

**SUPER
HYDRAULICS**

Pump, Motor, Spare Parts

Variable Displacement Pump A2V

Series 5, for open, closed and semi-closed circuits
Axial piston unit, bent axis design

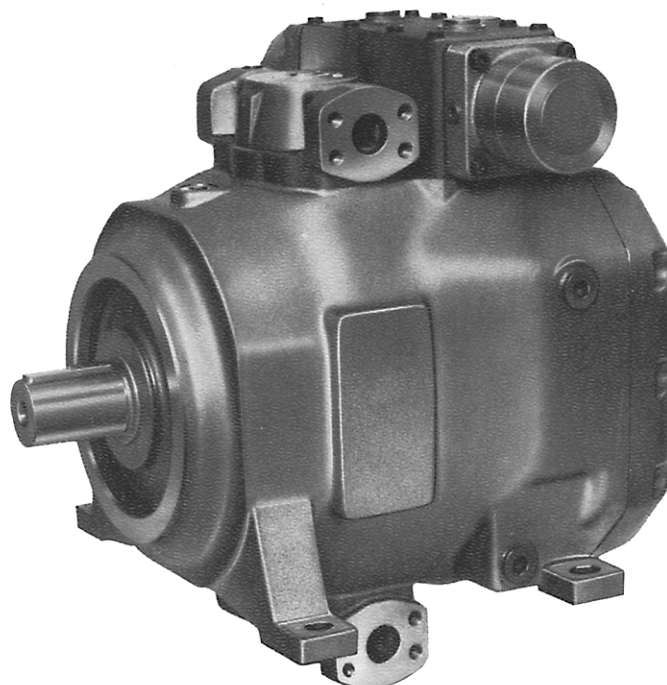
Sizes 250...1000

High pressure range up to 400 bar

RE

92450/09.83

replaces 01.82



Description

Axial piston unit of bent axis design with variable displacement, for hydrostatic drives in closed and semi-closed, and open circuits.

Maximum flow is proportional to the drive speed and displacement and is infinitely variable at constant drive speed.

Comprehensive control programme for every control and regulating function.

Special Features of Series 5:

New, simplified high performance rotary group with enhanced technical data and well-proven spherical control area.

Heavy duty rolling bearings for intermittent high pressure operation.

For continuous duty at high pressures, hydrostatic bearings are available.

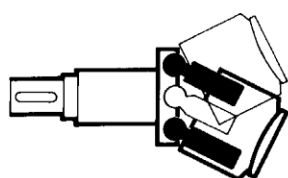
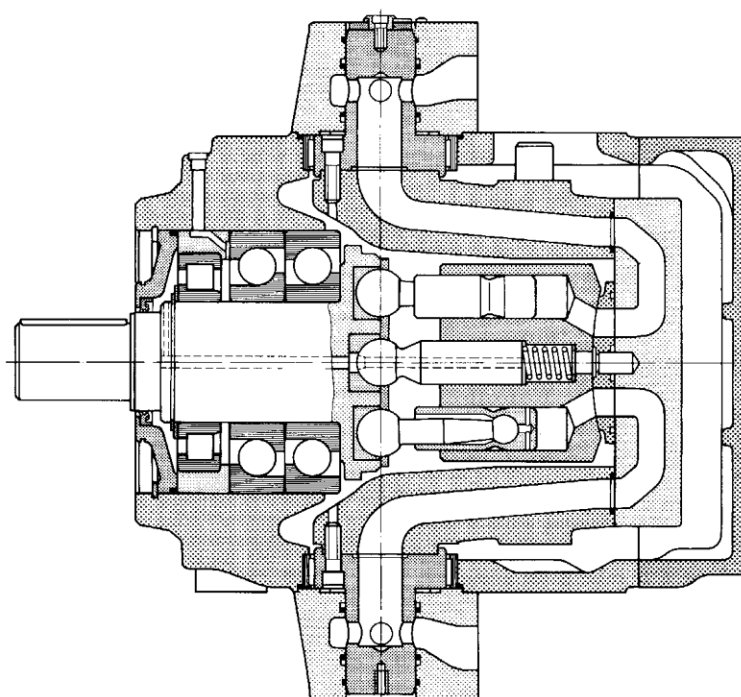
Operation on fire-resistant fluids is possible (please consult us).

Improved port plate design and compact design reduces noise level by 5 dBA.

Complete primary units with all auxiliary devices for closed circuits (see RE 93700).

Section

Housed pump for closed circuit



Variable Displacement Pump A2V (Series 5)

Ordering Code

Short code							
A2V	500	OV	G	R	5	G	P

Pump Type

Axial piston
variable displacement
pump

A2V

Size

Size Δ
displacement
(cm³/rev)

250**355****500****1000**

Sizes 12 — 107
see RE 92400

Size 2000 — on enquiry

Control Device

without control

OV

hydraulic control
pressure related
Additional functions:
Constant HP control (L)
Electrical control (RMVB)
Pressure regulation (DAS)
(Details in clear text)

HD

hydraulic control
servo stem

HW

hydraulic control
flow related

HM

hydraulic control
flow related

for fitting of
servo valve

HS

for fitting of
servo valve and
bypass valve

HSK

electronic control

EO

electronic control EO
with bypass valve

EOK

electric control
electro-mechanical

EL

handwheel control

MA

pressure regulator,
hydraulically operated

DRH 1

with pressure
unloading

DRH 2

with two point
control

DRH 3

with two point control
and unloading

DRH 4

with three
point control

DRH 5

pressure regulator,
electro-hydraulically
operated

DRE

Ordering Example A2V.500.OV.G.R.5.G.P

Variable displacement pump A2V, size 500 without control device, closed circuit, clockwise rotation, series 5, design G, keyed shaft.

Shaft End

keyed shaft

P

splined shaft

Z

Design

submersible pump
sizes 250 — 1000
flange mounting

E

housed pump
sizes 250 and 355
flange mounting

G

sizes 500 and 1000
foot mounting

Series

series

5

Direction of Rotation

(viewed on drive shaft)

clockwise

R

anti-clockwise

L

Type of Circuit

closed circuit

G

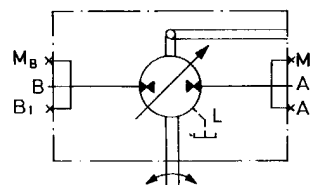
semi-closed circuit

H

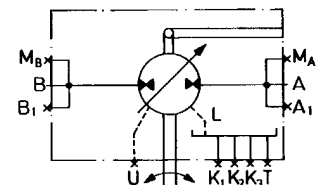
open circuit

O

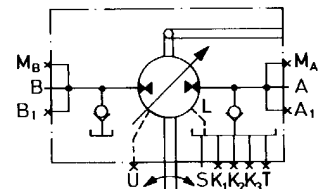
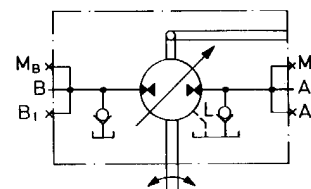
Design E



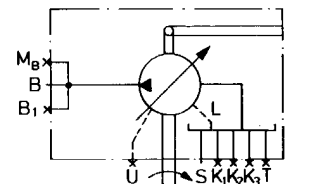
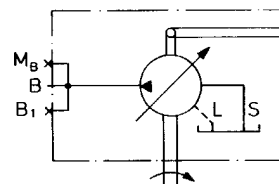
Design G



closed circuit



semi-closed circuit



open circuit

A, B
A₁, B₁
K₁, K₂, K₃
L
M_A, M_B

service ports
additional ports
flushing ports
case drain
gauge connections

S
T
U
suction port
oil drain
flushing port
(for flushing of
bearings)

Variable Displacement Pump A2V (Series 5)

Technical Data

Inlet Pressure

Minimum pressure at port S (suction inlet)

 P_{abs} _____ 0,8 bar P_{max} (see case pressure)

The boost pressure in a closed circuit is set at 16 bar.

Outlet Operating Pressure

Pressure at ports A or B

Rated pressure _____ P_N 350 barPeak pressure _____ P_{max} 400 bar

(Pressure data to DIN 24312)

With pulsating pressures in excess of 315 bar, we recommend using splined shafts to DIN 5480.

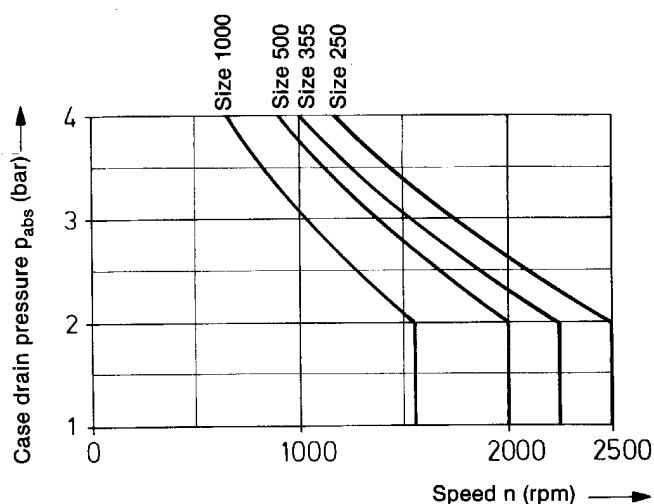
Case Pressure

Maximum permissible pressure in pump casing

 P_{max} _____ 4 bar abs.

The permissible pressure is, however, dependent on speed.

Standard shaft seal



A higher case drain pressure is possible by fitting glide ring seals — see RE 94104. When ordering state in clear text "with glide ring seal".

Mounting position: Optional. (use case drain port at highest point). The pump housing must always be filled with oil.

Hydraulic Fluid

Operating Viscosity Range

In order to obtain optimum efficiency and service life, we recommend that the operating viscosity (at operating temperature) be selected in the range.

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

as referred to the circuit temperature in closed circuits and the tank temperature in open circuits.

Viscosity Limits

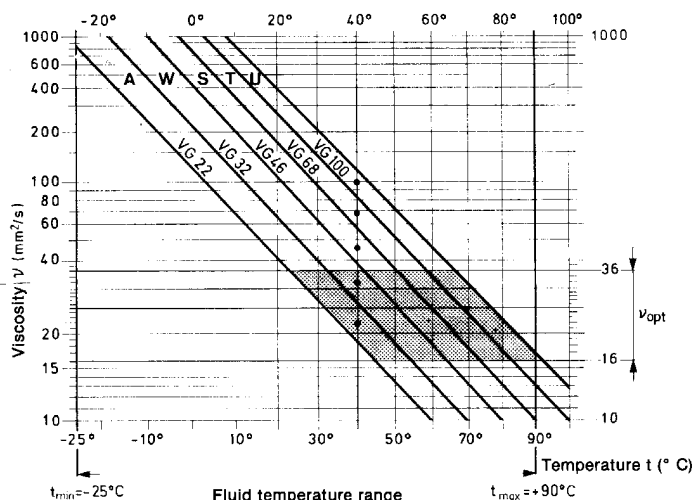
The following values are valid for extreme operating conditions:

$\nu_{min} = 10 \text{ mm}^2/\text{s}$
for short periods with a max. permissible leakage oil temperature of 90° C.

$\nu_{max} = 1000 \text{ mm}^2/\text{s}$
for short periods upon cold start.

Prior to project design, please see our data sheet RE 90220 for detailed information on the selection of fluids on an mineral oil base and application conditions.

Selection Diagram



Notes on Selection of the Hydraulic Fluid

For correct selection of the hydraulic fluid, it is necessary to know the operating temperature in relation to the ambient temperature: in closed circuits this is the circuit temperature, in open circuits the tank temperature.

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

Example: At an ambient temperature of X° C, the operating temperature in the circuit is 60° C. Within the optimum viscosity range (ν_{opt} ; shaded section) this corresponds to viscosity grades VG 46 and VG 68. VG 68 is selected.

Note: The leakage oil temperature is influenced by pressure and speed and is always higher than the circuit or tank temperature. It must not be allowed to increase beyond 90° C.

If it is not possible to maintain the above conditions because of extreme operating parameters or high ambient temperatures, we recommend flushing of the bearings via port U.

Flushing flows	Size	250	355	500	1000
	Q_{Sp} l/min	12,5	16	25	40

Temperature of flushing fluid $\leq$ tank temperature

When using water-based and synthetic fluids, see our data sheet RE 90223.

Filtration

Recommended filtration 10 micron.

Coarser filtration of 25 — 40 microns is possible, but longer component life will be achieved using 10 micron filtration due to lower component wear.

Direction of Flow Through Pump

Swivel direction	Clockwise rotation		Anti-clockwise rotation	
	open circuit	closed and semi-closed circuits	open circuit	closed and semi-closed circuits
clockwise	S to B A blocked	A to B	S to A B blocked	B to A
anti-clockwise	S to A B blocked	B to A	S to B A blocked	A to B

Pressure regulation only available with clockwise rotation and clockwise swivel angle.

Variable Displacement Pump A2V (Series 5)

Technical Data (theoretical values, not considering mechanical-hydraulic and volumetric efficiency)

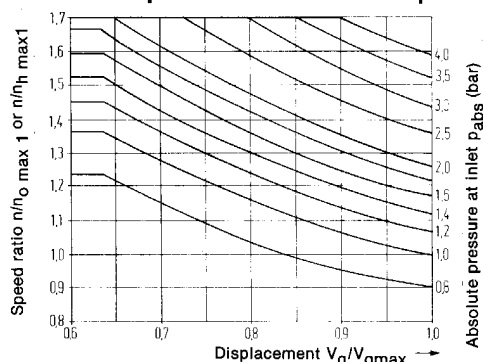
Size				250	355	500	1000	
Displacement			$V_{g \max}$	cm ³	250	355	500	1000
closed circuit	Max. speed ¹⁾		$n_{\max}$	rpm	2500	2240	2000	1600
	Max. output flow		$Q_{\max}$	L/min	625	795	1000	1600
	Max. power	($\Delta p = 350$ bar)	$P_{\max}$	kW	365	464	583	933
semi-closed circuit	Max. speed ¹⁾	at $V_{g \max}$	$n_{h \max 1}$	rpm	1320	1200	1060	850
		at $V_g < V_{g \max}$ (see diagram)	$n_{h \max 2}$	rpm	1800	1640	1450	1160
	Max. perm. speed (speed limit) when increasing inlet pressure p_{abs} (see diagram)		$n_{h \max \text{ perm.}}$	rpm	2245	2040	1800	1445
	Max. output flow ²⁾	at $n_{h \max 1}$ ($V_{g \max}$)	$Q_{h \max 1}$	L/min	320	413	514	825
		at $n_{h \max 2}$ ($V_g < V_{g \max}$)	$Q_{h \max 2}$	L/min	279	361	450	720
	Max. power ($\Delta p = 350$ bar)	at $Q_{h \max 1}$	$P_{h \max 1}$	kW	192	248	309	496
		at $Q_{h \max 2}$	$P_{h \max 2}$	kW	168	217	270	433
open circuit	Max. speed ¹⁾	at $V_{g \max}$	$n_{o \max 1}$	rpm	1500	1320	1200	950
		at $V_g < V_{g \max}$ (see diagram)	$n_{o \max 2}$	rpm	2050	1800	1640	1300
	Max. perm. speed (speed limit) when increasing inlet pressure p_{abs} (see diagram)		$n_{o \max \text{ perm.}}$	rpm	2500	2240	2000	1600
	Max. output flow ²⁾	at $n_{o \max 1}$ ($V_{g \max}$)	$Q_{o \max 1}$	L/min	364	455	582	921
		at $n_{o \max 2}$ ($V_g < V_{g \max}$)	$Q_{o \max 2}$	L/min	318	396	509	807
	Max. power ($\Delta p = 350$ bar)	at $Q_{o \max 1}$	$P_{o \max 1}$	kW	218	273	350	554
		at $Q_{o \max 2}$	$P_{o \max 2}$	kW	191	238	306	485
Torque ($\Delta p = 100$ bar)		at $V_{g \max}$	M	Nm/100 bar	397,5	564,5	795	1590
Max. torque ($\Delta p = 350$ bar)		at $V_{g \max}$	$M_{\max}$	Nm	1391	1975	2782	5565
Moment of inertia about the drive axis			J	kgm ²	0,088	0,160	0,270	0,824
Case fill capacity			V	l	20,4	28	40,5	79

¹⁾ The values shown are valid for an absolute pressure of 1 bar at the suction inlet S, and for mineral oils.

When idling, excess speed of 50 rpm is permissible at $n_{o \max 2}$ or $n_{h \max 2}$. By increasing the inlet pressure ($p_{abs} > 1$ bar), speeds may be increased up to "max. permissible speed (speed limit)" (see diagram).

²⁾ Calculated with a volumetric efficiency of 97 %.

Calculation of inlet pressure p_{abs} at suction inlet S and of reduction in displacement for increased speeds.

**Calculation of Size**

Flow	$Q = \frac{V_g \cdot n \cdot \eta_v}{1000}$	[l/min]
Drive Torque	$M = \frac{1,59 \cdot V_g \cdot \Delta p}{100 \cdot \eta_{mh}}$	[Nm]
Drive Power	$P = \frac{2 \pi \cdot M \cdot n}{60 \cdot 1000} = \frac{M \cdot n}{9549} = \frac{Q \cdot \Delta p}{600 \cdot \eta_t}$	[kW]

Example

Given:

Size 500

Drive speed 1345 rpm

open circuit

Required:

Pressure p_{abs} at the suction inlet S

Solution:

$$\text{Speed ratio} = \frac{n}{n_{o \max 1}} = \frac{1345}{1200} = 1,12$$

This gives an inlet pressure of $p_{abs} = 1,4$ bar at full swivel angle.

If the, for example, maximum achievable inlet pressure = 1 bar, the displacement must then be reduced to 84,5 %.

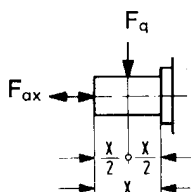
V_g = geometr. displacement (cm³)
 Δp = differential pressure (bar)
 n = speed (rpm)
 η_v = volumetric efficiency
 η_{mh} = mech.-hyd. efficiency
 η_t = overall efficiency

Variable Displacement Pump A2V (Series 5)

Pump/motor drive Drive shaft Loading

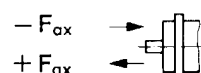
The drive shaft has bearings which allow axial and radial forces to be absorbed. Such forces arise from gear or belt drives, etc.

Point of Application of Force



Permissible Axial Loads

The direction of axial forces must be carefully noted.



The values for $+F_{ax}$ given below have no significant influence on the service life.

Permissible Axial Force at Operating Pressure $p = 1 \text{ bar abs}$

Size	250	355	500	1000
Axial force $-F_{ax}$ (N)	1600	2000	2500	4000
Axial force $+F_{ax}$ (N)	4000	5000	6250	10000

Permissible Axial Force at Operating Pressure $p > 1 \text{ bar abs}$

Size	250	355	500	1000
Axial force $+F_{ax}$ (N)	4000	5000	6250	10000
Constant K_1 (N/bar)	90	115	140	220

A negative axial force ($-F_{ax}$) is permissible, dependent on the operating pressure.

This may be calculated as follows:

$$-F_{ax \text{ perm.}} = -F_{ax} + K_1 \cdot p \text{ (N)}$$

$$K_1 = \text{constant} \left(\frac{\text{N}}{\text{bar}} \right)$$

p = operating pressure (bar)

Permissible Radial Loads

At operating pressure $p = 1 \text{ bar abs}$

The radial load applied at the centre of the shaft length when the pump is stationary, or when it is rotating at zero pressure, may not exceed the value F_q .

At operating pressure $p > 1 \text{ bar abs}$

As the operating pressure is increased, higher radial forces are permissible on the drive shaft.

a) Gear drive

For direct gear drive, the values are given for a minimum pitch circle diameter $D_{R \min}$, which are correct for forces in the centre of the drive shaft, and for a gear designed to DIN 867.

b) V-belt drive (narrow series) to DIN 7752)

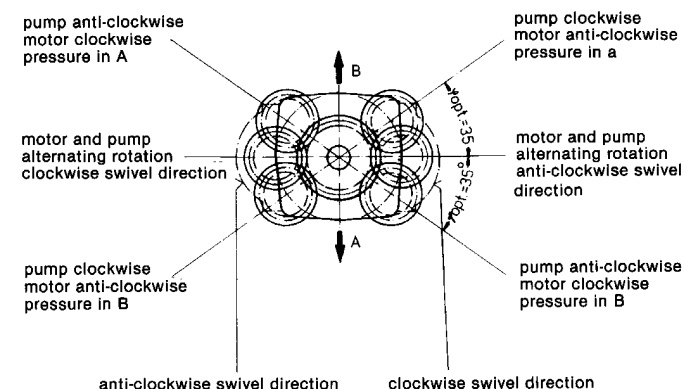
The table shows the minimum permissible V-belt pulley diameters $D_{K \min}$ for forces applied to the centre of the drive shaft. Belt pre-tension should not exceed the value F_q .

Size	250	355	500	1000
F_q (N)	2800	3500	4400	7000
$D_{R \min}$ (mm) ¹⁾	150	180	210	270
$D_{K \min}$ (mm) ¹⁾	250	300	350	450

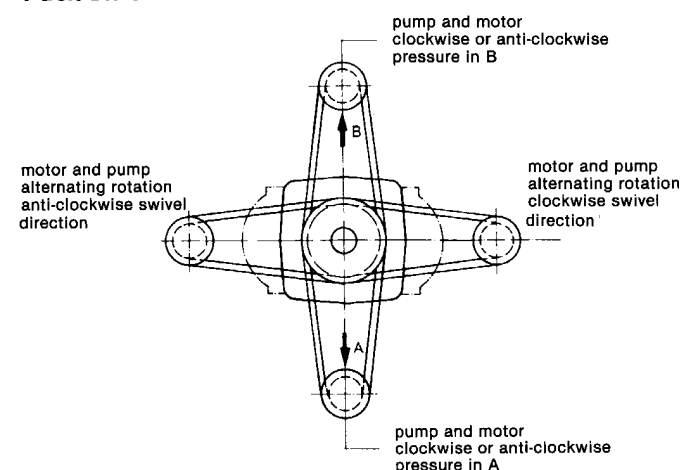
¹⁾ These diameters and pressure angles will ensure that the service life of the units is not reduced.

c) Optimum direction of operation of the radial force.

Gear drive



V-Belt Drive



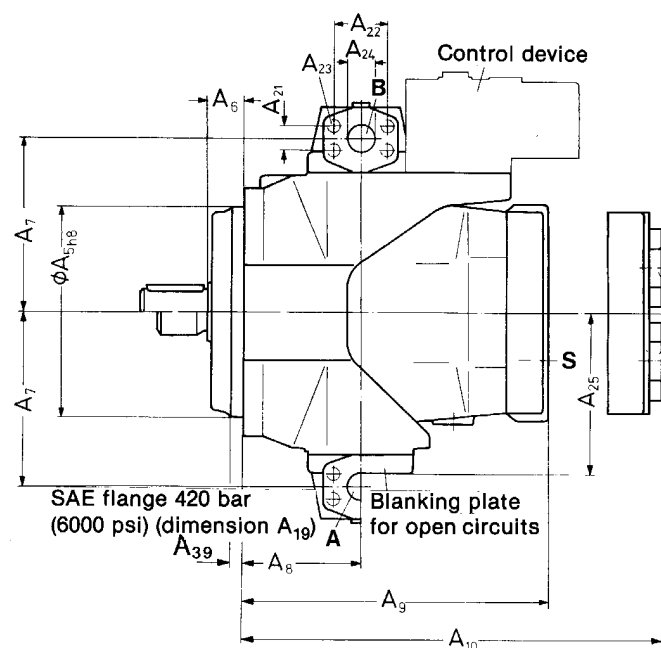
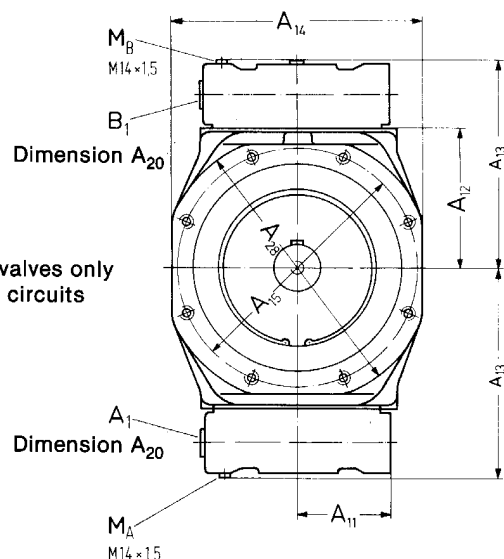
The following data are valid provided the optimum direction of operation of radial force F_{q0} is maintained:

Size	250	355	500	1000
F_{q0} (N)	4000	5000	6300	10000
$D_{R0 \min}$ (mm)	300	360	420	540
$D_{K0 \min}$ (mm)	380	450	520	680

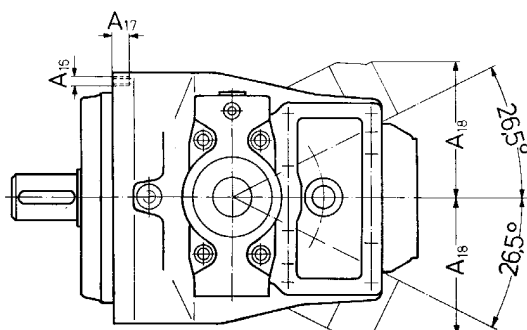
Unit Dimensions

Design E

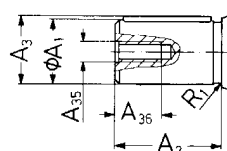
Sizes 355 — 1000

Anti-cavitation valves only
for semi-closed circuits

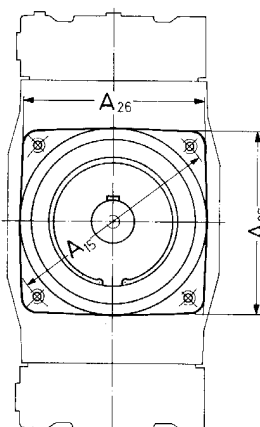
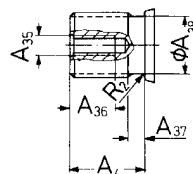
Size 250



Key to DIN 6885



Splines to DIN 5480



Connections:

A, B service lines
A₁, B₁ additional ports
M_A, B_B gauge connections

Size	A ₁	A ₂	A ₃	A ₄	A ₅	A ₆	A ₇	A ₈	A ₉	A ₁₀	A ₁₁	A ₁₂	A ₁₃	A ₁₄	A ₁₅	A ₁₆	A ₁₇	A ₁₈	A ₁₉	A ₂₀
250	50 _{k6}	82	53,5	58	224	50	211	134	379	391	120	170	253	275	280	M 20	30	176	1 1/4"	M 22 x 1,5
355	60 _{m6}	105	64	82	280	50	238	160	436	449	130	190	285	336	320	M 16	24	200	1 1/2"	M 33 x 2
500	70 _{m6}	105	74,5	82	315	50	260	175	475	490	137,5	210	313	375	360	M 20	30	222	1 1/2"	M 33 x 2
1000	90 _{m6}	130	95	105	400	50	325	230	605	624	178	265	392	465	450	M 20	30	277	2"	M 42 x 2

Size	A ₂₁	A ₂₂	A ₂₃	A ₂₄	A ₂₅	A ₂₆	A ₂₇	A ₂₈	A ₃₅	A ₃₆	A ₃₇	A ₃₈	A ₃₉	R ₁	R ₂
250	31,8	66,6	M 14, 22 deep	32	197	246	246	—	M 16	36	11	45	9	1,2	1,2
355	36,6	79,4	M 16, 24 deep	40	220	—	—	360	M 20	42	13	55	13	1,6	1,6
500	36,6	79,4	M 16, 24 deep	40	242	—	—	400	M 20	42	15	62,6	15	1,6	1,6
1000	44,4	96,8	M 20, 30 deep	50	304	—	—	500	M 24	50	27	82,6	15	1,6	2,5

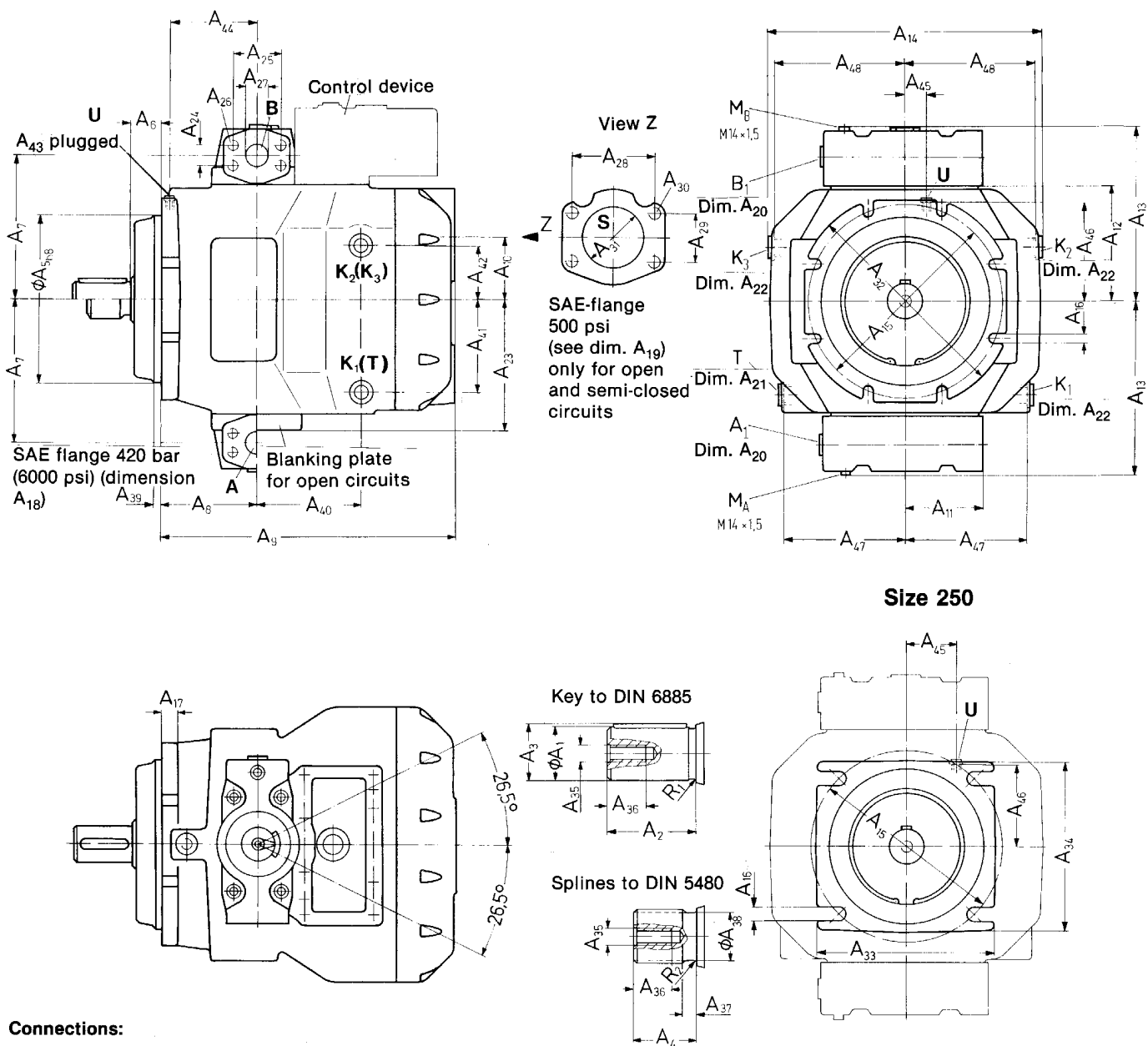
Size	Keyed Shaft DIN 6885	Splined Shaft DIN 5480	Weight (kg) without control device
250	AS 14 x 9 x 80	W 50 x 2 x 24 x 9 g	160
355	AS 18 x 11 x 100	W 60 x 2 x 28 x 9 g	240
500	AS 20 x 12 x 100	W 70 x 3 x 22 x 9 g	312
1000	AS 25 x 14 x 125	W 90 x 3 x 28 x 9 g	601

Variable Displacement Pump A2V (Series 5)

Prior to finalising your design, please request certified installation drawing.
All rights reserved.

Unit Dimensions

Design G



Connections:

A, B	service lines	K ₁ , K ₂ , K ₃	flushing lines or case drain
S	suction line		
T	case drain		
A ₁ , B ₁	additional ports	U	flushing port (for flushing bearings)
M _A , B _B	gauge connections		

Size	A ₁	A ₂	A ₃	A ₄	A ₅	A ₆	A ₇	A ₈	A ₉	A ₁₀	A ₁₁	A ₁₂	A ₁₃	A ₁₄	A ₁₅	A ₁₆	A ₁₇	A ₁₈	A ₁₉	A ₂₀
250	50 _{k6}	82	53,5	58	224	50	211	134	427	92	120	170	253	402	280	22	25	1 1/4"	3 1/2"	M 22×1,5
355	60 _{m6}	105	64	82	280	50	238	160	490	105	130	190	285	455	320	18	28	1 1/2"	4"	M 33×2

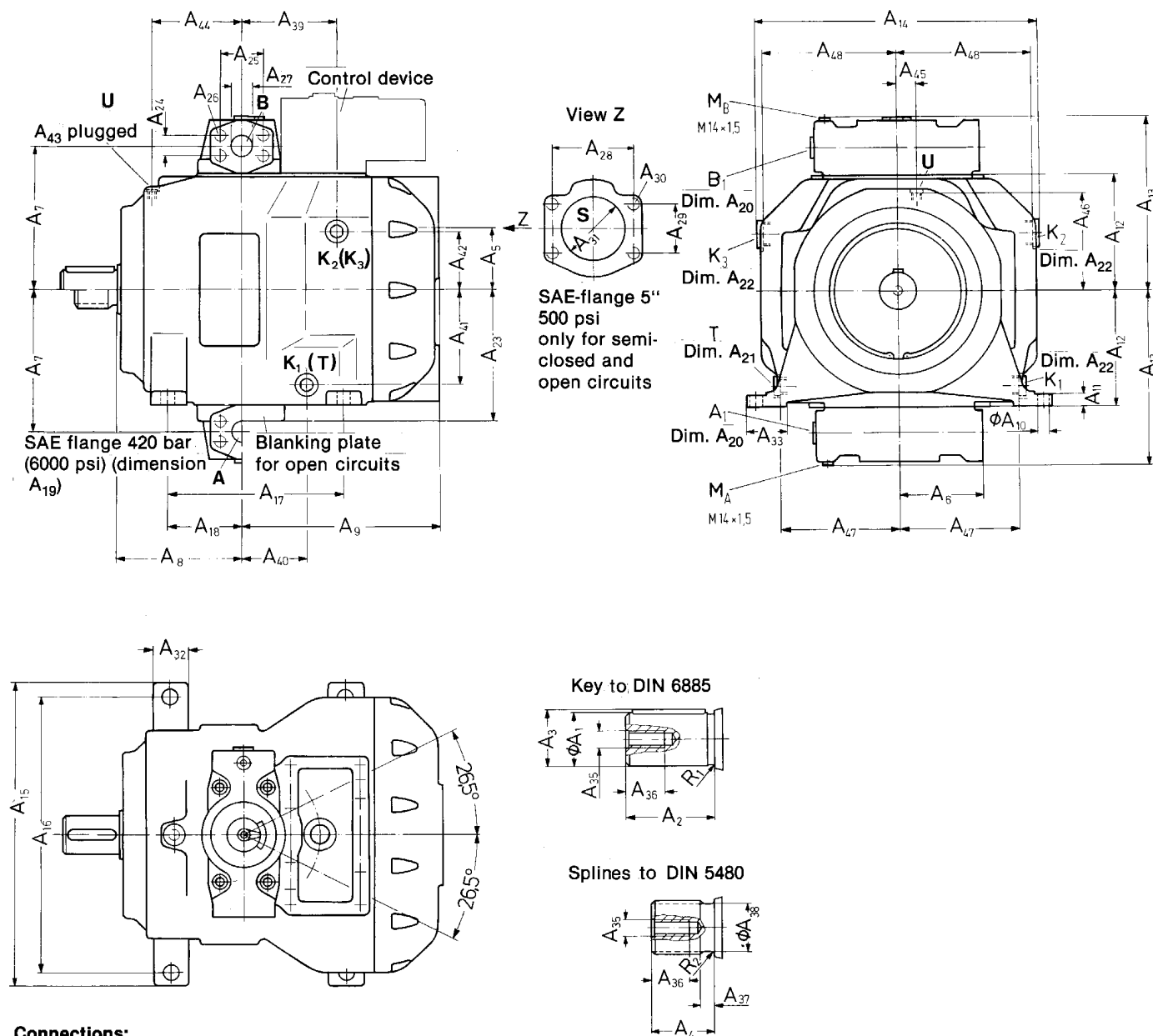
Size	A ₂₁	A ₂₂	A ₂₃	A ₂₄	A ₂₅	A ₂₆	A ₂₇	A ₂₈	A ₂₉	A ₃₀	A ₃₁	A ₃₂	A ₃₃	A ₃₄	A ₃₅	A ₃₆
250	M 22×1,5	M 22×1,5	197	31,8	66,6	M 14, 22 deep 32	120,6	70	M 16, 24 deep 90	—	260	246	M 16	36		
355	M 33×2	M 33×2	220	36,6	79,4	M 16, 24 deep 40	130,2	77,8	M 16, 24 deep 100	360	—	—	M 20	42		

Size	A ₃₇	A ₃₈	A ₃₉	A ₄₀	A ₄₁	A ₄₂	A ₄₃	A ₄₄	A ₄₅	A ₄₆	A ₄₇	A ₄₈	R ₁	R ₂
250	11	45	9	148,5	142	85	M 14×1,5	121	70	122	183	195,5	1,2	1,2
355	13	55	13	174	155	90	M 14×1,5	147	35	166	205	220,5	1,6	1,6

Size	Keyed Shaft DIN 6885	Splined Shaft DIN 5480	Weight (kg) without control device
250	AS 14×9×80	W 50×2×24×9 g	203
355	AS 18×11×100	W 60×2×28×9 g	293

Unit Dimensions Sizes 500 and 1000

Design G



Connections:

A, B	service lines	K ₁ , K ₂ , K ₃	flushing lines or case drain
S	suction line		
T	case drain		for closed circuits
A ₁ , B ₁	additional ports	U	flushing port (for flushing bearings)
M _A , B _B	gauge connections		

Size	A ₁	A ₂	A ₃	A ₄	A ₅	A ₆	A ₇	A ₈	A ₉	A ₁₀	A ₁₁	A ₁₂	A ₁₃	A ₁₄	A ₁₅	A ₁₆	A ₁₇	A ₁₈	A ₁₉	A ₂₀
500	70 _{m6}	105	74,5	82	115	137,5	260	225	355	26	30	210	313	505	550	500	315	135	1 1/2"	M 33×2
1000	90 _{m6}	130	95	105	165	178	325	280	440	33	35	265	392	630	690	625	400	180	2"	M 42×2

Size	A ₂₁	A ₂₂	A ₂₃	A ₂₄	A ₂₅	A ₂₆	A ₂₇	A ₂₈	A ₂₉	A ₃₀	A ₃₁	A ₃₂	A ₃₃	A ₃₅	A ₃₆
500	M 33×2	M 33×2	242	36,6	79,4	M 16, 24 deep	40	152,4	92	M 16, 24 deep	120	65	75	M 20	42
1000	M 42×2	M 42×2	304	44,4	96,8	M 20, 30 deep	50	152,4	92	M 16, 24 deep	125	85	95	M 24	50

Size	A ₃₇	A ₃₈	A ₃₉	A ₄₀	A ₄₁	A ₄₂	A ₄₃	A ₄₄	A ₄₅	A ₄₆	A ₄₇	A ₄₈	R ₁	R ₂
500	15	62,6	172	115	175	105	M 18×1,5	160	35	186	218	245,5	1,6	1,6
1000	27	82,6	220	140	222	130	M 18×1,5	210	50	231	273	307,5	1,6	2,5

Size	Keyed Shaft	Splined Shaft	Weight (kg)
	DIN 6885	DIN 5480	without control device
500	AS 20×12×100	W 70×3×22×9 g	384
1000	AS 25×14×125	W 90×3×28×9 g	801

Variable Displacement Pump A2V (Series 5)

Prior to finalising your design, please request certified installation drawing.
All rights reserved.

HD Hydraulic Control, Pressure Related

The HD control device adjusts the pump displacement in relation to a pilot pressure signal.

The swivel angle may be mechanically limited in both directions between $V_{g \max}$ and $V_{g 0}$.

If required, the control may be supplied with spring centering of the control cylinder.

(Please order in clear text).

Technical Data

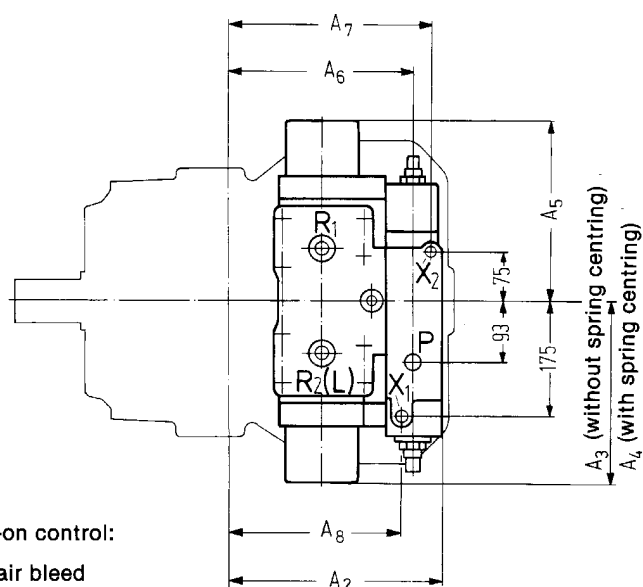
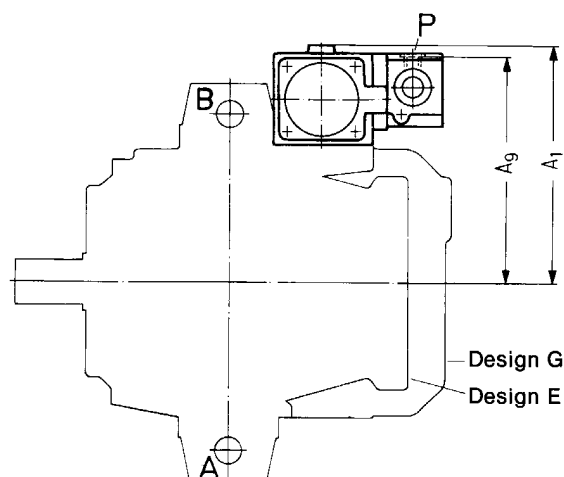
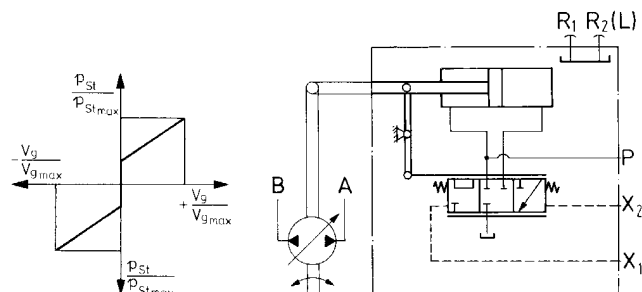
Size		250	355	500	1000	
Control piston stroke s	mm	51,5	55,8	62,5	80,3	
Control area (servo piston) A	cm ²	14	14	20	31	
Control vol. (servo cyl.) V _S	cm ³	72	78	125	250	
Control pressure (P) p _{min}	bar	30	40	50	50	
	p _{max}	100	100	100	100	
Pilot pressure (X ₁ , X ₂) p _{St}	bar	10-45	10-45	10-45	10-45	
Pilot volume V _{st}	cm ³	6	6	6	6	
Minimum swivel time	s	0,15	0,15	0,15	0,2	
Weight (approx.)		(pump with control device)				
Design E	HD	kg	215	296	382	718
	HD + L	kg	217	298	384	720
	HD + DAS	kg	221	302	389	726
Design G	HD	kg	258	349	454	918
	HD + L	kg	260	351	456	920
	HD + DAS	kg	264	355	461	925
	HD + RMVB	kg	272	363	468	932

Direction of Flow Through Pump

Pilot pressure	Elec. pilot signal for HD + RMVB 14	Direction of rotation	
		clockwise	anti-clockwise
in X ₁	in solenoid "a"	A to B	B to A
in X ₂	in solenoid "b"	B to A	A to B

A, B	service lines
P	control pressure (M 22x1,5)
P _{zp}	boost pump line (M 22x1,5)
R _{kv}	return line (M 22x1,5)
T	tank port (M 18x1,5)
X ₁ , X ₂	pilot connections (M 18x1,5)

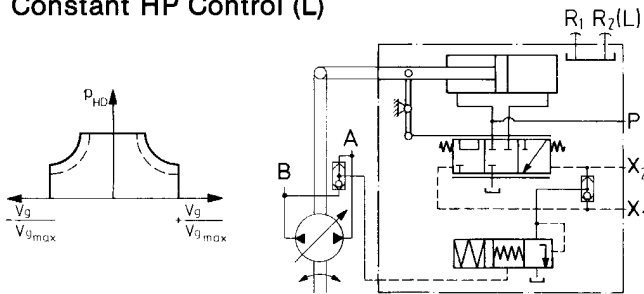
Design G with built-on control:
R₁, R₂ oil filler and air bleed
(in closed circuits either
R₁ or R₂ may be used as a case drain)



Unit Dimensions

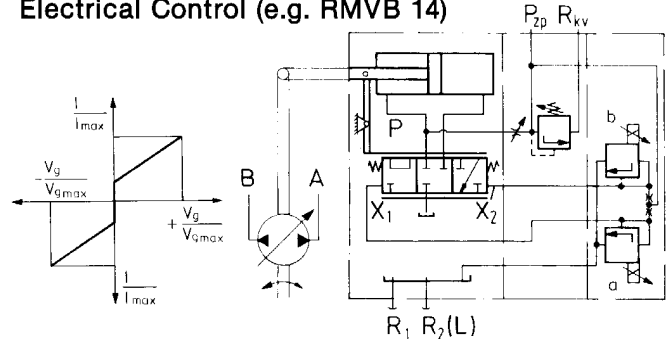
Size	A ₁	A ₂	A ₃	A ₄	A ₅	A ₆	A ₇	A ₈	A ₉	A ₁₀	A ₁₁	A ₁₂	Ports R ₁ , R ₂ (L)
250	304	306	243	331	243	258	285	241	297	356	398	451	M 22x1,5
355	324	315	243	331	243	267	294	250	317	365	418	460	M 22x1,5
500	356	331	275	367	275	284	311	267	348	381	450	476	M 33x2
1000	443	405	345	448	345	357	384	340	428,5	455	532	550	M 42x2

HD Control Additional Function: Constant HP Control (L)



The displacement of the pump is additionally controlled by an overriding high pressure signal via the power control valve. The constant HP control is effected via connections X_1 and X_2 . The power control valve may be mounted separately if re-

HD Control Additional Function: Electrical Control (e.g. RMVB 14)



The displacement of the pump is dependent on a variable electrical control signal.

If required, this control is also available with a constant HP control. Separate mounting of the RMVB is also possible.

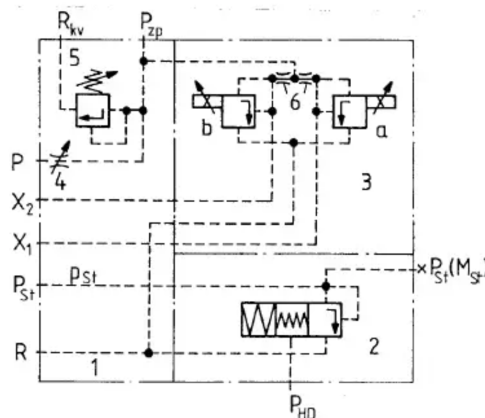
2. Design

Proportional valve block RMVB with DBEP 6

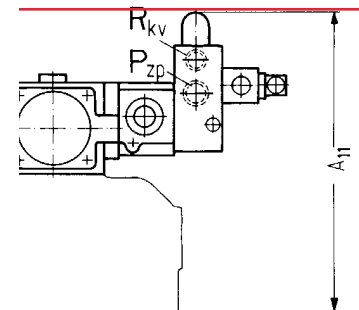
Manifold (1) can be built directly on to the control device of the HD control of the series 5 unit, or supplied separately with threaded ports or O ring connections. It also includes a pressure limiting valve type DBDS10K1X/100 (5) and an adjustable throttle valve (4).

The connections are arranged for use with a single gear pump. Please enquire if you wish to use the unit with a tandem gear pump.

Proportional valve DREP6X 06-1X/45 A 24 is built on to the manifold. The pressure relief valve can therefore be operated with either of the two proportional solenoids dependent upon the direction of the swivel angle. This valve exhibits very low hysteresis. In addition, it is also possible to install the series 5 power limiting valve, LV 06(2) on the manifold.



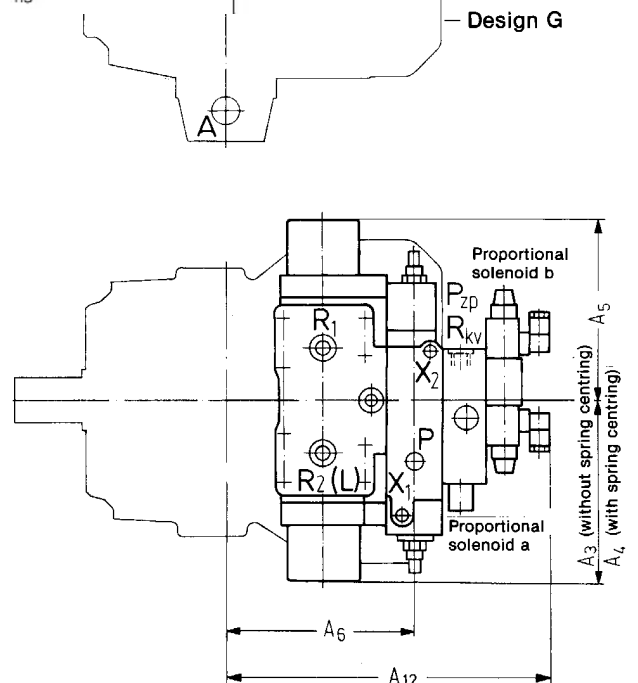
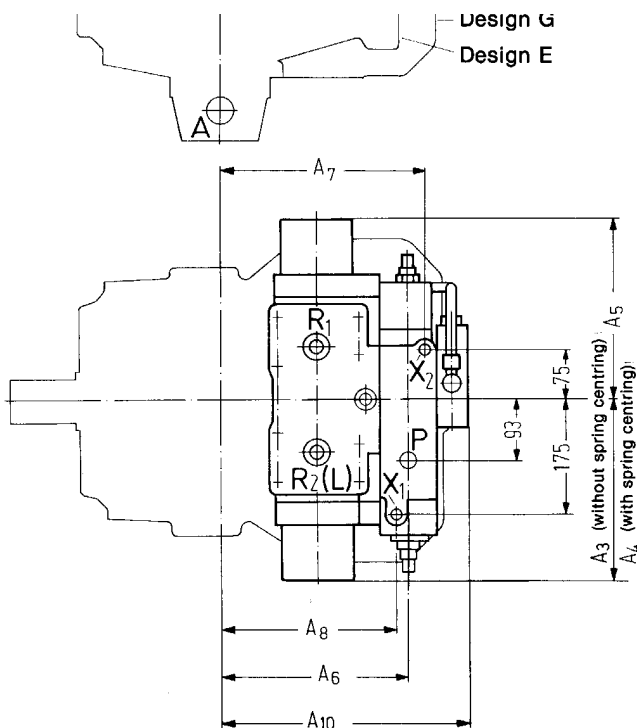
and dimensions see data sheet RE



Design G

Design G

Design E



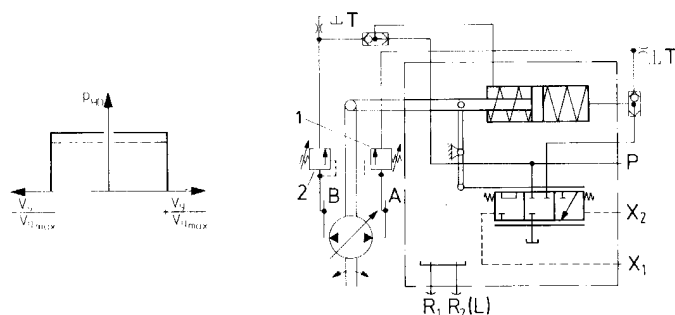
For HD control with constant HP control, power curves¹⁾ are arranged to the following values:

	Nominal speed (rpm)	Drive Power P (kW)																		
Size		22	30	37	40	44	55	66	74	88	90	110	132	147	160	180	188	220	243	290
250	1450	●	●	●	●	●	●	●	●	●		●								
355	970	●	●	●	●	●	●	●	●	●		●		●	●					
500	970		●	●		●	●		●		●	●	●			●				
1000	730						●		●		●	●	●		●		●	●	●	●

¹⁾ See data sheet RE 95546 (power valve LV06) for power curves.

Variable Displacement Pump A2V (Series 5)

Prior to finalising your design, please request certified installation drawing.
All rights reserved.

HD Control Additional Function:**Pressure Regulator (DAS) — both sides**

1 Pressure relief valve
Setting range 50...315 bar
(X₂ anti-clockwise swivel)

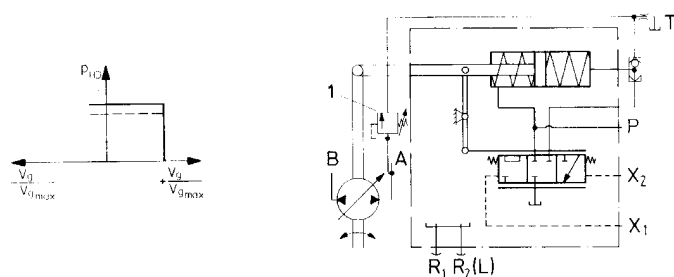
2 Pressure relief valve
setting range 100...315 bar
(X₁ clockwise swivel)

The pump displacement is additionally controlled via two overriding high pressure signals.
Control may be either on both sides, or over centre (mooring control).

HD Control Additional Function:**Pressure Regulator (DAS) — one side only**

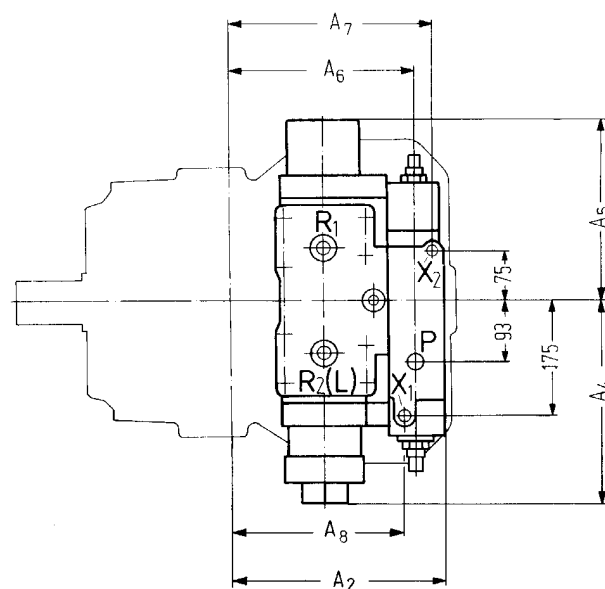
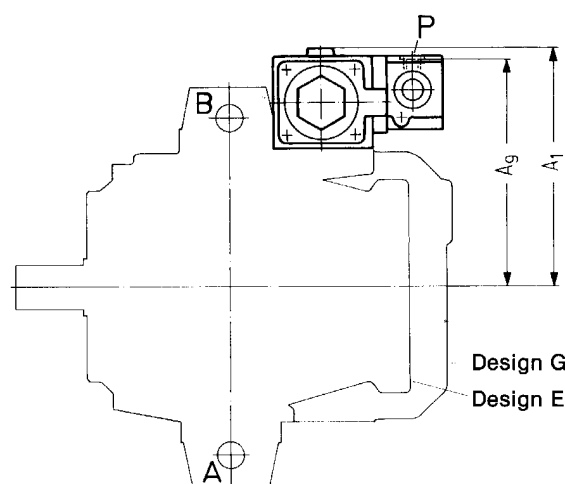
The pump displacement is additionally controlled via an overriding high pressure signal.
Control may be either single-sided, or over centre (mooring control).

Anti-clockwise swivel (pilot pressure in X₂)

**Direction of Flow**

Swivel range ¹⁾	Pilot pressure	Direction of rotation	
		clockwise	anti-clockwise
clockwise	in X ₁	A to B	B to A
anti-clockwise	in X ₂	B to A	A to B

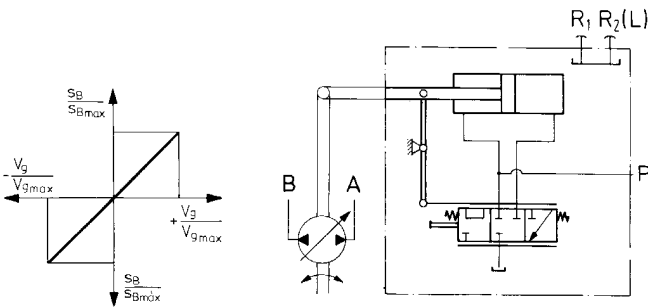
¹⁾ as viewed on drive shaft and in normal mounting position.



HW Hydraulic Control,
Servo Stem

By means of the HW control, the pump displacement is controlled relative to the position of the spring-centred control rod.¹⁾
The swivel angle may be mechanically limited on both sides between $V_{g\max}$ and V_{g0} .
If required, the control may be supplied with spring centering of the control cylinder.
(Please order in clear text).

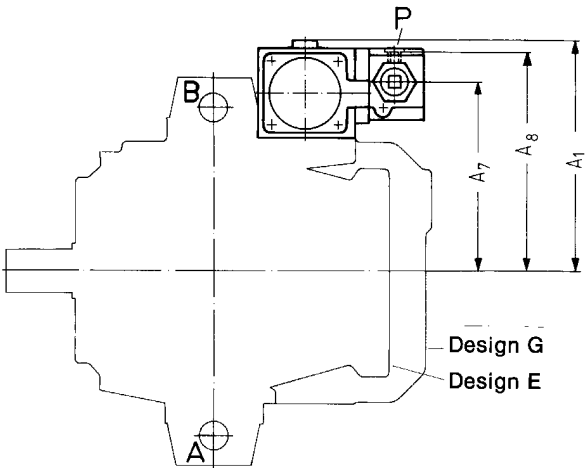
1) standard model



Technical Data

Size		250	355	500	1000
Control piston stroke s	mm	51,5	55,8	62,5	80,3
Stellfläche (Servokolben) A	cm ²	14	14	20	31
Control vol. (servo cyl.) V _S	cm ³	72	78	125	250
Control pressure (P)	p _{min}	bar	30	40	50
	p _{max}	bar	100	100	100
Operating stroke sop	mm	12,5	12,5	12,5	12,5
Operating force with spring force F	kp	8-15	8-15	8-15	8-15
Minimum swivel time	s	0,15	0,15	0,15	0,2

Weight (approx.)		(pump with control device)			
Design E	kg	216	297	383	718
Design G	kg	259	350	455	918



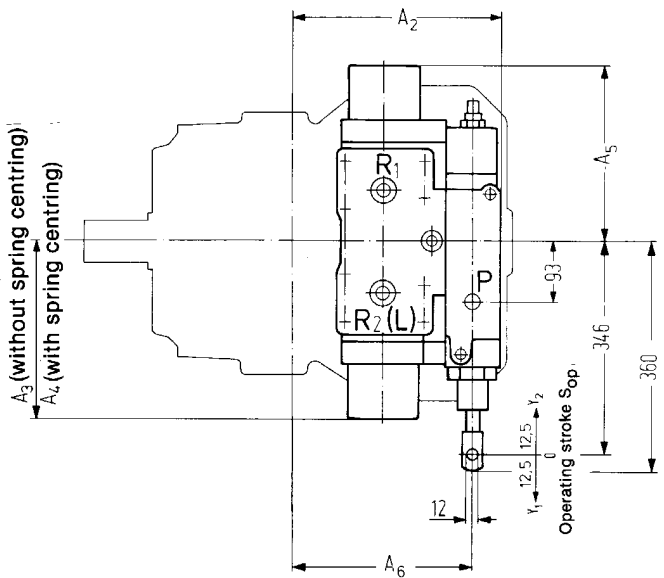
Direction of Flow Through Pump

Direction of operation	Direction of rotation	
	clockwise	anti-clockwise
Y ₂	A to B	B to A
Y ₁	B to A	A to B

A, B service lines
P control pressure port (M 22 x 1,6)

Design G with built-on control:

R₁, R₂ oil filler and air bleed
(in closed circuits either
R₁ or R₂ may be used as a case drain)



Unit Dimensions

Size	A ₁	A ₂	A ₃	A ₄	A ₅	A ₆	A ₇	A ₈	Ports R ₁ , R ₂ (L)
250	304	306	243	331	243	258	244	297	M 22 x 1,5
355	324	315	243	331	243	267	254	317	M 22 x 1,5
500	356	331	275	367	275	284	296	348	M 33 x 2
1000	443	405	345	448	345	357	378	428,5	M 42 x 2

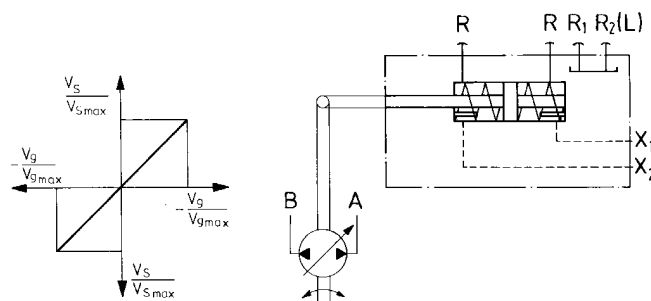
HM Hydraulic Control, Flow Related

In the HM control device, the pump displacement is controlled in direct proportion to the volume of pilot oil supplied to the control cylinder.

The swivel angle may be mechanically limited on both sides between $V_{g\max}$ and V_{g0} . Limiting down to V_{g0} is possible (state this requirement when ordering).

The control cylinder has elastometric seals, spring centring and cushioning of the end positions as standard. Also available without spring centring and without control cylinder seals if required.

(Please order in clear text).

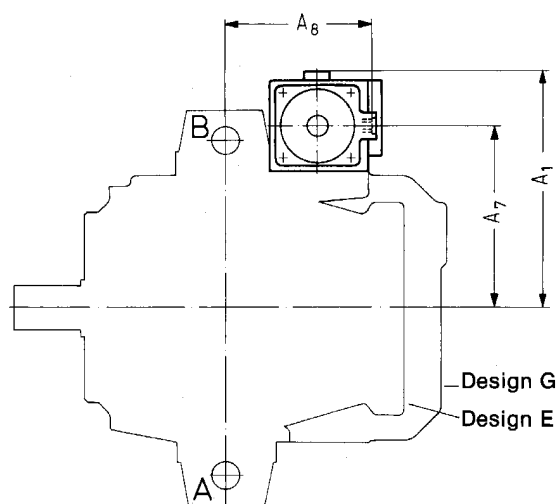


Technical Data

Size		250	355	500	1000
Control piston stroke s	mm	51,5	55,8	62,5	80,3
Control area A	cm ²	16	16	20	31
Control volume Vs	cm ³	83	90	125	250
Control pressure (X ₁ , X ₂) p	bar	50	50	50	50
Max. permissible control pressure p _{max1})	bar	100	100	100	100
Minimum swivel time	s	0,15	0,15	0,15	0,2

1) without spring centring: 150 bar

Weight (approx.)		(pump with control device)			
Design E	kg	196	276	362	697
Design G	kg	239	329	434	897



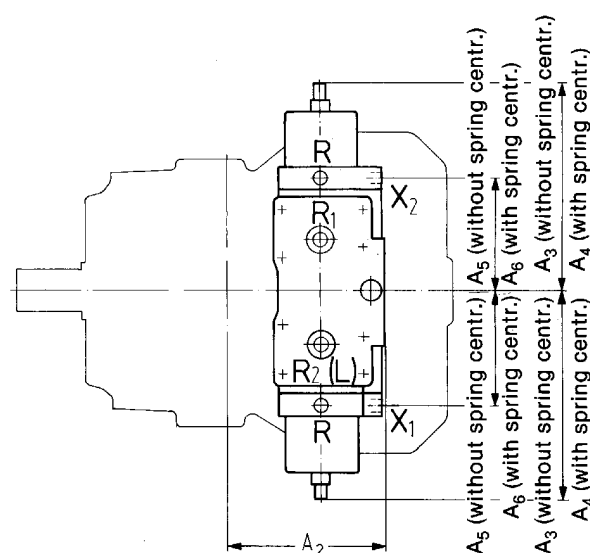
Direction of Flow Through Pump

Pilot pressure	Direction of rotation	
	clockwise	anti-clockwise
in X ₁	B to A	A to B
in X ₂	A to B	B to A

A, B service lines
X₁, X₂ pilot ports
R control cylinder air bleed (M 10 x 1)

Design G with built-on control device:

R₁, R₂ oil filler and air bleed
(in closed circuits either
R₁ or R₂ may be used as a case drain)



Unit Dimensions

Size	A ₁	A ₂	A ₃	A ₄	A ₅	A ₆	A ₇	A ₈	Ports R ₁ , R ₂ (L)	X ₁ , X ₂
250	304	220	276	327	146,5	154	230	198	M 22x1,5	M 18x1,5
355	324	229	276	327	146,5	154	250	207	M 22x1,5	M 18x1,5
500	356	245	308	368	172,5	179	278	240	M 33x2	M 22x1,5
1000	443	319	378	428	215	213	350	301	M 42x2	M 27x2

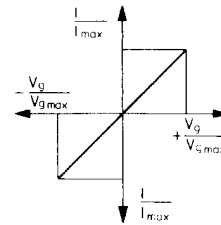
Variable Displacement Pump A2V (Series 5)

Hydraulic Control, Flow Related

With control device HS or HSK, the pump displacement is set via built-on servo valve proportional to the pilot oil flow.

The swivel angle may be limited on both sides in the range V_g max down to $3/4 V_{g \max}$. Limiting down to V_{g0} is possible (please state this requirement when ordering).

End position cushioning, spring centring and sealing of the control cylinder are standard. Also available without spring centring and without control cylinder seals (please order in clear text).

**HS Hydraulic Control, flow related**

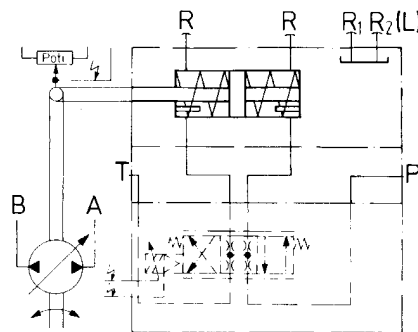
suitable for mounting of servo valve

Recommended servo valve: ¹⁾

Type 4 WS 2 EM 10-30/XX B 2 ET 315 Z8 D/M
The relevant flow should be inserted at "XX"
(at pressure differential of 30 to 40 bar).
See RE 29585 for further details.

Recommended feedback potentiometer: ¹⁾

Type MCP 40 RA, Single track, centre tapped 360° rotation,
(manufactured by Megatron), 5 k Ohm over 340°.

**HSK Hydraulic Control, flow related,**

suitable for mounting of servo valve and bypass valve

Function and construction as HS, but with additional bypass function.

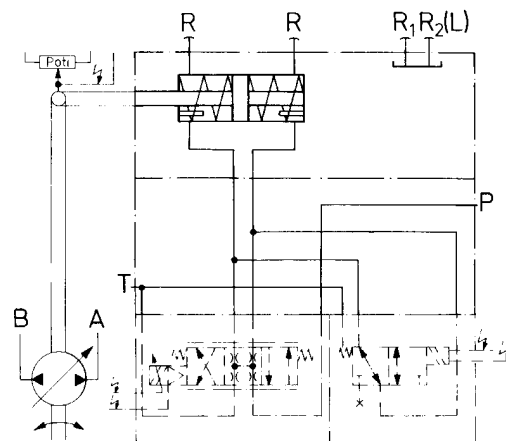
The connection plate is suitable for mounting a 3/2-way directional valve, which connects the two control chambers when the solenoid valve is de-energised.

Recommended 3/2-way directional valve: ¹⁾

Type 3 WE 10 B 3.1/0 G 24 NZ 4.
See RE 23196 for further details.

¹⁾ State required model in clear text.

Direct mounting of servo valve, bypass valve and potentiometer only possible on housed pump.

**Technical Data**

Size		250	355	500	1000
Control piston stroke s	mm	51,5	55,8	62,5	80,3
Control area A	cm ²	16	16	20	31
Control volume V _S	cm ³	83	90	125	250
Control pressure (P) p	bar	50	50	50	50
Max. permissible control control pressure p _{max} ²⁾	bar	100	100	100	100
Minimum swivel time	s	0,15	0,15	0,15	0,2

²⁾ without spring centring: 150 bar

Direction of Flow Through Pump

Swivel range ³⁾	Direction of rotation	
	clockwise	anti-clockwise
clockwise	A to B	B to A
anti-clockwise	B to A	A to B

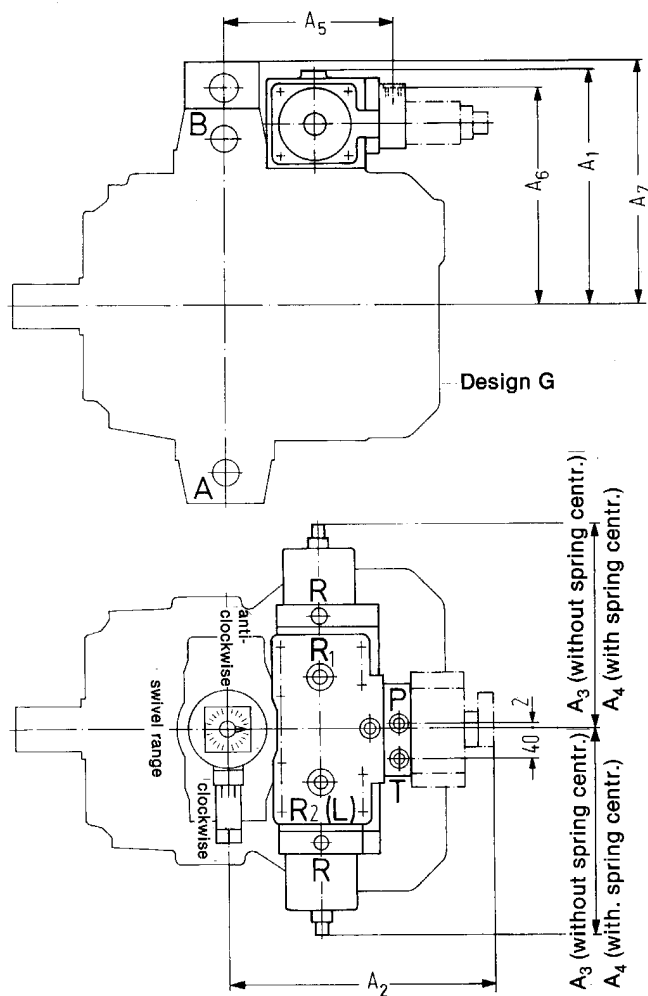
³⁾ as viewed on drive shaft and in normal mounting position

A, B service lines
P control pressure (M 22x1,5)
T tank port (M 22x1,5)
R air bleed for control (M 10x1)
R₁, R₂ oil filler and air bleed
(in closed circuits, either R₁ or R₂ may be used as a case drain)

Variable Displacement Pump A2V (Series 5)

Prior to finalising your design please request certified installation drawing
All right reserved

Unit Dimensions (HS Control Device)



Size	A ₁	A ₂	A ₃	A ₄	A ₅	A ₆	A ₇	Ports R ₁ , R ₂ (L)
250	304	410	276	327	240	310	320	M 22x1,5
355	324	419	276	327	249	330	352	M 22x1,5
500	356	435	308	368	265	358	375	M 33x2
1000	443	509	378	428	339	430	448	M 42x2

Components of the EO Control

- 1 Axial piston variable pump
- 2 Hydraulic control¹⁾
- 3 4/3-way proportional valve
- 4 Positional feedback unit:
indicator rod on submersible pump²⁾
potentiometer on housed pump
- 5 Pressure transducer
- 6 Electronic regulator
- 7 Input signal potentiometer
- 8 Power supply
- 9 Shuttle valve
- 10 Pilot pump
- 11 3/2-way directional valve (bypass
valve) (EOK control only)

¹⁾ Model with spring centring and without control cylinders seals

²⁾ The indicator rod can operate a linear potentiometer, for example. This is not, however, supplied with the EO control.

EO Electronic Control,

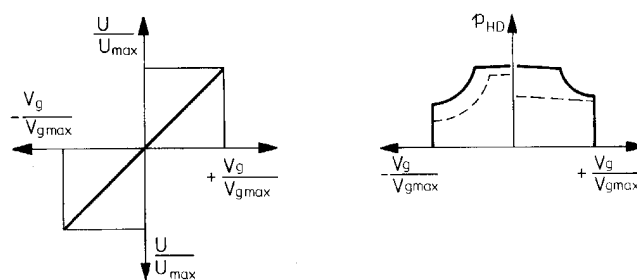
With the electronic control, the pump displacement is set via an electrically controlled proportional flow valve.

A feedback potentiometer signals the pump position. In addition, the hydraulic pressure is converted into an electrical signal via a pressure transducer, so that pressure/flow functions can be calculated in an electronic regulator.

For each flow side, the maximum flow, horsepower limiter and pressure cut-off can be set by means of decade switches.

Swivel angle limiter, end position cushioning and spring centring of the control cylinder are fitted as standard.

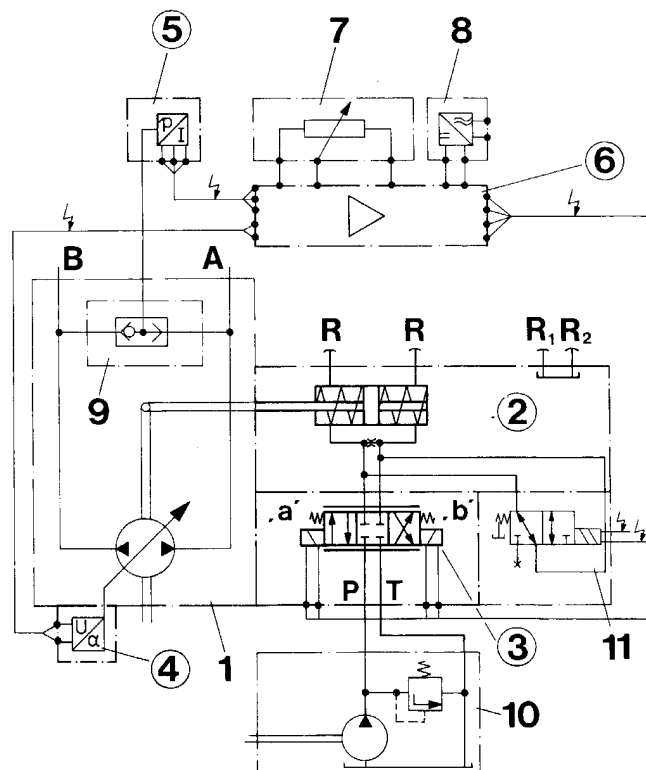
For detailed information on the EO control, see RE 92460.



Technical Data

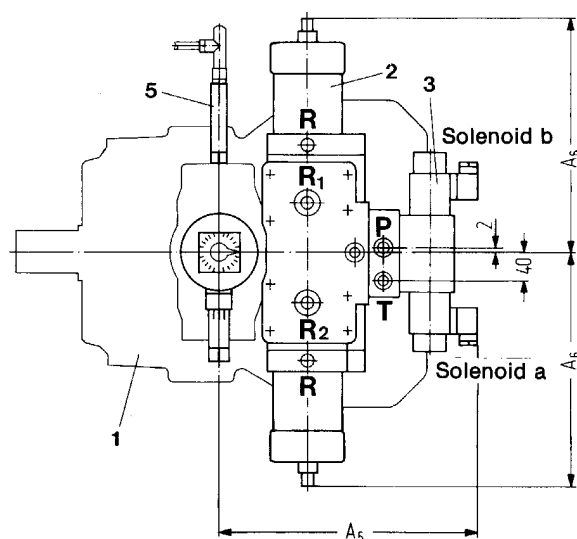
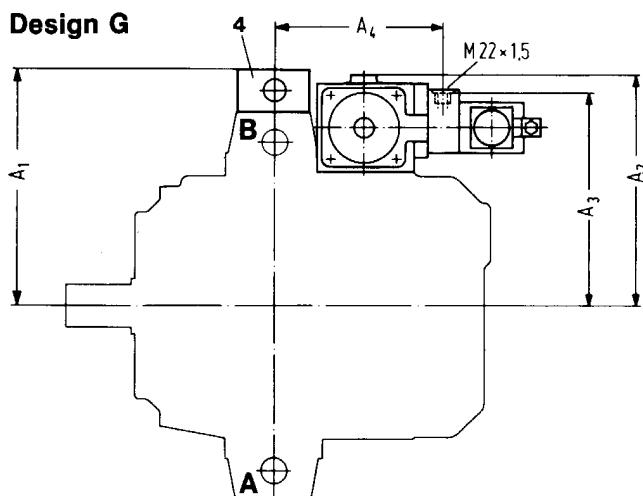
Size	250	355	500	1000
Control piston stroke s	mm 51,5	55,8	62,5	80,3
Control area A	cm ² 16	16	20	31
Control volume V _S	cm ³ 83	90	125	250
Control pressure (P) p	bar 50	50	50	50
Max. perm. contr. press. p _{max}	bar 100	100	100	100
Minimum swivel time	s 0,15	0,15	0,15	0,2

Housed pump (G) Model EOK with bypass valve
(Circled items are supplied with the EO control)



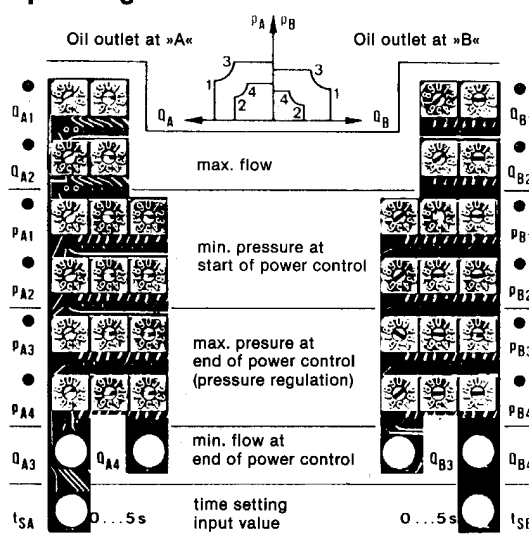
Unit Dimensions (EO Control Device)

Design G

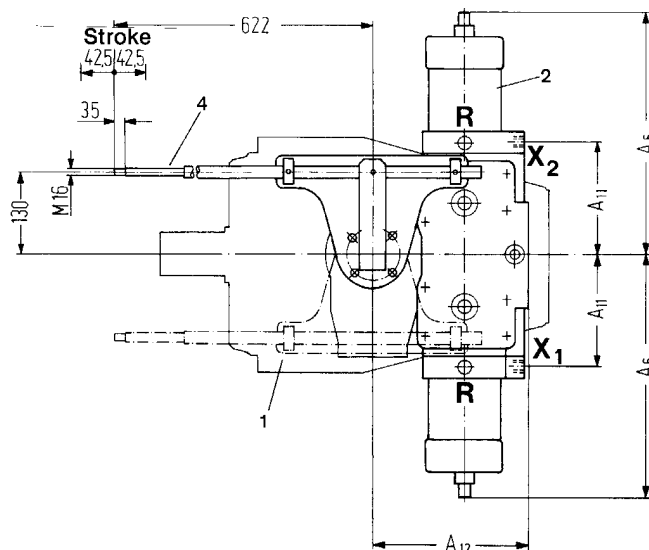
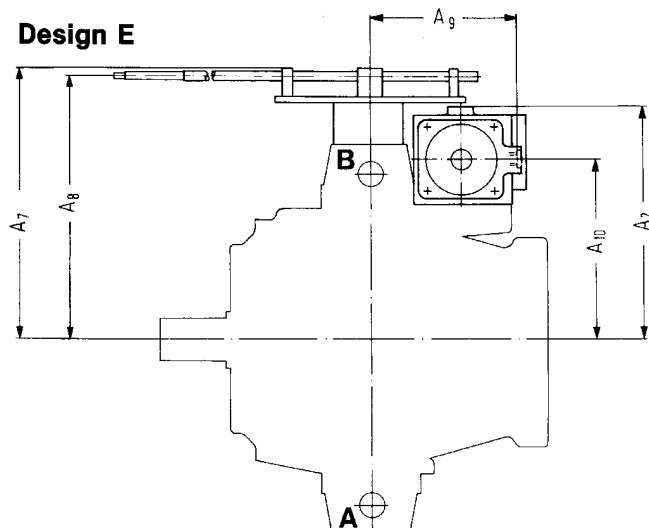


- A, B service ports
P control pressure port (M 22x1,5)
T tank (M 22x1,5)
R air bleed (M 10x1)
R₁, R₂ oil filler and air bleed
(in closed circuits, either R₁ or R₂
may be used as a case drain)
X₁, X₂ pilot ports

Operating Panel



Design E

Mounting position of indicator rod
(state in clear text when ordering):

- a) for open circuits, only on top end of pump
(as shown)
b) for semi-closed and closed circuits, on top or bottom of pump.

Size	A ₁	A ₂	A ₃	A ₄	A ₅	A ₆	A ₇	A ₈	A ₉
250	320	304	294	240	368	322	393	368	198
355	352	324	314	249	377	326	425	400	207
500	375	356	342	265	393	368	448	423	240
1000	448	443	414	339	467	428	533	508	301

Size	A ₁₀	A ₁₁	A ₁₂	Weight (kg) approx. ¹⁾		Ports	
				Design G	Design E	X ₁ , X ₂	R ₁ , R ₂
250	230	154	220	235	200	M 18x1,5	M 22x1,5
355	250	154	229	332	280	M 18x1,5	M 22x1,5
500	278	179	245	420	372	M 22x1,5	M 33x2
1000	350	213	319	880	720	M 27x2	M 42x2

¹⁾ Pump with control device

Direction of rotation

Swivel range ²⁾	Direction of rotation	
	clockwise	anti-clockwise
clockwise	A to B	B to A
anti-clockwise	B to A	A to B

²⁾ Viewed on drive shaft and in normal mounting position

EL Electric Control,

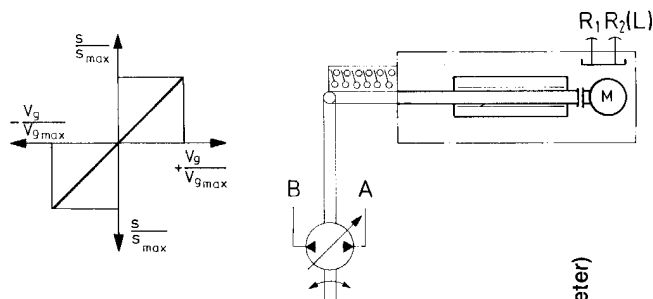
In the EL control device, the pump displacement is directly controlled by means of an electric motor driving a control screw via a reduction gear.

The swivel angle of the control may be limited by preset stops anywhere in the range from $+V_{g\max}$ to $-V_{g\max}$. Variation in the pump swivel angle can be seen on the swivel angle indicator.

The standard design includes 6 limits switches, and an overload coupling for the protection of the control motor.

Hand emergency operation is possible. In addition, a position Indicating potentiometer may be mounted, and an explosion-proof model is available if required.

(Order in clear text).



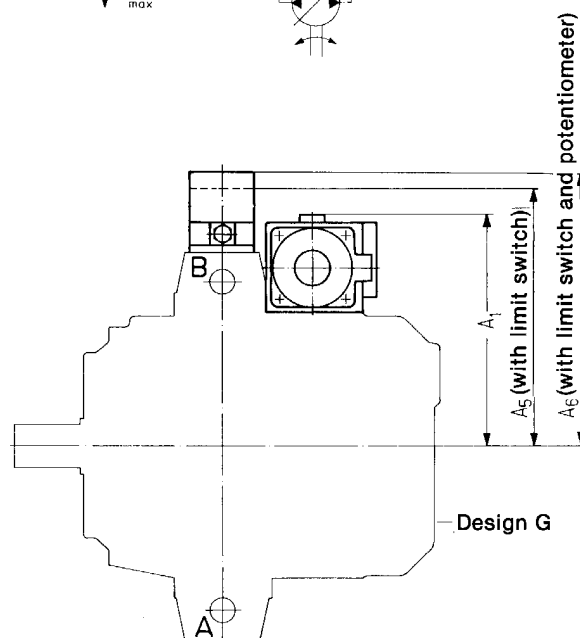
Technical Data

Size		250	355	500	1000
Control stroke (0... $V_{g\max}$) s	mm	51,5	55,8	62,5	80,3
Swivel time (max...min) t ¹⁾	s	296...7	322...8	360...8,5	371...9
Control motor voltage U	V	220/380	220/380	220/380	220/380

Weight (approx.) (pump with control device)¹⁾

Design G	kg	243	333	439	900
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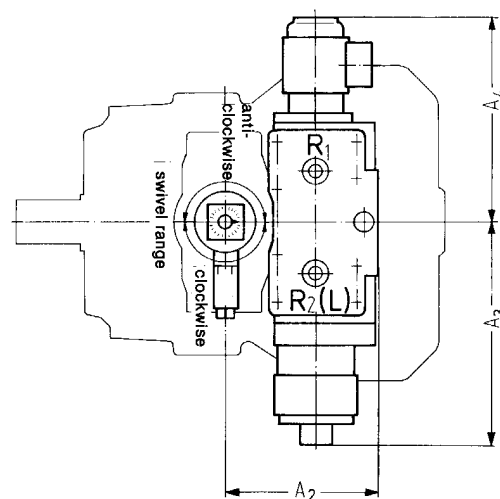
¹⁾ EL control with control motor and limit switch combination



Direction of Flow Through Pump

Swivel range ³⁾	Direction of rotation	
	clockwise	anti-clockwise
clockwise	A to B	B to A
anti-clockwise	B to A	A to B

³⁾ Viewed on drive shaft and in normal mounting position



A, B service lines
R₁, R₂ oil filler and air bleed
(in closed circuits, either R₁ or R₂ may be used as a case drain).

Unit Dimensions

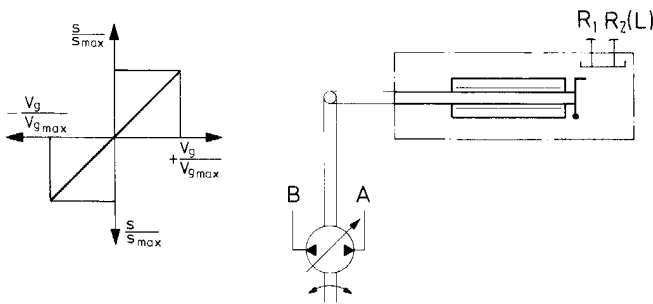
Size	A ₁	A ₂	A ₃	A ₄	A ₅	A ₆	Ports R ₁ , R ₂ (L)
250	304	220	317	336	371	407	M 22 x 1,5
355	324	229	317	336	403	439	M 22 x 1,5
500	356	245	346	378	426	462	M 33 x 2
1000	443	319	362	408	499	535	M 42 x 2

MA Manual Control,

In the MA control, the pump displacement is adjusted by means of a handwheel operating a threaded spindle.

The swivel angle of the pump may be limited by preset stops anywhere in the range from + $V_{g\ max}$ to - $V_{g\ max}$.

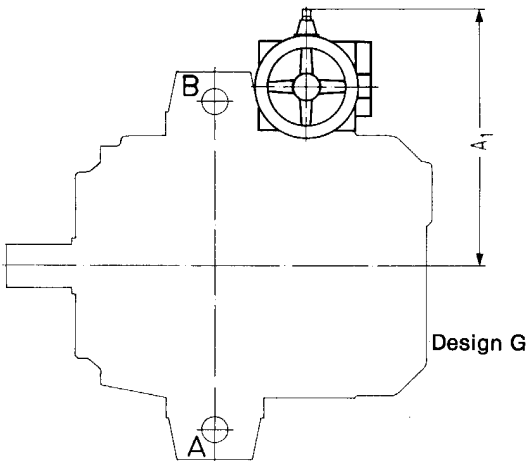
The unit includes a position lock. Variations in pump swivel angle may be seen on the swivel angle indicator.



Technical Data

Size		250	355	500	1000
Control stroke (0... $V_{g\ max}$) s	mm	51,5	55,8	62,5	80,3
Spindle revolutions (0... $V_{g\ max}$)		12,82	13,95	15,6	16,1
Force at control wheel rim (at $p = 350\ bar$)	N $\approx$ 600	825	1050	1200	

Weight (approx.)		(pump with control device)			
Design G	kg	227	317	422	883

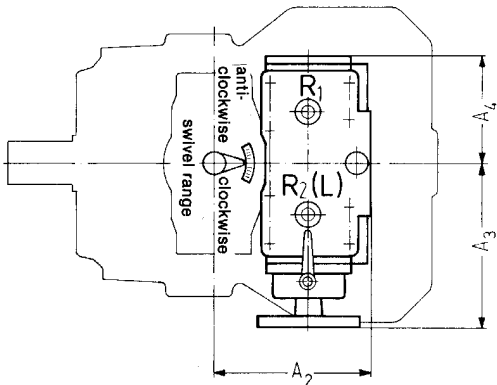


Direction of Flow Through Pump

Swivel range ¹⁾	Direction of rotation	
	clockwise	anti-clockwise
clockwise	A to B	B to A
anti-clockwise	B to A	A to B

¹⁾ Viewed on drive shaft and in normal mounting position

A, B service lines
R₁, R₂ oil filler and air bleed
(in closed circuits, either R₁ or R₂ may be used as a case drain).



Unit Dimensions

Size	A ₁	A ₂	A ₃	A ₄	Ports R ₁ , R ₂ (L)
250	358	220	245	160	M 22 x 1,5
355	378	229	245	160	M 22 x 1,5
500	406	245	271	180	M 33 x 2
1000	493	319	311	226	M 42 x 2

Variable Displacement Pump A2V (Series 5)

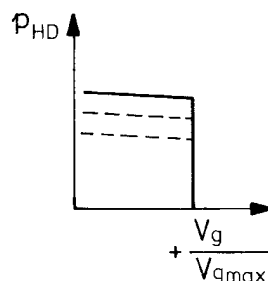
Pressure Regulator

The pressure regulator maintains the pressure in the hydraulic system constant within the control range of the pump.

The swivel angle can be limited in the range $V_{g \max}$ to $3/4 V_{g \max}$.

The pressure relief valve (3) can either be mounted direct on the connection plate (1) or may be mounted separately (e.g. for submersible pump).¹⁾

Changing from hydraulic to electro-hydraulic pressure regulator is only possible by exchanging the valves mounted on the connection plate.



DRH1 Pressure Regulator hydraulically operated

Pilot valve (2) and pressure relief valve (3) are mounted on the connection plate (1) with built-in jets (4, 5 and 6).

If the pressure set at pressure relief valve (3) is exceeded, pilot valve (2) is brought out of the balanced condition by jet (5) and pressurises the piston chamber of the control device (7).

Separate mounting (e.g. for submersible pump) is possible (state in clear text when ordering).¹⁾

The following variations of the hydraulic pressure regulator incorporate the DRH1, but include some additional functions:

DRH 2 — with pressure unloading

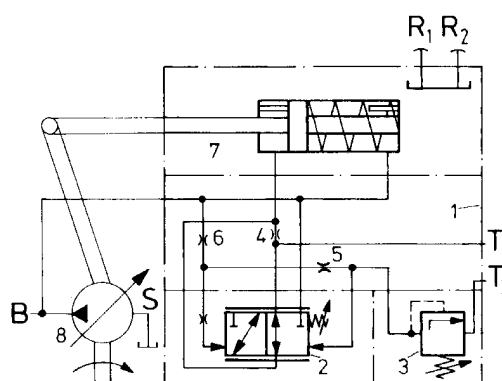
DRH 3 — with two control points

DRH 4 — with two control points and unloading

DRH 5 — with three control points

In this case, too, separate mounting of the pressure relief valve is possible.

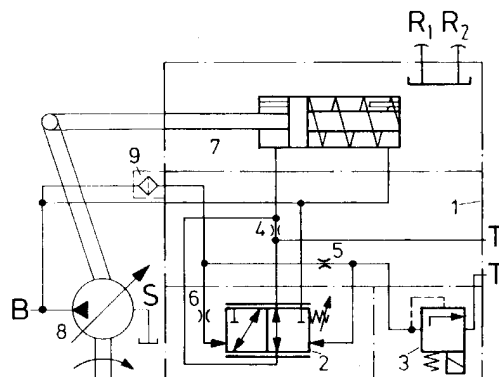
(State in clear text when ordering).



DRE Pressure Regulator electro-hydraulically operated

In this case an electrically operated pressure relief valve (3) is mounted on the connection plate in place of the hydraulically operated relief valve. A high pressure filter (9) of 10 micron pore size is also required in the supply line. The pressure relief valve may be controlled by means of standard electrical control cards.

Once again, separate mounting of the pressure relief valve is possible. (State in clear text when ordering).¹⁾



¹⁾ For separate mounting, threaded connections are provided on pump and connection plate.

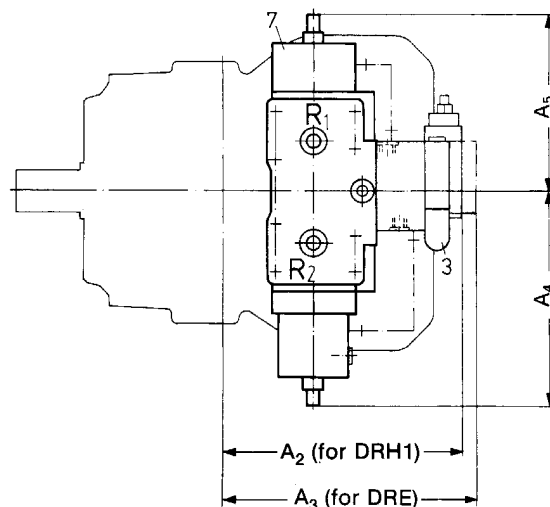
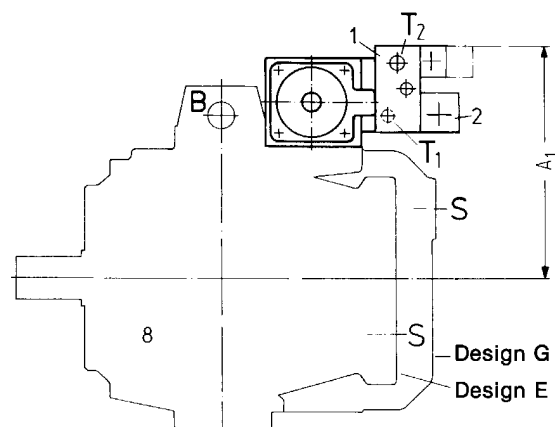
The maximum distance to the control device or variable pump should not exceed 3 m.

Technical Data

Size		250	355	500	1000
Min. control time t_s	s	0,15	0,15	0,15	0,20
Control piston stroke s	mm	51,5	55,8	62,5	80,3
Control area A	cm ²	38,5	38,5	56,7	95
Control volume V_s	cm ³	198	214,5	354,5	760
Pressure setting	$p_{HD \min}$ bar	50	50	50	50
	$p_{HD \max}$ bar	315	315	315	315
Hysteresis (approx.)	bar	5	5	5	5
Pressure increase Δp (app.)	bar	10	10	10	10

- 1 Connection plate
- 2 Pilot valve
- 3 Pressure relief valve
- 4 Jet
- 5 Jet
- 6 Jet
- 7 Control device
- 8 Variable pump
- 9 High pressure filter

B service line
 S suction port
 R₁, R₂ oil filler and air bleed
 (for design G with built-on control)
 T₁, T₂ tank port (M 18 x 1,5)

**Direction of Flow Through Pump**

with clockwise direction of rotation:
 from S to B

Unit Dimensions

Size	A_1	A_2	A_3	A_4	A_5	Weight (kg) approx. ¹⁾		Ports R ₁ , R ₂
						Design E	Design G	
250	310	348	390	260	232	197	242	M 22 x 1,5
355	330	357	399	260	232	277	329	M 22 x 1,5
500	367	373	415	312	263	357	425	M 33 x 2
1000	439	447	489	362	305	689	818	M 42 x 2

¹⁾ Pump with pressure regulator DRH1