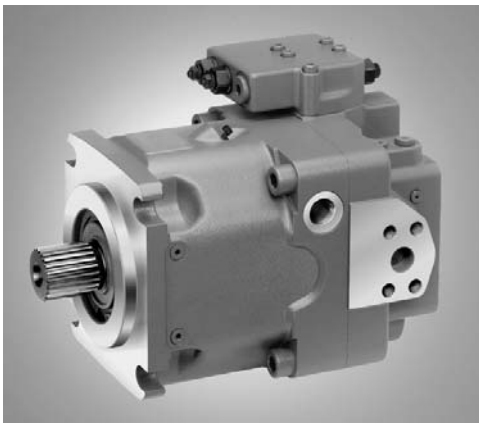
Itahydraulic
Power Tecnology

Axial Piston Variable Pump
AA11VO

Data sheet



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

Itahydraulic
Power Tecnology

Ordering code for standard program

AA11V		O			/	1			–	N							
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	negative	U = 12 V	LE1				❍	❍	❍	●	●	●	●	●	LE1
			negative	U = 24 V	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

Itahydraulic
Power Tecnology

Ordering code for standard program

AA11V		O			/	1			–	N							
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**
	Splined shaft ANSI B92.1a–1976 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

Itahydraulic
Power Tecnology

Ordering code for standard program

AA11V		O			/	1			–	N							
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

Itahydraulic
Power Tecnology

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).

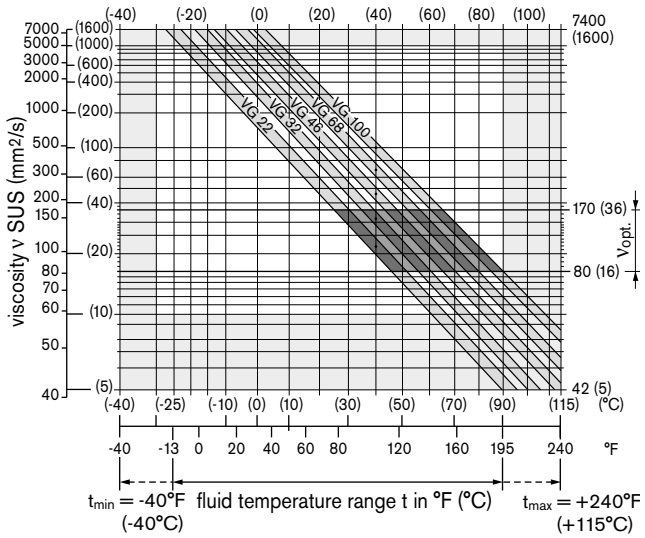
ν_{max} = 7400 SUS (1600 mm²/s)
Short-term (t < 3 min)
At cold start (p ≤ 435 psi (30 bar), n ≤ 1000 rpm, t_{min} = -40 °F (-40 °C)).
Only for starting up without load. Optimum operating viscosity must be reached within approx. 15 minutes.

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.

Itahydraulic
Power Tecnology

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)

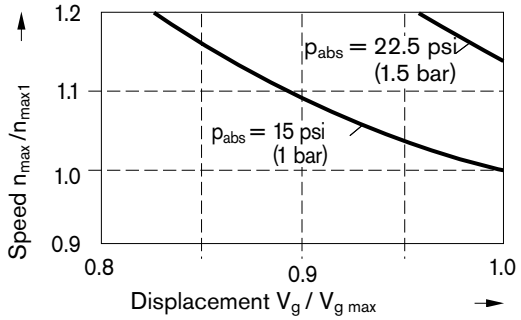
If the pressure is > 75 psi (5 bar), please ask.

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

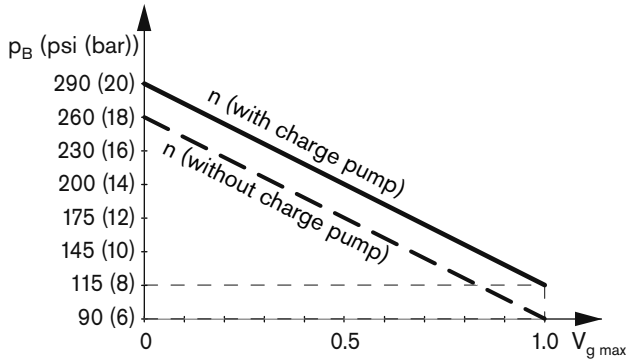
Nominal pressure p_N _____ 5100 psi (350 bar)
Maximum pressure p_{max} _____ 5800 psi (400 bar)

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

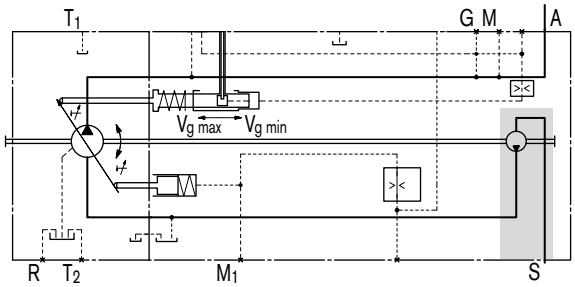
If a variable pump with control unit **EP, HD, DR** or stroke limiter (**H., U.**,) is operated over a long period (t > 10 min) with flow zero or operating pressure < 220 psi (15 bar), flushing of the case via ports "T_1", "T_2" or "R" is necessary.

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.

Itahydraulic
Power Tecnology

Technical data

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

Size	AA11VLO (with charge pump)		130	145	190	260
Displacement	$V_{g\,max}$	in^3/rev.	7.93	8.84	11.78	15.87
		cm^3	130	145	193	260
	$V_{g\,min}$	cm^3	0	0	0	0
Speed maximum at $V_{g\,max}$ [1]	n_{max}	rpm	2500	2500	2500	2300
maximum at $V_g \le V_{g\,max}$ [2]	n_{max1}	rpm	2500	2500	2500	2300
Flow at n_{max} and $V_{g\,max}$	$q_{v\,max}$	gpm	85.9	95.9	127.6	158
		l/min	325	363	483	598
Power at $q_{v\,max}$ and $\Delta p = 350$ bar	P_{max}	hp	254.8	283	376.8	468
		kW	190	211	281	349
Torque at $V_{g\,max}$ and $\Delta p = 350$ bar	T_{max}	lb-ft	534	596	792.9	1068
		Nm	724	808	1075	1448
Rotary stiffness	P shaft	lb-ft/rad	230417	230417	282702	482244
		Nm/rad	312403	312403	383292	653835
	S shaft	lb-ft/rad	174700	174700	191599	259628
		Nm/rad	236861	236861	259773	352009
	T shaft	lb-ft/rad	–	–	222691	418282
		Nm/rad	–	–	301928	567115
Moment of inertia for rotary group	J_{TR}	$lbs\text{-}ft^2$	0.7997	0.8543	1.3692	2.1238
		kgm^2	0.0337	0.036	0.0577	0.0895
Angular acceleration, maximum [3]	α	rad/s^2	10500	9000	6800	4800
Filling capacity	V	gal	0.77	0.77	1.0	1.22
		L	2.9	2.9	3.8	4.6
Mass (approx.)	m	lbs	159	161	229	304
		kg	72	73	104	138

1) The values apply at absolute pressure (p_{abs}) of at least 12 psi (0.8 bar) at the suction port S and mineral hydraulic fluid.
2) 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 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.

Determining the size

Flow $q_v = \dfrac{V_g \cdot n \cdot \eta_v}{231}$ [gpm] $\left(\dfrac{V_g \cdot n \cdot \eta_v}{1000} \text{ [l/min]} \right)$

Torque $T = \dfrac{V_g \cdot \Delta p}{24 \cdot \pi \cdot \eta_{mh}}$ [lb-ft] $\left(\dfrac{V_g \cdot \Delta p}{20 \cdot \pi \cdot \eta_{mh}} \text{ [Nm]} \right)$

Power $P = \dfrac{2\pi \cdot T \cdot n}{33000} = \dfrac{q_v \cdot \Delta p}{1714 \cdot \eta_t}$ [hp] $\left(\dfrac{q_v \cdot \Delta p}{600 \cdot \eta_t} = \dfrac{2\pi \cdot T \cdot n}{60000} \text{ [kW]} \right)$

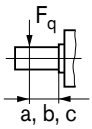
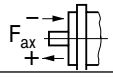
V_g = Displacement per revolution [cm^3]
Δ_p = Differential pressure [bar]
n = Speed [rpm]
η_v = Volumetric efficiency
η_{mh} = Mechanical-hydraulic efficiency
η_t = Total efficiency ($\eta_t = \eta_v \cdot \eta_{mh}$)

Itahydraulic
Power Tecnology

Technical data

Permissible radial and axial loading on drive shaft

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

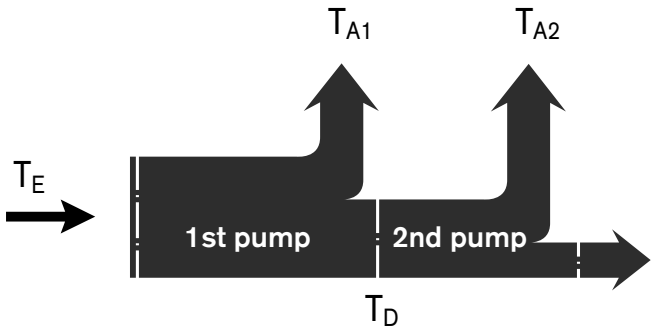
Size			Size	40	60	75	95	130	145	190	260
Radial force, maximum at distance a, b, c (from shaft collar)		$F_{q\ max}$	lbf	809	1124	1416	1798	2472	2472	3805	4946
			N	3600	5000	6300	8000	11000	11000	16925	22000
		a	in	0.69	0.69	0.79	0.79	0.89	0.89	1.02	1.14
			mm	17.5	17.5	20	20	22.5	22.5	26	29
		$F_{q\ max}$	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



Itahydraulic
Power Tecnology

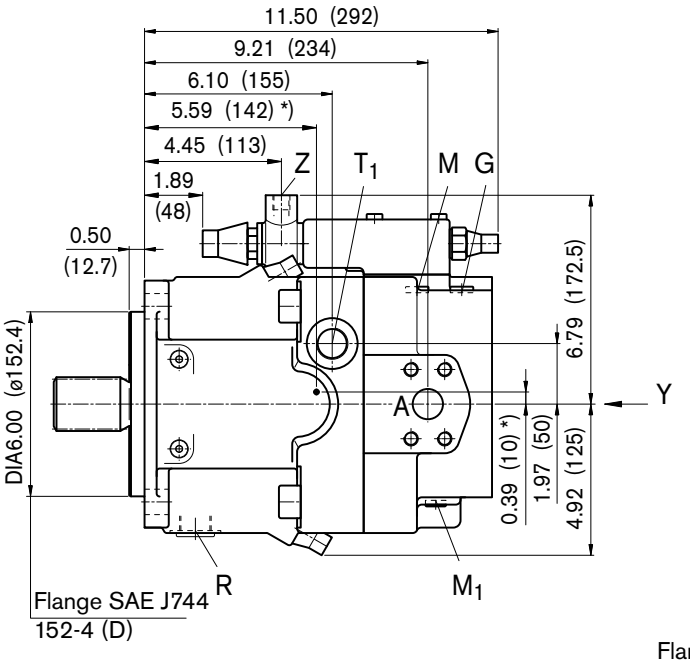
Dimensions size 95

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

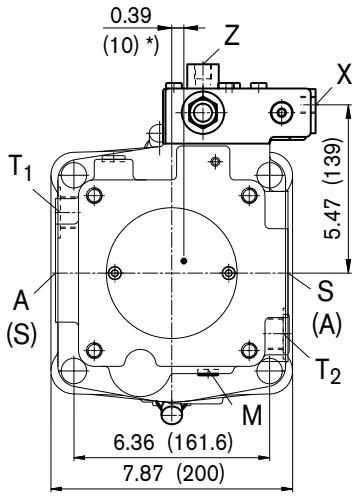
LRDCS

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

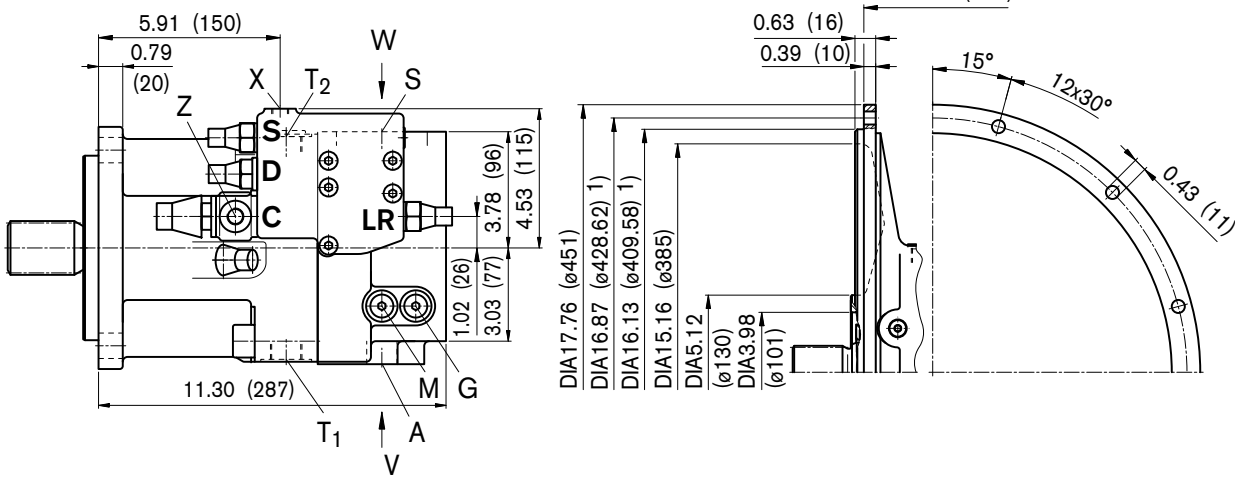
*) Center of gravity



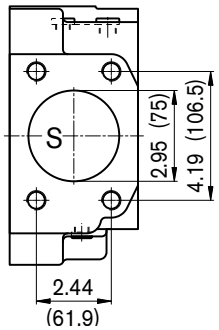
View Y
clockwise rotation
(counter-clockwise
rotation)



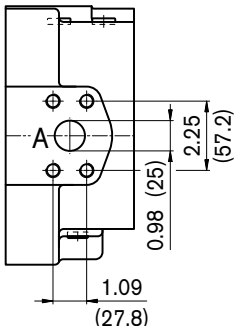
Flange SAE J617
(SAE 3)



Detail W



Detail V



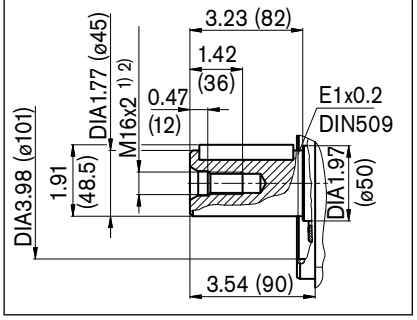
1) Dimensions according to SAE J617-No. 3, for connection to the flywheel case of the combustion engine

Dimensions size 95

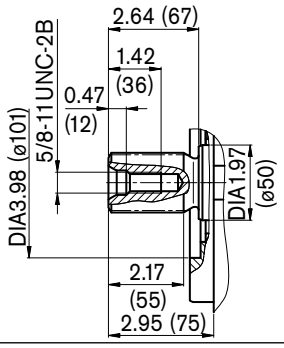
Before finalizing your design,
please request a certified drawing.
Dimensions in inches and (millimeters).

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)

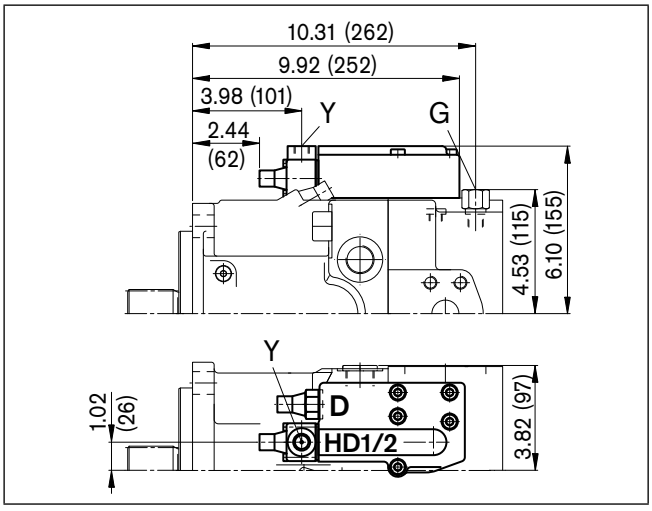
Itahydraulic
Power Tecnology

Dimensions size 95

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

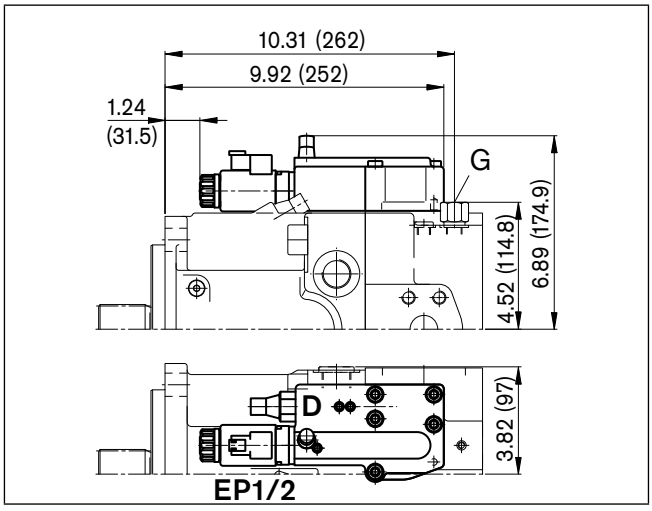
HD1D/HD2D

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



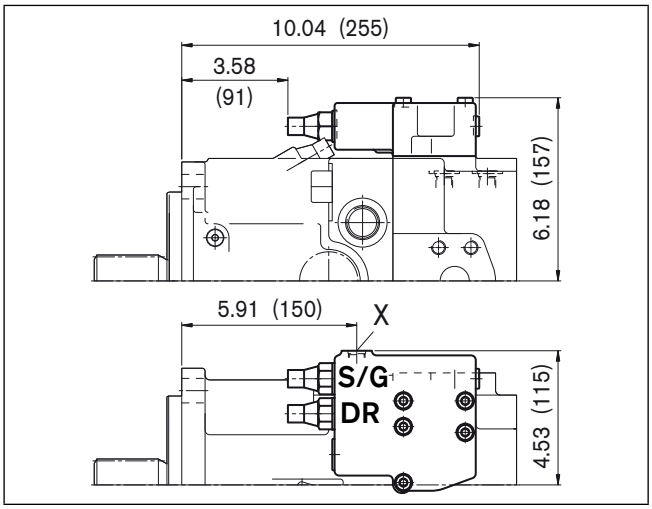
EP1D/EP2D

Electric control with proportional solenoid and
pressure cut-off



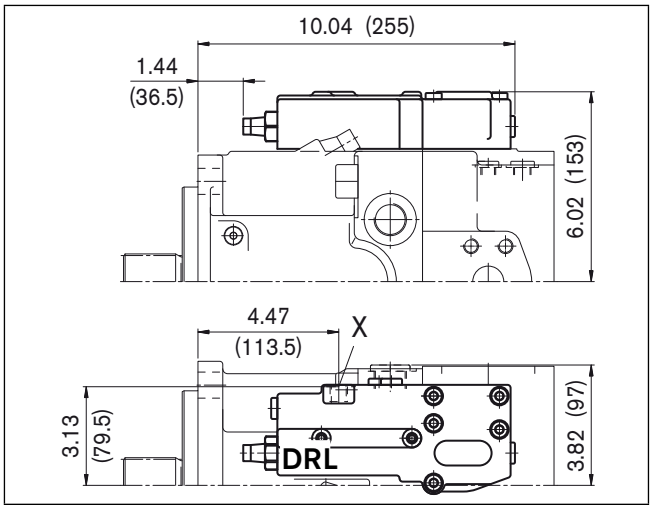
DRS/DRG

Pressure control with load sensing control
Pressure control remote controlled



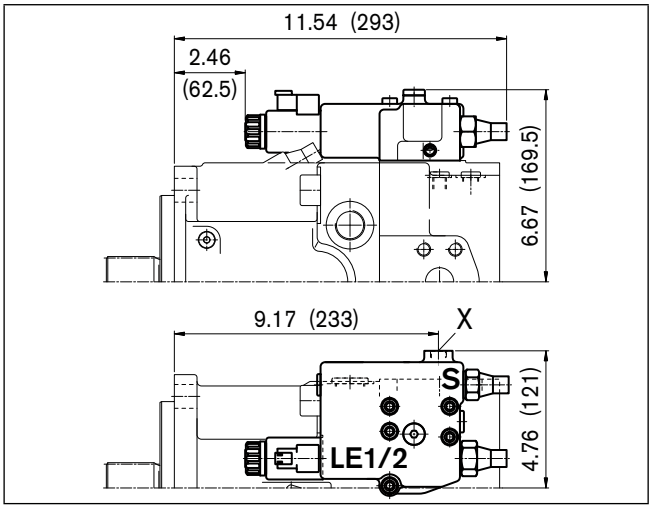
DRL

Pressure control for parallel operation



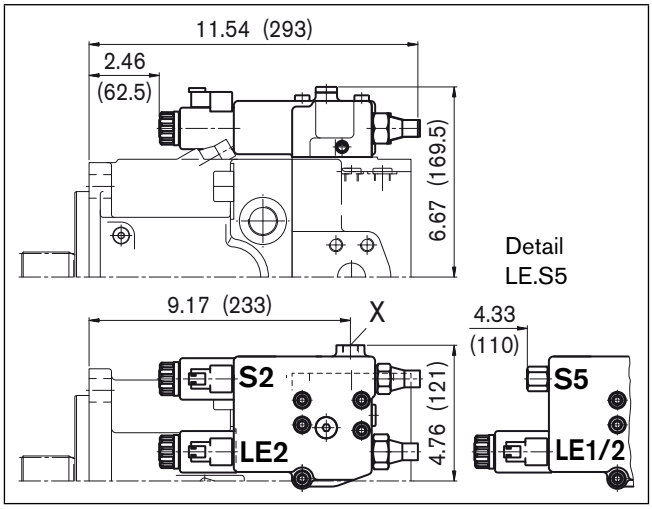
LE1S/LE2S

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



LE2S2/LE1S5/LE2S5

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

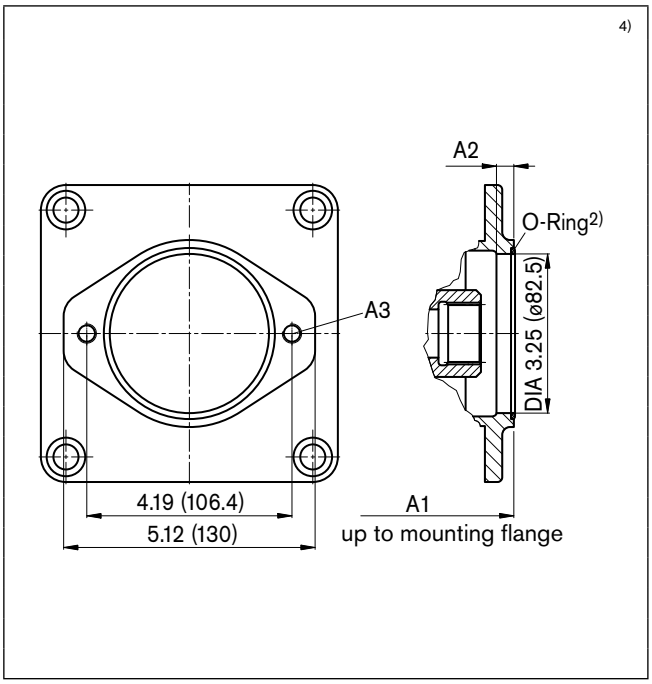


Itahydraulic
Power Tecnology

Through drive dimensions

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

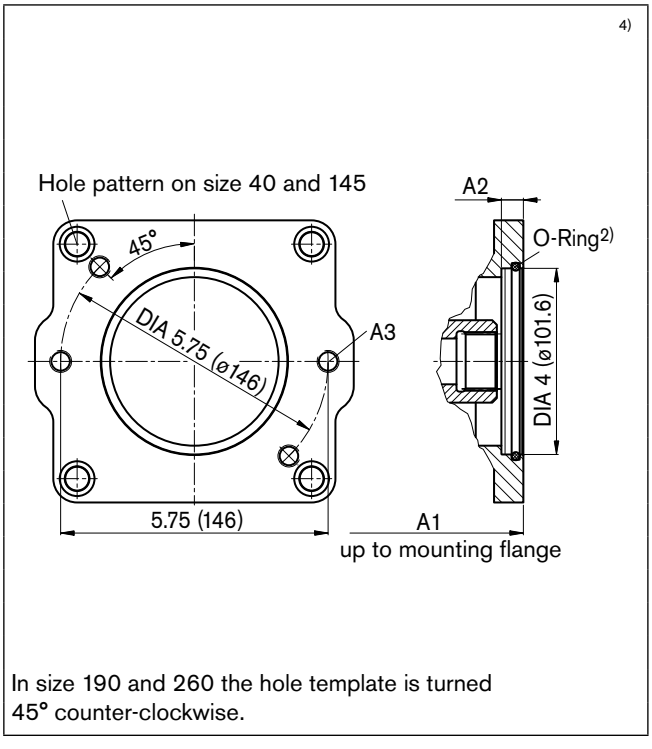
Flange SAE J744 – 82-2 (A) **Coupler** for splined shaft acc. to ANSI B92.1a-1976 5/8 in 9T 16/32 DP[1] (SAE J744 – 16-4 (A) **K01**
3/4 in 11T 16/32 DP[1] (SAE J744 – 19-4 (A-B)) **K52**



Size	A1 K01	A1 K52	A2	A3[3]	deep
40	9.45	9.45	0.32	3/8in-16UNC	0.59
	(240)	(240)	(8)		(15)
60	10.12	10.12			0.59
	(257)	(257)	–		(15)
75	10.83	10.83			0.59
	(275)	(275)	–		(15)
95	12.05	12.05			0.49
	(306)	(306)	–		(12.5)
130/145	12.95	12.95			0.49
	(329)	(329)	–		(12.5)
130/145*	14.29	14.29			0.49
	(363)	(363)	–		(12.5)
190	14.17	14.17			0.51
	(359.8)	(359.8)	–		(13)
190*	15.51	15.51			0.51
	(394)	(394)	–		(13)
260	15.16	15.16			0.51
	(385)	(385)	–		(13)
260*	16.82	16.82			0.51
	(427.3)	(427.3)	–		(13)

*) Version with charge pump

Flange SAE J744 – 101-2 (B) **Coupler** for splined shaft acc. to ANSI B92.1a-1976 7/8 in 13T 16/32 DP[1] (SAE J744 – 22-4 (B)) **K02**
1 in 15T 16/32 DP[1] (SAE J744 – 25-4 (B-B))**K04**



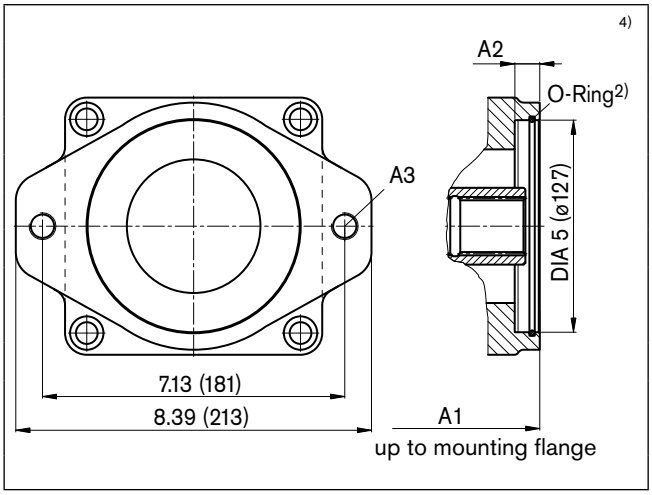
Size	A1 K02	A1 K04	A2	A3[3]	deep
40	9.61	9.61	0.39	1/2in-10UNC	0.75
	(244)	(244)	(10)		(19)
60	10.28	10.28	0.39		0.75
	(261)	(261)	(10)		(19)
75	10.98	10.98	0.39		0.75
	(279)	(279)	(10)		(19)
95	11.93	11.93	0.39		0.63
	(303)	(303)	(10)		(16)
130/145	12.83	12.83	0.39		0.63
	(326)	(326)	(10)		(16)
130/145*	14.17	14.17	0.39		0.63
	(360)	(360)	(10)		(16)
190	14.64	14.56	–		0.59
	371.8	369.8	–		(15)
190*	15.91	15.91	–		0.59
	(404)	(404)	–		(15)
260	15.55	15.55	–		0.59
	(395)	(395)	–		(15)
260*	17.22	17.22	–		0.59
	(437.5)	(437.5)	–		(15)

*) Version with charge pump

Through drive dimensions

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

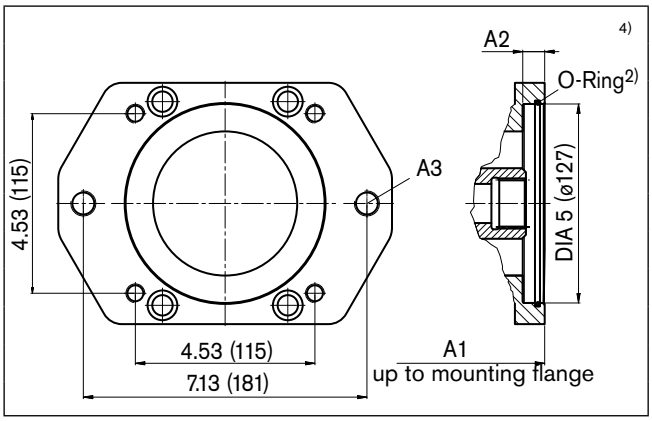
Flange SAE J744 – 127-2 (C) **Coupler** for splined shaft acc. to ANSI B92.1a-1976 1 1/4 in 14T 12/24 DP[1] (SAE J744 – 32-4 (C)) **K07**
1 1/2 in 17T 12/24 DP[1] (SAE J744 – 38-4 (C-C)) **K24**



Size	A1 K07	A1 K24	A2	A3[3]	deep
60	10.71	–	0.51	5/8in-11UNC	0.79
	(272)	–	(13)		(20)
75	11.42	–	0.51		0.79
	(290)	–	(13)		(20)
95	12.52	12.52	0.51		0.79
	(318)	(318)	(13)		(20)
130/145	12.99	12.99	0.51		0.79
	(330)	(330)	(13)		(20)
130/145*	14.33	14.33	0.51		0.79
	(364)	(364)	(13)		(20)

*) Version with charge pump

Flange SAE J744–127-2+4 (A) **Coupler** for splined shaft acc. to ANSI B92.1a-19761 1/4 in 14T 12/24 DP[1] (SAE J744 – 32-4 (C) **K07**
1 1/2 in 17T 12/24 DP[1] (SAE J744 – 38-4 (C-C)) **K24**



Size	A1 K07	A1 K24	A2	A3[3]	deep
190	14.48	14.48	0.51	5/8in-11UNC	0.75
	(367.8)	(367.8)	(13)		(19)
190*	15.75	15.75	0.51		0.75
	(400)	(400)	(13)		(19)
260	15.41	15.41	0.51		0.75
	(391.5)	(391.5)	(13)		(19)
260*	17.07	17.07	0.51		0.75
	(433.5)	(433.5)	(13)		(19)

*) Version with charge pump

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

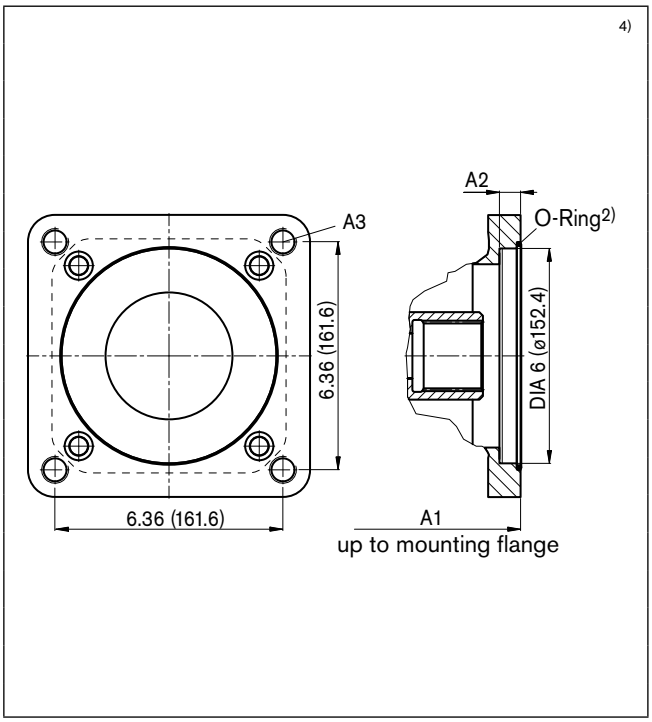
1) 30° pressure angle, flat root, side fit, tolerance class 5
2) O-ring included in the delivery contents
3) ISO 68, for maximum tightening torque, please refer to general notes on page 64
4) See page 59

Itahydraulic
Power Tecnology

Through drive dimensions

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

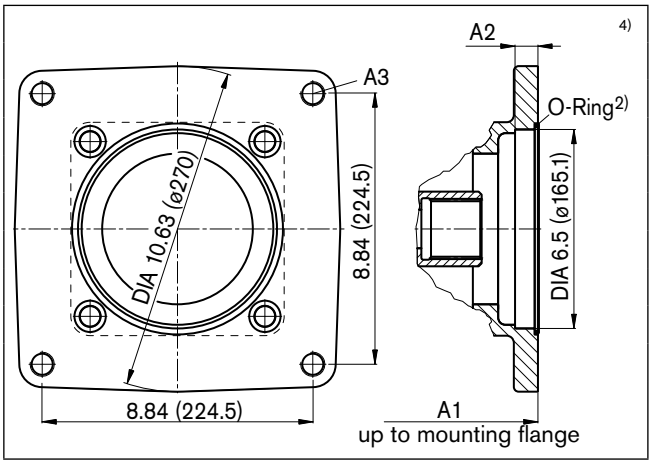
Flange SAE J744 – 152-4 (D) **Coupler** for splined shaft acc. to ANSI B92.1a-1976 1 1/4 in 14T 12/24 DP[1] (SAE J744 – 32-4 (C)) **K86**
1 3/4 in 13T 8/16 DP[1] (SAE J744 – 44-4 (D)) **K17**



Size	A1 K86	A1 K17	A2	A3[3]	deep
75	11.42	–	0.51	3/4in-10UNC	1.10
	(290)	–	(13)		(28)
95	12.48	12.87	1.18		0.98
	(317)	(327)	(30)		(25)
130/145	13.39	13.78	1.18		0.98
	(340)	(350)	(30)		(25)
130/145*	14.72	15.12	1.18		0.98
	(374)	(384)	(30)		(25)
190	15.43	15.43	0.51		0.87
	(392)	(392)	(13)		(22)
190*	16.69	16.69	0.51		0.87
	(424)	(424)	(13)		(22)
260	16.42	16.42	0.51		0.87
	(417)	(417)	(13)		(22)
260*	18.07	18.07	0.51		0.87
	(459)	(459)	(13)		(22)

*) Version with charge pump

Flange SAE J744 – 101-2 (E) **Coupler** for splined shaft acc. to ANSI B92.1a-1976 1 3/4 in 13T 16/32 DP[1] (SAE J744 – 32-4 (C)) **K72**



Size	A1 K72	A2	A3[3]	deep
190	14.83	0.75	3/4in-10UNC	0.79
	(376.8)	(19)		(20)
190*	16.10	0.75		0.79
	(409)	(19)		(20)
260	16.42	0.75		0.79
	(417)	(19)		(20)
260*	18.07	0.75		0.79
	(459)	(19)		(20)

*) Version with charge pump

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

1) 30° pressure angle, flat root, side fit, tolerance class 5
2) O-ring included in the delivery contents
3) ISO 68, for maximum tightening torque, please refer to general notes on page 64
4) See page 59

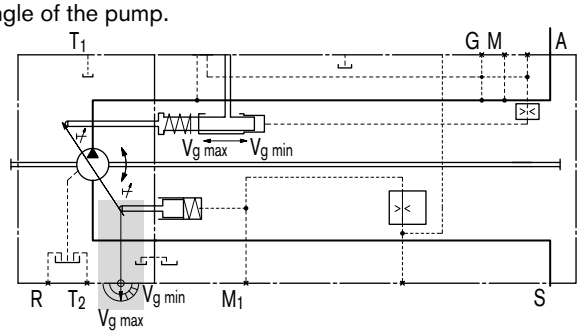
Itahydraulic
Power Tecnology

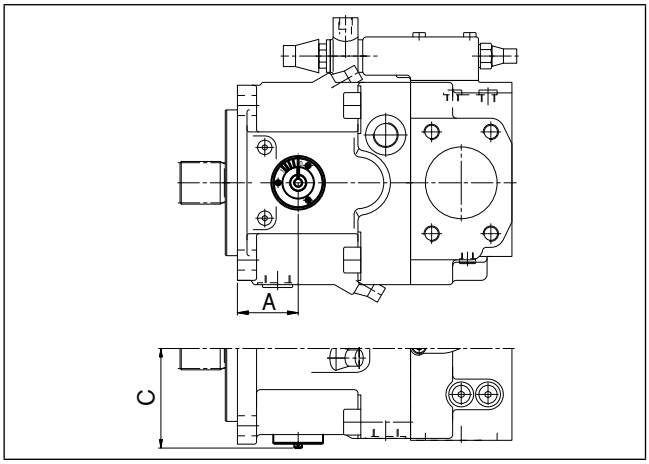
Swivel angle indicator

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

Optical swivel angle indicator, V

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



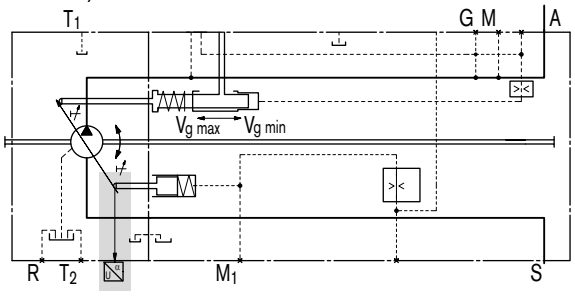


Size	A	C
40	1.99 (50.5)	3.31 (84.0)
60	not available	
75	2.39 (60.7)	3.82 (97.0)
95	2.50 (63.5)	4.09 (104.0)
130	2.79 (70.9)	4.41 (112.0)
190	3.45 (87.6)	4.86 (123.5)
260	3.45 (87.6)	5.39 (137.0)

Electric swivel angle sensor, R

With the electric swivel angle indicator the swivel position of the pump is measured by an electric swivel angle sensor. It has a robust, sealed case 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).



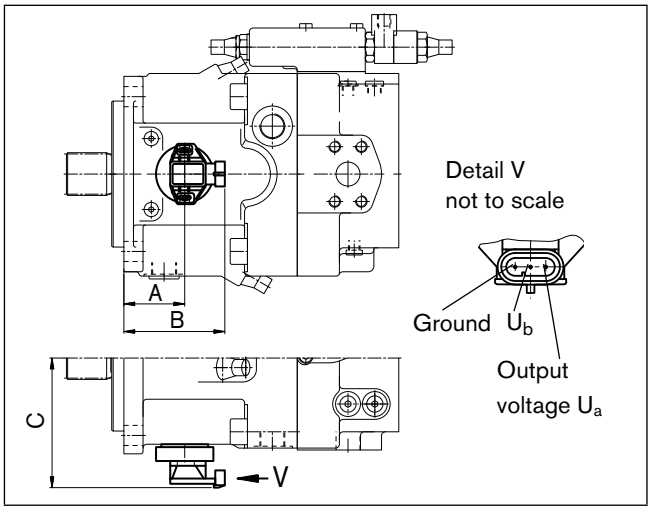
Parameters		
Supply voltage U_b	10...30 V DC	
Output voltage U_a	2.5 V ($V_{g\ min}$)	4.5 V ($V_{g\ max}$)
Reverse-connect protection	Short-circuit-proof	
EMC stability	Details on request	
Operating temperature range	-40 °F to +257 °F (-40 °C to +125 °C)	
Vibration resistance Sinusoidal vibration EN 60068-2-6	10 *g* / 5...2000 Hz	
Shock resistance: Continuous shock IEC 68-2-29	*25 g*	
Resistance to salt spray DIN 50021-SS	96 h	
Type of protection DIN/EN 60529	IP67 and IP69K	
Case material	synthetic material	

Mating connector

AMP Superseal 1.5; 3-pin,
Rexroth mat. no. R902602132

Consisting of:	AMP no.
– 1 female connector case, 3-pin	282087-1
– 3 single wire seals, yellow	281934-2
– 3 female connector contacts 0.07 to 0.13 in (1.8 to 3.3 mm)	283025-1

The mating connector is not included in the delivery contents. This can be delivered by Rexroth on request.



Size	A	B	C
40	1.99 (50.5)	3.48 (88.5)	4.66 (118.3)
60		not available	
75	2.39 (60.7)	3.89 (98.7)	5.17 (131.3)
95	2.50 (63.5)	4.00 (101.5)	5.44 (138.3)
130	2.79 (70.9)	4.29 (108.9)	5.76 (146.3)
190	3.45 (87.6)	4.94 (125.6)	6.21 (157.8)
260	3.45 (87.6)	4.94 (125.6)	6.74 (171.3)

Itahydraulic
Power Tecnology

Connector for solenoids

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

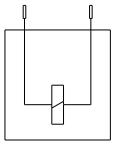
DEUTSCH DT04-2P-EP04, 2-pin

molded, without bidirectional suppressor diode
(standard) _____ **P**

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

Circuit diagram symbol

without bidirectional
suppressor diode

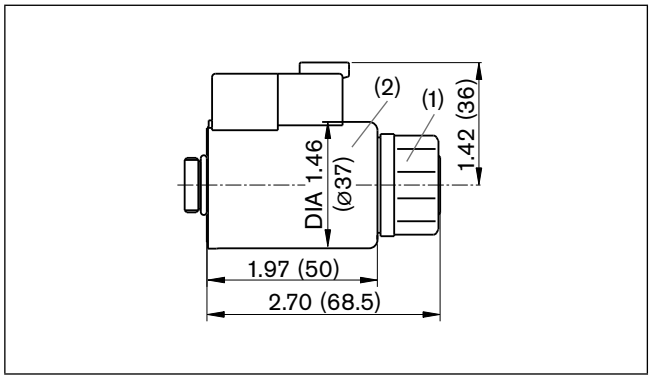


Mating connector

DEUTSCH DT06-2S-EP04
Rexroth mat. no. R902601804

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

The mating connector is not included in the delivery contents.
This can be delivered by Rexroth on request.



Note for round solenoids:

The position of the connector can be changed by turning the solenoid body.

Proceed as follows:

– 1. Loosen fixing nut (1)

– 2. Turn the solenoid body (2) to the desired position.

– 3. Tighten the fixing nut
Tightening torque of fixing nut: $3.69^{+0.74}$ lb-ft (5^{+1} Nm)
(width across the flats WAF 26, 12kt DIN 3124)

Itahydraulic
Power Tecnology

Installation notes

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

General

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

The case drain in the case interior must be directed to the tank via the highest tank port (T_1, T_2). The minimum suction pressure at port S must not fall below 12 psi (0.8 bar) absolute (without charge pump) or 9 psi (0.6 bar) (with charge pump).

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

Installation position

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

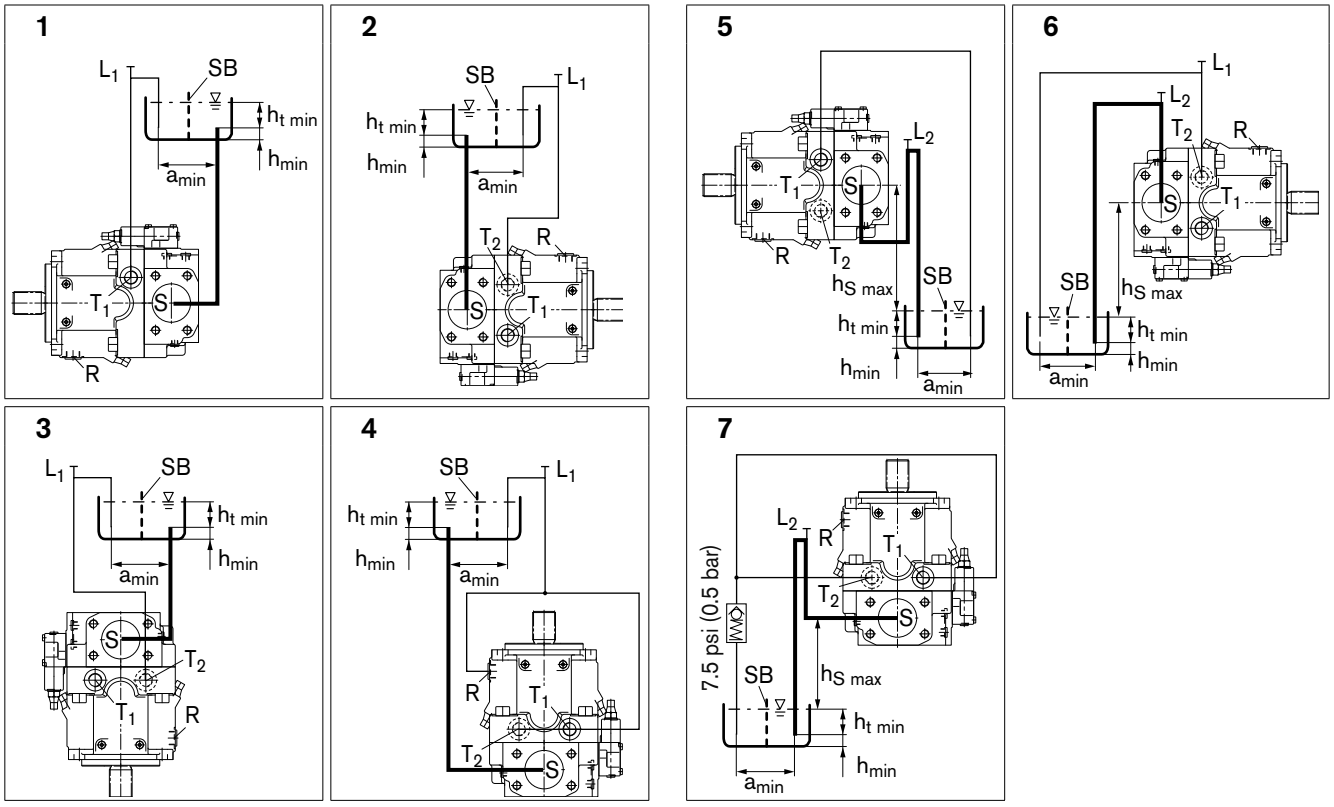
Below-tank installation (standard)
Pump below the minimum fluid level of the tank.

Recommended installation positions: 1 and 2.

Above-tank installation
Pump above the minimum fluid level of the tank.

Observe the maximum permissible suction height $h_{s\ max}$ = 31.50 in (800 mm).

The version AA11VLO (with charge pump) is not designed for installation above the tank.
Recommendation for installation position 7 (shaft up): A check valve in the case drain line (opening pressure 7.5 psi (0.5 bar)) can prevent the case interior from draining.
For control options with pressure control, displacement limiters, HD and EP control, the minimum displacement setting must be $V_g \geq 5\%\ V_{g\ max}$.



$h_{s\ max}$ = 31.50 in (800 mm), $h_{t\ min}$ = 7.87 in (200 mm), h_{min} = 3.94 in (100 mm), SB = Silencer plate (baffle plate)

When designing the tank, ensure adequate space a_{min} between the suction line and the case drain line to prevent the heated, returned fluid from being directly drawn back out.

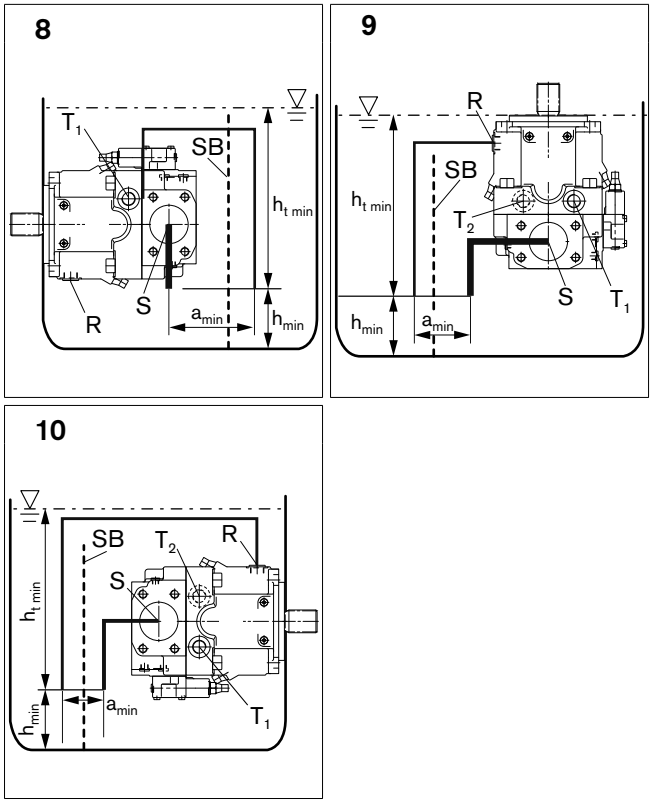
Installation position	Air bleeding	Filling
1	T_1	S + T_1
2	R	S + T_2
3	T_1/T_2	S + T_1/T_2
4	R	S + T_1/T_2

Installation position	Air bleeding	Filling
5	L_1 + L_2	L_2 (S) + L_1 (T_1)
6	R + L_2	L_2 (S) + L_1 (T_2)
7	L_1 + L_2	L_2 (S) + L_1 (T_1/T_2)

Installation Notes

Tank installation

Pump below the minimum fluid level in the tank.



$h_{s\ max}$ = 31.50 in (800 mm), $h_{t\ min}$ = 7.87 in (200 mm), h_{min} = 3.94 in (100 mm), SB = Silencer plate (baffle plate)

When designing the tank, ensure adequate space a_{min} between the suction line and the case drain line to prevent the heated, returned fluid from being directly drawn back out.

Installation position	Air bleeding	Filling
8	T_1	automatically via all open T_1, T_2, R and S ports, though position below the hyraulic fluid level
9	R	
10	R	