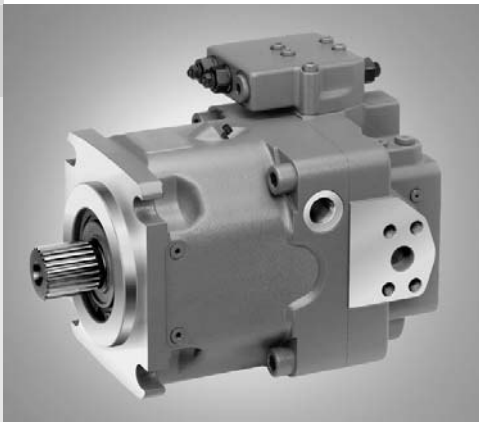
Axial Piston Variable Pump AA11VO

RA 92500-A/10.09 **1**/68
Replaces: 06.09

Data sheet



Series 1
Size NG40 to 260
Nominal pressure 5100 psi (350 bar)
Maximum pressure 5800 psi (400 bar)
Open circuit

Contents

Ordering code for standard program	2
Technical data	5
LR – Power control	10
DR – Pressure control	21
HD – Hydraulic control, pilot-pressure related	25
EP – Electric control with proportional solenoid	27
Dimensions size 40	30
Dimensions size 60	34
Dimensions size 75	38
Dimensions size 95	42
Dimensions size 130/145	46
Dimensions size 190	50
Dimensions size 260	54
Through drive dimensions	58
Overview of attachments for AA11V(L)O	61
Combination pumps AA11VO + AA11VO	62
Swivel angle indicator	63
Connector for solenoids	64
Installation notes	65
General notes	68

Features

- Variable 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 size, i.e. 100% through drive.
- The output flow is proportional to the drive speed and infinitely variable between $q_{V\,max}$ and $q_{V\,min} = 0$.

Ordering code for standard program

AA11V	-	O	95	LG2S /	1	0	R	–	N	Z	G	XX	K80			-S
01	02	03	04	05	06	07	08		09	10	11	12	13	14	15	16

Axial piston unit

01	Swashplate design, variable, nominal pressure 5100 psi (350 bar), maximum pressure 5800 psi (400 bar)	AA11V

Charge pump (impeller)

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

Operation

03	Pump, open circuit	O

Size

			40	60	75	95	130	145	190	260
04	≈ Displacement $V_{g\,max}$	cm^3/rev.	42	58.5	74	93.5	130	145	193	260
		in^3/rev.	2.56	3.57	4.52	5.71	7.93	8.84	11.78	15.87

Control unit

									40	60	75	95	130	145	190	260	
05	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
		electric U = 12 V	negative	LE1					❍	❍	❍	●	●	●	●	●	LE1
		U = 24 V	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
		electric, prop. override, 24 V						S2	❍	❍	❍	●	●	●	●	●	L . . . S2
		hydraulic, prop. override						S5	❍	❍	❍	●	●	●	●	●	L . . . S5
	with stroke limiter	negative characteristic	Δp=365 psi (25 bar)					H1	●	●	●	●	●	●	●	●	L . . . H1
			Δp=145 psi (10 bar)					H5	●	●	●	●	●	●	●	●	L . . . H5
		positive characteristic	Δp=365 psi (25 bar)					H2	●	●	●	●	●	●	●	●	L . . . H2
			Δp=145 psi (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 pilot-pressure related		Δp = 145 psi (10 bar)	HD1					●	●	●	●	●	●	●	●	HD1
		(positive characteristic)	Δp = 365 psi (25 bar)	HD2					●	●	●	●	●	●	●	●	HD2
		with pressure cut-off			D				●	●	●	●	●	●	●	●	HD.D
		with pressure cut-off, remote controlled			G				❍	●	❍	❍	❍	❍	●	●	HD. G
	Electric control		U = 12 V	EP1					●	●	●	●	●	●	●	●	EP1
	with proportional solenoid	(positive characteristic)	U = 24 V	EP2					●	●	●	●	●	●	●	●	EP2
		with pressure cut-off			D				●	●	●	●	●	●	●	●	EP. D
		with pressure cut-off, remote control			G				●	●	●	●	●	●	●	●	EP. G

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 conjunction with the stroke limiters H1, H2, H5, H6, U1 and U2.

● = available ❍ = on request – = not available

Ordering code for standard program

AA11V	-	O	95	LG2S	/	1	0	R	–	N	Z	G	XX	K80			-S
01	02	03	04	05		06	07	08		09	10	11	12	13	14	15	16

Series

06		**1**

Index

07	Size 40 to 130		**0**
	Size 145 to 260		**1**

Direction of rotation

08	Viewed from drive shaft	clockwise	**R**
		counter-clockwise	**L**

Seals

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

	Drive shaft (see page 8 for permissible input and through drive torques)		**40**	**60**	**75**	**95**	**130**	**145**	**190**	**260**	
10	Parallel keyed shaft 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**	
11	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**	
12	Pressure and suction port SAE, at side, opposite side (with UNC fastening threads)	●	●	●	●	●	●	●	●	**62**

	Through drive (see page 58 for attachments)				**40**	**60**	**75**	**95**	**130**	**145**	**190**	**260**	
13	Flange SAE J744[3]	Coupler for splined shaft											
	–	–			●	●	●	●	●	●	●	●	**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**
		1 in	15T 16/32DP	(B-B)	●	●	●	●	●	●	●	●	**K04**
	127-2 (C)[4]	1 1/4in	14T 12/24DP	(C)	–	●	●	●	●	●	●	●	**K07**
		1 1/2in	17T 12/24DP	(C-C)	–	–	–	●	●	●	●	●	**K24**
	152-4 (D)	1 1/4in	14T 12/24DP	(C)	–	–	●	●	●	●	●	●	**K86**
		1 3/4in	13T 8/16DP	(D)	–	–	–	–	●	●	●	●	**K17**
	165-4 (E)	1 3/4in	13T 8/16DP	(D)	–	–	–	–	–	–	●	●	**K72**

1) **S**-shaft suitable for combination pump!
2) To fit the flywheel case of the combustion engine
3) 2 ≙ 2-hole; 4 ≙ 4-hole
4) Size 190 and 260 with 2 + 4-hole flange

● = available ❍ = on request – = not available

Ordering code for standard program

AA11V	-	O	95	LG2S /	1	0	R	–	N	Z	G	XX	K80			-S
01	02	03	04	05	06	07	08		09	10	11	12	13	14	15	16

	Swivel angle indicator (page 63)	**40**	**60**	**75**	**95**	**130**	**145**	**190**	**260**	
14	without swivel angle indicator (no symbol)	●	●	●	●	●	●	●	●	
	with optical swivel angle indicator	●	–	●	●	●	●	●	●	**V**
	with electric swivel angle sensor	●	–	●	●	●	●	●	●	**R**

	Connector for solenoids (page 64)	**40**	**60**	**75**	**95**	**130**	**145**	**190**	**260**	
15	DEUTSCH connector molded, 2-pin – without suppressor diode	●	●	●	●	●	●	●	●	**P**

Standard / special version

16	Standard version	without symbol	
		combined with attachment part or attachment pump	**-K**
	Special version		**-S**
		combined with attachment part or attachment pump	**-SK**

● = available ❍ = on request – = not available

Technical data

Hydraulic fluid

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

The variable pump AA11VO is not suitable for operating with HFA, HFB and HFC. If HFD or environmentally acceptable hydraulic fluids are being used, the limitations regarding technical data and seals mentioned in RE 90221 and RE 90223 must be observed.

When ordering, indicate the hydraulic fluid that is to be used.

Operating viscosity range

For optimum efficiency and service life, select an operating viscosity (at operating temperature) within the optimum range of

ν_{opt} = opt. operating viscosity 80 to 170 SUS (16 to 36 mm²/s)

depending on the tank temperature (open circuit).

Limits of viscosity range

The limiting values for viscosity are as follows:

ν_{min} = 42 SUS (5 mm²/s)
Short-term (t < 3 min)
At max. perm. temperature of t_{max} = 240 °F (+115 °C).

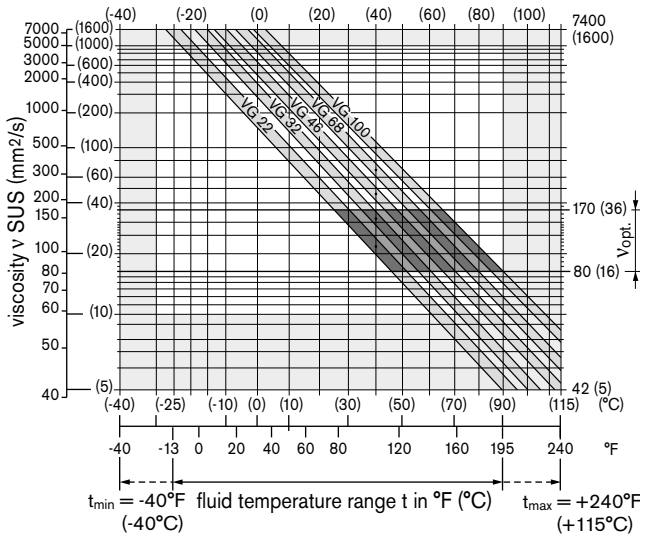
ν_{max} = 7400 SUS (1600 mm²/s)
Short-term (t < 3 min)
At cold start (p ≤ 435 psi (30 bar), n ≤ 1000 rpm, t_{min} = -40 °F (-40 °C)).
Only for starting up without load. Optimum operating viscosity must be reached within approx. 15 minutes.

Note that the maximum hydraulic fluid temperature of 240 °F (115 °C) must not be exceeded locally either (e.g. in the bearing area). The temperature in the bearing area is – depending on pressure and speed – up to 9°F (5 K) higher than the average case drain temperature.

Special measures are necessary in the temperature range from -40 °F (-40 °C) and -13 °F (-25 °C) (cold start phase), please contact us.

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

Selection diagram



Details regarding the choice of hydraulic fluid

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

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

Example: At an ambient temperature of X °C an operating temperature of 140 °F (60 °C) is set. In the optimum operating viscosity range (ν_{opt}; shaded area) this corresponds to the viscosity classes VG 46 and VG 68; to be selected: VG 68.

Note
The case drain temperature, which is affected by pressure and speed, is always higher than the tank temperature. At no point in the system may the temperature be higher than 240 °F (115°C).

If the above conditions cannot be maintained due to extreme operating parameters, please contact us.

Filtration

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

To ensure functional reliability of the axial piston unit, the hydraulic fluid must have a claenliness level of at least 20/18/15 according to ISO 4406.

At very high hydraulic fluid temperatures (195 °F (90 °C) to maximum 240 °F (115 °C), at least cleanliness level 19/17/14 according to ISO 4406 is required.

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

Technical data

Operating pressure range

Inlet

Absolute pressure at port S (suction port)
Version **without** charge pump

$p_{abs\ min}$ 12 psi (0.8 bar)
$p_{abs\ max}$ 435 psi (30 bar)

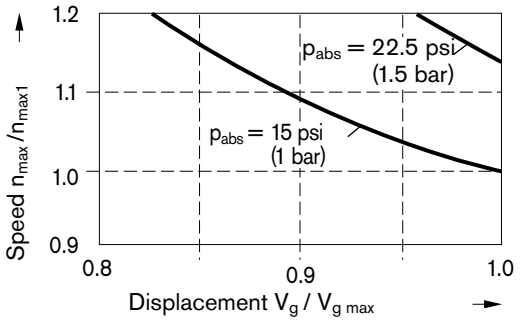
If the pressure is > 75 psi (5 bar), please ask.

Version **with** charge pump

$p_{abs\ min}$ 9 psi (0.6 bar)
$p_{abs\ max}$ 30 psi (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

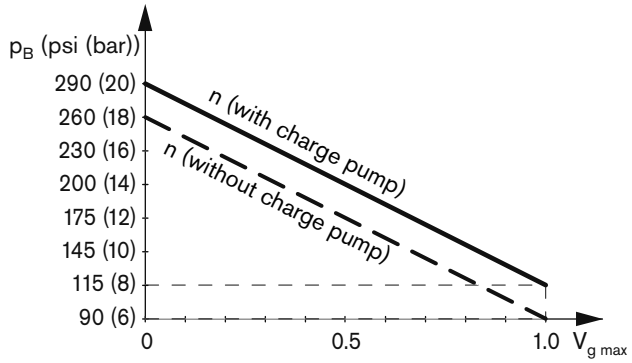
Nominal pressure p_N 5100 psi (350 bar)
Maximum pressure p_{max} 5800 psi (400 bar)

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

Maximum pressure: Maximum operating pressure which is permissible for short-term (t < 1s).

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 of 17.5 psi (1.2 bar) higher than the inlet pressure at the port S but not higher than

$p_{L\ abs.\ max}$ 30 psi (2 bar).

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

Temperature range of the shaft seal ring

The FKM shaft seal ring is permissible for case drain temperatures of -13 °F to 240 °F (-25 °C to +115 °C).

Note
For applications below-13 °F (-25 °C), an NBR shaft seal ring is necessary (permissible temperature range: -40 °F to 194 °F (-40 °C to +90 °C).
State NBR shaft seal ring in clear text in the order.

Flushing the case

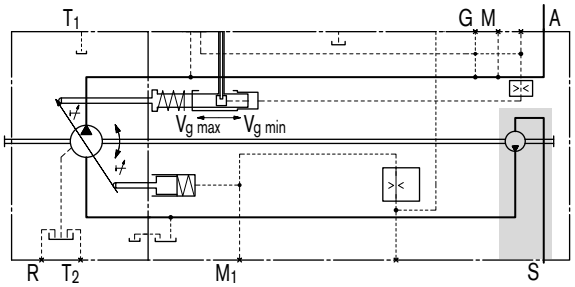
If a variable pump with control unit **EP, HD, DR** or stroke limiter (**H., U.,**) is operated over a long period (t > 10 min) with flow zero or operating pressure < 220 psi (15 bar), flushing of the case via ports "T_1", "T_2" or "R" is necessary.

Size		40	60	75	95	130	145	190	260
$q_{V\ flush}$	gpm	0.5	0.8	0.8	1.0	1.0	1.0	1.3	1.6
	(l/min)	2	3	3	4	4	4	5	6

Flushing the case is unnecessary in versions with charge pump (AA11VLO), since a part of the charge flow is directed to the case.

Charge pump (impeller)

The charge pump is a circulating pump with which the AA11VLO (size 130 to 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 pressure of a maximum 30 psi (2 bar) is permissible with charge pump.



Technical data

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

Size	AA11VO		40	60	75	95	130	145	190	260
Displacement	$V_{g\ max}$	in^3/rev.	2.56	3.57	4.52	5.71	7.93	8.84	11.78	15.87
		cm^3	42	58.5	74	93.5	130	145	193	260
	$V_{g\ min}$	cm^3	0	0	0	0	0	0	0	0
Speed maximum at $V_{g\ max}$ [1]	n_{max}	rpm	3000	2700	2550	2350	2100	2200	2100	1800
maximum at $V_g \leq V_{g\ max}$ [2]	n_{max1}	rpm	3500	3250	3000	2780	2500	2500	2100	2300
Flow at n_{max} and $V_{g\ max}$	$q_{v\ max}$	gpm	33.3	41.7	49.9	58.1	72.1	84.3	107	123.6
		l/min	126	158	189	220	273	319	405	468
Power at $q_{v\ max}$ and $\Delta p = 350$ bar	P_{max}	hp	99.2	123.4	147.5	171.7	213.2	249.4	316.5	366.1
		kW	74	92	110	128	159	186	236	273
Torque at $V_{g\ max}$ and $\Delta p = 350$ bar	T_{max}	lb-ft	172.6	240.4	303.9	384.3	534	596	792.9	1068
		Nm	234	326	412	521	724	808	1075	1448
Rotary stiffness	P shaft	lb-ft/rad	64512	79574	105548	14883	230417	230417	282702	482244
		Nm/rad	87467	107888	143104	196435	312403	312403	383292	653835
	S shaft	lb-ft/rad	43035	63658	75173	128117	174700	174700	191599	259628
		Nm/rad	58347	86308	101921	173704	236861	236861	259773	352009
	T shaft	lb-ft/rad	54931	75556	92640	–	–	–	222691	418282
		Nm/rad	74476	102440	125603	–	–	–	301928	567115
Moment of inertia for rotary group	J_{TW}	$lbs\text{-}ft^2$	0.1139	0.1946	0.2729	0.4105	0.7546	0.8092	1.3052	2.0835
		kgm^2	0.0048	0.0082	0.0115	0.0173	0.0318	0.0341	0.055	0.0878
Angular acceleration, maximum [3]	α	rad/s^2	22000	17500	15000	13000	10500	9000	6800	4800
Filling capacity	V	gal	0.29	0.36	0.49	0.55	0.77	0.77	1.0	1.22
		L	1.1	1.35	1.85	2.1	2.9	2.9	3.8	4.6
Mass (approx.)	m	lbs	71	88	99	117	145	168	209	276
		kg	32	40	45	53	66	76	95	125

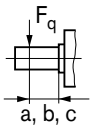
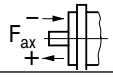
1) The values apply at absolute pressure (p_{abs}) 15 psi (1 bar) at the suction port S and mineral hydraulic fluid.
2) The values apply at $V_g \leq V_{g\ max}$ or in case of an increase in the inlet pressure p_{abs} at the suction port S (see diagram page 6)
3) The area of validity is situated between 0 and the maximum permissible speed.
It applies for external stimuli (e.g. engine 2 to 8 times rotary frequency, cardan shaft twice the rotary frequency).
The limit value applies for a single pump only.
The loading on the connection parts has to be considered.

Caution
Exceeding the permissible limit values could cause a loss of function, reduced service life or the destruction of the axial piston unit. The permissible values can be determined by calculation.

Technical data

Permissible radial and axial loading on drive shaft

The values stated are maximum data and not permissible for continuous operation

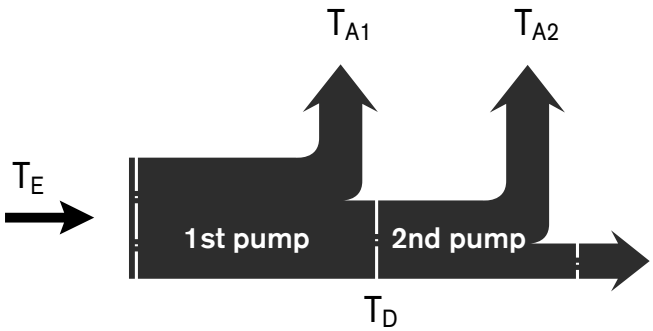
Size			Size	40	60	75	95	130	145	190	260
Radial force, maximum at distance a, b, c (from shaft collar)		$F_{q\ max}$	lbf	809	1124	1416	1798	2472	2472	3805	4946
			N	3600	5000	6300	8000	11000	11000	16925	22000
		a	in	0.69	0.69	0.79	0.79	0.89	0.89	1.02	1.14
			mm	17.5	17.5	20	20	22.5	22.5	26	29
		$F_{q\ max}$	lbf	650	910	1113	1424	1932	1932	2973	3779
			N	2891	4046	4950	6334	8594	8594	13225	16809
		b	in	1.18	1.18	1.38	1.38	1.57	1.57	1.81	1.97
			mm	30	30	35	35	40	40	46	50
		$F_{q\ max}$	lbf	543	764	917	1178	1585	1585	2439	3057
			N	2416	3398	4077	5242	7051	7051	10850	13600
		c	in	1.67	1.67	1.97	1.97	2.26	2.26	2.60	2.80
			mm	42.5	42.5	50	50	57.5	57.5	66	71
Axial force, maximum		$\pm F_{ax\ max}$	lbf	337	495	618	787	1079	1079	1349	933
			N	1500	2200	2750	3500	4800	4800	6000	4150

Permissible input and through drive torques

Size		Size	40	60	75	95	130	145	190	260
Torque (at $V_{g\ max}$ and $\Delta p = 5100$ psi (350 bar[1]))	T_{max}	lb-ft	173	240	304	384	534	596	793	1068
		Nm	234	326	412	521	724	808	1075	1448
Input torque, maximum[2]										
at shaft end P Shaft key DIN 6885	$T_{E\ perm.}$	lb-ft	345	478	608	770	1068	1068	1642	2056
		Nm	468	648	824	1044	1448	1448	2226	2787
		DIA in	1.26	1.38	1.57	1.77	1.97	1.97	2.17	2.36
		DIA mm	ø32	ø35	ø40	ø45	ø50	ø50	ø55	ø60
at S shaft end ANSI B92.1a-1976 (SAE J744)	$T_{E\ perm.}$	lb-ft	232	444	444	1210	1210	1210	1210	1210
		Nm	314	602	602	1640	1640	1640	1640	1640
		in	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 T shaft end ANSI B92.1a-1976 (SAE J744)	$T_{E\ perm.}$	lb-ft	444	715	715	–	–	–	1969	3002
		Nm	602	970	970	–	–	–	2670	4070
		in	1 1/4 in	1 3/8 in	1 3/8 in	–	–	–	2 in	2 1/4 in
Through drive torque, maximum [3]	$T_{D\ perm.}$	lb-ft	232	384	487	606	819	819	1298	1523
		Nm	314	521	660	822	1110	1110	1760	2065

1) Efficiency not considered
2) For drive shafts with no radial force
3) Observe maximum input torque for shaft **S**!

Torque distribution



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 an 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 AA11VO (e.g. see also data sheet RE 95310, Electronic Load Limiting Control, LLC).

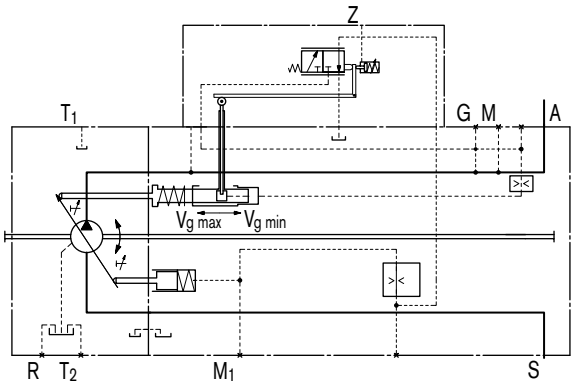
LG1 Negative power override

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

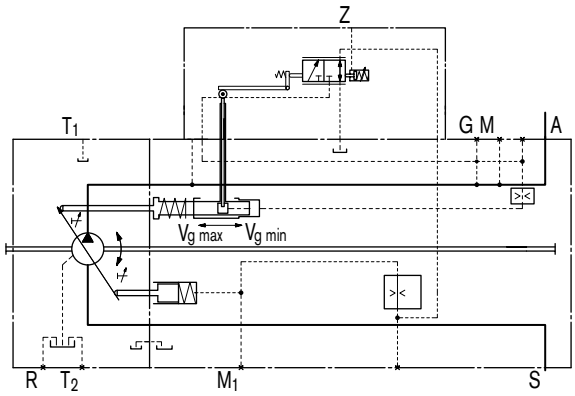
Increasing the pilot pressure reduces the power setting.

Circuit diagram LG1

Size 40 to 145



Size 190 to 260



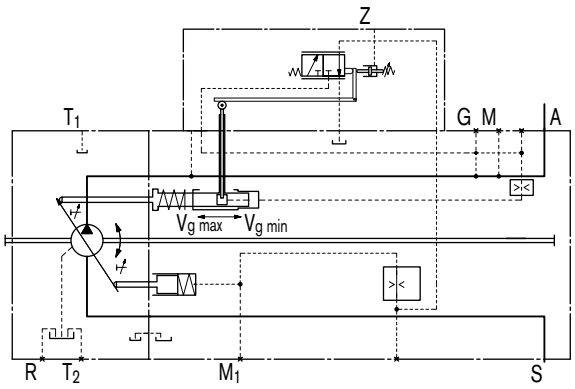
LG2 Positive power override

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

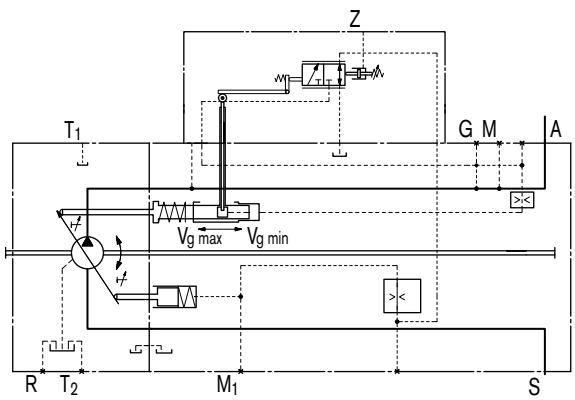
An increase in pilot pressure increases the power output.

Circuit diagram LG2

Size 40 to 145



Size 190 to 260



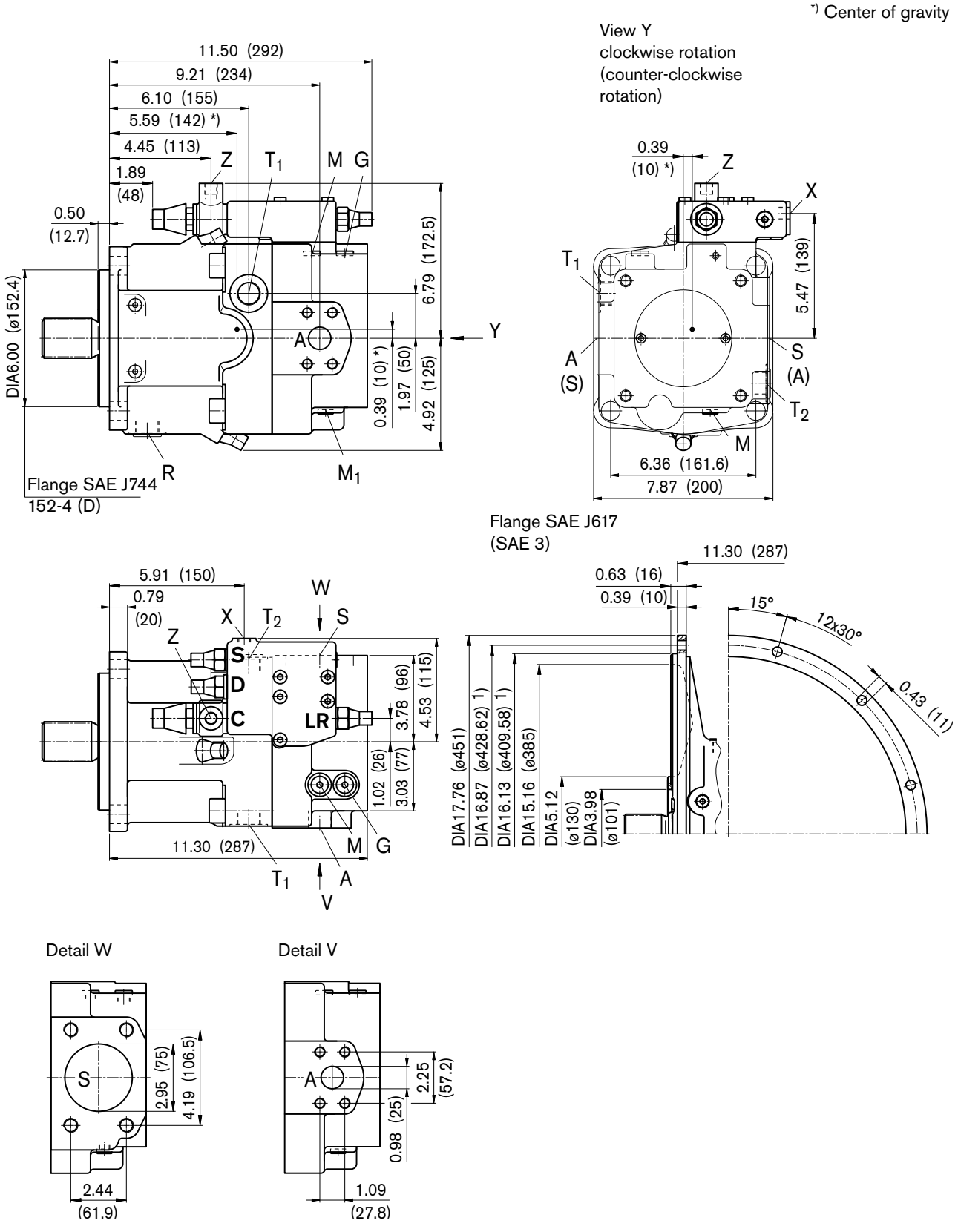
Dimensions size 95

Before finalizing your design,
please request a certified drawing.
Dimensions in inches and (millimeters).

LRDCS

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

*) Center of gravity



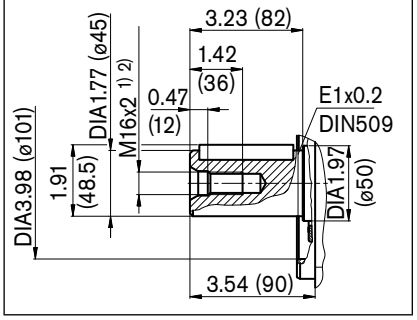
1) Dimensions according to SAE J617-No. 3, for connection to the flywheel case of the combustion engine

Dimensions size 95

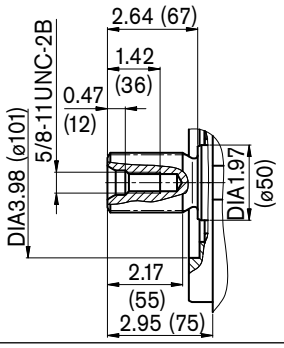
Before finalizing your design,
please request a certified drawing.
Dimensions in inches and (millimeters).

Drive shaft

P Parallel keyed shaft DIN 6885 – AS14x9x80



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



Ports

Designation	Function	Standard	Size[2)]		Max. pressure [psi (bar)][4)]	State
A	Service line port	SAE J518	1 in		5800 (400)	O
	Fixing thread	ISO 68	7/16in-14UNC-2B;	0.67 (17) deep		
S	Suction port	SAE J518	3 in		435 (30)	O
	Fixing thread	ISO 68	5/8in-11UNC-2B;	0.94 (24) deep		
T_1, T_2	Tank port	ISO 11926	1 1/16in-12UNF-2B;	0.63 (16) deep	145 (10)	[5)]
R	Air bleed	ISO 11926	1 1/16in-12UNF-2B;	0.63 (16) deep	145 (10)	X
M_1	Measurement point, positioning chamber	ISO 11926	9/16in-18UNF-2B;	0.47 (12) deep	580 (400)	X
M	Measurement point, service line port	ISO 11926	9/16in-18UNF-2B;	0.47 (12) deep	5800 (400)	X
X	Pilot pressure port in version with load sensing (S) and remote controlled pressure cut-off (G)	ISO 11926	9/16in-18UNF-2B;	0.47 (12) deep	5800 (400)	O
Y	Pilot pressure port in version with stroke limiter (H...), 2-stage pressure cut-off (E) and HD	ISO 11926	9/16in-18UNF-2B;	0.47 (12) deep	580 (40)	O
Z	Pilot pressure port in version with cross sensing (C) and power override (LR3) power overrice (LG1)	ISO 11926	9/16in-18UNF-2B;	0.47 (12) deep	5800 (400) 580 (40)	O
G	Port for control pressure (controller) in version with stroke limiter (H.., U2), HD and EP with screw union GE10 - PLM (otherwise closed)	ISO 11926	9/16in-18UNF-2B;	0.47 (12) deep	580 (40)	O

1) Center bore according to DIN 332 (thread acc. to DIN 13)
2) For maximum tightening torque, please refer to general notes on page 64
3) ANSI B92.1a-1976, 30° pressure angle, flat root, side fit, tolerance class 5
4) Depending on adjustment data and operating pressure
5) Depending on installation position, T_1 or T_2 must be connected (see also page 61)

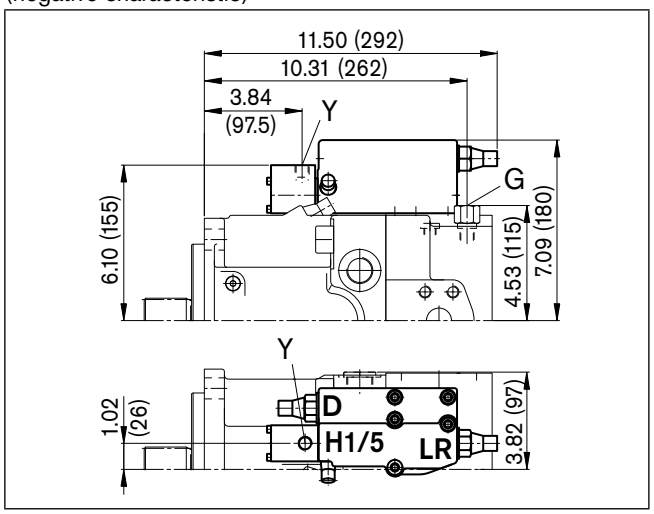
O = Open, must be connected (closed on delivery)
X = Closed (in normal operation)

Dimensions size 95

Before finalizing your design,
please request a certified drawing.
Dimensions in inches and (millimeters).

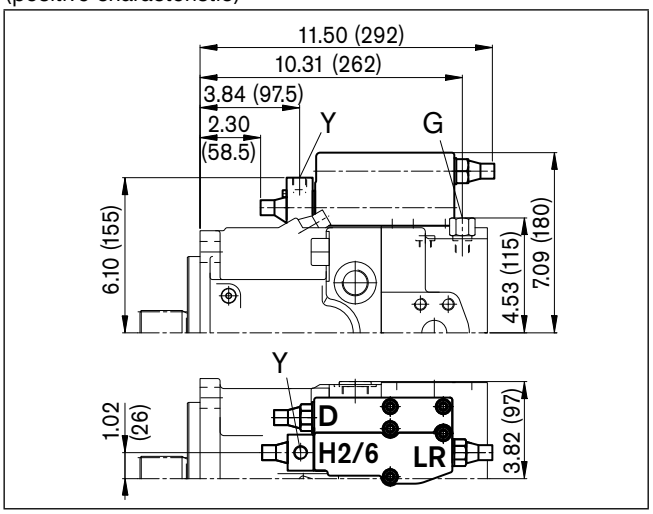
LRDH1/LRDH5

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



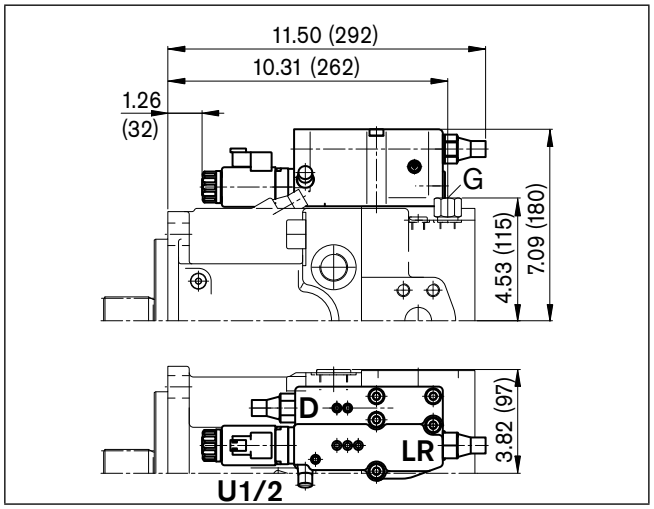
LRDH2/LRDH6

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



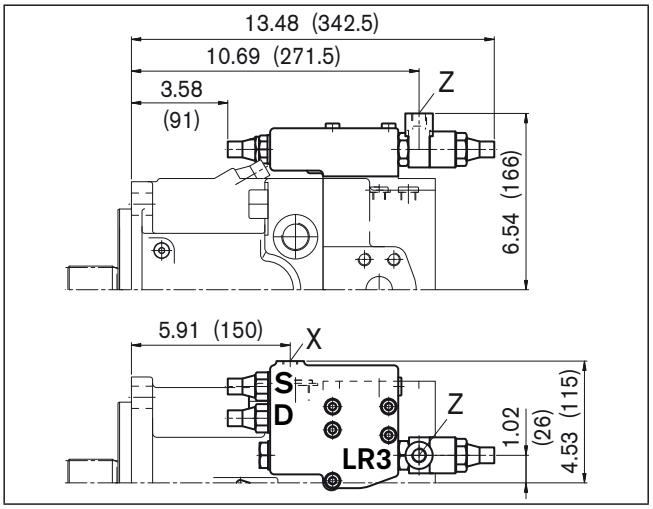
LRDU1/LRDU2

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



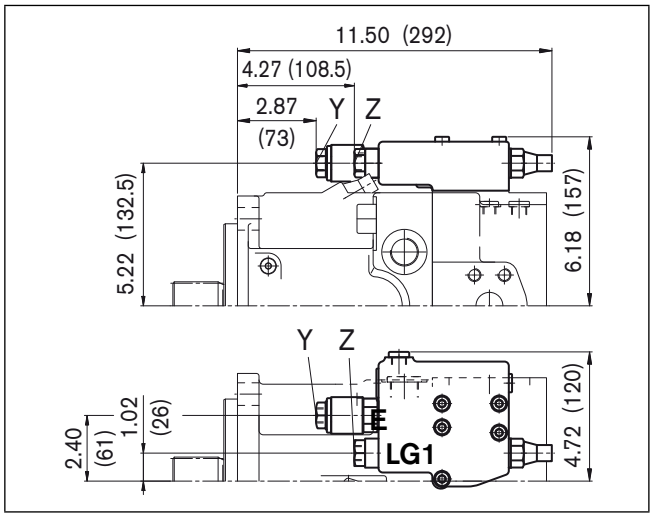
LR3DS

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

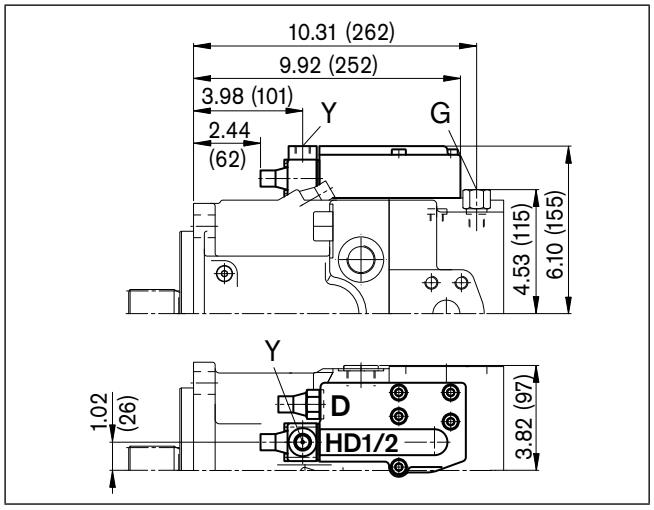
Power control with pilot-pressure related override (positive) and 2-stage pressure cut-off

Dimensions size 95

Before finalizing your design,
please request a certified drawing.
Dimensions in inches and (millimeters).

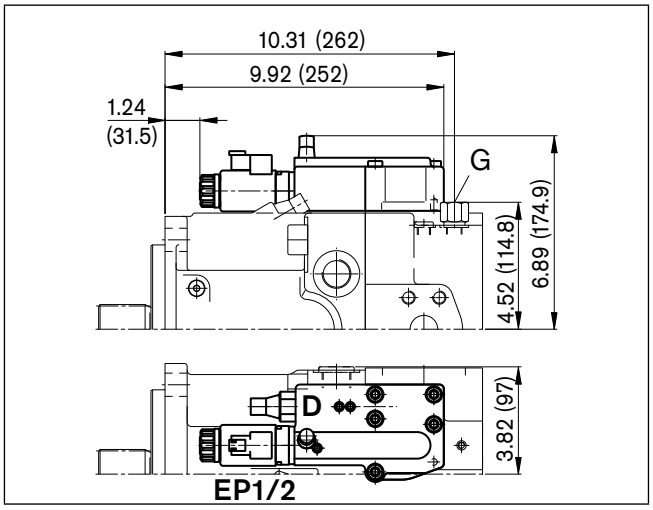
HD1D/HD2D

Hydraulic control, pilot-pressure related with pressure cut-off



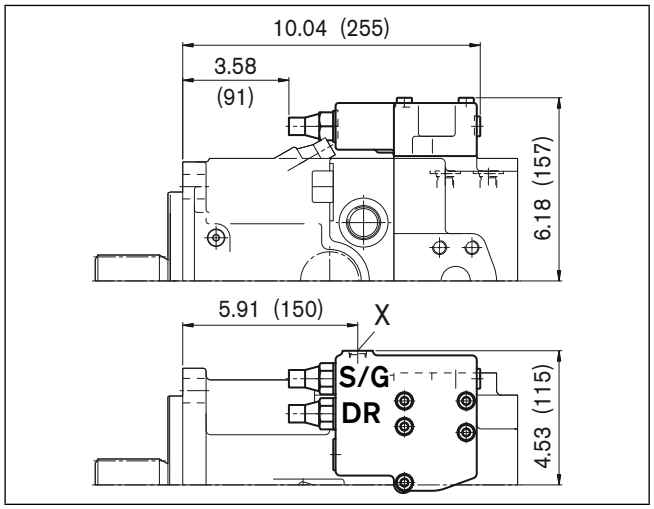
EP1D/EP2D

Electric control with proportional solenoid and pressure cut-off



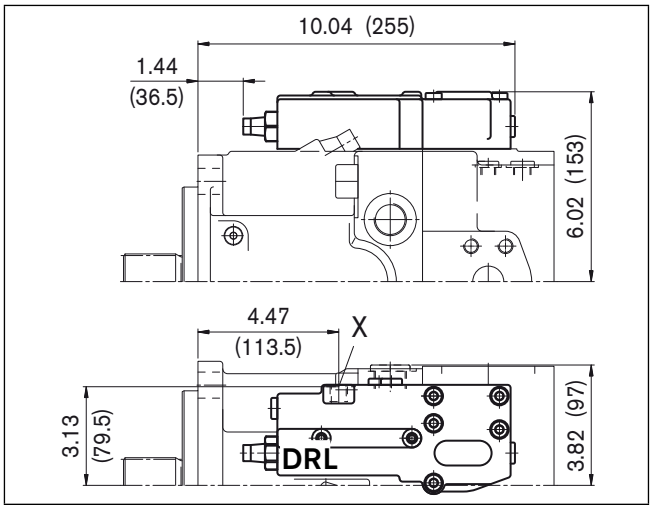
DRS/DRG

Pressure control with load sensing control
Pressure control remote controlled



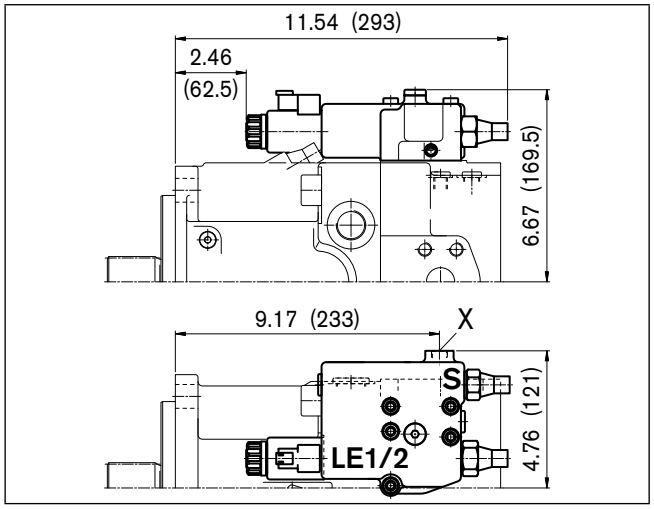
DRL

Pressure control for parallel operation



LE1S/LE2S

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



LE2S2/LE1S5/LE2S5

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