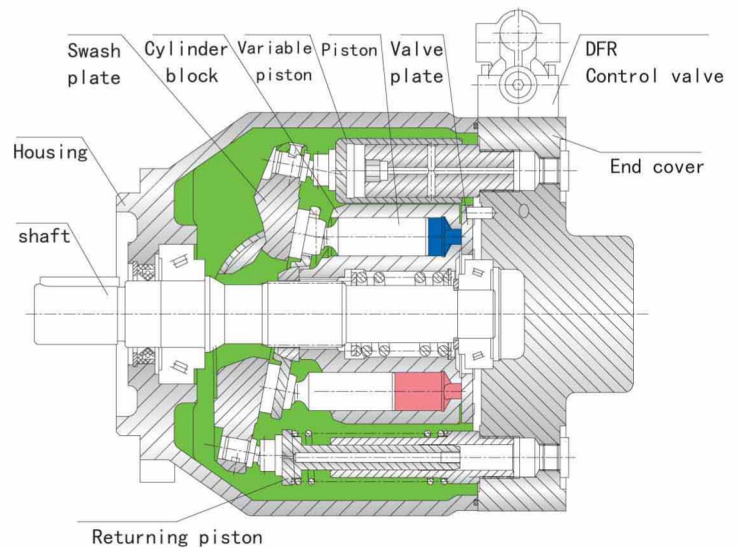


Variable displacement pump 10VO, Series 31



Features:

Axial piston pump L10VO in swashplate design is used for hydrostatic transmissions in open loop circuits. Flow is proportional to drive speed and displacement. By adjusting the position of the swashplate it is possible to smoothly vary the flow.



- Flange connections to SAE-UNC or SAE metric
- 2 leakage ports
- High permissible speeds
- Good suction characteristics
- Low noise level
- High power/weight ratio
- Long service life
- Short control times
- Axial and radial loading of drive shaft possible
- Wide range of controls
- Through drive option for multi-circuit system

Technical data

1、 Input operating pressure range

Absolute pressure at port S (A)

Pabs min.....0.8bar

Pabs max.....3bar

2、 Output operating pressure range

Pressure at port B

Nominal pressure P_N.....280bar

Peak pressure P_{max}.....350bar

3、 Case drain pressure

Maximum pressure of leakage fluid (at ports L, L1), Maximum 7 psi (0.5 bar) higher than input pressure at port S, but not higher than 30 psi (2 bar) absolute.

4、 Direction of flow

(S to B)

5、 Table of values (theoretical values, without considering η_{mh} and η_v ; values rounded)

Size				28	45	71	100
Displacement		V _{gmax}	cm ³	28	45	71	100
Max. speed	V _{gmax} at V _{gmax}	n _{omax}	rpm	3000	2600	2200	2000
Max. flow	n _{omax} at n _{omax}	Q _{omax}	L/min	84	117	156	200
Max. power	n _{omax} at n _{omax}	P _{omax}	kW	39	55	73	93
Max. torque	V _{gmax} at V _{gmax}	T _{max}	Nm	125	200	316	445
Weight (without fluid)		m	kg	15	21	33	45

Notes: Values shown are valid for an absolute pressure of 1 bar at suction port. If the flow is reduced or if the inlet pressure is increased the speed may be increased.

6、 Determination of size

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

Drive torque $T = \frac{1 \cdot 59 \cdot V_g \cdot \Delta P}{100 \cdot \eta_{mh}}$ [N·m]

Drive power $P = \frac{2 \pi \cdot T \cdot n}{60000} = \frac{Q \cdot \Delta P}{600 \cdot \eta_t}$ [Kw]

V_g=

geometric displacement [cm³] per rev.

ΔP= (bar) differential pressure [bar]

n= (rpm) speed [rpm]

η_v= volumetric efficiency

η_{mh}=

mechanical-hydraulic efficiency

η_t= (η_t=η_v·η_{mh}) total efficiency (η_t=η_v·η_{mh})

Variable displacement pump 10VO, Series 31

Ordering Code:

Axial piston unit

L10V	O	71	DR	/	31	R	-	P	S
------	---	----	----	---	----	---	---	---	---

Swash plate variable pump	L10V
Swash plate variable pump, for industrial	L10VS

Mode of operation

Pump, open circuit	0
--------------------	---

Size

Displacement V _{gmax} (cm ³)	28	45	71	100	140
---	----	----	----	-----	-----

Control devices

pressure control	●	●	●	○	—	DR
Remote control	●	●	●	○	—	DRG
Pressure and flow control, X port closed	●	●	●	●	—	DFR DFR1
Pressure flow and power control	●	●	●	●	—	DFLR
Electronic flow control+pressure control	●	●	●	●	—	RZQZ

Series

Series	31
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Direction of rotation

Viewed on drive shaft	clockwise	R
	counter-clockwise	L

Seals

Buna-N (NBR per DIN ISO 1629);	P
FPM (fluorocarbon)	V

Shaft end

	28	45	71	100	140	
SAE-splined shaft	●	●	●	●	—	S
SAE-splined shaft, reinforced (higher thru drive torques)	●	●	●	—	—	R
SAE-splined shaft, smaller size (not for pumps with thru drive)	—	●	—	●	—	U
SAE-splined shaft, reinforced U-type shaft	—	○	—	○	—	W
SAE-keyed shaft	●	●	●	●	—	K
parallel with key DIN 6885	●	●	●	●	—	P

Thru-drive			28	45	71	100	140	
Without through drive			●	●	●	●	—	N00
With thru-drive, pump with side port only								
Mounting flange	Shaft/coupling	For the mounting of:						
82-2 (SAE A)	16-4 (SAE A)	G2, GC2/GC3-1X	●	●	●	—	—	K01
101-2 (SAE B)	22-4 (SAE B)	A10V028 (shaft S), G3	●	○	●	—	—	K02
101-2 (SAE B)	22-4 (SAE B)	A10V028 (shaft S), G4	○	●	○	—	—	K68
127-2 (SAE C)	32-4 (SAE C)	A10V0 71 (shaft S)			●	—	—	K07

Service ports

Pressure port B and Suction port S)

28 45 71 100 140

(Rear ports, UNC mounting screws)	●	●	●	—	—	61	Port pos. 61, 11, 91 and 41 only for version without through drive
(Opposite side ports, UNC mounting screws)	●	●	●	●	—	62	
(Rear ports, metric mounting screws)	○	○	●	—	—	11	
(Opposite side ports, metric mounting screws)	●	●	●	●	—	12	
(Rear ports, UNC mounting screws)	—	—	●	—	—	91	
(Opposite side ports, UNC mounting screws)	—	—	●	—	—	92	
(Rear ports, metric mounting screws)			●		—	41	
(Opposite side ports, metric mounting screws)	—	—	○	—	—	42	

Mounting flange

28 45 71 100 140

SAE 2孔 SAE 2 hole	●	●	●	●	—	C
ISO 2孔 ISO 2 hole	●	●	●	●	—	A
SAE 4孔 SAE 4 hole	—	—	—	—	—	D

●	=	available
○	=	in preparation
—	=	not available

Multiple pumps

1. If a second Liyuan hydraulic pump is to be factory-mounted, then both ordering codes are to be specified, combined with a "+". Ordering code 1st pump + Ordering code 2nd pump
Ordering example: L10V071DR/31R-PSC62K02+L10V028DR/31R-PSC62N00
2. If a gear pump is to be factory-mounted please contact us.

Variable displacement pump 10VO, Series 31

Fluid

1、 Fluid : MR20S(Q/TCNK12-2001)

2、 Operating viscosity range

$$V_{opt} = \text{最佳工作粘度 } 16 \text{ mm}^2/\text{s} \sim 36 \text{ mm}^2/\text{s}$$

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

$$V_{opt} = \text{opt. operating viscosity } 16 \sim 36 \text{ mm}^2/\text{s}$$

referred to tank temperature (open loop circuit).

Limits of viscosity range

(The following values are valid for extreme operating conditions.)

$$V_{min} = 10 \text{ mm}^2/\text{s}$$

for short periods at max. leakage oil temperature of 80°C.

$$V_{max} = 1000 \text{ mm}^2/\text{s}$$

for short periods upon cold start.

3、 Temperature range

$$t_{min} = -20^{\circ}\text{C} ; t_{max} = +80^{\circ}\text{C}$$

4、 Filtration

In order to ensure reliable operation of the axial piston unit, the operating fluid must be maintained to a cleanliness class of at least: 16/19 to ISO4406. This may be achieved with filter elements, cleanliness class of pump leakage fluid 10um.

Installation notes

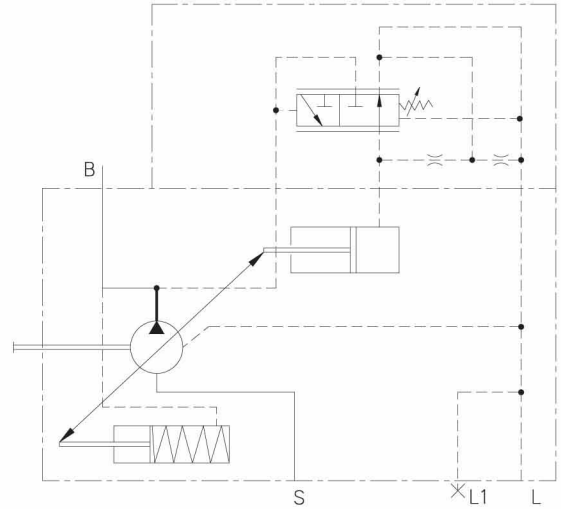
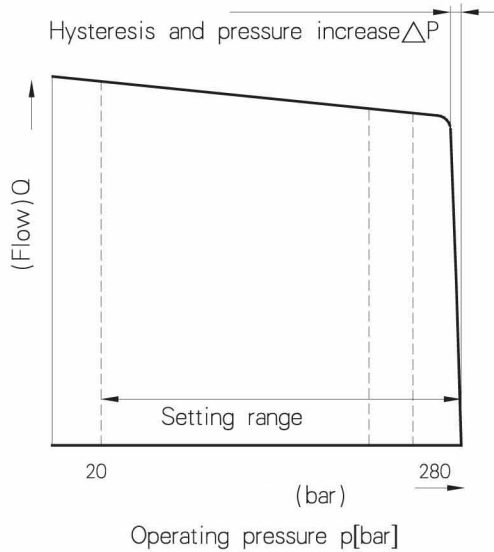
The pump housing must be filled with fluid during commissioning and remain full when operating.

The concentricity between engine transmission shaft and pump shaft must less than $\Phi 0.05\text{mm}$

DR Pressure control

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

Static characteristic
(at $n_1=1450\text{rpm}$; $t_{oil}=50^\circ\text{C}$)



Ports

B	Pressure port
S	Suction port
L, L1	(L1密封) Case drain ports (L1 sealed)

Control data

Hysteresis and repetitive accuracy Δp max. 3 bar

Max. pressure increase

Size		28	45	71	100
ΔP	Bar	4	6	8	10

Pilot oil consumption max. approx. 3 L/min

Variable displacement pump 10VO, Series 31

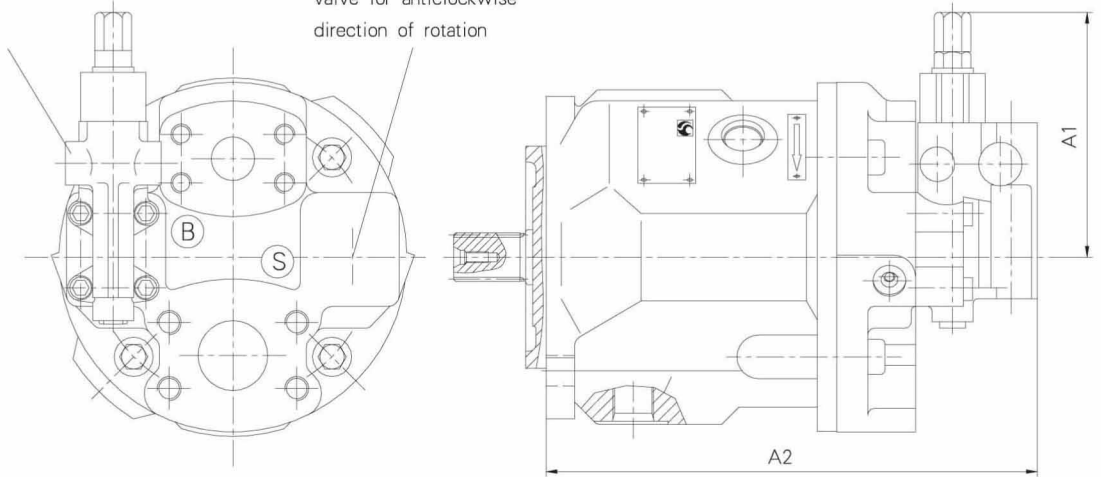
Unit dimensions DR

Service ports at rear; Models 61N00 and 11N00

28 100 Sizes 28 to 100

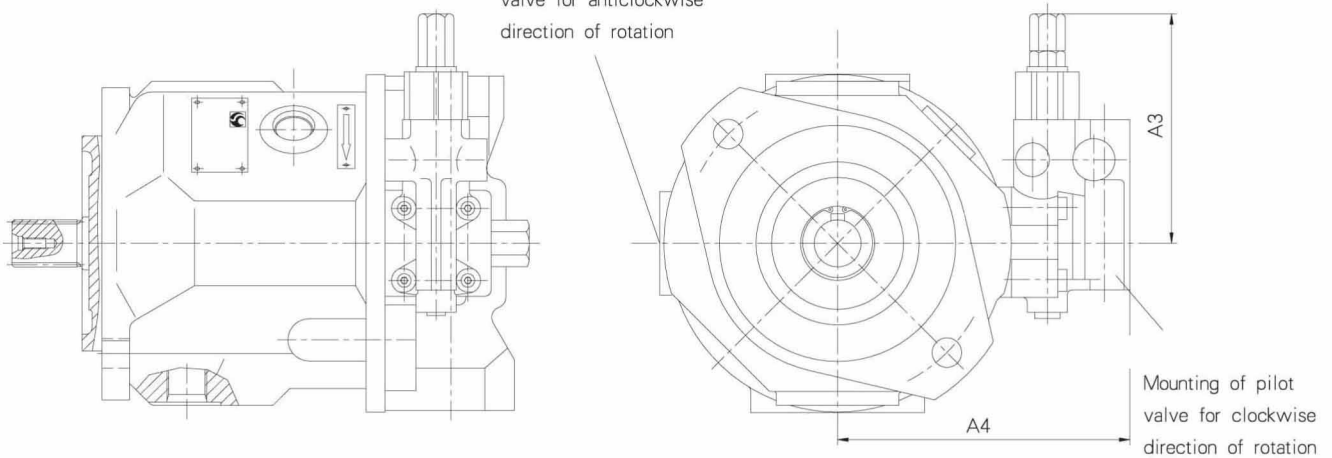
Mounting of pilot valve for clockwise direction of rotation

Mounting of pilot valve for anticlockwise direction of rotation



28 100 Sizes 28 to 100

Mounting of pilot valve for anticlockwise direction of rotation



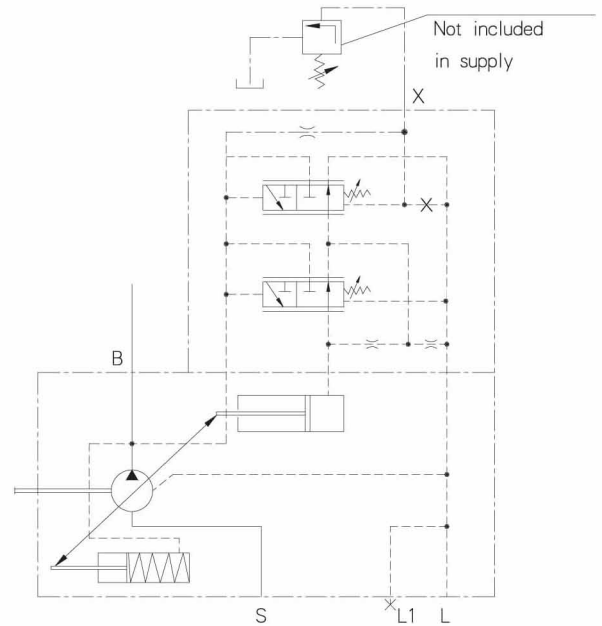
Sizes	A1	A2	A3	A4
28	108.5	226.2	108.5	136
45	108.5	245	108.5	146
71	106	279	108.5	160
100	108.5	344	108.5	158
140				

DRG Pressure control, remote control

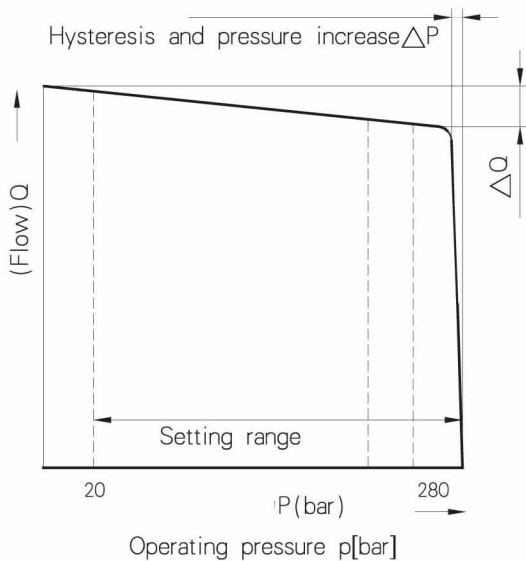
Function and design as for DR.

A pressure relief valve may be externally piped to port X for remote control purposes. It is not, however, included with the DRG control.

The differential pressure at the pilot valve is set as standard to 20 bar and this results in a pilot flow of 1,5 L/min. If another setting is required (in the range 10–22 bar), please state this in clear text.



Static characteristic
(at $n_1=1450\text{rpm}$; $t_{oil}=50^\circ\text{C}$)



Ports

B	Pressure port
S	Suction port
L, L1	Case drain ports (L1 sealed)
X	Pilot pressure port

Control data

Hysteresis and repetitive accuracy $p \dots \dots \dots$ max. 3 bar

Max. pressure increase

Size		28	45	71	100
ΔP	Bar	4	6	8	10

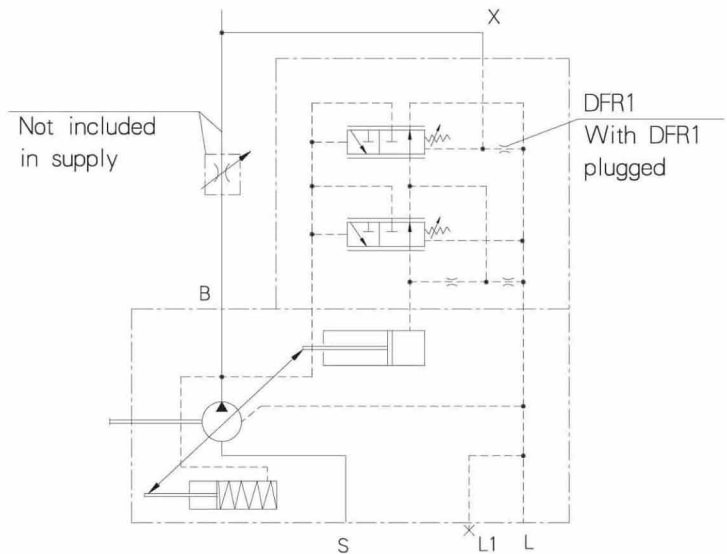
Pilot oil consumption $\dots \dots \dots$ max. approx. 4.5 L/min

Variable displacement pump 10VO, Series 31

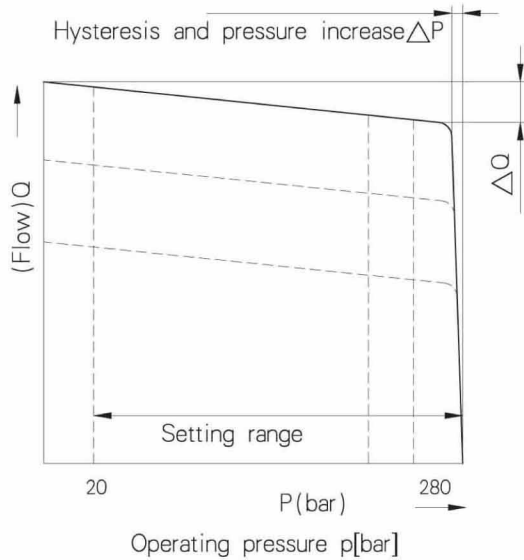
DFR/DFR1 Pressure/flow control

In addition to the pressure control function, the pump flow may be varied by means of a differential pressure at the actuator (e.g. an orifice).

In model DFR1 the X orifice is plugged.



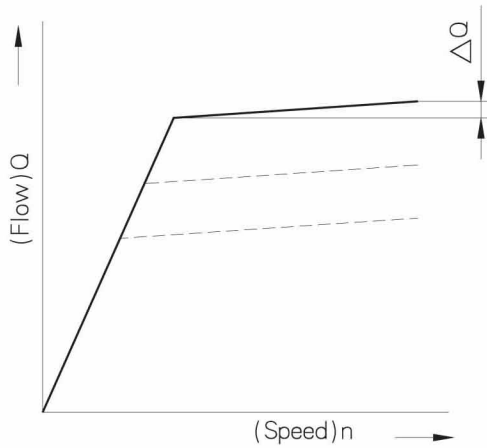
Static characteristic
(at $n_1=1450\text{rpm}$; $t_{oil}=50^\circ\text{C}$)



Ports

B	Pressure port
S	Suction port
L, L1	Case drain ports (L1 sealed)
X	Pilot pressure port

Static characteristic at variable speed



Flow control/differential pressure Δp :

Adjustable between 10 and 22 bar (higher values on request) Standard setting: 14 bar. If a different setting is required, please state in clear text.

When port X is unloaded to tank, a zero stroke pressure of $p = 18 \pm 2$ bar ("stand by") results.

Control data

For pressure control technical data see DR Pressure control

Max. flow deviation (hysteresis and increase) measured at drive speed $n = 1450$ rpm

Size	28	45	71	100
ΔQ_{max} L/min	1.0	1.8	2.8	4.0

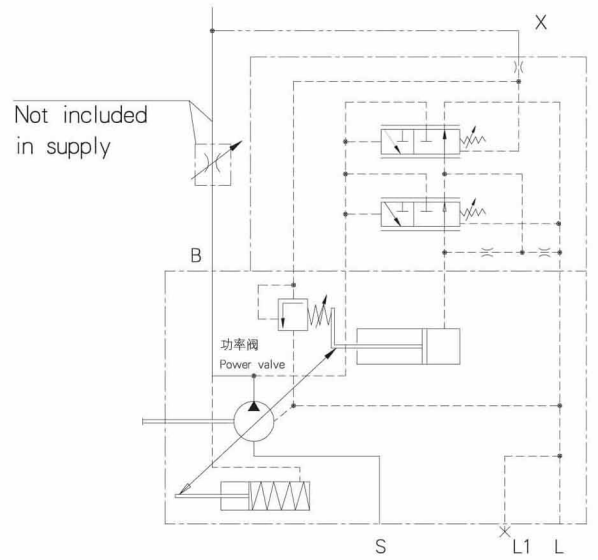
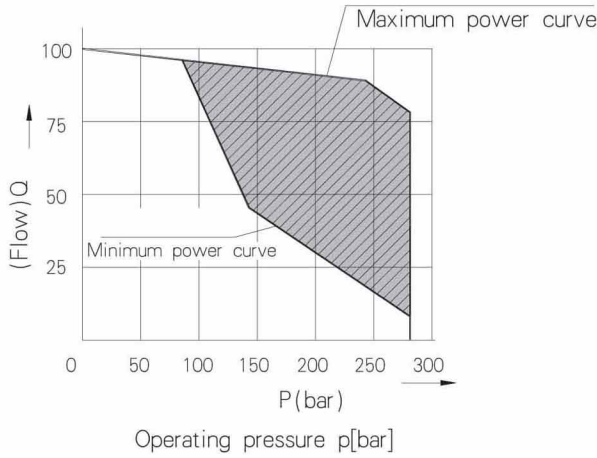
Pilot oil consumption DFR.....max. approx. 3–4,5 L/min

Pilot oil consumption DFR1.....max. approx. 3 L/min

DFLR Pressure/flow/power control

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

Flow control is possible below the limit of the power curve.



Ports

B	Pressure port
S	Suction port
L, L1	Case drain ports (L1 sealed)
X	Pilot pressure port

The power characteristic is factory-set, so please enter details in clear text, e.g. 20 kW at 1450 rpm.

Control data

For pressure control technical data see DR Pressure control.

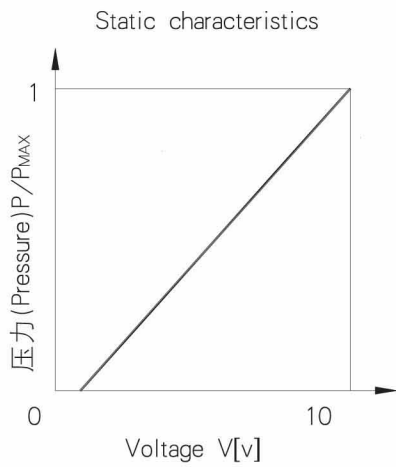
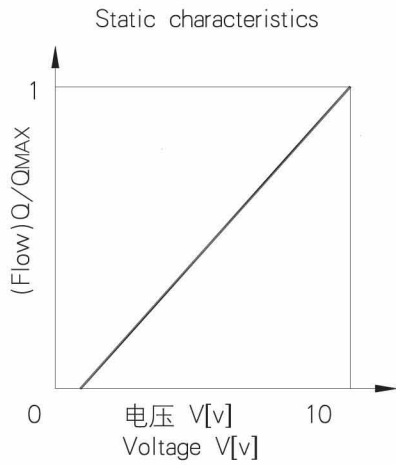
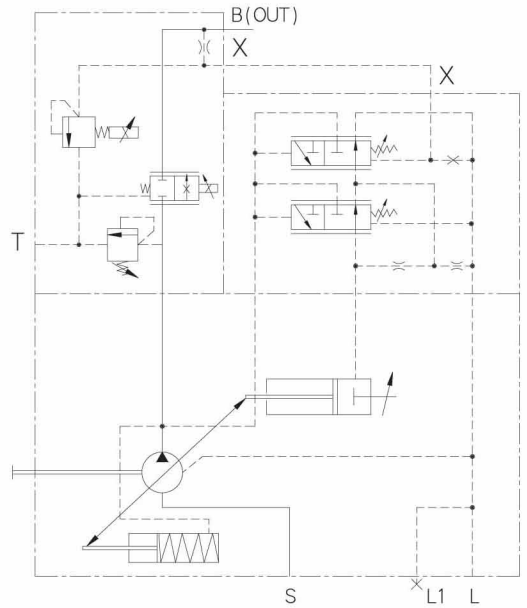
For flow control technical data see DFR control.

Start of control from 80 bar

Pilot oil consumption..... max. approx. 5,5 L/min

Electronic flow control + Electronic pressure control

Pressure and flow control of the pump are carried out by an electrically controlled proportional valve mounting at pressure port . Pressure and flow increased with voltage.



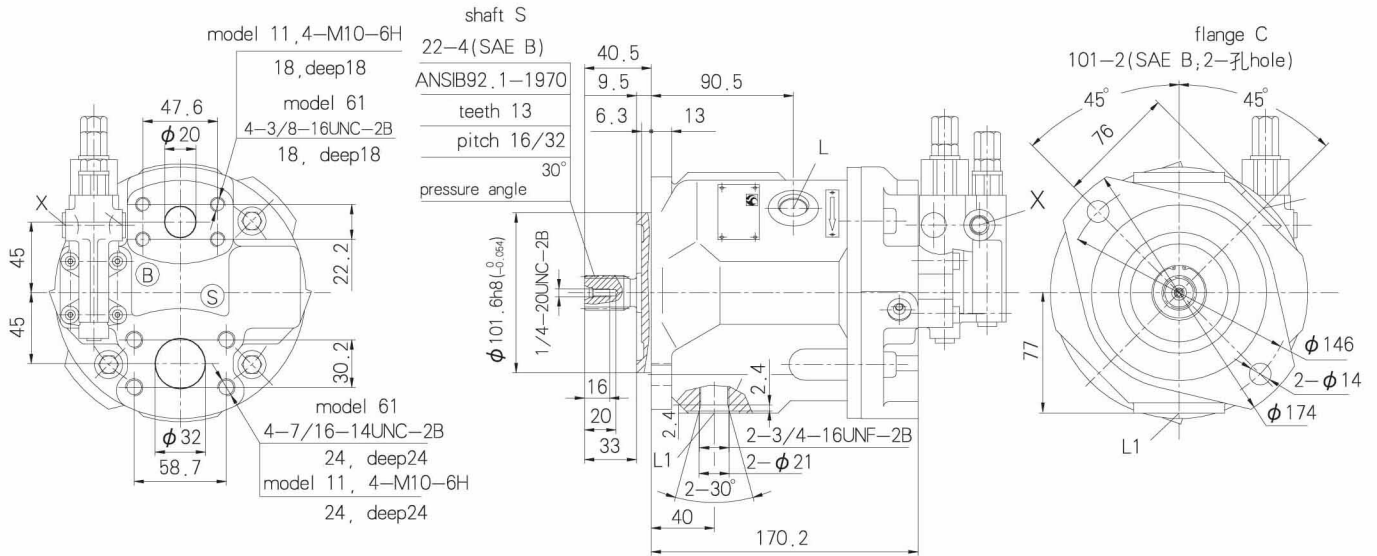
Ports

B	Pressure port
S	Suction port
L, L1	Case drain ports (L1 sealed)
T	drain port
X	Pilot pressure port

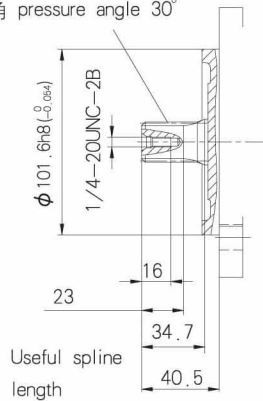
Mounting Dimension, Sizes 28

Service ports at rear, no through drive, Models 61N00 and 11N00 ;

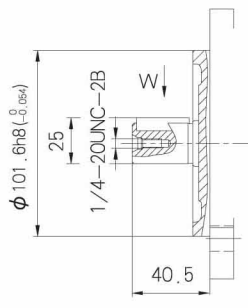
without considering adjustment



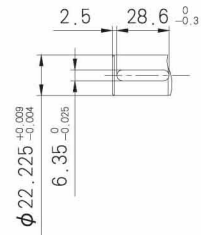
shaft R
22-4 (SAE B)
ANSIB92.1-1970
齿节pitch 16/32 齿数teeth 13
压力角 pressure angle 30°



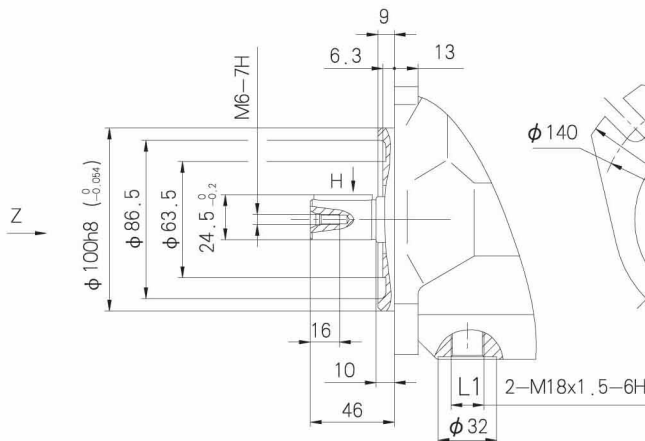
shaft k



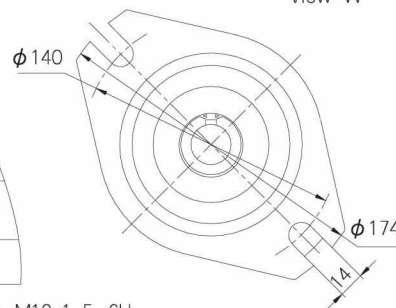
view W



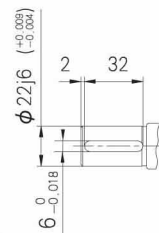
shaft P, flange A



view W



view H

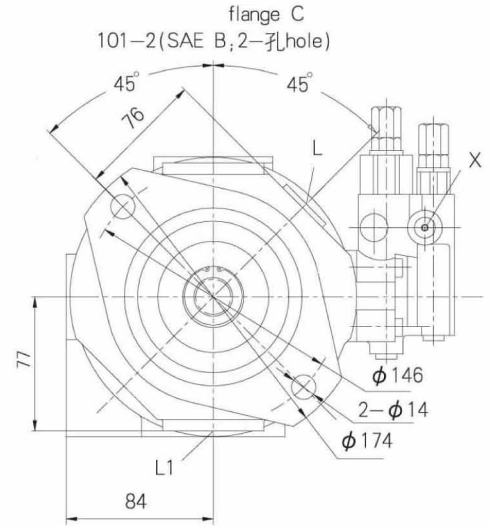
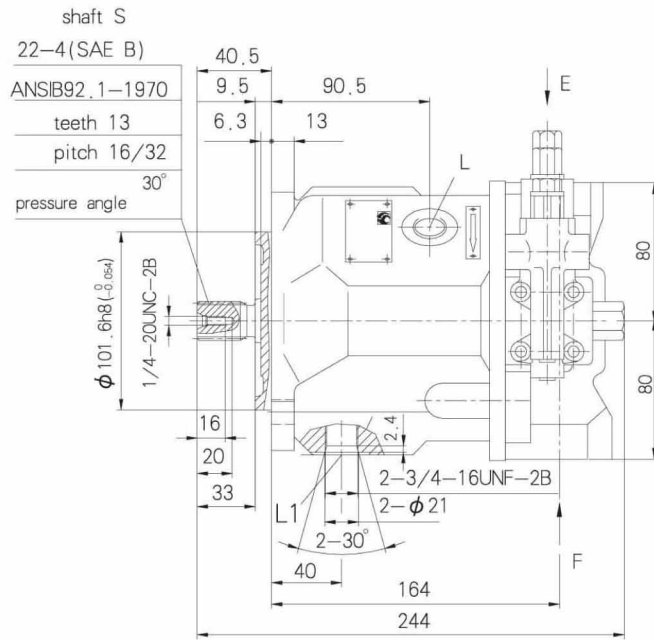


Variable displacement pump 10VO, Series 31

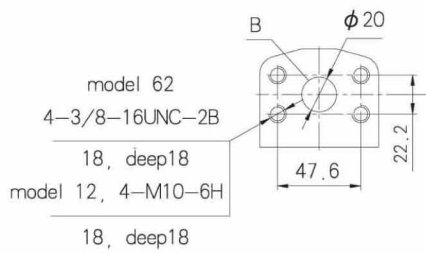
Mounting Dimension, Sizes 28

Service ports on sides; no through drive, Models 62N00 and 12N00

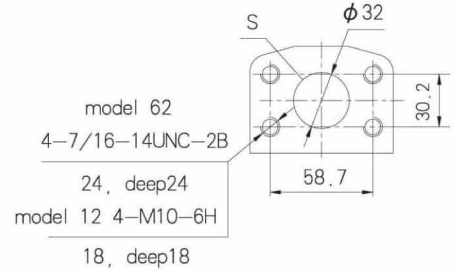
without considering adjustment



view E rotation



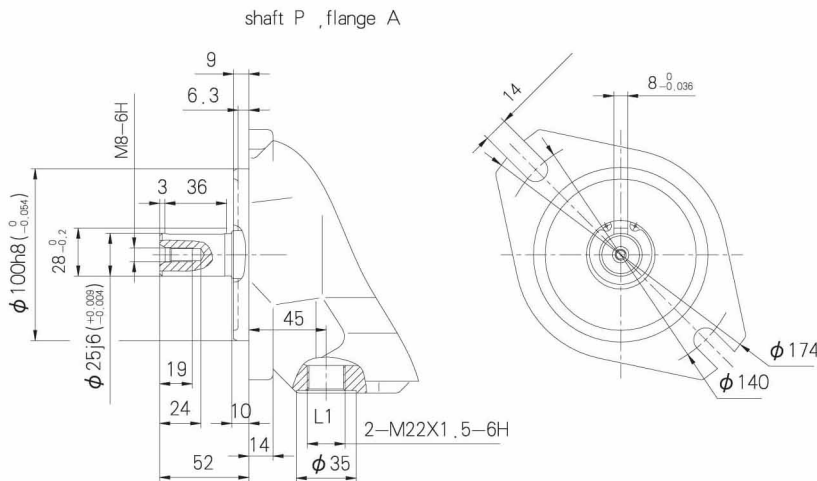
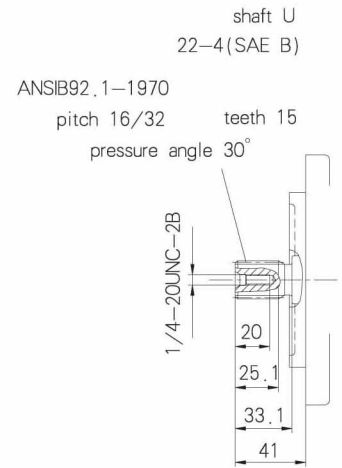
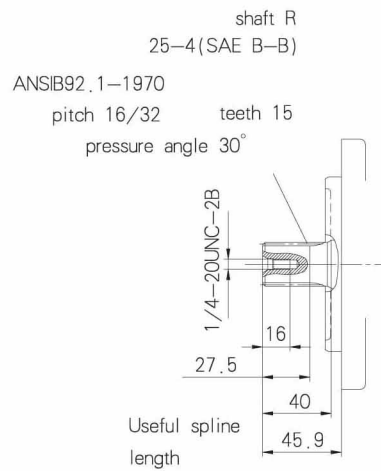
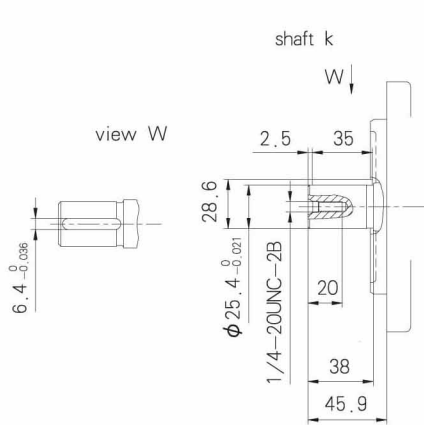
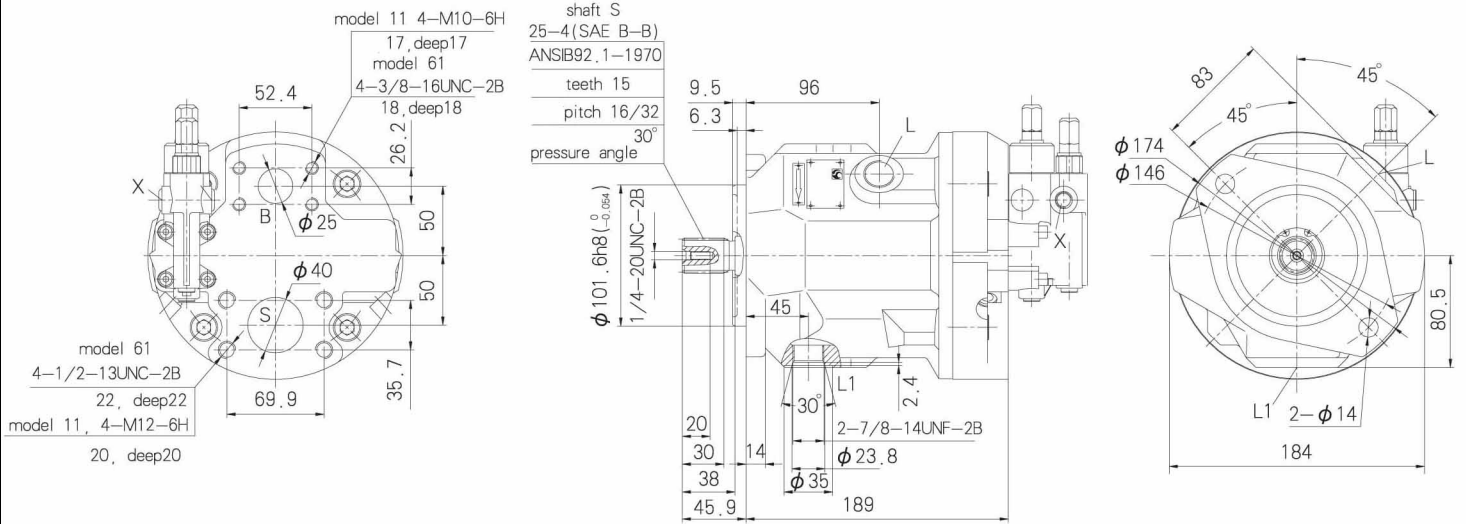
view F rotation



Mounting Dimension, Sizes 45

Service ports at rear; no through drive, Models 61N00 and 11N00

without considering adjustment

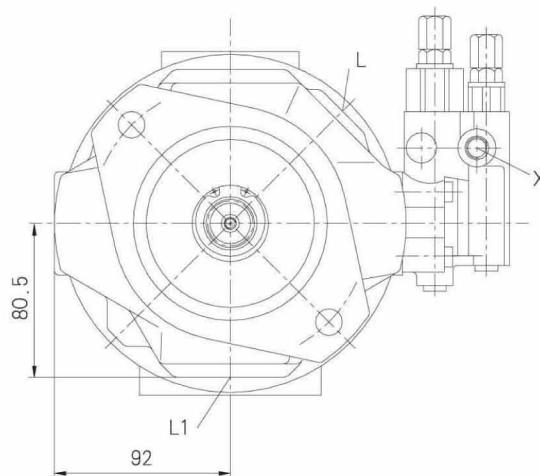
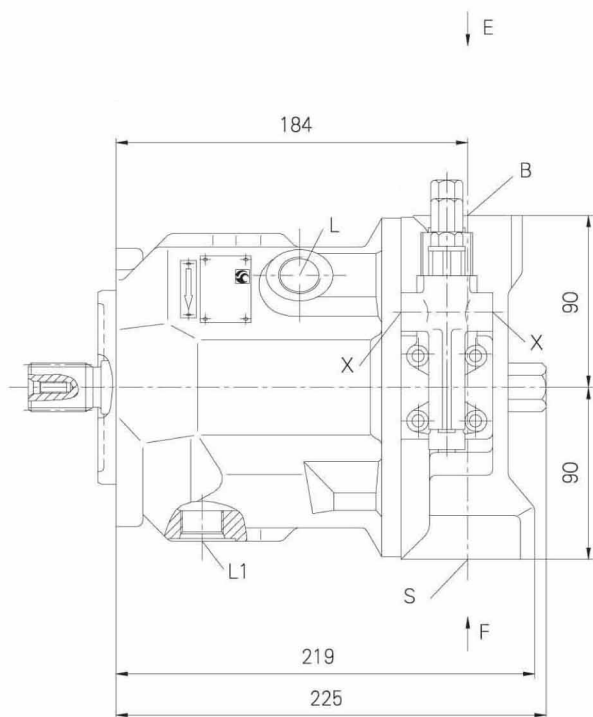


Variable displacement pump 10VO, Series 31

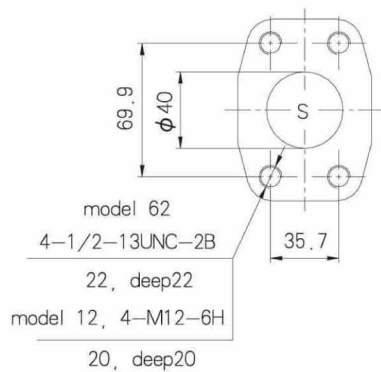
Mounting Dimension, Sizes 45

Service ports on sides; no through drive, Models 62N00 and 12N00

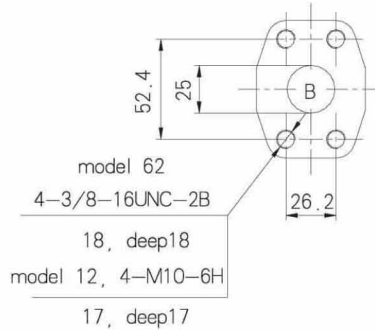
without considering adjustment



view F rotation



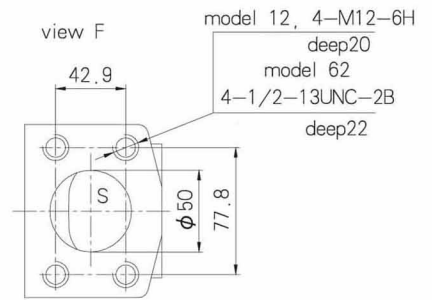
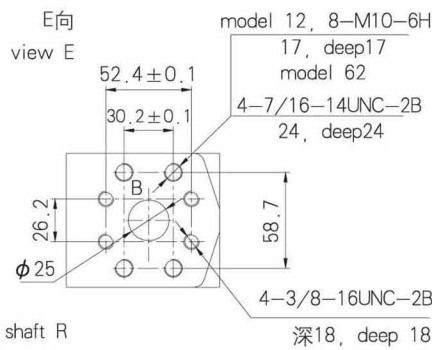
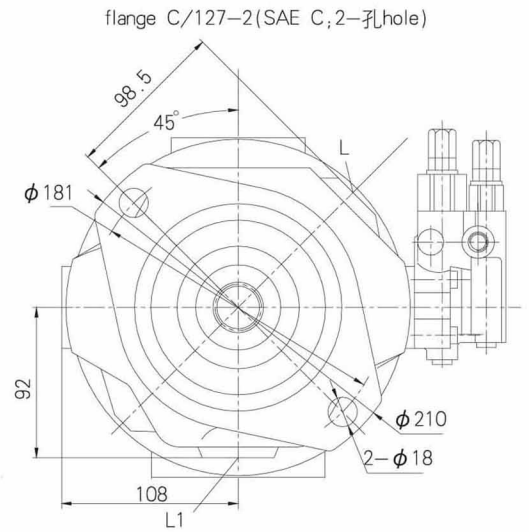
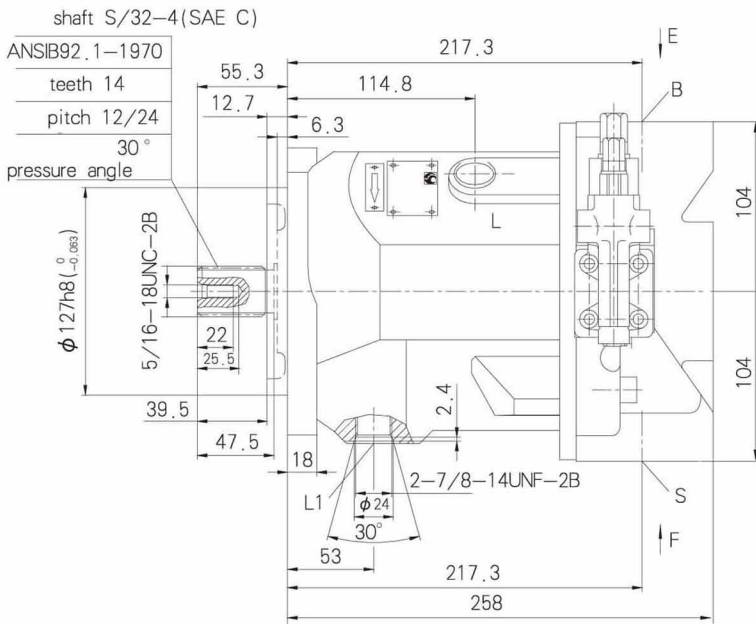
view E rotation



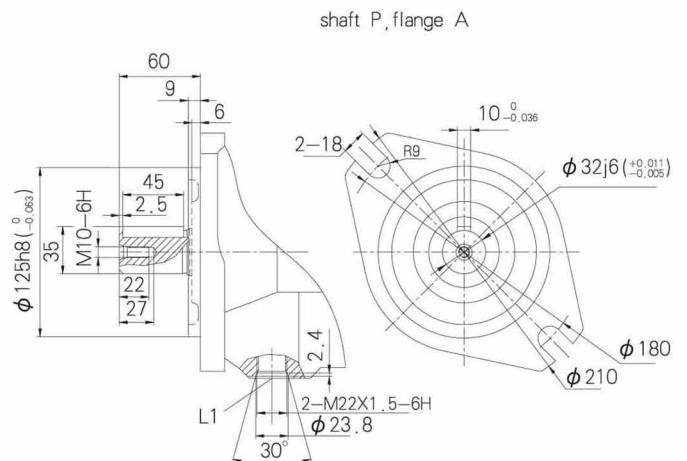
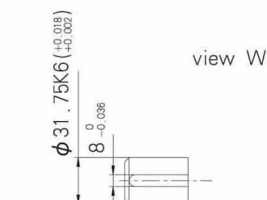
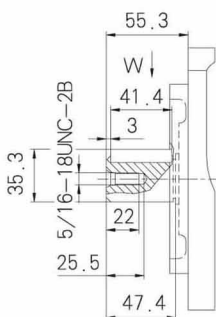
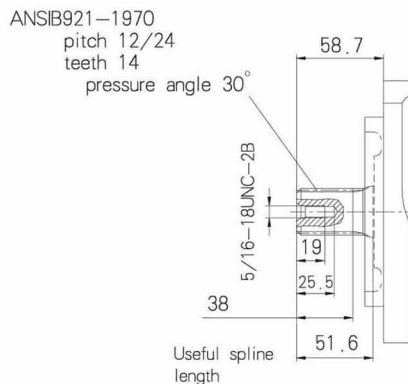
Mounting Dimension, Sizes 71

Service ports on sides; no through drive, Models 62N00 and 12N00

without considering adjustment



shaft R
K轴 shaft K
32-4 (SAE C)

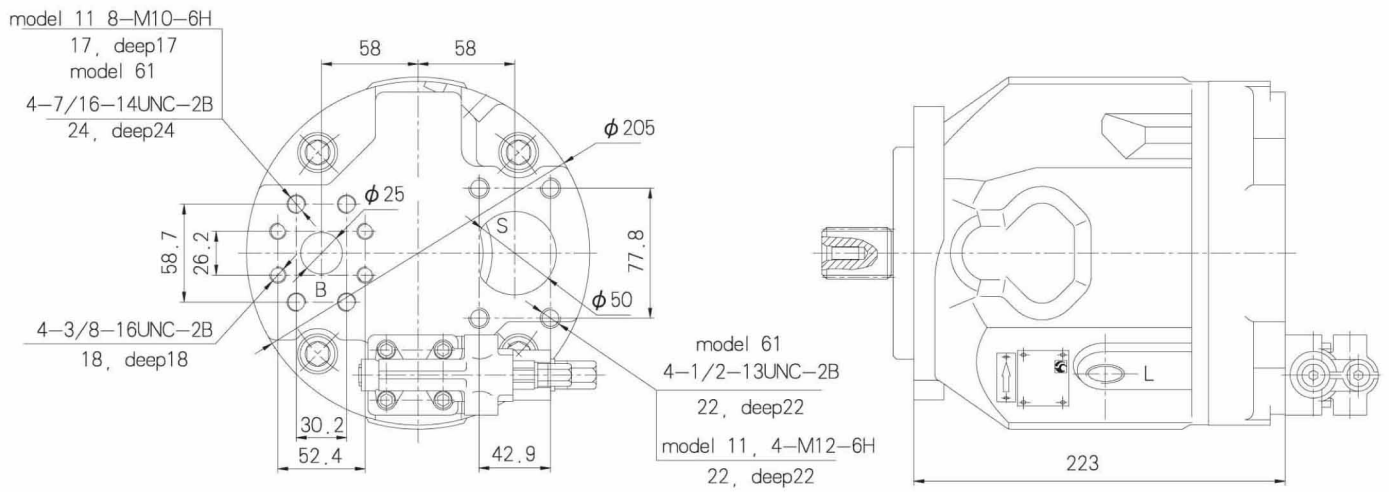


Variable displacement pump 10VO, Series 31

Mounting Dimension, Sizes 71

Service ports at rear; no through drive, Models 61N00 and 11N00 ;

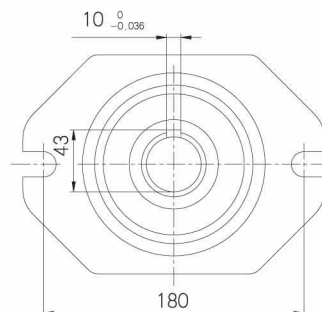
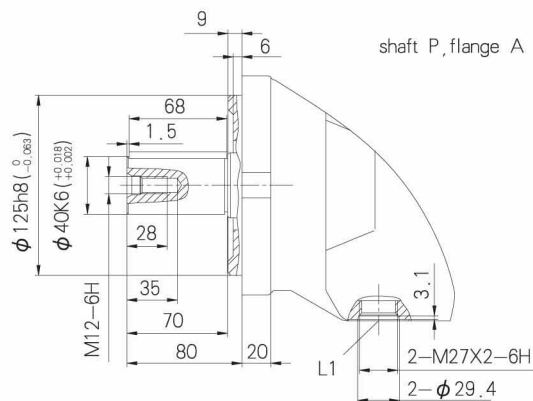
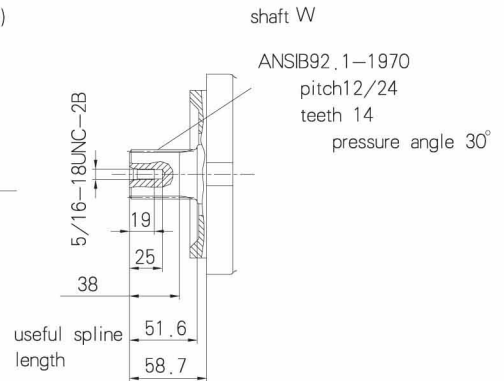
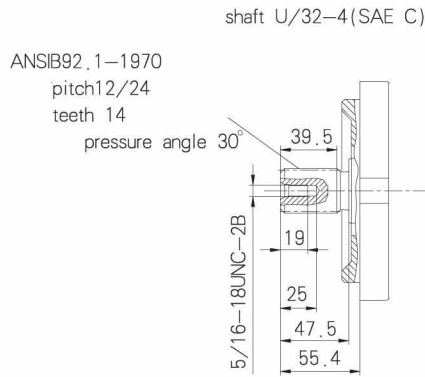
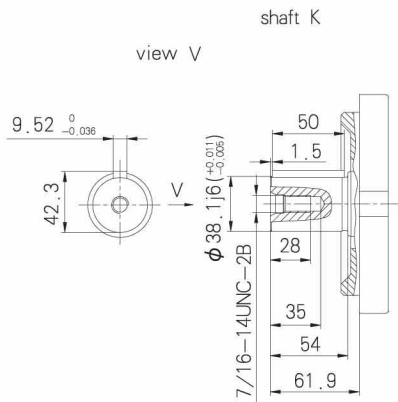
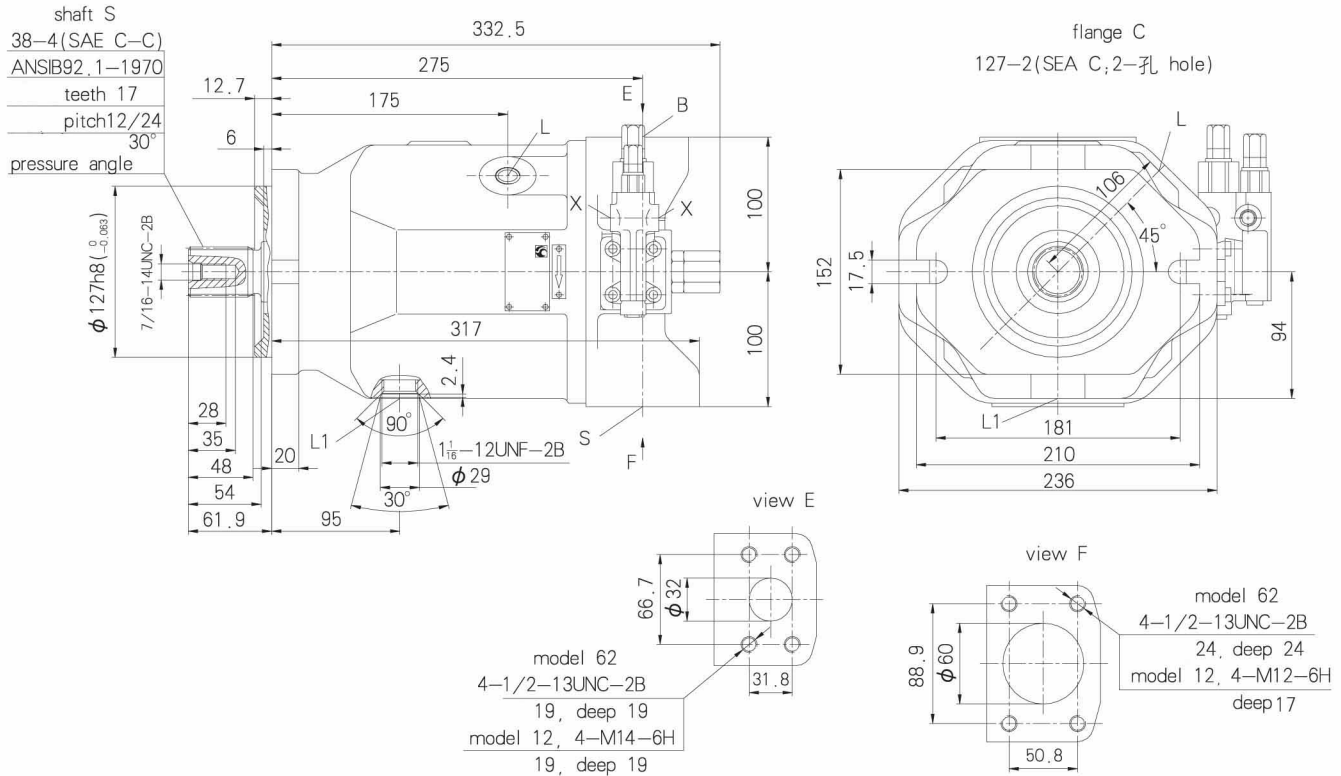
without considering adjustment



Mounting Dimension, Sizes 100

Service ports on sides; no through drive, Models 62N00 and 12N00

without considering adjustment

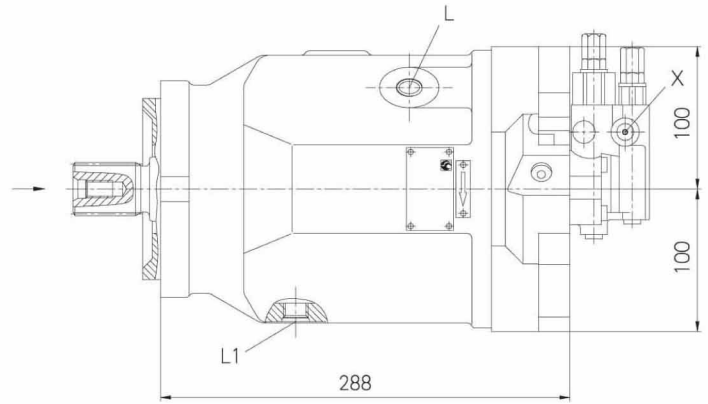
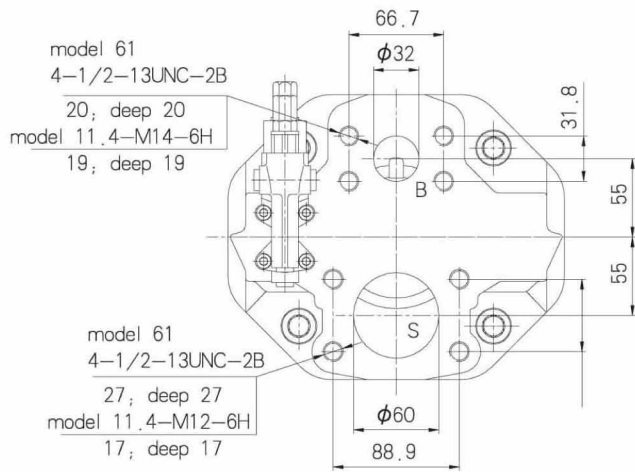


Variable displacement pump 10VO, Series 31

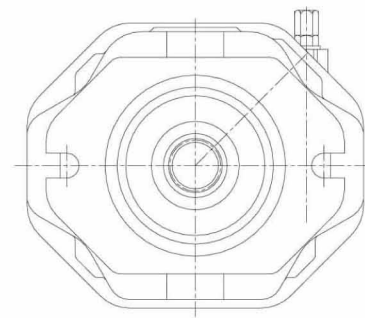
Mounting Dimension, Sizes 100

Service ports at rear; no through drive, Models 61N00 and 11N00 ;

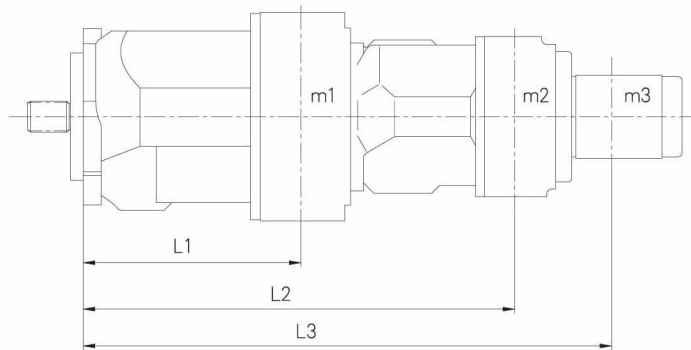
without considering adjustment



view W



Permissible moment of inertia



m_1, m_2, m_3 [Kg] Mass of pump

L_1, L_2, L_3 [mm] Distance between centres of gravity

$$Mm = (m_1 \cdot L_1 + m_2 \cdot L_2 + m_3 \cdot L_3) \cdot \frac{1}{102} \text{ [Nm]}$$

Sizes		28	45	71	100	140
Mm	Nm	88	137	216	300	
m1	kg	15	21	33	45	
L1	mm	110	130	150	160	

Through drive

Axial piston unit L10VO can be supplied with a through drive, as shown in the ordering code on page 3.

The type of through drive is determined by codes (K01–K07). If the combination pump is not mounted in the factory, the simple type code is sufficient.

Included in this case are:

coupling sleeve, seals and if necessary a sandwich flange.

Combination pumps

By mounting combination pumps circuits independent of each other are available for use.

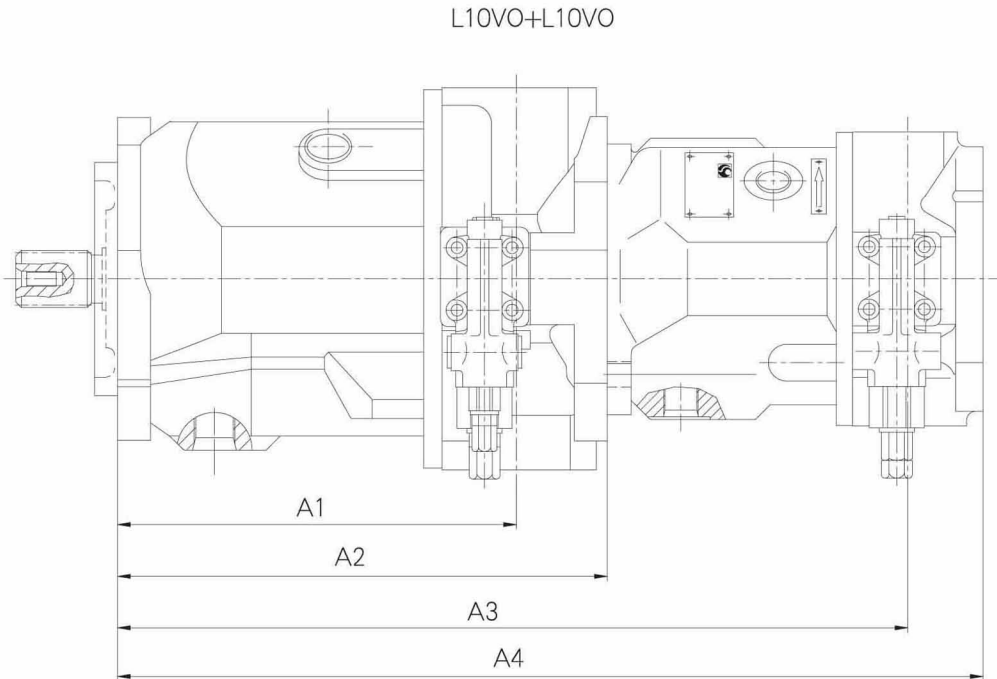
1. If the combination pump consists of 2 L10VO pumps and if these are to be delivered ready assembled, then the two type codes are to be combined with a "+".

Ordering example: L10VO71DR/31R–PSC62K02 +L10VO28DR/31R–PSC62N00

2. If a gear pump or radial piston pump is to be mounted in the factory as a second pump. It contains a list of the various pump combinations together with the type code of the first pump.

Variable displacement pump 10VO, Series 31

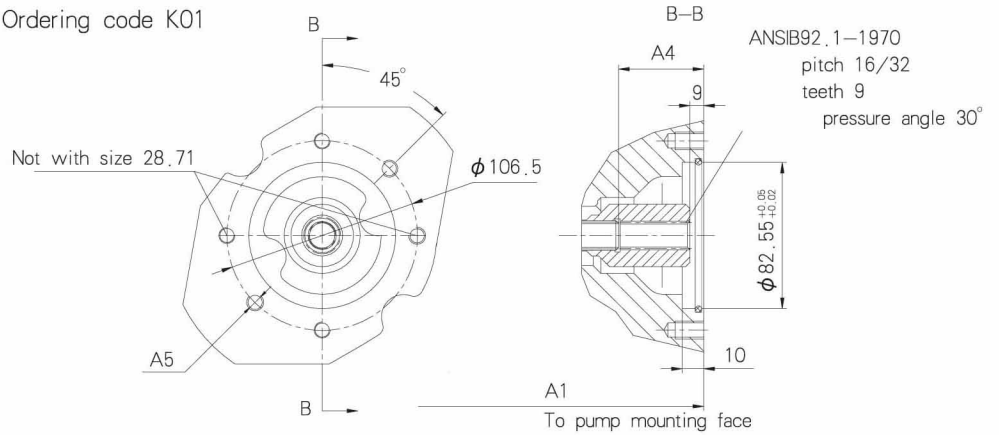
Unit dimensions of combination pumps



Pump 1 Pump 2	L10VO28				L10VO45				L10VO71				L10VO100				L10VO140			
	A1	A2	A3	A4	A1	A2	A3	A4	A1	A2	A3	A4	A1	A2	A3	A4	A1	A2	A3	A4
L10VO28	165	204	369	408	184	229	394	423	217	267	432	461	275	338	503	532				
L10VO45	—	—	—	—	184	229	413	458	217	267	451	486	275	338	522	557				
L10VO71	—	—	—	—	—	—	—	—	217	267	484	534	275	338	555	605				
L10VO100	—	—	—	—	—	—	—	—	—	—	—	—	275	338	613	676				
L10VO140	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—				

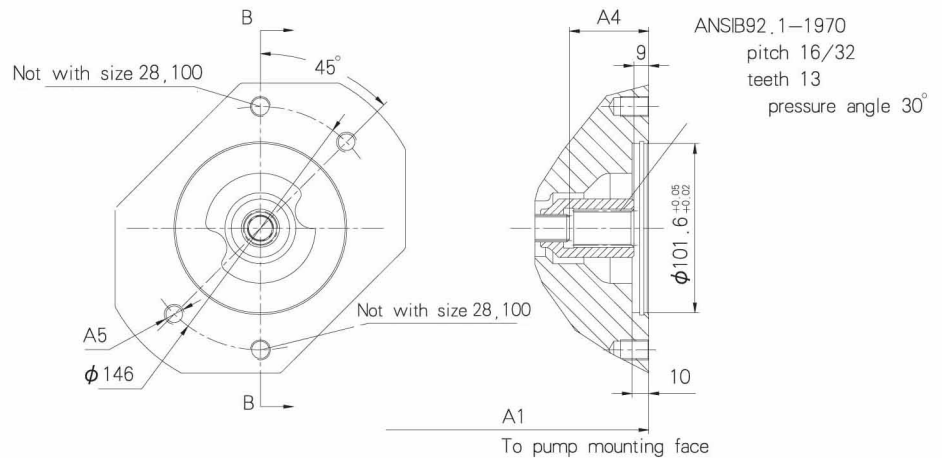
Dimensions of through drives

Flange SAE 82-2 (SAE A, 2-hole) for mounting of external gear pump G2 or internal gear pump 1 PF2GC2 /3-1X/XXXXR07MU2; Ordering code K01



Sizes	A1	A4	A5
28	204	47	4-M10-6H, 深16(16 deep)
45	229	53	6-M10-6H, 深16(16 deep)
71	267	60	4-M10-6H, 深20(20 deep)
100	340	65	6-M10-6H, 深20(20 deep)
140			

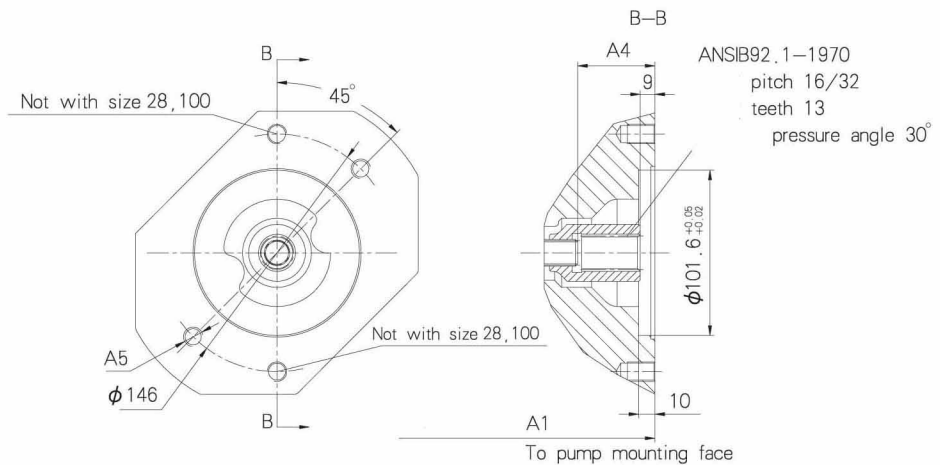
Flange SAE 101-2 (SAE B, 2-hole) for mounting of external gear pump G3 or L10VO28 (shaft S); Ordering code K02



Sizes	A1	A4	A5
28	204	47	2-M12-6H, 15(15 deep)
45	229	53	4-M12-6H, 18(18 deep)
71	267	60	4-M12-6H, 20(20 deep)
100	340	65	2-M12-6H, (Through hole)
140			

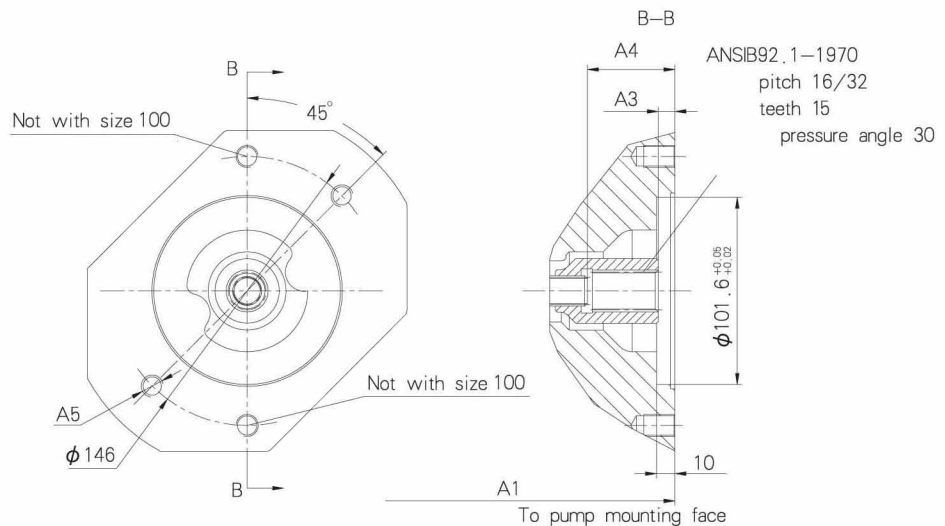
Variable displacement pump 10VO, Series 31

Flange SAE 101-2 (SAE B, 2-hole) for mounting of G4 or L10VO28 (shaft S); Ordering code K68



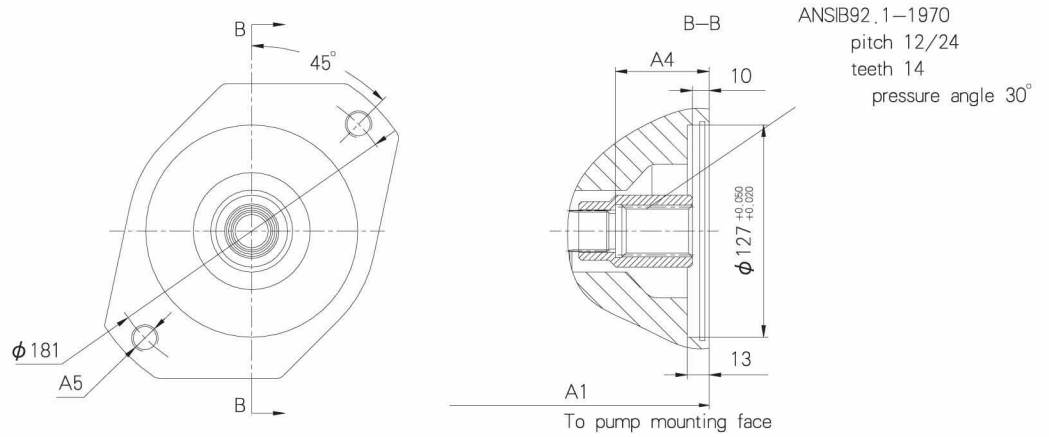
Sizes	A1	A4	A5
28	204	47	2-M12-6H, 15 (15 deep)
45	229	53	4-M12-6H, 18 (18 deep)
71	267	60	4-M12-6H, 20 (20 deep)
100	340	65	4-M12-6H, (Through hole)
140			

Flange SAE 101-2 (SAE B, 2-hole) for mounting of L10VO45—shaft S or external gear pump; Ordering code K04



Sizes	A1	A3	A4	A5
45	229	9	53	4-M12-6H, 18 (18 deep)
71	267	8	60	4-M12-6H, 20 (20 deep)
100	340	10	65	2-M12-6H, (through hole)
140				

Flange SAE 127-2 (SAE C, 2-hole) for mounting of L10VO71 (shaft S); Ordering code K07



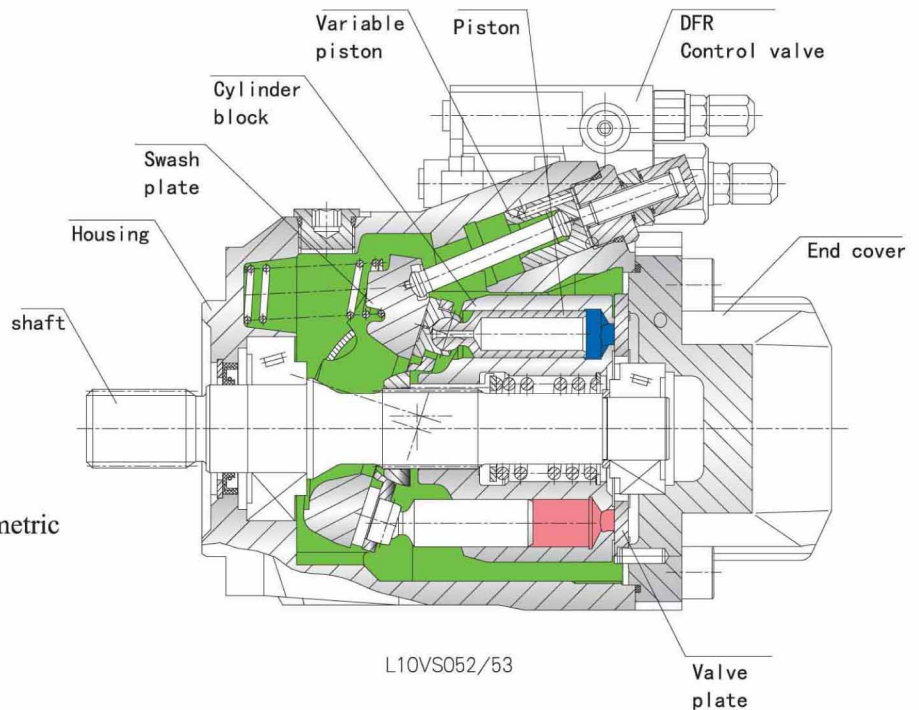
规格Sizes	A1	A4	A5
71	267	60	2-M16-6H, 18(18 deep)
100	340	65	2-M16-6H, (Through hole)
140			

Variable displacement pump 10VSO, Series 52/53



Features:

Axial piston pump L10VSO in swashplate design is used for hydrostatic transmissions in open loop circuits. Flow is proportional to drive speed and displacement. By adjusting the position of the swashplate it is possible to smoothly vary the flow.



- Flange connections to SAE-UNC or SAE metric
- 2 leakage ports
- High permissible speeds
- Good suction characteristics
- Low noise level
- High power/weight ratio
- Long service life
- Short control times
- Axial and radial loading of drive shaft possible
- Wide range of controls
- Through drive option for multi-circuit system

Technical data

1、Absolute pressure at port S (A)

Pabs min.....0.8bar

Pabs max.....3bar

2、Output operating pressure range

Pressure at port B

Nominal pressure P_N.....250bar

Peak pressure P_{max}.....315bar

3、Case drain pressure

Maximum pressure of leakage fluid (at ports L, L1), Maximum 7 psi (0.5 bar) higher than input pressure at port S, but not higher than 30 psi (2 bar) absolute.

4、Direction of flow

S至B (S to B)

5、Table of values (theoretical values, without considering η_{mh} and η_v ; values rounded)

Size				28	45	60	85
Displacement		V _{gmax}	cm ³	28	45	60	85
Max. speed	V _{gmax} at V _{gmax}	n _{omax}	rpm		2600	2700	
Max. flow	n _{omax} at n _{omax}	Q _{omax}	L/min		117	162	
Max. power	n _{omax} at n _{omax}	P _{omax}	kW		49	68	
Max. torque	V _{gmax} at V _{gmax}	T _{max}	Nm		179	238	
Weight (without fluid)		m	kg		18	22	

Notes: Values shown are valid for an absolute pressure of 1 bar at suction port, If the flow is reduced or if the inlet pressure is increased the speed may be increased according to the diagram.

6、Determination of size

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

Drive torque $T = \frac{1 \cdot 59 \cdot Vg \cdot \Delta P}{100 \cdot \eta_{mh}}$ [N·m]

Drive power $P = \frac{2\pi \cdot T \cdot n}{60000} = \frac{Q \cdot \Delta P}{600 \cdot \eta_t}$ [Kw]

V_g=

geometric displacement [cm³] per rev.

ΔP= (bar) differential pressure [bar]

n=转速 (rpm) speed [rpm]

η_v =容积效率 volumetric efficiency

η_{mh} =.....

mechanical-hydraulic efficiency

total efficiency ($\eta_t = \eta_v \cdot \eta_{mh}$)

Variable displacement pump 10VSO, Series 52/53

Ordering Code:

L10VS	O	45	DFR	/	52/53	R	-	P	S	C
-------	---	----	-----	---	-------	---	---	---	---	---

Axial piston unit

Swash plate variable pump	L10VS
---------------------------	-------

Mode of operation

Pump, open circuit	O
--------------------	---

Size

Displacement	Vgmax (cm ³)	28	45	60	85
--------------	--------------------------	----	----	----	----

Control devices

pressure control	—	●	●	—	DR
Remote control	—	●	●	—	DRG
Pressure and flow control, X port closed	—	●	●	—	DFR DFR1

Series

Series	52/53
--------	-------

Direction of rotation

Viewed on drive shaft	顺时针 clockwise	R
	逆时针 counter-clockwise	L

Seals

Buna-N (NBR per DIN ISO 1629);	P
(fluorocarbon)	V

Shaft end

	28	45	60	85	
SAE-splined shaft	—	●	●	—	S
SAE-splined shaft, reinforced (higher thru drive torques)	—	●	○	—	R
SAE-splined shaft, smaller size (not for pumps with thru drive)	—	●	●	—	U
SAE-splined shaft, reinforced U-type shaft	—	—	—	—	W
SAE-keyed shaft	—	●	○	—	K
parallel with key DIN 6885	—	●	○	—	P

Mounting flange

	28	45	60	85	
SAE 2孔 SAE 2 hole	—	●	●	—	C
ISO 2孔 ISO 2 hole	—	○	○	—	A
SAE 4孔 SAE 4 hole	—	○	●	—	D

Thru-drive

			28	45	60	85	
Without through drive			-	●	●	-	N00
With thru-drive, pump with side port only							
Mounting flange	Shaft/coupling	For the mounting of:					
82-2 (SAE A)	16-4 (SAE A)	G2, GC2/GC3-1X	-	●	○	-	K01
101-2 (SAE B)	25-4 (SAE B-B)	L10VS045 (shaft S);PGH4	-	●	○	-	K04
100-2		Gear pump	-	●	-	-	K10
80-2	Keyed shaft	Gear pump	-	●	-	-	KP1

Service ports

Pressure port B and Suction port S)

	28	45	60	85	
(Rear ports, UNC mounting screws)	-	○	●	-	61
(Opposite side ports, UNC mounting screws)	-	●	●	-	62
(Rear ports, metric mounting screws)	-	○	●	-	11
(Opposite side ports, metric mounting screws)	-	●	●	-	12
(SAE-threaded rear)	-	●	○	-	64

Port pos. 61, 11 and 64 only for version without through drive

●	=	available
○	=	in preparation
-	=	not available

Multiple pumps

1. If a second Liyuan hydraulic pump is to be factory-mounted, then both ordering codes are to be specified, combined with a "+". Ordering code 1st pump + Ordering code 2nd pump

Ordering example: L10VS045DFR/52R-PSC62K04+L10VS045DR/52R-PSC62N00

2. If a gear pump is to be factory-mounted please contact us.

Variable displacement pump 10VSO, Series 52/53

Fluid

1、 Fluid : MR20S (Q/TCNK12-2001)

2、 Operating viscosity range

$$V_{opt} = 16 \text{ mm}^2/\text{s} \sim 36 \text{ mm}^2/\text{s}$$

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

$$V_{opt} = \text{opt. operating viscosity } 16 \text{ mm}^2/\text{s} \sim 36 \text{ mm}^2/\text{s}$$

referred to tank temperature (open loop circuit).

Limits of viscosity range

(The following values are valid for extreme operating conditions.)

$$V_{min} = 10 \text{ mm}^2/\text{s}$$

for short periods at max. leakage oil temperature of 80°C.

$$V_{max} = 1000 \text{ mm}^2/\text{s}$$

for short periods upon cold start.

3、 Temperature range

$$t_{min} = -20^\circ\text{C} ; t_{max} = +80^\circ\text{C}$$

4、 Filtration

In order to ensure reliable operation of the axial piston unit, the operating fluid must be maintained to a cleanliness class of at least: 16/19 to ISO4406. This may be achieved with filter elements, cleanliness class of pump leakage fluid 10um.

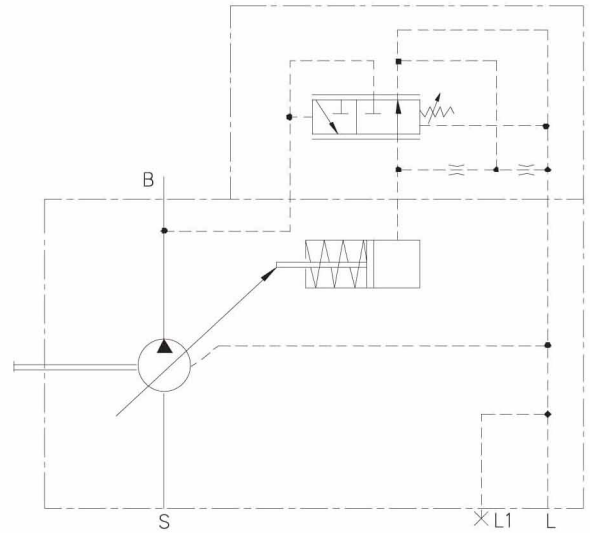
Installation notes

The pump housing must be filled with fluid during commissioning and remain full when operating.

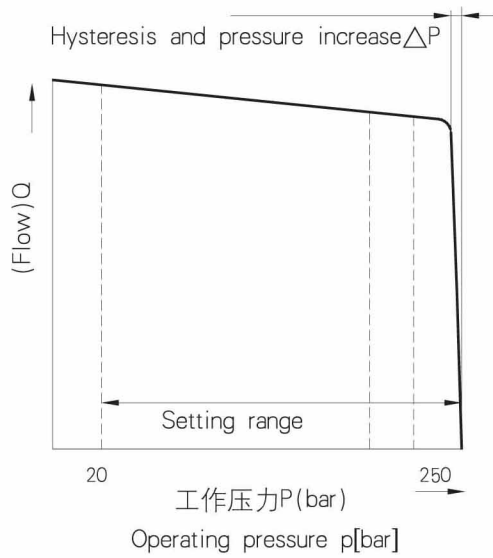
The concentricity between engine transmission shaft and pump shaft must less than $\Phi 0.05\text{mm}$

DR Pressure control

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



Static characteristic
(at $n_1=1450\text{rpm}$; $t_{oil}=50^\circ\text{C}$)



Ports

B	Pressure port
S	Suction port
L, L1	Case drain ports (L1 sealed)

Control data

Hysteresis and repetitive accuracy Δp max. 3 bar

Max. pressure increase

规格Size		28	45	60	85
ΔP	Bar		6	8	

Pilot oil consumption..... max. approx. 3 L/min

Variable displacement pump 10VSO, Series 52/53

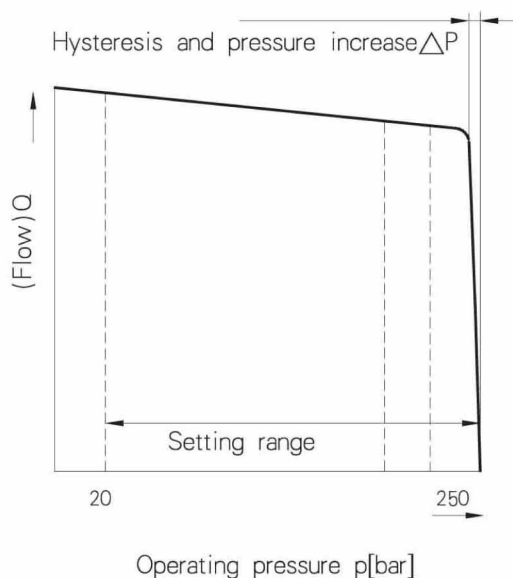
Pressure control, remote control

Function and design as for DR.

A pressure relief valve may be externally piped to port X for remote control purposes. It is not, however, included with the DRG control.

The differential pressure at the pilot valve is set as standard to 20 bar and this results in a pilot flow of 1,5 L/min. If another setting is required (in the range 10–22 bar), please state this in clear text.

Static characteristic
(at $n_1=1450\text{rpm}$; $t_{oil}=50^\circ\text{C}$)



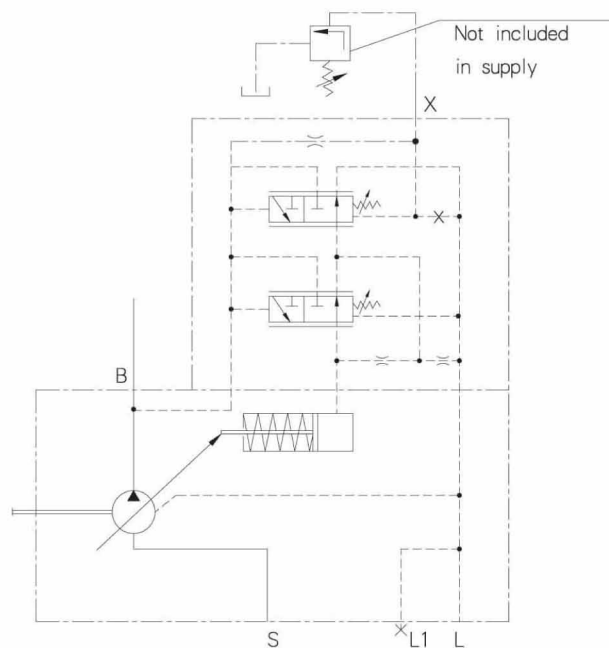
Control data

Hysteresis and repetitive accuracy ΔP max. 3 bar

Max. pressure increase

规格Size		28	45	60	85
ΔP	Bar		6	8	

Pilot oil consumption..... max. approx. 4.5 L/min



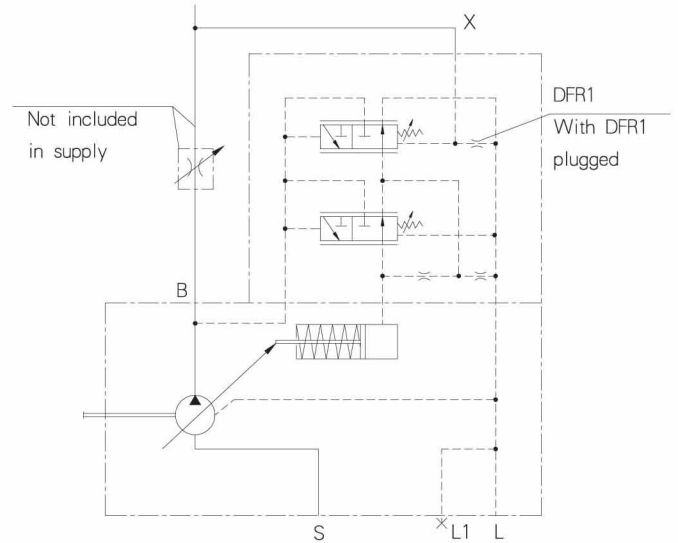
Ports

B	Pressure port
S	Suction port
L, L1	Case drain ports (L1 sealed)
X	Pilot pressure port

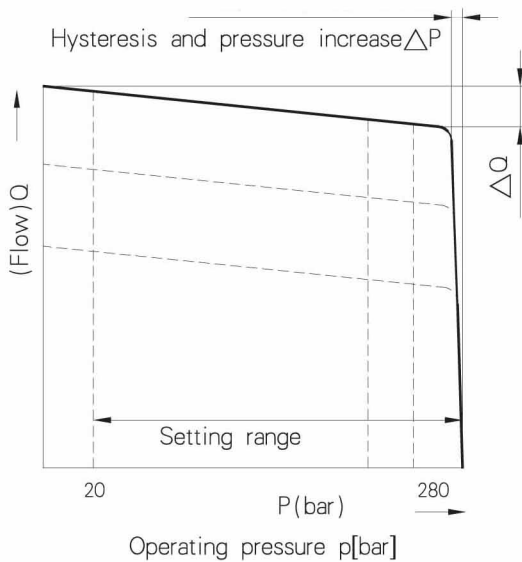
Pressure/flow control

In addition to the pressure control function, the pump flow may be varied by means of a differential pressure at the actuator (e.g. an orifice).

In model DFR1 the X orifice is plugged.



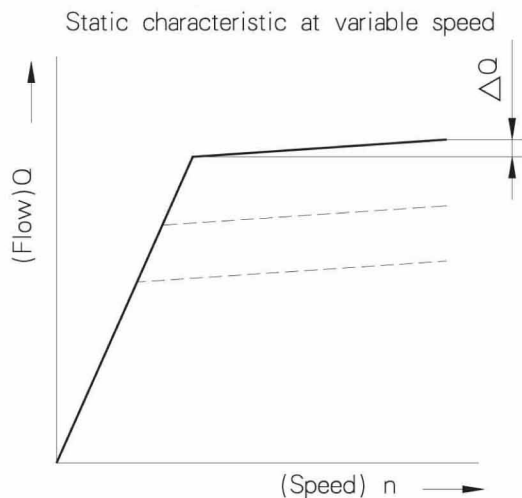
Static characteristic
(at $n_1=1450\text{rpm}$; $t_{oil}=50^\circ\text{C}$)



Ports

B	Pressure port
S	Suction port
L, L1	Case drain ports (L1 sealed)
X	Pilot pressure port

Variable displacement pump 10VSO, Series 52/53



Flow control/differential pressure Δp :

Adjustable between 10 and 22 bar (higher values on request) Standard setting: 14 bar. If a different setting is required, please state in clear text.

When port X is unloaded to tank, a zero stroke pressure of $p = 18.2$ bar ("stand by") results.

Control data

For pressure control technical data see DR Pressure control

Max. flow deviation (hysteresis and increase) measured at drive speed $n = 1450$ rpm

规格Size		28	45	60	85
ΔQ_{\max}	L/min		1.8	2.5	

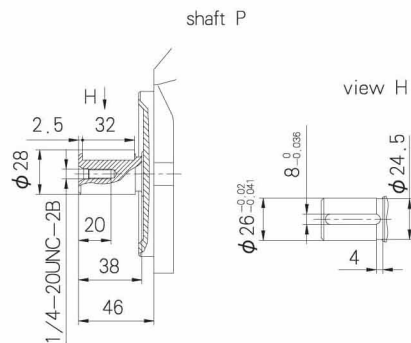
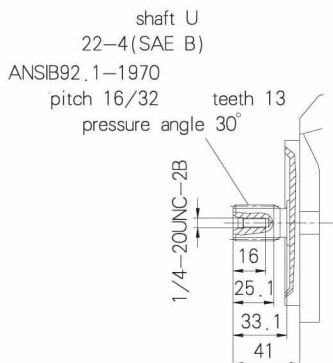
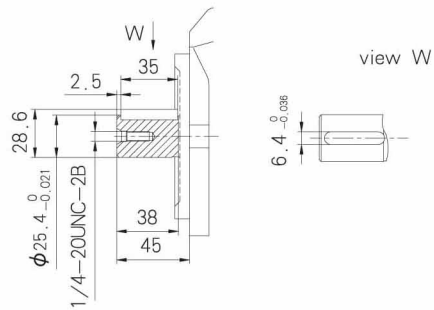
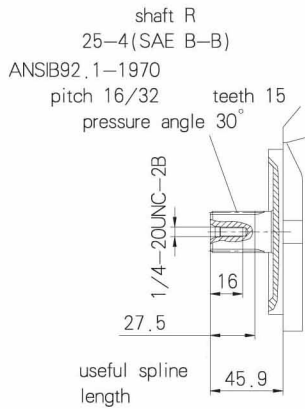
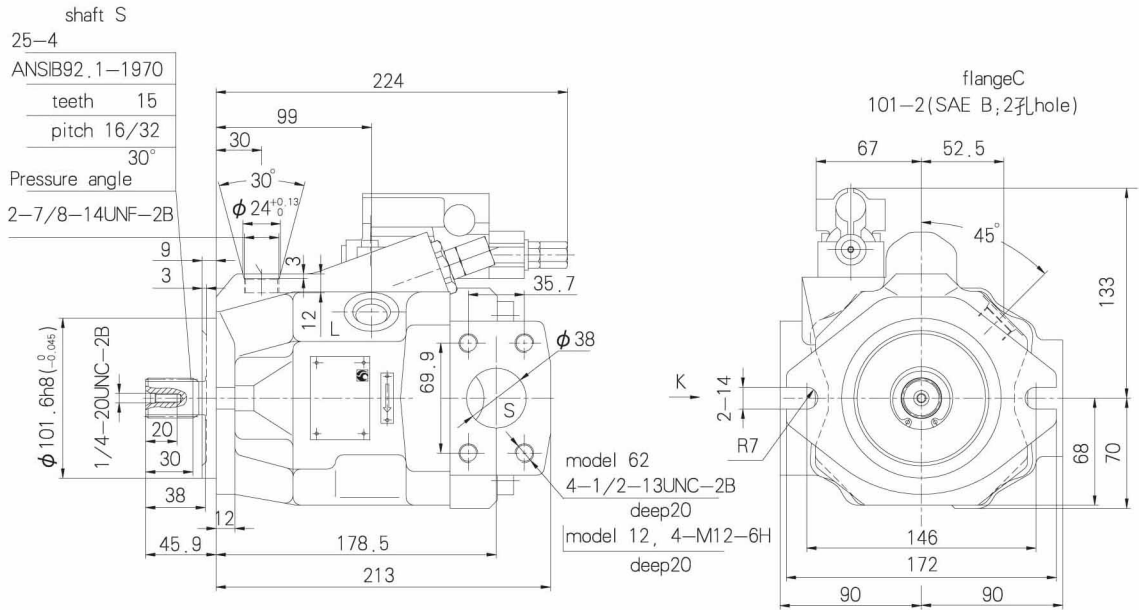
Pilot oil consumption DFR.....max. approx. 3–4.5 L/min

Pilot oil consumption DFR1max. approx. 3 L/min

Mounting Dimension, Sizes 45

Pressure control DR

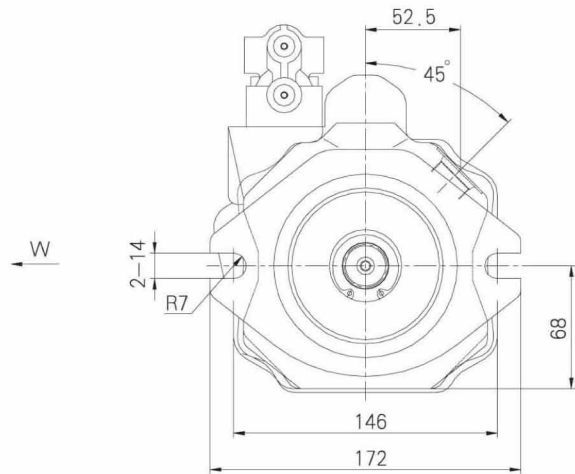
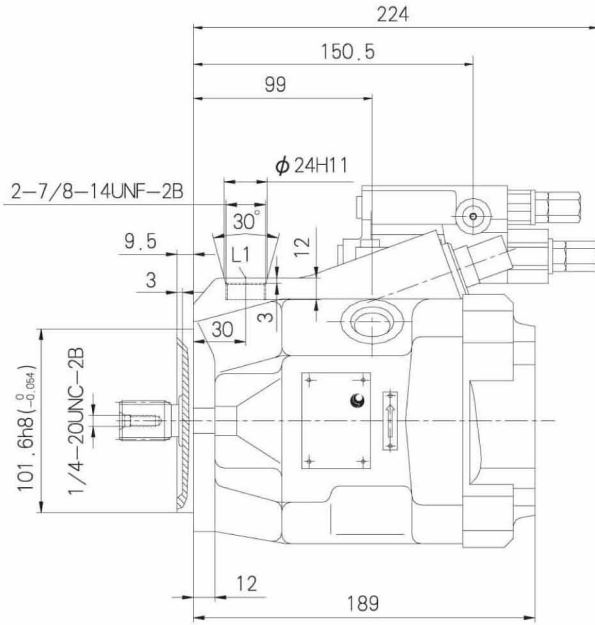
Version L10VSO45DR/52R-XXC62/12N00



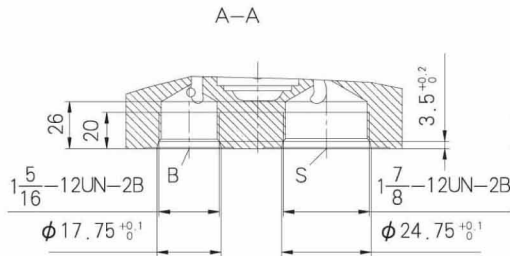
Variable displacement pump 10VSO, Series 52/53

Mounting Dimension, Sizes 45

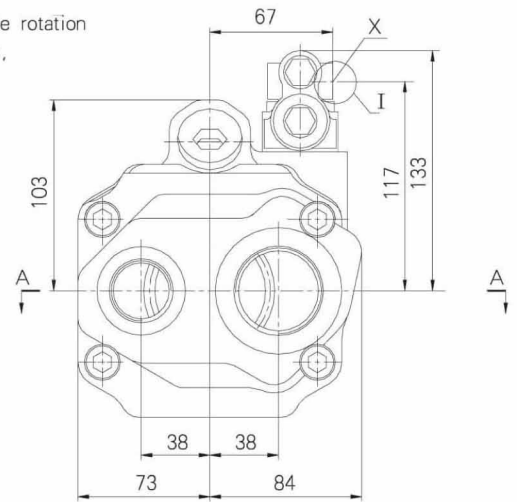
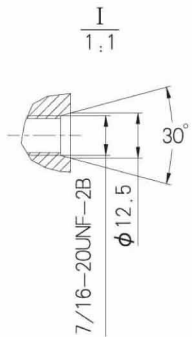
Version L10VSO45
 DFR /52L-XXC64N00
 DRG



view W

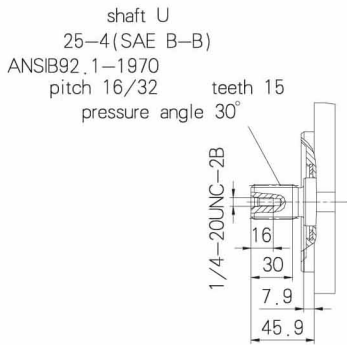
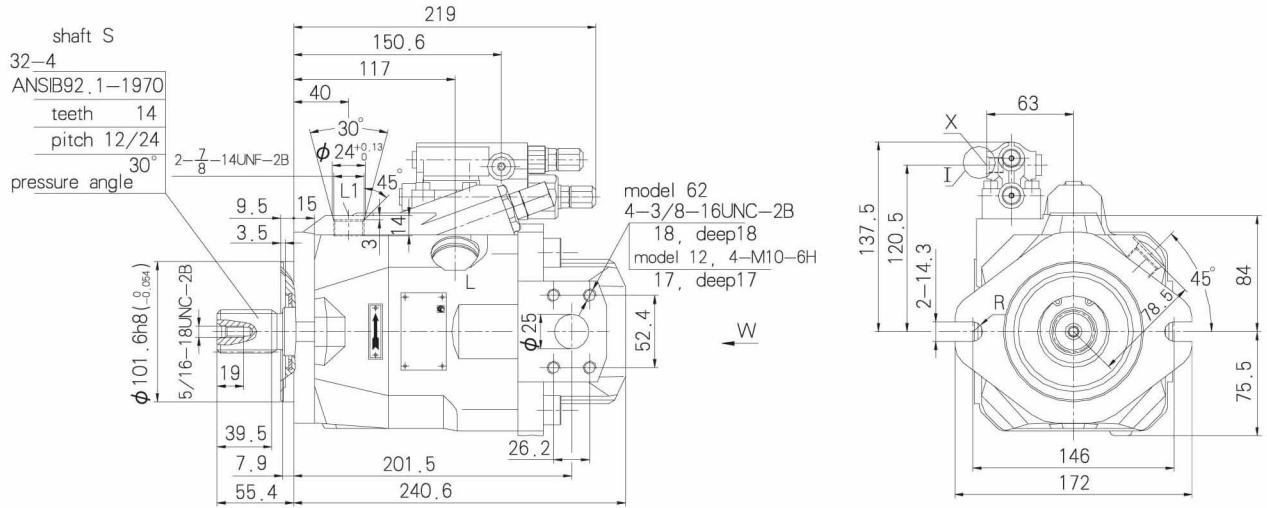


Port plate 64
 shown is anticlockwise rotation
 For clockwise rotation,
 turn port plate 180°

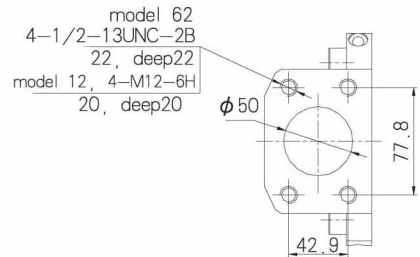
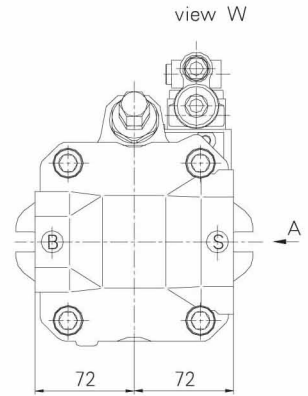
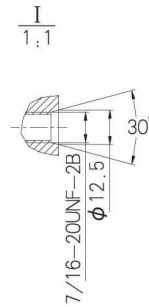


Mounting Dimension, Sizes 60

Version L10VS060
 DFR
 DFR1 /53L-XXC62/12N00
 DRG



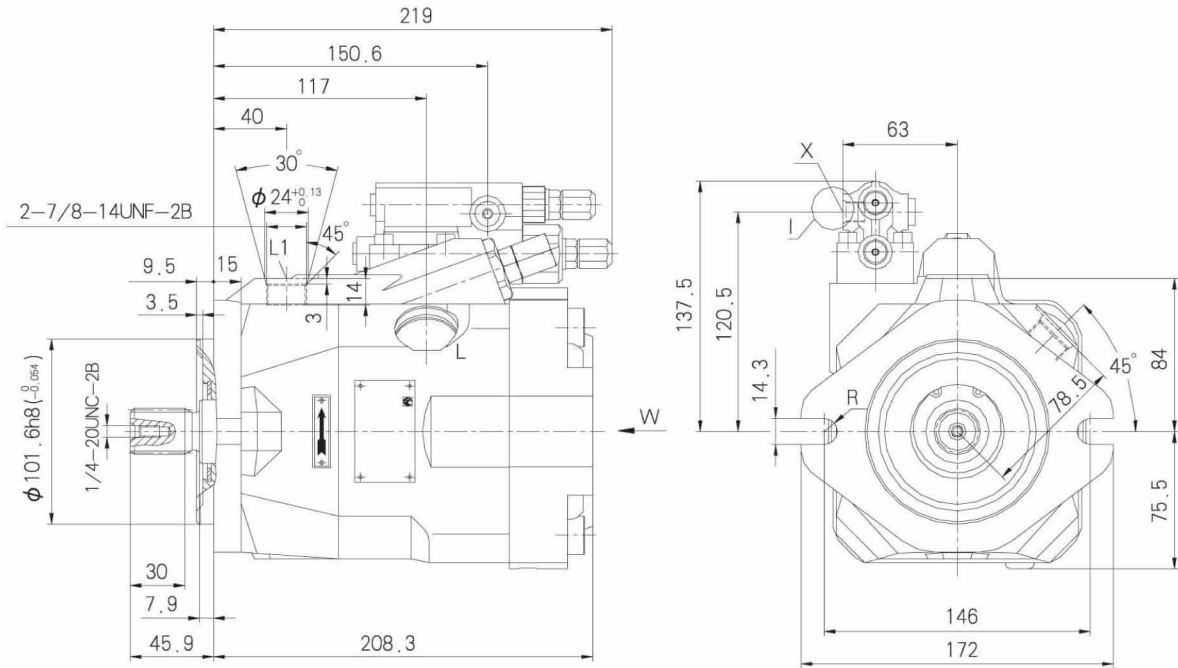
Port plate 62/12
 shown is anticlockwise rotation
 For clockwise rotation,
 turn port plate 180°



Variable displacement pump 10VSO, Series 52/53

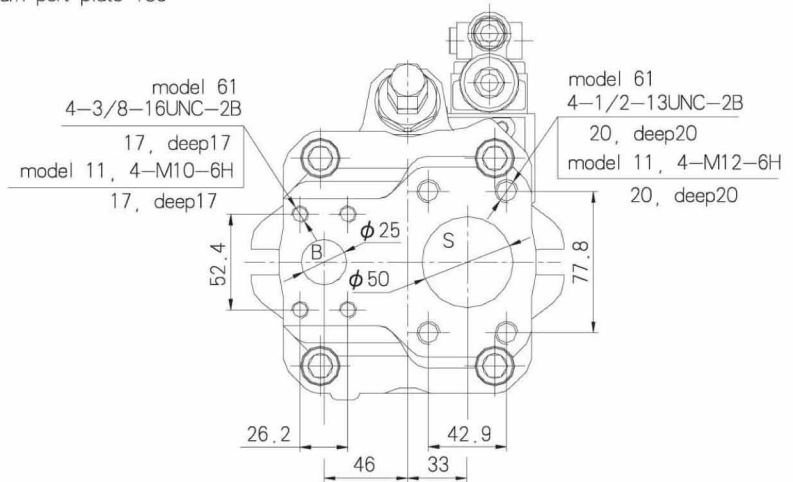
Mounting Dimension, Sizes 60

Version L10VSO60 DFR1 /53L-XXC61/11N00
 DFR
 DRG



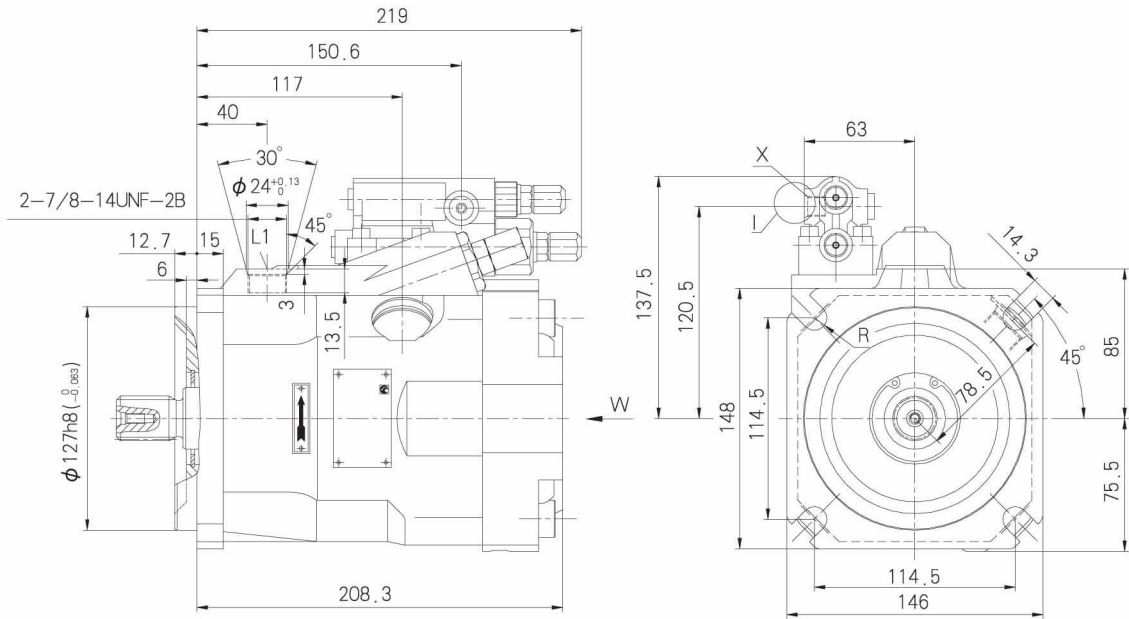
Port plate 61/11
 shown is anticlockwise rotation
 For clockwise rotation,
 turn port plate 180°

view W



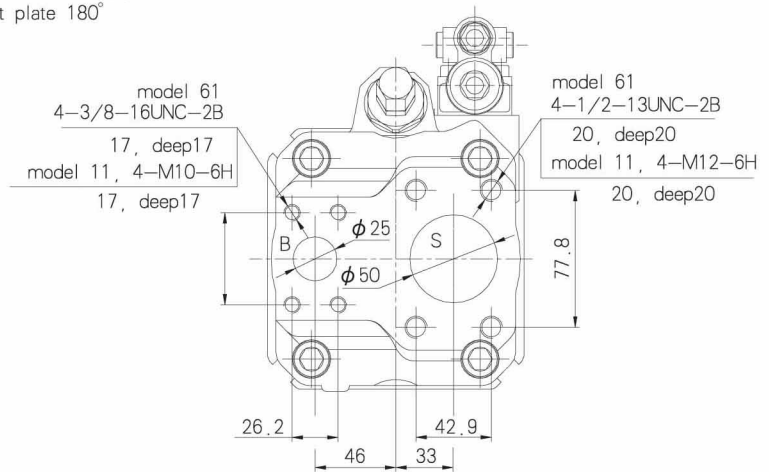
Mounting Dimension, Sizes 60

Version L10VSO60 DFR
 DFR1 /53L-XXD61/11N00
 DRG

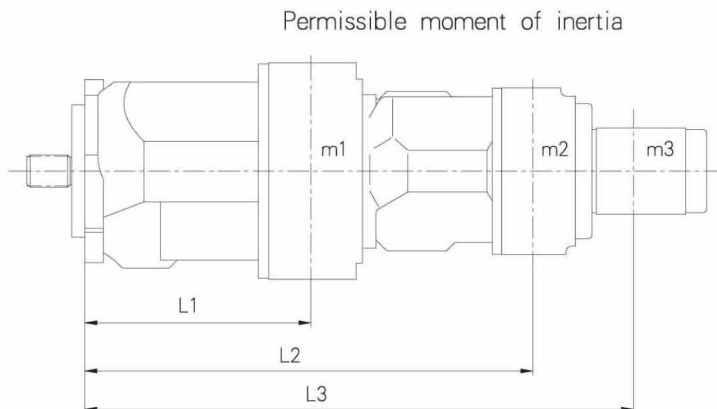


Port plate 61/11
 shown is anticlockwise rotation
 For clockwise rotation,
 turn port plate 180°

view W



Variable displacement pump 10VSO, Series 52/53



m1, m2, m3 [Kg] Mass of pump
 L1, L2, L3 [mm] Distance between centres of gravity
 $Mm = (m1 \cdot L1 + m2 \cdot L2 + m3 \cdot L3) \cdot \frac{1}{102} \text{ [Nm]}$

Sizes		28	45	60	85
m1	kg		18	22	
L1	mm		95	100	

Through drive

Axial piston unit L10VO can be supplied with a through drive, as shown in the ordering code on page 3.

The type of through drive is determined by codes (K01–K04). If the combination pump is not mounted in the factory, the simple type code is sufficient.

Included in this case are:

coupling sleeve, seals and if necessary a sandwich flange.

Combination pumps

By mounting combination pumps circuits independent of each other are available for use.

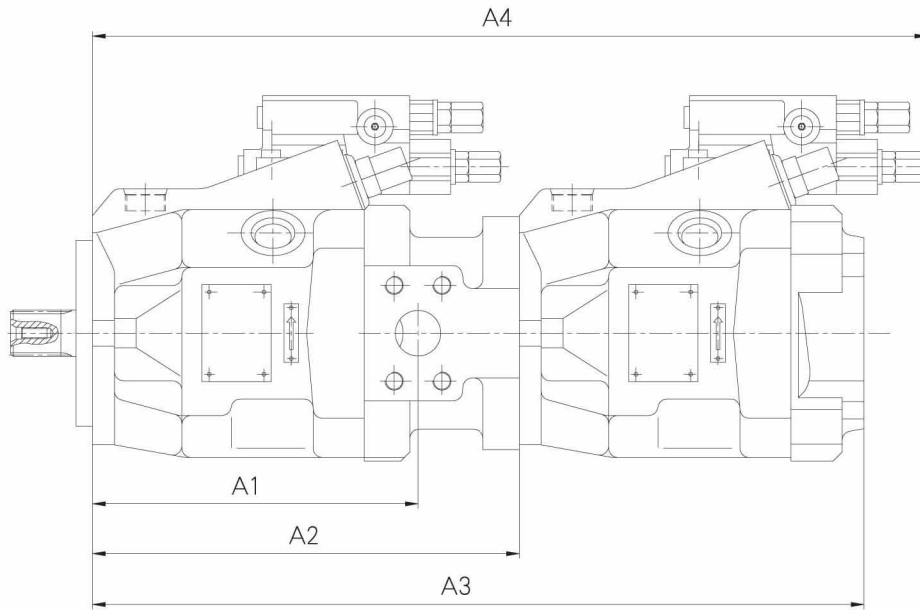
1. If the combination pump consists of 2 L10VO pumps and if these are to be delivered ready assembled, then the two type codes are to be combined with a "+".

Ordering example: L10VSO45DR/52R–PSC62K04 +L10VSO45DFR/52R–PSC62N00

2. If a gear pump or radial piston pump is to be mounted in the factory as a second pump. It contains a list of the various pump combinations together with the type code of the first pump.

Unit dimensions of combination pumps

L10VSO+L10VSO

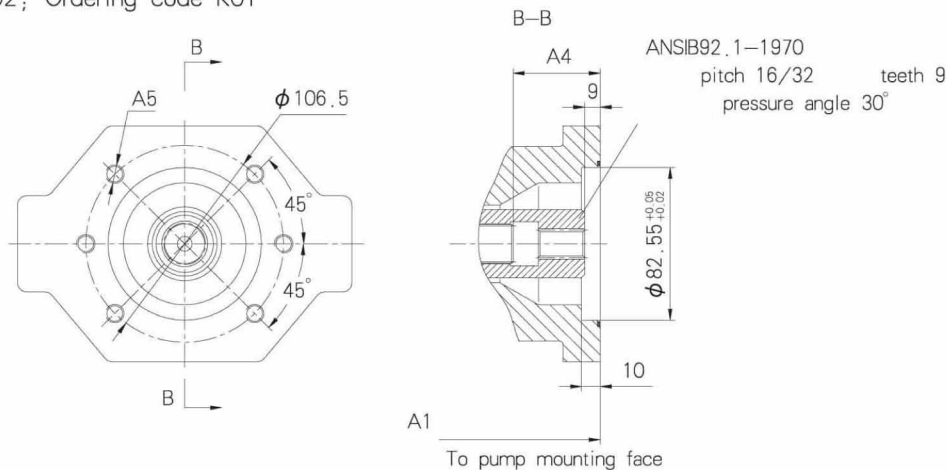


Pump 1 Pump 2	L10VSO28				L10VSO45				L10VSO60				L10VSO85			
	A1	A2	A3	A4	A1	A2	A3	A4	A1	A2	A3	A4	A1	A2	A3	A4
L10VSO28																
L10VSO45	—	—	—	—	178	229	418	445	202	255	444	471				
L10VSO60	—	—	—	—	—	—	—	—	202	255	463	471				
L10VSO85	—	—	—	—	—	—	—	—	—	—	—	—				

Variable displacement pump 10VSO, Series 52/53

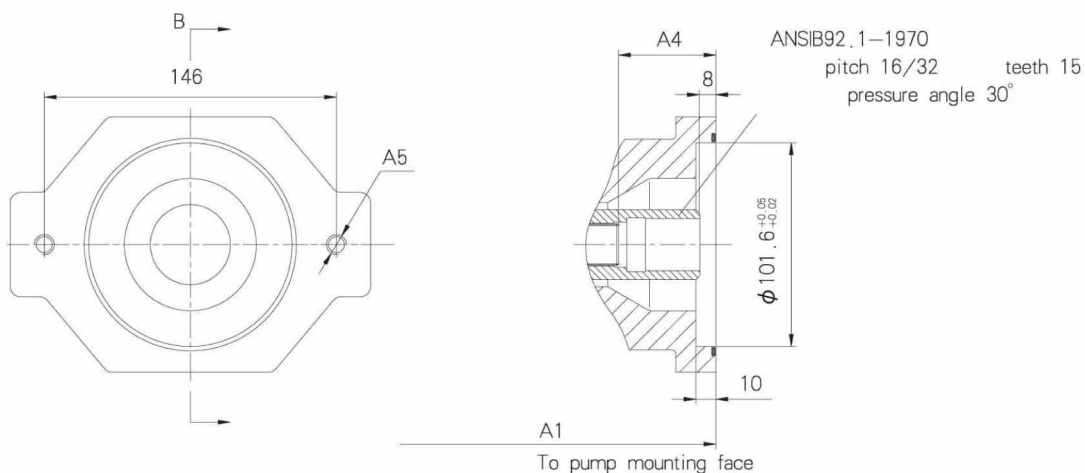
Dimensions of through drives

Flange SAE 82-2 (SAE A, 2-hole) for mounting of external gear pump G2 or internal gear pump 1 PF2GC2 /3-1X/XXXXR07MU2; Ordering code K01



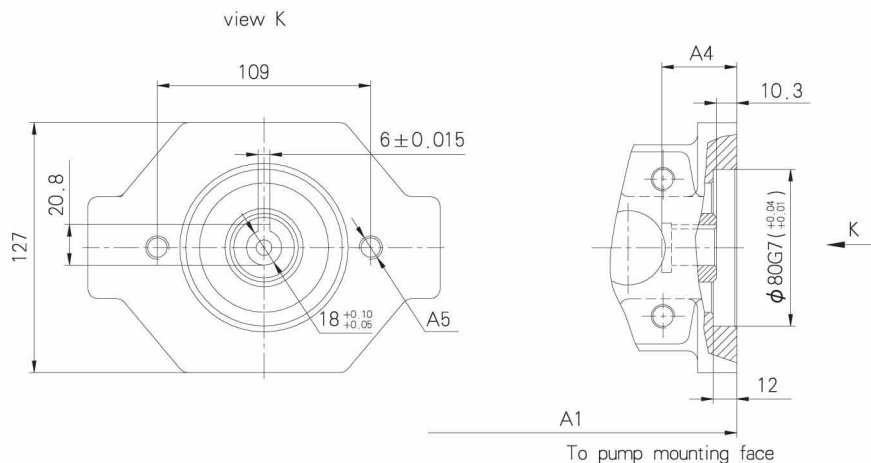
Sizes	A1	A4	A5
28			
45	234	53	6-M10-6H, (16 deep)
60	255	59	6-M10-6H, (16 deep)
85			

Flange SAE 101-2 (SAE B, 2-hole) for mounting an L10VSO45 — shaft S or an internally geared gear pump PGH4; Ordering code K04



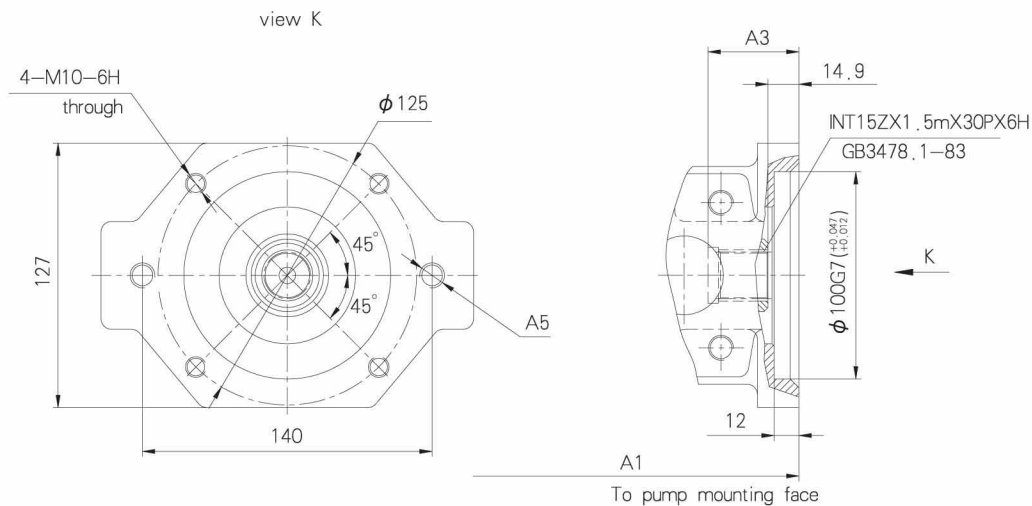
Sizes	A1	A4	A5
45	234	53	2-M12-6H, (18 deep)
60	255	59	2-M12-6H, (18 deep)

Flange 80-2 (2-hole) for mounting of gear pump; Ordering code KP1



Sizes	A1	A4	A5
45	234	38.3	2-M10-6H, (18 deep)

Flange 100-2 (2-hole) for mounting of gear pump; Ordering code K10



Sizes	A1	A4	A5
45	234	43.9	2-M12-6H, (18 deep)