

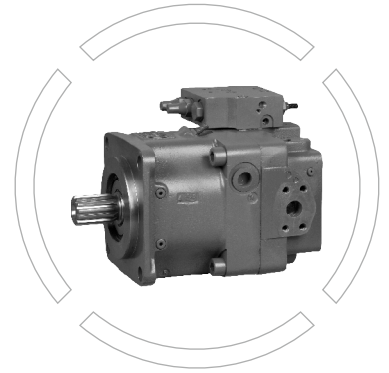
A11V(L)O

Swash plate Axial Piston Pump

Sizes: 40 to 260 mL/r

Nominal pressure up to 350 bar

Maximum pressure up to 400 bar



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Features

- Variable axial piston pump of swash plate design for hydrostatic drives in open circuit hydraulic system.
- Designed primarily for use in mobile applications.
- The pump operates under self-priming conditions, with tank pressurization, or with an optional built-in charge pump (impeller).
- A comprehensive range of control options is available matching any application requirement.
- Power control option is externally adjustable, even when the pump is running.
- The through drive is suitable for adding gear pumps and axial piston pumps up to the same, i.e. 100% through drive.
- The output flow is proportional to the drive speed and infinitely variable between q_{vmax} and $q_{vmin}=0$



Ordering code

Swash plate design variable pump	= A11V									
Charge pump										
Without Charge pump	= No code									
With charge pump (only 130, 145, 190)	= L									
Way of working										
Pumps for open circuit	= O									
Specifications										
Displacement $V_{g\ max}$ (cm ³)	=40, 60, 75, 95, 115, 130, 145, 190, 260									
Control Unit										
Size	40	60	75	95	115	130	145	190	260	
Power control/pressure cut-off stroke limiter U= 12V	●	●	●	●	●	●	●	●	●	LRDU1
Positive Characteristics U= 24V	●	●	●	●	●	●	●	●	●	LRDU2
Power control/pressure cut-off stroke limiter $\Delta p= 25$ bar	—	—	○	○	○	○	○	●	●	LRDH2
Positive Characteristics $\Delta p= 10$ bar	—	—	●	—	●	—	●	—	—	LRDH6
Power control/ pressure cut-off/ load sensing	●	●	●	●	●	●	●	●	●	LRDS
power control, Negative with electric unauthorized / load sensing U= 12V	—	—	—	●	●	●	●	●	●	LE1S
U= 24V	—	—	—	●	●	●	●	●	●	LE2S
electric prop. override U= 24V	—	—	—	●	●	●	●	●	●	LE2S2
Pressure control with load sensing	—	—	●	●	●	●	●	●	●	DRS
Electric control Positive characteristic with proportional solenoid U= 12V	—	—	○	●	●	●	●	●	●	EP1
U= 24V	—	—	○	●	●	●	●	●	●	EP2
with pressure cut-off positive characteristic U= 12V	●	●	○	●	●	●	●	●	●	EP1D
U= 24V	●	●	○	●	●	●	●	●	●	EP2D
Series										
Size 40 to 115		= 10								
Size 130 to 260		= 11								
Direction of rotation (View from shaft end)										
Clockwise		= R								
Counter-clockwise		= L								
Seal										
NBR (nitrile- caoutchouc), shaft seal ring in FKM (fluor-caoutchouc)		= N								
Drive shaft										
Size	40	60	75	95	115	130	145	190	260	
Splined shaft DIN5480 for single and combinations pump	●	●	●	●	●	●	●	●	●	Z
Parallel keyed shaft DIN6885	●	●	●	●	●	●	●	●	●	P
Splined shaft ANSI B92 1a-1976 For single pump	●	●	●	●	●	●	●	●	●	S
For combination pump	●	●	●	●	●	●	●	●	●	T
Mounting Flange										
SAE J744 - 2hole (only NG60)		= C								
SAE J744 - 4 hole		= D								
Service Line Port										
Pressure and suction port SAE at side opposite side (with metric fastening threads)		= 12								



Ordering code

Through drives

Flange SAE J744	Coupler for splined shaft	40	60	75	95	115	130	145	190	260	
Without through drive		●	●	●	●	●	●	●	●	●	N00
82-2 (A)	5/8" 9T 16/32 DP (A)	●	●	●	●	●	●	●	●	●	K01
	3/4" 11T 16/32 DP (A-B)	●	●	●	●	●	●	●	●	●	K52
101-2 (B)	7/8" 13T 16/32 DP (B)	●	●	●	●	●	●	●	●	●	K02
	1" 15T 16/32 DP (B-B)	●	●	●	●	●	●	●	●	●	K04
	W35 2x30x16-9g	●	●	●	●	●	●	●	●	●	K79
127-2 (C)	1 1/4" 14T 12/24DP (C)	—	●	●	●	●	●	●	●	●	K07
	1 1/2" 17T 12/24 DP (C-C)	—	—	—	●	●	●	●	●	●	K24
	W30 2x30x14-9g	—	●	●	●	●	●	●	●	●	K80
	W35 2x30x16-9g	—	●	●	●	●	●	●	●	●	K61
152-4 (D)	1 1/4" 14T 12/24DP (C)	—	—	●	●	●	●	●	●	●	K86
	1 3/4" 13T 8/16 DP (D)	—	—	—	—	—	●	●	●	●	K17
	W40 2x30x18-9g	—	—	●	●	●	●	●	●	●	K81
	W45 2x30x21-9g	—	—	—	●	●	●	●	●	●	K82
	W50 2x30x24-9g	—	—	—	—	—	●	●	●	●	K83
165-4 (E)	1 3/4" 13T 8/16 DP (D)	—	—	—	—	—	—	—	●	●	K72
	W50 2x30x24-9g	—	—	—	—	—	—	—	●	●	K84

● = Available

— = Not Available

○ = On Request

S-Shaft Suitable for combination pump



Technical parameters

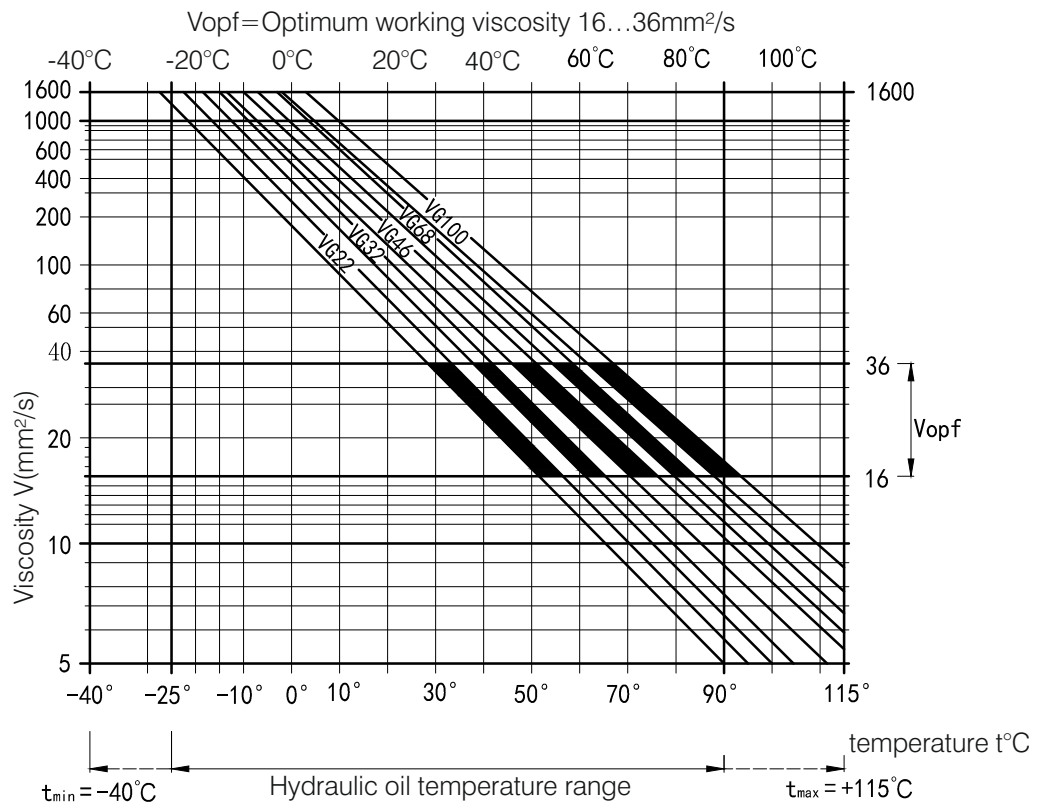
Hydraulic oil

When choosing hydraulic oil, you should first consider the ambient temperature where the equipment often works, whether the equipment is working in the south or the north, whether it is working on the ground or underground, and whether it is exported to the tropics.

In this way, the thermal equilibrium temperature that the hydraulic system usually reaches can be estimated as accurately as possible. A11V(L)O piston pump can only use mineral based hydraulic oil (HLP), Fire-resistant hydraulic oil (HF) cannot be used. When using HFD or environmentally friendly hydraulic fluids, the relevant technical data and seals must be observed

Working viscosity range

For optimum efficiency and longevity, we recommend operating viscosity (at operating temperature) within the following ranges:



According to the viscosity-temperature curves of different grades of hydraulic oil, each oblique line represents a grade of hydraulic oil, the abscissa is the temperature, and the ordinate is its viscosity. The shaded part is 16~32mm²/s range. Therefore, when we know the thermal equilibrium temperature of the system, we can make rational oil choices accordingly. For example, if the thermal equilibrium temperature of the system is 60°C, from It can be found in the picture that VG46 and VG68 hydraulic oils are suitable. Usually when two or more hydraulic oils meet the requirements, it is recommended to choose a high-grade hydraulic oil, but we still need to see which hydraulic oil has viscosity characteristics in a wider temperature range (at 16...36mm² range)

Viscosity limit range

A11V(L)O plunger pump, the minimum allowable oil viscosity is $V_{min} = 5 \text{ mm}^2/\text{s}$ (operation time does not exceed 3min.); the maximum allowable oil viscosity is $V_{max} = 1600 \text{ mm}^2/\text{s}$ (operation time no more than 3 minutes).

When the A11V(L)O plunger pump is cold started ($P \leq 3 \text{ Mpa}$, $n \leq 1000 \text{ rpm}$, $t_{min} = -40^\circ\text{C}$), it must be started without load, and it must be ensured that the oil can reach normal after running for 15 minutes Viscosity required for the job

NOTE: Please note that the allowable high temperature is 115°C, and no part of the pump body can exceed this temperature. (Usually the temperature at the bearing is high, which is higher than the case drain temperature high degree.



Technical parameters

- Filter

The finer the oil is filtered and the cleaner the oil is, the longer the axial piston element will last. In order to ensure the normal operation of the axial piston element, the cleaning of the oil, The cleanliness level should be at least ISO 4406 20/18/15
Depending on the system and application, for SA6VM we recommend filter element $\beta_{20} \geq 100$, β must not decrease as the pressure differential across the filter element increases. at higher oil temperatures (90°C up to 115°C), cleanliness should be graded ISO 4406 19/17/14

Working pressure range

Pressure at suction port S

without booster pump

$P_{s \min} \geq 0.8 \text{ Bar}$ $P_{s \max} \geq 30 \text{ Bar}$

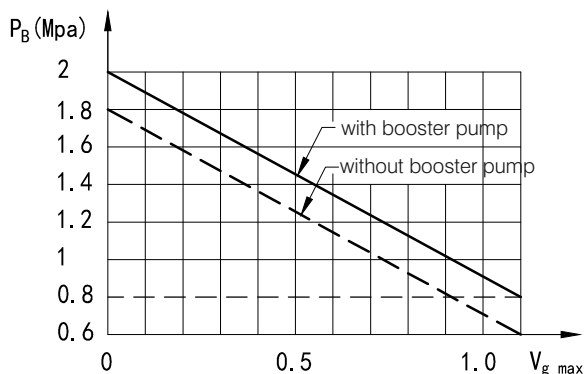
Pressure at work line port (A or B)

Nominal pressure: $P = 350 \text{ bar}$

Peak pressure: $P_{\max} = 400 \text{ bar}$

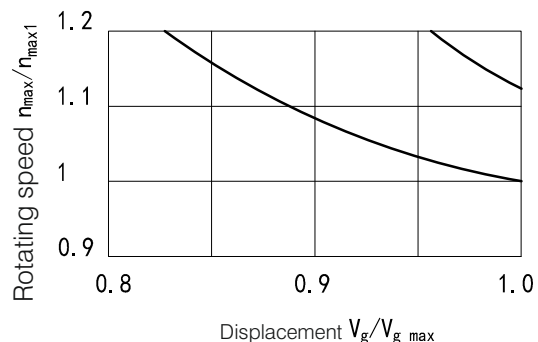
Minimum working pressure

The minimum working pressure plus a in the working line depends on the rotational speed, the swash plate swing angle and pump displacement.



Maximum allowable speed

By increasing the pressure P at the suction port S, the allowable speed $V_g \leq V_{g \max}$



Case drain

The pressure at ports T1 and T2 is allowed to be 1.2bar higher than the inlet pressure at S, but the maximum drain pressure $P_{\text{Labs max}} \geq 2\text{bar}$

Shaft seal

temperature

Viton shaft seals are suitable for case temperature range of 25°C to 115°C, applications below -25°C require the use of nitrile rubber shaft seals (allowable temperature range: -40°C to +90°C). When ordering, please specify the nitrile rubber shaft seal in words. Please contact our company

Specifications calculations

Output flow $q_V = \frac{V_g \cdot n \cdot h_v}{1000}$ in L/min

Drive torque $T = \frac{V_g \cdot \Delta p}{20 \cdot p \cdot h_{mh}} = \frac{1.59 \cdot V_g \cdot Dp}{100 \cdot h_{mh}}$ in Nm

Drive power $P = \frac{2p \cdot T \cdot n}{60000} = \frac{T \cdot n}{9549} = \frac{q_V \cdot \Delta p}{600 \cdot h_t}$ in kW

V_g = geom. displacement per rev. in cm^3

Δp = differential pressure in bar

n = speed in rpm

h_v = volumetric efficiency

h_{mh} = mech-hyd. efficiency

h_t = overall efficiency ($h_t = h_v \cdot h_{mh}$)



Specifications

Table of performance parameters (theoretical values, efficiency and tolerances are not considered, values are rounded)

A11VO			40	60	75	95	115	130	145				
A11VLO										130	145	190	260
Displacement	V_{gmax}	ml/r	42	58.5	74	93.5	115	130	145	130	145	193	260
Rotating speed													
Maximum value at $V_g \text{ max a)}$	n_{max}	rpm	3000	2700	2550	2350	2350	2100	2200	2500	2500	2500	2300
Maximum value when $V_g < V_g \text{ max b)}$	n_{max1}	rpm	3500	3250	3000	2780	2780	2500	2500	2500	2500	2500	2300
Flow (at n_{max}, V_{gmax})	q_v	L/min	126	158	189	220	220	273	319	325	363	483	598
Power													
at $n_{max}, V_g \text{ max}$ and $\Delta P=350\text{bar}$	p	Kw	74	92	110	128	158	159	186	190	211	281	349
Torque													
at $V_g \text{ max}$ and $\Delta P=350\text{bar}$	T	Nm	234	326	412	521	641	724	808	724	808	1075	1448
Oil filling amount	V	L	1.1	1.35	1.85	2.1	2.1	2.9	2.9	2.9	2.9	3.8	4.6
Weight Approx (without thru-shaft drive)	m	Kg	32	40	45	53	53	76	76	72	73	104	138

a) The values apply at absolute pressure (P_{abs}) 0.1MPa at the suction port S and mineral hydraulic fluid.

b), The values apply at $V_g < V_g \text{ max}$ or in case of an increase in the inlet pressure P_{abs} at the suction port S.



LR-Power Control

The power control regulates the displacement of the pump depending on the operating pressure so that a given drive power is not exceeded at constant drive speed.

$PB \times Vg = \text{constant}$
 PB=operating pressure
 Vg=displacement

The precise control with a hyperbolic control characteristic provides an optimum utilization of available power. The operating pressure acts on a rocker via a measuring piston. An externally adjustable spring force counteracts this, it determines the power setting.

If the operating pressure exceeds the set spring force, the control valve is actuated by the rocker, the pump swivels back (direction Vg_{min}). The lever length at the rocker is shortened and the operating pressure can increase at the same rate as the displacement decreases without the drive powers being exceeded ($PB \times Vg = \text{constant}$).

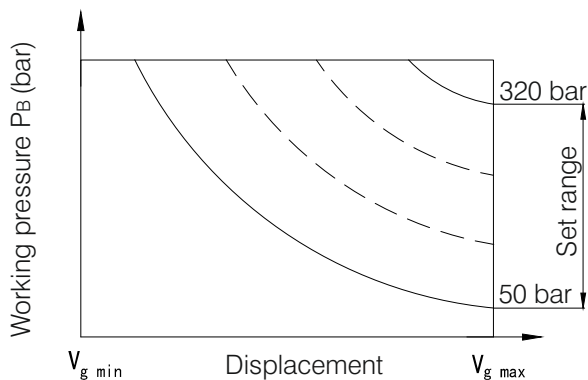
The hydraulic output power (characteristic LR) is influenced by the efficiency of the pump.

State in clear text in the order:

- drive power P in kW
- drive speed n in prm
- max. flow $q_{v \max}$ in L/min

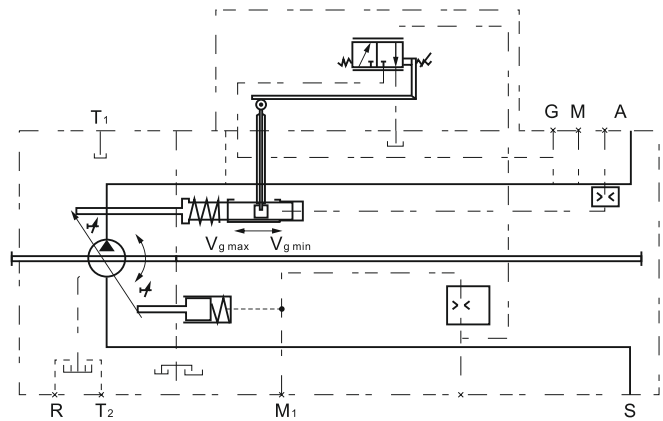
After clarifying the details a power diagram can be created by our computer.

Characteristic curve (LR)

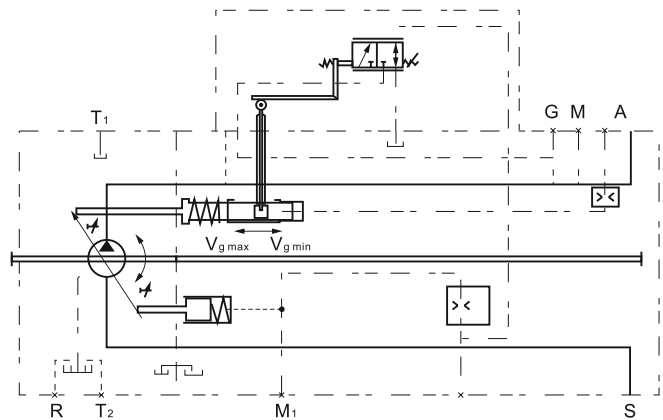


Circuit diagram LR

Size:40...145



Size:190...260





LR-Power Control

LE1/2 Electric override (negative)

Contrary to hydraulic power control override, the basic power setting is reduced by an electric pilot current applied to a proportional solenoid. The resulting force is acting against the mechanical power control adjustment spring. The mechanically adjusted basic power setting can be varied by means of different control current settings.

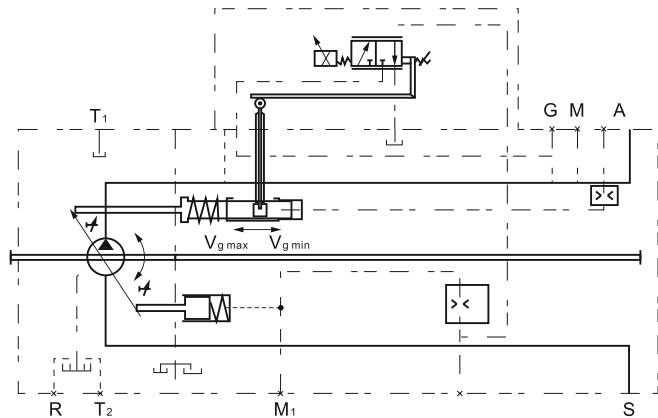
Increase in current = decrease in power

If the pilot current signal is adjusted by a load limiting control the power consumption of all actuators will be reduced to match the available power from the diesel engine.

A 12V(LE1) or 24V(LE2) supply is required for the control of the proportion solenoid.

Circuit diagram LE1/2

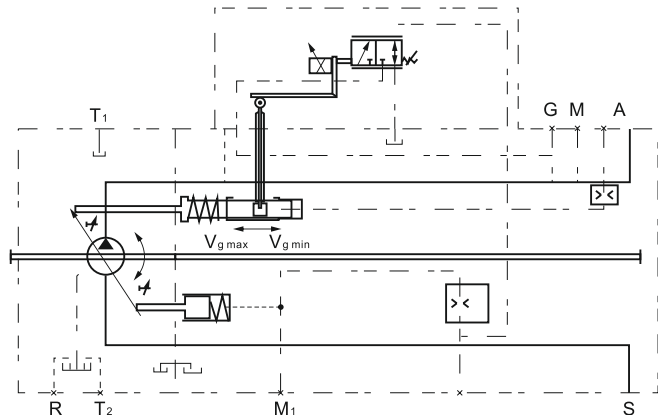
Size:40...145



Technical data - solenoids

	LE1	LE2
Voltage	12V DC (± 20%)	24V DC (± 20%)
Control current		
Start of control	400mA	200mA
End of control	1200mA	600mA
Limiting current	1.54A	0.77A
Nominal resistance(at 20°C)	5.5Ω	22.7Ω
Dither frequency	100Hz	100Hz
Actuated time	100%	100%
Type of protection	IP65	

Size:190...260





LR-Power Control

LRD Power control with pressure cut-off

The pressure cut-off corresponds to a pressure control which adjusts the pump displacement back to $V_g \text{ min}$, when the pressure setting is reached.

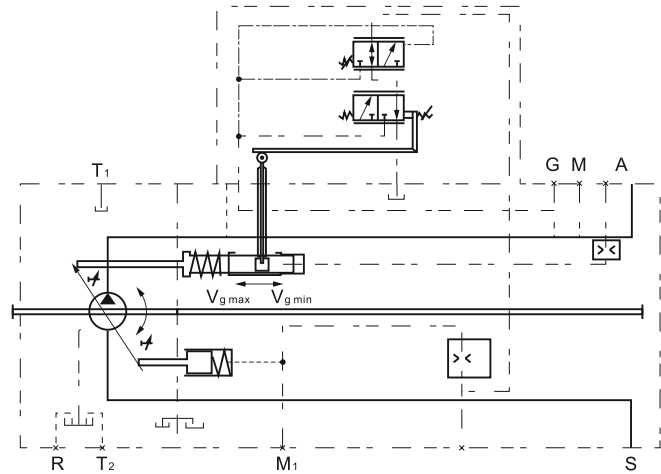
This function overrides the power control, i.e. below the preset pressure value, the power function is effective.

The pressure cut-off function is integrated into the pump control module and is preset to a specified value at the factory.

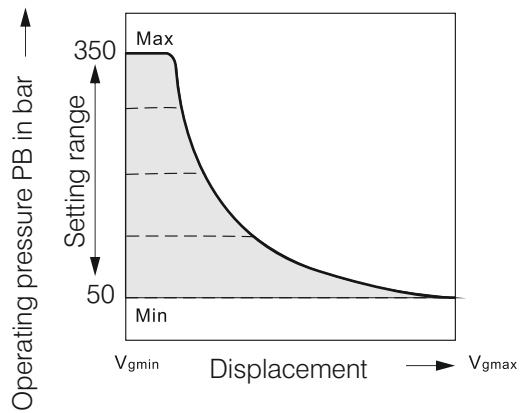
Setting range from 50 to 350 bar

Circuit diagram LRD

Size: 40...145



Characteristic LRD





LR-Power Control

LRDS Power control with pressure cut-off and load sensing

The load sensing control 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 sensing orifice(1) fitted between the pump outlet and the actuator. The flow is independent of the load pressure below the power curve and the pressure cut-off setting and within the control range of the pump.

The sensing 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 sensing orifice and thus the flow of the pump.

The load sensing control compares pressure before and after the sensing orifice and maintains the pressure drop across the orifice (differential pressure ΔP) and with it the pump flow constant.

If the differential pressure ΔP increases at the sensing orifice, the pump is swivelled back (towards $V_{g \text{ min}}$),and, if the differential pressure ΔP decreases, the pump is swivelled out (towards $V_{g \text{ max}}$) until the pressure drop across the sensing orifice in the valve is restored.

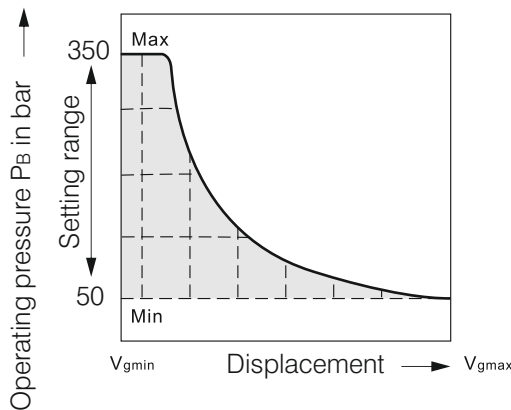
$$\Delta P_{\text{orifice}} = P_{\text{pump}} - P_{\text{actuator}}$$

The setting range for ΔP is between 14 bar and 25 bar. The standard differential pressure setting is 18 bar. (Please state in clear text when ordering).

The stand-by pressure in zero stroke operation (sensing orifice plugged) is slightly above the ΔP setting.

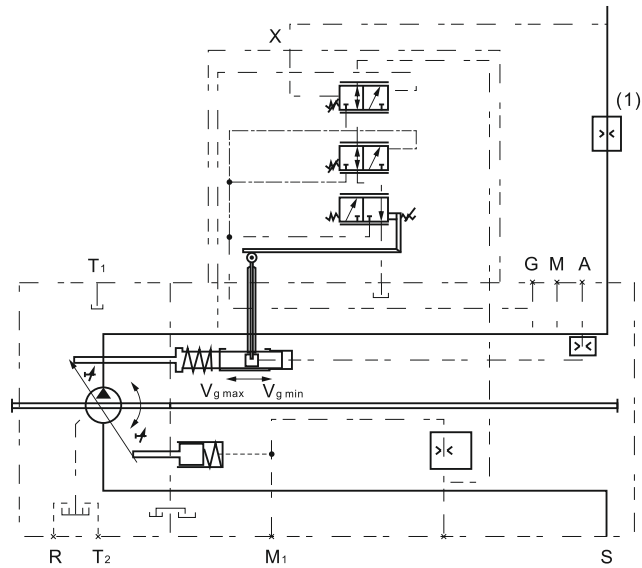
(1) The sensing orifice (control block) is not included in the pump supply.

Characteristic LRDS

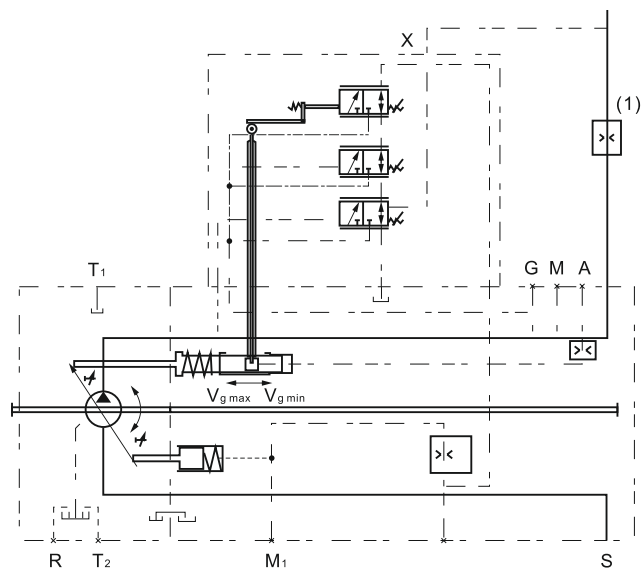


Circuit diagram LRDS

Size:40...145



Size:190...260



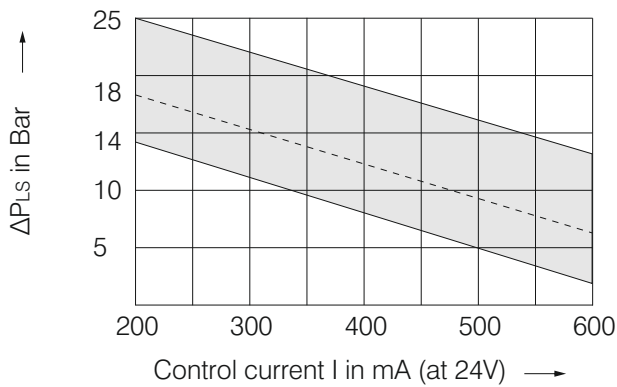


LR-Power Control

LRS2 Power control with load sensing, electric override

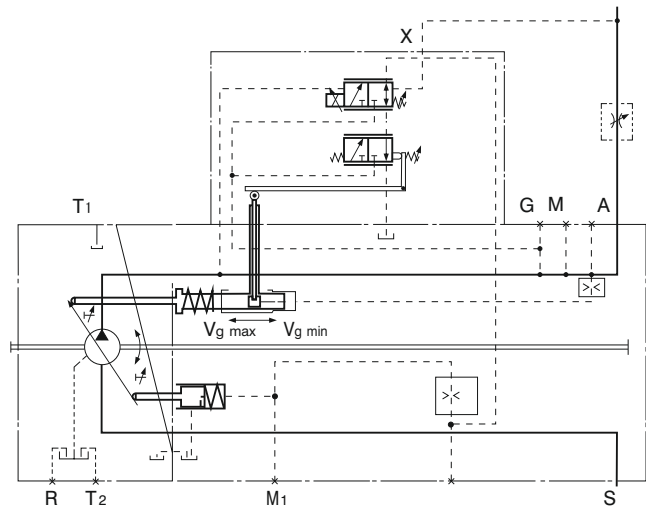
This control option adds a proportional solenoid to override to the mechanically set load sensing pressure. The pressure differential change is proportional to the solenoid current. Increasing current = smaller ΔP -setting
 See following characteristic for details (example).
 Please consult us during the project planning phase.
 For solenoid specification, see LE2 control

Characteristic LRS2

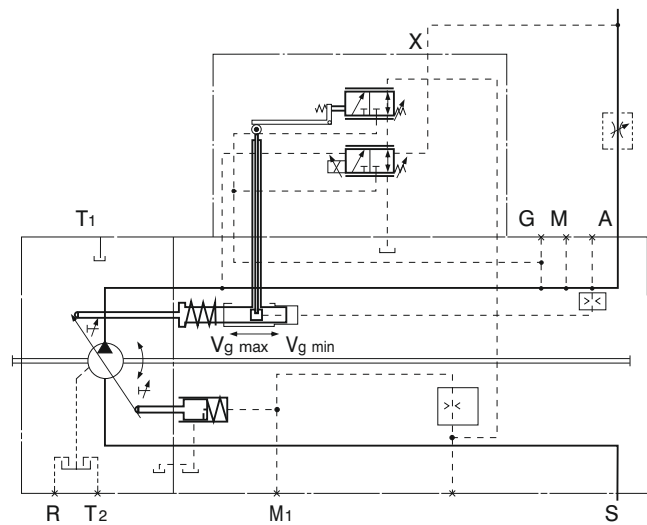


Circuit diagram LRS2

Size:40...145



Size:190...260





LR-Power Control

LR... Power control with stroke limiter

The stroke limiter can be used to vary or limit the displacement of the pump continuously over the whole control range. The displacement is set in LRH with the pilot pressure P_{st} (max.4 Mpa) applied to port Y or in LRU by the control current applied to the proportional solenoid. A DC current of 12V (U1) or 24V(U2) is required to control the proportional solenoid.

The power control overrides the stroke limiter control, i.e. below the hyperbolic power characteristic, the displacement is controlled by the control current or pilot pressure. When exceeding the power characteristic with a set flow or load pressure, the power control overrides and reduces the displacement following the hyperbolic characteristic.

To permit operation of the pump displacement control from its starting position $V_{g \max}$ to $V_{g \min}$, a minimum control pressure of 3 MPa is required for the electric stroke limiter LRU1/2 and the hydraulic stroke limiter LRH2/6.

The required control pressure is taken either from the load pressure, or from the externally applied control pressure at the G port. To ensure functioning of the stroke limiter even at low operating pressure, port G must be supplied with external control pressure of approx.3 Mpa.

Note: If no external control pressure is connected at G, the shuttle valve must be removed.

LRH2/6 Hydraulic stroke limiter (positive characteristic)

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

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

Start of control (at $V_{g \min}$), can be set from 0.4-1MPa.

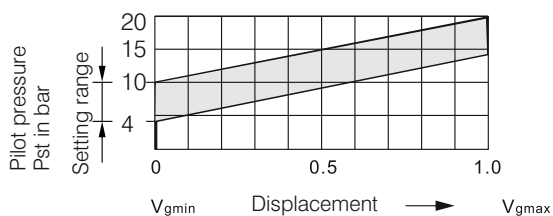
State start of control in clear text in the order.

Starting position without control signal (pilot pressure):

- at operating pressure and external control pressure < 3 MPa: $V_{g \max}$
- at operating pressure or external control pressure < 3 MPa: $V_{g \min}$

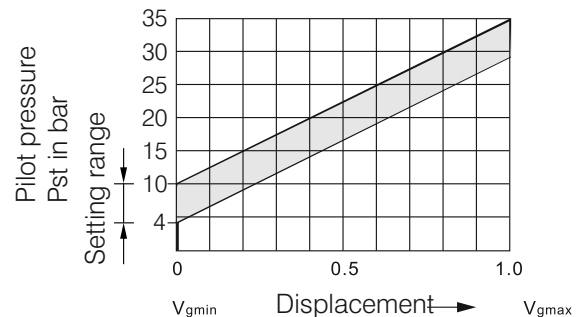
Characteristic H6

Increase in pilot pressure ($V_{g \min} - V_{g \max}$) $\Delta P = 10 \text{ bar}$



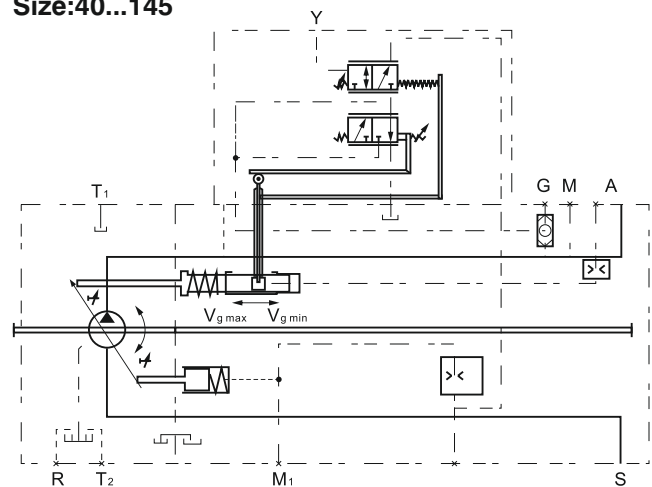
Characteristic H2

Increase in pilot pressure ($V_{g \min} - V_{g \max}$) $\Delta P = 25 \text{ bar}$

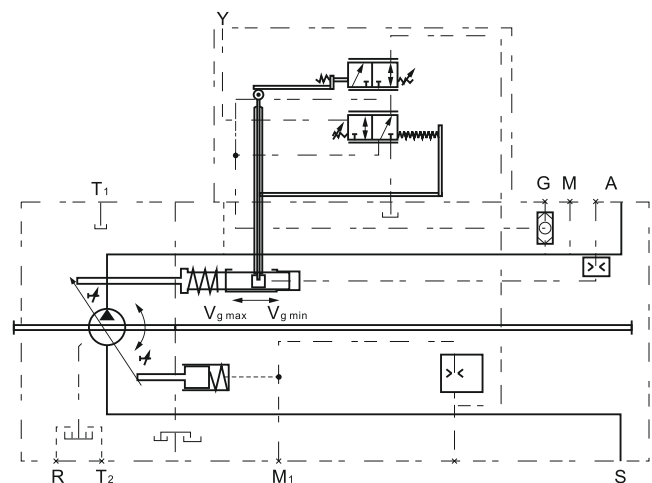


Circuit diagram LRS2

Size: 40...145



Size: 190...260





LR-Power Control

LRU1/2 Electric stroke limiter (positive characteristic)

Control from $V_g \text{ min}$ to $V_g \text{ max}$

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

Technical data - solenoids

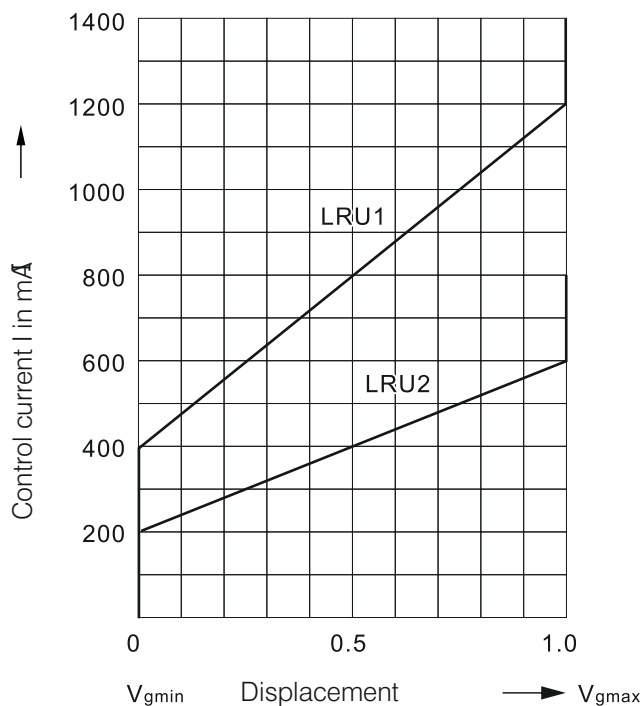
	LRU1	LRU2
Voltage	12V DC ($\pm 20\%$)	24V DC ($\pm 20\%$)
Control current		
Start of control	400mA	200mA
End of control	1200mA	600mA
Limiting current	1.54A	0.77A
Nominal resistance(at 20°C)	5.5 Ω	22.7 Ω
Dither frequency	100Hz	100Hz
Actuated time	100%	100%
Type of protection	IP65	

Starting position without control signal(control current):

at operating pressure and external control pressure < 30 bar: $V_g \text{ max}$

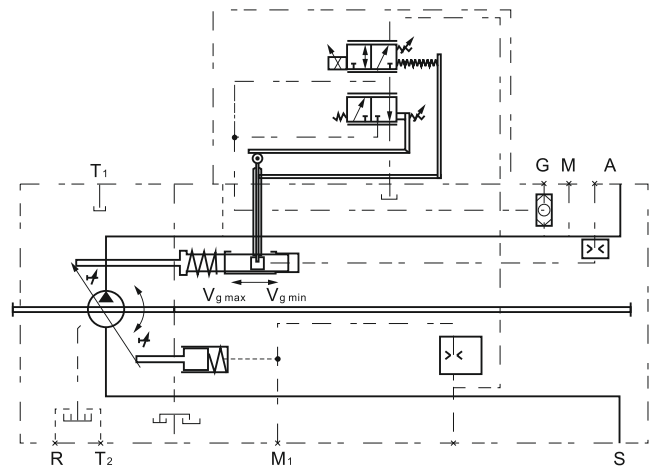
- at operating pressure or external control pressure < 30 bar: $V_g \text{ min}$

Characteristic LRU1/2



Circuit diagram LRU1/2

Size:40...145



Size:190...260



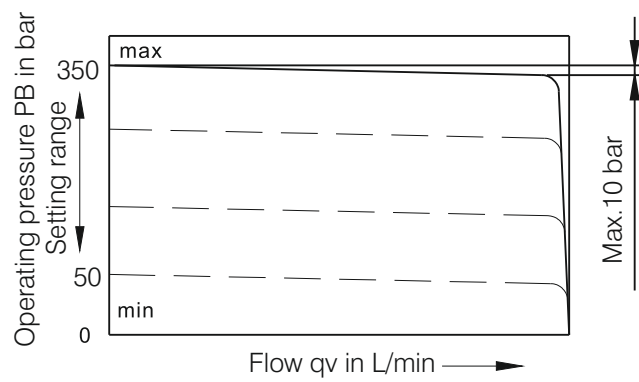


DR-Power Control

DR Pressure control

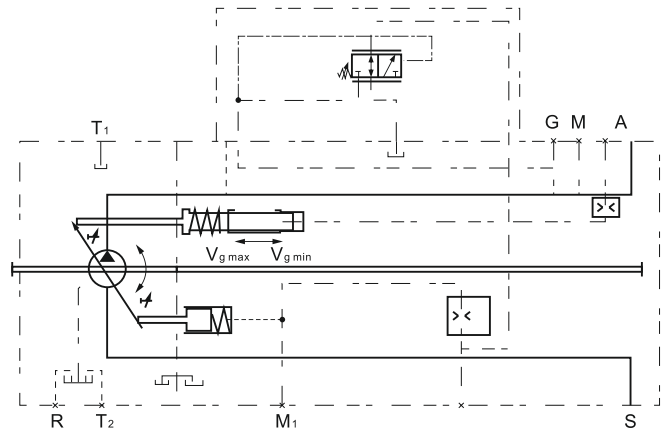
The pressure control keeps the pressure in a hydraulic system constant within its control range even under varying flow conditions. The variable pump only moves as much hydraulic fluid as is required by the actuators. If the operating pressure exceeds the set point set at the integral pressure control valve, the pump displacement is automatically swivelled back until the pressure deviation is corrected. Starting position in depressurized state: $V_g \text{ max}$
 Setting range from 50 to 350 bar

Characteristic DR

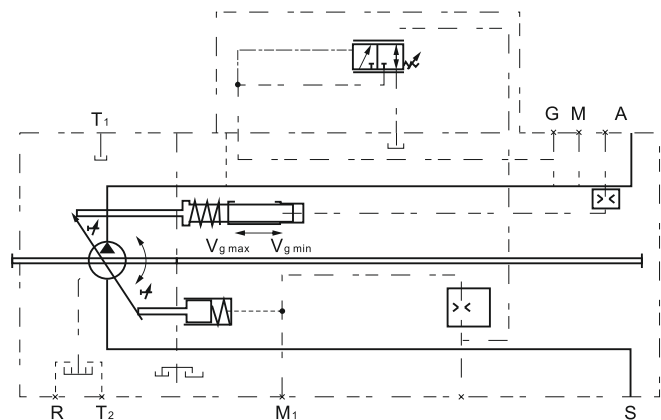


Circuit diagram DR

Size:40...145



Size:190...260





DR-Power Control

DRS Pressure control with load sensing

The load sensing control 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 sensing orifice (1) fitted between the pump outlet and the actuator. The flow is independent of the load pressure below the pressure cut-off setting and within the control range of the pump.

The sensing 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 sensing orifice and thus the flow of the pump. The load sensing control compares pressure before and after the sensing orifice and maintains the pressure drop across the orifice (differential pressure ΔP) and with it the pump flow constant.

If the differential pressure ΔP increases at sensing orifice, the pump is swivelled back (towards $V_g \text{ min}$), and, if the differential pressure ΔP decreases, the pump is swivelled out (towards $V_g \text{ max}$) until the pressure drop across the sensing orifice in the valve is restored.

$$\Delta P_{\text{orifice}} = P_{\text{pump}} - P_{\text{actuator}}$$

The setting range for ΔP is between 1.4MPa and 2.5MPa.

The standard differential pressure setting is 1.8MPa.

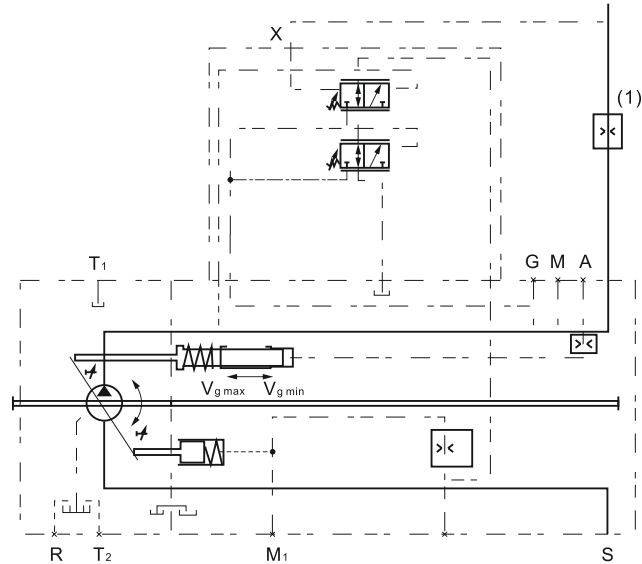
(Please state in clear text when ordering).

The stand-by pressure in zero stroke operation (sensing orifice plugged) is slightly above the ΔP setting.

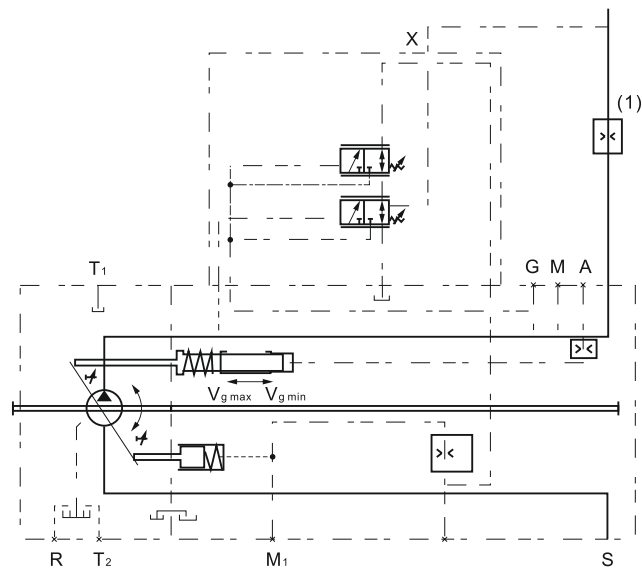
(1) The sensing orifice (control block) is not included in the pump supply

Circuit diagram DRS

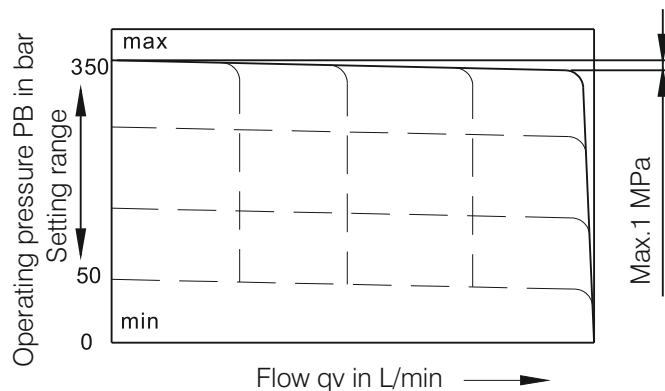
Size: 40...145



Size: 190...260



Characteristic DRS





EP - Electric Control With Proportional Solenoid

With the electric control with proportional solenoid, the pump displacement is adjusted proportionally to the solenoid current, resulting in a magnetic control force, acting directly onto the control spool that pilots the pump control piston.

Control from $V_g \text{ min}$ to $V_g \text{ max}$

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

Starting position without control signal (control current):

- at operating pressure and external control pressure < 3MPa: $V_g \text{ max}$
- at operating pressure and external control pressure < 3MPa: $V_g \text{ min}$

A control pressure of 3 MPa is required to swivel the pump from its starting position $V_g \text{ max}$ to $V_g \text{ min}$.

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

To ensure the control even at low operating pressure < 3 MPa the port G must be supplied with an external control pressure of approx. 3 MPa.

Note:

If no external control pressure is connected at G, the shuttle valve must be removed.

Note:

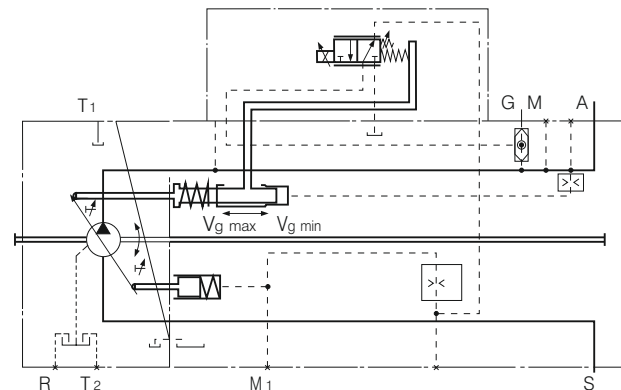
Install pump with EP control in the oil tank only when using mineral hydraulic oils and an oil temperature in the tank of max. 80°C.

Technical data - solenoids

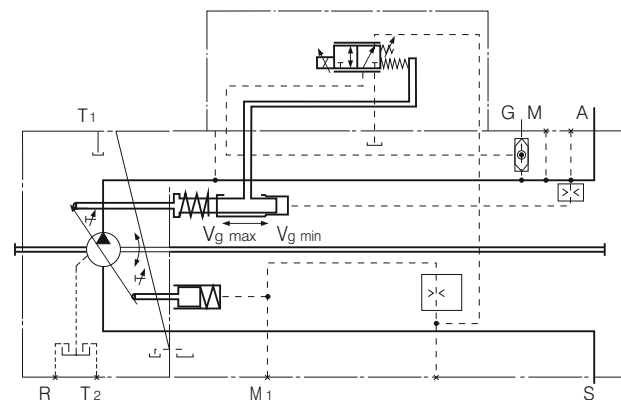
	Ep1	Ep2
Voltage	12V DC (± 20%)	24V DC (± 20%)
Control current		
Start of control at $V_{g \text{ min}}$	400mA	200mA
End of control at $V_{g \text{ max}}$	1200mA	600mA
Limiting current	1.54A	0.77A
Nominal resistance (at 20°C)	5.5Ω	22.7Ω
Dither frequency	100Hz	100Hz
Actuated time	100%	100%
Type of protection	IP65	

Circuit diagram EP1/2

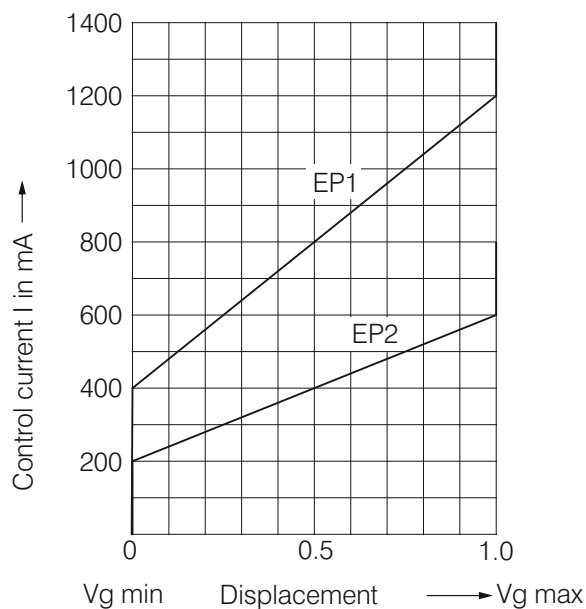
Size: 40...145



Size: 190...260



Characteristic EP1/2



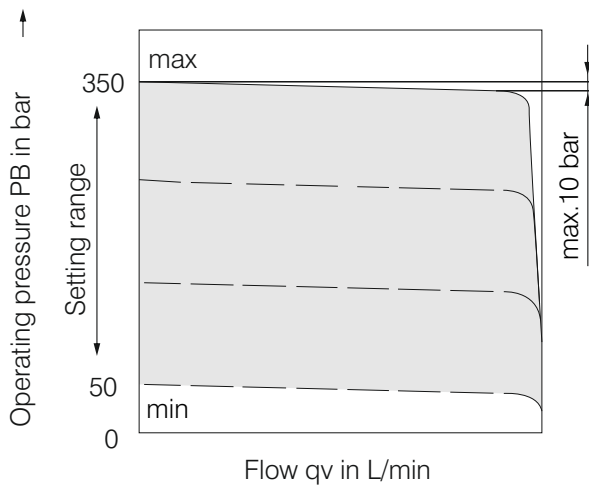


EP - Electric Control With Proportional Solenoid

EPD Electric control with pressure cut-off

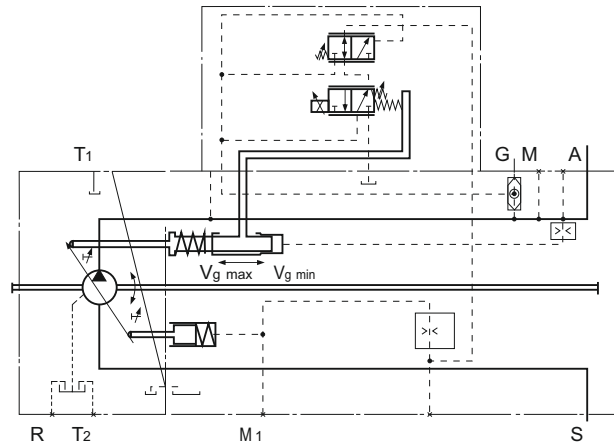
The pressure cut-off corresponds to a pressure control which adjusts the pump displacement back to $V_g \text{ min}$ when the pressure setting is reached. This function overrides the EP control, i.e. the control current related displacement control is functional below the pressure setting. The valve for the pressure cut-off is integrated in the control case and is set to a fixed specified pressure value at the factory. Setting range from 50 to 350 bar

Pressure cut-off characteristic D

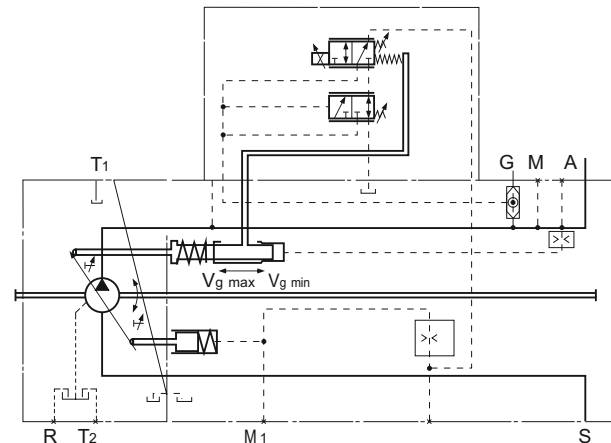


Circuit diagram EPD

Size:40...145



Size:190...260

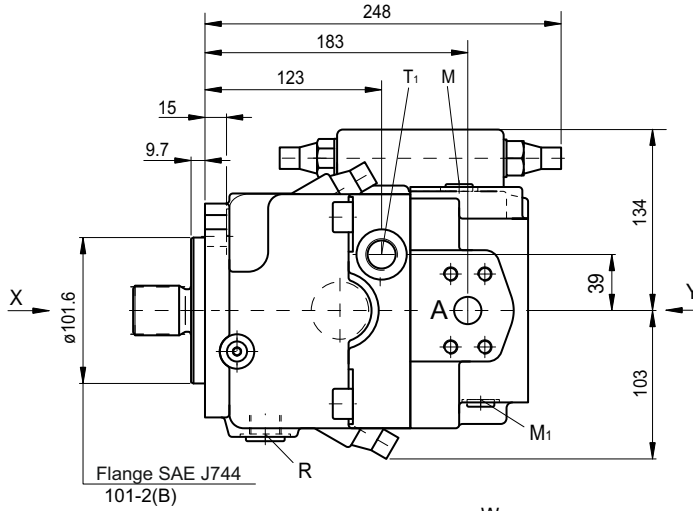




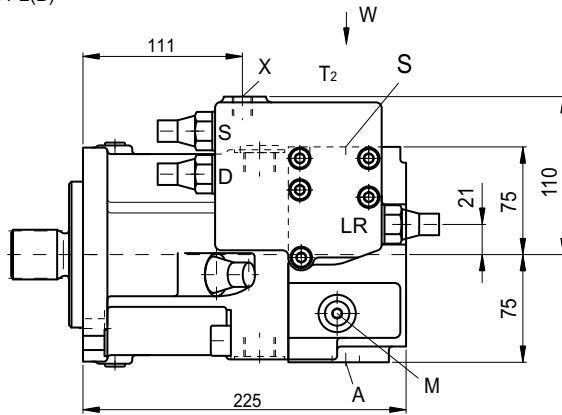
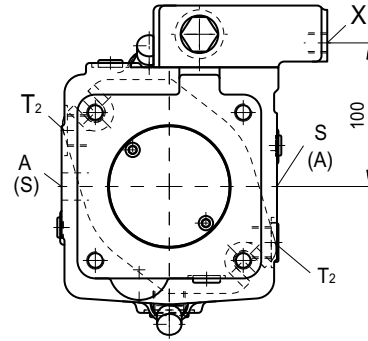
Unit Dimensions Size40

(Dimensions in mm)

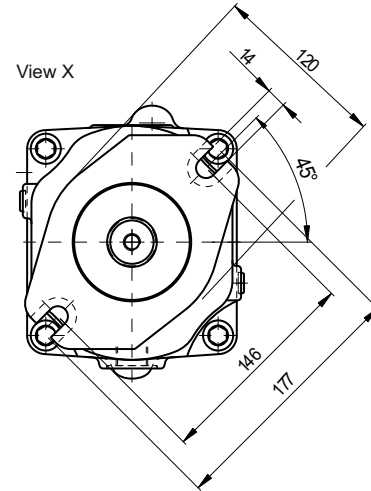
Power control LR with cut-off D and load sensing control S



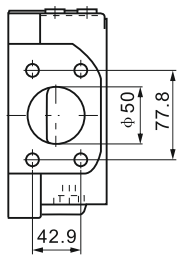
View Y
clockwise rotation
(counter-clockwise rotation)



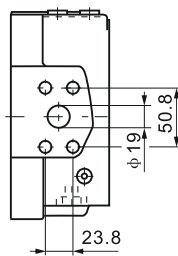
View X



Detail W



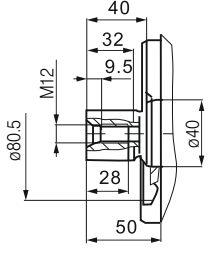
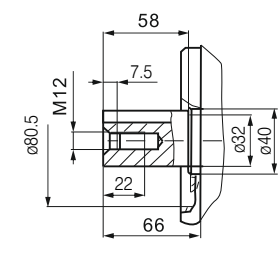
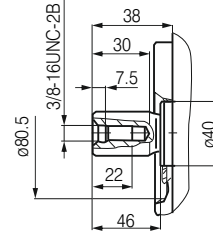
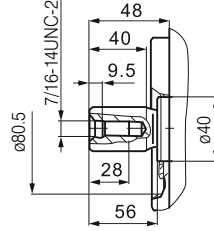
Detail V



Ports

A	Service line ports fixing thread	SAE J518 3/4" M10,17 deep
S	Suction port fixing thread	SAE J518 2" M12,20 deep
T1,T2	Tank port	M22×1.5,14 deep
R	Air bleed	M22×1.5,14 deep
M1	Measurement point, positioning chamber	M12×1.5,12 deep
M	Measurement point, service line port	M12×1.5,12 deep
X	Poilt pressure port	M14×1.5,12 deep

Shaft ends

<p>Z Splined shaft DIN5480 W35×2×30×16×9g</p> 	<p>P. Parallel keyed shaft DIN6885 AS10×8×56</p> 
<p>S Splined shaft SAE J744 1in 15T 16/32DP¹⁾</p> 	<p>T Splined shaft SAE J744 1 1/4in 14T 12/24DP¹⁾</p> 

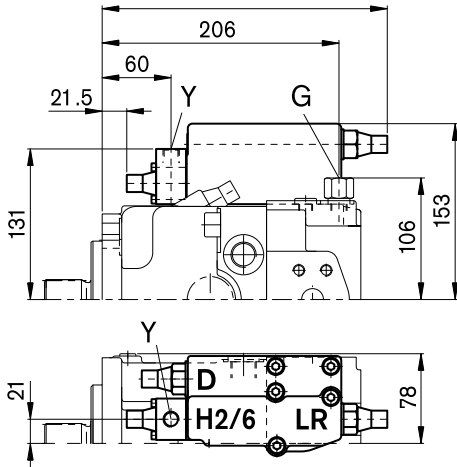


Unit Dimensions Size40

(Dimensions in mm)

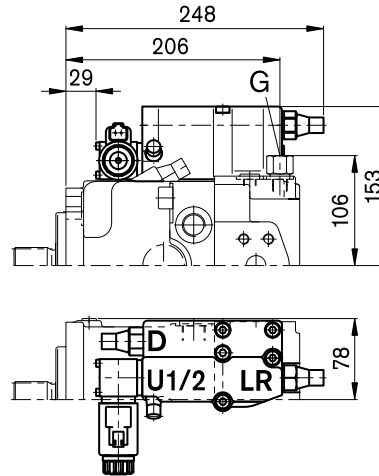
LRDH2/LRDH6:

Power control with pressure cut-off and hydraulic stroke limiter(positive characteristic)



LRDU1/LRDU2:

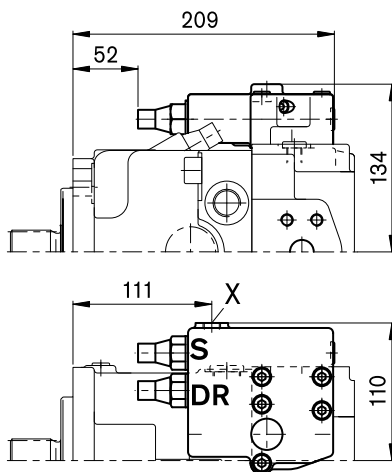
Power control with pressure cut-off and electric stroke limiter(positive characteristic)



Y Poilt pressure port M14×1.5,12 deep

DRS:

Pressure control with load sensing control

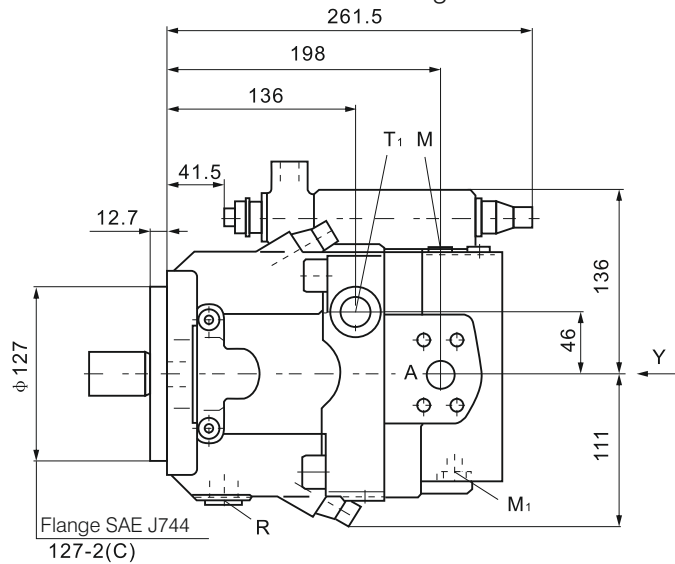




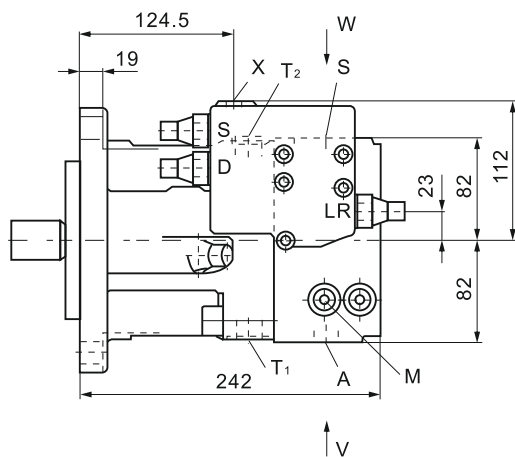
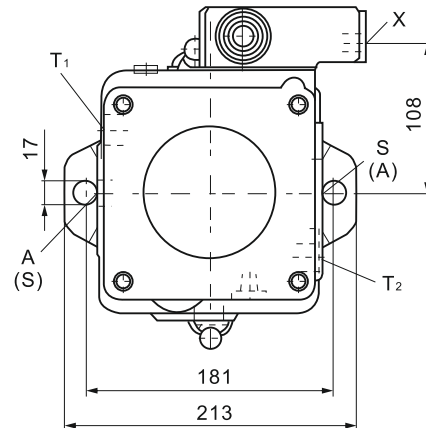
Unit Dimensions Size 60

(Dimensions in mm)

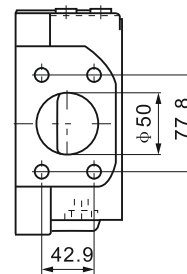
Power control LR with cut-off D and load sensing control S



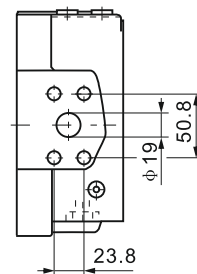
View Y
clockwise rotation
(counter-clockwise rotation)



Detail W



Detail V



Ports

A	Service line ports fixing thread	SAE J518 3/4"
S	Suction port fixing thread	SAE J518 2"
T1,T2	Tank port	M22×1.5,14 deep
R	Air bleed	M22×1.5,14 deep
M1	Measurement point, positioning chamber	M12×1.5,12 deep
M	Measurement point, service line port	M12×1.5,12 deep
X	Poilt pressure port	M14×1.5,12 deep

Shaft ends

<p>Z Splined shaft DIN5480 W35×2×30×16×9g</p>	<p>P. Parallel keyed shaft DIN6885 AS10×8×56</p>
<p>S Splined shaft SAE J744 1 1/4in 14T 12/24DP ¹⁾</p>	<p>T Splined shaft SAE J744 1 3/8in 21T 16/32DP ¹⁾</p>

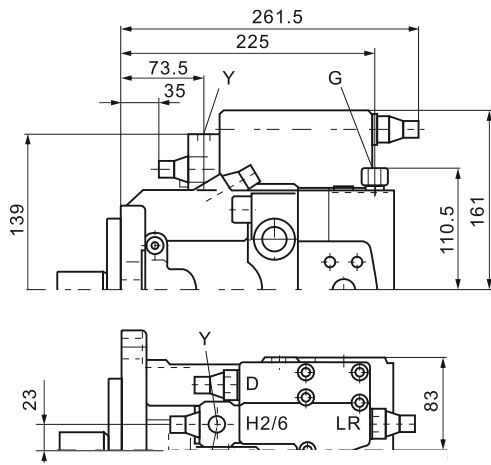


Unit Dimensions Size 60

(Dimensions in mm)

LRDH2/LRDH6:

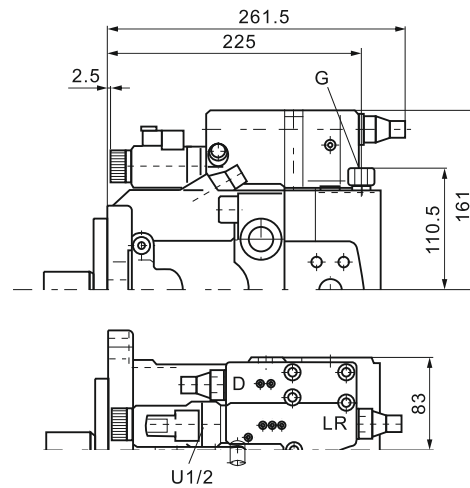
Power control with pressure cut-off and hydraulic stroke limiter(positive characteristic)



Y Poilt pressure port M14×1.5,12 deep

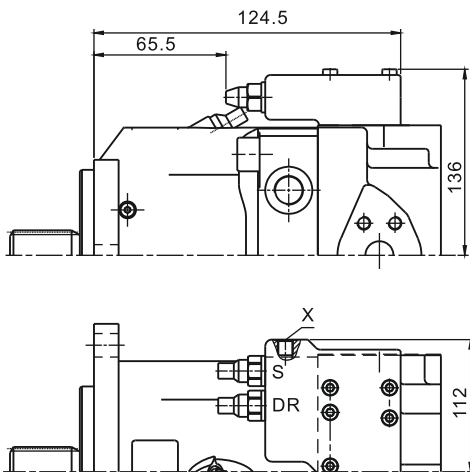
LRDU1/LRDU2:

Power control with pressure cut-off and electric stroke limiter(positive characteristic)



DRS:

Pressure control with load sensing control

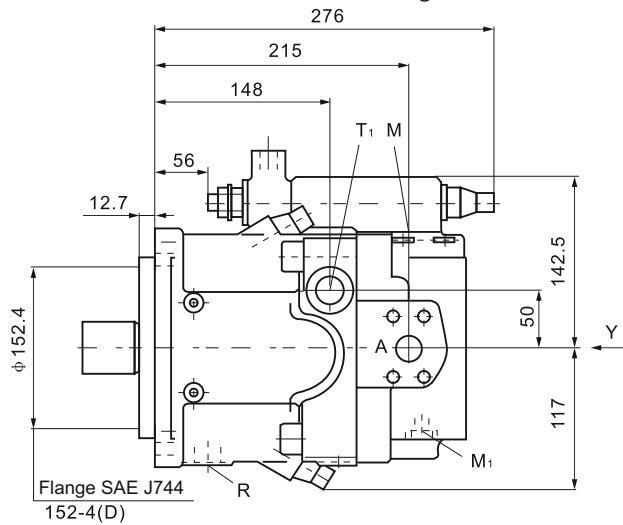




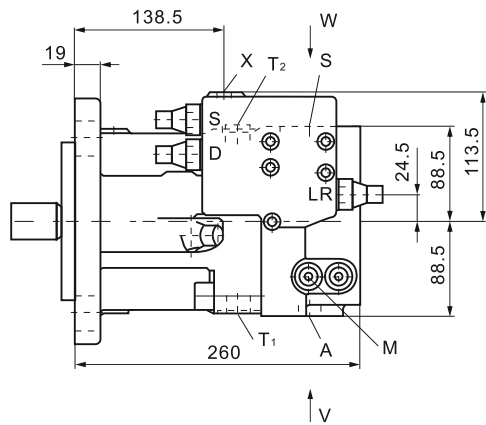
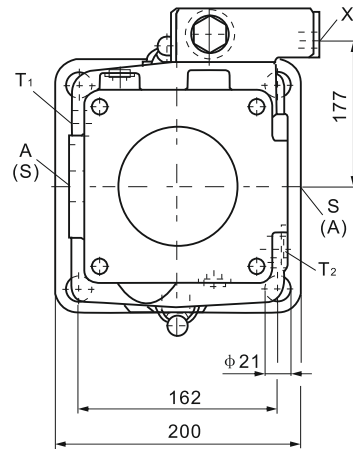
Unit Dimensions Size 75

(Dimensions in mm)

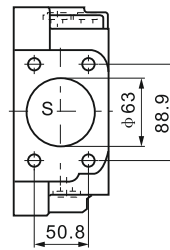
Power control LR with cut-off D and load sensing control S



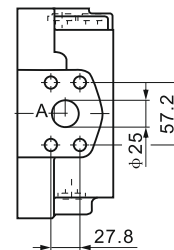
View Y
clockwise rotation
(counter-clockwise rotation)



Detail W



Detail V



Shaft ends

<p>Z Splined shaft DIN5480 W40×2×30×18×9g</p>	<p>P Parallel keyed shaft DIN6885 AS12×8×80</p>
<p>S Splined shaft SAE J744 1 1/4in 14T 12/24DP ¹⁾</p>	<p>T Splined shaft SAE J744 1 3/8in 21T 16/32DP ¹⁾</p>

Ports		
A	Service line ports fixing thread	SAE J518 1" M12,17 deep
S	Suction port fixing thread	SAE J518 2 1/2" M12,17 deep
T1,T2	Tank port	M22×1.5,14 deep
R	Air bleed	M22×1.5,14 deep
M1	Measurement point, positioning chamber	M12×1.5,12 deep
M	Measurement point, service line port	M12×1.5,12 deep
X	Poilt pressure port	M14×1.5,12 deep

1) ANSI B92,1a-1976,30° pressure angle,flat root,side fit,tolerance class 5

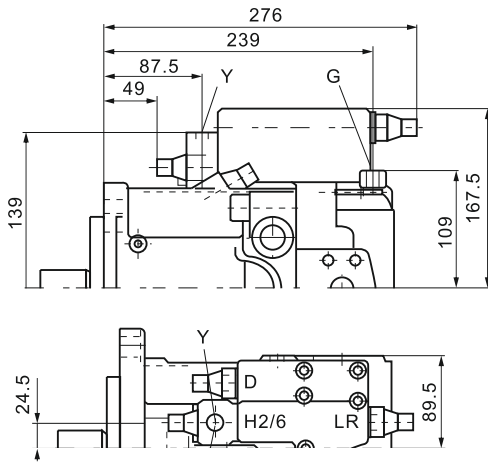


Unit Dimensions Size 75

(Dimensions in mm)

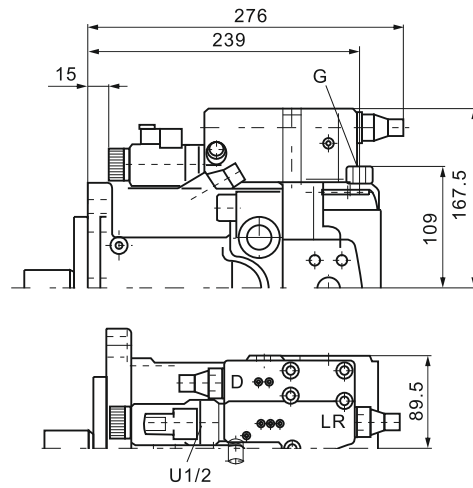
LRDH2/LRDH6:

Power control with pressure cut-off and hydraulic stroke limiter(positive characteristic)



LRDU1/LRDU2:

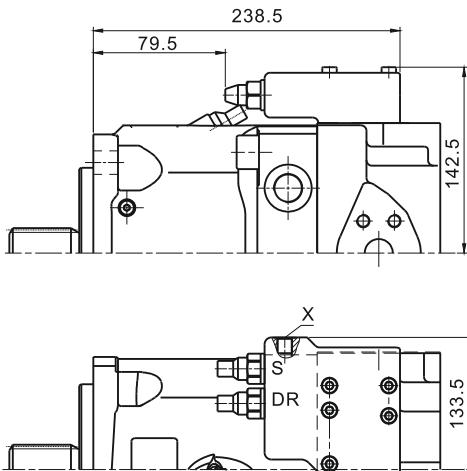
Power control with pressure cut-off and electric stroke limiter(positive characteristic)



- Y Pilot pressure port M14×1.5,12 deep
- G Port for control pressure (controller) M14×1.5,12 deep

DRS:

Pressure control with load sensing control

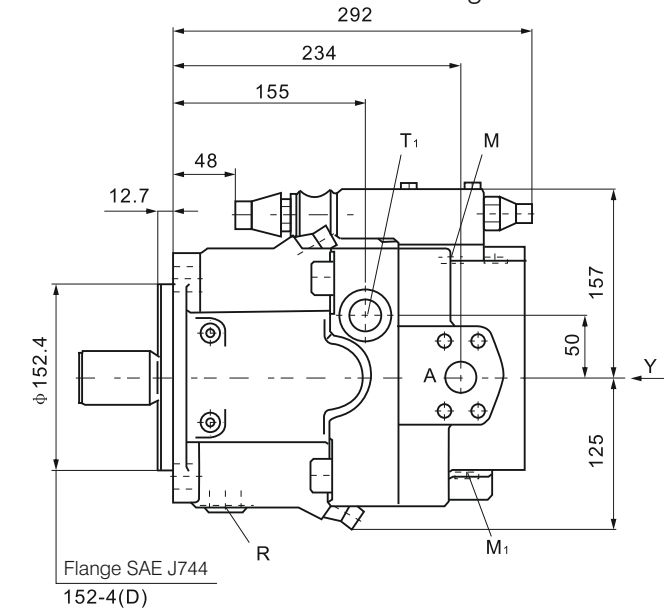




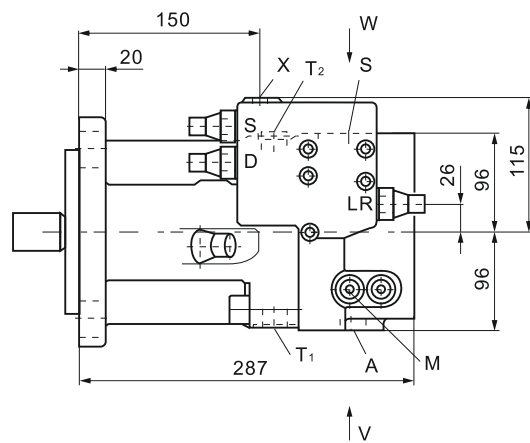
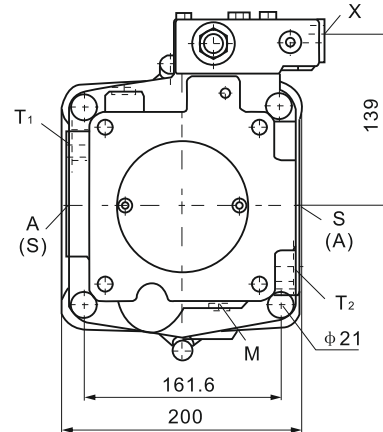
Unit Dimensions Size 95, 115

(Dimensions in mm)

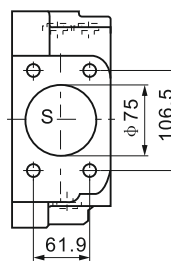
Power control LR with cut-off D and load sensing control S



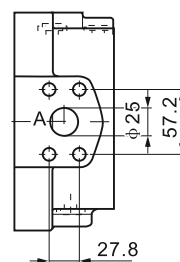
View Y
clockwise rotation
(counter-clockwise rotation)



Detail W



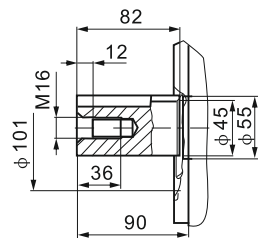
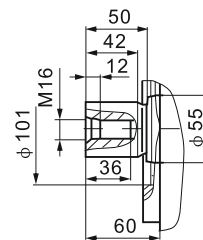
Detail V



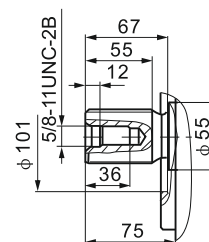
Shaft ends

Z Splined shaft DIN5480
W45×2×30×21×9g

P Parallel keyed shaft DIN6885
AS14×9×80



S Splined shaft SAE J744
1 3/4in 13T 8/16DP 1)



Ports

A	Service line ports	SAE J518 1"
	fixing thread	M12,17 deep
S	Suction port	SAE J518 3"
	fixing thread	M12,17 deep
T1,T2	Tank port	M26×1.5,16 deep
R	Air bleed	M26×1.5,16 deep
M1	Measurement point, positioning chamber	M12×1.5,12 deep
M	Measurement point, service line port	M12×1.5,12 deep
X	Poilt pressure port	M14×1.5,12 deep

1) ANSI B92,1a-1976,30° pressure angle,flat root,side fit,tolerance class 5

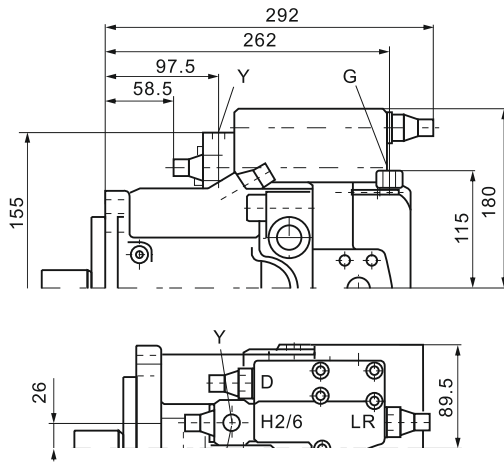


Unit Dimensions Size 95, 115

(Dimensions in mm)

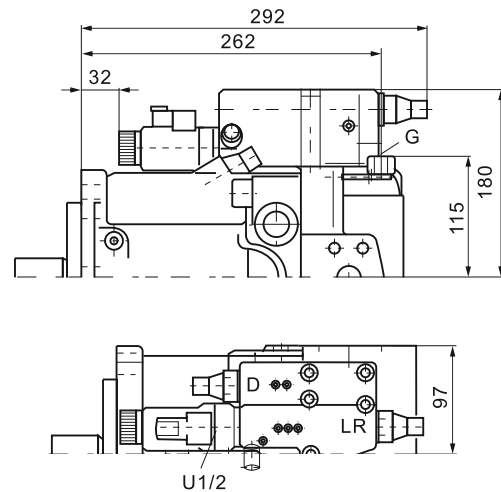
LRDH2/LRDH6:

Power control with pressure cut-off and hydraulic stroke limiter(positive characteristic)



LRDU1/LRDU2:

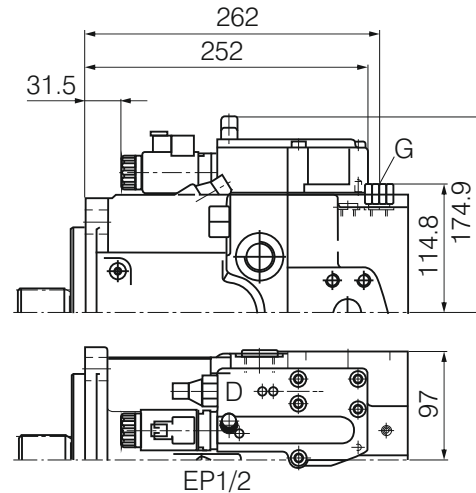
Power control with pressure cut-off and electric stroke limiter(positive characteristic)



- Y Poilt pressure port M14×1.5,12 deep
- G Port for control pressure (controller) M14×1.5,12 deep

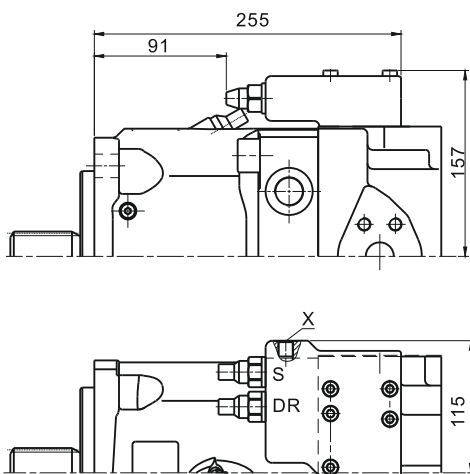
EP1D/EP2D:

Electric control with proportional solenoid and pressure cut-off



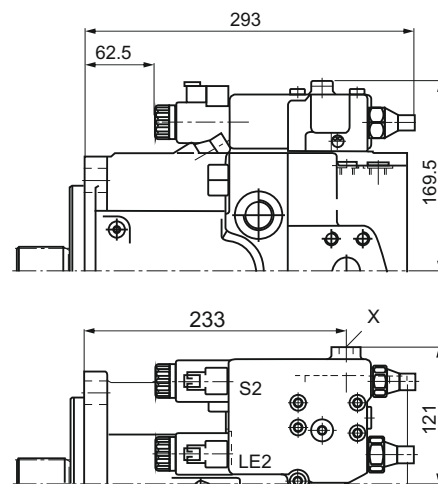
DRS:

Pressure control with load sensing control



LE2S2:

Power control with electric override(negative) and load sensing control,override

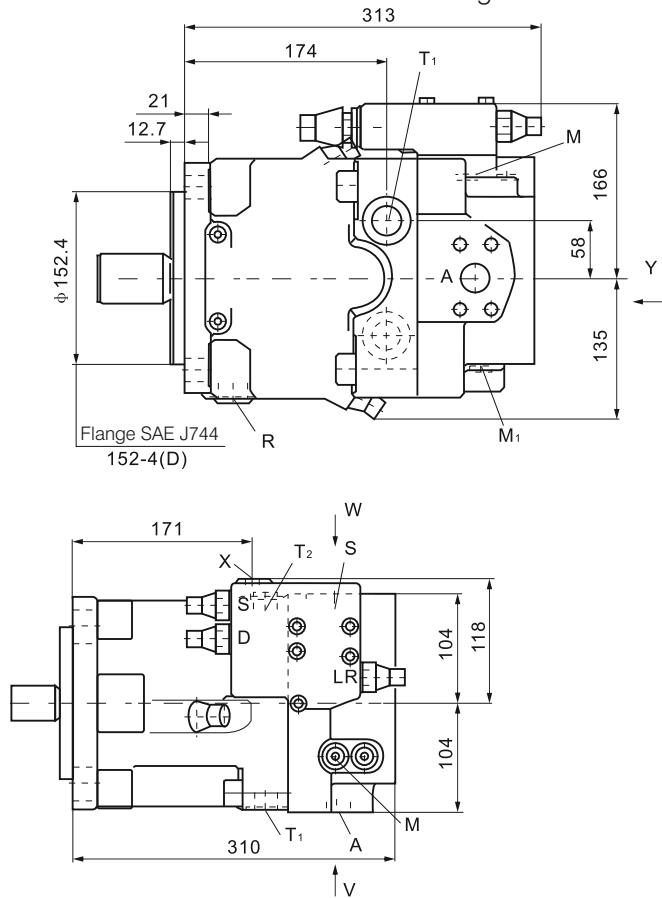




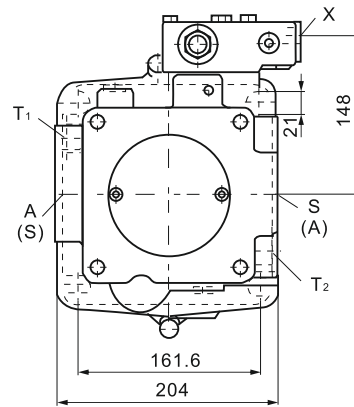
Unit Dimensions Size 130, 145

(Dimensions in mm)

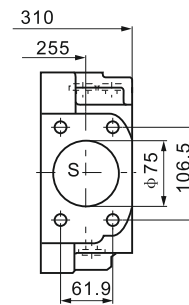
Power control LR with cut-off D and load sensing control S



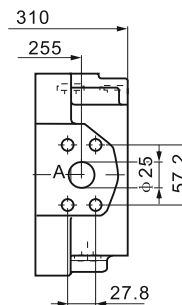
View Y
clockwise rotation
(counter-clockwise rotation)



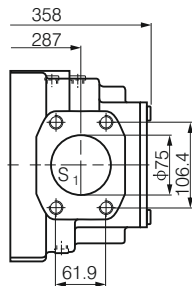
Without change pump
Detail W



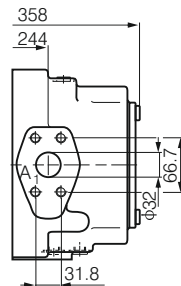
Detail V



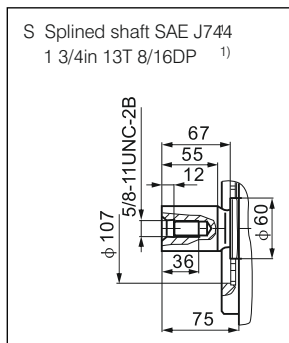
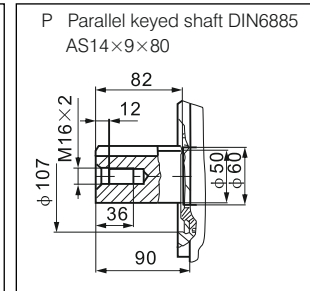
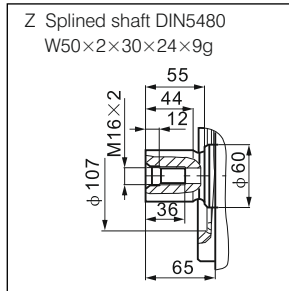
With change pump
Detail W



Detail V



Shaft ends



Ports

A	Service line port fixing thread	SAE J518 1"
A1	Service line port fixing thread	SAE J518 1 1/4"
S,S1	Suction port fixing thread	SAE J518 3"
T1,T2	Tank port	M12,17 deep
R	Air bleed	M26×1.5,16 deep
M1	Measurement point, positioning chamber	M12×1.5,12 deep
M	Measurement point, service line port	M12×1.5,12 deep
X	Port pressure port	M14×1.5,12 deep

1) ANSI B92,1a-1976,30° pressure angle, flat root, side fit, tolerance class 5

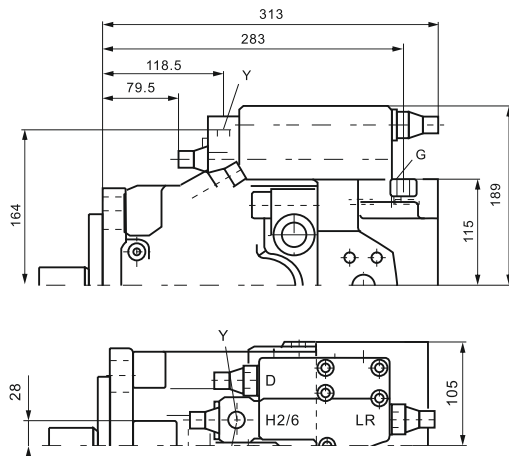


Unit Dimensions Size 130, 145

(Dimensions in mm)

LRDH2/LRDH6:

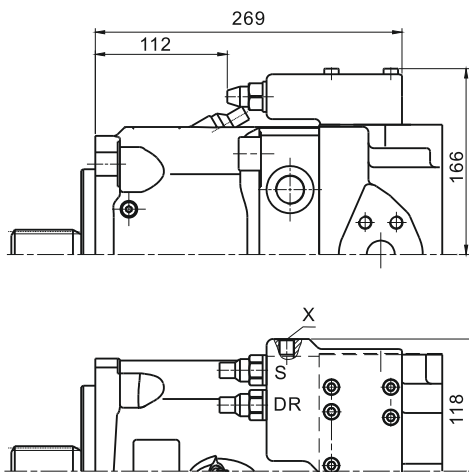
Power control with pressure cut-off and hydraulic stroke limiter(positive characteristic)



- Y Poilt pressure port M14×1.5,12 deep
- G Port for control pressure (controller) M14×1.5,12 deep

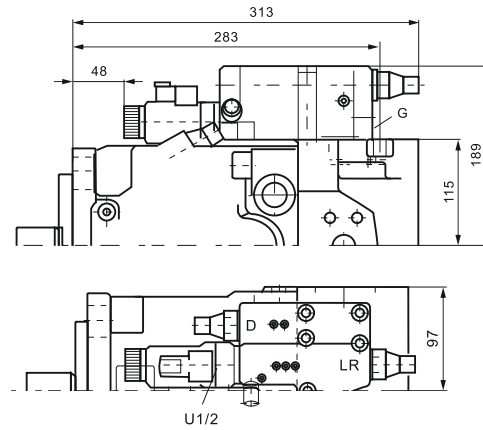
DRS:

Pressure control with load sensing control



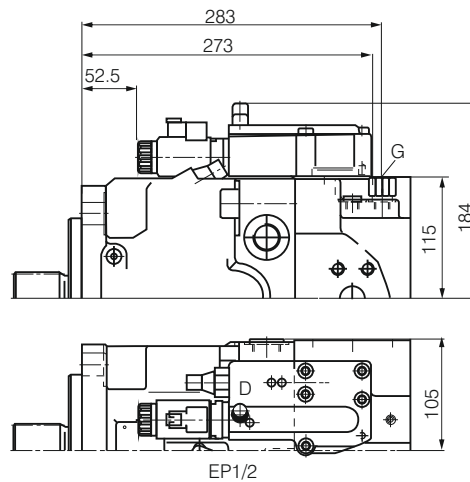
LRDU1/LRDU2:

Power control with pressure cut-off and electric stroke limiter(positive characteristic)



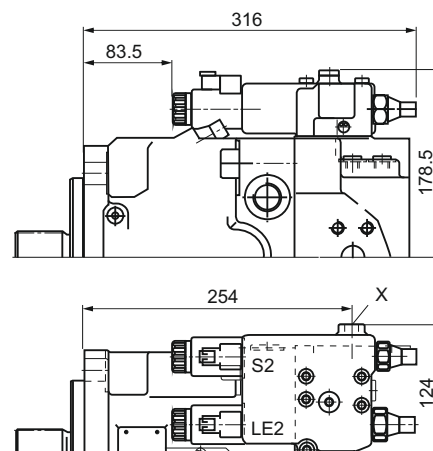
EP1D/EP2D:

Electric control with proportional solenoid and pressure cut-off



LE2S2:

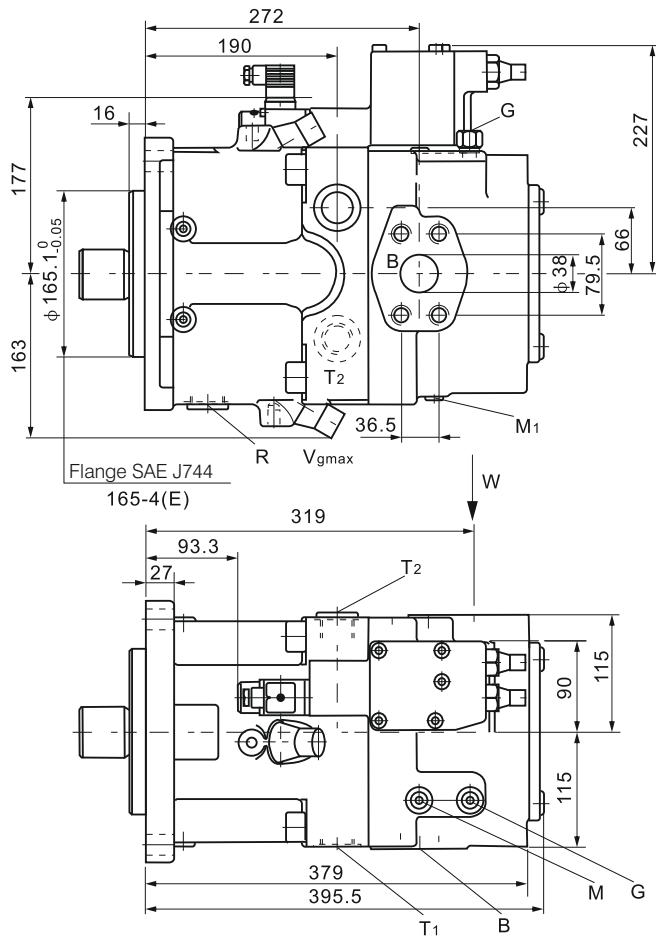
Power control with electric override(negative) and load sensing control,override



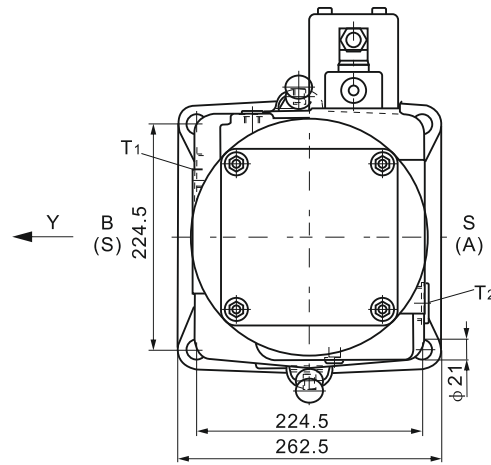


Unit Dimensions Size 190

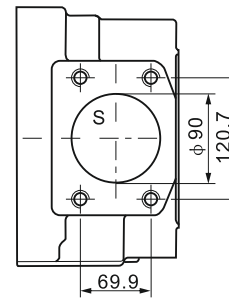
(Dimensions in mm)



View Y clockwise rotation (counter-clockwise rotation)



Detail W



Shaft ends

<p>Z Splined shaft DIN5480 W50×2×30×24×9g</p>	<p>P Parallel keyed shaft DIN6885 AS16×10×100</p>
<p>S Splined shaft SAE J744 1 3/4in 13T 8/16DP ¹⁾</p>	<p>T Splined shaft SAE J744 2in 15T 8/16DP ¹⁾</p>

Ports

A	Service line port fixing thread	SAE J518 1 1/2" M16,21 deep
S	Suction port fixing thread	SAE J518 3 1/2" M16,24 deep
T1,T2	Tank port	M33×2,18 deep
R	Air bleed	M33×2,18 deep
M1	Measurement point, positioning chamber	M12×1.5,12 deep
M	Measurement point, service line port	M12×1.5,12 deep
G	Port for control pressure (controller)	M14×1.5,12 deep

1) ANSI B92,1a-1976,30° pressure angle,flat root,side fit, tolerance class 5

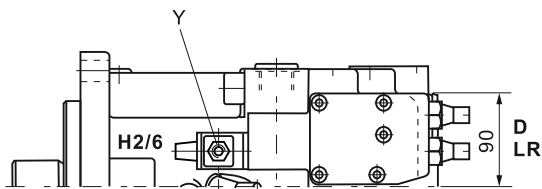
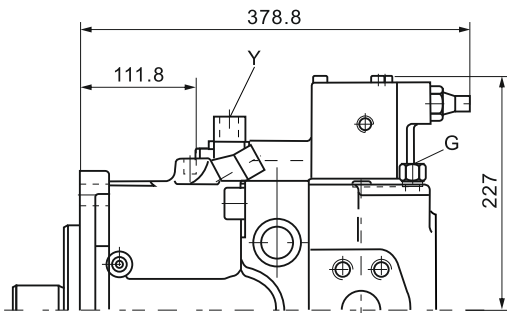


Unit Dimensions Size 190

(Dimensions in mm)

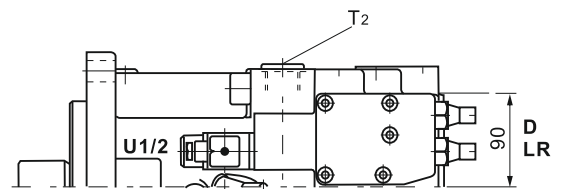
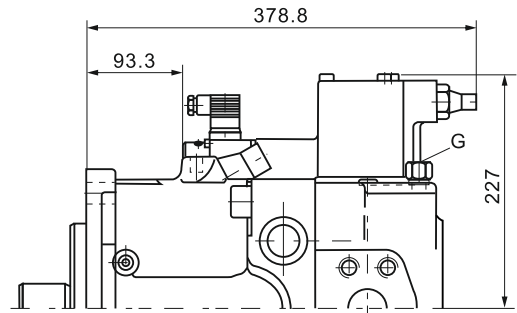
LRDH2/LRDH6:

Power control with pressure cut-off and hydraulic stroke limiter(positive characteristic)



LRDU1/LRDU2:

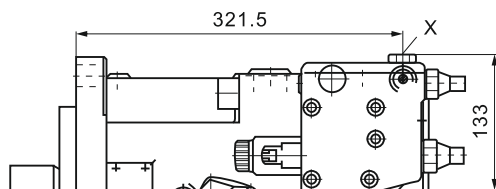
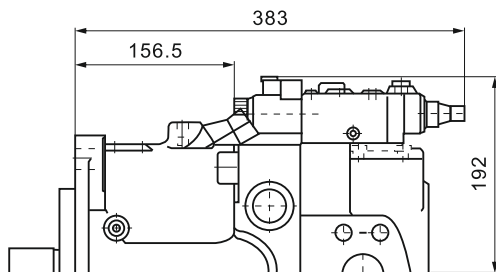
Power control with pressure cut-off and electric stroke limiter(positive characteristic)



Y Poilt pressure port M14×1.5,12 deep

LE2S2:

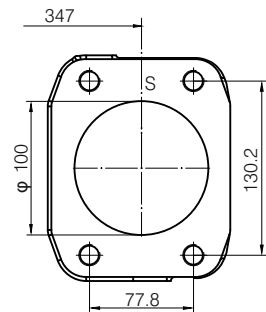
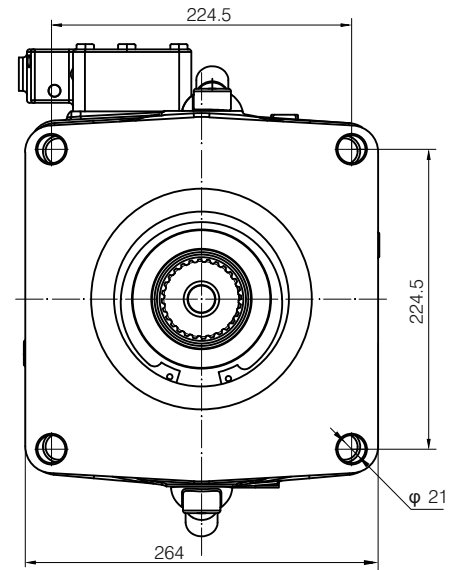
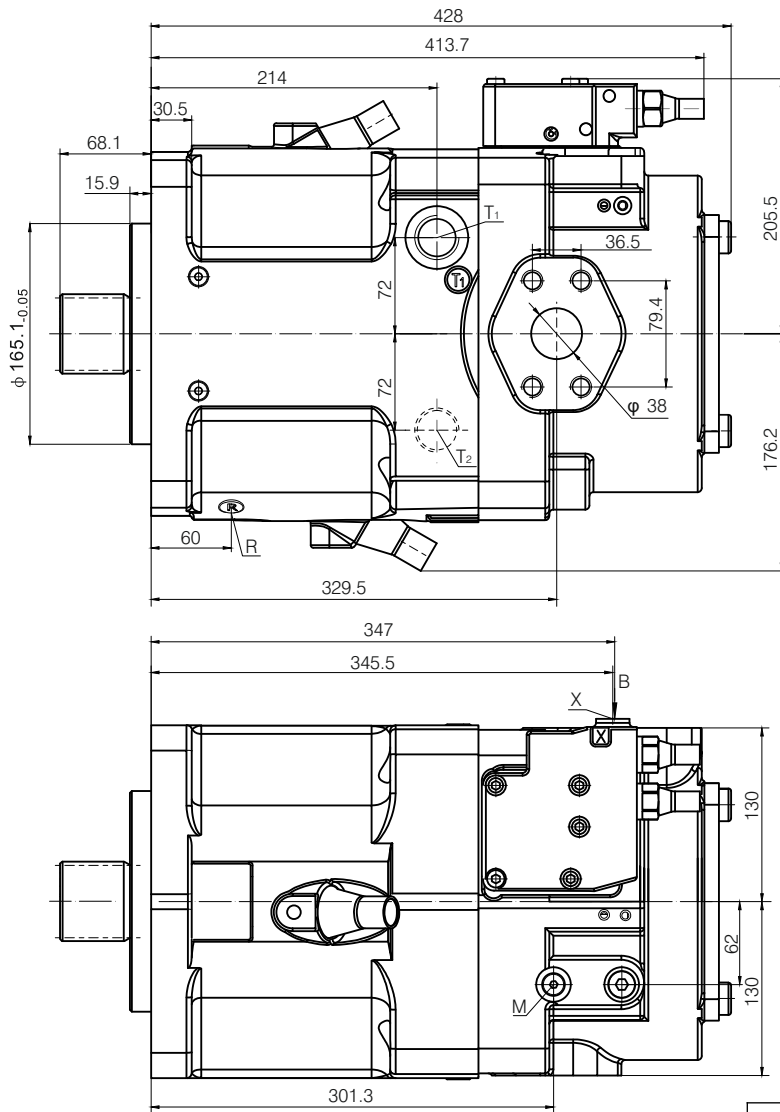
Power control with electric override(negative) and load sensing control,override





Unit Dimensions Size 260

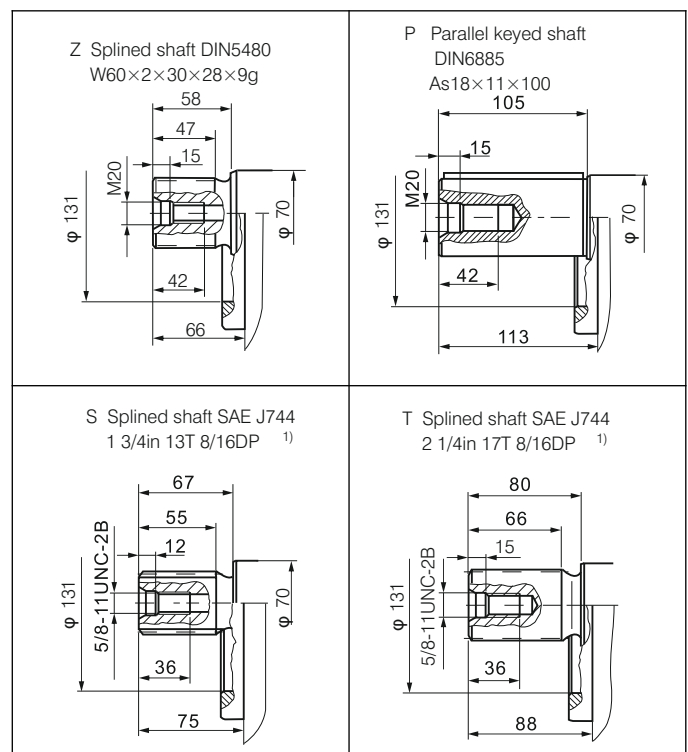
(Dimensions in mm)



Shaft ends

Ports

A	Service line port fixing thread	SAE J518 1 1/2" M16,21 deep
S	Suction port fixing thread	SAE J518 3 1/2" M16,24 deep
T ₁ ,T ₂	Tank port	M33×2,18 deep
R	Air bleed	M33×2,18 deep
M ₁	Measurement point, positioning chamber	M12×1.5,12 deep
M	Measurement point, service line port	M12×1.5,12 deep
G	Port for control pressure (controller)	M14×1.5,12 deep



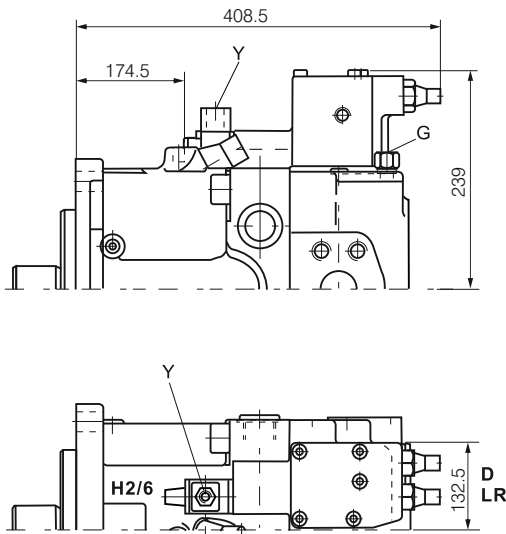


Unit Dimensions Size 260

(Dimensions in mm)

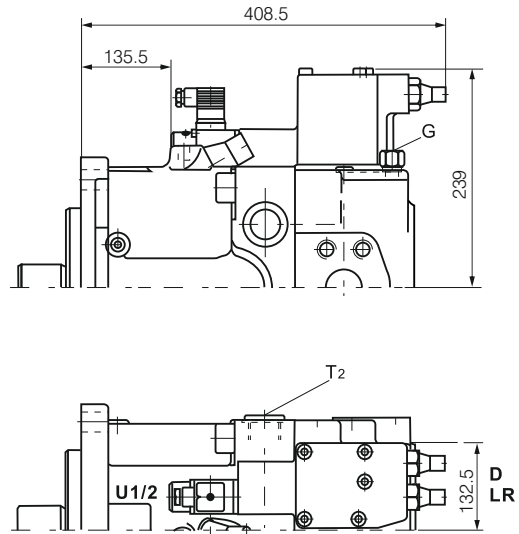
LRDH2/LRDH6:

Power control with pressure cut-off and hydraulic stroke limiter(positive characteristic)



LRDU1/LRDU2:

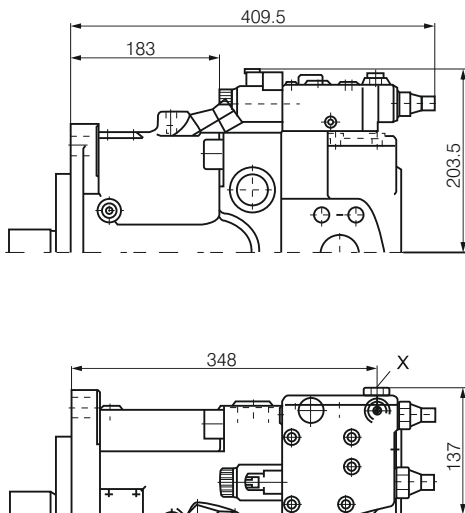
Power control with pressure cut-off and electric stroke limiter(positive characteristic)



Y Poilt pressure port M14×1.5,12 deep

LE2S2:

Power control with electric override(negative) and load sensing control,override



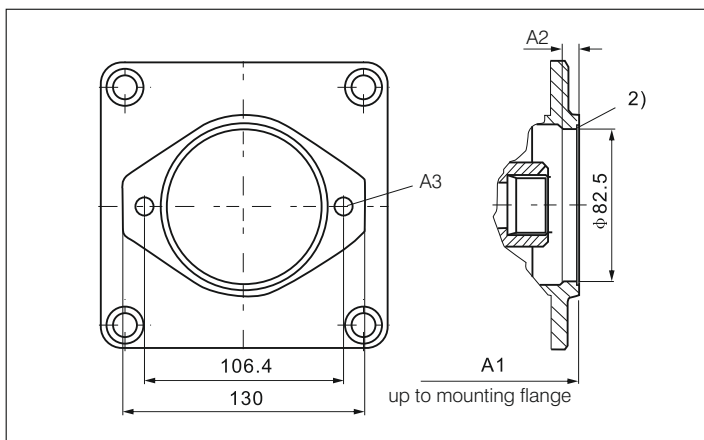


Through drive dimensions

(Dimensions in mm)

Flange SAE J744-82-2(A)

Coupler for splined shaft acc.to ANSI B92,1a-1976



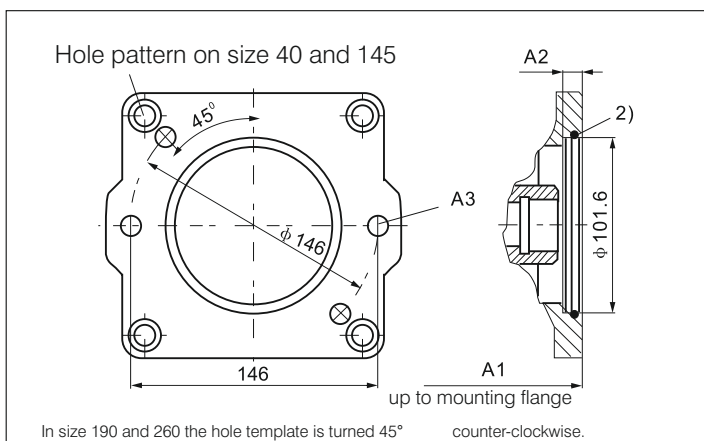
5/8in 9T 16/32DP¹⁾ (SAE J744-16-4(A)) K01
 3/4in 11T 16/32DP¹⁾ (SAE J744-19-4(A-B)) K52

	A1		A2	A3	
Size	K01	K52			
40	240	240	8	M10;15 deep	
60	257	257	-	M10;15 deep	
75	275	275	-	M10;15 deep	
95/115	306	306	-	M10;12.5 deep	
130/145	329	329	-	M10;12.5 deep	
130/145*	363	363	-	M10;12.5 deep	
190*	394	394	-	M10;13 deep	
260*	427.3	427.3	-	M10;13 deep	

*) Version with charge pump

Flange SAE J744-101-2(B)

Coupler for splined shaft acc.to ANSI B92,1a-1976
 Coupler for splined shaft acc.to DIN 5480



7/8in 13T 16/32DP¹⁾ (SAE J744-22-4(B)) K02
 1in 15T 16/32DP¹⁾ (SAE J744-25-4(B-B)) K04

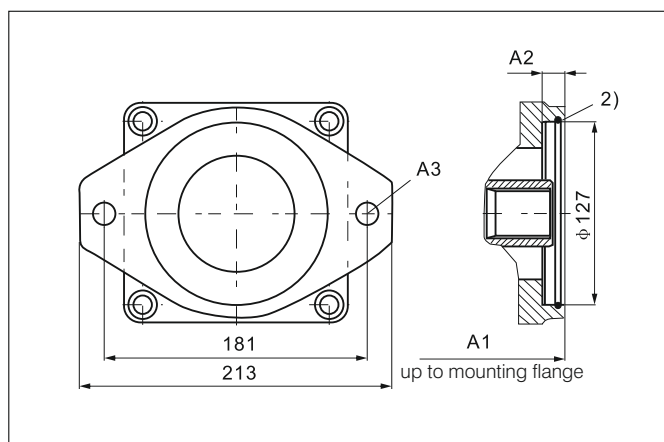
W35×2×30×16×9g K79

	A1		A2		A3
Size	K02	K04	K79		
40	244	244	10		M12;19 deep
60	261	261	261	10	M12;19 deep
75	279	279	10		M12;19 deep
95/115	303	303	303	10	M12;16 deep
130/145	326	326	326	10	M12;16 deep
130/145*	360	360	360	10	M12;16 deep
190*	404	404	394	-	M12;15 deep
260*	437.5	437.5	437.5	-	M12;15 deep

*) Version with charge pump

Flange SAE J744-127-2(C)

Coupler for splined shaft acc.to ANSI B92,1a-1976
 Coupler for splined shaft acc.to DIN 5480



1 1/4in 14T 12/24DP¹⁾ (SAE J744-32-4(C)) K07
 1 1/2in 17T 12/24DP¹⁾ (SAE J744-38-4(C-C)) K24

W30×2×30×14×9g K80
 W35×2×30×16×9g K61

	A1		A2		A3
Size	K07	K24	K80	K61	
60	272	-	265	265	13 M16,20 deep
75	290	-	283	283	13 M16,20 deep
95/115	318	318	318	318	13 M16,20 deep
130/145	330	330	330	330	13 M16,20 deep
130/145*	364	364	364	364	13 M16,20 deep
190*	400	400	400	400	13 M16,19 deep

*) Version with charge pump

NOTE: The mounting flange may be turned through 90°. Standard position as illustrated. Please state in clear text if required.

1) 30° pressure angle, flat root, side fit, tolerance class 5
 2) O-ring included in the delivery contents



Through drive dimensions

(Dimensions in mm)

Flange SAE J744-152-4(A)

Coupler for splined shaft acc.to ANSI B92,1a-1976

Coupler for splined shaft acc.to DIN 5480

1 1/4in 14T 12/24DP¹⁾ (SAE J744-32-4(C))

K86

1 3/4in 13T 8/16DP¹⁾ (SAE J744-44-4(D))

K17

W40×2×30×18×9g

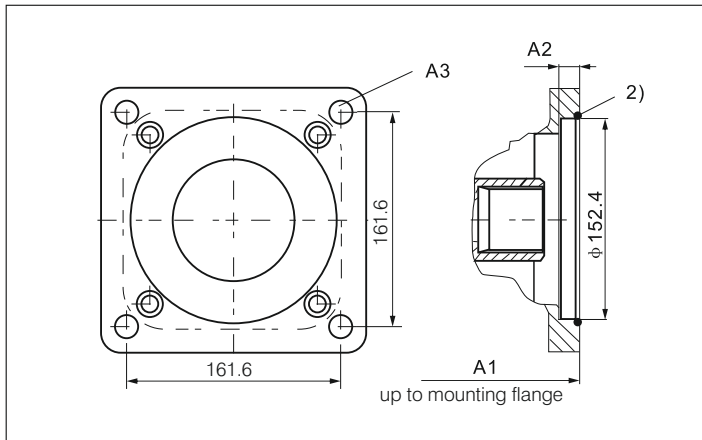
K81

W45×2×30×21×9g

K82

W50×2×30×24×9g

K83



Size	A1					A2	A3
	K86	K17	K81	K82	K83		
75	290	-	290	-	-	13	M20,28 deep
95/115	317	-	317	317	-	30	M20,25 deep
130/145	340	350	340	340	340	30	M20,25 deep
130/145*	374	384	374	374	374	30	M20,25 deep
190*	424	424	424	424	424	13	M20,22 deep
260*	459	459	459	459	459	13	M20,22 deep

*) Version with charge pump

Flange SAE J744-165-4(E)

Coupler for splined shaft acc.to ANSI B92,1a-1976

Coupler for splined shaft acc.to DIN 5480

1 3/4in 13T 8/16DP¹⁾(SAE J744-32-4(C))

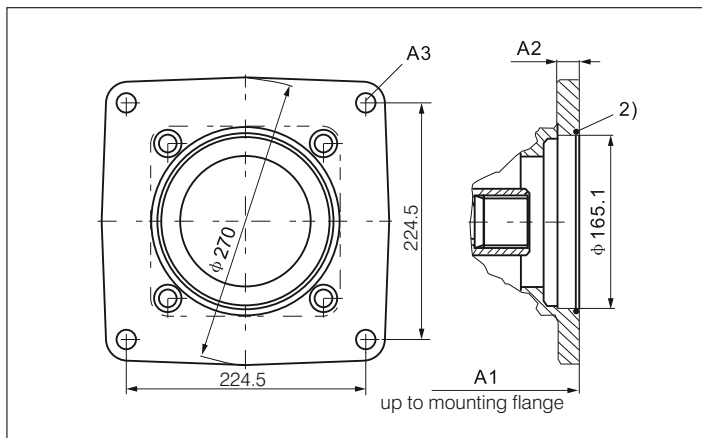
K72

W50×2×30×24×9g

K84

W60×2×30×28×9g

K67



Size	A1			A2	A3
	K72	K84	K67		
190*	409	409	-	19	M20;20 deep
260*	459	442.5	442.5	19	M20;20 deep

*) Version with charge pump



Installation Notes

(Dimensions in mm)

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 in the case interior must be directed to the tank via the highest tank port (T1, T2). The minimum suction pressure at port S must not fall below 0.8 bar absolute (without charge pump) or 0.6 bar (with charge pump).

In all operational conditions, the suction line and case drain line must flow into the tank below the minimum fluid level.

Below-tank installation (standard)

Pump below the minimum fluid level of the tank.

- Any installation position
- Mounting position "shaft up"

It must be ensured that the pump casing is completely filled with oil during commissioning. If air bubbles appear at the bearing, it will damage the axial plunger bearing.

Above-tank installation

Pump above the minimum fluid level of the tank.

Observe the maximum permissible suction height $H_s \text{ max} = 800 \text{ mm}$.

The version A11VLO (with charge pump) is not designed for installation above the tank.

Recommendation for installation shaft up: A check valve in the case drain line (opening pressure 0.05 MPa) can prevent the case interior from draining.

For control options with pressure control, displacement limiters, HD and EP control, the minimum displacement setting must be $V_g \geq 5\% V_g \text{ max}$

