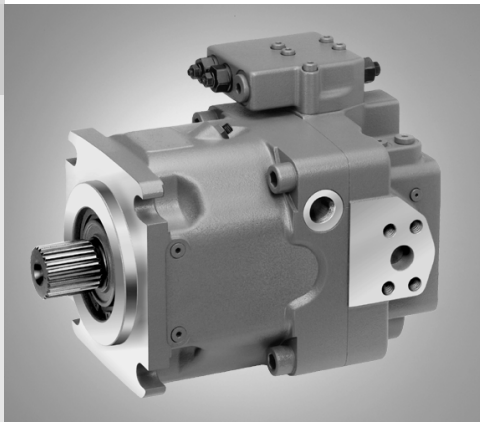
Rexroth
Bosch Group

Axial Piston
Variable Displacement Pump A11VO

RE 92 500/06.04 1/60
Replaces: 07.00

Open circuit



Sizes 40...260
Series 1
Nominal pressure 350 bar
Peak pressure 400 bar

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Features

- Variable displacement axial piston pump of swashplate 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 maximum and zero

Ordering Code / Standard Program

Axial piston unit

Swashplate design, variable displacement	**A11V**

Charge pump (impeller)

	40	60	75	95	130	145	190	260	
without charge pump (no code)	●	●	●	●	●	●	●	●	
with charge pump	–	–	–	–	●	●	●	●	**L**

Operation

Pump, open circuit	**O**

Size

	40	60	75	95	130	145	190	260
≙ Displacement $V_{g\,max}$ (cm^3)	**40**	**60**	**75**	**95**	**130**	**145**	**190**	**260**

Control device

							40	60	75	95	130	145	190	260	
Power control			LR				●	●	●	●	●	●	●	●	**LR**
with override	cross-sensing	negative	LR		C		●	●	●	●	●	●	●	●	**LR.C**
	high pressure related	negative	LR3				●	●	●	●	●	●	●	●	**LR3**
	pilot pressure related	negative	LG1				●	●	●	●	●	●	●	●	**LG1**
		positive	LG2				●	●	●	●	●	●	●	●	**LG2**
	electrical 12V	negative	LE1				❍	❍	❍	●	●	●	●	●	**LE1**
	24V	negative	LE2				❍	●	●	●	●	●	●	●	**LE2**
with pressure cut-off				D			●	●	●	●	●	●	●	●	**L.D..**
	hydraulic 2-stage			E			●	●	●	●	●	●	●	●	**L.E..**
	hydraulic remote controlled					G	●	●	●	●	●	●	●	●	**L..G.**
with load sensing						S	●	●	●	●	●	●	●	●	**L...S**
	electr. prop. override, 24V					S2	❍	❍	❍	●	●	●	●	●	**L...S2**
	hydr. prop. override					S5	❍	❍	❍	●	●	●	●	●	**L...S5**
with stroke limiter	negative characteristic	Δp = 25 bar				H1	●	●	●	●	●	●	●	●	**L...H1**
		Δp = 10 bar				H5	●	●	●	●	●	●	●	●	**L...H5**
	positive characteristic	Δp = 25 bar				H2	●	●	●	●	●	●	●	●	**L...H2**
		Δp = 10 bar				H6	●	●	●	●	●	●	●	●	**L...H6**
		U = 12 V				U1	●	●	●	●	●	●	●	●	**L...U1**
		U = 24 V				U2	●	●	●	●	●	●	●	●	**L...U2**
Pressure control				DR			●	●	●	●	●	●	●	●	**DR**
with load sensing			DRS				●	●	●	●	●	●	●	●	**DRS**
remote controlled			DRG				●	●	●	●	●	●	●	●	**DRG**
for parallel operation			DRL				●	●	●	●	●	●	●	●	**DRL**
Hydraulic control		Δp = 10 bar	HD1				●	●	●	●	●	●	●	●	**HD1**
pilot pressure related (pos. characteristic)		Δp = 25 bar	HD2				●	●	●	●	●	●	●	●	**HD2**
with pressure cut-off				D			●	●	●	●	●	●	●	●	**HD.D**
with pressure cut-off, remote controlled				G			❍	●	❍	❍	❍	❍	●	●	**HD.G**
Electrical control		U = 12 V	EP1				●	●	●	●	●	●	●	●	**EP1**
with proportional solenoid (pos. characteristic)		U = 24 V	EP2				●	●	●	●	●	●	●	●	**EP2**
with pressure cut-off				D			●	●	●	●	●	●	●	●	**EP.D**
with pressure cut-off, remote controlled				G			●	●	●	●	●	●	●	●	**EP.G**

Series

	1

Index

Size	40...130	**0**
Size	145...260	**1**

Direction of rotation

viewed on shaft end	clockwise	**R**
	anti-clockwise	**L**

In case of controls with several additional functions, observe the order of the columns, only one option per column is possible (e.g. LRDCH2).

The following combinations are not available for the power control:

LRDS2, LRDS5, L...GS, L...GS2, L...GS5, L...EC and the combination L...DG in connection with the stroke limiters H1, H2, H5, H6, U1 and U2.

● = available

❍ = available on request

– = not available

▢ = preferred program

A11V		O			/	1			–	N			12				–	6)

Axial piston unit

Charge pump

Operation

Size

Control device

Series

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Direction of rotation

Seals

NBR (nitrile-caoutchouc), shaft seal in FKM (fluor-caoutchouc)	N

Shaft end (perm. input torques see page 7)

	40	60	75	95	130	145	190	260	
Splined shaft DIN 5480 for single and combi pump	●	●	●	●	●	●	●	●	Z
Cylindrical shaft with key DIN 6885	●	●	●	●	●	●	●	●	P
Splined shaft ANSI B92.1a–1976 for single pump	●	●	●	●	●	●	●	●	S
for combination pump	●	●	●	–[1]	–[1]	–[1]	●	●	T

Mounting flange

	40	60	75	95	130	145	190	260	
SAE J744 – 2-hole	●	●	–	–	–	–	–	–	C
SAE J744 – 4-hole	–	–	●	●	●	●	●	●	D
SAE J617 [2] (SAE 3)	–	–	–	●	●	●	●	–	G

Service line ports

	40	60	75	95	130	145	190	260	
SAE pressure and suction port on (opposite) sides, with metric fastening threads	●	●	●	●	●	●	●	●	12

Through drive (see page 56 for attachments)

Flange SAE J744 [3]	Splined shaft coupler		40	60	75	95	130	145	190	260	
–	–		●	●	●	●	●	●	●	●	N00
82-2 (A)	5/8in	9T 16/32DP (A)	●	●	●	●	●	●	●	●	K01
	3/4in	11T 16/32DP (A-B)	❍	●	❍	●	●	●	❍	❍	K52
101-2 (B)	7/8in	13T 16/32DP (B)	●	●	●	●	●	●	●	●	K02
	1in	15T 16/32DP (B-B)	●	●	●	●	●	●	●	●	K04
	W35	2x30x16x9g	●	●	●	●	●	●	●	●	K79
127-2 (C) [4]	1 1/4in	14T 12/24DP (C)	–	●	●	●	●	●	●	●	K07
	1 1/2in	17T 12/24DP (C-C)	–	–	–	●	●	●	●	●	K24
	W30	2x30x14x9g	–	●	●	●	●	●	●	●	K80
	W35	2x30x16x9g	–	●	●	●	●	●	●	●	K61
152-4 (D)	1 1/4in	14T 12/24DP (C)	–	–	●	●	●	●	●	●	K86
	1 3/4in	13T 8/16DP (D)	–	–	–	–	●	●	●	●	K17
	W40	2x30x18x9g	–	–	●	●	●	●	●	●	K81
	W45	2x30x21x9g	–	–	–	●	●	●	●	●	K82
	W50	2x30x24x9g	–	–	–	–	●	●	●	●	K83
165-4 (E)	1 3/4in	13T 8/16DP (D)	–	–	–	–	–	–	●	●	K72
	W50	2x30x24x9g	–	–	–	–	–	–	●	●	K84
	W60	2x30x28x9g	–	–	–	–	–	–	–	●	K67

Swivel angle indicator (page 57)

	40	60	75	95	130	145	190	260	
without (no code)	●	●	●	●	●	●	●	●	
with optical swivel angle indicator	●	–	●	●	●	●	●	●	V
with electrical swivel angle sensor	●	–	●	●	●	●	●	●	R

Male connectors for solenoids [5] (page 58)

	40	60	75	95	130	145	190	260	
DEUTSCH DT04-2P-EP04 (2-pole), moulded on the solenoid coil	●	●	●	●	●	●	●	●	P
Hirschmann according to DIN EN 175 301-803-A (not for new projects)	●	●	●	●	●	●	●	●	H

[1] **S**-shaft suitable for combination pump!
[2] To fit the flywheel housing of the combustion engine
[3] 2 ≙ 2-hole; 4 ≙ 4-hole
[4] Size 190 and 260 with 2 + 4-hole flange
[5] Male connector without bidirectional surpressor diode
[6] no code = standard version, S = special version, K = combination with mounting part or mounting pump

Technical Data

Hydraulic fluid

For detailed information on the choice of hydraulic fluids and application conditions, please see our catalog pages RE 90220 (mineral oil), RE 90221 (environmentally acceptable hydraulic fluids) and RE 90223 (HF-hydraulic fluids) prior to configuration.

The variable displacement pump A11VO is unsuitable for operation with HFA, HFB and HFC. When using HF- or environmentally acceptable (Eco-evaluated) hydraulic fluids possible restrictions in the technical data may have to be taken in consideration. If required please consult with our technical support department. The hydraulic fluide type used should be stated on the order.

Operating viscosity range

We recommend you to choose the operating viscosity (at operating temperature) in the optimum range for efficiency and useful life of

ν_{opt} = opt. operating viscosity 16...36 mm²/s

related to the tank temperature (open circuit).

Limit viscosity range

The following values apply for borderline conditions:

ν_{min} = 5 mm²/s
temporary (t < 3 min)
at max. perm. temperature of t_{max} = +115°C.

Note that the max. hydraulic fluid temperature of 115°C may not be exceeded even locally (e.g. in the bearing area).

ν_{max} = 1600 mm²/s
temporary (t < 3 min)
at cold start (p ≤ 30 bar, n ≤ 1000 min^{-1}, t_{min} = -40°C). Only for starting up without load. The optimum operating viscosity must be reached within about 15 minutes.

Special measures are necessary in the temperature range from -40°C to -25°C, please ask.

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

Explanation of selection of the hydraulic fluid

Knowledge of the operating temperature in the tank (open circuit) depending on the ambient temperature is a prerequisite for the correct choice of hydraulic fluid.

The hydraulic fluid should be selected so that the operating viscosity is in the optimum range (ν_{opt}) in the operating temperature range, see selection diagram, shaded area. We recommend you to choose the respective higher viscosity class.

Example: At an ambient temperature of X° C an operating temperature of 60° C is set in the circuit. 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 leakage oil temperature, influenced by pressure and speed, is always above the tank temperature. The temperature may not be higher than 115°C at any point in the machine.

If the above conditions cannot be satisfied in the case of extreme operating parameters or high ambient temperatures, please ask.

Filtration

The finer the filtration the better the cleanliness class of hydraulic fluid reached, the longer the life of the axial piston unit.

To ensure functional reliability of the axial piston unit at least cleanliness class

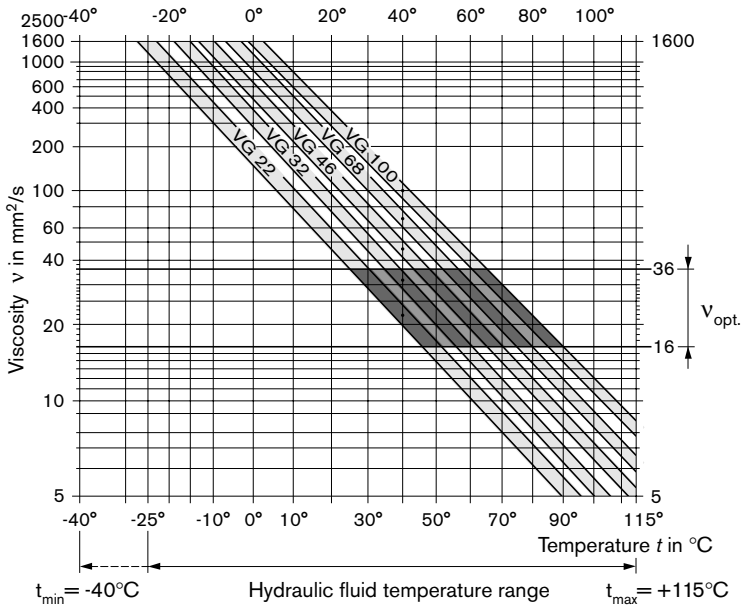
20/18/15 in accordance with ISO 4406 is necessary for the hydraulic fluid.

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

19/17/14 in accordance with ISO 4406 is required.

If the above classes cannot be observed, please consult with product support.

Selection diagram



Technical Data

Operating pressure range

Inlet

Absolute pressure at port S (suction port)

Version *without* charge pump

$p_{abs\ min}$ 0.8 bar

$p_{abs\ max}$ 30 bar

If the pressure is > 5 bar, please ask.

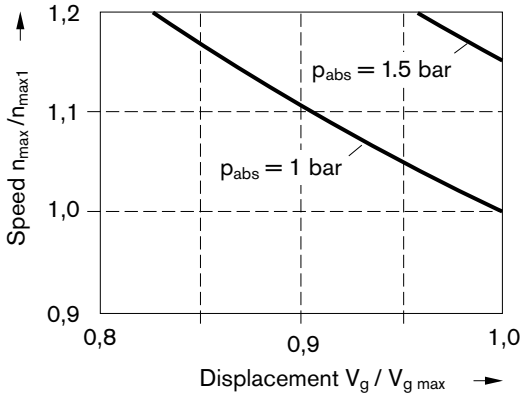
Version *with* charge pump

$p_{abs\ min}$ 0.6 bar

$p_{abs\ max}$ 2 bar

Maximum permissible speed (speed limit)

Permissible speed by increasing the inlet pressure p_{abs} at the suction port S or at $V_g \leq V_{g\ max}$



Outlet

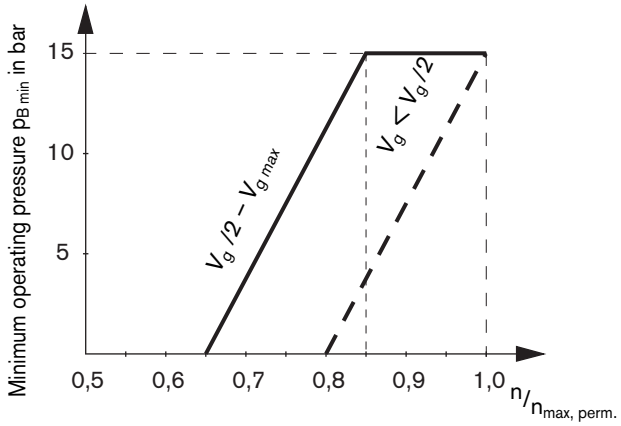
Pressure at port A or B

Nominal pressure p_N 350 bar

Peak pressure p_{max} 400 bar

Minimum operating pressure

A minimum operating pressure $p_{B\ min}$ is required in the pump service line depending on the speed, the swivel angle and the displacement (see diagram).



Case drain pressure

The case drain pressure at the ports T_1 and T_2 may be a maximum 1.2 bar higher than the inlet pressure at the port S but not higher than

$p_{L\ abs.\ max}$ 2 bar.

An unrestricted, full size case drain line directly to tank is required.

Temperature range of the shaft seal

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

Note:
For applications below -25°C, an NBR shaft seal is necessary as a special version (permissible temperature range: -40°C to +90°C).
State NBR shaft seal in clear text in the order.

Flushing the housing

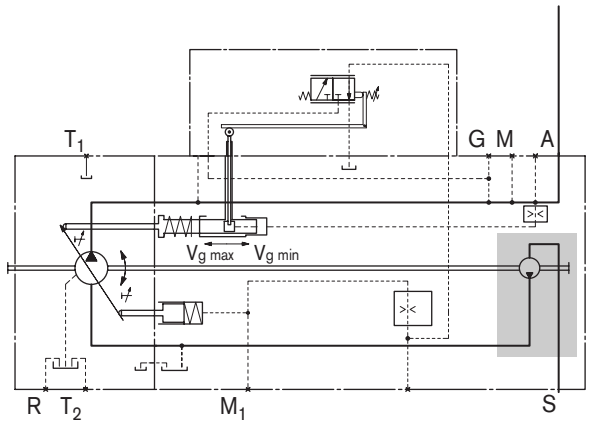
If a variable displacement pump with control device **EP, HD, DR** or stroke limiter (**H.**, **U.**) is operated over a long period (t > 10 min) with flow zero or operating pressure < 15 bar, flushing of the housing via ports "T1", "T2" or "R" is necessary.

size	40	60	75	95	130	145	190	260
$q_{V\ flush}$ (L/min)	2	3	3	4	4	4	5	6

The housing flushing is unnecessary in versions with charge pump (A11VLO), since a part of the charge flow is directed to the housing. Higher case drain flow beyond volumetric rotary group losses and control flow may be noticed.

Charge pump (impeller)

The charge pump is a circulating pump with which the A11VLO (size 130...260) is filled and therefore can be operated at higher speeds. This also simplifies cold starting at low temperatures and high viscosity of the hydraulic fluid. Tank charging is therefore unnecessary in most cases. A tank pressurization of a max. 2 bar is permissible with charge pump.



Technical Data

Value table

(theoretical values, without efficiencies and tolerances; values rounded)

Size	**A11VO**			**40**	**60**	**75**	**95**	**130**	**145**	**190**	**260**				
	A11VLO (with charge pump)											**130**	**145**	**190**	**260**
Displacement		$V_{g\,max}$	cm³	42	58.5	74	93.5	130	145	193	260	130	145	193	260
		$V_{g\,min}$	cm³	0	0	0	0	0	0	0	0	0	0	0	0
Speed															
maximum at $V_{g\,max}$ [1]		n_{max}	min⁻¹	3000	2700	2550	2350	2100	2200	2100	1800	2500 [2]	2500 [2]	2500 [2]	2300 [2]
maximum at $V_g \le V_{g\,max}$ [3]		n_{max1}	min⁻¹	3500	3250	3000	2780	2500	2500	2500	2300	2500	2500	2500	2300
Flow [4] at n_{max} and $V_{g\,max}$		$q_{V\,max}$	L/min	126	158	189	220	273	319	405	468	325	363	483	598
Power at $q_{V\,max}$ and $\Delta p = 350$ bar		P_{max}	kW	74	92	110	128	159	186	236	273	190	211	281	349
Torque at $V_{g\,max}$ and $\Delta p = 350$ bar		T_{max}	Nm	234	326	412	521	724	808	1075	1448	724	808	1075	1448
Mass moment of inertia around drive axis		J	kgm²	0.0048	0.0082	0.0115	0.0173	0.0318	0.0341	0.055	0.0878	0.0337	0.036	0.0577	0.0895
Rotational vibration [4]															
Angular acceleration, max.		α	rad/s²	22000	17500	15000	13000	10500	9000	6800	4800	10500	9000	6800	4800
Speed variation, max.		Δn	min⁻¹	85	73	68	63	57	49	37	28	57	49	37	28
Frequency limit		f_{limit}	Hz	788	731	675	626	563	563	563	518	563	563	563	518
Rotary stiffness	Shaft end Z		Nm/rad	88894	102440	145836	199601	302495	302495	346190	686465	302495	302495	346190	686465
	Shaft end P		Nm/rad	87467	107888	143104	196435	312403	312403	383292	653835	312403	312403	383292	653835
	Shaft end S		Nm/rad	58347	86308	101921	173704	236861	236861	259773	352009	236861	236861	259773	352009
	Shaft end T		Nm/rad	74476	102440	125603	–	–	–	301928	567115	–	–	301928	567115
Filling volume			L	1.1	1.35	1.85	2.1	2.9	2.9	3.8	4.6	2.9	2.9	3.8	4.6
Weight (approx.)		m	kg	32	40	45	53	66	76	95	125	72	73	104	138

[1] The values apply at absolute pressure (p_{abs}) 1 bar at the suction port S and mineral hydraulic fluid.
[2] The values apply at absolute pressure (p_{abs}) of at least 0.8 bar at the suction port S and mineral hydraulic fluid.
[3] The values apply at $V_g \le V_{g\,max}$ or in case of an increase in the inlet pressure p_{abs} at the suction port S (see diagram page 5)
[4] The permissible angular acceleration or speed variation only applies for single pumps, not for combi pumps.
The load on connection parts (e.g. through drive) must be taken into account additionally.
At $f < f_{limit}$ the Δn specified in the table is permissible.
At $f > f_{limit}$ the permissible angular acceleration α specified in the table limits the value of the speed variation:
$\Delta n_{perm} = 3.04 \cdot \alpha / f$.

Determining the nominal value

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

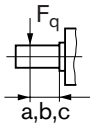
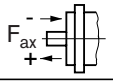
Torque $T = \dfrac{V_g \cdot \Delta p}{20 \cdot \pi \cdot \eta_{mh}}$ Nm

Power $P = \dfrac{2\,\pi \cdot T \cdot n}{60\,000} = \dfrac{q_v \cdot \Delta p}{600 \cdot \eta_t}$ kW

V_g = Displacement per revolution cm³
Δp = Differential pressure bar
n = Speed rpm
η_v = volumetric efficiency
η_{mh} = mechanical-hydraulic efficiency
η_t = overall efficiency ($\eta_t = \eta_v \cdot \eta_{mh}$)

Technical Data

Permissible radial and axial loading on the drive shaft

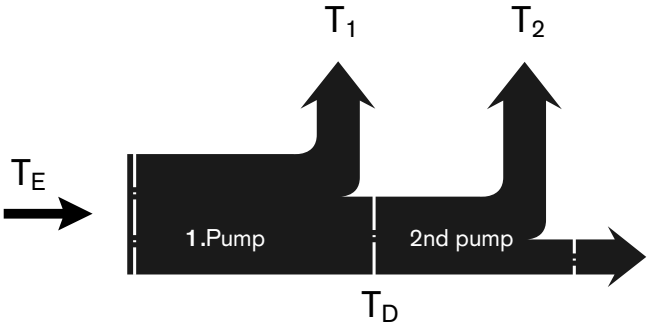
Size				40	60	75	95	130	145	190	260
Radial force, max.		$F_{q\,max}$	N	3600	5000	6300	8000	11000	11000	16925	22000
at distance (from shaft collar)		a	mm	17.5	17.5	20	20	22.5	22.5	26	29
		$F_{q\,max}$	N	2891	4046	4950	6334	8594	8594	13225	16809
		b	mm	30	30	35	35	40	40	46	50
		$F_{q\,max}$	N	2416	3398	4077	5242	7051	7051	10850	13600
		c	mm	42.5	42.5	50	50	57.5	57.5	66	71
Axial force, max.		$\pm F_{ax\,max}$	N	1500	2200	2750	3500	4800	4800	6000	4150

Permissible input and through drive torques

Size			40	60	75	95	130	145	190	260
Torque (at $V_{g\,max}$ and $\Delta p = 350$ bar [1])	T_{max}	Nm	234	326	412	521	724	808	1075	1448
Input torque, max. [2]										
at shaft end P	$T_{E\,perm.}$	Nm	468	648	824	1044	1448	1448	2226	2787
Keyed per DIN 6885			Ø32	Ø35	Ø40	Ø45	Ø50	Ø50	Ø55	Ø60
at shaft end Z	$T_{E\,perm.}$	Nm	912	912	1460	2190	3140	3140	3140	5780
DIN 5480			W35	W35	W40	W45	W50	W50	W50	W60
at shaft end S	$T_{E\,perm.}$	Nm	314	602	602	1640	1640	1640	1640	1640
ANSI B92.1a-1976 (SAE J744)			1 in	1 1/4 in	1 1/4 in	1 3/4 in	1 3/4 in	1 3/4 in	1 3/4 in	1 3/4 in
at shaft end T	$T_{E\,perm.}$	Nm	602	970	970	–	–	–	2670	4070
ANSI B92.1a-1976 (SAE J744)			1 1/4 in	1 3/8 in	1 3/8 in	–	–	–	2 in	2 1/4 in
Through drive torque, max. [3]	$T_{D\,perm.}$	Nm	314	521	660	822	1110	1110	1760	2065

[1]) Efficiency not taken into account
[2]) For side load-free drive shafts
[3]) Observe max. input torque for shaft S!

Distribution of torques



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.

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

p_B = operating pressure

V_g = 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 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 $V_{g\,min}$). 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 ($p_B \bullet V_g$ = constant).

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

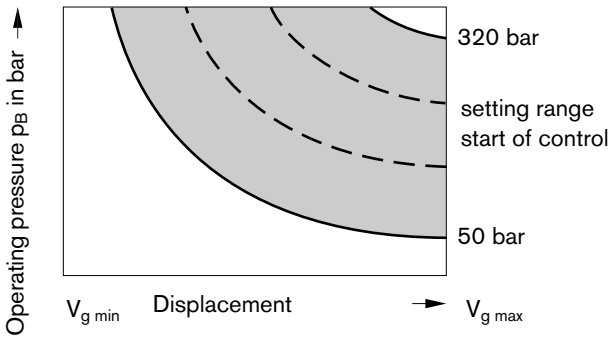
State in clear text in the order:

– drive power P in kW

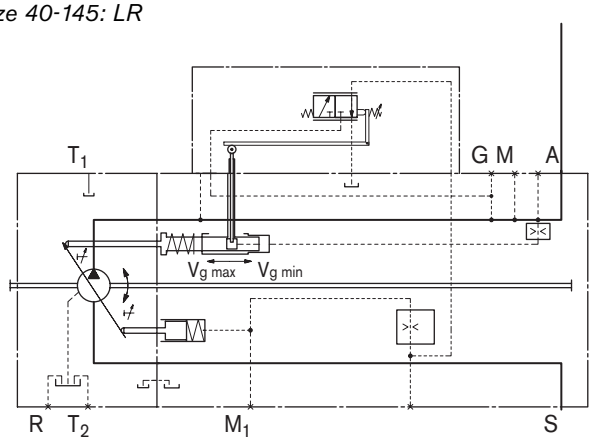
– drive speed n in rpm

– max. flow $q_{V\,max}$ in l/min

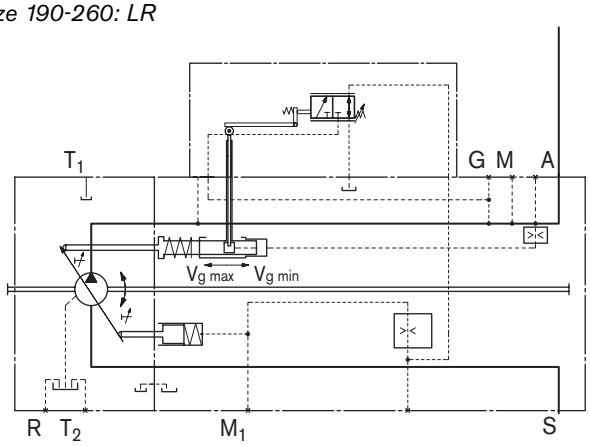
After clarifying the details a power diagram can be created by our computer.



Size 40-145: LR



Size 190-260: LR



LR Power Control

LRC Override with cross-sensing

Cross sensing control is a summation power control system, whereby the total power, of both the A11VO and of a same size A11VO power controlled pump mounted onto the through drive, are kept constant.

If a pump is operating at pressures below the start of the control curve setting, then the surplus power not required, in a critical case up to 100%, becomes available to the other pump. Total power is thus divided between two systems as demand requires.

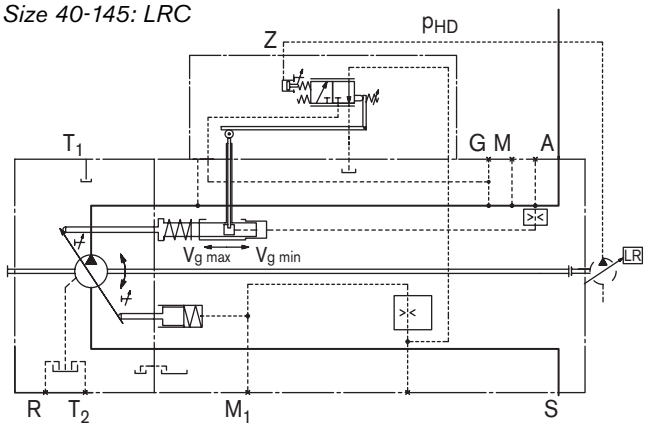
Any power being limited by means of pressure cut-off or other override functions is not taken into account.

Half side cross-sensing function

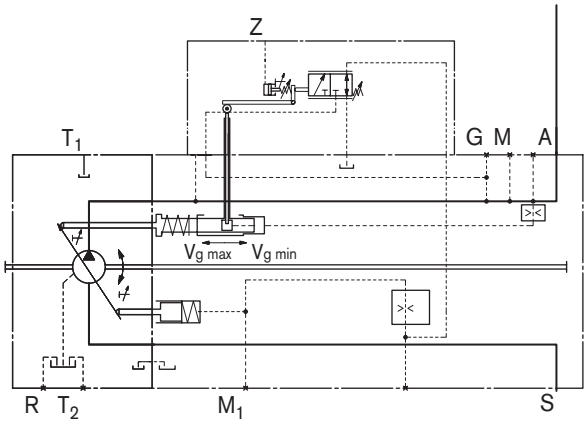
When using the LRC control on the 1st pump (A11VO) and a power-controlled pump without cross-sensing attached to the through drive, the power required for the 2nd pump is deducted from the setting of the 1st pump. The 2nd pump has priority in the total power setting.

The size and start of control of the power control of the 2nd pump must be specified for rating the control of the 1st pump.

Size 40-145: LRC



Size 190-260: LRC



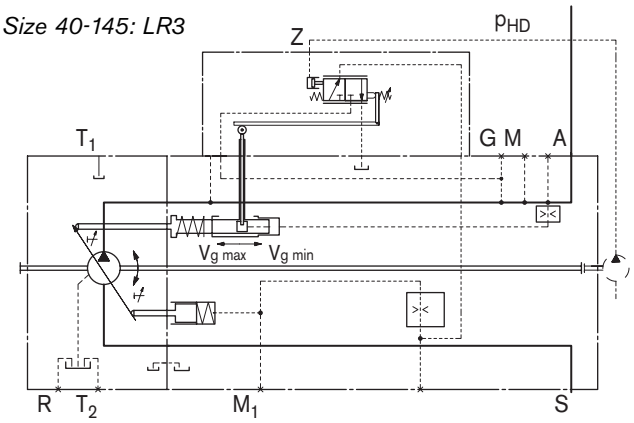
LR3 High pressure related override

The high pressure related power override is a total power control in which the power control setting is piloted by the load pressure of an attached fixed displacement pump (port Z).

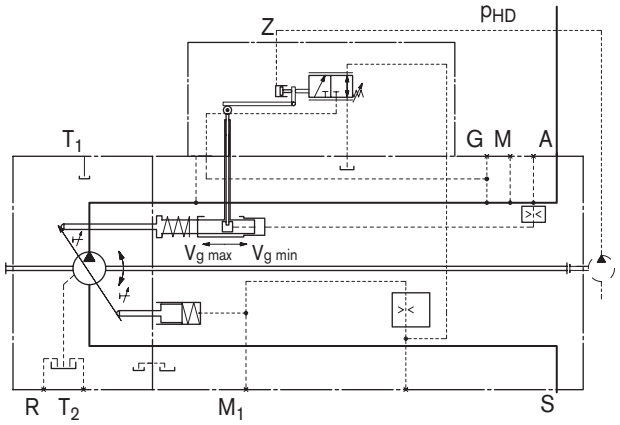
As a result the A11VO can be set to 100 % of the total drive power. The power setting of the A11VO is reduced proportional to the load-dependent rise in operating pressure of the fixed displacement pump. The fixed displacement pump has priority in the total power setting.

The measuring area of the power reduction pilot piston is designed as a function of the size of the fixed displacement pump.

Size 40-145: LR3



Size 190-260: LR3



LR Power Control

LG1/2 Pilot pressure related override

This power control works by overriding the control setting with an external pilot pressure signal. This pilot pressure acts on the adjustment spring of the power regulator via port Z.

The mechanically adjusted basic setting can be hydraulically adjusted by means of different pilot pressure settings, enabling different power mode settings.

If the pilot pressure signal is then adjusted by means of a external power limiting control, the total hydraulic power consumption of all users can be adapted to the available drive power from the engine.

The pilot pressure used for power control is generated by an external control element that is not a component part of the A11VO (e.g. see also data sheet RE 95310, Electronic Load Limiting Control, LLC).

LG1 Negative power override

Power control with negative override, LG1: the force resulting from the pilot pressure is acting against the mechanical adjustment spring of the power control.

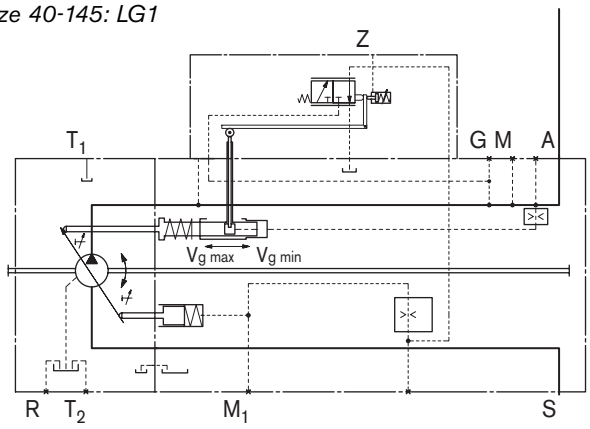
Increasing the pilot pressure reduces the power setting.

LG2 Positive power override

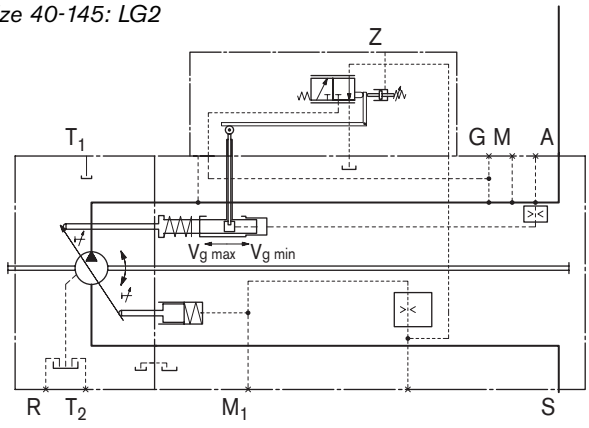
Power control with positive override, LG2: the force resulting from the pilot pressure is additive the mechanical adjustment spring of the power control.

An increase in pilot pressure increases the power output.

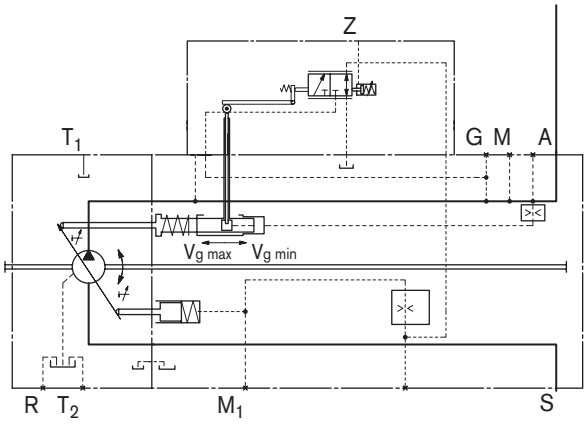
Size 40-145: LG1



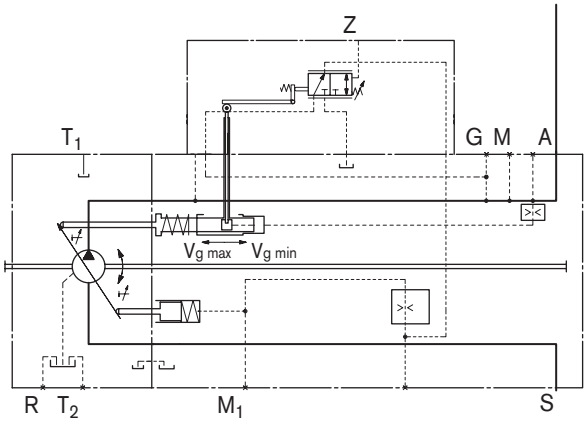
Size 40-145: LG2



Size 190-260: LG1



Size 190-260: LG2



LR Power Control

LE1/2 Electrical override (negative)

Contrary to hydraulic power control override, the basic power setting is reduced by an electrical pilot current applied to a proportional solenoid. The resulting force is acting against the mechanical power control adjustment spring.

Increase in current = decrease in power

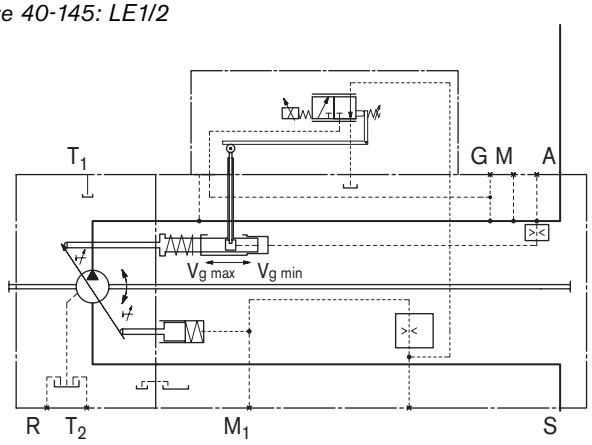
If the pilot current signal is adjusted by a load limiting control (e.g. LLC control RE 95310) the power consumption of all mechanical and hydraulic actuators is decreasing the A11VO power setting to match the remaining available power from the engine.

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

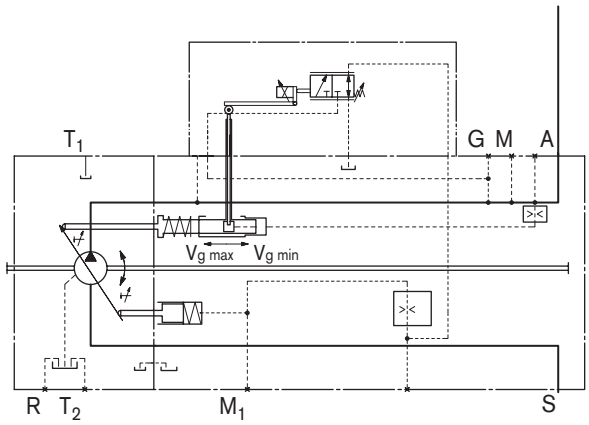
Technical data of solenoids

	LE1	LE2
Voltage	12 V DC (±20 %)	24 V DC (±20 %)
Control current		
Start of control	400 mA	200 mA
End of control	1200 mA	600 mA
Limiting current	1.54 A	0.77 A
Nominal resistance (at 20°C)	5.5 Ω	22.7 Ω
Dither frequency	100 Hz	100 Hz
Duty cycle	100 %	100%
Type of protection	dependent on connector version, see page 58	

Size 40-145: LE1/2

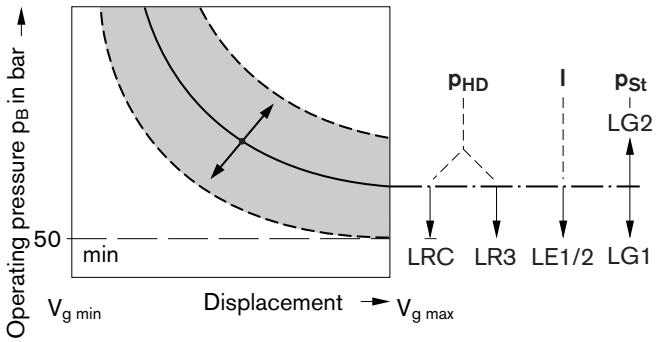


Size 190-260: LE1/2



Overview of power overrides

Effect of power overrides at rising pressure or current



LR Power Control

LRD Power control with pressure cut-off

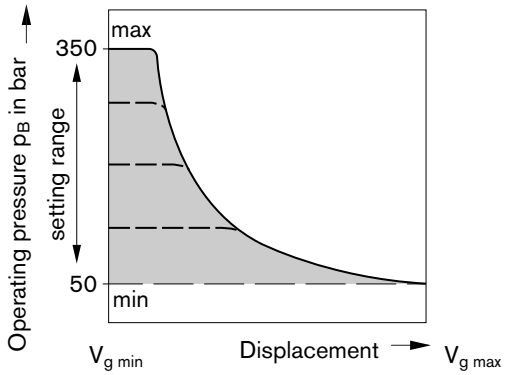
Pressure cut-of is a pressure control that adjusts the pump displacement back towards $V_{g\,min}$ when a preset pressure value is reached.

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

Characteristic: LRD



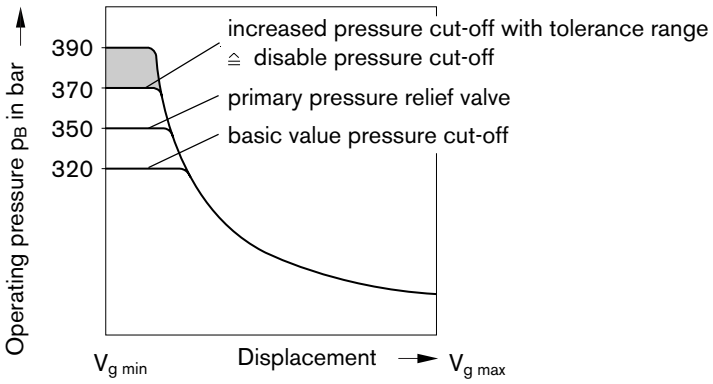
LRE Power control with pressure cut-off, 2-stage

By connecting an external pilot pressure to port Y, the basic value of the pressure cut-off can be increased by 50 $^{+20}$ bar and a 2nd pressure setting implemented.

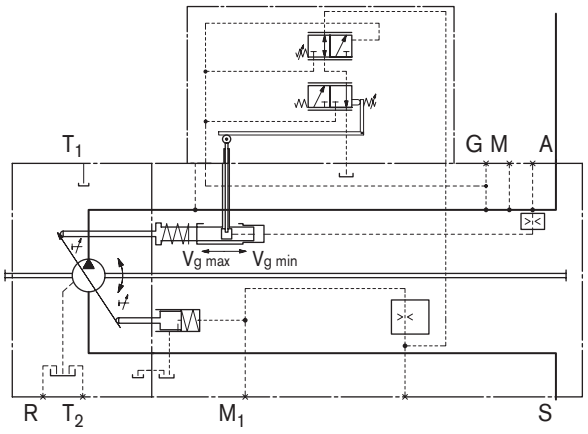
This value is usually above the primary pressure relief valve setting and therefore disables the pressure cut-off function.

The pressure signal at port Y must be between 20 and 50 bar.

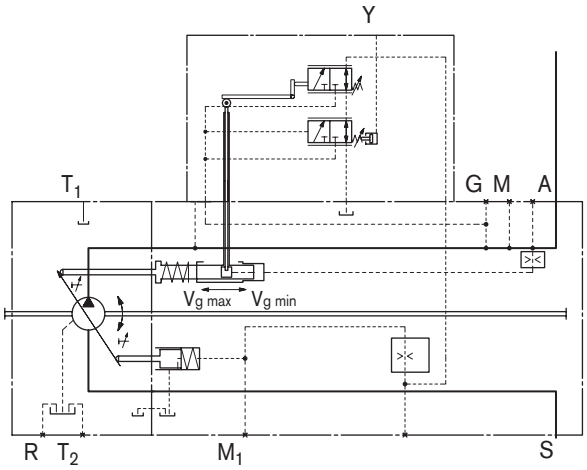
Characteristic: LRE



Size 40-145: LRD



Size 190-260: LRE



LRG Power control with pressure cut-off, hydraulically remote controlled

See page 20 for description and characteristic (pressure control remote controlled, DRG)

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 - and therefore the pump flow - constant as a function of the orifice size.

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

$\Delta p_{orifice} = p_{pump} - p_{actuator}$

The setting range for Δp is between 18 bar and 25 bar.

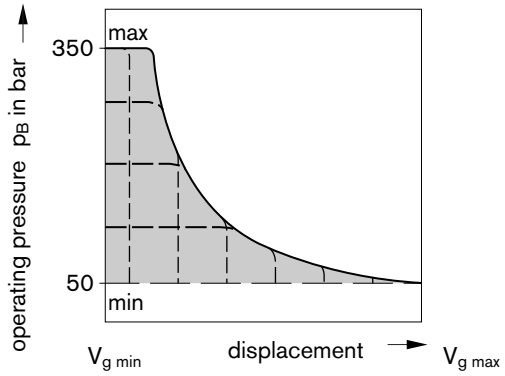
The standard differential pressure setting 18 bar. (Please state in clear text when ordering).

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

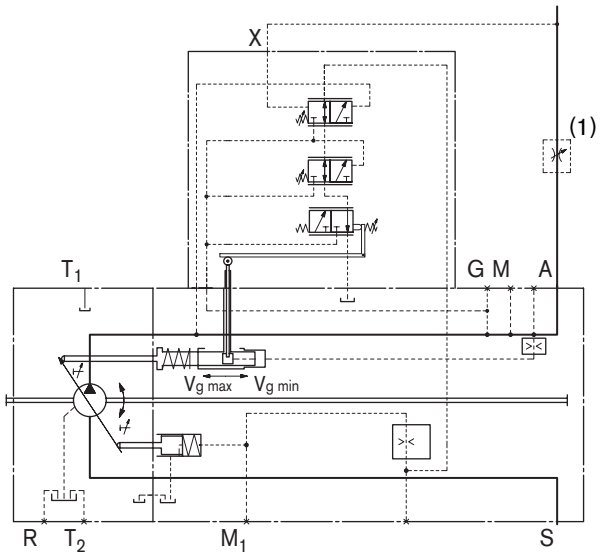
In a standard LS system the pressure cut-off is integrated in the pump control. In a LUDV (flow sharing) system the pressure cut-off is integrated in the LUDV control block.

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

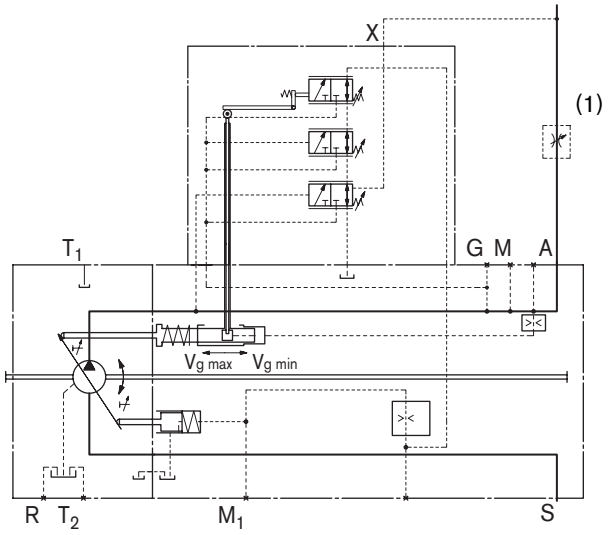
Characteristic: LRDS



Size 40-145: LRDS



Size 190-260: LRDS



LR Power Control

LRS2 Power control with load sensing, electrically 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.

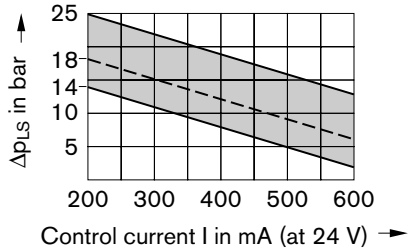
Increasing current = smaller Δp-setting

See following characteristic for details (example).

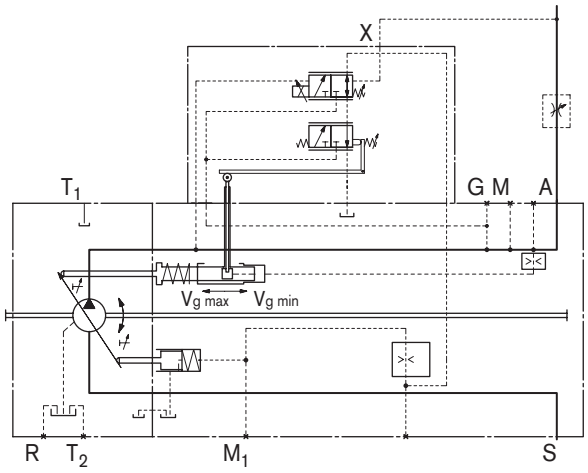
This permits a change in flow with the same sensing orifice size, to improve control resolution of the control block. Please consult us when applying.

For solenoid specification, see page 11 (LE2)

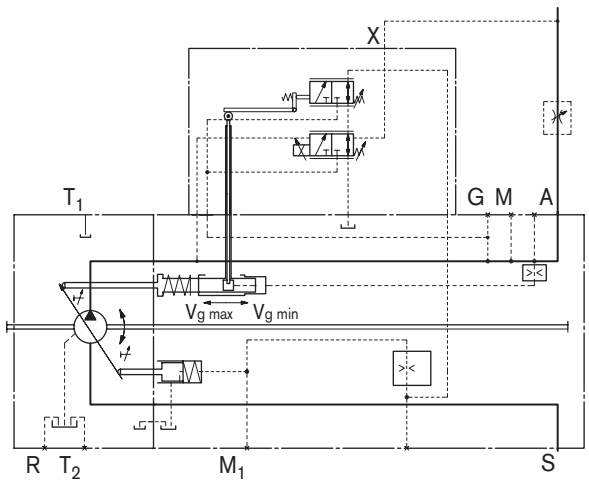
Characteristic: LRS2



Size 40-145: LRS2



Size 190-260: LRS2



LRS5 Power control with load sensing, hydraulically override

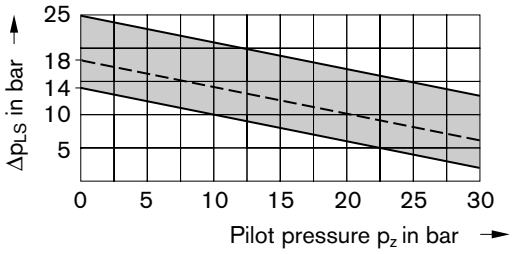
This control option adds an external proportional pilot pressure signal (to port Z) to override the mechanically set load-sensing pressure.

Increasing pilot pressure = smaller Δp-setting

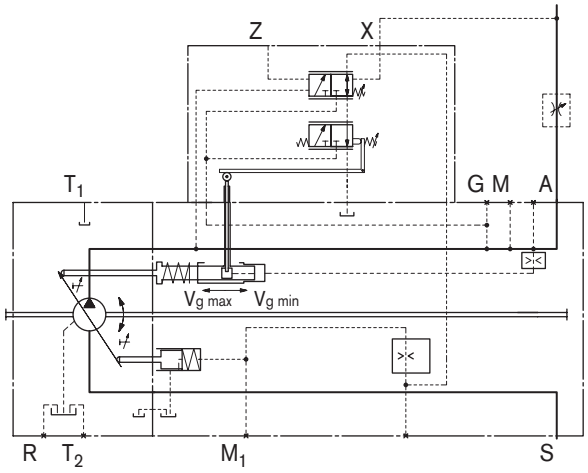
See following characteristic for details (example).

This permits a change in flow with the same sensing orifice size, to improve control resolution of the control block. Please consult us when applying.

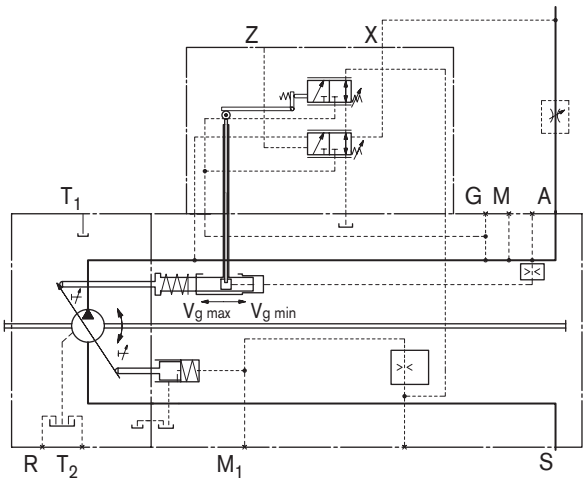
Characteristic: LRS5



Size 40-145: LRS5



Size 190-260: LRS5



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. 40 bar) 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 stoke 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 30 bar is required for the electrical stroke limiter LRU1/2 and the hydraulic stroke limiter.

The required control oil 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 at low operating pressure as well, the port G must be supplied with external control pressure of approx. 30 bar.

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

LRH1/5 Hydraulic stroke limiter (negative characteristic)

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

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

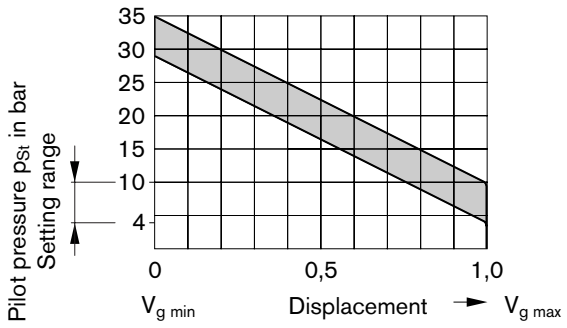
Start of control (at $V_{g\,max}$), settable _____ from 4 – 10 bar

Please state start of control value, when ordering.

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

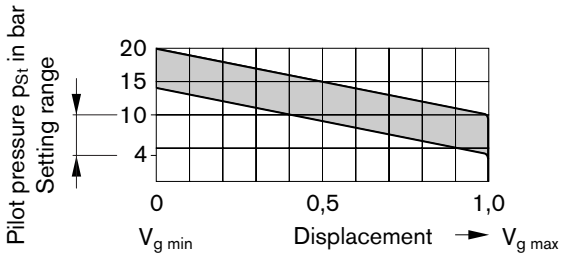
Characteristic: H1

Increase in pilot pressure ($V_{g\,max} - V_{g\,min}$) _____ $\Delta p = 25$ bar

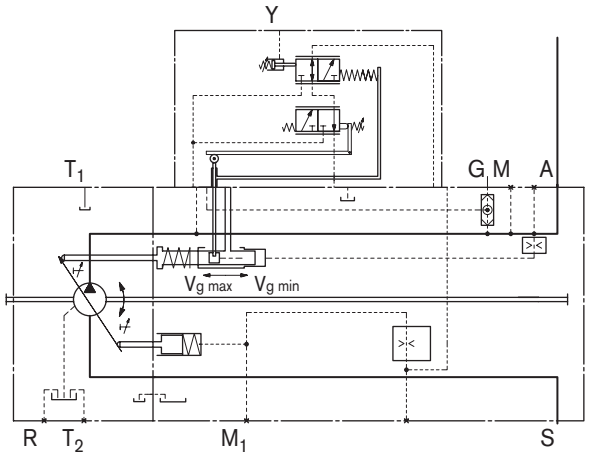


Characteristic: H5

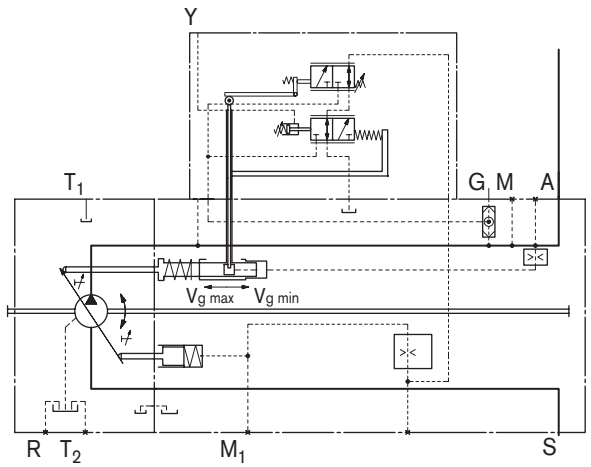
Increase in pilot pressure ($V_{g\,max} - V_{g\,min}$) _____ $\Delta p = 10$ bar



Size 40-145: LRH1/5



Size 190-260: LRH1/5



LR Power Control

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 $V_{g\,min}$), settable from 4 – 10 bar

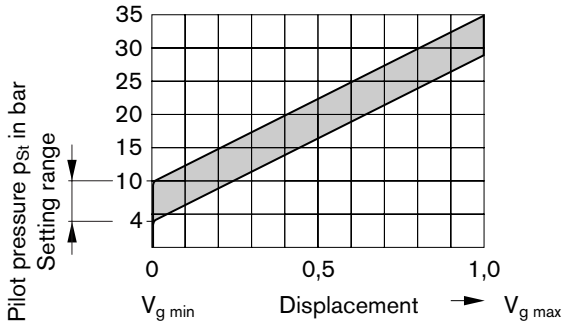
Please state start of control value, when ordering.

Starting position without control signal (pilot pressure):

– at operating pressure and external control pressure < 30 bar: $V_{g\,max}$
– at operating pressure or external control pressure > 30 bar: $V_{g\,min}$

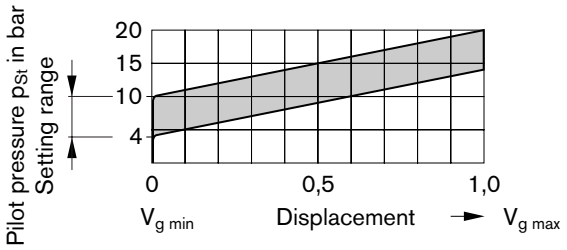
Characteristic: H2

Increase in pilot pressure ($V_{g\,min}$ – $V_{g\,max}$) _____ Δp = 25 bar

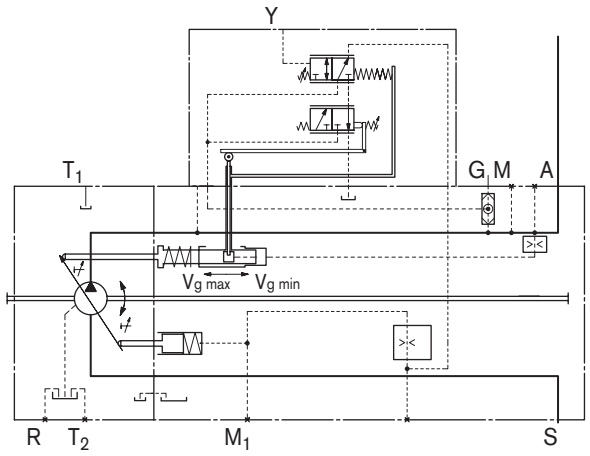


Characteristic: H6

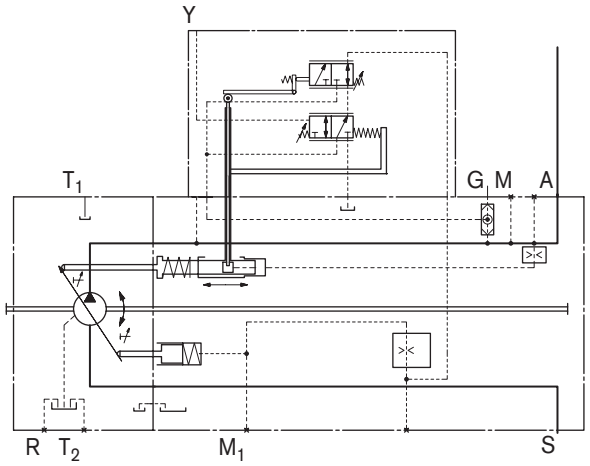
Increase in pilot pressure ($V_{g\,min}$ – $V_{g\,max}$) _____ Δp = 10 bar



Size 40-145: LRH2/6



Size 190-260: LRH2/6



LR Power Control

LRU1/2 Electrical stroke limiter (positive characteristic)

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

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

Technical data of solenoids

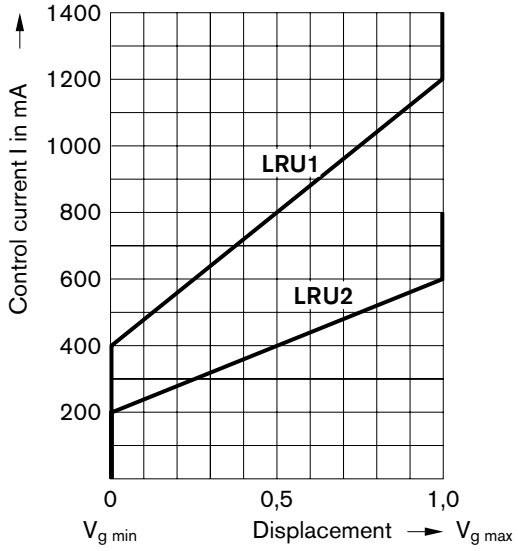
	LRU1	LRU2
Voltage	12 V DC (±20 %)	24 V DC (±20 %)
Control current		
Start of control at $V_{g\,min}$	400 mA	200 mA
End of control at $V_{g\,max}$	1200 mA	600 mA
Limiting current	1.54 A	0.77 A
Nominal resistance (at 20°C)	5.5 Ω	22.7 Ω
Dither frequency	100 Hz	100 Hz
Duty cycle	100 %	100%
Type of protection	dependent on connector version, see page 58	

Starting position without control signal (control current):
- at operating pressure and external control pressure < 30 bar: $V_{g\,max}$
- at operating pressure or external control pressure > 30 bar: $V_{g\,min}$

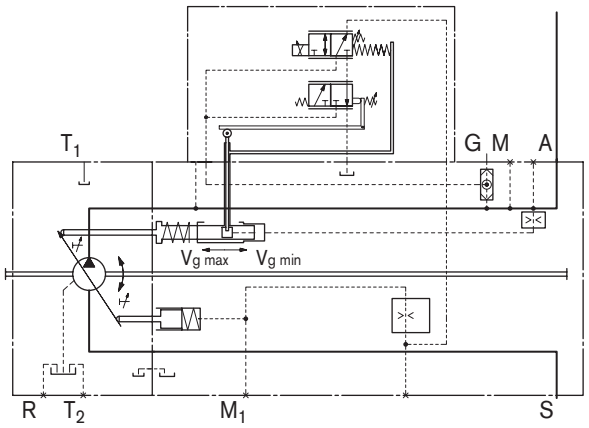
The following electronic control devices are available for controlling the proportional solenoid:

- Proportional amplifier **PV** (see RE 95023)
- Electronic control unit **RC** (see RE 95200)

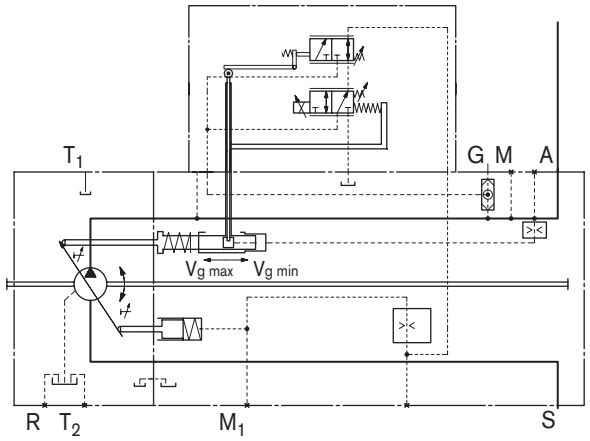
Characteristic: LRU1/2



Size 40-145: LRU1/2



Size 190-260: LRU1/2



DR Pressure Control

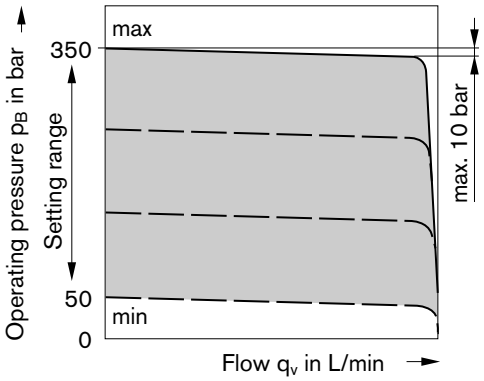
DR Pressure control

The pressure control keeps the pressure in a hydraulic system constant within its control range even under varying flow conditions. The variable displacement pump only moves as much hydraulic fluid as is required by the actuators. If the operating pressure exceeds the setpoint set at the integral pressure control valve, the pump displacement is automatically swivelled back until the pressure deviation is corrected.

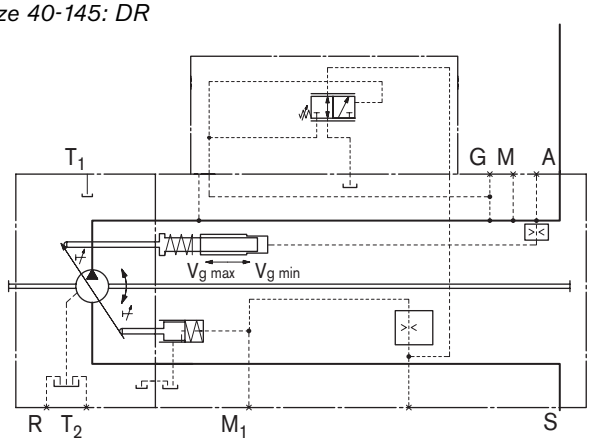
In zero pressure non-running condition, the pump is swivelled to its starting position ($V_{g\,max}$) by means of the control spring.

Setting range from 50 to 350 bar.

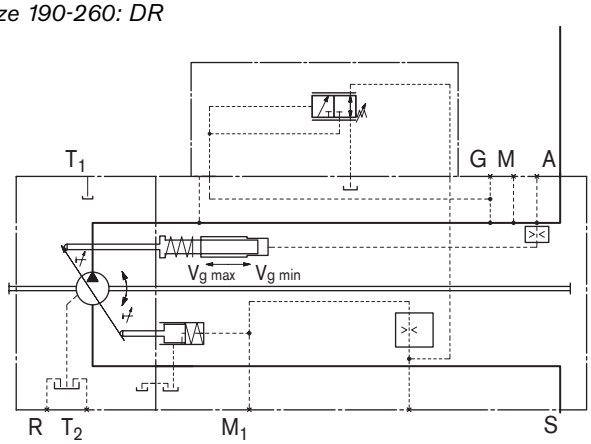
Characteristic: DR



Size 40-145: DR



Size 190-260: DR



DR Pressure 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 - and therefore the pump flow - constant as a function of the orifice size.

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

$\Delta p_{orifice} = p_{pump} - p_{actuator}$

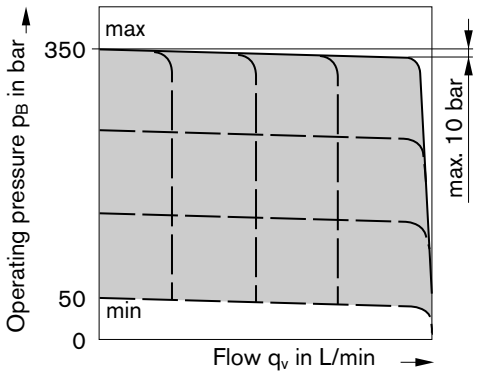
The setting range for Δp is between 14 bar and 25 bar.

The standard differential pressure setting is 18 bar. (Please state in clear text when ordering).

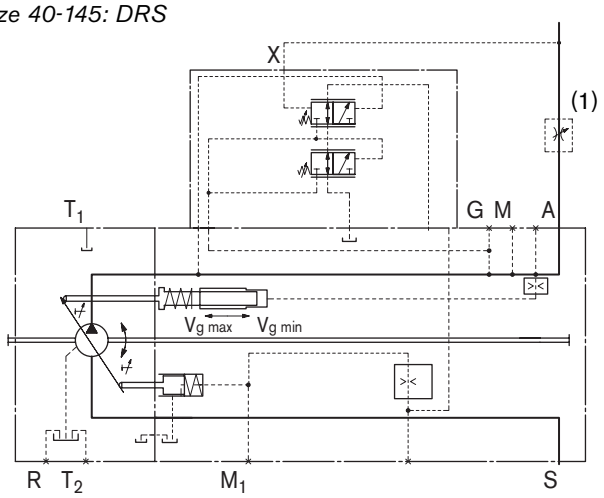
The stand-by pressure in zero stroke operation (sensing orifice plugged) is slightly above the Δp setting.

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

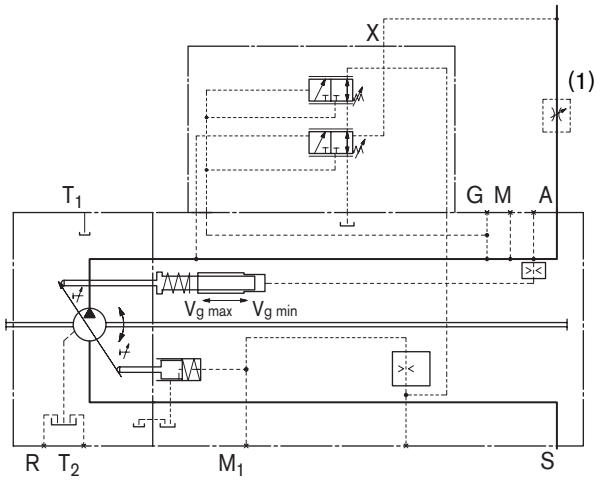
Characteristic: DRS



Size 40-145: DRS



Size 190-260: DRS



DR Pressure Control

DRG Pressure control, remote controlled

The remote control pressure cut-off regulator permits the adjustment of the pressure setting by a remotely installed pressure relief valve (1). Pilot flow for this valve is provide by a fixed orifice in the control module. The pressure drop across this relief valve is additive to the spring bias of the control spool.

Setting range from 50 to 350 bar.

In addition the pump can be unloaded into a standby pressure condition by an externally installed 2/2-way directional valve (2).

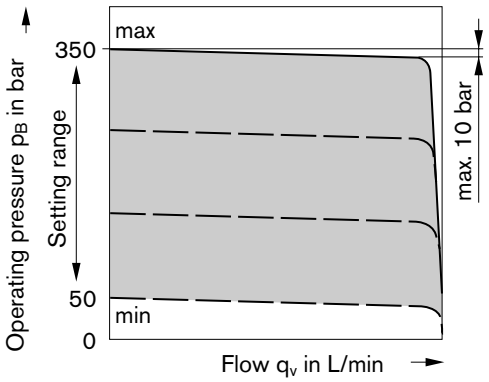
Both functions can be used individually or in combination (see circuit diagram).

The external valves are not included in the pump supply.

As a separate pressure relief valve (1) we recommend:

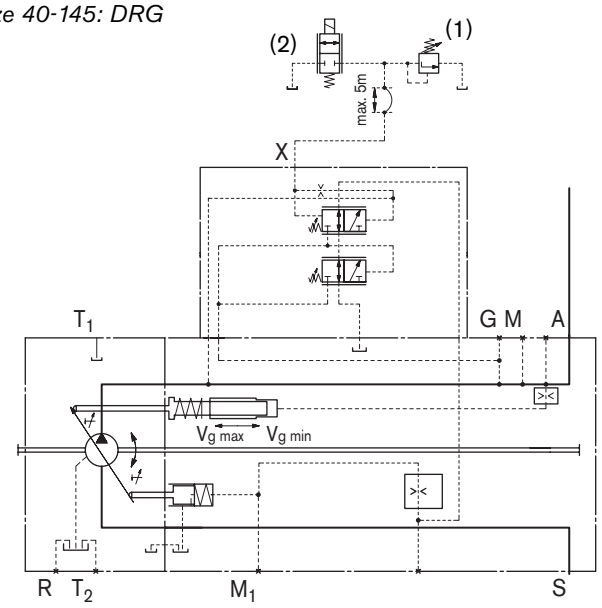
- DBDH 6 (manual control), see RE 25402

Characteristic: DRG

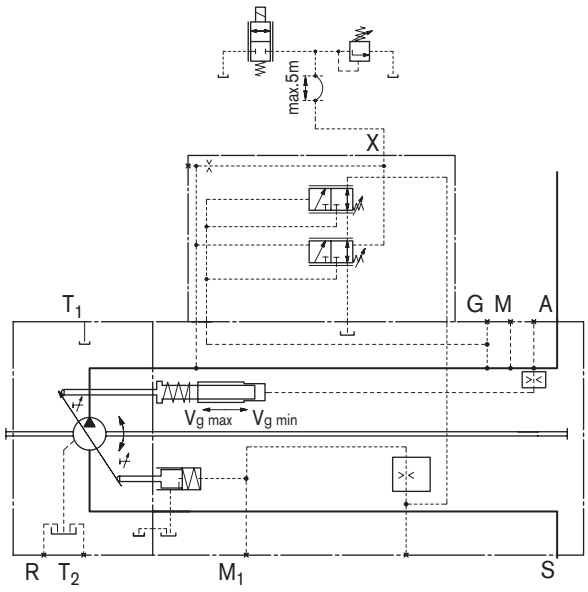


Note: The remote controlled pressure cut-off is also possible in combination with *LR, HD* and *EP*.

Size 40-145: DRG



Size 190-260: DRG



DR Pressure Control

DRL Pressure control for parallel operation

The pressure control DRL is suitable for pressure control of several axial piston pumps A11VO in parallel operation pumping into a common pressure header.

The parallel pressure control has a pressure rise characteristic of approx. 15 bar from $q_{v\,max}$ to $q_{v\,min}$. The pump regulates therefore to a pressure dependent displacement position. This results in stable control behavior, without the need of "staging" the individual pump compensators.

With the externally installed pressure relief valve (1) the nominal pressure setting of all pumps connected to the system is adjusted to the same value.

Setting range from 50 to 350 bar.

Each pump can be individually unloaded from the system by an separately installed 3/2- way directional valve (2).

The check valves (3) in the service line (port A) or control line (port X) must be provided generally.

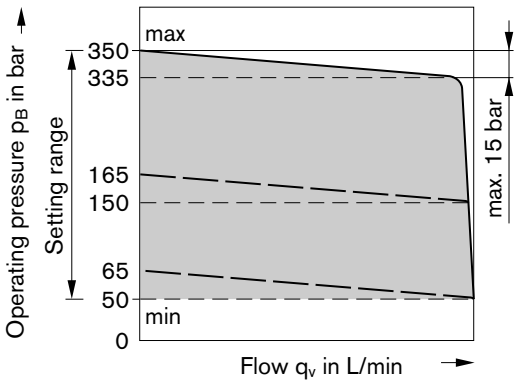
The external valves are not included in the pump supply.

As a separate pressure relief valve (1) we recommend:

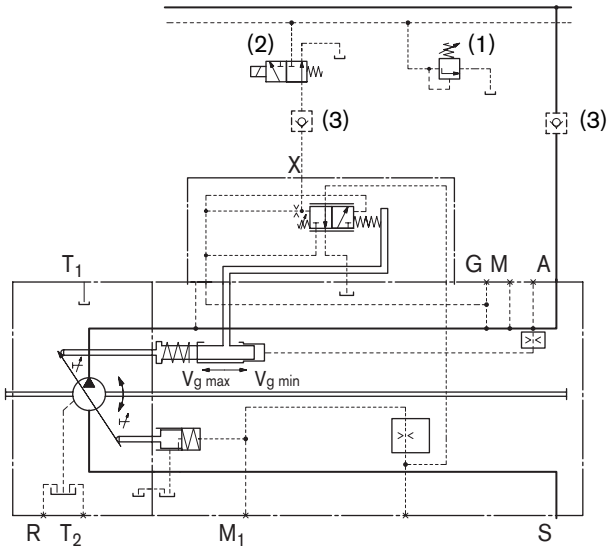
DBDH 6 (manual control) see RE 25402

The size of the remote relief valve depends on the number of pumps installed in parallel, and has to be able to handle the sum of the pilot flows provided by each pump control.

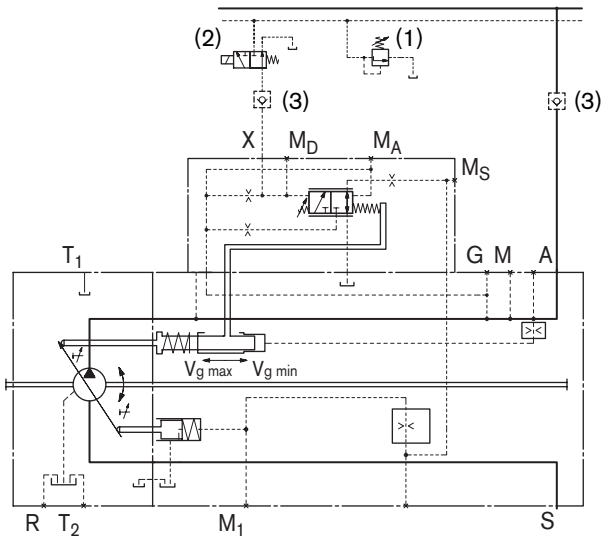
Characteristic: DRL



Size 40-145: DRL



Size 190-260: DRL



HD Hydraulic Control, Pilot Pressure Related

With the pilot pressure related control the pump displacement is adjusted in proportion to the pilot pressure applied to port Y.

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.

Start of control (at $V_{g\ min}$), settable from 4 - 10 bar

State start of control in clear text in the order.

Starting position without control signal (pilot pressure):

– at operating pressure and external control pressure < 30 bar: $V_{g\ max}$

– at operating pressure or external control pressure > 30 bar: $V_{g\ min}$

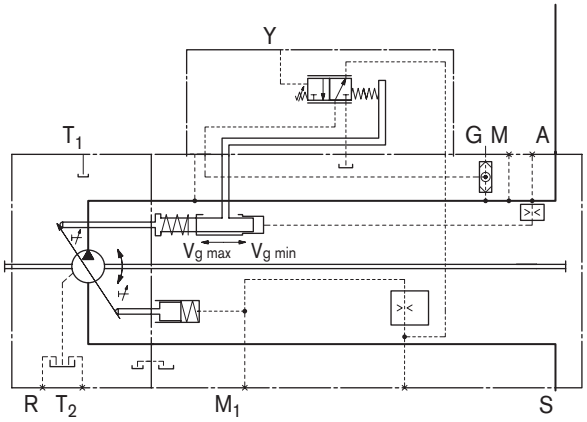
A control pressure of 30 bar is required to swivel the pump from its starting position $V_{g\ max}$ to $V_{g\ min}$.

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

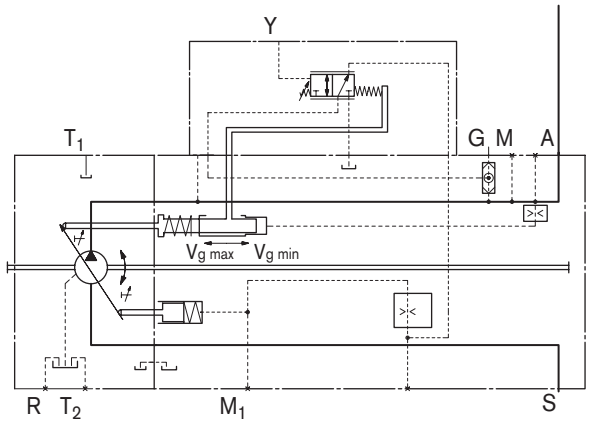
To ensure the control even at low operating pressure < 30 bar the port G must be supplied with an external control pressure of approx. 30 bar.

Note:
If no external control pressure is required at G port, the parts of the shuttle valve are to be removed from the pump and G port must be plugged.

Size 40-145: HD

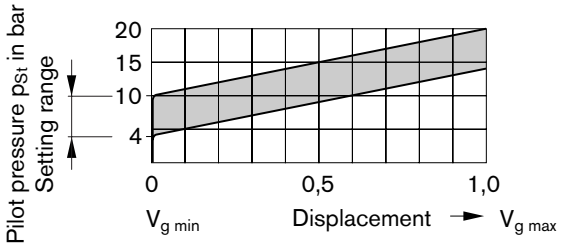


Size 190-260: HD



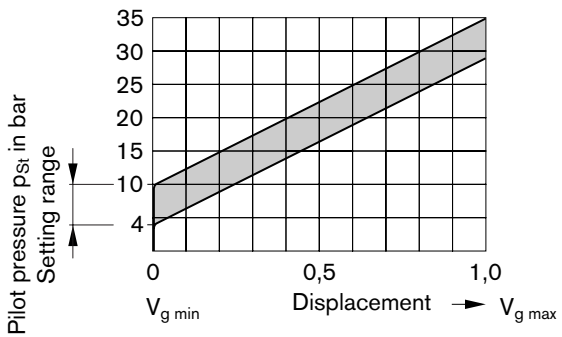
Characteristic: HD1

Increase in pilot pressure $V_{g\ min}$ to $V_{g\ max}$ _____ $\Delta p = 10$ bar



Characteristic: HD2

Increase in pilot pressure $V_{g\ min}$ to $V_{g\ max}$ _____ $\Delta p = 25$ bar



HD Hydraulic Control, Pilot Pressure Related

HD.D Hydraulic control with pressure cut-off

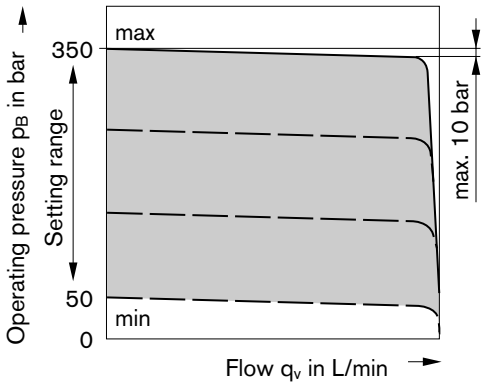
The pressure cut-off corresponds to a pressure control which adjusts the pump displacement back to $V_{g\,min}$, when the pressure setting is reached.

This function overrides the HD control, i.e. the pilot pressure related displacement control is functional below the pressure setting.

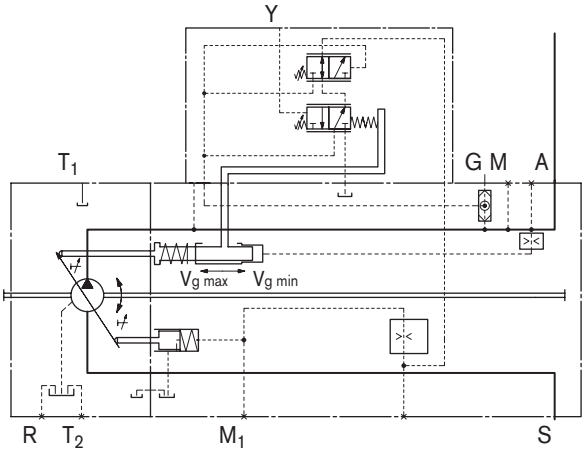
The valve for the pressure cut-off is integrated in the control housing and is set to a fixed specified pressure value at the factory.

Setting range from 50 to 350 bar

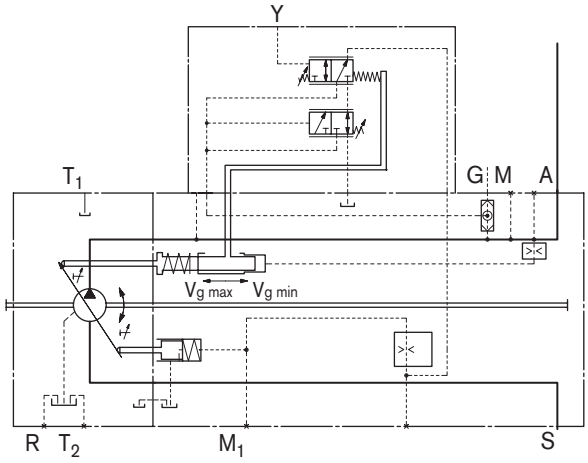
Characteristic: Pressure cut-off D



Size 40-145: HD.D



Size 190-260: HD.D



EP Electrical Control With Proportional Solenoid

With the electrical 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.

A 12V DC (EP1) or 24V DC (EP2) supply is required to operate the proportional solenoid.

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

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 < 30 bar: $V_{g\,max}$
– at operating pressure or external control pressure > 30 bar: $V_{g\,min}$

A control pressure of 30 bar is required to swivel the pump from its starting position $V_{g\,max}$ to $V_{g\,min}$.

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

To ensure the control even at low operating pressure < 30 bar the port G must be supplied with a external control pressure of approx. 30 bar.

Note:
If no external control pressure is required at G port, the parts of the shuttle valve are to be removed from the pump and G port must be plugged.

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.

The following electronic control devices are available for controlling the proportional solenoid:

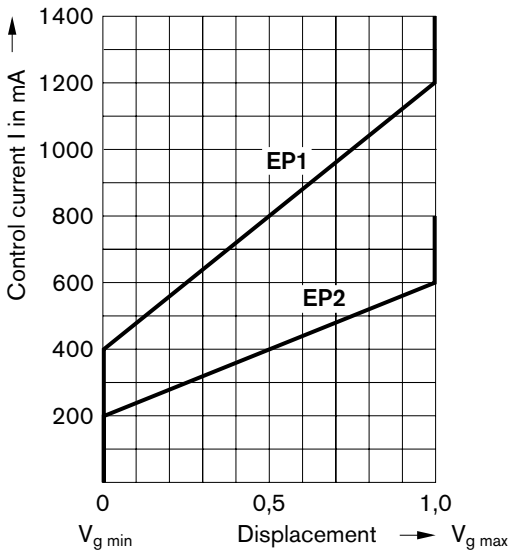
– Proportional amplifier **PV** (see RE 95023)

– Electronic control unit **RC** (see RE 95200)

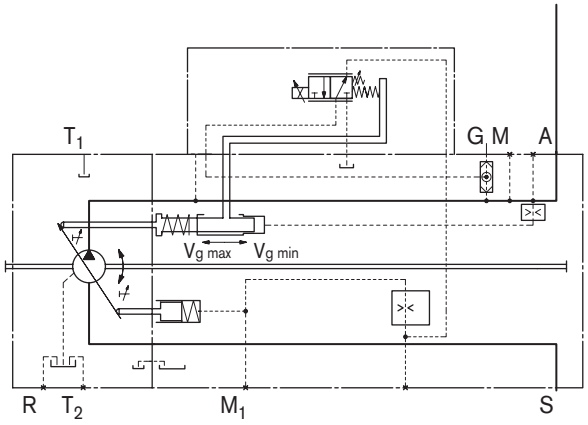
Technical data of solenoids

	EP1	EP2
Voltage	12 V DC (±20 %)	24 V DC (±20 %)
Control current		
Start of control at $V_{g\,0}$	400 mA	200 mA
End of control at $V_{g\,max}$	1200 mA	600 mA
Limiting current	1.54 A	0.77 A
Nominal resistance (at 20°C)	5.5 Ω	22.7 Ω
Dither frequency	100 Hz	100 Hz
Duty cycle	100 %	100%
Type of protection	dependent on connector version, see page 58	

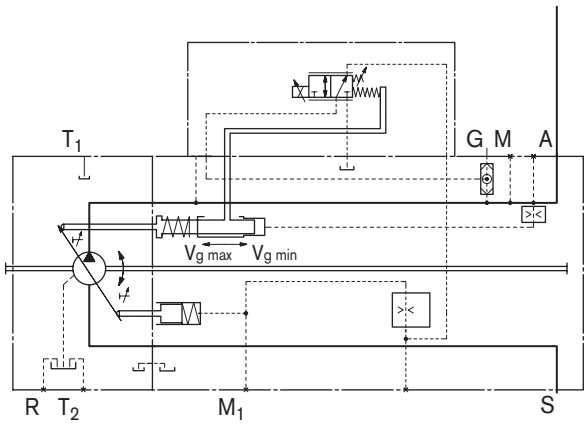
Characteristic: EP1/2



Size 40-145: EP



Size 190-260: EP



EP Electrical Control With Proportional Solenoid

EP.D Electrical control with pressure cut-off

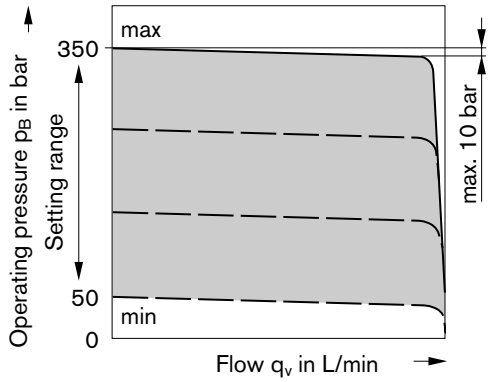
The pressure cut-off corresponds to a pressure control which adjusts the pump displacement back to $V_{g\,min}$, when the pressure setting is reached.

This function overrides the EP control, i.e. the control current related displacement control is functional below the pressure setting.

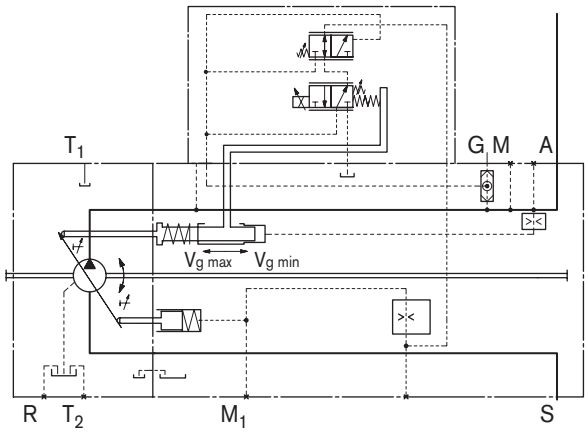
The valve for the pressure cut-off is integrated in the control housing and is set to a fixed specified pressure value at the factory.

Setting range from 50 to 350 bar

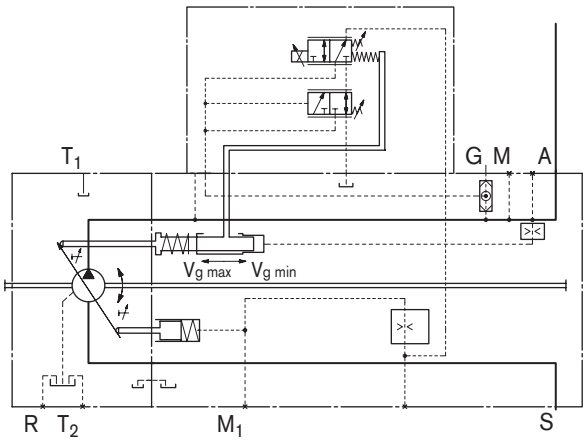
Characteristic: Pressure cut-off D



Size 40-145: EP.D



Size 190-260: EP.D

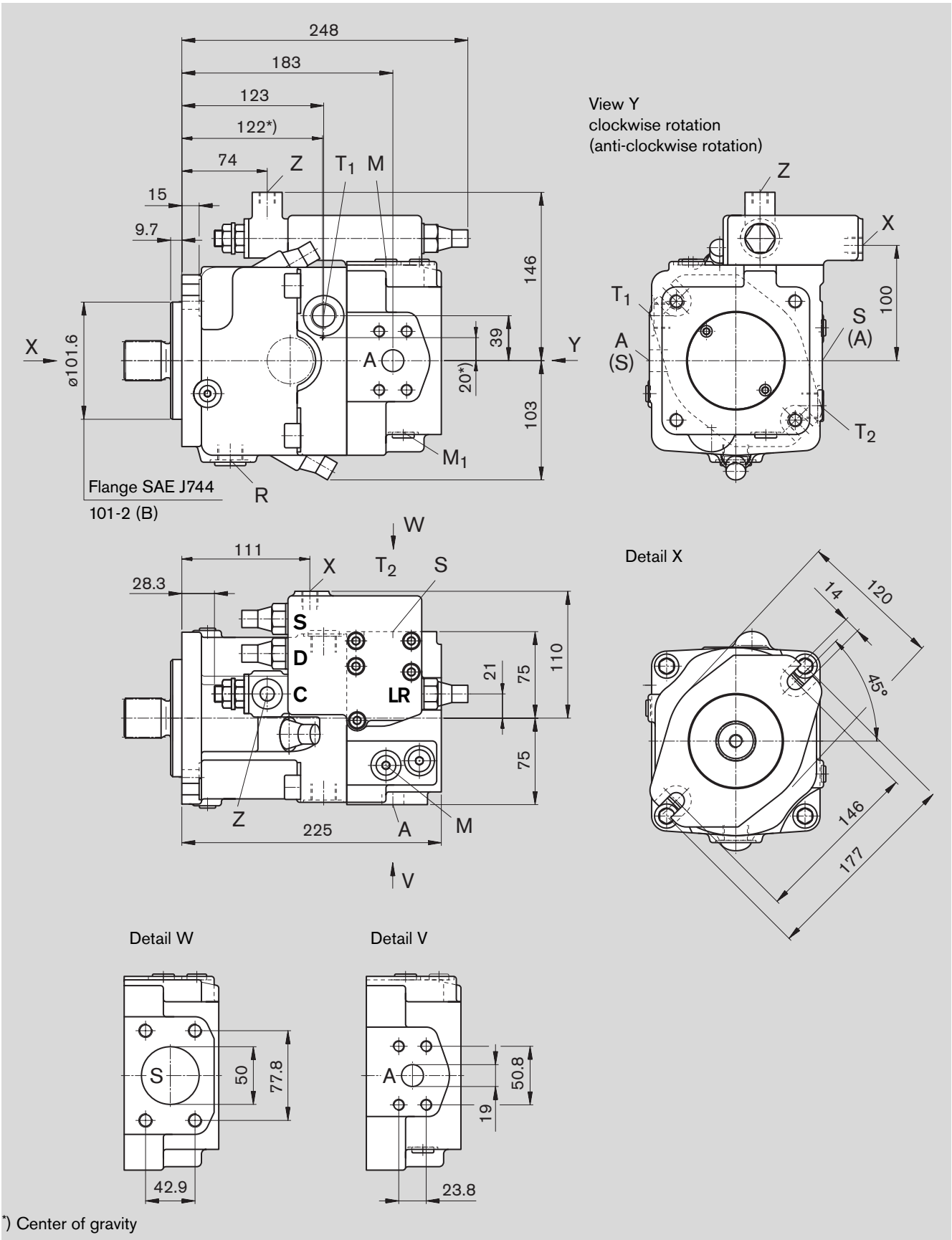


Unit Dimensions, Size 40

Before finalizing your design, please request a certified drawing.

LRDCS:

Power control LR with pressure cut-off D, cross sensing control C and load sensing control S



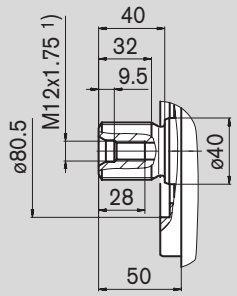
*) Center of gravity

Unit Dimensions, Size 40

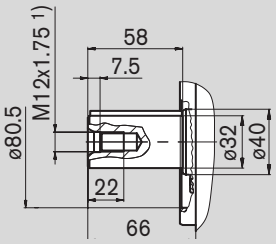
Before finalizing your design, please request a certified drawing.

Shaft ends

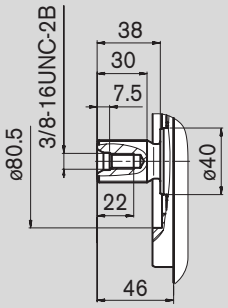
Z splined shaft DIN 5480
W35x2x30x16x9g



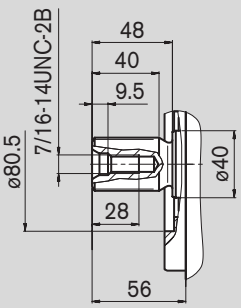
P cyl. shaft with key
DIN 6885 – AS10x8x56



S splined shaft
1 in 15T 16/32DP 2)
(SAE J744 – 25-4 (B-B))



T splined shaft
1 1/4 in 14T 12/24DP 2)
(SAE J744 – 32-4 (C))



Ports

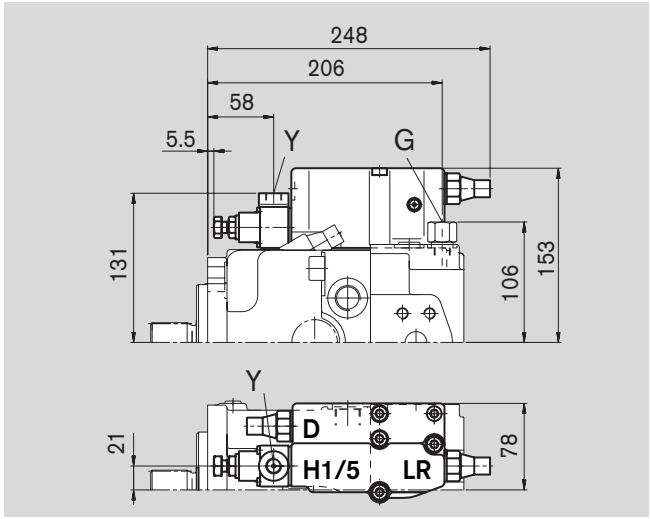
				Tightening torque, max.
A	Service ports (high pressure series) Fastening thread	SAE J518 DIN 13	3/4 in – M10x1.5; 17 deep	 see safety instructions
S	Suction port (standard series) Fastening thread	SAE J518 DIN 13	2 in – M12x1.75; 20 deep	 see safety instructions
T_1, T_2	Bleeding, tank	DIN 3852	M22x1.5; 14 deep	210 Nm
R	Bleeding, oil drain	DIN 3852	M22x1.5; 14 deep	210 Nm
M_1	Measuring position, positioning chamber	DIN 3852	M12x1.5; 12 deep	50 Nm
M	Measuring position, service port	DIN 3852	M12x1.5; 12 deep	50 Nm
X	Pilot pressure port in version with load sensing (S) and remote controlled pressure cut-off (G)	DIN 3852	M14x1.5; 12 deep	80 Nm
Y	Pilot pressure port in version with stroke limiter (H...), 2-stage pressure cut-off (E) and HD	DIN 3852	M14x1.5; 12 deep	80 Nm
Z	Pilot pressure port in version with cross sensing (C) and power override (LR3, LG1)	DIN 3852	M14x1.5; 12 deep	80 Nm
G	Port for control pressure (controller) in version with stroke limiter (H.., U2), HD and EP with screw union GE10 - PLM (otherwise port G plugged)	DIN 3852	M14x1.5; 12 deep	80 Nm

1) Centering bore in accordance with DIN 332
2) ANSI B92.1a-1976, 30° pressure angle, flat root side fit, tolerance class 5

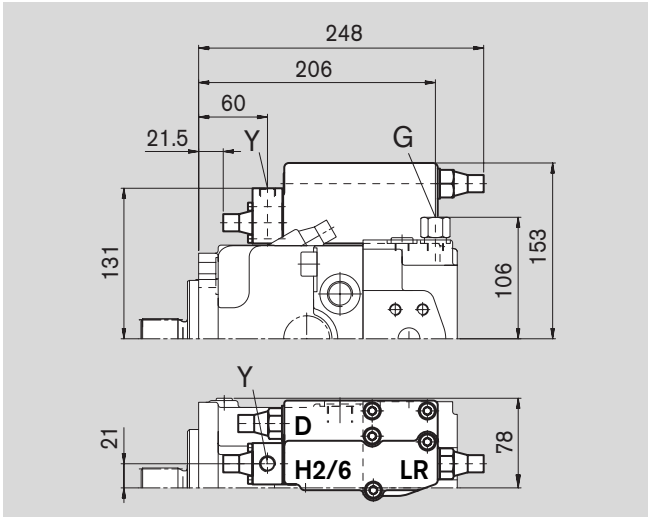
Unit Dimensions, Size 40

Before finalizing your design, please request a certified drawing.

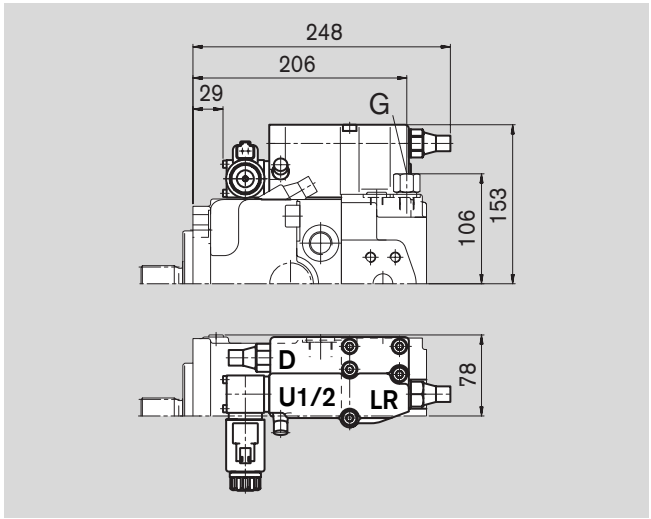
LRDH1/LRDH5:
Power control with pressure cut-off and hydraulic stroke limiter (negative characteristic)



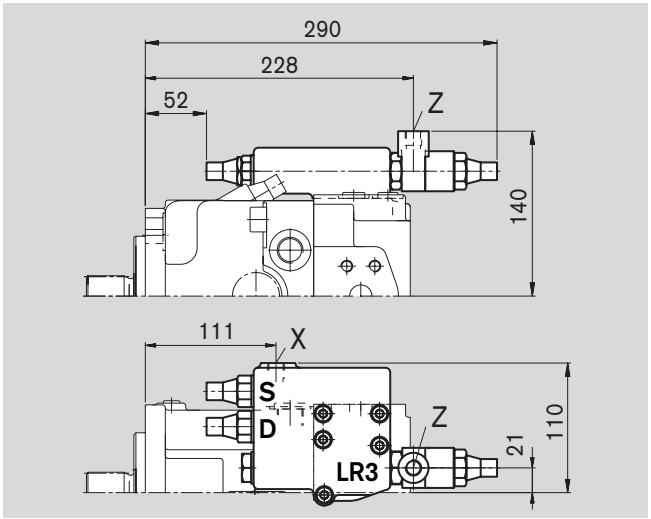
LRDH2/LRDH6:
Power control with pressure cut-off and hydraulic stroke limiter (positive characteristic)



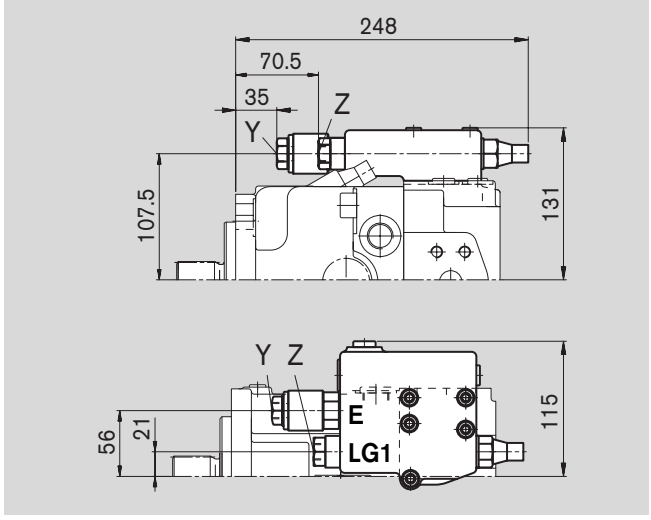
LRDU1/LRDU2:
Power control with pressure cut-off and electrical stroke limiter (positive characteristic)



LR3DS:
Power control with high pressure related override, pressure cut-off and load sensing control



LG1E:
Power control with pilot pressure related override (negative) and 2-stage pressure cut-off



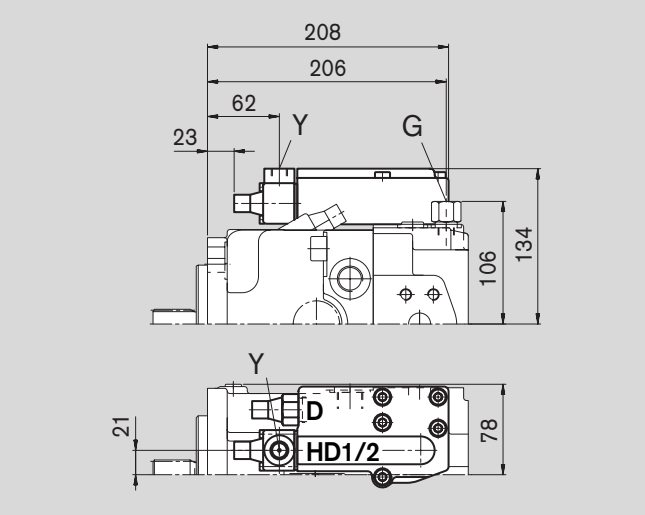
LG2E:
Power control with pilot pressure related override (positive) and 2-stage pressure cut-off

Unit Dimensions, Size 40

Before finalizing your design, please request a certified drawing.

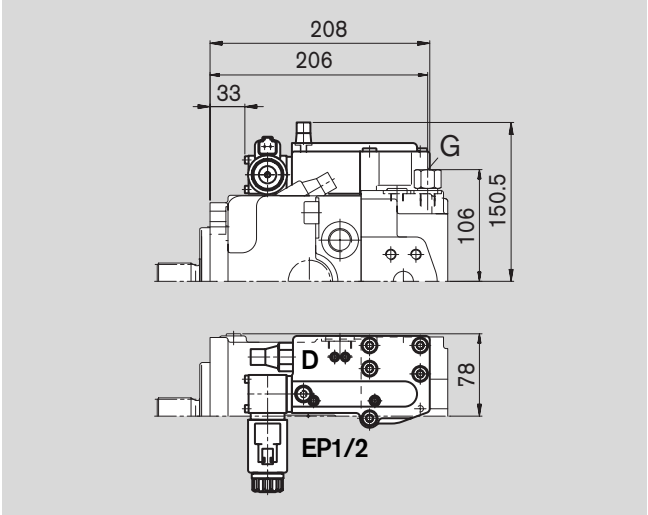
HD1D/HD2D:

Hydraulic control, pilot pressure related with pressure cut-off



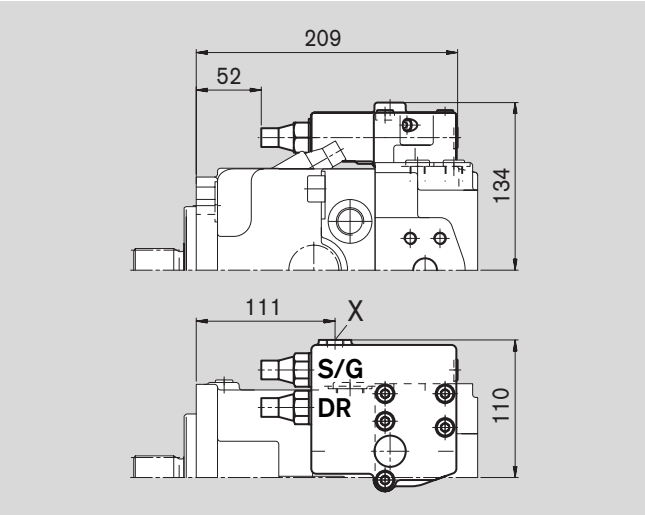
EP1D/EP2D:

Electrical control with proportional solenoid and pressure cut-off



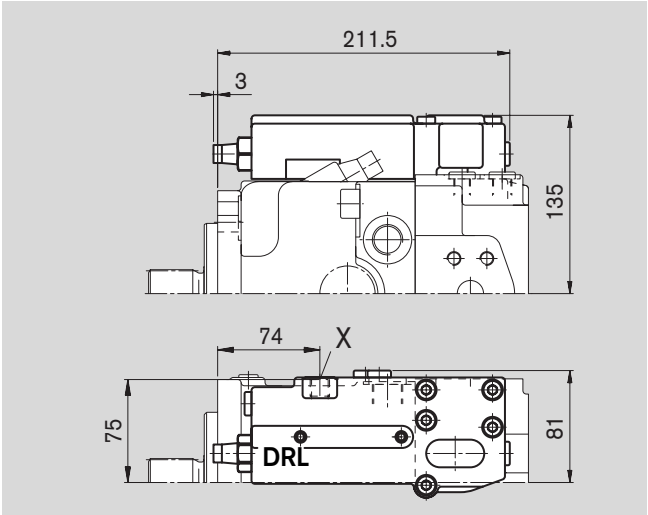
DRS/DRG:

Pressure control with load sensing control
Pressure control remote controlled



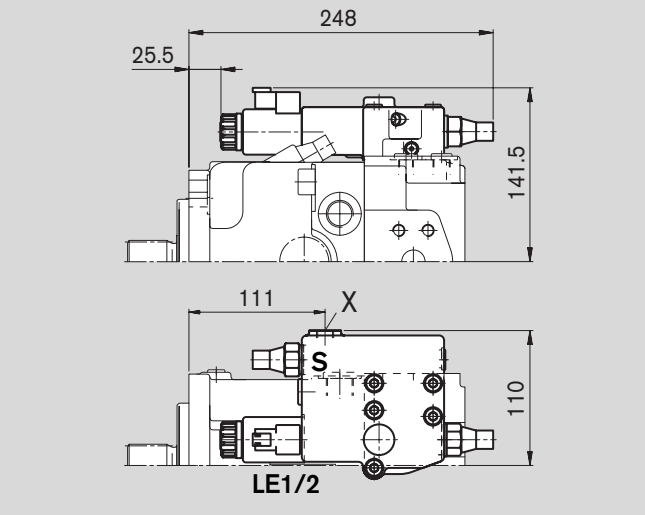
DRL:

Pressure control for parallel operation



LE1S/LE2S:

Power control with electrical override (negative) and load sensing control



LE2S2/LE1S5/LE2S5:

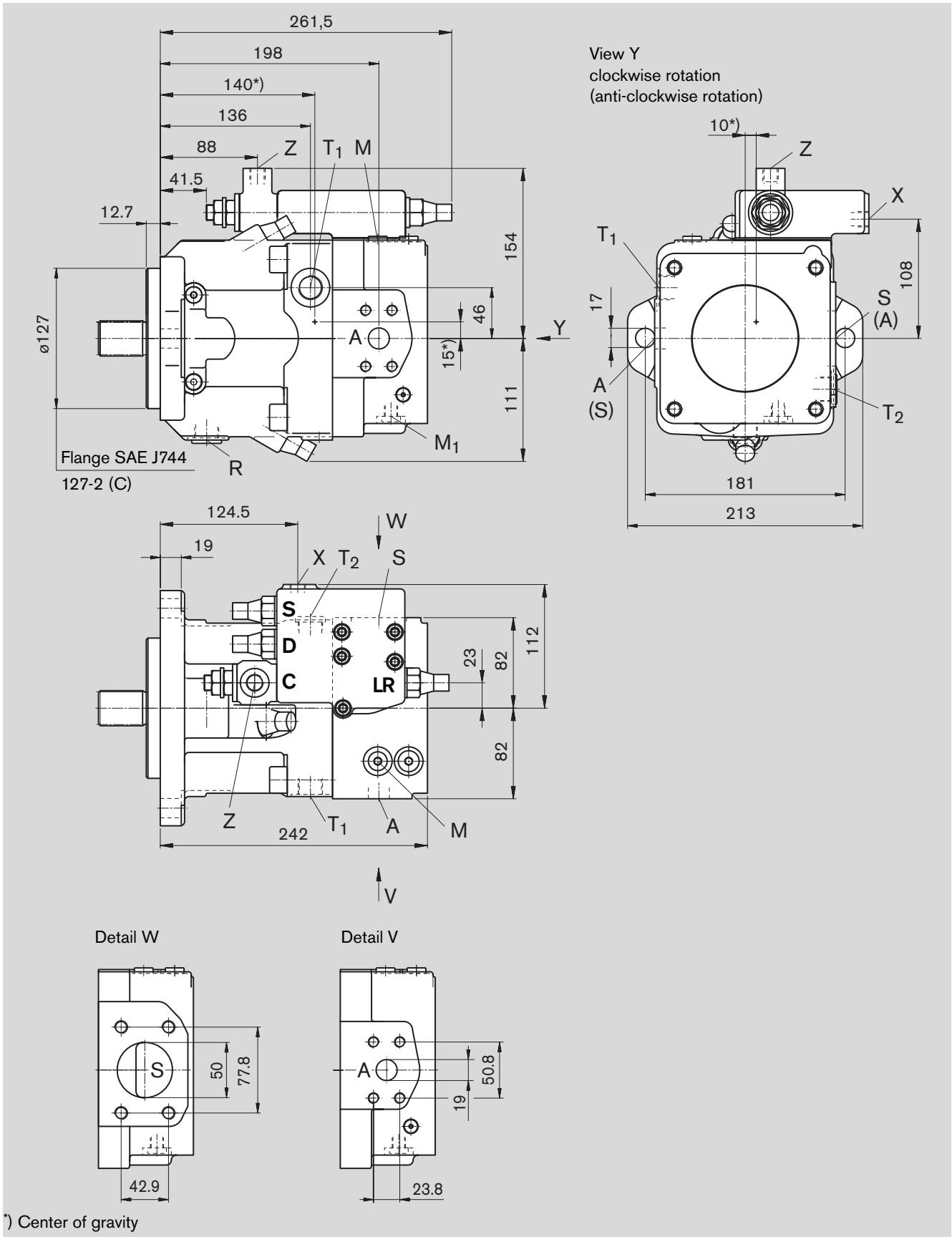
Power control with electrical override (negative) and load sensing control, override

Unit Dimensions, Size 60

Before finalizing your design, please request a certified drawing.

LRDCS:

Power control LR with pressure cut-off D, cross sensing control C and load sensing control S



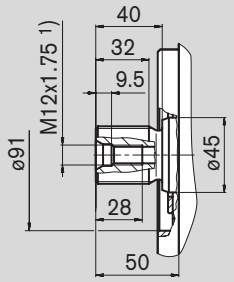
*) Center of gravity

Unit Dimensions, Size 60

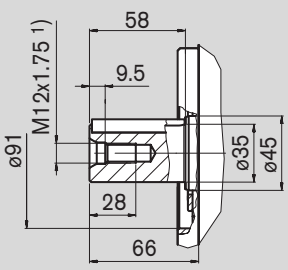
Before finalizing your design, please request a certified drawing.

Shaft ends

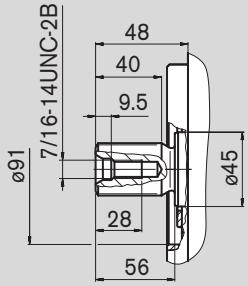
Z splined shaft DIN 5480
W35x2x30x16x9g



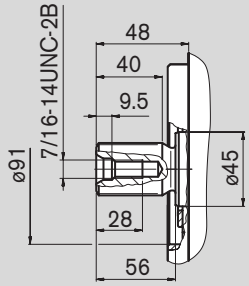
P cyl. shaft with key
DIN 6885 – AS10x8x56



S splined shaft
1 1/4 in 14T 12/24DP 2)
(SAE J744 – 32-4 (C))



T splined shaft
1 3/8 in 21T 16/32DP 2)



Ports

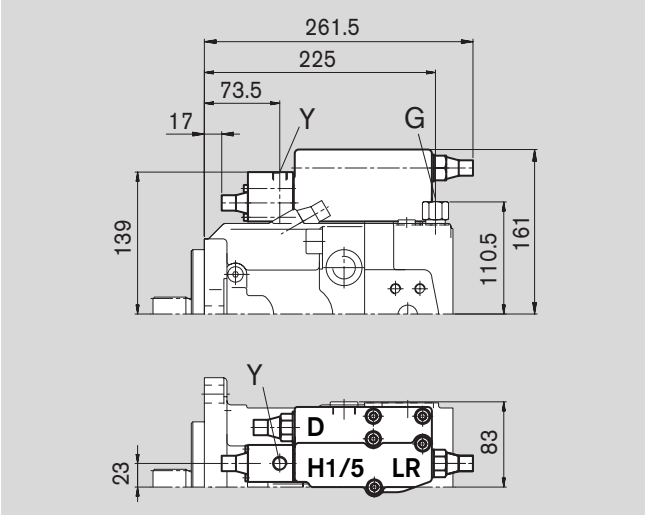
				Tightening torque, max.
A	Service ports (high pressure series) Fastening thread	SAE J518 DIN 13	3/4 in M10x1.5; 17 deep	– see safety instructions
S	Suction port (standard series) Fastening thread	SAE J518 DIN 13	2 in M12x1.75; 20 deep	– see safety instructions
T_1, T_2	Bleeding, tank	DIN 3852	M22x1.5; 14 deep	210 Nm
R	Bleeding, oil drain	DIN 3852	M22x1.5; 14 deep	210 Nm
M_1	Measuring position, positioning chamber	DIN 3852	M12x1.5; 12 deep	50 Nm
M	Measuring position, service port	DIN 3852	M12x1.5; 12 deep	50 Nm
X	Pilot pressure port in version with load sensing (S) and remote controlled pressure cut-off (G)	DIN 3852	M14x1.5; 12 deep	80 Nm
Y	Pilot pressure port in version with stroke limiter (H...), 2-stage pressure cut-off (E) and HD	DIN 3852	M14x1.5; 12 deep	80 Nm
Z	Pilot pressure port in version with cross sensing (C) and power override (LR3, LG1)	DIN 3852	M14x1.5; 12 deep	80 Nm
G	Port for control pressure (controller) in version with stroke limiter (H.., U2), HD and EP with screw union GE10 - PLM (otherwise port G plugged)	DIN 3852	M14x1.5; 12 deep	80 Nm

1) Centering bore in accordance with DIN 332
2) ANSI B92.1a-1976, 30° pressure angle, flat root side fit, tolerance class 5

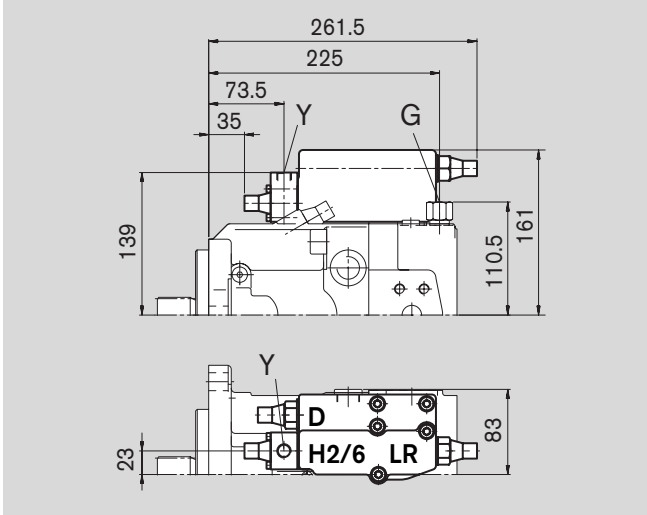
Unit Dimensions, Size 60

Before finalizing your design, please request a certified drawing.

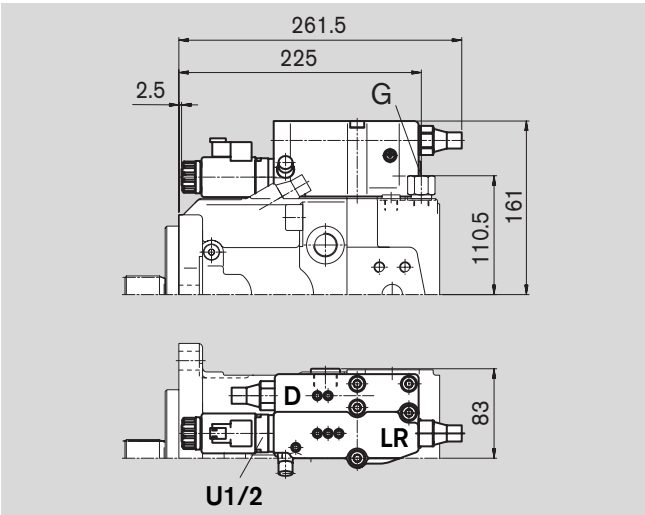
LRDH1/LRDH5:
Power control with pressure cut-off and hydraulic stroke limiter (negative characteristic)



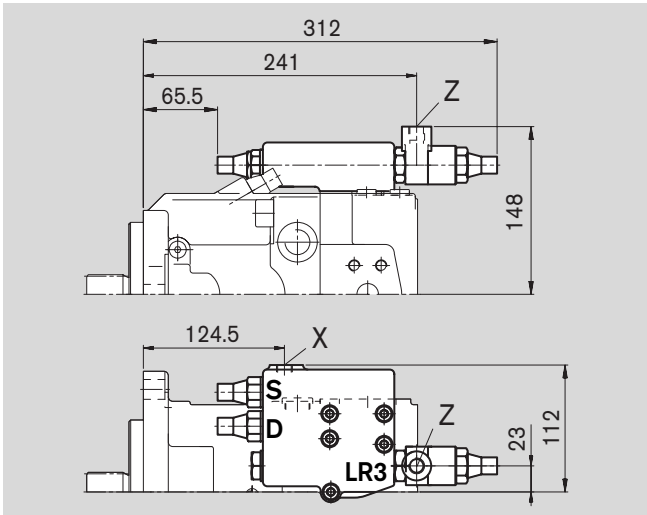
LRDH2/LRDH6:
Power control with pressure cut-off and hydraulic stroke limiter (positive characteristic)



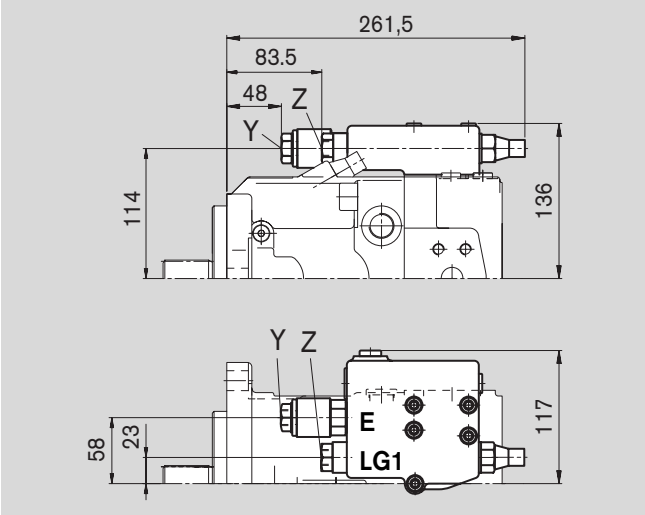
LRDU1/LRDU2:
Power control with pressure cut-off and electrical stroke limiter (positive characteristic)



LR3DS:
Power control with high pressure related override, pressure cut-off and load sensing control



LG1E:
Power control with pilot pressure related override (negative) and 2-stage pressure cut-off



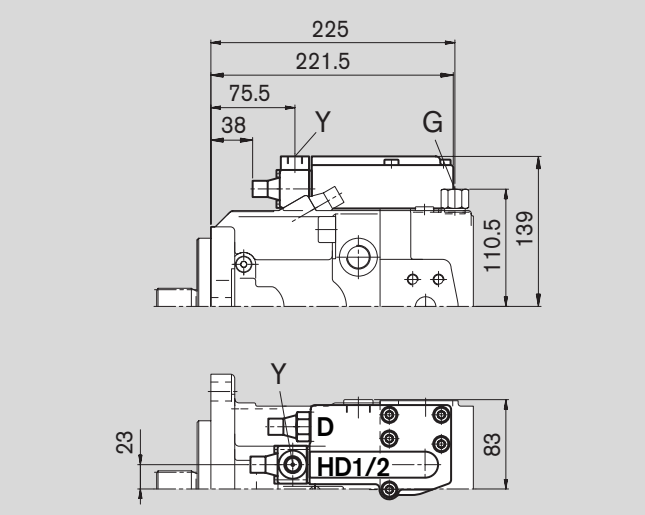
LG2E:
Power control with pilot pressure related override (positive) and 2-stage pressure cut-off

Unit Dimensions, Size 60

Before finalizing your design, please request a certified drawing.

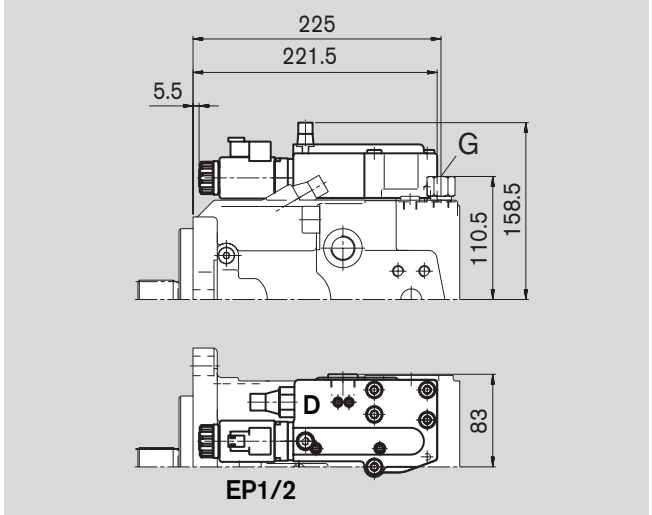
HD1D/HD2D:

Hydraulic control, pilot pressure related with pressure cut-off



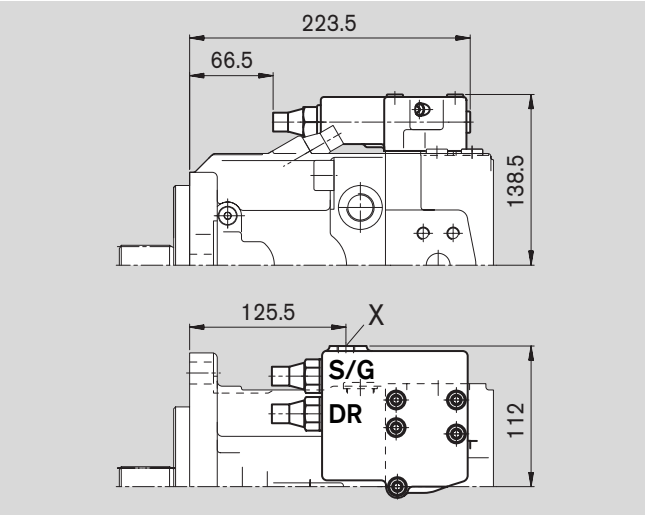
EP1D/EP2D:

Electrical control with proportional solenoid and pressure cut-off



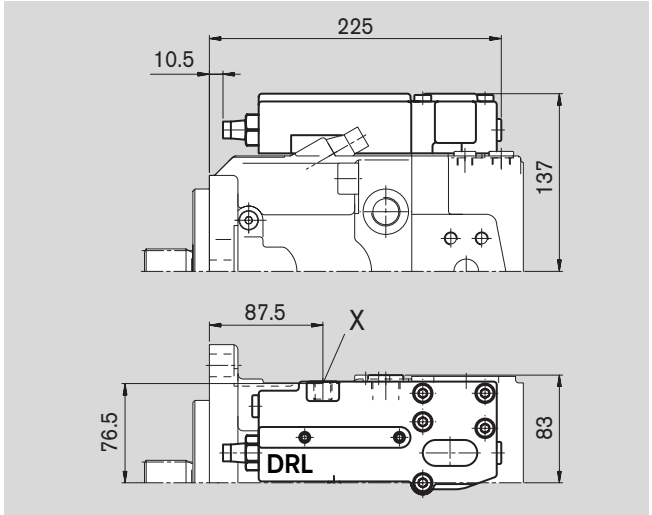
DRS/DRG:

Pressure control with load sensing control
Pressure control remote controlled



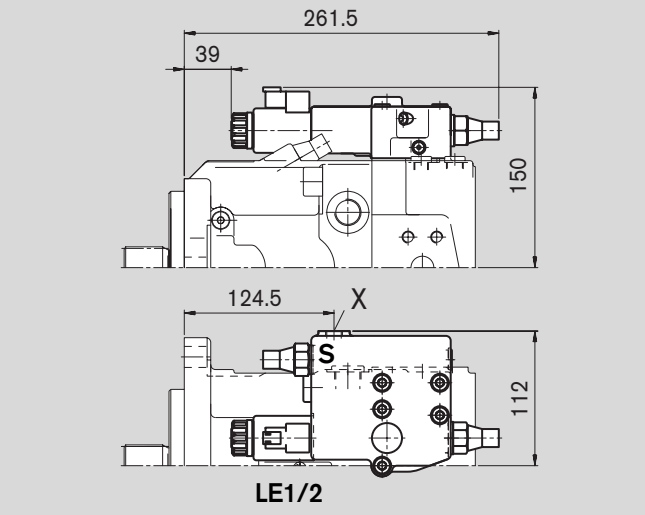
DRL:

Pressure control for parallel operation



LE1S/LE2S:

Power control with electrical override (negative) and load sensing control



LE2S2/LE1S5/LE2S5:

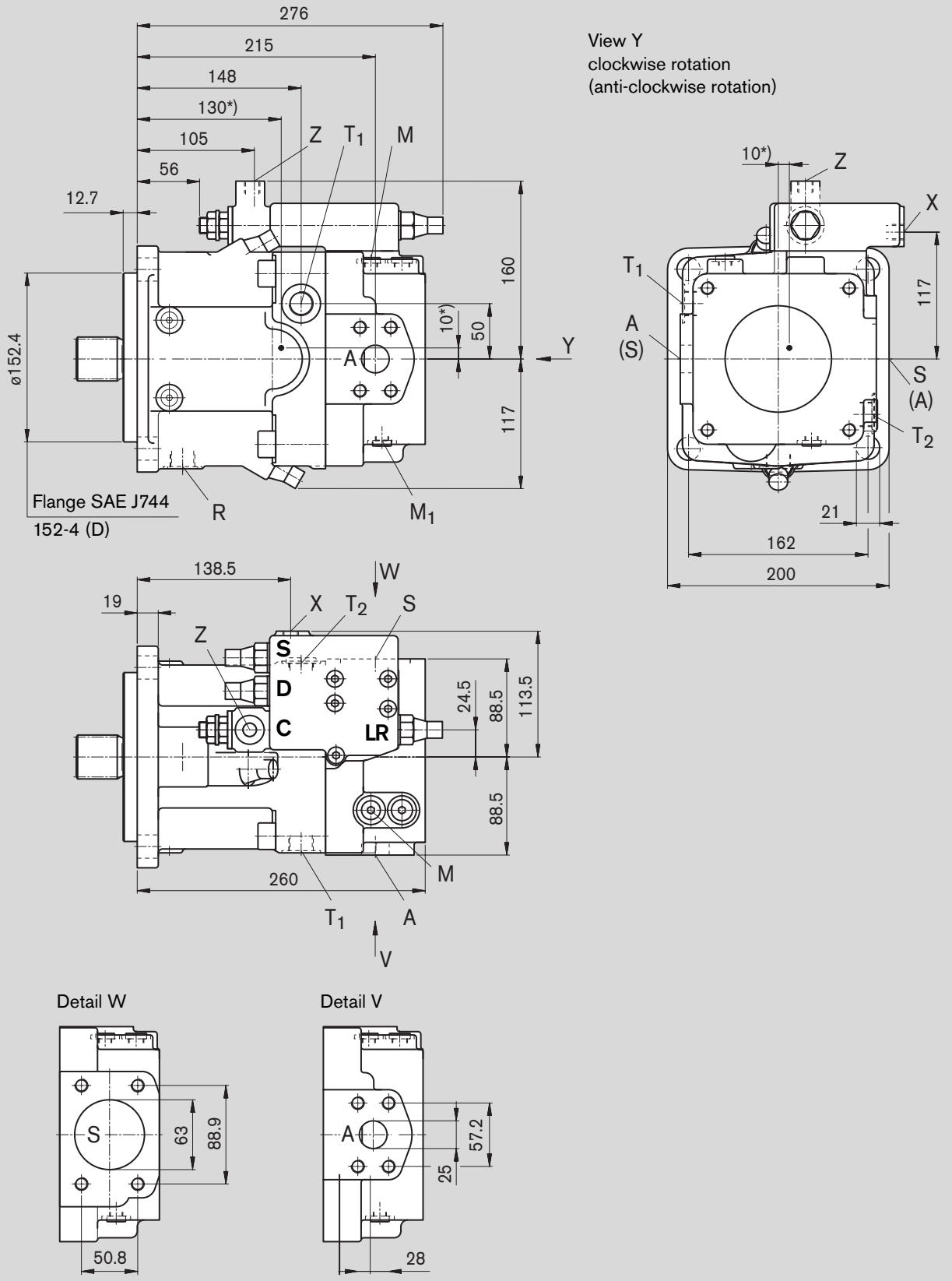
Power control with electrical override (negative) and load sensing control, override

Unit Dimensions, Size 75

Before finalizing your design, please request a certified drawing.

LRDCS:

Power control LR with pressure cut-off D, cross sensing control C and load sensing control S



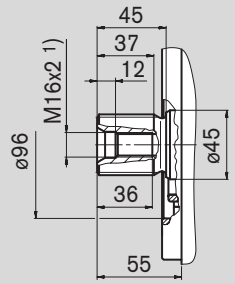
*) Center of gravity

Unit Dimensions, Size 75

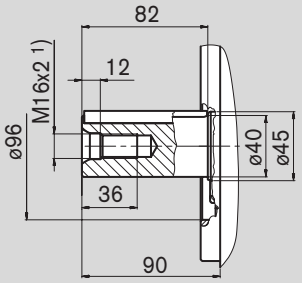
Before finalizing your design, please request a certified drawing.

Shaft ends

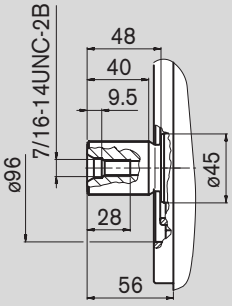
Z splined shaft DIN 5480
W40x2x30x18x9g



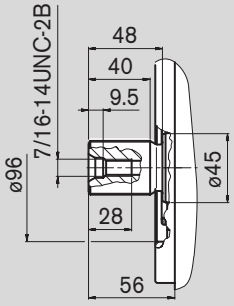
P cyl. shaft with key
DIN 6885 – AS12x8x80



S splined shaft
1 1/4 in 14T 12/24DP 2)
(SAE J744 – 32-4 (C))



T splined shaft
1 3/8 in 21T 16/32DP 2)



Ports

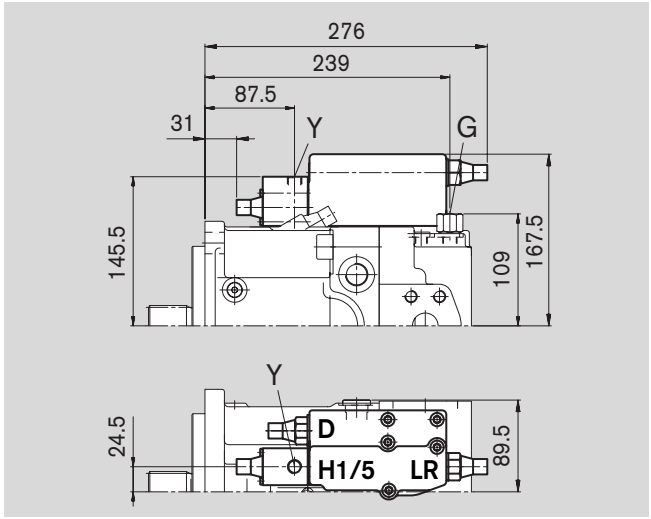
				Tightening torque, max.
A	Service ports (high pressure series) Fastening thread	SAE J518 DIN 13	1 in M12x1.75; 17 deep	– see safety instructions
S	Suction port Fastening thread	SAE J518 DIN 13	2 1/2 in M12x1.75; 17 deep	– see safety instructions
T_1, T_2	Bleeding, tank	DIN 3852	M22x1.5; 14 deep	210 Nm
R	Bleeding, oil drain	DIN 3852	M22x1.5; 14 deep	210 Nm
M_1	Measuring position, positioning chamber	DIN 3852	M12x1.5; 12 deep	50 Nm
M	Measuring position, service port	DIN 3852	M12x1.5; 12 deep	50 Nm
X	Pilot pressure port in version with load sensing (S) and remote controlled pressure cut-off (G)	DIN 3852	M14x1.5; 12 deep	80 Nm
Y	Pilot pressure port in version with stroke limiter (H...), 2-stage pressure cut-off (E) and HD	DIN 3852	M14x1.5; 12 deep	80 Nm
Z	Pilot pressure port in version with cross sensing (C) and power override (LR3, LG1)	DIN 3852	M14x1.5; 12 deep	80 Nm
G	Port for control pressure (controller) in version with stroke limiter (H.., U2), HD and EP with screw union GE10 - PLM (otherwise port G plugged)	DIN 3852	M14x1.5; 12 deep	80 Nm

1) Centering bore in accordance with DIN 332
2) ANSI B92.1a-1976, 30° pressure angle, flat root side fit, tolerance class 5

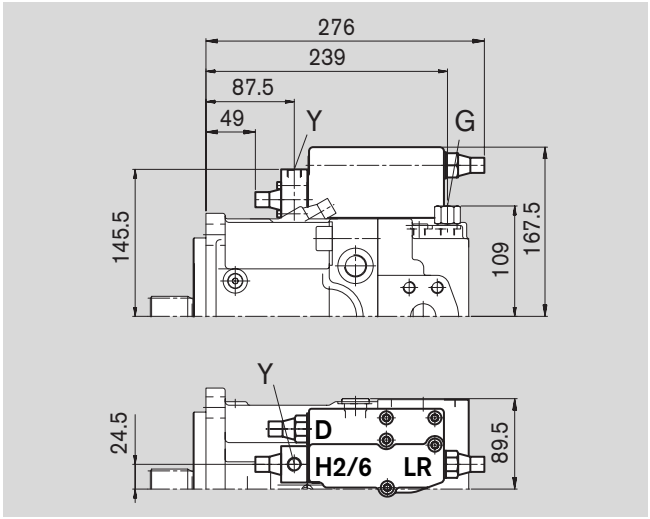
Unit Dimensions, Size 75

Before finalizing your design, please request a certified drawing.

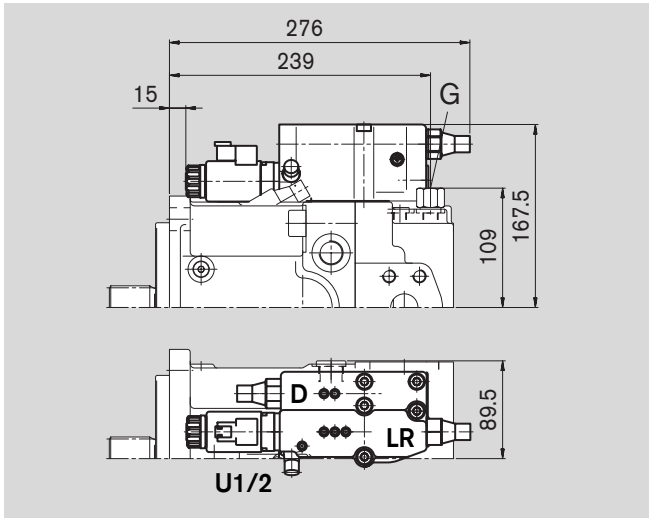
LRDH1/LRDH5:
Power control with pressure cut-off and hydraulic stroke limiter (negative characteristic)



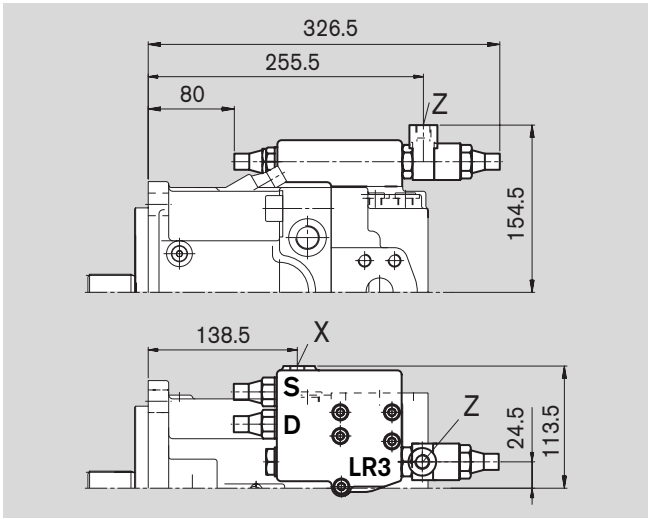
LRDH2/LRDH6:
Power control with pressure cut-off and hydraulic stroke limiter (positive characteristic)



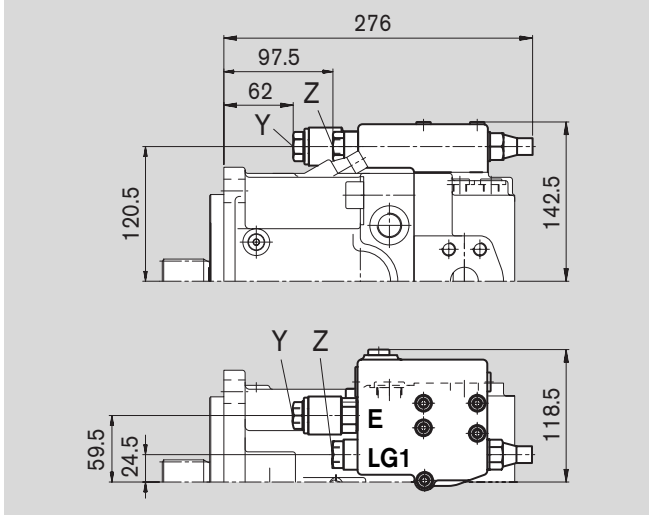
LRDU1/LRDU2:
Power control with pressure cut-off and electrical stroke limiter (positive characteristic)



LR3DS:
Power control with high pressure related override, pressure cut-off and load sensing control



LG1E:
Power control with pilot pressure related override (negative) and 2-stage pressure cut-off



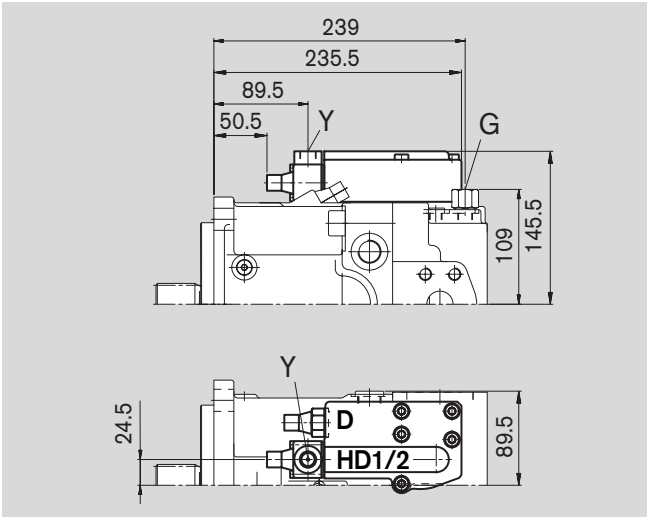
LG2E:
Power control with pilot pressure related override (positive) and 2-stage pressure cut-off

Unit Dimensions, Size 75

Before finalizing your design, please request a certified drawing.

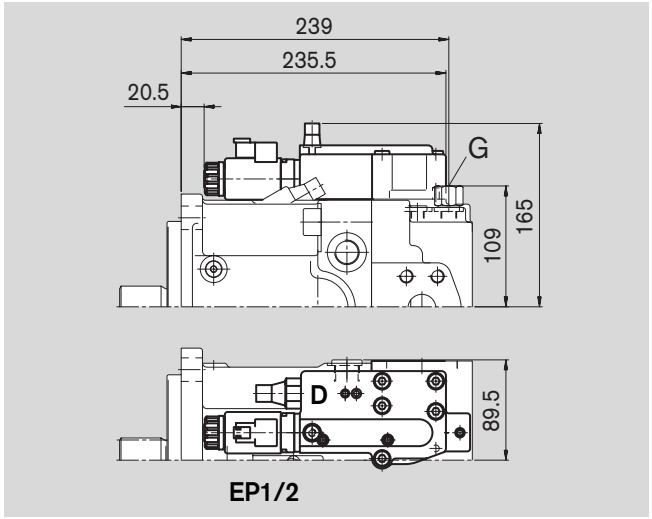
HD1D/HD2D:

Hydraulic control, pilot pressure related with pressure cut-off



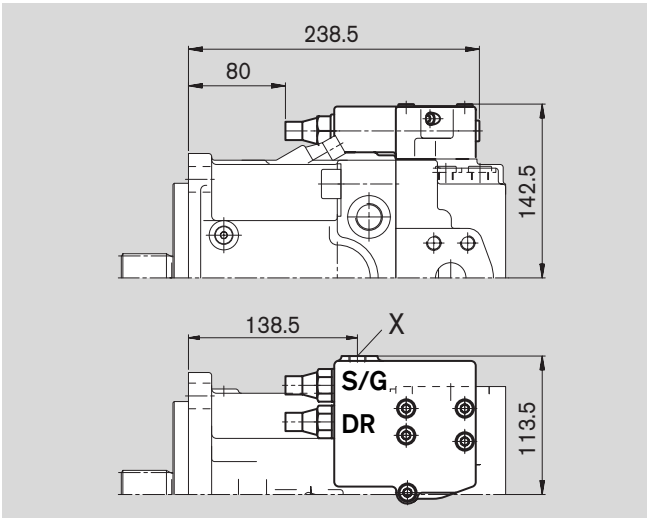
EP1D/EP2D:

Electrical control with proportional solenoid and pressure cut-off



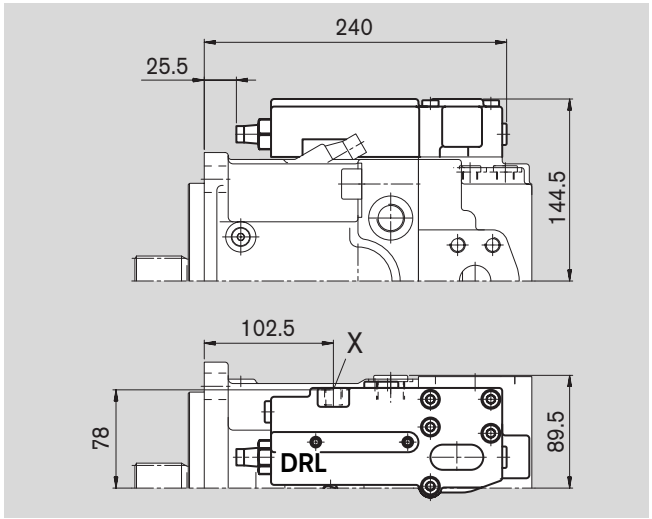
DRS/DRG:

Pressure control with load sensing control
Pressure control remote controlled



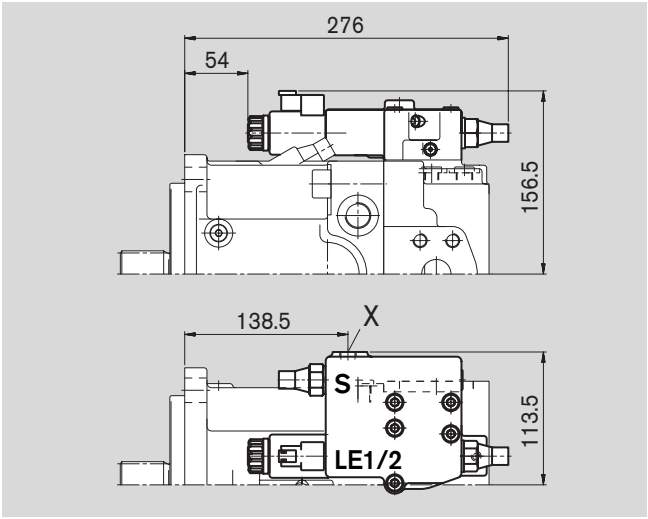
DRL:

Pressure control for parallel operation



LE1S/LE2S:

Power control with electrical override (negative) and load sensing control



LE2S2/LE1S5/LE2S5:

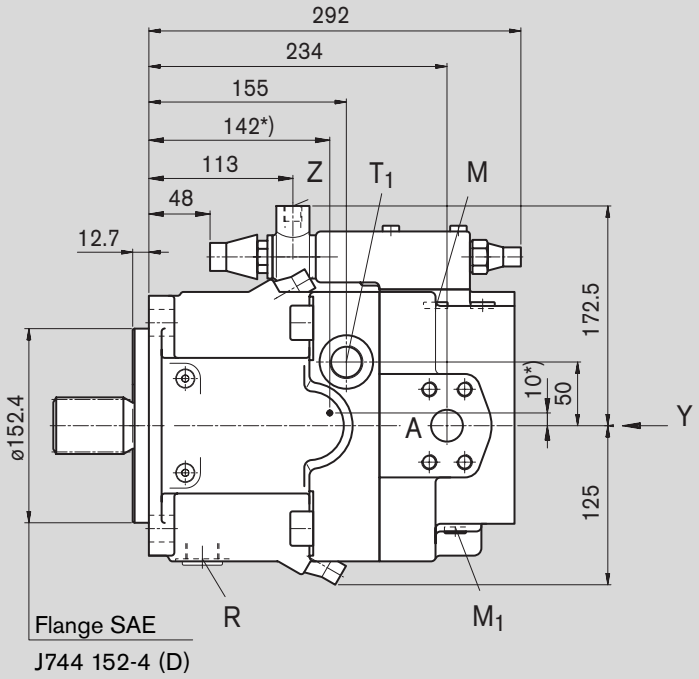
Power control with electrical override (negative) and load sensing control, override

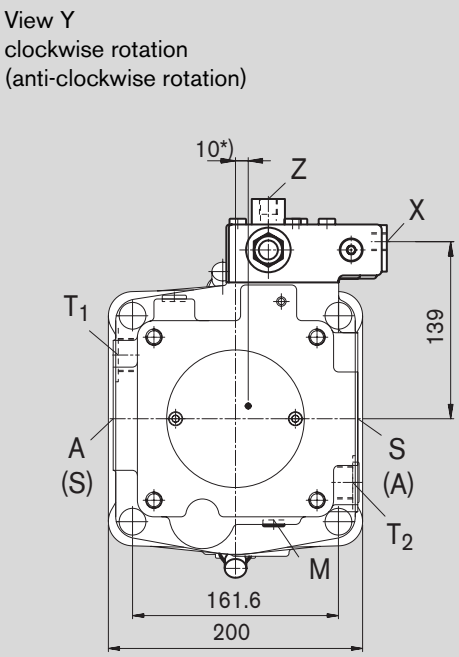
Unit Dimensions, Size 95

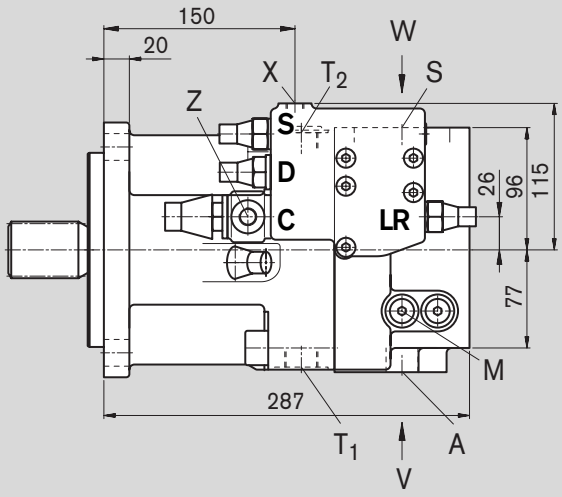
Before finalizing your design, please request a certified drawing.

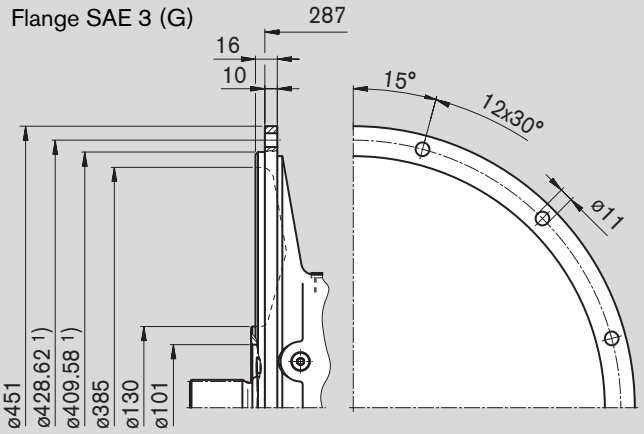
LRDCS:

Power control LR with pressure cut-off D, cross sensing control C and load sensing control S

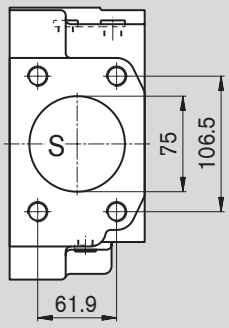




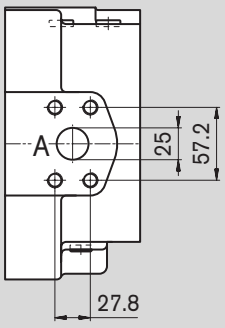




Detail W



Detail V



[1]) Dimensions according to SAE J617-No. 3, for connection to the flywheel housing of the combustion engine

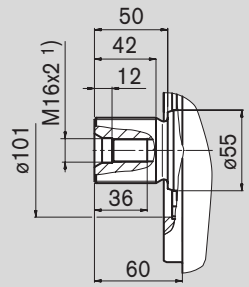
*) Center of gravity

Unit Dimensions, Size 95

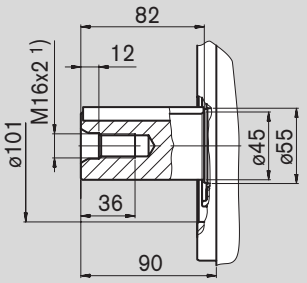
Before finalizing your design, please request a certified drawing.

Shaft ends

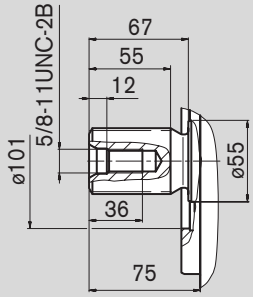
Z splined shaft DIN 5480
W45x2x30x21x9g



P cyl. shaft with key
DIN 6885 – AS14x9x80



S splined shaft
1 3/4 in 13T 8/16DP 2)
(SAE J744 – 44-4 (D))



Ports

				Tightening torque, max.
A	Service ports (high pressure series) Fastening thread	SAE J518 DIN 13	1 in M12x1.75; 17 deep	– see safety instructions
S	Suction port (standard series) Fastening thread	SAE J518 DIN 13	3 in M16x2; 24 deep	– see safety instructions
T_1, T_2	Bleeding, tank	DIN 3852	M26x1.5; 16 deep	230 Nm
R	Bleeding, oil drain	DIN 3852	M26x1.5; 16 deep	230 Nm
M_1	Measuring position, positioning chamber	DIN 3852	M12x1.5; 12 deep	50 Nm
M	Measuring position, service port	DIN 3852	M12x1.5; 12 deep	50 Nm
X	Pilot pressure port in version with load sensing (S) and remote controlled pressure cut-off (G)	DIN 3852	M14x1.5; 12 deep	80 Nm
Y	Pilot pressure port in version with stroke limiter (H...), 2-stage pressure cut-off (E) and HD	DIN 3852	M14x1.5; 12 deep	80 Nm
Z	Pilot pressure port in version with cross sensing (C) and power override (LR3, LG1)	DIN 3852	M14x1.5; 12 deep	80 Nm
G	Port for control pressure (controller) in version with stroke limiter (H.., U2), HD and EP with screw union GE10 - PLM (otherwise port G plugged)	DIN 3852	M14x1.5; 12 deep	80 Nm

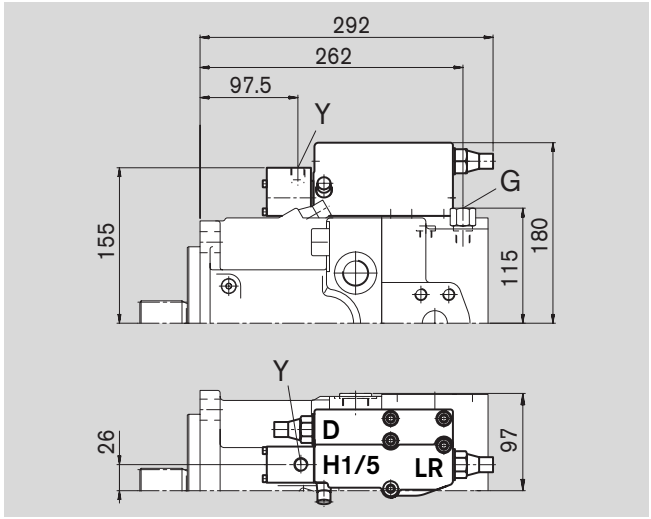
1) Centering bore in accordance with DIN 332
2) ANSI B92.1a-1976, 30° pressure angle, flat root side fit, tolerance class 5

Unit Dimensions, Size 95

Before finalizing your design, please request a certified drawing.

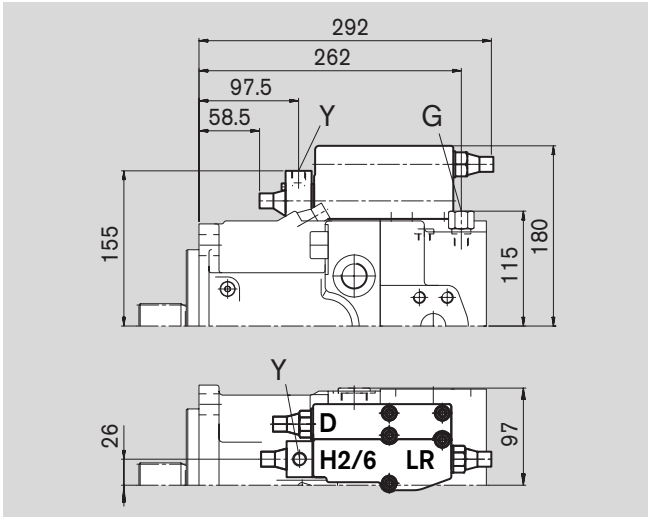
LRDH1/LRDH5:

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



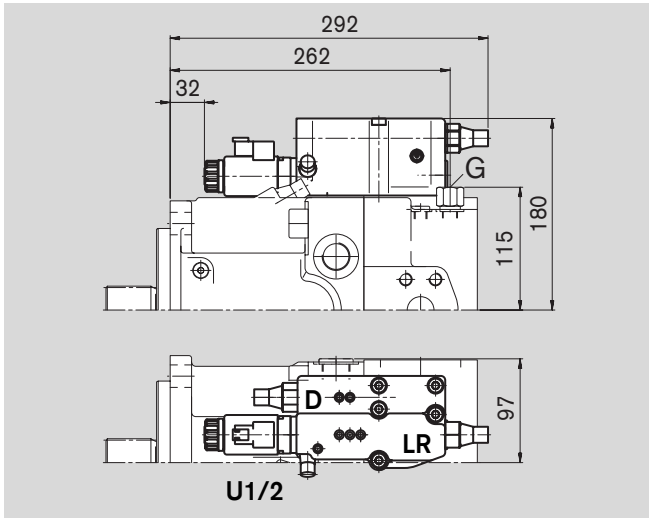
LRDH2/LRDH6:

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



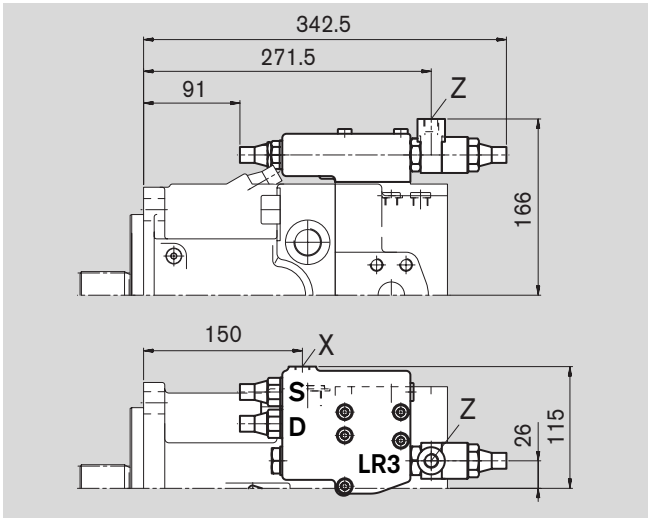
LRDU1/LRDU2:

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



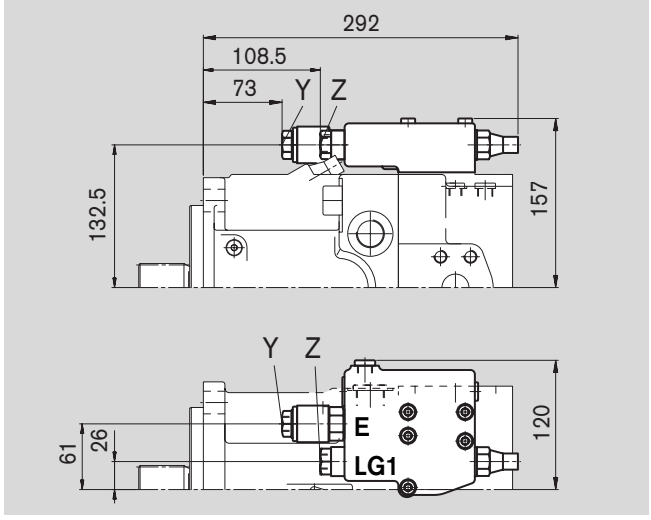
LR3DS:

Power control with high pressure related override, pressure cut-off and load sensing control



LG1E:

Power control with pilot pressure related override (negative) and 2-stage pressure cut-off



LG2E:

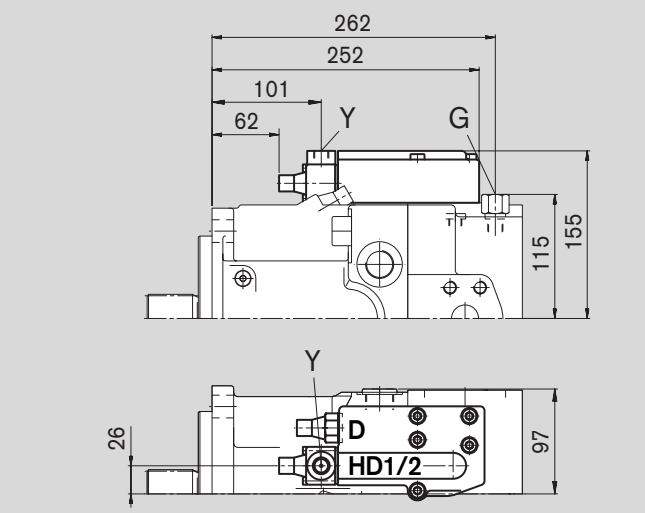
Power control with pilot pressure related override (positive) and 2-stage pressure cut-off

Unit Dimensions, Size 95

Before finalizing your design, please request a certified drawing.

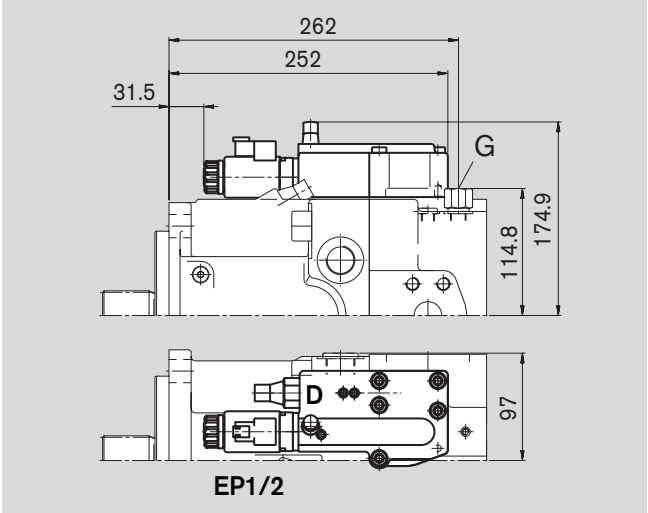
HD1D/HD2D:

Hydraulic control, pilot pressure related with pressure cut-off



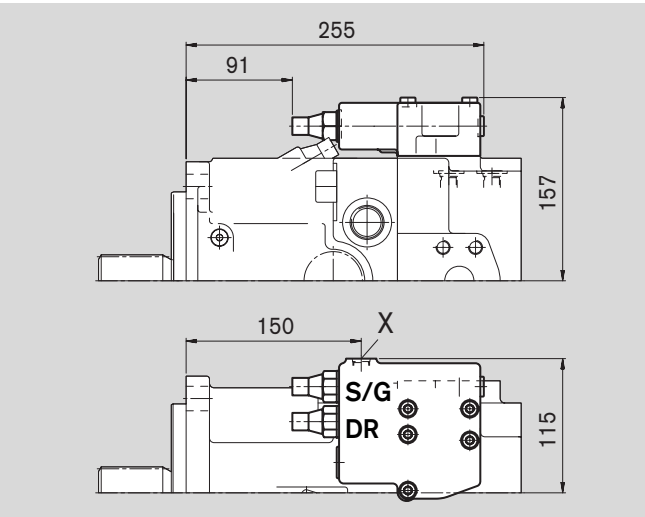
EP1D/EP2D:

Electrical control with proportional solenoid and pressure cut-off



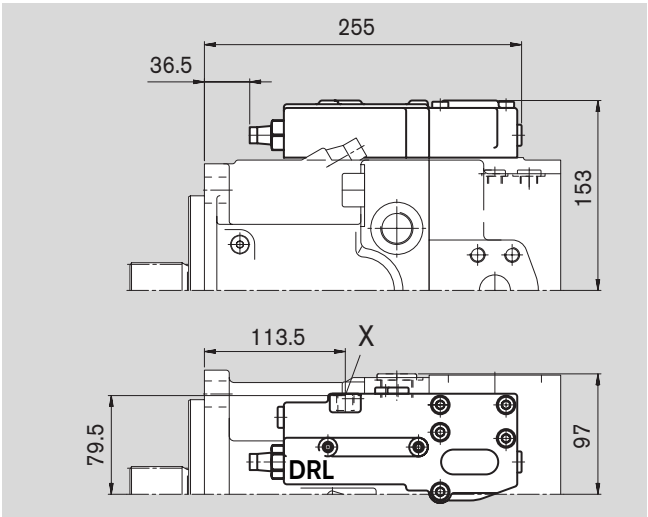
DRS/DRG:

Pressure control with load sensing control
Pressure control remote controlled



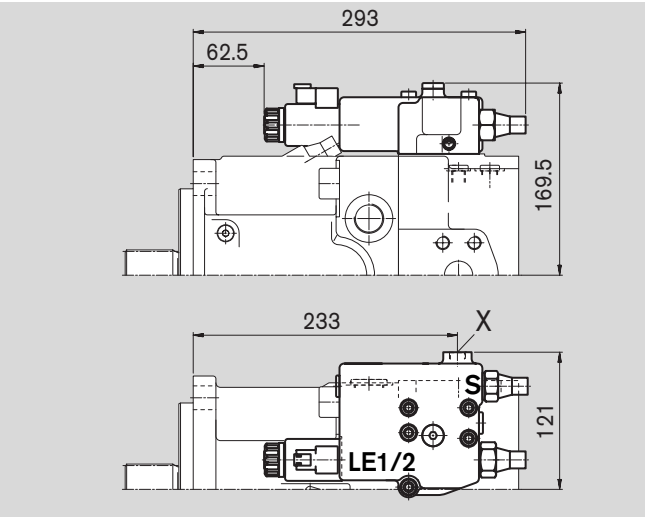
DRL:

Pressure control for parallel operation



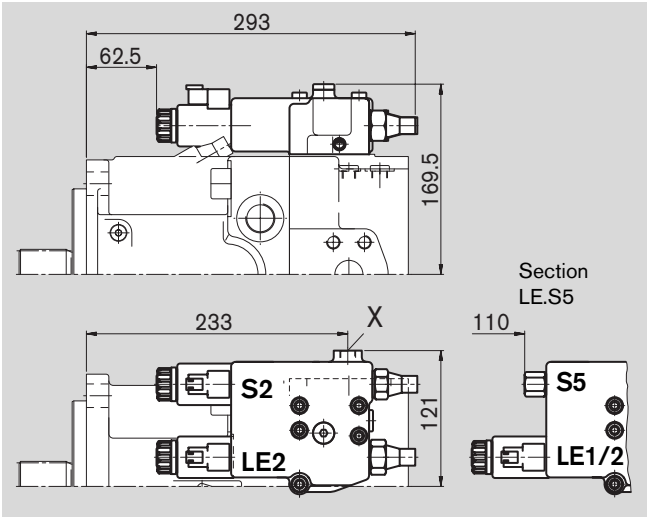
LE1S/LE2S:

Power control with electrical override (negative) and load sensing control



LE2S2/LE1S5/LE2S5:

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

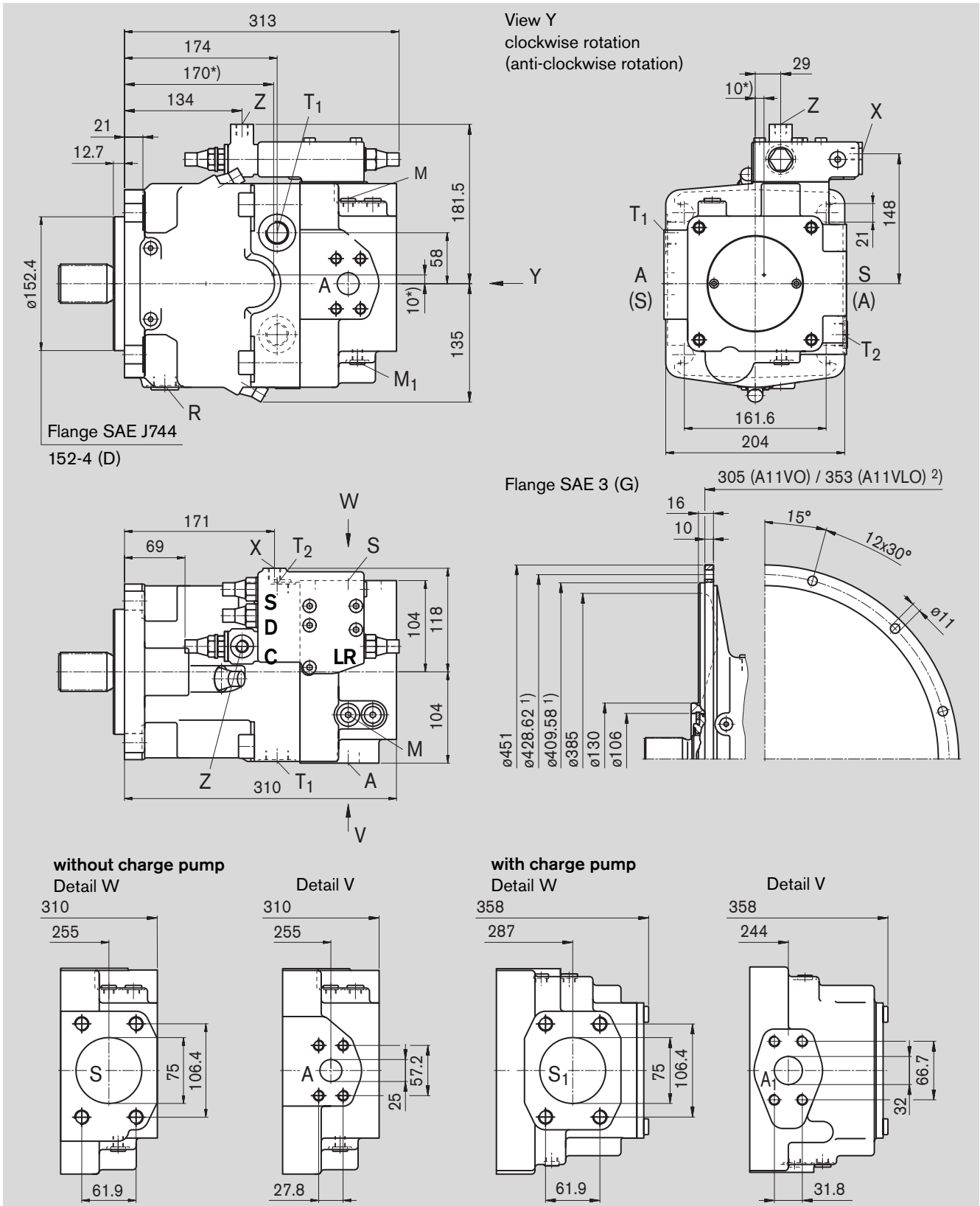


Unit Dimensions, Size 130/145

Before finalizing your design, please request a certified drawing.

LRDCS:

Power control LR with pressure cut-off D, cross sensing control C and load sensing control S



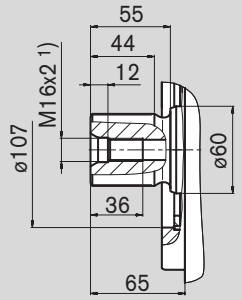
1) Dimensions according to SAE J617-No. 3, for connection to the flywheel housing of the combustion engine
2) The housing or length dimension with flange SAE 3 is 5 mm shorter than the standard housing.
*) Center of gravity

Unit Dimensions, Size 130/145

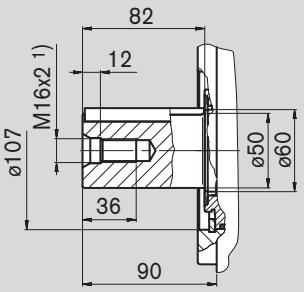
Before finalizing your design, please request a certified drawing.

Shaft ends

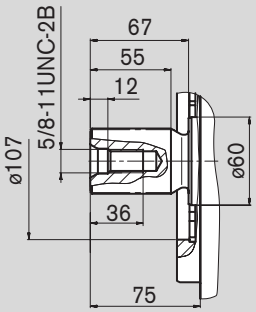
Z splined shaft DIN 5480
W50x2x30x24x9g



P cyl. shaft with key DIN
6885 – AS14x9x80



S splined shaft
1 3/4 in 13T 8/16DP 2)
(SAE J744 – 44-4 (D))



Ports

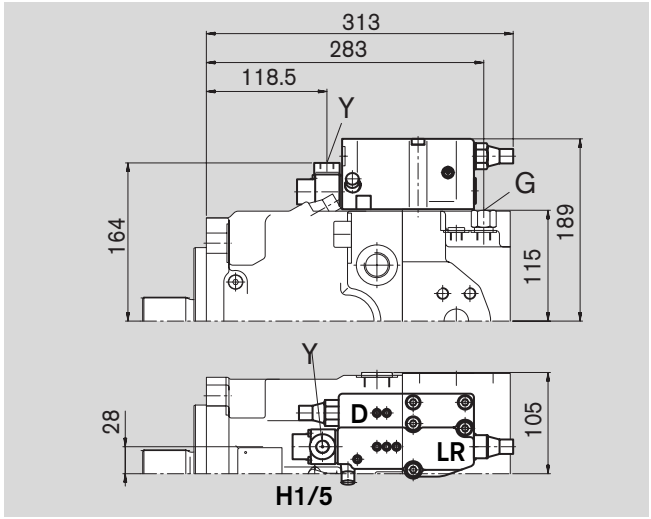
				Tightening torque, max.
A	Service ports (high pressure series) Fastening thread	SAE J518 DIN 13	1 in M12x1.75; 17 deep	– see safety instructions
A_1	Service ports (high pressure series) with charge pump Fastening thread	SAE J518 DIN 13	1 1/4 in M14x2; 19 deep	– see safety instructions
S, S_1	Suction port (standard series) Fastening thread	SAE J518 DIN 13	3 in M16x2; 24 deep	– see safety instructions
T_1, T_2	Bleeding, tank	DIN 3852	M26x1.5; 16 deep	230 Nm
R	Bleeding, oil drain	DIN 3852	M26x1.5; 16 deep	230 Nm
M_1	Measuring position, positioning chamber	DIN 3852	M12x1.5; 12 deep	50 Nm
M	Measuring position, service port	DIN 3852	M12x1.5; 12 deep	50 Nm
X	Pilot pressure port in version with load sensing (S) and remote controlled pressure cut-off (G)	DIN 3852	M14x1.5; 12 deep	80 Nm
Y	Pilot pressure port in version with stroke limiter (H...), 2-stage pressure cut-off (E) and HD	DIN 3852	M14x1.5; 12 deep	80 Nm
Z	Pilot pressure port in version with cross sensing (C) and power override (LR3, LG1)	DIN 3852	M14x1.5; 12 deep	80 Nm
G	Port for control pressure (controller) in version with stroke limiter (H.., U2), HD and EP with screw union GE10 - PLM (otherwise port G plugged)	DIN 3852	M14x1.5; 12 deep	80 Nm

1) Centering bore in accordance with DIN 332
2) ANSI B92.1a-1976, 30° pressure angle, flat root side fit, tolerance class 5

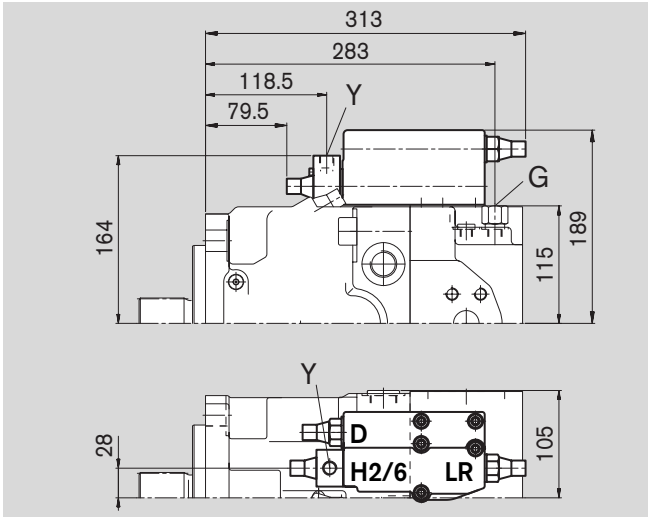
Unit Dimensions, Size 130/145

Before finalizing your design, please request a certified drawing.

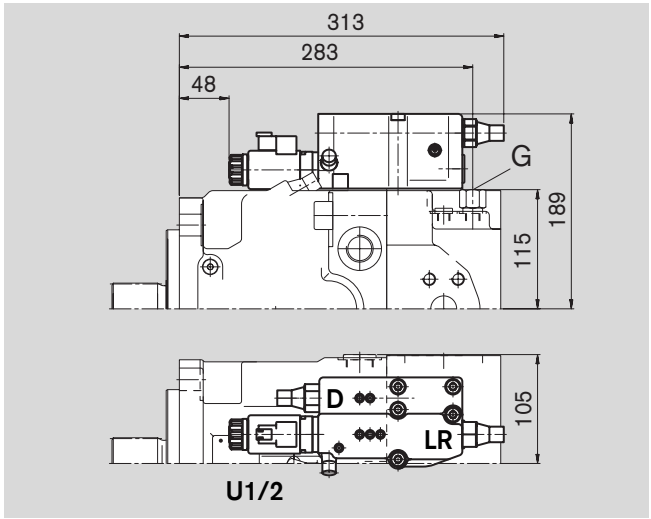
LRDH1/LRDH5:
Power control with pressure cut-off and hydraulic stroke limiter (negative characteristic)



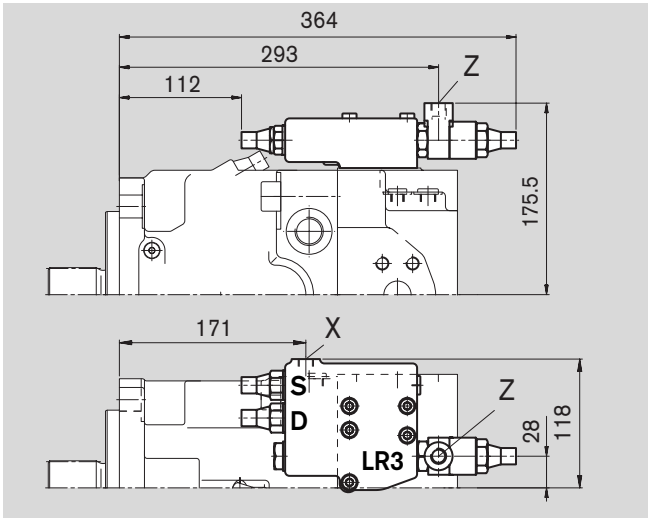
LRDH2/LRDH6:
Power control with pressure cut-off and hydraulic stroke limiter (positive characteristic)



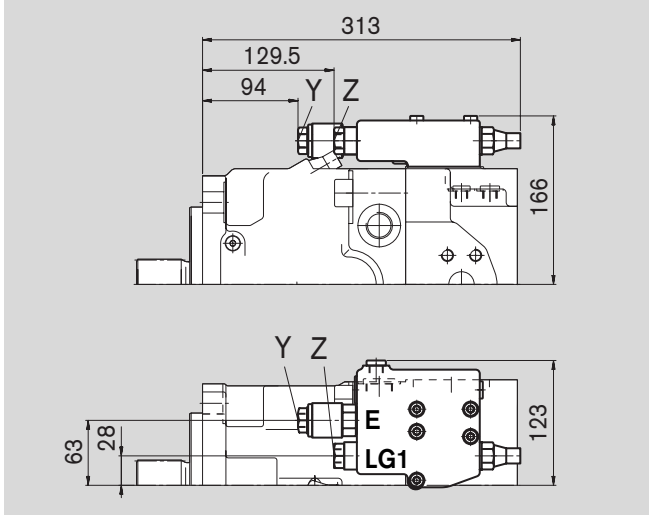
LRDU1/LRDU2:
Power control with pressure cut-off and electrical stroke limiter (positive characteristic)



LR3DS:
Power control with high pressure related override, pressure cut-off and load sensing control



LG1E:
Power control with pilot pressure related override (negative) and 2-stage pressure cut-off



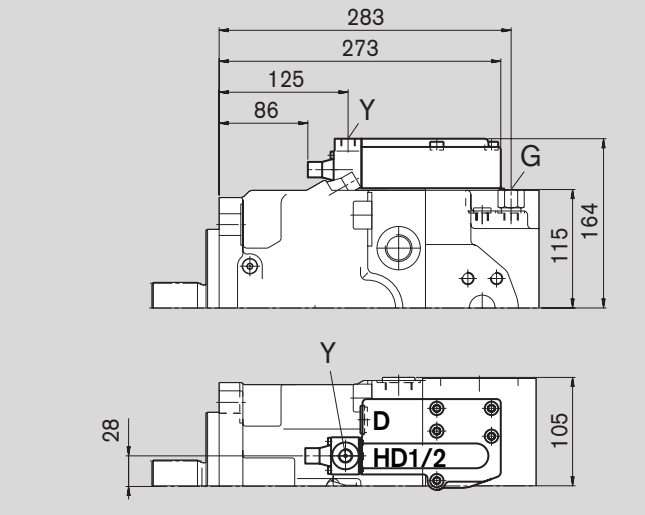
LG2E:
Power control with pilot pressure related override (positive) and 2-stage pressure cut-off

Unit Dimensions, Size 130/145

Before finalizing your design, please request a certified drawing.

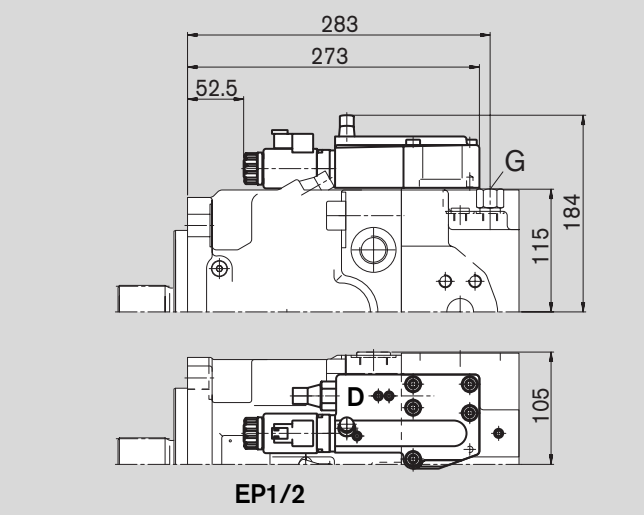
HD1D/HD2D:

Hydraulic control, pilot pressure related with pressure cut-off



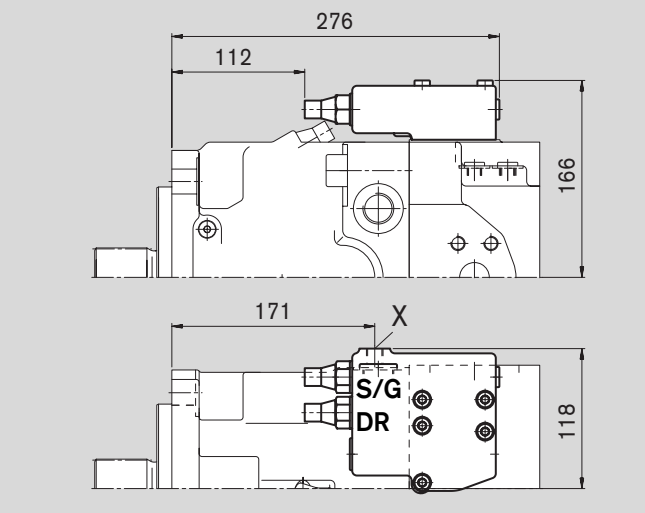
EP1D/EP2D:

Electrical control with proportional solenoid and pressure cut-off



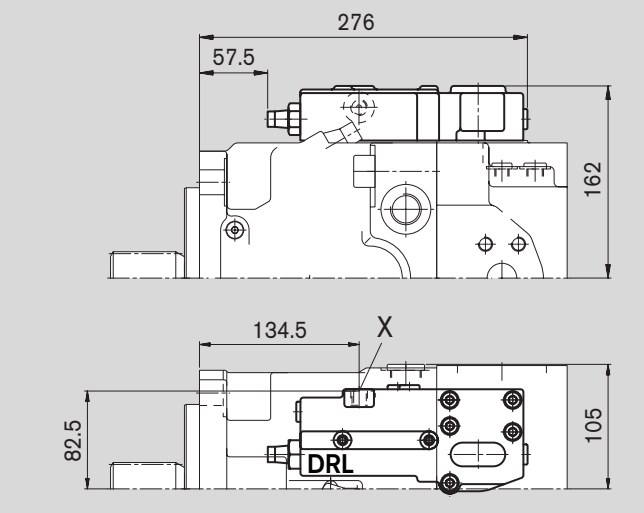
DRS/DRG:

Pressure control with load sensing control
Pressure control remote controlled



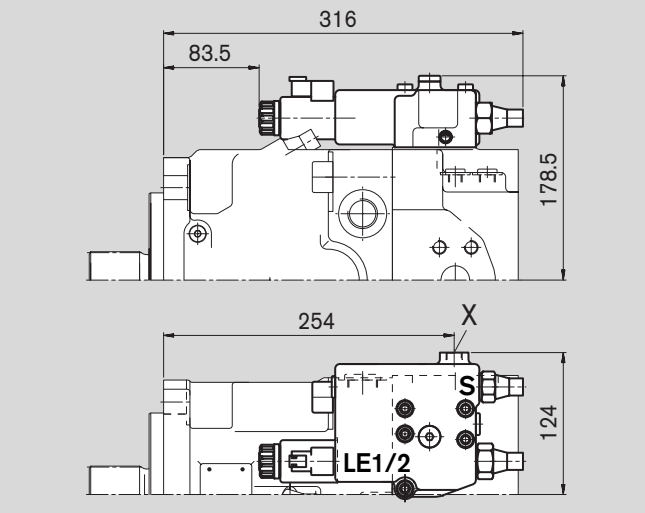
DRL:

Pressure control for parallel operation



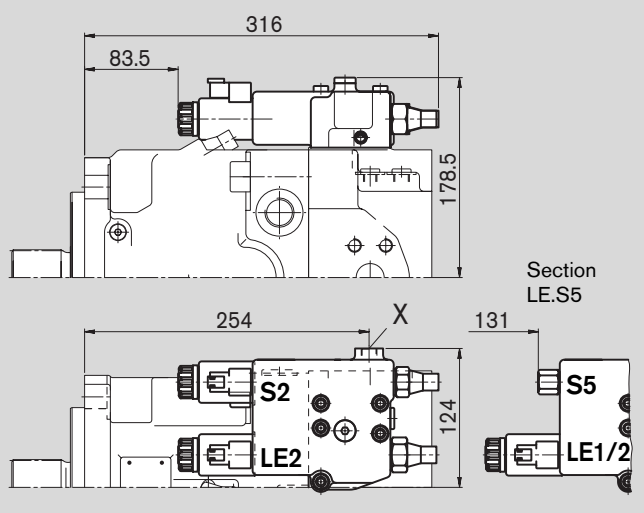
LE1S/LE2S:

Power control with electrical override (negative) and load sensing control



LE2S2/ LE1S5/LE2S5:

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

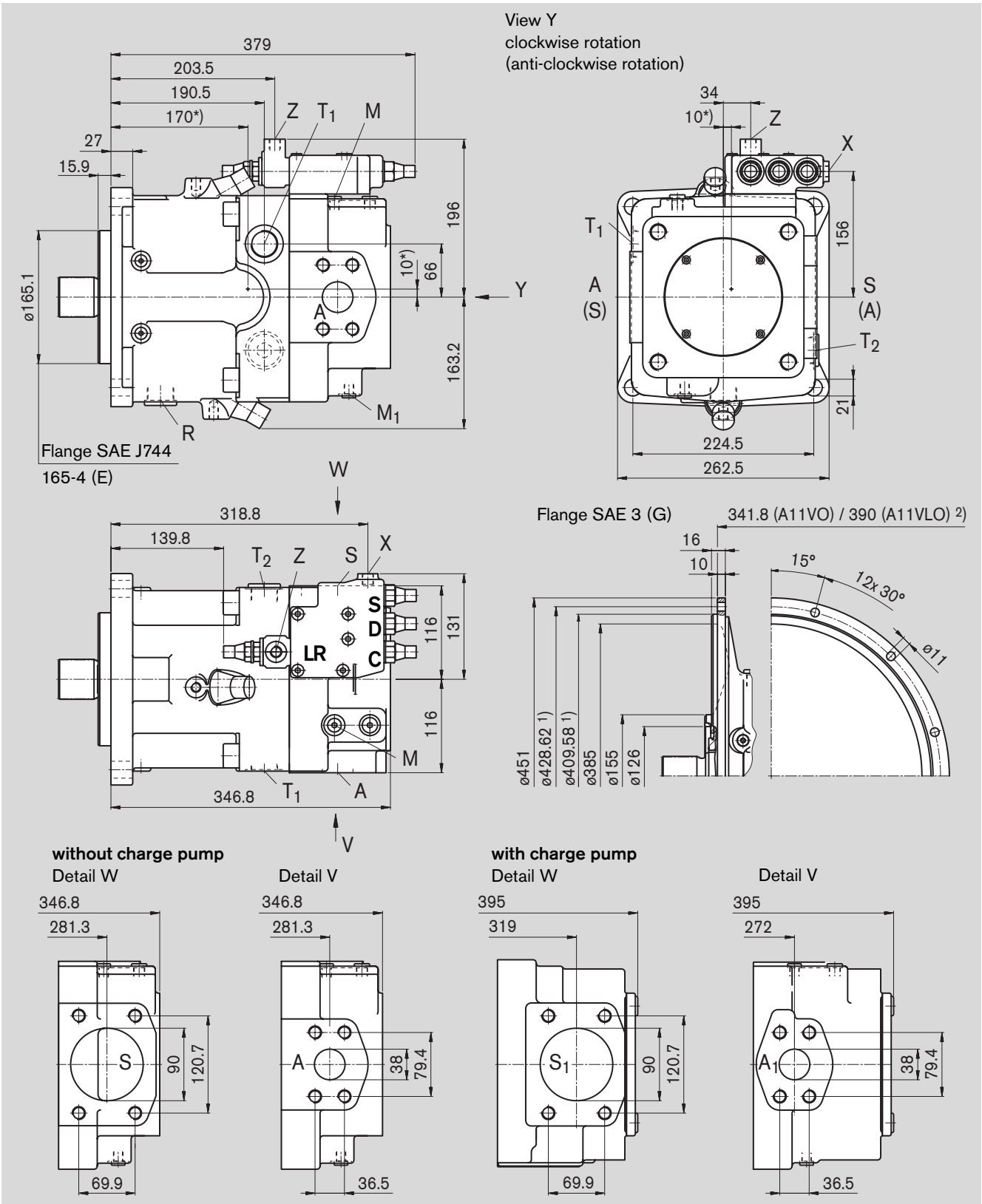


Unit Dimensions, Size 190

Before finalizing your design, please request a certified drawing.

LRDCS:

Power control LR with pressure cut-off D, cross sensing control C and load sensing control S



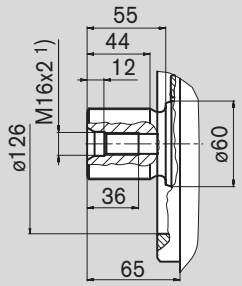
1) Dimensions according to SAE J617-No. 3, for connection to the flywheel housing of the combustion engine
2) The housing or length dimension with flange SAE 3 is 5 mm shorter than the standard housing.
*) Center of gravity

Unit Dimensions, Size 190

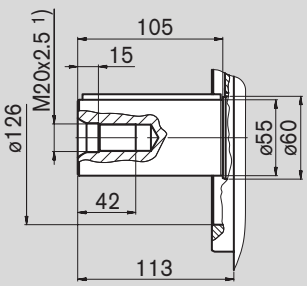
Before finalizing your design, please request a certified drawing.

Shaft ends

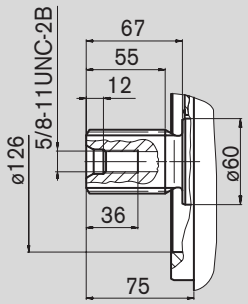
Z splined shaft DIN 5480
W50x2x30x24x9g



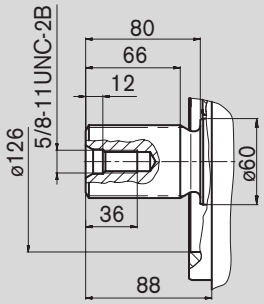
P cyl. shaft with key DIN
6885 – AS16x10x100



S splined shaft
1 3/4 in 13T 8/16DP 2)
(SAE J744 – 44-4 (D))



T splined shaft
2 in 15T 8/16DP 2)
(SAE J744 – 50-4 (F))



Ports

				Tightening torque, max.
A, A_1	Service ports (high pressure series) Fastening thread	SAE J518 DIN 13	1 1/2 in M16x2; 21 deep	– see safety instructions
S, S_1	Suction port (standard series) Fastening thread	SAE J518 DIN 13	3 1/2 in M16x2; 24 deep	– see safety instructions
T_1, T_2	Bleeding, tank	DIN 3852	M33x2; 18 deep	540 Nm
R	Bleeding, oil drain	DIN 3852	M33x2; 18 deep	540 Nm
M_1	Measuring position, positioning chamber	DIN 3852	M12x1.5; 12 deep	50 Nm
M	Measuring position, service port	DIN 3852	M12x1.5; 12 deep	50 Nm
X	Pilot pressure port in version with load sensing (S) and remote controlled pressure cut-off (G)	DIN 3852	M14x1.5; 12 deep	80 Nm
Y	Pilot pressure port in version with stroke limiter (H...), 2-stage pressure cut-off (E) and HD	DIN 3852	M14x1.5; 12 deep	80 Nm
Z	Pilot pressure port in version with cross sensing (C) and power override (LR3, LG1)	DIN 3852	M14x1.5; 12 deep	80 Nm
G	Port for control pressure (controller) in version with stroke limiter (H.., U2), HD and EP with screw union GE10 - PLM (otherwise port G plugged)	DIN 3852	M14x1.5; 12 deep	80 Nm

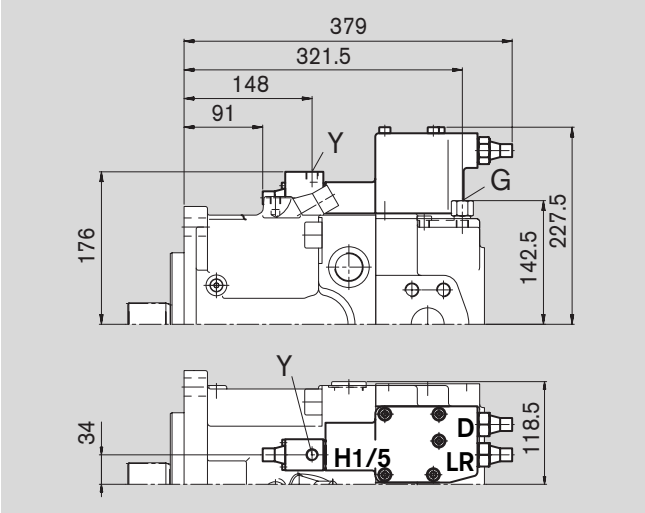
1) Centering bore in accordance with DIN 332
2) ANSI B92.1a-1976, 30° pressure angle, flat root side fit, tolerance class 5

Unit Dimensions, Size 190

Before finalizing your design, please request a certified drawing.

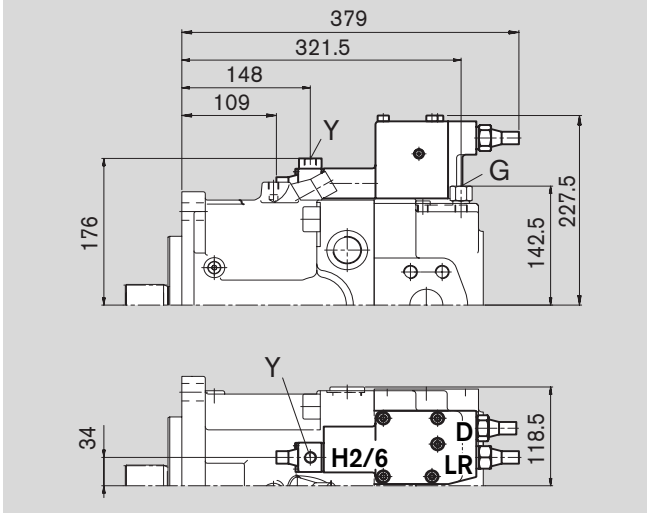
LRDH1/LRDH5:

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



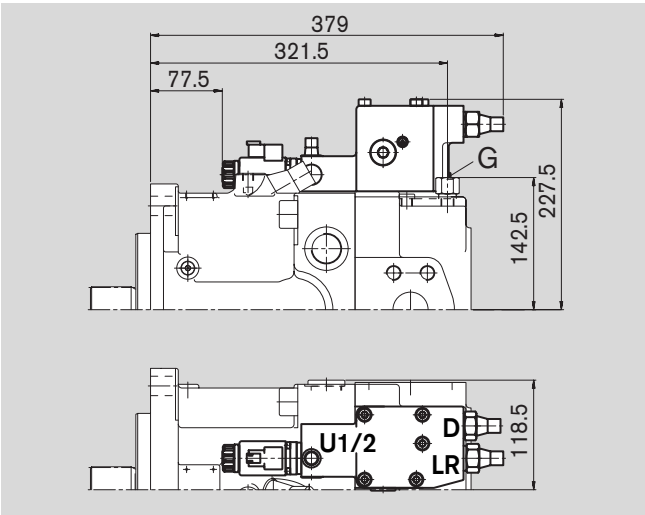
LRDH2/LRDH6:

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



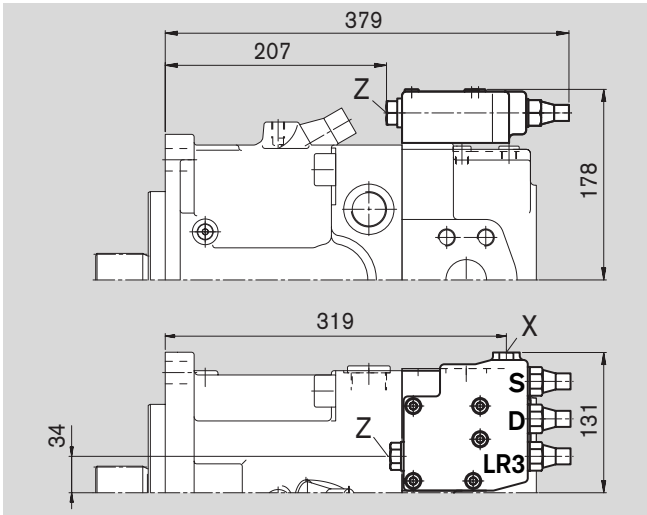
LRDU1/LRDU2:

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



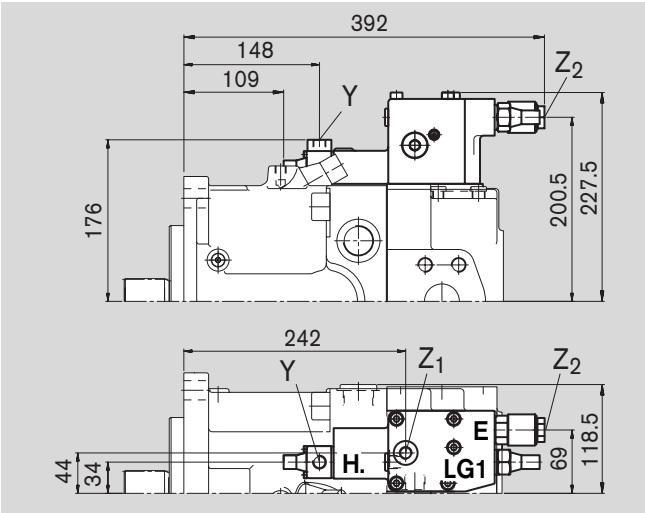
LR3DS:

Power control with high pressure related override, pressure cut-off and load sensing control



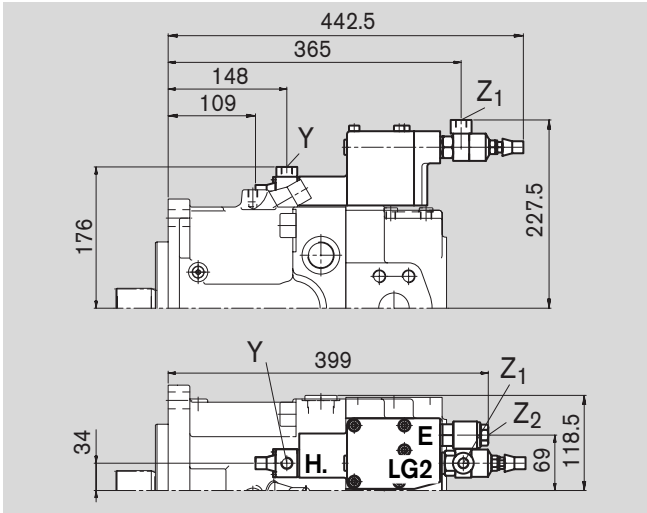
LG1EH.:

Power control with pilot pressure related override (neg.), 2-stage pressure cut-off and hydr. stroke limiter



LG2EH.:

Power control with pilot pressure related override (pos.), 2-stage pressure cut-off and hydr. stroke limiter

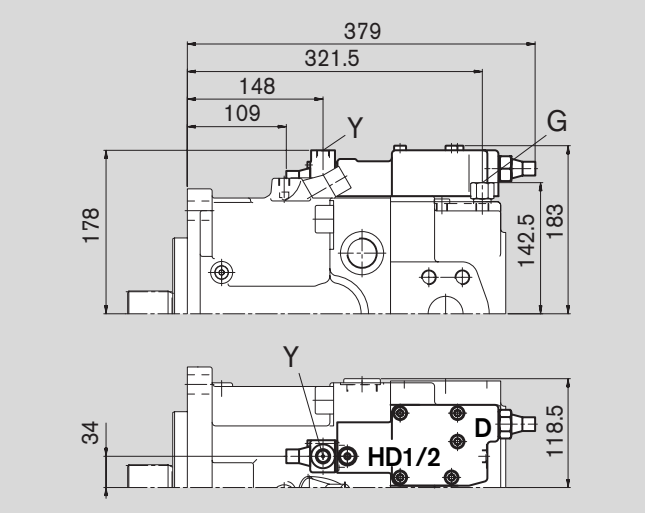


Unit Dimensions, Size 190

Before finalizing your design, please request a certified drawing.

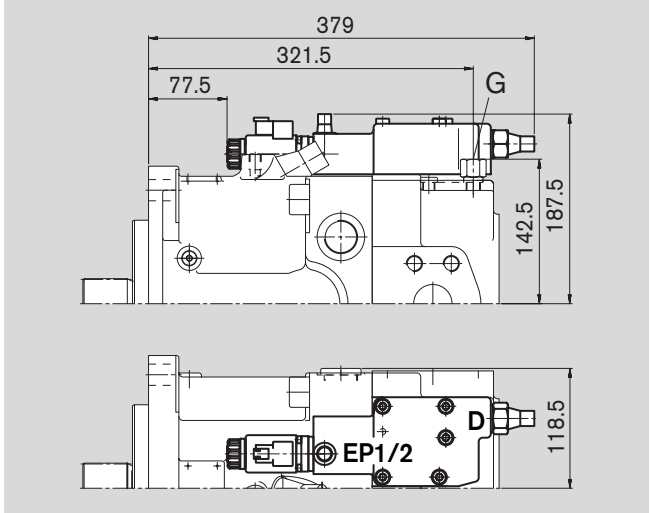
HD1D/HD2D:

Hydraulic control, pilot pressure related with pressure cut-off



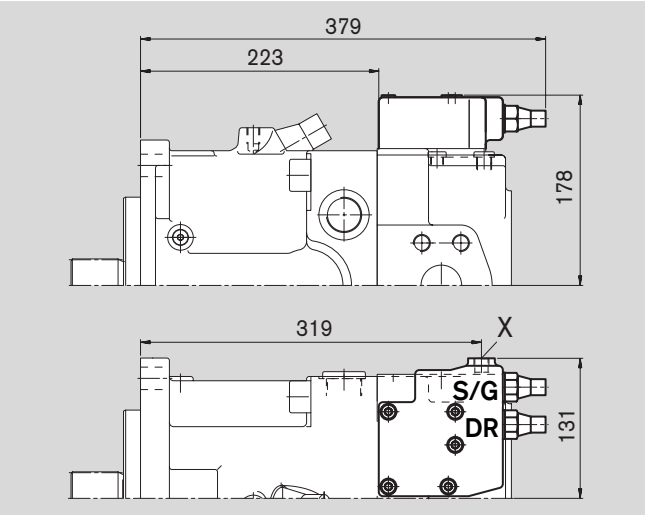
EP1D/EP2D:

Electrical control with proportional solenoid and pressure cut-off



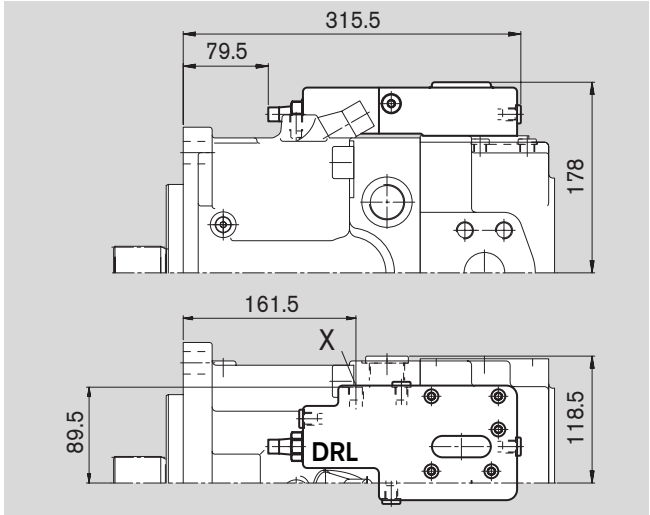
DRS/DRG:

Pressure control with load sensing control
Pressure control remote controlled



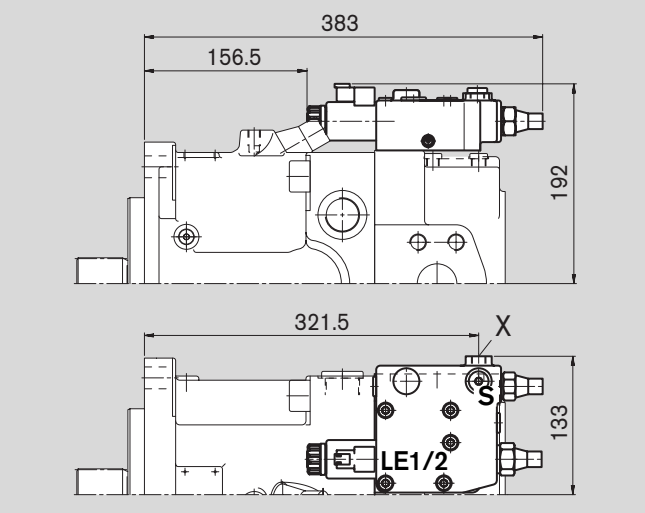
DRL:

Pressure control for parallel operation



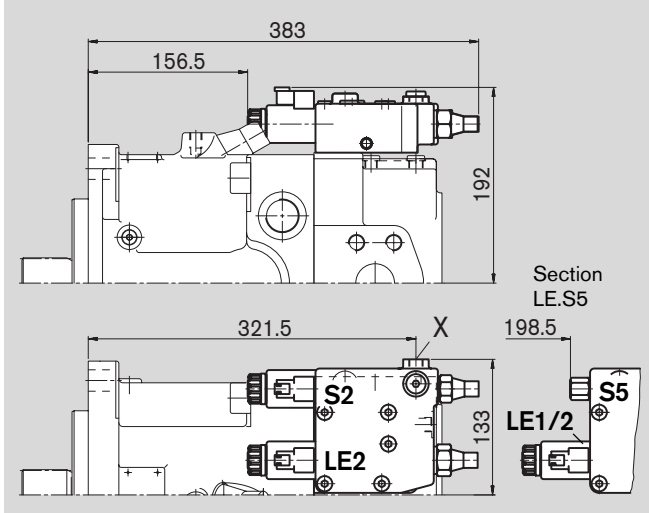
LE1S/LE2S:

Power control with electrical override (negative) and load sensing control



LE2S2/LE1S5/LE2S5:

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

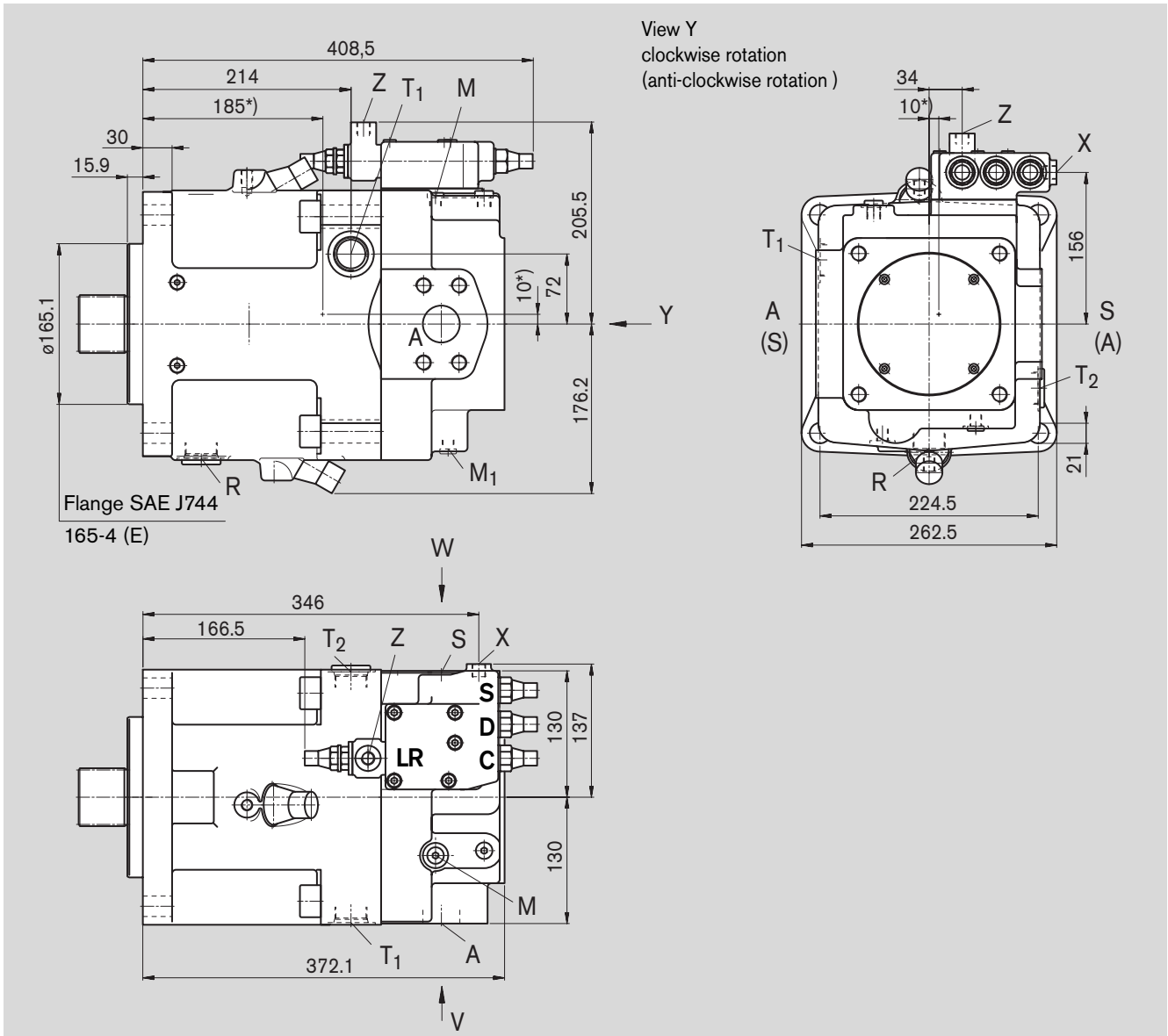


Unit Dimensions, Size 260

Before finalizing your design, please request a certified drawing.

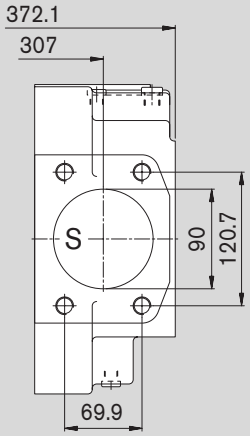
LRDCS:

Power control LR with pressure cut-off D, cross sensing control C and load sensing control S

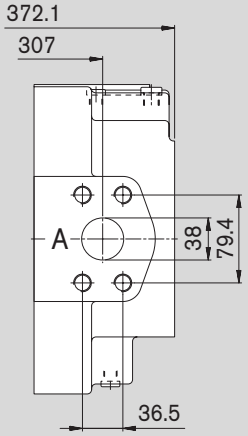


without charge pump

Detail W

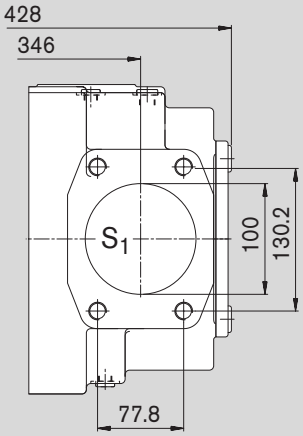


Detail V

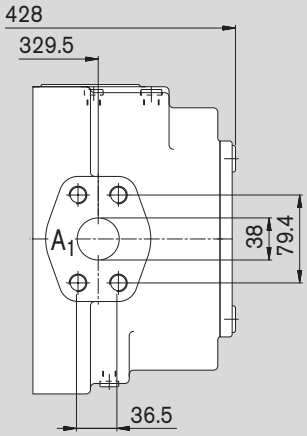


with charge pump

Detail W



Detail V



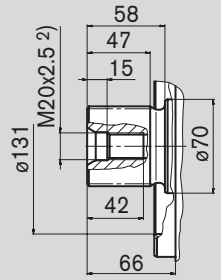
*) Center of gravity

Unit Dimensions, Size 260

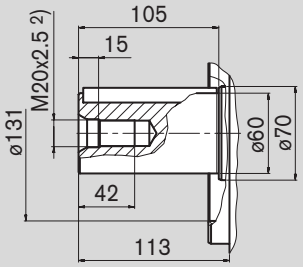
Before finalizing your design, please request a certified drawing.

Shaft ends

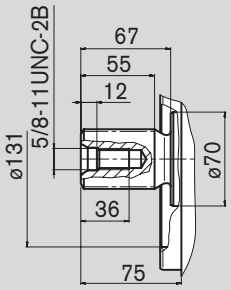
Z splined shaft DIN 5480
W60x2x30x28x9g



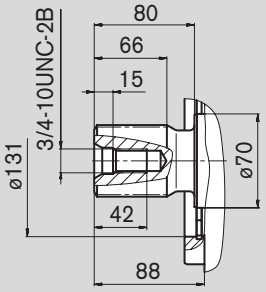
P cyl. shaft with key
DIN 6885 –AS18x11x100



S splined shaft
1 3/4 in 13T 8/16DP 2)
(SAE J744 – 44-4 (D))



T splined shaft
2 1/4 in 17T 8/16DP 2)



Ports

				Tightening torque, max.
A, A_1	Service ports (high pressure series) Fastening thread	SAE J518 DIN 13	1 1/2 in M16x2; 21 deep	– see safety instructions
S	Suction port (standard series) Fastening thread	SAE J518 DIN 13	3 1/2 in M16x2; 21 deep	– see safety instructions
S_1	Suction port (standard series) Fastening thread	SAE J518 DIN 13	4 in M16x1; 21 deep	– see safety instructions
T_1, T_2	Bleeding, tank	DIN 3852	M33x2; 16 deep	540 Nm
R	Bleeding, oil drain	DIN 3852	M33x2; 16 deep	540 Nm
M_1	Measuring position, positioning chamber	DIN 3852	M12x1.5; 12 deep	50 Nm
M	Measuring position, service port	DIN 3852	M12x1.5; 12 deep	50 Nm
X	Pilot pressure port in version with load sensing (S) and remote controlled pressure cut-off (G)	DIN 3852	M14x1.5; 12 deep	80 Nm
Y	Pilot pressure port in version with stroke limiter (H...), 2-stage pressure cut-off (E) and HD	DIN 3852	M14x1.5; 12 deep	80 Nm
Z	Pilot pressure port in version with cross sensing (C) and power override (LR3, LG1)	DIN 3852	M14x1.5; 12 deep	80 Nm
G	Port for control pressure (controller) in version with stroke limiter (H.., U2), HD and EP with screw union GE10 - PLM (otherwise port G plugged)	DIN 3852	M14x1.5; 12 deep	80 Nm

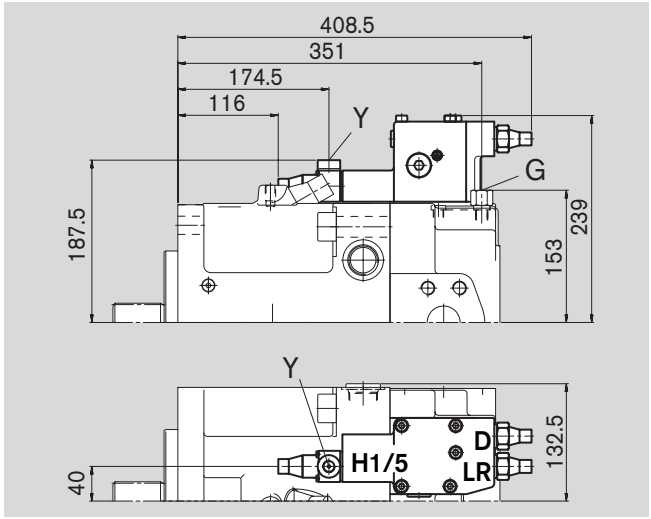
1) Centering bore in accordance with DIN 332
2) ANSI B92.1a-1976, 30° pressure angle, flat root side fit, tolerance class 5

Unit Dimensions, Size 260

Before finalizing your design, please request a certified drawing.

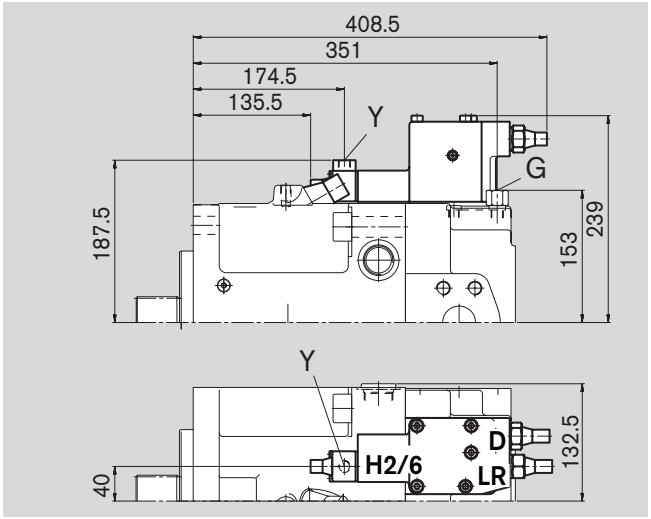
LRDH1/LRDH5:

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



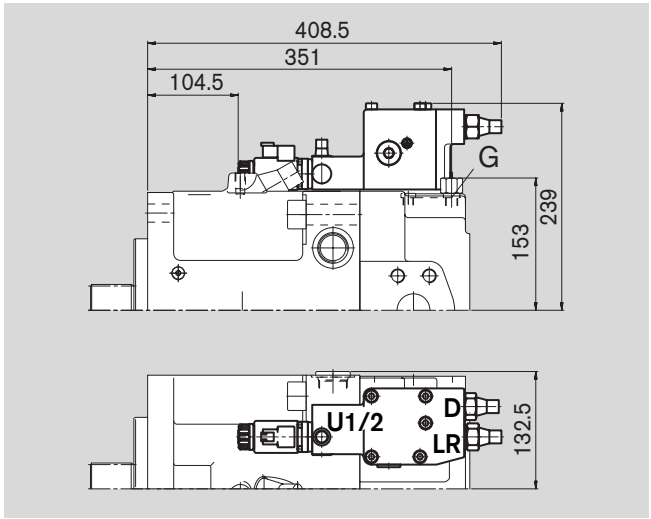
LRDH2/LRDH6:

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



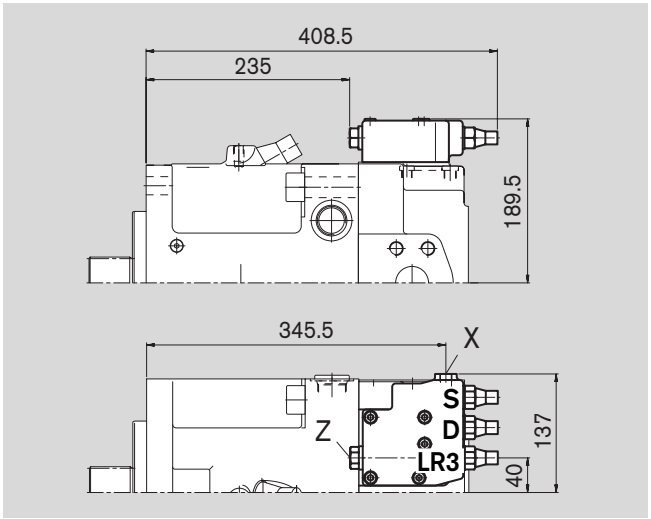
LRDU1/LRDU2:

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



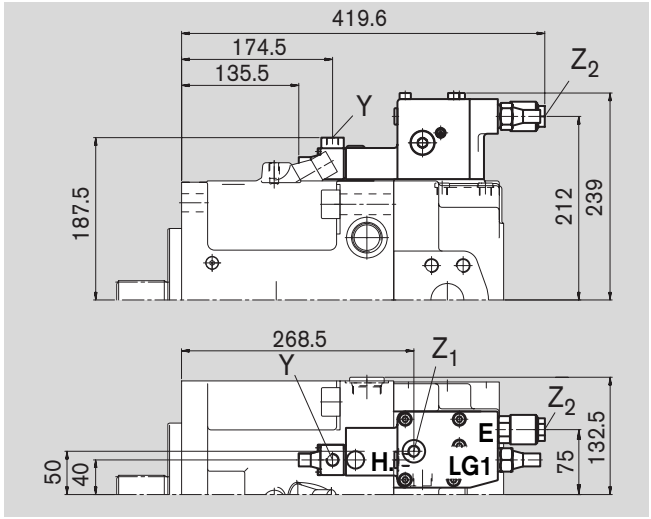
LR3DS:

Power control with high pressure related override, pressure cut-off and load sensing control



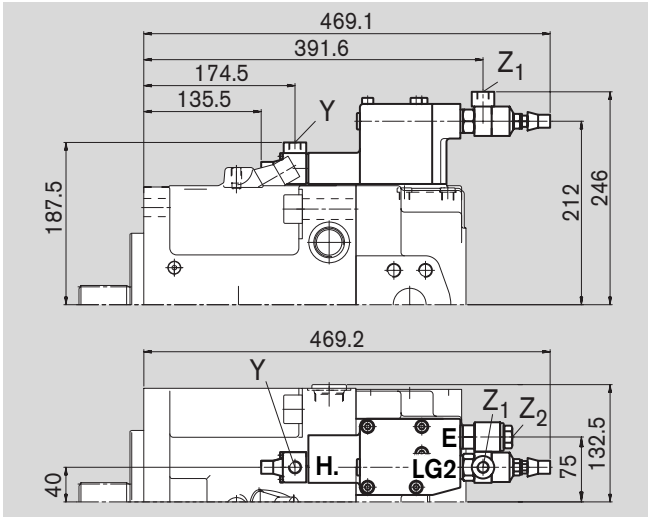
LG1EH.:

Power control with pilot pressure related override (neg.), 2-stage pressure cut-off and hydr. stroke limiter



LG2EH.:

Power control with pilot pressure related override (pos.), 2-stage pressure cut-off and hydr. stroke limiter

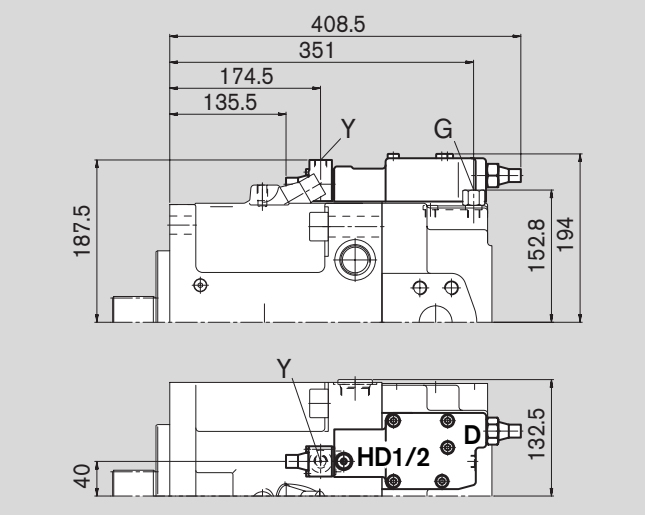


Unit Dimensions, Size 260

Before finalizing your design, please request a certified drawing.

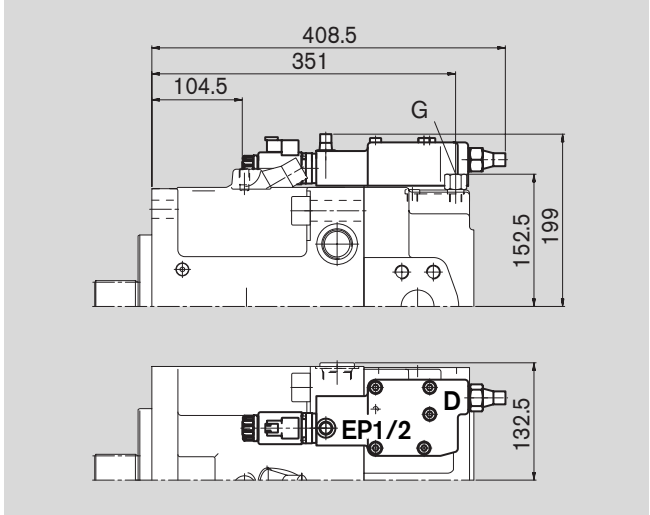
HD1D/HD2D:

Hydraulic control, pilot pressure related with pressure cut-off



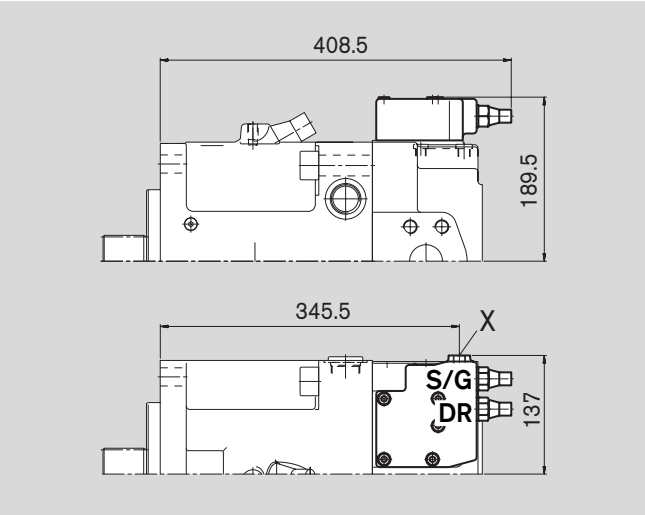
EP1D/EP2D:

Electrical control with proportional solenoid and pressure cut-off



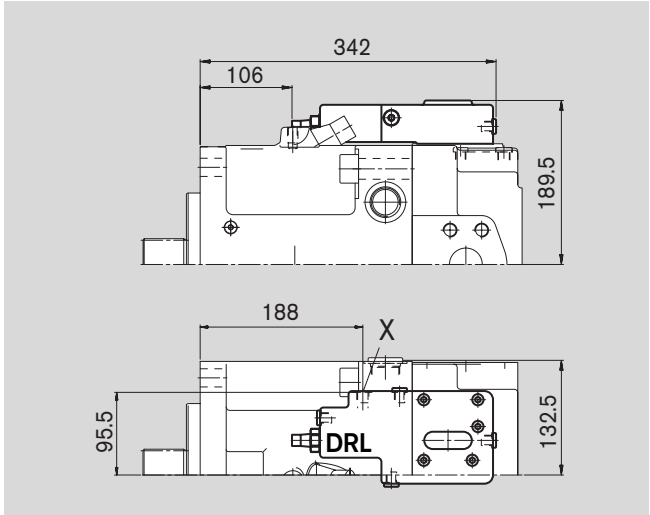
DRS/DRG:

Pressure control with load sensing control
Pressure control remote controlled



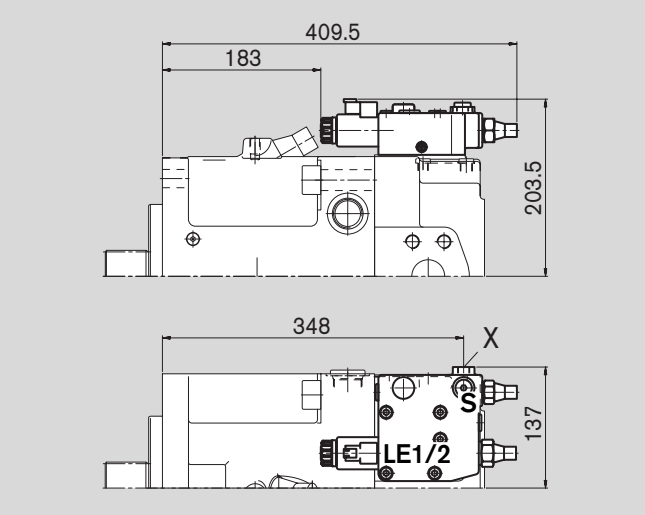
DRL:

Pressure control for parallel operation



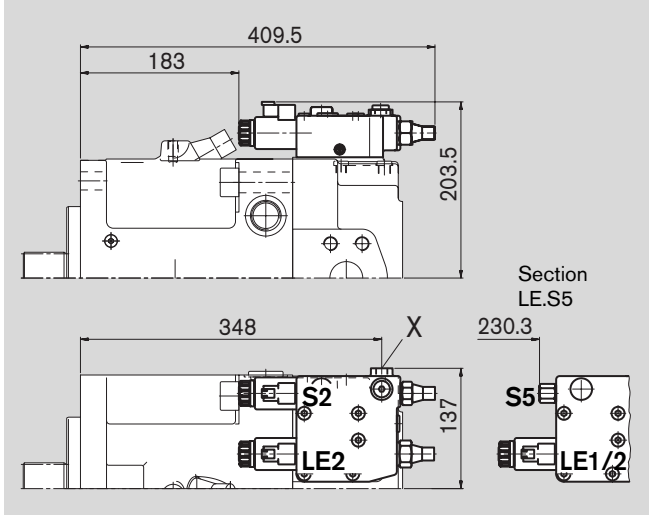
LE1S/LE2S:

Power control with electrical override (negative) and load sensing control



LE2S2/LE1S5/LE2S5:

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

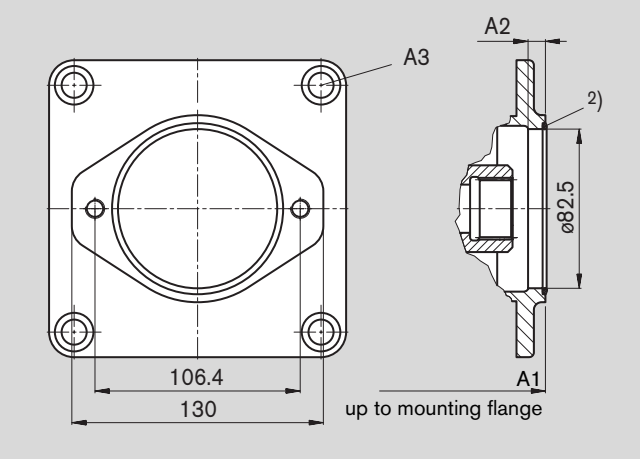


Through Drive Dimensions

Before finalizing your design, please request a certified drawing.

Flange SAE J744 – 82-2 (A) **Coupler** for splined shaft according to ANSI B92.1a-1976

5/8in 9T 16/32DP [1] (SAE J744 – 16-4 (A)) **K01**
3/4in 11T 16/32DP [1] (SAE J744 – 19-4 (A-B)) **K52**

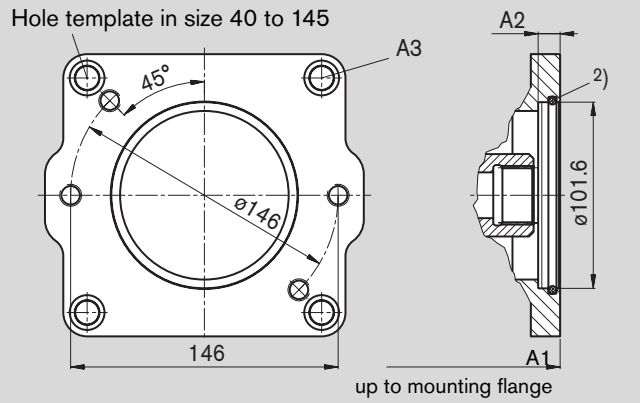


Size	A1 K01	A1 K52	A2	A3 [3]
40	240	240	8	M10x1.5; 15 deep
60	257	257	–	M10x1.5; 15 deep
75	275	275	–	M10x1.5; 15 deep
95	306	306	–	M10x1.5; 12.5 deep
130/145	339	329	–	M10x1.5; 12.5 deep
130/145*	373	363	–	M10x1.5; 12.5 deep
190	359.8	359.8	–	M10x1.5; 13 deep
190*	394	394	–	M10x1.5; 13 deep
260	385	385	–	M10x1.5; 13 deep
260*	27.3	427.3	–	M10x1.5; 13 deep

*) Version with charge pump

Flange SAE J744 – 101-2 (B) **Coupler** for splined shaft according to ANSI B92.1a-1976
Coupler for splined shaft according to DIN 5480

7/8in 13T 16/32DP [1] (SAE J744 – 22-4 (B)) **K02**
1in 15T 16/32DP [1] (SAE J744 – 25-4 (B-B)) **K04**
W35x2x30x16x9g **K79**



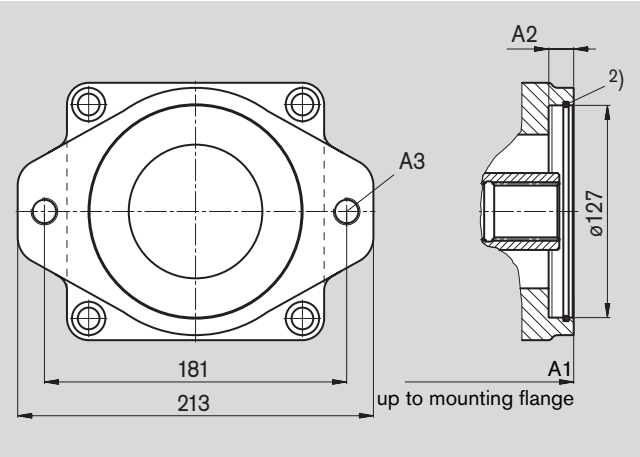
In size 190 and 260 the hole template is turned 45° counterclockwise.

Size	A1 K02	A1 K04	A1 K79	A2	A3 [3]
40	244	244		10	M12x1.75; 19 deep
60	261	261	265	10	M12x1.75; 19 deep
75	279	279		10	M12x1.75; 19 deep
95	303	303	303	10	M12x1.75; 16 deep
130/145	326	326	326	10	M12x1.75; 16 deep
130/145*	360	360	360	10	M12x1.75; 16 deep
190	371.8	371.8	361.8	–	M12x1.75; 15 deep
190*	404	404	394	–	M12x1.75; 15 deep
260	395	395	395	–	M12x1.75; 15 deep
260*	437.5	437.5	437.5	–	M12x1.75; 15 deep

*) Version with charge pump

Flange SAE J744 – 127-2 (C) **Coupler** for splined shaft according to ANSI B92.1a-1976
Coupler for splined shaft according to DIN 5480

1 1/4in 14T 12/24DP [1] (SAE J744 – 32-4 (C)) **K07**
1 1/2in 17T 12/24 DP [1] (SAE J744 – 38-4 (C-C)) **K24**
W30x2x30x14x9g **K80**
W35x2x30x16x9g **K61**



Size	A1 K07	A1 K24	A1 K80	A1 K61	A2	A3 [3]
60	272	–	265	265	13	M16x2; 20 deep
75	290	–	283	283	13	M16x2; 20 deep
95	318	318	318	318	13	M16x2; 16 deep
130/145	330	330	330	330	13	M16x2; 20 deep
130/145*	364	364	364	364	13	M16x2; 20 deep

*) Version with charge pump

Note: All through drive flanges can be turned 90°. Please state in clear text if required.

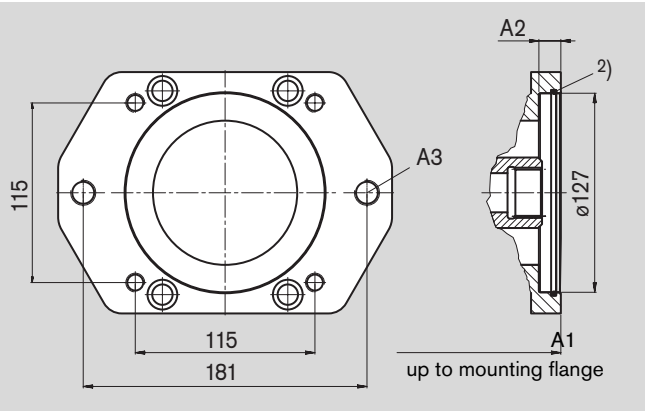
[1]) Pressure angle 30°, flat root side fit, tolerance class 5
[2]) O-ring seal is included in the supply
[3]) Thread according to DIN 13, see safety instructions

Through Drive Dimensions

Before finalizing your design, please request a certified drawing.

Flange SAE J744 – 127-2 + 4 (C)

Coupler for splined shaft according to			
ANSI B92.1a-1976	1 1/4in 14T 12/24DP [1]	(SAE J744 – 32-4 (C))	**K07**
	1 1/2in 17T 12/24 DP [1]	(SAE J744 – 38-4 (C-C))	**K24**
Coupler for splined shaft according to			
DIN 5480	W30x2x30x14x9g		**K80**
	W35x2x30x16x9g		**K61**

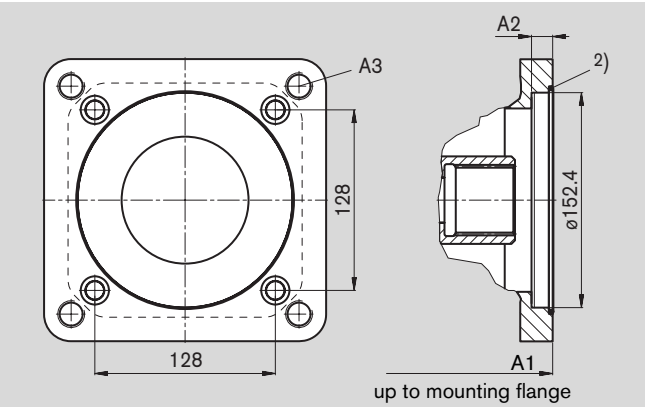


Size	A1 K07	A1 K24	A1 K80	A1 K61	A2	A3 [3]
190	367.8	367.8	367.8	367.8	13	M16x2; 19 deep
190*	400	400	400	400	13	M16x2; 19 deep
260	391.5	391.5	391.5	391.5	13	M16x2; 19 deep
260*	433.5	433.5	433.5	433.5	13	M16x2; 19 deep

*) Version with charge pump

Flange SAE J744 – 152-4 (D)

Coupler for splined shaft according to			
ANSI B92.1a-1976	1 1/4in 14T 12/24DP [1]	(SAE J744 – 32-4 (C))	**K86**
	1 3/4in 13T 8/16DP [1]	(SAE J744 – 44-4 (D))	**K17**
Coupler for splined shaft according to			
DIN 5480	W40x2x30x18x9g		**K81**
	W45x2x30x21x9g		**K82**
	W50x2x30x24x9g		**K83**

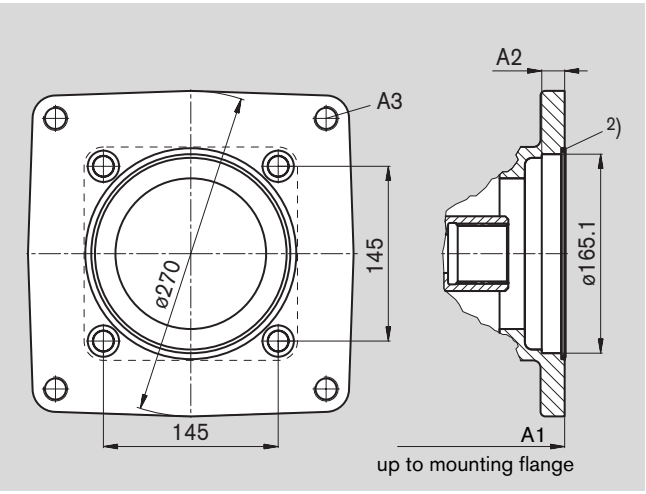


Size	A1 K86	A1 K17	A1 K81	A1 K82	A1 K83	A2	A3 [3]
75	290	–	290	–	–	13	M20x2.5; 28 deep
95	317	–	317	317	–	30	M20x2.5; 25 deep
130/145	340	350	340	340	340	30	M20x2.5; 25 deep
130/145*	374	384	374	374	374	30	M20x2.5; 25 deep
190	392	392	392	392	392	13	M20x2.5; 22 deep
190*	424	424	424	424	424	13	M20x2.5; 22 deep
260	417	417	417	417	417	13	M20x2.5; 22 deep
260*	459	459	459	459	459	13	M20x2.5; 22 deep

*) Version with charge pump

Flange SAE J744 – 101-2 (E)

Coupler for splined shaft according to			
ANSI B92.1a-1976	13/4 in 13T 16/32 DP [1]	(SAE J744 – 32-4 (C))	**K72**
Coupler for splined shaft according to			
DIN 5480	W50x2x30x24x9g		**K84**
	W60x2x30x28x9g		**K67**



Size	A1 K72	A1 K84	A1 K67	A2	A3 [3]
190	376.8	376.8	–	19	M20x2.5; 20 deep
190*	409	409	–	19	M20x2.5; 20 deep
260	417	400	400	19	M20x2.5; 20 deep
260*	459	442.5	442.5	19	M20x2.5; 20 deep

*) Version with charge pump

Note: All through drive flanges can be turned 90°. Please state in clear text if required.

[1]) 30° pressure angle, flat root side fit, tolerance class 5
[2]) O-ring seal is included in the supply
[3]) Thread according to DIN 13, see safety instructions

Summary of Through Drive Assembly Possibilites for A11V(L)O

Through drive – A11VO Flange	coupler for splined shaft code		attachment – 2nd pump A11VO Size (shaft)	A10V(S)O/31 Size (shaft)	A10V(S)O/52 Size (shaft)	A4FO Size (shaft)	A4VG Size (shaft)	A10VG Size (shaft)	external gear-pump	through drive available for Size
82-2 (A)	5/8in	**K01**	–	18 (U)	10 (U)	–	–	–	frame size F size 4-22 [1]	40...260
	3/4in	**K52**	–	18 (S)	10 (S)	–	–	–	–	40...260
101-2 (B)	7/8in	**K02**	–	28 (S,R) 45 (U)	28 (S,R) 45 (U,W)	16, 22, 28 (S)	–	18 (S)	frame size N size 20-32 [1] frame size G size 38-45 [1]	40...260
	1in	**K04**	40 (S)	45 (S,R)	45 (S,R) 60 (U,W)	–	28 (S)	28, 45 (S)	–	40...260
	W35	**K79**	40 (Z)	–	–	–	–	–	–	40...260
127-2 (C)	1 1/4in	**K07**	60 (S)	71 (S,R) 100 (U)	60 (S) [2] 85 (U)	–	40, 56, 71 (S)	63 (S)	–	60...260
	1 1/2in	**K24**	–	100 (S)	85 (S)	–	–	–	–	95...260
	W30	**K80**	–	–	–	–	40, 56 (Z)	–	–	60...260
	W35	**K61**	60 (Z)	–	–	–	40, 56 (A) 71 (Z)	–	–	60...260
152-4 (D)	1 1/4in	**K86**	75 (S)	–	–	–	–	–	–	75...260
	1 3/4in	**K17**	95, 130, 145 (S)	140 (S)	–	–	90, 125 (S)	–	–	130...260
	W40	**K81**	75 (Z)	–	–	–	125 (Z)	–	–	75...260
	W45	**K82**	95 (Z)	–	–	–	90, 125 (A)	–	–	95...260
	W50	**K83**	130, 145 (Z)	–	–	–	–	–	–	130...260
165-4 (E)	1 3/4in	**K72**	190, 260 (S)	–	–	–	180, 250 (S)	–	–	190...260
	W50	**K84**	190 (Z)	–	–	–	180 (Z)	–	–	190...260
	W60	**K67**	260 (Z)	–	–	–	–	–	–	260

[1]) Rexroth recommends special versions of the gear pumps. Please ask.

[2]) Only A10VO with 4-hole mounting flange can be mounted to A11V(L)O 190 and 260.

Combination Pumps A11VO + A11VO

Total length A [1])

A11VO	A11VO (2nd pump)									
(1st pump)	size 40	size 60	size 75	size 95	size 130/145	size 130/145 [2])	size 190	size 190 [2])	size 260	size 260 [2])
size 40		–	–	–	–	–	–	–	–	–
size 60	490	507	–	–	–	–	–	–	–	–
size 75		525	550	–	–	–	–	–	–	–
size 95	528	560	577	604	–	–	–	–	–	–
size 130/145	551	572	600	627	650	698	–	–	–	–
size 130/145 [2])	585	606	634	661	684	732	–	–	–	–
size 190	586.8	609.8	652	679	702	750	723.6	772.3	–	–
size 190 [2])	619	642	684	711	734	782	755.8	804.5	–	–
size 260	620	633.5	677	704	727	775	746.8	795.5	772	828
size 260 [2])	662.5	675.5	719	746	769	817	789.3	838	814.5	870.5

[1]) When using the S shaft (splined shaft DIN 5480) for the attached pump (2nd pump)

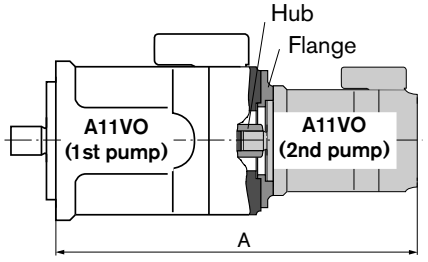
[2]) Version with charge pump

When ordering combination pumps, the type designations of the 1st and 2nd pumps must be connected by a "+".

Ordering code 1st pump + Ordering code 2nd pump

Ordering example:

A11VO130LRDS/10R-NZD12**K61** + A11VO60LRDS/10R-NZC12N00

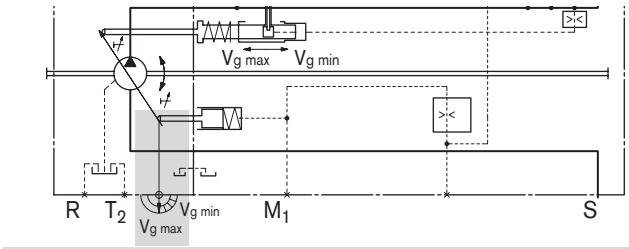


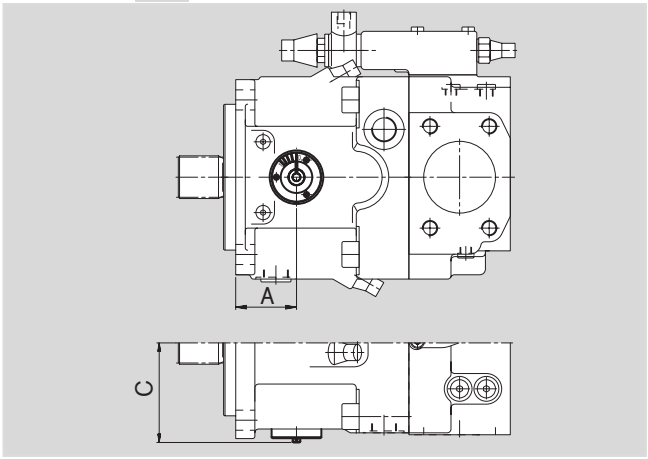
Note:
For permissible input torques and though drive torques see page 7, technical data.

Swivel Angle Indicator

Optical swivel angle indicator, V

With the optical swivel angle indicator, a mechanical pointer on the side of the pump housing displays the position of the swivel angle of the pump.



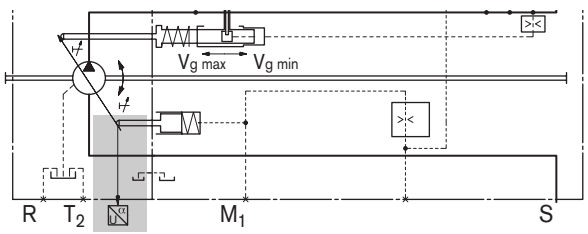


size	A	C
40	50.5	84.0
60	not available	
75	60.7	97.0
95	63.5	104.0
130	70.9	112.0
190	87.6	123.5
260	87.6	137.0

Electrical swivel angle sensor, R

With the electrical swivel angle indicator the swivel position of the pump is measured by an electrical swivel angle sensor. It has a robust, sealed housing and integrated electronics designed for automotive applications.

As an output the Hall effect swivel angle sensor supplies a voltage signal proportional to the swivel angle (see technical parameters).



Parameters	
Supply voltage U_b	10...30 V DC
Current consumption	< 15 mA
Output voltage U_a	2.5 V ($V_{g\,min}$)...4.5 V ($V_{g\,max}$)
Load resistance	≥ 20 kΩ
Reverse polarity protection	Supply voltage to ground
Protection against short circuit of the signal	to ground
EMC - DIN 40839 EN 55025, ISO/EN 14982, ISO 11452, ISO 7637-1	Details on request
Operating temperature range	-40° C...+125° C
Vibration resistance	
Sinusoidal vibration EN 60068-2-6	4*g* / 22...500 Hz
Random vibration IEC 68-2-36	min. 0.02g^2 / Hz
Shock resistance:	
Continuous shocking IEC 68-2-29	10*g* / 15 ms
Type of protection DIN/EN 60529	IP67 and IP69K
Housing material	synthetic material

Mating connector

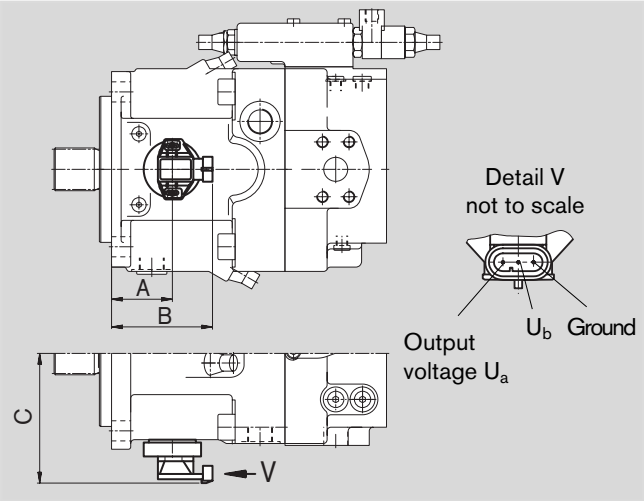
Female connector AMP Superseal 1.5; 3-pin,
Rexroth Mat. no. 2602132, consisting of: AMP-No.

– 1 female connector housing, 3-pins 282087-1

– 3 single wire seal, yellow 281934-2

– 3 female connector contacts 1.8 - 3.3 mm 283025-1

The mating connector is not included in the supply. It can be supplied by Rexroth on request.



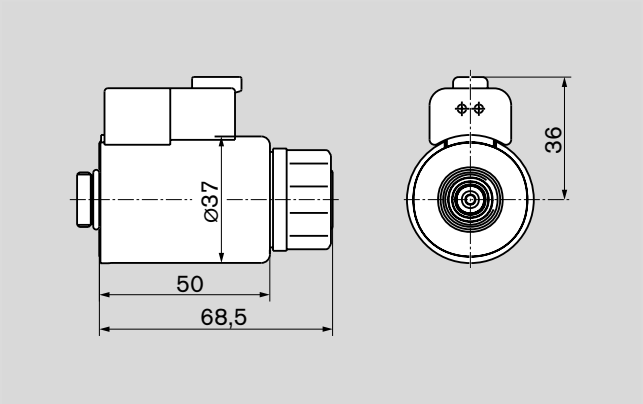
size	A	B	C
40	50.5	88.5	118.3
60	not available		
75	60.7	98.7	131.3
95	63.5	101.5	138.3
130	70.9	108.9	146.3
190	87.6	125.6	157.8
260	87.6	125.6	171.3

Male Connector for Solenoids

DEUTSCH DT04-2P-EP04 (2-pole)

moulded to the solenoid coil,
without bidirectional surpressor diode _____ **P**

Type of protection according to DIN/EN 60529: IP67 and IP69K



Mating connector

Female connector DEUTSCH DT06-2S-EP04
Rexroth Mat. no. 02601804

consisting of:	DT designation
– 1 housing	DT06-2S-EP04
– 1 wedge	W2S
– 2 female connectors	0462-201-16141

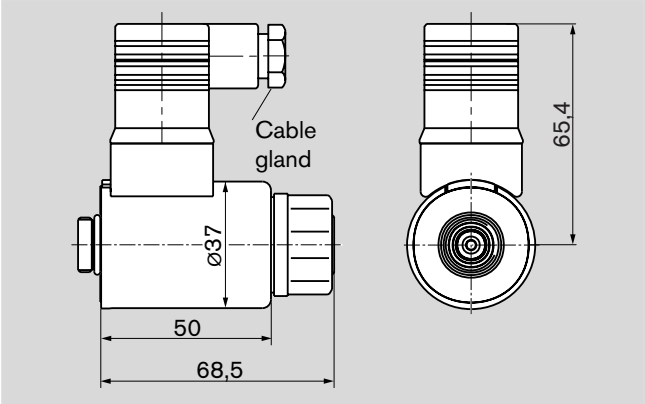
The mating connector is not included in the supply. It can be supplied by Rexroth on request.

Hirschmann DIN EN 175 301-803-A/ISO 4400

(not for new projects)

without bidirectional surpressor diode _____ **H**

Type of protection according to DIN/EN 60529: IP65



The sealing ring in the screw cable gland (M16x1.5) is suitable for line diameters of 4.5 mm to 10 mm.

The mating connector is included in the supply of the pump.

Installation and Commissioning Instructions

General

The pump housing must be filled with hydraulic fluid during commissioning and before operation (filling of housing case). Commissioning must take place at low speed and without load until the system has been bled completely.

In long periods at standstill the housing can empty via the service lines, sufficient filling of the housing must be guaranteed when restarting.

The case drain for the pump housing cavity must be drained into the tank through the highest leakage oil port. The minimum suction pressure at port S of 0.8 bar absolute (without charge pump) or 0.6 bar (with charge pump) may not be dropped below of.

Installation below tank

Pumps under minimum oil level in the tank (standard).

– any installation position.

– installation position "shaft upwards":

  Make sure that the pump housing is completely filled during commissioning. An air cushion in the area of the bearings causes damage to the axial piston unit.

Measures:

– Fill the axial piston pump via the highest leakage oil port T1, T2, R prior to commissioning.

– Recommendation: fill suction lines.

– Operate the pump at low speed (starter speed) until the pump is completely filled.

– Minimum immersion depth of the suction or leakage oil line in the tank: 200 mm (related to the min. oil level in the tank).

Installation above tank

Pumps above minimum oil level in the tank.

  The housing cavity may empty via the service lines during long periods of standstill (air gets in through the shaft seal), the bearing is not adequately lubricated when restarting. The axial piston unit must be filled via the highest leakage oil port prior to restarting (bleed via port R). Emptying via the leakage oil line can be prevented with a check valve in the leak oil line (opening pressure 0.5 bar). Emptying via the service ports can be reduced with a special version of the control plate.

– installation position "shaft horizontal" and "shaft upwards".

– installation position "shaft upwards".

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

See installation below tank for further measures.

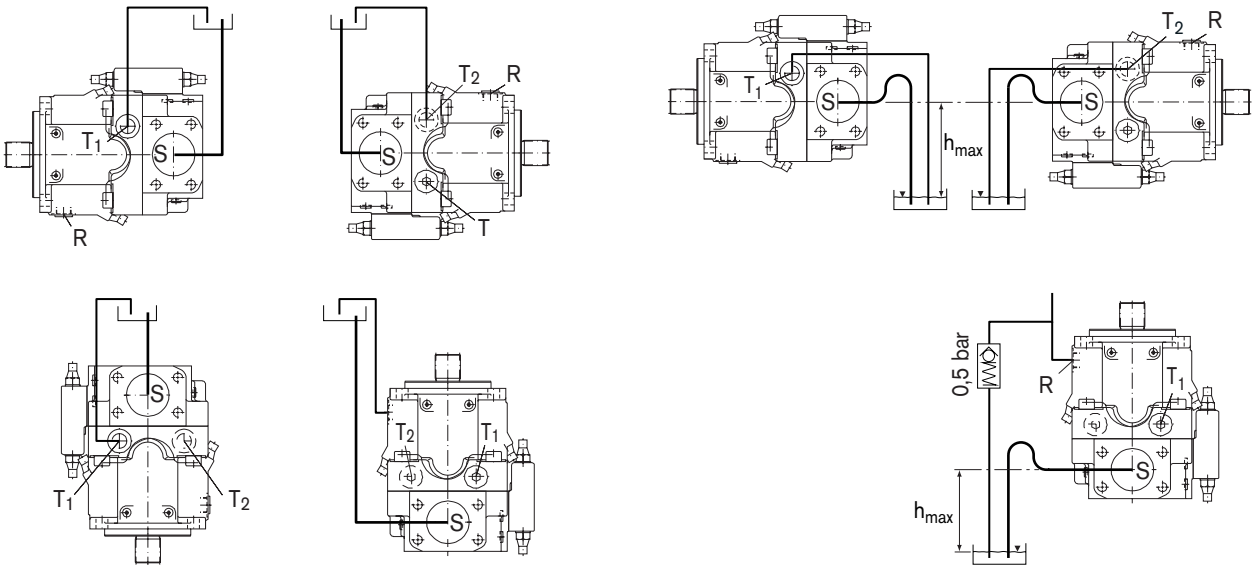
Additional measures for installation above the tank:

– max. permissible suction height $h_{max} = 800$ mm

– min. permissible pressure at port S (min. suction pressure)

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

– Recommendation: use suction line with "goose neck".



Safety Instructions

– The pump A11VO is designed for using in an open circuit.

– Configuration, assembly, commissioning of the pump must be performed by trained and qualified personnel.

– The operating and function ports are designed exclusively for connecting hydraulic lines.

– Tightening torques: The tightening torques specified in this data sheet are maximum values and may not be exceeded (maximum value for screw thread). Manufacturer specifications for the max. permissible tightening torques of the used fittings must be observed!

For DIN 13 fastening screws we recommend checking the tightening torque individually according to VDI 2230 Edition 2003.

– There is a danger of burns from the pump and especially the solenoids during and shortly after operation.

– Observe the specified data and instructions.

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