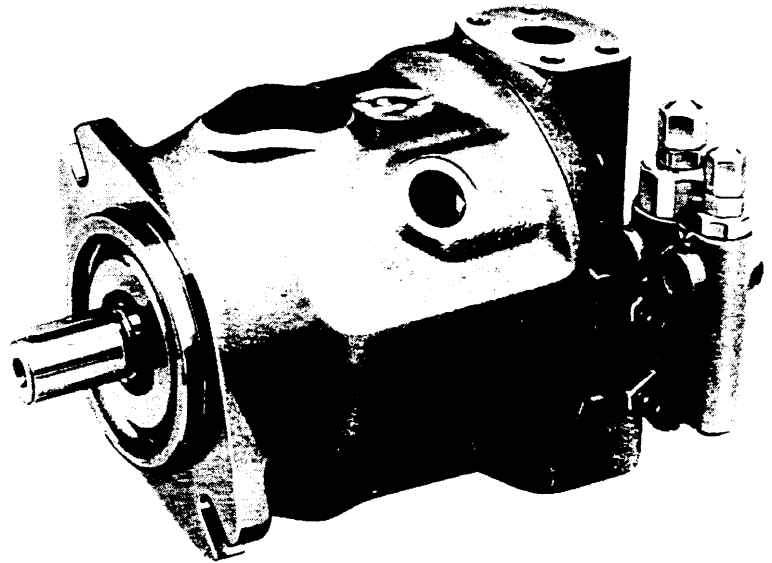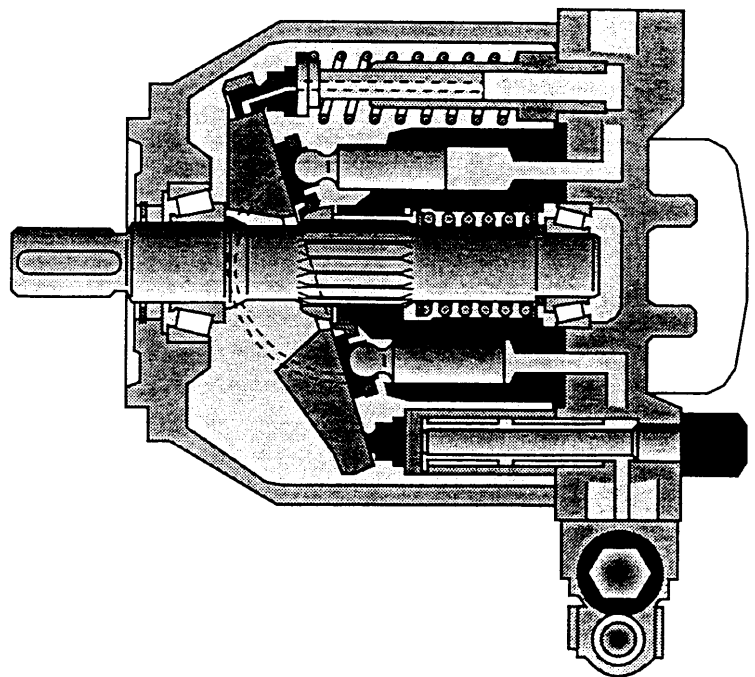| **MANNESMANN REXROTH** Brueninghaus Hydromatik	**A10VSO Variable Displacement Pump** Series 31, Industrial Model, for Open Circuits Axial Piston Swashplate Design	**RE 92711/03.93**
	Size 28...140 Nominal pressure 280 bar Peak pressure 350 bar	Replaces RE 92711/10.89

Medium pressure range

A10VSO Size 18
See RE 92712

Variable displacement, axial piston pump A10VSO of swashplate design is designed for open circuit hydrostatic transmissions. Flow is proportional to the drive speed and the displacement. By adjusting the position of the swashplate it is possible to steplessly vary the flow.

– ISO 2 hole mounting flange
– flange connections SAE metric
– 2 case drain connections
– good suction characteristics
– permissible continuous operating pressure 250 bar
– low noise level
– long service life
– axial and radial loading of drive shaft possible
– high power/weight ratio
– wide range of controls available
– short control times
– optional through drive for tandem pumps

```
                                                        ┌──────┬──┬──┬──┬───┬──┬──┬──┐
                                                        │A10VS │O │  │  │/31│──│P │12│
                                                        └──────┴──┴──┴──┴───┴──┴──┴──┘
```

Hydraulic fluid

Axial piston pump

Type of operation

Size

Control and adjustment device

Series

Direction of rotation

Seals

| Perbunan (shaft sealing ring in Viton) | P |
| Viton | V |

Shaft end

| Parallel with key   DIN 6885 | P |

Mounting flange

	28	45	71	100	140	
ISO 2-hole	●	●	●	●	–	A
ISO 4-hole	–	–	–	–	●	B

Service line connections

| Pressure port B } SAE ports at opposite sides
Suction port S } Metric fixing thread | 12 |

Through-drives

			28	45	71	100	140	
Without through-drive			●	●	●	●	●	N00
With through-drive to accept an axial piston pump, a gear pump or a radial piston pump								
Mounting flange	Shaft/coupling	For mounting:						
ISO 80, 2-hole	keyed shaft Ø 18	A10VSO 18	●	●	●	●	●	K51
ISO 100, 2-hole	keyed shaft Ø 22	A10VSO 28	●	●	●	●	●	K25
ISO 100, 2-hole	keyed shaft Ø 25	A10VSO 45	–	●	●	●	●	K26
ISO 125, 2–hole	keyed shaft Ø 32	A10VSO 71	–	–	●	●	●	K27
ISO 125, 2-hole	keyed shaft Ø 40	A10VSO 100	–	–	–	●	●	K37
ISO 180, 4-hole	keyed shaft Ø 45	A10VSO 140	–	–	–	–	●	K59
82-2(SAE A)	16-4 (SAE A)	G2	●	●	●	●	●	K01
101-2(SAE–B)	22-4 (SAE B)	G3	●	●	●	●	●	K02
ISO 100, 4-hole	splined shaft 21 X 24	GU (1) *	●	●	●	●	●	K54*
ISO 125, 4-hole	splined shaft 21 X 24	GU (2) *	–	●	●	●	●	K55*
ISO 160, 4-hole	splined shaft 30 X 34	GU (3) *	–	–	●	●	●	K56*
Metr.4-hole,Centr.ø 63	keyed shaft Ø 25	R4	●	●	●	●	●	K57

*not for new projects, please consult us if required.

Combination pumps

1.   If a **second Brueninghaus pump is to be fitted at factory** then the two model codes must be linked with a "+" sign. Model code 1st pump + model code 2nd pump.
      Ordering example: A10VSO 100DR/31R-PPA12K27 + A10VSO 71DFR/31R-PPAN00

2.   If a **gear or radial piston pump is to be fitted at factory** please consult us (RE 90139 in preparation).

Model coding

Fluid

Mineral oil (no short code)	
HFA-, HFB and HFC operation [1])	E –

Axial piston unit

Variable, swashplate design for industrial use Nominal pressure 250 bar, peak pressure 315 bar	A10VS

Mode of Operation

Pump, in open circuit	O

Size

≙ Displacement $V_{g\,max}$ (cm³)	28	45	71	100	140

Control Device

			28	45	71	100	140	
Constant pressure control	DR		●	●	●	●	●	DR
	DR	G	●	●	●	●	●	DRG
remotely controlled								
Pressure/flow control	DFR		●	●	●	●	●	DFR
	DFR	1	●	●	●	●	●	DFR1
X port plugged								
Pressure/flow power control			●	●	●	●	●	DFLR
Flow control, pilot pressure dependent with pressure control			●	●	●	●	○	FHD
Electrical flow control	FE		●	●	●	●	○	FE
	FE	D	●	●	●	●	○	FED
with pressure control								
Pressure/flow control, electronic			●	●	●	●	○	DFE1

For speed control, secondary control DS see RE 92715

Series

	31

Direction of rotation

Viewed on shaft end	clockwise	R
	anti-clockwise	L

· Project note for size 71
Pressure port B consists of a high pressure combination port
SAE 11/4" standard pressure range, 3000 psi, for pressures up to 250 bar
SAE 1" standard pressure range, 5000 psi, for pressures in excess of 250 bar (see p. 11).
For new applications high pressure port SAE 1" must be used.

● = available
○ = in preparation
– = not available

Hydraulic fluid
For extensive information on the range of fluids and application conditions please see our data sheet RE 90220 (mineral oils), RE 90221 (environmentally acceptable fluids) and RE 90223 (HF - fire resistant hydraulic fluids). When operating on HF- fluids any existing constraints in respect of technical data should be observed or, if necessary, consult our technical department. Operation on Skydrol hydraulic fluid is subject to consultation.

Operating viscosity range
In order to obtain optimum efficiciency and service life we recommend that operating viscosity (at operating temperature) be selected from within the following range

v_{opt} = opt. operating viscosity 16...36 mm²/s

The above refers to the tank temperature (open circuits).

Viscosity limits
The following limiting values for viscosity are as follows:

v_{min} = 10 mm²/s
short term at maximum permissible drain of 90°C.°

v_{max} = 1000 mm²/s or 300 mm²/s with mounted auxiliary pump short term on cold start

Temperature range (cf. selection diagram)
t_{min} = – 25° C
t_{max} = 90° C

Selection diagram

t_{min} = – 25° C   Fluid temperature range t_{max} = + 90° C
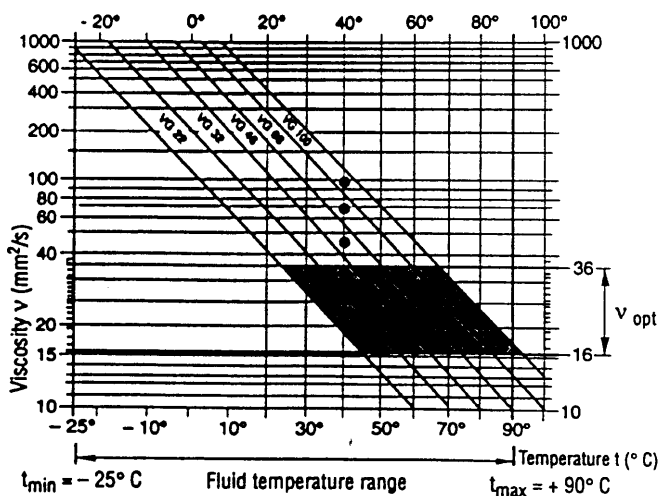
Notes on hydraulic fluid selection
In order to select the correct fluid it is necessary to know the operating temperature in the tank (open loop) in relation to the ambient temperature.
The hydraulic fluid should be selected so that within the operating temperature range the operating viscosity lies within the optimum range (v_{opt}) (see shaded section of selection diagram). We recommend that the highest possible viscosity range be chosen in each case.
Example: At an ambient temperature of X° C the operating temperature is 60° C . Within the operating viscosity range (v_{opt}; shaded area) this corresponds to viscosity ranges VG 46 or VG 68; VG 68 should be selected.
Important: The case drain oil temperature is influenced by pressure and speed and is always higher than the tank temperature. However, the temperature may not exceed 90° C at any point on the installation.
If it is not possible to comply with the above conditions because of extreme operating parameters or high ambient temperatures, please consult us.

Filtration of fluid
In order to guarantee correct functioning of the unit, a minimum level of cleanliness to
NAS 1638, class 9
SAE, ASTM, AIA or
18/15 to ISO/DIS 4406
This can be achieved (for instance) using filter element type ...D 020...(see RE 31278).
This gives a filter quotient of

$\beta_{20} \geq 100$.

Mechanical displacement limiter
Mechanical displacement limiter is possible on the non-through-drive model, N00 series but not for the model with through-drive.

Q_{max}: for sizes 28 to 140
Setting range $V_{g\,max}$ to 50% $V_{g\,max}$

Q_{min}: for sizes100 and 140
Setting range $V_{g\,min}$ to 50% $V_{g\,max}$

Technical data
(valid for operation on mineral oil;
for **water based fluids see RE 90223** and **RE 90221**
for environmentally friendly fluids)

Operating pressure range - inlet side
Absolute pressure at port S

$p_{abs\,min}$ —————————————————————— 0,8 bar

$p_{abs\,max}$ —————————————————————— 30 bar

Operating pressure range - outlet side
Pressure at port B
Nominal pressure p_N ————————————— 280 bar
Peak pressure p_{max} ——————————————— 350 bar
(Pressure data to DIN 24312)
Applications with intermittent operating pressures up to 315 bar
at 10% duty are permissible.

Case drain pressure
Maximum permissible pressure of leakage fluid
(at port L, L_1):
Maximum 0,5 bar higher than the inlet pressure at port S, but no
higher than 2 bar absolute.

Direction of through flow
S to B.

Determination of inlet pressure p_{abs} at suction port S or reduction in output flow for increasing speed
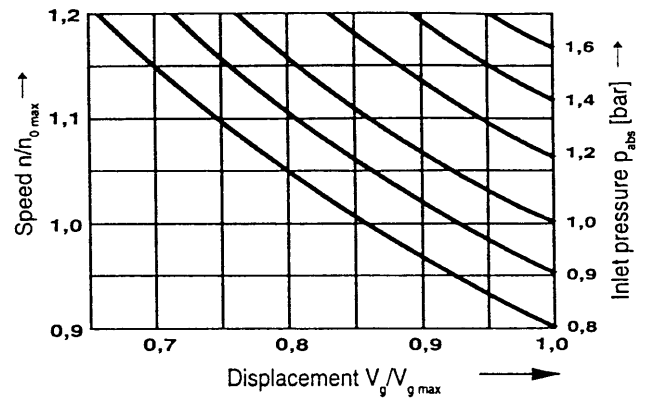
Table of values (theoretical values, without taking into account η_{mh} and η_v; values rounded off)

Size				28	45	71	100	140
Displacement	$V_{g\,max}$	cm³		28	45	71	100	140
Max. speed[1]	at $V_{g\,max}$	$n_{o\,max}$	rpm	3000	2600	2200	2000	1800
Max. permitted speed (limit speed) With increased input pressure p_{abs} or $V_g < V_{g\,max}$		$n_{o\,max}$	rpm	3600	3100	2600	2400	2100
Max. flow	at $n_{o\,max}$	$Q_{o\,max}$	L/min	84	117	156	200	252
	at $n_E = 1500$ rpm		L/min	42	68	107	150	210
Max. power ($\Delta p = 280$ bar)	at $n_{o\,max}$	$P_{o\,max}$	kW	39	55	73	93	118
	at $n_E = 1500$ rpm		kW	20	32	50	70	98
Max. torque ($\Delta p = 280$ bar)	at $V_{g\,max}$	M_{max}	Nm	125	200	316	445	623
Torque ($\Delta p = 100$ bar)	at $V_{g\,max}$	M	Nm	45	72	113	159	223
Moment of inertia about drive axis		J	kgm²	0,0017	0,0033	0,0083	0,0167	0,024
Case volume	•		L	0,7	1,0	1,6	2,2	3,0
Weight (excl. case volume)		m	kg	15	21	33	45	60
Permissible loading of drive shaft: max. axial force		$F_{ax.max}$	N	1000	1500	2400	4000	4800
Max. permissible radial force [2]		$F_{q\,max}$	N	1200	1500	1900	2300	2800

[1] These values are valid for an absolute pressure of 1 bar at the suction port S. By reducing the output flow or increasing the input pressure the speed can be increased as shown in the diagram.
[2] Please consult us for higher radial forces.

Application of forces

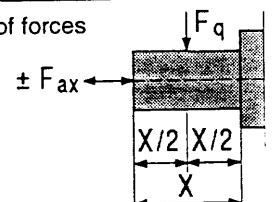### Determination of displacement

Output flow	$Q = \dfrac{V_g \cdot n \cdot \eta_v}{1000}$	[L/min]
Torque	$M = \dfrac{1,59 \cdot V_g \cdot \Delta p}{100 \cdot \eta_{mh}}$	[Nm]
Power	$P = \dfrac{2\pi \cdot M \cdot n}{60000} = \dfrac{M \cdot n}{9549} = \dfrac{Q \cdot \Delta p}{600 \cdot \eta_t}$ [kW]	

V_g = Displacement [cm³] per revolution
Δp = Differential pressure [bar]
n = Speed [rpm]
η_v = Volumetric efficiency
η_{mh} = Mechanical hydraulic efficiency
η_t = Overall efficiency ($\eta_t = \eta_v \cdot \eta_{mh}$)

Installation Notes

Installation position is optional. The pump housing must be filled with oil during commissioning and stay full when operating. In order to achieve the lowest possible noise level all connections (suction, pressure and drain connections) must be de-coupled from the tank by means of flexible elements.

A non-return valve in the drain line should be avoided.

However, it may be permitted following discussion with ourselves.

> **See RE 90400 for detailed installation notes and commissioning information**

Performance Curves for Pump with Constant 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 to ISO VG 46 DIN 51519, t = 50° C)

Size 28
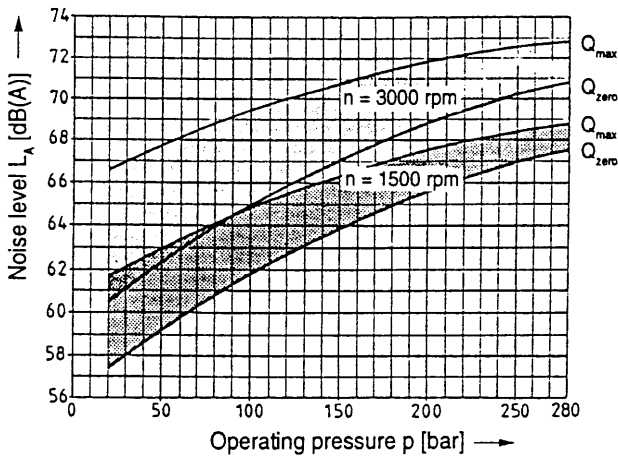
Size 45
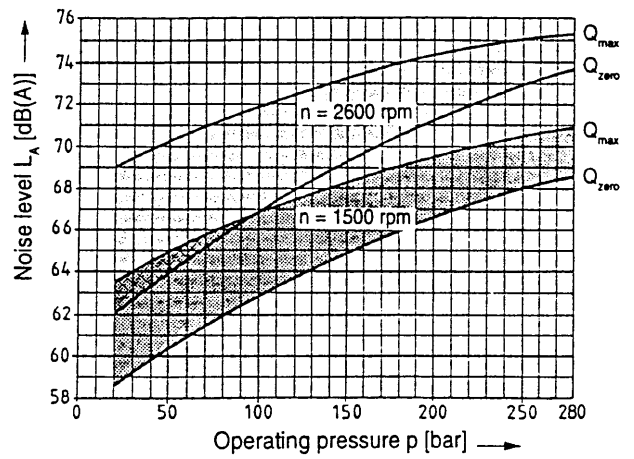
Size 71
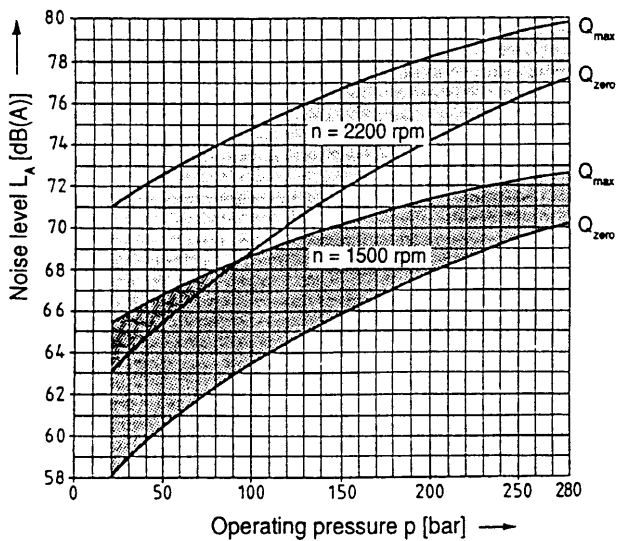
Size 100
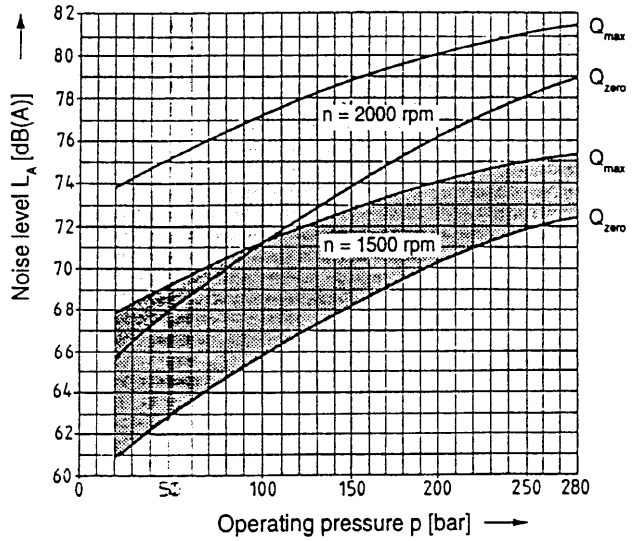
Operating Curves for Pump with Constant Pressure Control DR

Noise level
Measured in an anechoic chamber
Distance from microphone to pump = 1 m
Measuring error: ± 2 dB (A)
(Fluid: Hydraulic oil to ISO VG 46 DIN 51519, t = 50° C)

Size 140
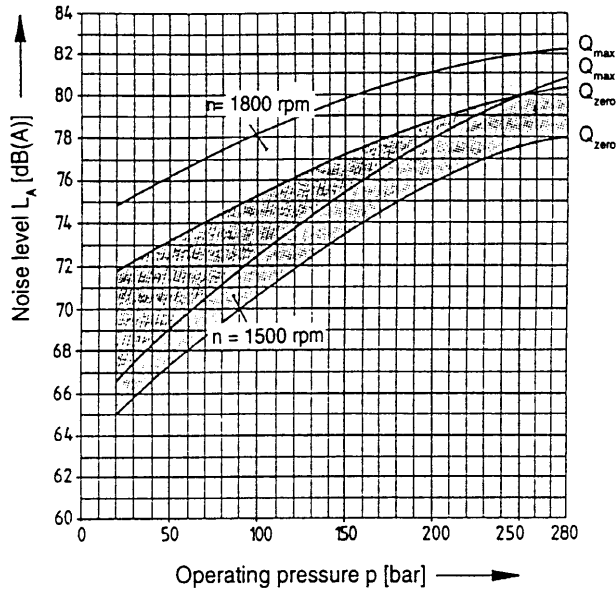
Drive power and Output Flow

(Fluid:
Hydraulic oil ISO VG 46 DIN 51519, t = 50° C)

Size 28
- - - - n = 1500 rpm
———— n = 3000 rpm
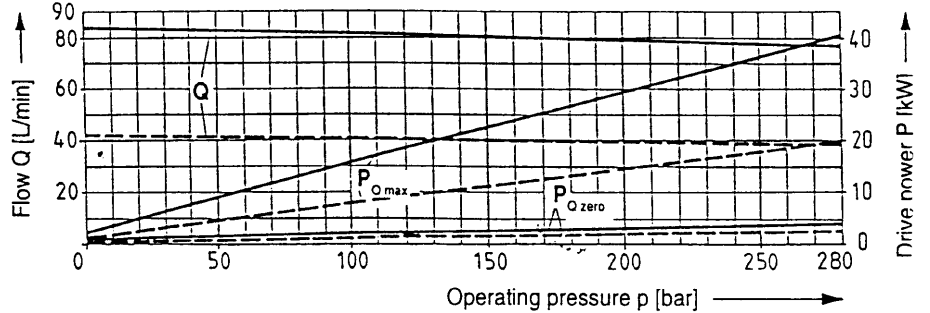
Size 45
- - - - n = 1500 rpm
———— n = 2600 rpm
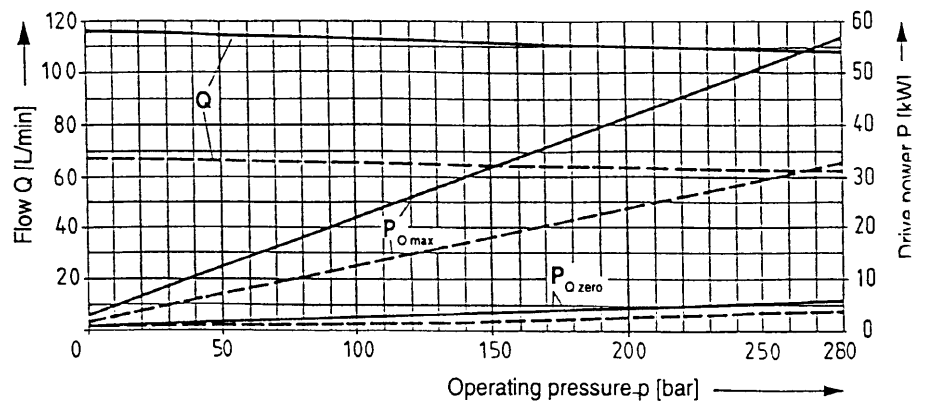
Drive Power and Output Flow
(Fluid: Hydraulic oil to ISO VG 46 DIN 51519, t = 50° C)

Size 71
- – – – n = 1500 rpm
- ——— n = 2200 rpm
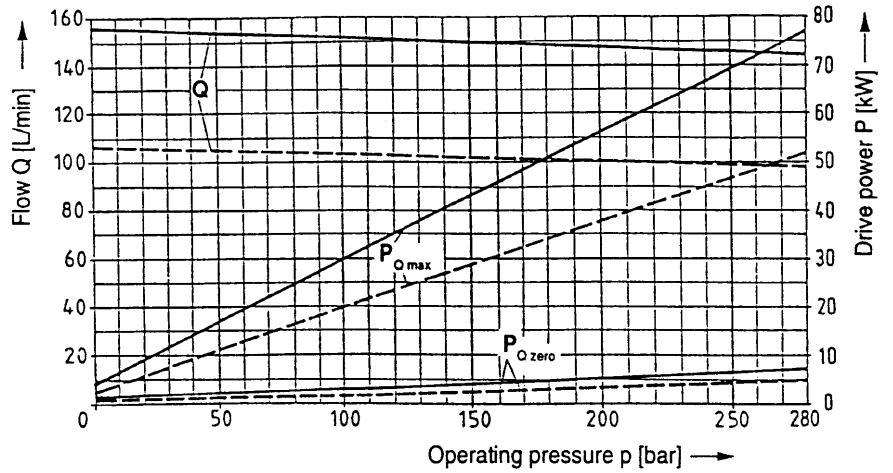
Size 100
- – – – n = 1500 rpm
- ——— n = 2000 rpm
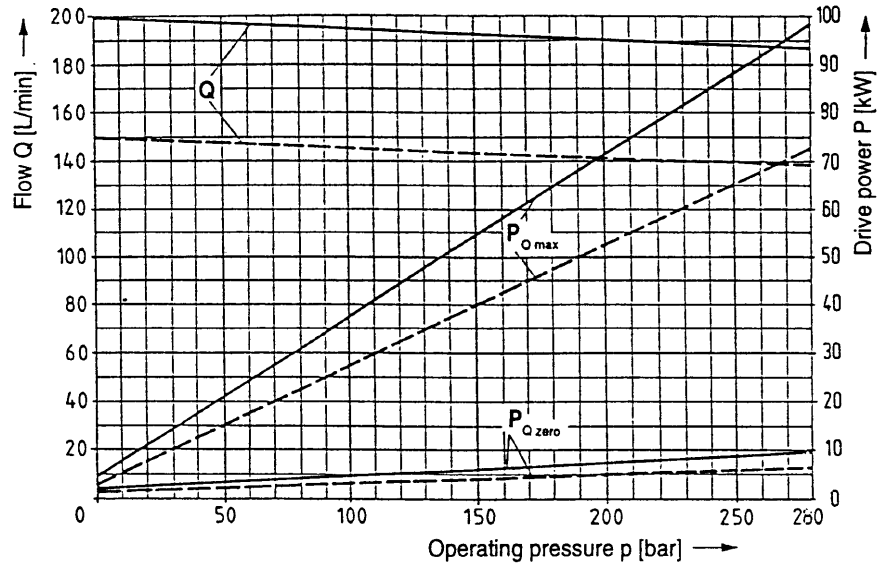
Size 140
- – – – n = 1500 rpm
- ——— n = 1800 rpm
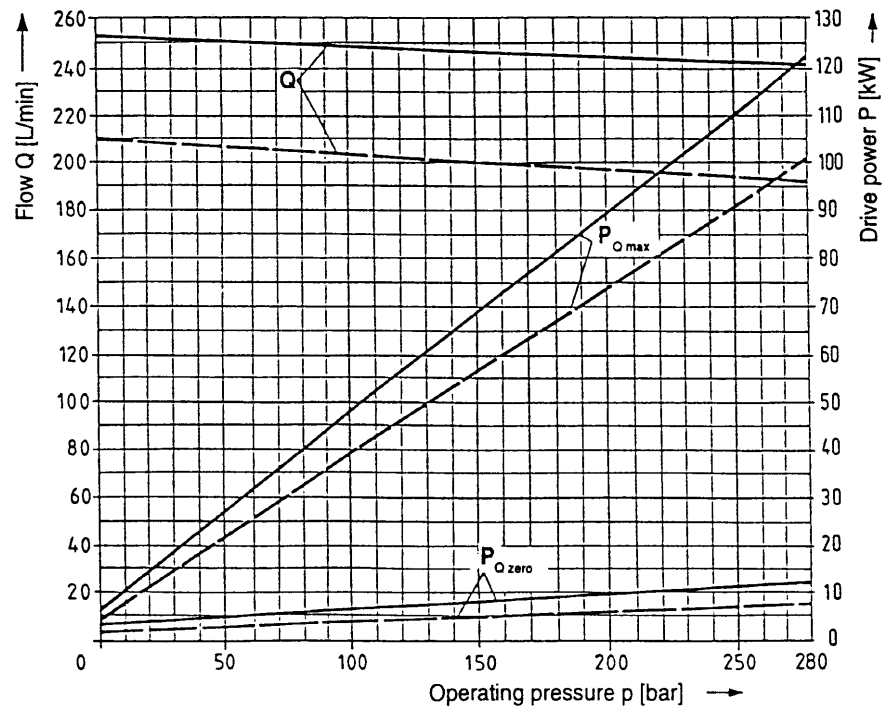
Overall efficiency

$$\eta_t = \frac{Q \cdot p}{P_{Q\,max} \cdot 600}$$
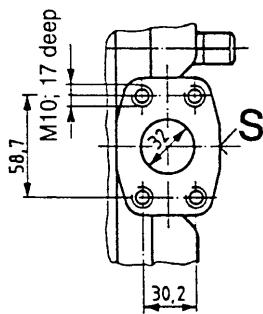
Volumetric efficiency:

$$\eta_v = \frac{Q}{Q_{theor.}}$$

Unit Dimensions Size 28
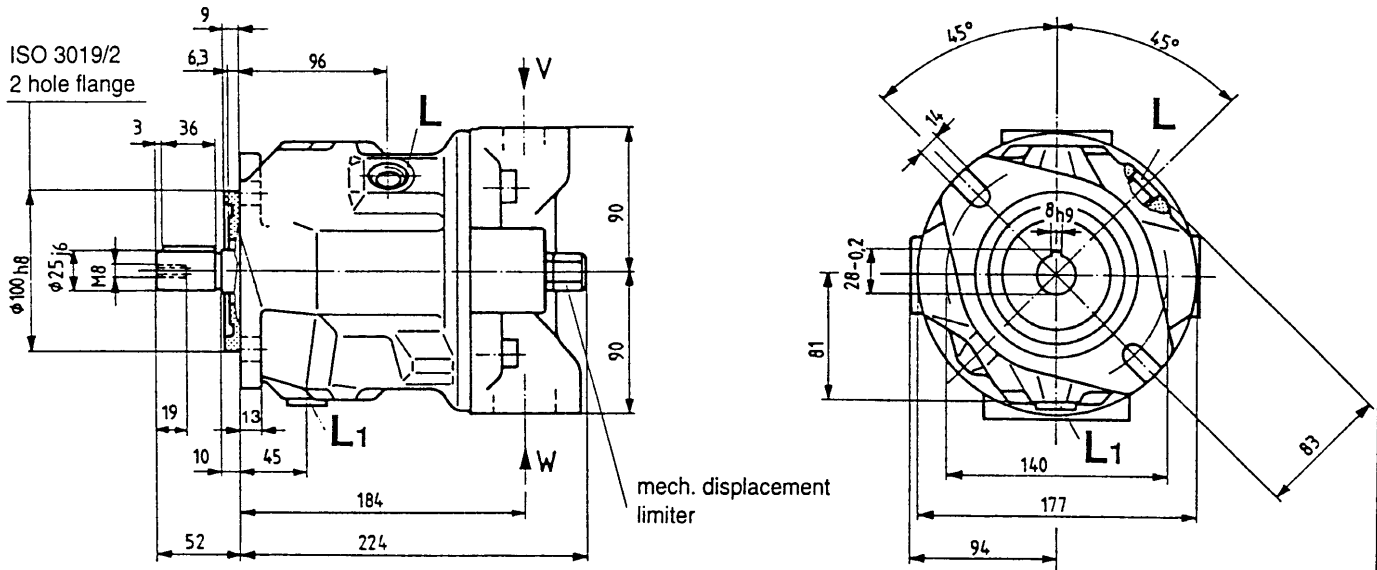N00 model (without through drive)
not including control

ISO 3019/2
2 hole flange

mech. displacement
limiter
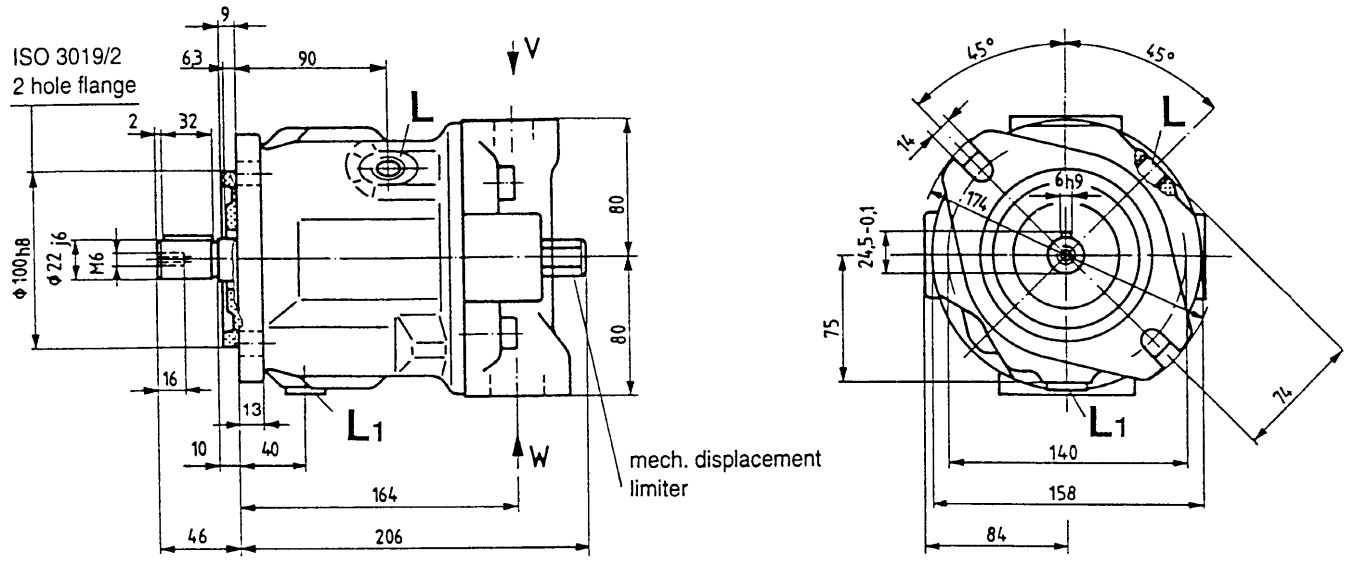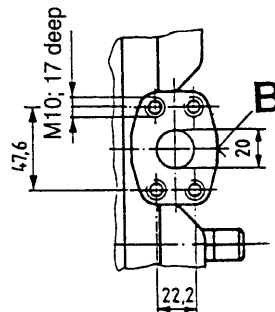
View W

View V

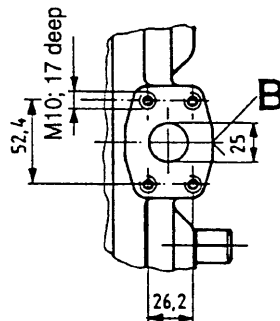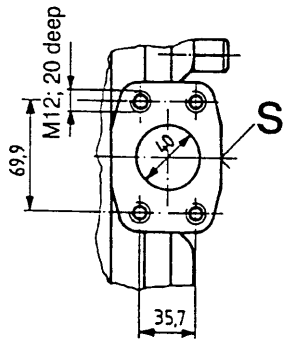| B | Pressure port | SAE 3/4" | (Standard pressure series) |
| S | Suction port | SAE 1 1/4" | (Standard pressure series) |
| L/L₁ | Case drain ports | M18x1,5 | (L₁ plugged at factory) |

A10VSO Variable Displacement Pump, Series 31

Before finalising your design, please request a certified drawing.
Subject to revision.

Unit Dimensions Size 45
N00 model (without through drive)
not including controls

ISO 3019/2
2 hole flange

mech. displacement limiter

View W

View V

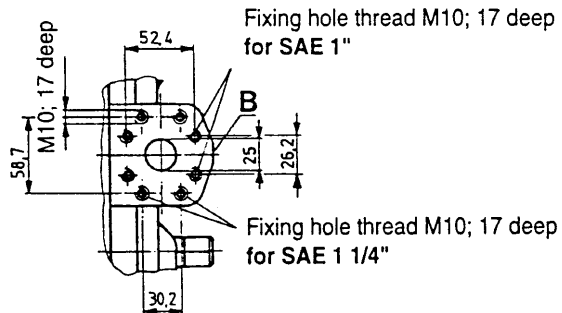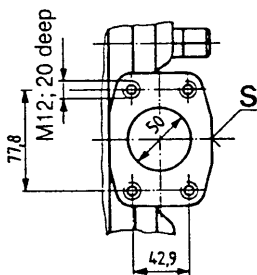| B | Pressure port | SAE 1" | (Standard pressure series) |
| S | Suction port | SAE 1 1/2" | (Standard pressure series) |
| L/L₁ | Case drain ports | M22x1,5 | (L₁ plugged at factory) |

A10VSO Variable Displacement Pump, Series 31

Before finalising your design, please request a certified drawing.
Subject to revision.

Unit Dimensions Size 71
N00 model (without through drive)
not including control

ISO 3019/2
2 hole flange

View W

View V

Fixing hole thread M10; 17 deep
for SAE 1"

Fixing hole thread M10; 17 deep
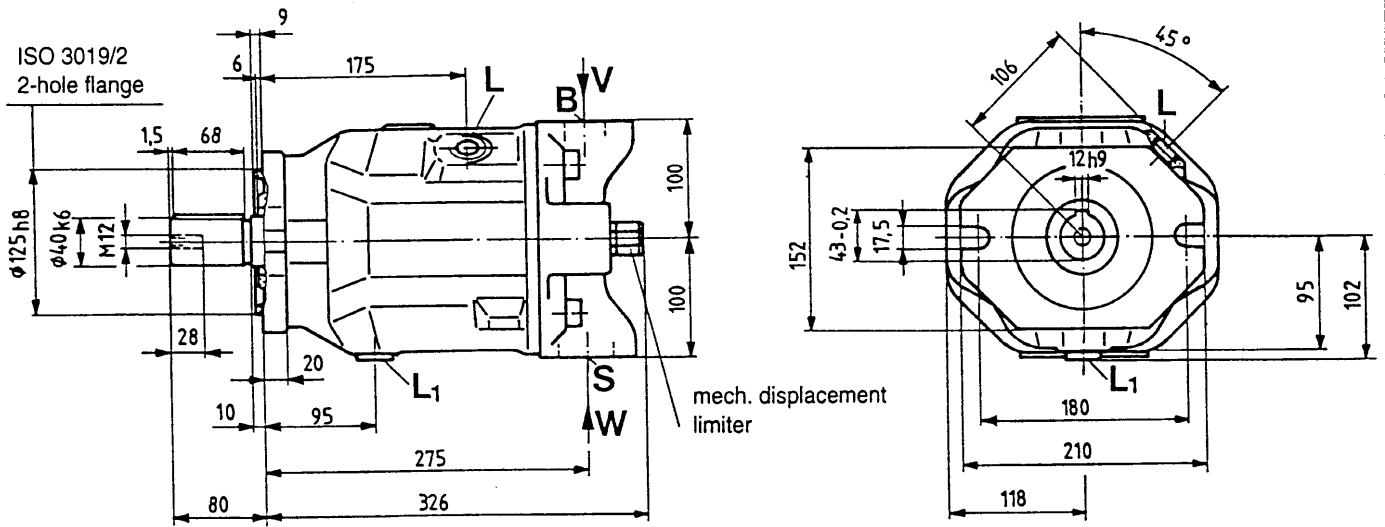for SAE 1 1/4"

mech.displacement
limiter
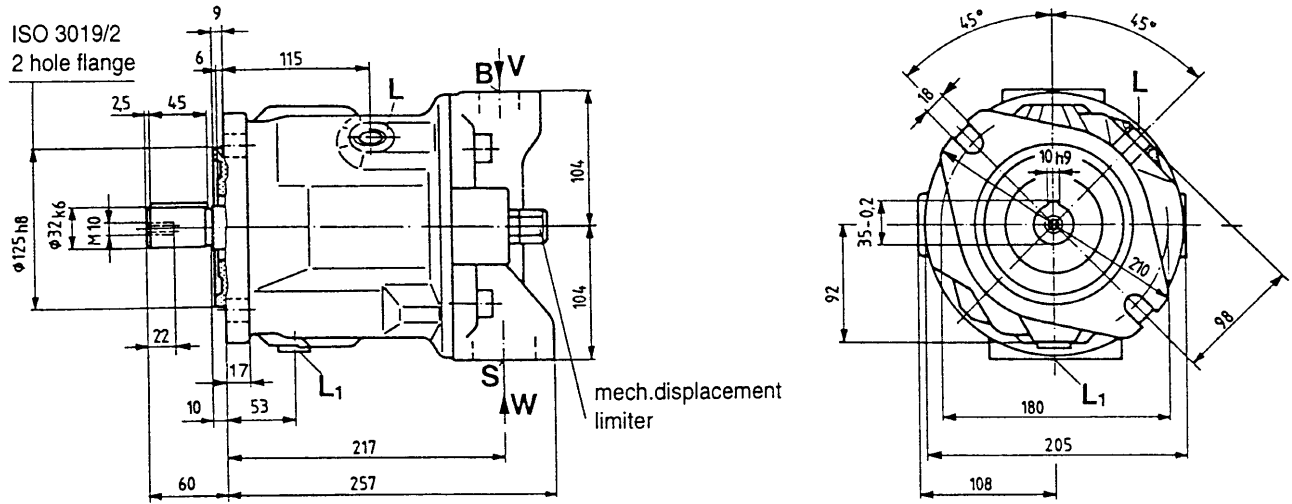
Note:
At **pressure port B** there are two SAE mountings available, each offset by 90°.
SAE 1 1/4" Standard pressure series, 3000 psi, for pressures **up to 250 bar** or
SAE 1" standard pressure series, 5000 psi, for pressures **in excess of 250 bar.**
For operating pressures in excess of 250 bar or for new projects an SAE 1" pressure flange should be used.

B	Pressure port	SAE 1"	(Standard pressure series) fixing hole thread to either SAE 1" or SAE 1 1/4" (optional)
S	Suction port	SAE 2"	(Standard pressure series)
L/L₁	Case drain ports	M22x1,5	(L₁ plugged at factory)

Brueninghaus Hydromatik

Unit Dimensions size 100
N00 model (without through drive)
not including control
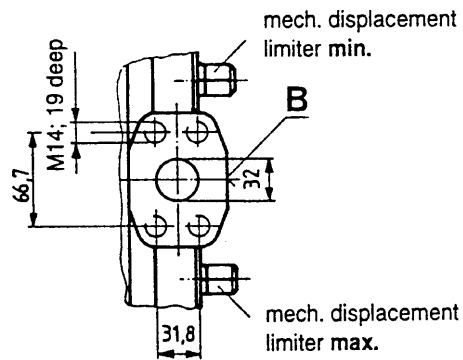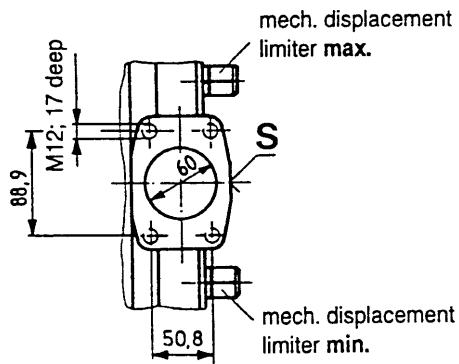
ISO 3019/2
2-hole flange

mech. displacement
limiter

View W

mech. displacement
limiter **max.**

M12; 17 deep

S

mech. displacement
limiter **min.**

View V

mech. displacement
limiter **min.**

M14; 19 deep

B

mech. displacement
limiter **max.**

B	Pressure port	SAE 1 1/4"	(High pressure series)
S	Suction port	SAE 2 1/2"	(Standard pressure series)
L/L₁	Case drain ports	M27x2	(L₁ plugged at factory)

Unit Dimensions size 140
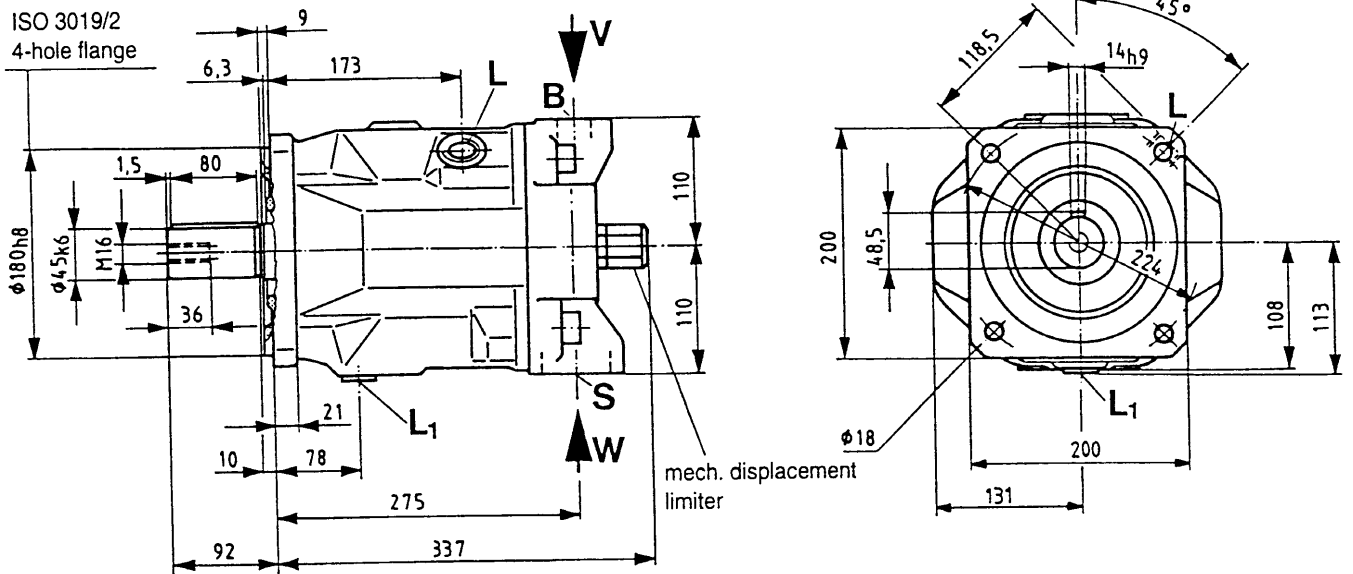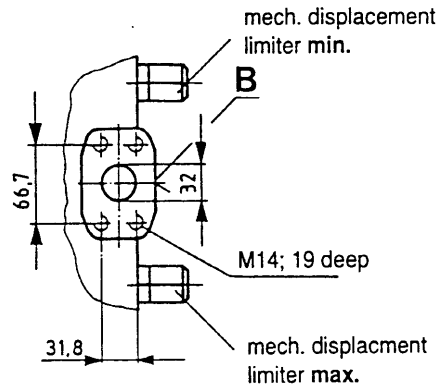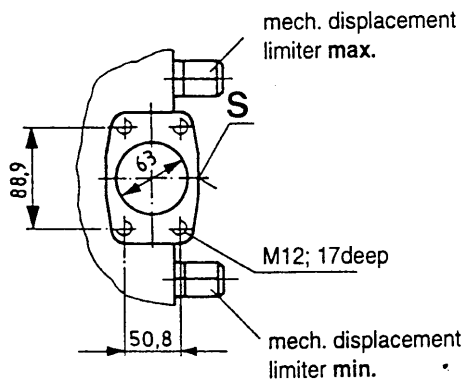N00 (without through drive)
not including control

ISO 3019/2
4-hole flange

mech. displacement limiter

View W

mech. displacement limiter **max.**

M12; 17deep

mech. displacement limiter **min.**

View V

mech. displacement limiter **min.**

M14; 19 deep

mech. displacment limiter **max.**

B	Pressure port	SAE 1 1/4"	(High pressure series)
S	Suction port	SAE 2 1/2"	(Standard pressure series)
L/L₁	Case drain ports	M27x2	(L₁ plugged at factory)

Brueninghaus Hydromatik

DR Constant 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 pilot valve.

Static Operating Curve
(at n_1 = 1500 rpm; t_{oil} = 50° C)

Hysteresis and pressure rise Δp

Flow Q

Adjustment range

20   **280**

Operating pressure p [bar]
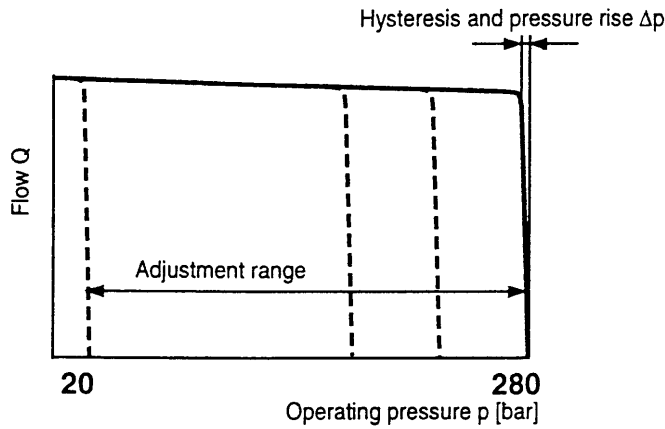
Dynamic Operating Curves
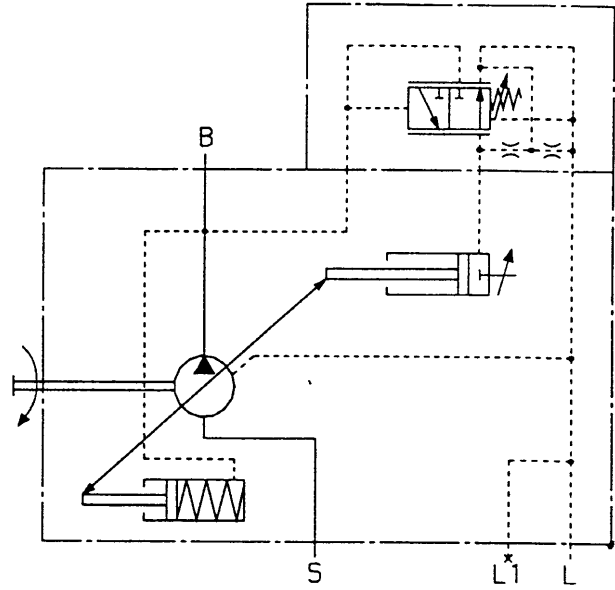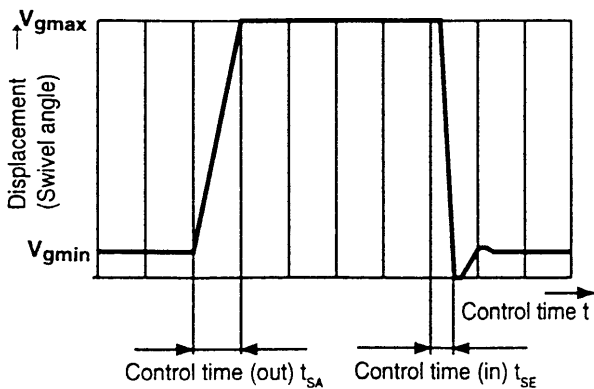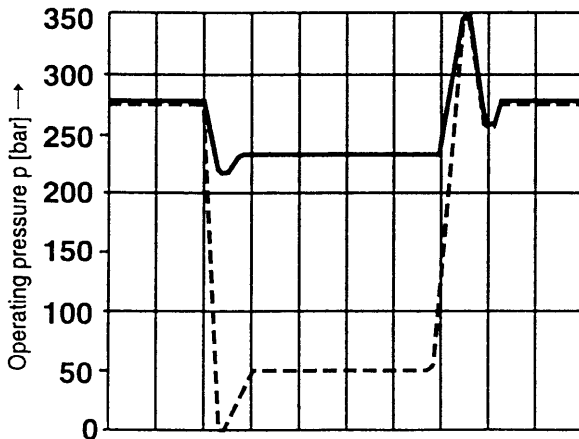The operating curves are mean values measured under test conditions with the unit mounted inside the tank.

Conditions: n = 1500 rpm
           t_{oil} = 50° C
           Pressure cut-off at 350 bar

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.

Operating pressure p [bar]

Displacement (Swivel angle)

V_{gmax}

V_{gmin}

Control time t

Control time (out) t_{SA} Control time (in) t_{SE}

Ports

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

Controller data

Hysteresis and pressure rise Δp —————————— max. 4 bar

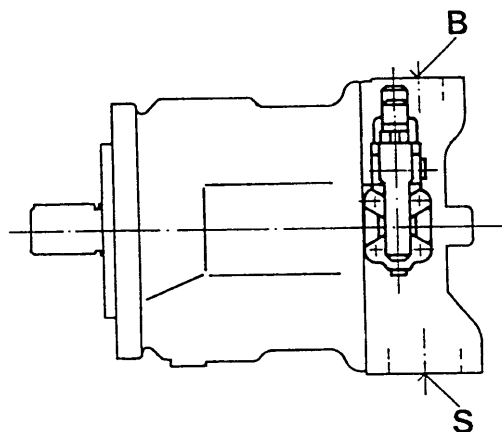Pilot oil requirement ————————— max. approx. 3 L/min

Flow loss at Q_{max} see pages 7 and 8.

Control times

Size	t_{SA} (ms) against 50 bar	t_{SA} (ms) against 220 bar	t_{SE} (ms) stalled at 280 bar
28	60	30	20
45	80	40	20
71	100	50	25
100	125	90	30
140	130	150	30

Unit Dimensions
DR Pressure Control

Size 28...100

Pilot valve installed here
for anti-clockwise rotation

Pilot valve installed here
for clockwise rotation

Adjustment screw for pressure
controller stall pressure

B

S

A_1

A_2
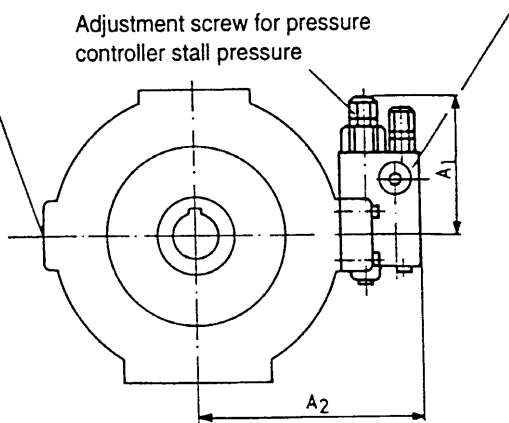
On sizes 28 to 100 the DFR valve used has the flow control port
blocked in the factory and is not tested.

Size 140
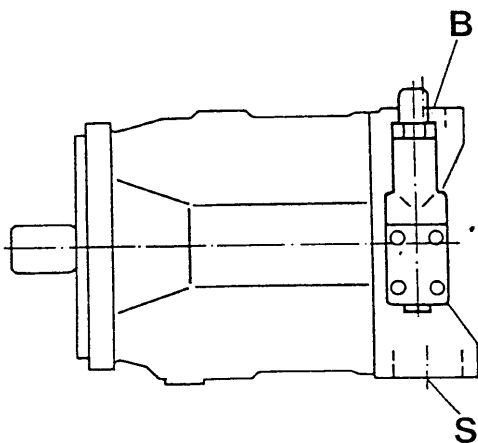
Pilot valve installed here
for anti-clockwise rotation

Pilot valve installed here
for clockwise rotation

Adjustment screw for pressure
controller stall pressure

B

S

A_1

A_2
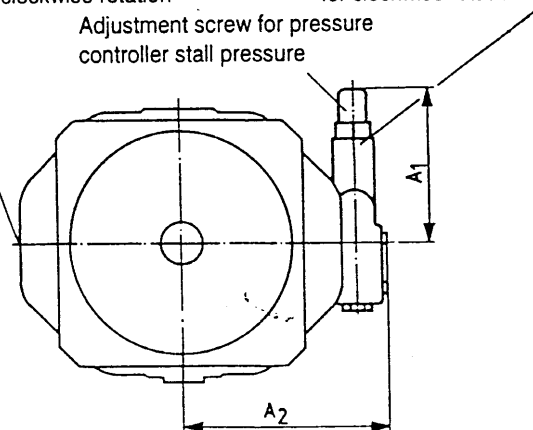
Size	A_1	A_2
28	104,5	136
45	104,5	146
71	104,5	160
100	104,5	165
140	125	169

Brueninghaus Hydromatik

DRG Pressure controller, remote controlled

Function and equipment as for DR.

A pressure relief valve can be connected to port X for remote control applications; this is not included in the items supplied with the DRG control.
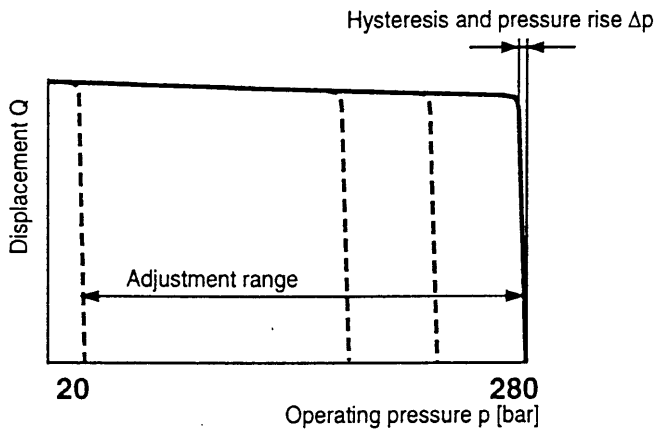
The standard pressure differential setting at the pilot valve is 20 bar. A pilot oil flow of approx. 1,5 L/min is then required. If a further setting (range 10–22 bar) is required please indicate in clear text.

We recommend the following as separate pressure relief valves:
DBDH 6 (hydraulic) to RE 25402,
DBEC-3X (electric) to RE 29142 or
DBETR-SO 381 with orifice ø0,8 in P (electric) to RE 29166.

The max. pipe length should not exceed 2m.

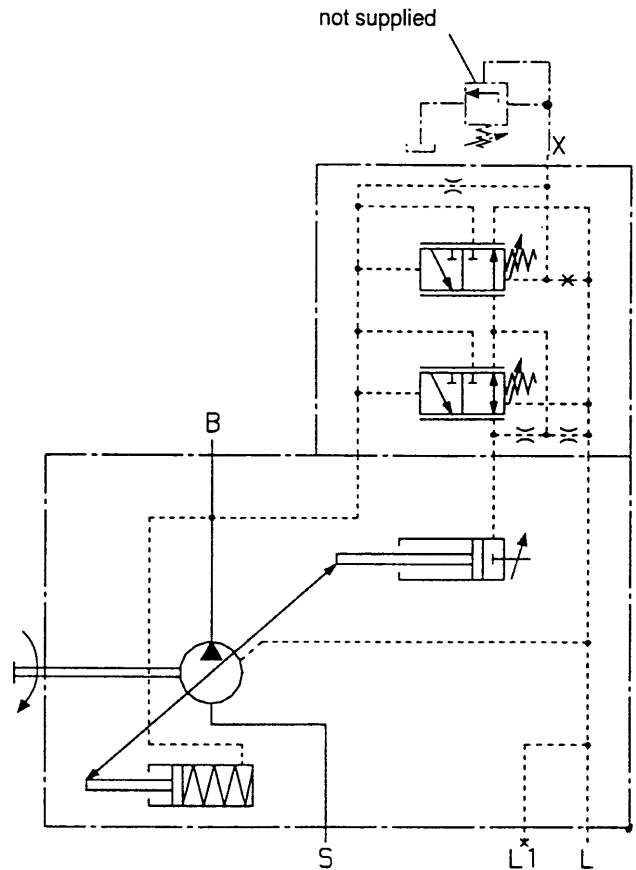## Static Operating Curve
(at n_1 = 1500 rpm; t_{oil} = 50° C)

Hysteresis and pressure rise Δp

Displacement Q

Adjustment range

20   **280**
Operating pressure p [bar]

Controller data

Hysteresis and pressure rise Δp ———————— max. 4 bar
Pilot oil requirement —————————— approx. 4,5 L/min
Flow loss at Q_{max} see pages 7 and 8.

Size 28...100

not supplied

B

S   L1 L

Size 140

not supplied

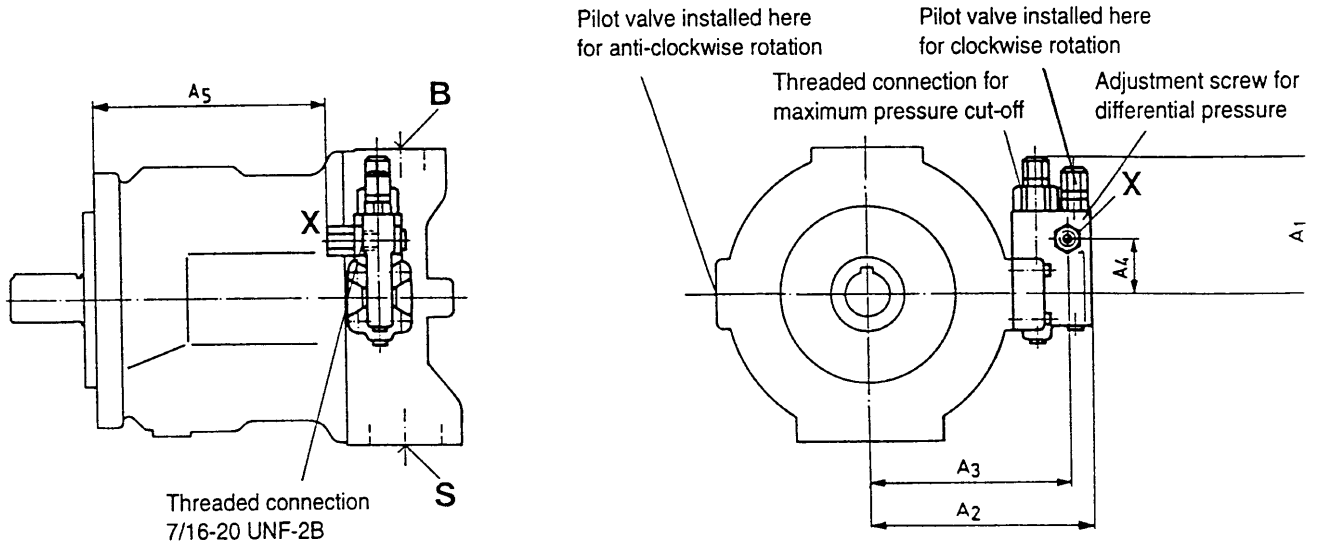B

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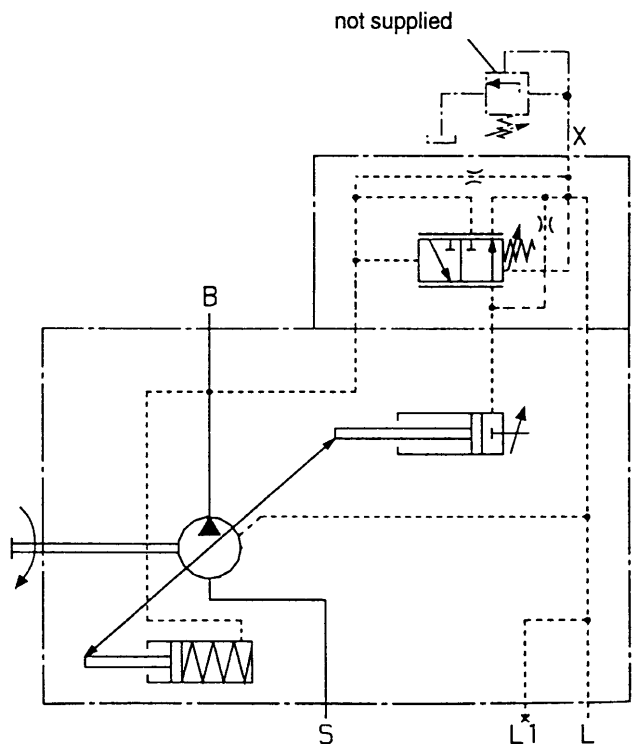
Ports
B	Pressure port
S	Suction port
L, L1	Case drain ports (L1 plugged)
X	Pilot pressure port

Unit Dimensions
DRG Pressure controller with remote control

Sizes 28...100
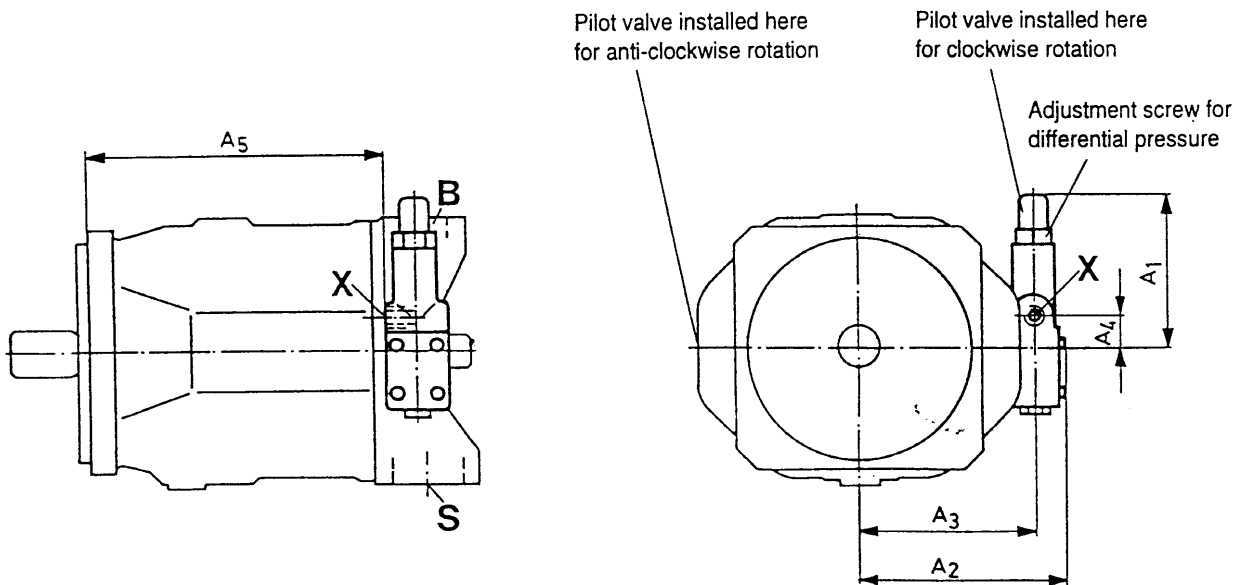
A5

B

X

Threaded connection
7/16-20 UNF-2B

S

Pilot valve installed here
for anti-clockwise rotation

Pilot valve installed here
for clockwise rotation

Threaded connection for
maximum pressure cut-off

Adjustment screw for
differential pressure

X

A_1

A_4

A_3

A_2

Size 140

A5

B

X

S

Pilot valve installed here
for anti-clockwise rotation

Pilot valve installed here
for clockwise rotation

Adjustment screw for
differential pressure

X

A_1

A_4

A_3

A_2

| Size	A_1	A_2	A_3	A_4	A_5	Port X
28	104,5	136	119	40	120	M14x1,5; 12 deep
45	104,5	146	129	40	135	M14x1,5; 12 deep
71	104,5	160	143	40	163	M14x1,5; 12 deep
100	104,5	165	148	40	230	M14x1,5; 12 deep
140	125	209	183	26	244	M14x1,5; 12 deep

DFR/DFR1 Pressure /flow controller

In addition to the constant pressure control function the pump flow may be regulated by means of a differential pressure (e.g. an orifice) installed in the service line.
On model DFR1 the X- orifice is plugged.

Static Operating Curve
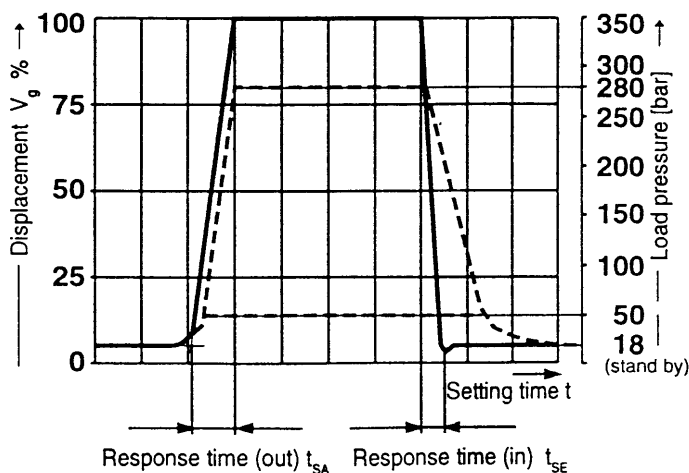(at n_1 = 1500 rpm; t_{oil}= 50° C)
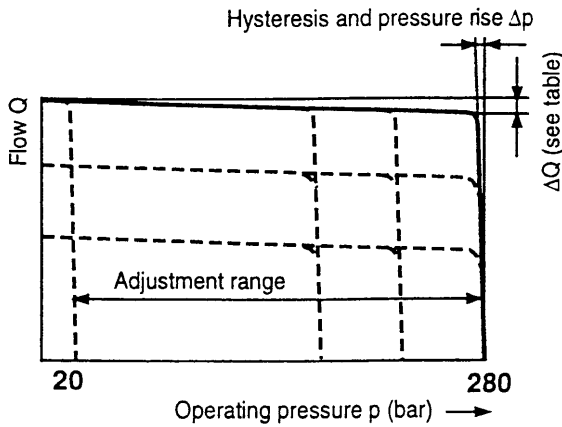
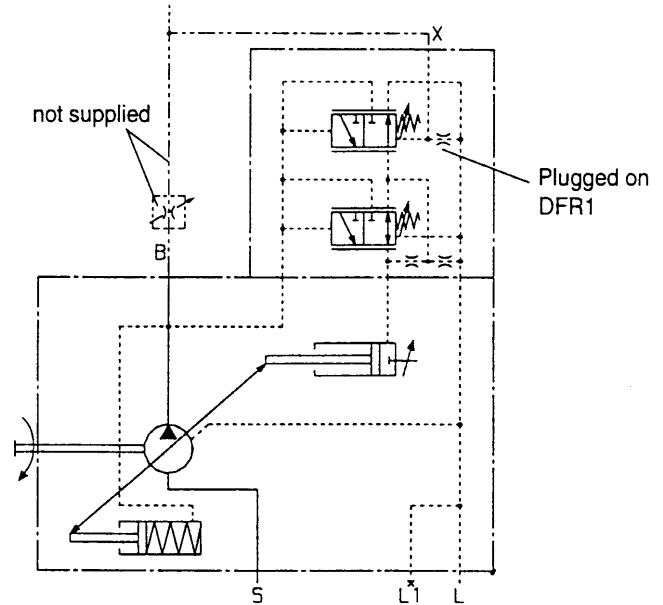### Static Operating Curve at Variable Speed
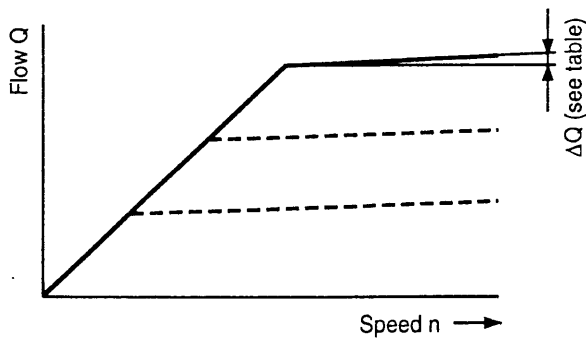
Dynamic Flow Control Operating Curve
The operating curves are average values measured under test conditions with the unit mounted inside the tank.

Size	t_{SA} (ms) stand by–280 bar	t_{SE} (ms) 280 bar–stand by	t_{SE} 50 bar–stand by
28	40	20	40
45	50	25	50
71	60	30	60
100	120	60	120
140	130	60	130

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

Differential pressure Δp:
Adjustable between 10 and 22 bar (higher values on request).
Standard setting: 14 bar. If a different setting is required please indicate in clear text.
When port X is unloaded to tank a "cut-off pressure" of p = 18 ± 2 bar ("stand by") results.

Controller data
Max. flow variation (hysteresis and increase) measured at drive speed n = 1500 rpm

Size		28	45	71	100	140
ΔQ_{max}	L/min	1	1,8	2,8	4,0	6,0

Hysteresis and pressure increase Δp _____ max. 4 bar
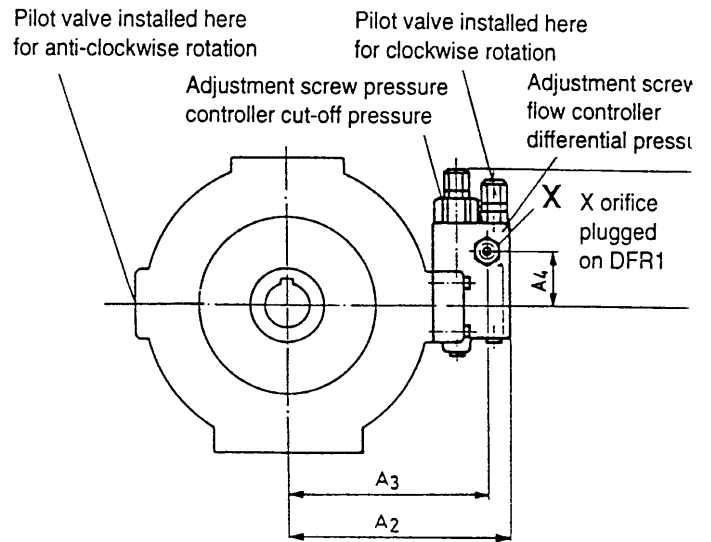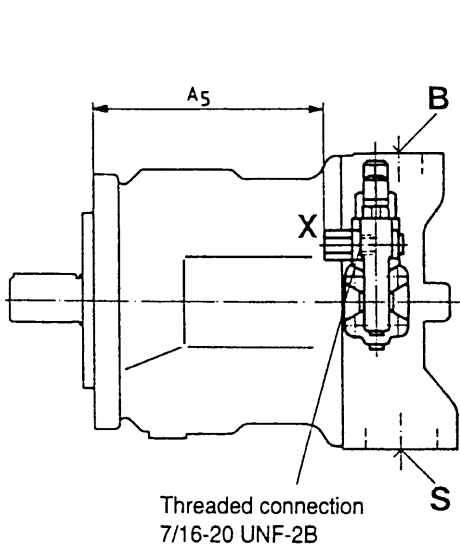DFR pilot oil consumption _____ max. approx. 3 ... 4,5 L/min
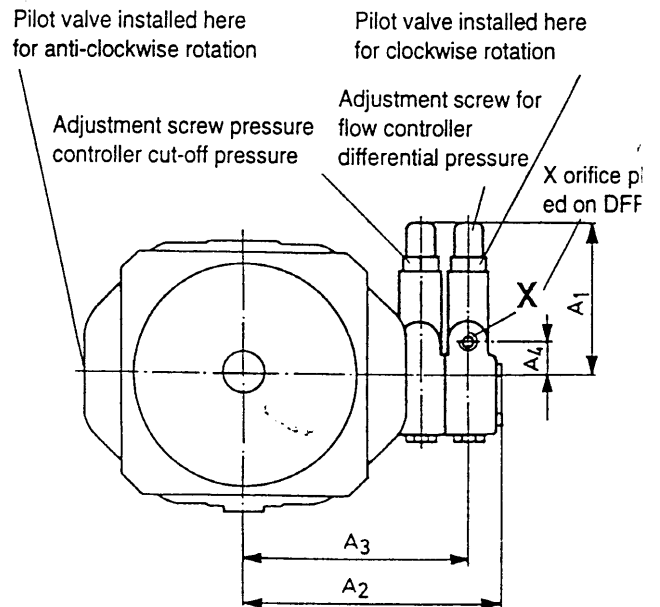DFR1 pilot oil consumption _____ max. approx. 3 L/min
Flow loss at Q_{max} see pages 7 and 8.
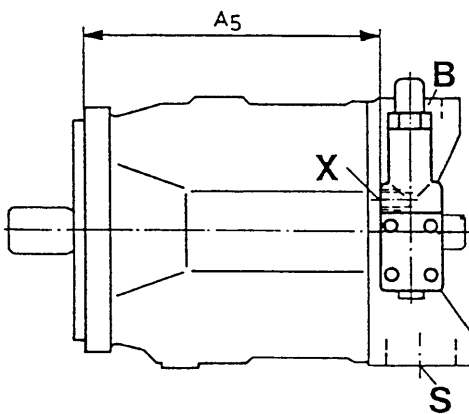
Unit Dimensions
## DFR; DFR1 Pressure and Flow Regulator

Sizes 28...100

Pilot valve installed here
for anti-clockwise rotation

Pilot valve installed here
for clockwise rotation

Adjustment screw pressure
controller cut-off pressure

Adjustment screv
flow controller
differential press

X orifice
plugged
on DFR1

Threaded connection
7/16-20 UNF-2B

Size 140

Pilot valve installed here
for anti-clockwise rotation

Pilot valve installed here
for clockwise rotation

Adjustment screw pressure
controller cut-off pressure

Adjustment screw for
flow controller
differential pressure

X orifice p
ed on DFF

Size	A_1	A_2	A_3	A_4	A_5	Port X
28	104,5	136	119	40	120	M14x1,5; 12 deep
45	104,5	146	129	40	135	M14x1,5; 12 deep
71	104,5	160	143	40	163	M14x1,5; 12 deep
100	104,5	165	148	40	230	M14x1,5; 12 deep
140	125	209	183	26	244	M14x1,5; 12 deep

DFLR Constant 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 of the axial piston pump is varied so that the product of flow and pressure remains constant.
Constant flow control is possible below the power curve.

Static Operating Curve
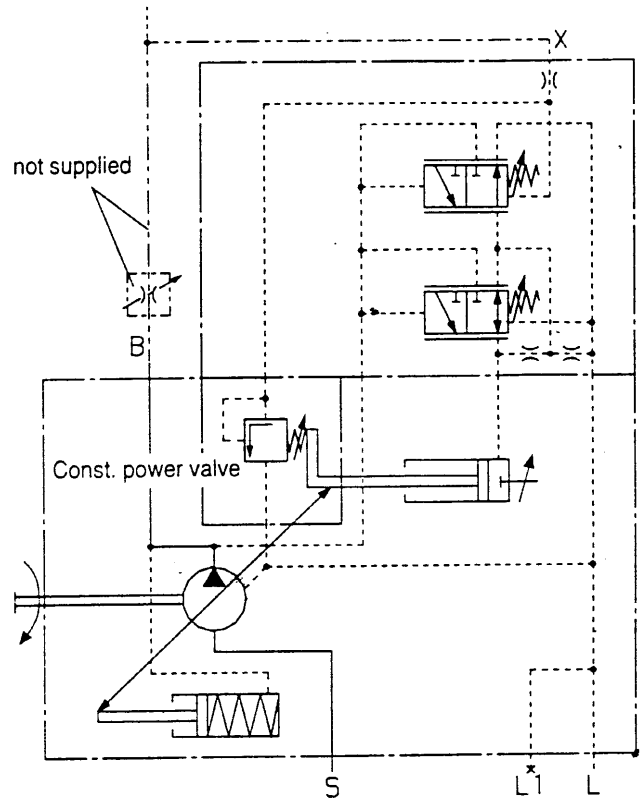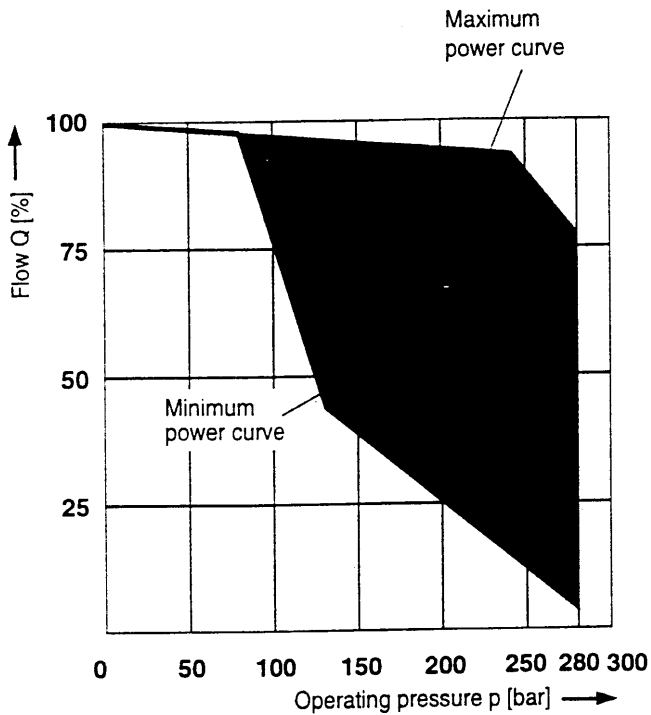
The power curve is set at the factory, please state your requirements in clear text e.g. 5 kW at 1500 rpm.
When port X is unloaded to tank a "cut-off pressure" of $p = 18 \pm 2$ bar ("stand by") results.
A maximum of 5,5 L/min pilot oil is required.

Ports

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

Controller data

Start of control ———————————————— from 80 bar

Pilot oil requirement ———————— max. approx. 5,5 L/min

Flow loss at Q_{max} see pages 7 and 8.

Unit Dimensions
Constant Pressure / Flow / DFLR

Sizes 28...100

Pilot valve installed here
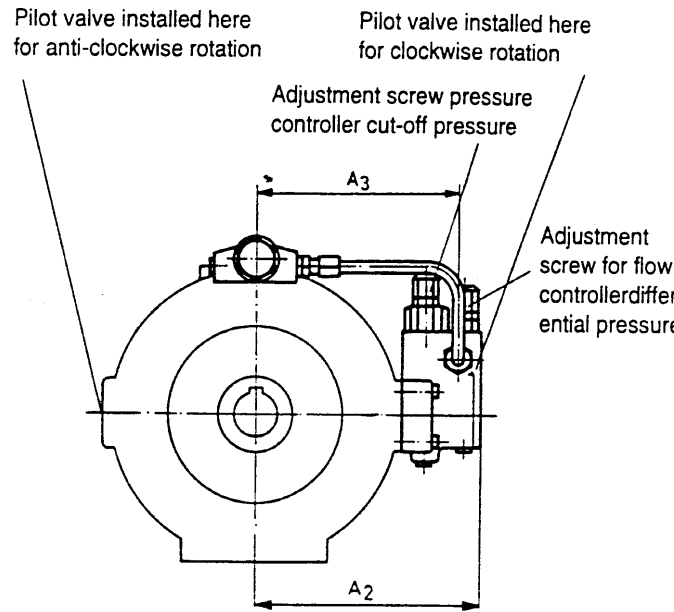for anti-clockwise rotation

Pilot valve installed here
for clockwise rotation

Adjustment screw pressure
controller cut-off pressure

Adjustment
screw for flow
controllerdiffer
ential pressure

Threaded connection
7/16-20 UNF-2B

Size 140

Pilot valve installed here
for anti-clockwise rotation

Pilot valve installed here
for clockwise rotation

Adjustment screw pressure
controller cut-off pressure

Adjustment
screw for flow
controllerdiffer-
ential pressure

Size	A_1	A_2	A_3	A_4	A_5	A_6	Port X
28	104,5	136	119	40	193	106,5	M14x1,5; 12 deep
45	104,5	146	129	40	208	112	M14x1,5; 12 deep
71	104,5	160	143	40	236	126	M14x1,5; 12 deep
100	104,5	165	148	40	303	129	M14x1,5; 12 deep
140	125	209	183	26	314	139,5	M14x1,5; 12 deep

FHD Pilot pressure dependent flow control with pressure cut-off

The swivel angle of the pump and therefore its displacement is dependent on the pilot pressure $P_{St\,X}$ present in port X.
A constant pressure of $p_y = 35$ bar should be applied to port Y.
The integral pressure control is steplessly adjustable.
(Please state set value required in clear text).

Static Curve
(at $n_1 = 1500$ rpm; $t_{oil} = 50°$ C)

Hysteresis and pressure rise Δp
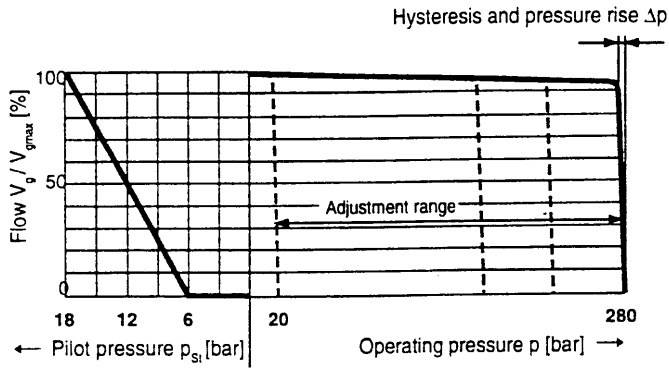
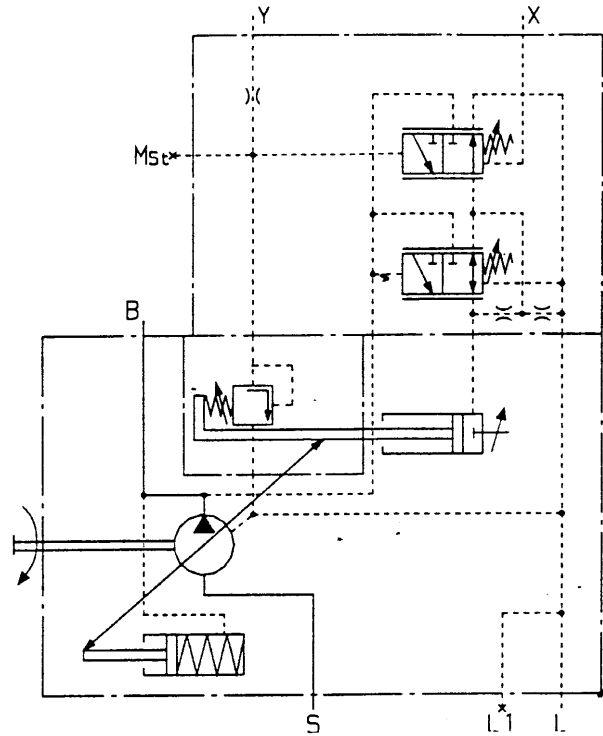**Controller data**

Hysteresis ± 2 % of $V_{g\,max}$
External pilot oil consumption in Y approx. 3 ... 4,5 L/min max.
Pressure rise Δp _____ max. 4 bar
Flow loss at Q_{max} see pages 7 and 8.

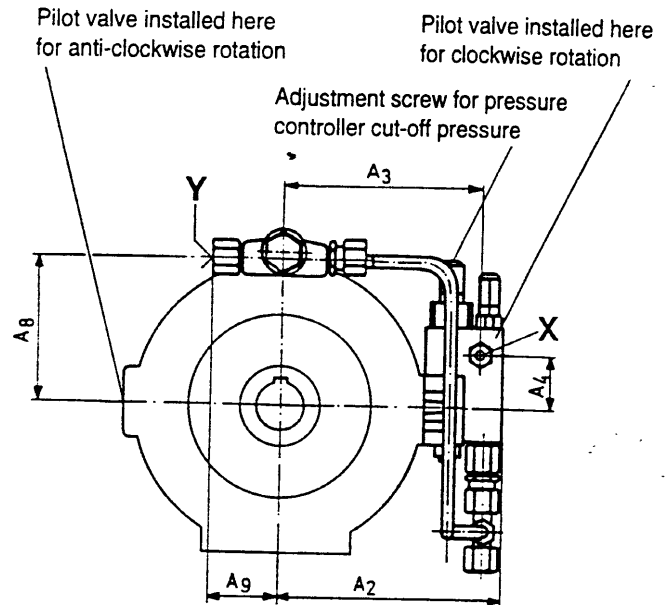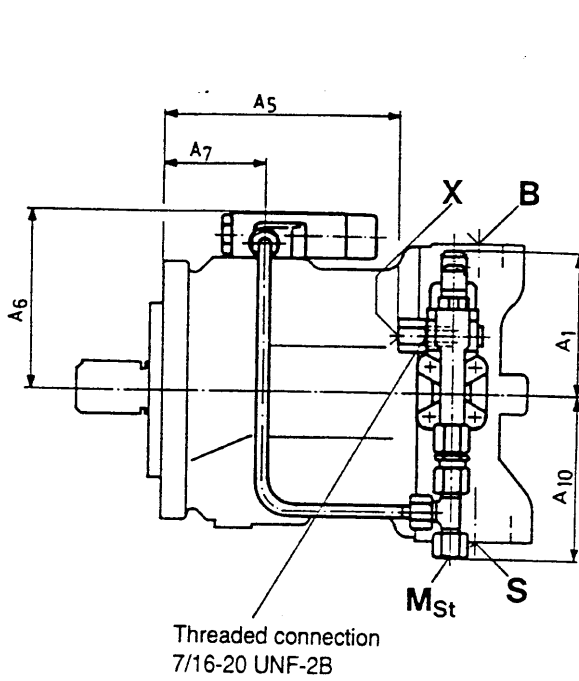**Ports**

B	Pressure port
S	Suction port
L, L1	Case drain port (L1 plugged)
X, Y	Pilot pressure ports
MSt	Test port

Unit Dimensions
FHD pilot pressure dependent flow control with pressure cut-off

Size 28...100

Pilot valve installed here
for anti-clockwise rotation

Pilot valve installed here
for clockwise rotation

Adjustment screw for pressure
controller cut-off pressure

Threaded connection
7/16-20 UNF-2B

| Size	A₁	A₂	A₃	A₄	A₅	A₆	A₇	A₈	A₉	A₁₀	Port X	Port Y	M_St
28	104,5	136	119	40	120	106,5	49	86	48	109	M14x1,5	M14x1,5	Pipe dia.8x1,5 DIN 2391
45	104,5	146	129	40	135	112	54	91,5	48	109	M14x1,5	M14x1,5	Pipe dia.8x1,5 DIN 2391
71	104,5	160	143	40	163	124	69	103,5	48	109	M14x1,5	M14x1,5	Pipe dia.8x1,5 DIN 2391
100	104,5	165	148	40	230	129	111	108,5	48	109	M14x1,5	M14x1,5	Pipe dia.8x1,5 DIN 2391
140	in preparation												

FE   Electrical Flow Control

The output flow of the pump is set by an electrically controlled proportional valve.

Flow control is achieved by means of the variable swivel angle of the pump, possible variations in drive speed (e.g. diesel engine speeds) are not taken into consideration.

The swivel angle of the pump is fed back via an inductive positional transducer to the amplifier card VT 5036 (RE 29957) or the amplifier module VT 11019 (RD 29763) required for control.

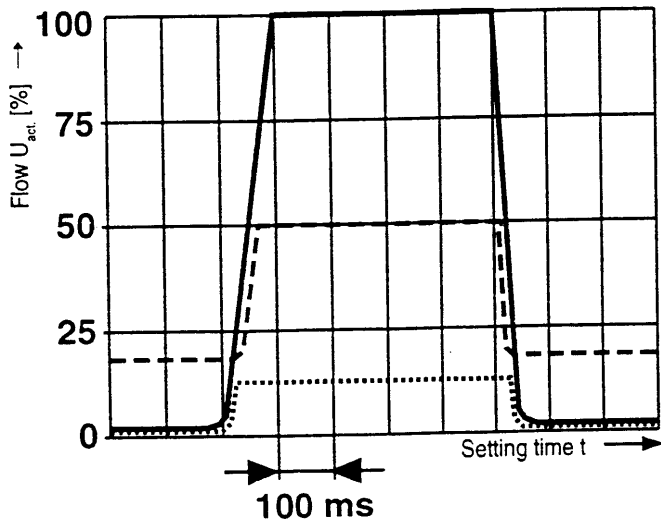The amplifier card /amplfier module are used to control pump flow and should be ordered separately.
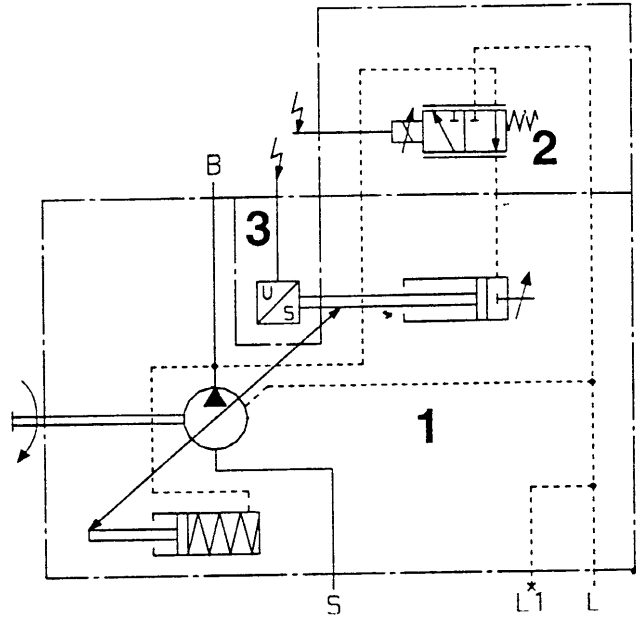
Static Curve
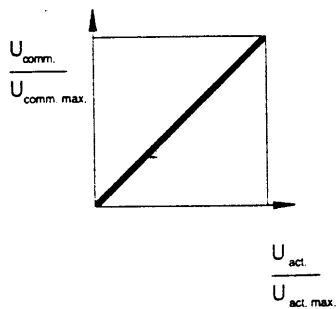
Dynamic Curve

Displacement time characteristics
measured: A10VSO 45 FE
Stepped pressure signal value 100 bar (Pressure relief valve)

_____ 5% −100%− 5% Flow $U_{act.}$
--------------- 20% − 50% −20% Flow $U_{act.}$
.... 5% − 15% − 5% Flow $U_{act.}$

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

Components
1   A10VSO with hydraulic control device
2   Control valve FT 202–4–0
3   Inductive positional transducer IW9–03–01

Control data

Minimum setting pressure required ————————— 20 bar

Pilot oil consumption ——————— max. 2,5 L/min approx.

Hysteresis ————————————— ≤ ± 1 % of $V_{g\,max}$

Repeatability ————————————————— ≤ ± 1 %

Flow loss at Q_{max} see pages 7 and 8.

Pilot valve:

Type of voltage ————————————————— DC

Nominal voltage ————————————————— 24 V

Coil resistance at 20° C ————————————— 12 Ω

Duty ———————————————————— 100 %

Ambient temperature ————————————— ...50° C

Coil temperature ————————————— ...150° C

Insulation to DIN 40050 ————————————— IP 65

Insulation class to VDE 0580 ——————————— F

Inductive positional transducer:

Carrier frequency ————————————— 1000 Hz...5000 Hz

Inductivity ————————————————— 9.5 mH

RE 92711/03.9

A10VSO Variable Displacement Pump, Series 31

Before finalising your design, please request a certified drawing
Subject to revision.

Unit Dimensions
Electrical flow controller FE

Size 28...100

Pilot valve installed here for anti-clockwise rotation

Pilot valve installed here for clockwise rotation
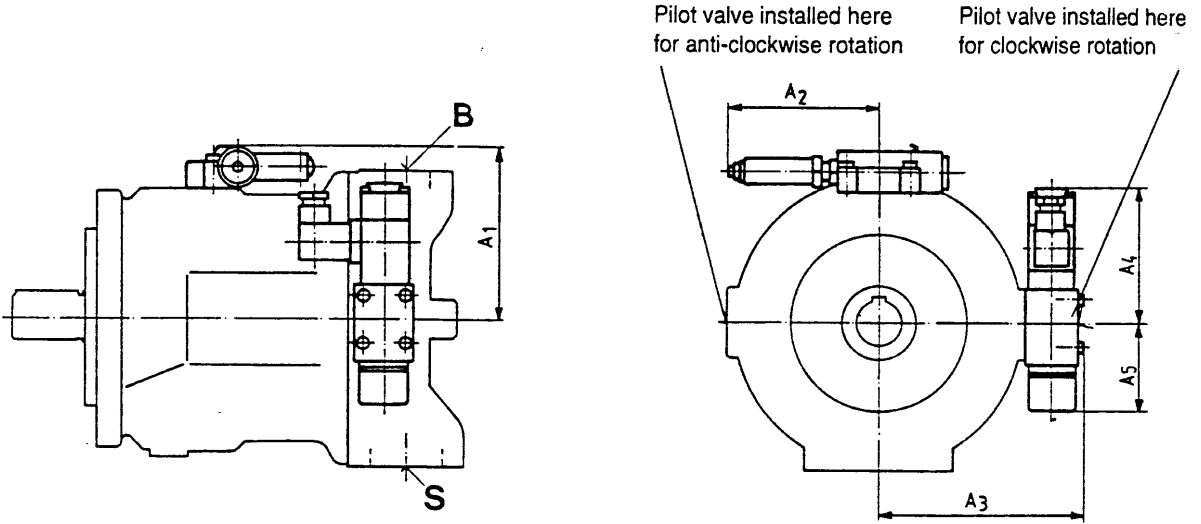
Size	A_1	A_2	A_3	A_4	A_5
28	103,5	106,5	123,5	95	61
45	109	106,5	133,5	95	61
71	126	106,5	147,5	95	61
100	131	106,5	152,5	95	61
140	in preparation				

FED Electrical flow controller with pressure cut-off

The output flow of the pump is controlled by means of an electrically operated proportional valve.

Control of output flow is achieved by varying the swivel angle of the pump. Possible variations in drive speed (e.g. diesel engine speeds) are not taken into consideration.

The position of the pump is fed back via an inductive positional transducer to amplifier card VT 5036 (RE 29957) or amplifier module VT 11019 (RE 29763).

The amplifier card / amplifier module is used to control the flow of the pump and is subject to separate order.

As opposed to the FE, this control is fitted with an additional sandwich valve (item 4) so as to give a supplementary hydraulic pressure control facility.
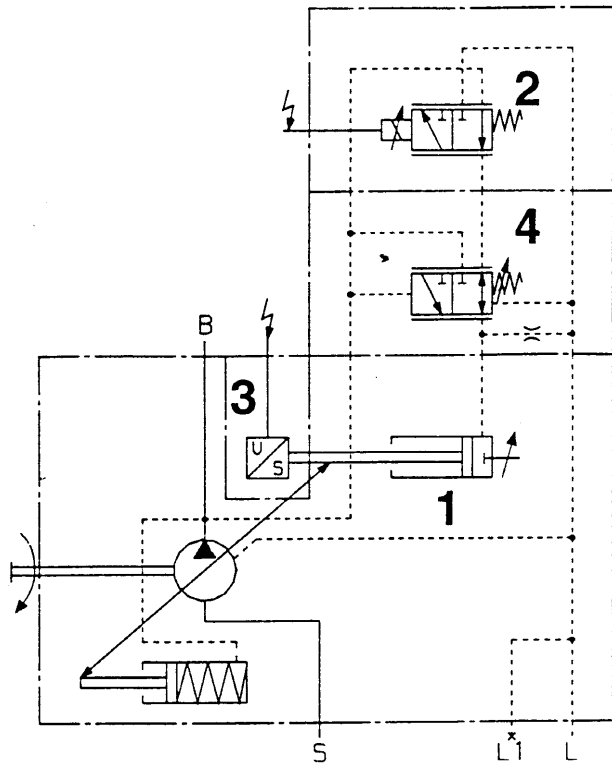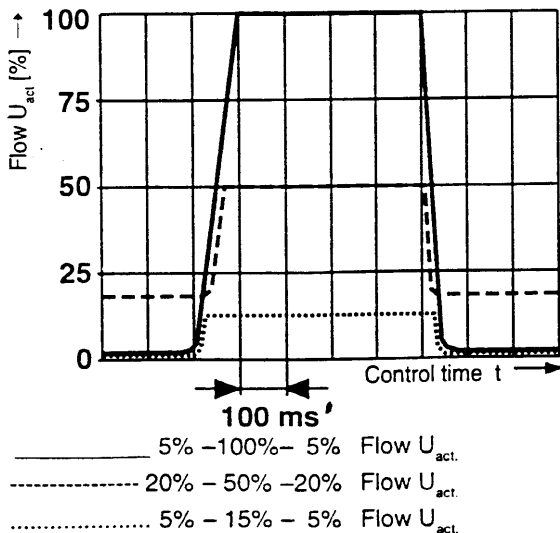
Static Curves

Pressure rise Δp

Flow Q

280

Operating pressure p (bar) →
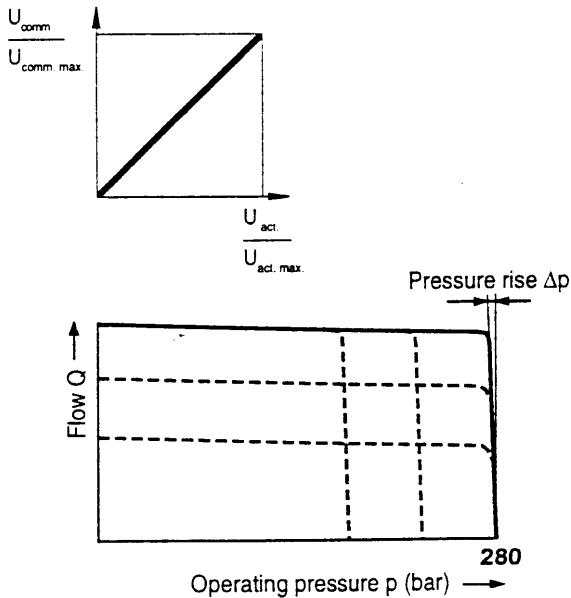
Dynamic Curve

Displacement time characteristics
measured: A10VSO 45 FE
Stepped press. signal value against 100 bar (press. relief valve)

100 ms

———— 5% –100%– 5% Flow $U_{act.}$

--------- 20% – 50% –20% Flow $U_{act.}$

.... 5% – 15% – 5% Flow $U_{act.}$

B

S   L1   L

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

Components
1 A10VSO with hydraulic control device
2 Control valve FT 202–4–0
3 Inductive positional transducer IW9–03–01
4 Sandwich plate valve

Control data
Minimum setting pressure required	20 bar
Pilot oil consumption	approx. 3 L/min max.
Δp pressure rise	max. 4 bar
Hysteresis	$\leq \pm 1$ % of $V_{g\,max}$
Repeatability	$\leq \pm 1$ %

Flow loss at Q_{max} see pages 7 and 8

Pilot valve:
Type of voltage	DC
Nominal voltage	24 V
Coil resistance at 20° C	12 Ω
Duty	100 %
Ambient temperature	...50° C
Coil temperature	...150° C
Insulation to DIN 40050	IP 65
Insulation class to VDE 0580	F

Inductive positional transducer:
Carrier frequency	1000 Hz...5000 Hz
Inductivity	9.5 mH

A10VSO Variable Displacement Pump, Series 31

RE 92711/
Before finalising your design, please request a certified dra
Subject to rev

Unit Dimensions
FED electrical flow controller with pressure cut-off

Sizes 28...100

Pilot valve installed here
for anti-clockwise rotation

Pilot valve installed here
for clockwise rotation

Adjustment screw for pressure
controller stall pressure
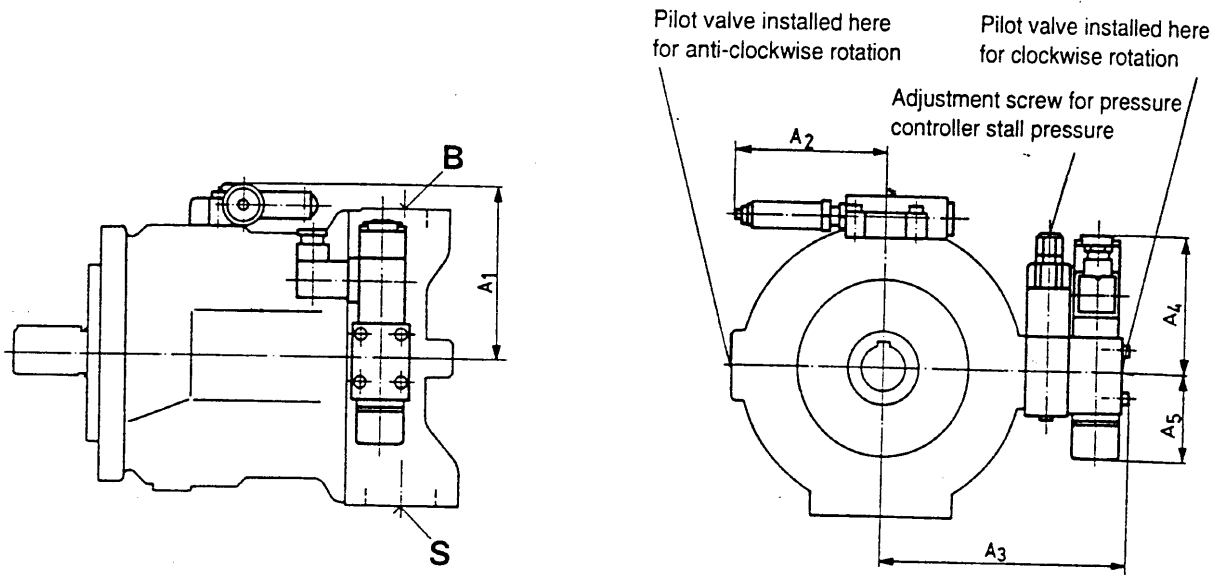
| Size	A_1	A_2	A_3	A_4	A_5
28	103,5	106,5	156,5	104	61
45	109	106,5	166,5	104	61
71	126	106,5	180,5	104	61
100	131	106,5	195,5	104	61
140	in preparation				

DFE1 Electronic pressure and flow control

The pressure and output flow of the pump are controlled electronically by means of a proportional valve. The output flow is controlled by varying the swivel angle of the pump. Variations in pump speed - e.g. with a diesel engine drive - are not taken into consideration. The pump pressure and position are fed back via a pressure sensor and inductive positional transducer to the amplifier card which is necessary to the control.

The DFE1 model pump is suitable for control applications in conjunction with analogue amplifier card VT 5041.
The amplifier card and the pressure sensor should be ordered separately.

For safety reasons an additional pressure relief valve should be mounted near to the pump pressure control system. This is used to ensure that the maximum permissible operating pressure is not exceeded.

For further information and typical applications see RE 67016 and RE 98090.

Static Curves
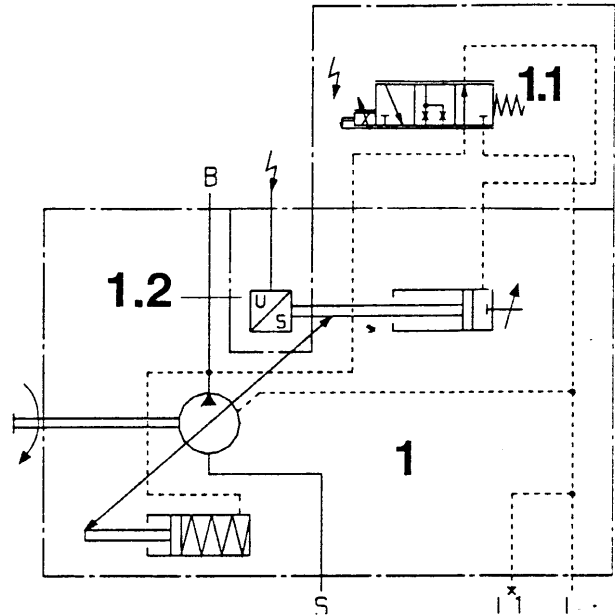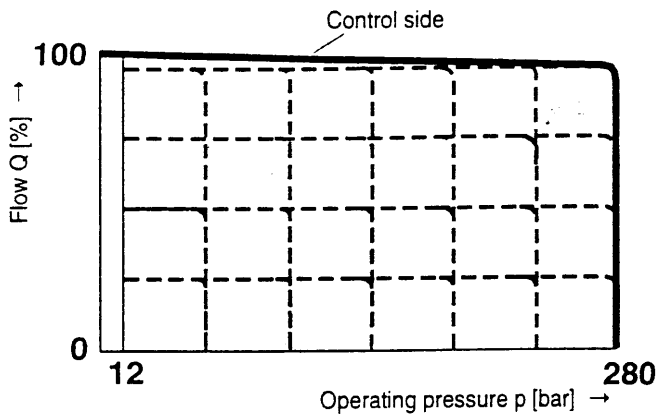
Ports
B	Pressure port
S	Suction port
L, L1	Case drain ports (L1 plugged)

Components
1   A10VSO with hydraulic control device
1.1   Proportional valve
1.2   Inductive positional transducer
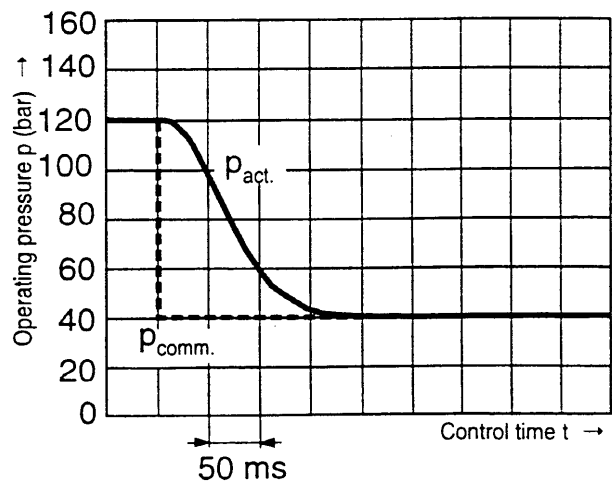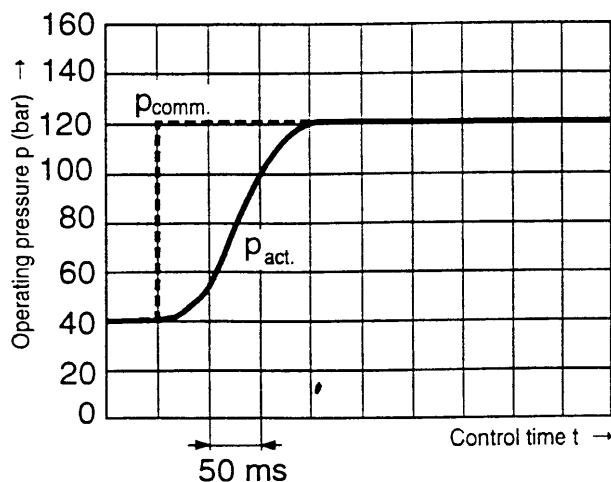Pressure sensors and electronic control items are supplied 'loose' (please order separately as per RE 67016)

Control data
Hysteresis ⎯⎯⎯⎯⎯⎯⎯⎯⎯⎯⎯⎯⎯ < 1% of $V_{g\,max}$

Repeatabilityt ⎯⎯⎯⎯⎯⎯⎯⎯⎯⎯⎯ < 1%

Pilot oil consumption ⎯⎯⎯⎯⎯ approx. 2,5 L/min max.

Loss of flow at Q_{max} see pages 7 and 8.

Dynamic Curves
Stepped pressure signal value e.g. 40 bar – 120 bar
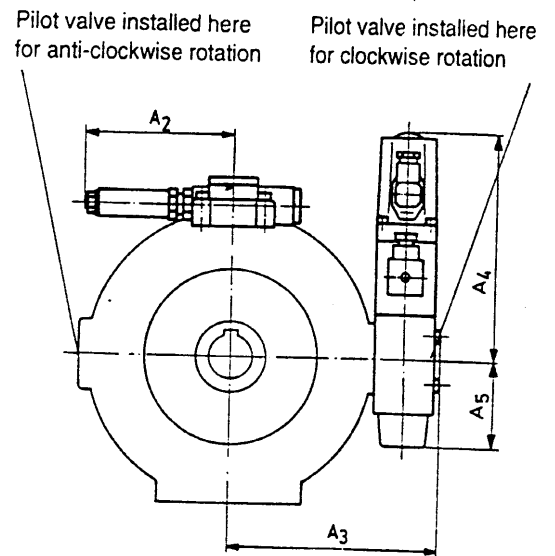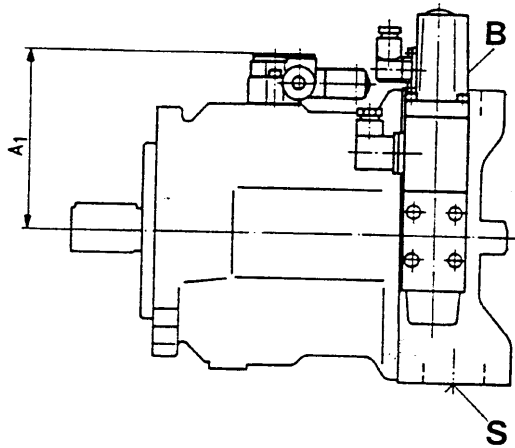DFE1 45 with oil compression volume (5L)

Stepped pressure signal value e.g. 120 bar – 40 bar
DFE1 45 with oil compression volume (5L)

A10VSO Variable Displacement Pump, Series 31

RE 92711
Before finalising your design, please request a certified dr
Subject to re

Unit Dimensions
DFE1 electronic pressure and flow control

Sizes 28...100

Pilot valve installed here for anti-clockwise rotation

Pilot valve installed here for clockwise rotation

Size	A_1	A_2	A_3	A_4	A_5
28	104	107	128	158	63
45	109	107	138	158	63
71	121	107	152	158	63
100	126	107	157	158	63
140	140	110	195	143	78

RE 92711/03.93

A10VSO Variable Displacement Pump, Series 31

Before finalising your design, please request a certified drawing.
Subject to revision.

Through drive

The A10VSO pump can be supplied with through drive in accordance with the type code on page 3.
Code (K01–K59) is used to identify the through drive model.
The following items are included in the supply:
  Coupling, fixing screws, seal and, if necessary, an adaptor flange.

Combination pumps
By building on further pumps it is possible for the user to obtain mutually independent circuits:

1. If the combination pump consists of **2 Brueninghaus units** and if these are to be **supplied assembled** then the two order codes should be linked by means of a"+" sign.
    Ordering example:
    A10VSO 71 DR/31 R–PPA12K25 +
    A10VSO 28 DR/31 R–PPA12N00

2. If a **gear or radial piston pump** is to be built on at the factory, please refer to **RE 90139**. In this the possible combinations for built-on pumps are listed along with the key coding for the first pump.
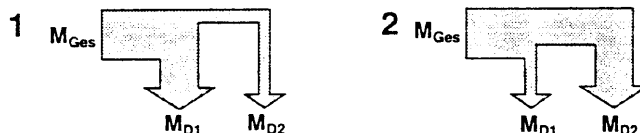
Permissible bending moment
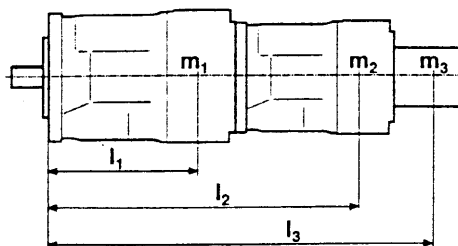
m_1, m_2 [kg]   Pump weight
l_1, l_2 [mm]   Centre to centre spacing

$$M_m = (m_1 \times l_1 + m_2 \times l_2 + m_3 \times l_3) \cdot \frac{1}{102} \text{ [Nm]}$$

Size			28	45	71	100	140
Max. bending moment	M_{max}	Nm	88	137	216	300	450
Weight	m	kg	15	21	33	45	60
Centre to centre spacing	l_1	mm	110	130	150	160	160

Permissible through drive torque

Size		28	45	71	100	140
Max. perm. total through drive torque at shaft pump 1 (Pump1 + Pump 2)	$M_{vel.\ max}$ Nm	156	249	392	618	867
1 Permissible through drive torque	M_{D1max} Nm	125	200	316	445	623
	M_{D2max} Nm	31	49	76	173	244
2 Permissible through drive torque	M_{D1max} Nm	31	49	76	173	244
	M_{D2max} Nm	125	200	316	445	623

Unit Dimensions: combination pumps

A10VSO + A10VSO
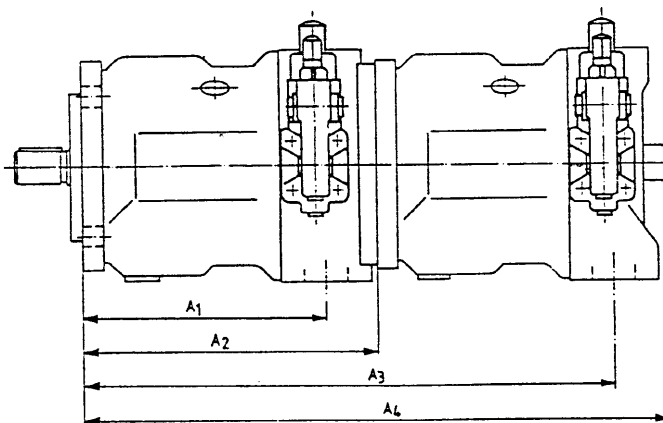
Main p. Built-on p.	A10VSO 28				A10VSO 45				A10VSO 71				A10VSO 100				A10VSO 140			
	A_1	A_2	A_3	A_4	A_1	A_2	A_3	A_4	A_1	A_2	A_3	A_4	A_1	A_2	A_3	A_4	A_1	A_2	A_3	A_4
A10VSO 18	164	204	349	399	184	229	374	424	217	267	412	462	275	338	483	533	275	350	495	545
A10VSO 28	164	204	368	410	184	229	393	435	217	267	431	473	275	338	502	544	275	350	514	556
A10VSO 45	–	–	–	–	184	229	413	453	217	267	451	491	275	338	522	562	275	350	534	574
A10VSO 71	–	–	–	–	–	–	–	–	217	267	484	524	275	338	555	595	275	350	567	607
A10VSO 100	–	–	–	–	–	–	–	–	–	–	–	–	275	356	631	682	275	368	643	694
A10VSO 140	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	275	368	643	705

Built-on A10VSO 18; see RE 92712
Order code **K51**
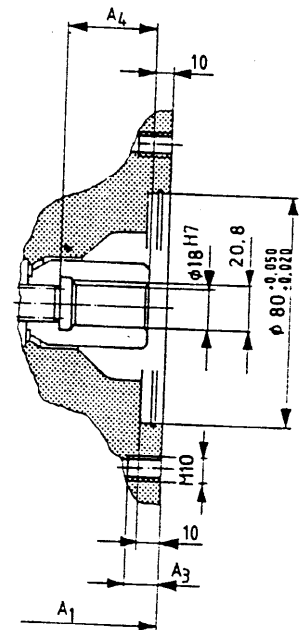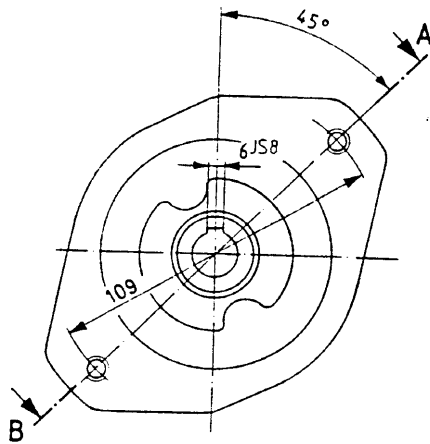
to pump mounting flange

Size	A₁	A₃	A₄
28	204	16	37
45	229	16	43
71	267	20	51
100	338	20	55
140	350	20	67

Built-on A10VSO 28;
Order code **K25**
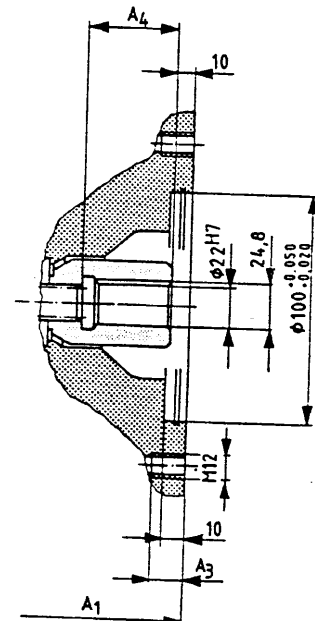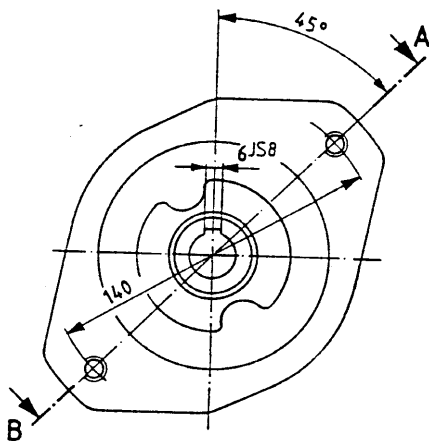
to pump mounting flange

Size	A₁	A₃	A₄
28	204	14	37
45	229	14	43
71	267	23	51
100	338	20	55
140	350	24	62

Built-on A10VSO 45;
Order code **K26**

to pump mounting flange
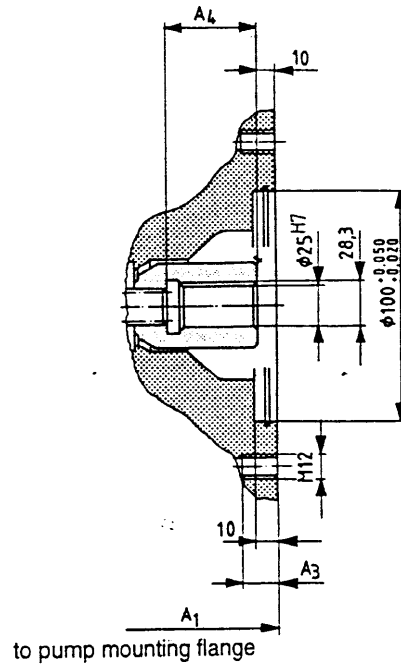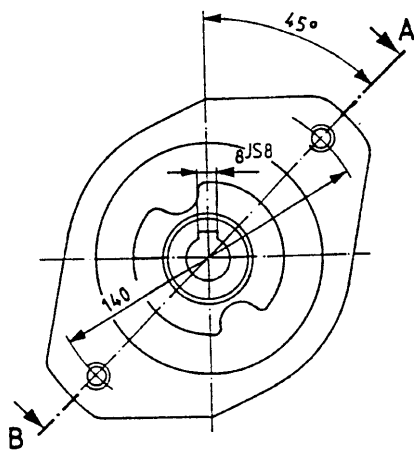
Size	A₁	A₃	A₄
45	229	14	43
71	267	23	51
100	338	20	56
140	350	24	67

Built-on A10VSO 71;
Order code **K27**

to pump mounting flange
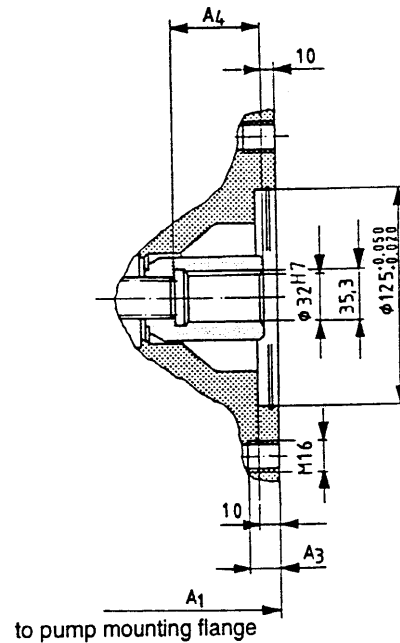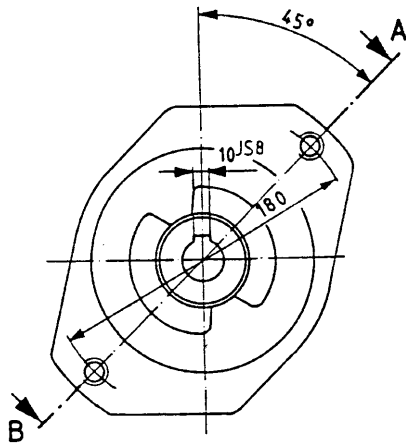
Size	A₁	A₃	A₄
71	267	18	51
100	338	20	54
140	350	24	63

Built-on A10VSO 100;
Order code **K37**

12 JS8

M16; 20 deep

A4

9

$\phi 125^{-0.050}_{-0.020}$

180

43.3

40 H7

125

A₁

to pump mounting flange
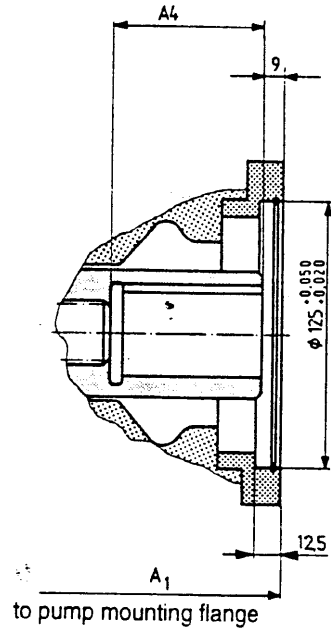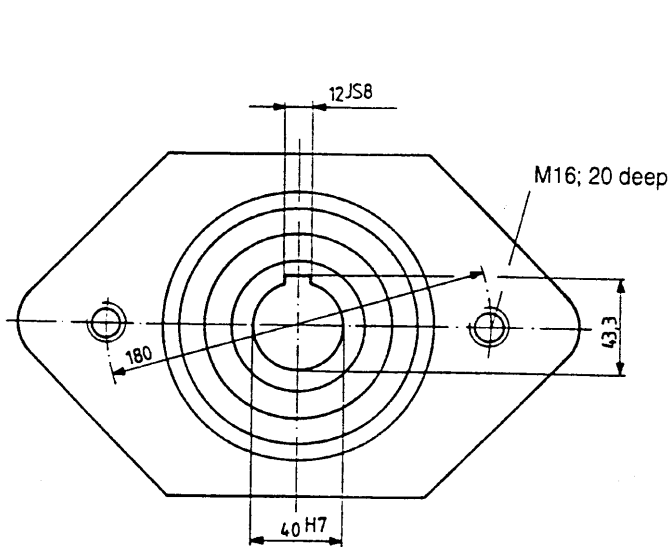
Size	A₁	A₄
100	356	71
140	368	80

Built-on A10VSO 140;
Order code **K59**

45°

14 JS8

M16

$\phi 180^{-0.050}_{-0.020}$

80

12

224

45 H7

10

368

to pump mounting flange

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A10VSO Variable Displacement Pump, Series 31

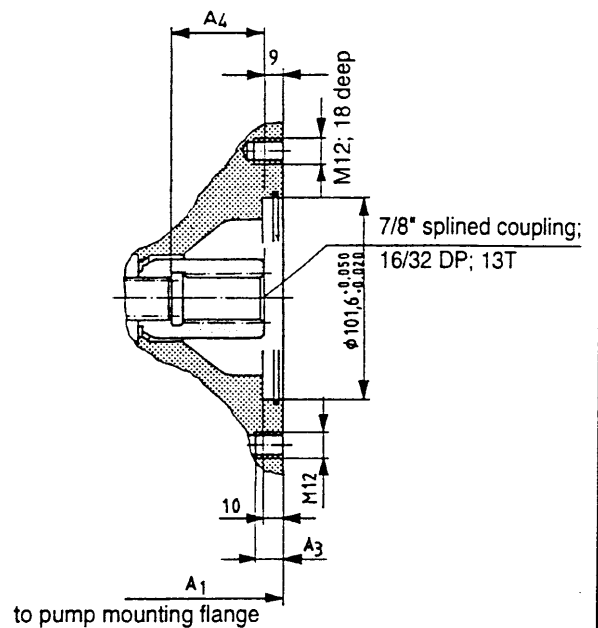Before finalising your design, please request a certified drawing.
Subject to revision
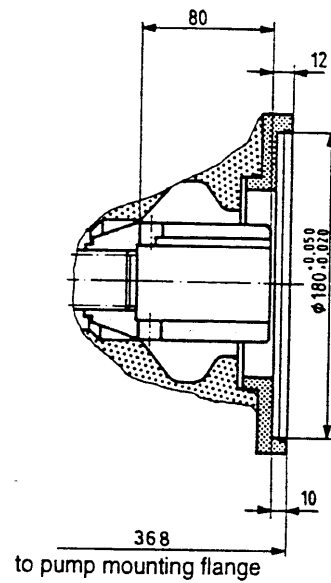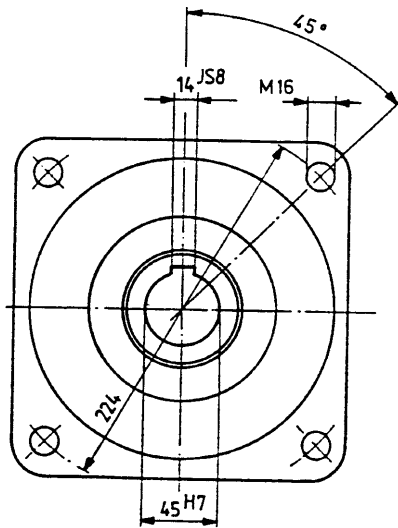
Dimensions
SAE A for built-on gear pump G2
(see RE 10030), order code **K01**

M10; 16 deep

A₄

9

M10; 16 deep

5/8" splined coupling;
16/32 DP; 9T

$\phi 82.55 {}^{-0.050}_{-0.020}$

10

A_1
to pump mounting flange
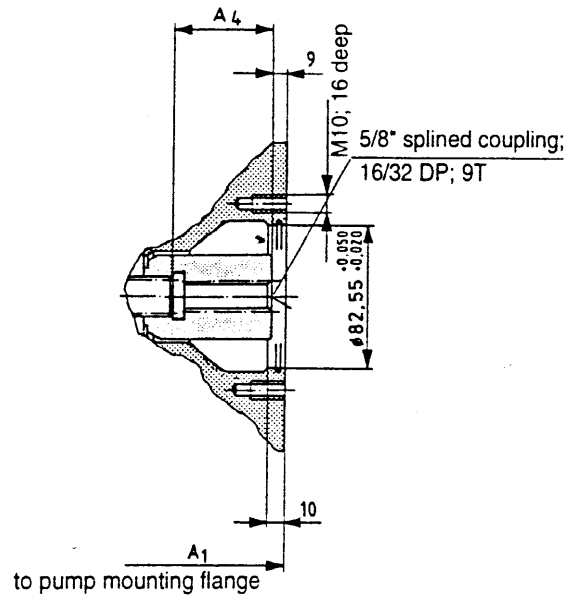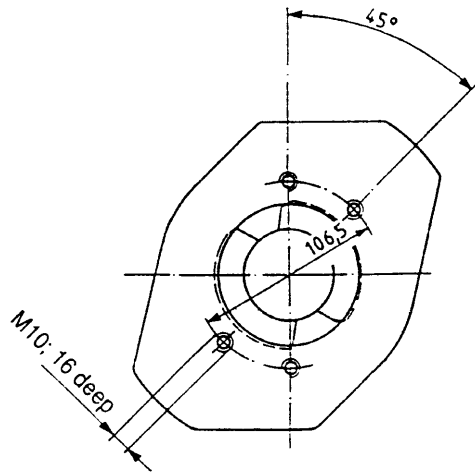
Size	A_1	A_4
28	204	38
45	229	44
71	267	52
100	338	56
140	350	68

SAE B for built-on G3 (see RE 10039);
Order code **K02**

omitted on size 28

omitted on size 28

A₄

9

M12; 18 deep

7/8" splined coupling;
16/32 DP; 13T

$\phi 101.6 {}^{-0.050}_{-0.020}$

10

M12

A_3

A_1
to pump mounting flange
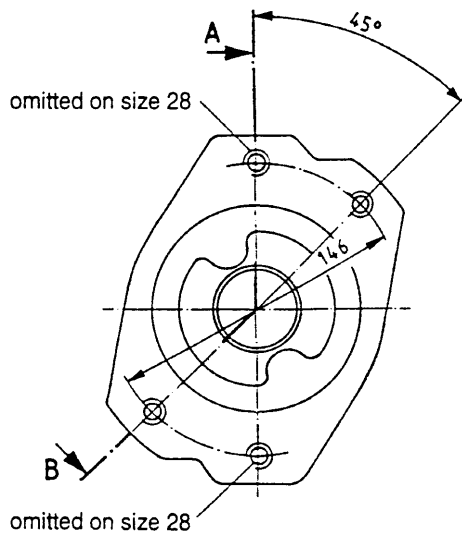
Size	A_1	A_3	A_4
28	204	14	38
45	229	18	44
71	267	20	52
100	338	20	56
140	350	20	68

ISO 100, 4-hole, for built-on internal gear pump GU(1)
(shaft G, see RE10211), order code **K54**
not for new projects, if required please consult us.

splined shaft
21x24 DIN 5481

$\phi\,100^{+0.050}_{-0.020}$

to pump mounting flange
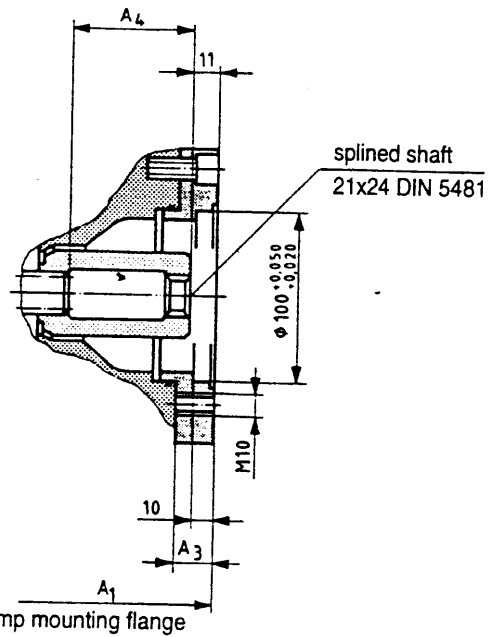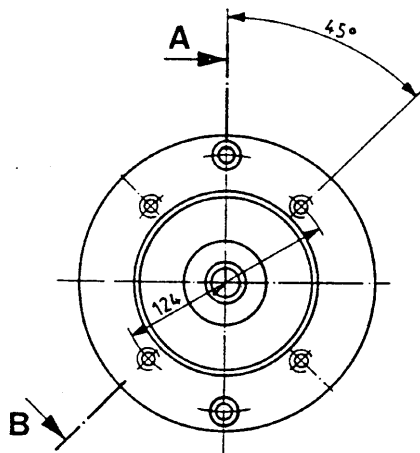
On size 28 the fixing holes are offset by 45° for design reasons

Size	A_1	A_3	A_4
28	226	22	58
45	251	22	65
71	289	22	72
100	360	22	77
140	372	22	86,5

When ordering separately please give the following
information:
$$1\ PF2G\,^U_N\,\begin{matrix}1-1X\\2-2X\end{matrix}/...RG\ 07\,^M_V\,K\ O\\3-1X$$
with built-on combination sections A10 + GU
Clockwise rotation only.

ISO 125, 4-hole, for built-on internal gear pump GU(2)
(shaft G, see RE 10211), order code **K55.**
Not for new projects; if required please consult us.

splined shaft
21x24 DIN 5481

$\phi\,125^{+0.050}_{-0.020}$

to pump mounting flange
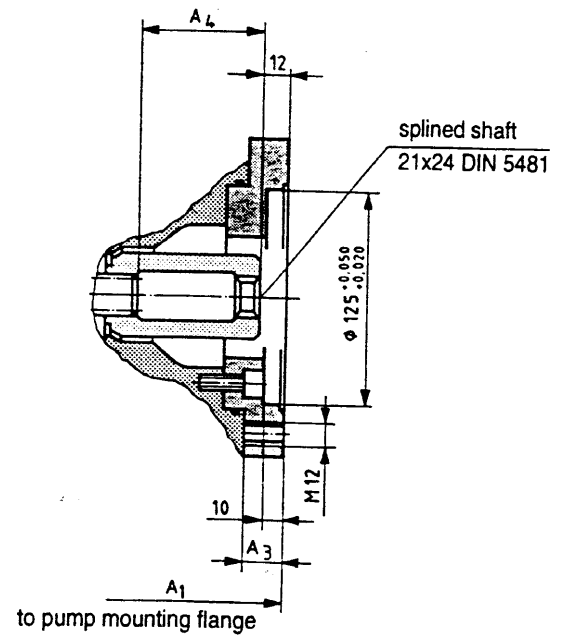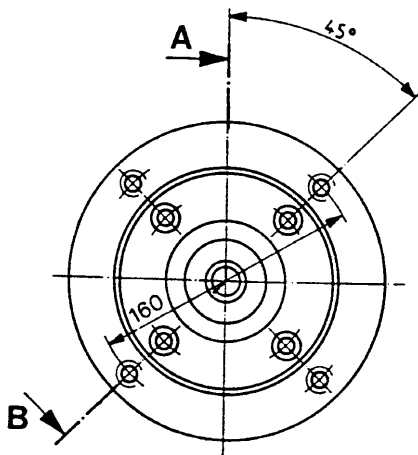
Size	A_1	A_3	A_4
45	262	18	73
71	290	20	72
100	361	23	78
140	372	22	86

When ordering separately please give the following
information:
$$1\ PF2G\,^U_N\,\begin{matrix}1-1X\\2-2X\end{matrix}/...RG\ 07\,^M_V\,K\ O\\3-1X$$
with built-on combination sections A10 + GU
Clockwise rotation only.

A10VSO Variable Displacement Pump, Series 31

Before finalising your design, please request a certified drawing.
Subject to revision.

ISO 160, 4-hole, for built-on internal gear pump GU(3)
(shaft G; see RE 10211), order code **K56.**
Not for new projects; please consult us if required.

splined shaft
30x34 DIN 5481

to pump mounting flange
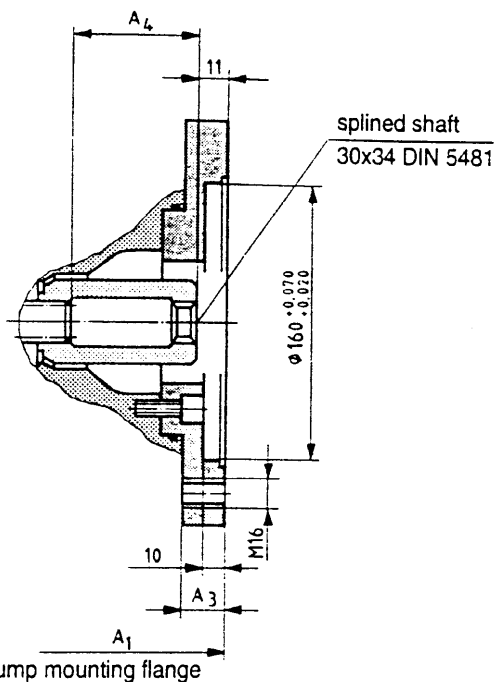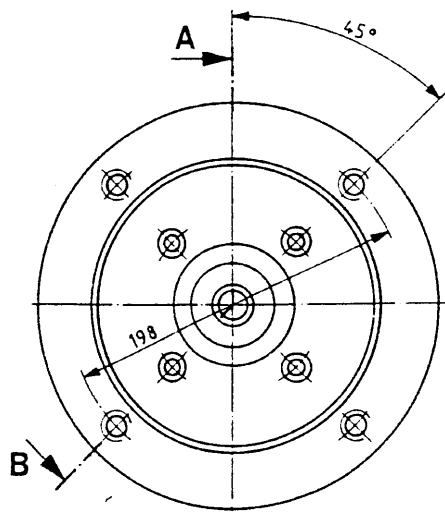
Size	A_1	A_3	A_4
71	291	22	74
100	363	22	79
140	350	22	66

When ordering separately please give the following
information:

$$1 \; PF2G \begin{matrix} U \\ N \end{matrix} \begin{matrix} 1-1X \\ 2-2X/...RG \; 07 \begin{matrix} M \\ V \end{matrix} K \; O \\ 3-1X \end{matrix}$$

with built-on combination sections A10 + GU

Clockwise rotation only.

Metric 4-hole flange for built-on radial piston pump R4 (see RE 11263),
Order code **K57**

to pump mounting flange
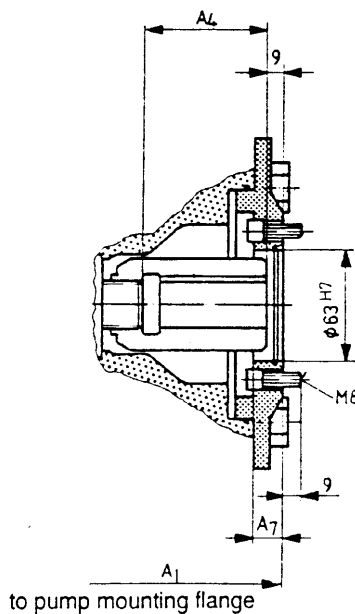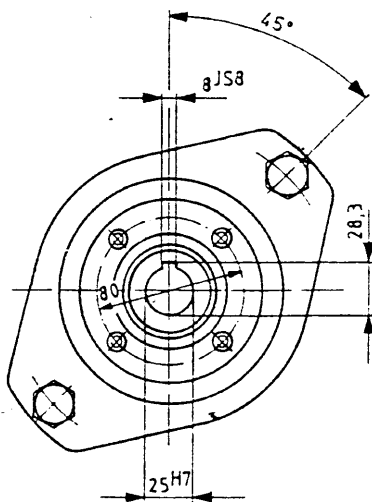
Size	A_1	A_4	A_7
28	233	47	8
45	258	71,5	8
71	283	68	8
100	354	70,5	8
140	366	84	8