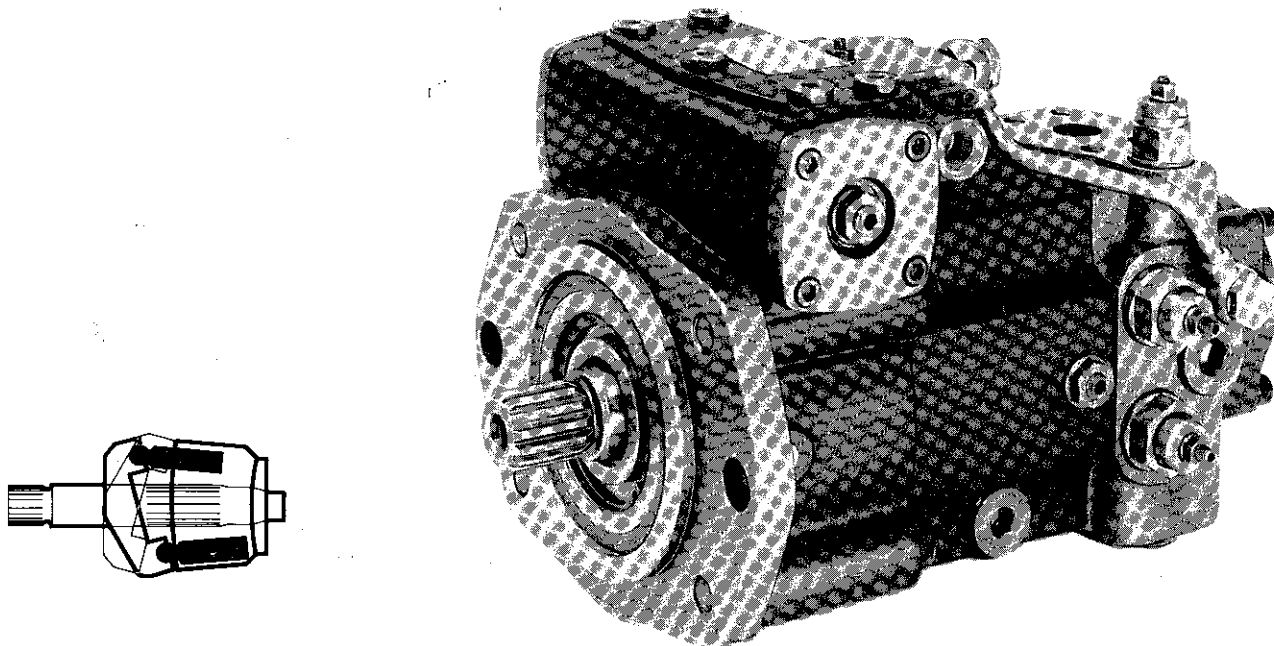


**MANNESMANN
REXROTH**Hydromatik
Brueninghaus Hydraulik**Variable Displacement Pump A4V**Series 1 and 2
for closed circuits
axial piston, swashplate design**RE
92000
02.83**

Sizes 40...250

High pressure range up to 450 bar

Replaces Issue 4.80 and RE 92004

**Description**

The A4V is a variable displacement pump of axial piston, swashplate design for hydrostatic transmissions in closed circuits.

Flow is proportional to drive speed and displacement is infinitely variable.

Output flow increases with swivel angle from 0 to its maximum value. Swivelling the swashplate over centre causes smooth reversal of the direction of flow.

The various control and regulating functions are catered for by the well-matched range of control and regulating devices.

The pump is equipped with a pair of crossline relief valves to protect the high pressure side of the Hydromatic transmission from overload. These valves also act as boost inlet valves.

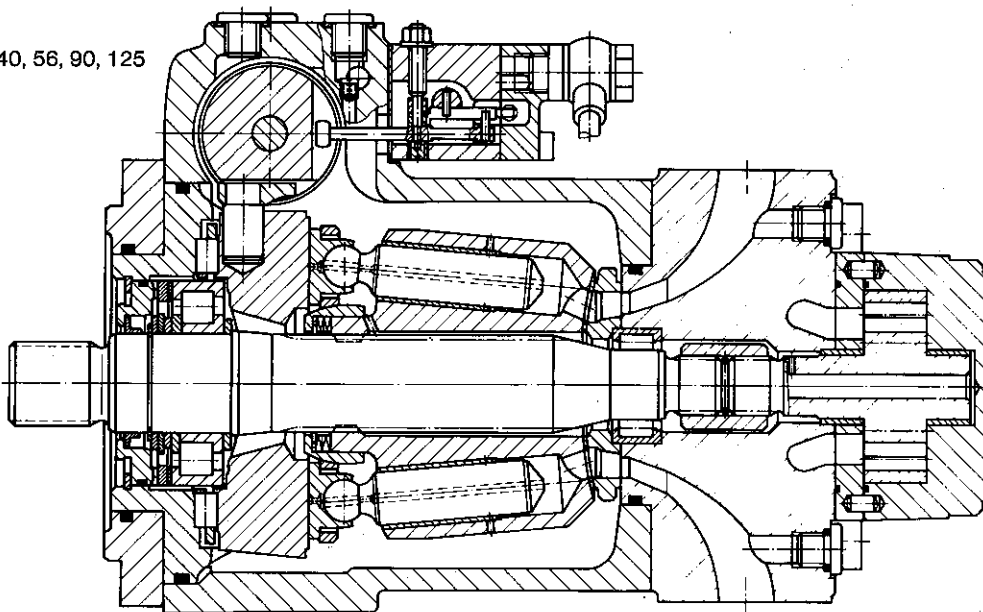
In the standard model, the A4V is supplied with a built-on auxiliary pump, which acts as boost supply and pilot pump. Maximum boost pressure is limited by a built-in pressure relief valve.

As standard, filtration of the suction line of the boost pump is recommended. If required, however, filtration may be in the boost pressure line, via either a line mounted or direct mounted filter.

Variable pumps type A4V can be supplied with a through drive, which may be used for mounting a further gear pump as an additional boost pump (for installation with leakage greater than 70% of the output flow of the auxiliary pump), or for mounting a further variable pump type A10V, which may be used to power a separate circuit.

Section

Variable pump A4V, sizes 40, 56, 90, 125
with hydraulic control,
pressure related, HD



Variable Displacement Pump A4V

Type Code

Short designation

A4V	56	HW	1.0	R	0	0	1	B	1	A
-----	----	----	-----	---	---	---	---	---	---	---

Further details in clear text

Pump Type

Variable displacement pump

A4V

Size

displacement	40 cm ³	40
V _{g max}	56 cm ³	56
	71 cm ³	71
	90 cm ³	90
	125 cm ³	125
	250 cm ³	250

Control Device

without control device	OV	
Hydraulic Control pressure related	HD	
Hydraulic Manual Servo Control	HW	see pages 7...13 and 14...25
Hydraulic Manual Servo Control (cam operated)	HK	
Electric Control* (with proportional solenoids)	EL	
Torque Control	MS	*) Voltage 12 or 24 volts
Hydraulic Control speed related*	DA	- please indicate in clear text

Series

Size 40, 56, 90, 125	1.0
Size 71, 250	2.0

Direction of Rotation

Viewed on drive shaft

Clockwise	R
Anti-clockwise	L



Flange and Shaft

Flange ISO 2-hole Splined shaft DIN 5480	0	Size 40, 56, 90, 125
Flange SAE 4-hole Splined shaft DIN 5480	1	Size 71, 250

Boost Pump and Through Drive Shaft

without through shaft with boost pump (standard model)	O	with through shaft with boost pump SAE A	C
without through shaft without boost pump with end plate	E	with through shaft with boost pump SAE B	G
		with through shaft with boost pump SAE B-B	J
see pages 26 and 27		with through shaft with boost pump SAE C	M
		with through shaft with boost pump connection flange for customer adaptation	D

Pressure Cut-off

without pressure cut-off	O
with pressure cut-off	A

Pressure Relief Valve

with pressure relief valve, pilot operated setting range 250 - 420 bar (standard model)	1
with pressure relief valve, pilot operated setting range 80 - 320bar	2
with pressure relief valve, direct operated setting range 250 - 420 bar (for lifting equipment)	3

DA Control valve

without DA contr. valve,	O
with DA control valve, fixed setting	A
with DA control valve, mech. adjustable with control lever	B
with DA control valve, fixed setting and with built-on hydr. inch valve	C
with DA control valve, mech. adjustable, with control lever and built-on hydr. inch valve	C
with DA control valve, fixed setting and with connections for rotary inch valve	E

see pages 13 and 30

Filtration

Filtration in suction line of boost pump (standard model)	1
Filtration in pressure line of boost pump, connections F _b and F _a for line mounted filter	2
Filtration in pressure line of boost pump, direct mounted filter (supplied with pump)	5

see pages 28 and 29

Ordering Example

A4V.56.HW.1.0.R.0.0.1.B.1.A.

Variable pump A4V, size 56, hydraulic manual servo control, series 1.0, clockwise rotation, ISO 2-hole flange, splined shaft DIN 5480, with auxiliary pump, without through drive, filtration in suction line, with DA control valve, mech. adjustable with control lever, with pressure relief valve, pilot operated, setting range 250 - 450 bar, with pressure cut-off.

Variable Displacement Pump A4V

Product Summary

Size		40	56	71	90	125	250
Control Device	without control device	OV	●	●	●	●	●
	hydraulic control, pressure related	HD	●	●	●	●	●
	hydraulic manual servo control	HW	●	●	●	●	●
	hydraulic cam operated servo control	HK	●	●		●	●
	electrical control (with proportional solenoid)*	EL	●	●	●	●	●
	torque control	MS	●	●	**	●	●
	hydraulic control, speed related*	DA	●	●	●	●	●
Series	series 1.0	1.0	●	●		●	●
	series 2.0	2.0			●		●
Direction of Rotation	clockwise	R	●	●	●	●	●
	anti-clockwise	L	●	●	●	●	●
Flange and Shaft	flange, ISO 2-hole; splined shaft to DIN 5480	0	●	●		●	●
	flange SAE 4-hole, splined shaft to DIN 5480	1			●		●
Auxiliary Pump and Through Drive	with auxiliary pump, without through drive, standard model	O	●	●	●	●	●
	without auxiliary pump, without through drive, with cover plate	E	●	●		●	●
	with auxiliary pump with through drive	SAE A C	●	●	●	●	●
		SAE B G	●	●	●	●	●
		SAE B-B J	●	●	●	●	●
		SAE C M				●	●
	to suit customer requirement, D	●	●	●	●	●	
Filtration	in section line of boost pump standard model	1	●	●	●	●	●
	in pressure line of boost pump, connections F _e and F _a for line mounted filter	2	●	●	●	●	●
	in pressure line of boost pump, direct mounted	5	●	●	●	●	●
DA Control Valve *	without DA control valve	O**	●	●	●	●	●
	for control device OV HD HW HK EL MS						
	with DA control valve, fixed setting	A	●	●	●	●	●
	for control device HD HW HK EL DA						
	with DA control valve, mech. adjustable with control lever	B	●	●	●	●	●
	for control device HD HW HK EL DA						
	with DA control valve, fixed setting and hydr. inch valve built on	C	●	●	●	●	●
for control device DA							
with DA control valve, mech. adjustable with control lever and built on hydr. inch valve	D	●	●	●	●	●	
for control device DA							
with DA control valve, fixed setting and connections for rotary inch valve	E	●	●	●	●	●	
for control device HD HW HK EL DA							
Pressure Relief valve	pilot operated, setting range 250...450 bar, standard model	1	●	●	●	●	●
	pilot operated, setting range 80...320 bar	2	●	●	●	●	●
	direct operated, setting range 250...420 bar	3	●	●	●	●	●
Pressure Cut-Off	without pressure cut-off	O	●	●	●	●	●
	with pressure cut-off	A	●	●	●	●	●
	for control device HD HW HK EL DA						

* 12 or 24 V; indicate in clear text when ordering

** Torque regulating valve only available separated from pump, see page 11

Variable Displacement Pump A4V

Technical Data

Operating pressure range – inlet side

Variable displacement pump:
 Boost pressure p_{Bo} _____ 25 bar
 boost pump
 Suction pressure $p_{s \min}$ ($v \leq 30 \text{ mm}^2/\text{s}$) _____ $\geq 0,8$ bar absolute
 for cold start _____ $\geq 0,5$ bar absolute

Operating pressure range – outlet side

Variable displacement pump:
 Pressure at port A or B
 Nominal pressure p_N _____ 400 bar
 Peak pressure p_{max} _____ 450 bar
 Boost pump:
 Nominal pressure p_B _____ 25 bar
 Peak pressure $p_{R \max}$ _____ 40 bar
 (Pressure data to DIN 24312)

Leakage Fluid Pressure

Permissible max. fluid pressure at ports
 T_1, T_2 or T_3 and T_4
 p_L _____ 2 bar absolute
 short-term (on start) _____ 3 bar absolute

Mounting Position

Optional, but the housing must always be filled with fluid.

Direction of Flow

For correlation of direction of rotation, control and direction of flow – see control devices, pages 7...13

Calculation of Size

Flow	$Q = \frac{V_g \cdot n \cdot \eta_v}{1000}$	[l/min]
Torque	$M = \frac{1,59 \cdot V_g \cdot \Delta p}{100 \cdot \eta_{mh}}$	[Nm]
Power	$P = \frac{M \cdot n}{9550} = \frac{Q \cdot \Delta p}{600 \cdot \eta_t}$	[kW]

V_g = Displacement (cm³) per rev
 Δp = Differential pressure (bar)
 n = Speed (rpm)
 η_v = Volumetric efficiency
 η_{mh} = Mechanical-hydraulic efficiency
 η_t = Overall efficiency

(see data table, page 6)

Filtration

Filtration in Suction Line of Boost Pump (built-on auxiliary pump)

Standard model, preferred installation
 Filter pore size _____ 10 μm nominal

Resistance to flow at filter element
 at $v = 30 \text{ mm}^2/\text{s}$, $n = n_{max}$ _____ $\Delta p \leq 0,1$ bar
 at $v = 1000 \text{ mm}^2/\text{s}$, $n = 1000 \text{ rpm}$ _____ $\Delta p \leq 0,3$ bar

Pressure at port S of boost pump
 at $v = 30 \text{ mm}^2/\text{s}$ _____ $p \geq 0,8$ bar
 on cold start _____ $p \geq 0,5$ bar

Use a filter without bypass, preferably with clogging indicator.

Filtration in Pressure Line of Boost Pump (built-on auxiliary pump)

Filter installation:
 either separately in the pressure line, or mounted directly on the variable pump.

Filter pore size _____ 10 μm nominal

Resistance to flow at filter element
 at $v = 30 \text{ mm}^2/\text{s}$ _____ $\Delta p \leq 1$ bar
 on cold start _____ $\Delta p \text{ max. } 3$ bar
 (valid for the whole speed range $n_{min} - n_{max}$)

Filters with bypass are not recommended; please consult us if bypass is to be used.
 A clogging indicator is recommended.

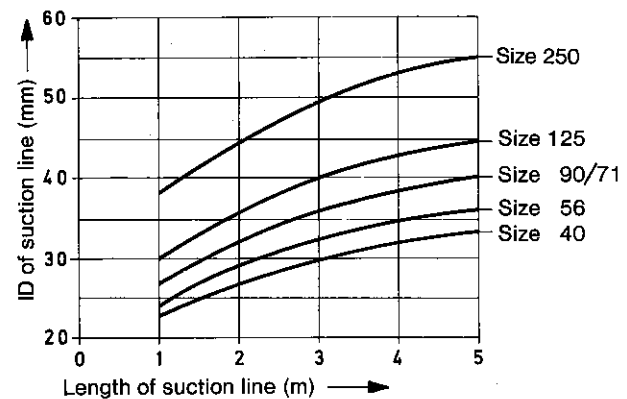
When ordering a variable pump with built-on filter, the details of the required clogging indicator must be stated in clear text, e.g.:

- electrical (12 V or 24 V)
- optical or
- optical/electrical (12 V or 24 V).

Dimensioning of Suction Line

(for built-on boost pump)

Typical values



See hose details, RE 95009.

Variable Displacement Pump A4V

Hydraulic Fluid

Viscosity Range

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

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

referred to the closed loop temperature.

Limits of Viscosity Range

The following limits of viscosity apply:

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

$\nu_{max} = 1000 \text{ mm}^2/\text{s}$
short-term, on cold start.

Detailed information on the selection of fluids on a mineral oil basis and their additives may be obtained from our catalogue sheet RE 90220 for project engineering work.

Comments on the Selection of Fluids

A prerequisite for the correct choice of fluid is the knowledge of the operating temperature in the closed loop, together with the relevant ambient temperature.

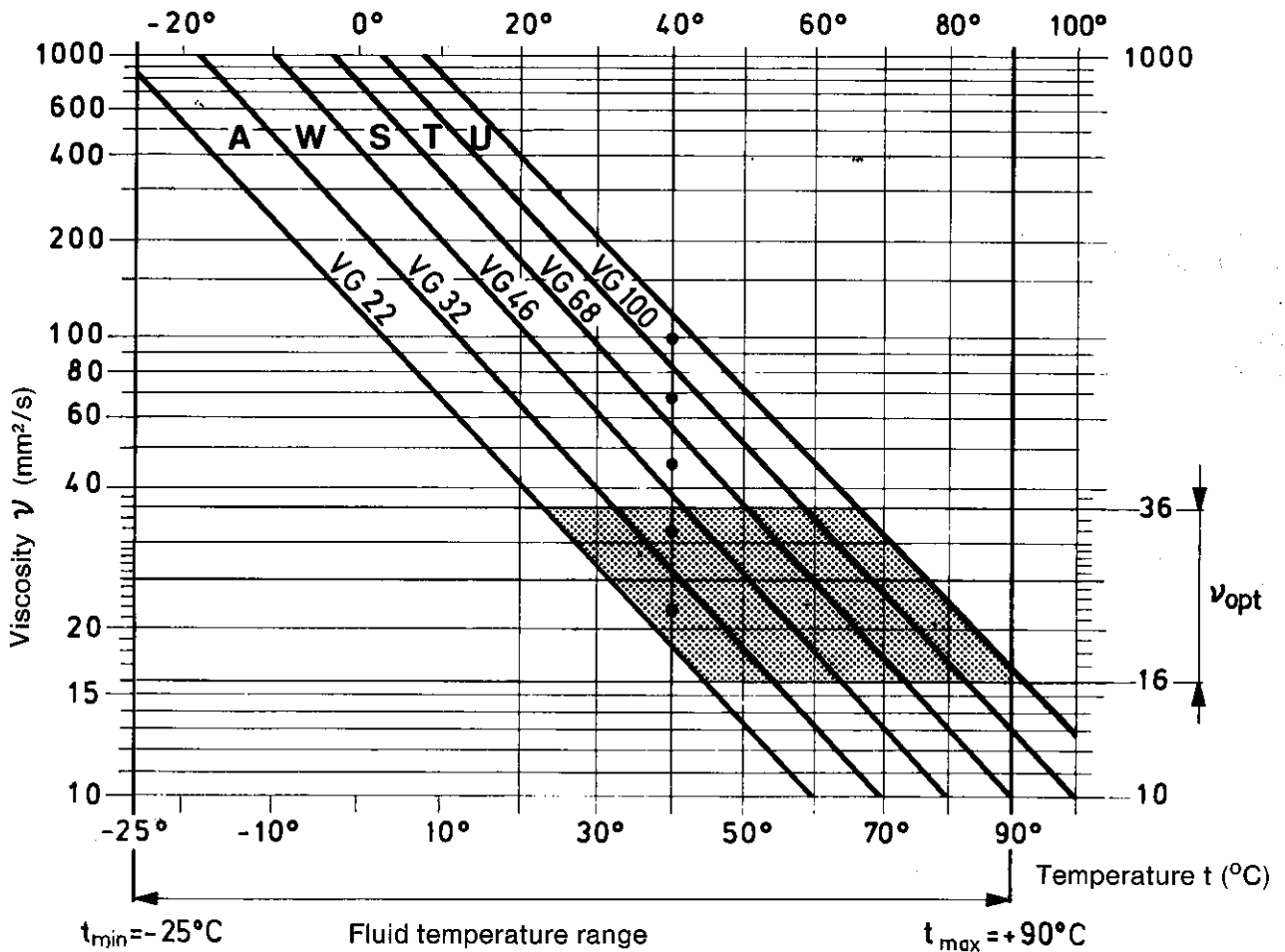
The selection of fluid must then be made so that, within the operating temperature range, the operating viscosity also lies within the optimum range (ν_{opt}) (see shaded section of the selection diagram). We recommend that the higher viscosity grade is chosen.

Example: with an ambient temperature of X °C, an operating temperature of 60 °C is found within the circuit. From the optimum operating viscosity range (ν_{opt} - shaded section), viscosity grades VG 46 or VG 68 may be selected; VG 68 should be selected.

Note: leakage oil temperature, which is dependent upon pressure and speed, is always higher than the closed loop temperature. At no point within a circuit may the temperature be higher than 90 °C.

If the above conditions cannot be met during extreme operating conditions, or with a high ambient temperature, please consult us.

Selection Diagram



Variable Displacement Pump A4V

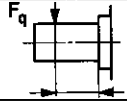
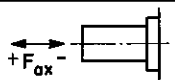
(theoretical values, without taking into account η_{mh} and η_v)

Size				40	56	71	90	125	250	
Displacement	Variable displacement pump	$V_{g \max}$	cm ³	40	56	71	90	125	250	
	Boost pump	V_{gH}	cm ³	8,4	11,4	19,0	19,0	26,4	52,5	
Speed	maximum*	n_{\max}	rpm	3700	3400	3200	2900	2600	2000	
	minimum	n_{\min}	rpm	500	500	500	500	500	500	
Flow	at n_{\max}	Variable displacement pump	Q_{\max}	l/min	148	190	227	261	325	500
		Boost pump	$Q_{H \max}$	l/min	31	38	61	55	68	105
	at $n_E = 1450 \text{ min}^{-1}$	Variable displacement pump	Q	l/min	58	81	103	130	181	362
		Boost pump	Q_H	l/min	12	16	27	27	38	76
Power	at n_{\max}	Var. displ. pump $\Delta p = 400 \text{ bar}$	P_{\max}	kW	99	127	151	174	217	333
		Boost pump $\Delta p = 25 \text{ bar}$	$P_{H \max}$	kW	1,3	1,6	2,5	2,3	2,8	4,3
	at $n_E = 1450 \text{ min}^{-1}$	Var. displ. pump $\Delta p = 400 \text{ bar}$	P	kW	39	54	69	87	121	241
		Boost pump $\Delta p = 25 \text{ bar}$	P_H	kW	0,5	0,7	1,1	1,1	1,	3,1
Torque	at $V_{g \max}$	Var. displ. pump $\Delta p = 400 \text{ bar}$ (without boost pump)	M_{\max}	Nm	254	356	451	572	795	1590
		$\Delta p = 100 \text{ bar}$	M	Nm	63,6	89	113	143	199	397
Moment of inertia (around drive axis)			J	kgm ²	0,0049	0,0085	0,0121	0,0175	0,03	0,0959
Swivel time**	Min. swivel time with built-in throttles (at X_1, X_2), Standard model	$0 - V_{g \max}$	s	1,0	1,0	2,0	1,2	1,2	2,5	
		$V_{g \max} - 0$	s	1,0	1,0	1,2	1,2	1,2	1,8	
		Throttle- \emptyset	mm	0,8	0,8	1,0	1,0	1,0	2,2	
	Min. swivel time without throttles	$0 - V_{g \max}$	s	0,5	0,5	1,2	0,5	0,5	1,5	
		$V_{g \max} - 0$	s	0,4	0,4	0,7	0,5	0,5	1,0	
Weight	(standard model, without through shaft)		m	kg (ca.)	30	37	54	54	75	160

* Higher speeds may be permissible if full operating details are known – please consult us.

** The swivel time can be influenced by means of additional meter-in and meter-out throttles in the pilot lines.

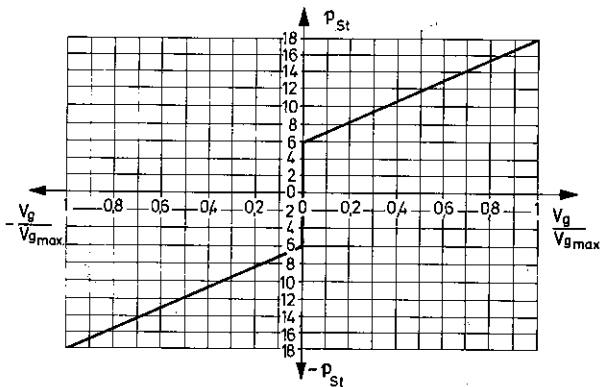
Permissible Radial and Axial Forces on the Drive Shaft

Size				40	56	71	90	125	250
Force moment arm (from shaft shoulder)		a	mm	17,5	17,5	20	20	22,5	29
		b	mm	30	30	35	35	40	50
		c	mm	42,5	42,5	50	50	57,5	71
Max. permissible radial force at offset	a	$F_{q \max}$	N	3600	5000	6300	8000	11000	22000
	b	$F_{q \max}$	N	2891	4046	4950	6334	8594	16809
	c	$F_{q \max}$	N	2416	3398	4077	5242	7051	13600
Max. permissible axial force		$\pm F_{ax \max}$	N	1500	2200	2750	3500	4800	6000

Variable Displacement Pump A4V

Hydraulic Control, pressure related, HD

By means of the control device HD the adjusting cylinder in the pump is pressurised with an adjusting pressure relative to the pilot pressure difference in the two pilot lines (ports Y_1 and Y_2), thereby allowing infinite adjustment of the swashplate and thus of the displacement. One pilot line is allocated to each flow direction.



V_g Displacement at p_{st}
 $V_{g\ max}$ Displacement at $p_{st} = 18$ bar

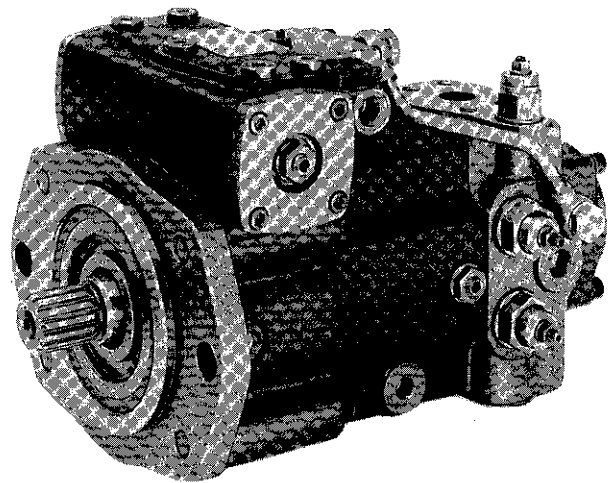
Pilot pressure $p_{st} = 6 - 18$ bar (at port Y_1, Y_2)
 Commencement of control at 6 bar
 End of control at 18 bar (max. displacement $V_{g\ max}$)
 Hysteresis approx. 0,5 - 0,8 bar.

The reproducibility of the pump position when approached from the same direction is around 2 - 4%.

The pilot unit TH7 (RE 64558) with control curve, code no. 05 can be used for the control.

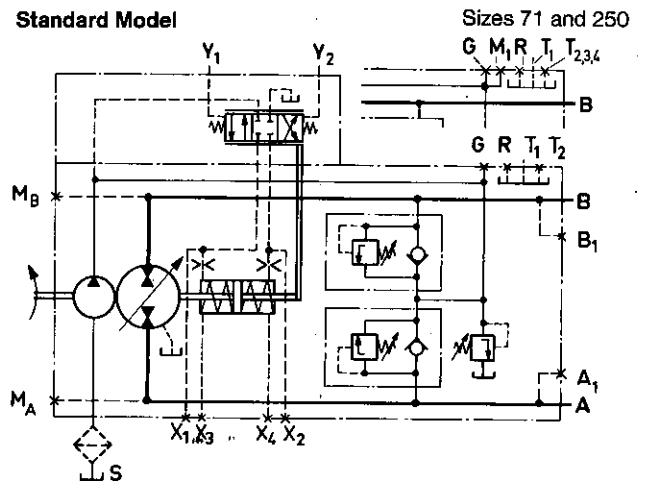
If the pump is also equipped with a DA control valve, automotive type control is also possible (e.g. for a vehicle transmission). See control device type DA, page 13 and DA control valve, page 30.

For pressure cut-off, see page 31.

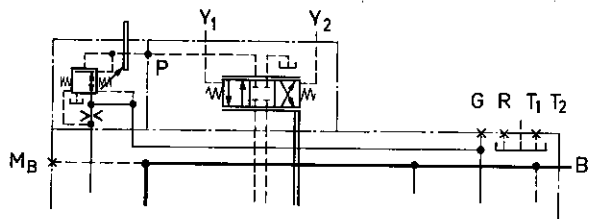


Hydraulic control, pressure related HD

Standard Model

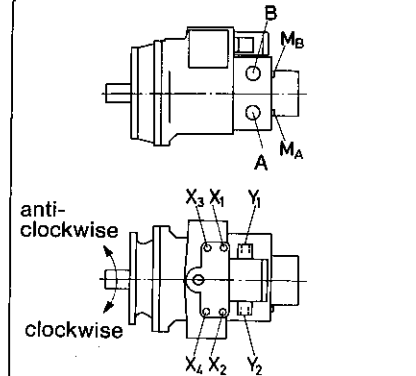
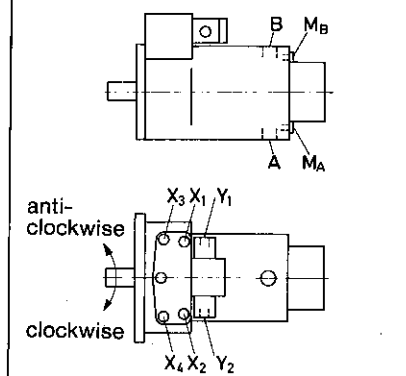


Model with DA Control Valve



Correlation of Direction of Rotation, Control and Direction of Flow

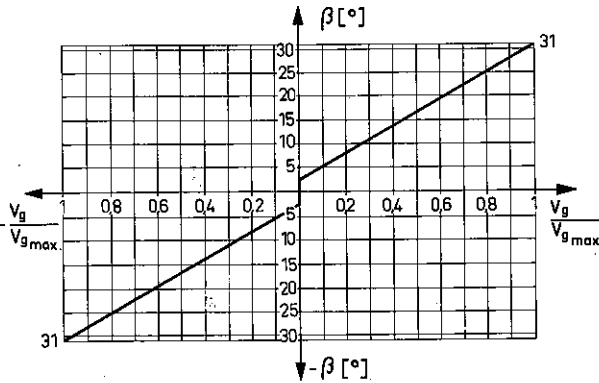
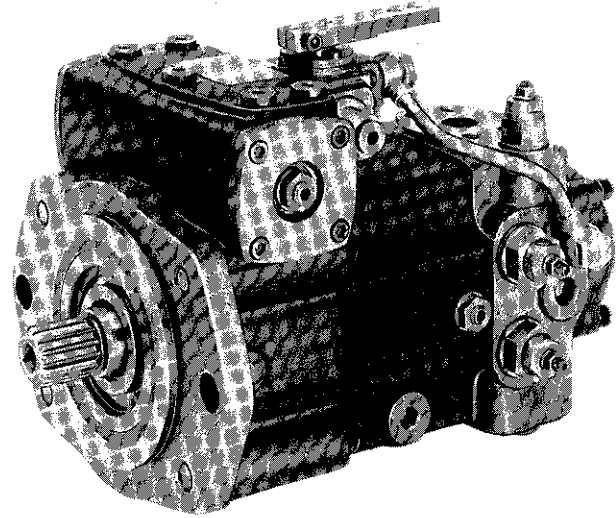
Size	40, 56, 90, 125				71, 250			
	clockwise		anti-clockwise		clockwise		anti-clockwise	
Direction of rotation	clockwise		anti-clockwise		clockwise		anti-clockwise	
Pilot pressure inlet	Y_1	Y_2	Y_1	Y_2	Y_1	Y_2	Y_1	Y_2
Control pressure inlet	$X_1; X_3$	$X_2; X_4$	$X_1; X_3$	$X_2; X_4$	$X_1; X_3$	$X_2; X_4$	$X_1; X_3$	$X_2; X_4$
Direction of flow from	$A \rightarrow B$	$B \rightarrow A$	$B \rightarrow A$	$A \rightarrow B$	$B \rightarrow A$	$A \rightarrow B$	$A \rightarrow B$	$B \rightarrow A$
Operating pressure in	M_B	M_A	M_A	M_B	M_A	M_B	M_B	M_A



Variable Displacement Pump A4V

Hydraulic manual Servo Control, HW

The adjusting cylinder in the pump is pressurised with an adjusting pressure relative to the position of the control lever on control device HW, thereby allowing infinite adjustment of the swashplate and thus of the displacement. One swivel direction of the control lever is allocated to each flow direction.



Swivel stroke of control lever:
 from 0 to $\pm V_{g \max} = \pm 0$ to $\pm 31^\circ$
 Hysteresis approx. $1.2 - 1.9^\circ$
 Necessary torque on adjustment lever
 approx. 160 - 220 Ncm

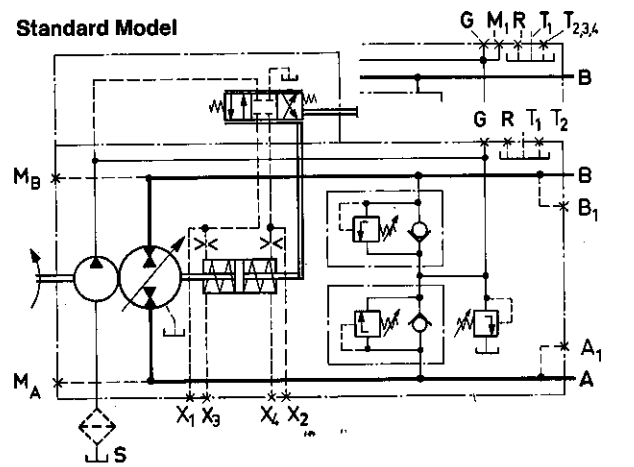
The reproducibility of the pump position when approached from the same direction is around 2 - 4%.

If the pump is also equipped with a DA control valve, automotive type control is also possible (e.g. for a vehicle transmission). See control device type DA, page 13 and DA control valve, page 30.

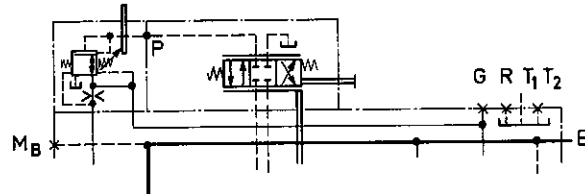
For pressure cut-off, see page 31.

Hydraulic control, manual servo, HW

Standard Model

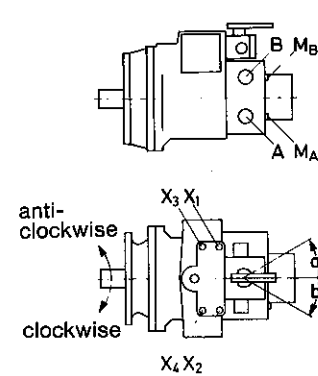
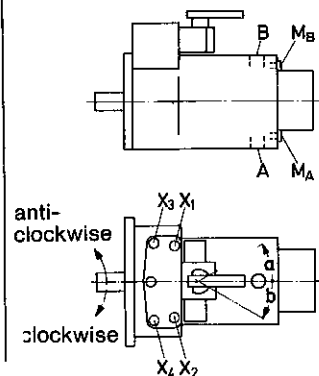


Model with DA Control Valve



Correlation of Direction of Rotation, Control and Direction of Flow

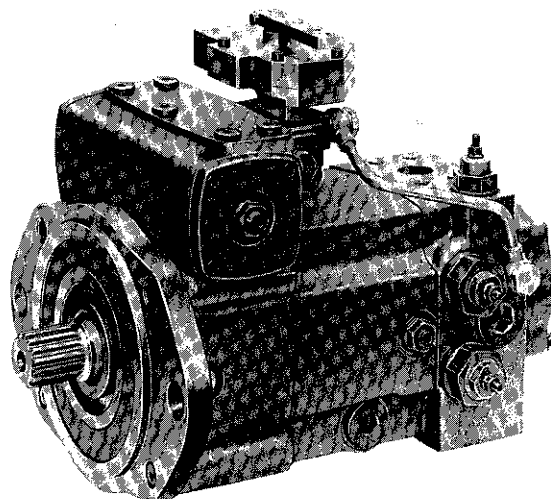
Size	40, 56, 90, 125				71, 250			
	clockwise		anti-clockwise		clockwise		anti-clockwise	
Direction of rotation	a	b	a	b	a	b	a	b
Direction of lever movement	X ₂ ; X ₄	X ₁ ; X ₃	X ₂ ; X ₄	X ₁ ; X ₃	X ₂ ; X ₄	X ₁ ; X ₃	X ₂ ; X ₄	X ₁ ; X ₃
Control pressure in	B → A	A → B	A → B	B → A	A → B	B → A	B → A	A → B
Direction of flow from	M _A	M _B	M _B	M _A	M _B	M _A	M _A	M _B



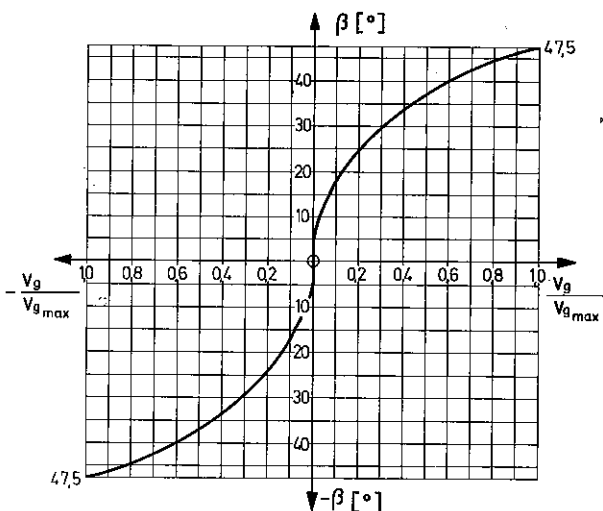
Variable Displacement Pump A4V

Hydraulic Cam Operated Servo Control, HK

The external control lever operates a cam, which in turn controls the position of the control shaft of the servo pilot device, so as to produce a depressive operating curve. This allows a particularly sensitive control to be obtained when swivelling the pump into and out of the null position ($V_g = 0$). The spring centering of the control lever allows automatic return to the null position. Each direction of lever movement corresponds to an offset swivel direction of the swashplate.



Hydraulic cam operated servo control, HK

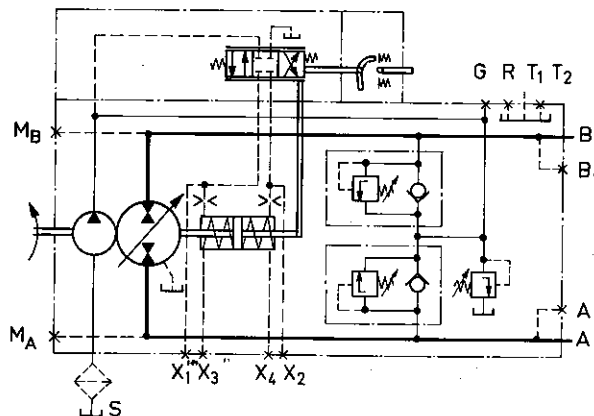


Swivel movement of the control lever:
 from 0 to $\pm V_{g \max} = \pm \beta 0$ to $\pm 47,5^\circ$
 Hysteresis approx. $1.5 - 2^\circ$
 Torque required at control lever:
 approx. 235 - 370 Ncm

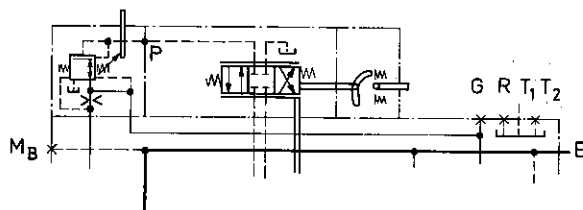
If the pump is also equipped with a DA control valve, automotive type control is also possible (e.g. for a vehicle transmission). See control device type DA, page 13 and DA control valve, page 30.

For pressure cut-off, see page 31.

Standard Model

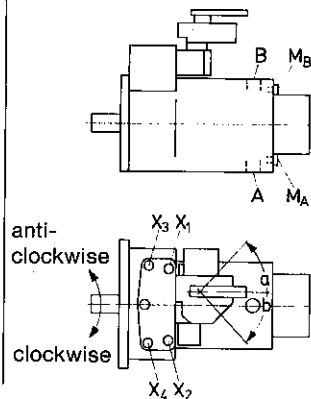


Model with DA Control Valve



Correlation of Direction of Rotation, Control and Direction of Flow

Size	40, 56, 90, 125			
	clockwise		anti-clockwise	
Direction of rotation	clockwise		anti-clockwise	
Direction of lever movement	a	b	a	b
Control pressure in	$X_2 ; X_4$	$X_1 ; X_3$	$X_2 ; X_4$	$X_1 ; X_3$
Direction of flow from	$B \rightarrow A$	$A \rightarrow B$	$A \rightarrow B$	$B \rightarrow A$
Operating pressure in	M_A	M_B	M_B	M_A

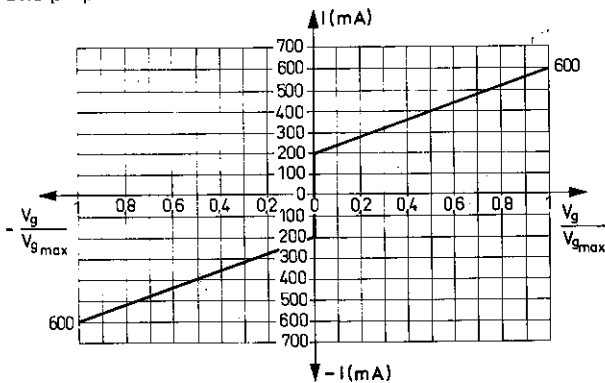


Variable Displacement Pump A4V

Electric Control, EL

Via two proportional solenoids on control device EL the adjusting cylinder in the pump is pressurised with an adjusting pressure relative to the pre-selected current, thereby allowing infinitive adjustment of the swashplate and thus the displacement.

One proportional solenoid is allocated to each flow direction.



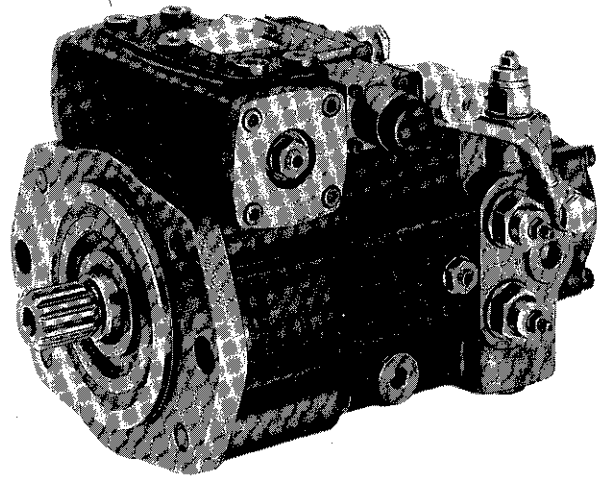
- Control current $I = 200 - 600$ mA with 24 V DC control solenoids
- Control current $I = 400 - 1200$ mA with 12 V DC control solenoids
- Commencement of control at 200 (400) mA (V_{g0})
- End of control at 600 (1200) mA (V_{gmax})
- Hysteresis approx. 20 - 30 mA for 24 V, 40 - 60 mA for 12 V.

The reproducibility of the pump position when approached from the same direction is around 2 - 4%.

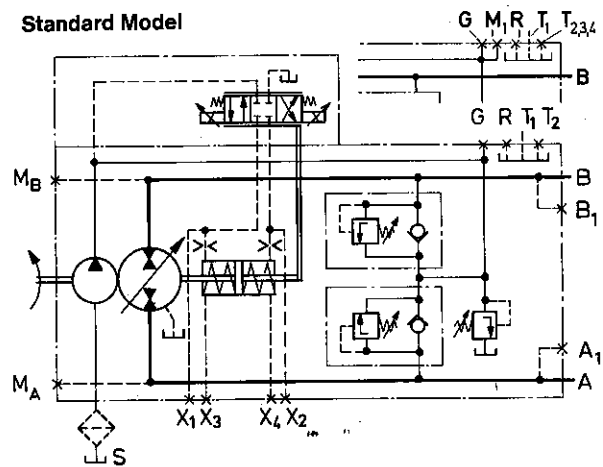
Available for the control of the proportional solenoids are the chopper amplifier (see leaflet Z7), electric amplifier VT 2000 (see leaflet RE 29911) or electric amplifier 3004/5 (see leaflet Z16). For a pure switching function the feed voltage can also be applied direct (without amplifier) to the proportional solenoid.

If the pump is also equipped with a DA control valve, automotive type control is also possible (e.g. for a vehicle transmission). See control device type DA, page 13 and DA control valve, page 30.

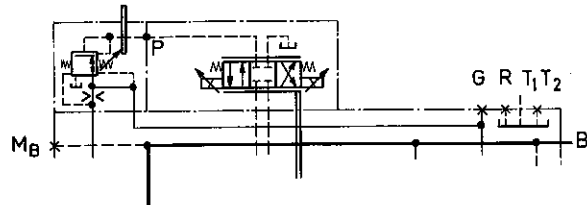
For pressure cut-off, see page 31.



Electric control EL
Standard Model

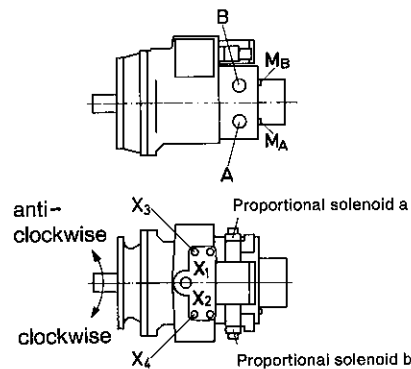
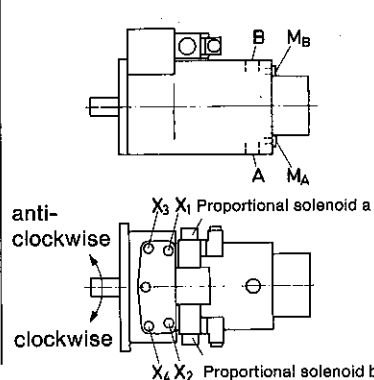


Model with DA Control Valve



Correlation of Direction of Rotation, Control and Direction of Flow

Size	40, 56, 90, 125				71, 250			
	clockwise		anti-clockwise		clockwise		anti-clockwise	
Direction of rotation	clockwise		anti-clockwise		clockwise		anti-clockwise	
Solenoid operated	a	b	a	b	a	b	a	b
Control pressure in	$X_1; X_3$	$X_2; X_4$	$X_1; X_3$	$X_2; X_4$	$X_1; X_3$	$X_2; X_4$	$X_1; X_3$	$X_2; X_4$
Direction of flow from	$A \rightarrow B$	$B \rightarrow A$	$B \rightarrow A$	$A \rightarrow B$	$B \rightarrow A$	$A \rightarrow B$	$A \rightarrow B$	$B \rightarrow A$
Operating pressure in	M_B	M_A	M_A	M_B	M_A	M_B	M_B	M_A



Variable Displacement Pump A4V

Torque Control, MS

Operating pressure and pressure direction, and thus the size and direction of the torque on the hydraulic motor (fixed displacement motor) are controlled relative to the preselected pilot pressure (via control device, e.g. TH7, control curve 05) and with infinitive variation.

Ratio HP (Δp) – pilot pressure 16 : 1
 160 bar high pressure (Δp) $\hat{=}$ 10 bar pilot pressure

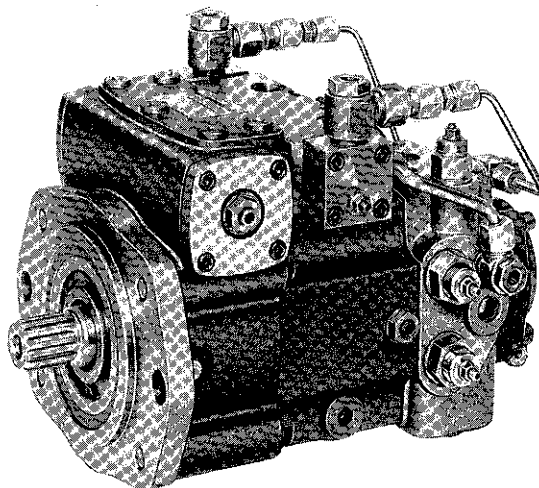
This control permits utilisation of the drive system free of losses both for acceleration and for braking processes (adjustable pressure control).

Sudden pressure changes at the secondary unit (hydraulic motor) can lead in critical cases to brief activation of the relief valves.

Relief valve setting: 20 – 30 bar higher than the maximum controlled high pressure.

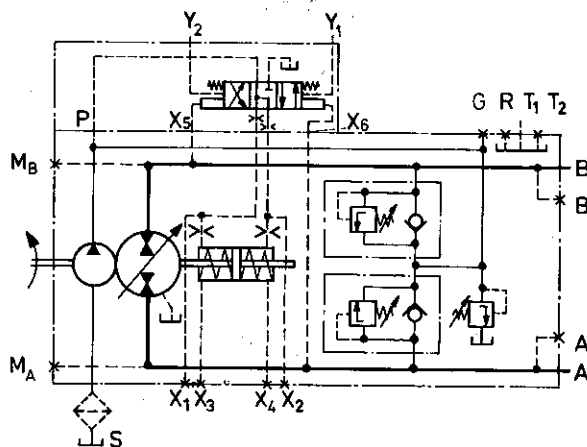
On safety grounds, when designing systems with MS control, care should be taken that, should the pilot pressure fail, it is possible to stop the machine – e.g. in order to stop the slew mechanism on an excavator: instal a mechanical brake.

The torque regulating valve may either be installed direct on the pump or separately.



Torque control, MS

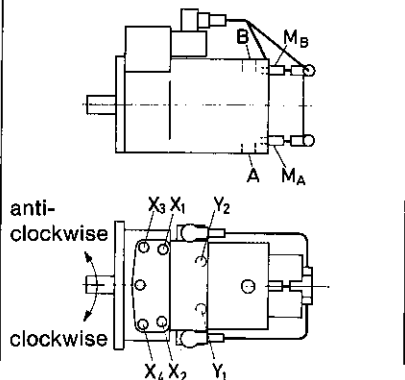
Standard Model



Ordering Code	Size	Pump (for Type Code see page 2)	Additional data: torque regulating valve with subplate	Connector on pump side
Torque Control				
direct mounted	40 56 90 125	A4V. .MS.1.0.	-	-
separately mounted	40 56 90 125	A4V. .OV.1.0.	77014/545.08.01.01	79220/551.25.01.00
	71 250	A4V. .OV.2.0.	77014/545.08.01.01	-

Correlation of Direction of Rotation, Control and Direction of Flow

Size	40, 56, 90, 125			
	clockwise		anti-clockwise	
Direction of rotation	clockwise		anti-clockwise	
Pilot pressure inlet	Y ₁	Y ₂	Y ₁	Y ₂
Control pressure inlet	X ₁ ; X ₃	X ₂ ; X ₄	X ₁ ; X ₃	X ₂ ; X ₄
Direction of flow from	A → B	B → A	B → A	A → B
Operating pressure in	M _B	M _A	M _A	M _B



Variable Displacement Pump A4V

Hydraulic Control, Speed Related, DA

By means of the control valve, via a 4/3-way valve, the adjusting cylinder in the pump is pressurised with an adjusting pressure relative to the drive speed, thereby allowing infinite adjustment of the swashplate and thus of the displacement. One solenoid is allocated to each flow direction.

Increasing drive speed – higher pilot pressure (see Fig. 1)

Higher pilot pressure – higher displacement

The operating pressure (high pressure) effects destroking of the pump to a displacement corresponding to the pump curve.

Increasing operating pressure – lower displacement (see Fig. 2)

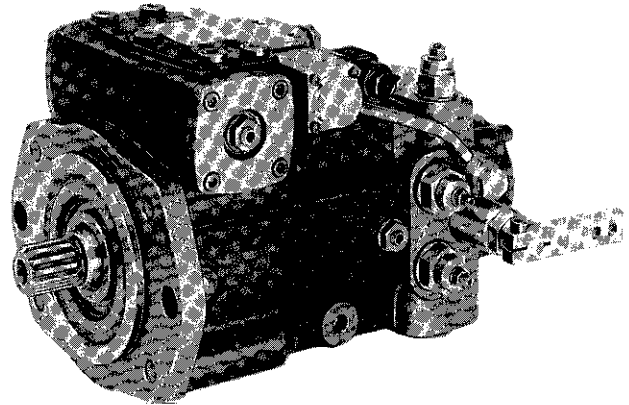
Via the mechanical adjustment on the control valve the pilot pressure can be reduced as required, irrespective of speed (inching function).

Lower pilot pressure – lower displacement

Control to produce a constant torque (M_{const}) is obtained by means of the destroking characteristic of the pump and the reduction of the speed of the drive unit. Speed reduction means the reduction of pilot pressure.

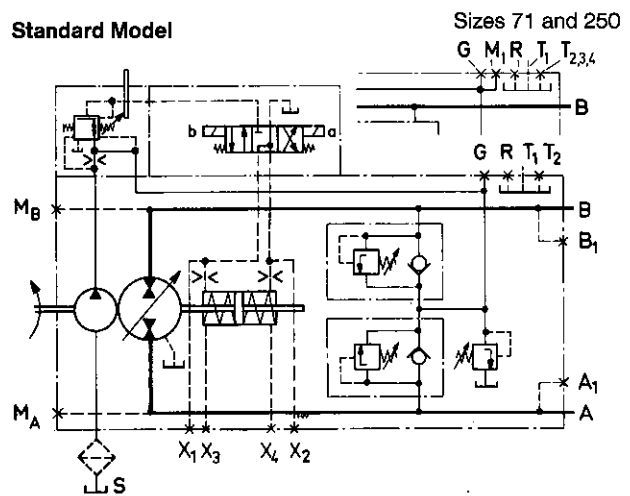
The lowest possible speed reduction means optimum utilisation of the drive power. This is achieved by the ("partial inching"). Here the control valve is coupled mechanically to the accelerator, i.e. from a certain speed (travel of accelerator) the control curve is moved parallel to the operating speed (see Fig. 1).

Additional power requirement (e.g. by the work hydraulics) can mean reduction of the drive motor speed. This leads to a reduction of the pilot pressure and thus also of the pump displacement. The power thus released is fully available for additional services. Automatic power division, full utilisation of the drive power for the vehicle drive and service hydraulics.



Hydraulic control speed related, DA

Standard Model



Sizes 71 and 250

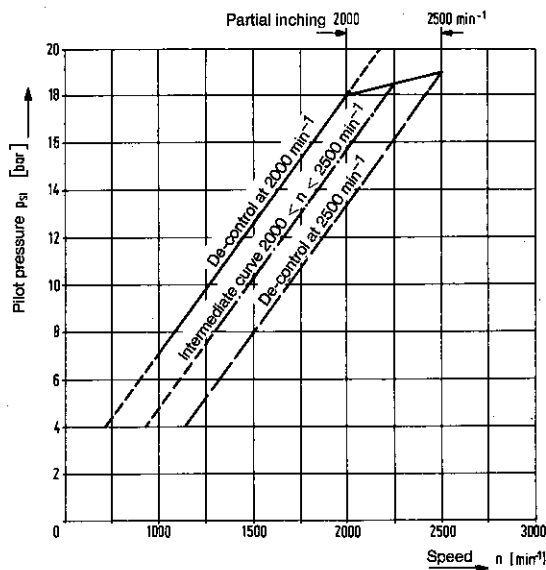


Fig. 1 Selection of speed control.

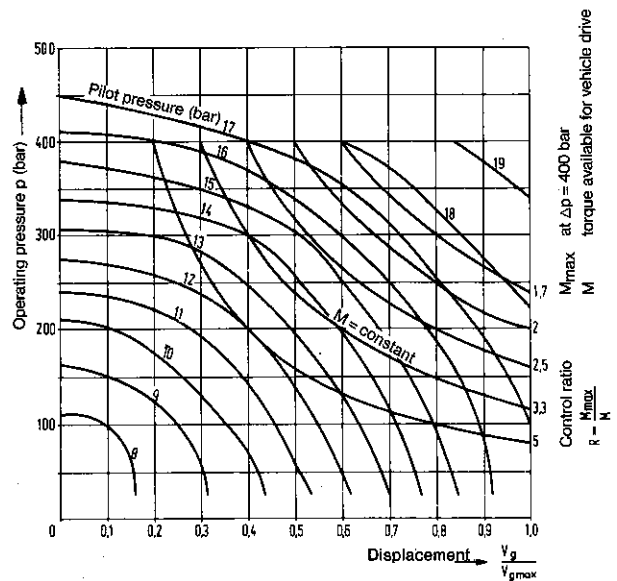


Fig. 2 Graph showing necessary pilot pressures in relation to displacement and operating pressure (approx. values) at $n = 2000$ rpm.

Variable Displacement Pump A4V

Function and Control of DA Control Valves

(for unit dimensions, see page 30)

DA Control Valve, fixed setting

Pilot pressure is generated dependent upon the drive speed. When ordering, please state drive speed at start of control (set at factory).

DA Control Valve, mech. adjustable with control lever

The pilot pressure is generated dependent upon drive speed. When ordering, please state drive speed at start of control (set at factory).

The pilot pressure may be reduced as required, independent of drive speed, by means of mechanical operation of the control lever (inch function).

Max. rotary angle 70°, position of the lever optional. When ordering, please state the following in clear text: direction of lever operation for inching (clockwise or anti-clockwise). This is fixed on assembly.

Hydraulic Inch Valve

(installed in combination with DA control valve, either with fixed setting or mech. adjustable, for inching function).

For reducing the pilot pressure as required, independent of drive speed, hydraulically controlled (port Z). Preferably operated by means of the braking fluid from the braking system of the vehicle (allows hydraulic coupling with the vehicle brakes).

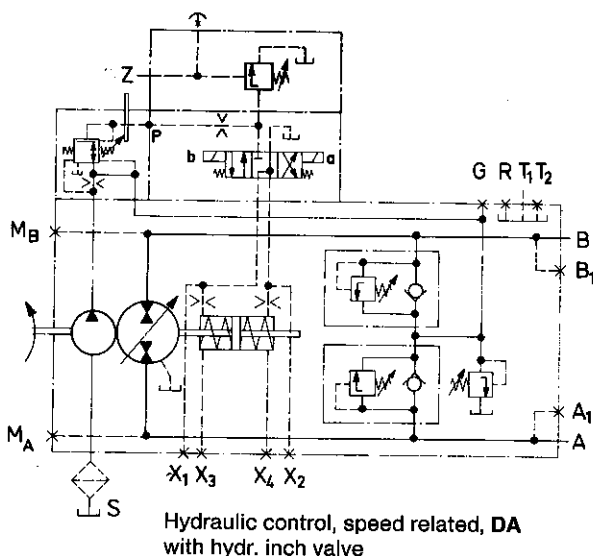
Rotary Inch Valve

(installed in combination with the fixed setting DA control valve for inching function).

Allows optional reduction of the pilot pressure, independent of the drive speed, by mechanical operation of the control lever. Maximum lever angle 90°, position of the lever is optional. The valve is mounted separately from the pump and connected to it by a hydraulic pilot line (max. line length approx. 2 m). The rotary inch valve must be ordered separately.

Ordering code: 410403/470.05.01.06.

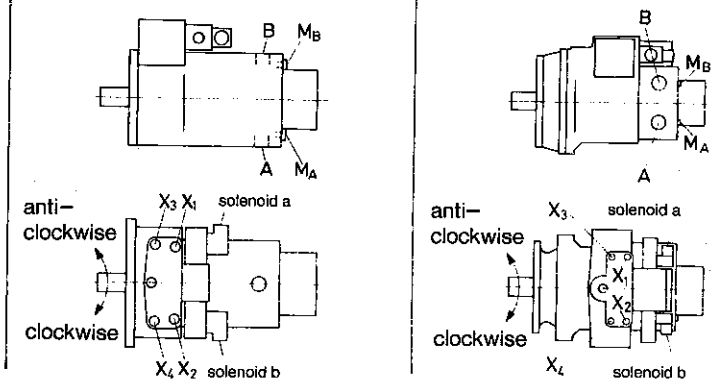
Indicate in clear text: direction of lever operation for inching (clockwise or anti-clockwise) – fixed on assembly.



Detailed information is available from our Mobile Sales Division. Take advantage of the possibility to determine the design of your drive by means of the computer programme at HYDROMATIK ULM. Release of a drive with DA control in principle only through HYDROMATIK.

Correlation of Direction of Rotation, Control and Direction of Flow

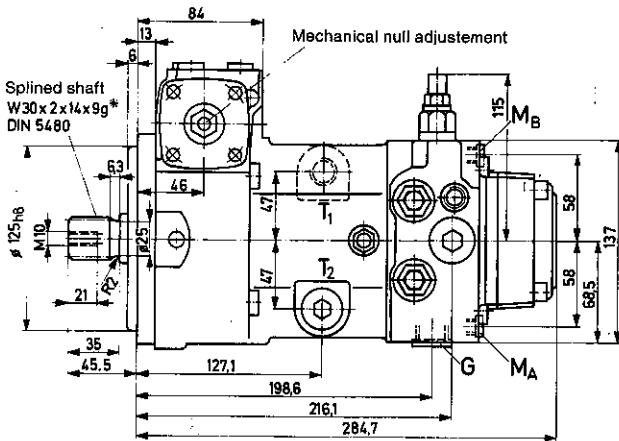
Size	40, 56, 90, 125				71, 250			
	clockwise		anti-clockwise		clockwise		anti-clockwise	
Direction of rotation	clockwise		anti-clockwise		clockwise		anti-clockwise	
Direction of lever movement	a	b	a	b	a	b	a	b
Control pressure in	X ₂ ; X ₄	X ₁ ; X ₃	X ₂ ; X ₄	X ₁ ; X ₃	X ₂ ; X ₄	X ₁ ; X ₃	X ₂ ; X ₄	X ₁ ; X ₃
Direction of flow from	B → A	A → B	A → B	B → A	A → B	B → A	B → A	A → B
Operating pressure in	M _A	M _B	M _B	M _A	M _B	M _A	M _A	M _B



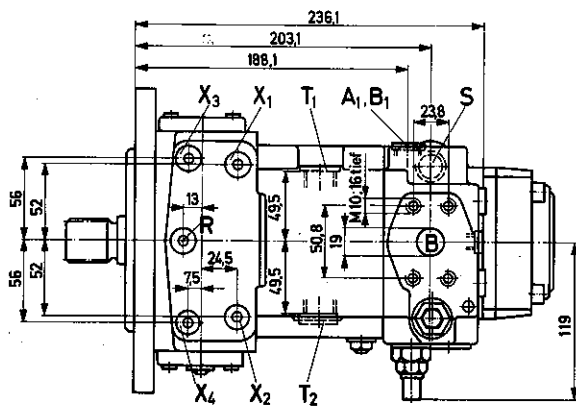
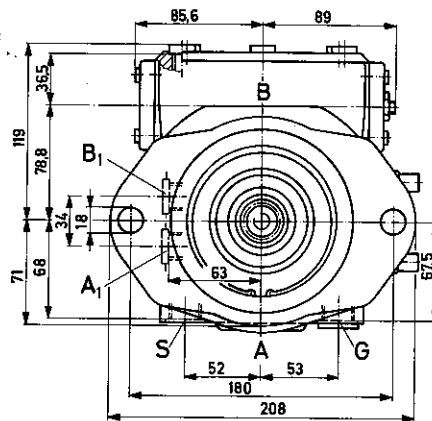
Variable Displacement Pump A4V

Unit Dimensions, Size 40

Without Control Device, OV



*does not correspond to latest standard DIN 5480 (14 teeth)

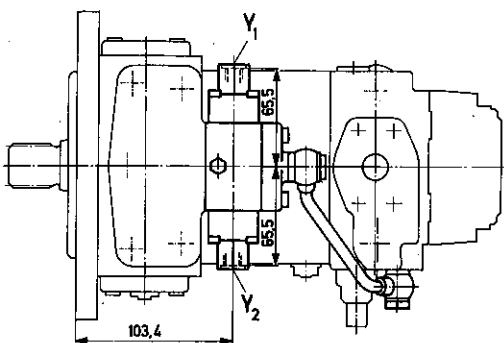
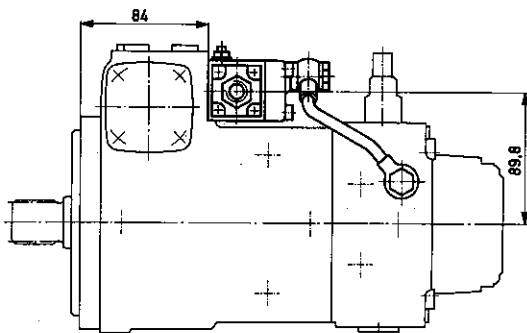


Connections

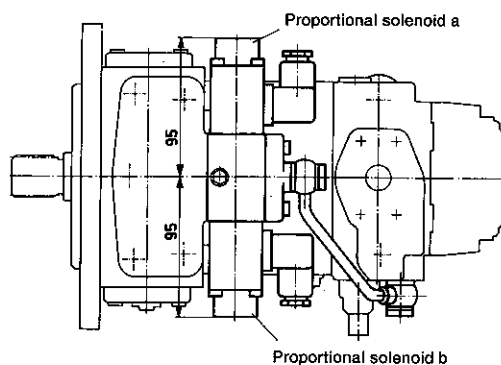
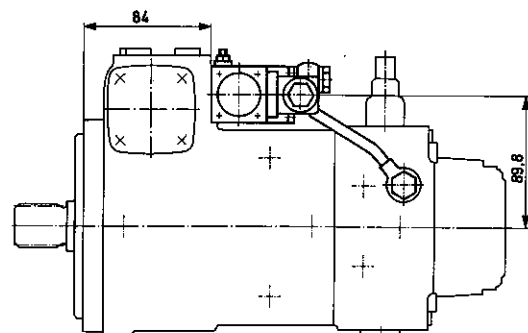
A, B	service lines	SAE 3/4", 420 bar (8000 psi)
A ₁ , B ₁	bypass connections	M 18x1,5, 12 depth
G	boost pressure port	M 22x1,5, 14 depth
T ₁	leakage fluid or oil fill	M 22x1,5, 14 depth
T ₂	leakage fluid or oil drain	M 22x1,5, 14 depth
M _A	gauge connection, service line A	M 12x1,5, 12 depth
M _B	gauge connection, service line B	M 12x1,5, 12 depth
R	bleed point	M 12x1,5, 12 depth
S	suction line for boost fluid*	M 22x1,5, 14 depth
X ₁ , X ₂	connect. for contr. pressure (before throttles)	M 12x1,5, 12 depth
X ₃ , X ₄	connect. for contr. pressures (control chamber pressure)	M 12x1,5, 12 depth
X ₅ , X ₆	pilot connections for overriding working pressure	M 16x1,5, 12 depth
Y ₁ , Y ₂	remote control connections	M 16x1,5, 12 depth

* Note: dimensioning of suction line, see page 4.

Hydraulic Control, Pressure Related, HD



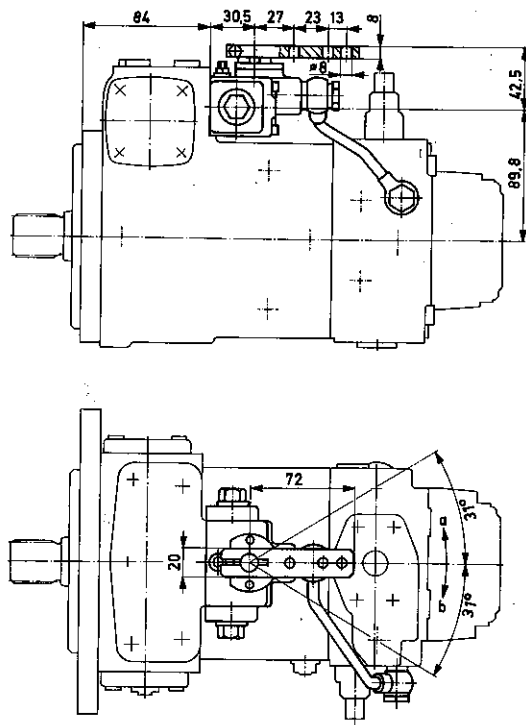
Electric Control, EL



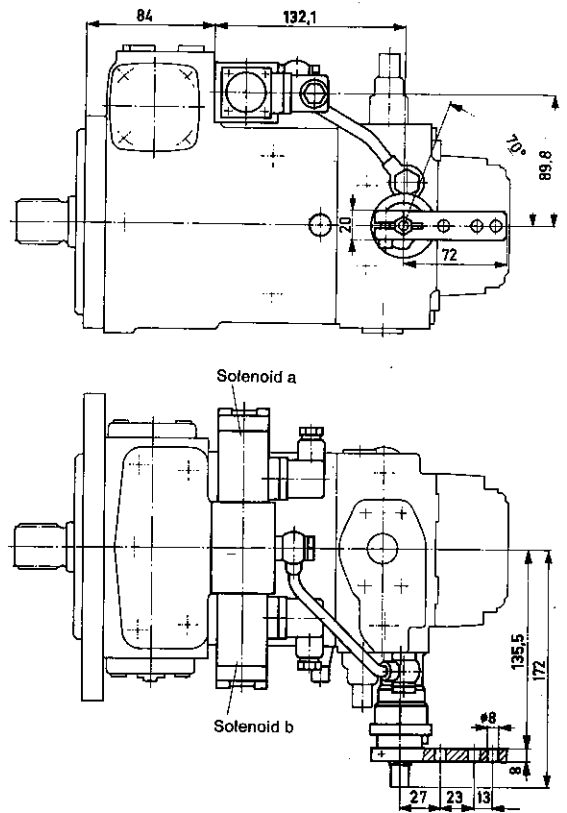
Variable Displacement Pump A4V

Prior to finalising your design, please request certified installation drawing.
Subject to revision.

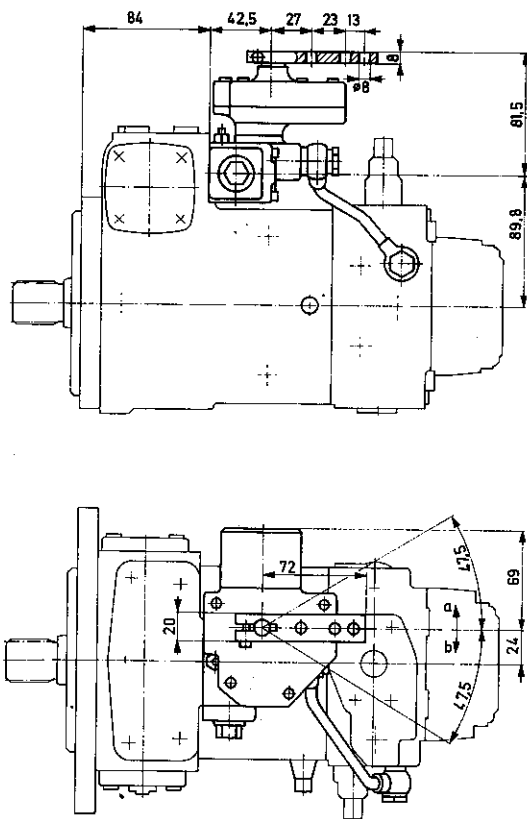
Hydraulic Control, Manual Servo, HW



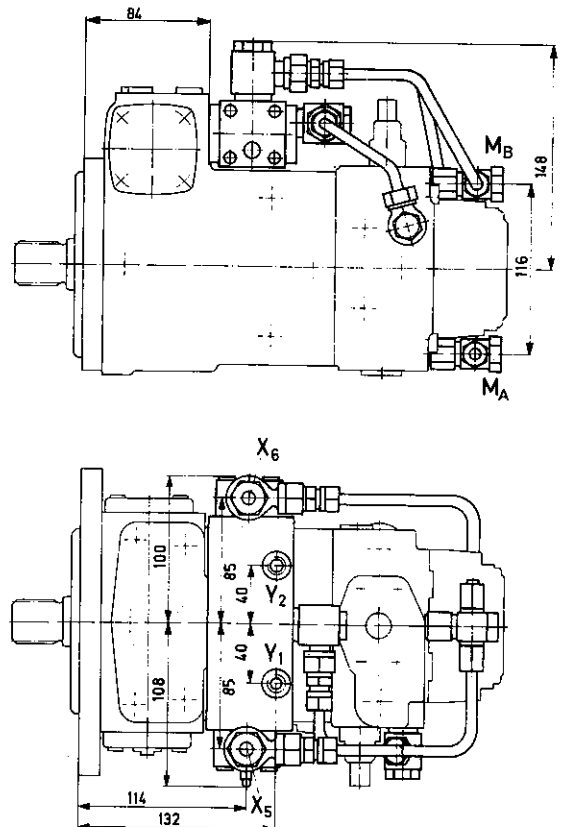
Hydraulic Control, Speed Related, DA



Hydraulic Cam Operated Servo Control, HK



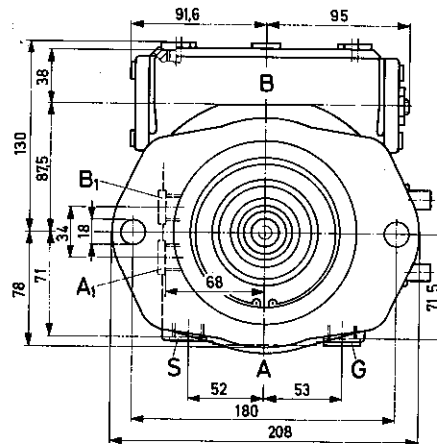
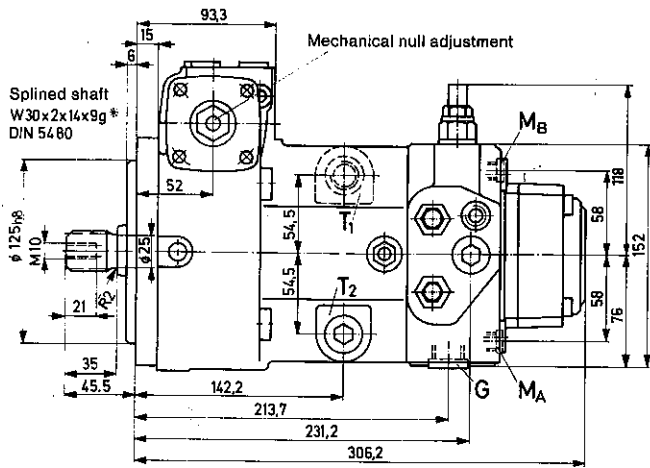
Torque Control, MS



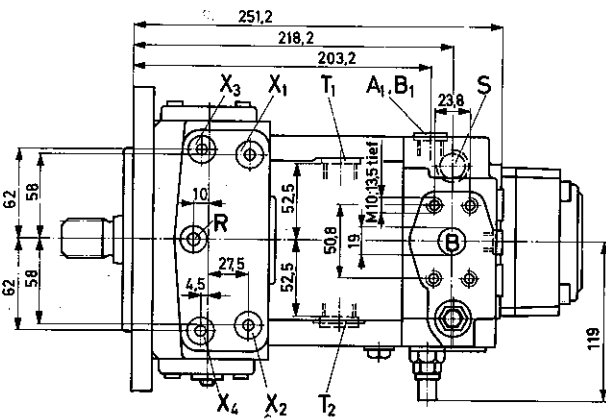
Variable Displacement Pump A4V

Unit Dimensions, Size 56

without Control Device, OV



*does not correspond to latest standard DIN 5480 (14 teeth)

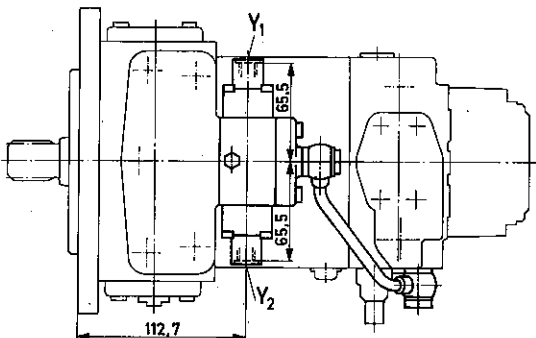
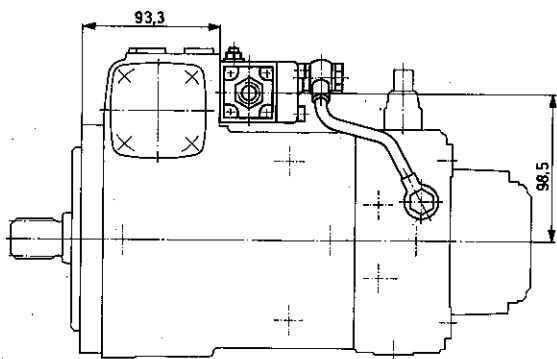


Connections

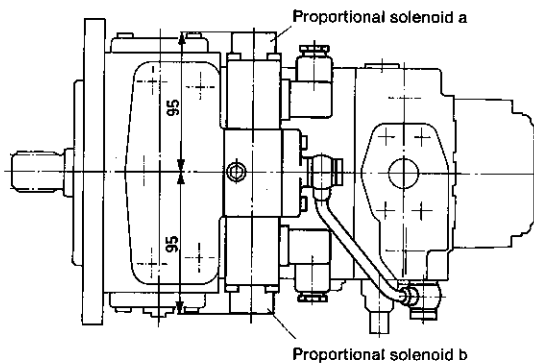
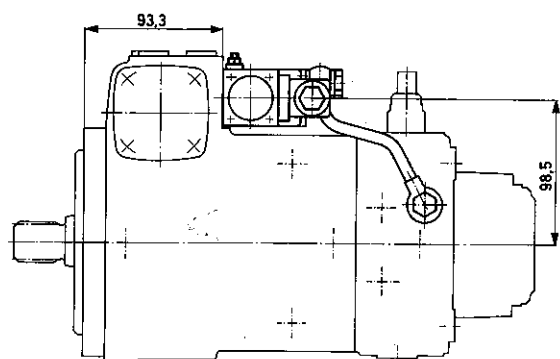
- A, B service lines SAE 3/4", 420 bar (6000 psi)
- A₁, B₁ bypass connections M 18x1,5, 12 depth
- G boost pressure port M 22x1,5, 14 depth
- T₁ leakage fluid or oil fill M 22x1,5, 14 depth
- T₂ leakage fluid or oil drain M 22x1,5, 14 depth
- M_A gauge connection, service line A M 12x1,5, 12 depth
- M_B gauge connection, service line B M 12x1,5, 12 depth
- R bleed point M 12x1,5, 12 depth
- S suction line for boost fluid* M 22x1,5, 14 depth
- X₁, X₂ connect. for contr. pressure (before throttles) M 12x1,5, 12 depth
- X₃, X₄ connect. for contr. pressures (control chamber pressure) M 12x1,5, 12 depth
- X₅, X₆ pilot connections for overriding working pressure M 16x1,5, 12 depth
- Y₁, Y₂ remote control connections M 16x1,5, 12 depth
- P pressure port M 16x1,5, 12 depth

* Note: dimensioning of suction line, see page 4.

Hydraulic Control, Pressure Related, HD



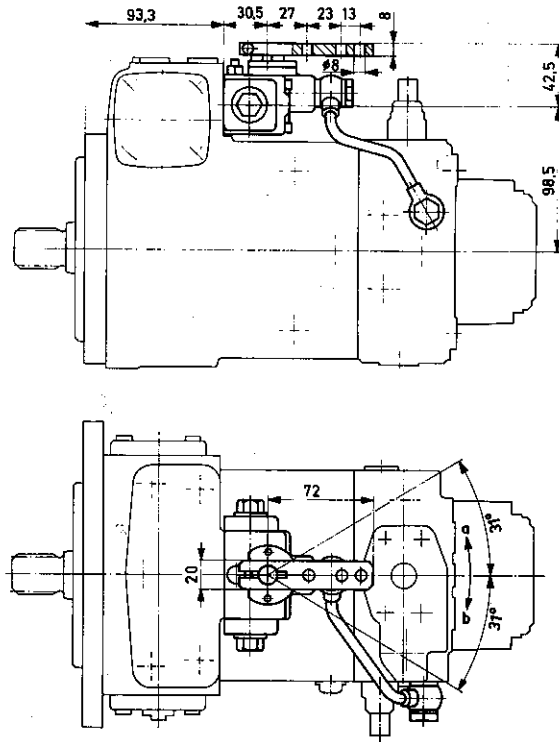
Electric Control, EL



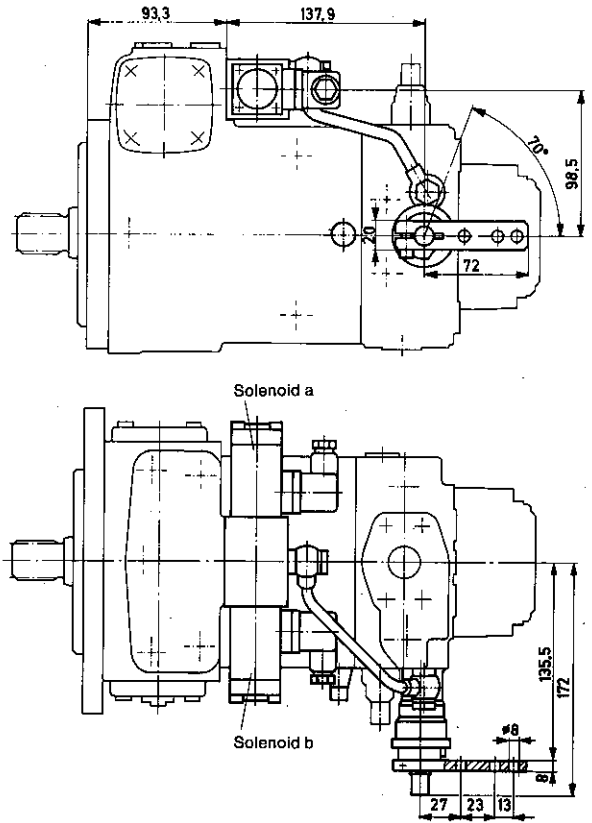
Variable Displacement Pump A4V

Prior to finalising your design, please request certified installation drawing. Subject to revision.

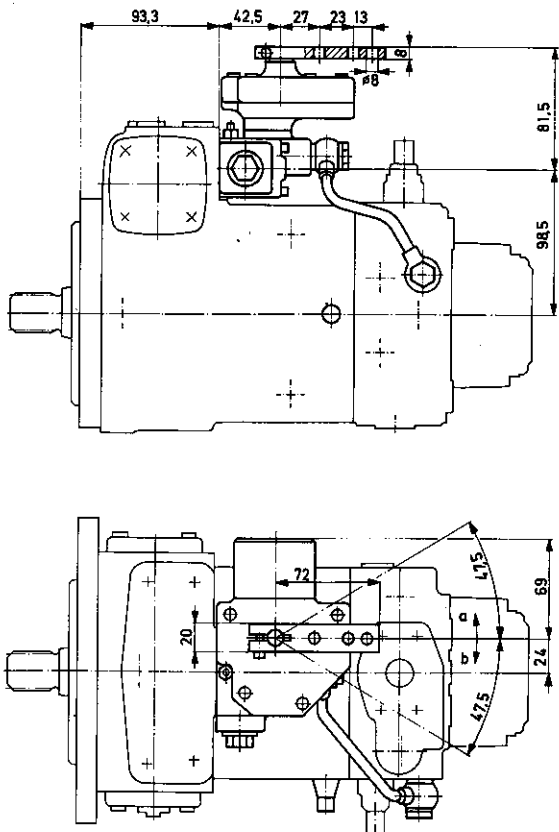
Hydraulic Control, Manual Servo, HW



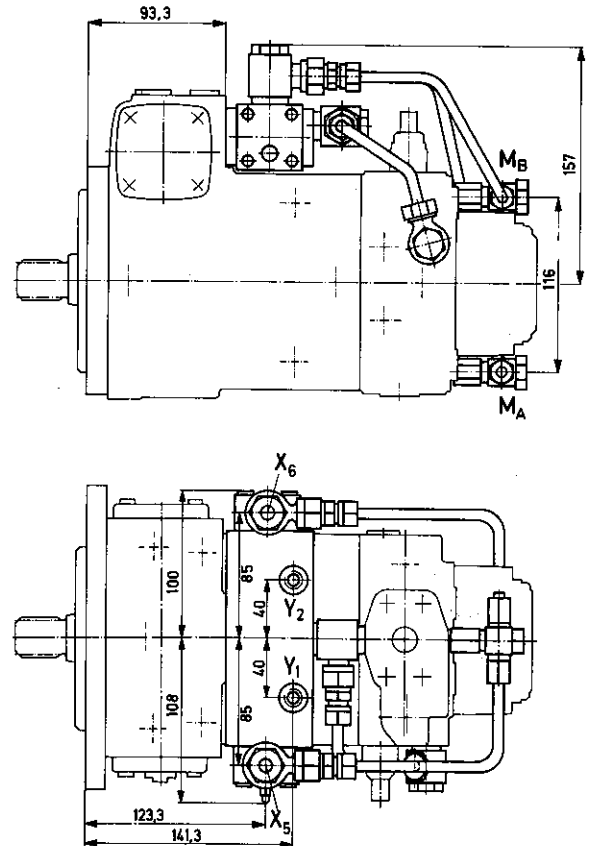
Hydraulic Control, Speed Related, DA



Hydraulic Cam Operated Servo Control, HK



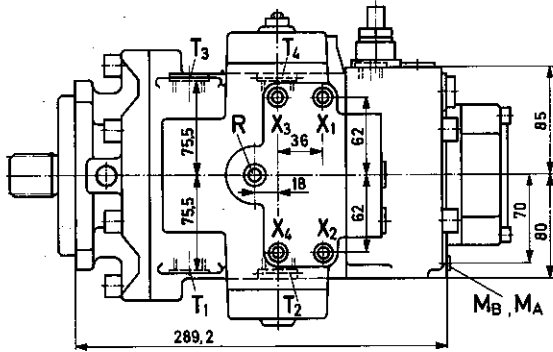
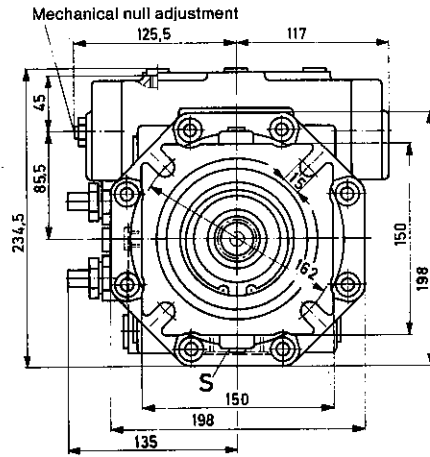
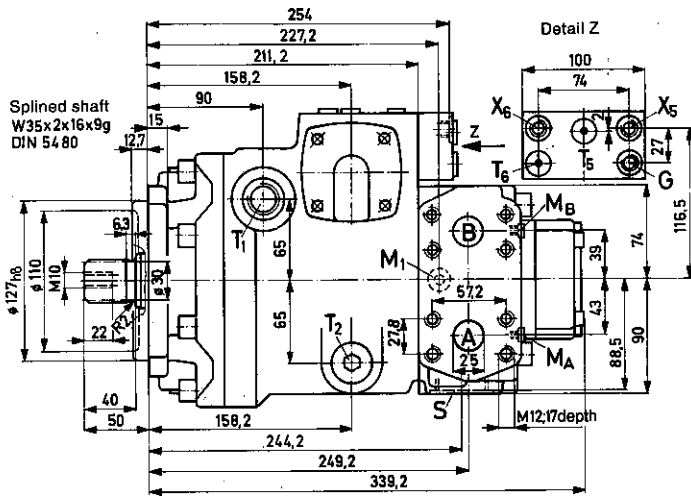
Torque Control, MS



Variable Displacement Pump A4V

Unit Dimensions, Size 71

Without Control Device, OV

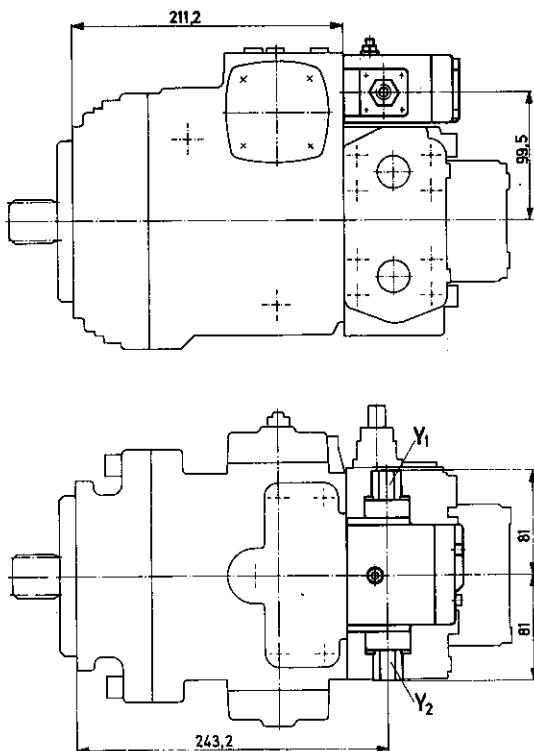


Connections

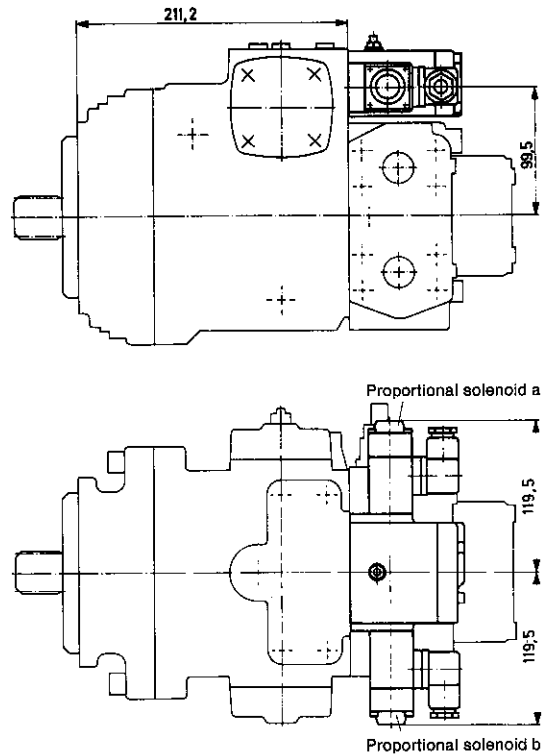
A, B	service lines	SAE 1", 420 bar (6000 psi)
G	boost pressure port	M 14x1,5, 12 depth
T ₁	leakage fluid or oil fill	M 26x1,5, 16 depth
T _{2/4}	leakage fluid or oil drain	M 26x1,5, 16 depth
T _{5,6}	pilot oil return	M 14x1,5, 12 depth
MA	gauge connection, service line A	M 8x1, 8 depth
MB	gauge connection, service line B	M 8x1, 8 depth
M ₁	gauge connection boost fluid	M 12x1,5, 15 depth
R	bleed point	M 12x1,5, 16 depth
S	suction line for boost fluid*	M 42x2, 18,5 depth
X ₁ , X ₂	connect. for contr. pressure (before throttles)	M 12x1,5, 11,5 depth
X ₃ , X ₄	connect. for contr. pressures (control chamber pressure)	M 12x1,5, 14 depth
X ₅ , X ₆	pilot connections for overriding working pressure	M 14x1,5, 12 depth
Y ₁ , Y ₂	remote control connections	M 14x1,5, 12 depth

* Note: dimensioning of suction line, see page 4.

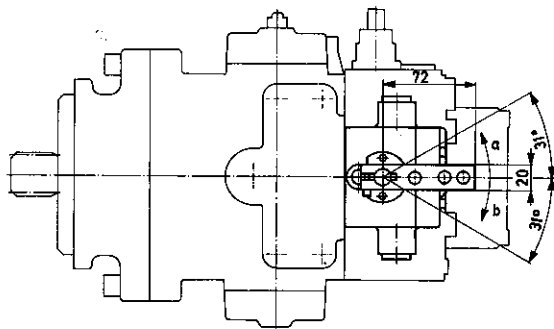
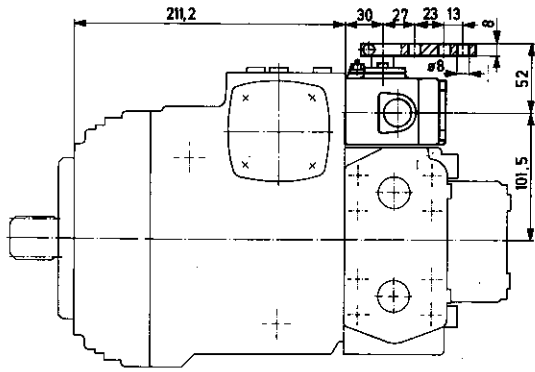
Hydraulic Control, Pressure Related, HD



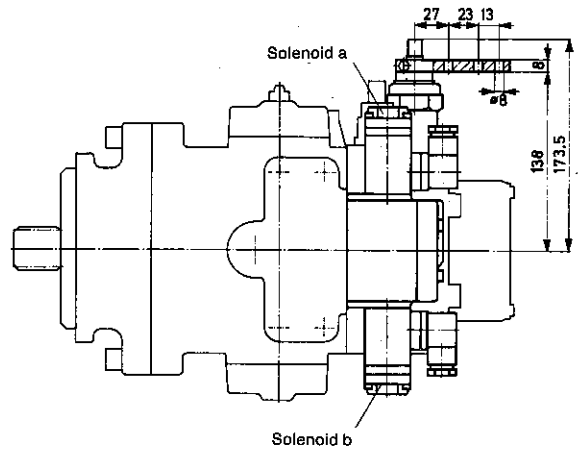
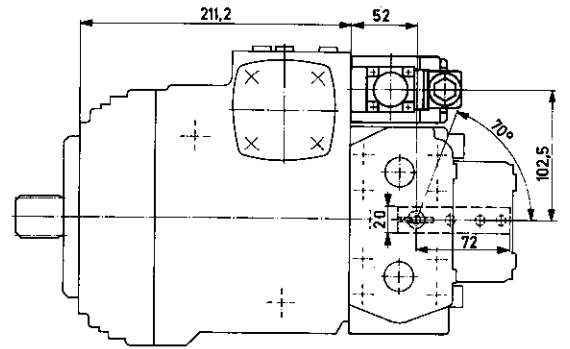
Electric Control, EL



Hydraulic Control, Manual Servo, HW



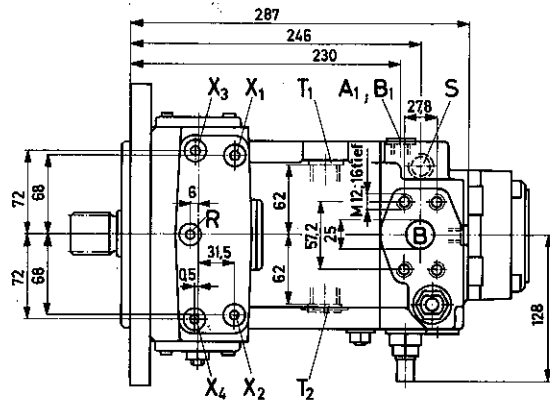
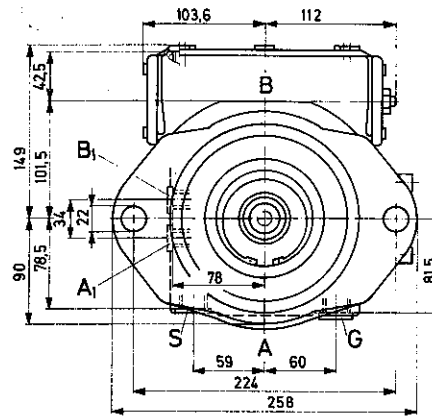
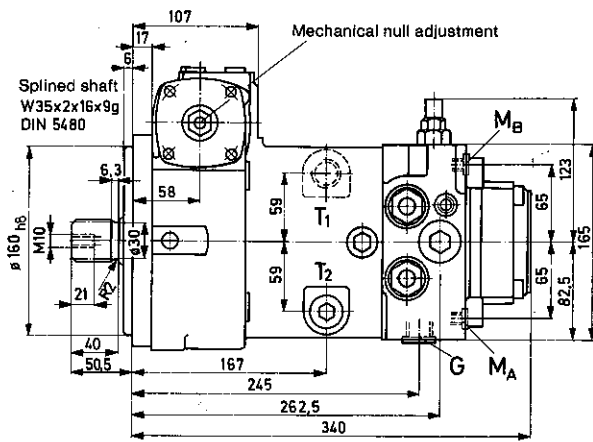
Hydraulic Control, Speed Related, DA



Variable Displacement Pump A4V

Unit Dimensions, Size 90

Without control Device, OV

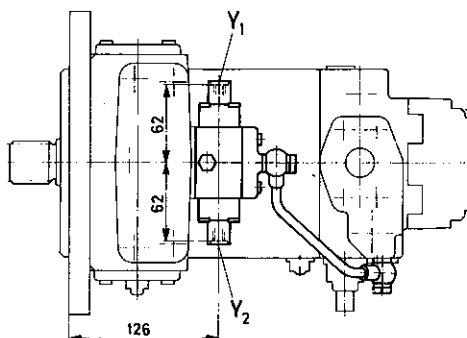
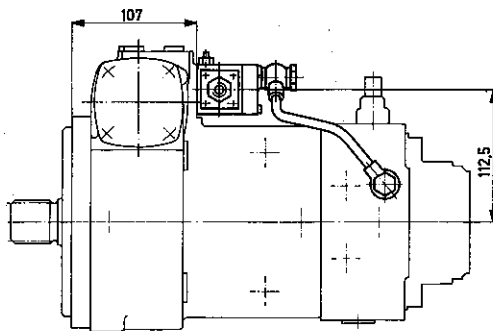


Connections

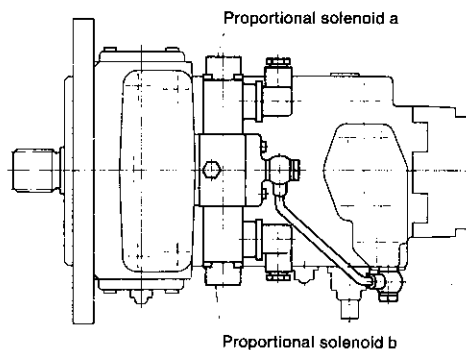
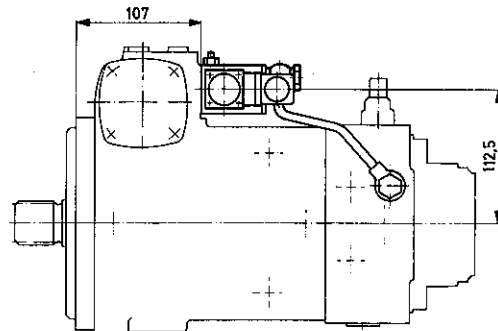
A, B	service lines	SAE 1, 420 bar (6000 psi)
A ₁ , B ₁	bypass connections	M 18x1,5, 12 depth
G	boost pressure port	M 22x1,5, 14 depth
T ₁	leakage fluid or oil fill	M 26x1,5, 16 depth
T ₂	leakage fluid or oil drain	M 26x1,5, 16 depth
M _A	gauge connection, service line A	M 12x1,5, 12 depth
M _B	gauge connection, service line B	M 12x1,5, 12 depth
R	bleed point	M 12x1,5, 12 depth
S	suction line for boost fluid*	M 26x1,5, 16 depth
X ₁ , X ₂	connect. for contr. pressure (before throttles)	M 12x1,5, 12 depth
X ₃ , X ₄	connect. for contr. pressures (control chamber pressure)	M 12x1,5, 12 depth
X ₅ , X ₆	pilot connections for overriding working pressure	M 16x1,5, 12 depth
Y ₁ , Y ₂	remote control connections	M 16x1,5, 12 depth

* Note: dimensioning of suction line, see page 4.

Hydraulic Control, Pressure Related, HD



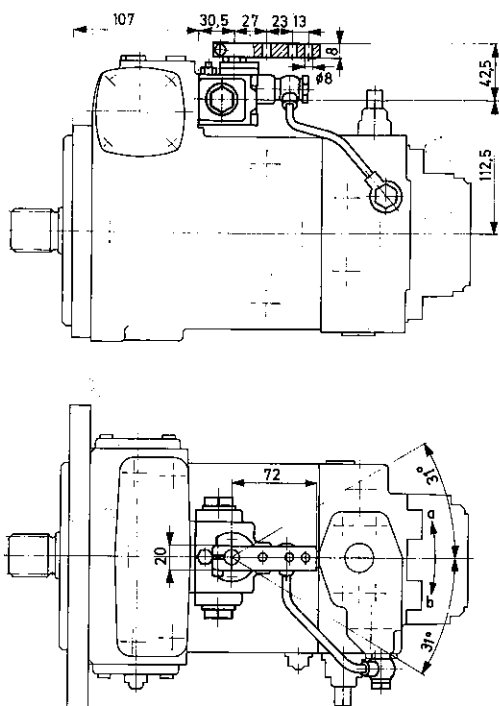
Electric Control, EL



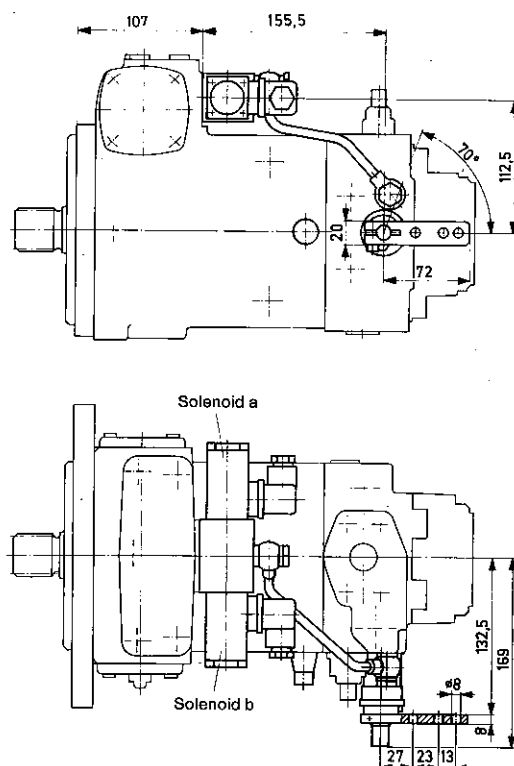
Variable Displacement Pump A4V

Prior to finalising your design, please request certified installation drawing.
Subject to revision.

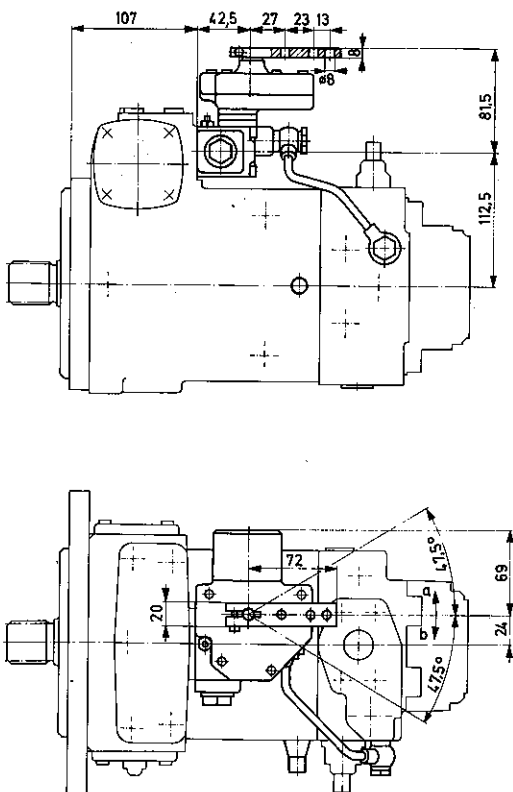
Hydraulic Control, Manual Servo, HW



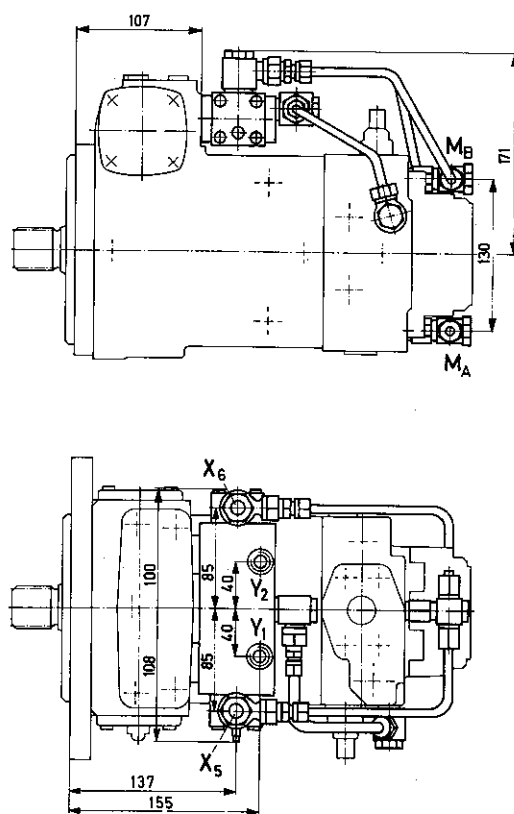
Hydraulic Control, Speed Related, DA



Hydraulic Cam Operated Servo Control, HK



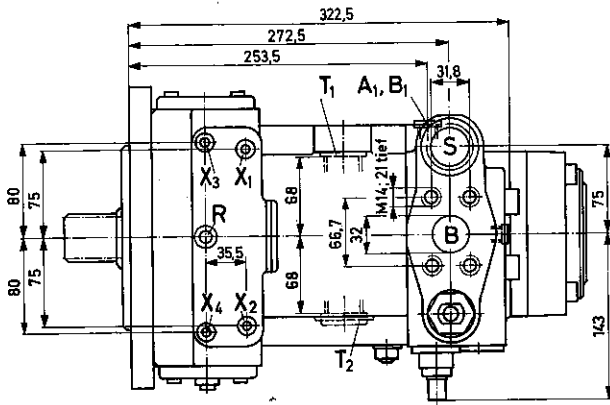
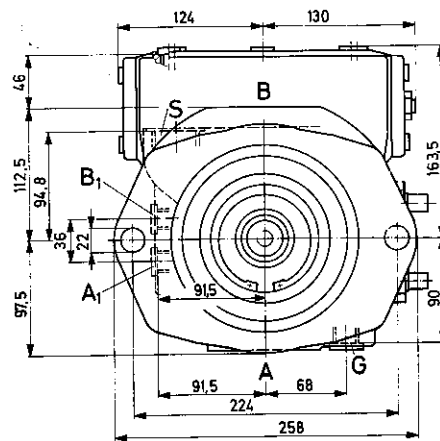
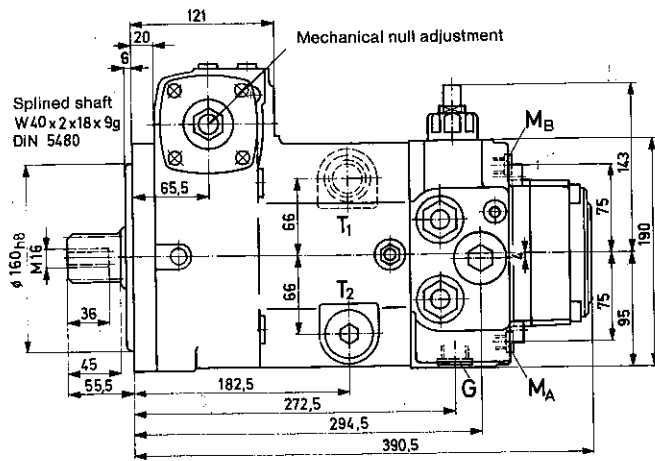
Torque Control, MS



Variable Displacement Pump A4V

Unit Dimensions, Size 125

Without Control Device, OV

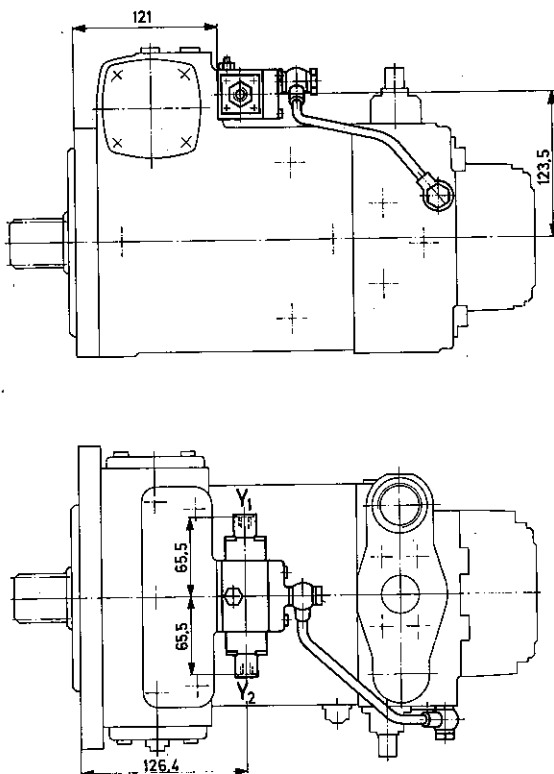


Connections

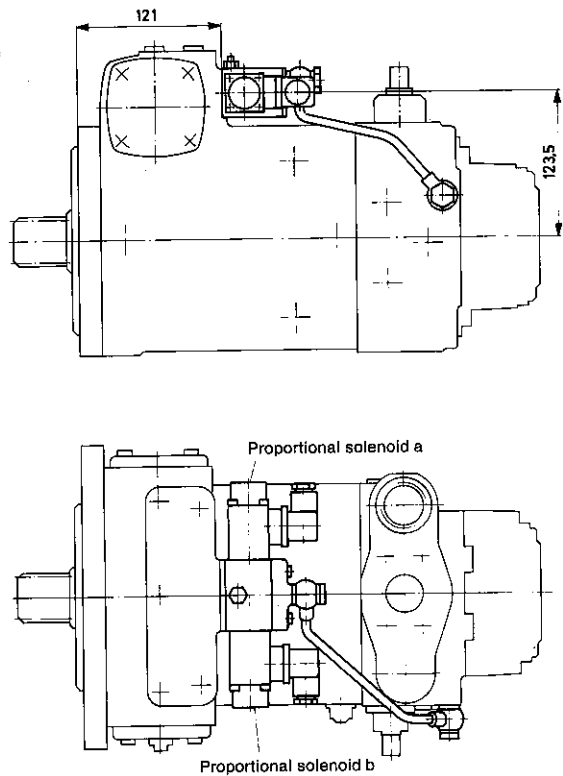
A, B	service lines	SAE 1 1/4", 420 bar (6000 psi)
A ₁ , B ₁	bypass connections	M 18x1,5, 12 depth
G	boost pressure port	M 22x1,5, 14 depth
T ₁	leakage fluid or oil fill	M 33x2, 18 depth
T ₂	leakage fluid or oil drain	M 33x2, 18 depth
M _A	gauge connection, service line A	M 12x1,5, 12 depth
M _B	gauge connection, service line B	M 12x1,5, 12 depth
R	bleed point	M 12x1,5, 12 depth
S	suction line for boost fluid*	M 24x2, 20 depth
X ₁ , X ₂	connect. for contr. pressure (before throttles)	M 12x1,5, 12 depth
X ₃ , X ₄	connect. for contr. pressures (control chamber pressure)	M 12x1,5, 12 depth
X ₅ , X ₆	pilot connections for overriding working pressure	M 16x1,5, 12 depth
Y ₁ , Y ₂	remote control connections	M 16x1,5, 12 depth

* Note: dimensioning of suction line, see page 4.

Hydraulic Control, Pressure Related, HD



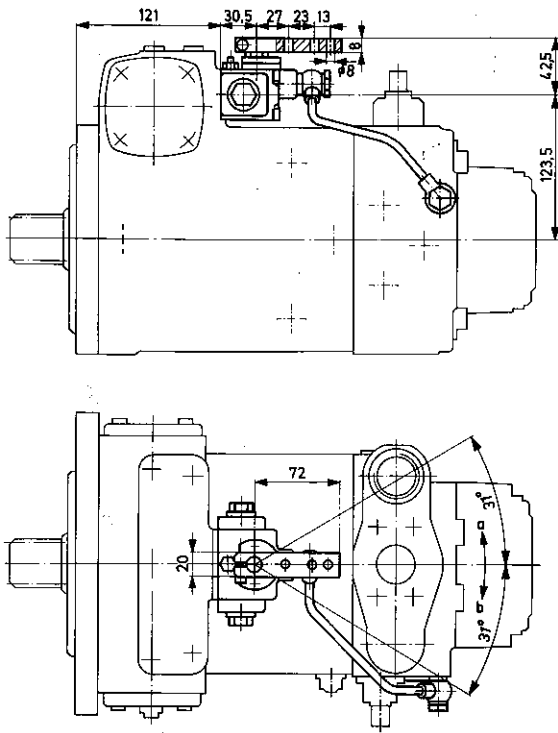
Electric Control, EL



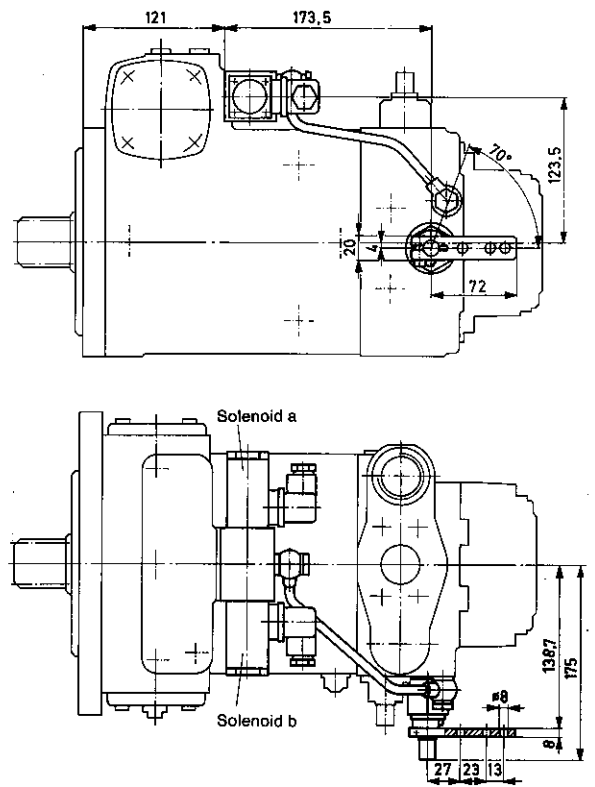
Variable Displacement Pump A4V

Prior to finalising your design, please request certified installation drawing. Subject to revision.

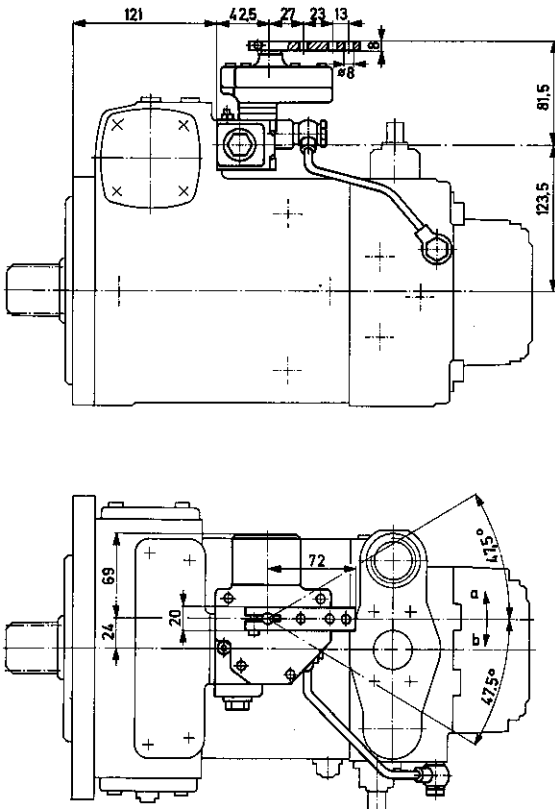
Hydraulic Control, Manual Servo, HW



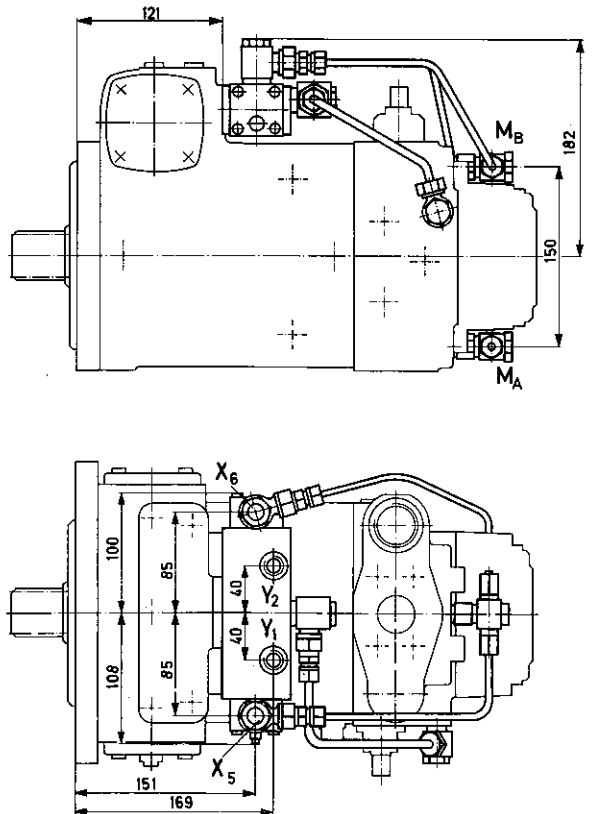
Hydraulic Control, Speed Related, DA



Hydraulic Cam Operated Servo Control, HK



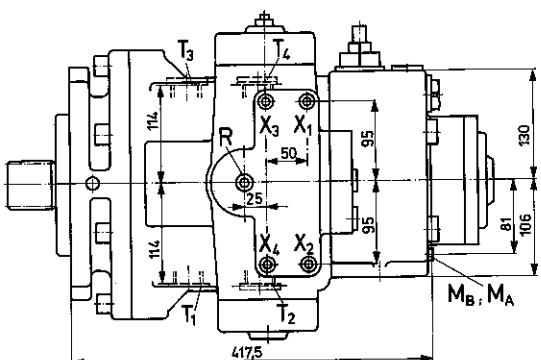
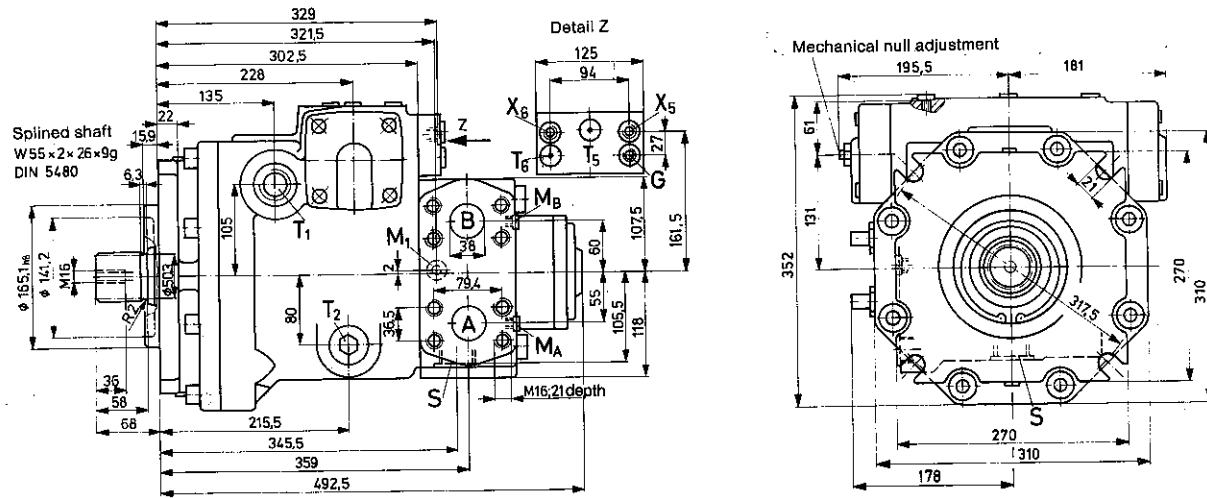
Torque Control, MS



Variable Displacement Pump A4V

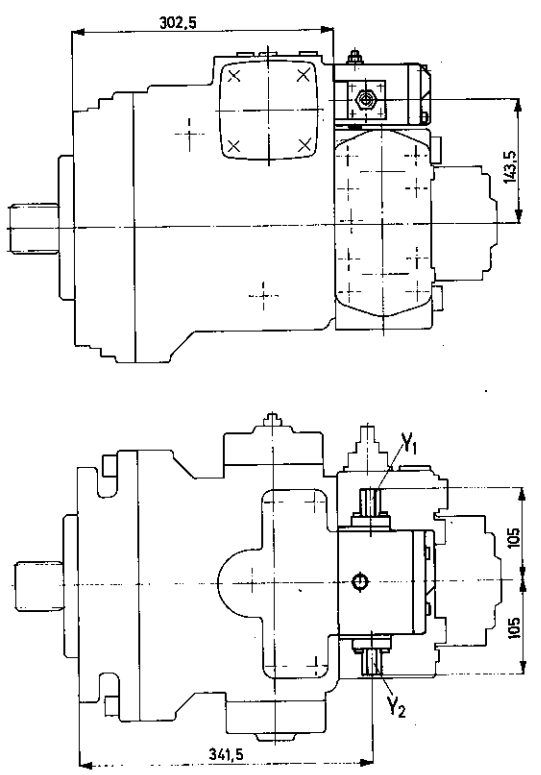
Unit Dimensions, Size 250

Without Control Device, OV

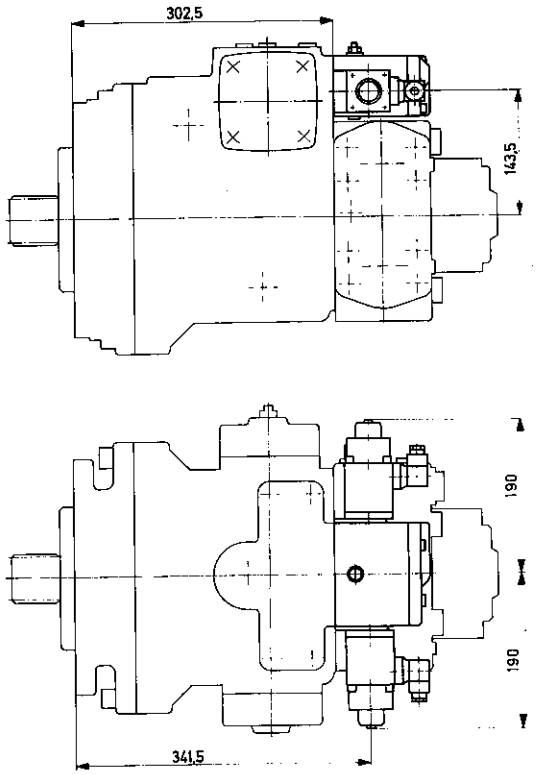


- Connections**
- | | | |
|--------|--|--------------------------------|
| A, B | service lines | SAE 1 1/2", 420 bar (6000 psi) |
| G | boost pressure port | M 14x1, 5 depth |
| T1 | leakage fluid or oil fill | M 42x2, 20 depth |
| T2/4 | leakage fluid or oil drain | M 42x2, 20 depth |
| T5/6 | pilot oil return | M 14x1, 5, 12 depth |
| MA | gauge connection, service line A | M 12x1, 5, 12 depth |
| MB | gauge connection, service line B | M 12x1, 5, 12 depth |
| M1 | gauge connection boost fluid | M 12x1, 5, 22 depth |
| R | bleed point | M 16x1, 5, 22 depth |
| S | suction line for boost fluid* | M 48x2, 22, 5 depth |
| X1, X2 | connect. for contr. pressure (before throttles) | M 16x1, 5, 11 depth |
| X3, X4 | connect. for contr. pressures (control chamber pressure) | M 16x1, 5, 14 depth |
| X5, X6 | pilot connections for overriding working pressure | M 14x1, 5, 12 depth |
| Y1, Y2 | remote control connections | M 14x1, 5, 12 depth |
- * Note: dimensioning of suction line, see page 4.

Hydraulic Control, Pressure Related, HD



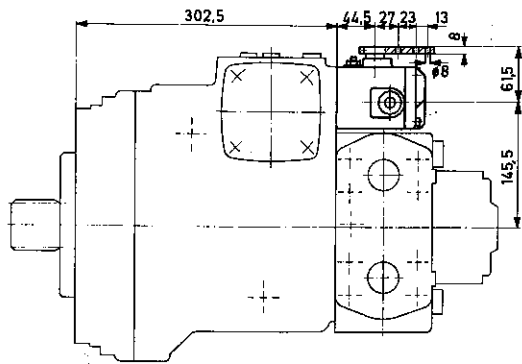
Electric Control, EL



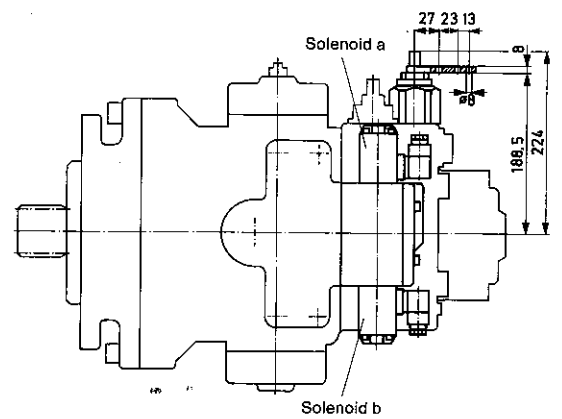
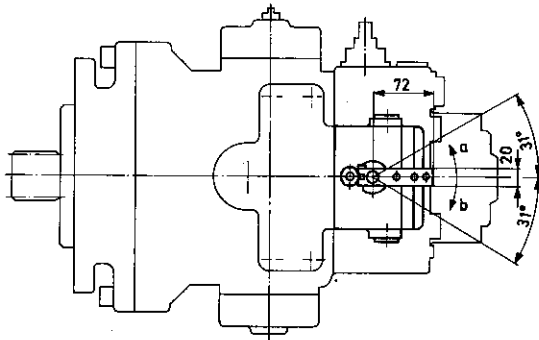
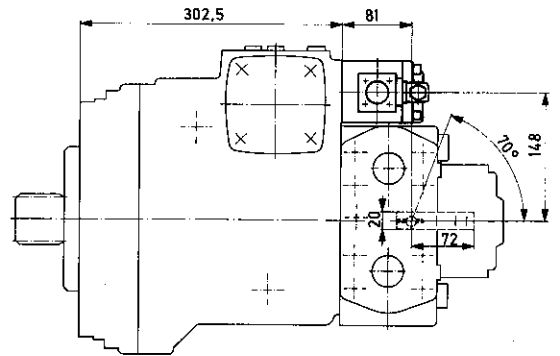
Variable Displacement Pump A4V

Prior to finalising your design, please request certified installation drawing.
Subject to revision.

Hydraulic Control, Manual Servo, HW



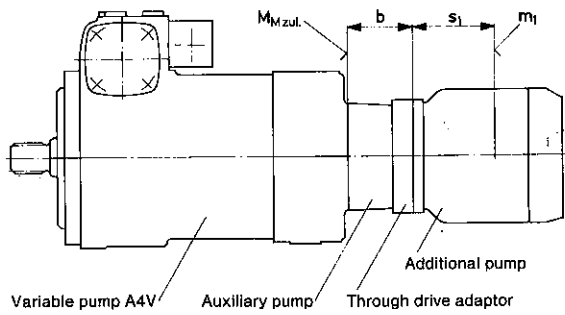
Hydraulic Control, Speed Related, DA



Variable Displacement Pump A4V

Auxiliary Pump and Through Drive

Permissible bending moment mounting flange and permissible torque on through drive



- s₁ [mm] distance to centre of gravity of additional pump
- b [mm] distance to end of auxiliary drive (see unit dimensions of through drive)
- m₁ [kg] weight of combination pump

$$M_M = m_1 \cdot (s_1 + b) \cdot \frac{1}{102} \text{ [Nm]}$$

Permissible Bending Moment at flange M_{Mzul} [Nm]

Through drive	Size 40	56	71	90	125	250
SAE A	52	52	46	52	103	161
SAE B	50	50	44	50	103	161
SAE B-B	50	50	44	50	103	161
SAE C				220	163	240
To customer requirement	52	52	46	52	102	161

Allowing for dynamic acceleration of mass of 10 g ± 98,1 m/s²

Permissible Torque M_{Dzul} [Nm]

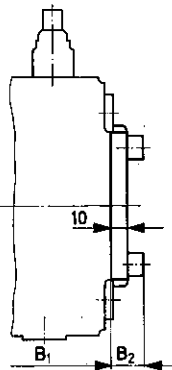
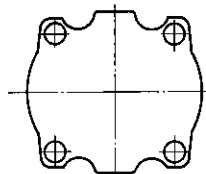
Through drive	Size 40	56	71	90	125	250
SAE A	100	100	100	100	100	100
SAE B	160	160	160	160	220	220
SAE B-B	160	160	160	160	330	330
SAE C				220	220	570
To customer requirement	220	220	220	220	220	220

With Auxiliary Pump, without Through Drive (standard model)

see unit dimensions, pages 14...25

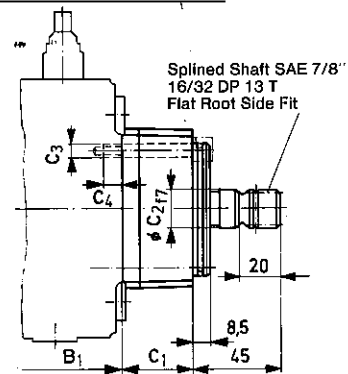
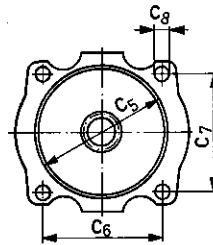
Without Auxiliary Pump, without Through Drive and with Cover Plate

Size	B ₁	B ₂
40	236,1	19
56	251,2	19
90	287	19
125	322,5	21,5



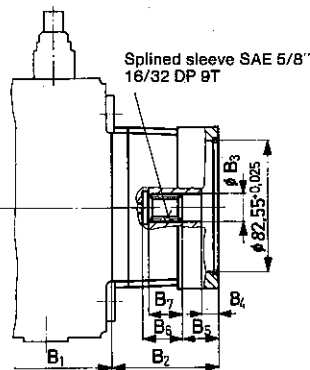
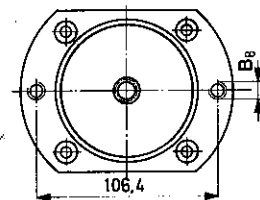
With Auxiliary Pump and Through Drive to suit customer requirements

Size	B ₁	C ₁	C ₂	C ₃	C ₄	C ₅	C ₆	C ₇	C ₈
40	236,1	34,6	22	M 8	10	80	70,7	70,7	8,4
56	251,2	41	22	M 8	10	80	70,7	70,7	8,4
71	289,2	35,5	22	M 8	10	90	95	63	8,4
90	287	39	22	M 8	10	90	79,2	79,2	8,4
125	322,5	52	30	M 10	15	112	99	99	10,5
250	417,5	58	35	M 12	15	112	104	86	13



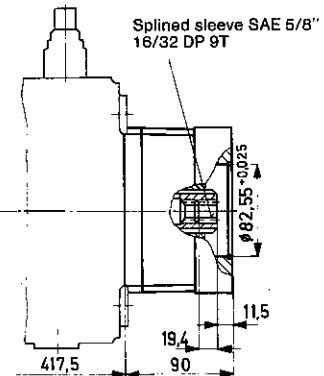
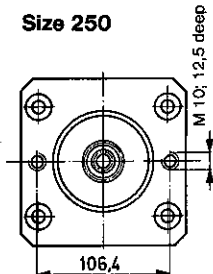
With Auxiliary Pump and Through Drive SAE A

Size 40..125



Size	B ₁	B ₂	B ₃	B ₄	B ₅	B ₆	B ₇	B ₈
40	236,1	50,6	16,5	8	15	25	19	M 10; 16 deep
56	251,2	57	16,5	8	15	25	19	M 10; 16 deep
71	289,2	51,5	18	7,5	14,5	24	19	M 10; 16 deep
90	287	55	16,5	8	15	25	19	M 10; 18 deep
125	322,5	84	16,5	11	15,5	19	15	M 10; 12,5 deep

Size 250



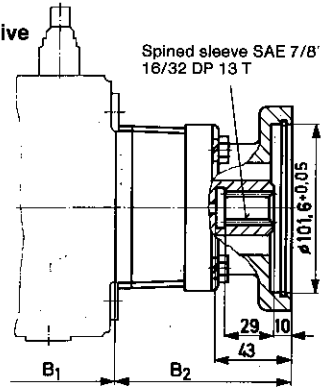
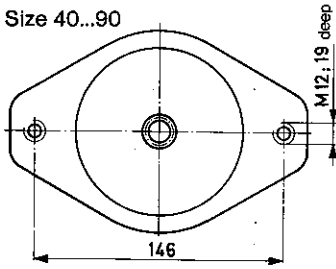
Suitable for mounting of gear pump type G2 (see RE 10034)

Variable Displacement Pump A4V

Prior to finalising your design, please request certified installation drawing.
Subject to revision.

With Auxiliary Pump and Through Drive
SAE-B

Size 40...90

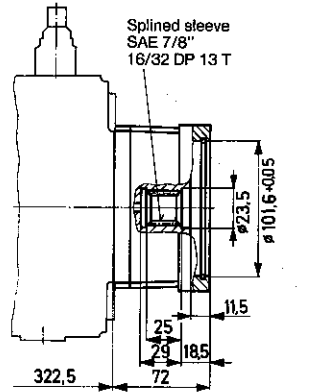
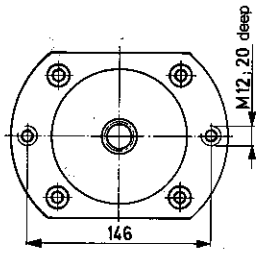


Suitable for mounting

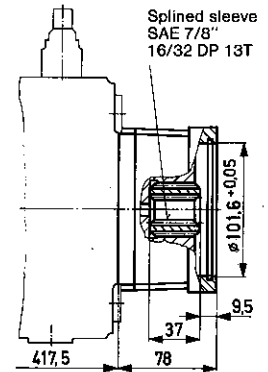
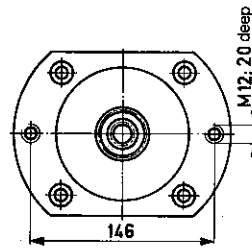
- Gear pump G3 (see RE 10038)
- Gear pump G4 (see RE 10042)
- Variable pump A10V.25 (see RE 92700)

Size	B ₁	B ₂
40	236,1	95,6
56	251,2	102
71	289,2	96,5
90	287	100

Size 125



Size 250

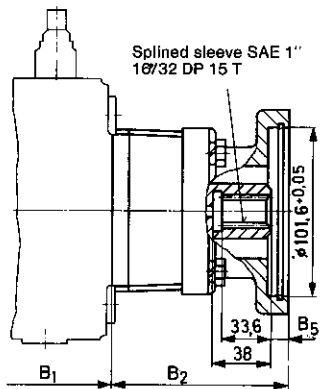
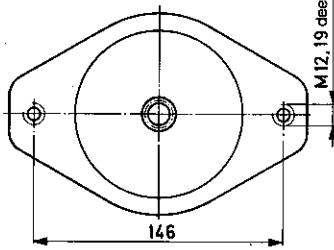


With Auxiliary Pump and Through Drive
SAE-B-B

Sizes 40...90

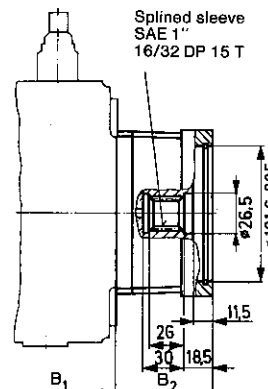
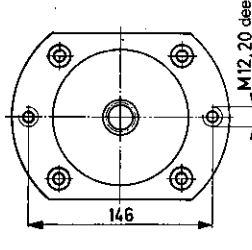
Size	B ₁	B ₂	B ₅
40	236,1	95,6	9
56	251,2	102	9
71	289,2	96,5	8,5
90	287	100	9

Suitable for mounting:
Variable pump A10V.40 (see RE 92700)



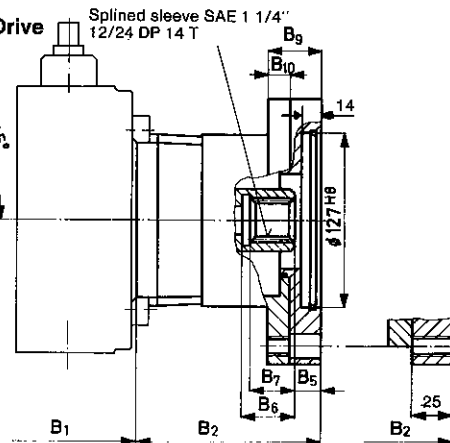
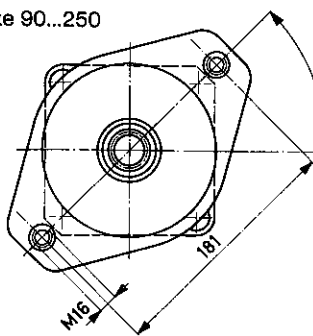
Size 125 and 250

Size	B ₁	B ₂
125	322,5	72
250	417,5	78



With Auxiliary Pump and Through Drive
SAE-C

Size 90...250



Suitable for mounting:

- Gear pump G4 (see RE 10042)
- Variable pump A10V.63 (see RE 92700)

Size	B ₁	B ₂	B ₅	B ₆	B ₇	B ₈	B ₁₀
90	287	126	23,5	34,5	30,5	29	17
125	322,5	139	23,5	34,5	30,5	30	18
250	417,5	133	18,5	41	37	-	-

Size 90 and 125 Size 250

Variable Displacement Pump A4V

Filtration

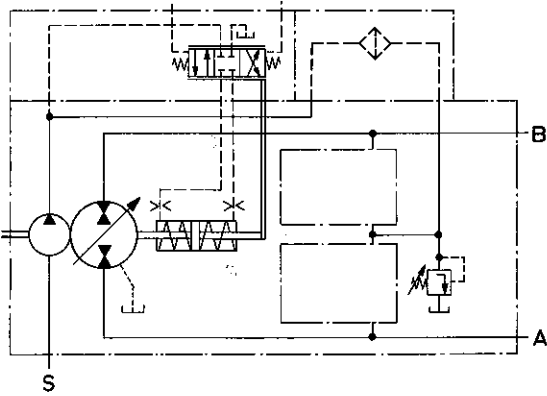
Filtration in the suction line of boost pump (built on auxiliary pump)

Standard model (preferred installation)

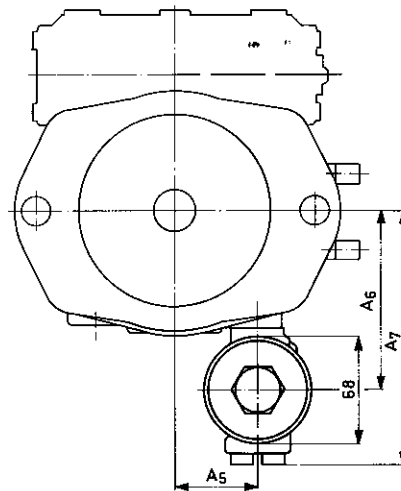
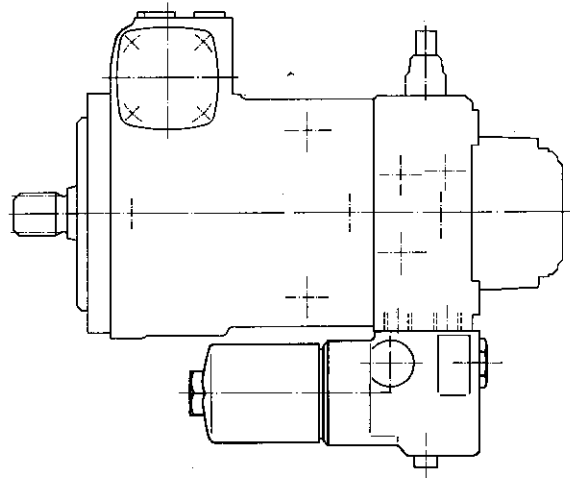
See page 4, and also circuit diagrams on pages 7...12

Filtration in pressure line of boost pump (built on auxiliary pump)

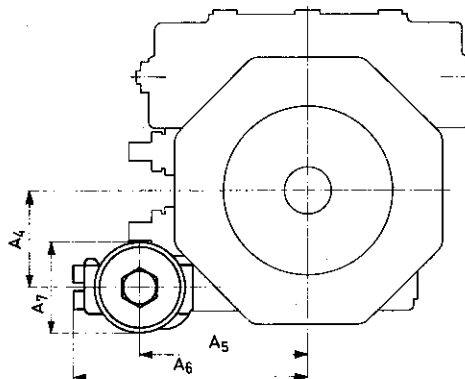
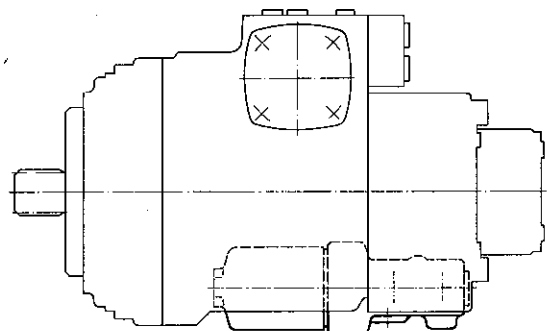
Filter mounted direct on variable pump



Size	A ₅	A ₆	A ₇
40	53	108,5	157,5
56	53	116	165
90	59	122,5	171,5
125	69	146	197,5



Size	A ₄	A ₅	A ₆	A ₇
71	72	125	174	68
250	96	191	243	103



Variable Displacement Pump A4V

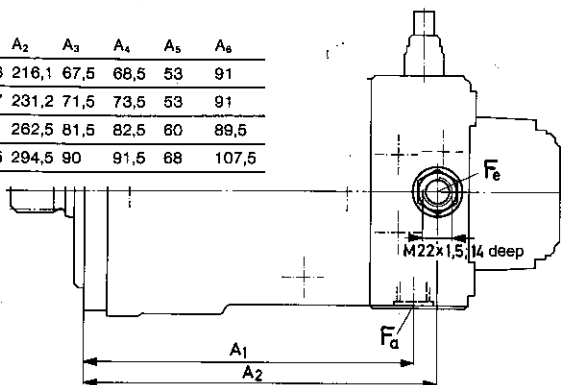
Prior to finalising your design, please request certified installation drawing. Subject to revision.

Filtration in pressure line of boost pump (built on auxiliary pump)

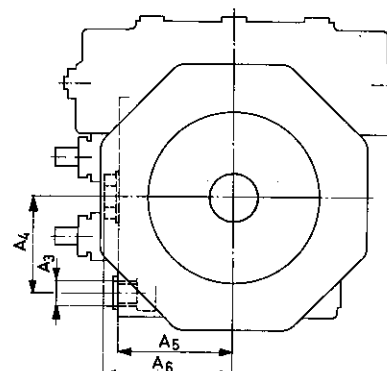
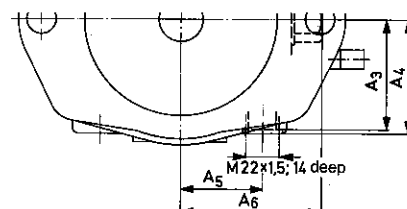
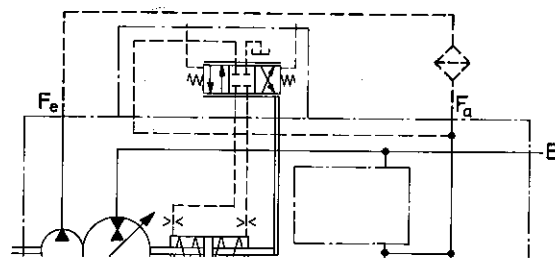
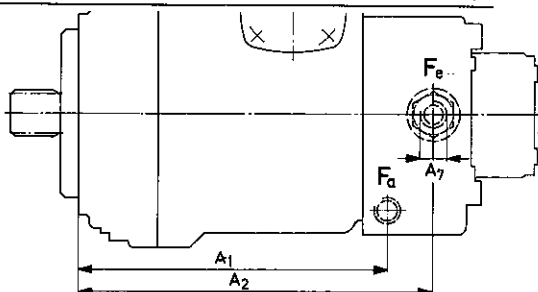
Filter mounted separately
Connections F_e and F_a for line mounted filter

Pump model
without DA control valve

Size	A_1	A_2	A_3	A_4	A_5	A_6
40	198,6	216,1	67,5	68,5	53	91
56	213,7	231,2	71,5	73,5	53	91
90	245	262,5	81,5	82,5	60	89,5
125	272,5	294,5	90	91,5	68	107,5



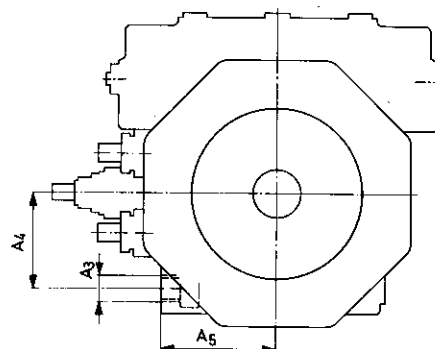
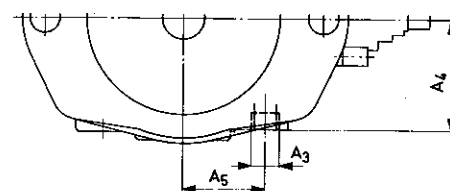
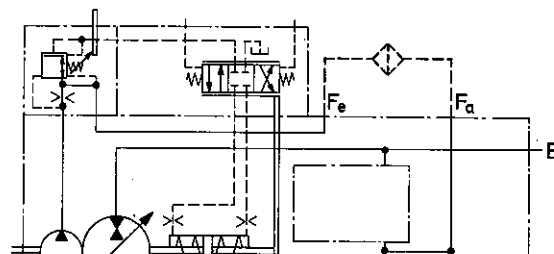
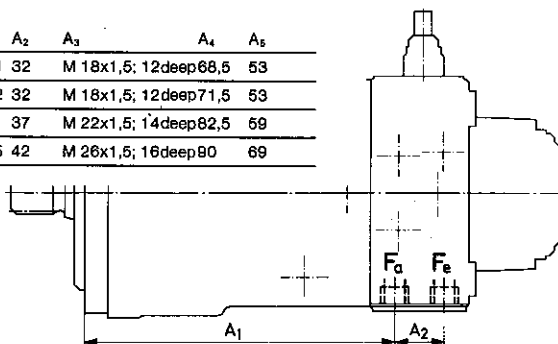
Size	A_1	A_2	A_3	A_4	A_5	A_6	A_7
71	230,2	263,2	M 22x1,5; 15 deep	72	85	95,5	M 22x1,5; 14 deep
250	329,5	393,5	M 33x2; 22 deep	94	130	143	M 33x2; 18 deep



Filter mounted separately
Connections F_e and F_a for line mounted filter

Pump model
with DA control valve

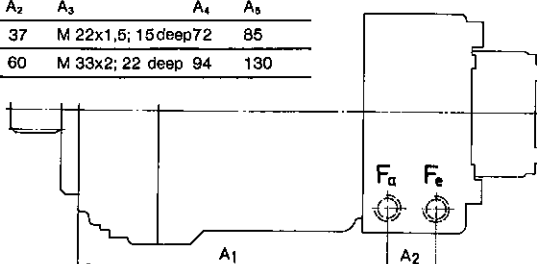
Size	A_1	A_2	A_3	A_4	A_5
40	186,1	32	M 18x1,5; 12 deep	68,5	53
56	201,2	32	M 18x1,5; 12 deep	71,5	53
90	231	37	M 22x1,5; 14 deep	82,5	59
125	256,5	42	M 26x1,5; 16 deep	90	69



F_e filter inlet

F_a filter outlet

Size	A_1	A_2	A_3	A_4	A_5
71	230,2	37	M 22x1,5; 15 deep	72	85
250	329,5	60	M 33x2; 22 deep	94	130



Variable Displacement Pump A4V

DA-Control Valve

For automotive transmissions, the DA control valve is installed in combination with a direct hydraulic control type DA.

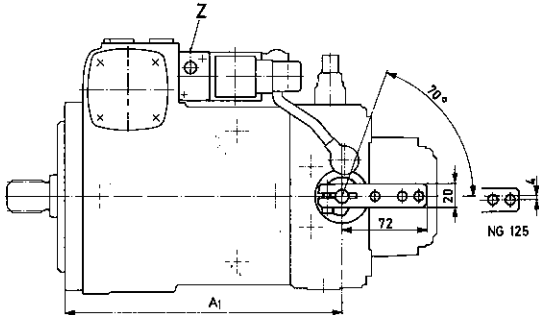
However, pumps with control devices types HD, EL, HW or HK can also be equipped with DA control valves. In this way, the vehicle automatic transmission characteristics may be overridden by speed related high pressure or output flow load

limiting characteristics.

(See description of DA control, pages 12 and 13).

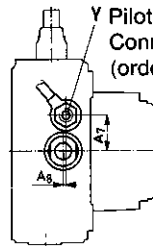
The max. output flow is, however, determined by the specified setting of the relevant pilot device for all these control devices.

Pilot pressure port M 10 x 1 x 8 deep
(plugged at the factory on despatch)

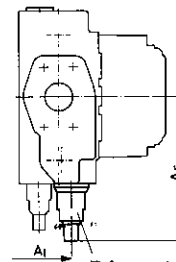
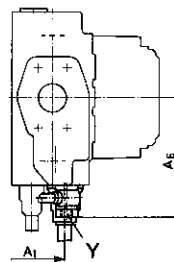
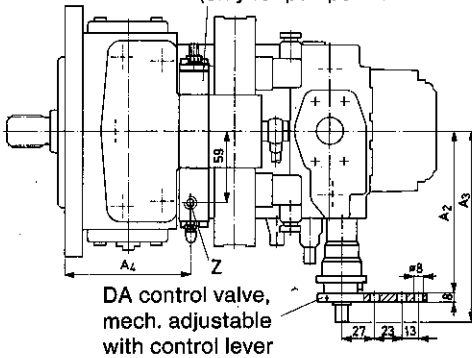


Size	A ₁	A ₂	A ₃	A ₄	A ₅	A ₆	A ₇	A ₈
40	216,1	135,5	172	91,5	133	94	28	1,5
56	231,2	135,5	172	100,8	133	94	28	1,5
90	262,5	132,5	169	114,5	130	104	31,5	5,5
125	294,5	138,5	175	128,5	136,8	119,5	41	12

Y Pilot pressure port M 10 x 1 x 8 deep
Connection for rotary inch valve
(order valve separately)



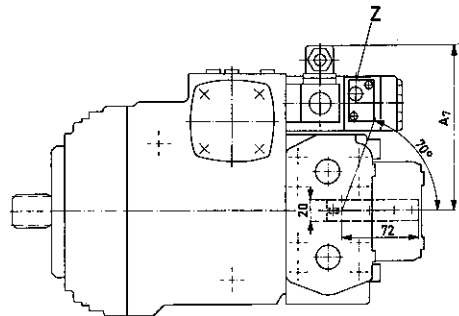
Hydraulic inch valve
(only for pumps with DA control device)



DA control valve,
mech. adjustable
with control lever

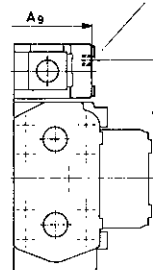
DA-control valve,
fixed setting

Pilot pressure port M 10 x 1 x 8 deep
(plugged at the factory on despatch)

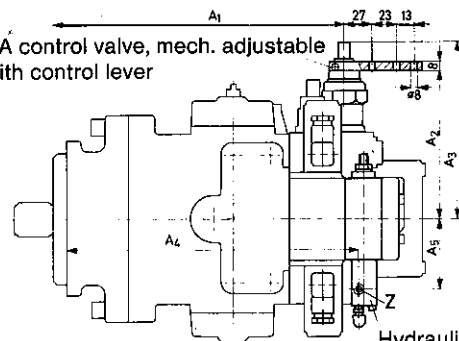


Size	A ₁	A ₂	A ₃	A ₄	A ₅	A ₆	A ₇	A ₈	A ₉
71	263,5	138	173,5	279	68	131	154,2	112,5	283,5
250	383,2	188,5	224	-	-	182	-	-	-

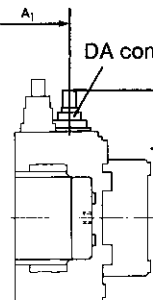
Y Pilot pressure port M 10 x 1 x 8 deep
Connection for rotary inch valve
(order valve separately)



DA control valve, mech. adjustable
with control lever



DA control valve, fixed setting



Hydraulic inch valve (only for pumps with DA control device)

Pressure Cut-off

This valve prevents operation of the pressure relief valve during acceleration operations, when pressure peaks may occur.

When the pump is loaded above the set value of this valve, the pump is automatically swivelled towards zero. For very rapid changes of pressure, occurring while the pump is swivelling towards zero, the maximum pressure is limited by the pressure relief valve.

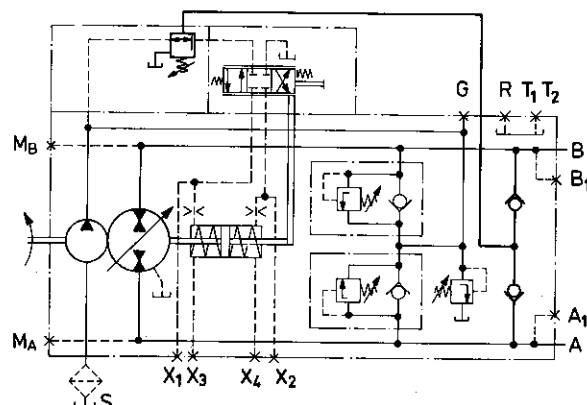
Pressure cut-off is required, for example, in transmissions which frequently require the set high pressure level to be achieved, or where it is required to reduce or set the corner horsepower.

The setting range of the pressure cut-off covers the whole operating pressure range, but the set value must be 20 – 30 bar lower than the setting of the high pressure relief valve.

When the pump operates as a motor (e.g. for vehicle transmissions when being hydrostatically braked), the swept volume of the unit is reduced to zero when the pressure reaches the set pressure of the pressure cut-off.

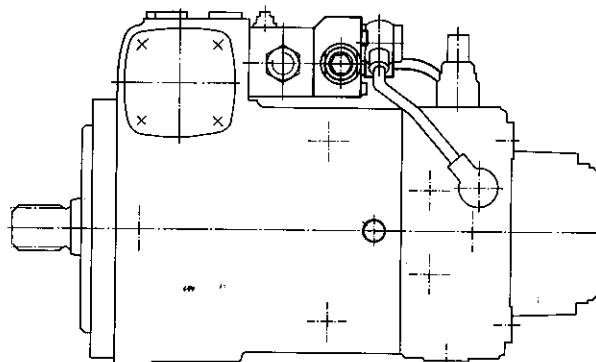
The braking characteristic is therefore determined by the setting of the pressure relief valves, the swivel time throttles and the return springs of the hydraulic control.

Typical Circuit

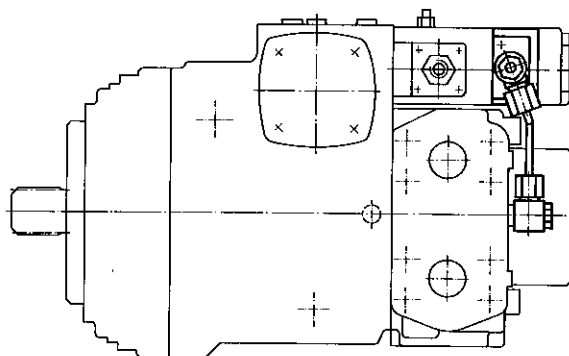


Variable pump A4V with hydraulic manual servo control, HW with pressure cut-off

Size 40, 56, 90, 125



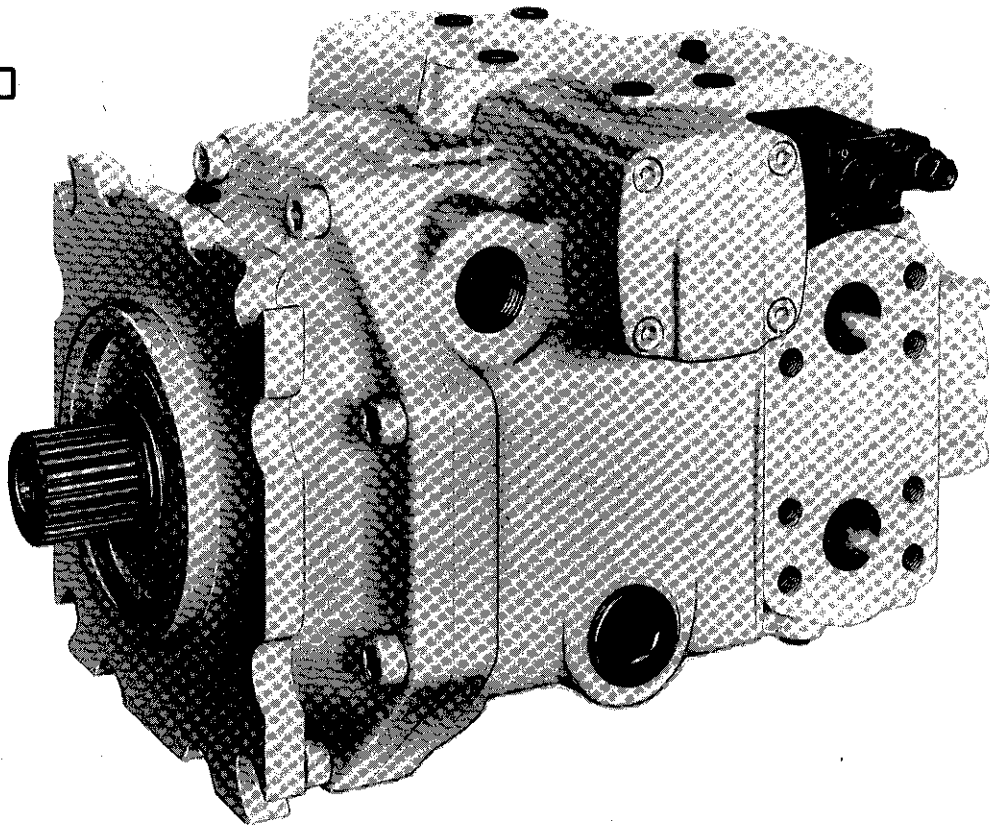
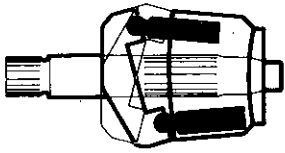
Size 71, 250



The pressure cut-off is mounted on the pilot control and piped as necessary.

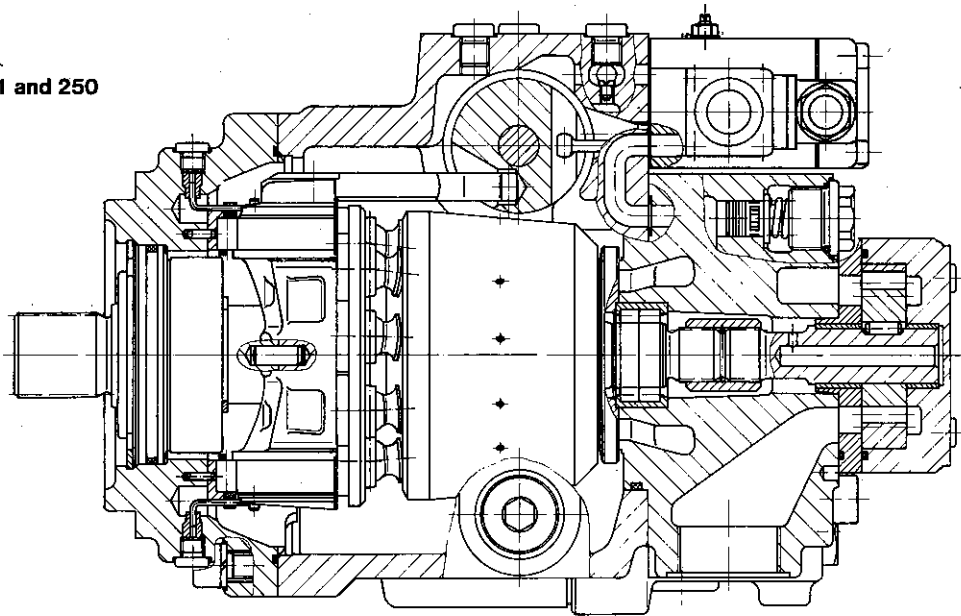
For sizes 40, 56, 90 and 125, the pressure cut-off and the control device HW are mounted together within a single housing.

Variable Displacement Pump A4V



Section

Variable Pump A4V, Sizes 71 and 250
with Electrical Control, EL



Hydromatik GmbH, Glockeraustraße 2, D-7915 Eichingen 2, Telephone (0 73 08) 8 20, Telex 712 538
Brueninghaus Hydraulik GmbH, An den Kelterwiesen 14, D-7240 Horb 1, Telephone (0 74 51) 9 20, Telex 765 321