Variable Displacement Pump A7V

Type Code

A7V	55	LV	1	L	Z	F	O	O

Pimp Type

Axial piston variable Displacement pump	A7V

Size

0-20.5	20
8.1-28.1	28
0-40.1	40
15.8-54.8	55
0-58	58
23.1-80	80
0-78	78
30.8-107	107
0-117	117
46.2-160	160
0-250	250
0-355	355
0-500	500

Displacement V_{gmin}-V_{gmax} ml/r)

Control Device

Constant horsepower control	LV
Constant pressure control	DR
Electrical control (with prop.solenoid)	EP
Hydraulic control pressure related	HD
Manual control (with handwheel)	MA
Brake control	SC
Numerical control	NC

Series

see section	1
	5.1

Direction of Rotation(Viewed of shaft end)

clockwise	R
anti-clockwise	L

Shaft End

splined shaft DIN 5480	Z
splined shaft GB 3478.1-83	S
keyed shaft GB1096-79	P

Pipe connections

Pressure port: SAE flange, on side Suction port: SAE flange, on side	F
Pressure port: Threaded, on side Suction port: SAE flange, on side	G

Stroke Limiter

none	O
Stroke Limiter mechanically adjustable (for LV and DR)	M
Stroke Limiter, hydraulic (for LV)	H

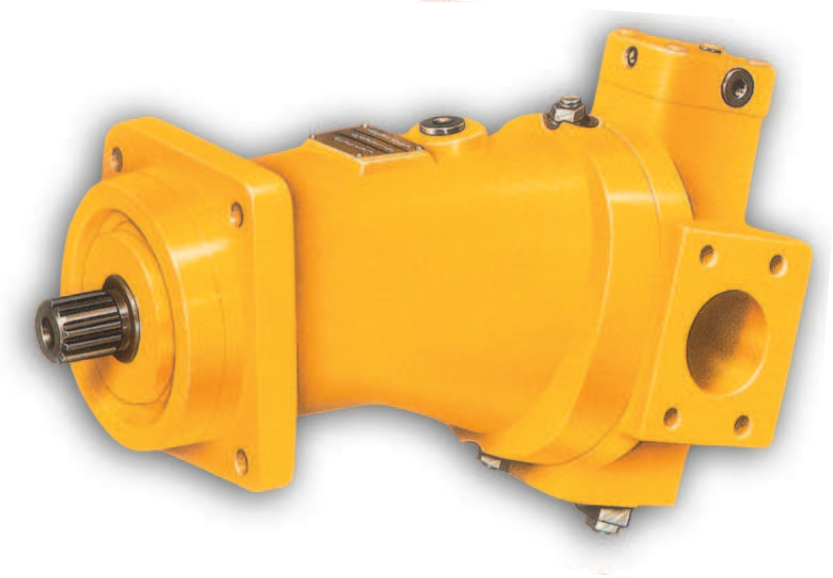
Auxiliary Equipment

none	O

Ordering Example: A7V.55.LV.1.L.Z.F.O.O

Axial piston variable displacement pump A7V,
size 55. With constant horsepower control, series 1.

anti-clockwise rotation, splined shaft
SAE side flange connections, without auxiliary equipment



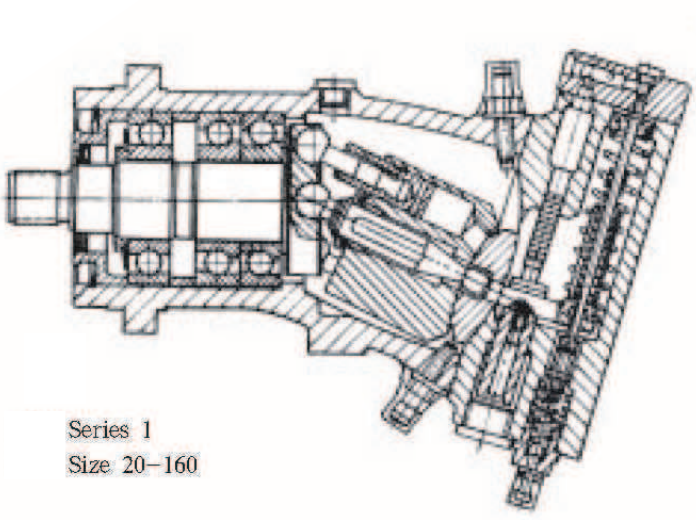
Description

Variable displacement pump, axial piston, bent axis design, for hydrostatic transmissions in open circuits.
The flow if proportional to the drive speed and the displacement and is steplessly variable at constant drive speed.
Comprehensive programme of control devices for every control and regulation function.
Operation of both mineral, and fire-resistant fluids.

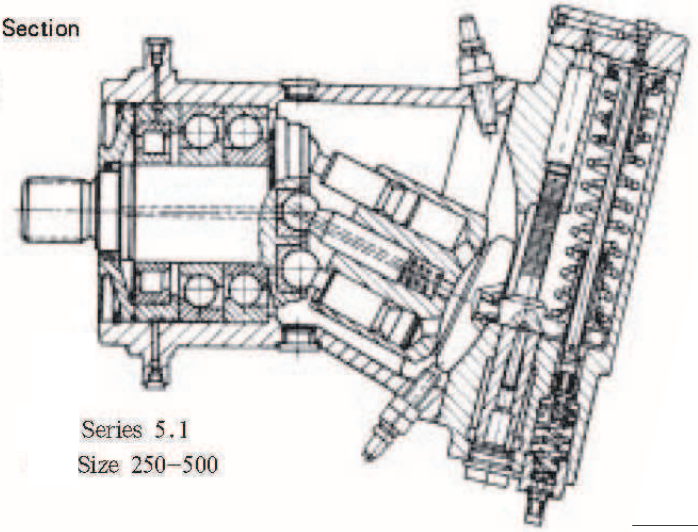
Special Features
series 1

High performance rotary group with well-proven spherical control area offering the following advantages ,self-centering, low peripheral speed, high efficiency.
Long service life robust rolling bearing.
Drive shaft will support radial loads.
Low noise level.
High duty roller bearing for inter-mittent high presure operation. For continuous duty hydrostatic bearing are available.

Section



Series 1
Size 20−160



Series 5.1
Size 250−500

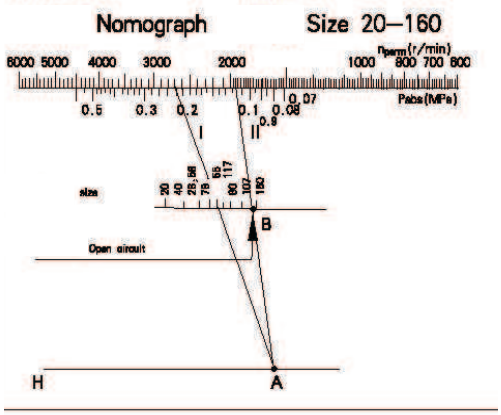
Technical Data (theoretical values, without considering mech-hyd.and volumetric efficiency)

	Size				20	28	40	55	58	80	78	107	117	160	250	355	500
	Control Device																
LV	Constant HP control				●	●	●	●	●	●	●	●	●	●	●	●	●
LVS	Constant HP control with load sending												●				
DR	Constant pressure control				●		●		●		●		●		●	●	●
DRS	Constant pressure control with load sending												●				
HD	Hydraulic control				●	●	●	●	●	●	●	●	●				
EP	Electric control (Proportional)						●	●	●	●	●	●	●	●	●		
MA	Manual control				●	●	●	●	●	●	●	●	●	●	●		
SC	Brake control												●	●	●		
NC	Numerical control										●	●					
355	Displacement			V_{gmax}	ml/r	20.5	28.1	40.1	54.8	58.8	80	78	107	117	160	250	
500																	
			V_{gmin}	mi/r	0	8.1	0	15.8	0	23.1	0	30.8	0	46.2	0	0	0
		0.09MPa[1]	n_{max} 0.09	r/min	3800	2800	3200	2360	2850	2120	2540	1900	2240	1650	1400	1250	1120
Max.speed[3]		0.1MPa[1]	n_{max} 0.1	r/min	4100	3000	3400	2500	3000	2240	2700	2000	2360	1750	1500	1320	1200
		0.15MPa[1]	n_{max}0.15	r/min	4750	3600	3750	3000	3350	2750	3000	2450	2650	2100	1850	1650	1500
		n_{max} 0.09	Q_{max}0.09	L /min	76	76	124	125	161	164	192	197	254	256	340	430	543
Max.flow[2]		n_{max} 0.1	Q_{max} 0.1	L /min	82	82	132	133	170	174	204	208	267	271	364	455	582
		n_{max} 0.15	Q_{max}0.15	L /min	94	98	146	160	190	213	227	254	300	326	449	568	728
		Q_{max} 0.09	P_{max}0.09	KW	45	46	75	75	97	99	116	119	153	154	204	259	326
Max.Power		Q_{max} 0.1	P_{max} 0.1	KW	49	49	80	80	102	105	123	125	161	163	218	273	350
(△p=35MPa)		Q_{max} 0.15	P_{max}0.15	KW	57	59	88	96	114	128	136	153	181	196	270	342	437
Flow Q[2]	NE=1450r/min			L/min	28.8	39.5	56.4	77.1	82.3	112.5	109.7	150.5	164.6	225	—	—	—
Power																	
P(△p=35MPa)	NE=1450r/min			KW	17	24	34	46	50	68	66	91	99	135	—	—	—
Torque	V_{gmax}			Nm/10MPa	32.6	44.6	63.7	87	93.2	127.5	124	169.7	186	254	397.5	564.5	795
M(△p=10MPa)	V_{gmin}			Nm/10MPa	—	12.9	—	25.1	—	36.8	—	49	—	73.5	—	—	—
(△p=35MPa)	V_{gmax}			Nm	114	156	223	305	326	446	431	594	651	889	1391	1975	2782
Max.torque M_{max}	V_{gmin}			Nm	—	45	—	88	—	129	—	171	—	257	—	—	—
Moment		J		kgm^2	0017	0.00170	00520	00520	01090	0109	0.0167	0.0167	0.0322	0.0322	0.0880	16000	270
Weight				kg	19	19	28	28	44	44	53	53	76	76	105	165	245

l)The values shown are valid for V_{gmax}.with an absolute pressure at suction inlet S and when operated on mineral oil.

2)Calculated with a volumetric efficiency of 97%.

3)The maximum speeds at 0.15MPa shown must not be exceeded ,even with higher loading. On those sizes with V_{gmin} >0, however the maximum speeds can be increased to the values for those sizes with V_{gmin} =0 by reducing the displacement (V_g <V_{gmax}) and maintaining max.flow. The relevant sizes are 28-20,55-40,80-85,107-78,160-117.



Permissible speed n_{pern} and suction pressure pabs can be read from the nommograph. However, the max,speeds(see table)and min. and max. suction pressure must be taken into account.

Example: Given: size 55D rive speed 2700r/ min Required: pressure P_{abs} at the suction inlet.

Solution: Line1 on scale n_{perm} drawn towards size 55 crosses line Hat portA . Line 11 from point A to point B(open circuit) gives the result P_{abs}=0.117MPa.

Technical Data

Inlet operation Pressure

Absolute pressure at port S

$P_{abs\ min}$_____0.08MPa

$P_{abs\ max}$_____0.2MPa

Operating Pressure Range-Outlet Side

Nominal pressure_____p_N=35MPa

Peak pressure_____p_{max}=40MPa

Fluid Temperature Range

t_{min}_____-25ºC

t_{max}_____+80ºC

Viscosity Range:

V_{min}_____10mm²/s

V_{max}_____(for short periods)1000mm²/s

Optimun Operating Viscosity:

V_{opt}_____16-36mm²/S

Fluid Recommendation:

Operating Temperature Range	Recommended Viscosity grade to DIN51519 ISO(VG) (at 40ºC)
30-40 ºC	VG22 . 22mm²/s
40-50 ºC	VG32 . 32mm²/s
50-60 ºC	VG46 . 46mm²/s
60-70 ºC	VG68 . 68mm²/s
70-80 ºC	VG100 . 100mm²/s

Filtration of Hydraulic Fluid

Recommended filtration 10∞m Coarser filtration of 25-40∞m is possible, but longer component life, will be achieved using 10∞m filtration due to lowest component wear.

Mounting Position

Optional, The pump housing must always be filled with oil. When mounting within a tank the plug must be removed form port R and this port must be at the top. 90°C pipe bend to be screwed in (noise reduction).

Note:

Vertical mounting with drive shaft pointing upwards: for this case a model with ports U_1 and U_2 must be ordered (indicate in clear text: "with ports U_1 and U_2 ").The minimum oil level must not fall below the "A" line, as shown is Fig1.

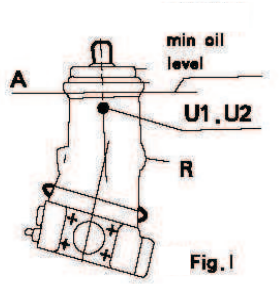


Fig.1

Mounting on Top of Tank

when mounting outside a tank, the pump must be bled at port U1 or U2 prior to commissioning.

Mounting on Top of Tank

Mounting of the A7V variable pump above tank must be considered as a special pump Installation and should only be realized under specific conditions. When ordering pumps for mounting on top of tank, state in clear text: "To Be Used for Above Tank Mounting"

This installation requires that the suction port be at the top and the suction pipe be kept as short as possible and the end of the pope be at least 200mm below minimum oil level, see Fig2.

The cross-cut of the suction pump should be so dimensioned to ensure that the flow velocity of the pressure fluid lies between 0.8 and 1m/s.

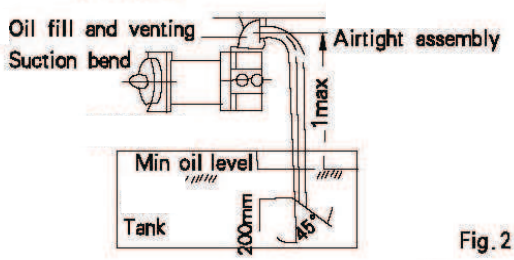


Fig.2

Size	Max speed n_{max} r/min	Max length of Suction pipe L_{max} (mm)	Calculated suction pie 1.D. (mm) at flow velocity V=0.9m/s and $V_{gmax.}$ speed n_{max}(r/min)	speed n_E =1450(r/min)
20	3610	600	41.8	26.5
28	2660	600	42	31
40	3040	750	53.6	37
55	2240	750	53.8	43.3
58	2700	750	61.3	45
80	2015	750	61.6	52.3
78	2410	750	66.6	51.6
107	1800	750	67.5	60.5
117	2125	850	76.6	63.3
160	1565	850	77	74

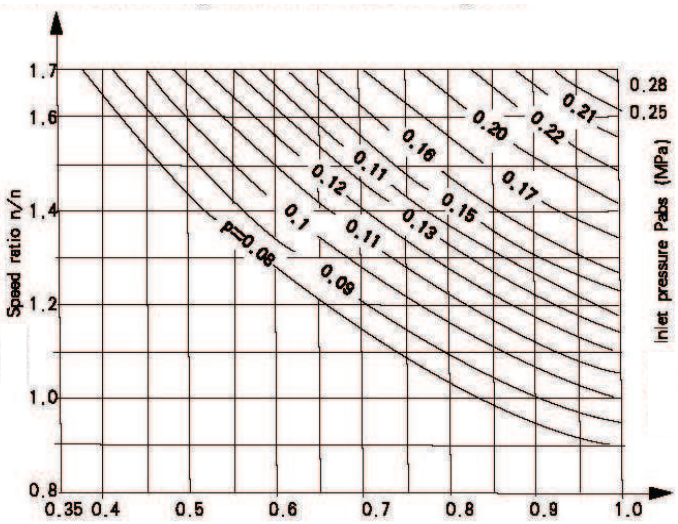
1) The values shown are valid for V_{gmax} with 0.09MPa absolute pressure at suction inlet S and when operated on mineral oil.

Note:

Start-up of the pump with all controls is only possible when the pump is at its full swivel angle (V_{gmax}), For pumps with minimum flow of ≥5% of $V_{gmax.}$ in order to avoid emptying of the suction line during zero position operation.

Size 250-500

Calculation of Inlet Pressure Pabs at Suction Inlet S and of Reduction in Displacement at Increased Speeds.



Displacement $\frac{V_g}{V_{gmax}}$

Size	250	355	500
$n_{maxperm}$(T/min)	2500	2240	2000

Example:

Given:

Size 500

Drive speed 1320rpm

Required:

pressure Pabs at suction inlet S

Solution:speed ration

$$\frac{n}{n_{max0.1}} = \frac{1320}{1200} = 1.1$$

gives an inlet pressure of Pabs=0.12MPa

at full swivel for example free flow is only possible with Pabs =0.12MPa, the displacement must be reduced to 87.6%

nmax = Max, perm speed.

Calculation of Size

Flow	$Q=\frac{V_g.n.\eta_v}{1000}$	[L/min]
Drive Torque	$M=\frac{1.59.V_g.\triangle P}{10.\eta_{mh}}$	[Nm]
Drive Power	$P=\frac{M.n}{9549}=\frac{Q.\triangle P}{60\eta_t}$	[KW]

V_g geom.displacement per rev(ml/r)

$\triangle P$ differential pressure(MPa)

n speed(r/min)

ηv volumetric efficiency

η_{mh} mech.hyd.efficiency

η_t overall efficiency

$[\eta_t=\eta_v.\eta_{mh}]$

Constant Horsepower Control

The constant HP control controls flow in relation to pressure. thereby maintaining hydraulic power constant.(Provided that the drive speed is constant.)

$P=\frac{P.Q}{60}$ =Constant

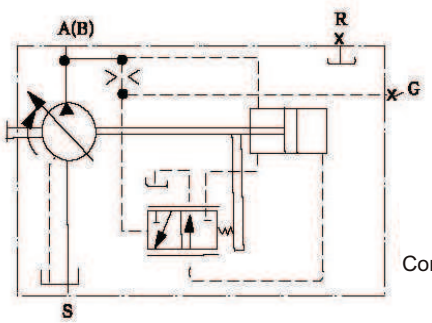
P= power[KW]

P=pressure[MPa]

Q=flow[L/min]

Commencement of control:min.5MPa

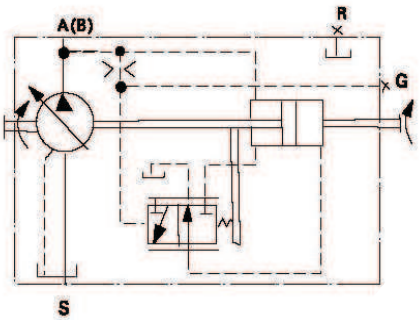
Summation HP control possible by throttles via port G.



Constant HP control LV

Stroke Limiter :

By means of a mechanical or hydraulic stroke limiter, the max. displacement can be infinitely varied or limited. Adjustment range from V_{gmax} to V_{gmin}



Constant HP control LV with mechanical stroke limiter

Size	20	40	58	78	117			
	28	55	80	107	160	250	355	500
Spindle Revolutions	23	21	28	31	26	21.25	24	25
Required Torque (approx.)Ncm	80	140	500	630	—	—	—	

For all sizes with V_{gmin}=0

The pressure cut-off is a constant pressure control superposed on the constant HP control and is carried out by means of a sequence valve, when the set. maximum pressure is reached (adjustment range

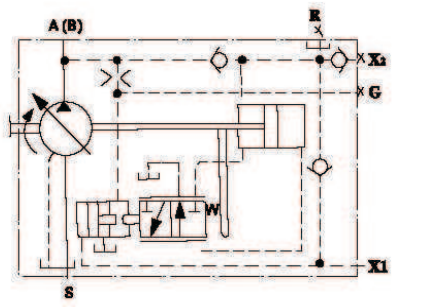
up to 315MPa),the valve opens and the flow is automatically reduced (to Q=0).

The sequence valve is mounted separately from the pump in any suitable location one subplate (remote control).

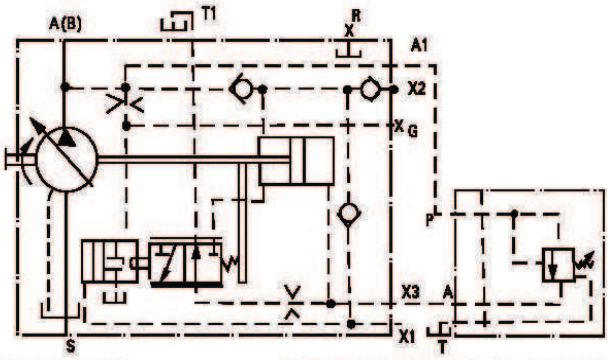
The max./single pipe length must not exceed 5 m. order sequence valve and subplate separately.

When using the constant HP control with pressure cut -off, the pump control times, will be approximately 3 times longer than those obtained with the constant pressure control DR. Important : Port T form the sequence valve and pilot oil return line Tl must be piped direct to tank (cooler).Continuous operation in zero position see constant pressure control DR.

Constant HP control LV with pressure cutoff (remote controlled)and hydraulic stroke limiter



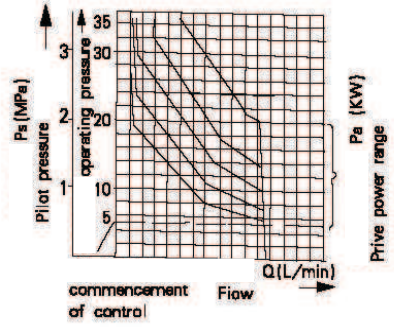
Auxiliary Equipment;Pressure Cut—Off



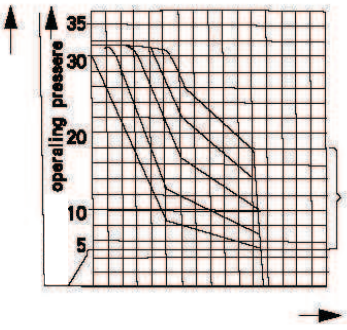
Connections

A.B service lines
S suction-line
G port for Summation HP control line
X1 pilot pressure
X2 remote contr.pressure
A1. X3 control valve remote control valve
T1 pilot oil retum
R air bleed

without Pressure Cut—off



with Pressure Cut-Off
Pa (KW)



Size			20	28	40	55	58	80	78	107	117	160	250	355	500
Speed	no	r/min	1450	1450	1450	1450	1450	1450	1450	1450	1450	1450	980	980	980
Max.Flow Q at no		L/min	28	39	57	77	81	110.5	110	150	165	225	237	337	475
Drive without pressure		P_{omin}	3	4	5.5	7.5	7.5	11	11	15	15	22	22	30	45
		P_{omax}	11	15	18.5	30	30	37	37	45	55	75	90	132	200
cut-off power		P_{omin}	3	—	5.5	—	7.5	—	11	—	15	—	22	30	45
range		P_{omax}	10	—	18.5	—	27	—	37	—	55	—	90	132	200
P.(KW) with pressure cut-off															

Conversion to speeds n(rpm) other than n.

Drive power $P=P_o \frac{n}{no}$

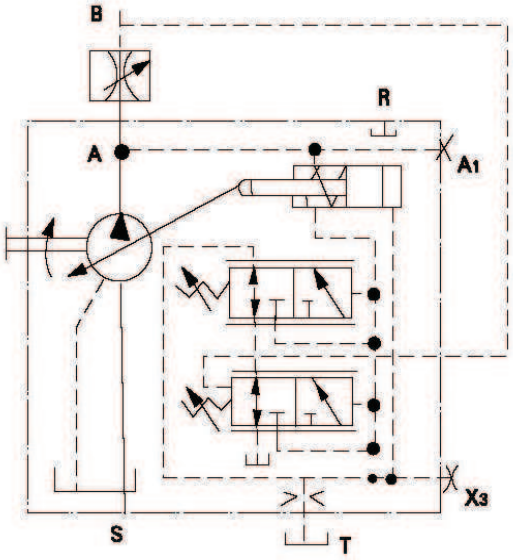
1. Calculated with a volumetric efficiency of 97%

Variation: Constant HP Control with Load Sensing

The load sensing valve is a flow control valve which operates as function of the load pressure to regulate the pump displacement in order to match the requirement of the consumer unit. The pump flow is influenced by the external orifice (control black, throttle) fitted between pump and serviced unit , ber curve. The valve compares pressure before and after the orifice and maintains the pressure before and after the orifice and maintains the pressure drop (differential pressure △P)across the orifice and therefore the pump flow-constant. if differential pressure △P increases, the pump is swivelled back towards V_{gmin} and if△P decreases the pump is swivelled out towards V_{gmax}, until a balance is restored within the valve.

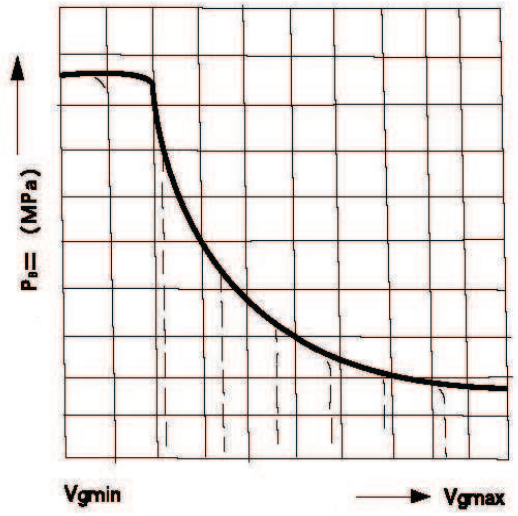
$\triangle P = P_{\text{serviced unit}}$

△P may be set with the range 14 bar to 25 bar. The standard setting is 18 bar (please state required setting in clear text). The stand by pressure for zero stroke operation (orifice close)is approx.2 bar above the △P setting. The constant power control and the pressure cut -off are super imposed on the load sensing valve, for example the set power hyperbola and set pressure the orifice is not included in the standard, in the standard supply.



LVS

Constant HP control with load Sensing

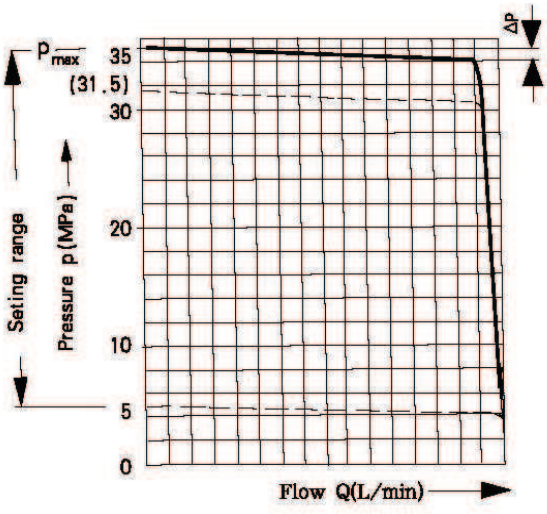


Constant Pressure Control

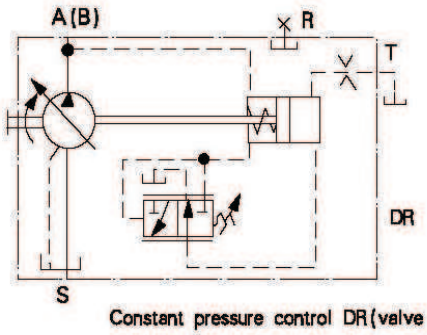
The constant pressure control maintains the pressure in a hydraulic system constant within its control range in spite of changing pump flow requirements. The variable pump supplies only the volume of fluid required by the services, Should operating pressure exceed the set pressure, the pump is automatically swivelled back to a smaller angle. The required pressure is set either direct at the pump (valve built in standard model) or at the separate sequence valve for the model with remote control.

Setting range from 5 to 35MPa.

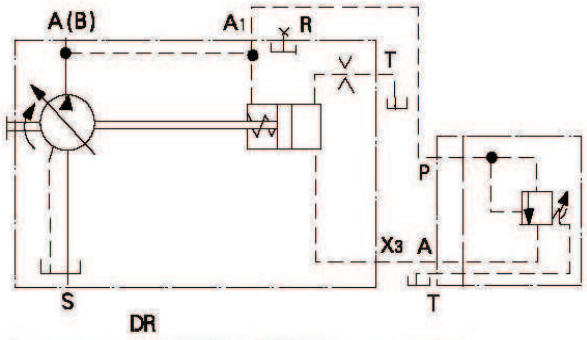
Setting range for remote control 5 to 31.5MPa.



Size	20−17	250−500
△P Max (MPa)	1	1.4



Constant pressure control DR(valve built-in)



Constant pressure control DR(remote controlled)

Note:

Order sequence valve subplate separately The max. single pipe length should not exceed 5m. Port T from the sequence valve must be piped separately to tank A pressure relief valve installed in the system for protection of the max. pressure must be set 2MPa above the setting of the constant pressure control.

Size		Adjustment times 20	40	58	78	117
V_{gmin}-V_{gmax}	te(S)	0.16	0.2	0.25	0.25	0.3
35-5MPa Pressure unloading						
V_{gmax}-V_{gmin}	ta(S)	0.03	0.04	0.05	0.05	0.06
5-35MPa Pressure built-up						

The values in the table are increased by 3 time for remote control.

For parallel operation of several A7V pumps with constant pressure control a steeper curve is used for the constant pressure control.

please indicate this requirement in text after the type code when order in ("parallel operation").

For parallel operation each individual pump requires its own sequence valve.

Stoke Limiter

The max. displacement can be steplessly limited between V_{gmax} to V_{gmin} by means of a mechanical stroke limiter.

For details see control device LV.

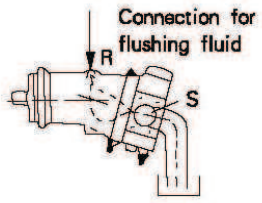
Continuous Operation in Zero Position

Zero stroke operation without flushing of housing.

short periods <10min (~50% ED)		long periods	
max.perm pressure	max.perm tank temperature	max.perm pressure	max.perm tank temperature
p_{max} (MPa)	t_{max} (°C)	p_{max} (MPa)	t_{max} (°C)
31.5	50	20	50

Zero stroke operation with flushing of housing

long periods	
max.perm pressure	max.perm tank temperature
p_{max}(MPa) 31.5	t_{max}(°C) 50



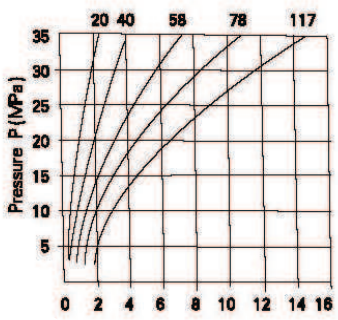
Flushing flow

Size	20	40	58	78	117	250	355	500
flow Qsp 1/min	2	4	6	8	12	12.5	16	25

Temperature of flushing fluid ⩽ tank temperature

Note : When mounting the A7V on top of tank and at zero stroke operation for longer periods of time at pressures up to P_{max} 31.5MPa a minimum flow ⩾corresponding to flushing flow as indicated for each size in the above table must be set instead of case flushing.

Power at Zero Stroke



Size

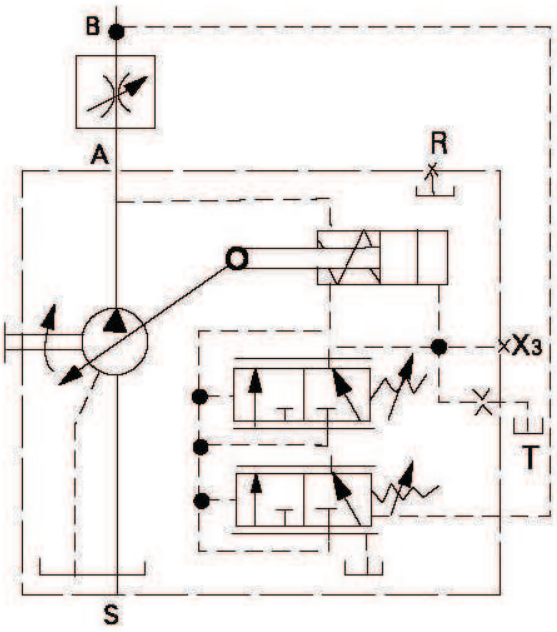
Typical values at speed n=1450rpm
fluid temperature=50°C
Power at zero stroke (KW)

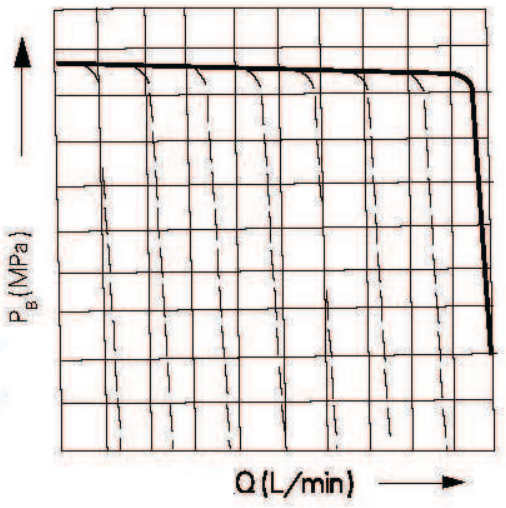
Variation:Constant Pressure control with Load sensing

The load sensing valve is a flow control valve which operates as function of the load pressure to regulate the pump displacement in. order to match the requirement of the consumer unit. The pump flow is influenced by the external orifice (control black, throttle) fitted between pump and serviced unit, but is not affected by load pressure throughout the range below the power curve. The valve compares pressure before and after the orifice and maintains the pressure before and after the orifice and maintains the pressure drop (differential pressure △P)across the orifice-and therefore the pump flow-constant. if differential pressure△P increases, the pump is swivelled back to words Vgmin' and if △ P decreases the pump is swivelled out towards Vgmax' until a balance is restored with in the valve.

△ $P=P_{pump}-P_{serviced}$ unit

△ P may be set with range 14 bar to 25 bar. The standard setting is 18 bar (please state required setting in clear text) The stand by pressure for zero stoke operation (orifice close) is approx. 2 bar above the△P setting. The constant pressure control is superimposed on the load sensing valve, i, e, the load sensing function operates below the set pressure. The orifice is not included in the standard supply.





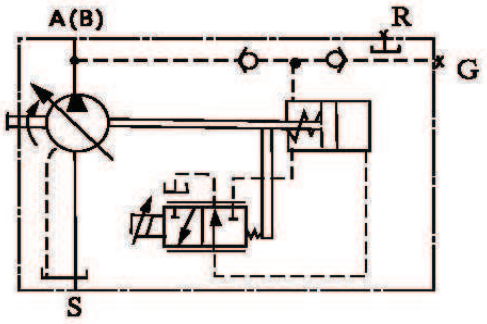
Constant pressure control with load sensing valve.

EP Electric Proportional Control

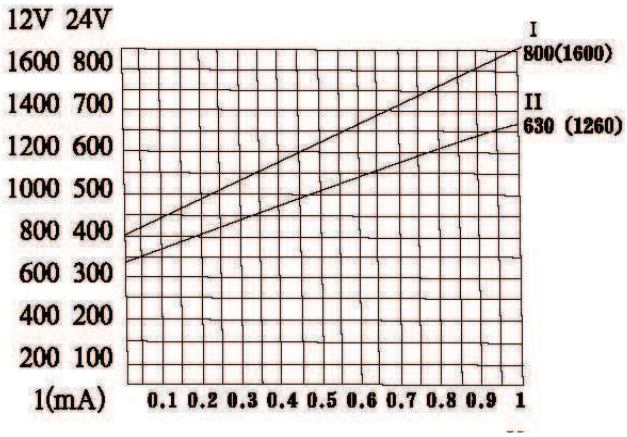
The electric control permits stepless and programmable adjustment of the solenoid force i.e. the strength of solenoid current. The control force on the control piston is generated by a proportional solenoid. The proportional solenoid need a 24V(12V)DC power supply that the current is 300_630mA (600_l260mA). commencement of control at approx. 300mA(600mA).

End of control at approx.630 mA (1260mA). Adjustment is from V_{gmin} to $V_{gmax.}$ please consult us if control in the opposite direction (V_{gmax} to V_{gmin}) required,

if the pump is to be moved out of the zero position <Vg=0) or if the operating pressure<4MPa,a pilot pressure of 4Mpa is necessary at port G.



Electric pro.Control



Commencement of control at V_{gmin} $\frac{V_g}{V_{gmax}}$

Line I adapts for V_{gmax} ≥250ml/r Line || adapts for V_{gmax} ≤250ml/r.

Adjustment Times

Size	20	40	58	78	117
	28	55	80	107	160
V_{gmin}-V_{gmax} $t_{min_{(s)}}$	0.16	0.2	0.25	0.25	0.3
V_{gmax} V_{gmin} $t_{min_{(s)}}$	0.12	0.16	0.2	0.2	0.25

※The values shown are valid for operating pressure P_b=20MPa,

Hysteresis

A hysteresis of±2.5 to 4%(approx.) is present in the control because of the electric/hydraulic control (referred to the complete adjustment, range V_{min} to V_{gmax}). The repeatability of the pump position, when starting from the same direction, is around 2-4%.

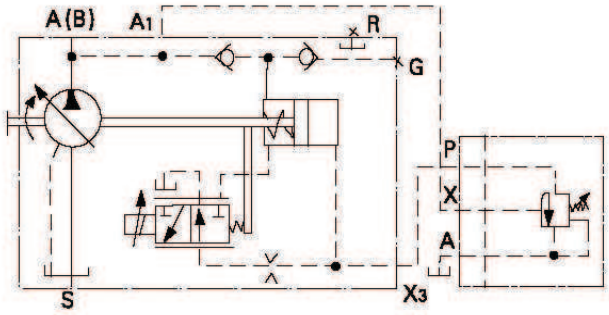
Note:

Mounting of the pump with EP. control inside the oil tank is possible, only when using mineral hydraulic oil and with a max. oil temperature in the tank of 80°C .if the pump is to be submersed in oil, please indicate in clear text when ordering). Auxiliary Equipment: Pressure Cut-Off

For all sizes with V_{gmin}=0.

For description see control device HD.

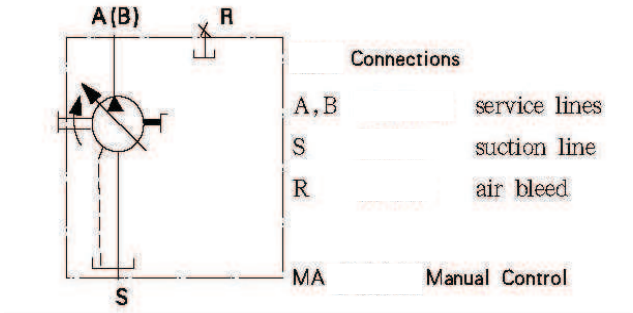
Order sequence valve and subplate separately



EP Electric Pro. Control with Pressure cut-off Connections
A,B Service lines
S. Suction line
G. Remote control pressure
R. air bleed
A1, X3 Ports for remote control valve

Manual Control

By turning the handwheel, a piston is is moved in an axial direction by means of a threaded spindle. A carrier pin moves the control lens on its sliding plane, thus permitting stepless variation of the pump displacement in the range V_{gmin} to V_{gmax}. The pump position indicator is located in the handwheel.



Hydraulic Control, Pressure Related

The hydraulic control pressure related, permits the stepless adjustment of the pump displacement in relation to pilot pressure Adjustment is proportional to the pilot pressure at port XI. When using the Hd control ax 2-position control (V_{gmin} to V_{gmax}) the pilot oil pressure on port XI must not exceed 4MPa.

Adjustment is from V_{gmin} to V_{gmax} . The increase in pilot pressure over the complete adjustment range(min-max)is 1MPa.

The setting range for commencement of control is between 0.4 and 1.5MPa. The necessary control oil is taken from the high pressure circuit, and a minimum operating pressure of 4MPa is required. If necessary apply pilot pressure of 4MPa at port X2.

The oil flow at pilot XI is approx 0.5L/min.

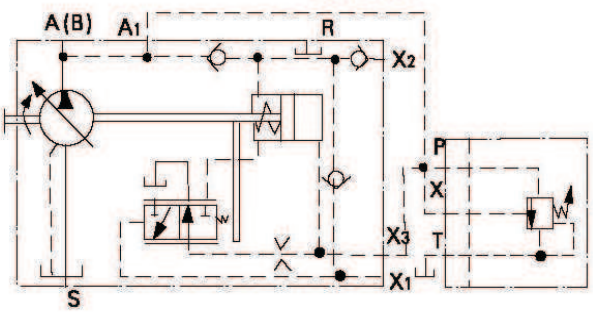
Additional Function; Pressure cut—Off

For all sizes with V_{gmin}=0.

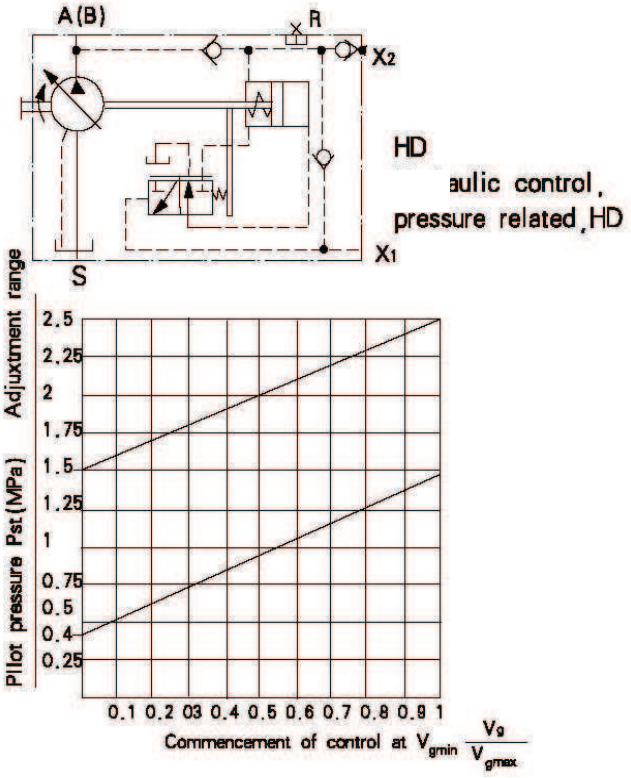
The pressure cut-off serves to limit the flow as a function of the high pressure so that a predetermined operating pressure is not exceeded. This function is carried out by a sequence valve. On reaching the set maximum pressure (adjustment range up to 31.5MPa),the valve opens and the flow is automatically reduced (to Q=0).

The sequence valve is mounted separately from the pump in any suitable location by means of a subplate (remote control).The max, Single pipe length should not exceed 5m.

Order sequence valve and subplate separately.



Hydraulic Control,pressure rela
HD with pressure cut-off



Hydraulic Control, pressure related, HD with pressure cut-off

Important: port T from the sequence valve must be piped separately to tank.

Continuous Operations is Zero position

For details see constant pressure control DR.

Connections

A,B service lines

S. suction line

X_1 pilot pressure

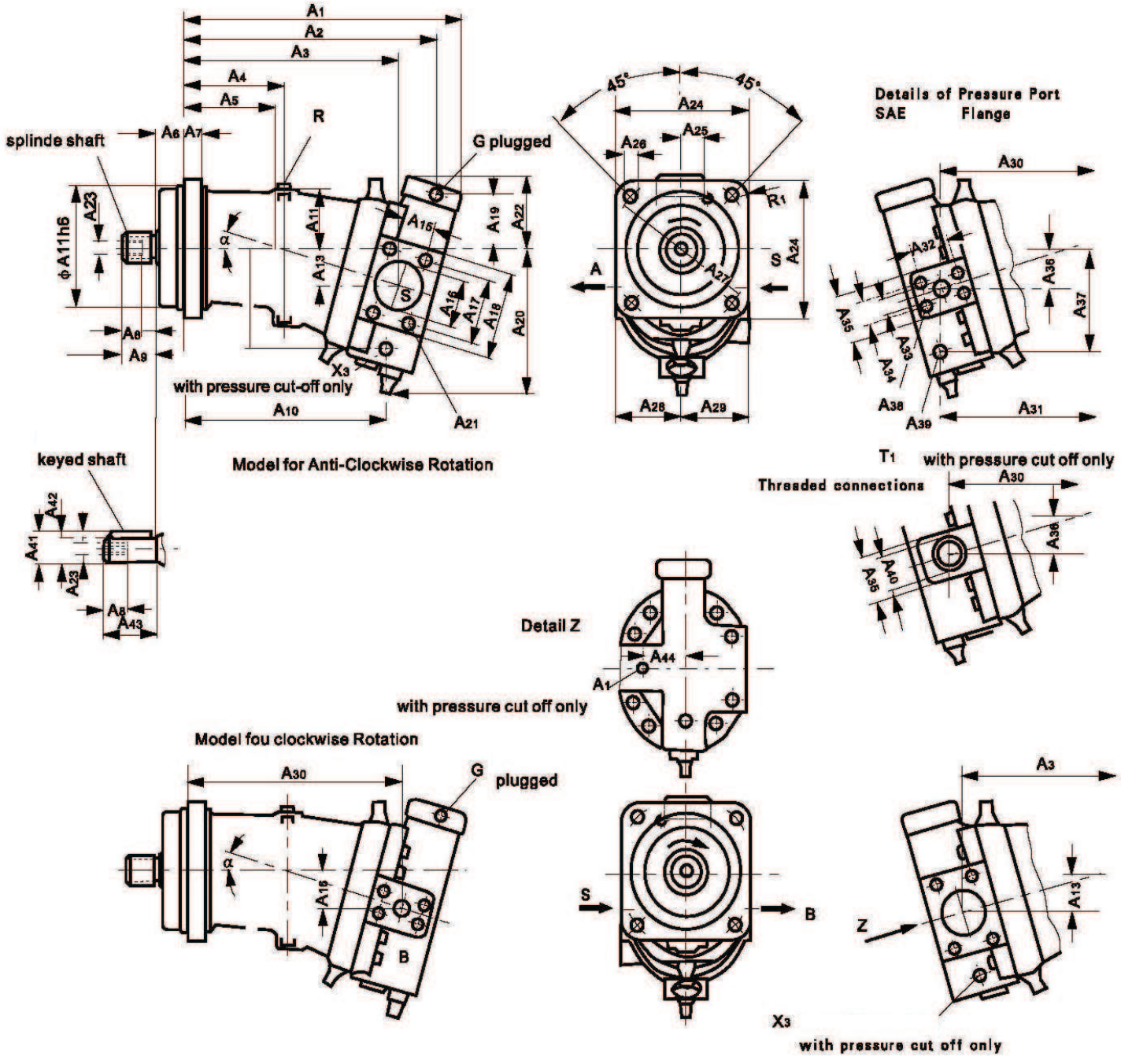
X_2 remote control pressure

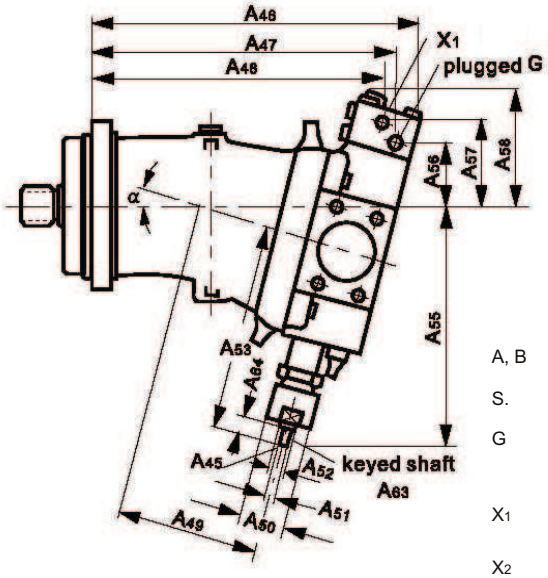
A_1, X_3 ports for remote control valve

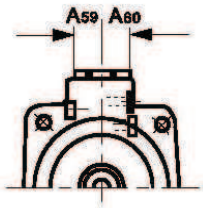
R. air bleed

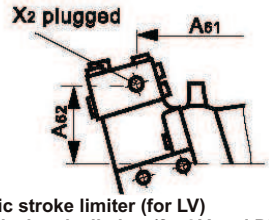
Unit dimensions Size 20-160

LV Constant HP Control









Auxiliary equipment : hydraulic stroke limiter (for LV)
Auxiliary equipment : mechanical stoke limiter (for LV-and DR)

Connections

A, B	service lines
S.	suction line
G	remote control pressure M14 x 1.5
	(connection for summation HP control)
X_1	pilot pressure M14 x1.5
X_2	remote control pressure (HD) M14 x 1.5
A_1,X_3,	ports for remote control valve
T	pilot oil return line M12 x 1.5
T_1	pilot oil return line
R.	air bleed

Size	a	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}	A_{21}	deep	A_{22}	A_{23}	A_{24}	A_{25}	A_{26}	A_{27}
20	9	251	224	199	107	75	25	16	19	43	160	100	85	20	52	35.7	38	69.9	94	78	132	M12	20	95	M8	118	23.5	11	125
28	16	260	232	195	107	75	25	16	19	43	149	100	95	34	50	37.5	38	69.9	94	59	145	M12	20	80	M8	118	23.5	11	125
40	9	317	287	255	123	108	32	20	28	35	244	125	95	23	63	42.9	50	77.8	102	87	166	M12	20	109	M12	150	29	13.5	160
55	16	327	296	251	123	108	32	20	28	35	—	125	—	41	63	42.9	50	77.8	102	64	182	M12	20	91	M12	150	29	13.5	160
58	9	374	337	304	152	137	32	23	28	40	295	140	106	26.5	77	50.8	63	88.9	115	93	168	M12	20	113	M12	165	33	13.5	180
80	16	385	347	300	152	137	32	23	28	40	—	140	—	48	77	50.8	63	88.9	115	68	194	M12	20	120	M12	165	33	13.5	180
78	9	381	347	310	145	130	40	25	28	45	298	160	113	29	80	50.8	63	88.9	115	101	180	M12	20	120	M12	190	33	17.5	200
107	16	393	358	305	145	130	40	25	28	45	—	160	—	50	80	50.8	63	88.9	115	73	200	M12	20	98	M12	190	33	17.5	200
117	9	443	402	364	214	156	40	28	36	50	350	180	130	33	93	61.9	75	106.4	135	114	195	M16	24	137	M16	210	34	17.5	224
160	16	454	414	359	213	156	40	28	36	50	—	180	—	58	88	61.9	75	106.4	135	83	222	M16	21	112	M16	210	34	17.5	224

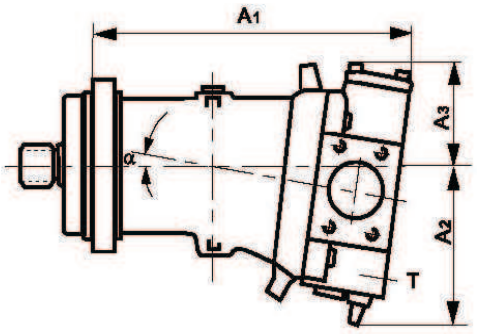
(T1)

Size	A_{28}	A_{29}	A_{30}	A_{31}	A_{32}	A_{33}	A_{34}	A_{35}	A_{36}	A_{37}	A_{38}	deep	A_{39}	A_{40}	A_{41}	A_{42}	A_{43}	A_{44}	A_{45}	deep	A_{46}	A_{47}	A_{48}	A_{49}	A_{50}	A_{51}	A_{52}
20	58	58	193	—	50.8	19	23.8	46	19	—	M10	17	——	M27 x 2	27.9	25	50	38	M3	9	257	226	230	108	42	8.8	8
28	58	58	189	—	50.8	19	23.8	46	33	—	M10	17	——	M27 x 2	27.9	25	50	38	M3	9	269	234	2420	108	42	8.8	8
40	71	81	253	261	50.8	19	23.8	53	23	98	M10	17	M18 x1.5	M33 x 2	32.9	30	60	40	M4	10	323	290	279	134	—	11.2	10
55	71	81	249	—	50.8	19	23.8	53	40	—	M10	17	——	M33 x 2	32.9	30	60	40	M4	10	337	299	292	134	—	11.2	10
58	86	92	301	313	57.2	25	27.8	64	26	109	M12	18	M18 x1.5	M42 x 2	38	35	70	62	M5	12	378	344	330	155.5	52	18	16
80	86	92	297	—	57.2	25	27.8	64	47	—	M12	18	——	M42 x 2	38	35	70	62	M5	12	391	354	343	155.5	52	18	16
78	89	93	306	318	57.2	25	27.8	64	28	119	M12	18	M18 x1.5	M42 x 2	43.1	40	80	55	M5	12	385	342	338	169	52	18	16
107	89	93	301	—	57.2	25	27.8	64	19	—	M12	18	——	M42 x 2	43.1	40	80	55	M5	12	400	363	351	169	52	18	16
117	104	113	359	369	66.7	32	31.8	70	32	136	M14	19	M18 x1.5	M45 x 2	48.5	45	90	65	M5	12.5	445	408	384	192	65	18	16
160	104	113	354	—	66.7	32	31.8	70	57	—	M14	19	——	M48 x 2	48.5	45	90	65	M5	12.5	461	420	399	192	65	18	16

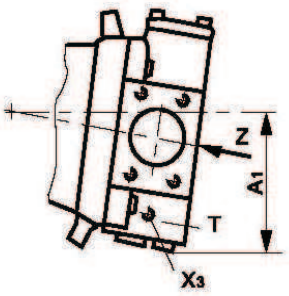
											A63							
											Keyed	Keyed	Splined	Splined		Connection	Connection	Weight
size	A_{53}	A_{54}	A_{55}	A_{56}	A_{57}	A_{58}	A_{59}	A_{60}	A_{61}	A_{62}	GB1096 79	GB1096 79	DIN5180	GB3478.1 83	R_1	R	A_1 X_3	kg
20	161	14	176	77	104	129	35	30	228	92	2 x 10	8 x 40	W25 x 1.25 x 18 x 9g	EXT18Z x 1.25m x 30R x 5f	12	M16 x 1.5	M12 x 1.5	19
28	161	14	186	58	84	144	35	30	238	73	2 x 10	8 x 40	W25 x 1.25 x 18 x 9g	EXT18Z x 1.25m x 30R x 5f	12	M16 x 1.5	M12 x 1.5	19
40	184	16	204	85	117	147	30	30	276	104	3 x 10	8 x 50	W30 x 2 x 14 x 9g	EXT14Z x 2m x 30R x 5f	12	M16 x 1.5	M12 x 1.5	28
55	184	16	215	62	98	128	30	30	288	83	3 x 10	8 x 50	W30 x 2 x 14 x 9g	EXT14Z x 2m x 30R x 5f	12	M18 x 1.5	M12 x 1.5	28
58	228	24	251	91	116	142	33	33	328	104	5 x 16	10 x 56	W35 x 2 x 16 x 9g	EXT16Z x 2m x 30R x 5f	12	M18 x 1.5	M18 x 1.5	44
80	228	24	265	65	91	120	33	33	339	80	5 x 16	10 x 56	W35 x 2 x 16 x 9g	EXT16Z x 2m x 30R x 5f	12	M18 x 1.5	M18 x 1.5	44
78	236	24	261	99	124	150	33	33	336	112	5 x 16	12 x 63	W40 x 2 x 18 x 9g	EXT18Z x 2m x 30R x 5f	12	M18 x 1.5	M18 x 1.5	53
107	236	24	276	71	97	126	33	33	348	86	5 x 16	12 x 63	W40 x 2 x 18 x 9g	EXT18Z x 2m x 30R x 5f	12	M18 x 1.5	M18 x 1.5	53
117	266	24	294	111	137	164	34	34	382	125	5 x 16	14 x 70	W45 x 2 x 21 x 9g	EXT21Z x 2m x 30R x 5f	12	M22 x 1.5	M20 x 1.5	76
160	266	24	310	79	108	137	34	34	396	96	5 x 16	14 x 70	W45 x 2 x 21 x 9g	EXT21Z x 2m x 30R x 5f	12	M22 x 1.5	M20 x 1.5	76

DR Constant Pressure Control

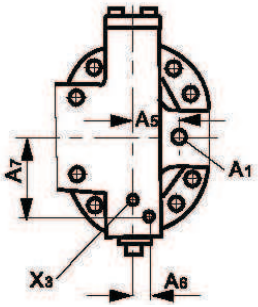
Standard Model



Remote Control



Detail z



A1 and X3 only for remote control

Other dimensions see LV.

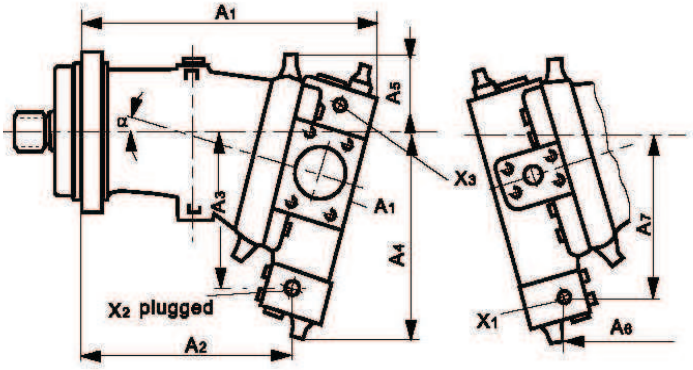
T1: M12 x 1.5

Size	a	A1	A2	A3	A4	A5	A6	A7
20	9°	251	134	95	106	38	—	—
40	9°	315	166	107	127	40	14	53
58	9°	372	160	107	138	62	15	69
78	9°	380	180	114	147	60	14	70
117	9°	441	199	132	165	65	14	83

HD Hydraulic Control, Pressure Related

Size	a	A1	A2	A3	A4	A5	A6	A7
20	9°	248	175	132	182	75	190	147
28	16°	253	158	143	195	75	172	160
40	9°	312	236	151	206	110	233	166
55	16°	318	217	166	220	84	212	180
58	9°	367	287	158	213	110	285	170
80	16°	373	266	175	232	105	263	186
78	9°	375	292	170	225	122	290	182
107	16°	382	270	188	245	106	266	200
117	9°	434	333	188	250	132	331	200
160	16°	442	308	209	272	114	305	220

Other dimensions see LV.

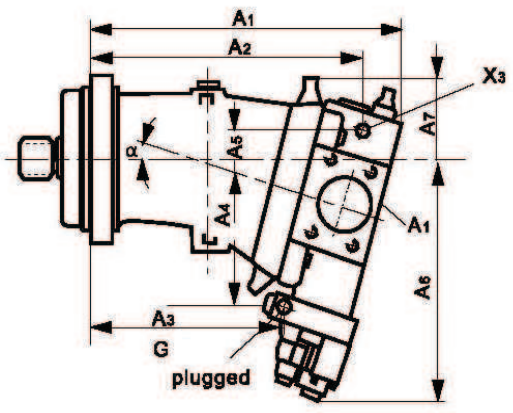


A1 and X3 with pressure cut-off only

EP Electric Proportional Control

Size	a	A1	A2	A3	A4	A5	A6	A7
20	9°	248	182	144	113	54	216	75
28	16°	252	188	130	121	41	229	75
40	9°	312	267	201	130	49	234	110
55	16°	318	217	184	140	29	249	84
58	9°	367	320	249	141	52	245	110
80	16°	373	325	231	154	29	264	105
78	9°	374	325	254	153	55	257	122
107	16°	381	330	234	167	31	277	106
117	9°	434	381	294	172	64	279	132
160	16°	442	387	272	187	36	298	114

Other dimensions see LV.



A1 and X3 with pressure cut-off only

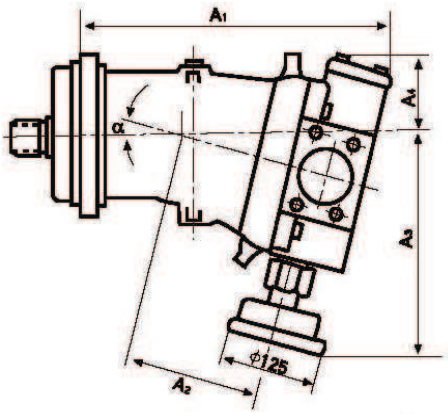
MA Manual Control

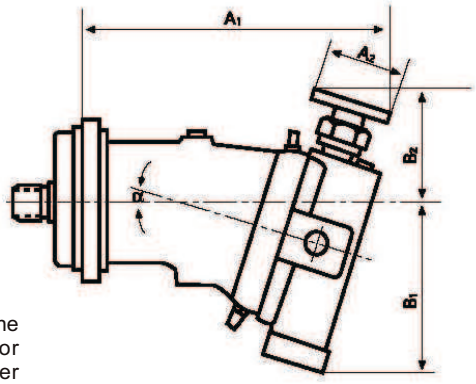
handwheel downwards

Size	a	A_1	A_2	A_3	A_4
20	9°	251	108	175	95
28	16°	260	108	190	80
40	9°	315	134	197	108
55	16°	323	134	215	89
58	9°	327	155.5	215	107
80	16°	380	155.5	235	86
78	9°	380	169	246	144
107	16°	390	169	270	92
117	9°	441	192	261	132
160	16°	450	192	285	107

handwheel upwards

Size	a	A_1	A_2	B_1	B_2
20	9°	—	—	—	—
28	16°	—	—	—	—
40	9°	317	100	175	132.5
58	9°	—	—	—	—
80	16°	—	—	—	—
78	9°	315	1000	180	157.5
107	16°	383	100	270.5	132.5
117	19°	—	—	—	—
160	16°	445	100	225	143
250	26.5	584	120	320	230

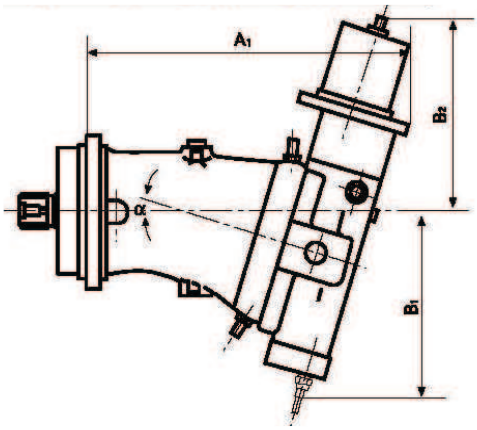




Please give clear indication of the handwheels are upwards or downwards, when you order goods!

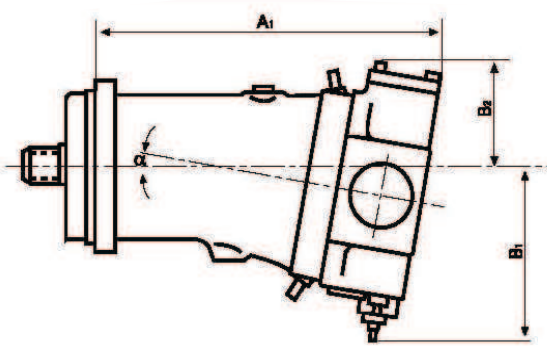
NC Numerical Control

Size	a	A_1	B_1	B_2
107	16°	419	225.5	224.5



LVS Constant HP Control with Load Sensing

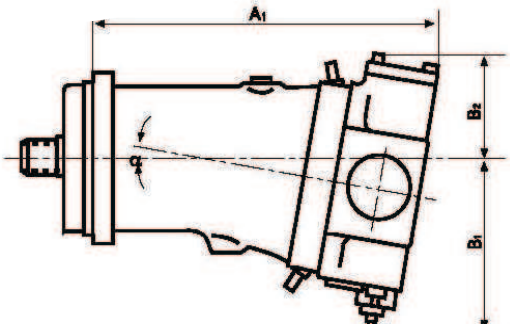
Size	a	A_1	B_1	B_2
117	9°	443	215	137



DRS

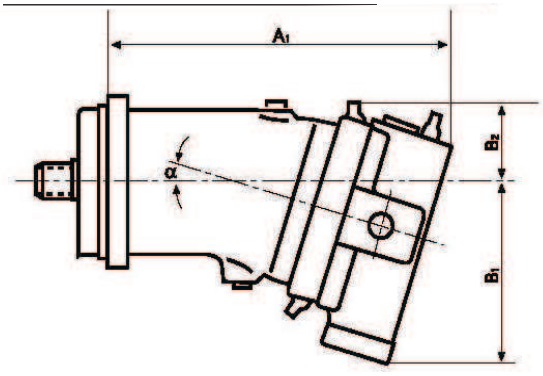
Constant Pressure Control with Load Sensing SC

Size	a	A_1	B_1	B_2
117	9°	441	214	132



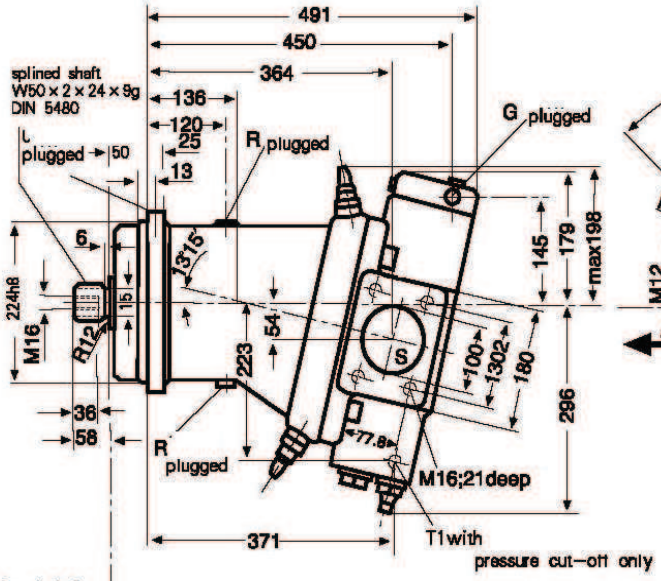
SC Brake Control

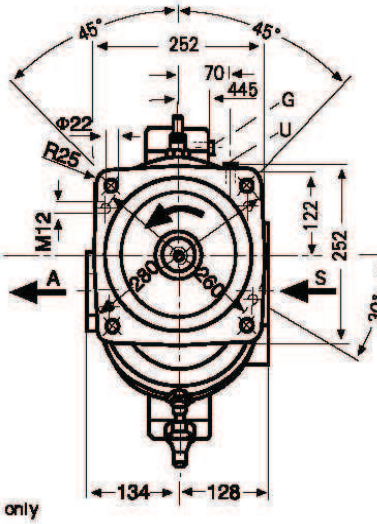
Size	a	A_1	B_1	B_2
160	16°	441	230	98

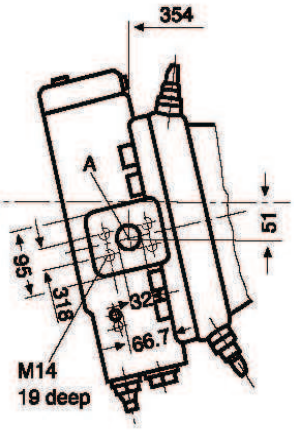


Unit dimensions Size-250

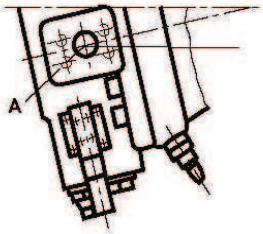
Constant HP control

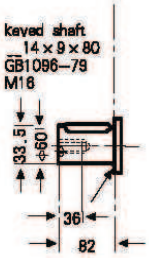






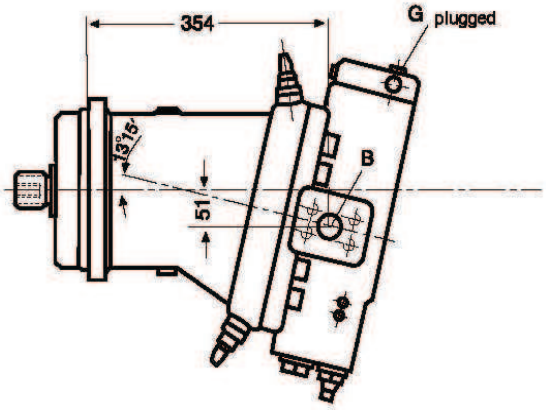
With Pressure Cut-Off

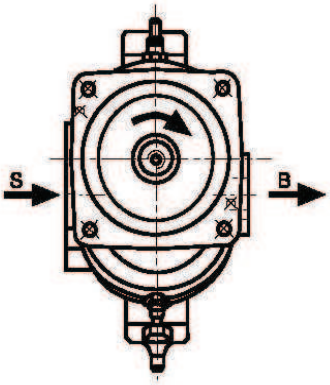


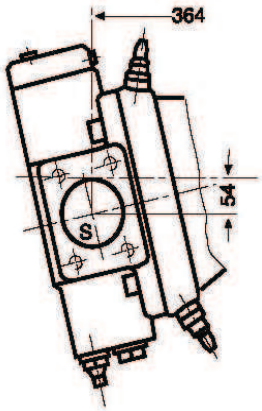


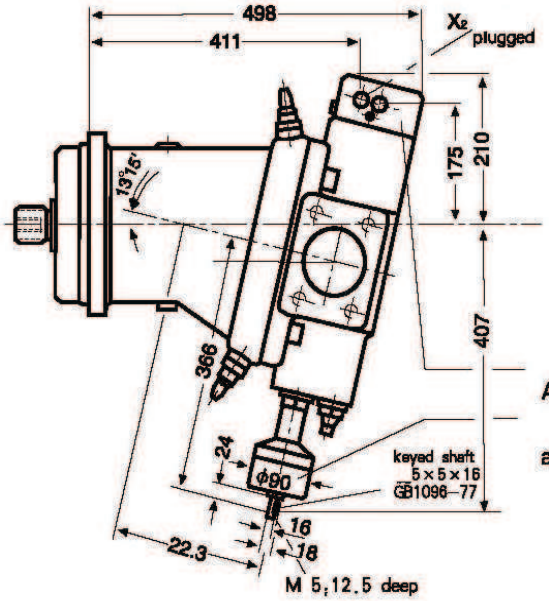
Model for Anti-Clockwise Rotation

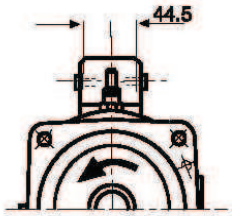
Model for Clockwise Rotation

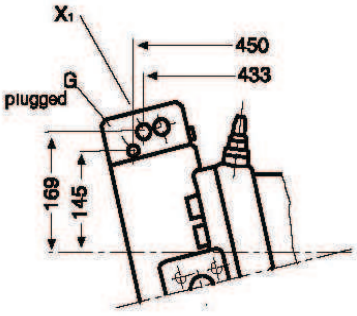












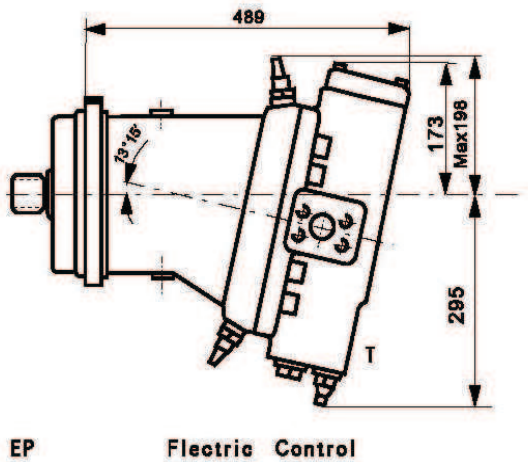
Auxiliary equipment; hydraulic stroke limiter (for LV)

anxiliary equipment; mechanical stroke limiter (for LV and DR)

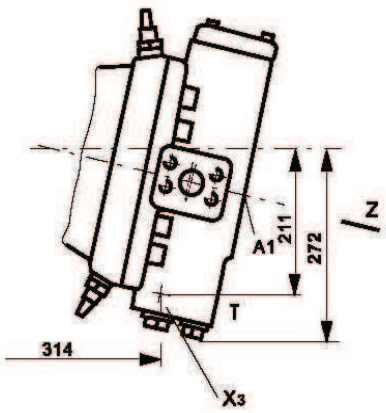
Weight, size 250; approx. 105kg

DR Constant Pressure Control

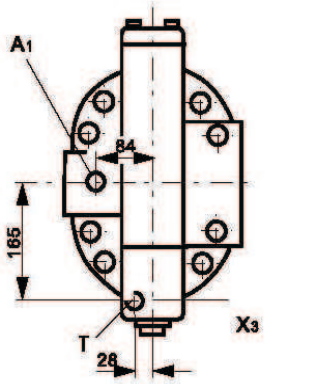
Standard Model



Remote Control

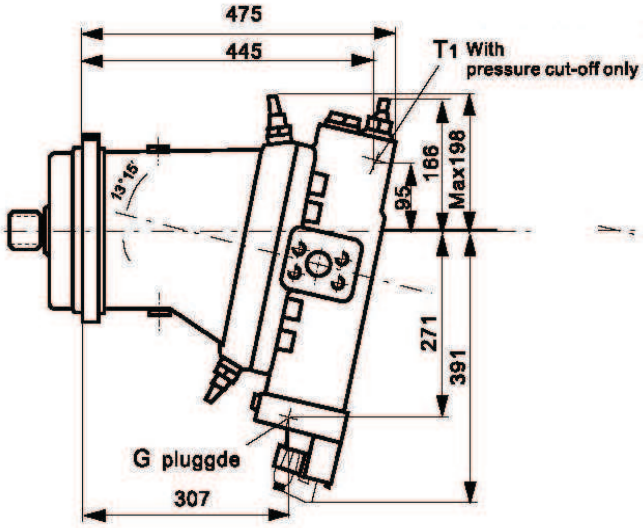


Detail z



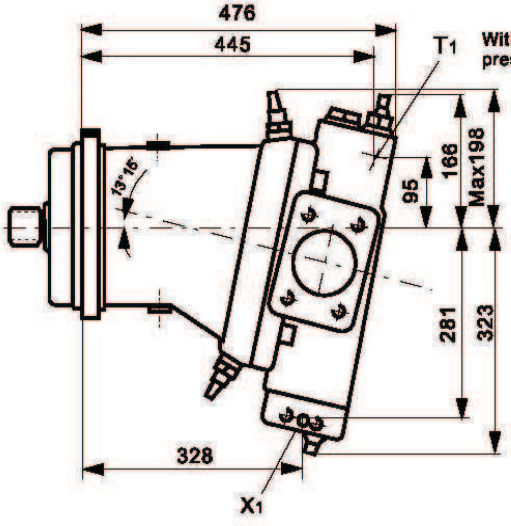
A1 and X3 only for remote conrtol

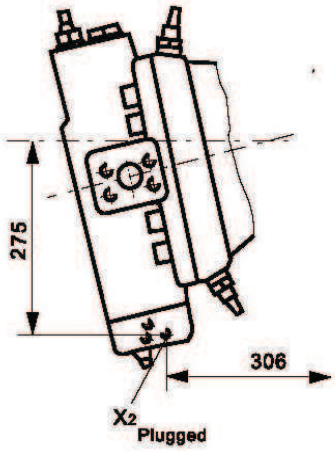
EP Flectric Control



With Pressure Cut-off

HD Hydraulic Control, Pressure Rclatcd



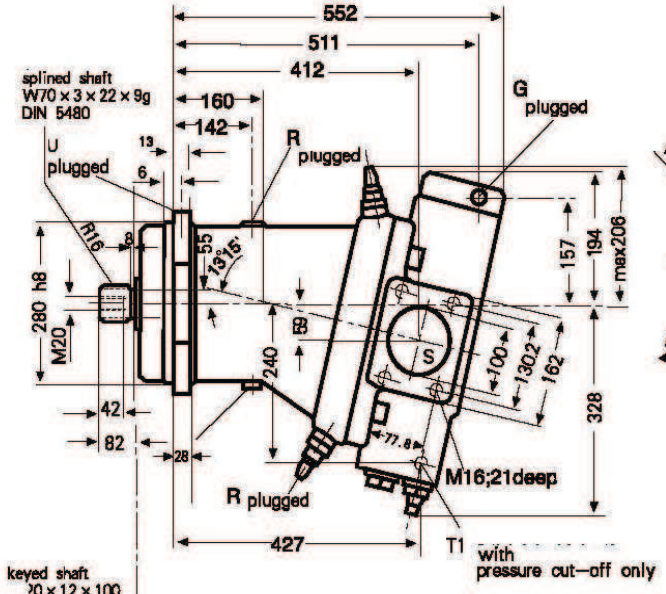


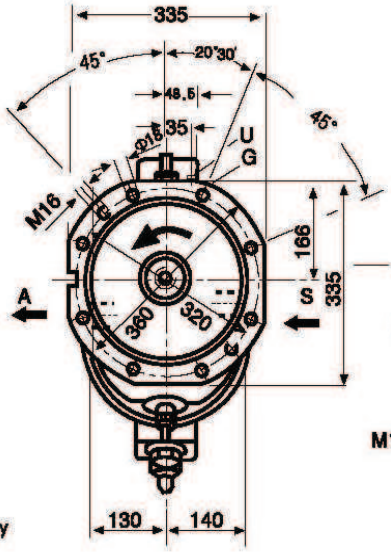
With pressure cut-off only

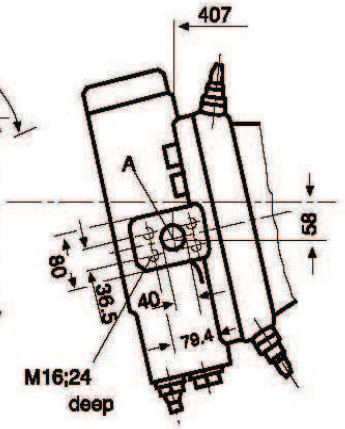
A,B	service lines
S	suction line
G	remote control pressure M14 x 1.5 (connection for summation HP control)
A_1,X_3	ports for remote control valve M16 x 1.5
U	flushing port M14 x1.5
X_1	pilot pressure M14 x 1.5
X_2	remote control pressure (HD) M14 x 1.5
T	pilot oil return line M16 x1.5
T_1	pilot oil return line M22 x1.5
R.	air bleed M22 x 2

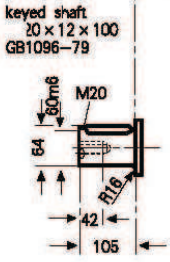
Unit dimensions Size-355

LV Constant HP control





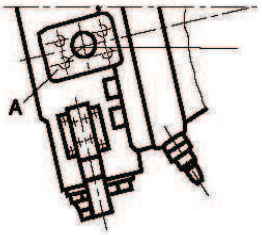


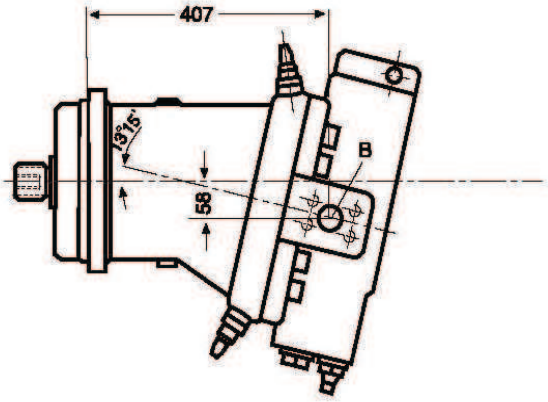


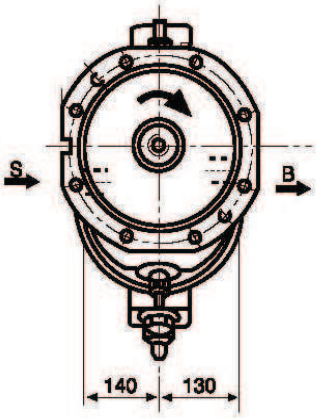
Model for Anti-Clockwise Rotation

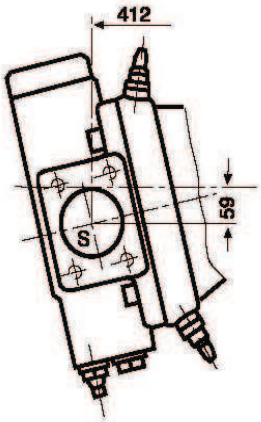
Model for Clockwise Rotation

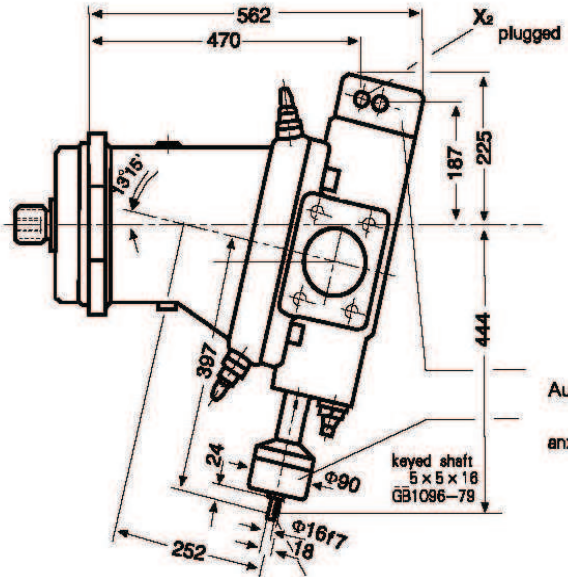
With Pressure Cut-Off

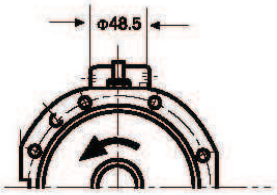


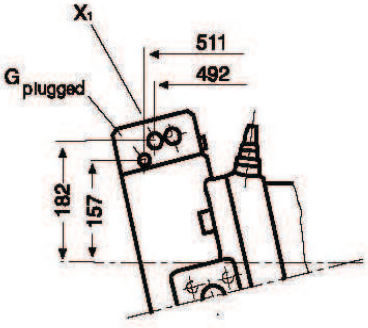












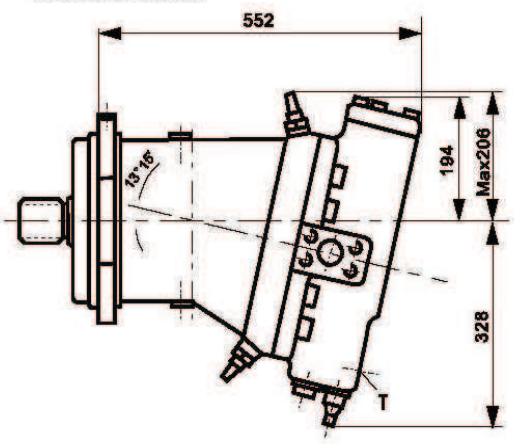
Auxiliary equipment: hydraulic stroke limiter (for LV)

anxiliart equipment: mechanical stroke limiter (for LV and DR)

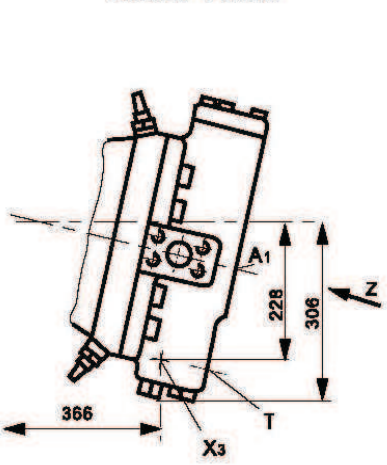
Weight, size 5355: approx. 165kg

DR Constant Pressure Control

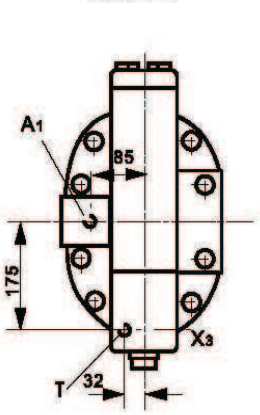
Standard Model



Remote Control

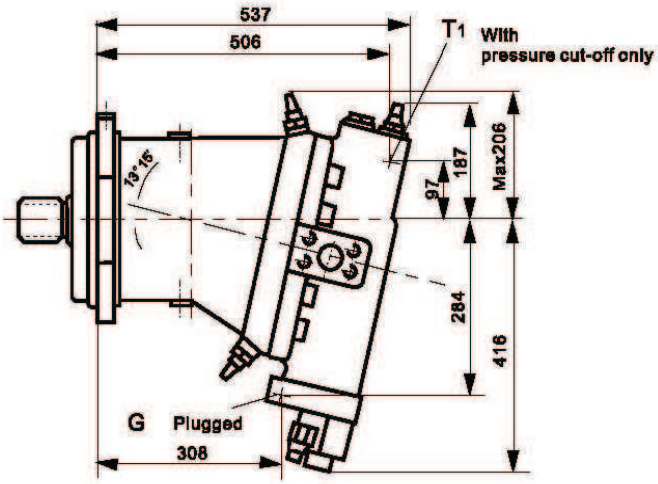


Detail z

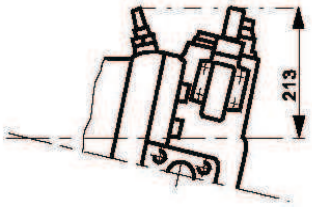


EP **Flectric Control**

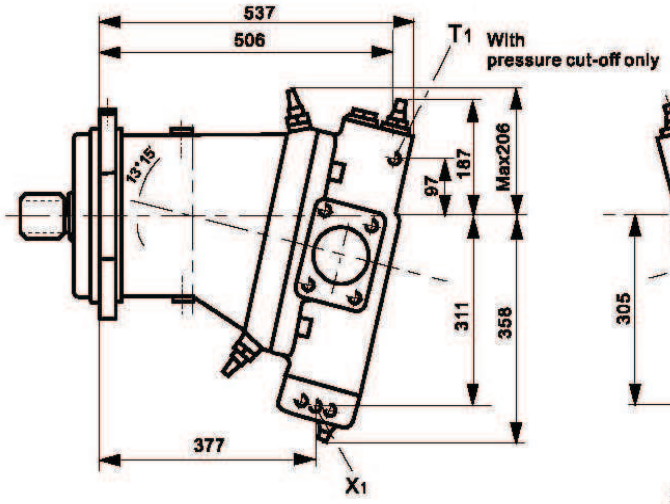
A1 and X3 only for remote conrtol

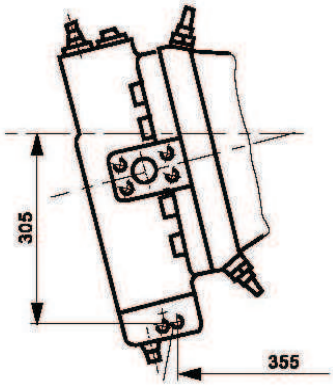


With Pressure Cut -off

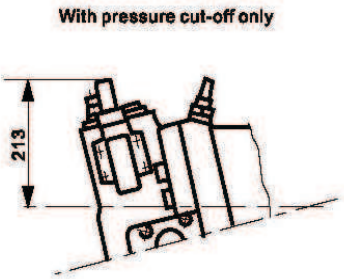


HD **Hydraulic Control, Pressure Rclatcd**





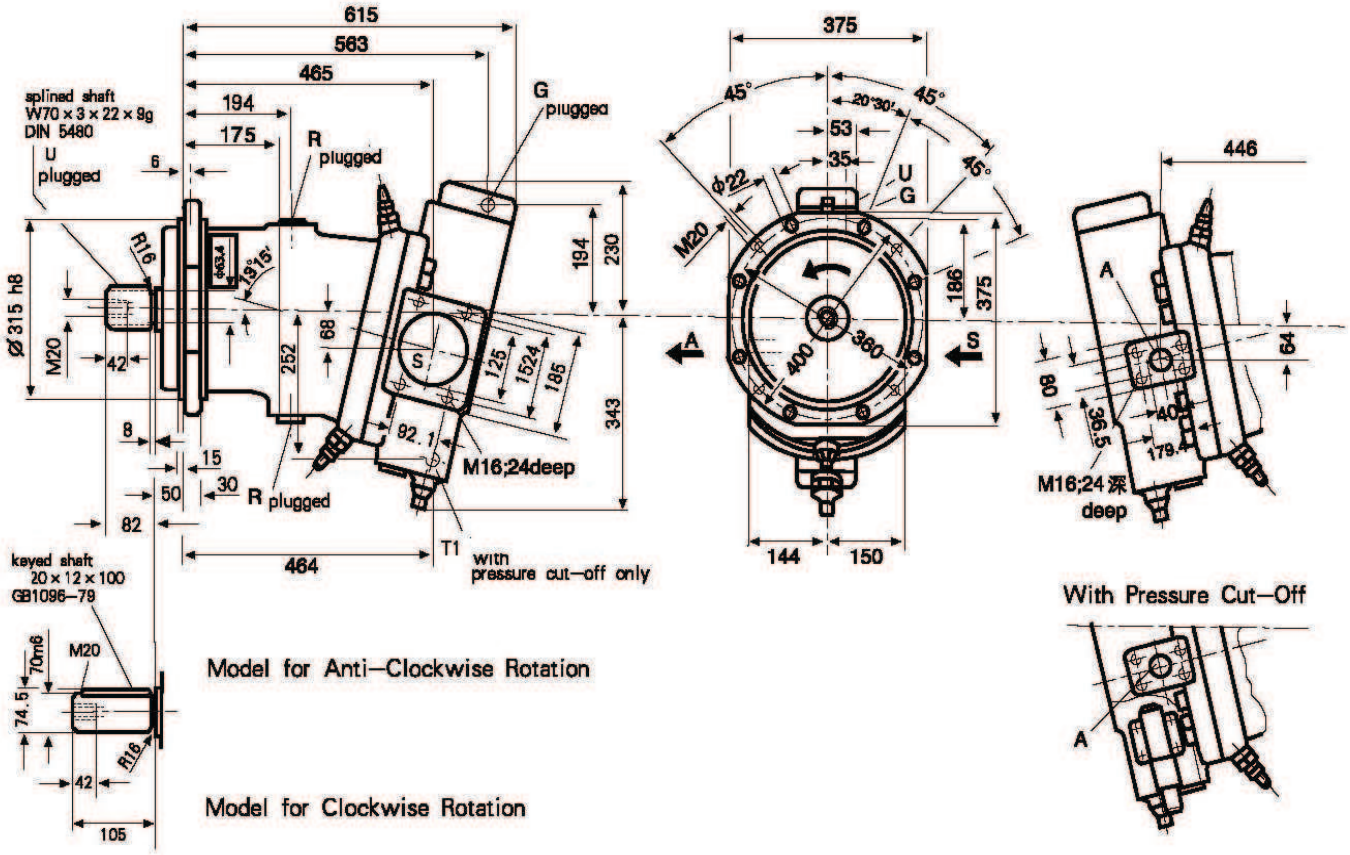
With pressure cut-off only

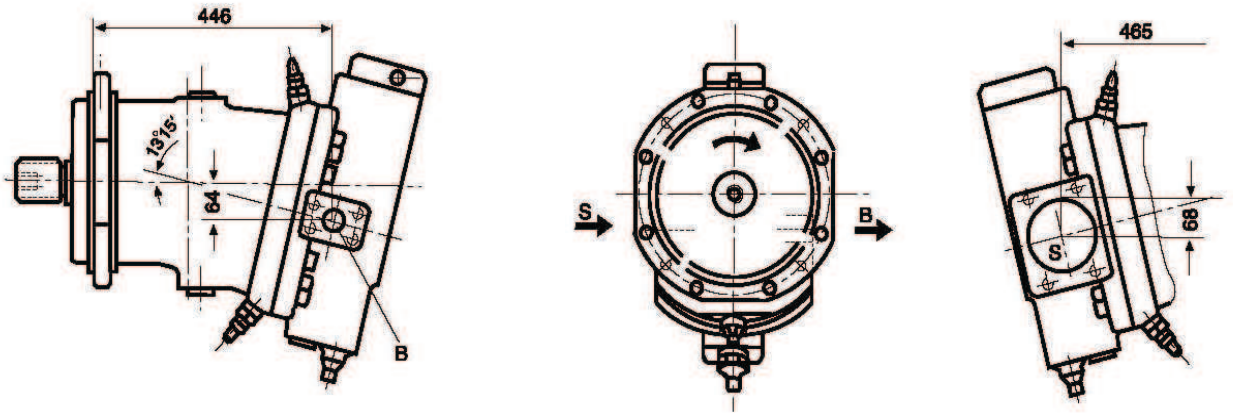


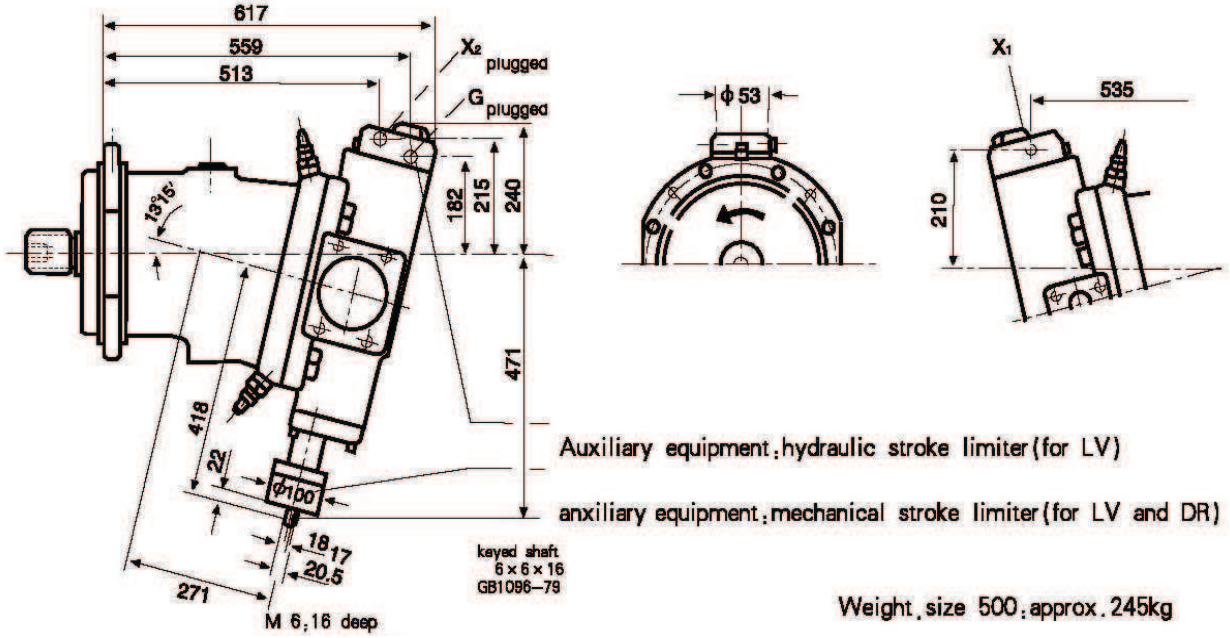
A,B	service lines	A_1, X_3	ports for remote control valve M22 x 1.5
S	suction line	T	pilot oil return line M16 x1.5
G	remote control pressure M16 x 1.5 (connection for summation HP control)	T_1	pilot oil return line M22 x1.5
		R	air bleed M33 x 2
X_1	pilot pressure M16 x 1.5	U	flushing port M14 x 1.5
X_2	remote control pressure (HD) M16 x 1.5		

Unit dimensions Size-500

LV Constant HP control

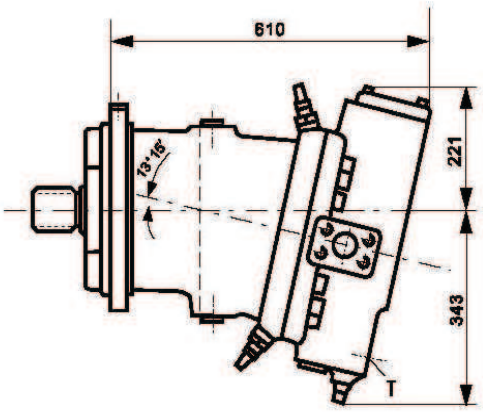






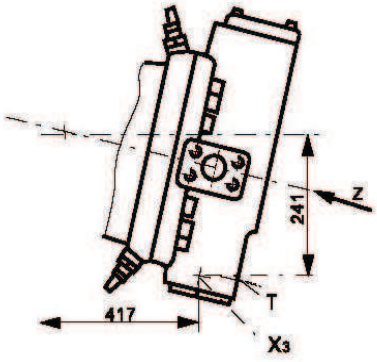
DR Constant Pressure Control

Standard Model

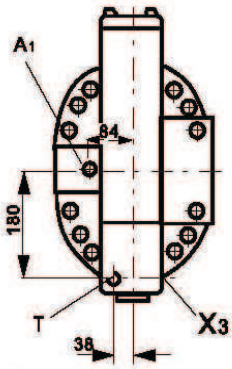


Electric Control

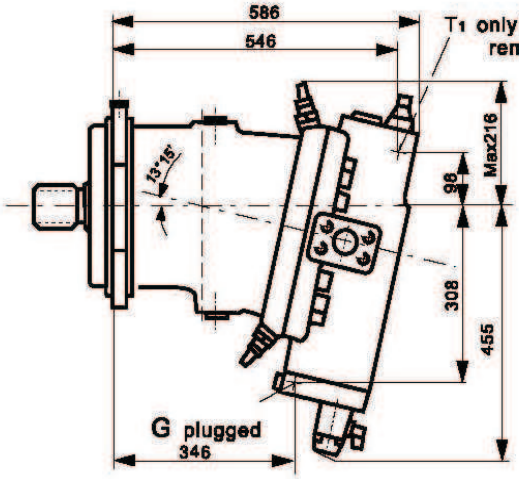
Remote Control



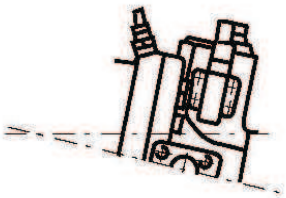
Detail z



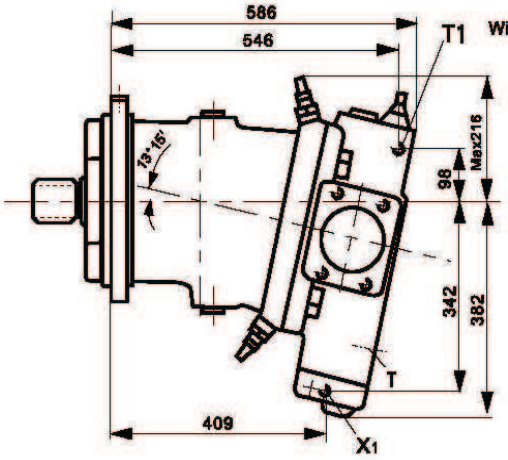
A1 and X3 only for remote conrtol

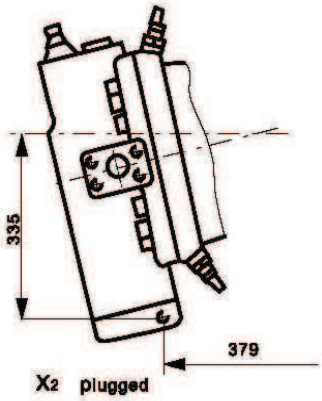


With Pressure Cut -off

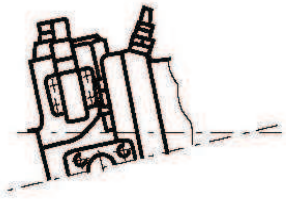


Hydraulic Control, Pressure Rclatcd





With Pressure Cut-Off



A,B	service lines	A_1, X_3	ports for remote control valve M22 x 1.5
S	suction line	T	pilot oil return line M16 x1.5
G	remote control pressure (connection for summation HP control)	T_1	pilot oil return line M22 x1.5
		R	air bleed M33 x 2
X_1	pilot pressure M16 x 1.5	U	flushing port M14 x 1.5
X_2	remote control pressure (HD) M16 x 1.5		

Notice

1. **The fluid must be filtered. Minimum filter fineness is 20 μm.**
2. **The tank must be sealing up and an air filter must be installed on air entrance.**
3. **Products without subplate when leaving factory, if need them, please ordering specially.**
4. **Valve fixing screws must be high intensity level (class 10.9). Please select and use them according to the parameter listed in the sample book.**
5. **Roughness of surface linked with the valve is required to** 

.
6. **Surface finish of mating piece is required to 0.01/100mm.**

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