. Please contact us.For information on axial forces during unit operation, please contact us.

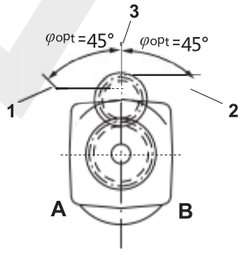
Influence of Radial Force F_q on Bearing Service Life

By selecting the appropriate direction of the radial force F_q, the load exerted on the bearings by the internal rotating components can be reduced, thus optimizing bearing service life. The recommended position of the mating gear depends on the direction of rotation. Examples:

Gear drive, sizes 5…180



Gear drive, sizes 200…1000



1 Direction of rotation: "anticlockwise", pressure at port B.

2 Direction of rotation: "clockwise", pressure at port A.

3 Direction of rotation: "alternating"

Long–Life Bearings

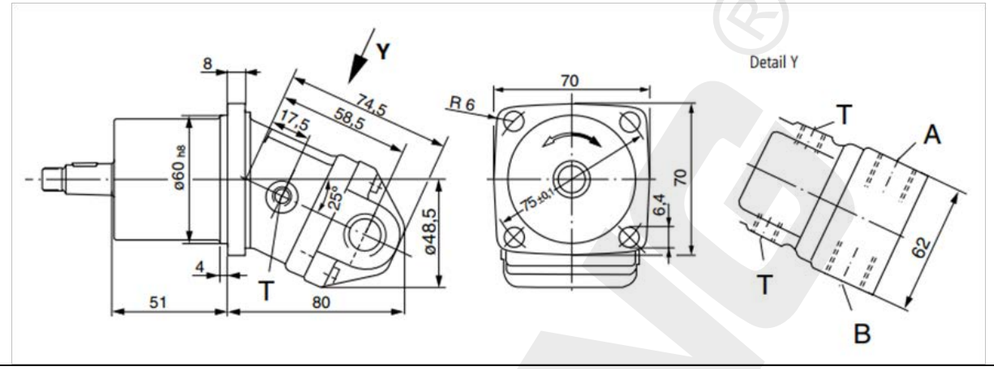
Sizes 250 to 1000 suitable for long service life cycles and use with HF hydraulic fluids.External dimensions are identical to the standard bearing design. Retrofitting with long-life bearings is possible.It is recommended to flush the bearings and housing via port U.

Bearing Flushing

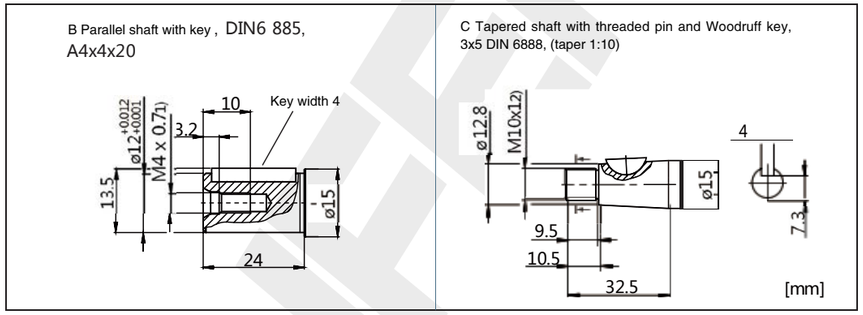
Flushing Flow Rate (Recommended Values)

Size:	250	355	500	710	1000
Flushing flow rate qv l/min	10	16	16	16	16

Dimensions Size 5



Drive Shaft



1) Center hole in accordance with DIN 332 (thread in accordance with DIN 13)
2) Thread in accordance with DIN 3852, max. tightening torque: 30 Nm

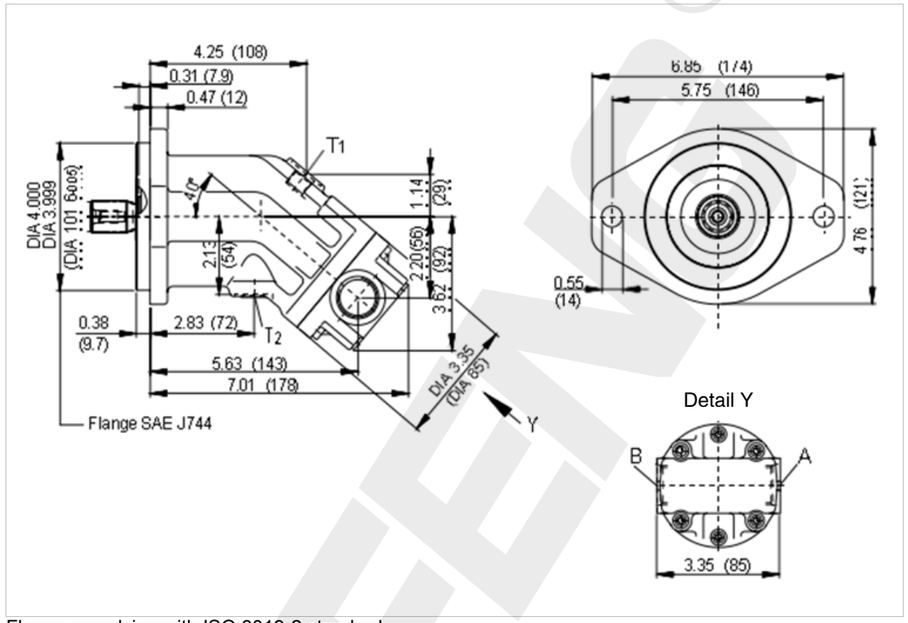
Ports

Size			5
A,B	Working ports	Specification	M18 × 15；12mm depth
		Standard[1]	DIN3852
		Delivery state	With protective cap (must remain connected)
T1	Drain Port	Specification	M10 × 1；8mm depth
		Standard[1]	DIN3852
		Delivery state[2]	Plugged (refer to installation instructions)
T2	Drain Port	Specification	M10 × 1；8mm depth
		Standard[1]	DIN3852
		Delivery state[2]	Plugged (refer to installation instructions)

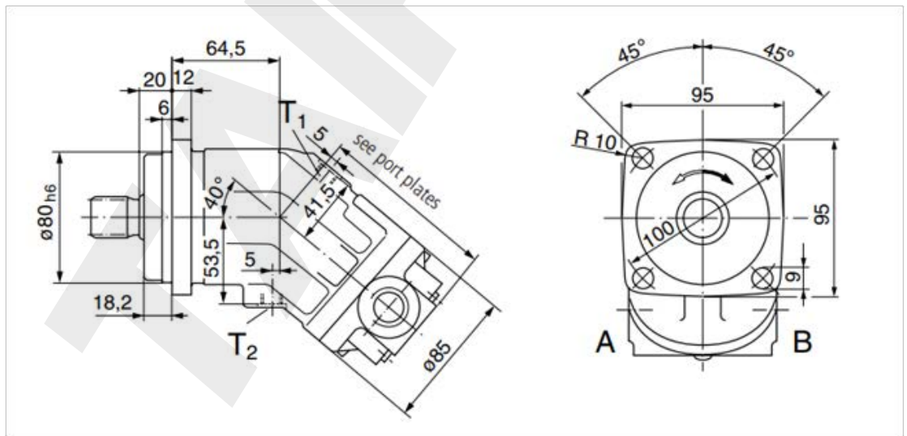
1) The seat face may be deeper than specified in the relevant standard.
2) Unless otherwise specified. Other port configurations are available on request.

Sizes 10 ··· 16

Flange complying with ISO 3019-1 standard

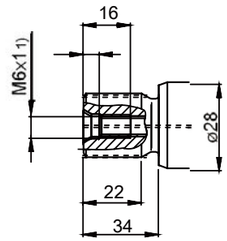


Flange complying with ISO 3019-2 standard



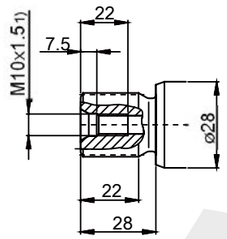
Drive Shafts Z and A

Z Splined shaft complying with DIN 5480 standard W20x1.25x18x9g



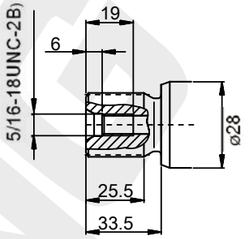
Not applicable to NG 16

A Splined shaft complying with DIN 5480 standard W25x1.25x18x9g



[mm]

S Splined shaft complying with ANSI B92.1 standard 7/8 in 13T 16/32 DP

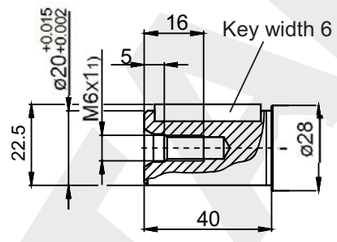


[mm]

1) Center bore complying with DIN 332 standard (thread complying with DIN 13 standard)

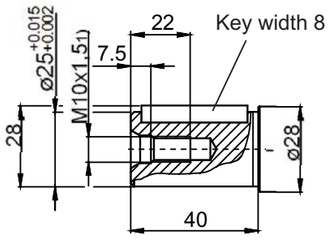
Drive Shafts P and B

P Parallel shaft with key DIN 6885, AS6x6x32



Not applicable to NG 16

P Parallel shaft with key DIN 6885, AS8x7x32

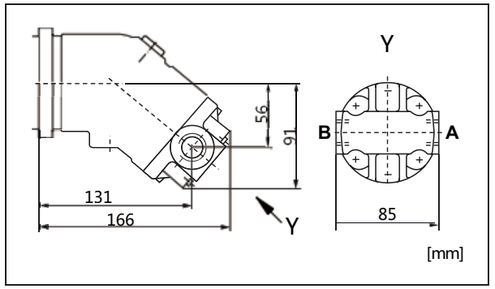


[mm]

1) Center bore complying with DIN 332 standard (thread complying with DIN 13 standard)

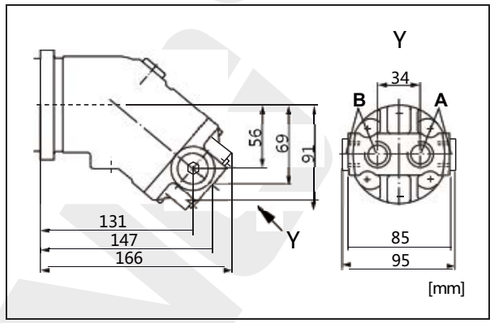
Port Plate 03

DIN 3852 threaded ports located on opposite sides



Port Plate 04

DIN 3852 threaded Ports located on the side and back

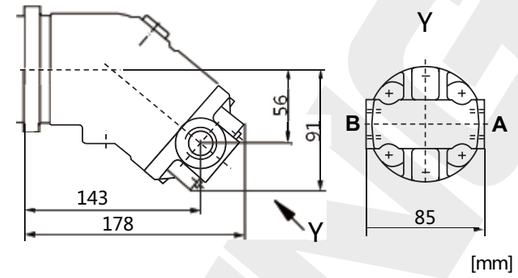


Ports

Size			5
A,B	Working ports	Specification	M18×15；12mm depth
		Standard[1)]	DIN3852
		Delivery state	With protective cover (must be connected)
T_1	Drain port	Specification	M10×1；8mm depth
		Standard[1)]	DIN3852
		Delivery state[2)]	Plugged (Please follow the installation instructions)
T_2	Drain port	Specification	M10×1；8mm depth
		Standard[1)]	DIN3852
		Delivery state[2)]	Plugged (Please follow the installation instructions)

Port plate 53

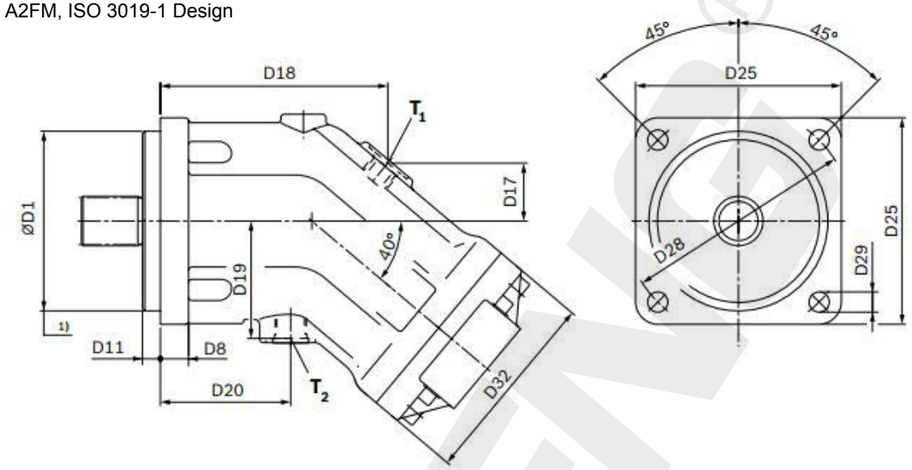
ISO 11926 Threaded ports Located on opposite sides



Size			10	12	16
A,B	Working ports	Specification	1 1/16 in 12UN–2B；0.79 in(20mm) depth		
		Standard	ISO11926		
		Delivery state	With protective cover (must be connected)		
T_1	Drain port	Specification	9/16 in 18UNF–2B；0.51 in(13mm) depth		
		Standard	ISO11926		
		Delivery state	Plugged (Please follow the installation instructions)		
T_2	Drain port	Specification	9/16 in 18UNF–2B；0.51 in(13mm) depth		
		Standard	ISO11926		
		Delivery state	With protective cover (Please follow the installation instructions)		

Sizes 23 ··· 180

A2FM, ISO 3019-1 Design

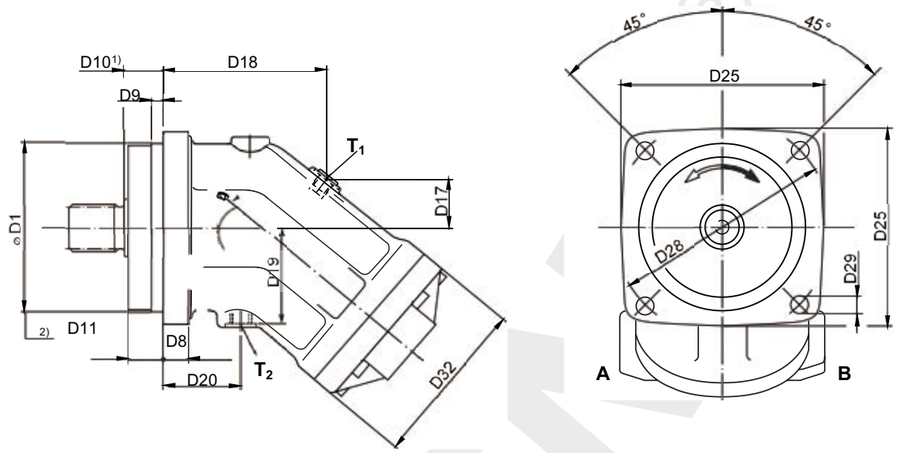


1) From shaft shoulder

2) Flange complying with ISO 3019-2 standard

Size	D1		D8	D11	D17	D18	D19	D20	D25	D28	D29	D32
	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm
23	127	0 – 0.025	20	12.7	25	123	56	59	146	162	14.3	106
28	127	0 – 0.025	20	12.7	25	123	56	59	146	162	14.3	106
32	127	0 – 0.025	20	12.7	25	123	56	59	146	162	14.3	106
45	127	0 – 0.025	20	12.7	30	133	65	66	146	162	14.3	118
56	127	0 – 0.025	20	12.7	33	143	72	74	146	162	14.3	128
63	127	0 – 0.025	20	12.7	33	143	72	74	146	162	14.3	128
80	127	0 – 0.025	20	12.7	40	161	83	93	146	162	14.3	138
90	127	0 – 0.025	20	12.7	40	161	83	93	146	162	14.3	138
107	152.4	0 – 0.05	25	12.7	40	172	86	97	200	228.6	20.6	180
125	152.4	0 – 0.05	25	12.7	40	172	86	97	200	228.6	20.6	180
160	152.4	0 – 0.05	25	12.7	47	190	96	104	200	228.6	20.6	180
180	152.4	0 – 0.05	25	12.7	47	190	96	104	200	228.6	20.6	180

A2FM, ISO 3019–2 Design



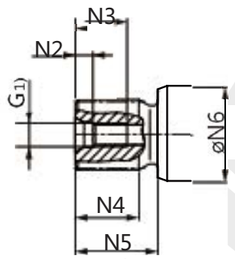
1) From shaft shoulder

2) Flange complying with ISO 3019-2 standard

Size	D1		D8	D9	D10	D11	D17	D18	D19	D20	D25	D28	D29	D32
	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm
23	100	0 – 0.022	18	8	25	23.2	25	106	56	42	118	125	11	106
28	100	0 – 0.022	18	8	25	23.2	25	106	56	42	118	125	11	106
32	100	0 – 0.022	18	8	25	23.2	25	106	56	42	118	125	11	106
45	125	0 – 0.025	20	12	32	30	x	x	63	42	150	160	13.5	118
56	125	0 – 0.025	20	10	32	30	x	x	70	49	150	160	13.5	128
63	125	0 – 0.025	20	10	32	30	x	x	70	49	150	160	13.5	128
80	140	0 – 0.025	20	10	32	29	x	x	83	63.5	165	180	13.5	138
90	140	0 – 0.025	20	10	32	29	x	x	83	63.5	165	180	13.5	138
107	160	0 – 0.025	23	10	40	36.5	40	140	85	65	190	200	17.5	150
125	160	0 – 0.025	23	10	40	36.5	40	140	85	65	190	200	17.5	150
160	180	0 – 0.025	25	10	40	37.2	47	158	96	72	210	224	17.5	180
180	180	0 – 0.025	25	10	40	37.2	47	158	96	72	210	224	17.5	180

Drive Shafts Z and A

Splined shaft complying with DIN 5480 standard



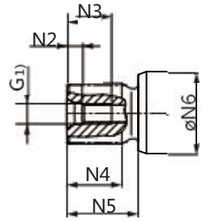
1) Center bore complying with DIN 332 standard (thread complying with DIN 13 standard)

Splined shaft complying with DIN 5480 standard

NG	Code	Description	Thread G	N2	N3	N4	N5	ØN6
				mm	mm	mm	mm	mm
23	Z	W25 × 1.25 × 18 × 9g	M8	6	19	28	43	35
	A	W30 × 2 × 14 × 9g	M10	7.5	22	27	35	35
28	Z	W25 × 1.25 × 18 × 9g	M8	6	19	28	43	35
	A	W30 × 2 × 14 × 9g	M10	7.5	22	27	35	35
32	A	W30 × 2 × 14 × 9g	M10	7.5	22	27	35	35
45	Z	W30 × 2 × 14 × 9g	M12	9.5	28	27	38	_
	A	W32 × 2 × 14 × 9g	M12	9.5	28	27	38	_
56	Z	W30 × 2 × 14 × 9g	M12	9.5	28	27	35	_
63	Z	W30 × 2 × 14 × 9g	M12	9.5	28	27	35	_
	A	W35 × 2 × 16 × 9g	M12	9.5	28	27	40	_
80	Z	W35 × 2 × 16 × 9g	M12	9.5	28	27	40	–
90	Z	W35 × 2 × 16 × 9g	M12	9.5	28	27	40	–
	A	W40 × 2 × 18 × 9g	M12	9.5	28	37	45	–
107	Z	W40 × 2 × 18 × 9g	M12	9.5	28	37	45	50
	A	W45 × 2 × 21 × 9g	M16	12	36	42	50	50
125	A	W45 × 2 × 21 × 9g	M16	12	36	42	50	50
160	Z	W45 × 2 × 21 × 9g	M16	12	36	42	50	60
	A	W50 × 2 × 24 × 9g	M16	12	36	44	55	60
180	A	W50 × 2 × 24 × 9g	M16	12	36	44	55	60

Drive Shafts S and U

Splined shaft complying with SAE J744 standard



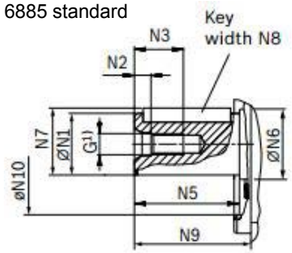
1) Center bore complying with DIN 332 standard (thread complying with DIN 13 standard)

Splined shaft complying with SAE J744 standard

NG	Code	Description	Thread G	N2	N3	N4	N5	ØN6	ØN9	ØN10
				mm	mm	mm	mm	mm	mm	mm
23	S	1 1/4in 14T 12/24 DP	7/16–14UNC–2B	9.5	28	40	48	35	55.9	80
28	S	1 1/4in 14T 12/24 DP	7/16–14UNC–2B	9.5	28	40	48	35	55.9	80
32	S	1 1/4in 14T 12/24 DP	7/16–14UNC–2B	9.5	28	40	48	35	55.9	80
45	S	1 1/4in 14T 12/24 DP	7/16-14UNC-2B	9.5	28	40	48	35	-	-
56	S	1 1/4in 14T 12/24 DP	7/16-14UNC-2B	9.5	28	40	48	40	-	-
	T	1 3/8 in 21T16/32 DP	7/16-14UNC-2B	9.5	28	40	48	40	-	-
63	S	1 1/4in 14T 12/24 DP	7/16-14UNC-2B	9.5	28	40	48	40	-	-
	T	1 3/8 in 21T16/32 DP	7/16-14UNC-2B	9.5	28	40	48	40	-	-
80	U	1 3/8 in 21T16/32 DP	7/16-14UNC-2B	9.5	28	40	48	45	-	-
	S	1 1/2 in 23T16/32 DP	7/16–14UNC–2B	9.5	28	40	48	45	–	–
	Q	1 1/4in 14T 12/24 DP	7/16–14UNC–2B	9.5	28	40	48	45	–	–
90	U	1 3/8 in 21T16/32 DP	7/16–14UNC–2B	9.5	28	40	48	45	–	–
	S	1 1/2 in 23T16/32 DP	7/16–14UNC–2B	9.5	28	40	48	45	–	–
	Q	1 1/4in 14T 12/24 DP	7/16–14UNC–2B	9.5	28	40	48	45	–	–
107	U	1 1/2 in 23T16/32 DP	5/8–11UNC–2B	12	36	56	62	50	69.9	125
	S	1 3/4 in 13T 8/16 DP	5/8–11UNC–2B	12	36	55	67	50	74.9	125
125	U	1 1/2 in 23T16/32 DP	5/8–11UNC–2B	12	36	56	62	50	69.9	125
	S	1 3/4 in 13T 8/16 DP	5/8–11UNC–2B	12	36	55	67	50	74.9	125
160	S	1 3/4 in 13T 8/16 DP	5/8–11UNC–2B	12	36	55	67	60	74.9	140
180	S	1 3/4 in 13T 8/16 DP	5/8–11UNC–2B	12	36	55	67	60	74.9	140

Drive Shafts P and B

Splined shaft complying with DIN 6885 standard



1) Center bore complying with DIN 332 standard (thread complying with DIN 13 standard)

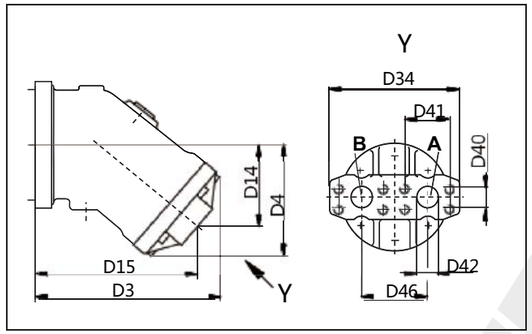
Parallel shaft with key complying with DIN 6885 standard

NG	Code	Description	Thread G	ØN1		N2	N3	N5	ØN6	N7	N8	N9	N10
				mm	mm	mm	mm	mm	mm	mm	mm	mm	mm
23	P	Ø25, AS8×7×40	M8	25	+ 0.015 + 0.002	6	19	50	35	28	8	57.9	80
	B	Ø30, AS8×7×40	M10	30	+ 0.015 + 0.002	7.5	22	50	35	33	8	57.9	80
28	P	Ø25, AS8×7×40	M8	25	+ 0.015 + 0.002	6	19	50	35	28	8	57.9	80
	B	Ø30, AS8×7×40	M10	30	+ 0.015 + 0.002	7.5	22	50	35	33	8	57.9	80
32	B	Ø30, AS8×7×40	M10	30	+ 0.015 + 0.002	7.5	22	50	35	33	8	57.9	80
45	B	Ø30, AS8×7×50	M12	30	+ 0.015 + 0.002	9.5	28	60	–	33	8		
56	P	Ø30, AS8×7×50	M12	30	+ 0.015 + 0.002	9.5	28	60	–	33	8		
	B	Ø35, AS10×8×50	M12	35	+ 0.015 + 0.002	9.5	28	60	–	38	10		
63	B	Ø35, AS10×8×50	M12	35	+ 0.015 + 0.002	9.5	28	60	–	38	10		
80	P	Ø35, AS10×8×56	M12	35	+ 0.015 + 0.002	9.5	28	70	–	38	10		
90	P	Ø35, AS10×8×56	M12	35	+ 0.015 + 0.002	9.5	28	70	–	38	10		
	B	Ø40, AS12×8×56	M16	40	+ 0.015 + 0.002	12	36	70	–	43	12		
107	P	Ø40, AS12×8×63	M12	40	+ 0.018 + 0.002	9.5	28	80	50	43	12	87.9	
	B	Ø45, AS14×9×63	M16 × 2	45	+ 0.018 + 0.002	12	36	80	50	48.5	14	87.9	
125	B	Ø45, AS14×9×63	M16 × 2	45	+ 0.018 + 0.002	12	36	80	50	48.5	14	87.9	
160	P	Ø45, AS14×9×70	M16 × 2	45	+ 0.018 + 0.002	12	36	90	60	48.5	14	97.9	
	B	Ø50, AS14×9×70	M16 × 2	50	+ 0.018 + 0.002	12	36	90	60	53.5	14	97.9	
180	B	Ø50, AS14×9×70	M16 × 2	50	+ 0.018 + 0.002	12	36	90	60	53.5	14	97.9	

Ports

Port plate 010

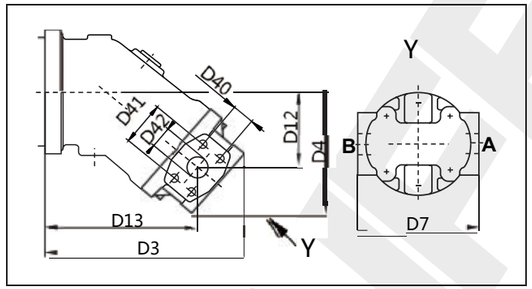
SAE Working ports located on the Back



Size	D3	D4	D14	D15	D34	D40	D41	D42	D46
	mm	mm	mm	mm	mm	mm	mm	mm	mm
23…32	173	106	78	153	115	18.2	40.5	13	59
45	194	122	89	166	147	23.8	50.8	19	75
56,63	206	130	96	182	147	23.8	50.8	19	75
80,90	233	145	104.5	203	166	27.8	57.2	25	84
107…125	252	159	120	225.5	194	31.8	66.7	32	99
160…180	294	188	134	252	194	31.8	66.7	32	99

Port plate 020

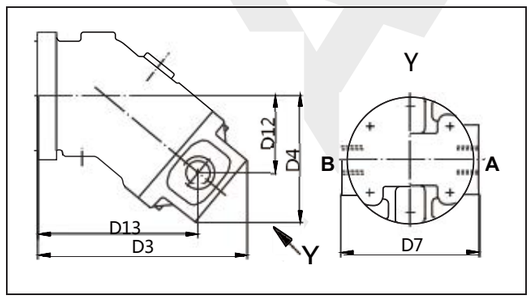
SAE Working ports located on opposite sides



Size	D3	D4	D7	D12	D13	D40	D41	D42
	mm	mm	mm	mm	mm	mm	mm	mm
23…32	190	117	120	70	144	18.2	40.5	13
45	207	133	128	80	155	23.8	50.8	19
56,63	225	142	136	87	171	23.8	50.8	19
80,90	257	162	160	99	196	27.8	57.2	25
107	285	181	178	110	213	27.8	57.2	25
125	285	181	178	110	213	31.8	66.7	32
160…180	294	188	202	121	237	31.8	66.7	32

Port plate 030

Threaded ports located on opposite sides

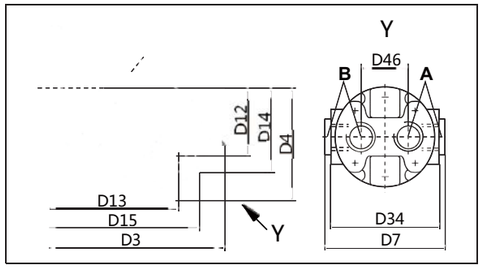


Size	D3	D4	D7	D12	D13
	mm	mm	mm	mm	mm
23…32	190	117	120	70	144
45	–	–	–	–	–

Ports

Port plate 040

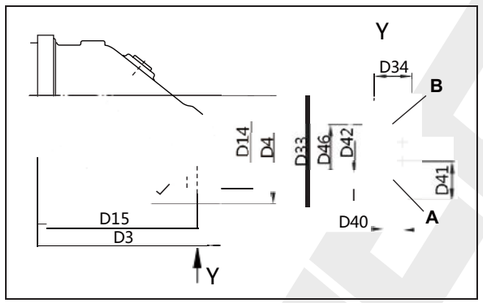
Threaded ports on the side and back



Size	D3	D4	D7	D12	D13	D14	D15	D34	D46
	mm	mm	mm	mm	mm	mm	mm	mm	mm
23 ... 32	190	117	130	70	144	88	166	120	58
45	207	133	128	80	155	100	179	-	58
56,63	225	142	136	87	171	107	195	-	58
80,90	-	-	-	-	-	-	-	-	-

Port plate 100

SAE Working ports on the bottom



Size	D3	D4	D14	D15	D33	D34	D40	D41	D42	D46
	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm
28 ... 32	178	106	91	158	115	40	18.2	40.5	13	59
45	193	119	102	169	147	49	23.8	50.8	19	75
56,63	206	130	107	182	147	49	23.8	50.8	19	75
80,90	236	145	121	206	166	60	27.8	57.2	25	84
107 ... 125	261	157	136	226	194	70	31.8	66.7	32	99
160 ... 180	290	185	149	252	194	70	31.8	66.7	32	99

Note

- For dimension drawings of port connection plates with valve network, please refer to the "Extended Functions and Model Designation" chapter.

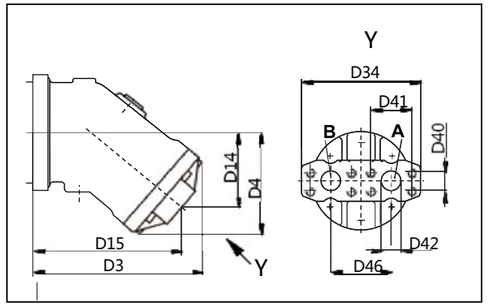
Ports

Specification		23	28	32	45	56	63	80	90	107	125	160	180
A, B (Plates 010, 020, 100) Working ports	Specification	1/2 in			3/4 in			1 in		1 1/4 in		1 1/4 in	
	Standard	Dimensions in accordance with SAE J518											
	Fastening threads	M8 ; 15 mm depth			M10 ; 17 mm depth			M12 ; 17 mm depth		M14 × 2; 19 mm depth		M14 × 2 ; 19 mm depth	
	Delivery condition	With protective cap (must be connected)											
A, B (Plates 030, 040) Working ports	Specification	M27 × 2 ; 16 mm depth			M33 × 2 ; 16 mm depth			———					
	Standard	DIN 3852											
	Delivery condition	With protective cap (must be connected)											
T_1 Drain Port	Specification	M16 × 1.5 ; 12 mm depth			M18 × 1.5 ; 12 mm depth							M22 × 15 ; 14 mm depth	
	Standard	DIN 3852											
	Delivery condition	Plugged (Please observe installation instructions)											
T_2 Drain Port	Specification	M16 × 1.5 ; 12 mm depth			M18 × 1.5 ; 12 mm depth							M22 × 15 ; 14 mm depth	
	Standard	DIN 3852											
	Delivery condition	With protective cap (Please observe installation instructions)											

Ports

Port plate 510

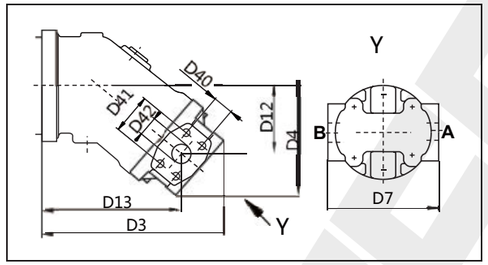
SAE Working ports on the back



Size	D3	D4	D14	D15	D34	D40	D41	D42	D46
	mm	mm	mm	mm	mm	mm	mm	mm	mm
23 ... 32	190	106	78	170	115	18.2	40.5	13	59
45	218	122	59	190	147	23.8	50.8	19	75
56,63	230	130	96	206	147	23.8	50.8	19	75
80,90	262	144	104	232	166	27.8	57.2	25	84
107 ... 125	284	156	120	258	194	31.8	66.7	32	99
160 ... 180	326	188	134	284	194	31.8	66.7	32	99

Port plate 520

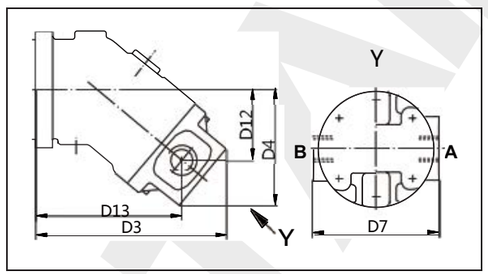
SAE Working ports located on opposite sides



Size	D3	D4	D7	D12	D13	D40	D41	D42
	mm	mm	mm	mm	mm	mm	mm	mm
23 ... 32	207	117	120	70	161	18.2	40.5	13
45	231	133	147	80	179	23.8	50.8	19
56,63	258	150	150	91	200	27.8	57.2	25
80,90	286	162	160	99	225	27.8	57.2	25
107 ... 125	317	181	178	110	245	31.8	66.7	32
160 ... 180	326	188	202	121	269	31.8	66.7	32

Port plate 530

Threaded ports located on opposite sides

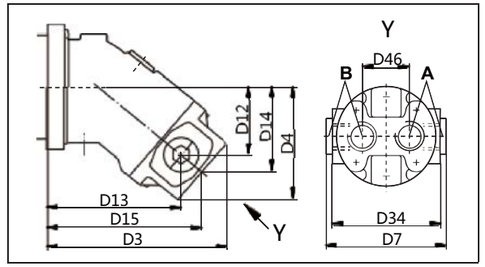


Size	D3	D4	D7	D12	D13
	mm	mm	mm	mm	mm
23 ... 32	207	117	120	70	161
45	-	-	-	-	-
56,63	-	-	-	-	-
90,90	-	-	-	-	-

Ports

Port plate 540

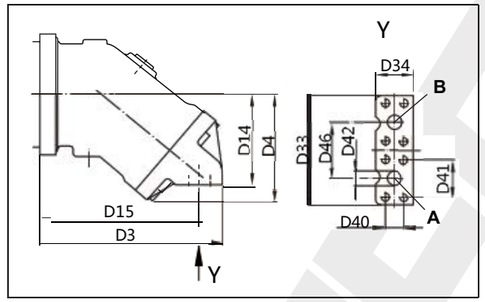
Threaded ports on the side and back



Size	D3	D4	D7	D12	D13	D14	D15	D34	D46
	mm	mm	mm	mm	mm	mm	mm	mm	mm
23 ... 32	207	118	130	70	161	89	183	120	58
45	-	-	-	-	-	-	-	-	-
56,63	-	-	-	-	-	-	-	-	-
80,90	-	-	-	-	-	-	-	-	-

Port plate 600

SAE Working ports on the bottom



Size	D3	D4	D14	D15	D33	D34	D40	D41	D42	D46
	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm
28 ... 32	-	-	-	-	-	-	-	-	-	-
45	-	-	-	-	-	-	-	-	-	-
56,63	-	-	-	-	-	-	-	-	-	-
80,90	-	-	-	-	-	-	-	-	-	-
107 ... 125	293	158	136	258	194	70	31.8	66.7	32	99
160 ... 180	-	-	-	-	-	-	-	-	-	-

Note

- For dimension drawings of port connection plates with valve network, please refer to the "Extended Functions and Model Designation" chapter.

Ports

Specification			23	28	32	107	125	160	180
A, B (Plates 510,520, 600)	Working ports	Specification	1/2 in			1 1/4 in [1]			
		Standard	Dimensions in accordance with SAE J518						
		Fastening threads [2]	5/16 18UNC-2B;0.71in (18mm) depth			1/2 13UNC-2B;0.75in (19mm) depth			
		Delivery condition	With protective cap (must be connected)						
A, B (Plates 530, 540)	Working ports	Specification	-			-			
		Standard [3]	ISO 11926			-			
		Fastening threads [4]	With protective cap (must be connected)						
T_1	Drain port	Specification	3/4 16UNC-2B;0.59in (15mm) depth			7/8 14UNC-2B;0.67in (17mm) depth			
		Standard [3]	ISO 11926						
		Fastening threads [5]	Plugged (Please observe installation instructions)						
T_2	Drain port	Specification	3/4 16UNC-2B;0.59in (15mm) depth			7/8 14UNC-2B;0.67in (17mm) depth			
		Standard [3]	ISO 11926						
		Fastening threads [5]	With protective cap (Please observe installation instructions)						

[1]) For Port plate 02: Working ports A, B size: 1 in, with fastening thread M12 × 1.75, 17 mm deep
[2]) Threads in accordance with ISO 68
[3]) The bottom face may be deeper than specified in the relevant standard.
[4]) Unless otherwise specified: For port connection plate 54, the ports on both sides are plugged. Other distribution diagrams are available on request.
[5]) Unless otherwise specified, Other distribution diagrams are available on request.

Extended Functions and Model Designation

Flushing and boost valve

The flushing and boost valves are used in closed circuits for cooling, to keep the boost pressure level as low as possible.

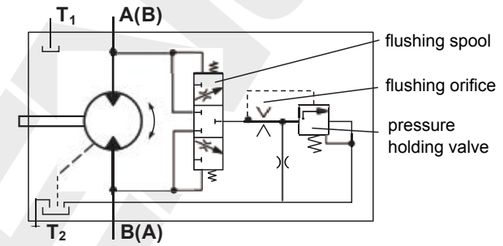
Hydraulic oil from the corresponding low-pressure side flows into the motor housing. It is then sent to the tank together with leakage oil. The discharged hydraulic oil must be replaced with cooled hydraulic oil supplied by the boost pump. The valves can be mounted directly on the fixed motor using port connection plate 027 (sizes 107 to 180, 250); or mounted on a plate using port connection plate 017 (sizes 355 and 500).

Opening pressure of the pressure holding valve

(Observe when setting the main valve)

Sizes 107 to 500, fixed setting: 16 bar

Hydraulic circuit diagram



Switching pressure $_{\Delta}p$ of the flushing Spool

Sizes 107 to 500: 8 ± 1 bar

Flushing flow

The flushing flow can be adjusted using an orifice as required. The following information is based on: $_{\Delta}p_{ND}=p_{ND}-p_G=25$bar and $\nu=10mm^2/s$

(p_{ND} =low pressure, p_G =case pressure)

With flushing valve and boost valve (port plates 027 and 017)

Size	Flushing flow qv (L/min)	Orifice Ø
	L/min	mm
45, 56,63	3.5	
80,90	5	
107,125	8	1.8
160,180	10	2
250		
355	16	2.5
500		

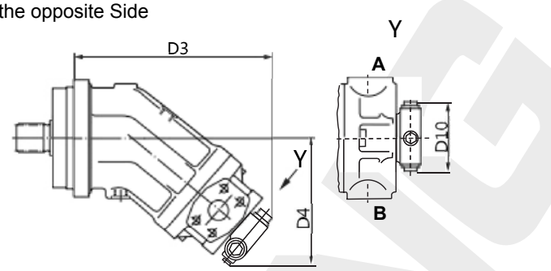
For sizes 45 to 180, orifices are available for flushing flows between 3.5 and 10 L/min. If the flushing flow deviates from the values in the table, please specify the required flushing flow when ordering. For sizes 250 to 1000, the flushing flow must be specified. For sizes 107 to 180, the flushing flow without an orifice is approximately 12 to 14 L/min at a low pressure $_{\Delta}p$=25 bar.

Extended Functions and Model Designation

Dimensions

Port plate 027

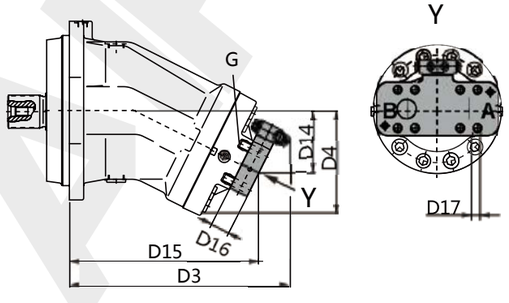
SAE Working ports on the opposite Side



Size	D3	D4	D10
	mm	mm	mm
45	247	151	
56,63	263	159	
80,90	297	173.5	
107,125	294	192	102
160,180	315	201	102
250	344	172	102

Port plate 017

SAE Working ports on the back



Size	D3	D4	D14	D15	D16	D17	G[1]
	mm	mm	mm	mm	mm	mm	
355	421	198	120	356	40	18	M16×2; 21mm depth
500	464	220	130	397	40	18	M16×2; 21mm depth

1) Threads in accordance with DIN 13 standard

Pressure Relief Valve

The MHDB relief valve is used to prevent overload of the hydraulic motor. Once the set opening pressure is reached, hydraulic fluid flows from the high-pressure side to the low-pressure side.

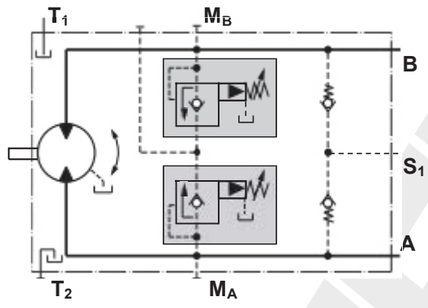
The pressure relief valve can only be used in combination with port connection plates 181, 191 or 192. (For port connection plate 181: see the section "BVD and BVE Counterbalance Valves")

Opening pressure setting range: 50 to 420 bar

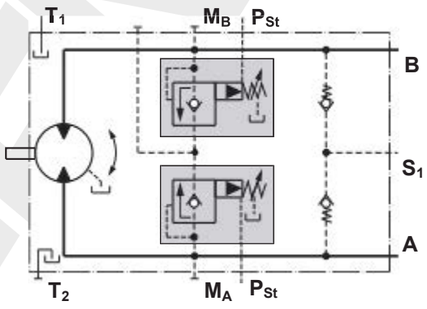
For versions with "pressure sequence stage" (code 192), higher pressure settings can be achieved by applying an external pilot pressure of 25 to 30 bar at port p_{St}. Please specify this clearly when ordering:

- Opening pressure of the pressure relief valve
- Opening pressure with pilot pressure applied at p_{St} (only for version 192)

Version without pressure intensifier (code 191)



Version with pressure intensifier (code 192)

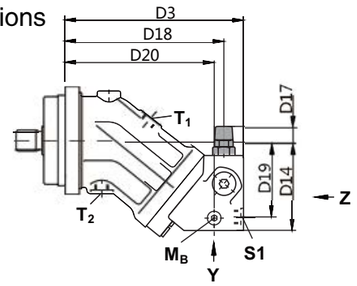


Permitted input flow or pressure for port plates with pressure relief valve

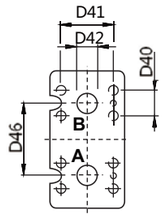
Size		Code	p_{nom}	p_{max}	q_V
Motor	MHDB		bar	bar	l/min
28…32	16	191、192	350	420	100
45	16				240
56,63	22				240
80,90	22				240
107…180	32				400

Prussure Relief Valve

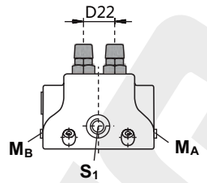
Dimensions



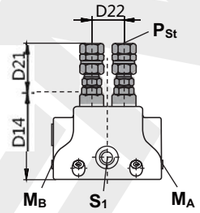
Detail Y:



Detail Z:
Version without pressure sequence range (code 191)



Detail Z:
Version with pressure sequence range (code 192)



Size		D3	D14	D17	D18	D19	D20	D21	D22	D40	D41	D42	D46
Motor	MHDB	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm
28, 32	16	209	102	25	186	87	174	68	36	23.8	50.8	19	66
45	16	222	113	22	198	98	187	60	36	23.8	50.8	19	66
56,63	22	250	124	19	222	105	208	57	42	23.8	50.8	19	75
80,90	22	271	134	17.5	243.5	114	229	55	42	27.8	57.2	25	75
107, 125	32	298	149.5	10	266	130	251	52	53	31.8	66.7	32	84
160, 180	32	332	170	5	301	149	285	47	53	31.8	66.7	32	84

Ports

Size			28, 32	45	56,63	80,90	107, 125	160, 180
A, B	Working ports	Specification	3/4 in			1 in	1 1/4 in	
		Standard	Dimensions in accordance with SAE J518					
		Fastening threads 1)	M10 × 1.5 ; 17 mm depth				M14 × 2 ; 19 mm depth	
		Delivery condition	With protective cap (must be connected)					
S_1	Boost port	Specification	M22 × 1.5 ; 14 mm depth		M26 × 15 ; 16 mm depth			
		Standard	DIN 3852					
		Delivery condition	With protective cap (must be connected)					
P_{St}	Case pilot pressure oil	Specification	G 1/4 2)					
		Fastening threads	DIN ISO 228					
		Delivery condition	With protective cap (must be connected)					
M_A, M_B	Measurement ports pressure A, B	Specification	M20 × 1.5 ; 14 mm depth		M26 × 1.5 ; 16 mm depth			M30 × 1.5 ; 16 mm depth
		Fastening threads 3)	DIN 3852					
		Delivery condition	Plugged					

1) Threads in accordance with DIN 13 standard 2) Only applicable to port connection plate 192

Counterbalance Valves BVD and BVE

Function

The travel drive and winch counterbalance valves are designed to reduce the risk of overspeed and cavitation in axial piston motors in open circuits. Cavitation occurs if, during braking, downhill travel or load lowering, the motor speed exceeds the speed corresponding to the given input flow.

If the inlet pressure drops, the counterbalance valve spool throttles the return flow and brakes the motor until the inlet pressure returns to approximately 20 bar.

Note

- BVD is suitable for sizes 28 to 180, BVE for sizes 107 to 180.
- The counterbalance valve must be ordered separately. We recommend ordering the counterbalance valve and motor together as a package.

Order example:； A2FM(E)107/61W–VAB188+
BVD20F27S/41B–V03K16D0400S12

- The counterbalance valve cannot replace mechanical brakes or parking brakes.
- Please observe the detailed descriptions of the BVD counterbalance valve in data sheet 95522 and of the BVE counterbalance valve in data sheet 95526!
- To design the brake release valve, we need to know the mechanical parking brake:

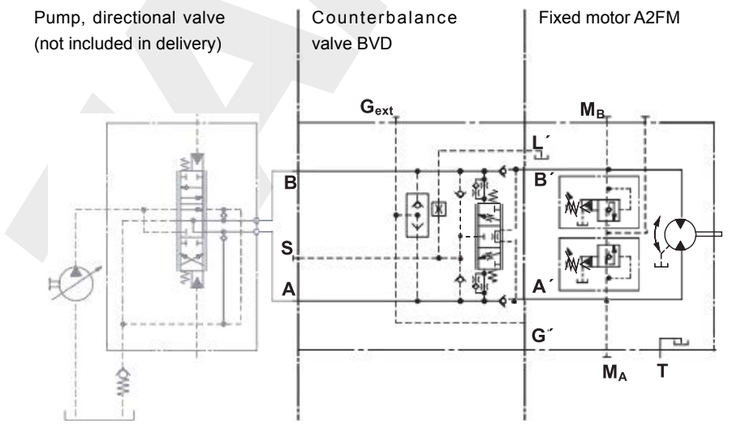
- Pressure at initial opening
- Volume of the counterbalance valve spool between minimum travel (brake closed) and maximum travel (brake released, pressure 21 bar)
- Closing time required for the heating device (oil viscosity approx. 16 mm²/s)

Counterbalance Valve BVD_F for Travel Drives

Application option: Travel drive for wheeled excavators

Example schematic diagram for a wheeled excavator travel drive

A2FM(E)107/61W-VAB188 +BVD20F27S/41B–V03K16D0400S12



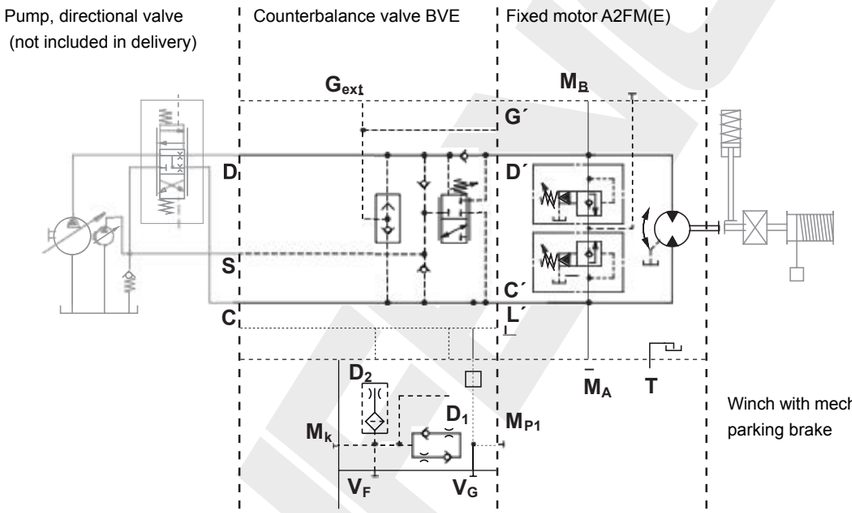
Winch Counterbalance Valves BVD···W and BVE

Application options:

- Crane winch drive (BVD and BVE)
- Excavator track drive (BVD)

Example circuit diagram for a crane winch drive

A2FM(E)107/61W-VAB188+BVE25W385/51ND-V100K00D4599T30S00-0



Winch with mechanical parking brake

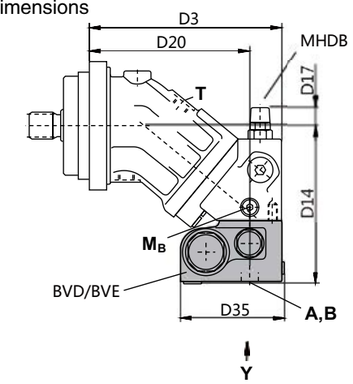
Permitted inlet flow or pressure for port plates with counterbalance valve

Size			Code	p_{nom}	p_{max}	q_V
Motor	BVD/BVE	MHDB		bar	bar	l/min
28 ... 32	20	16	181, 188	350	420	100
45		17				
56,63		17				
80,90		27				
107 ... 125		22	171, 178			220
160 ... 180	25	32	181, 188			320

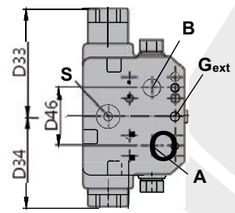
High-pressure Fixed Displacement Piston Motor
TFA2FM 6X Series
TAIFENG

Winch Counterbalance Valves BVD···W and BVE

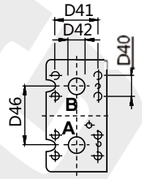
Dimensions



Detail Y:
With BVD/BVE (code 178, 188)



Detail Y:
Without BVD/BVE (code 171, 181)



Size		Code	D3	D14	D17	D20	D33	D34	D35 [1]	D40	D41	D42	D46
Motor	Counterbalance Valve		mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm
28, 32	BVD20..16	188	209	175	25	174	139	98	142	23.8	50.8	19	66
45	BVD20..16		229	191	22	187	139	98	142	23.8	50.8	19	66
56,63	BVD20..17		250	192	19	208	139	98	142	23.8	50.8	19	75
80,90	BVD20..27		271	202	17.5	229	139	98	142	27.8	57.2	25	75
107, 125	BVD20..28	178	298	238	10	251	139	98	142	27.8	57.2	25	84
	BVD25..38	188	298	239	10	251	175	120.5	158	31.8	66.7	32	84
	BVE25..38	188	298	240	10	251	214	137	167	31.8	66.7	32	84
160, 180	BVD25..38	188	332	260	5	285	175	120.5	158	31.8	66.7	32	84
	BVE25..38	188	332	260	5	285	214	137	167	31.8	66.7	32	84

1) Applicable to models with brake release valve (BV...L): Size D35 +5 mm

Ports

Size			28, 32 , 45 , 56,63	80,90	107, 125	160, 180
A, B	Working ports	Specification	3/4 in	1 in [1]	1 in [1]	1 1/4 in [2]
		Standard	Dimensions in accordance with SAE J518			
		Fastening threads [3]	M10 × 15 ; 17 mm depth	M12 × 175 ; 16 mm depth	M14 × 2 ; 19 mm depth	
		Delivery condition	With protective cap (must be connected)			
S	Boost port	Specification	M22 × 15 ; 14 mm depth		M27 × 2 ; 16 mm depth	
		Standard [4]	DIN 3852			
		Delivery condition	Plugged			
B_r	Speed measuring port (only with BVD...W)	Specification	M12 × 1.5			
		Standard [4]	DIN 3852			
		Delivery condition	With protective cap (must be connected)			
G_{ext}	External pilot port (only with BVE)	Specification	M12 × 1.5			
		Standard [4]	DIN 3852			
		Delivery condition	Plugged			
M_A, M_B	Measurement ports pressure A, B	Specification	M12 × 15 ; 12 mm depth			
		Standard [4]	ISO 6149			
		Delivery condition	Plugged			

1) With BVD20 2) With BVD25 / BVE25 3) Threads in accordance with DIN 13 4) The bottom face may be deeper than specified in the relevant standard

Speed Sensor

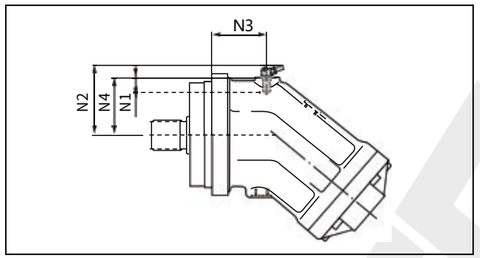
Models A2FM···U and A2FM···F (suitable for speed sensors, i.e. without sensor) are equipped with a toothed ring on the rotating shaft. When motors are delivered “suitable for speed sensors”, the ports are fitted with pressure caps.
After installing the DSA or HDD speed sensor, a signal proportional to the motor speed can be generated. The sensor is used to measure speed and direction of rotation.
For order codes, technical data, dimensions and detailed information on the connector, as well as safety instructions for the sensor, please refer to the relevant data sheets.

DSA: Data sheet 95133
HDD: Data sheet 95135

The sensor is installed in a dedicated port, as shown below:
DSA: with one mounting bolt
HDD: with two mounting bolts

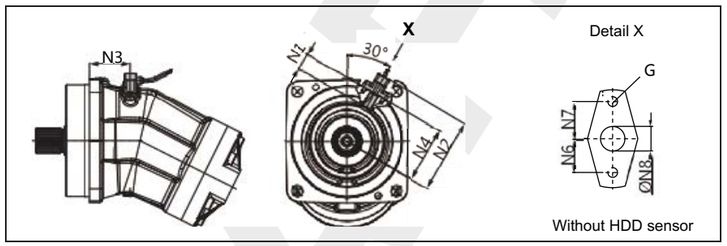
We recommend ordering the A2FM fixed motor with the sensor already installed.

With DSA speed sensor installed (code V)
Sizes 23 ··· 200



Motor Size	Number of Teeth	N1 mm	N2 mm	N3 mm	N4 mm
23 ... 32	38	18.4 +0.1 -0.1	74.5	54.7	57.9
45	45	18.4 +0.1 -0.1	——	54.8	——
56,63	47	18.4 +0.1 -0.1	——	61.5	——
80,90	53	18.4 +0.1 -0.1	——	72.5	——
107, 125	59	18.4 +0.1 -0.1	96.5	76.8	79.9
160, 180	67	18.4 +0.1 -0.1	104	86.8	87.4
200	80	18.4 +0.1 -0.1	117.5	97.5	100.9

With HDD speed sensor installed (code H)
Sizes 250 ··· 500



Motor Size	Number of Teeth	N1 mm	N2 mm	N3 mm	N4 mm	N6 mm	N7 mm	ØN8 mm	G 1)
250	78	32 +0.1 -0.1	149	82	110.5	20	22	18.2	M6 × 1; 7.5 mm depth
355	90	32 +0.1 -0.1	161	93	122.5				
500	99	32 +0.1 -0.1	171	113	132.5				
710, 1000	126	32 +0.1 -0.1	199	172	160.5				

1) Threads in accordance with DIN 13 standard

Installation Instructions

Installation Notes

- During commissioning and operation, the axial piston unit must be filled with hydraulic fluid and vented. Since the axial piston unit may drain oil through the hydraulic lines, the above provisions must also be observed during extended shutdown periods.
- Due to hazards such as dry running, it is especially important to ensure the installation position is "drive shaft up" when filling and venting.
- Leakage in the housing area must be discharged to the tank via the highest drain ports (T_1, T_2).
- If the connection drain line is used for multiple units, it is necessary to ensure that the relevant housing pressure is not exceeded. The dimensions of the connection drain line must ensure that the maximum permissible housing pressure of all connected units is not exceeded under any operating conditions (especially during cold starts). If this cannot be achieved, a separate drain line must be installed if necessary.
- For good noise levels, all connecting lines must be decoupled using elastic elements, and installation above the tank must be avoided.
- Under all operating conditions, the tank line must flow into the tank below the minimum hydraulic fluid level.

Installation Position

See examples 1 to 8 below. Additional installation positions are available on request. Recommended installation positions: 1 and 2.

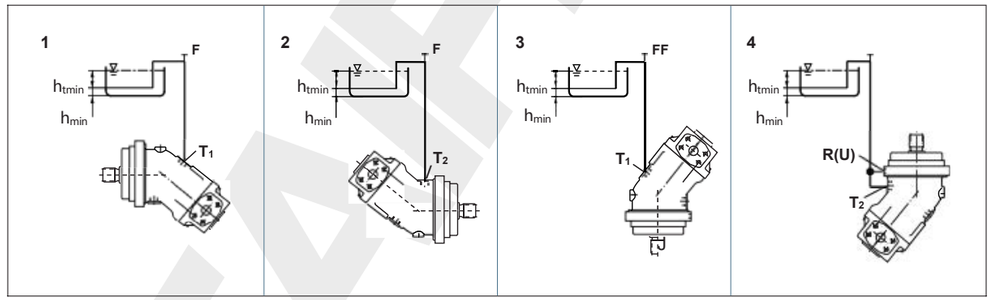
Note

For "shaft up" installation positions 4 and 8, a drain port R is required (specify clearly when ordering, special version).

For sizes 250 to 1000, a bearing surrounding control port U is provided for air venting.

Installation below the tank (standard)

Installation below the tank means the axial piston unit is installed outside the tank, below the minimum oil level.

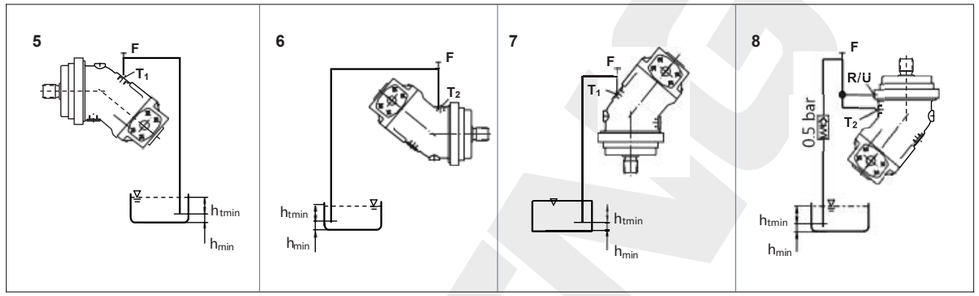


Installation Position	Air Vent	Oil Filling
1	F	T1
2	F	T2
3	F	T1
4	R(U)	T2

Installation Instructions

Installation above the tank

Installation above the tank means the axial piston unit is installed above the minimum oil level of the tank. Recommended for installation position 8 (drive shaft up): A check valve (opening pressure 0.5 bar) in the drain line can prevent pump housing oil drainage.



Installation Position	Air Vent	Oil Filling
5	F	T_1(F)
6	F	T_2(F)
7	F	T_1(F)
8	R(U)	T_2(F)

Key Symbols

F	Oil filling / Air vent
R	Air vent port
U	Bearing flushing / Air vent port
T_1, T_2	Drain ports
h_{tmin}	Minimum required immersion depth (200 mm)
h_{min}	Minimum required distance from tank bottom (100 mm)

Note: Port F is part of the external piping and must be provided by the customer to simplify oil filling and venting.

Safety Instructions

● The axial piston motor is suitable for open and closed circuits.

● The project planning, installation and commissioning of the axial piston unit must be carried out by qualified, technically skilled personnel.

● Read the relevant instruction manual completely and thoroughly before using the axial piston unit. If required, it can be obtained from Taifeng.

● Before completing the final design, obtain the installation drawings that must be observed.

● The specified data and notes must be observed.

● Storage: Our axial piston units are supplied as standard with corrosion protection for up to 12 months. If a longer storage period (max. 24 months) is required, this must be specified in plain text when ordering. The storage period is valid under optimal storage conditions.

● Not all product variants are approved for safety functions in accordance with ISO 13849.

● A pressure relief valve must be provided in the hydraulic system.

● Observe the instructions in the instruction manual regarding tightening torques for port threads and other threaded connections.

● The notes in the instruction manual regarding tightening torques for port threads and other threaded connections must be observed.

● Port and fastening threads are designed for the maximum permissible pressure pmax (see instruction manual). The machine or system manufacturer must ensure that the connecting elements and lines comply with the specified operating conditions (pressure, flow, hydraulic fluid, temperature) and the necessary safety factors.

● Working ports and functional ports are only intended for hydraulic lines.

● The axial piston unit presents an ignition hazard during operation and shortly after shutdown. Appropriate safety measures must be taken (e.g. wearing protective clothing).

● In some cases, drive components in high-pressure pressure relief valves can become stuck in an undefined position due to contamination (e.g. contaminated hydraulic fluid), which may limit or impair the load-holding function of lifting winches. It is therefore the responsibility of the machine and/or system manufacturer to ensure that the load can always be placed in a safe mode as required, and that these measures are properly implemented.

High pressure axial piston motor
TFA6V Bent axis variable motor

TAIFENG

- Size: 28 to 500
- Nominal pressure 315bar
- Maximum pressure 350 bar
- Open circuit

Description:

The variable motor is designed for a hydrostatic drive with secondary control.
Complete control assembly with maximum adjustment range V_{max} / V_{min}=3.47.

Features

- Large range of adjustment when using static hydraulic transmission
- Secondary control and regulation with various control devices
- Improve max. output speed at a smaller inclination angle
- Save cost by using smaller pumps
- Eliminating the need of multi-speed gear drives
- High power density
- High external axial load is allowed
- Optional installation position
- High efficiency
- Excellent starting characteristics
- Small inertia

Contents

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Size..... 248

High pressure axial piston motor
TFA6V Bent axis variable motor

TAIFENG

TFA6V | | | | | | - | 023

Motor model
Variable displacement motor
TFA6V

Specifications

8.1−28.1ml/r	28
15.8−54.8ml/r	55
23−80ml/r	80
30.8−107ml/r	107
46−160ml/r	160
64.8−225ml/r	225
137−500ml/r	500
(Displacement V_{gmin}− V_{gmax}) Variable mode	

Fluid control variable, control pressure difference	△p=1MPa	HD1
With constant pressure control	△p=1MPa	HD1D
Mpa control differential pressure	△p=2.5MPa	HD2
With constant pressure control	△p=1MPa	HD2D
Control two-speed variable control starting	0.2−2MPa	HS1
Point 0.2−2Mpa control starting point	0.5−5MPa	HS2
High pressure automatic variable, constant pressure without overshoot		HA1
Constant pressure belt overshoot		HA1H
Lift up without overshoot	△p=10MPa	HA2
Booband overshoot	△p=10MPa	HA2H
Speed liquid control variable		DA
Electronic control double speed variable	12V	ES1
	24V	ES2
Electrical control proportion variable	12V	EP1
	24V	EP2
Torque variable		MO
Manual variable		MA

Minimum displacement setting value
For example: V_{gmin}=23ml/r 023

Special for crane series (with one-way throttle)
—

Assembly type
For explanation, see the variable control instructions and component dimensions 1 2

Axis extension

Flat key shaft, GB 1096−79	P
Spline DIN 5480	Z
Spline GB 3478.1−83	S

Oil port connection

SAE flange, side	F
thread connection,side	G

Order example: TFA6VM80HD1FZ2-023
bent axis variable motor TFA 6 V, specification 80, liquid control variable,
△p = 1 Mpa, side SAE flange connection,
Germany standard spline,
2nd assembly form, minimum displacement
$V_{g\,min}$ = 23 ml / r

Hydraulic fluid

TFA6V Variable pump is designed according to the DIN 51524 using HLP mineral oil.

Detailed instructions on the selection of the hydraulic oil

When selecting the hydraulic oil, ensure that the working viscosity within the operating temperature range is in the optimal range (v_{opt}, see selection diagram).

Notes

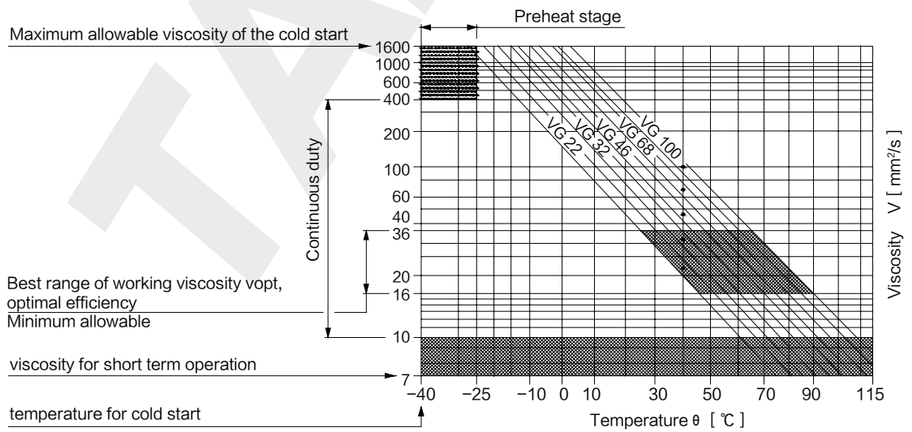
The temperature of any part shall not be higher than 115℃. Hydraulic oil adhesion at the determination bearing degree, the temperature difference specified in the table shall be taken into account.

If the above conditions cannot be maintained due to extreme working parameters, we recommend passing the oil port U rinse the shell.

Hydraulic oil viscosity and temperature

	Dynamic viscosity	temperature	remarks
Cold start	v_{max} ≤1600mm²/s	θ_{St} ≥ -40℃	t≤3 min, n ≤ 1000 rpm, no loaded p ≤ 50 bar
Allow temperature difference		ΔT≤25K	Between the axial piston unit and the hydraulic oil in the system
Preheat stage	v<1600 to 400 mm²/s	θ= -40℃ to -25℃	v <1600 to 400 m m2/s θ = -40 to-25 at p 0.7 p_{norm}, n 0.5 n_{norm}, and t for 15 min
Continuous operation	v=400 to 10mm²/s		For example, for VG 46, this corresponds to the temperature range + 5 to + 85 (see selection drawing)
		θ=-25℃ to +103℃	θ=-25 to + 103 was measured at the oil port R1 / R2
			Note the allowable temperature range of the shaft seal (Δ T = about 12 K, between the bearing / shaft seal and the oil port R1 / R2)
	v_{opt} = 16 to 36 mm²/s		Optimum range for optimal working viscosity and efficiency
Short-term operation	v_{min} ≥ 7 mm²/s		And t <3 min, p <0.3 p_{norm}

Selection diagram



High pressure axial piston motor
TFA6V Bent axis variable motor
TAIFENG

Filtering of hydraulic oil

Finer filtration improves the cleanliness of the hydraulic oil and extending the service life of the axial piston unit.

Cleanliness shall be maintained at at least 20 / 18 / 15.

When the hydraulic oil temperature is very high (90℃ to 115℃ at R1 / R2), the cleanliness shall be at least 19 / 17 / 14 of ISO 4406 standard.

Leakage

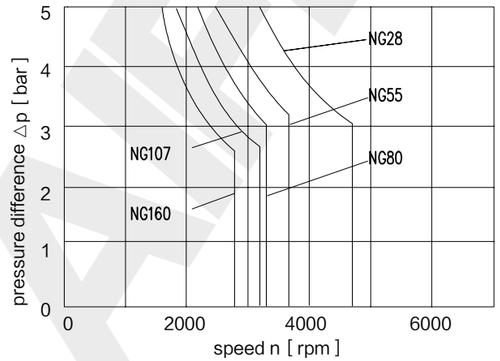
The housing is connected to the suction chamber. Therefore, there is no separate housing drain line connected from the housing to the tank (both R oil ports are blocked). Exception: For models with pressure controller or pressure cut-off valve, a drain line is used to drain the oil port T1 to the tank.

Axis sealing ring

Permissible pressure load

The service life of the shaft seal is affected by the axial piston unit speed and the housing drain pressure (housing pressure). The highest allowable value of the instantaneous pressure peak (t <0.1 s) is 10 bar. The service life of shaft seal will shorten with the frequency of peak pressure and the average pressure difference.

The shell pressure must be equal to or above the ambient pressure.



The FKM shaft seal ring can be used at a shell oil drain temperature of−25℃ to + 115℃. For applications below−25℃, NBR axis seal (allowable temperature range: −40℃ to + 90℃).

Flow direction

Rotation direction (viewed from the shaft end)	
Clockwise	Anticlockwise
S to B	S to A

Technical parameter

Working pressure range:
A or B port pressure: rated pressure Pn=31.5MPa
Maximum pressure Pmax= 31.5MPa
The total pressure of oil outlet A and B shall not exceed 63MPa, and the maximum pressure of oil outlet on each side shall be 35MPa.
Oil relief pressure: allowed T port maximum oil relief pressure Pabs = 0.2 MPa
Oil temperature range: t_{min} = -25℃
Viscosity range of t_{max} = + 80℃
V_{min} = 10mm^2 / s V_{max} (short time) =1000mm^2 / s
Optimum working viscosity: v_{opt} = 16-36mm^2/ s
Filtration of hydraulic oil:

the recommended filtration accuracy is 10um. 25-40um can also be used, but 10um can extend the service life (reduce wear).
Speed range:
the minimum speed is not limited, when a very uniform speed is required, nmin is not less than 50r / min, the maximum speed is determined by the maximum flow from the pump and the minimum displacement of the variable motor. The minimum displacement is limited by a adjusting screw, so the variable motor does not overdrive. The maximum allowable rotation speed is shown in the technical parameter table. Speci-fication calculation: technical parameters

Flow rate $Q=\frac{v_g \cdot n}{1000 \cdot \eta_v}$ [L/min]

Output speed $n=\frac{Q \cdot 1000 \cdot \eta_v}{v_g}$ [r/min]

Output torque or $M=\frac{v_g \cdot \triangle p \cdot \eta_{mn}}{2\pi}$ [Nm]

$\frac{1.59 V_g \cdot \triangle p \cdot \eta_{mn}}{10}$

$M=\frac{K_M \cdot \triangle p \cdot \eta_{mn}}{10}$

Torque output $P=\frac{M \cdot n}{9549}$ [Nm]

$=\frac{Q \cdot \triangle p}{60} \cdot \eta_t$ [KW]

Velvg = max displacement(ml / r)
M= torque (Nm)
p= differential pressure (MPa)
n= rotational speed (r/min)
η_v= volumetric efficiency
η_{mn} = mechanical efficiency η_t= total efficiency

Oil selection:

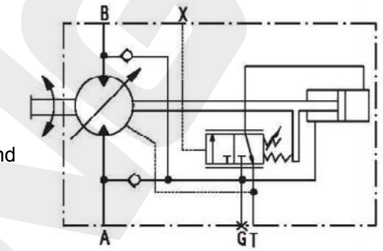
Working temperature 30-40℃	VG22=22mm^2/s	at40℃
Recommended viscosity grade	40-50℃ VG32=32mm^2/s	at40℃
Comply with DIN51519 50-60℃	VG46=46mm^2/s	at40℃
60-70℃	VG68=68mm^2/s	at40℃
70-80℃	VG100=100mm^2/s	at40℃

Specifications			28	55	80	107	160	225	500
Variable made									
Of the HD hydraulic control variables			●	●	●	●	●	●	●
HD1D hydraulic control constant pressure variable				●	●	●	●		
The HS hydraulic control (double-speed) variable			●	●	●	●	●	●	●
The HA high-pressure automatic variable			●	●	●	●	●	●	
The DA rotational speed hydraulic control variable			●	●	●	●	●		
ES electric control (double-speed) variable			●	●	●	●	●		
EP electronic control (proportional) variable			●	●	●	●	●		
The MO torque variable			●	●	●	●	●	●	●
The MA manual variable									
Displacement	V_{gmax}	ml/r	28.1	54.8	80	107	160	225	500
	V_{gmin}	ml/r	8.1	15.8	23	30.8	46	64.8	137
Maximum allowable flow rate	Q_{gmax}	l/min	133	206	267	321	424	530	950
Maximum speed at Q_{max} n_{max} at V_{gmax}	Under the n_{max} at <V_{gmax}	r/min	4750	3750	3350	3000	2650	2360	1900
	Under the n_{max} at <V_{gmax}	r/min	6250	5000	4500	4000	3500	3100	2500
Torque constant	M_x at V_{gmax}	Nm/MPa	4.463	8.701	12.75	16.97	25.41	35.71	79.577
	$M_x$at V_{gmin}	Nm/MPa	1.285	2.511	3.73	4.9	7.35	10.3	21.804
Maximum torque is at △P=35MPa	M_x at V_{gmax}	Nm	156	304	446	594	889	1250	2782
	M_x at V_{gmin}	Nm	45	88	130	171	257	360	763
Maximumoutput	(At 35MPa and Q_{max}) KW	KW	78	120	156	187	247	309	507
Moment of inertia		kgm^2	0.0017	0.0052	0.0109	0.0167	0.0322	0.0532	
Weight		kg	18	27	39	52	71	103	223

HD hydraulic control variable

Standard structure of the displacement of the infinite control motor
According to the pilot pressure of the external control oil source: supply
According to the second assembly type
Control starting point at V_{gmax} (maximum torque, minimum speed)
Control end point at V_{gmin} (minimum torque, maximum speed)
For the first assembly type, the control function is the opposite:
Control starts at Vg min and control ends at Vg max.
Setting of the variable mechanism
There are two options available:
1. HD1-Pilot pressure differential (by Vgmax Vgmin) -
Ps = 1 MPa control start point adjustable from 0. 2-2MPa
Standard set point: control starting pressure is 0. 3 MPa, control end pressure is 1. 3MPa
2. HD2-Pilot pressure differential (by Vgmax Vgmin) -Ps = 2.5MPa
Control starting point is adjustable from 0. 5-5 MPa
Standard set point: the control starting pressure is 1 MPa, the control end pressure is 3. 5MPa, when HD is
used as double speed control, the maximum pilot pressure is up to 7. 5MPa
Oil supply at x of external control port: about 0. 5L / min.
When the working pressure <1. 5MPa, the auxiliary pressure is 1. 5MPa
HD hydraulic control variable (HD1、HD2)

HD fluid control variables (HD1.HD2)



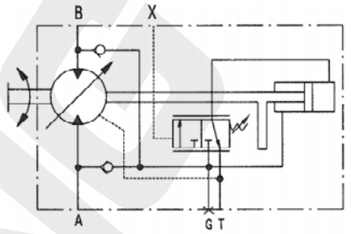
HD1D、HD2D hydraulic control constant pressure variable

Constant pressure control is increased on HD function.
If the system pressure increases due to load torque or due to reduced motor swing angle, the motor swings to a large swing angle when the set point of the constant pressure control is reached. Due to increasing displacement and reducing pressure, the control deviation disappeared.
By increasing the displacement, the motor generates a large torque at constant pressure. By applying a pressure signal at the oil port G2, we can obtain constant pressure setting pressure (such as rise or fall).
The signal must be between 2 and 5MPa.
The setting range of the constant pressure control valve is 8-40MPa.
Standard type: supply according to the second assembly type.
Control starting point at V_{gmax} (maximum torque, minimum speed)
Control end point at V_{gmin} (minimum torque, maximum speed)

HS hydraulic control two–speed variable

Standard structure of two-point control motor displacement according to the pilot pressure of external control oil source, supply according to the second assembly type.
Control starting point at Vgmax (maximum torque, minimum speed)
The control end point is Vgmin (minimum torque, maximum speed) For the first assembly type, the control function is opposite:
Control starts at Vg min and control ends at Vg max.
Setting of the variable mechanism There are two options for choice
1. HS1-Control start point adjustable-from 0. 2-2MPa
2. HS2-adjustable control starting point-oil supply from 0. 5-5MPa (by Vgmin Vgmax) - P 0.2MPa external control port x: approximately 0. 5 L / min.
When the working pressure is less than 1. 5MPa, the auxiliary pressure of 1. 5MPa must be provided at G port.

HS. Double-speed variable (HS1, HS2)



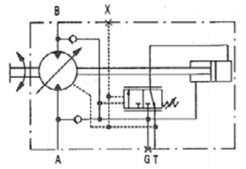
HA high–pressure automatic variable

Automatic control of motor displacement by working pressure
Standard structure: supply according to the first assembly type
The control starting point is at Vgmin (minimum torque, maximum speed)
Control end point at Vgmax (maximum torque, minimum speed)
In this variable mode, when the internal working pressure of port A or B reaches the set value,
The motor changes from the minimum displacement Vgmin to the maximum displacement Vgmax.
The control starting point is adjustable between 8 and 35MPa.
There are two options:
1. HA1-Work pressure remains constant under control. △P=1MPa
Pressure increase from Vgmin to Vgmax is about 1MPa.
2. HA2-within the control range, the work pressure is increased. △P=10MPa
The pressure was increased by 10MPa from Vgmin (7°) to Vgmax (25°).
HA variables can be controlled in port X (i. e. with overshoot), in this case,
The pressure setting value (working pressure) of the variable mechanism decreases at a rate of 1. 6 MPa per 0. 1MPa lead (external control) pressure.for instance:
The variable mechanism starting variable pressure was set at 30MPa.
Pilot pressure (X port): at 0MPa, the variable starts at 30MPa.
Pilot pressure (X port): starting point of variable becomes 14MPa at 1MPa.
（30MPa-10x1 .6MPa=14MPa）

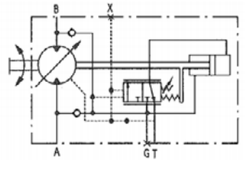
HA with overshoot, the variable is available in two ways:

1. HA1H- Within the control range, the working pressure remains constant within the control range, P=1MPa.
2. HA2H-Within the control range, the working pressure is increased, P=10MPa.
If the control only needs to reach the maximum displacement, the maximum lead pressure is 5MPa. The oil supply at the external control port X is 0. 5L /min.

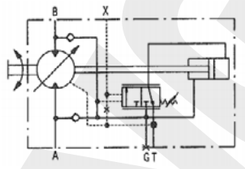
HA. High-pressure automatic variable (HA1)



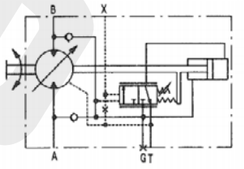
HA. High pressure automatic variable (HA1H) HA



High pressure automatic variable (HA2)



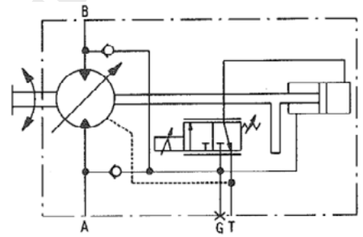
HA. High-pressure automatic variable (HA2H)



ES, an electronically controlled two–speed variable

The motor displacement at V_{gmin} or V_{gmax} is achieved by the control electromagnet fracture. Standard structure: supply according to the second assembly type
Control start at Vgmax (maximum torque, minimum speed)
Control end point at Vgmin (minimum torque, maximum speed)
For the first assembly type, the control function is the opposite:
There are two options available:
1. ES 1-, with a control voltage of 12VDC
2. ES 2-, with a control voltage of 24VDC

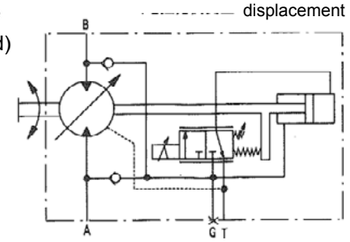
ES. Electronic control of the two-speed variabl



EP, an electronically controlled proportional variable

Control motor displacement according to the stepless or double points of electrical signals
Standard structure: supply according to the second assembly type
Control starting point at Vgmax (maximum torque, minimum speed)
Control endpoint at Vg min (minimum torque, maximum speed)
For the first assembly type, the control function is the opposite:
Control the hydraulic control by a proportional electromagnet.
There are two options available:
1. ES 1-, the control voltage is 12VDC 400mA-900 mA
2. ES 2-, the control voltage of 24VDC 200mA-450 mA
If only the variable motor is required for two-point (two-speed) control, simply switch the current on and off to obtain these two positions (for the 2nd assembly type,power off at $V_{g\,max}$; for the first assembly type, power off at $V_{g\,min}$). If the working pressure is below 1. 5MPa, an auxiliary pressure of 1. 5MPa is introduced at port G.

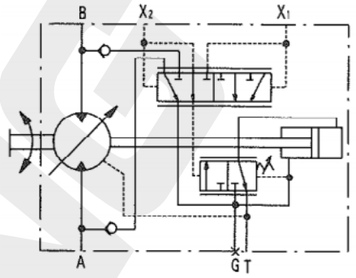
EP.electric control proportional displacement



DA. Speed hydraulic control variable

The speed hydraulic control variable is only used for transmission systems used with the variable pump A4V. DA.
Assembly type: 2
Variable starting point, by lead pressure: at V_{gmax} (to V_{gmin})
Press pressure: at V_{gmin} (to V_{gmax})
The starting point is at V_{gmax} (maximum torque).
The pilot pressure determined by the A4V variable pump (increasing the prime motor speed = increasing the variable pump speed = increasing the pilot pressure) is led to port X_1 or X_2, depending on the driving direction, the motor changes to the reduced reduction direction (torque reduction, speed increase).
If the working pressure increases to exceed the pressure value set by the variable mechanism, the motor changes to the direction of increased displacement (torque increases and rotation speed decreases). Pilot pressure and high pressure hold: Pst / PH = 3 / 100.
The pilot pressure change of 0.3MPa (up or down) makes
the working pressure rise and decrease by 10MP accordingly.
When designing the driver with DA variables,the technical data of A40,PA variable pump must be considered.

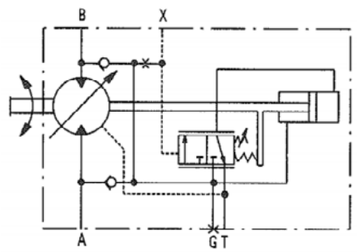
DA. Speed fluid control variable



MO. Torque variable

Torque variables, mainly used to drive the winch, produce constant traction. Assembly type: the first assembly type Control starting point at Vgmin (minimum torque, maximum speed)
Setting of the variable mechanism:
Pilot pressure increase (V_{gmin}-V_{gmax}) △ p=5MPa, control starting from 8-35MPa, adjustable (indicated when ordering).
By changing the displacement of the motor, which can be changed as needed to produce a constant traction. If there is no tension on the scroll, the motor works at a lower pressure, so the pilot pressure is lower, the motor displacement decreases, the speed increases, and the hinge car accelerates until the tension and stops running when the hinge force is reached. To limit the maximum speed of the motor, a flow valve or similar element shall be provided in front of the motor in the circuit.
As a pilot control of the torque variable itself, a overflow valve can be used. Maximum oil supply at port X About 5 L/min, the lead oil flow decreases with the difference between the lead pressure and the working pressure.

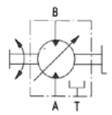
MO. Torque variable



MA. Manual variable

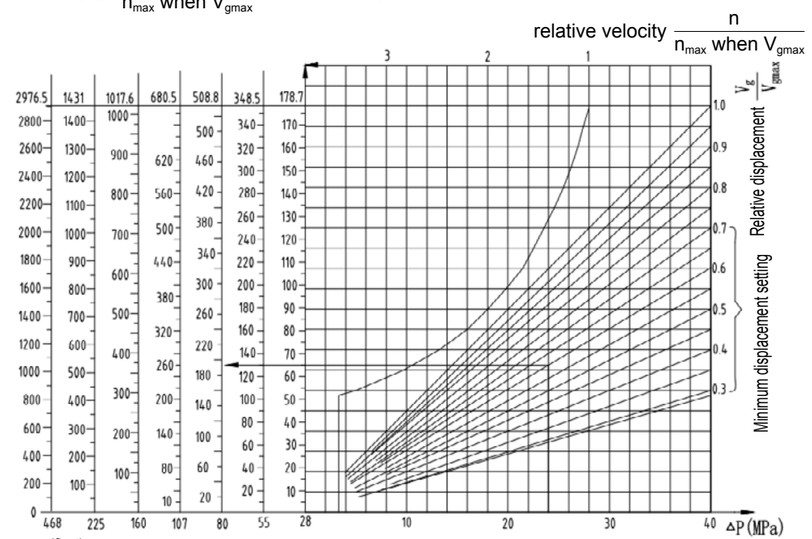
Drive the screw to adjust the displacement of the motor.
Assembly type: the first assembly type

MA. Manual variables

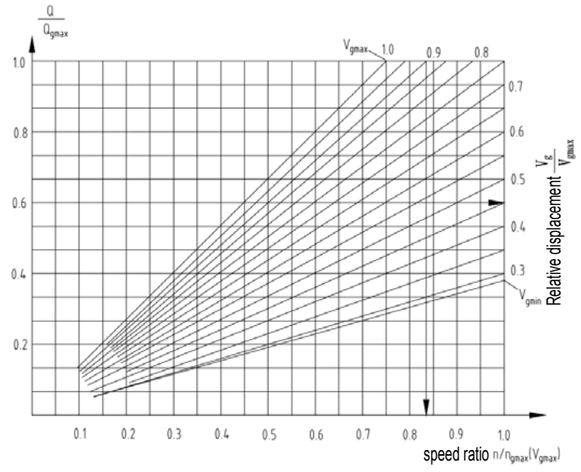


Universal feature curve

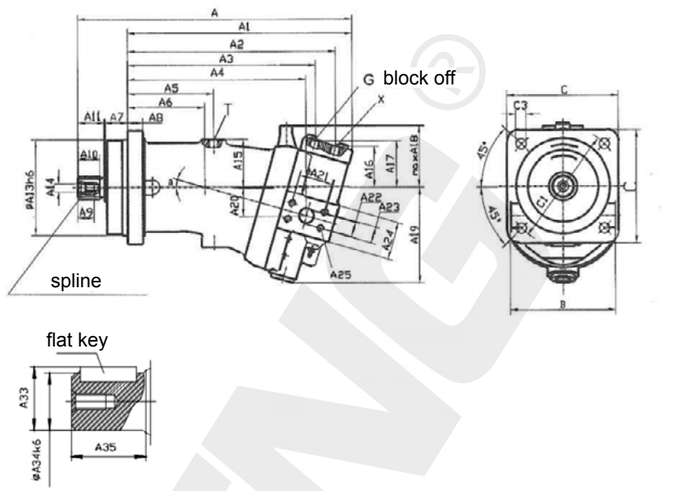
(P-M) and(Vg- $\frac{n}{n_{max} \text{ when } V_{gmax}}$) feature ,Torque M does not consider efficiency



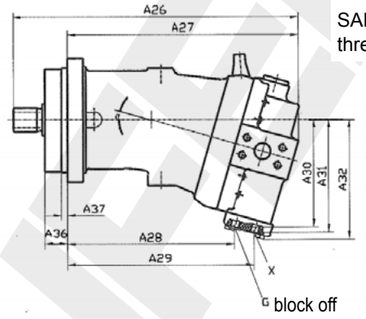
The limit value of the rotation speed and the displacement



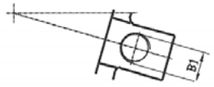
Overall Dimension
specification 28- 225
HD, HA variable assembly
mode 2



Overall Dimension
specification 28-225
HD, HA variable assembly
mode 1



SAE flange connection (pressure oil port)
thread connection (pressure oil port)



A, B, working oil port
G multi-component synchronous control
And remote pressure oil port

X pilot (external control) oil port
T shell • oil port

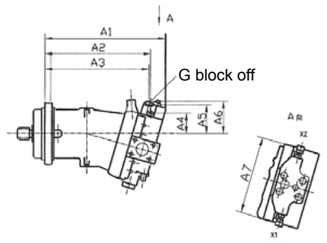
Spec	A	A_1	A_2	A_3	A_4	A_5	A_6	A_7	A_8	A_9	A_{10}	A_{11}	A_{12}	A_{13}	A_{14}	A_{15}	A_{16}	A_{17}	A_{18}	A_{19}	A_{20}
28	317	249	230	206	189	107	75	25	16	19	28	43	M16×1.5	100	M8	50	57	64	81	110	33
55	379	312	291	264	249	123	108	32	20	28	28	35	M18×1.5	125	M12	63	52	60	84	132	40
80	440	368	345	316	297	152	137	32	23	28	33	40	M18×1.5	140	M12	71	59	68	99	150	46
107	463	378	356	326	301	145	130	40	25	28	37.5	45	M18×1.5	160	M12	80	63	71	107	162	49
160	530	440	412	377	354	213	156	40	28	36	42.5	50	M22×1.5	180	M16	88	66	77	108	182	57
225	573	468	441	405	375	222	162	50	32	36	43.5	55	M22×1.5	200	M16	96	74	85	121	199	61

Spec	A_{21}	A_{22}	A_{23}	A_{24}	A_{25}	Deep	A_{26}	A_{27}	A_{28}	A_{29}	A_{30}	A_{31}	A_{32}	A_{33}	A_{34}	A_{35}	A_{36}	A_{37}	B	B_1	C
28	50.8	20	23.8	45	M10	17	298	230	152	176	124	131	139	27.9	25	50	23	8	116	M27×2	118
55	50.8	20	23.8	53	M10	17	368	301	208	235	133	141	153	33	30	60	29	10	142	M33×2	150
80	57.2	25	27.8	64	M12	18	425	353	252	282	152	161	177	38	35	70	29.5	10	172	M42×2	165
107	57.2	25	27.8	64	M12	18	442	357	259	288	164	173	188	43	40	80	35	10	178	M42×2	190
160	66.7	32	31.8	70	M14	19	513	423	302.5	338	182.5	193	201	48.5	45	90	36.5	11.5	208	M48×2	210
225	66.7	32	31.8	70	M14	21	546	441	324	359	201	211	219	53.5	50	100	50	12	226	M48×2	236

Spec	C_1	C_2	C_3	Flat-bond GB1096-79	Spline-key DIN5480	Spline-key DB 3478.1-83	G	X
28	50.8	20	23.8	Key 8×40	W25×1.25×18×9g	EXT18Z×1.25×30R×5f	M12×1.5	M14×1.5
55	50.8	20	23.8	Key 8×50	W30×2×14×9g	EXT14Z×2M×30R×5f	M14×1.5	M14×1.5
80	57.2	25	27.8	Key 10×56	W35×2×16×9g	EXT16Z×2M×30R×5f	M14×1.5	M14×1.5
107	57.2	25	27.8	Key 12×63	W40×2×18×9g	EXT18Z×2M×30R×5f	M14×1.5	M14×1.5
160	66.7	32	31.8	Key 14×70	W45×2×21×9g	EXT21Z×2M×30R×5f	M14×1.5	M14×1.5
225	66.7	32	31.8	Key 14×80	W50×2×24×9g	EXT24Z×2M×30R×5f	M12×1.5	M14×1.5

Universal feature curve

DA variable assembly type 2

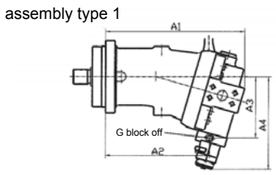


Spec	A_1	A_2	A_3	A_4	A_5	A_6	A_7	X_1、X_2
28	253	212	209	53	73	81	144	M14×1.5
55	317	272	268	49	70	77	146	M14×1.5
80	371	326	322	56	77	83	152	M14×1.5
107	380	336	332	59	81	88	152	M14×1.5
160	442	387	383	65	86	94	158	M14×1.5
225	471	416	411	73	95	103	158	M14×1.5

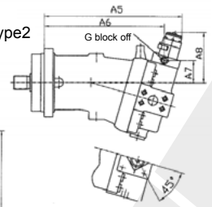
The remaining dimensions are shown in HD / HA

EP variable

assembly type 1



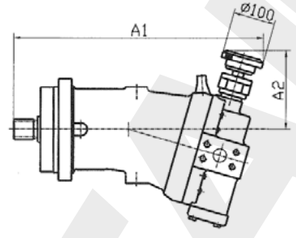
assembly type2



Spec	A_1	A_2	A_3	A_4	A_5	A_6	A_7	A_8
28	230	164	119	204	266	212	53	131
55	301	223	129	213	334	274	48	124
80	353	267	148	240	392	326	56	137
107	357	269.5	160	254	393	333	64.5	144
160	423	313	177	265	452	386	70	139
225	441	334	196	284	481	414	74.5	147

The remaining dimensions are shown in HD / HA

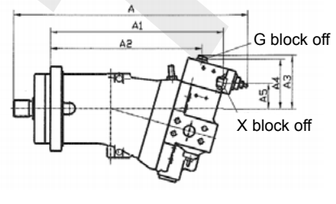
MA variable assembly type 1



Spec	A_1	A_2	A_3
28	269	128	188
55	329	134	208
80	381	138	223
107	390	137	230
160	441	149	254
225	470	155	272

The remaining dimensions are shown in HD / HA

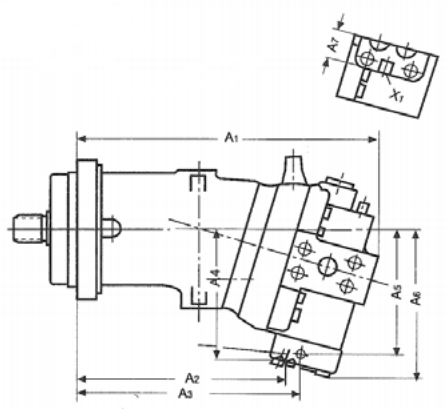
The HD1D variable



Spec	A	A_1	A_2	A_3	A_4	A_5
55	422	311	273	96	89	46
107	496	376.5	335.5	108	100	56

The remaining dimensions are shown in HD / HA

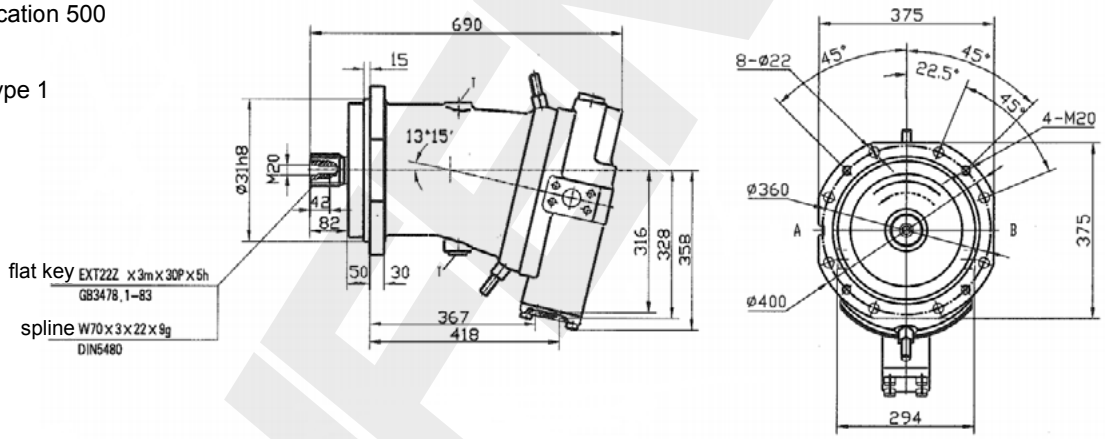
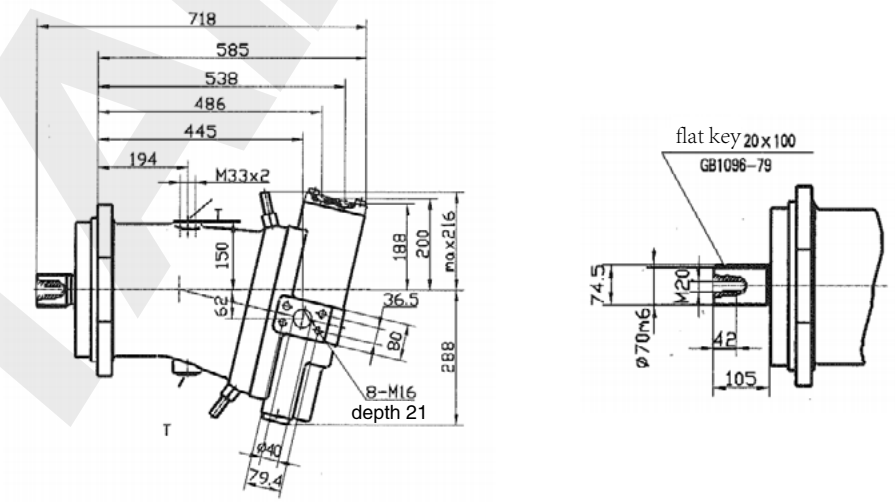
MO variable assembly type 1



Spec	A_1	A_2	A_3	A_4	A_5	A_6	A_7	X_1
55	301	208	224	138	130	155	30	M14×1.5
80	353	252	268	157	149	177	33	M14×1.5
107	357	257	273	169	161	188	33	M14×1.5
160	423	300	312	187	178	206	34	M14×1.5
225	441	322	334	206	197	225	34	M14×1.5

See other dimensions HD/HA

Size specification 500
HA variable
Assembly type 1



HD variable
Assembly type 2