



- Variable displacement axial piston pump of swashplate design for hydraulic open circuit systems.
- Flow is proportional to drive speed and displacement. It can be infinitely varied by adjustment of the swashplate.
- ISO mounting flange.
- Flange connections to SAE metric.
- 2 Case drain ports.
- Good suction characteristics.

- Permissible continuous pressure 28MPa.
- Low noise level.
- Long service life.
- Axial and radial loading of drive shaft possible.
- High power-weight ratio
- Wide range of controls
- Short response times
- Through drive option for Multi-circuit system.

Ordering code

VNKBA10VS	0	45	DRG	31	L	P	B	A	12	N00
Axial piston pump unit	Type of operation	DISPLACEMENT cc/rev	Control device	Series	Direction of rotation	Seals	Shaft end	Mounting flange	Connections	Through drives
Nominal Pressure 28Mpa Peak Pressure 35Mpa	0: pumps in open circuits	28	DR: Pressure control	31	Viewed on shaft end R: Right L: left	P: NBR V: FKM	see below	A: ISO 2 hole	Pressure B and Suction S ports : SAE ports at opposite sides Metric fixing thread	see below
		45	DRG: Pressure control, remotely controlled							
		71	DFR: Pressure/flow control							
		100	DFR1: Pressure/flow control, without orifice in X and tank							
		140								

Shaft end

Size	28	45	71	100	140
Parallel with key DIN6885	P	*	*	*	*
Splined shaft SAE	R	7/8"	1"	1 1/4"	1 1/2"
Splined shaft SAE (higher through drive torque)	S	7/8"	1"	1 1/4"	-

\*=available - = not available

### Through drives

Size	28	45	71	100	140	
Without through drive	N00	*	*	*	*	*
ISO 100,2-hole splined shaft 7/8" 22-4 SAE B BA10VS028 shaft S or R	KB3	*	/	*	*	*
ISO 100,2-hole splined shaft 1" 25-4 SAE B-B BA10VS045 shaft S or R	KB4	/	*	*	*	*
ISO 100,2-hole splined shaft 1" 1/4" 35-4 SAE C BA10VS071 shaft S or R	KB5	/	/	*	*	*
ISO 125,2-hole splined shaft 1" 1/2" 38-4 SAE C-C BA10VS0100 shaft S	KB6	/	/	/	*	*

\*=available -= not available

### Fluid

The VNKBA10VSO variable displacement pump is suitable for use with mineral oil.

### Operating viscosity range

We recommend that the operating viscosity (at operating temperature) for both the efficiency and life of the unit, be chosen within the optimum range of

$V_{opt}$  = opt. operating viscosity 80...170 SUS (16...36 mm<sup>2</sup>/s)

### Viscosity limits

The limiting values for viscosity are as follows:

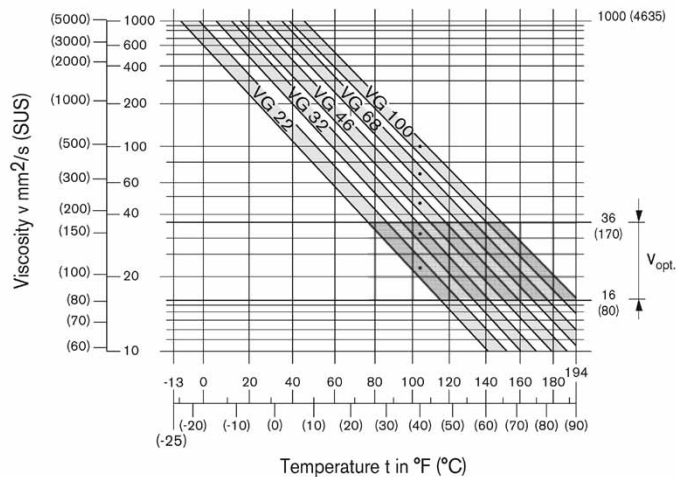
$V_{min}$  = 10mm<sup>2</sup>/s short term at a max. permissible case temperature of 90°C

$V_{max}$  = 1000mm<sup>2</sup>/s short term on cold start

### Temperature range

$T_{min}$  = -25°C

$T_{max}$  = 90°C



### Filtration

The finer the filtration, the better the achieved cleanliness of the pressure fluid and the longer the life of the axial piston unit. To ensure the functioning of the axial piston unit a minimum cleanliness level of:

9 to NAS 1638

18/15 to ISO/DIS 4406

is necessary

## TECHNICAL DATA

### Operating pressure range-inlet

Pabs min	0,08Mpa
Pabs maxn	30Mpa

### Operating pressure range-outlet

Nominal pressure	28Mpa
Peak pressure	35Mpa

Applications with intermittent operating pressures up to 315bar at 10% duty are permissible. Limitation of pump output pressure spikes is possible with relief valve blocks mounted directly on flange connection.

### Case drain pressure

Maximum permissible pressure of the leakage fluid at port L max. 0,05Mpa higher than inlet pressure at port S, but not higher than 0,2Mpa absolute.

Determination of inlet pressure P abs suction port S or reduction of displacement for increasing speed.

### Maximum Speed

Size / Displacement	28	45	71	100	145
Max. Speed rpm	3000	2600	2200	2000	1800

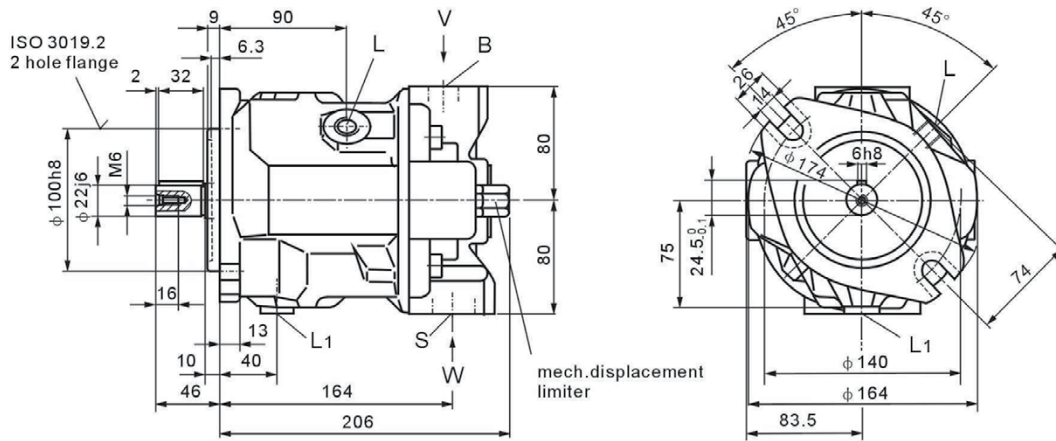
### Weight

28 12kg	45 15kg	71 33kg	100 45kg	140 60kg
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Dimension

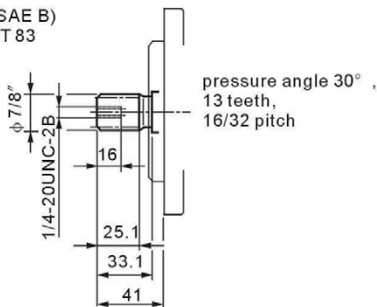
VNKBA10VSO28\*31\*\*A12N00 (without control valves)

Shaft P

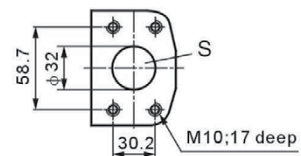


Shaft S

Shaft 22-4; (SAE B)  
SAE J744 OCT 83

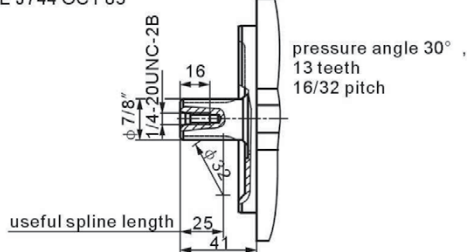


View W

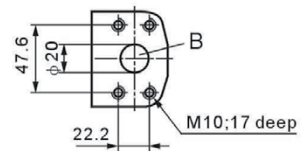


Shaft R

Shaft 22-4; (SAE B)  
SAE J744 OCT 83



View V

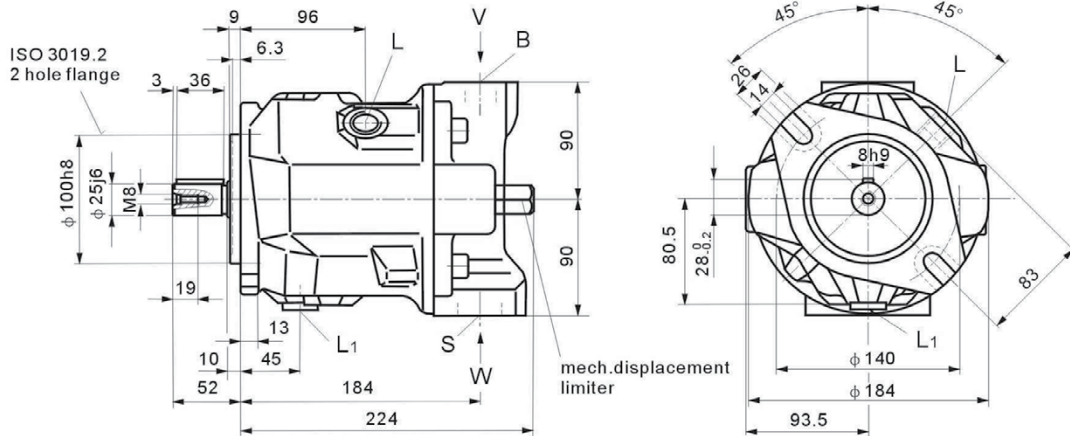


B	Pressure port	SAE 3/4"	(Standard pressure range)
S	Suction port	SAE 1 1/4"	(Standard pressure range)
L/L <sub>1</sub>	Case drain ports	M18 × 1.5	(L <sub>1</sub> plugged at factory)

Dimension

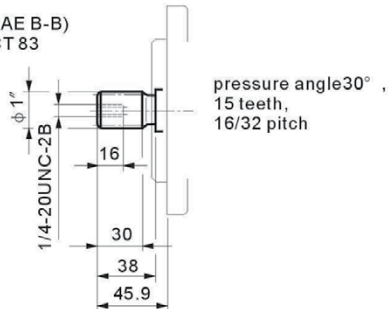
VNKBA10VSO45\*31\*\*A12N00 (without control valves)

Shaft P

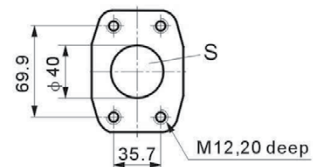


Shaft S

Shaft 25-4;(SAE B-B)  
SAE J744 OCT 83

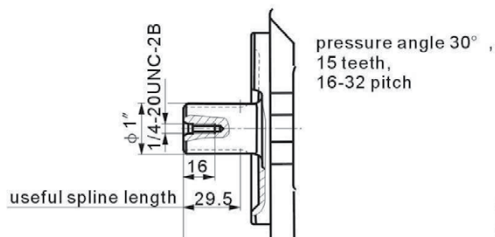


View W

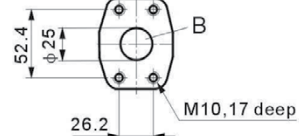


Shaft R

Shaft 25-4;(SAE B-B)  
SAE J744 OCT 83



View V

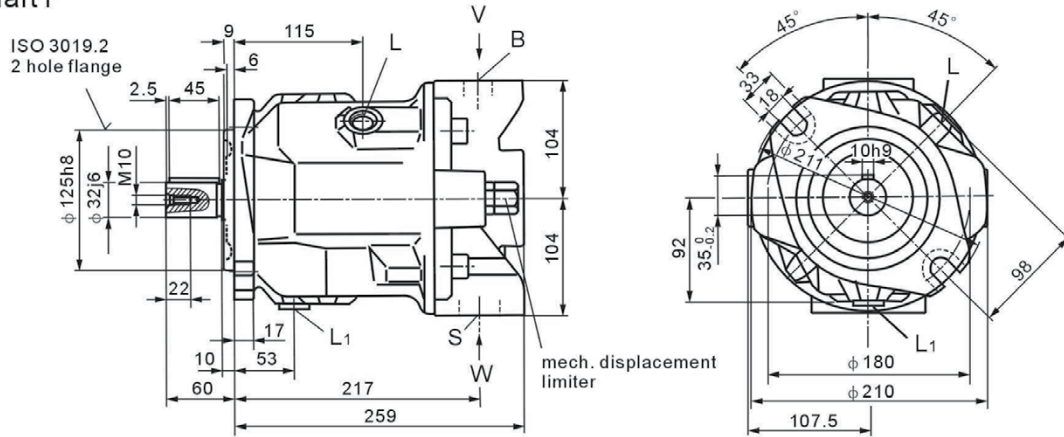


- |   |               |           |                           |
|---|---------------|-----------|---------------------------|
| B | Pressure port | SAE 1"    | (Standard pressure range) |
| S | Suction port  | SAE 11/2" | (Standard pressure range) |

Dimension

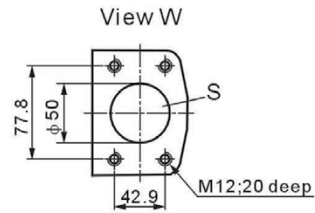
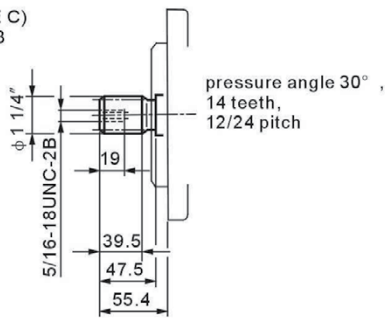
VNKBA10VSO71\*31\*\*A12N00 (without control valves)

Shaft P



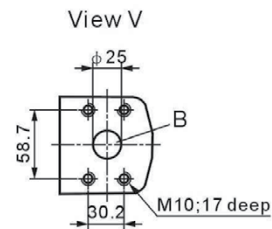
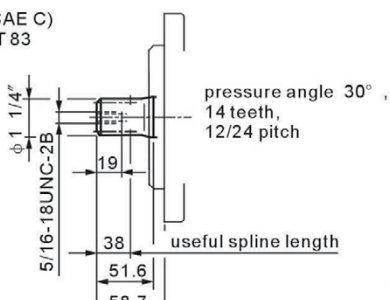
Shaft S

Shaft 32-4; (SAE C)  
SAE J744 OCT 83



Shaft R

Shaft 32-4; (SAE C)  
SAE J744 OCT 83

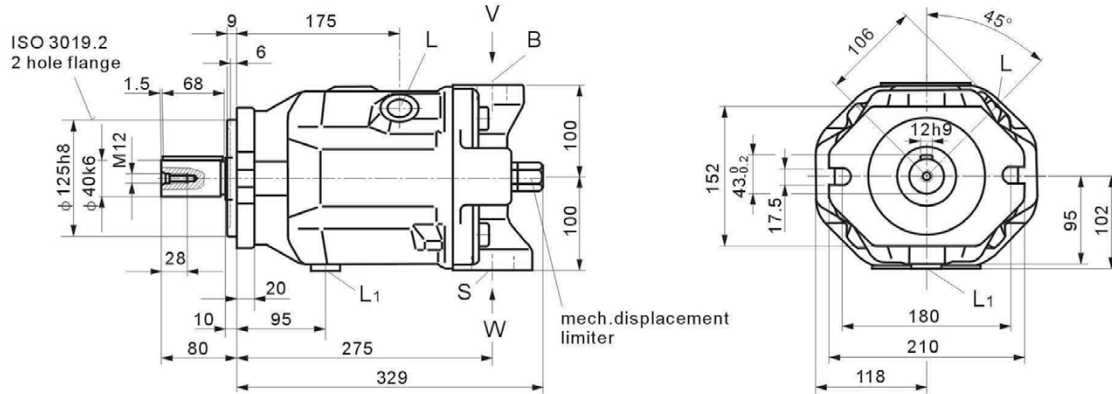


B Pressure port SAE 1" (Standard pressure range)

Dimension

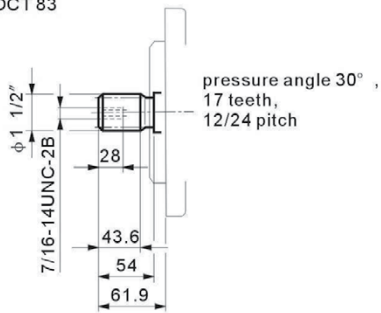
VNKBA10VSO100\*31\*\*A12N00 (without control valves)

Shaft P

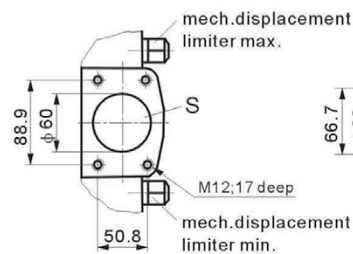


Shaft S

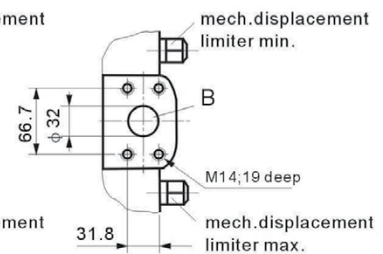
Shaft 38-4; (SAE C-C)  
SAE J744 OCT 83



View W



View V



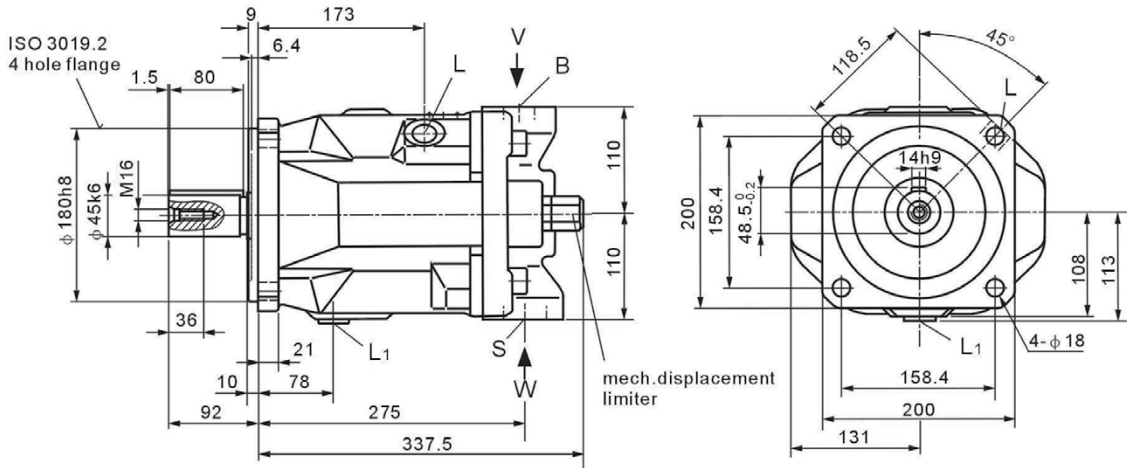
B	Pressure port	SAE 1 1/4"	(High pressure range)
S	Suction port	SAE 2 1/2"	(Standard pressure range)
L/L <sub>1</sub>	Case drain ports	M27 × 2	(L, plugged at factory)



Dimension

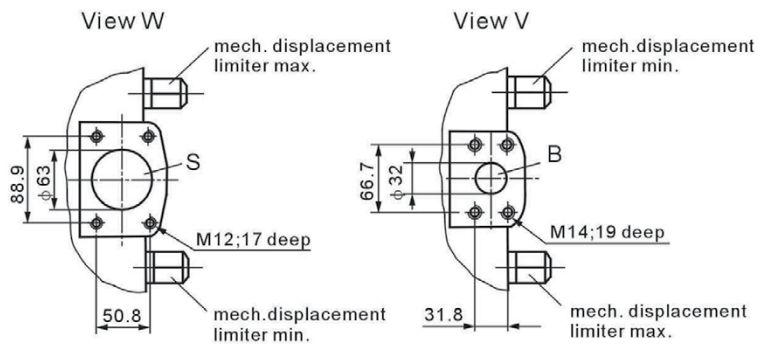
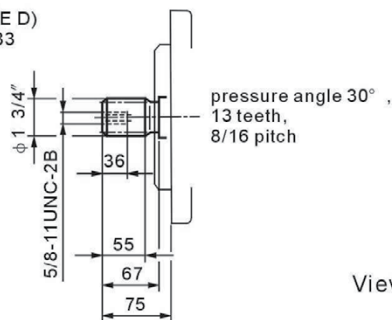
VNKBA10VSO140\*31\*\*A12N00 (without control valves)

Shaft P



Shaft S

Shaft 44-4; (SAE D)  
SAE J744 OCT 83



B	Pressure port	SAE 1 1/4"	(High pressure range)
S	Suction port	SAE 2 1/2"	(Standard pressure range)
L/L <sub>1</sub>	Case drain port	M27 × 2	(L <sub>1</sub> plugged at factory)

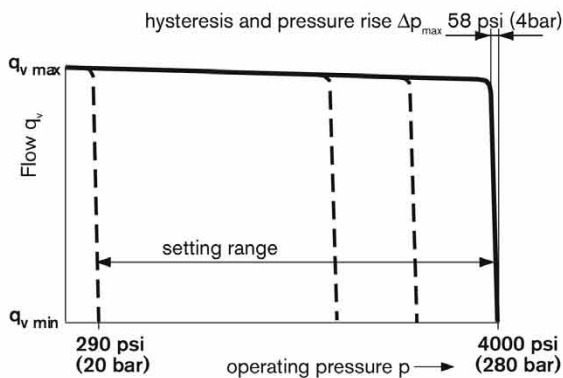


**DR Pressure control**

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 at the control valves.

**Static characteristic**

(at  $n_1 = 1500 \text{ rpm}$ ;  $t_{oil} = 122^\circ\text{F} / 50^\circ\text{C}$ )

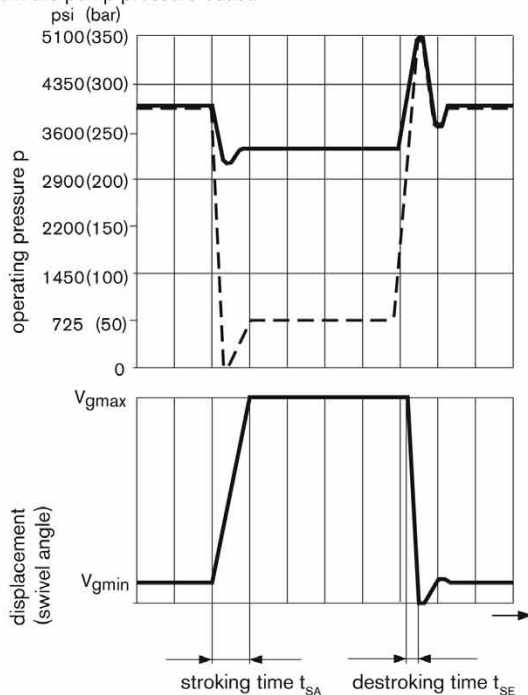


**Dynamic characteristic**

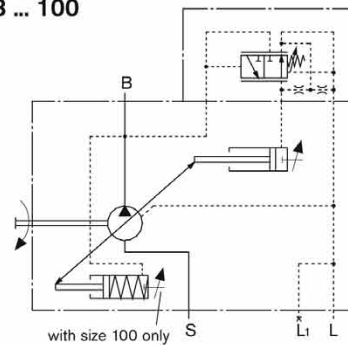
The opening curves are mean values measured under test conditions with the unit mounted inside the tank.

Conditions:  $n = 1500 \text{ rpm}$   
 $t_{oil} = 122^\circ\text{F} (50^\circ\text{C})$   
 Main relief set at 5100 psi (350 bar)

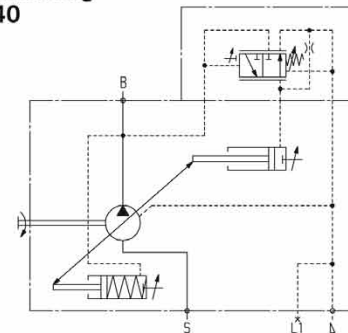
Stepped loading by suddenly opening or closing the pressure line using a pressure relief valve at 3.3 ft (1 m) downstream from the pump pressure outlet.



**Circuit drawing  
Size 18 ... 100**



**Circuit drawing  
Size 140**



**Ports**

- B Pressure port
- S Inlet port
- L, L<sub>1</sub> Case drain port (L<sub>1</sub> plugged)

**Controller data**

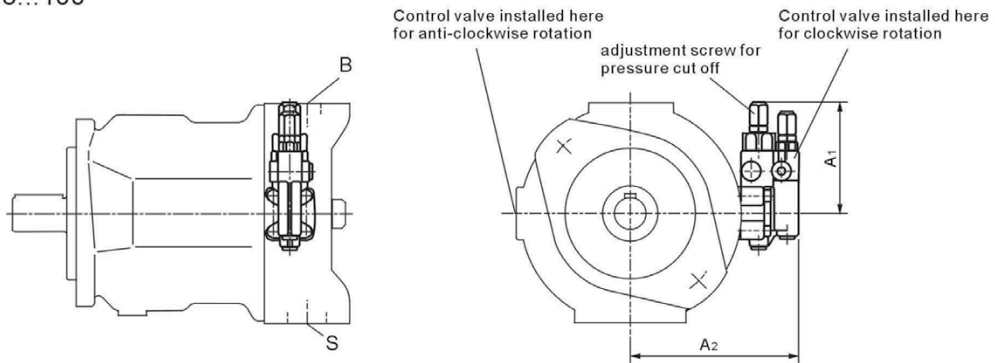
Hysteresis and repetitive accuracy  $\Delta p$  \_\_\_ max. 45 psi (3 bar)  
 Pilot oil consumption max. approx 0.8 gpm (3 L/min)  
 Flow loss at  $q_{vmax}$  see pages 8 and 9.

**Control times**

	$t_{SA}$ [ms]	$t_{SA}$ [ms]	$t_{SE}$ [ms]
Size	against 725 psi (50 bar)	against 3200 psi (220 bar)	zero stroke 4000 psi (280 bar)
18	50	25	20
28	60	30	20
45	80	40	20
71	100	50	25
100	125	90	30
140	130	110	30

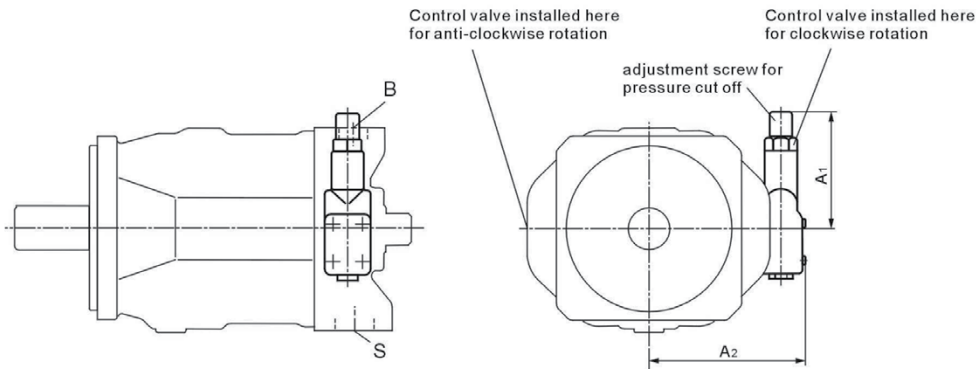
DR Pressure control

Sizes 28...100



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

Size 140



Size	A1	A2
28	109	136
45	106	146
71	106	160
100	106	165
140	127	169

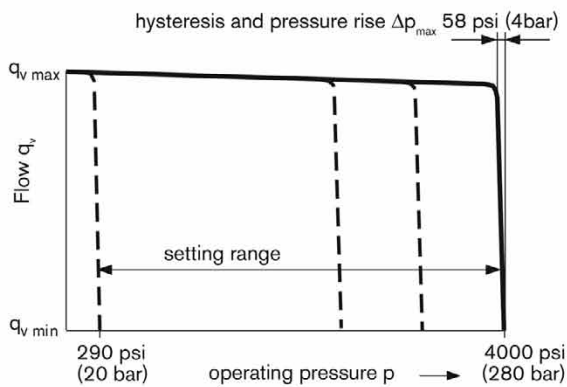
**DRG Pressure control, remote**

**Function and equipment as for DR.**

A pressure relief valve may be externally piped to port X for remote control purposes. However it is not included in the scope of supply with the DRG control. The differential pressure at the DRG control spool is set as standard to 20 bar and this results in a pilot flow of 0.4 gpm (1,5 L/min). If another setting (range 10-22 bar) is required, please state this in clear text.

**Static characteristic**

(at  $n_1 = 1500 \text{ rpm}$ ;  $t_{oil} = 122^\circ\text{F} / 50^\circ\text{C}$ )



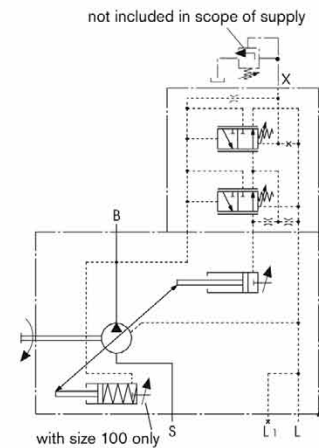
**Control data**

Hysteresis  $\Delta p$  \_\_\_\_\_ max. 45 psi (3 bar)

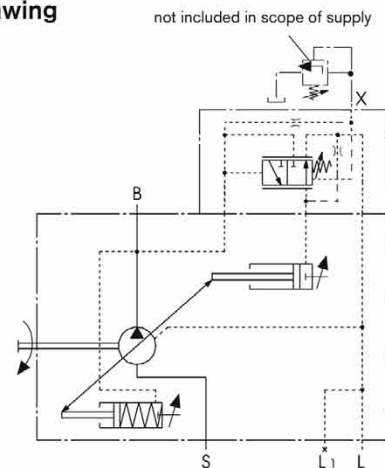
Pilot oil requirement \_\_\_\_\_ approx. 1.2 gpm (4,5 L/min)

Flow loss at  $q_{vmax}$  see pages 8 and 9.

**Circuit drawing  
Size 18 ... 100**



**Circuit drawing  
Size 140**

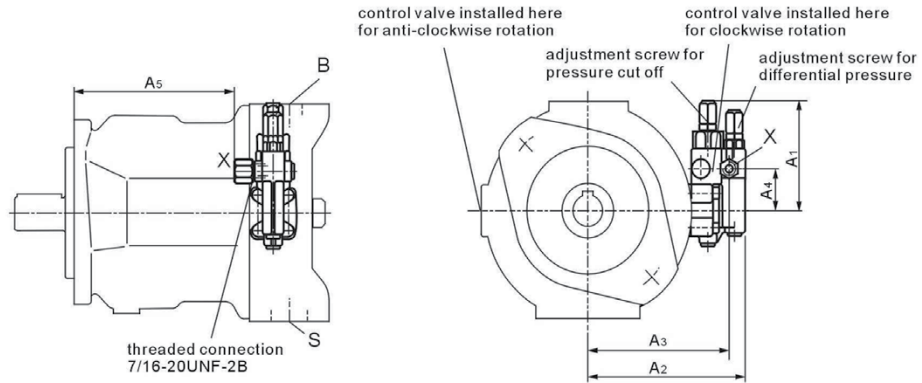


**Ports**

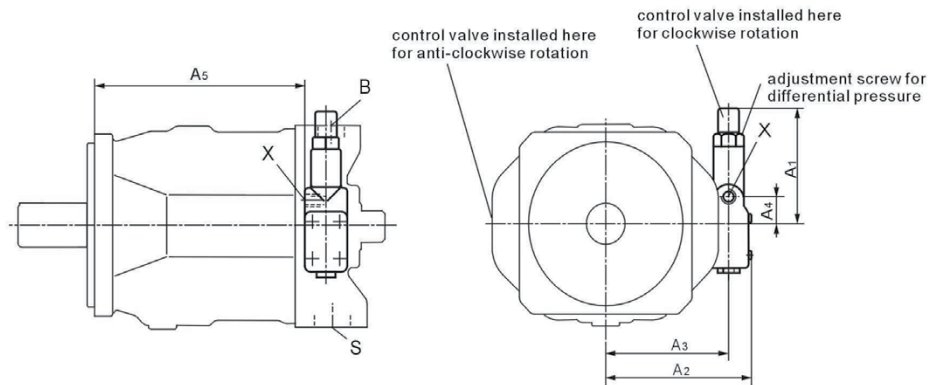
- B Pressure port
- S Inlet port
- L, L<sub>1</sub> Case drain port (L, plugged)
- X Pilot pressure port

DRG Pressure control, remote

Sizes 28...100



Size 140

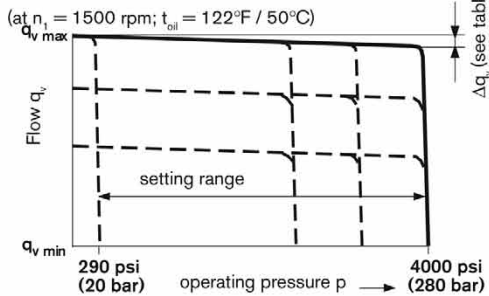


Size	A1	A2	A3	A4	A5	Port X
28	109	136	119	40	119	M 14x1.5
45	106	146	129	40	134	M 14x1.5
71	106	160	143	40	162	M 14x1.5
100	106	165	148	40	229	M 14x1.5
140	127	169	183	27	244	M 14x1.5

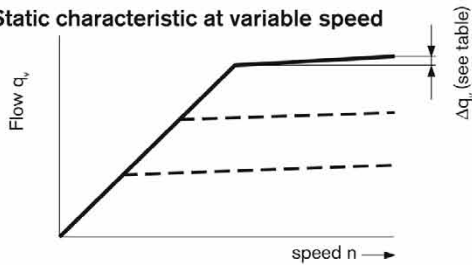
DFR / DFR1 Pressure / Flow control

In addition to the pressure control function, the pump flow to the actuator may be varied by means of a differential pressure (e.g. over an orifice or directional control valve). The pump supplies only the amount of fluid as required by the actuator. In the DFR1-valve version the orifice between the X port and tank is plugged.

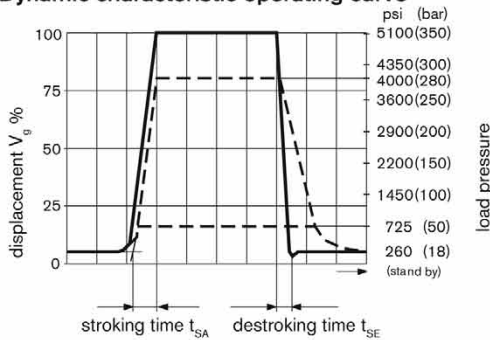
Static characteristic



Static characteristic at variable speed

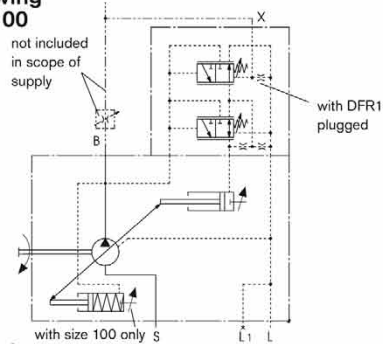


Dynamic characteristic operating curve

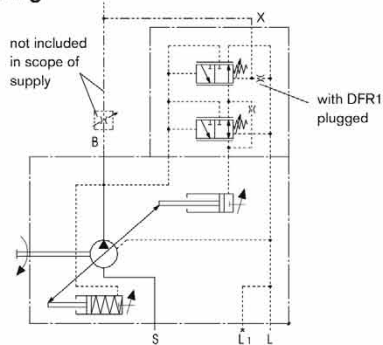


	t <sub>SA</sub> [ms]	t <sub>SE</sub> [ms]	t <sub>SE</sub> [ms]
Size	4000 psi (280 bar)-stand by	4000 psi (280 bar)-stand by	725 psi (50 bar)-stand by
18	40	15	40
28	40	20	40
45	50	25	50
71	60	30	60
100	120	60	120
140	130	60	130

Circuit drawing  
Size 18 ... 100



Circuit drawing  
Size 140



Ports

- B Pressure port
- S Inlet port
- L, L<sub>1</sub> Drain port (L<sub>1</sub> closed)
- X Pilot pressure port

Differential pressure Δp:

Standard setting: 200 psi (14 bar). If a different setting is required please state in clear text.

When port X is loaded to tank (and outlet B is closed), a zero stroke pressure (standby) of p = 260±30 psi (18±2 bar) results. (depends on Δp)

Control data

For technical data of pressure control see page 12.  
Max. flow deviation (hysteresis and rise) measured at drive speed n = 1500 rpm.

Size	18	28	45	71	100	140
Δq <sub>v max</sub>						
gpm	0.24	0.26	0.48	0.75	1.06	1.60
(L/min)	(0,9)	(1,0)	(1,8)	(2,8)	(4,0)	(6,0)

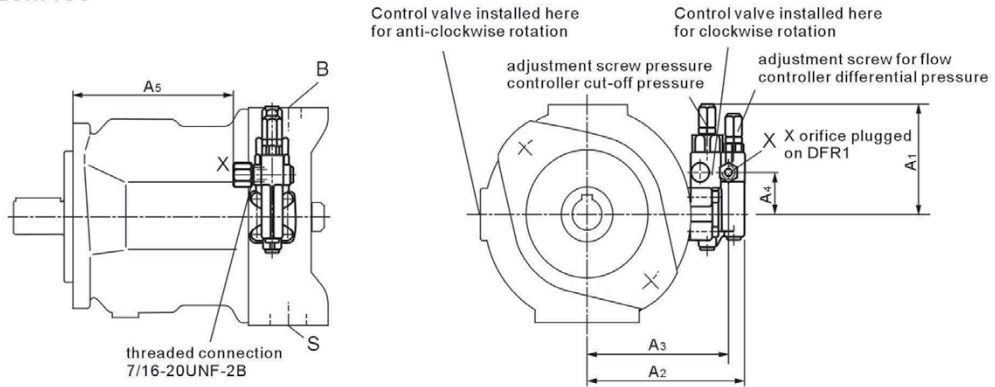
DFR pilot oil consumption \_\_\_ max. approx. 0.8 ... 1.2 gpm (3 ... 4,5 L/min)

DFR1 pilot oil consumption \_\_\_ max. approx. 0.8 gpm (3 L/min)

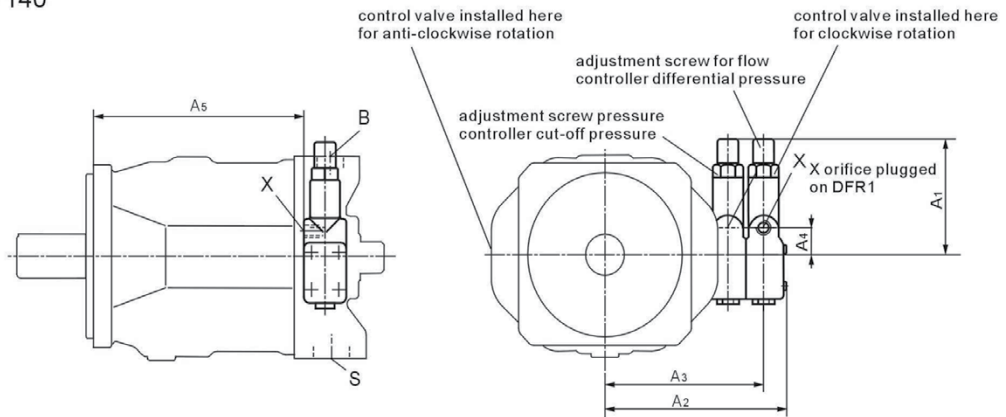
Flow loss at q<sub>v max</sub> see pages 8 and 9.

DFR / DFR1 Pressure / Flow control

Sizes 28...100



Size 140



Size	A1	A2	A3	A4	A5	Port X
28	109	136	119	40	119	M 14x1.5
45	106	146	129	40	134	M 14x1.5
71	106	160	143	40	162	M 14x1.5
100	106	165	148	40	229	M 14x1.5
140	127	169	183	27	244	M 14x1.5