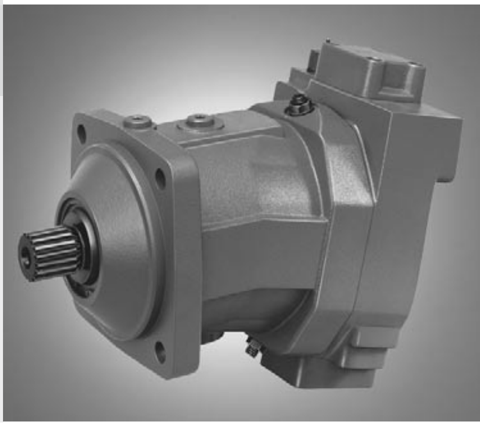
Rexroth
Bosch Group

Axial Piston Variable Pump A7VO

Data sheet



Series 63
Sizes 28...160
Nominal pressure 350 bar
Peak pressure 400 bar
Open circuit

Contents

Features

– Variable pump with axial tapered piston rotary group of bent-axis design, for hydrostatic drives in open circuits

– For use in mobile and stationary application areas

– The flow is proportional to the drive speed and to the displacement, and is infinitely variable from $q_{v\ max}$ to $q_{v\ min} = 0$

– Wide selection of control devices

– Compact, robust bearing system with long service life

Ordering Code / Standard Program

A7V	O			/	63		–			B	01	
01	02	03	04		05	06		07	08	09	10	11

Axial piston unit

01	Bent-axis design, variable, nominal pressure 350 bar, peak pressure 400 bar	**A7V**

Operation mode

02	Pump in open circuit	**O**

Size

03	≈ Displacement $V_{g\ max}$ in cm^3	**28**	**55**	**80**	**107**	**160**
	See RE 92203			250	355	500

	Control device			**28**	**55**	**80**	**107**	**160**	
04	Power controller			●	●	●	●	●	**LR**
	With pressure cut-off			●	●	●	●	●	**LRD**
	With pressure cut-off and stroke limiter	Negative control	Δp = 25 bar	–	●	●	●	●	**LRDH1**
	With stroke limiter	Negative control	Δp = 25 bar	–	●	●	●	●	**LRH1**
	Pressure controller			●	●	●	●	●	**DR**
	Remote controlled			●	●	●	●	●	**DRG**
	With load sensing			–	●	●	●	●	**DRS**
	Hydraulic control, pilot-pressure related (positive control)		Δp = 10 bar	●	●	●	●	●	**HD1**
			Δp = 25 bar	●	●	●	●	●	**HD2**
	For pressure cut-off, remote controlled		Δp = 10 bar	●	●	●	●	●	**HD1G**
			Δp = 25 bar	●	●	●	●	●	**HD2G**
	Electric control with proportional solenoid (positive control)			●	●	●	●	●	**EP**
	For pressure cut-off, remote controlled			●	●	●	●	●	**EPG**

	Series	**28**	**55**	**80**	**107**	**160**	
05	Series 6, index 3	●	●	●	●	●	**63**

	Direction of rotation		**28...160**	
06	Viewed from shaft end	Clockwise	●	**R**
		Counter-clockwise	●	**L**

	Seals	**28**	**55**	**80**	**107**	**160**	
07	NBR (nitrile-caoutchouc), shaft seal ring in FKM (fluor-caoutchouc)	●	●	●	●	●	**N**

	Shaft end	**28**	**55**	**80**	**107**	**160**	
08	Splined shaft, DIN 5480	●	●	●	●	●	**Z**
	Parallel keyed shaft DIN 6885	●	●	●	●	●	**P**

	Mounting flange	**28**	**55**	**80**	**107**	**160**	
09	4-hole – ISO 3019-2	●	●	●	●	●	**B**

	Service line ports	**28**	**55**	**80**	**107**	**160**	
10	SAE flange port B or A at rear (metric fixing thread) SAE flange port S at rear (metric fixing thread)	●	●	●	●	●	**01**

Standard / special version

11	Standard version (without code)	
	Special version	**-S**

▭ = preferred program ● = available – = not available

Technical Data

Hydraulic fluid

Before starting project planning, please refer to our data sheets RE 90220 (mineral oil), RE 90221 (environmentally acceptable hydraulic fluids) and RE 90223 (HF hydraulic fluids) for detailed information regarding the choice of hydraulic fluids and application conditions.

The A7VO variable pump is not suitable for operation with HFA. If HFB, HFC and HFD or environmentally acceptable hydraulic fluids are being used, the limitations regarding technical data and seals mentioned in RE 90221 and RE 90223 must be observed.

When ordering, please indicate the used hydraulic fluid.

Operating viscosity range

We recommend that a viscosity (at operating temperature) for optimum efficiency and service life purposes of

ν_{opt} = optimum operating viscosity 16 to 36 mm^2/s

be chosen, taken the tank temperature (open circuits) into account.

Limits of viscosity range

The following values apply in extreme cases:

$\nu_{min} = 5$ mm^2/s
short-term ($t < 3$ min)
at max. permissible temperature of $t_{max} = +115$°C.

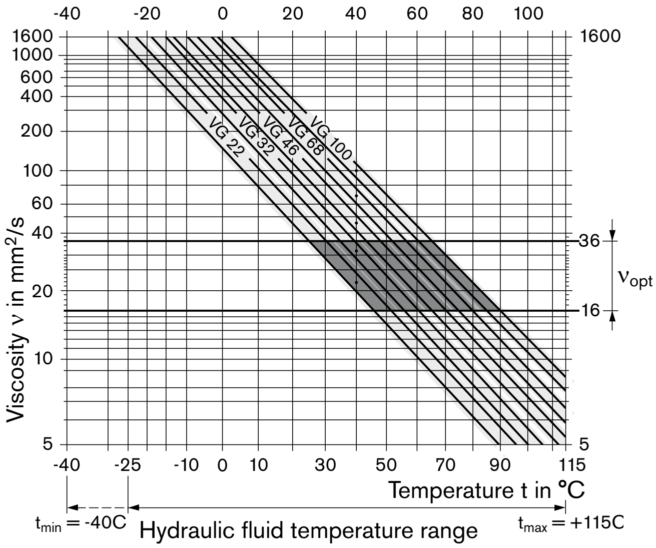
$\nu_{max} = 1600$ mm^2/s,
short-term ($t < 3$ min)
at cold start ($p \leq 30$ bar, $n \leq 1000$ rpm, $t_{min} = -40$°C).
Only for starting up without load. Optimum operating viscosity must be reached within approx. 15 minutes.

Note that the maximum hydraulic fluid temperature of 115°C must not be exceeded locally either (e.g. in the bearing area). The temperature in the bearing area is - depending on pressure and speed - up to 12 K higher than the average case drain temperature.

Special measures are necessary in the temperature range from -40°C and -25°C (cold start phase), please contact us.

For detailed information about use at low temperatures, see RE 90300-03-B.

Selection diagram



Details regarding the choice of hydraulic fluid

The correct choice of hydraulic fluid requires knowledge of the operating temperature in relation to the ambient temperature, in an open circuit the tank temperature.

The hydraulic fluid should be chosen so that the operating viscosity in the operating temperature range is within the optimum range ($\nu_{opt.}$) - the shaded area of the selection diagram. We recommended that the higher viscosity class be selected in each case.

Example: At an ambient temperature of X°C an operating temperature of 60°C is set. In the optimum operating viscosity range (ν_{opt}; shaded area) this corresponds to the viscosity classes VG 46 or VG 68; to be selected: VG 68.

Note:
The case drain temperature, which is affected by pressure and speed, is always higher than the tank temperature. At no point in the system may the temperature be higher than 115°C.

If the above conditions cannot be maintained due to extreme operating parameters, we recommend flushing the case at port U.

Filtration

The finer the filtration, the higher the cleanliness level of the hydraulic fluid and the longer the service life of the axial piston unit.

To ensure functional reliability of the axial piston unit, the hydraulic fluid must have a claenliness level of at least

20/18/15 according to ISO 4406.

At very high hydraulic fluid temperatures (90°C to max. 115°C) at least cleanliness level

19/17/14 according to ISO 4406 is required.

If the above classes cannot be observed, please contact us.

Technical Data

Operating pressure range

Input

Pressure on port S

The minimum permissible inlet pressure depends on the drive speed. The following limit values must not be exceeded or undercut.

$p_{abs\ min}$ ________________________ 0.8 bar

The maximum pressure $p_{abs\ max}$ also depends on the speed (see diagram on page 5).

Output

Maximum pressure on port B or A
(pressure data according to DIN 24312)

Drive shaft	Nominal pressure p_N	Peak pressure p_{max}
Without radial loading (coupling)	350 bar	400 bar
With radial loading [1] (pinion, v-belt)	315 bar	350 bar

[1]) Note permissible radial loading, see page 6

Nominal pressure: Max. design pressure at which fatigue strength is ensured.

Peak pressure: Max. operating pressure which is permissible for short-term (t < 0.1 s).

Direction of flow

Direction of rotation, viewed from shaft end Clockwise	Counter-clockwise
S to **B**	**S** to **A**

Case drain fluid

The case drain chamber is connected to the suction chamber. A case drain line to the tank is not required (both R-ports are plugged).

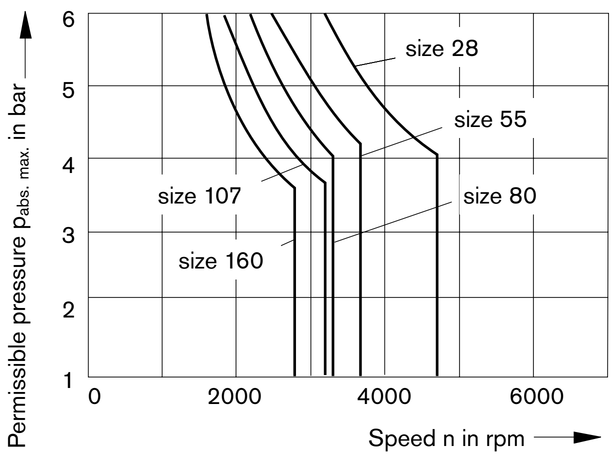
Exception:
On the version with pressure controller or pressure cut-off, a case drain line is required for discharge from port T_1 to the tank.

Shaft seal ring

Permissible pressure load

The service life of the shaft seal ring is affected by the speed of the pump and the case drain pressure. It is recommended that the average, continuous case drain pressure at operating temperature 3 bar absolute not be exceeded (max. permissible case drain pressure 6 bar absolute at reduced speed, see diagram). Short-term (t < 0.1 s) pressure spikes of up to 10 bar absolute are permitted. The service life of the shaft seal ring decreases with an increase in the frequency of pressure spikes.

The case pressure must be equal to or greater than the external pressure on the shaft seal ring.



Temperature range

The FKM shaft seal ring is permissible for case drain temperatures of -25°C to +115°C.

Note:
For application cases below -25°C, an NBR shaft seal ring is necessary (permissible temperature range: -40°C to +90°C). Please state NBR shaft seal ring in plain text when ordering. Please consult us.

Technical Data

Table of values (theoretical values, without efficiency and tolerances; values rounded)

Size				28	55	80	107	160
Displacement		$V_{g\,max}$	cm³	28.1	54.8	80	107	160
Speed max. 1)	at $V_{g\,max}$	n_{max1}	rpm	3150	2500	2240	2150	1900
	at $V_g < 0.74 \cdot V_{g\,max}$ (see diagram)	n_{max2}	rpm	4250	3400	3000	2900	2560
Speed max. 2)		$n_{max\,perm.}$	rpm	4750	3750	3350	3200	2850
Flow	at n_{max1} and $V_{g\,max}$	$q_{V\,max1}$	L/min	89	137	179	230	304
Power	at $q_{v\,max1}$ and $\Delta p = 350$ bar	P_{max1}	kW	52	80	105	134	177
Torque	at $V_{g\,max}$ and $\Delta p = 350$ bar	T_{max}	Nm	156	305	446	596	891
Rotary stiffness	$V_{g\,max}$ to $0,5 \cdot V_{g\,max}$	c_{min}	Nm/rad	5546	10594	15911	21469	36073
	$0,5 \cdot V_{g\,max}$ to $0_{(interpolated)}$	c_{max}	Nm/rad	16541	32103	48971	67666	104622
Moment of inertia for rotary group		J_{TW}	kgm²	0.0042	0.0042	0.0080	0.0127	0.0253
Angular acceleration maximum		α	rad/s²	35900	31600	24200	19200	15300
Filling capacity		V	L	0.5	0.75	1.2	1.5	2.4
Mass (approx.)		m	kg	17	25	40	49	71

1) The values shown are valid for absolute pressure (p_{abs}) 1 bar at suction port S and for operation with mineral fluids with a specific mass of 0.88 kg/l.
2) Maximum speed (limiting speed) with increased inlet pressure p_{abs} at suction port S and $V_g < V_{g\,max}$

Caution: Exceeding the permissible limit values may result in a loss of function, a reduction in service life or in the destruction of the axial piston unit.
Other permissible limit values with respect to speed variation, reduced angular acceleration as a function of the frequency and the permissible startup angular acceleration (lower than the maximum angular acceleration) can be found in data sheet RE 90261.

Determining the size

Flow $q_v = \dfrac{V_g \cdot n \cdot \eta_v}{1000}$ L/min

Torque $T = \dfrac{V_g \cdot \Delta p}{20 \cdot \pi \cdot \eta_{mh}}$ Nm

Power $P = \dfrac{2\,\pi \cdot T \cdot n}{60000} = \dfrac{q_v \cdot \Delta p}{600 \cdot \eta_t}$ kW

V_g = Displacement per revolution in cm³

Δp = Differential pressure in bar

n = Speed in rpm

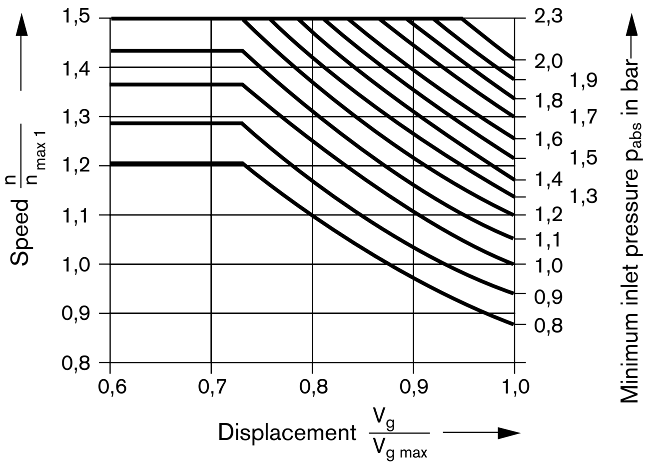
η_v = Volumetric efficiency

η_{mh} = Mechanical-hydraulic efficiency

η_t = Overall efficiency ($\eta_t = \eta_v \cdot \eta_{mh}$)

Minimum permissible inlet pressure at suction port S with increased speed

In order to avoid damage to the pump (cavitation) a minimum inlet pressure at the suction port must be assured. The minimum inlet pressure depends on the speed and the displacement of the variable pump.



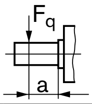
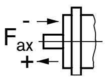
Note:

- Max. speed n_{max} (limiting speed, see table of values)
- Min. and max. permissible pressure at port S

Technical Data

Permissible radial and axial loading on the drive shaft

The specified values are maximum values and do not apply to continuous operation.

Size				28	55	80	107	160
Radial force, max. at distance a from shaft collar		$F_{q\ max}$	N	5696	9280	11657	13580	18062
		a	mm	12.5	15	17.5	20	22.5
Radial force/bar operating pressure [1]		F_q/bar	N/bar	14.2	23.2	29.1	34	45.2
Axial force, max.[2]		$+ F_{ax\ max}$	N	315	500	710	900	1120
		$- F_{ax\ max}$	N	315	500	710	900	1120
Permissible axial force/ bar operating pressure		$\pm F_{ax\ perm.}$/bar	N/bar	4.6	7.5	9.6	11.3	15.1

[1]) For toothed gear drive (DIN 867) with minimum pinion pitch circle diameter $D_{R\ min}$ and $V_{g\ max}$ ($D_{R\ min} = 2.5 \times D_{shaft\ end}$). Necessary pre-tension/bar operating pressure (radial force) for transmitting the torque with v-belt drive (DIN 7753) with minimum gear diameter $D_{K\ min}$ and $V_{g\ max}$ ($D_{K\ min} = 5 \times D_{shaft\ end}$).

[2]) Max. permissible axial force when at a downtime or when axial piston unit operating in depressurized condition.

When considering the permissible axial force, the force-transfer direction must be taken into account.

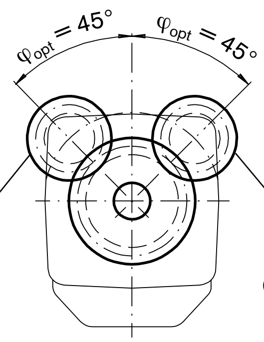
$- F_{ax\ max}$ = increase in service life of bearings

$+ F_{ax\ max}$ = reduction in service life of bearings (avoid if possible)

Effect of radial force F_q on the service life of bearings

By selecting a suitable force-transfer direction of F_q, the stress on the bearings caused by the internal transmission forces can be reduced, thus achieving the optimum service life of the bearings. Recommended position of mating gear is dependent on direction of rotation. Examples:

Toothed gear drive



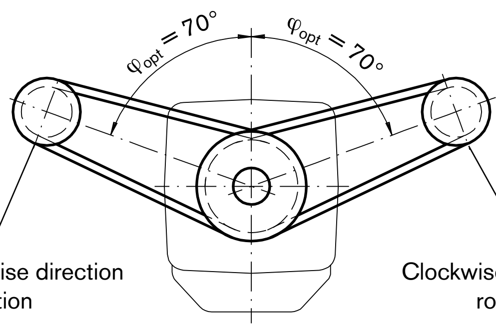
Clockwise direction of rotation

Pressure on port **B**

Counter-clockwise direction of rotation

Pressure on port **B**

V-belt drive



Clockwise direction of rotation

Pressure on port **B**

LR - Power Controller

The power controller controls the displacement of the pump depending on the operating pressure so that a defined drive power is not exceeded at a constant drive speed.

$$p_B \cdot V_g = \text{constant}$$

p_B = operating pressure; V_g = displacement

The precision of the control along the hyperbolic characteristic provides for optimum power utilization.

Operating pressure is applied to the rocker via a measuring piston. This is countered by the force of an externally adjustable spring. This determines the power setting.

If the operating pressure exceeds the set force of the spring, the rocker actuates the control valve and the pump swivels back (towards $V_{g\ min}$). Here, the leverage on the rocker is shortened and the operating pressure is able to rise in the same ratio as the displacement is reduced with exceeding the drive power ($p_B \cdot V_g$ = constant).

When not under pressure, the pump is swiveled back to its initial position at $V_{g\ max}$ by a return spring.

Setting range for start of control _____________50 – 220 bar

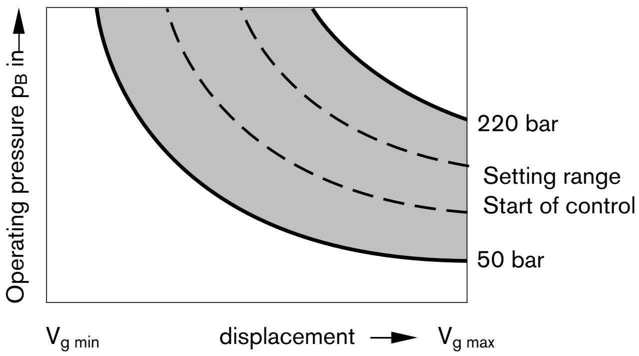
The hydraulic output power (LR characteristic) is influenced by the efficiency of the pump.

Please state in clear text when ordering:

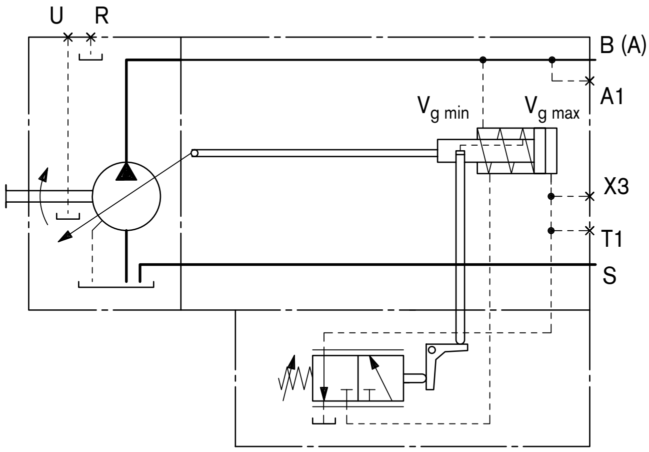
- Drive power P in kW
- Drive speed n in rpm
- Max. flow $q_{v\ max}$ in l/min

After clarifying the details a power diagram can be created by our computer.

LR characteristic



LR circuit diagram



LR - Power Controller

LRD Power Controller with Pressure Cut-Off

The pressure cut-off corresponds to a pressure control which, after reaching the set pressure, adjusts the displacement of the pump to $V_{g\ min}$.

This function overlies the power control, i.e. the power control is executed at levels below the pressure setting.

The pressure cut-off has a fixed default pressure setting.

Setting range for pressure cut-off __________ 200 – 350 bar

When ordering, please state the pressure cut-off setting in plain text.

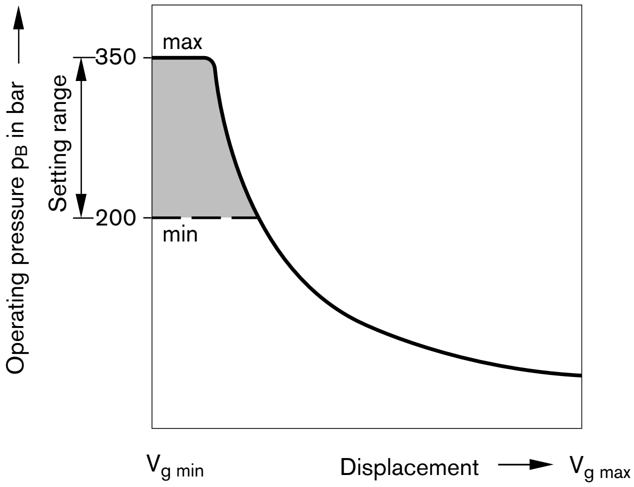
Note:

– The maximum permissible setting for the pressure cut-off must be a factor of 5 greater than that at start of power control.
  Example: start of control (power control): 50 bar
  max. permissible setting for pressure cut-off:
  50 bar • 5 = 250 bar

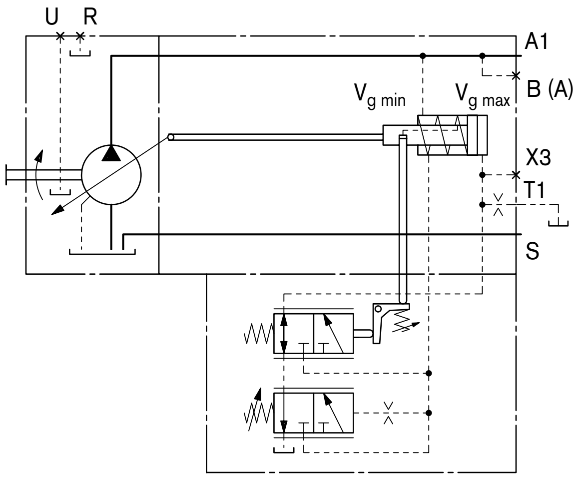
– On versions with pressure cut-off, a case drain line to the tank is needed (port T_1).
  When the case drain port is plugged and $t_{Tank} \leq 50°C$, the permissible actuated time for the pressure cut-off is ≤ 2 min.

– A pressure-relief valve fitted to ensure the maximum pressure in the system must be at least 20 bar above the setting for pressure cut-off when it starts to open.

LRD characteristic



LRD circuit diagram



LR - Power Controller

LR... Power control with stroke limiter

The hydraulic stroke limiter enables the displacement of the pump to be infinitely varied or limited across the entire control range. The displacement is set proportionally by the pilot pressure p_{St} applied at port X_1 (max. 40 bar).

The hydraulic stroke limiter is overridden by the power control, i.e. below the power control characteristic (hyperbolic characteristic), the displacement is adjusted depending on the pilot pressure. If the set flow or the operating pressure is such that the power control characteristic is exceeded, the power control overrides the stroke limiter and reduces the displacement along the hyperbolic characteristic.

A control pressure of 40 bar is needed to move the pump from its initial position $V_{g\,max}$ to $V_{g\,min}$.

The required control pressure is taken either from the operating pressure, or from the externally applied control pressure at the Y_3 port.

To ensure the control even at low operating pressure < 40 bar the port Y_3 must be supplied with an external control pressure of approx. 40 bar.

LRH1 Hydraulic stroke limiter (negative control)

Control from $V_{g\,max}$ to $V_{g\,min}$

With increasing pilot pressure the pump swivels to a smaller displacement.

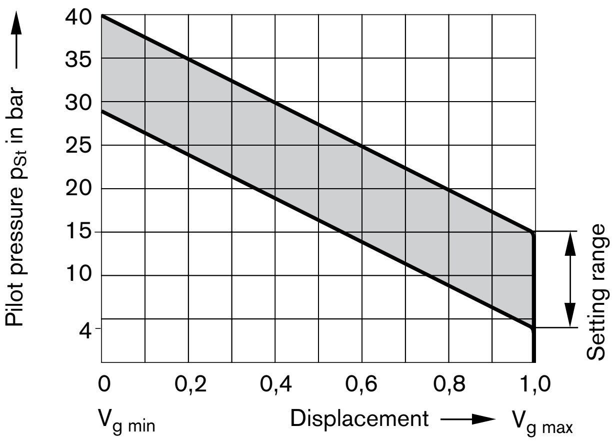
Setting range for start of control ______________ 4 – 15 bar

Please specify start of control in plain text when ordering.

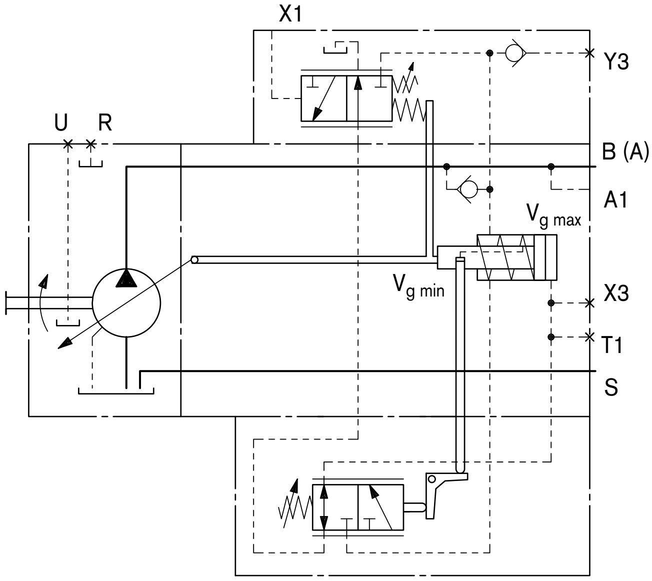
Initial position without actuation signal (pilot pressure): $V_{g\,max}$

LRH1 characteristic

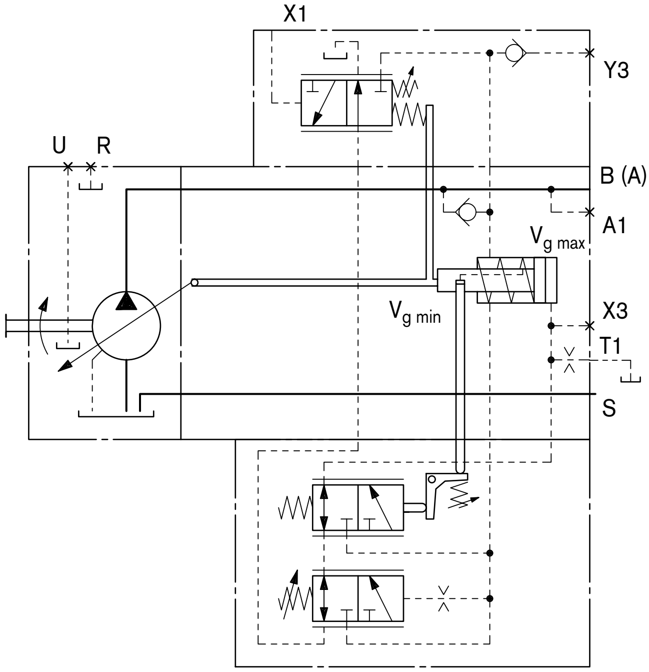
Pilot pressure increase ($V_{g\,max}$ – $V_{g\,min}$) _________ Δp = 25 bar



LRH1 circuit diagram



LRDH1 circuit diagram



DR - Pressure Controller

Within its control range, the pressure controller maintains the pressure in a hydraulic system at a constant level, even if the flow is variable. The variable pump supplies only the amount hydraulic fluid that is actually required by the consumers. If the operating pressure exceeds the setpoint value set at the integrated pressure control valve, the pump will automatically move back and the control deviation will be reduced.

When not under pressure, the pump is swiveled back to its initial position at $V_{g\,max}$ by a control spring.

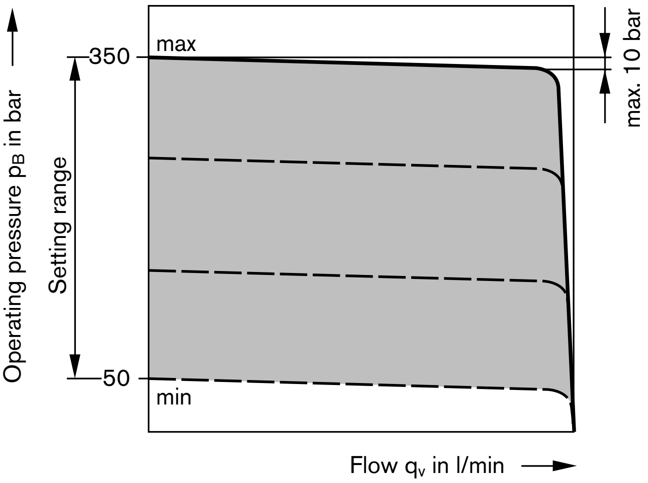
Setting range for pressure control ____________50 – 350 bar

When ordering, please state the pressure controller setting in plain text.

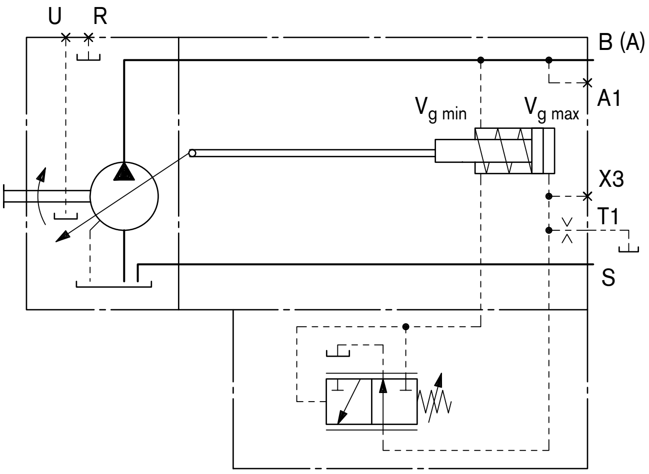
Note:

- On versions with DR pressure controller, a case drain line from port T_1 to the tank is needed .
- A pressure-relief valve fitted to ensure the maximum pressure in the system must be at least 20 bar above the controller setting when it starts to open.

DR characteristic



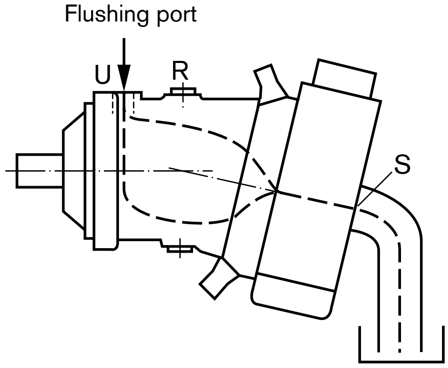
DR circuit diagram



Zero stroke operation

The standard version is configured for intermittent pressure control operation. Short-term zero stroke operation (< 10 min.) is permissible to an operating pressure of p_{max} = 315 bar at a tank temperature ≤ 50°C.

For long-term periods of zero stroke operation the bearings should be flushed at port U.



Flushing volumes (recommended)

Size	28	55	80	107	160
$q_{v\,flush}$ (l/min)	3	4	6	8	12

Temperature of flushing fluid ≤ tank temperature

DR - Pressure Controller

DRG Pressure controller, remote controlled

A sequence valve with port plate assumes the pressure control function. The valve is located separate from the pump, whereby the simple line length of 5 m should not be exceeded. The valve is supplied with high pressure from port A_1 of the pump. The control pressure from the valve is fed back to the pump via port X_3, which adjusts the displacement of the pump to $V_{g\,min}$. Please ensure that the ports T on the sequence valve and T_1 on the pump are fed back to the tank (cooler).

Setting range for pressure control ___________ 50 – 315 bar

When ordering, please state the pressure controller setting in plain text.

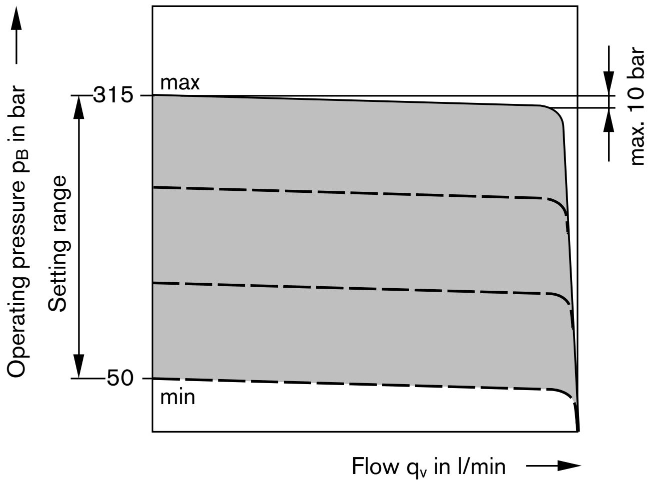
Note:

– A pressure-relief valve fitted to ensure the maximum pressure in the system must be at least 20 bar above the controller setting when it starts to open.

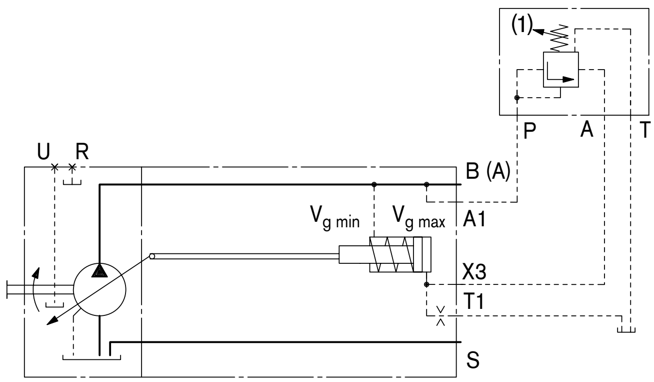
The sequence valve and port plate must be ordered separately.

Sequence valve: DZ5DP2-1X/315YMSO21
(Mat.No. R900495604)
Port plate: G 115/1 (Mat.No. R900424379)

DRG characteristic



DRG circuit diagram



Item (1) is not included in supply of the pump.

DR - Pressure Controller

DRS Pressure controller with load sensing

The load-sensing controller is a flow control option that operates as a function of the load pressure to regulate the pump displacement to match the actuator flow requirement.

The flow depends here on the cross section of the external measuring orifice (1) fitted between the pump outlet and the actuator. The flow is independent of the load pressure below the pressure control setting and within the control range of the pump.

The measuring orifice is usually a separately arranged load sensing directional valve (control block). The position of the directional valve piston determines the opening cross section of the measuring orifice and thus the flow of the pump.

The load-sensing control compares pressure before and after the measuring orifice and maintains the pressure drop (differential pressure Δp) and thus the flow constant.

If the differential pressure Δp increases, the pump is swiveled back (towards $V_{g\,min}$), and if the differential pressure Δp decreases, the pump is swiveled out (towards $V_{g\,max}$), until equilibrium is restored in the valve.

$\Delta p_{Measuring\ orifice} = p_{Pump} - p_{Consumer}$

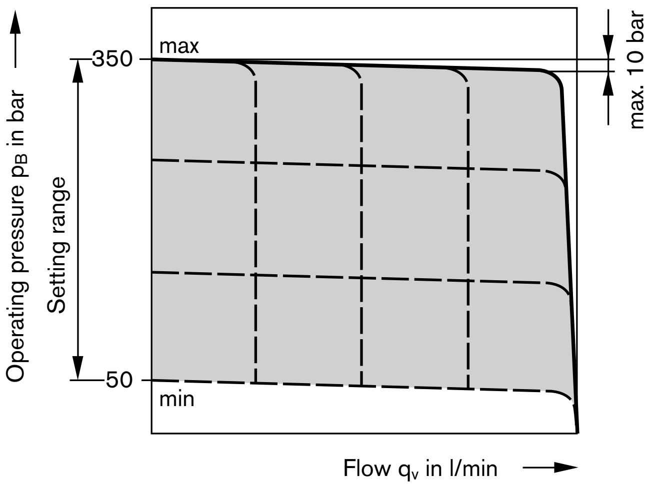
Setting range for Δp ______________________ 14 – 25 bar

Standard setting _________ 18 bar (please state in clear text).

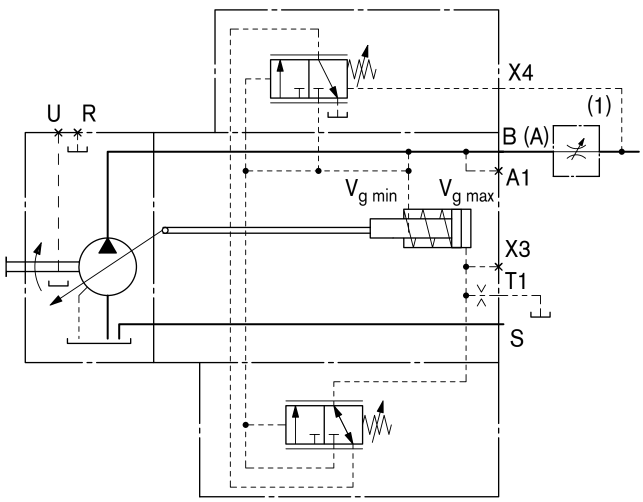
The standby pressure in zero stroke operation (measuring orifice plugged) is slightly above the Δp setting

(1) The measuring orifice (control block) is not included in the supply.

DRS characteristic



DRS circuit diagram



Item (1) is not included in supply of the pump.

HD - Hydraulic Control, Pilot-Pressure Related

The pilot-pressure related control proportionally and infinitely variable the displacement if the pump with a pilot pressure at port X_1.

Maximum permissible pilot pressure $p_{St\ max}$ = 40 bar

Control from $V_{g\ min}$ to $V_{g\ max}$.

With increasing pilot pressure the pump swivels to a higher displacement.

Setting range for start of control ________________ 4 – 15 bar

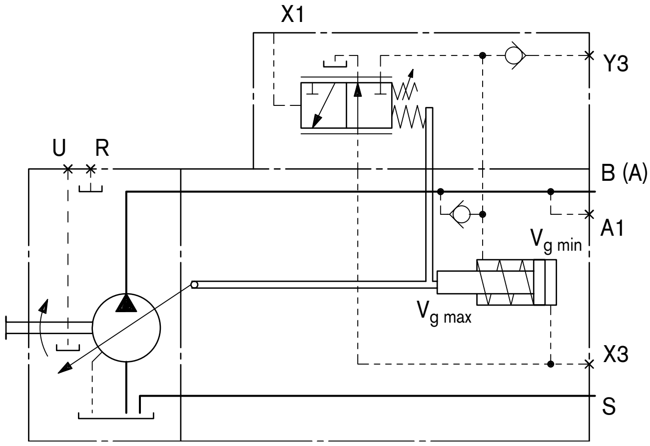
Please specify start of control in plain text when ordering.

A control pressure of 40 bar is needed to swivel the pump from its initial position $V_{g\ min}$ to $V_{g\ max}$.

The required control pressure is taken either from the operating pressure, or from the externally applied control pressure at the Y_3 port.

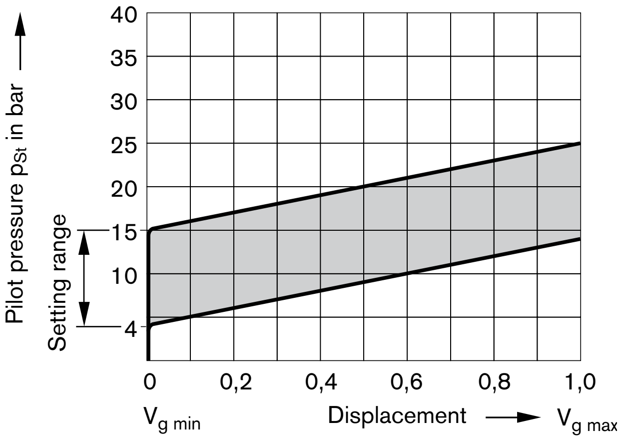
To ensure the control even at low operating pressure < 40 bar the port Y_3 must be supplied with an external control pressure of approx. 40 bar.

HD circuit diagram



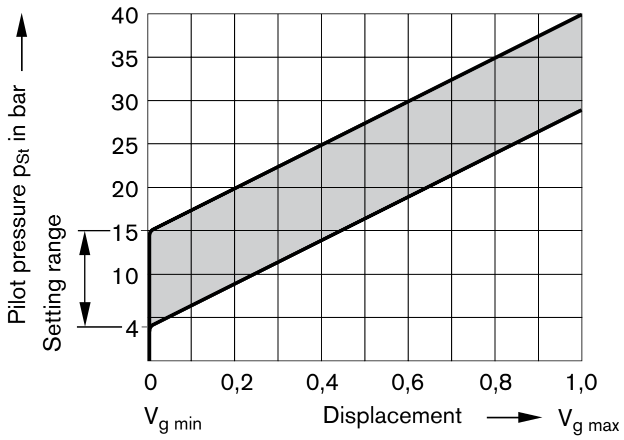
Characteristic HD1

Pilot pressure increase $V_{g\ min}$ to $V_{g\ max}$ _________ Δp = 10 bar



Characteristic HD2

Pilot pressure increase $V_{g\ min}$ to $V_{g\ max}$ _________ Δp = 25 bar



HD - Hydraulic Control, Pilot-Pressure Related

HD.G Hydraulic control, for pressure cut-off, remote controlled

A sequence valve with port plate assumes the pressure cut-off function. The valve is located separate from the pump, whereby the simple line length of 5 m should not be exceeded. The valve is supplied with high pressure from port A_1 of the pump. The control pressure for the pump is fed into the valve via port X_3 and is diverted to the tank at port A on the port plate of the sequence valve, enabling the pump to be controlled to $V_{g\,min}$ if the set pressure setpoint is exceeded .

Setting range for pressure control ___________ 50 – 315 bar

When ordering, please state the pressure controller setting in plain text.

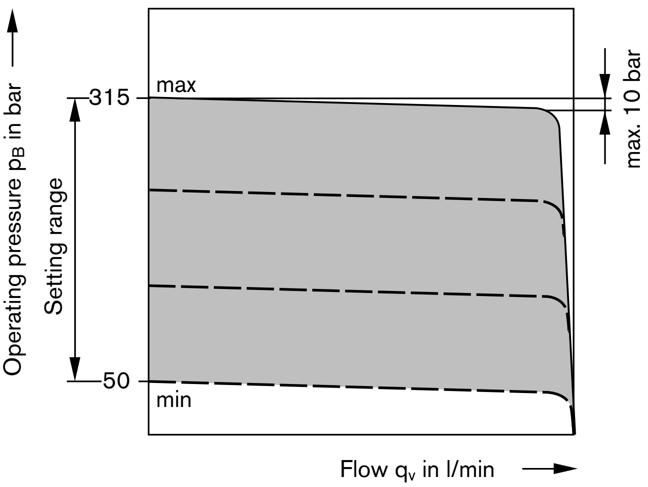
Note:

- Port A from the sequence valve must be fed back to the tank (cooler)
- A pressure-relief valve fitted to ensure the maximum pressure in the system must be at least 20 bar above the controller setting when it starts to open.

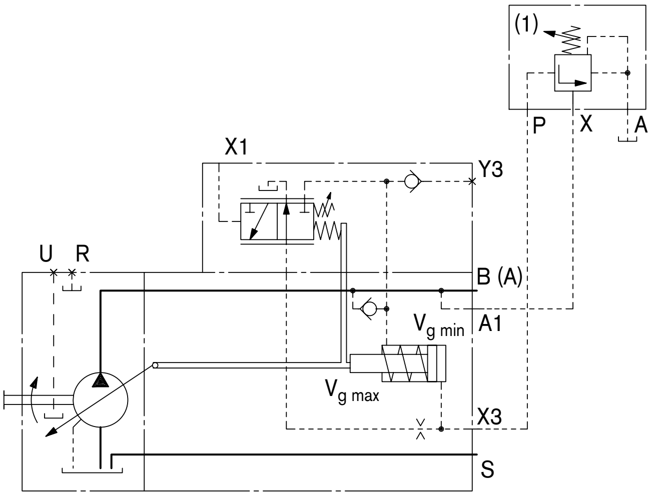
The sequence valve and port plate must be ordered separately.

Sequence valve: DZ5DP2-1X/315XYMSO20 (Mat.No. R900490554)
Port plate: G 115/1 (Mat.No. R900424379)

HD.G characteristic



HD.G circuit diagram



Item (1) is not included in supply of the pump.

Note

The spring return in the control unit is not a security device.

The control spool and/or the positioning piston can be blocked in an undefined position by internal contamination – e.g. impure hydraulic fluid, abrasion or residual contamination from system components. As a result, the variable pump can no longer provide the speed an torque specified by the operator.

- Install an appropriate emergency-off function to ensure that the driven consumer can be brought to a safe position (e.g. immediate stop).
- Maintain the specified cleanliness level 20/18/15 (< 90°C) or 19/17/14 (> 90°C) in accordance with ISO 4406.

EP - Electric Control with Proportional Solenoid

With the electric control with proportional solenoid, the pump displacement is adjusted proportionally and steplessly to the current by means of the magnetic force.

Control from $V_{g\ min}$ to $V_{g\ max}$

With increasing control current the pump swivels to a higher displacement.

A control pressure of 40 bar is needed to swivel the pump from its initial position $V_{g\ min}$ to $V_{g\ max}$.

The required control pressure is taken either from the operating pressure, or from the externally applied control pressure at the Y_3 port.

To ensure the control even at low operating pressure < 40 bar the port Y_3 must be supplied with an external control pressure of approx. 40 bar.

Note:
The pump with EP control in the fluid tank may only be installed if mineral hydraulic oil are used and the fluid temperature in the tank is no greater than 80°C.

The following electronic controllers and amplifiers are available for controlling the proportional solenoids (sizes 28 to 200) (information is also available on the Internet at www.boschrexroth.com/mobile-electronics):

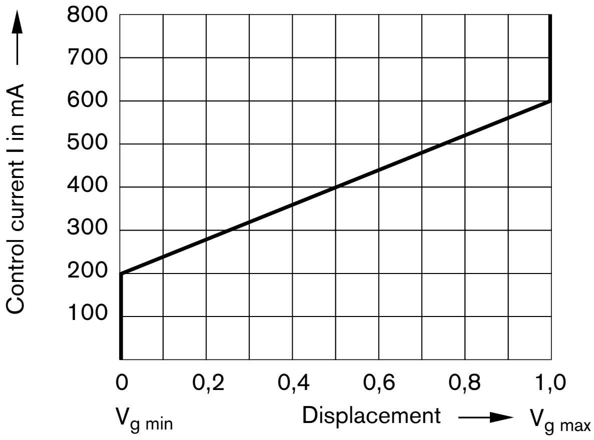
- BODAS controller RC
  Series 20 ____ RE 95200
  Series 21 ____ RE 95201
  Series 22 ____ RE 95202
  Series 30 ____ RE 95203
  and application software
- Analog amplifier RA ____ RE 95230

The use of a proportional amplifier means that the control time can be influenced.

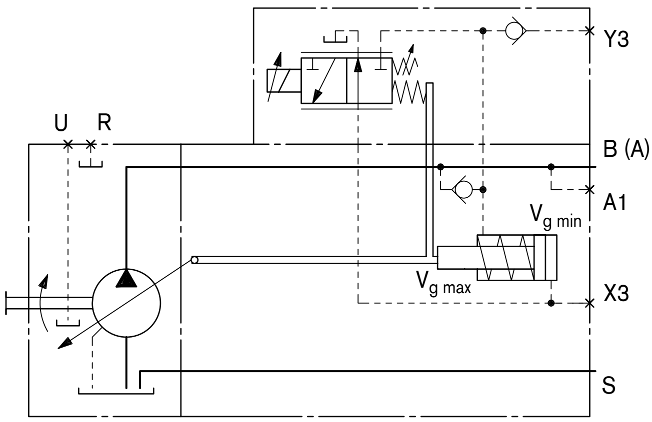
Technical data solenoid

	EP
Voltage	24V DC (±20%)
Control current	
Start of control at $V_{g\ max}$	200 mA
End of control at $V_{g\ max}$	600 mA
Limiting current	0.68 A
Nominal resistance (at 20°C)	19.5 Ω
Dither frequency	100 Hz
Actuated time	100%
Type of protection (HIRSCHMANN) according to DIN EN 60529	IP65

EP characteristic



EP circuit diagram



ED.G Electric control, for pressure cut-off, remote controlled

see HD.G

Note

The spring return in the control unit is not a security device.

The control spool and/or the positioning piston can be blocked in an undefined position by internal contamination – e.g. impure hydraulic fluid, abrasion or residual contamination from system components. As a result, the variable pump can no longer provide the speed an torque specified by the operator.

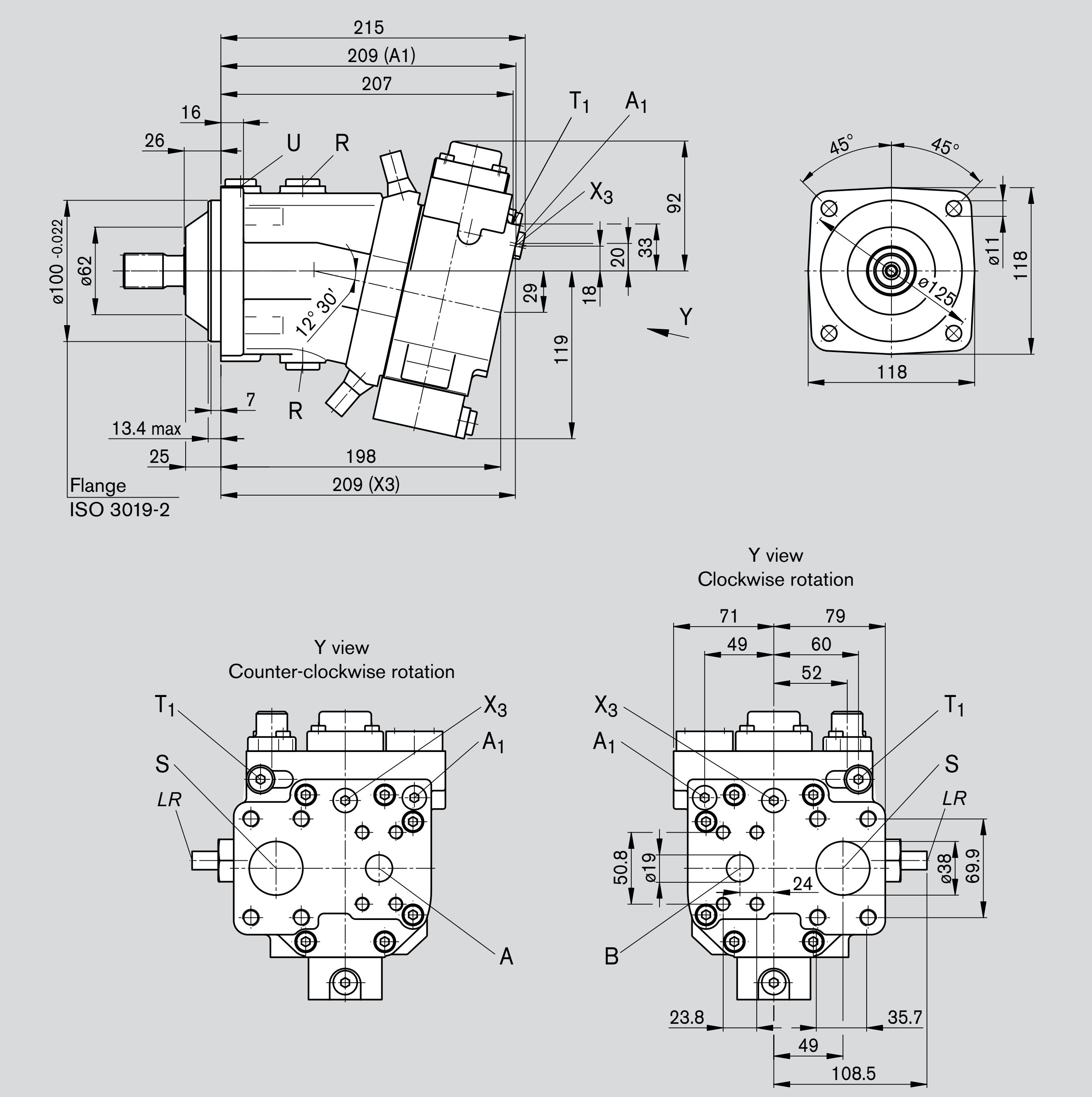
- Install an appropriate emergency-off function to ensure that the driven consumer can be brought to a safe position (e.g. immediate stop).
- Maintain the specified cleanliness level 20/18/15 (< 90°C) or 19/17/14 (> 90°C) in accordance with ISO 4406.

Unit Dimensions, Size 28

Before finalizing your design, please request a binding installation drawing. Dimensions in mm.

LR - Power Controller

Note: all control versions are illustrated in clockwise rotation

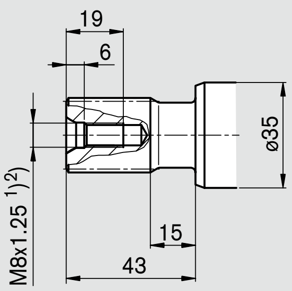


Unit Dimensions, Size 28

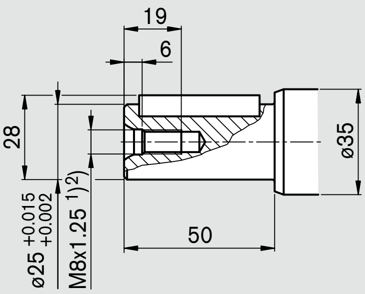
Before finalizing your design, please request a binding installation drawing. Dimensions in mm.

Shaft ends

Z Splined shaft DIN 5480
W25x1.25x30x18x9g



P Cyl. shaft with key
DIN 6885, AS8x7x40



Ports

B and A	Service line port (high-pressure series) Fixing thread	SAE J518 DIN 13	3/4 in M10x1.5; 17 deep[2])	
S	Suction port (standard series) Fixing thread	SAE J518 DIN 13	1 1/2 in M12x1.75; 20 deep[2])	
U	Bearing flushing [3])	DIN 3852	M16x1.5; 12 deep	100 Nm [2])
R	Air bleed [3])	DIN 3852	M18x1.5; 12 deep	140 Nm [2])
A1	High pressure [3])	DIN 3852	M12x1.5; 12 deep	50 Nm [2])
T_1	Pilot fluid drain [4])	DIN 3852	M12x1.5; 12 deep	50 Nm [2])
X_3	Override [3])	DIN 3852	M12x1.5; 12 deep	50 Nm [2])
Y_3	External control pressure [3])	DIN 3852	M14x1.5; 12 deep	80 Nm [2])
X_1	Pilot pressure	DIN 3852	M14x1.5; 12 deep	80 Nm [2])

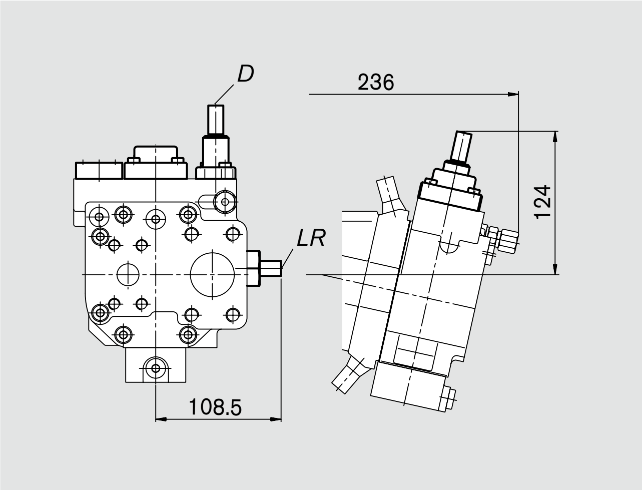
[1]) Center bore according to DIN 332 (thread according to DIN 13)
[2]) Please observe the general notes for the max. tightening torques on page 32
[3]) Plugged
[4]) Plugged, only DR, ..D.. open

Unit Dimensions, Size 28

Before finalizing your design, please request a binding installation drawing. Dimensions in mm.

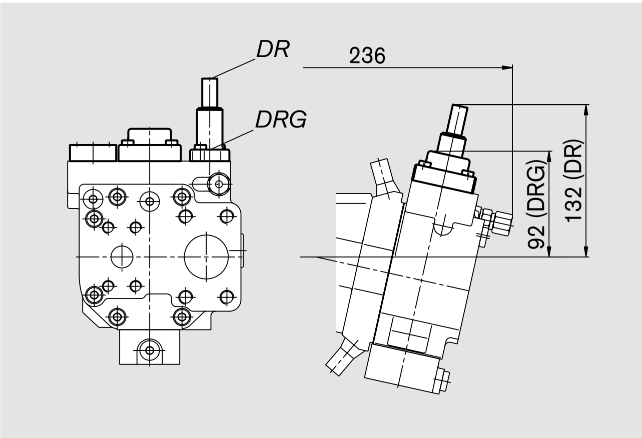
LRD

Power controller with pressure cut-off



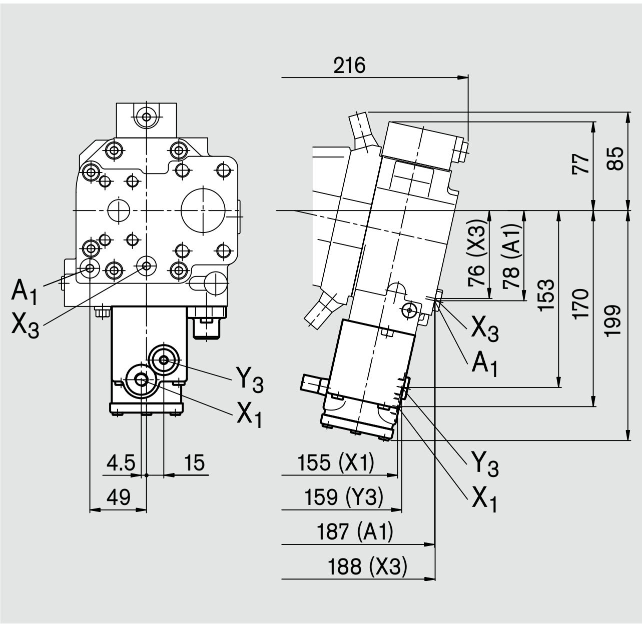
DR/DRG

Pressure controller, remote controlled



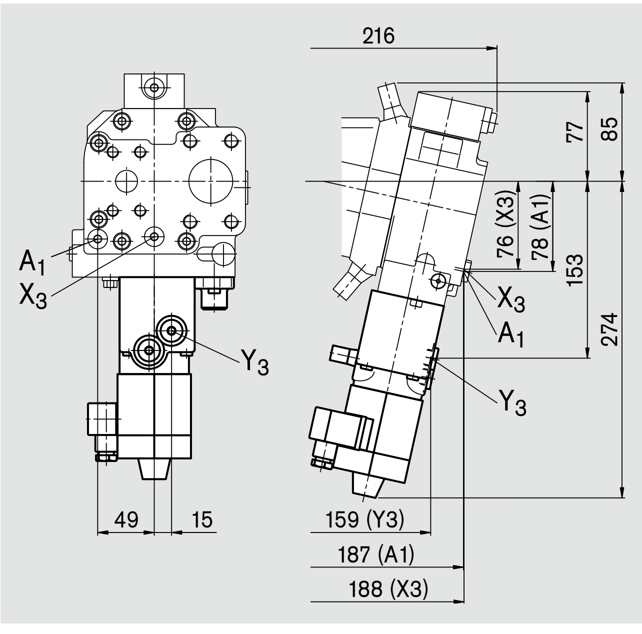
HD1/HD1G/HD2/HD2G

Hydraulic control for pressure cut-off, remote controlled



EP/EPG

Electric control for pressure cut-off, remote controlled

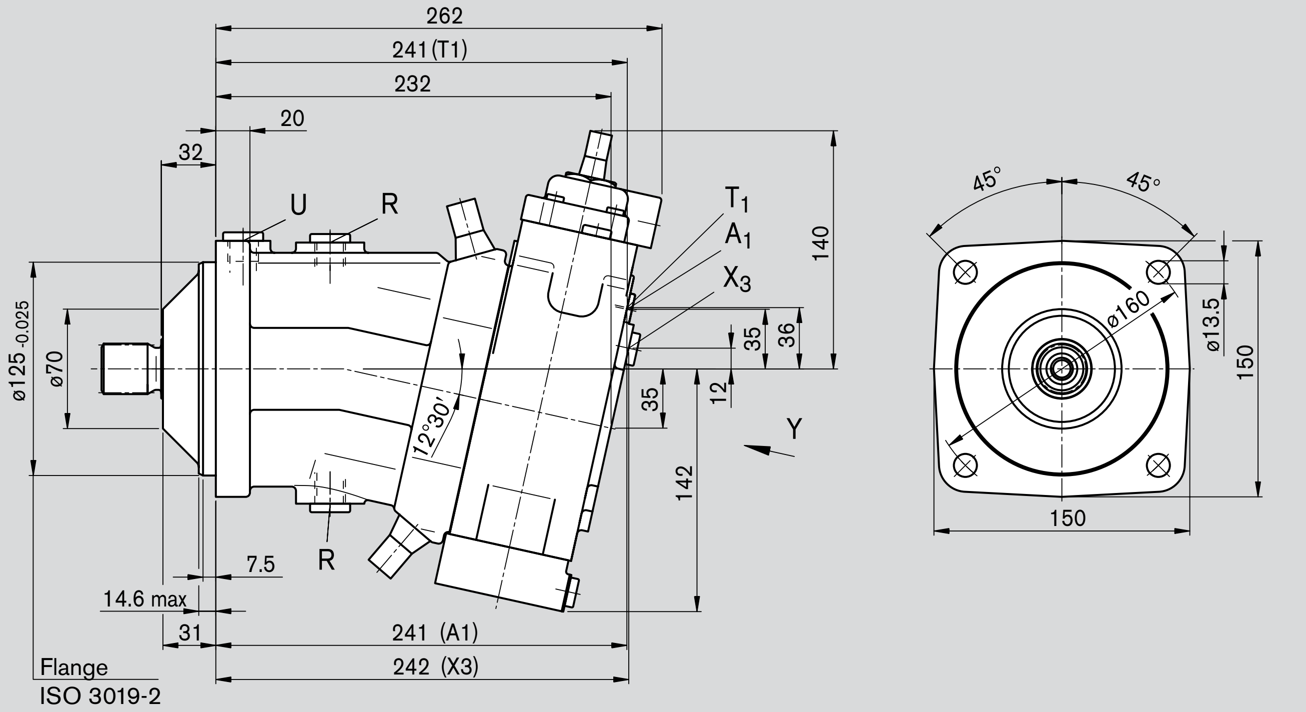


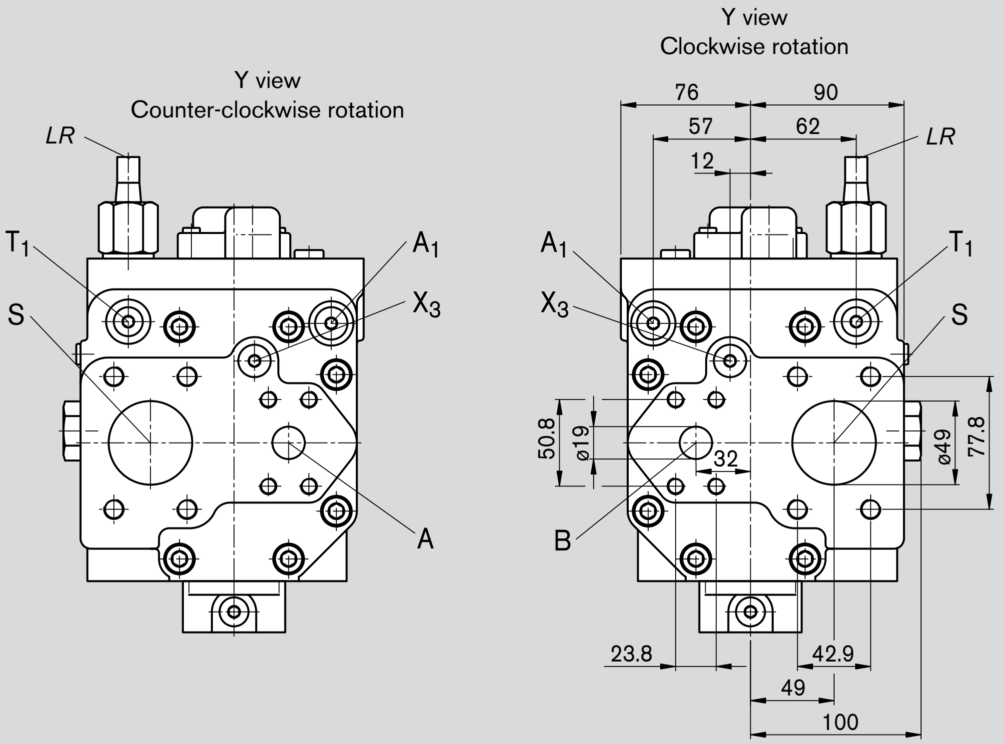
Unit Dimensions, Size 55

Before finalizing your design, please request a binding installation drawing. Dimensions in mm.

LR - Power Controller

Note: all control versions are illustrated in clockwise rotation



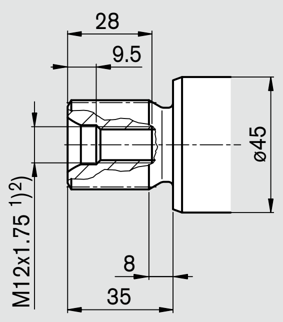


Unit Dimensions, Size 55

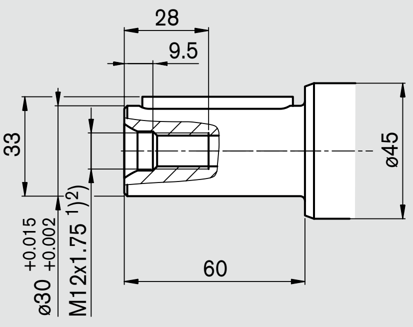
Before finalizing your design, please request a binding installation drawing. Dimensions in mm.

Shaft ends

Z Splined shaft DIN 5480 W30x2x30x14x9g



P Cyl. shaft with key DIN 6885, AS8x7x50



Ports

B and A	Service line port (high-pressure series) Fixing thread	SAE J518 DIN 13	3/4 in M10x1.5; 17 deep[2])	
S	Suction port (standard series) Fixing thread	SAE J518 DIN 13	2 in M12x1.75; 20 deep[2])	
U	Bearing flushing [3])	DIN 3852	M18x1.5; 12 deep	140 Nm [2])
R	Air bleed [3])	DIN 3852	M18x1.5; 12 deep	140 Nm [2])
A1	High pressure [3])	DIN 3852	M14x1.5; 12 deep	80 Nm [2])
T_1	Pilot fluid drain [4])	DIN 3852	M12x1.5; 12 deep	50 Nm [2])
X_3	Override [3])	DIN 3852	M14x1.5; 12 deep	80 Nm [2])
Y_3	External control pressure [3])	DIN 3852	M14x1.5; 12 deep	80 Nm [2])
X_1	Pilot pressure	DIN 3852	M14x1.5; 12 deep	80 Nm [2])
X_4	Load pressure	DIN 3852	M14x1.5; 12 deep	80 Nm [2])

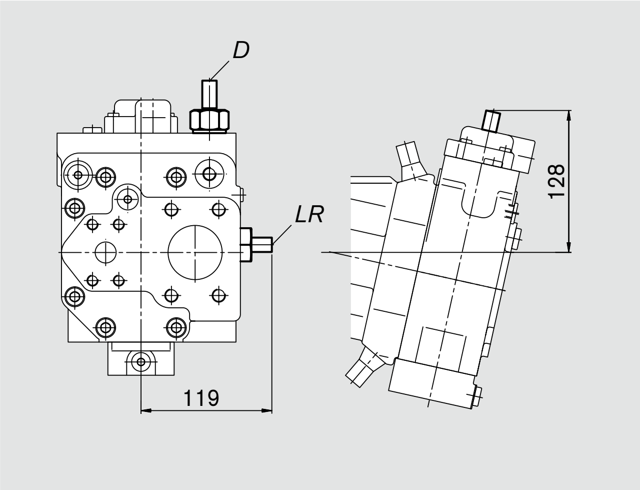
[1]) Center bore according to DIN 332 (thread according to DIN 13)
[2]) Please observe the general notes for the max. tightening torques on page 32
[3]) Plugged
[4]) Plugged, only DR, ..D.. open

Unit Dimensions, Size 55

Before finalizing your design, please request a binding installation drawing. Dimensions in mm.

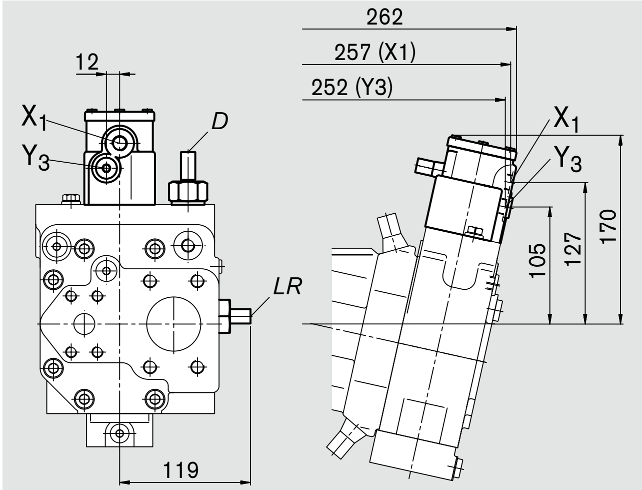
LRD

Power controller with pressure cut-off



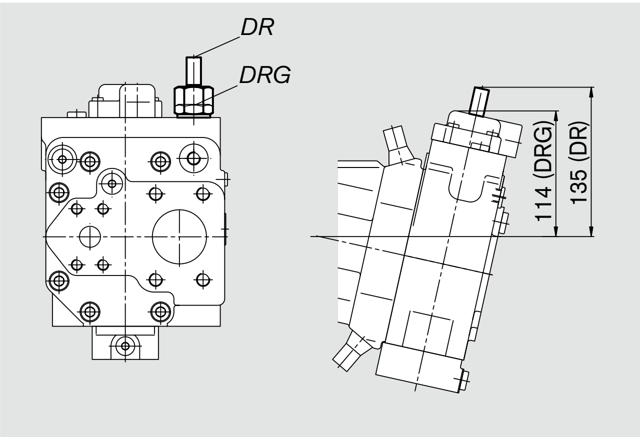
LRDH1

Power controller with pressure cut-off, stroke limiter



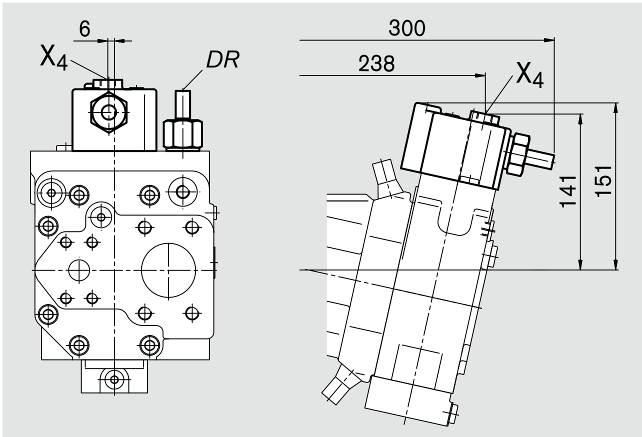
DR/DRG

Pressure controller, remote controlled



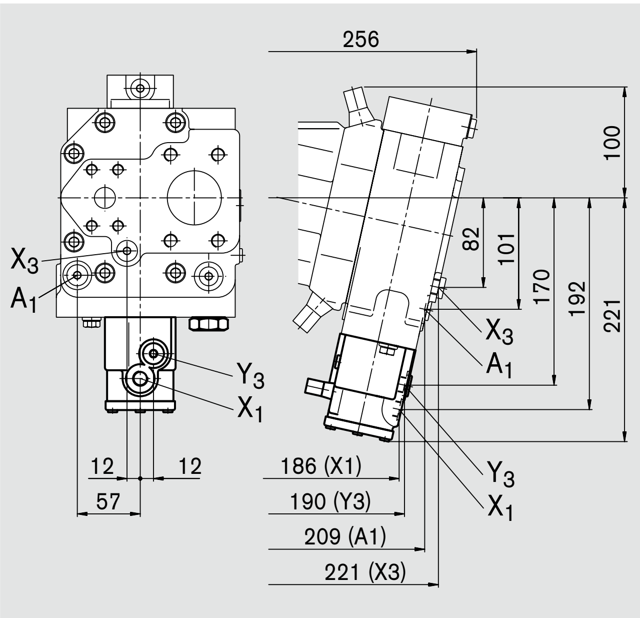
DRS

Pressure controller with load sensing



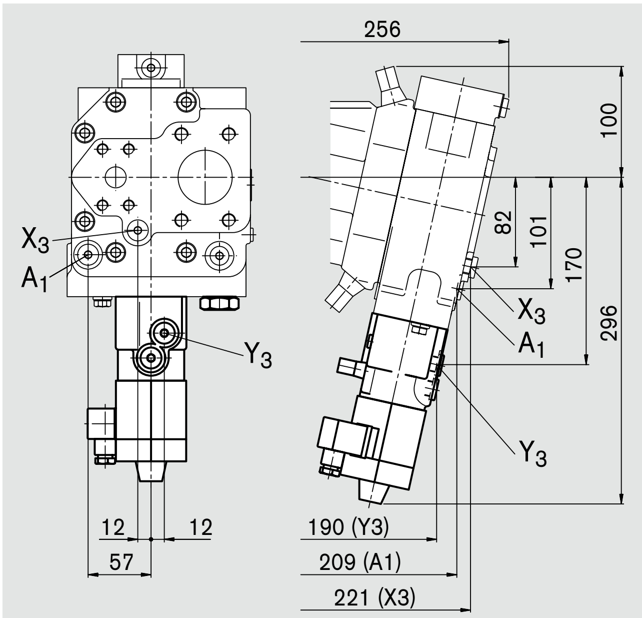
HD1/HD1G/HD2/HD2G

Hydraulic control for pressure cut-off, remote controlled



EP/EPG

Electric control for pressure cut-off, remote controlled

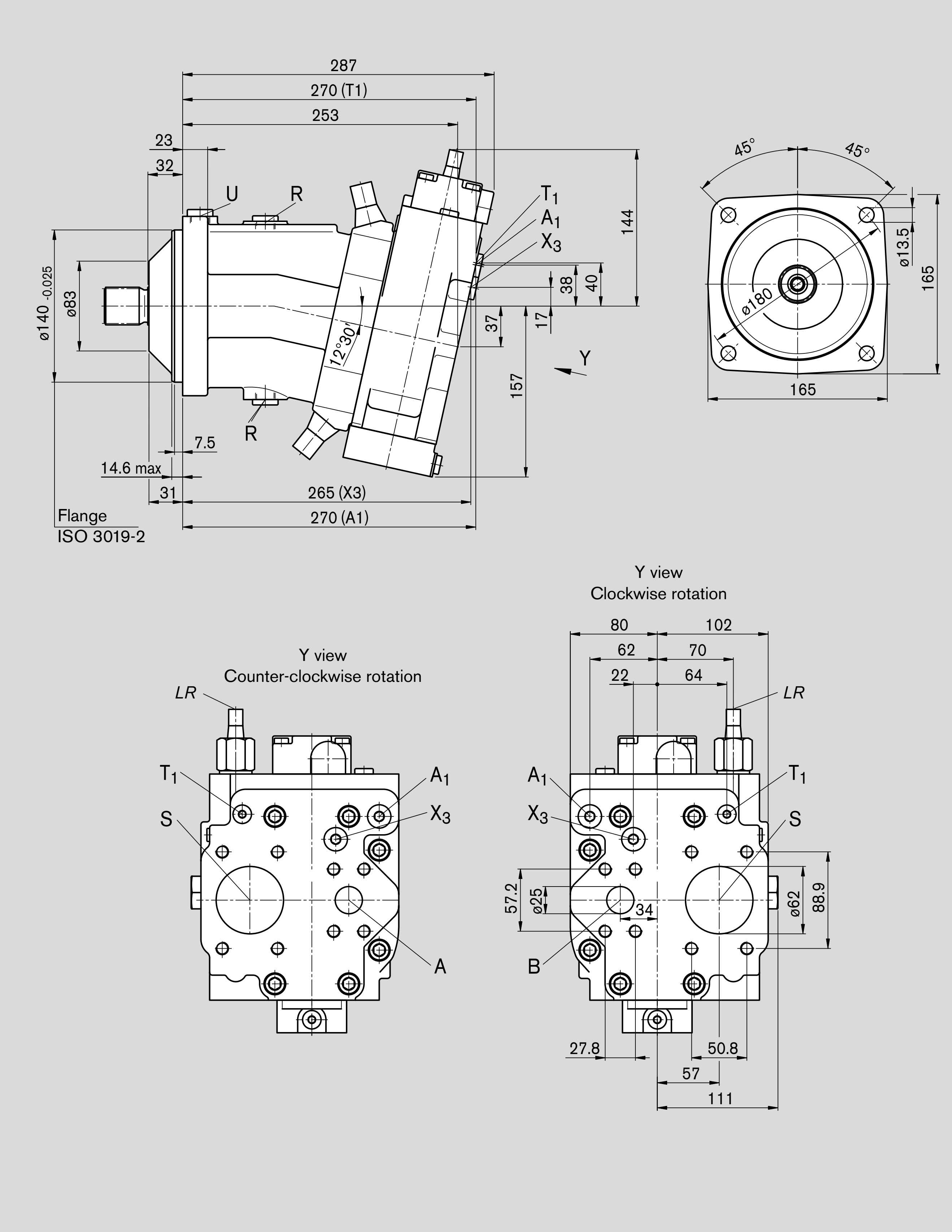


Unit Dimensions, Size 80

Before finalizing your design, please request a binding installation drawing. Dimensions in mm.

LR - Power Controller

Note: all control versions are illustrated in clockwise rotation

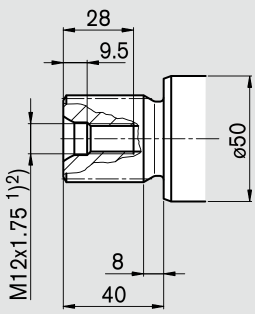


Unit Dimensions, Size 80

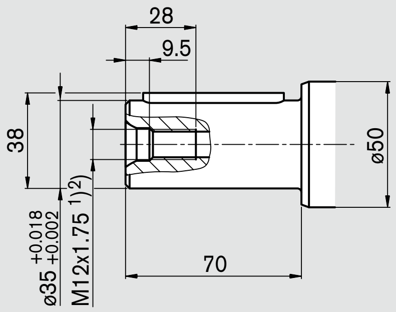
Before finalizing your design, please request a binding installation drawing. Dimensions in mm.

Shaft ends

Z Splined shaft DIN 5480
W35x2x30x16x9g



P Cyl. shaft with key
DIN 6885, AS10x8x56



Ports

B and A	Service line port (high-pressure series) Fixing thread	SAE J518 DIN 13	1 in M12x1.75; 17 deep[2]	
S	Suction port (standard series) Fixing thread	SAE J518 DIN 13	2 1/2 in M12x1.75; 17 deep[2]	
U	Bearing flushing [3]	DIN 3852	M18x1.5; 12 deep	140 Nm [2]
R	Air bleed [3]	DIN 3852	M18x1.5; 12 deep	140 Nm [2]
A1	High pressure [3]	DIN 3852	M16x1.5; 12 deep	100 Nm [2]
T_1	Pilot fluid drain [4]	DIN 3852	M12x1.5; 12 deep	50 Nm [2]
X_3	Override [3]	DIN 3852	M16x1.5; 12 deep	100 Nm [2]
Y_3	External control pressure [3]	DIN 3852	M14x1.5; 12 deep	80 Nm [2]
X_1	Pilot pressure	DIN 3852	M14x1.5; 12 deep	80 Nm [2]
X_4	Load pressure	DIN 3852	M14x1.5; 12 deep	80 Nm [2]

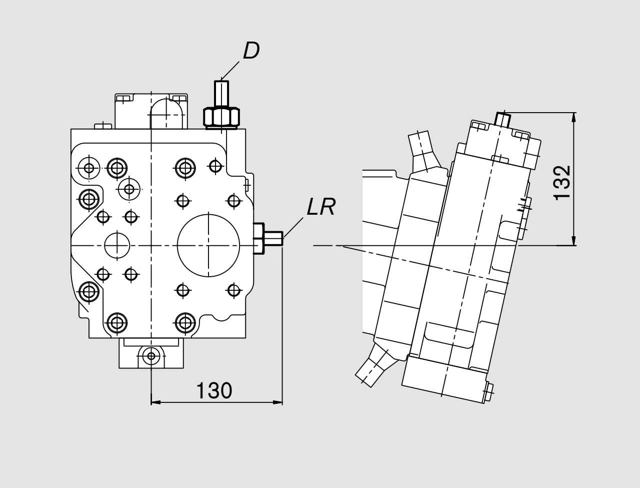
1) Center bore according to DIN 332 (thread according to DIN 13)
2) Please observe the general notes for the max. tightening torques on page 32
3) Plugged
4) Plugged, only DR, ..D.. open

Unit Dimensions, Size 80

Before finalizing your design, please request a binding installation drawing. Dimensions in mm.

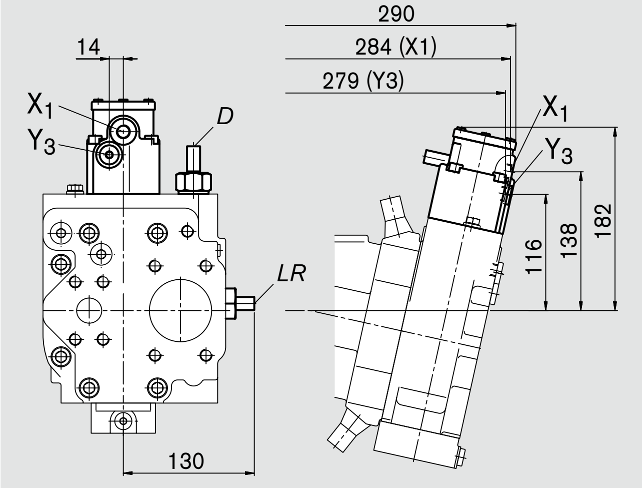
LRD

Power controller with pressure cut-off



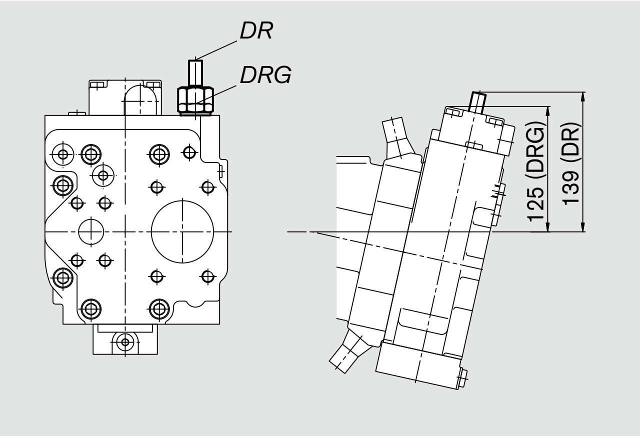
LRDH1

Power controller with pressure cut-off, stroke limiter



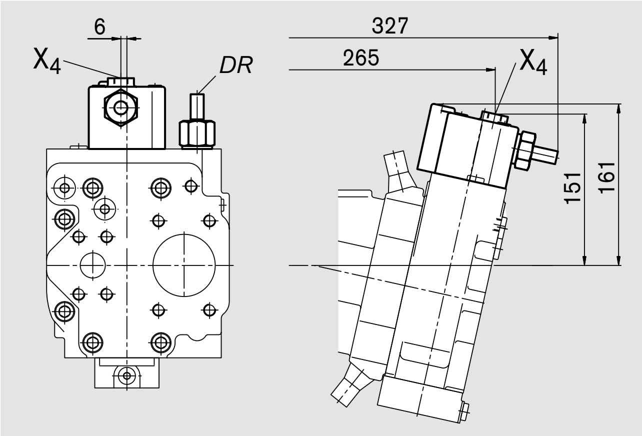
DR/DRG

Pressure controller, remote controlled



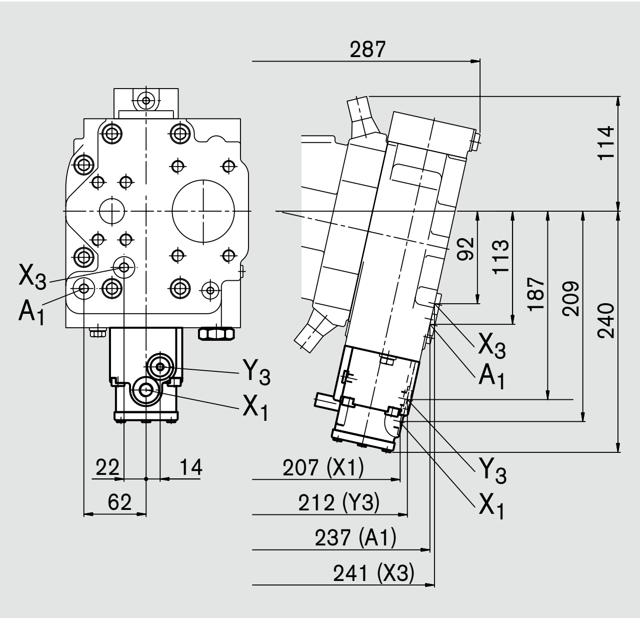
DRS

Pressure controller with load sensing



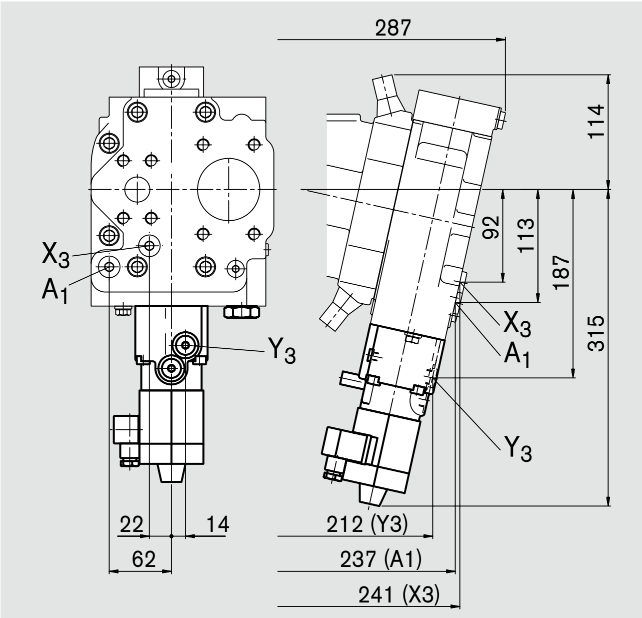
HD1/HD1G/HD2/HD2G

Hydraulic control for pressure cut-off, remote controlled



EP/EPG

Electric control for pressure cut-off, remote controlled

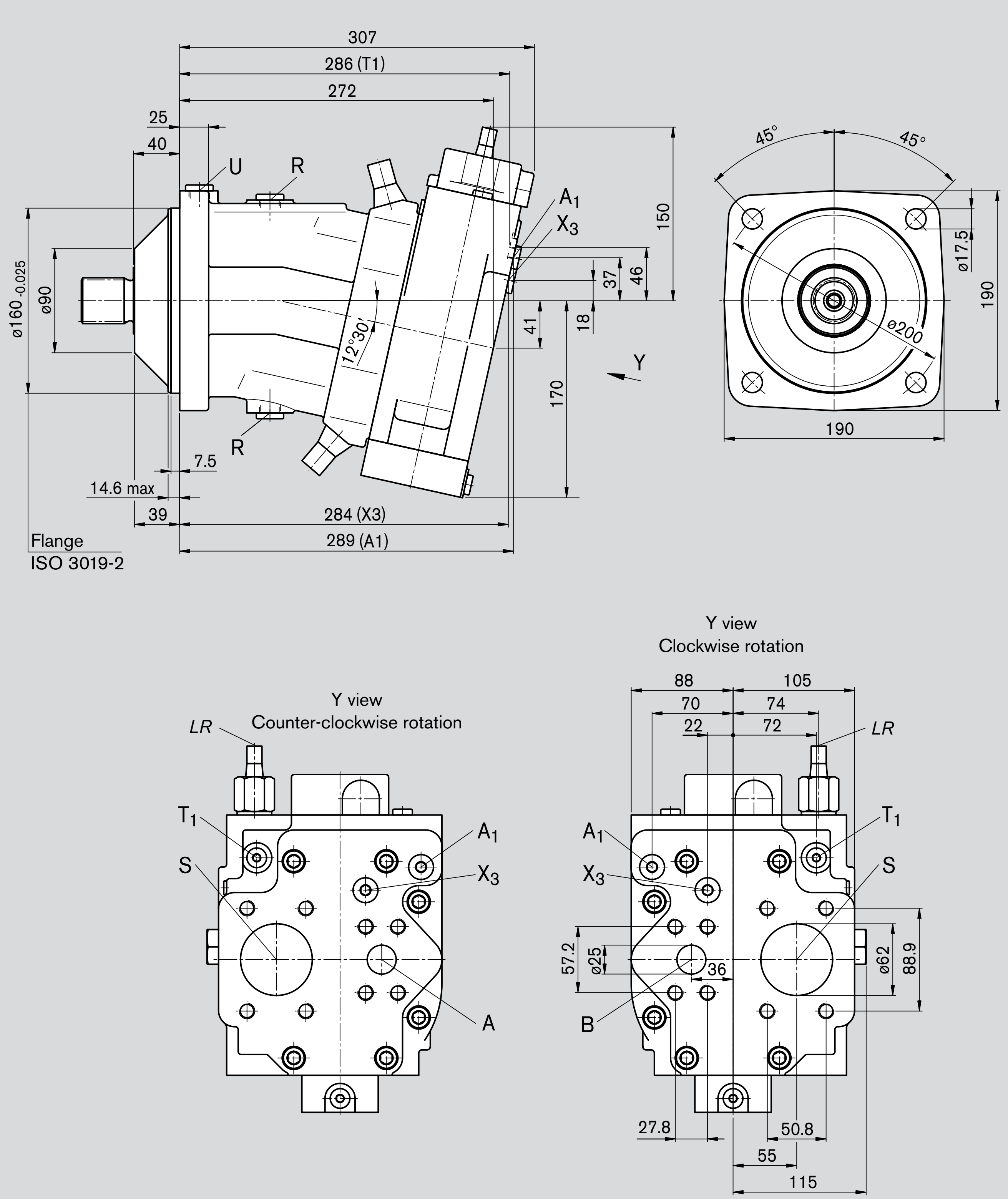


Unit Dimensions, Size 107

Before finalizing your design, please request a binding installation drawing. Dimensions in mm.

LR - Power Controller

Note: all control versions are illustrated in clockwise rotation

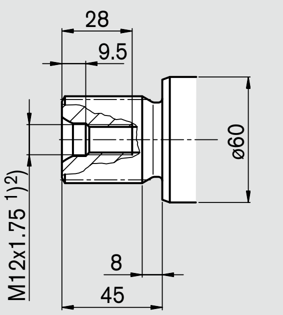


Unit Dimensions, Size 107

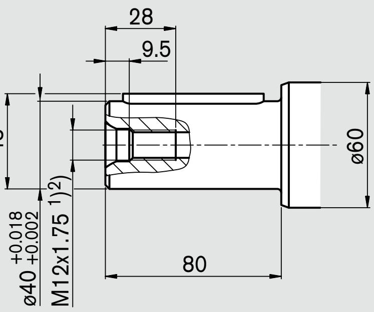
Before finalizing your design, please request a binding installation drawing. Dimensions in mm.

Shaft ends

Z Splined shaft DIN 5480
W40x2x30x18x9g



P Cyl. shaft with key
DIN 6885, AS12x8x63



Ports

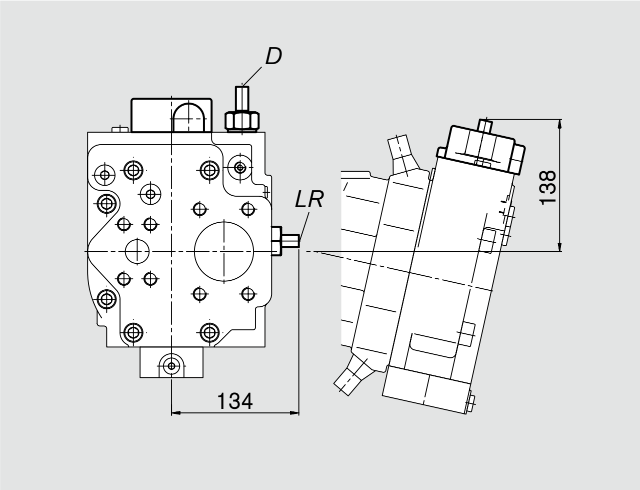
B and A	Service line port (high-pressure series) Fixing thread	SAE J518 DIN 13	1 in M12x1.75; 17 deep[2]	
S	Suction port (standard series) Fixing thread	SAE J518 DIN 13	2 1/2 in M12x1.75; 17 deep[2]	
U	Bearing flushing [3]	DIN 3852	M18x1.5; 12 deep	140 Nm [2]
R	Air bleed [3]	DIN 3852	M18x1.5; 12 deep	140 Nm [2]
A1	High pressure [3]	DIN 3852	M16x1.5; 12 deep	100 Nm [2]
T_1	Pilot fluid drain [4]	DIN 3852	M12x1.5; 12 deep	50 Nm [2]
X_3	Override [3]	DIN 3852	M16x1.5; 12 deep	100 Nm [2]
Y_3	External control pressure [3]	DIN 3852	M14x1.5; 12 deep	80 Nm [2]
X_1	Pilot pressure	DIN 3852	M14x1.5; 12 deep	80 Nm [2]
X_4	Load pressure	DIN 3852	M14x1.5; 12 deep	80 Nm [2]

[1] Center bore according to DIN 332 (thread according to DIN 13)
[2] Please observe the general notes for the max. tightening torques on page 32
[3] Plugged
[4] Plugged, only DR, ..D.. open

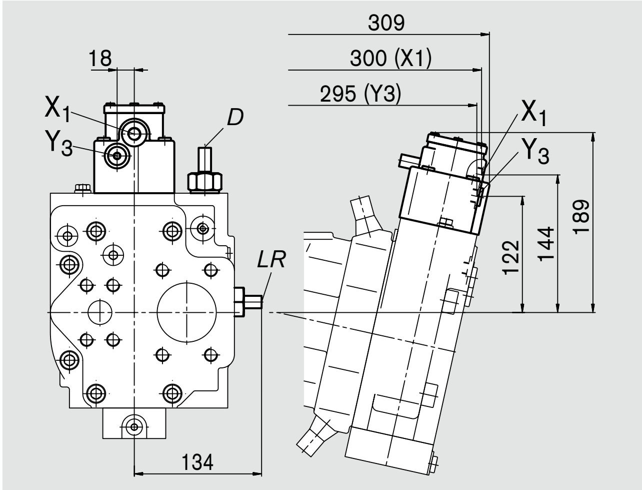
Unit Dimensions, Size 107

Before finalizing your design, please request a binding installation drawing. Dimensions in mm.

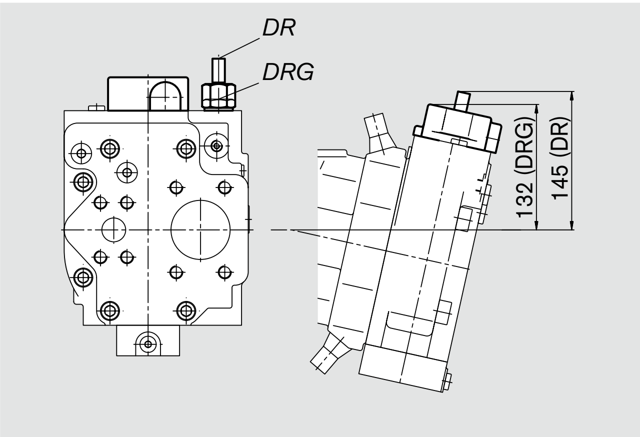
LRD
Power controller with pressure cut-off



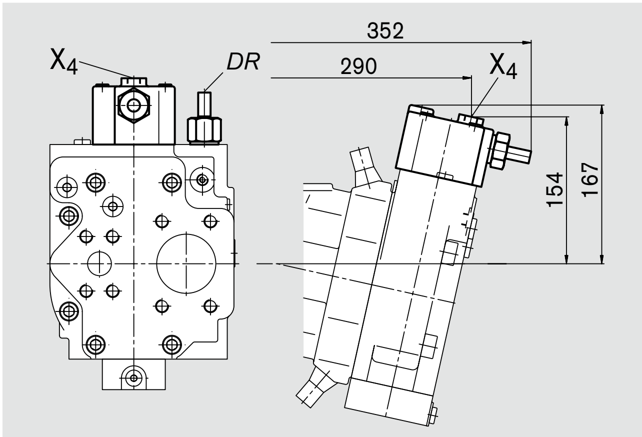
LRDH1
Power controller with pressure cut-off, stroke limiter



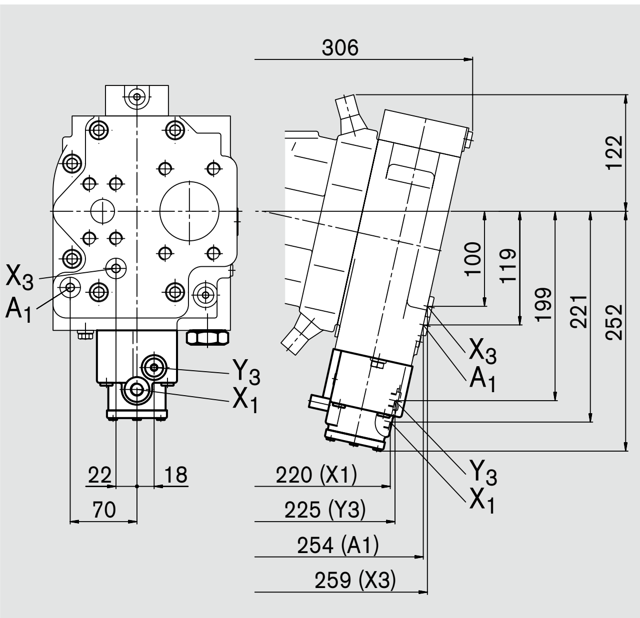
DR/DRG
Pressure controller, remote controlled



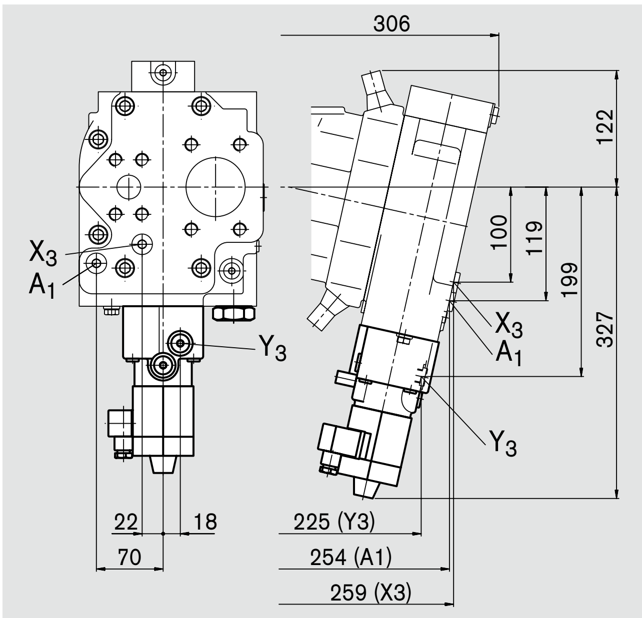
DRS
Pressure controller with load sensing



HD1/HD1G/HD2/HD2G
Hydraulic control for pressure cut-off, remote controlled



EP/EPG
Electric control for pressure cut-off, remote controlled

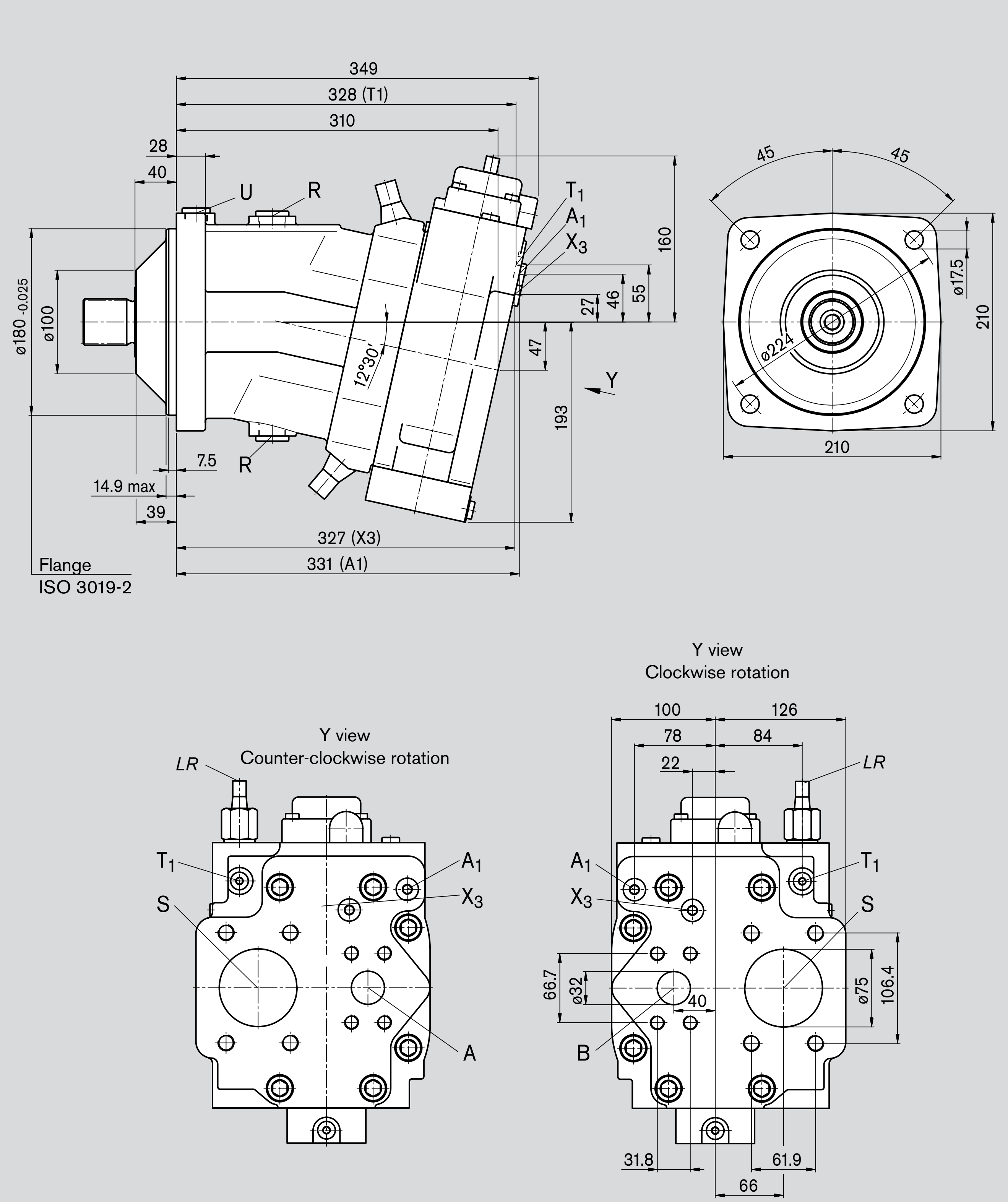


Unit Dimensions, Size 160

Before finalizing your design, please request a binding installation drawing. Dimensions in mm.

LR - Power Controller

Note: all control versions are illustrated in clockwise rotation

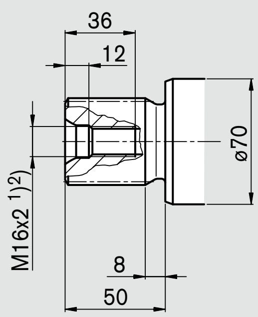


Unit Dimensions, Size 160

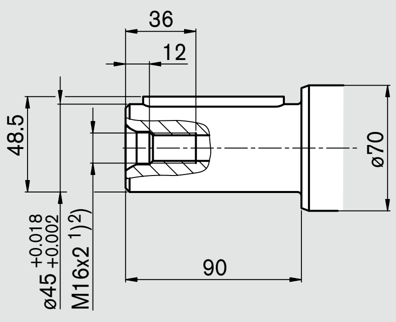
Before finalizing your design, please request a binding installation drawing. Dimensions in mm.

Shaft ends

Z Splined shaft DIN 5480
W45x2x30x21x9g



P Cyl. shaft with key
DIN 6885, AS14x9x70



Ports

B and A	Service line ports (high-pressure series) Fixing thread	SAE J518 DIN 13	1 1/4 in M14x1.5; 19 deep[2])	
S	Suction port (standard series) Fixing thread	SAE J518 DIN 13	3 in M16x1.5; 24 deep[2])	
U	Bearing flushing [3])	DIN 3852	M22x1.5; 14 deep	210 Nm [2])
R	Air bleed [3])	DIN 3852	M26x1.5; 16 deep	230 Nm [2])
A1	High pressure [3])	DIN 3852	M16x1.5; 12 deep	100 Nm [2])
T_1	Pilot fluid drain [4])	DIN 3852	M12x1.5; 12 deep	50 Nm [2])
X_3	Override [3])	DIN 3852	M16x1.5; 12 deep	100 Nm [2])
Y_3	External control pressure [3])	DIN 3852	M14x1.5; 12 deep	80 Nm [2])
X_1	Pilot pressure	DIN 3852	M14x1.5; 12 deep	80 Nm [2])
X_4	Load pressure	DIN 3852	M14x1.5; 12 deep	80 Nm [2])

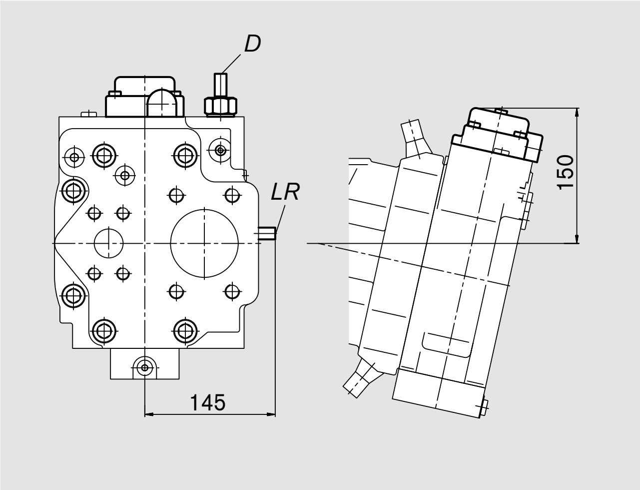
[1]) Center bore according to DIN 332 (thread according to DIN 13)
[2]) Please observe the general notes for the max. tightening torques on page 32
[3]) Plugged
[4]) Plugged, only DR, ..D.. open

Unit Dimensions, Size 160

Before finalizing your design, please request a binding installation drawing. Dimensions in mm.

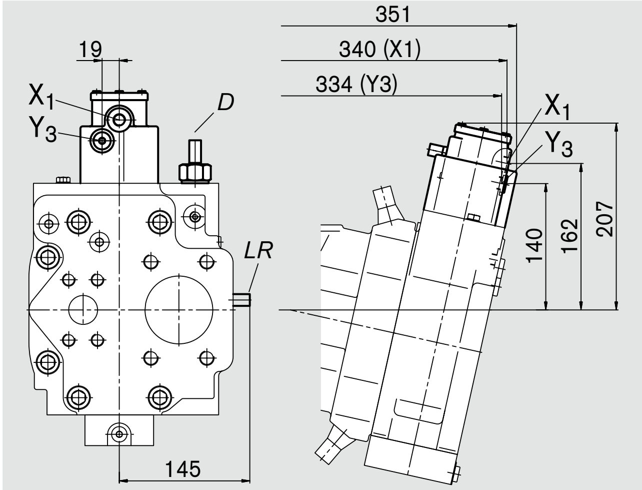
LRD

Power controller with pressure cut-off



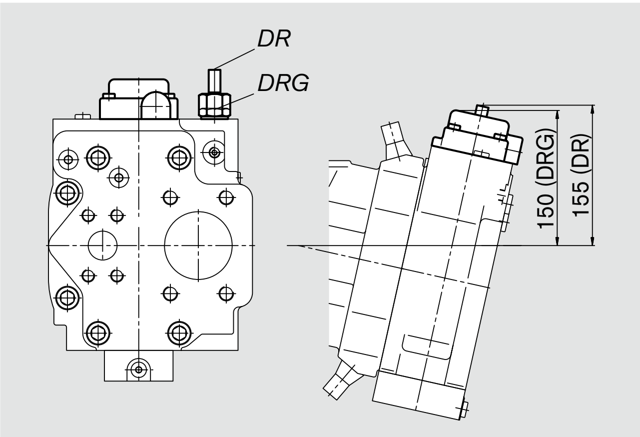
LRDH1

Power controller with pressure cut-off, stroke limiter



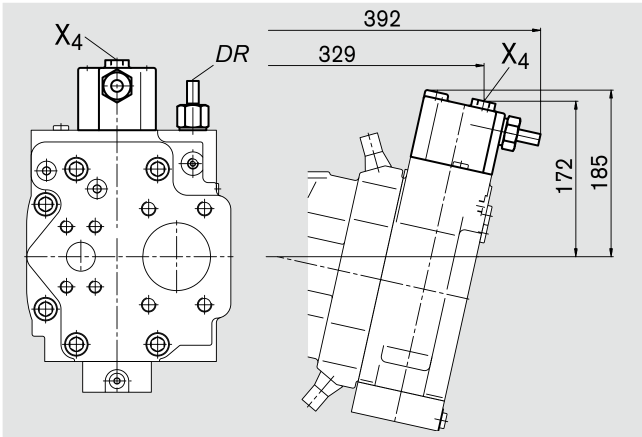
DR/DRG

Pressure controller, remote controlled



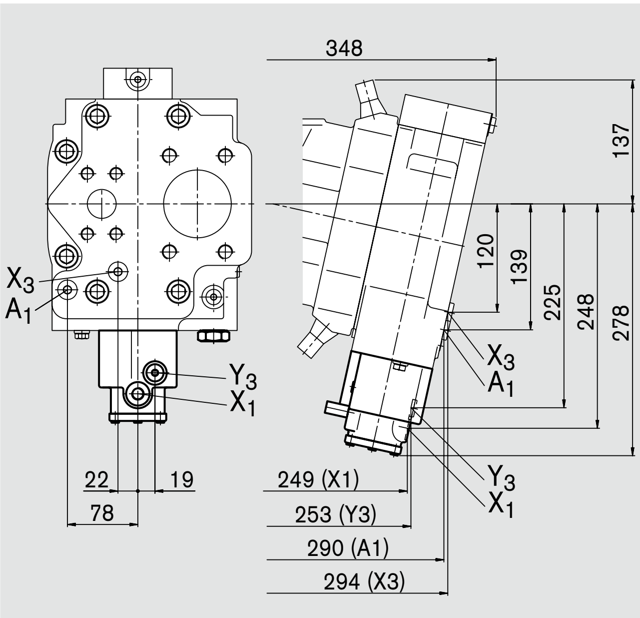
DRS

Pressure controller with load sensing



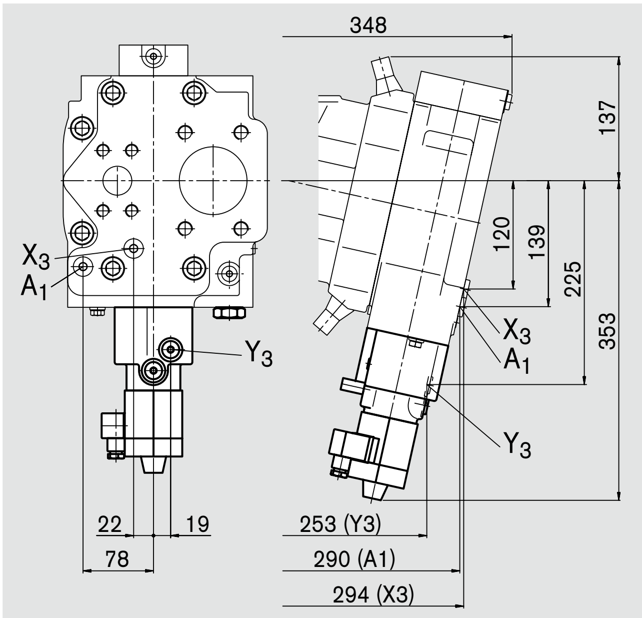
HD1/HD1G/HD2/HD2G

Hydraulic control for pressure cut-off, remote controlled



EP/EPG

Electric control for pressure cut-off, remote controlled



Installation Notes

General

During commissioning and operation, the axial piston unit must be filled with hydraulic fluid and air bled. This is also to be observed following a relatively long standstill as the system may empty via the hydraulic lines.

The case drain chamber is internally connected to the suction chamber. A case drain line to the tank is not required.
Exception: when operated with pressure controller or pressure cut-off.
In all operational states, the suction line must flow into the tank below the minimum fluid level.
The minimum suction pressure at port S must not fall below of 0.8 bar absolute.

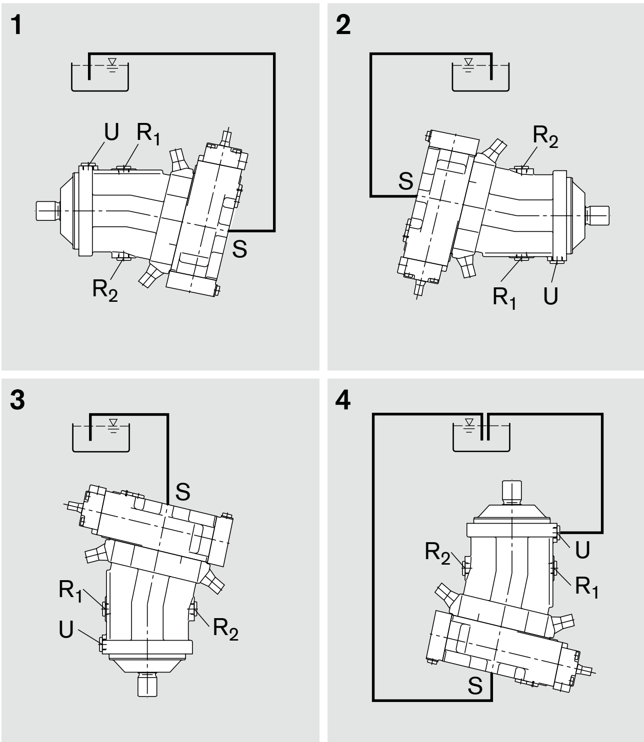
Installation position

See examples below. Additional installation positions are available upon request.

Below-tank installation (standard)

Pump below the minimum fluid level of the tank.

Recommended installation positions: 1 and 2.



Installation position	Air bleeding	Filling
1	R1	S
2	R2	S
3	R_1, R_2	S
4	U	S

General Notes

– The A7VO pump is designed to be used in open circuits.

– Project planning, assembly and commissioning of the pump require the involvement of qualified personnel.

– The service line ports and function ports are only designed to accommodate hydraulic lines.

– During and shortly after operation, there is a risk of burns on the pump and especially on the solenoids. Take suitable safety precautions, e.g. wear protective clothing

– There may be shifts in the characteristic depending on the operating state of the pump (operating pressure, fluid temperature).

– Tightening torques:
  - The tightening torques specified in this data sheet are maximum values and must not be exceeded (maximum values for screw thread).
    Manufacturer's instructions for the max. permissible tightening torques of the used fittings must be observed!
  - For DIN 13 fixing screws, we recommend checking the tightening torque individually according to VDI 2230 Edition 2003.

– The data and information contained herein must be adhered to.

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