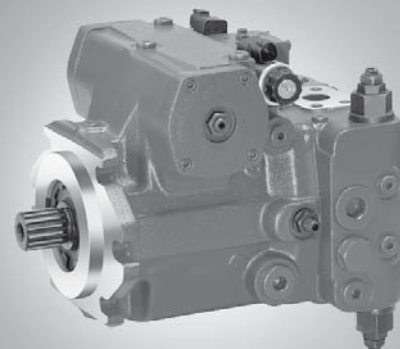


Axial Piston Variable Pump AA4VG

RA 92003-A/06.09 1/64
Replaces: 03.09

Data sheet

Series 32
Size 28 ... 250
Nominal pressure 5800 psi (400 bar)
Peak pressure 6500 psi (450 bar)
Closed circuit



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Features

- Variable axial piston pump of swashplate design for hydrostatic closed circuit transmissions
- Flow is proportional to drive speed and displacement and is infinitely variable
- Output flow increases with the swivel angle of the swashplate from 0 to its maximum value
- Flow direction changes smoothly when the swashplate is moved through the neutral position
- A wide range of highly adaptable control devices is available for different control and regulating functions
- The pump is equipped with two pressure relief valves on the high pressure ports to protect the hydrostatic transmission (pump and motor) from overload
- The high-pressure relief valves also function as boost valves
- The integrated boost pump acts as a feed and control oil pump
- The maximum boost pressure is limited by a built-in boost pressure relief valve
- The integral pressure cut-off is standard

Ordering Code / Standard Program

[illegible]

Axial piston unit

01	Variable swashplate design, nominal pressure 5800 psi (400 bar), peak pressure 6500 psi (450 bar)	AA4V
----	---	------

Operation mode

02	Pump in closed circuit	G
----	------------------------	---

Size

03	$\approx$ Displacement $V_{g \max}$	in ³ /rev.	1.71	2.44	3.42	4.33	5.49	7.63	10.98	15.25
		cm ³ /rev.	28	40	56	71	90	125	180	250

Control device

[illegible]

Pressure cut-off

[illegible]

Neutral position switch (only for HW)

	Neutral position switch (only for HW)	28	40	56	71	90	125	180	250
06	Without neutral position switch (without code)	●	●	●	●	●	●	●	
	With neutral position switch (with DEUTSCH connector)	●	●	●	●	●	●	●	L

Mechanical stroke limiter

	Mechanical stroke limiter	28	40	56	71	90	125	180	250
07	Without mechanical stroke limiter (without code)	●	●	●	●	●	●	●	
	With mechanical stroke limiter, external variable	●	●	●	●	●	●	●	M

Ports X₃, X₄ for positioning pressure

Ports X ₃ , X ₄ for positioning pressure		28	40	56	71	90	125	180	250
08	Without ports X ₃ , X ₄ (without code)	●	●	●	●	●	●	●	
	With ports X ₃ , X ₄	●	●	●	●	●	●	●	T

DA control valve

DA control valve		NV	HD1	HW	DG	DA	EP	EZ	
09	Without DA control valve	●	●	●	●	–	●	●	1
	With DA control valve, fixed setting	–	●	●	●	●	●	–	2
	With DA control valve, mech. <u>clockwise</u>	–	●	●	●	●	●	–	3R
	adjustable with position lever <u>counter-clockwise</u>	–	●	●	●	●	●	–	3L
	With DA control valve, fixed setting and hydraulic inch valve mounted, control with brake fluid according to ISO 4925, no mineral oil	–	–	–	–	●	–	–	4
	With DA control valve, fixed setting and ports for pilot control device	–	●	●	●	●	●	–	7
	With DA control valve, fixed setting and hydraulic inch valve mounted, control with brake fluid based on mineral oil	–	–	–	–	●	–	–	8

Ordering Code / Standard Program

AA4V	G			D					/ 32		- N												
01	02	03	04	05	06	07	08	09		10	11		12	13	14	15	16	17	18	19	20	21	22

Series

10	Series 3, Index 2	32
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Direction of rotation

11	Viewed from shaft end	clockwise	R
		counter-clockwise	L

Seals

12	NBR (nitrile-caoutchouc), shaft seal ring in FKM (fluor-caoutchouc)	N
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Shaft end (permissible input torque see page 8)

Shaft end (permissible input torque see page 8)			28	40	56	71	90	125	180	250	
13	Splined shaft ANSI B92.1a–1976	for single pump	●	●	●	●	●	●	●	●	S
		for combination pump - 1st pump	– 1)	– 1)	●	●	– 1)	●	●	●	T
		only for combination pump - 2nd pump	–	●	–	–	●	–	–	–	U

Mounting flange

Mounting flange		28	40	56	71	90	125	180	250
14	SAE J744 – 2-bolt	●	●	●	–	–	–	–	C
	SAE J744 – 4-bolt	–	–	–	–	–	–	●	D
	SAE J744 – 2+4-bolt	–	–	–	●	●	●	–	F

Service line ports (UN fixing thread)

Service line ports (UN fixing thread)				28	40...180	250	
15	SAE flange ports		suction port S bottom	—	●	—	52
	A/B top and bottom		suction port S at top	—	○	—	53
	SAE flange ports	right	suction port S bottom	●	—	●	60
	A/B same side	left	suction port S at top	○	—	○	63

Boost pump

[illegible]

Through drive (mounting options, see page 53)

17	Flange SAE J744 ²⁾		Hub for splined shaft		28	40	56	71	90	125	180	250
	82-2 (A)	5/8 in 9T 16/32DP ³⁾	●	●	●	●	●	●	●	●	●	.01
	101-2 (B)	7/8 in 13T 16/32DP ³⁾	●	●	●	●	●	●	●	●	●	.02
		1 in 15T 16/32DP ³⁾	●	●	●	●	●	●	●	●	●	.04
	127-2 (C)	1 in 15T 16/32DP ³⁾	—	●	—	—	—	—	—	—	—	.09
		1 1/4 in 14T 12/24DP ³⁾	—	—	●	●	●	●	●	●	●	.07
	152-2/4 (D)	1 1/4 in 14T 12/24DP ³⁾	—	—	—	—	●	—	—	—	—	.90
		1 3/4 in 13T 8/16DP ³⁾	—	—	—	—	—	●	●	●	●	.69
	165-4 (E)	1 3/4 in 13T 8/16DP ³⁾	—	—	—	—	—	—	—	●	●	.72

Ordering Code / Standard Program

AA4V	G			D					/	32		-	N																	
01	02	03	04	05	06	07	08	09		10	11		12	13	14	15	16	17	18	19	20	21	22							

Valves		setting range Δp	28	40	56	71	90	125	180	250
18	With high-pressure relief valve, pilot operated	1450...6100 psi ⁴⁾ with bypass	–	–	–	●	●	●	●	1
	With high-pressure relief valve, direct operated (fixed setting)	3900...6100 psi without bypass	●	●	●	–	–	–	–	3
		(270...420 bar) with bypass	●	●	●	–	–	–	–	5
		1450...3600 psi without bypass	●	●	●	–	–	–	–	4
		(100...250 bar) with bypass	●	●	●	–	–	–	–	6

[illegible]

Swivel angle indicator		28	40	56	71	90	125	180	250
20	Without swivel angle indicator (without code)	●	●	●	●	●	●	●	
	Electrical swivel angle sensor	●	●	●	●	●	●	●	R

[illegible]

Standard / special version ⁵⁾			
22	Standard version	without code	
		combined with attachment part or attachment pump	-K
	Special version		-S
		combined with attachment part or attachment pump	-SK

1) Standard for combination pump – 1st pump: shaft **S**

²⁾ 2 = 2-bolt; 4 = 4-bolt

³⁾ Hub for splined shaft acc. to ANSI B92.1a-1976 (splined shaft assigned acc. to SAE J744, see page 50-52)

4) (100...420 bar)

⁵⁾ Adjustment data are included in the material number

● = 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 application conditions.

The variable pump AA4VG is unsuitable for operation 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, please indicate the used hydraulic fluid.

Operating viscosity range

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

$$v_{\text{opt}} = \text{opt. operating viscosity } 80 \dots 170 \text{ SUS } (16 \dots 36 \text{ mm}^2/\text{s})$$

depending on the circuit temperature (closed circuit).

Limits of viscosity range

The limiting values for viscosity are as follows:

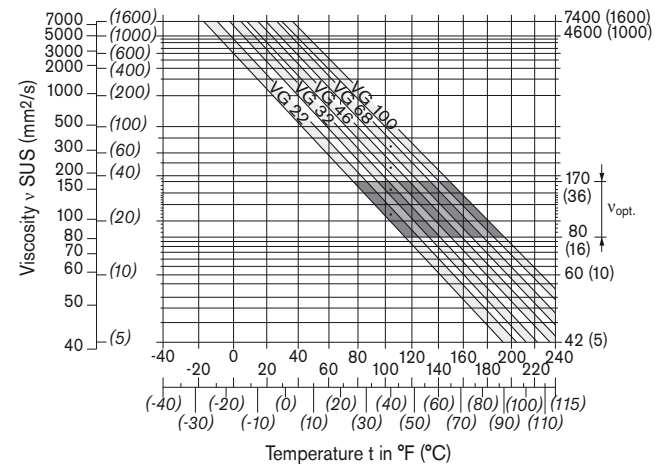
- $v_{\text{min}} = 42 \text{ SUS } (5 \text{ mm}^2/\text{s})$
 short term ($t < 3 \text{ min}$)
 at max. perm. temperature of $t_{\text{max}} = +240 \text{ }^\circ\text{F } (+115 \text{ }^\circ\text{C})$
- $v_{\text{max}} = 7400 \text{ SUS } (1600 \text{ mm}^2/\text{s})$
 short term ($t < 3 \text{ min}$)
 at cold start ($p \leq 435 \text{ psi } / 30 \text{ bar}$, $n \leq 1000 \text{ rpm}$,
 $t_{\text{min}} = -40 \text{ }^\circ\text{F } / -40 \text{ }^\circ\text{C}$).
 Only for starting up without load. Optimum operating viscosity must be reached within approx. 15 minutes.

Note that the maximum hydraulic fluid temperature of $240 \text{ }^\circ\text{F } (115 \text{ }^\circ\text{C})$ 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 $9 \text{ }^\circ\text{F } (5 \text{ K})$ higher than the average case drain temperature.

Special measures are necessary in the temperature range from $-40 \text{ }^\circ\text{F}$ to $-13 \text{ }^\circ\text{F } (-40 \text{ }^\circ\text{C}$ to $-25 \text{ }^\circ\text{C})$ (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 a closed circuit the circuit temperature.

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

Example: At an ambient temperature of $X \text{ }^\circ\text{F } (X \text{ }^\circ\text{C})$ an operating temperature of $140 \text{ }^\circ\text{F } (60 \text{ }^\circ\text{C})$ is set in the circuit. In the optimum operating viscosity range (v_{opt} ; shaded area) this corresponds to the viscosity classes VG 46 or VG 68; to be selected: VG 68.

Please note: The case drain temperature, which is affected by pressure and speed, is always higher than the circuit temperature. At no point in the system may the temperature be higher than $240 \text{ }^\circ\text{F } (115 \text{ }^\circ\text{C})$.

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

Technical Data

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 cleanliness level of at least

20/18/15 according to ISO 4406.

Depending on the system and the application, for the AA4VG, we recommend

Filter elements $\beta_{20} \geq 100$

With a rising differential pressure at the filter elements, the β -value must not deteriorate.

At very high hydraulic fluid temperatures (195 °F to max. 240 °F / 90 °C to max. 115 °C) at least cleanliness level

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

If the above classes cannot be observed, please contact us. For notes on filtration types, see pages 55-58

Operating pressure range

Input

Variable pump (with external supply, E):

For control EP, EZ, HW and HD
boost pressure (at $n = 2000$ rpm) p_{Sp} _____ 290 psi (20 bar)

For control DA, DG
boost pressure (at $n = 2000$ rpm) p_{Sp} _____ 365 psi (25 bar)

Boost pump:

suction pressure $p_{\sigma_{UV}}$ ($v \leq 30$ mm²/s) _____ ≥ 12 psi a (0.8 bar abs.)
at cold starts, short term ($t < 3$ min) _____ ≥ 7.5 psi a (0.5 bar abs.)

Output

Variable pump:

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

Nominal pressure p_N _____ 5800 psi (400 bar)

Peak pressure p_{max} _____ 6500 psi (450 bar)

Boost pump:

peak pressure $p_{Sp max}$ _____ 580 psi (40 bar)

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

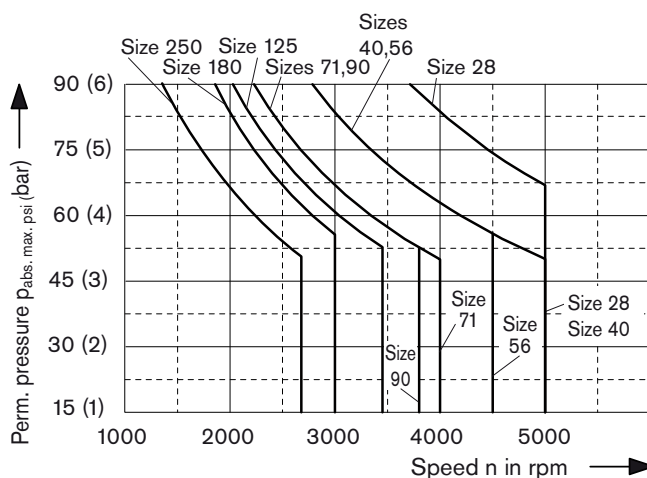
Peak pressure: Max. operating pressure which is permissible for short term ($t < 1$ s).

Shaft seal ring

Permissible pressure loading

The service life of the shaft seal ring is affected by the speed of the pump and the case drain pressure. It is recommended that the average, continuous case drain pressure at operating temperature 45 psi (3 bar) absolute not be exceeded (max. permissible case drain pressure 90 psi (6 bar) absolute at reduced speed, see diagram). Short term ($t < 0.1$ s) pressure spikes of up to 145 psi (10 bar) absolute are permitted. The service life of the shaft seal ring decreases with an increase in the frequency of pressure spikes.

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



Temperature range

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

Note:

For application cases below -13 °F (-25 °C), an NBR shaft seal ring is necessary (permissible temperature range: -40 °F to +195 °F / -40 °C to +90 °C). Please state NBR shaft seal ring in plain text when ordering. Please contact us.

Technical Data

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

Size			28	40	56	71	90	125	180	250
Displacement	$V_{g \text{ max}}$	in ³	1.71	2.44	3.42	4.33	5.49	7.63	10.98	15.25
variable pump		cm ³	28	40	56	71	90	125	180	250
boost pump (at p = 290 psi / 20 bar)	$V_{g \text{ Sp}}$	in ³	0.37	0.52	0.71	1.20	1.20	1.73	2.43	3.20
		cm ³	6.1	8.6	11.6	19.6	19.6	28.3	39.8	52.5
Speed										
maximum at $V_{g \text{ max}}$	$n_{\text{max continuous}}$	rpm	4250	4000	3600	3300	3050	2850	2500	2400
limited maximum ¹⁾	$n_{\text{max limited}}$	rpm	4500	4200	3900	3600	3300	3250	2900	2600
intermittent maximum ²⁾	$n_{\text{max interm.}}$	rpm	5000	5000	4500	4100	3800	3450	3000	2700
minimum	n_{min}	rpm	500	500	500	500	500	500	500	500
Flow	$q_{v \text{ max}}$	gpm	31.5	42.3	53.4	61.8	72.5	94.1	118.8	158.4
at $n_{\text{max continuous}}$ and $V_{g \text{ max}}$		l/min	119	160	202	234	275	356	450	600
Power ³⁾	$\Delta p = 5800 \text{ psi}$	P_{max}	hp	106	144	180	209	245	318	402
at $n_{\text{max continuous}}$ and $V_{g \text{ max}}$	$\Delta p = 400 \text{ bar}$		kW	79	107	134	156	183	237	300
Torque ³⁾	$\Delta p = 5800 \text{ psi}$	T_{max}	lb-ft	131	187	263	333	422	587	844
at $V_{g \text{ max}}$	$\Delta p = 400 \text{ bar}$		Nm	178	255	356	451	572	795	1144
	$\Delta p = 1450 \text{ psi}$	T	lb-ft	22.7	32.4	45.4	57.4	72.8	101.2	145.6
	$\Delta p = 100 \text{ bar}$		Nm	44.5	63.5	89	112.8	143	198.8	286
Rotary stiffness	shaft end S	c	lb-ft/rad	23159	50892	59595	72871	116609	161010	180334
			Nm/rad	31400	69000	80800	98800	158100	218300	244500
	shaft end T	c	lb-ft/rad	–	–	70068	89171	–	185939	234840
			Nm/rad	–	–	95000	120900	–	252100	318400
	shaft end U	c	lb-ft/rad	–	37468	–	–	79362	–	–
			Nm/rad	–	50800	–	–	107600	–	–
Moment of inertia for rotary group	J_{GR}	lbs-ft ²	0.0522	0.0902	0.1566	0.2302	0.3536	0.5505	1.0536	2.3327
		kgm ²	0.0022	0.0038	0.0066	0.0097	0.0149	0.0232	0.0444	0.0983
Angular acceleration max. ⁴⁾	α	rad/s ²	38000	30000	24000	21000	18000	14000	11000	6700
Filling capacity	V	gal	0.24	0.29	0.40	0.34	0.40	0.55	0.82	1.66
		L	0.9	1.1	1.5	1.3	1.5	2.1	3.1	6.3
Weight approx. (without through drive)	m	lbs	64	68	84	110	145	176	223	344
		kg	29	31	38	50	60	80	101	156

¹⁾ Restricted maximum speed: – at half corner power (e.g. at $V_{g \max}$ and $p_N / 2$)

²⁾ Intermittent maximum speed: – at high idle speed
– at overspeed: $\Delta p = 70 \dots 150 \text{ bar}$ and $V_{g \max}$
– at reversing peaks: $\Delta p < 300 \text{ bar}$ and $t < 0.1 \text{ s}$.

³⁾ Without boost pump

⁴⁾ – The area of validity is situated between the minimum required and maximum permissible speed.
It applies for external stimuli (e.g. engine 2-8 times rotary frequency, cardan shaft twice the rotary frequency).

– The limit value applies for a single pump only.

– The load capacity of the connection parts has to be considered.

Caution: Exceeding the permissible limit values may result in a loss of function, a reduction in service life or in the destruction of the axial piston unit.

A calculation can be performed to determine the permissible values.

Determining the size

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

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

$$\text{Power } P = \frac{2 \pi \cdot T \cdot n}{33000} = \frac{q_v \cdot \Delta p}{1714 \cdot \eta_t} \quad \text{HP} \quad \left(\frac{q_v \cdot \Delta p}{600 \cdot \eta_t} = \frac{2 \pi \cdot T \cdot n}{60000} \text{ kW} \right)$$

V_g = displacement volume per revolution in in³ (cm³)

Δp = differential pressure in psi (bar)

n = speed in rpm

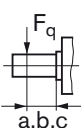
η_v = volumetric efficiency

η_{mh} = mechanical-hydraulic efficiency

η_t = total efficiency

Technical Data

Permissible axial and radial loading on drive shaft

Size			28	40	56	71	90	125	180	250
Radial force, max. at distance (from shaft collar)		$F_{q \max}$ lbf	562	809	1124	1416	1798	2473	3597	4946
		N	2500	3600	5000	6300	8000	11000	16000	22000
		a in	0.69	0.69	0.69	0.79	0.79	0.89	0.98	1.14
		mm	17.5	17.5	17.5	20	20	22.5	25	29
	$F_{q \max}$	lbf	450	650	910	1113	1424	1932	2782	3779
		N	2000	2891	4046	4950	6334	8594	12375	16809
		b in	1.18	1.18	1.18	1.38	1.38	1.57	1.77	1.97
		mm	30	30	30	35	35	40	45	50
	$F_{q \max}$	lbf	382	543	764	917	1178	1585	2282	3057
		N	1700	2416	3398	4077	5242	7051	10150	13600
		c in	1.67	1.67	1.67	1.97	1.97	2.26	2.36	2.80
		mm	42.5	42.5	42.5	50	50	57.5	60	71
Axial force, max.		$-F_{ax \max}$ lbf	350	476	654	953	973	1291	1585	933
		N	1557	2120	2910	4242	4330	5743	7053	4150
		$+F_{ax \max}$ lbf	94	198	335	620	600	867	1112	933
		N	417	880	1490	2758	2670	3857	4947	4150

Note: special requirements apply in the case of belt drives. Please contact us.

Permissible input and through-drive torques

Size			28	40	56	71	90	125	180	250
Torque (at $V_{g \max}$ and $\Delta p = 5800$ psi) ¹⁾ (at $V_{g \max}$ and $\Delta p = 400$ bar) ¹⁾	$T_{\max}$	lb-ft	131	187	263	333	422	587	844	1173
		Nm	178	254	356	451	572	795	1144	1590
Input torque, max. ²⁾ at shaft end S	$T_{E \text{ perm.}}$	lb-ft	232	444	444	444	1210	1210	1210	1210
		Nm	314	602	602	602	1640	1640	1640	1640
ANSI B92.1a-1976 (SAE J744)			1 in	1 1/4 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
at shaft end T	$T_{E \text{ perm.}}$	lb-ft	–	–	715	715	–	1969	3002	3002
		Nm	–	–	970	970	–	2670	4070	4070
ANSI B92.1a-1976 (SAE J744)					1 3/8 in	1 3/8 in	2 in	2 1/4 in	2 1/4 in	
at shaft end U ³⁾	$T_{E \text{ perm.}}$	lb-ft	–	232	–	–	444	–	–	–
		Nm	–	314	–	–	602	–	–	–
ANSI B92.1a-1976 (SAE J744)				1 in			1 1/4 in			
Through-drive torque, max. ⁴⁾	$T_{D \text{ perm.}}$	lb-ft	170	232	384	487	606	819	1298	1645
		Nm	231	314	521	660	822	1110	1760	2230

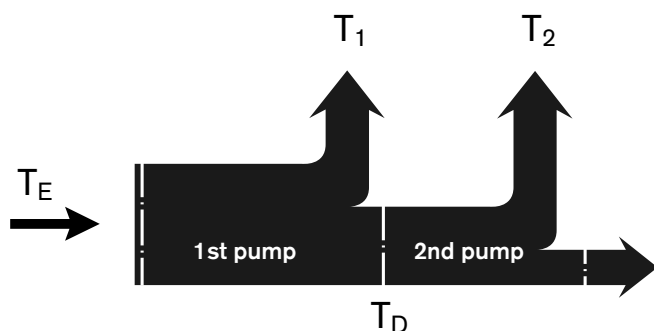
¹⁾ Efficiency not considered

²⁾ For drive shafts with no radial force

³⁾ Shaft "U" is only permitted as a shaft end on the **2nd pump** in a combination pump of the same size.

⁴⁾ Note max. input torque for **shaft S**!

Torque distribution



High-Pressure Relief Valves

Setting ranges

High-pressure relief valve, direct operated (size 28...56)	Differential pressure setting Δp_{HD}
Setting range for valve 3, 5 Δp 3900 - 6100 psi (Δp 270 - 420 bar) (refer to ordering code)	6100 psi (420 bar) 5800 psi (400 bar) ¹⁾ 5200 psi (360 bar) 4950 psi (340 bar) 4650 psi (320 bar) 4350 psi (300 bar) 3900 psi (270 bar)
Setting range for valve 4, 6 Δp 1450 - 3600 psi (Δp 100 - 250 bar) (refer to ordering code)	3600 psi (250 bar) 3350 psi (230 bar) ¹⁾ 2900 psi (200 bar) 2200 psi (150 bar) 1450 psi (100 bar)
High-pressure relief valve, pilot operated (size 71...250)	Differential pressure setting Δp_{HD}
Setting range for valve 1 Δp 1450 - 6100 psi (Δp 100 - 420 bar) (refer to ordering code)	6100 psi (420 bar) 5800 psi (400 bar) ¹⁾ 5200 psi (360 bar) 4950 psi (340 bar) 4650 psi (320 bar) 4350 psi (300 bar) 3900 psi (270 bar) 3600 psi (250 bar) 3350 psi (230 bar) 2900 psi (200 bar) 2200 psi (150 bar) 1450 psi (100 bar)

¹⁾ Standard differential pressure setting. The valves will be set to this value if the differential pressure is not specified on ordering.

Please state in plain text when ordering:

(only the Δp_{HD} values shown in the table are possible)

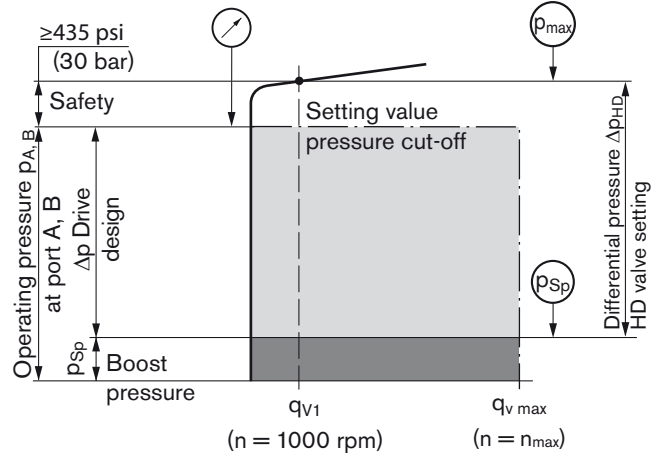
High-pressure relief valve A

Differential pressure setting : $\Delta p_{HD} = \dots$ psi (bar)
opening pressure of the HD valve (at q_{V1}): $p_{max} = \dots$ psi (bar)
($p_{max} = \Delta p_{HD} + p_{Sp}$)

High-pressure relief valve B

Differential pressure setting : $\Delta p_{HD} = \dots$ psi (bar)
opening pressure of the HD valve (at q_{V1}): $p_{max} = \dots$ psi (bar)
($p_{max} = \Delta p_{HD} + p_{Sp}$)

Setting diagram



Note: valve is set at
 $n = 1000$ rpm and $V_{g max} (q_{V1})$

Example: boost pressure 435 psi (30 bar);
operating pressure 5800 psi (400 bar)

Operating pres. $p_{A,B}$ - boost pres. p_{Sp} + safety = differential pres. Δp_{HD}
5800 psi - 435 psi + 435 psi = **5800 psi**
(400 bar - 30 bar + 30 bar = **400 bar**)

Bypass function

The bypass function can only be used for short periods with reduced displacement, e.g. to tow a vehicle out of an immediate danger zone.

Note:

The bypass function and the pilot operated high-pressure valves (size 71...250) are not shown in these circuit diagrams.

Pressure Cut-Off, D

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

This valve prevents the operation of the high-pressure relief valves when accelerating or decelerating.

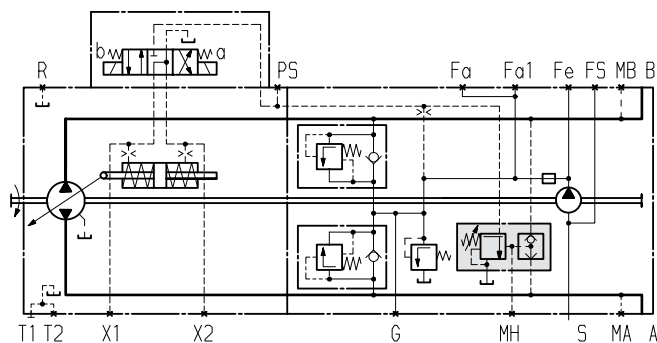
Both the pressure peaks occurring when the swashplate is swiveled rapidly and also the maximum pressure in the system are safeguarded by the high-pressure relief valves.

The setting range of the pressure cut-off may be anywhere within the entire operating pressure range. However, it must be set 435 psi (30 bar) lower than the setting of the high-pressure relief valves (see setting diagram, page 9).

Please state the setting value of the pressure cut-off in plain text when ordering.

Circuit diagram with pressure cut-off.

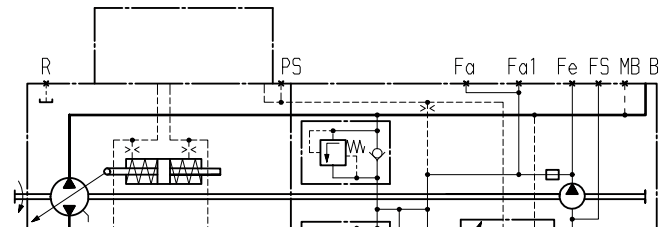
Example: Electric two-point control, EZ1D/EZ2D



NV - Version Without Control Unit

The mounting surface for the control unit is machined and is sealed with the standard seal for control units and a cover plate. This version is ready for retrofitting to control units (HD, HW, EP, EZ). When used directly for "DA" control and in combinations with "DA" control, the appropriate adjustments must be made to the spring assembly of the adjusting cylinder and control plate.

Standard version ¹⁾



¹⁾ Size 28 and 250 without port F_{a1} and F_S

DG - Hydraulic Control, Direct Operated

With the direct operated hydraulic control (DG), pump displacement is controlled by a hydraulic pilot pressure applied directly to the stroking piston through either the X_1 or X_2 port.

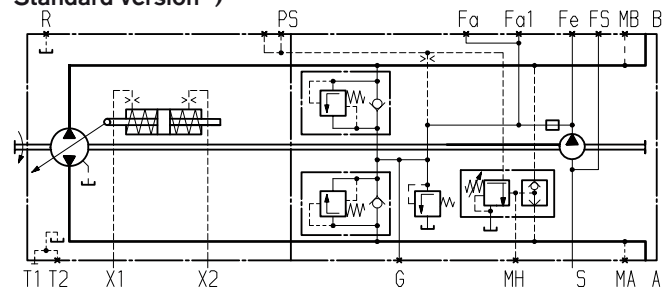
Flow direction is determined by which pilot port is pressurized (please refer to the data table at the top of page 12; control pressure column- X_1 ; X_2).

Pump displacement is infinitely variable and proportional to the applied pilot pressure, but is also influenced by system pressure and pump drive speed.

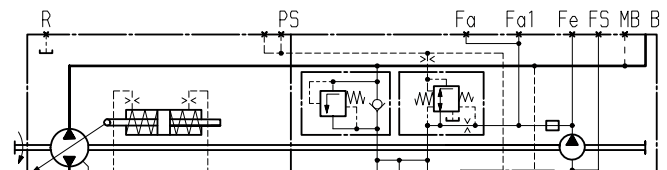
The P_s port must be used as the pilot pressure source for the selected control device, to enable the function of the built-in pressure cut-off valve. Please refer to page 10 for a description of the pressure cut-off function.

Application of the DG Control requires a review of the engine and vehicle parameters to ensure that the pump is set up correctly. All DG applications must be reviewed by a Rexroth Application Engineer.

Standard version ¹⁾



Version with DA control valve ¹⁾



¹⁾ Size 28 and 250 without port F_{a1} and F_S

EZ - Electric Two-Point Control, With Switching Solenoid

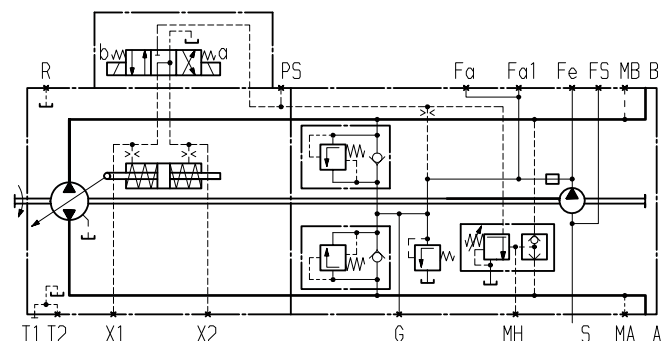
By energizing or de-energizing a control current to either switching solenoid a or b, the stroke cylinders of the pump are supplied with control pressure by the EZ control unit. In this way, the swashplate and thus the displacement is switchable without intermediate settings from $V_g = 0$ to $V_{g \max}$. Each direction of through put flow is assigned to a solenoid.

Solenoid technical data	EZ1	EZ2
Voltage	12 V DC ($\pm 20\%$)	24 V DC ($\pm 20\%$)
Neutral position $V_g = 0$	de-energized	de-energized
Position $V_{g \max}$	current energized	current energized
Nominal resistance (at 68°F /20°C)	5.5 Ω	21.7 Ω
Nominal power	26.2 W	26.5 W
Current required, minimum effective	1.32 A	0.67 A
Actuated time	100 %	100 %
Type of protection	see range of connectors on page 60	

Standard: switching solenoid without manual emergency operation.
On request: manual emergency operation with spring reset available.

Assignment direction of rotation - Control - Direction of through put flow DA control see page 16.

Standard version ¹⁾



¹⁾ Size 28 and 250 without port F_{a1} and F_S

HD - Hydraulic Control, Pilot-Pressure Related

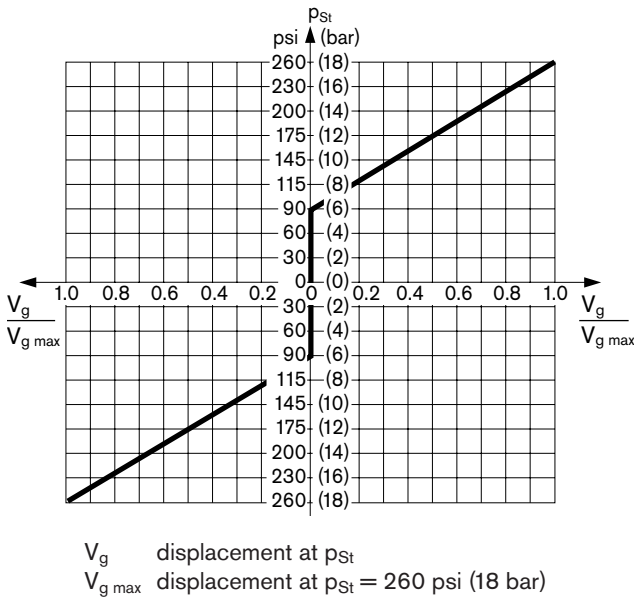
The flow output of the pump is infinitely varied between 0 and 100%, proportional to the difference in pilot pressure applied to the two control ports (Y_1 and Y_2).

The pilot signal, which originates from an external, remote source, is pressure only. Flow is negligible as the pilot signal is only acting on the spool of the control valve.

This spool then directs control oil into and out of the stroking cylinder to adjust pump displacement as required.

A feedback lever, connected to the stroking piston, maintains the pump flow for any given pilot signal.

If the pump is also equipped with a DA control valve (see page 17), automotive operation is possible for travel drives.



Pilot pressure $p_{St} = 90 - 260\ \text{psi (6 - 18 bar)}$ at ports Y_1, Y_2

Start of control 90 psi (6 bar)

End of control 260 psi (18 bar) (max. displacement $V_{g\ max}$)

Please note:

The external control device must vent the Y_1 and Y_2 ports to tank pressure in neutral

Note

The spring return feature in the control unit is not a safety device

The spool valve inside the control unit can get stuck in an undefined position by internal contamination (contaminated hydraulic fluid, abrasion or residual contamination from system components). As a result, the axial piston unit can no longer supply the flow specified by the operator.

Check whether your application requires that remedial measures be taken on your machine in order to bring the driven consumer into a safe position (e.g. immediate stop).

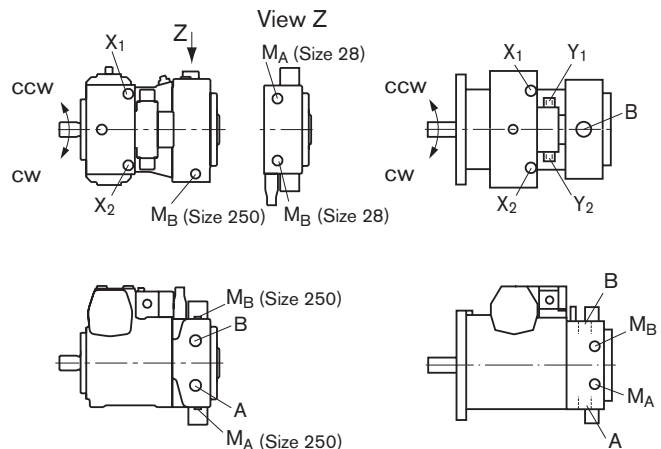
Assignment

Direction of rotation - Control - Direction of through put flow

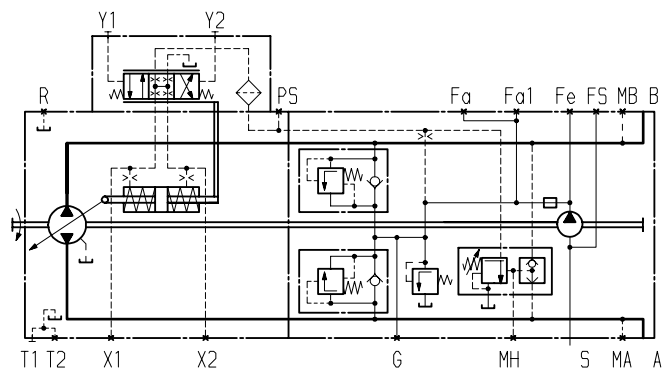
	Size	Pilot pressure	Control pressure	Through put flow	Operating pressure
Direction of rotation cw	28...56	Y_1	X_1	A to B	M_B
		Y_2	X_2	B to A	M_A
	71...250	Y_1	X_1	B to A	M_A
		Y_2	X_2	A to B	M_B
Direction of rotation ccw	28...56	Y_1	X_1	B to A	M_A
		Y_2	X_2	A to B	M_B
	71...250	Y_1	X_1	A to B	M_B
		Y_2	X_2	B to A	M_A

Sizes 28, 250

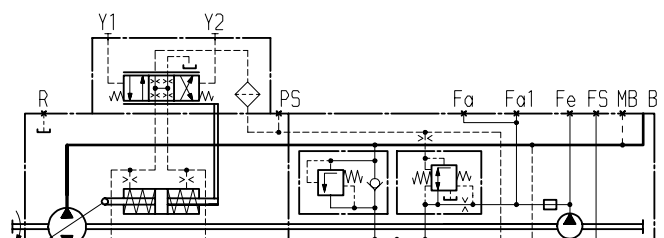
Sizes 40...180



Standard version¹⁾



Version with DA control valve¹⁾



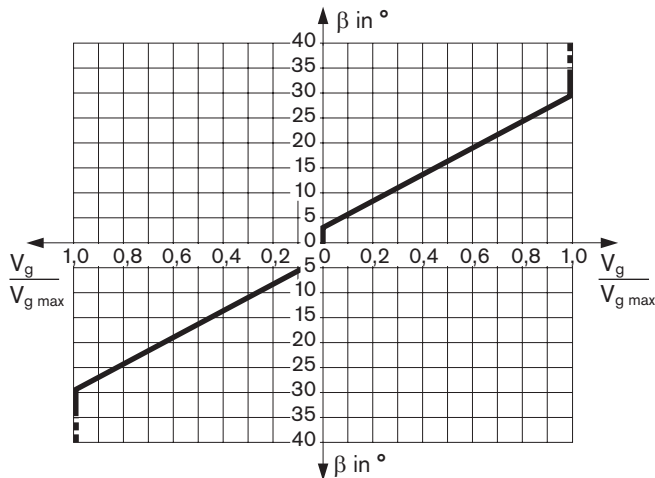
¹⁾ Size 28 and 250 without port F_{a1} and F_S

HW - Hydraulic Control, Mechanical Servo

The flow output of the pump is infinitely varied in the range of 0 to 100%, proportional to the rotation of the control lever between 0° and ±29° from the spring centered zero flow position.

A feedback lever, connected to the stroking piston, maintains the pump flow for any given position of the control lever between 0° and 29°.

If the pump is also equipped with a DA control valve (see page 17), automotive operation is possible for travel drives.



Swivel angle β at the control lever for deflection:

Start of control at $\beta = 3^\circ$

End of control at $\beta = 29^\circ$ (max. displacement $V_{g \max}$)

Mech. stop: sizes 28...71 $\pm 40^\circ$
sizes 90...250 $\pm 35^\circ$

The maximum required torque at the lever is 15 lb-in (170 Ncm). To prevent damage to the HW control module a positive mechanical stop must be provided for the HW control linkage.

Note:

Spring centering enables the pump to move automatically into neutral position ($V_g = 0$) as soon as there is no longer any torque on the control lever of the HW control unit (regardless of deflection angle).

Variation: Neutral position switch, L

The switch contact in the neutral position switch is closed when the control lever on the HW control unit is in its neutral position. The switch opens if the control lever is moved out of neutral in either direction.

The neutral position switch provides a safety function for drive units that require zero flow under certain operating conditions (e.g. starting diesel engines).

Technical data of neutral position switch

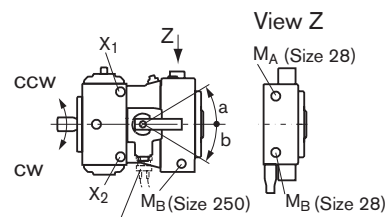
Load capacity	20 A (continuous), without switching operating
Switching capacity	15 A / 32 V (ohm's load)
	4 A / 32 V (inductive load)
Connector version	DEUTSCH connector DT04-2P-EP04 (mating connector see page 60)

Assignment

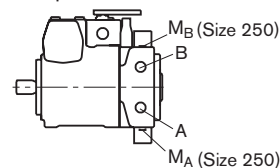
Direction of rotation - Control - Direction of through put flow

	Size	Lever direction	Control pressure	Through put flow	Operating pressure
Direction of rotation cw	28...56	a	X_2	B to A	M_A
		b	X_1	A to B	M_B
	71...250	a	X_2	A to B	M_B
		b	X_1	B to A	M_A
Direction of rotation ccw	28...56	a	X_2	A to B	M_B
		b	X_1	B to A	M_A
	71...250	a	X_2	B to A	M_A
		b	X_1	A to B	M_B

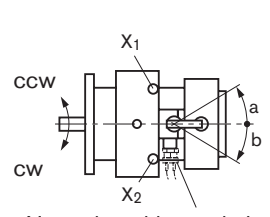
Sizes 28, 250



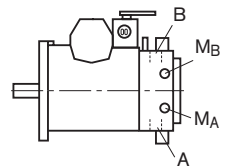
Neutral position switch



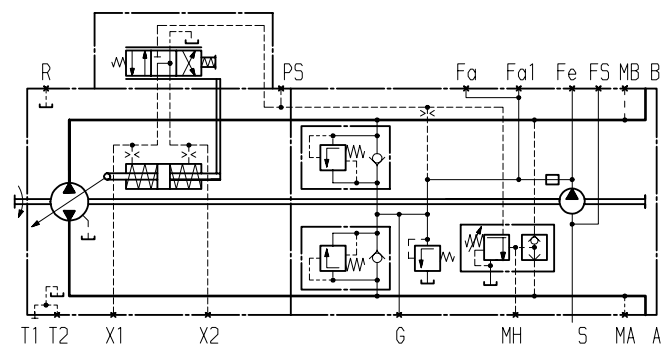
Sizes 40...180



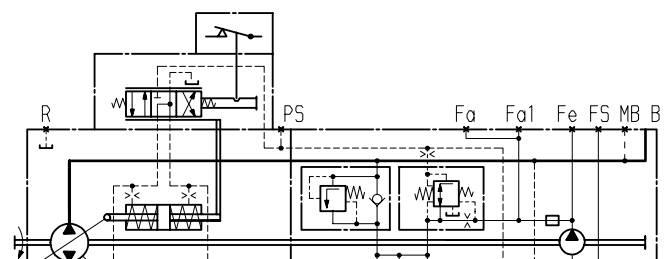
Neutral position switch



Standard version 1)



Version with DA control valve and neutral position switch 1)



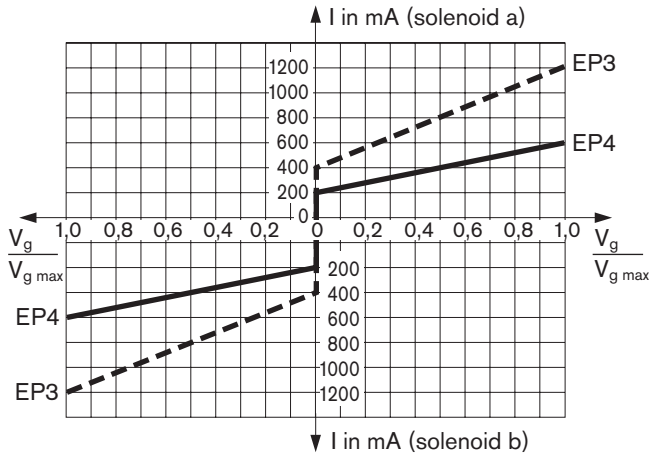
1) Size 28 and 250 without port F_{a1} and F_s

EP - Electric Control, With Proportional Solenoid

The flow output of the pump is infinitely varied in the range of 0 to 100%, proportional to an electrical current, supplied to solenoid a or b.

The electrical energy is converted to a force acting on the control spool. The spool then directs control oil in and out of the stroking piston to stroke the pump as required. A feedback lever, connected to the stroking piston, maintains the pump flow for any given current within the control range.

If the pump is also equipped with a DA control valve (see page 17), automotive operation is possible for travel drives.



Solenoid technical data	EP3	EP4
Voltage	12 V DC ($\pm 20\%$)	24 V DC ($\pm 20\%$)
Control current		
Start of control at V_{g0}	400 mA	200 mA
End of control at V_{gmax}	1200 mA	600 mA
Limiting current	1.54 A	0.77 A
Nominal resistance (at 68 °F / 20 °C)	5.5 Ω	22.7 Ω
Dither frequency	100 Hz	100 Hz
Actuated time	100 %	100 %
Type of protection	see range of connectors on page 60	

The following electronic controllers and amplifiers are available for actuating the proportional solenoids (details also available at www.boschrexroth.com/mobile-electronics):

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

Note

The spring return feature in the control unit is not a safety device

The spool valve inside the control unit can get stuck in an undefined position by internal contamination (contaminated hydraulic fluid, abrasion or residual contamination from system components). As a result, the axial piston unit can no longer supply the flow specified by the operator.

Check whether your application requires that remedial measures be taken on your machine in order to bring the driven consumer into a safe position (e.g. immediate stop).

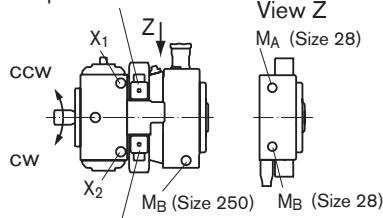
Assignment

Direction of rotation - Control - Direction of through put flow

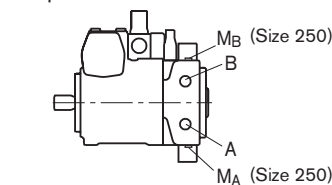
	Size	Actuation of solenoid	Control pressure	Through put flow	Operating pressure
Direction of rotation cw	28...56	a	X_1	A to B	M_B
		b	X_2	B to A	M_A
	71...250	a	X_1	B to A	M_A
		b	X_2	A to B	M_B
Direction of rotation ccw	28...56	a	X_1	B to A	M_A
		b	X_2	A to B	M_B
	71...250	a	X_1	A to B	M_B
		b	X_2	B to A	M_A

Sizes 28, 250

Proportional solenoid a

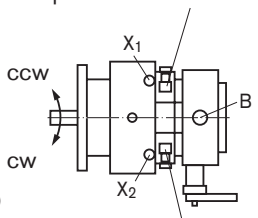


Proportional solenoid b

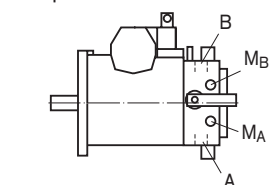


Sizes 40...180

Proportional solenoid a



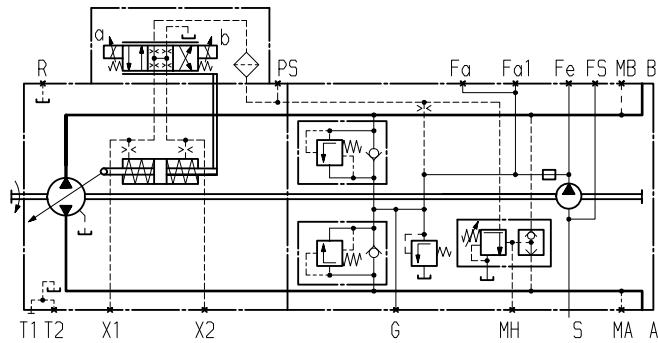
Proportional solenoid b



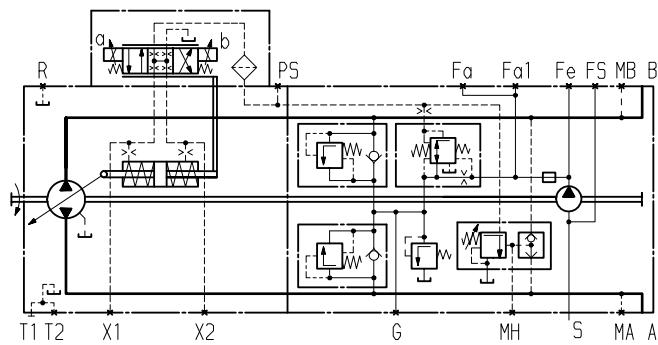
Standard: proportional solenoid without manual emergency operation.
On request: manual emergency operation with spring reset available.

EP - Electric Control, With Proportional Solenoid

Standard version¹⁾



Version with DA control valve¹⁾



¹⁾ Size 28 and 250 without port F_{a1} and F_S

DA - Hydraulic Control, Speed Related

The DA control is an engine speed-dependent, or automotive, type control system. The built-in DA regulating cartridge generates a pilot pressure that is proportional to pump (engine) drive speed. This pilot pressure is directed to the positioning cylinder of the pump by a solenoid actuated 4/3 way directional valve. Pump displacement is infinitely variable in each direction of flow, and is influenced by both pump drive speed and discharge pressure. Flow direction (i.e. machine forward or reverse) is controlled by energizing solenoid a or b.

Increasing pump drive speed generates a higher pilot pressure from the DA cartridge, with a subsequent increase in pump flow and/or pressure.

Dependent on the selected pump operating characteristics, increasing system pressure (i.e. machine load) causes the pump to swivel back towards a smaller displacement. Engine overload (anti-stall) protection is achieved by the combination of this pressure-related pump de-stroking, and the reduction of pilot pressure as the engine speed drops.

Any additional power requirement, such as implement hydraulics, may result in further engine pull down. This causes a further reduction in pilot pressure and therefore pump displacement. Automatic power division and full utilization of available power is thus achieved for both the vehicle transmission and the implement hydraulics, with priority given to the implement hydraulics.

To provide controllable reduced vehicle speed operation when high engine speeds are required for fast implement hydraulics, various inching options are available.

The DA regulating cartridge can also be used in pumps with conventional control devices, such as EP, HW or HD, to provide an engine anti-stall function, or as a combination of automotive and displacement control functions.

Application of the DA control is only appropriate on certain types of vehicle drive systems, and requires a review of the engine and vehicle parameters to ensure proper application of the pump, and safe and efficient machine operation. All DA applications must therefore be reviewed by a Rexroth Application Engineer.

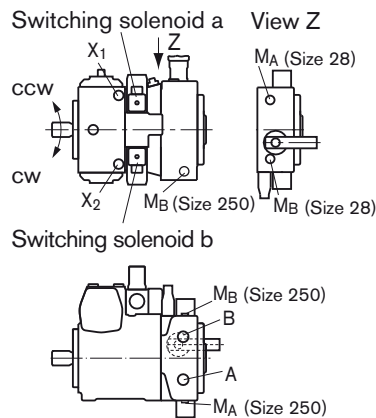
Solenoid technical data	DA1	DA2
Voltage	12 V DC ($\pm 20\%$)	24 V DC ($\pm 20\%$)
Neutral position V_{g0}	de-energized	de-energized
Position $V_{g\max}$	current energized	current energized
Nominal resistance (at 68 °F / 20 °C)	5.5 Ω	21.7 Ω
Nominal power	26.2 W	26.5 W
Current required, minimum effective	1.32 A	0.67 A
Actuated time	100 %	100 %
Type of protection	see range of connectors on page 60	

Standard: switching solenoid without manual emergency operation.
On request: manual emergency operation with spring reset available.

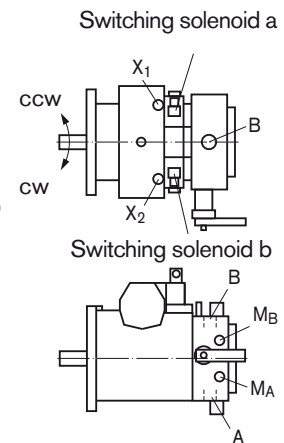
Assignment

Direction of rotation - Control - Direction of through put flow					
	Size	Actuation of solenoid	Control pressure	Through put flow	Operating pressure
Direction of rotation cw	28...56	a	X_2	B to A	M_A
		b	X_1	A to B	M_B
	71...250	a	X_2	A to B	M_B
		b	X_1	B to A	M_A
Direction of rotation ccw	28...56	a	X_2	A to B	M_B
		b	X_1	B to A	M_A
	71...250	a	X_2	B to A	M_A
		b	X_1	A to B	M_B

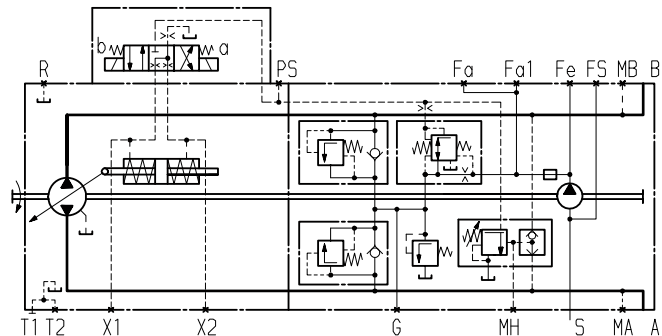
Sizes 28, 250



Sizes 40...180



Hydraulic control, speed related, DA control valve, fixed setting, DA1D2/DA2D2 1)



1) Size 28 and 250 without port F_{a1} and F_S

DA - Hydraulic Control, Speed Related

Function and control of DA control valves

DA control valve, fixed setting (2)

Pilot pressure is generated in relation to drive speed. When ordering, please state in plain text: Start of control (set at factory).

DA control valve, mechanically adjustable with position lever (3)

Pilot pressure is generated in relation to drive speed. When ordering, please state in plain text: Start of control (set at factory).

Pilot pressure may be reduced, independently of drive speed, through mechanical operation of the position lever (inch function).

Max. perm. operating torque at the position lever $T_{max} = 3 \text{ lb-ft (4 Nm)}$

Max. angle of rotation 70° , lever position: any.

Variation 3R _____ actuating direction of the position lever
- clockwise

Variation 3L _____ actuating direction of the position lever
- counterclockwise

DA control valve, fixed setting and hydraulic inch valve mounted, (4, 8)

(only for pumps with DA control unit)

– Version with throttle valve sizes 28, 40, 56, 71

– Version with pressure-reducing valve sizes 90, 125, 180, 250

Permits the pilot pressure to be reduced independently of the drive speed via hydraulic control (port Z).

Variation 4:

Control at port Z by means of brake fluid according to ISO 4925 (**no** mineral oil) from the vehicle braking system (hydraulically linked with the service brake).

Variation 8:

Control at port Z by means of brake fluid based on mineral oil.

DA control valve with fixed setting, ports for pilot control device as inch valve (7)

Any reduction of pilot pressure, independent from the drive speed through the mechanical operation of the pilot control device.

The pilot control device is installed separately from the pump (for example in the driver's cabin) and connected with the pump by 2 hydraulic control lines via ports P_S and Y.

A suitable pilot control device must be ordered separately and is not included in supply.

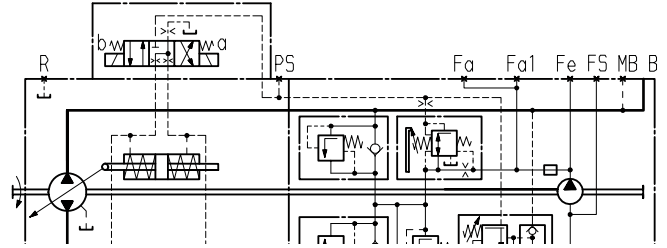
Detailed information is available from our sales department and on our website www.boschrexroth.com/da-control. Use our computer program to work out the input design that meets your needs. A DA control must be approved by Rexroth.

Note: see page 61 for rotary inch valves.

Circuit diagrams ¹⁾:

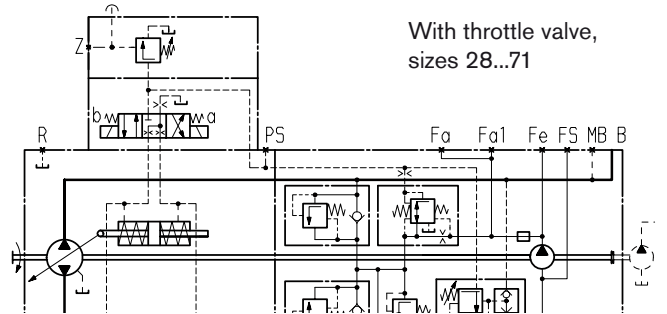
DA1D3/DA2D3

Hydraulic control, speed related, DA control valve, mech. adjustable with position lever

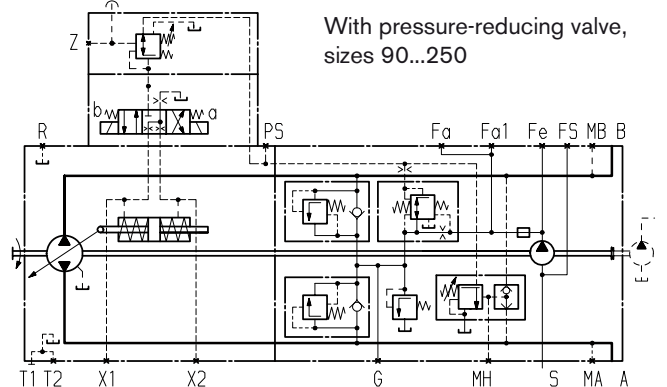


DA1D4/DA2D4

Hydraulic control, speed related,
DA control valve, fixed setting, with hydraulic inch valve



With throttle valve,
sizes 28...71

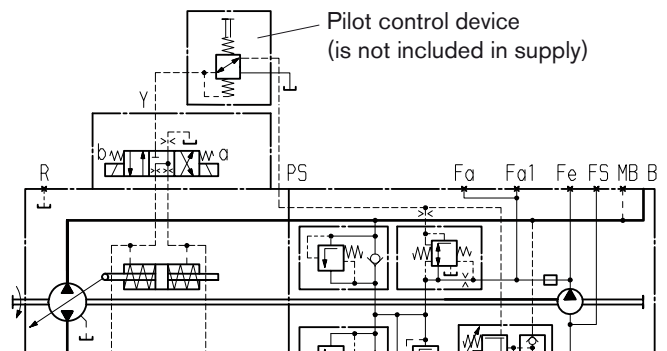


With pressure-reducing valve,
sizes 90...250

DA1D7/DA2D7

Hydraulic control, speed related, DA

DA control valve, fixed setting, with separately installed pilot control device as inch valve



Pilot control device
(is not included in supply)

¹⁾ Size 28 and 250 without port F_{a1} and F_S

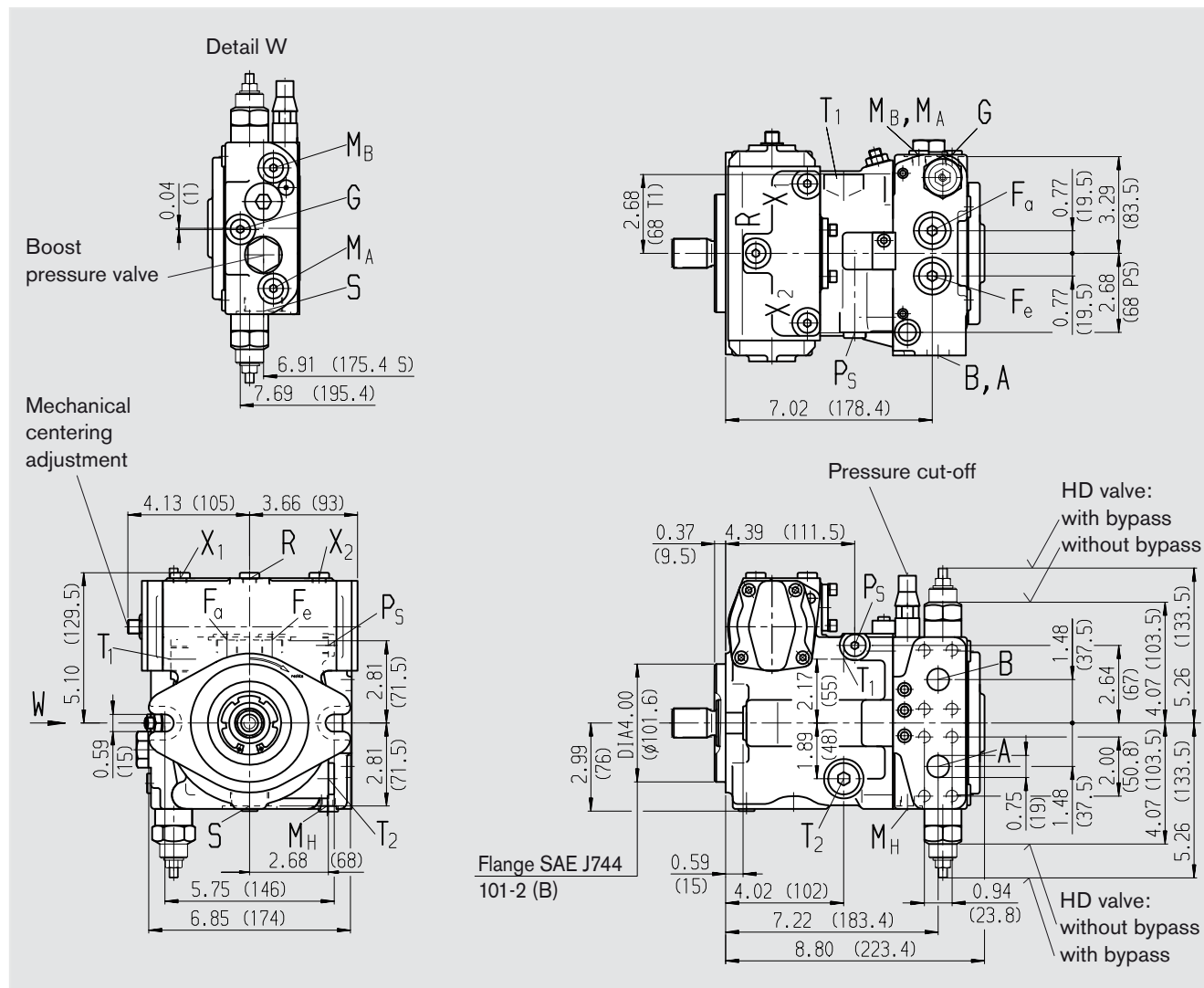
Unit Dimensions, Size 28

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

Version without control unit NV

Standard: suction port S at bottom (60)

Option: suction port S at top (63): port plate turned through 180°

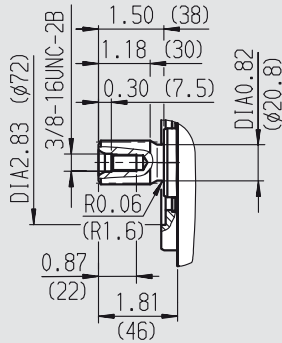


Unit Dimensions, Size 28

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

Shaft ends

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



Ports

A, B	service line ports (high-pressure series)	SAE J518	3/4 in	
	fixing thread A/B	ISO 68	3/8 in -16 UNC-2B; 0.67 (17) deep ²⁾	
T ₁	case drain or fill	ISO 11926	7/8 in -14 UNF-2B; 0.67 (17) deep	180 lb-ft (240 Nm) ²⁾
T ₂	case drain ³⁾	ISO 11926	7/8 in -14 UNF-2B; 0.67 (17) deep	180 lb-ft (240 Nm) ²⁾
M _A , M _B	pressure gauge - operating pressure A, B ³⁾	ISO 11926	7/16 in -20 UNF-2B; 0.47 (12) deep	30 lb-ft (40 Nm) ²⁾
R	air bleed ³⁾	ISO 11926	7/16 in -20 UNF-2B; 0.47 (12) deep	30 lb-ft (40 Nm) ²⁾
S	boost suction port	ISO 11926	1 5/16 in -12 UN-2B; 0.79 (20) deep	400 lb-ft (540 Nm) ²⁾
X ₁ , X ₂	port for control pressures (before orifice) ³⁾	ISO 11926	7/16 in -20 UNF-2B; 0.47 (12) deep	30 lb-ft (40 Nm) ²⁾
G	pressure port for auxiliary circuits ³⁾	ISO 11926	7/16 in -20 UNF-2B; 0.47 (12) deep	30 lb-ft (40 Nm) ²⁾
P _S	control pressure supply ³⁾	ISO 11926	9/16 in -18 UNF-2B; 0.51 (13) deep	60 lb-ft (80 Nm) ²⁾
F _a	filter output ³⁾	ISO 11926	3/4 in -16 UNF-2B; 0.59 (15) deep	120 lb-ft (160 Nm) ²⁾
F _e	filter input ³⁾	ISO 11926	3/4 in -16 UNF-2B; 0.59 (15) deep	120 lb-ft (160 Nm) ²⁾
M _H	port for balanced high pressure ³⁾	ISO 11926	7/16 in -20 UNF-2B; 0.47 (12) deep	30 lb-ft (40 Nm) ²⁾
Y ₁ , Y ₂	remote control ports (only HD)	ISO 11926	9/16 in -18 UNF-2B; 0.51 (13) deep	60 lb-ft (80 Nm) ²⁾
Z	pilot pressure port (only DA4/8) ³⁾	DIN 3852	M10x1; 0.31 (8) deep	22 lb-ft (30 Nm) ²⁾
Y	pilot pressure port (only DA7)	ISO 11926	9/16 in -18 UNF-2B; 0.51 (13) deep	60 lb-ft (80 Nm) ²⁾

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

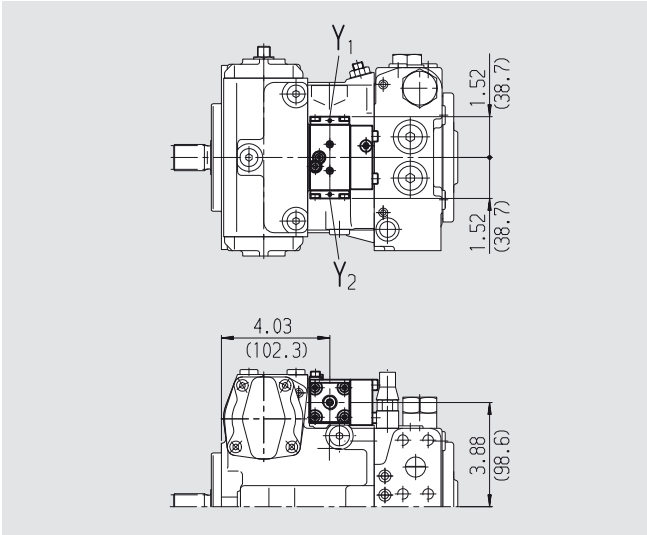
²⁾ Please observe the general notes for the max. tightening torques on page 64

³⁾ Plugged

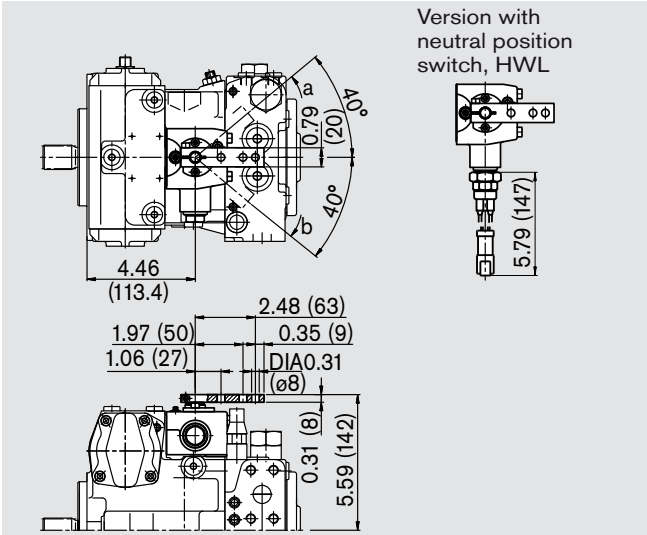
Unit Dimensions, Size 28

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

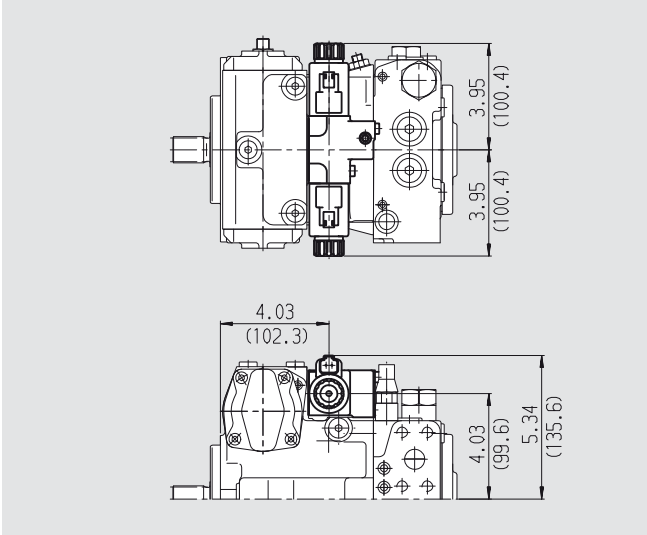
Hydraulic control, pilot-pressure related, HD



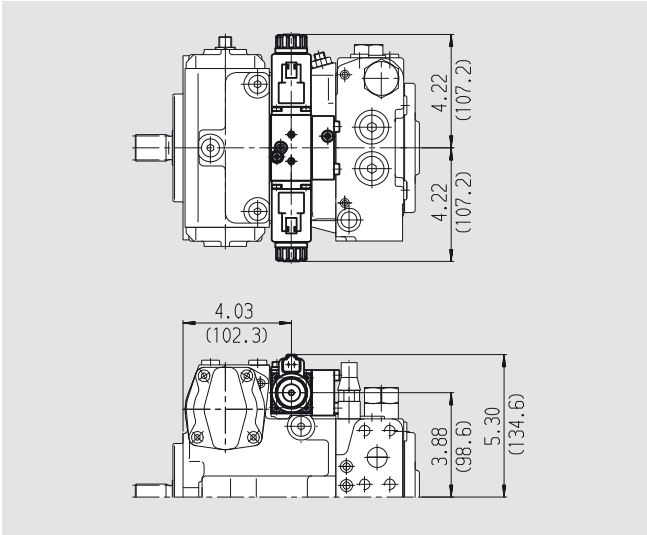
Hydraulic control, mechanical servo, HW



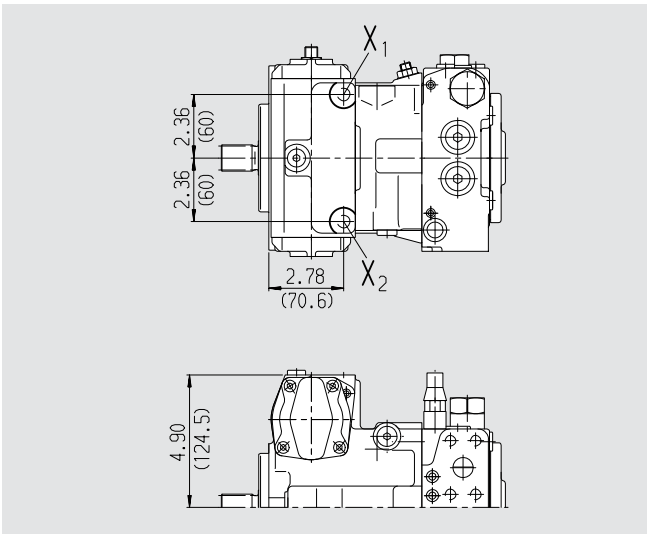
Electric two-point control with switching solenoid, EZ



Electric control with proportional solenoid, EP



Hydraulic control, direct operated, DG

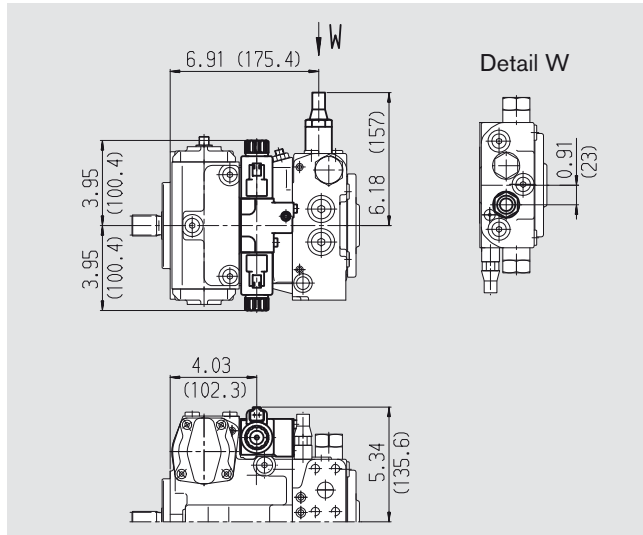


Unit Dimensions, Size 28

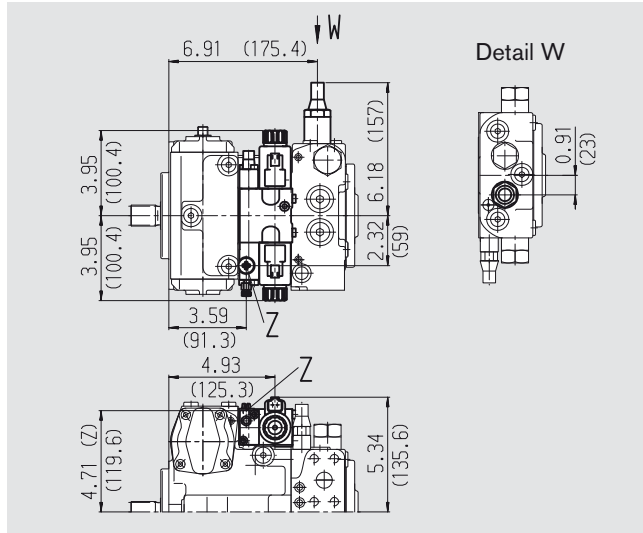
Before finalizing your design, please request a binding installation drawing. Dimensions in inches and (millimeters).

Hydraulic control, speed related, DA

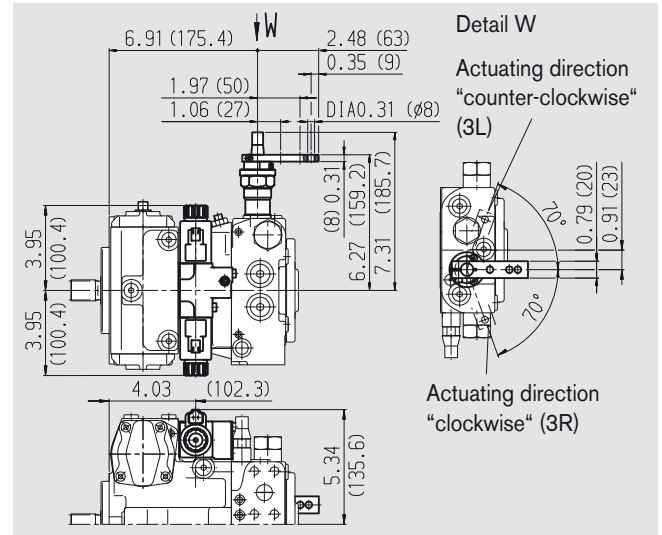
Control valve, fixed setting, DA2



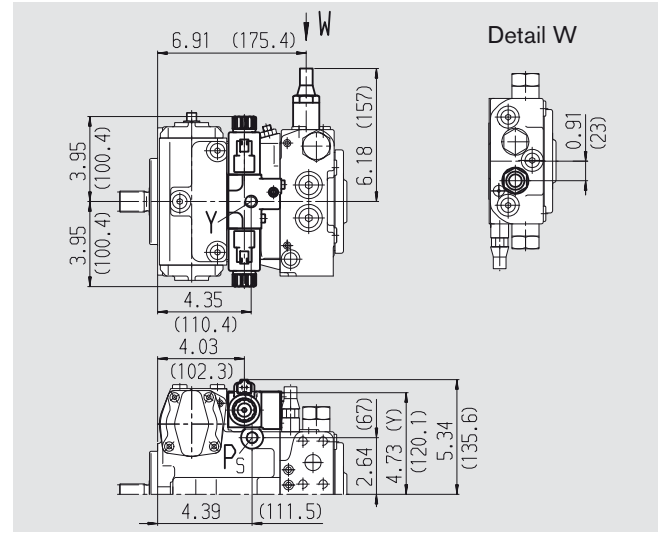
Control valve, fixed setting and hydraulic inch valve mounted, DA4/DA8



Control valve, mech. adjustable with position lever, DA3



Control valve, fixed setting and ports for pilot control device, DA7



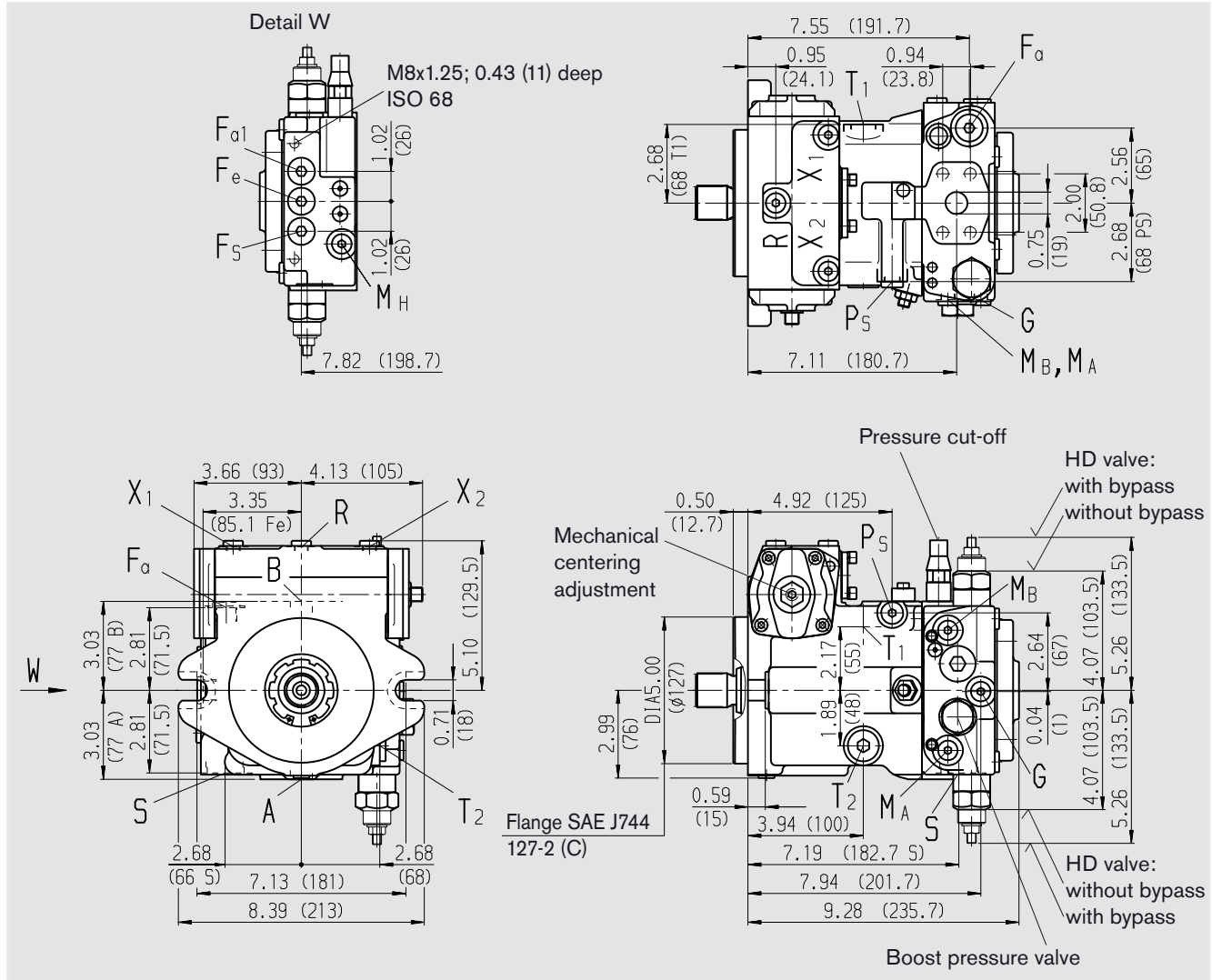
Unit Dimensions, Size 40

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

Version without control unit NV

Standard: suction port S at bottom (52)

Option: suction port S at top (53): port plate turned through 180°

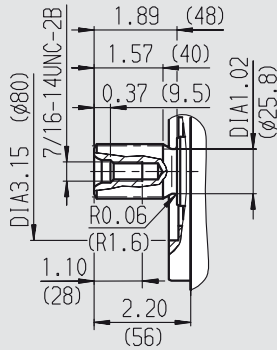


Unit Dimensions, Size 40

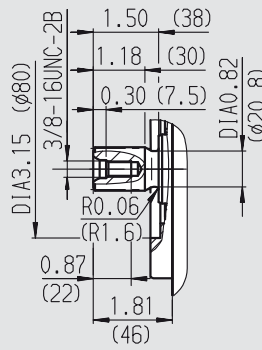
Before finalizing your design, please request a binding installation drawing. Dimensions in inches and (millimeters).

Shaft ends

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



U Splined shaft 1in
15T 16/32DP ¹⁾
(SAE J744 – 25-4 (B-B))



Ports

A, B	service line ports (high-pressure series)	SAE J518	3/4 in	
	fixing thread A/B	ISO 68	3/8 in -16 UNC-2B; 0.67 (17) deep ²⁾	
T ₁	case drain or fill	ISO 11926	7/8 in -14 UNF-2B; 0.67 (17) deep	180 lb-ft (240 Nm) ²⁾
T ₂	case drain ³⁾	ISO 11926	7/8 in -14 UNF-2B; 0.67 (17) deep	180 lb-ft (240 Nm) ²⁾
M _A , M _B	pressure gauge - operating pressure A, B ³⁾	ISO 11926	7/16 in -20 UNF-2B; 0.47 (12) deep	30 lb-ft (40 Nm) ²⁾
R	air bleed ³⁾	ISO 11926	7/16 in -20 UNF-2B; 0.47 (12) deep	30 lb-ft (40 Nm) ²⁾
S	boost suction port	ISO 11926	1 5/16 in -12 UN-2B; 0.79 (20) deep	400 lb-ft (540 Nm) ²⁾
X ₁ , X ₂	port for control pressures (before orifice) ³⁾	ISO 11926	7/16 in -20 UNF-2B; 0.47 (12) deep	30 lb-ft (40 Nm) ²⁾
G	pressure port for auxiliary circuits ³⁾	ISO 11926	7/16 in -20 UNF-2B; 0.47 (12) deep	30 lb-ft (40 Nm) ²⁾
P _S	control pressure supply ³⁾	ISO 11926	9/16 in -18 UNF-2B; 0.51 (13) deep	60 lb-ft (80 Nm) ²⁾
F _a	filter output ³⁾	ISO 11926	3/4 in -16 UNF-2B; 0.51 (13) deep	120 lb-ft (160 Nm) ²⁾
F _{a1}	filter output (filter assembly) ³⁾	DIN 3852	M18x1.5; 0.47 (12) deep	100 lb-ft (140 Nm) ²⁾
F _e	filter input ³⁾	DIN 3852	M18x1.5; 0.47 (12) deep	100 lb-ft (140 Nm) ²⁾
F _S	filter output ³⁾	DIN 3852	M18x1.5; 0.47 (12) deep	100 lb-ft (140 Nm) ²⁾
M _H	port for balanced high pressure ³⁾	ISO 11926	7/16 in -20 UNF-2B; 0.47 (12) deep	30 lb-ft (40 Nm) ²⁾
Y ₁ , Y ₂	remote control ports (only HD)	ISO 11926	9/16 in -18 UNF-2B; 0.51 (13) deep	60 lb-ft (80 Nm) ²⁾
Z	pilot pressure port (only DA4/8) ³⁾	DIN 3852	M10x1; 0.31 (8) deep	22 lb-ft (30 Nm) ²⁾
Y	pilot pressure port (only DA7)	ISO 11926	9/16 in -18 UNF-2B; 0.51 (13) deep	60 lb-ft (80 Nm) ²⁾

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

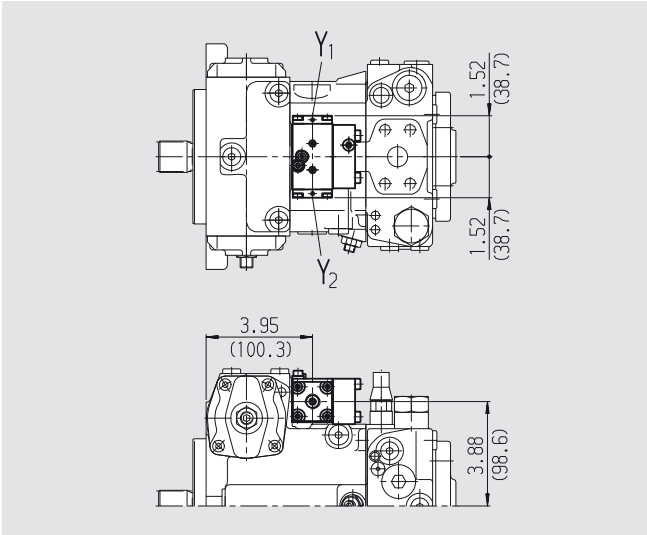
²⁾ Please observe the general notes for the max. tightening torques on page 64

³⁾ Plugged

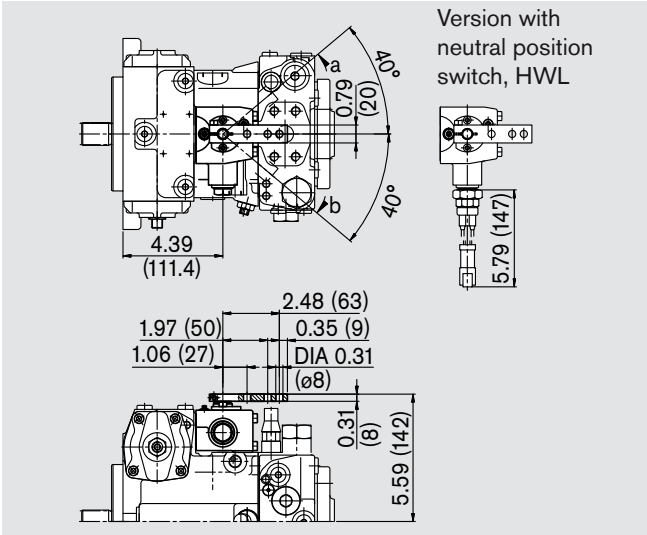
Unit Dimensions, Size 40

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

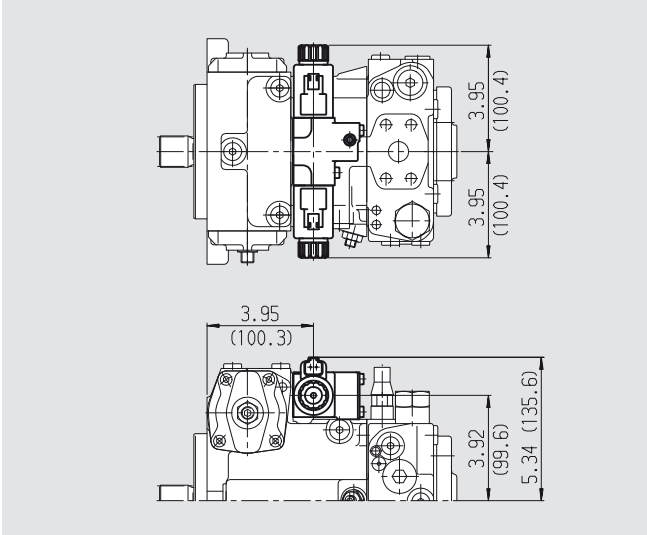
Hydraulic control, pilot-pressure related, HD



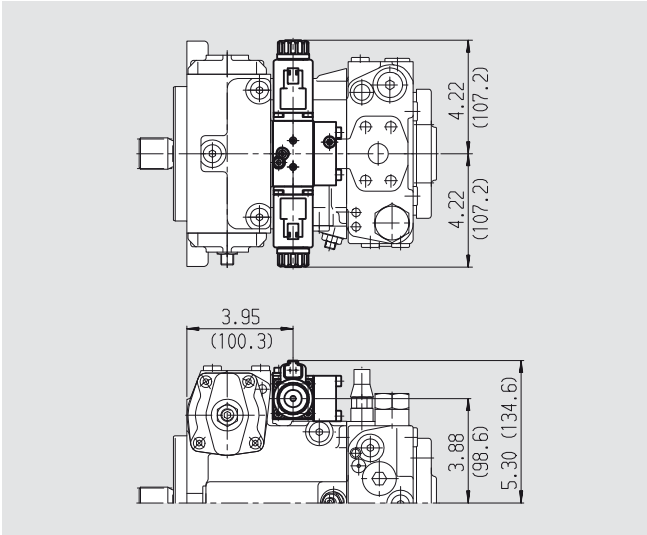
Hydraulic control, mechanical servo, HW



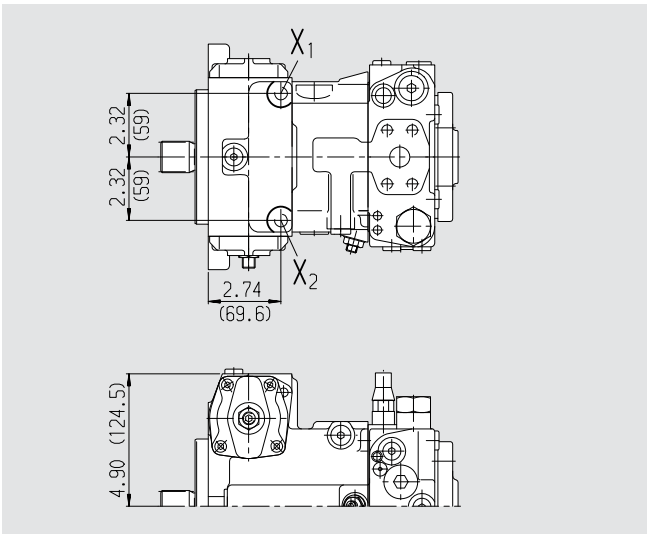
Electric two-point control with switching solenoid, EZ



Electric control with proportional solenoid, EP



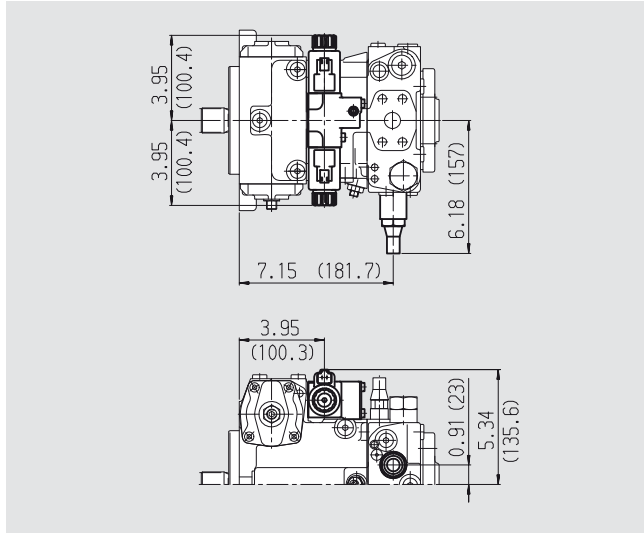
Hydraulic control, direct operated, DG



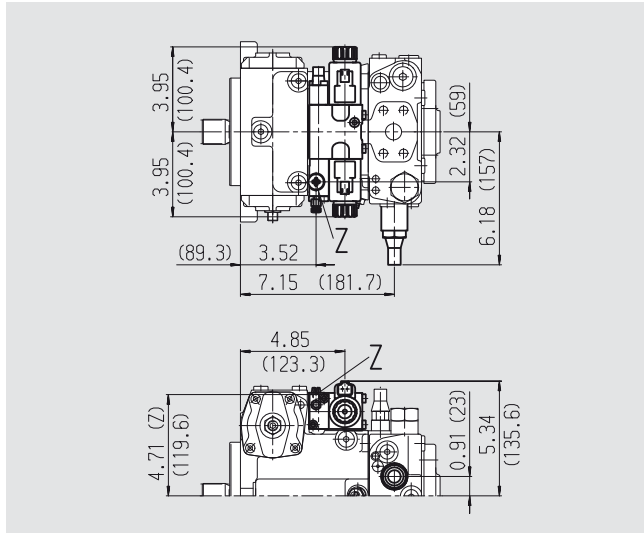
Unit Dimensions, Size 40

Hydraulic control, speed related, DA

Control valve, fixed setting, DA2

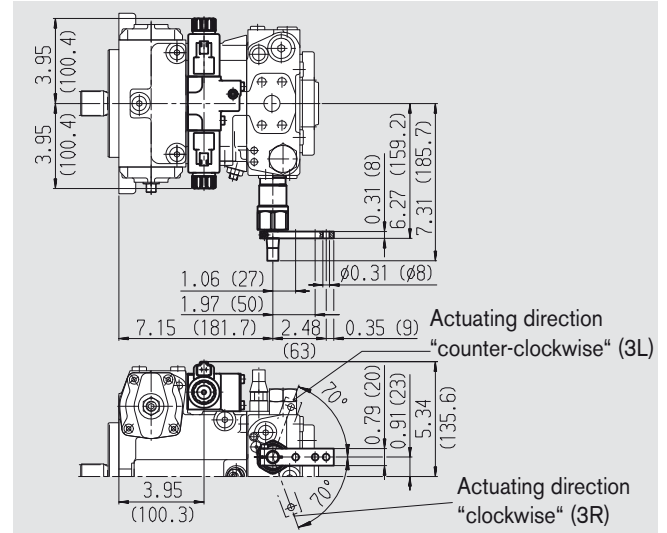


Control valve, fixed setting and hydraulic inch valve mounted, DA4/DA8

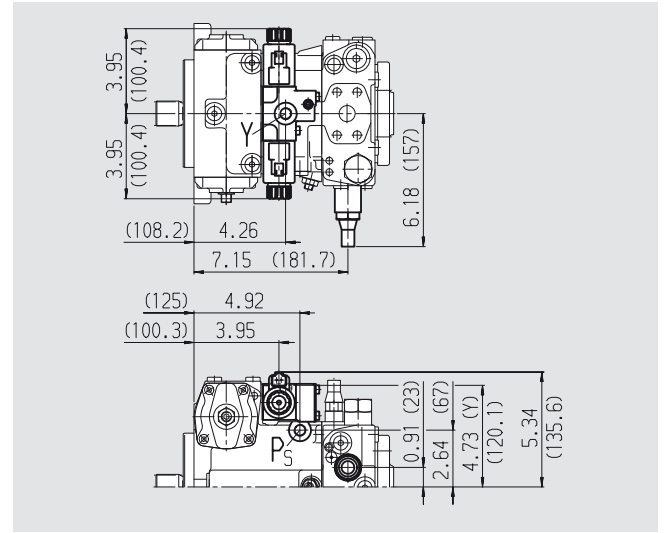


Before finalizing your design, please request a binding installation drawing. Dimensions in inches and (millimeters).

Control valve, mech. adjustable with position lever, DA3



Control valve, fixed setting and ports for pilot control device, DA7



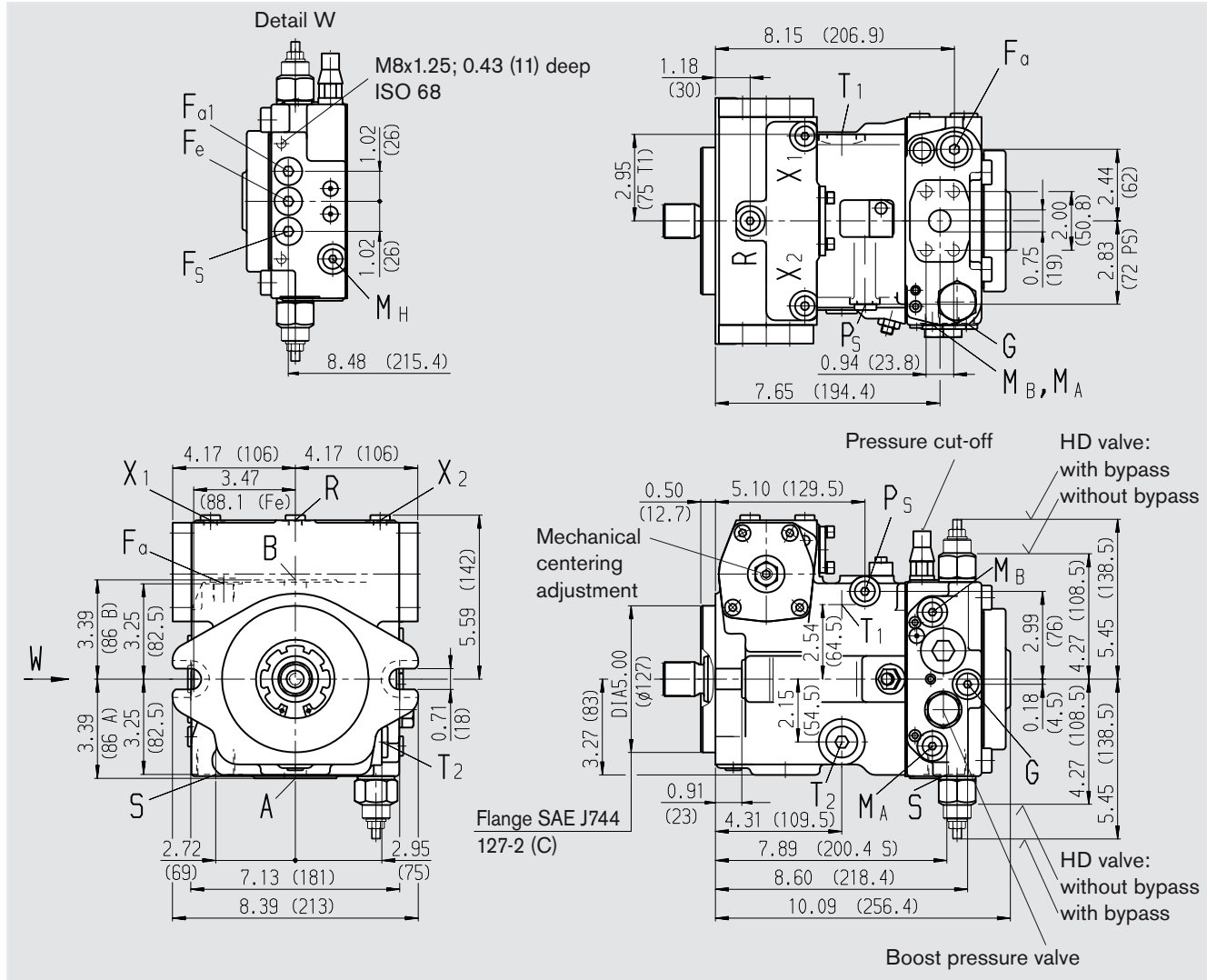
Unit Dimensions, Size 56

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

Version without control unit NV

Standard: suction port S at bottom (52)

Option: suction port S at top (53): port plate turned through 180°

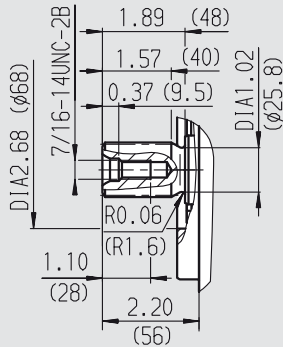


Unit Dimensions, Size 56

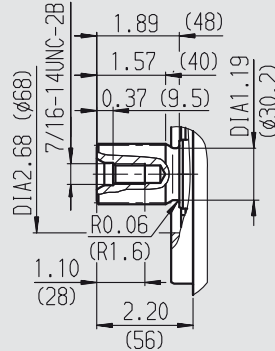
Before finalizing your design, please request a binding installation drawing. Dimensions in inches and (millimeters).

Shaft ends

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



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



Ports

A, B	service line ports (high-pressure series)	SAE J518	3/4 in	
	fixing thread A/B	ISO 68	3/8 in -16 UNC-2B; 0.67 (17) deep ²⁾	
T ₁	case drain or fill	ISO 11926	1 1/16 in -12 UN-2B; 0.79 (20) deep	265 lb-ft (360 Nm) ²⁾
T ₂	case drain ³⁾	ISO 11926	1 1/16 in -12 UN-2B; 0.79 (20) deep	265 lb-ft (360 Nm) ²⁾
M _A , M _B	pressure gauge - operating pressure A, B ³⁾	ISO 11926	7/16 in -20 UNF-2B; 0.47 (12) deep	30 lb-ft (40 Nm) ²⁾
R	air bleed ³⁾	ISO 11926	7/16 in -20 UNF-2B; 0.47 (12) deep	30 lb-ft (40 Nm) ²⁾
S	boost suction port	ISO 11926	1 5/16 in -12 UN-2B; 0.79 (20) deep	400 lb-ft (540 Nm) ²⁾
X ₁ , X ₂	port for control pressures (before orifice) ³⁾	ISO 11926	7/16 in -20 UNF-2B; 0.47 (12) deep	30 lb-ft (40 Nm) ²⁾
G	pressure port for auxiliary circuits ³⁾	ISO 11926	9/16 in -18 UNF-2B; 0.51 (13) deep	60 lb-ft (80 Nm) ²⁾
P _S	control pressure supply ³⁾	ISO 11926	9/16 in -18 UNF-2B; 0.51 (13) deep	60 lb-ft (80 Nm) ²⁾
F _a	filter output ³⁾	ISO 11926	3/4 in -16 UNF-2B; 0.59 (15) deep	120 lb-ft (160 Nm) ²⁾
F _{a1}	filter output (filter assembly) ³⁾	DIN 3852	M18x1.5; 0.47 (12) deep	100 lb-ft (140 Nm) ²⁾
F _e	filter input ³⁾	DIN 3852	M18x1.5; 0.47 (12) deep	100 lb-ft (140 Nm) ²⁾
F _S	filter output ³⁾	DIN 3852	M18x1.5; 0.47 (12) deep	100 lb-ft (140 Nm) ²⁾
M _H	port for balanced high pressure ³⁾	ISO 11926	7/16 in -20 UNF-2B; 0.47 (12) deep	30 lb-ft (40 Nm) ²⁾
Y ₁ , Y ₂	remote control ports (only HD)	ISO 11926	9/16 in -18 UNF-2B; 0.51 (13) deep	60 lb-ft (80 Nm) ²⁾
Z	pilot pressure port (only DA4/8) ³⁾	DIN 3852	M10x1; 0.31 (8) deep	22 lb-ft (30 Nm) ²⁾
Y	pilot pressure port (only DA7)	ISO 11926	9/16 in -18 UNF-2B; 0.51 (13) deep	60 lb-ft (80 Nm) ²⁾

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

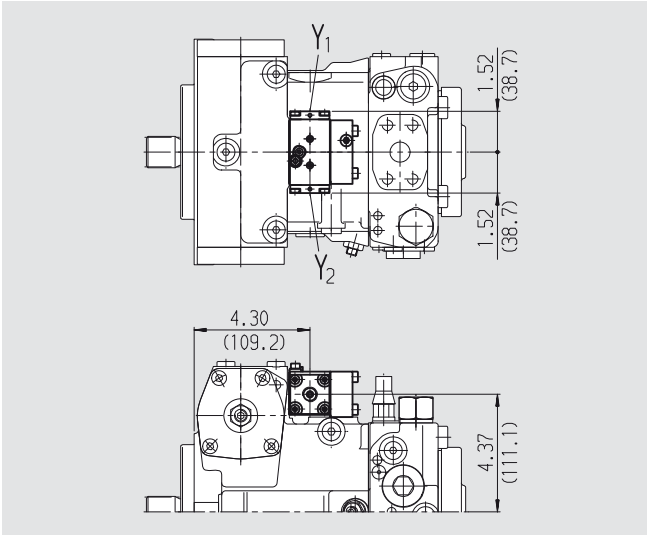
²⁾ Please observe the general notes for the max. tightening torques on page 64

³⁾ Plugged

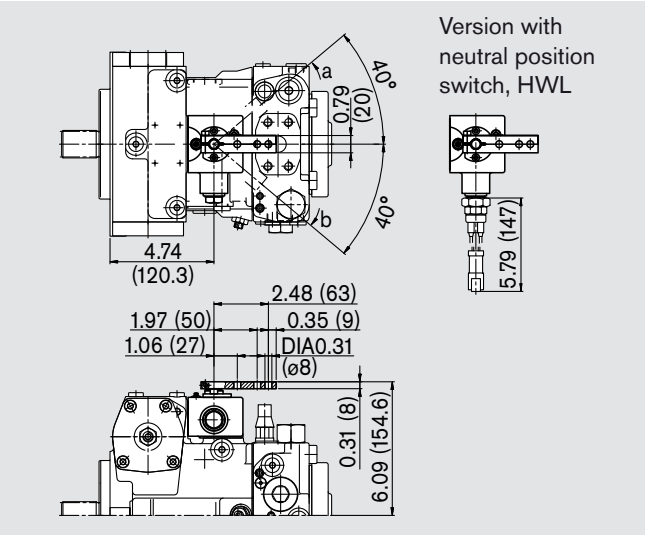
Unit Dimensions, Size 56

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

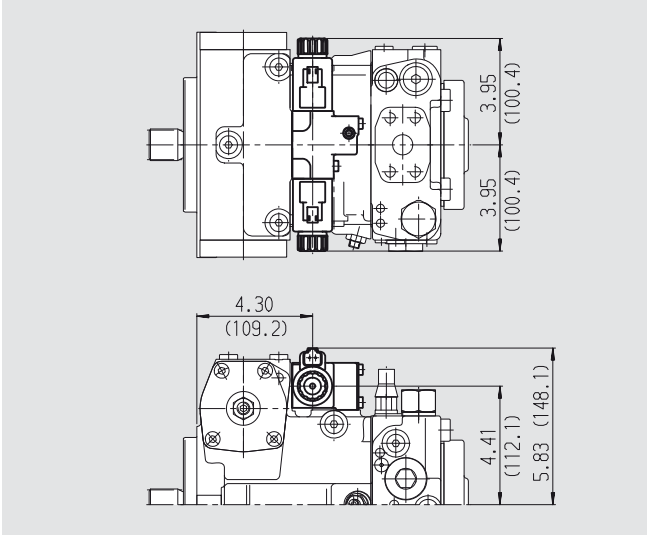
Hydraulic control, pilot-pressure related, HD



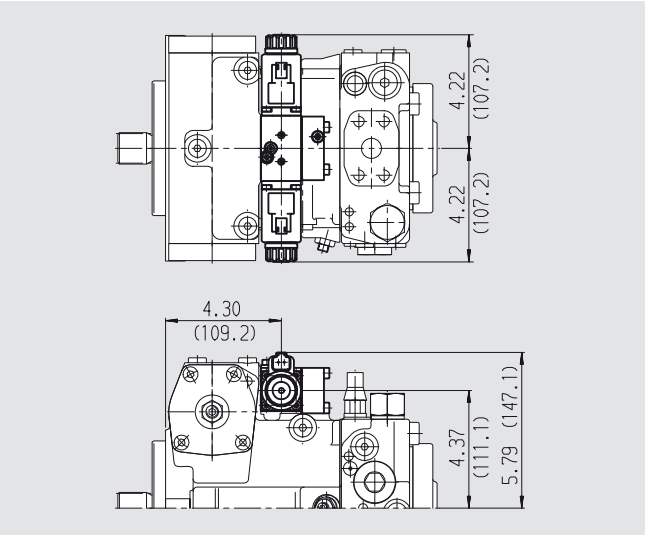
Hydraulic control, mechanical servo, HW



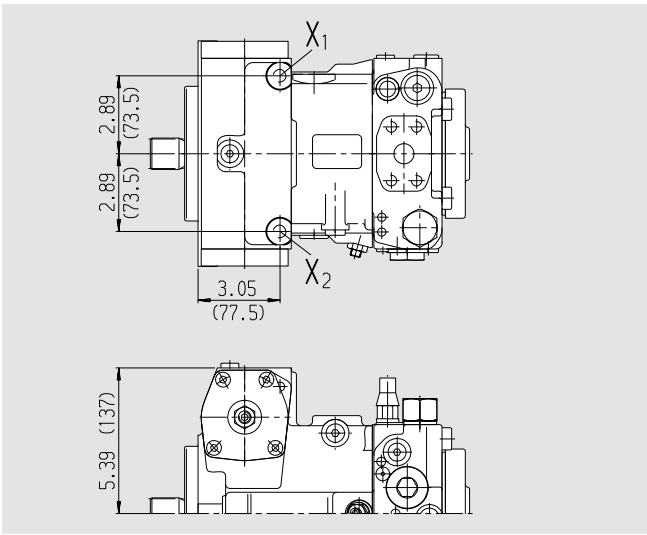
Electric two-point control with switching solenoid, EZ



Electric control with proportional solenoid, EP



Hydraulic control, direct operated, DG



Technical drawing of the 3D printing head assembly, showing two views with dimensions in mm and inches.

Top View Dimensions:

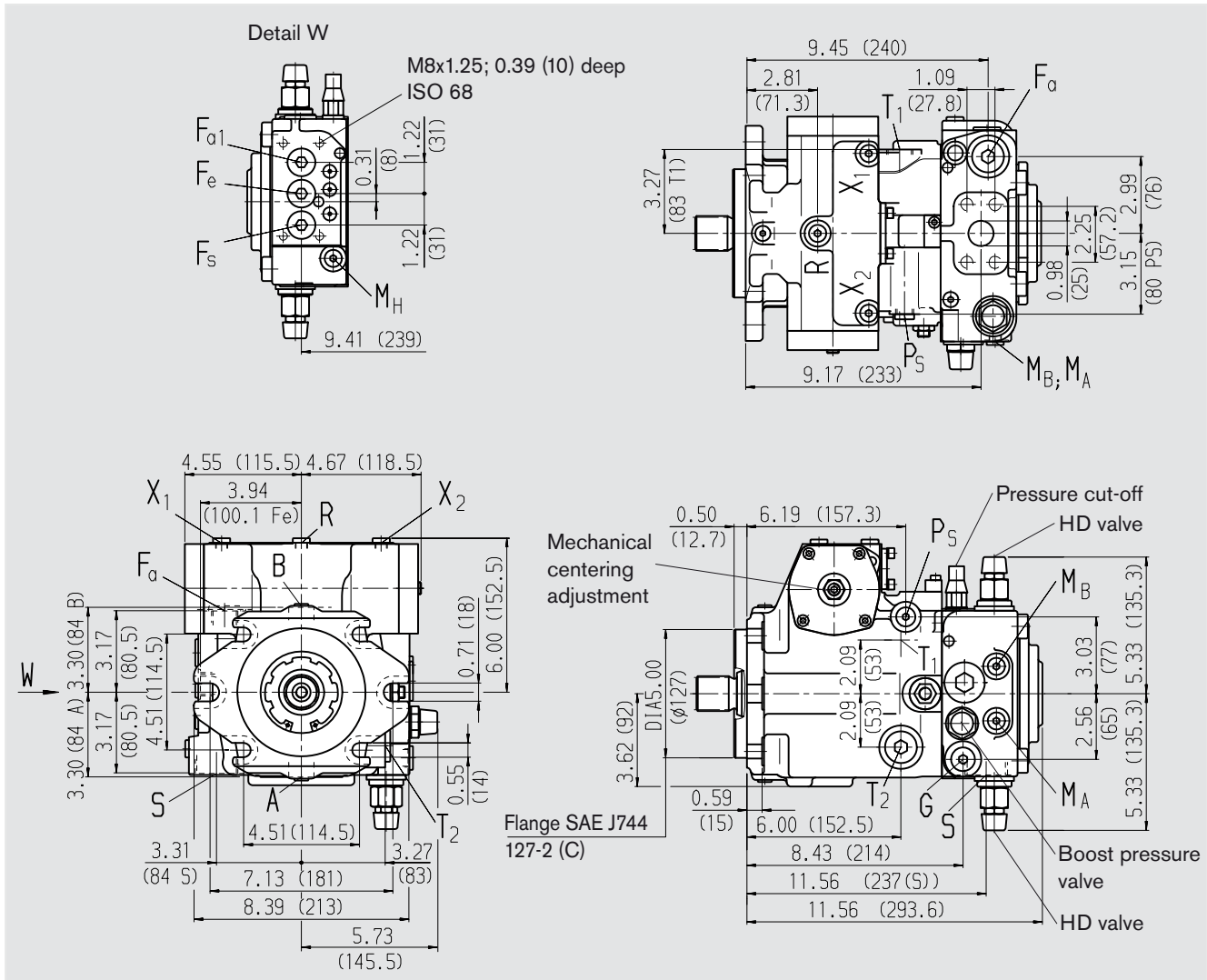
- Overall width: 3.95 (100.4)
- Distance from left edge to centerline: 3.95 (100.4)
- Distance from centerline to right edge: 3.95 (100.4)
- Distance from left edge to first vertical feature: 117.3 (4.62)
- Distance from first vertical feature to second vertical feature: 7.77 (197.4)
- Distance from second vertical feature to right edge: 5.89 (149.5)

Bottom View Dimensions:

- Overall width: 5.10 (129.5)
- Distance from left edge to centerline: 4.30 (109.2)
- Distance from centerline to right edge: 4.30 (109.2)
- Distance from left edge to first vertical feature: 0.96 (24.5)
- Distance from first vertical feature to second vertical feature: 2.99 (76)
- Distance from second vertical feature to third vertical feature: 5.22 (Y)
- Distance from third vertical feature to right edge: 5.83 (148.1)

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

Option: suction port S at top (53): port plate turned through 180°

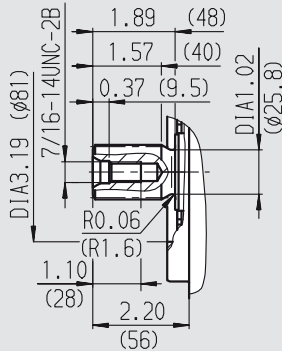


Unit Dimensions, Size 71

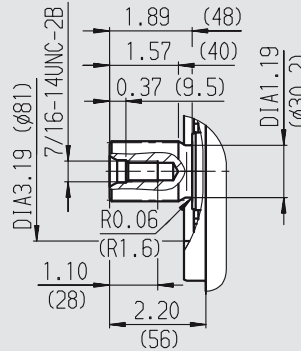
Before finalizing your design, please request a binding installation drawing. Dimensions in inches and (millimeters).

Shaft ends

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



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



Ports

A, B	service line ports (high-pressure series)	SAE J518	1 in	
	fixing thread A/B	ISO 68	7/16 in -14 UNC-2B; 0.67 (17) deep ²⁾	
T ₁	case drain or fill	ISO 11926	1 1/16 in -12 UN-2B; 0.79 (20) deep	265 lb-ft (360 Nm) ²⁾
T ₂	case drain ³⁾	ISO 11926	1 1/16 in -12 UN-2B; 0.79 (20) deep	265 lb-ft (360 Nm) ²⁾
M _A , M _B	pressure gauge - operating pressure A, B ³⁾	ISO 11926	7/16 in -20 UNF-2B; 0.47 (12) deep	30 lb-ft (40 Nm) ²⁾
R	air bleed ³⁾	ISO 11926	7/16 in -20 UNF-2B; 0.47 (12) deep	30 lb-ft (40 Nm) ²⁾
S	boost suction port	ISO 11926	1 5/8 in -12 UN-2B; 0.79 (20) deep	710 lb-ft (960 Nm) ²⁾
X ₁ , X ₂	port for control pressures (before orifice) ³⁾	ISO 11926	7/16 in -20 UNF-2B; 0.47 (12) deep	30 lb-ft (40 Nm) ²⁾
G	pressure port for auxiliary circuits ³⁾	ISO 11926	3/4 in -16 UNF-2B; 0.59 (15) deep	120 lb-ft (160 Nm) ²⁾
P _S	control pressure supply ³⁾	ISO 11926	9/16 in -18 UNF-2B; 0.51 (13) deep	60 lb-ft (80 Nm) ²⁾
F _a	filter output ³⁾	ISO 11926	1 1/16 in -12 UN-2B; 0.79 (20) deep	265 lb-ft (360 Nm) ²⁾
F _{a1}	filter output (filter assembly) ³⁾	DIN 3852	M22x1.5; 0.55 (14) deep	150 lb-ft (210 Nm) ²⁾
F _e	filter input ³⁾	DIN 3852	M22x1.5; 0.55 (14) deep	150 lb-ft (210 Nm) ²⁾
F _S	filter output ³⁾	DIN 3852	M22x1.5; 0.55 (14) deep	150 lb-ft (210 Nm) ²⁾
M _H	port for balanced high pressure ³⁾	ISO 11926	7/16 in -20 UNF-2B; 0.47 (12) deep	30 lb-ft (40 Nm) ²⁾
Y ₁ , Y ₂	remote control ports (only HD)	ISO 11926	9/16 in -18 UNF-2B; 0.51 (13) deep	60 lb-ft (80 Nm) ²⁾
Z	pilot pressure port (only DA4/8) ³⁾	DIN 3852	M10x1; 0.31 (8) deep	22 lb-ft (30 Nm) ²⁾
Y	pilot pressure port (only DA7)	ISO 11926	9/16 in -18 UNF-2B; 0.51 (13) deep	60 lb-ft (80 Nm) ²⁾

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

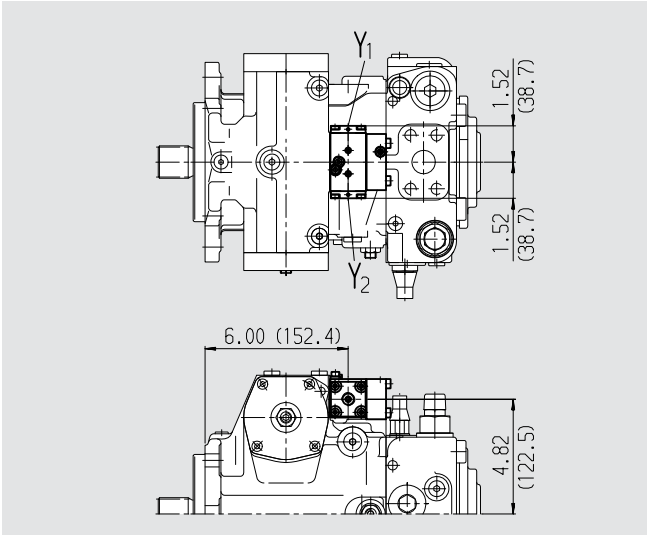
²⁾ Please observe the general notes for the max. tightening torques on page 64

³⁾ Plugged

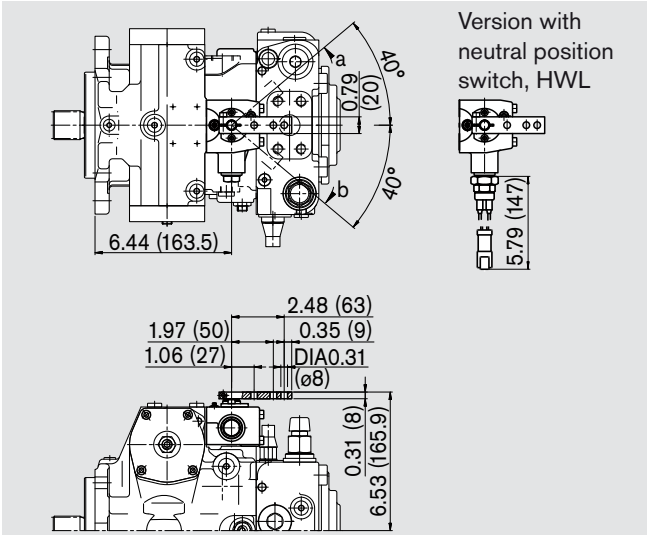
Unit Dimensions, Size 71

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

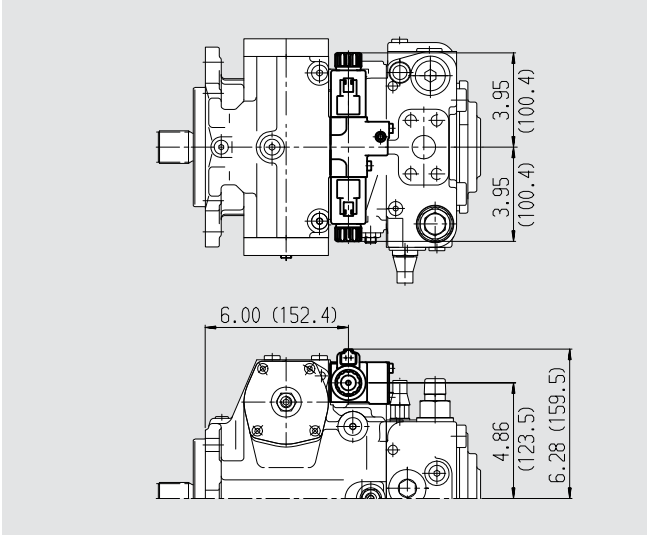
Hydraulic control, pilot-pressure related, HD



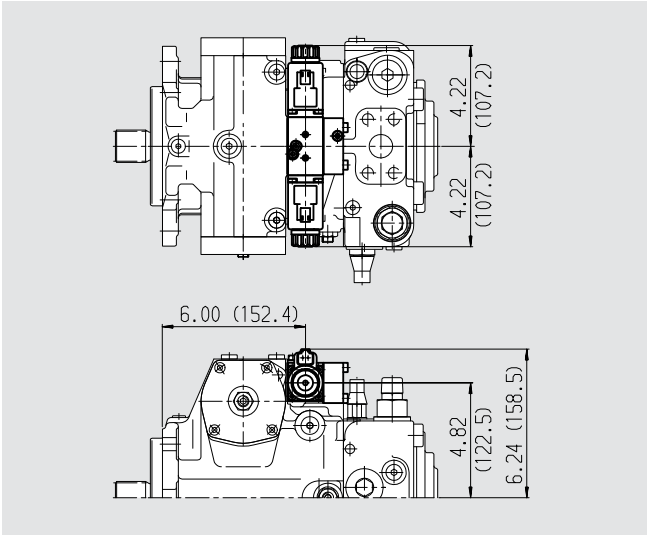
Hydraulic control, mechanical servo, HW



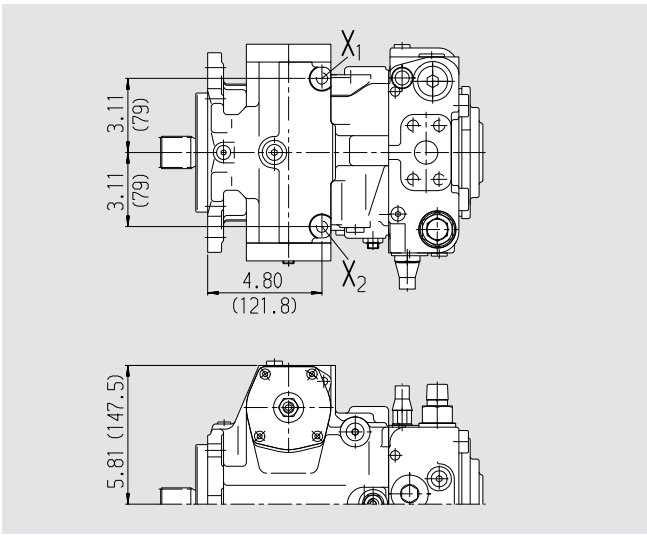
Electric two-point control with switching solenoid, EZ



Electric control with proportional solenoid, EP



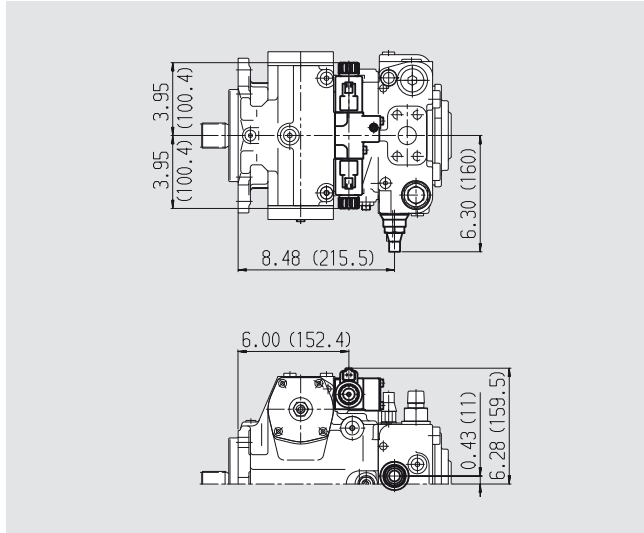
Hydraulic control, direct operated, DG



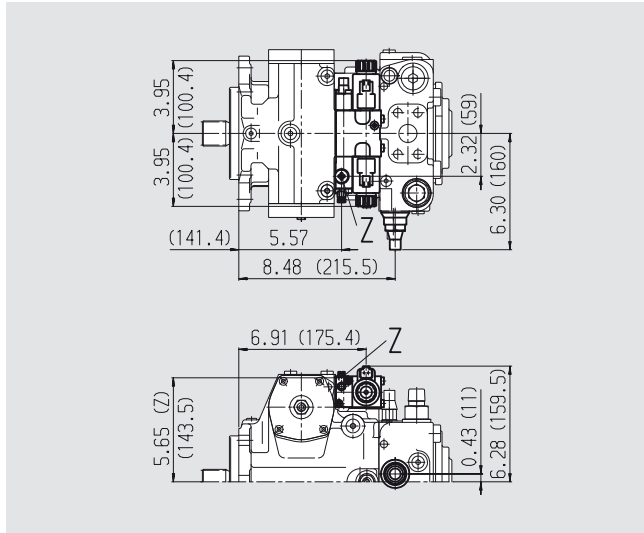
Unit Dimensions, Size 71

Hydraulic control, speed related, DA

Control valve, fixed setting, DA2

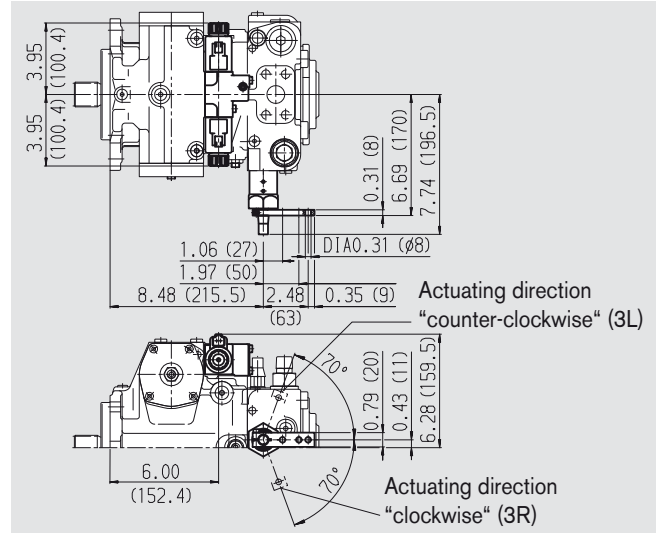


Control valve, fixed setting and hydraulic inch valve mounted, DA4/DA8

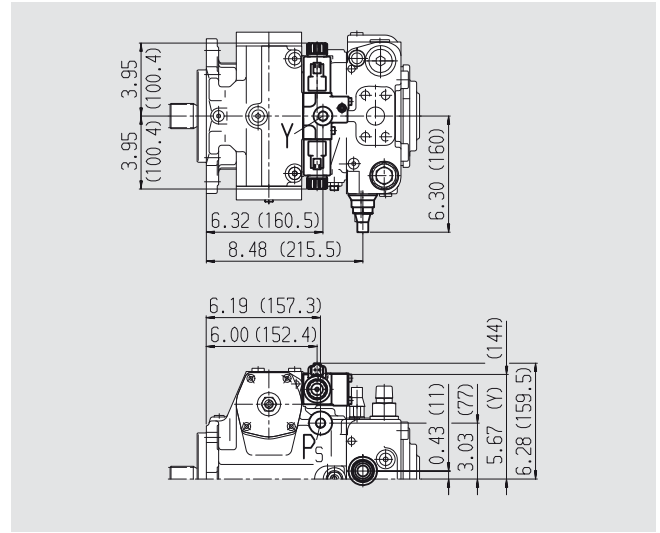


Before finalizing your design, please request a binding installation drawing. Dimensions in inches and (millimeters).

Control valve, mech. adjustable with position lever, DA3



Control valve, fixed setting and ports for pilot control device, DA7

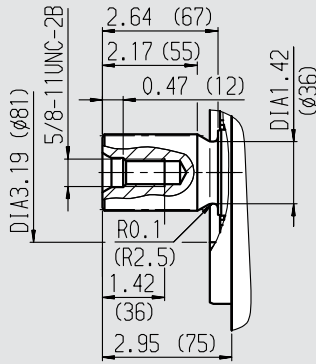


Unit Dimensions, Size 90

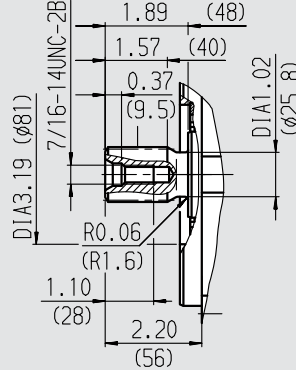
Before finalizing your design, please request a binding installation drawing. Dimensions in inches and (millimeters).

Shaft ends

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



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



Ports

A, B	service line ports (high-pressure series)	SAE J518	1 in	
	fixing thread A/B	ISO 68	7/16 in -14 UNC-2B; 0.67 (17) deep ²⁾	
T ₁	case drain or fill	ISO 11926	1 1/16 in -12 UN-2B; 0.79 (20) deep	265 lb-ft (360 Nm) ²⁾
T ₂	case drain ³⁾	ISO 11926	1 1/16 in -12 UN-2B; 0.79 (20) deep	265 lb-ft (360 Nm) ²⁾
M _A , M _B	pressure gauge - operating pressure A, B ³⁾	ISO 11926	7/16 in -20 UNF-2B; 0.47 (12) deep	30 lb-ft (40 Nm) ²⁾
R	air bleed ³⁾	ISO 11926	9/16 in -18 UNF-2B; 0.51 (13) deep	60 lb-ft (80 Nm) ²⁾
S	boost suction port	ISO 11926	1 5/8 in -12 UN-2B; 0.79 (20) deep	710 lb-ft (960 Nm) ²⁾
X ₁ , X ₂	port for control pressures (before orifice) ³⁾	ISO 11926	9/16 in -18 UNF-2B; 0.51 (13) deep	60 lb-ft (80 Nm) ²⁾
G	pressure port for auxiliary circuits ³⁾	ISO 11926	3/4 in -16 UNF-2B; 0.59 (15) deep	120 lb-ft (160 Nm) ²⁾
P _S	control pressure supply ³⁾	ISO 11926	9/16 in -18 UNF-2B; 0.51 (13) deep	60 lb-ft (80 Nm) ²⁾
F _a	filter output ³⁾	ISO 11926	1 1/16 in -12 UN-2B; 0.79 (20) deep	265 lb-ft (360 Nm) ²⁾
F _{a1}	filter output (filter assembly) ³⁾	DIN 3852	M22x1.5; 0.55 (14) deep	150 lb-ft (210 Nm) ²⁾
F _e	filter input ³⁾	DIN 3852	M22x1.5; 0.55 (14) deep	150 lb-ft (210 Nm) ²⁾
F _S	filter output ³⁾	DIN 3852	M22x1.5; 0.55 (14) deep	150 lb-ft (210 Nm) ²⁾
M _H	port for balanced high pressure ³⁾	ISO 11926	7/16 in -20 UNF-2B; 0.47 (12) deep	30 lb-ft (40 Nm) ²⁾
Y ₁ , Y ₂	remote control ports (only HD)	ISO 11926	9/16 in -18 UNF-2B; 0.51 (13) deep	60 lb-ft (80 Nm) ²⁾
Z	pilot pressure port (only DA4/8) ³⁾	DIN 3852	M10x1; 0.31 (8) deep	22 lb-ft (30 Nm) ²⁾
Y	pilot pressure port (only DA7)	ISO 11926	9/16 in -18 UNF-2B; 0.51 (13) deep	60 lb-ft (80 Nm) ²⁾

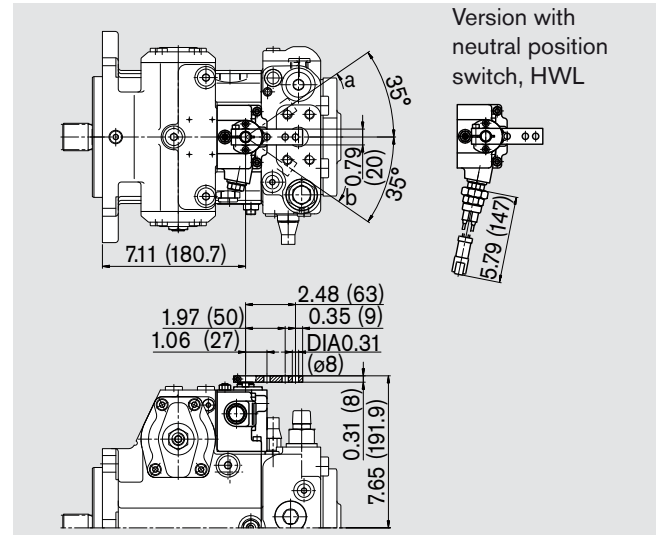
¹⁾ ANSI B92.1a-1976, 30° pressure angle, flat root, side fit, tolerance class 5

²⁾ Please observe the general notes for the max. tightening torques on page 64

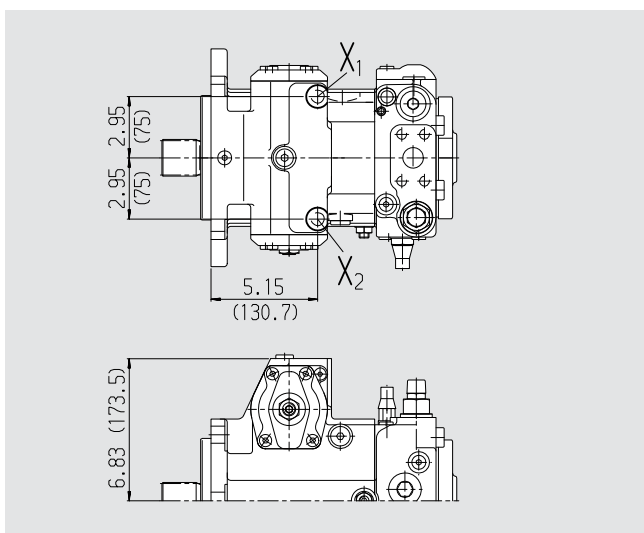
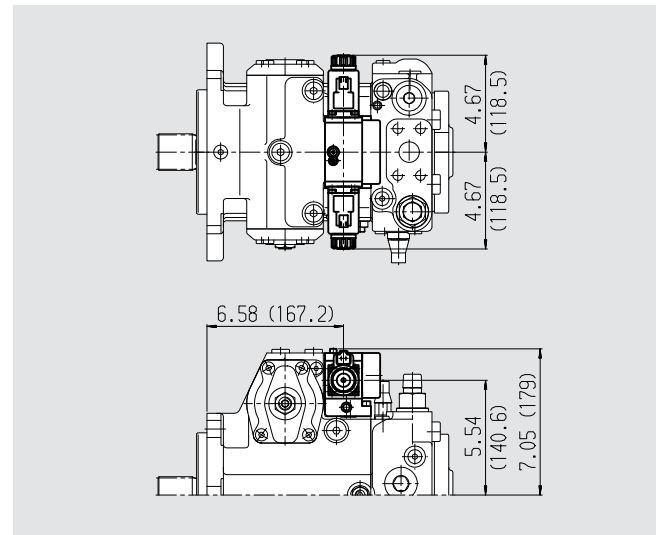
³⁾ Plugged

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

Hydraulic control, mechanical servo, HW



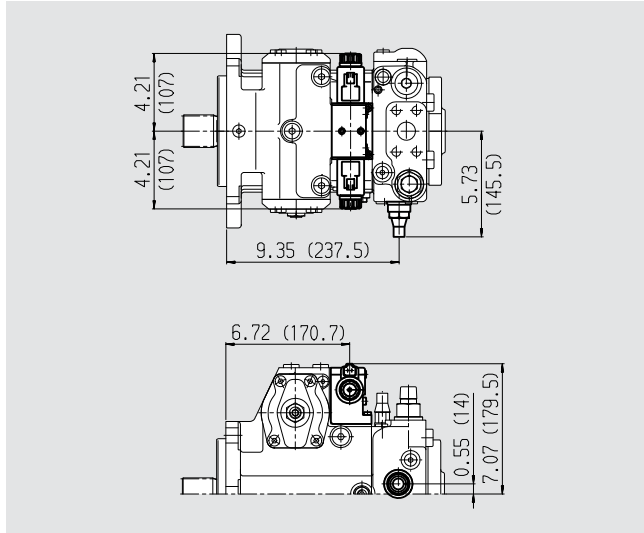
Electric control with proportional solenoid, EP



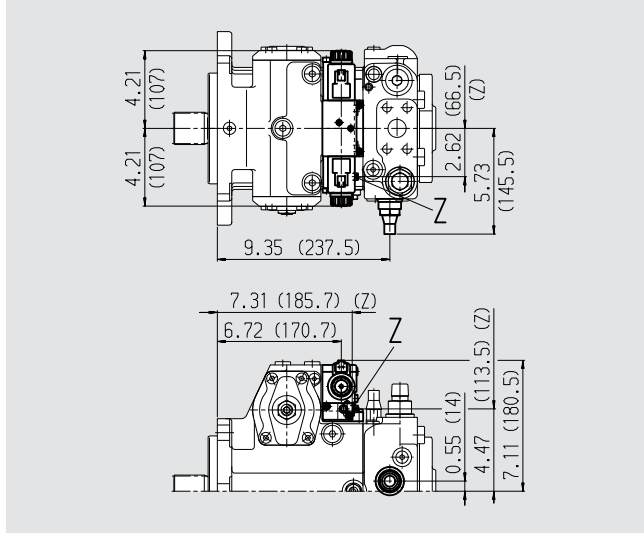
Unit Dimensions, Size 90

Hydraulic control, speed related, DA

Control valve, fixed setting, DA2

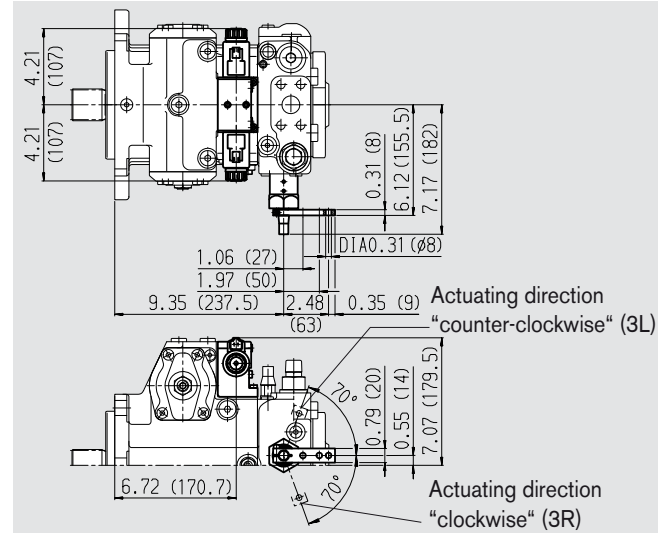


Control valve, fixed setting and hydraulic inch valve mounted, DA4/DA8

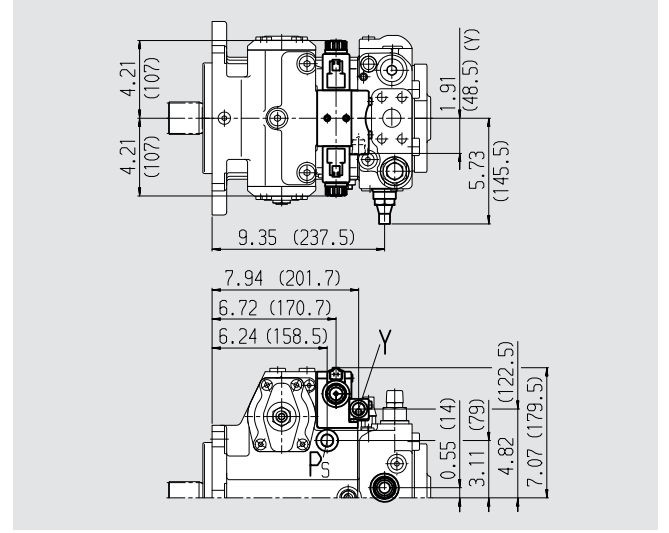


Before finalizing your design, please request a binding installation drawing. Dimensions in inches and (millimeters).

Control valve, mech. adjustable with position lever, DA3



Control valve, fixed setting and ports for pilot control device, DA7



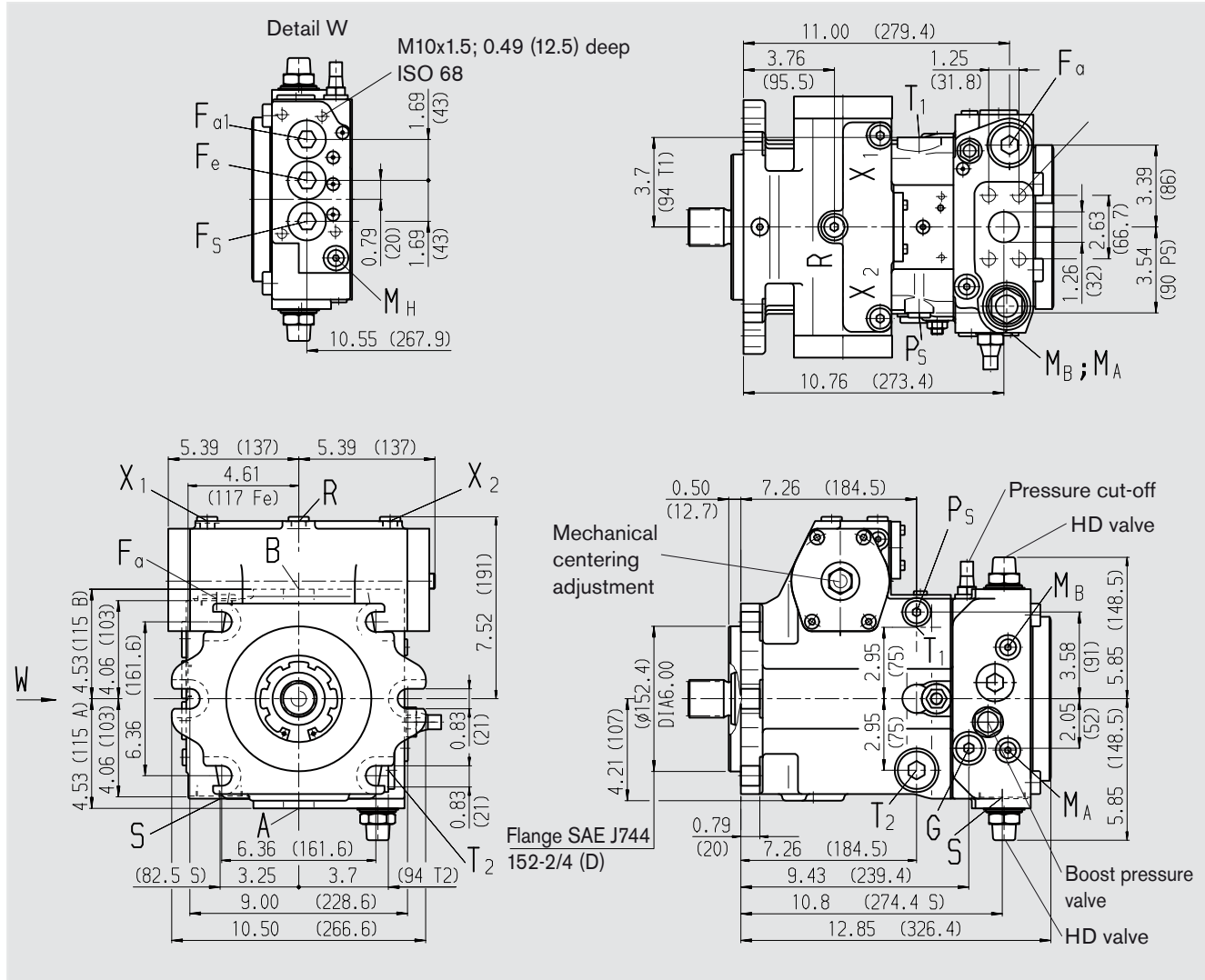
Unit Dimensions, Size 125

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

Version without control unit NV

Standard: suction port S at bottom (52)

Option: suction port S at top (53): port plate turned through 180°

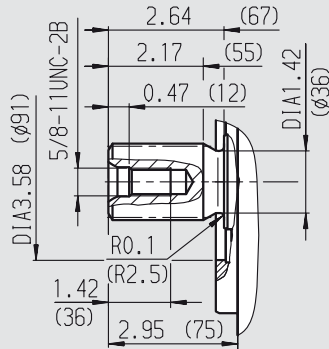


Unit Dimensions, Size 125

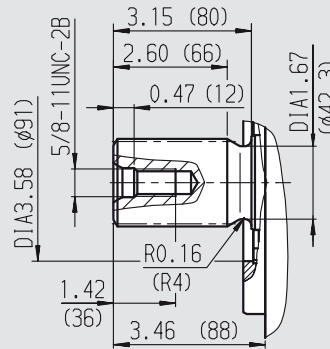
Before finalizing your design, please request a binding installation drawing. Dimensions in inches and (millimeters).

Shaft ends

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



T Splined shaft 2in
15T 8/16DP ¹⁾
(SAE J744 – 50-4 (F))



Ports

A, B	service line ports (high-pressure series)	SAE J518	1 1/4 in	
	fixing thread A/B	ISO 68	1/2 in -13 UNC-2B; 0.75 (19) deep ²⁾	
T ₁	case drain or fill	ISO 11926	1 5/16 in -12 UN-2B; 0.79 (20) deep	400 lb-ft (540 Nm) ²⁾
T ₂	case drain ³⁾	ISO 11926	1 5/16 in -12 UN-2B; 0.79 (20) deep	400 lb-ft (540 Nm) ²⁾
M _A , M _B	pressure gauge - operating pressure A, B ³⁾	ISO 11926	7/16 in -20 UNF-2B; 0.47 (12) deep	30 lb-ft (40 Nm) ²⁾
R	air bleed ³⁾	ISO 11926	9/16 in -18 UNF-2B; 0.51 (13) deep	60 lb-ft (80 Nm) ²⁾
S	boost suction port	ISO 11926	1 7/8 in -12 UN-2B; 0.79 (20) deep	330 lb-ft (450 Nm) ²⁾
X ₁ , X ₂	port for control pressures (before orifice) ³⁾	ISO 11926	9/16 in -18 UNF-2B; 0.51 (13) deep	60 lb-ft (80 Nm) ²⁾
G	pressure port for auxiliary circuits ³⁾	ISO 11926	7/8 in -14 UNF-2B; 0.67 (17) deep	180 lb-ft (240 Nm) ²⁾
P _S	control pressure supply ³⁾	ISO 11926	9/16 in -18 UNF-2B; 0.51 (13) deep	60 lb-ft (80 Nm) ²⁾
F _a	filter output ³⁾	ISO 11926	1 5/16 in -12 UN-2B; 0.79 (20) deep	400 lb-ft (540 Nm) ²⁾
F _{a1}	filter output (filter assembly) ³⁾	DIN 3852	M33x1.5; 0.71 (18) deep	400 lb-ft (540 Nm) ²⁾
F _e	filter input ³⁾	DIN 3852	M33x1.5; 0.71 (18) deep	400 lb-ft (540 Nm) ²⁾
F _S	filter output ³⁾	DIN 3852	M33x1.5; 0.71 (18) deep	400 lb-ft (540 Nm) ²⁾
M _H	port for balanced high pressure ³⁾	ISO 11926	7/16 in -20 UNF-2B; 0.47 (12) deep	30 lb-ft (40 Nm) ²⁾
Y ₁ , Y ₂	remote control ports (only HD)	ISO 11926	9/16 in -18 UNF-2B; 0.51 (13) deep	60 lb-ft (80 Nm) ²⁾
Z	pilot pressure port (only DA4/8) ³⁾	DIN 3852	M10x1; 0.31 (8) deep	22 lb-ft (30 Nm) ²⁾
Y	pilot pressure port (only DA7)	ISO 11926	9/16 in -18 UNF-2B; 0.51 (13) deep	60 lb-ft (80 Nm) ²⁾

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

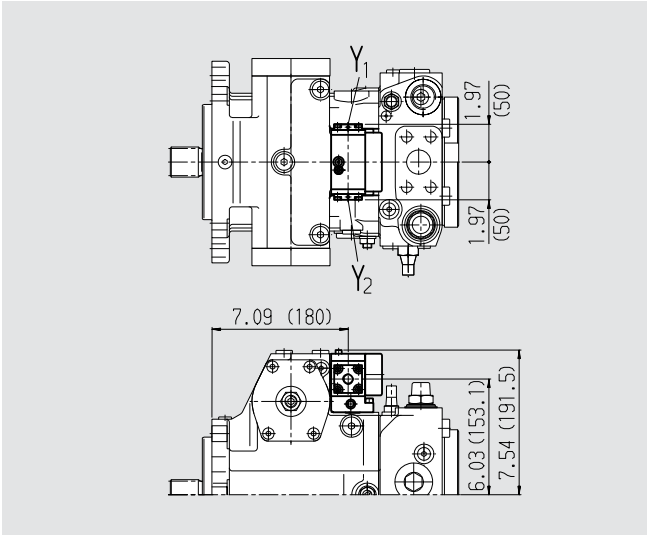
²⁾ Please observe the general notes for the max. tightening torques on page 64

³⁾ Plugged

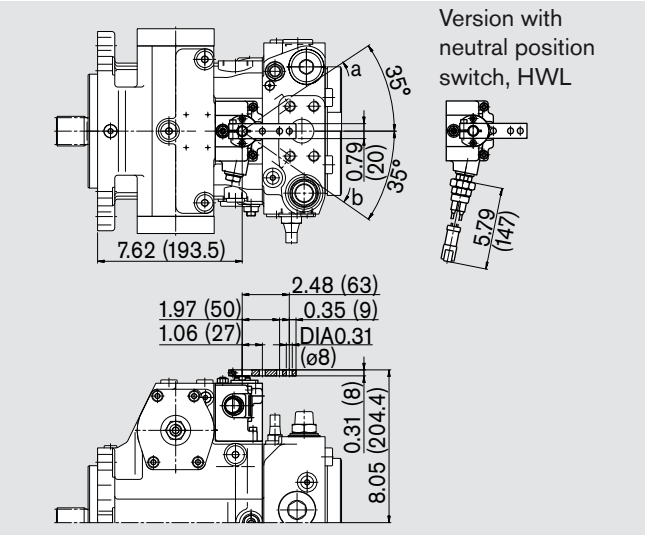
Unit Dimensions, Size 125

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

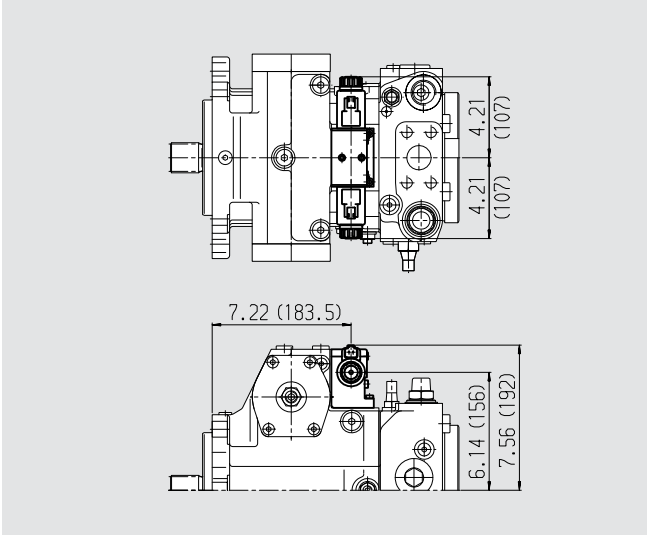
Hydraulic control, pilot-pressure related, HD



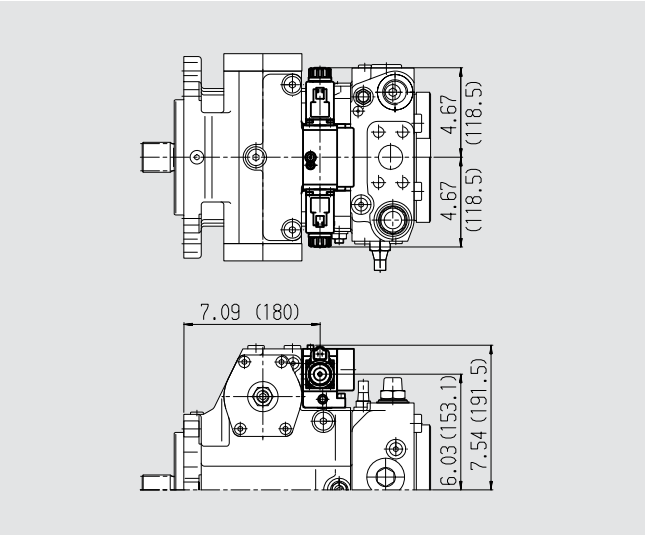
Hydraulic control, mechanical servo, HW



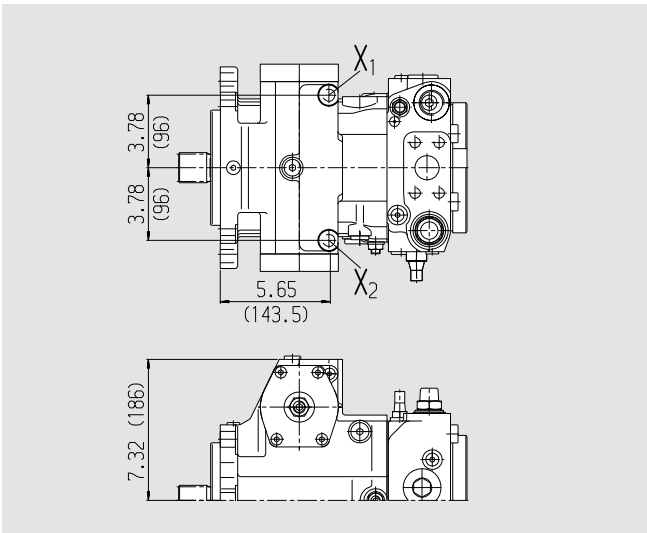
Electric two-point control with switching solenoid, EZ



Electric control with proportional solenoid, EP



Hydraulic control, direct operated, DG

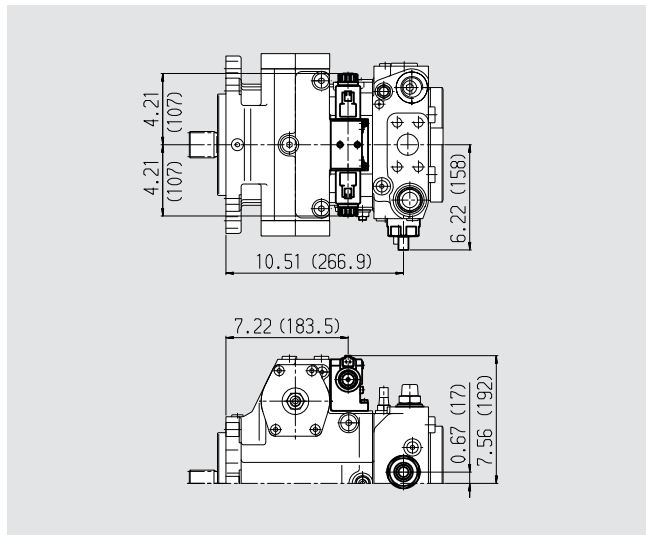


Unit Dimensions, Size 125

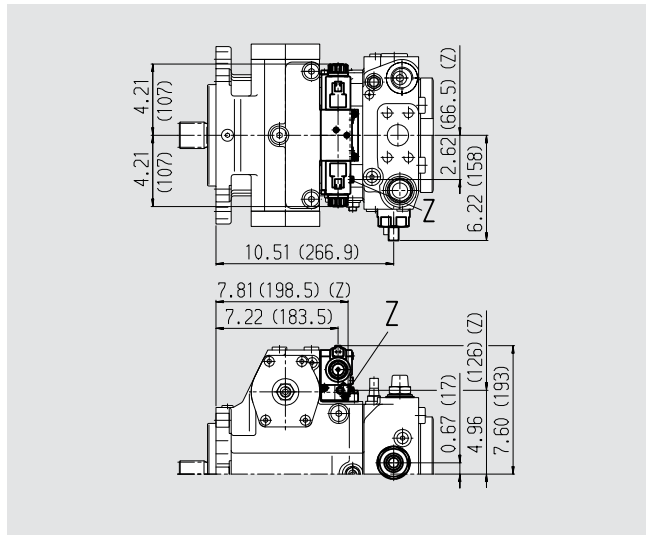
Before finalizing your design, please request a binding installation drawing. Dimensions in inches and (millimeters).

Hydraulic control, speed related, DA

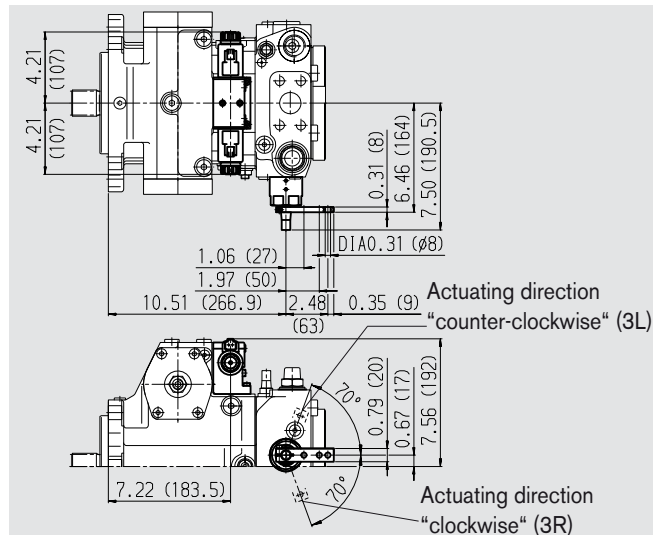
Control valve, fixed setting, DA2



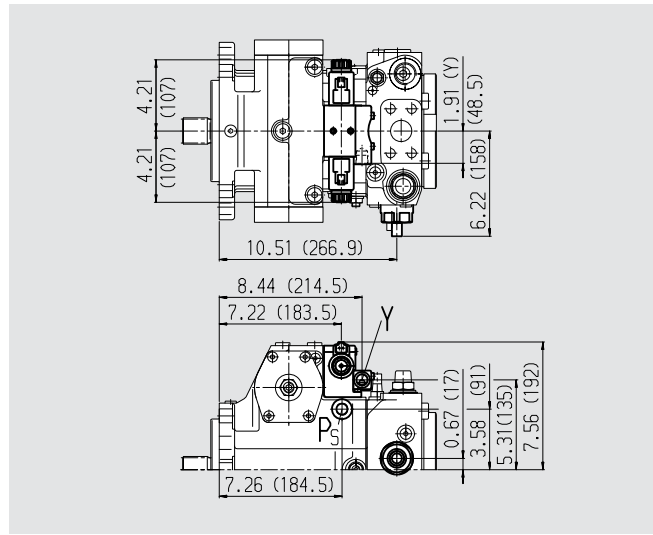
Control valve, fixed setting and hydraulic inch valve mounted, DA4/DA8



Control valve, mech. adjustable with position lever, DA3



Control valve, fixed setting and ports for pilot control device, DA7



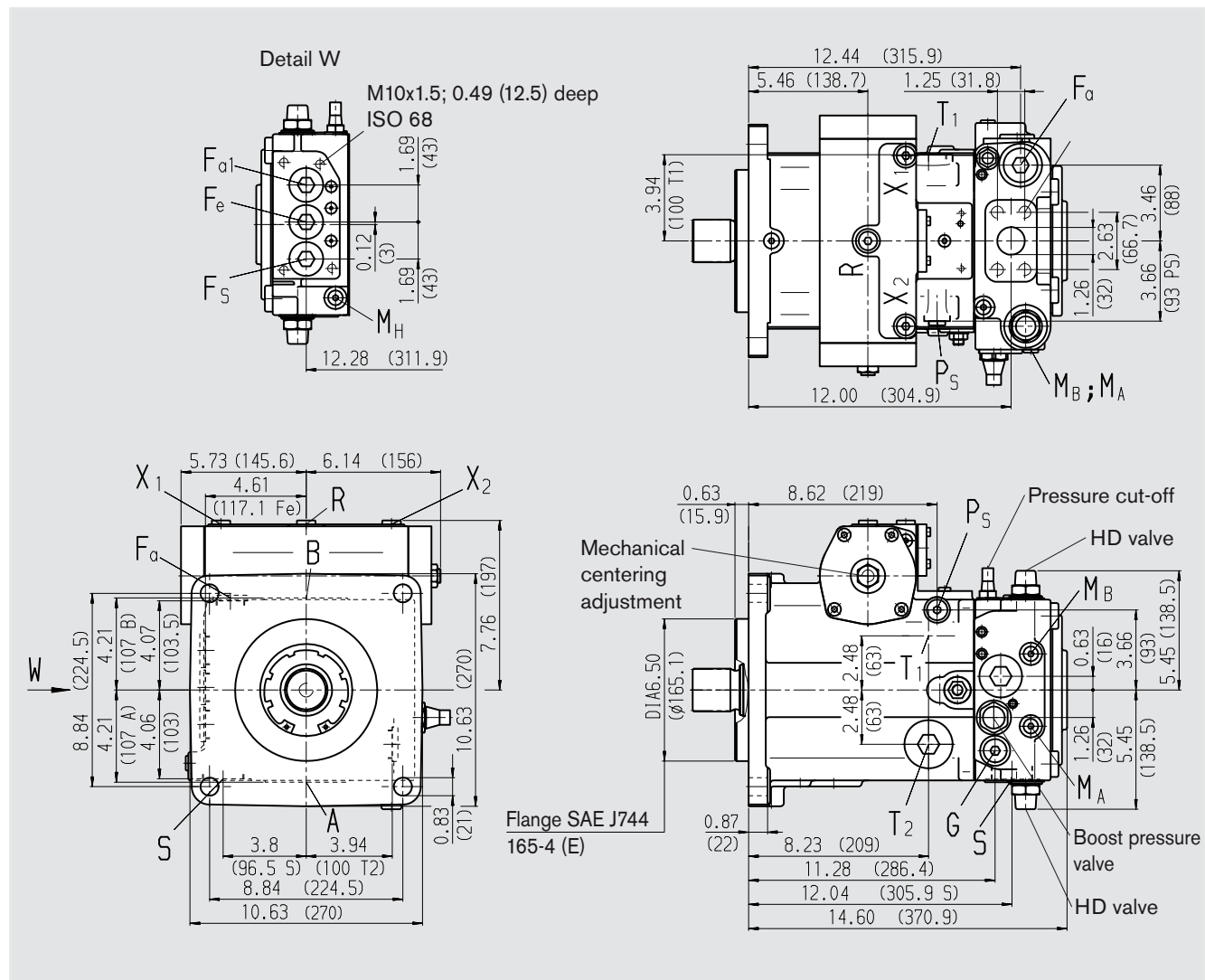
Unit Dimensions, Size 180

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

Version without control unit NV

Standard: suction port S at bottom (52)

Option: suction port S at top (53): port plate turned through 180°

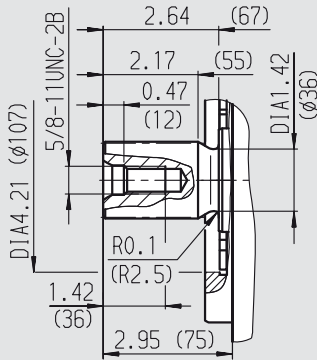


Unit Dimensions, Size 180

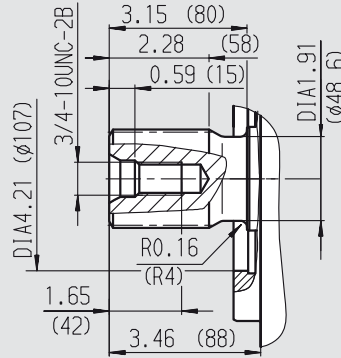
Before finalizing your design, please request a binding installation drawing. Dimensions in inches and (millimeters).

Shaft ends

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



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



Ports

A, B	service line ports (high-pressure series)	SAE J518	1 1/4 in	
	fixing thread A/B	ISO 68	1/2 in -13 UNC-2B; 0.75 (19) deep ²⁾	
T ₁	case drain or fill	ISO 11926	1 5/8 in -12 UN-2B; 0.79 (20) deep	710 lb-ft (960 Nm) ²⁾
T ₂	case drain ³⁾	ISO 11926	1 5/8 in -12 UN-2B; 0.79 (20) deep	710 lb-ft (960 Nm) ²⁾
M _A , M _B	pressure gauge - operating pressure A, B ³⁾	ISO 11926	7/16 in -20 UNF-2B; 0.47 (12) deep	30 lb-ft (40 Nm) ²⁾
R	air bleed ³⁾	ISO 11926	9/16 in -18 UNF-2B; 0.51 (13) deep	60 lb-ft (80 Nm) ²⁾
S	boost suction port	ISO 11926	1 7/8 in -12 UN-2B; 0.79 (20) deep	330 lb-ft (450 Nm) ²⁾
X ₁ , X ₂	port for control pressures (before orifice) ³⁾	ISO 11926	9/16 in -18 UNF-2B; 0.51 (13) deep	60 lb-ft (80 Nm) ²⁾
G	pressure port for auxiliary circuits ³⁾	ISO 11926	7/8 in -14 UNF-2B; 0.67 (17) deep	180 lb-ft (240 Nm) ²⁾
P _S	control pressure supply ³⁾	ISO 11926	9/16 in -18 UNF-2B; 0.51 (13) deep	60 lb-ft (80 Nm) ²⁾
F _a	filter output ³⁾	ISO 11926	1 5/16 in -12 UN-2B; 0.79 (20) deep	400 lb-ft (540 Nm) ²⁾
F _{a1}	filter output (filter assembly) ³⁾	DIN 3852	M33x1.5; 0.71 (18) deep	400 lb-ft (540 Nm) ²⁾
F _e	filter input ³⁾	DIN 3852	M33x1.5; 0.71 (18) deep	400 lb-ft (540 Nm) ²⁾
F _S	filter output ³⁾	DIN 3852	M33x1.5; 0.71 (18) deep	400 lb-ft (540 Nm) ²⁾
M _H	port for balanced high pressure ³⁾	ISO 11926	7/16 in -20 UNF-2B; 0.47 (12) deep	30 lb-ft (40 Nm) ²⁾
Y ₁ , Y ₂	remote control ports (only HD)	ISO 11926	9/16 in -18 UNF-2B; 0.51 (13) deep	60 lb-ft (80 Nm) ²⁾
Z	pilot pressure port (only DA4/8) ³⁾	DIN 3852	M10x1; 0.31 (8) deep	22 lb-ft (30 Nm) ²⁾
Y	pilot pressure port (only DA7)	ISO 11926	9/16 in -18 UNF-2B; 0.51 (13) deep	60 lb-ft (80 Nm) ²⁾

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

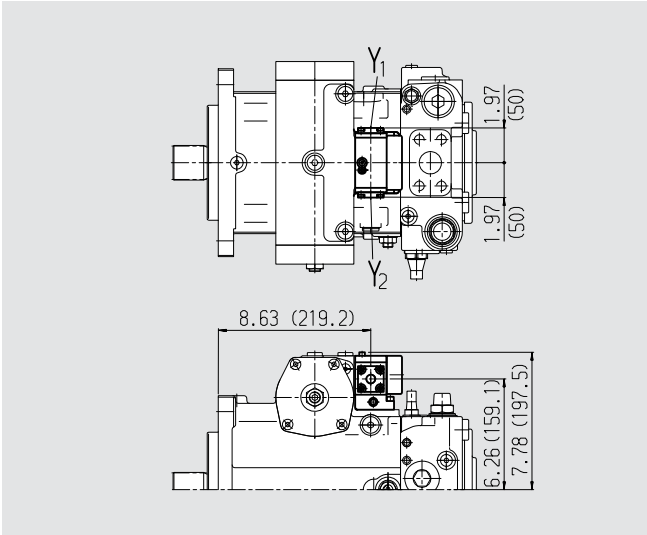
²⁾ Please observe the general notes for the max. tightening torques on page 64

³⁾ Plugged

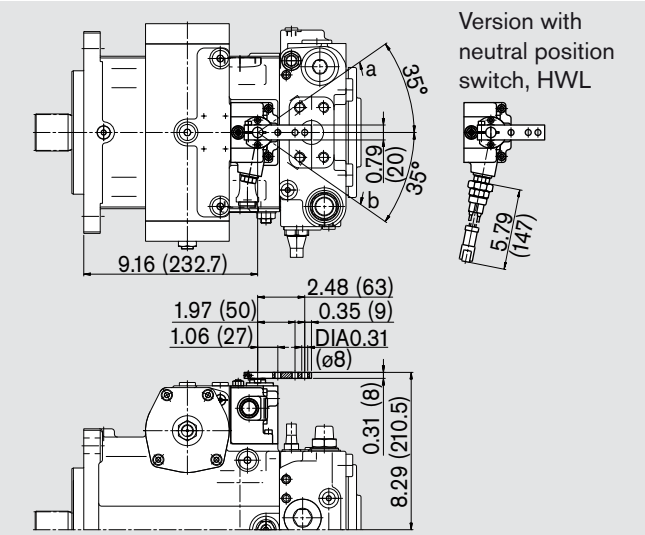
Unit Dimensions, Size 180

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

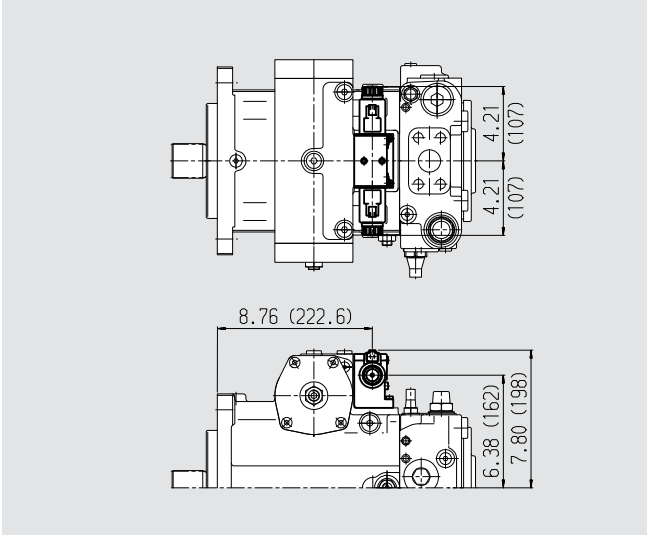
Hydraulic control, pilot-pressure related, HD



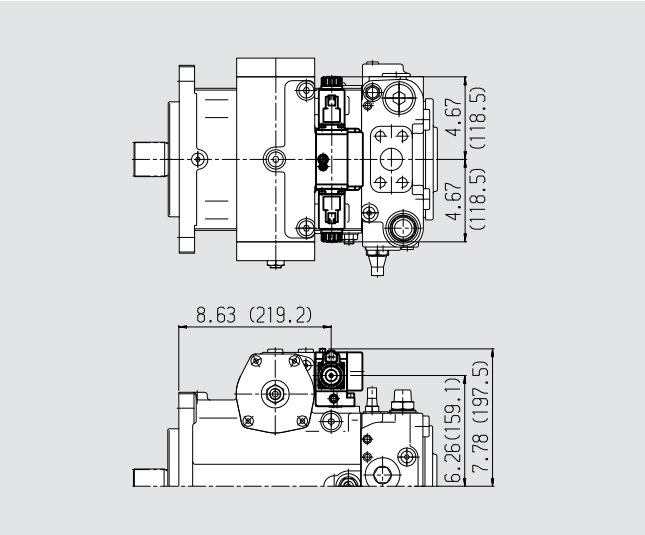
Hydraulic control, mechanical servo, HW



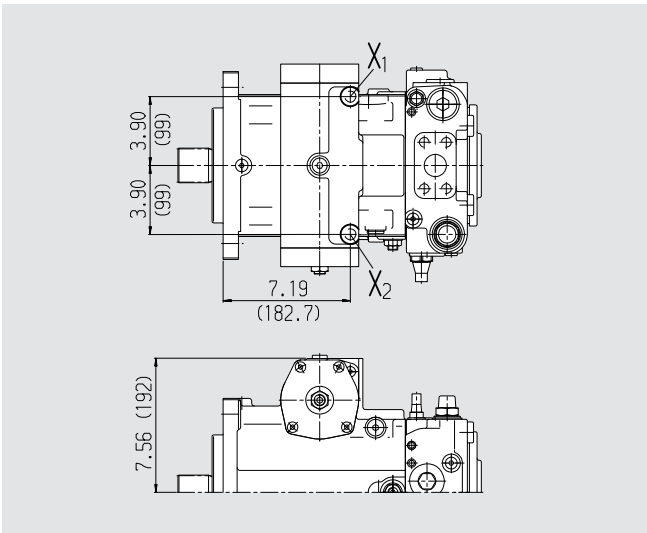
Electric two-point control with switching solenoid, EZ



Electric control with proportional solenoid, EP



Hydraulic control, direct operated, DG

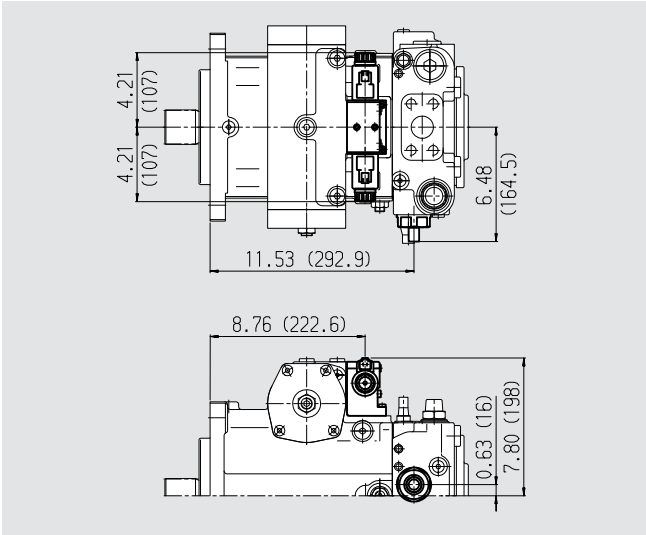


Unit Dimensions, Size 180

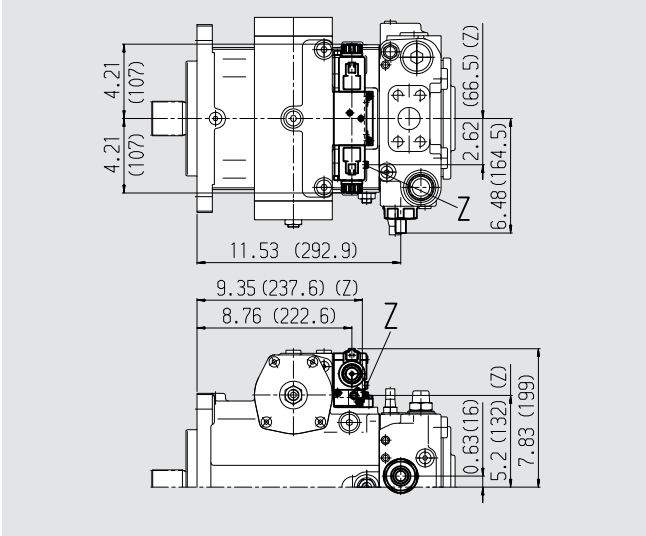
Before finalizing your design, please request a binding installation drawing. Dimensions in inches and (millimeters).

Hydraulic control, speed related, DA

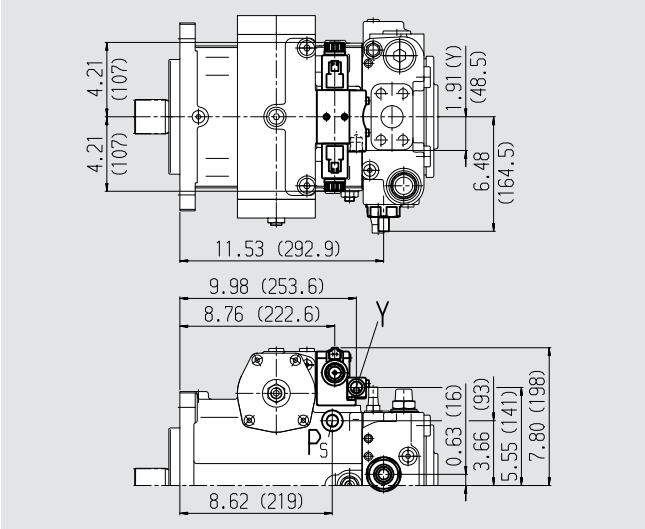
Control valve, fixed setting, DA2



Control valve, fixed setting and hydraulic inch valve mounted, DA4/DA8



Control valve, fixed setting and ports for pilot control device, DA7



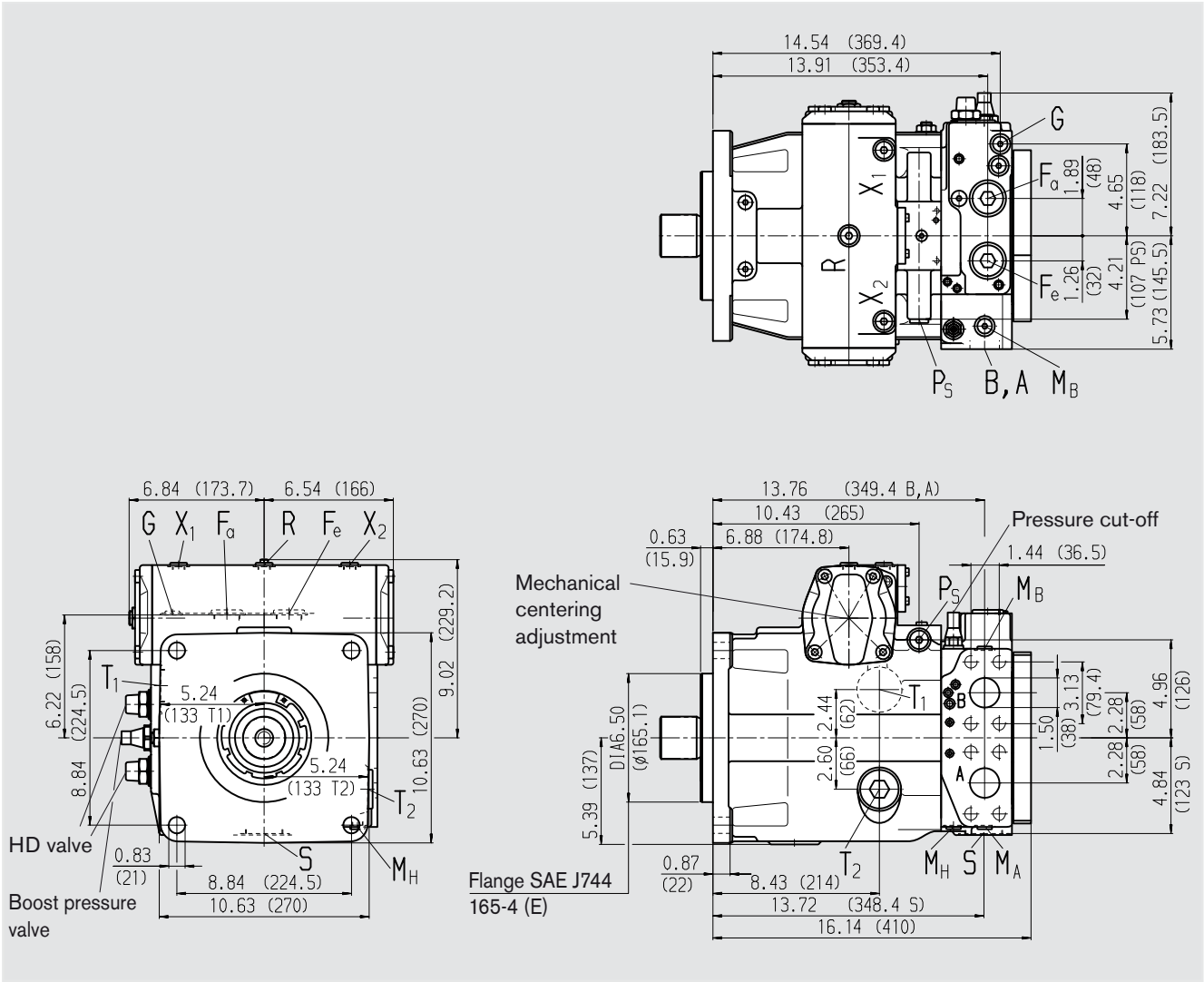
Unit Dimensions, Size 250

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

Version without control unit NV

Standard: suction port S at bottom (60)

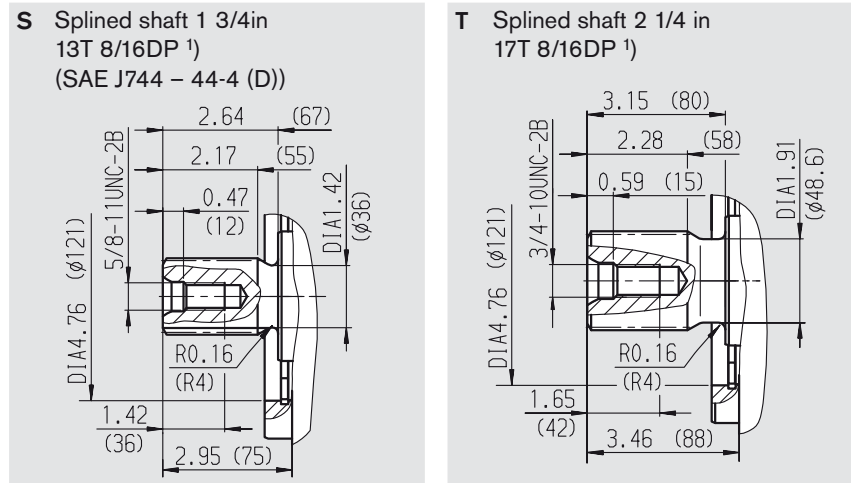
Option: suction port S at top (63): port plate turned through 180°



Unit Dimensions, Size 250

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

Shaft ends



Ports

A, B	service line ports (high-pressure series)	SAE J518	1 1/2 in	
	fixing thread A/B	ISO 68	5/8 in -11 UNC-2B; 0.83 (21) deep ²⁾	
T ₁	case drain or fill	ISO 11926	1 5/8 in -12 UN-2B; 0.79 (20) deep	710 lb-ft (960 Nm) ²⁾
T ₂	case drain ³⁾	ISO 11926	1 5/8 in -12 UN-2B; 0.79 (20) deep	710 lb-ft (960 Nm) ²⁾
M _A , M _B	pressure gauge - operating pressure A, B ³⁾	ISO 11926	9/16 in -18 UNF-2B; 0.51 (13) deep	60 lb-ft (80 Nm) ²⁾
R	air bleed ³⁾	ISO 11926	9/16 in -18 UNF-2B; 0.79 (20) deep	60 lb-ft (80 Nm) ²⁾
S	boost suction port	ISO 11926	1 7/8 in -12 UN-2B; 0.79 (20) deep	330 lb-ft (450 Nm) ²⁾
X ₁ , X ₂	port for control pressures (before orifice) ³⁾	ISO 11926	9/16 in -18 UNF-2B; 0.51 (13) deep	60 lb-ft (80 Nm) ²⁾
G	pressure port for auxiliary circuits ³⁾	ISO 11926	9/16 in -18 UNF-2B; 0.51 (13) deep	60 lb-ft (80 Nm) ²⁾
P _S	control pressure supply ³⁾	ISO 11926	3/4 in -16 UNF-2B; 0.47 (12) deep	120 lb-ft (160 Nm) ²⁾
F _a	filter output ³⁾	ISO 11926	1 5/16 in -12 UN-2B; 0.79 (20) deep	400 lb-ft (540 Nm) ²⁾
F _e	filter input ³⁾	ISO 11926	1 5/16 in -12 UN-2B; 0.79 (20) deep	400 lb-ft (540 Nm) ²⁾
M _H	port for balanced high pressure ³⁾	ISO 11926	9/16 in -18 UNF-2B; 0.51 (13) deep	60 lb-ft (80 Nm) ²⁾
Y ₁ , Y ₂	remote control ports (only HD)	ISO 11926	9/16 in -18 UNF-2B; 0.47 (12) deep	60 lb-ft (80 Nm) ²⁾
Z	pilot pressure port (only DA4/8) ³⁾	DIN 3852	M10x1; 0.31 (8) deep	22 lb-ft (30 Nm) ²⁾
Y	pilot pressure port (only DA7)	ISO 11926	9/16 in -18 UNF-2B; 0.51 (13) deep	60 lb-ft (80 Nm) ²⁾

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

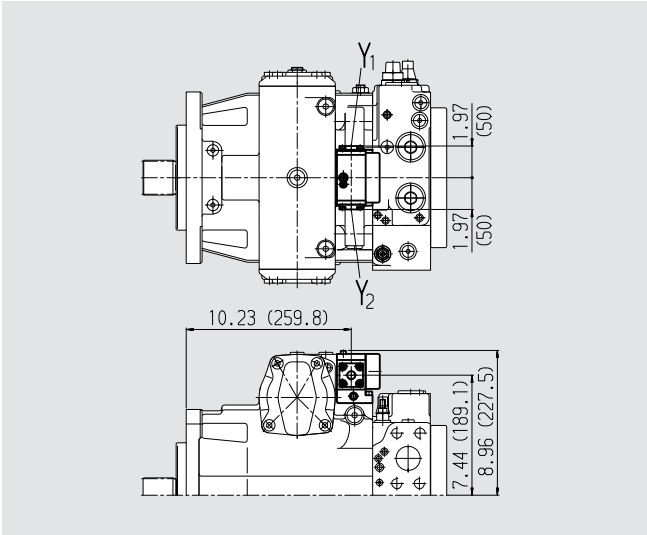
²⁾ Please observe the general notes for the max. tightening torques on page 64

³⁾ Plugged

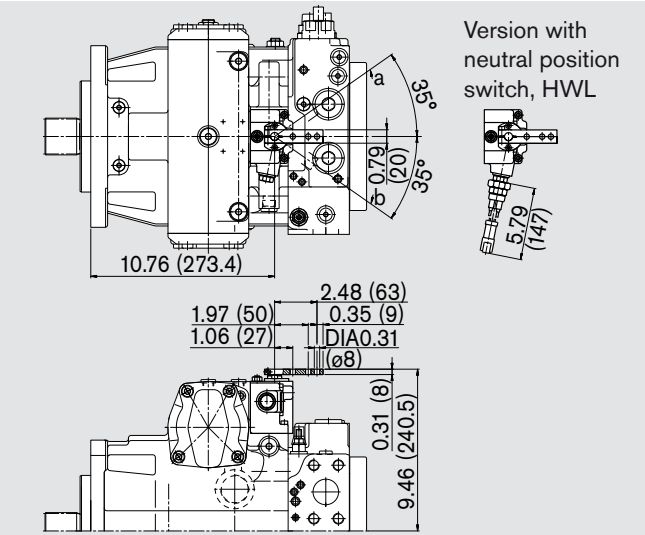
Unit Dimensions, Size 250

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

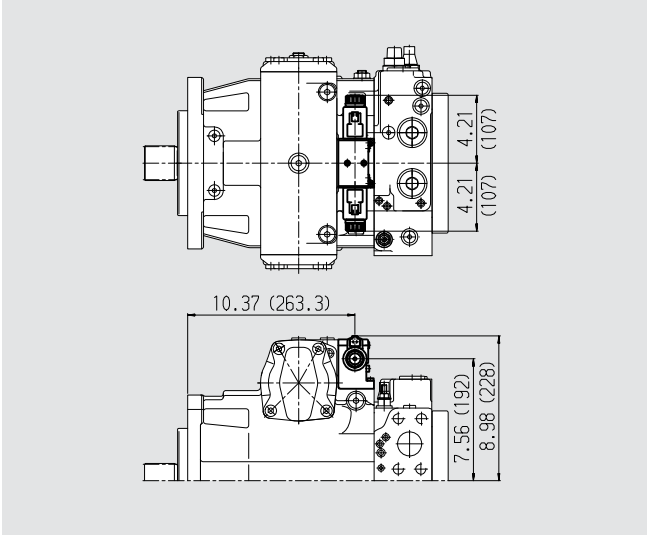
Hydraulic control, pilot-pressure related, HD



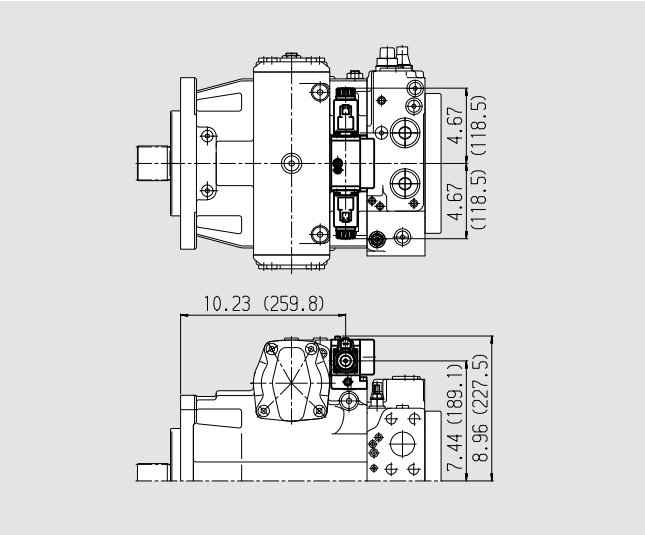
Hydraulic control, mechanical servo, HW



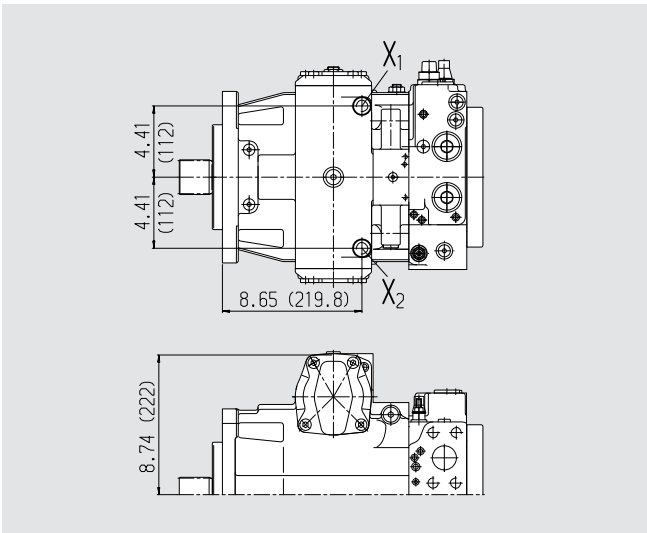
Electric two-point control with switching solenoid, EZ



Electric control with proportional solenoid, EP



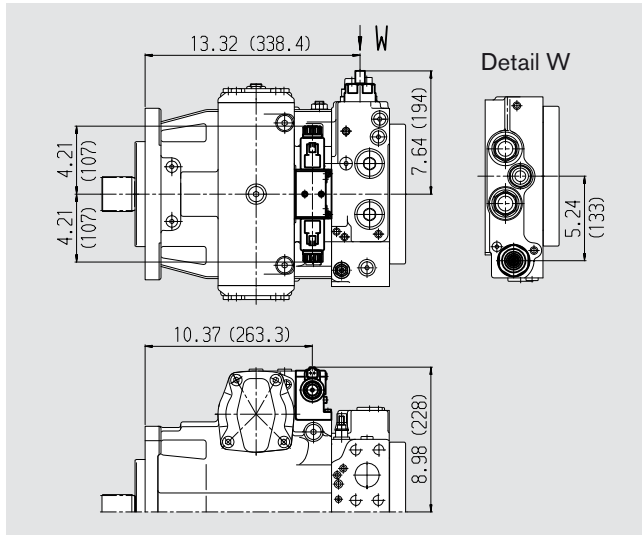
Hydraulic control, direct operated, DG



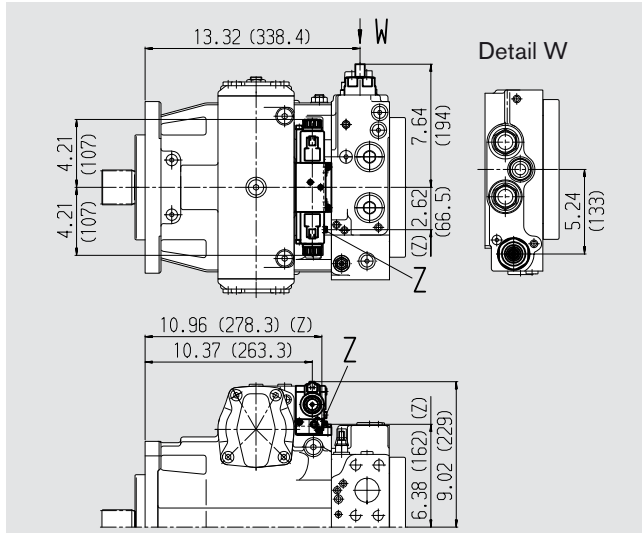
Unit Dimensions, Size 250

Hydraulic control, speed related, DA

Control valve, fixed setting, DA2

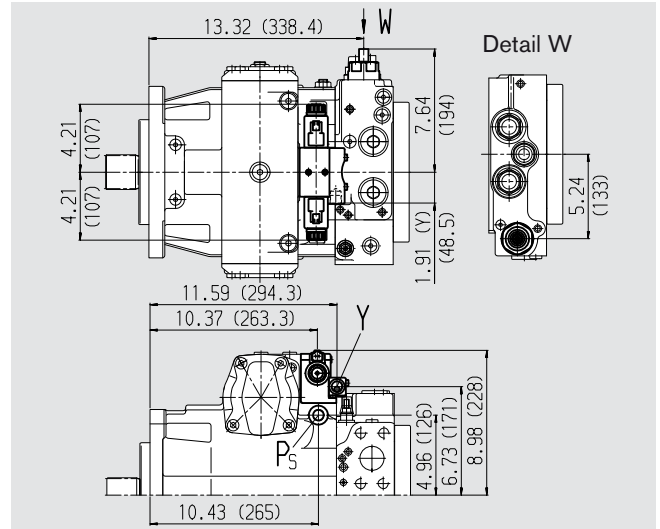


Control valve, fixed setting and hydraulic inch valve mounted, DA4/DA8



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

Control valve, fixed setting and ports for pilot control device, DA7

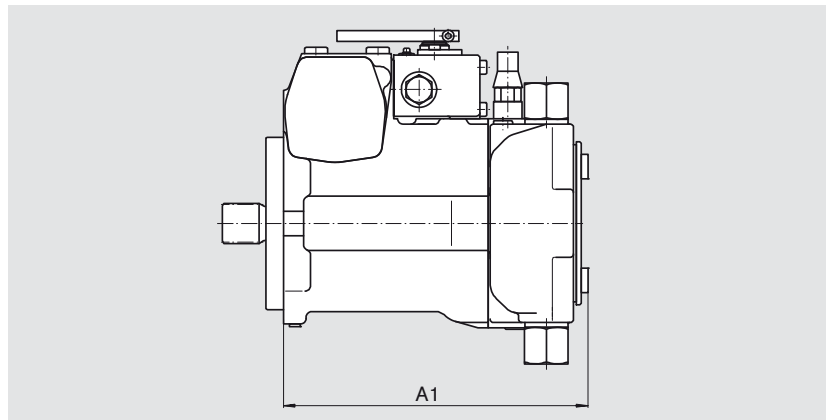


Through Drive Dimensions

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

N00 Without boost pump, without through drive

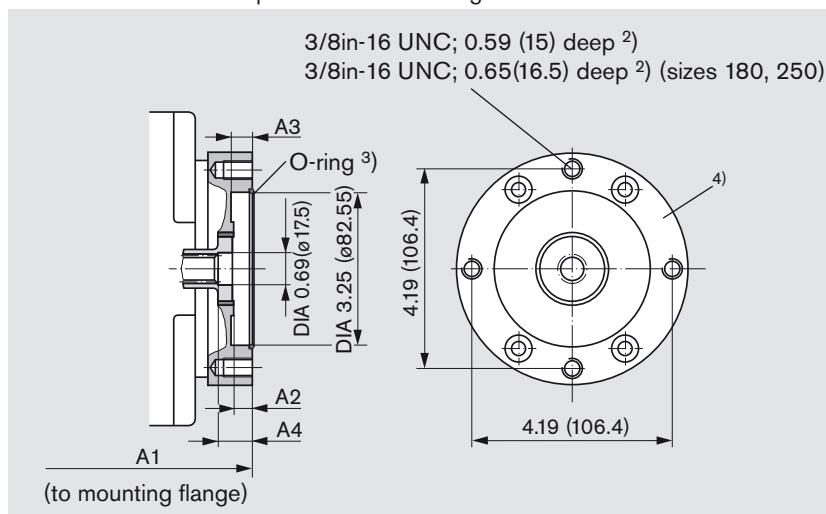
F00 With boost pump, without through drive



Size	A1 (N00)	A1 (F00)
28	8.42 (213.9)	8.8 (223.4)
40	8.67 (220.2)	9.28 (235.7)
56	9.43 (239.4)	10.09 (256.4)
71	10.99 (279.1)	11.56 (293.6)
90	11.30 (287.0)	11.85 (301.0)
125	12.63 (320.9)	12.85 (326.4)
180	14.60 (370.9)	14.60 (370.9)
250	15.68 (398.2)	16.10 (409.0)

F01/K01 Flange SAE J744 – 82-2 (A)

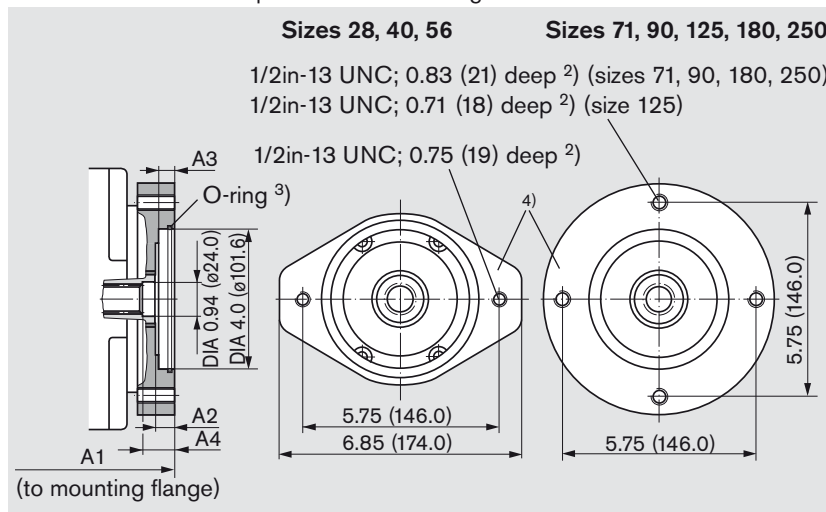
Hub for splined shaft according to ANSI B92.1a-1976 5/8 in 9T 16/32DP ¹⁾ (SAE J744 – 16-4 (A))



Size	A1 (F01)	A1 (K01)	A2	A3	A4
28	8.97 (227.9)	8.97 (227.9)	0.30 (7.5)	0.30 (7.5)	0.57 (14.5)
40	9.44 (239.7)	9.22 (234.2)	0.35 (9.0)	0.35 (9.0)	0.71 (18.0)
56	10.29 (261.4)	10.04 (254.9)	0.39 (10.0)	0.39 (10.0)	0.71 (18.0)
71	11.72 (297.6)	11.72 (297.6)	0.35 (9.0)	0.39 (10.0)	0.67 (17.0)
90	11.97 (304.0)	11.97 (304.0)	0.35 (9.0)	0.31 (8.0)	–
125	13.03 (330.9)	13.03 (330.9)	0.41 (10.5)	0.35 (9.0)	–
180	14.90 (378.4)	14.90 (378.4)	0.30 (7.5)	0.30 (7.5)	0.61 (15.5)
250	16.81 (426.9)	16.78 (426.2)	0.43 (11.0)	0.43 (11.0)	0.71 (18.0)

F02/K02 Flange SAE J744 – 101-2 (B)

Hub for splined shaft according to ANSI B92.1a-1976 7/8 in 13T 16/32DP ¹⁾ (SAE J744 – 22-4 (B))



Size	A1	A2	A3	A4
28	9.07 (230.4)	0.38 (9.7)	0.38 (9.7)	0.64 (16.2)
40	9.48 (240.7)	0.43 (11.0)	0.43 (11.0)	0.67 (17.0)
56	10.33 (262.4)	0.47 (12.0)	0.43 (11.0)	0.77 (19.5)
71	11.83 (300.6)	0.51 (13.0)	0.39 (9.8)	0.67 (17.0)
90	12.01 (305)	0.35 (9.0)	0.43 (11.0)	0.67 (17.0)
125	13.03 (330.9)	0.39 (10.0)	0.43 (11.0)	0.67 (17.0)
180	15.02 (381.4)	0.43 (11.0)	0.43 (11.0)	0.75 (19.0)
250	16.89 (428.9)	0.43 (11.0)	0.43 (11.0)	0.63 (16.0)

¹⁾ 30° pressure angle, flat root; side fit, tolerance class 5

²⁾ Thread acc. to ISO 68, please observe the general notes for the max. tightening torques on page 64

³⁾ O-ring included in supply

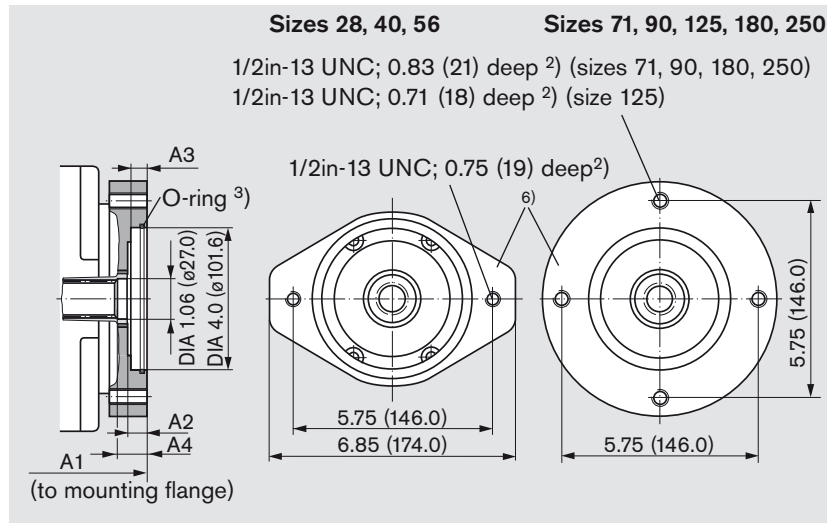
⁴⁾ Shown is the 2-bolt version. Please specify in plain text whether the 2-bolt horizontal or 2-bolt vertical version is used.

Through Drive Dimensions

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

F04/K04 Flange SAE J744 – 101-2 (B)

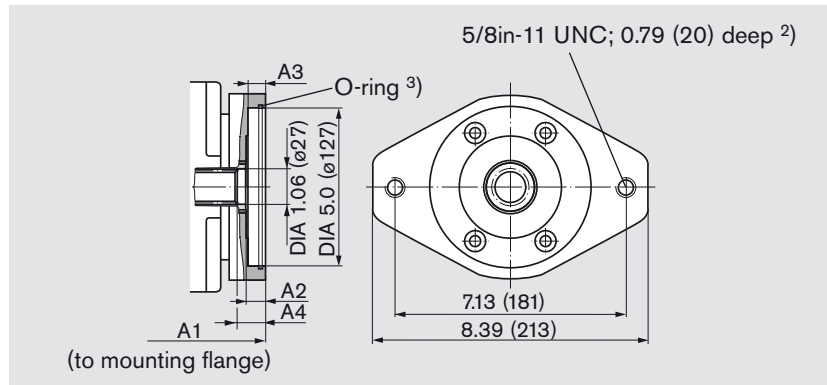
Hub for splined shaft according to ANSI B92.1a-1976 1 in 15T 16/32DP ¹⁾ (SAE J744 – 25-4 (B-B))



Size	A1	A2	A3	A4
28	9.07 (230.4)	0.38 (9.7)	0.38 (9.7)	0.54 (13.7)
40	9.48 (240.7)	0.43 (11.0)	0.38 (9.7)	0.63 (16.0)
56	10.33 (262.4)	0.51 (13.0)	0.43 (11.0)	0.73 (18.5)
71	11.83 (300.6)	0.51 (13.0)	0.39 (9.8)	0.61 (15.5)
90	12.01 (305.0)	0.35 (9.0)	0.43 (11.0)	0.59 (15.0)
125	13.03 (330.9)	0.39 (10.0)	0.43 (11.0)	0.65 (16.5)
180	15.02 (381.4)	0.43 (11.0)	0.43 (11.0)	0.71 (18.0)
250	16.89 (428.9)	0.43 (11.0)	0.43 (11.0)	0.61 (15.5)

F09/K09 Flange SAE J744 – 127-2 (C)

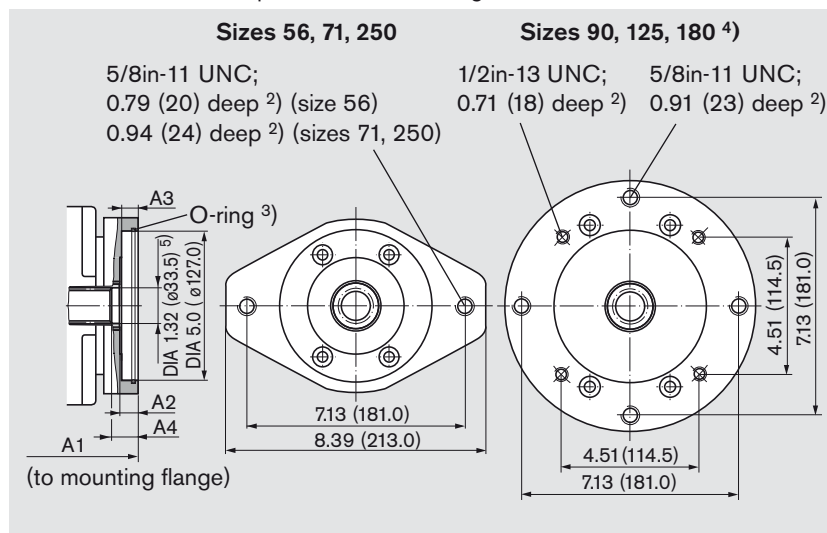
Hub for splined shaft according to ANSI B92.1a-1976 1 in 15T 16/32DP ¹⁾ (SAE J744 – 25-4 (B-B))



Size	A1	A2	A3	A4
40	9.63 (244.7)	0.55 (14.0)	0.55 (14.0)	0.77 (19.5)

F07/K07 Flange SAE J744 – 127-2 (C)

Hub for splined shaft according to ANSI B92.1a-1976 1 1/4 in 14T 12/24DP ¹⁾ (SAE J744 – 32-4 (C))



Size	A1	A2	A3	A4
56	10.49 (266.4)	0.59 (15.0)	0.55 (14.0)	0.69 (17.5)
71	11.95 (303.6)	0.59 (15.0)	0.53 (13.5)	0.79 (20.0)
90	12.17 (309.0)	0.51 (13.0)	0.55 (14.0)	0.81 (20.5)
125	13.22 (335.9)	0.59 (15.0)	0.61 (15.5)	0.89 (22.5)
180	15.13 (384.4)	0.55 (14.0)	0.75 (19.0)	0.67 (17.0)
250	16.77 (425.9)	0.63 (16.0)	0.55 (14.0)	0.63 (16.0)

Shown is the 4-bolt and 2-bolt version. Please specify in plain text whether the 4-bolt, 2-bolt horizontal or 2-bolt vertical version is used.

¹⁾ 30° pressure angle, flat root, side fit, tolerance class 5
²⁾ Thread acc. to ISO 68, Please observe the general notes for the max. tightening torques on page 64
³⁾ O-ring included in supply

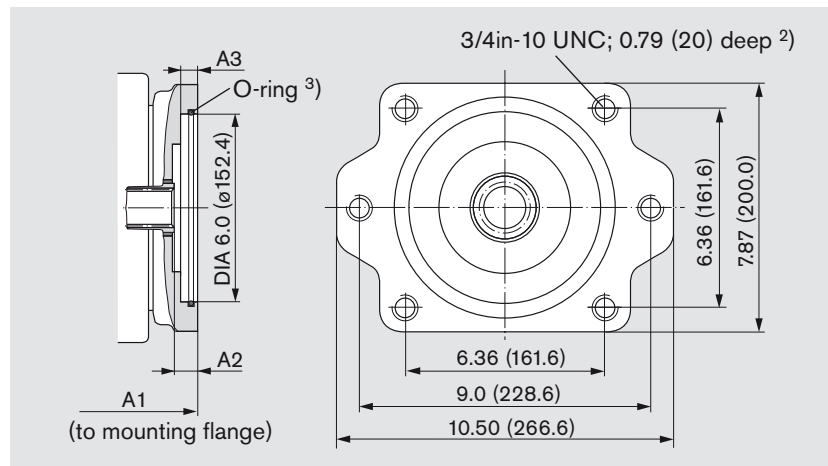
⁴⁾ Size 180 only with SAE 2-bolt flange
⁵⁾ Size 56: DIA 1.29 (ø32.7)
⁶⁾ Shown is the 2-bolt version. Please specify in plain text whether the 2-bolt horizontal or 2-bolt vertical version is used.

Through Drive Dimensions

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

F90/K90 Flange SAE J744 – 152-2/4 (D)

Hub for splined shaft according to ANSI B92.1a-1976 1 1/4 in 14T 12/24DP ¹⁾ (SAE J744 – 32-4 (C))

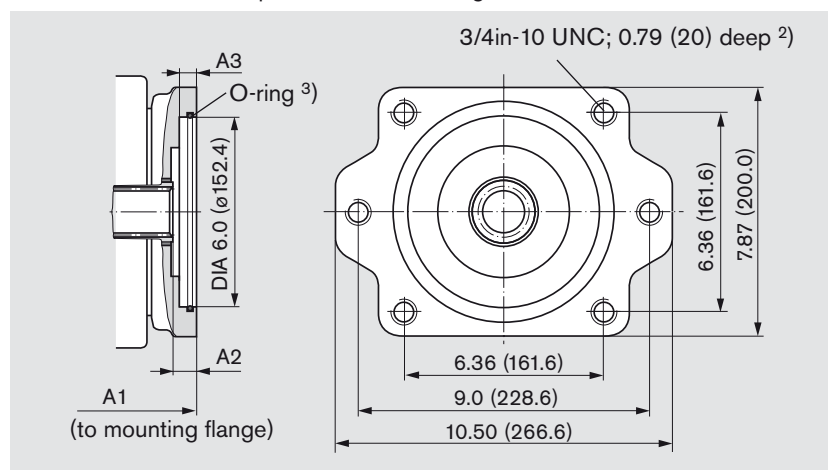


Size	A1	A2	A3
90	12.17 (309.0)	0.47 (12.0)	0.55 (14.0)

Shown is the 4+2-bolt version.
Please specify in plain text whether the 2-bolt, 4-bolt or 4+2-bolt version is used.

F69/K69 Flange SAE J744 – 152-2/4 (D)

Hub for splined shaft according to ANSI B92.1a-1976 1 3/4 in 13T 8/16DP ¹⁾ (SAE J744 – 44-4 (D))

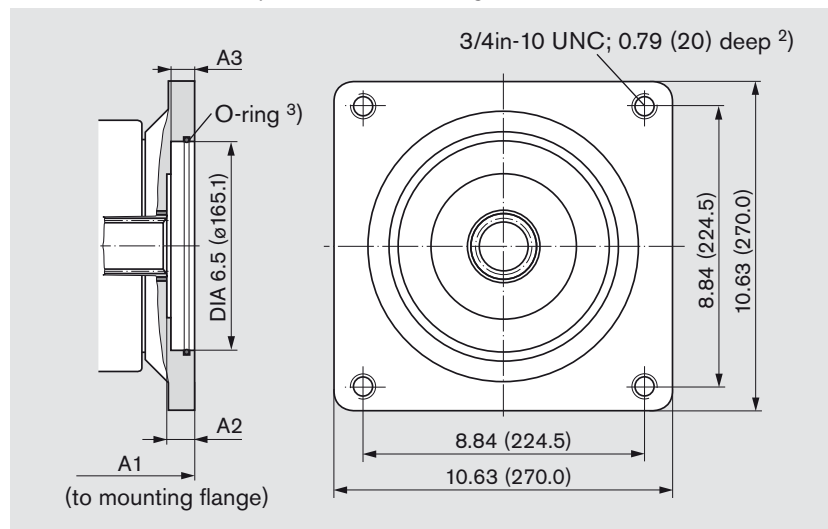


Size	A1	A2	A3
125	13.54 (343.9)	0.71 (18.0)	0.55 (14.0)
180	15.43 (391.9)	0.82 (20.9)	0.71 (18.0)
250	17.52 (444.9)	0.35 (9.0)	0.67 (17.0)

Shown is the 4+2-bolt version.
Please specify in plain text whether the 2-bolt, 4-bolt or 4+2-bolt version is used.

F72/K72 Flange SAE J744 – 165-4 (E)

Hub for splined shaft according to ANSI B92.1a-1976 1 3/4 in 13T 8/16DP ¹⁾ (SAE J744 – 44-4 (D))



Size	A1	A2	A3
180	15.43 (391.9)	0.82 (20.9)	0.71 (18)
250	17.52 (444.9)	0.35 (9)	0.67 (17)

¹⁾ 30° pressure angle, flat root, side fit, tolerance class 5

²⁾ Thread acc. to ISO 68, please observe the general notes for the max. tightening torques on page 64

³⁾ O-ring included in supply

Overview of Attachments on AA4VG

Through drive – AA4VG										Through drive
Flange	Hub for splined shaft	Code	AA4VG Size (shaft)	AA10V(S)O/31 Size (shaft)	A10V(S)O/53 Size (shaft)	A4FO Size (shaft)	AA11VO Size (shaft)	AA10VG Size (shaft)	External gear pump	Available for size
82-2 (A)	5/8 in	F/K01	–	18 (U)	10 (U)	–	–	–	Size F Size 4-22 ¹⁾	28...250
101-2 (B)	7/8 in	F/K02	–	28 (S,R)	28 (S,R)	16 (S) 22 (S) 28 (S)	–	18 (S)	Size N Size 20-32 ¹⁾ Size G Size 38-45 ¹⁾	28...250
	1 in	F/K04	28 (S)	45 (S,R)	45 (S,R) 60 (U,W)	–	40 (S)	28 (S) 45 (S)	–	28...250
127-2 (C)	1 in	F/K09	40 (U)	–	–	–	–	–	–	40
	1 1/4 in	F/K07	40 (S), 56 (S) 71 (S)	71 (S,R) 100 (U)	85 (U)	–	60 (S)	63 (S)	–	56...250
152-2/4 (D)	1 1/4 in	F/K90	90 (U)	–	–	–	–	–	–	90
	1 3/4 in	F/K69	90 (S) 125 (S)	140 (S)	–	–	95 (S) 130 (S)	–	–	125...250
165-4 (E)	1 3/4 in	F/K72	180 (S) 250 (S)	–	–	–	190 (S) 260 (S)	–	–	180...250

¹⁾ Rexroth recommends special gear pump versions. Please contact us.

Combination Pumps AA4VG + AA4VG

Overall length A

AA4VG (1st pump)		AA4VG (2nd pump) ¹⁾						
		Size 28	Size 40	Size 56	Size 71	Size 90	Size 125	Size 180
Size 28	in	17.87	–	–	–	–	–	–
	mm	(453.8)	–	–	–	–	–	–
Size 40	in	18.27	18.91	–	–	–	–	–
	mm	(464.1)	(480.4)	–	–	–	–	–
Size 56	in	19.13	19.77	20.58	–	–	–	–
	mm	(485.8)	(502.1)	(522.8)	–	–	–	–
Size 71	in	20.63	21.23	22.05	23.51	–	–	–
	mm	(524.0)	(539.3)	(560.0)	(597.2)	–	–	–
Size 90	in	20.80	21.44	22.26	23.72	24.02	–	–
	mm	(528.4)	(544.7)	(565.4)	(602.6)	(610.0)	–	–
Size 125	in	21.82	22.50	23.32	24.78	25.39	26.39	–
	mm	(554.3)	(571.6)	(592.3)	(629.5)	(644.9)	(670.3)	–
Size 180	in	23.81	24.41	25.23	26.69	27.28	28.28	30.03
	mm	(604.8)	(620.1)	(640.8)	(678.0)	(692.9)	(718.3)	(762.8)
Size 250	in	25.68	26.05	26.86	28.33	29.37	30.37	32.19
	mm	(652.3)	(661.6)	(682.3)	(719.5)	(745.9)	(771.3)	(815.8)

¹⁾ 2nd pump without through drive and with boost pump, F00
Combination pumps make it possible to have independent circuits without the need to fit splitter gearboxes.

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

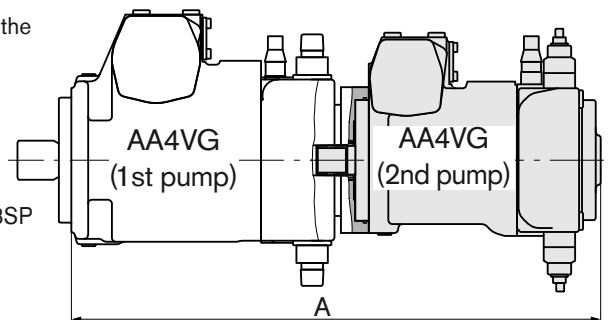
Example of order:

AA4VG56EP3D1/32R-NTC52F073SP + AA4VG56EP3D1/32R-NSC52F003SP

A tandem pump combined of two equal sizes is permissible without additional supports where the dynamic acceleration does not exceed max. 0.022 lbs (= 322 ft/s²) {10 g (= 98.1 m/s²)}.

We recommend the use of 4-bolt mounting flanges from size 71 and larger.

For combination pumps consisting of more than two pumps, the mounting flange must be rated for the permissible mass torque.



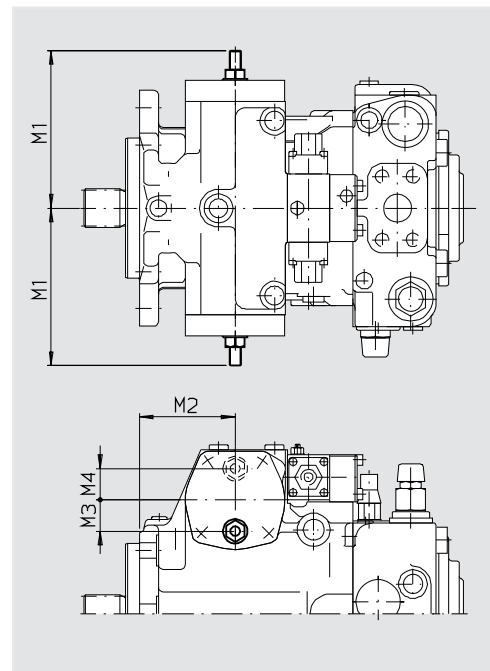
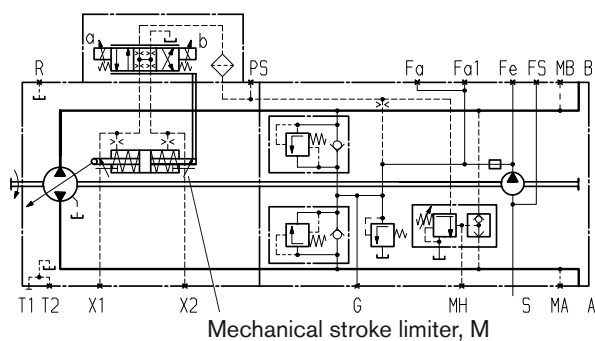
Mechanical Stroke Limiter, M

The mechanical stroke limiter is an additional function allowing continuous reduction of the maximum displacement of the pump, regardless of the control unit used. The stroke of the stroke cylinder and hence the maximum swivel angle of the pump are limited by means of two adjusting screws.

Dimensions

Size	M1 max.	M2	M3	M4
28	4.35 (110.6)	1.58 (40.1)	0.94 (24.0)	–
40	4.35 (110.6)	1.50 (38.1)	0.94 (24.0)	–
56	5.14 (130.5)	1.73 (44.0)	1.00 (25.5)	–
71	5.33 (135.4)	3.40 (86.3)	–	1.12 (28.5)
90	5.79 (147.0)	3.77 (95.7)	1.24 (31.5)	–
125	6.38 (162.0)	4.11 (104.5)	–	1.40 (35.5)
180	7.15 (181.6)	5.46 (138.7)	1.50 (38.0)	–
250	7.83 (198.9)	6.88 (174.8)	1.56 (39.5)	–

Circuit diagram 1)

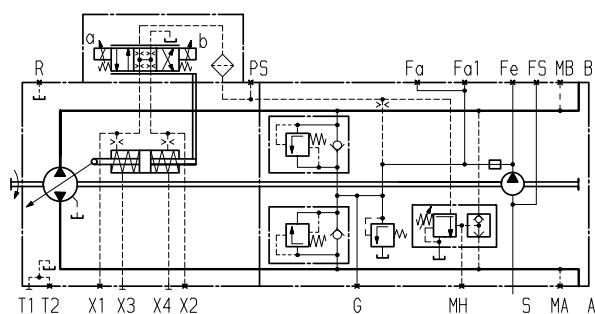


Ports X₃ and X₄ for Positioning Pressure, T

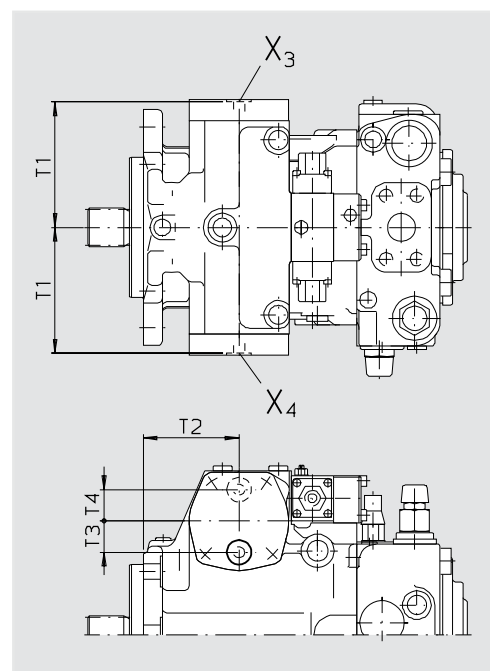
Dimensions

Size	T1	T2	T3	T4	X ₃ , X ₄
28	3.62 (92.0)	1.58 (40.1)	–	0.94 (24.0)	7/16in-20 UNF-2B
40	3.62 (92.0)	1.50 (38.1)	–	0.94 (24.0)	7/16in-20 UNF-2B
56	4.11 (104.5)	1.73 (44.0)	–	0.98 (25.0)	7/16in-20 UNF-2B
71	4.47 (113.5)	3.40 (86.3)	1.10 (28.0)	–	7/16in-20 UNF-2B
90	4.39 (111.5)	3.77 (95.7)	–	1.18 (30.0)	7/16in-20 UNF-2B
125	5.35 (136.0)	4.11 (104.5)	1.34 (34.0)	–	7/16in-20 UNF-2B
180	5.77 (146.5)	5.46 (138.7)	–	1.38 (35.0)	7/16in-20 UNF-2B
250	6.48 (164.5)	6.88 (174.8)	–	1.50 (38.0)	9/16in-18 UNF-2B

Circuit diagram 1)



1) Size 28 and 250 without port F_{a1} and F_s



Filtration Types

Standard: Filtration in the suction line of the boost pump, S

Standard version (preferred)

Filter type: _____ filter **without** bypass

Recommendation: _____ **with** contamination indicator

Flow resistance at the filter element:

at $v = 140 \text{ SUS}$, $n = n_{\max}$ _____ $\Delta p \leq 1.5 \text{ psi}$
 (30 mm²/s, $n = n_{\max}$ _____ $\Delta p \leq 0.1 \text{ bar}$)

at $v = 4600 \text{ SUS}$, $n = n_{\max}$ _____ $\Delta p \leq 4.5 \text{ psi}$
 (1000 mm²/s, $n = n_{\max}$ _____ $\Delta p \leq 0.3 \text{ bar}$)

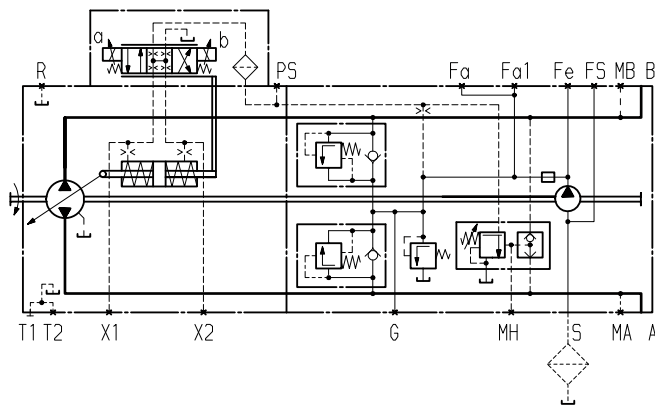
Pressure at port S of the boost pump:

at $v = 140 \text{ SUS}$ _____ $p \geq 12 \text{ psi}$
 (30 mm²/s _____ $p \geq 0.8 \text{ bar}$)

at cold start $v = 7400 \text{ SUS}$, $n \leq 1000 \text{ rpm}$ _____ $p \geq 7.5 \text{ psi}$
 ($v = 1600 \text{ mm}^2/\text{s}$, $n \leq 1000 \text{ rpm}$) _____ $p \geq 0.5 \text{ bar}$)

Filter is not included in supply.

Circuit diagram - standard version S



Variation: External supply, E

This variation should be used in versions **without** integral boost pump (N00 or K...).

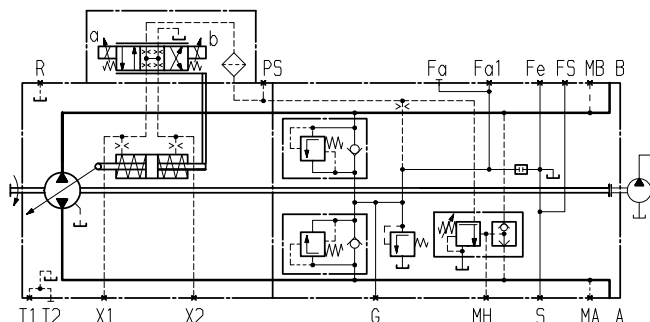
Port S is plugged.

Supply comes from port F_a.

Filter arrangement: _____ separate

For functional reliability ensure required cleanliness level for the boost pressure fluid at port F_a (see page 6).

Circuit diagram variation E (external supply)



Variation:

Filtration in the pressure line of the boost pump, ports for external boost circuit filter, D

Filter input: Port F_e

Filter output: Port F_a

Filter type: Filter with bypass are **not recommended**.
 When applying with bypass please consult us.

Recommendation: **with** contamination indicator

Note:

For versions with **DG** control (with pilot-pressure not from boost circuit), the following filter type should be employed:

Filter with bypass and with contamination indicator

Filter arrangement: separately in the pressure line (line filter)

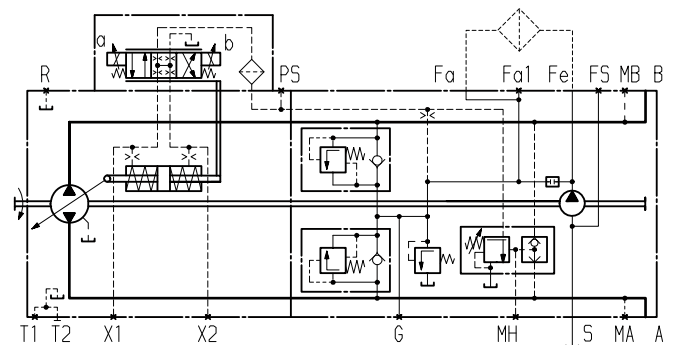
Flow resistance at the filter element:

at $v = 140 \text{ SUS}$ (30 mm²/s) _____ $\Delta p \leq 15 \text{ psi}$ (1 bar)

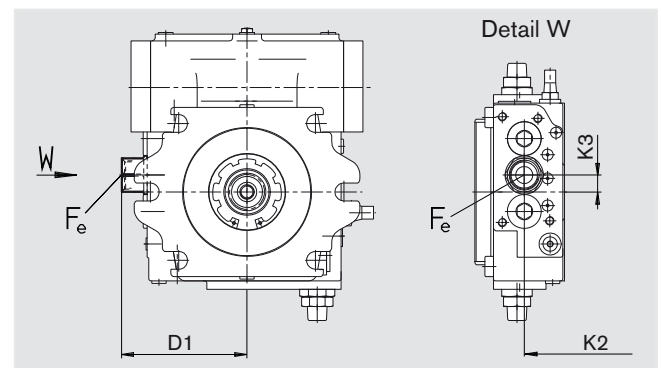
for cold start _____ $\Delta p \leq 45 \text{ psi}$ (3 bar)
 (valid for entire speed range $n_{\min} - n_{\max}$)

Filter is not included in supply.

Circuit diagram variation D



Dimensions variation D



Size	D1 ¹⁾	F _e ²⁾	
28	see page 18	3/4in-16 UNF-2B	0.59 (15) deep
40	4.49 (113)	3/4in-16 UNF-2B	0.59 (15) deep
56	4.57 (116)	3/4in-16 UNF-2B	0.59 (15) deep
71	5.27 (133.9)	1 1/16in-12 UN	0.63 (16) deep
90	5.04 (128)	1 1/16in-12 UN	0.63 (16) deep
125	5.83 (148)	1 5/16in-12 UN-2B	0.71 (18) deep
180	5.87 (149)	1 5/16in-12 UN-2B	0.71 (18) deep
250	see page 46	1 5/16in-12 UN-2B	0.79 (20) deep

¹⁾ Dimensions of K2 and K3 see page 56 variation K

²⁾ ISO 11926, tightening torque T_{max} see page 56 variation K

Filtration Types

Variation:

Filtration in the pressure line of the boost pump, with cold start valve and ports for external boost circuit filter, K

Version similar to variation D, however additionally with cold start valve:

- Port plate is equipped with cold start valve and therefore protects the pump from damage.

The valve opens at flow resistance $\Delta p \geq 90$ psi (6 bar).

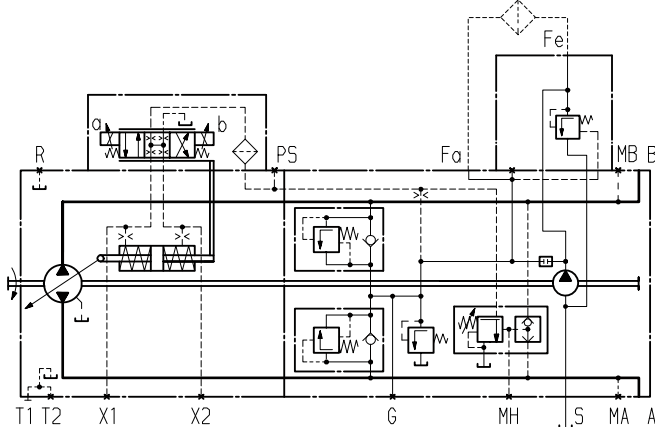
Port F_e : Filter input (at the cold start valve)

Port F_a : Filter output

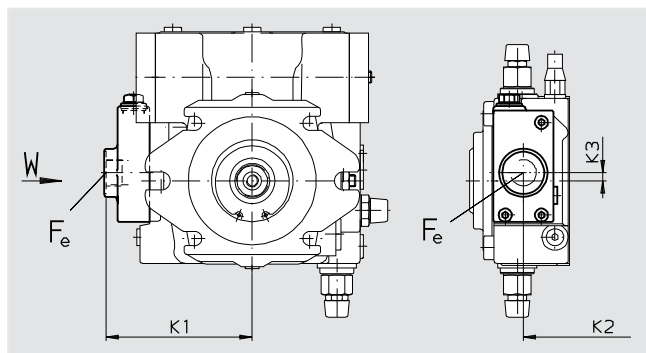
Filter arrangement _____ separately in the pressure line (line filter)

Filter is not included in supply.

Circuit diagram variation K (with cold start valve)



Dimensions variation K (with cold start valve)



Size	K1	K2	K3	F_e 1)	$T_{max.}$ 2)
40	4.82 (122.5)	7.82 (198.7)	0 (0)	3/4in-16 UNF-2B 0.59 (15) deep	120 lb-ft (160 Nm)
56	4.94 (125.5)	8.48 (215.4)	0 (0)	3/4in-16 UNF-2B 0.59 (15) deep	120 lb-ft (160 Nm)
71	5.73 (145.5)	9.41 (239.0)	0.31 (8)	1 1/16in-12 UN 0.63 (16) deep	265 lb-ft (360 Nm)
90	5.49 (139.5)	9.78 (248.5)	0.94 (24)	1 1/16in-12 UN 0.63 (16) deep	265 lb-ft (360 Nm)
125	6.77 (172.0)	10.55 (267.9)	0.79 (20)	1 5/16in-12 UN-2B 0.71 (18) deep	400 lb-ft (540 Nm)
180	6.81 (173.0)	12.28 (311.9)	0.12 (3)	1 5/16in-12 UN-2B 0.71 (18) deep	400 lb-ft (540 Nm)

1) ISO 11926

2) Please observe the general notes for the max. tightening torques on page 64

Variation:

Filtration in pressure line of boost pump, filter mounted, supplied, F

Filter type _____ filter **without** bypass

Filter grade (absolute) _____ 20 microns

Filter material _____ glass fiber

Pressure capacity _____ 1450 psi (100 bar)

Filter arrangement _____ connected to pump

Note:

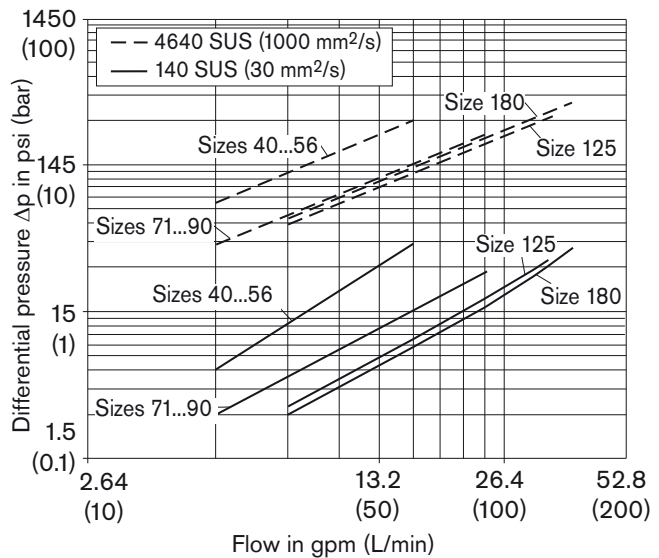
- Port plate is equipped with cold start valve and therefore protects the pump from damage.

The valve opens at flow resistance $\Delta p \geq 90$ psi (6 bar).

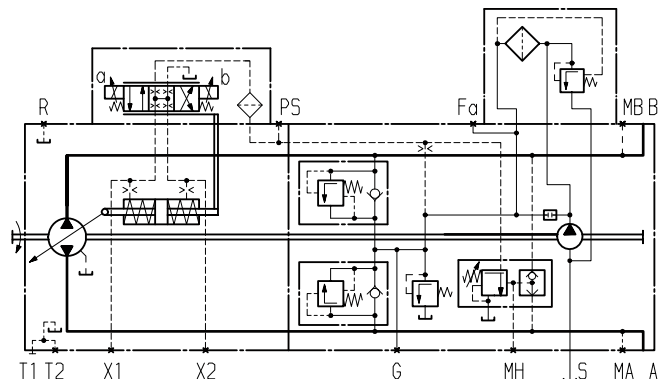
Recommendation: **with** contamination indicator (variation P, L, M, B)
(differential pressure $\Delta p = 75$ psi / 5 bar)

Filter characteristic

Differential pressure/volumetric flow characteristics conforming to ISO 3968 (valid for new filter element).



Circuit diagram variation F (with mountable filter)



Filtration Types

Variation:

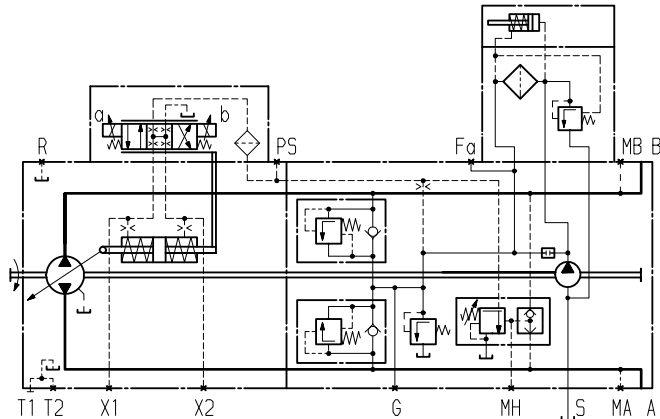
Filtration in pressure line of the boost pump, filter mounted, supplied, with visual contamination indicator, P

Version similar to variation F, however additionally with visual contamination indicator.

Indication: green/red window

Differential pressure (switching pressure) $\Delta p = 75 \text{ psi (5 bar)}$

Circuit diagram variation P



Variation:

Filtration in the pressure line of the boost pump, filter mounted, supplied, with electrical contamination indicator with DEUTSCH connector, B

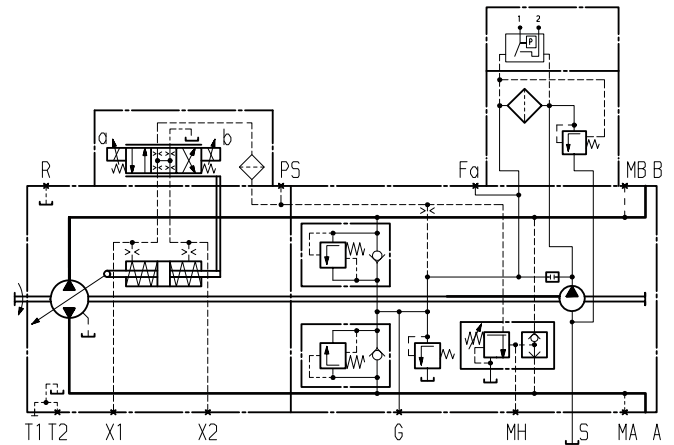
Version similar to variation F, however additionally with electrical contamination indicator.

Indication: electrical

Differential pressure (switching pressure) $\Delta p = 75 \text{ psi (5 bar)}$

Max. switching power at 24 V DC _____ 60 W

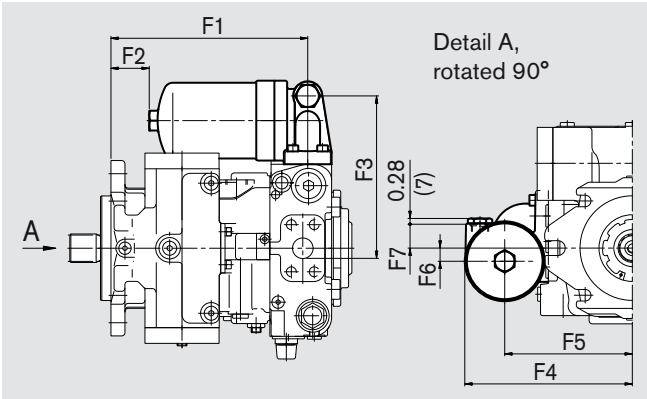
Circuit diagram variation B



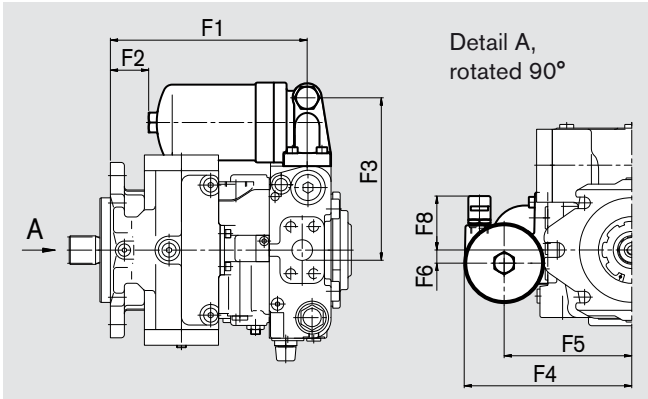
Filtration Types

Dimensions with mountable filter

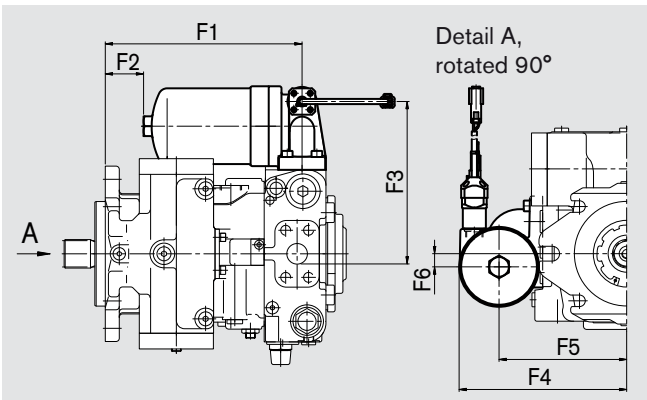
Variation F



Variation P: viewing window



Variation B: electr. signal with DEUTSCH connector



Size	F1	F2	F3	F4	F5	F6	F7	F8
40	7.94 (201.7)	1.88 (47.7)	6.30 (160)	6.89 (175)	5.31 (135)	0 (0)	1.65 (42)	3.09 (78.5)
56	8.60 (218.4)	2.54 (64.4)	6.42 (163)	7.01 (178)	5.43 (138)	0 (0)	1.65 (42)	3.09 (78.5)
71	9.41 (239)	1.83 (46.5)	7.28 (185)	8.01 (203.5)	6.01 (155)	0.63 (16)	1.14 (29)	2.58 (65.5)
90	9.78 (248.5)	2.20 (56)	7.05 (179)	7.78 (197.5)	5.87 (149)	0 (0)	1.77 (45)	3.21 (81.5)
125	9.29 (235.9)	2.34 (59.4)	7.91 (201)	8.64 (219.5)	6.73 (171)	0 (0)	2.09 (53)	3.52 (89.5)
180	11.02 (279.9)	1.59 (40.3)	7.95 (202)	8.68 (220.4)	6.77 (171.9)	0.67 (17)	1.42 (36)	2.85 (72.5)

Swivel Angle Indicator

Electrical swivel angle sensor, R

For swivel angle indicator, the pump swivel position is measured by an electric swivel angle sensor. The sensor has a robust, sealed case and a built-in electronic specially developed for automotive applications.

As an output parameter, the hall effect swivel angle sensor delivers a voltage proportional to the swivel angle (see table of output voltages).

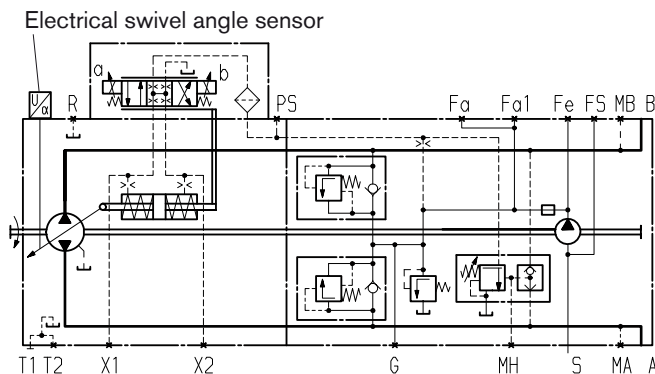
Technical Data

Supply voltage U_b	10...30 V DC		
Output voltage U_a	0,5 V ($V_{g \max a}$)	2,5 V ($V_{g 0}$)	4,5 V ($V_{g \max b}$)
Reserve-connect protection	Short circuit-resistant		
EMC resistance	Details on request		
Operating temperature range	-40 °F...+257 °F (-40 °C...+125 °C)		
Vibration resistance sinusoidal vibration EN 60068-2-6	10g / 5...2000 Hz		
Shock resistance: continuous shock IEC 68-2-29	25g		
Salt spray resistance (DIN 50 021-SS)	96h		
Type of protection DIN/EN 60529	IP67 and IP69K		
Case material	Plastic		

Output voltage

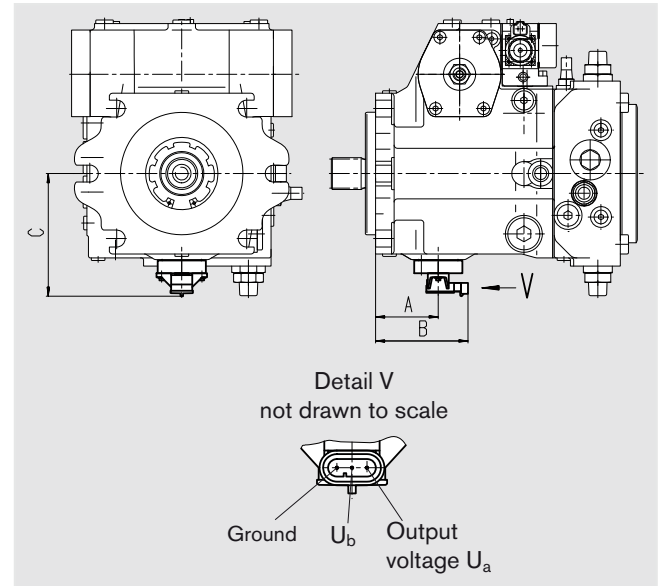
Direction of rotation	Direction of through put flow	Output voltage	
		at $V_{g 0}$	at $V_{g \max}$
clockwise	A to B	2.5 V	4.5 V
	B to A	2.5 V	0.5 V
counter-clockwise	B to A	2.5 V	4.5 V
	A to B	2.5 V	0.5 V

Circuit diagram



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

Dimensions



Size	A	B	C
28	2.23 (56.6)	3.70 (94.0)	4.69 (119.0)
40	2.31 (58.6)	3.78 (96.0)	4.69 (119.0)
56	2.39 (60.5)	3.84 (97.5)	5.06 (128.5)
71	2.82 (71.6)	4.28 (108.6)	5.41 (137.5)
90	2.78 (70.7)	4.24 (107.7)	5.73 (145.5)
125	3.07 (78.0)	4.53 (115.0)	6.00 (152.5)
180	3.96 (100.7)	5.42 (137.7)	6.04 (153.5)
250	4.14 (105.1)	5.59 (142.1)	7.11 (180.5)

Mating connector

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

comprising: AMP no.
 – 1 socket case, 3-pins _____ 282087-1
 – 3 single wire seal, yellow _____ 281934-2
 – 3 socket contact 0.07 - 0.13 in (1.8 - 3.3 mm) _____ 183025-1

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

Connector for Solenoids (Only for EP, EZ, DA)

DEUTSCH DT04-2P-EP04, 2-pin

Molded, without bi-directional suppressor diode (standard) **_P**

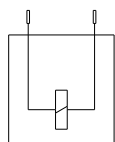
Molded, with bi-directional suppressor diode
(only for switching solenoids on control unit EZ1/2, DA) **___Q**

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

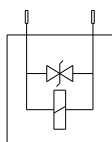
The protection circuit with a bi-directional suppressor diode is necessary for limiting overvoltages. Overvoltages are generated by disconnecting the current using switches, relay contacts or by unplugging an energized mating connector.

Circuit symbol

without bi-directional suppressor diode



with bi-directional suppressor diode



Mating connector

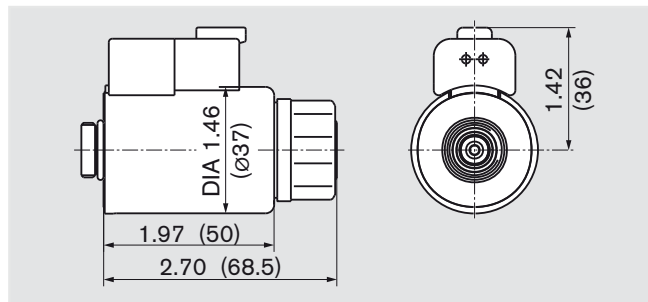
DEUTSCH DT06-2S-EP04
Rexroth Mat. No. R902601804

consisting of:

DT designation

- 1 case _____ DT06-2S-EP04
- 1 wedge _____ W2S
- 2 sockets _____ 0462-201-16141

The mating connector is not included in supply.
This can be supplied 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 the fixing nut (1)
2. Turn the solenoid body (2) to the desired position
3. Tighten the fixing nut
Tightening torque of the fixing nut: $3.69^{+0.74}$ lb-ft (5+1 Nm)
(width across flats WAF26, 12-sided DIN 3124)

Installation Situation for Coupling Assembly

To ensure that rotating components (coupling hub) and fixed components (case, retaining ring) do not come into contact with each other, the installation conditions described here must be observed. This depends on the size and the splined shaft.

Size 28 and 40 (with free turning):

- SAE and DIN splined shaft

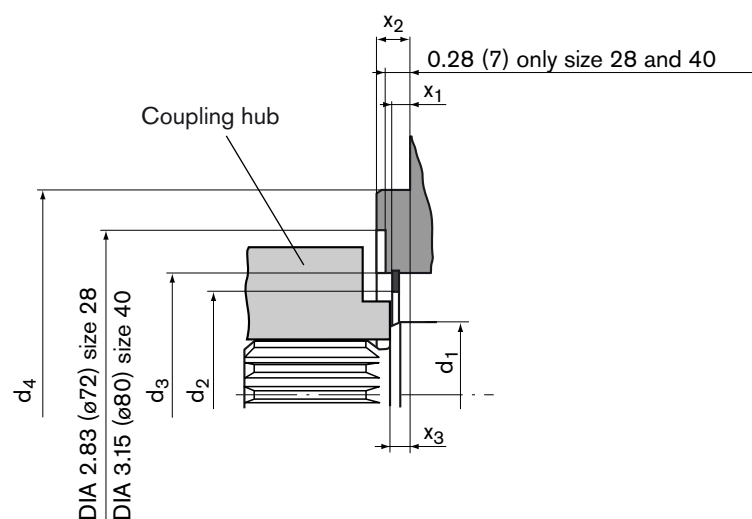
Please observe diameter of the free turning (size 28: DIA 2.83 / $\varnothing 72$, size 40: DIA 3.15 / $\varnothing 80$).

Size 56 to 250 (without free turning):

- SAE splined shaft (shaft S or T)

The outer diameter of the coupling hub must be smaller than the inner diameter of the retaining ring d_2 at the zone of the drive shaft collar (measure $x_2 - x_3$).

SAE splined shaft (spline acc. to ANSI B92.1a-1976)



Size	$\varnothing d_1$	$\varnothing d_{2 \text{ min}}$	$\varnothing d_3$	$\varnothing d_4$	x_1	x_2	x_3
28	1.38	1.71	2.165 ± 0.004	4.00	0.130 $^{+0.008}$	0.374 $_{-0.02}$	0.315 $^{+0.035}_{-0.024}$
	(35)	(43.4)	(55 ± 0.1)	(101.6)	(3.3 $^{+0.2}$)	(9.5 $_{-0.5}$)	(8 $^{+0.9}_{-0.6}$)
40	1.57	2.02	2.480 ± 0.004	5.00	0.169 $^{+0.008}$	0.500 $_{-0.02}$	0.315 $^{+0.035}_{-0.024}$
	(40)	(51.4)	(63 ± 0.1)	(127)	(4.3 $^{+0.2}$)	(12.7 $_{-0.5}$)	(8 $^{+0.9}_{-0.6}$)
56	1.57	2.14	2.677 ± 0.004	5.00	0.276 $^{+0.008}$	0.500 $_{-0.02}$	0.315 $^{+0.035}_{-0.024}$
	(40)	(54.4)	(68 ± 0.1)	(127)	(7.0 $^{+0.2}$)	(12.7 $_{-0.5}$)	(8 $^{+0.9}_{-0.6}$)
71	1.77	2.62	3.189 ± 0.004	5.00	0.276 $^{+0.008}$	0.500 $_{-0.02}$	0.315 $^{+0.035}_{-0.024}$
	(45)	(66.5)	(81 ± 0.1)	(127)	(7.0 $^{+0.2}$)	(12.7 $_{-0.5}$)	(8 $^{+0.9}_{-0.6}$)
90	1.97	2.62	3.189 ± 0.004	6.00	0.268 $^{+0.008}$	0.500 $_{-0.02}$	0.315 $^{+0.035}_{-0.024}$
	(50)	(66.5)	(81 ± 0.1)	(152.4)	(6.8 $^{+0.2}$)	(12.7 $_{-0.5}$)	(8 $^{+0.9}_{-0.6}$)
125	2.17	3.00	3.583 ± 0.004	6.00	0.276 $^{+0.008}$	0.500 $_{-0.02}$	0.315 $^{+0.035}_{-0.024}$
	(55)	(76.3)	(91 ± 0.1)	(152.4)	(7.0 $^{+0.2}$)	(12.7 $_{-0.5}$)	(8 $^{+0.9}_{-0.6}$)
180	2.36	3.46	4.213 ± 0.004	6.50	0.291 $^{+0.008}$	0.626 $_{-0.02}$	0.315 $^{+0.035}_{-0.024}$
	(60)	(88)	(107 ± 0.1)	(165.1)	(7.4 $^{+0.2}$)	(15.9 $_{-0.5}$)	(8 $^{+0.9}_{-0.6}$)
250	2.95	4.12	4.76	6.50	0.248 $^{+0.008}$	0.626 $_{-0.02}$	0.315 $^{+0.035}_{-0.024}$
	(75)	(104.6)	(121)	(165.1)	(6.3 $^{+0.2}$)	(15.9 $_{-0.5}$)	(8 $^{+0.9}_{-0.6}$)

Installation Notes

General

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

The pump case drain connection (i.e. T_1/T_2) must be directed to the tank via the highest case drain port. The minimum suction pressure at port S must not fall below 12 psi (0.8 bar) abs. (cold start 7.5 psi / 0.5 bar absolute).

In all operating 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.

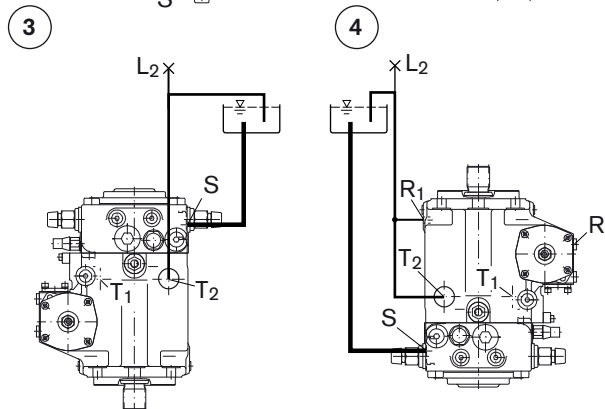
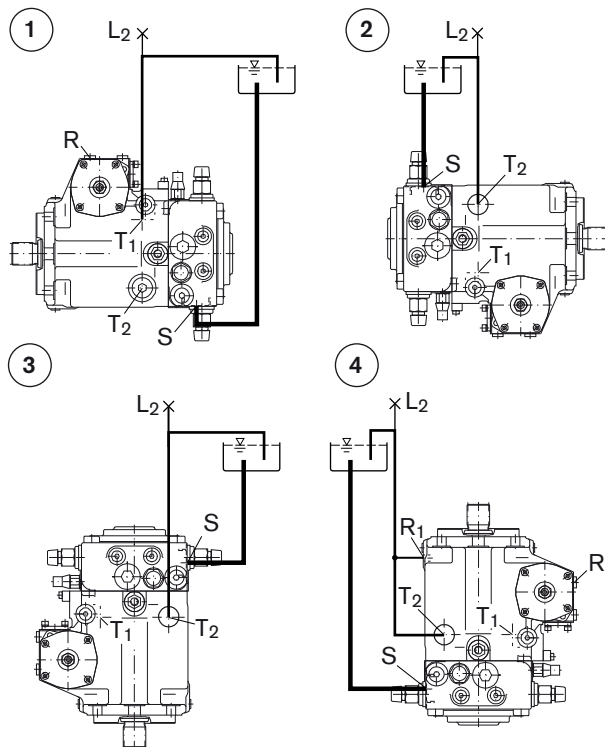
Note:

With size 71...250, installation position "shaft at top" must be specified at time of order (pump is supplied with additional vent port R_1 in flange area).

Below-tank installation (standard)

Pump below the minimum fluid level of the tank.

Recommended installation positions: 1 and 2.

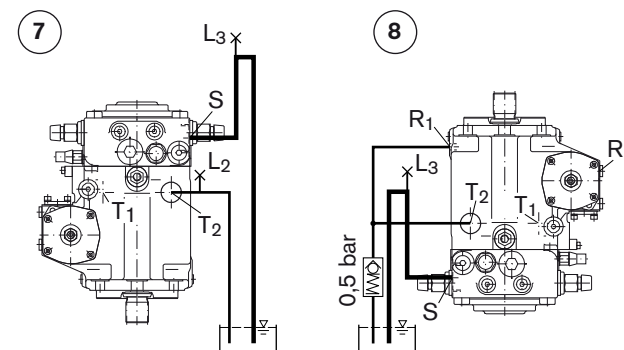
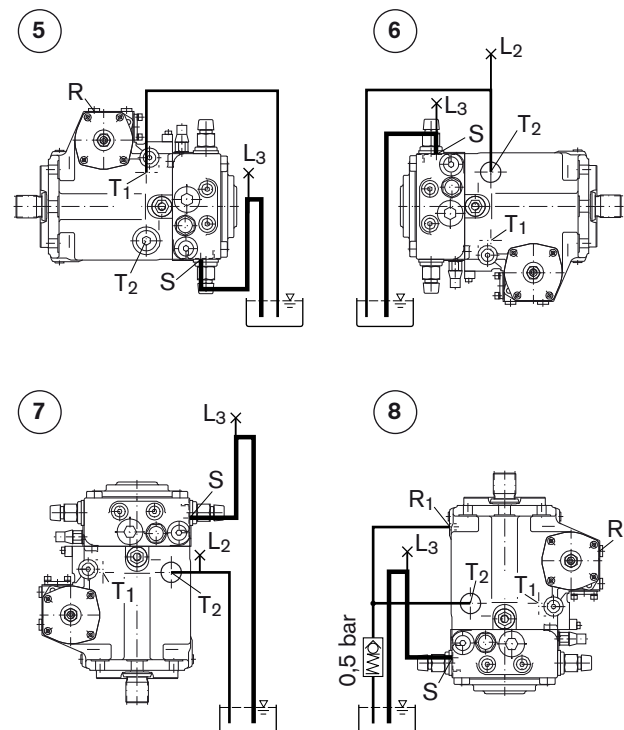


Above-tank installation

Pump above the min. fluid level of the tank

Observe the maximum permissible suction height $h_{max} = 31.5$ in (800 mm). Recommendation for installation position 8 (shaft upwards):

A check valve in the case drain line (opening pressure 7.5 psi / 0.5 bar) can prevent draining of the case interior.



Installation position	Air bleeding	Filling
1	R	S + T_1 (L_2)
2	L_2	S + T_2 (L_2)
3	L_2	S + T_2 (L_2)
4	R + L_2 (size 28 - 56) R ₁ + L_2 (size 71-250)	S + T_2 (L_2)

Installation position	Air bleeding	Filling
5	R	T_1 + (L_3)
6	L_2	S (L_3) + T_2 (L_2)
7	L_2 + L_3	S (L_3) + T_2 (L_2)
8	R + L_3 (size 28 - 56) R ₁ + L_3 (size 71-250)	S (L_3) + T_2

General Notes

- The AA4VG pump is designed to be used in closed circuits.
- Project planning, assembly and commissioning of the pump require the involvement of qualified personnel.
- The service line ports and function ports are only designed to accommodate hydraulic lines.
- During and shortly after operation, there is a risk of burns on the pump and especially on the solenoids. Take suitable safety precautions, e.g. wear protective clothing
- There may be shifts in the characteristic depending on the operating state of the pump (operating pressure, fluid temperature).
- Tightening torques:
 - The tightening torques specified in this data sheet are maximum values and must not be exceeded (maximum values for screw thread).
Manufacturer's instruction for the max. permissible tightening torques of the used fittings must be observed!
 - For ISO 68 / DIN 13 fixing screws, we recommend checking the tightening torque individually according to VDI 2230 Edition 2003.
- The data and information contained herein must be adhered to.

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