MANNESMANN REXROTH

Variable Displacement Pump AA4VG

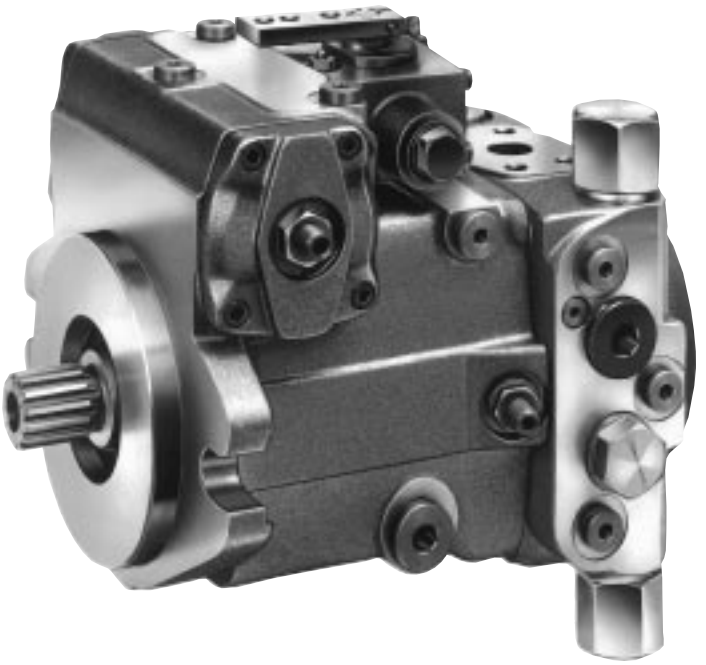
Series 3, for Closed Circuits
Axial Piston, Swashplate Design

Size 28...250 | Nominal Pressure 5800 psi | Peak Pressure 6500 psi

RA 92003/01.96

Replaces: 08.95

See Appendix for Sizes 28 and 250.



The AA4VG is a swashplate design, variable displacement axial piston pump specifically designed for hydrostatic closed circuit transmissions. The design incorporates a charge pump, charge pressure relief valve, two combination high-pressure relief/anti-cavitation check valves, and integral Pressure Cut-Off.

Flow is proportional to drive speed and pump displacement and is infinitely adjustable. It increases with increasing swashplate angle from zero to its maximum value. Swiveling the pump over center smoothly reverses the direction of oil flow.

A complete range of modular control and regulating devices is available.

The pump is available with a full range of through drive options and tandem pump configurations.

Ordering Code

AA4V	G				/	3	2		–				52			

Axial Piston Unit
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Control & Options
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Direction of Rotation

Hydraulic Fluid

Petroleum Oil *(For operation with other fluids, consult a Rexroth Application Engineer)*

Axial Piston Unit

Variable swashplate design. Nominal pressure 5800 psi; peak pressure 6500 psi	AA4V

Mode of Operation

Pump in closed circuit	G

Size

≈ Displacement $V_{g\,max}$ (cm^3)	28	40	56	71	90	125	180	250
Size 28, see Appendix								
Size 250, see Appendix								

Control Options

		40	56	71	90	125	180	
None	NV	●	●	●	●	●	●	NV
Hydraulic Control–Direct Operated	DG	●	●	●	●	●	●	DG
Electrical Control–Proportional	EP	●	●	●	●	●	●	EP
Electrical Control–Non Proportional	EZ	●	●	●	●	●	●	EZ
Rotary Manual Servo Control	HW	●	●	●	●	●	●	HW
Hydraulic Control–Pilot Operated	HD	●	●	●	●	●	●	HD
Hydraulic Control–Speed Dependent	DA	●	●	●	●	●	●	DA

Solenoid Voltage (EP, EZ, or DA only)

12 Volt DC		●	●	●	●	●	●	1
24 Volt DC		●	●	●	●	●	●	2

Pressure Cut-Off

With Pressure Cut-Off		●	●	●	●	●	●	D

Neutral Position Switch (HW control only)

Without Neutral Position Switch (no code)		●	●	●	●	●	●	Omit
With Neutral Position Switch		●	●	●	●	●	●	L

Mechanical Stroke Limiter

Without Stroke Limiter		●	●	●	●	●	●	Omit
With Stroke Limiter		●	●	●	●	●	●	M

Ports X_3, X_4 for Stroking Pressure

Without Ports X_3, X_4 (no code)		●	●	●	●	●	●	Omit
With Ports X_3, X_4		●	●	●	●	●	●	T

Regulating (DA) Cartridge

	NV	EZ	DG	EP	HW	HD	DA	40	56	71	90	125	180	
Without DA Cartridge	●	●	●	●	●	●	–	●	●	●	●	●	●	1
With DA Cartridge, fixed adjustment	–	●	●	●	●	●	●	●	●	●	●	●	●	2
With DA Cartridge, mech. adjustable w/lever	–	●	●	●		●	●	●	●	●	●	●	●	3
With DA Cartridge, fixed adjustment and Hydraulic Inching Valve built on	–	–	–	–	–	–	●	●	●	●	●	●	●	4
With DA Cartridge, mech. adjust. w/lever and Hydraulic Inching Valve built on	–	–	–	–	–	–	●	●	●	●	●	●	●	5
With DA Cartridge, fixed adjustment and connection for TH7 master controller	–	●	●	●	●	●	●	●	●	●	●	●	●	7

Series

	3

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	2

Direction of Rotation

(As viewed from drive shaft)	clockwise	R
	counter-clockwise	L

① Shaft Option “S” is standard for the front pump of tandem units.
② See Page 6.
③ With “Cold Start” bypass valve. See page 7.

● Available
❍ On Request; Consult Factory
– Not Available

Seals

NBR	P
NBR, FPM shaft seal	N

Shaft Type *(For maximum permissible shaft torque refer to page 33)*

	40	56	71	90	125	180	
Spline–SAE (Standard for single pump)	●	●	●	●	●	●	S
Spline–SAE (Standard for tandem pump, 1st pump)	①	●	●	①	●	●	T
Spline–SAE (Only for tandem pump, 2nd pump)	●	–	–	●	–	–	U
Spline–DIN 5480 (For tandem pump, 2nd pump)	–	–	–	❍	–	–	Z

Mounting Flange

		40	56	71	90	125	180	
SAE	2–bolt	●	●	–	–	–	–	C
	4–bolt	–	–	–	–	–	●	D
	2 + 4 bolt	–	–	●	●	●	–	F

Port Connections

	40	56	71	90	125	180	
Ports A & B (SAE 4-bolt flange), on top and bottom	●	●	●	●	●	●	52

Charge Pump

	40	56	71	90	125	180	
With Charge Pump & without Through-Drive	●	●	●	●	●	●	F00
Without Charge Pump & without Through-Drive	●	●	●	●	●	●	N00
With Charge Pump & with Through-Drive	●	●	●	●	●	●	F…
Without Charge Pump & with Through-Drive	❍	❍	❍	❍	❍	❍	K…

Through-Drive

Shaft		Flange	40	56	71	90	125	180	
SAE A	(⅝″ 9T 16/32P)	SAE A, 2-bolt	●	●	●	●	●	●	…01
SAE B	(⅞″ 13T-16/32P)	SAE B, 2-bolt	●	●	●	●	●	●	…02
SAE B–B	(1″ 15T-16/32P)	SAE B, 2-bolt	●	●	●	●	●	●	…04
SAE B–B	(1″ 15T-16/32P)	SAE C, 2-bolt	●	–	–	–	–	–	…09
SAE C	(1¼″ 14T-12/24P)	SAE C, 2-bolt	–	●	●	●	●	●	…07
DIN	(N35x2x30x16x9H DIN 5480)	SAE D, 2+4-bolt	–	–	–	●	–	–	…73
SAE D	(1¾″ 13T-8/16P)	SAE D, 2+4-bolt	–	–	–	–	●	●	…69
SAE D	(1¾″ 13T-8/16P)	SAE E, 4-bolt	–	–	–	–	–	❍	…72

Relief Valves ②

	Adjustment Range		40	56	71	90	125	180	
W/high press. relief valves, pilot oper.	1450...6100 psi	with bypass	–	–	●	●	●	●	1
With high pressure relief valves Direct operated, fixed setting	4000...6100 psi	without bypass	●	●	–	–	–	–	3
		with bypass	●	●	–	–	–	–	5
	1450...3600 psi	without bypass	●	●	–	–	–	–	4
		with bypass	●	●	–	–	–	–	6

Filtration

	40	56	71	90	125	180		
Filtration in Charge Pump suction line	●	●	●	●	●	●	S	
Charge Pressure Filtration (Ports Fe and Fa)	●	●	●	●	●	●	D	
Cold start valve and ports for external charge circuit filter (Ports Fe and Fa)		❍	❍	❍	❍	❍	❍	K
Mounted Filter (Without contamination indicator) ③	●	●	●	●	●	●	F	
Filter with visual contamination indicator ③	●	●	●	●	●	●	P	
Filter with electrical contamination indicator ③	●	●	●	●	●	●	L	
Filter with visual and electrical contamination indicator ③	●	●	●	●	●	●	M	
External Charge Supply (Units without charge pump–N00 or K..)	●	●	●	●	●	●	E	

***See Appendix for Sizes 28 and 250.**

Technical Data

Description
The AA4VG is a swashplate design, variable displacement, over center, axial piston pump. It has been designed exclusively for closed circuit hydrostatic transmissions where a self-contained pump package is required. The pump design incorporates a charge pump, a charge pressure relief valve, two combination high pressure relief and make-up check valves, and an integrated pressure cut-off valve.

Installation
The AA4VG pump may be mounted in any position around the horizontal (drive shaft) axis. Other mounting orientations (e.g- drive shaft vertical) are possible, but should be reviewed with a Rexroth Application Engineer prior to finalizing the design. The case drain line should be connected to the highest case drain port (T_1 or T_2) so that the pump case always remains full of oil. The case drain piping, or hose, should be sized to accept the full flow of the charge pump at the maximum anticipated drive speed, with minimal pressure drop.

Fluid Recommendations
The AA4VG pumps are supplied as standard for use with good quality, petroleum oil based, anti-wear hydraulic fluids. More detailed information regarding the selection of hydraulic fluids and their application limits can be found in our Data Sheets RA 90220 (Petroleum Oil), RE 90221 (Biodegradable Fluids) and RA 90223 (Type HF–Fire Resistant/Synthetic Fluids).

For applications with biodegradable or Type HF fluids, possible reduction of the operating specifications may be required. Please consult Rexroth and your oil supplier.

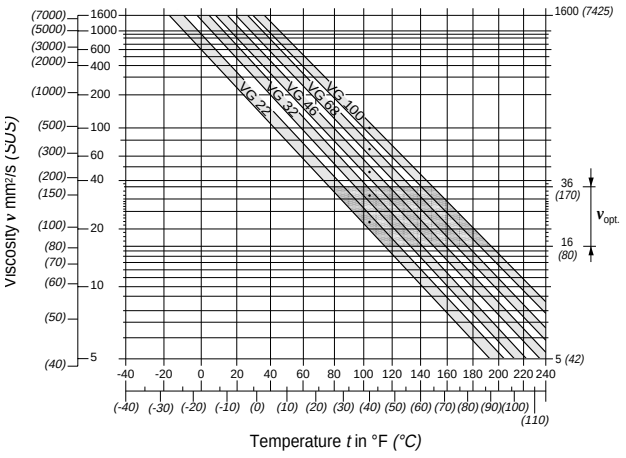
Operating Viscosity Range
In order to obtain optimum efficiency and service life, we recommend that the operating viscosity (at normal loop operating temperature) be selected from within the range:

Optimum Viscosity (ν_{opt}) . . . . . 80...170 SUS (16...36 mm²/S)

Viscosity Limits
Max. Viscosity at startup (ν_{max}) . . . . . 7273 SUS (1600 mm²/S)
Min. Viscosity *for short duration* (ν_{min}) . . . . . 42 SUS (5 mm²/S)

Operating Temperature Limits
Min. operating temperature. . . . . -13°F (-25°C)
Absolute min. temperature . . . . . -40°F (-40°C)
Max. operating temperature *for short duration* . . . . . 239°F (115°C)

Selection Diagram



Notes on hydraulic fluid selection
In order to select the correct fluid, it is necessary to know the normal operating temperature in the circuit (closed loop), when the system is operated at the design ambient temperature.

The hydraulic fluid should be selected so that, within the operating temperature range, the fluid viscosity is within the optimum range ν_{opt} (see shaded area of the selection diagram). We recommend that the higher viscosity grade is selected in each case.

Example: At an ambient temperature of X° F the closed circuit fluid temperature is 140° F (60° C). Within the optimum operating viscosity range ν_{opt} (shaded area), this corresponds to ISO viscosity grades VG 46 or VG 68. VG 68 should be selected.

Important: The leakage oil (case drain oil) temperature is influenced by pressure and pump speed and is typically higher than the circuit temperature. However, maximum temperature at any point in the system must be limited to 239° F (115° C).

If it is not possible to comply with the above conditions because of extreme operating parameters or high ambient temperatures please consult Rexroth.

Fluid Cleanliness Levels
In order to ensure proper and reliable operation, the hydraulic fluid must be maintained at a minimum cleanliness level of 18/15 (ISO/DIS 4406; SAE J1165). Axial piston pump component life is directly affected by the cleanliness of the fluid in the system.

Temperature Range	-40...195°F (-40...90°C)	195...240°F (90...115°C)
Cleanliness Recommendations:	Class	Class
ISO/DIS 4406 (SAE J1165)	18/15	17/14
NAS 1638	9	8
SAE, ASTM, AIA	6	5

Operating Pressures Ranges

Main pump:
Nominal charge pressure; p_{sp} . . . . . 20 bar (290 psi)
Nominal pressure (port A or B); p_N . . . . . 400 bar (5800 psi)
Peak pressure (port A or B); p_{max} . . . . . 450 bar (6525 psi)

Maximum case drain pressure (T_1,T_2,T_3, and T_4)
p_L . . . . . 2 bar abs. (30 psia)
short term (cold start). . . . . 3 bar abs. (43.5 psia)

Charge pump:
Nominal pressure p_{sp} . . . . . 20 bar (290 psi)
Peak pressure $p_{H\,max}$ . . . . . 40 bar (580 psi)
Min. pressure at charge pump inlet port (S):
at ν= 141 SUS (30 cSt) . . . . . $p \geq 0.8$ bar abs. (6.3 in-Hg.)
at cold start . . . . . $p \geq 0.5$ bar abs. (15.2 in-Hg.)

Technical Data

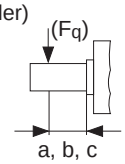
AA4VG Specifications *(Theoretical values; rounded)*

Size					40	56	71	90	125	180
Displacement	Variable pump		$V_{g\,max}$	cm^3/rev	40	56	71	90	125	180
				in^3/rev	2.44	3.42	4.33	5.49	7.63	10.98
	Charge pump		V_{gH}	cm^3/rev	8.4	11.1	18.7	18.7	25.7	36.9
				in^3/rev	0.51	0.68	1.14	1.14	1.56	2.25
Speed	max. rpm at $V_{g\,max}$		$n_{max\,cont}$	rpm	4000	3600	3300	3050	2750	2400
	limited max. rpm ①		$n_{max\,limit}$	rpm	4200	3900	3600	3300	3100	2900
	intermittent max. rpm ②		$n_{max\,Interm}$	rpm	5000	4500	4100	3800	3450	3000
	minimum rpm		n_{min}	rpm	500	500	500	500	500	500
Flow	at $n_{max\,cont}$ and $V_{g\,max}$		Q_{max}	L/min	160	202	234	275	344	432
				gpm	42.3	53.4	61.8	72.7	90.9	114.1
Power	at $n_{max\,cont}$	Δp = 400 bar	P_{max}	kW	107	134	156	183	229	288
		Δp = 5800 psi		hp	144	180	209	245	307	386
Torque	at $V_{g\,max}$	Δp = 400 bar	M_{max}	Nm	254	356	451	572	795	1144
(without charge pump)		Δp = 5800 psi		lb-ft	187	263	333	423	586	844
		Δp = 100 bar	M	Nm	63.5	89	112.8	143	198.8	286
		Δp = 1450 psi		lb-ft	46.8	65.6	83.2	105.5	146.6	210.9
Moment of inertia (about drive axis)			J	kgm^2	0.003	0.0051	0.0072	0.0106	0.0164	0.0323
				$lb\text{-}ft^2$	0.0712	0.1210	0.1709	0.2515	0.3892	0.7665
Weight (standard model without through drive)			m	kg	31	38	50	66	80	104
				lbs.	68	84	110	145	176	229

① Limited maximum rpm: – at half corner power (e.g. at $V_{g\,max}$ and $p_N/2$)
② Intermittent maximum rpm: – at high idle speed
– during engine overspeed: Δp = 70–150 bar (1015–2176 psi) and $V_{g\,max}$
– with reversing loads: Δp < 300 bar (4350 psi) and t < 5 seconds

V_g = Displacement (cm^3 or in^3) per revolution
Δp = Differential pressure
n = Speed (rpm)

Input Drive *(Permissible axial and radial loading on drive shaft)*

Size					40	56	71	90	125	180
Distance of F_q (from shaft shoulder) 		a		mm	17.5	17.5	20.0	20.0	22.5	25.0
		a		in	0.69	0.69	0.79	0.79	0.89	0.98
		b		mm	30	30	35	35	40	45
		b		in	1.18	1.18	1.38	1.38	1.57	1.77
		c		mm	42.5	42.5	50	50	57.5	60
		c		in	1.67	1.67	1.97	1.97	2.26	2.36
Max. permissible radial load at distance	a		$F_{q\,max}$	N	3600	5000	6300	8000	11000	16000
	a			lbs.	809	1124	1416	1798	2473	3597
	b		$F_{q\,max}$	N	2891	4046	4950	6334	8594	12375
	b			lbs.	650	910	1113	1424	1932	2782
	c		$F_{q\,max}$	N	2416	3398	4077	5242	7051	10150
	c			lbs.	543	764	917	1178	1585	2282
Max. permissible axial load 			$\pm F_{q\,max}$	N	1500	2200	3500	3500	4800	6000
				lbs.	337	495	787	787	1079	1349

Filtration Options

Many factors influence the selection of a filter to achieve the desired cleanliness level, including: dirt ingression rate, required cleanliness level, and system complexity. We have found the following filter Beta (ß) ratios (ISO 4572) to be satisfactory:

Suction Filtration.....$ß_{10} \geq 2.0$ & $ß_{30} \geq 100$
Charge Pressure Filtration.....$ß_{10} \geq 10.0$ & $ß_{20} \geq 100$

Machine testing is necessary to confirm the ability of the selected filter to maintain the desired fluid cleanliness levels.

Charge Flow Suction Filtration (standard model)**...S**

Filter type: . . . . . Filter **without** bypass

Filter element pressure drop:
at ν= 141 SUS (30 cSt); $n = n_{max}$ . . . . . $\Delta p \leq 0.1$ bar (1.5 psi)
at ν=4635 SUS (1000 cSt); n=1000 rpm. . $\Delta p \leq 0.3$ bar (4.5 psi)

Min. pressure at charge pump inlet port (S):
at ν= 141 SUS (30 cSt). . . . . $p \geq 0.8$ bar abs. (6.3 in-Hg.)
at cold start . . . . . $p \geq 0.5$ bar abs. (15.2 in-Hg.)
The filter should be fitted with a ΔP indicator and/or switch.

Filtration Options

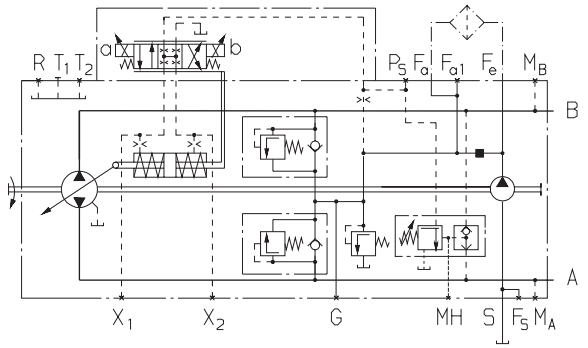
Charge Pressure Filtration…D (Ports Fe & Fa)

Filter type: . . . . . Filter **without** bypass

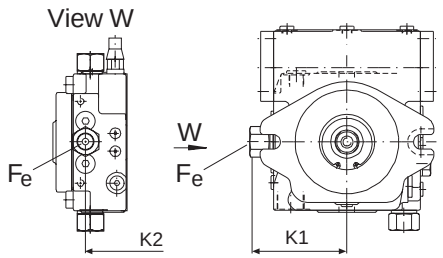
Filter element pressure drop (line mounted filter):
at ν=141 SUS (30 cSt); n=n_{max} . . . . . $\Delta p \leq 1$ bar (14.5 psi)
at cold start . . . . . Δp_{max}=3 bar (43.5 psi)
(valid for entire speed range n_{min}–n_{max})

Please note:
- With Direct Operated Hydraulic Control–Type DG, control pressure should be supplied from the P_S port.
- The filter should be fitted with a ΔP indicator and/or switch set at ≤3 bar (43.5 psid).

Circuit Diagram...D (Ports Fe & Fa)



Dimensions...D (Ports Fe & Fa)



Size	K1 mm (in)	K2 mm (in)	F_e
40	112 (4.40)	198.7 (7.82)	¾"-16 UNF-2B; 15 deep
56	115 (4.52)	215.4 (8.48)	¾"-16 UNF-2B; 15 deep
71	134 (5.27)	239.0 (9.40)	1 1/16"-12 UN; 20 deep
90	128 (5.03)	248.5 (9.78)	1 1/16"-12 UN; 20 deep
125	147 (5.78)	267.9 (10.5)	1 5/16"-12 UN-2B; 20 deep
180	148 (5.82)	311.9 (12.2)	1 5/16"-12 UN-2B; 20 deep

Charge Pressure Filtration…K (with cold start valve)

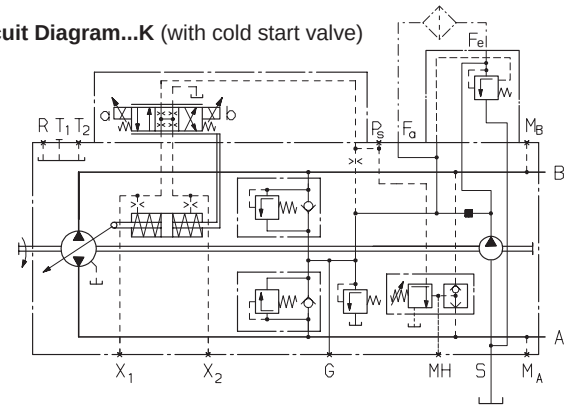
Similar to option D, except with cold start valve, providing filter bypass function and charge pump protection.

Bypass valve:
Bypass setting . . . . . $\Delta p \geq 3.5$ bar (50 psi)
Bypass flow . . . . . To charge pump inlet

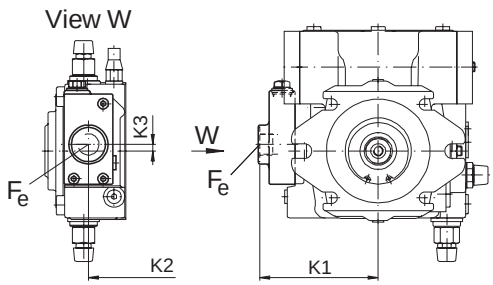
Port F_e. . . . . To line mounted filter
Port F_a. . . . . From line mounted filter

The filter should be fitted with a ΔP indicator and/or switch set at ≤3 bar (43.5 psid).

Circuit Diagram...K (with cold start valve)



Dimensions...K (with cold start valve)

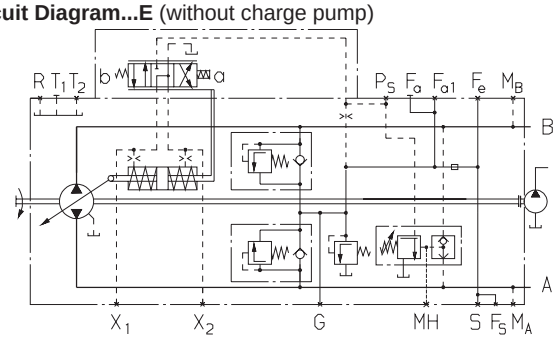


Size	K1 mm (in)	K2 mm (in)	K3 mm (in)	F_e
40	122.5 (4.82)	198.7 (7.82)	0	¾"-16 UNF-2B; 15 deep
56	125.5 (4.94)	215.4 (8.48)	0	¾"-16 UNF-2B; 15 deep
71	145.5 (5.72)	239.0 (9.40)	8 (0.31)	1 1/16"-12 UN; 20 deep
90	139.5 (5.49)	248.5 (9.78)	24 (0.94)	1 1/16"-12 UN; 20 deep
125	172.0 (6.77)	267.9 (10.5)	20 (0.78)	1 5/16"-12 UN-2B; 20 deep
180	173.0 (6.81)	311.9 (12.2)	3 (0.11)	1 5/16"-12 UN-2B; 20 deep

External Charge Supply…E (without charge pump)

On units supplied without an integrated charge pump (N00 or K…) the suction port (S) is plugged, and the external charge supply is connected at port F_a.
Please note that the externally supplied charge flow must be maintained at the cleanliness levels indicated on page 4.

Circuit Diagram...E (without charge pump)



Filtration Options

Charge Pressure Filtration…F (mounted filter)
(Without contamination indicator)

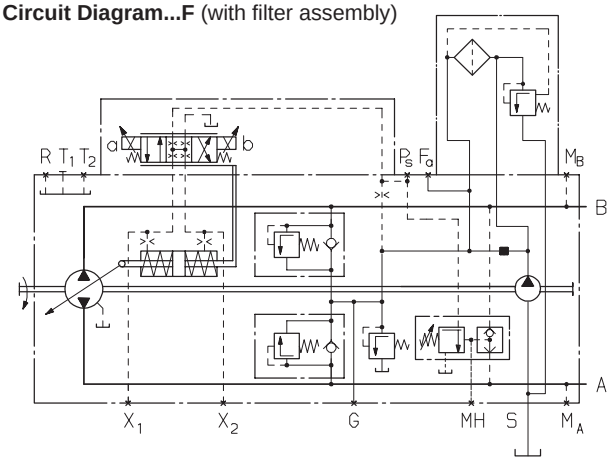
Filter type: . . . . . .Filter **without** bypass

Integral bypass valve:
Bypass setting . . . . . $\Delta P \geq 3.5$ bar (50 psi)
Bypass flow . . . . . To charge pump inlet

Filter element pressure drop (mounted filter):
at $\nu = 141$ SUS (30 cSt); $n = n_{max}$ . . . . . $\Delta p \leq 1$ bar (14.5 psi)
at cold start . . . . . $\Delta p_{max} = 3$ bar (43.5 psi)
(valid for entire speed range n_{min}–n_{max})

Please note:
- Max. perm. charge pressure for sizes 40 and 56:
  $p_{Sp\ max}$ = 510 psi (35 bar)
- With Direct Operated Hydraulic Control–Type DG, control pressure should be supplied from the P_S port.
- The filter should be fitted with a ΔP indicator and/or switch set at ≤ 3 bar (43.5 psid).

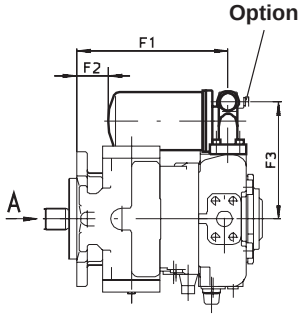
Circuit Diagram...F (with filter assembly)



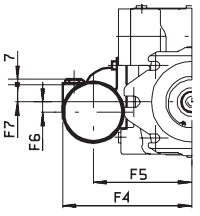
Dimensions...F, P, L, M in mm (in) (with filter assembly)

Size	F1	F2	F3	F4	F5	F6	F7	F8	F9	F10
40	198.7 (7.82)	46.7 (1.8)	160 (6.29)	175 (6.88)	135 (5.31)	0	42 (1.6)	78.5 (3.09)	122 (4.80)	125 (4.92)
56	215.4 (8.48)	63.4 (2.49)	163 (6.41)	178 (7.00)	138 (5.43)	0	42 (1.6)	78.5 (3.09)	122 (4.80)	125 (4.92)
71	239 (9.40)	50 (1.96)	185 (7.28)	203.5 (8.01)	155 (6.10)	16 (0.62)	29 (1.1)	65.5 (2.57)	109 (4.29)	112 (4.40)
90	248.5 (9.78)	59.4 (2.33)	179 (7.04)	197.5 (7.77)	149 (5.86)	0	53 (2.0)	89.5 (3.52)	133 (5.23)	136 (5.35)
125	267.9 (10.5)	62.8 (2.47)	201 (7.91)	219.5 (8.64)	171 (6.73)	0	53 (2.0)	89.5 (3.52)	133 (5.23)	136 (5.35)
180	311.9 (12.2)	37.9 (1.49)	202 (7.95)	220.4 (8.67)	171.9 (6.76)	17 (0.66)	36 (1.4)	72.5 (2.85)	116 (4.56)	119 (4.68)

Option L, M



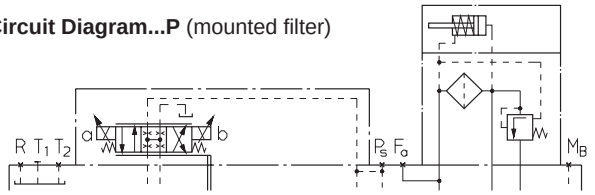
Option F



Charge Pressure Filtration…P (mounted filter)
(With visual contamination indicator)

Similar to option F, except model P includes visual contamination indicator. Indication: Green/Red window.
Indicator switching pressure. . . . . Δp = 3 bar (43.5 psi)

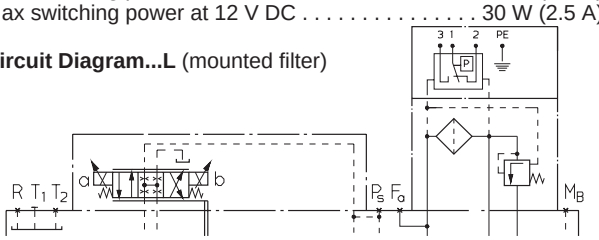
Circuit Diagram...P (mounted filter)



Charge Pressure Filtration…L (mounted filter)
(With electrical contamination indicator)

Similar to option F, except model L includes electrical contamination indicator. Indication: Electrical.
Indicator switching pressure. . . . . Δp = 3 bar (43.5 psi)
Max switching power at 24 V DC . . . . . 60 W (2.5 A)
Max switching power at 12 V DC . . . . . 30 W (2.5 A)

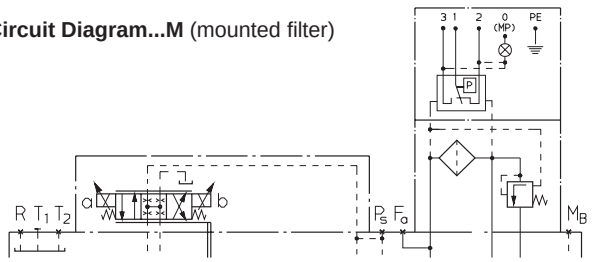
Circuit Diagram...L (mounted filter)



Charge Pressure Filtration…M (mounted filter)
(With visual and electrical contamination indicator)

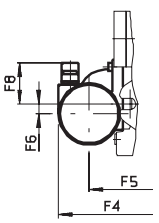
Similar to option F, except model M includes visual and electrical contamination indicator. Indication: el. and visual by lamp.
Indicator switching pressure. . . . . Δp = 3 bar (43.5 psi)
Max switching power at 24 V DC . . . . . 60 W (2.5 A)
Max switching power at 12 V DC . . . . . 30 W (2.5 A)

Circuit Diagram...M (mounted filter)

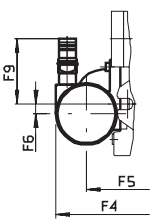


View A, rotated 90°

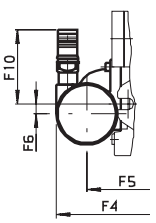
Option P



Option L

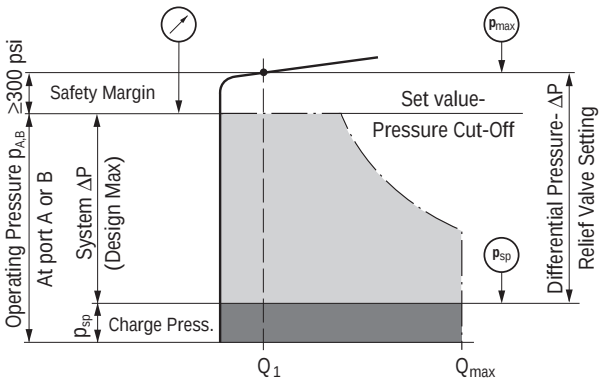


Option M



High Pressure Relief Valve

Adjustment diagram with Pressure Cut-Off



Note: Relief valves are adjusted at a flow rate of:
Q_1 = 6 – 10 l/min (1.6 – 2.6 gpm), depending on size

Example: Charge pressure . . . . . 30 bar (435 psi)

Operating pressure . . . . . 410 bar (5945 psi)
(Pressure cut-off setting)

Safety margin . . . . . 20 bar (290 psi)

Operating press. $p_{A,B}$	–	Charge press. p_{sp}	+	Safety Margin	=	Differential press. Δp
410 bar	–	30 bar	+	20 bar	=	400 bar
(5945 psi)	–	(435 psi)	+	(290 psi)	=	(5800 psi)

High pressure relief valve Pilot Operated (size 71...180)	Differential pressure settings (Δp_{HD})
Setting range valve 1	420 bar (6090 psi)
Δp 100–420 bar	400 bar (5800 psi) *
Δp 1450–6090 psi	350 bar (5075 psi)
(see model code)	320 bar (4640 psi)
	300 bar (4350 psi)
	270 bar (3915 psi)
	250 bar (3625 psi)
	230 bar (3335 psi)
	200 bar (2900 psi)
	150 bar (2175 psi)
	100 bar (1450 psi)

High pressure relief valve Direct Operated (size 40, 56)	Differential pressure settings (Δp_{HD})
Setting range valve 3, 5	420 bar (6090 psi)
Δp 270–420 bar	400 bar (5800 psi) *
Δp 3915–6090 psi	350 bar (5075 psi)
(see model code)	320 bar (4640 psi)
	300 bar (4350 psi)
	270 bar (3915 psi)
Setting range valve 4, 6	250 bar (3625 psi)
Δp 60–250 bar	230 bar (3335 psi)*
Δp 870–3625 psi	200 bar (2900 psi)
(see model code)	150 bar (2175 psi)
	100 bar (1450 psi)

* Standard setting if not specified otherwise

Bypass Function

Size 40, 56: HD-valves direct operated (3), (4): without bypass
Size 40, 56: HD-valves direct operated (5), (6): with bypass
Size 71...180: HD-valves pilot operated (1): with bypass

Simplification: The bypass function is not shown in the circuit diagrams.
The pilot operated HD-valves (sizes 71...180) are not shown in the circuit diagrams.

Please state in clear text when ordering:

High pressure relief valve A
Differential pressure setting: Δp_{HD} = ...psi
Pressure value of the HD-valve (at Q_1) p_{max} = ...psi
($p_{max} = \Delta p_{HD} + p_{Sp}$)

High pressure relief valve B
Differential pressure setting: Δp_{HD} = ...psi
Pressure value of the HD-valve (at Q_1) p_{max} = ...psi

Pressure Cut-Off

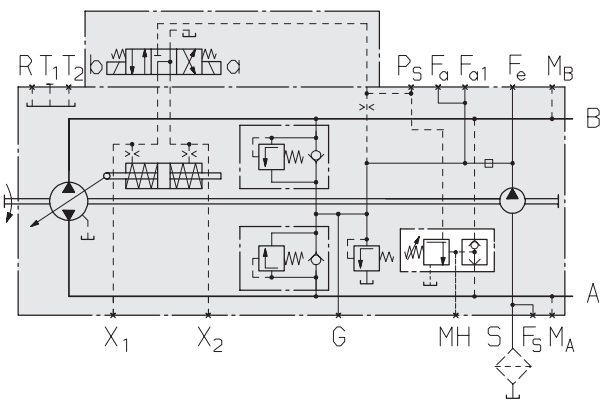
The pressure cut-off valve varies the swashplate angle, as required, to limit the maximum pressure at port A or B.

The pressure cut-off valve prevents continuous dumping of excessive flow, at load pressure, through the cross port relief valves in the pump. This eliminates unnecessary heating of the oil and protects the pump and motor during rapid acceleration or deceleration, or when the drive stalls, causing the pump to dead-head.

The pressure peaks that occur with rapid swivel angle changes, and also the maximum system pressure, are further protected by the high pressure relief valves.

The pressure cut-off valve should be set 20–30 bar (290–435 psi) less than the high pressure relief valve settings.

Standard Adjustment Range: 2175–6500 psi (150–450 bar)



Electrical Control–Non Proportional, EZ1D/EZ2D with Pressure Cut-Off

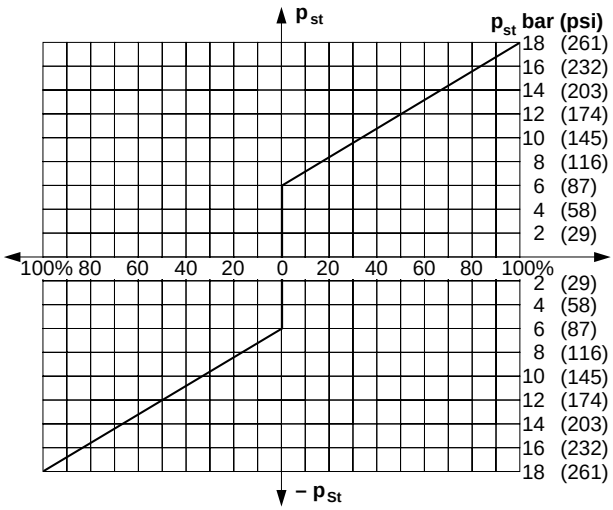
HD Hydraulic Pilot Control

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), in the range of 6 to 18 bar (87 to 261 psi).

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.

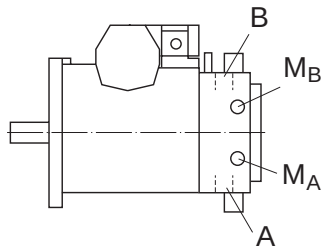


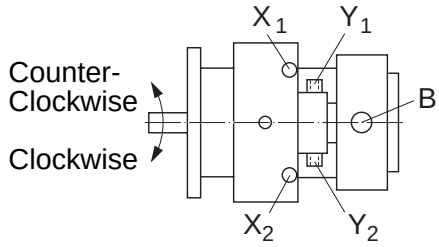
Pilot pressure p_{st}: 6–18 bar (87–261 psi) at ports Y_1, Y_2
Begin of regulation: 6 bar (87 psi)
End of regulation: 18 bar (261 psi)

If the pump is also fitted with a DA control valve, automotive control of the vehicle transmission is possible.
For DA control valve see page 12, 13, 28, & 29.

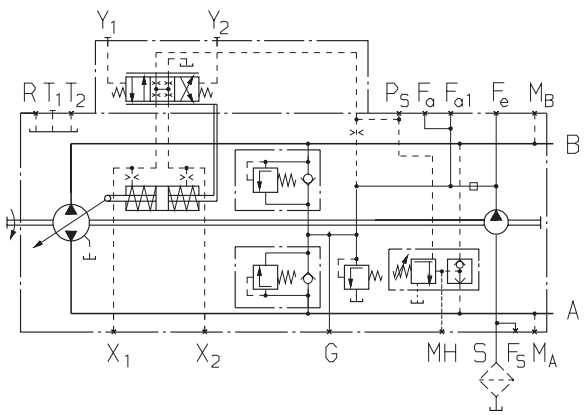
Data Table – AA4VG…HD
Direction of rotation – Control – Thruput flow direction

Direction of Rotation	Size	Pilot Pressure	Control Pressure	Direction of Flow	Operating Pressure
Clockwise	40, 56	Y_1	X_1	A to B	M_B
		Y_2	X_2	B to A	M_A
	71, 90, 125, 180	Y_1	X_1	B to A	M_A
		Y_2	X_2	A to B	M_B
Counter–Clockwise	40, 56	Y_1	X_1	B to A	M_A
		Y_2	X_2	A to B	M_B
	71, 90, 125, 180	Y_1	X_1	A to B	M_B
		Y_2	X_2	B to A	M_A

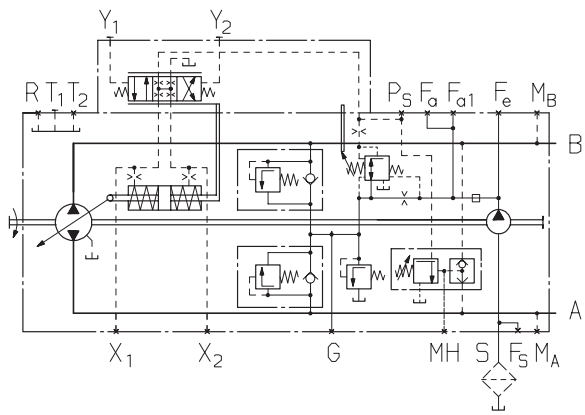




Standard model



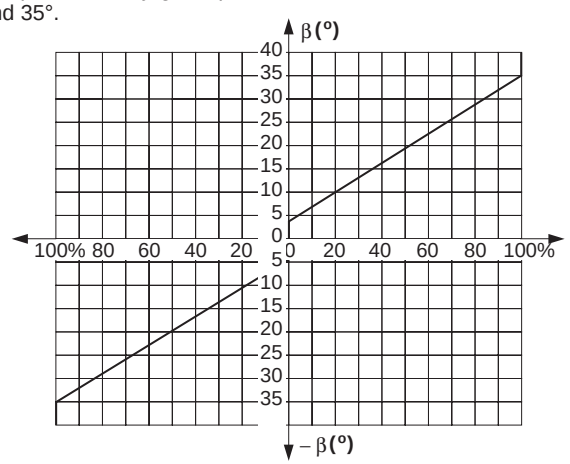
Model with DA control valve



HW Rotary Manual Servo Control

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 ±35° 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 35°.



Swivel angle of the control lever:
from 0 to ± $V_{g\,max}$ or ß = 0° to ± 35°
mechanical stop: size 40–71 . . . . . ± 40°
size 90–180 . . . . . ± 35°

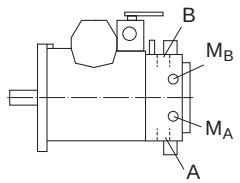
Required lever torque: 85–210 Ncm (7.5–19 lb-in)
Maximum lever torque: 250 Ncm (22 lb-in)

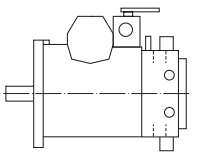
If the pump is also fitted with a DA valve, automotive control of the vehicle transmission is also possible.
For DA control valve see page 12, 13, 28, & 29.
For pressure cut-off see page 8.

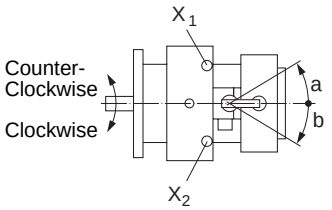
Option: Neutral position switch...HWDL
When the HW control lever is in the neutral position, the neutral position switch is closed. The switch opens if the control lever is moved out of neutral in either direction.
The neutral position switch provides a safety function for systems that require zero flow under certain operating conditions. (e.g.–engine start).

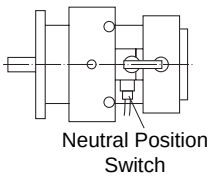
Data Table – AA4VG…HW
Direction of rotation – Control – Thruput flow direction

Direction of Rotation	Size	Lever Direction	Control Pressure	Direction of Flow	Operating Pressure
Clockwise	40, 56	a	X_2	B to A	M_A
		b	X_1	A to B	M_B
	71, 90, 125, 180	a	X_2	A to B	M_B
		b	X_1	B to A	M_A
Counter–Clockwise	40, 56	a	X_2	A to B	M_B
		b	X_1	B to A	M_A
	71, 90, 125, 180	a	X_2	B to A	M_A
		b	X_1	A to B	M_B





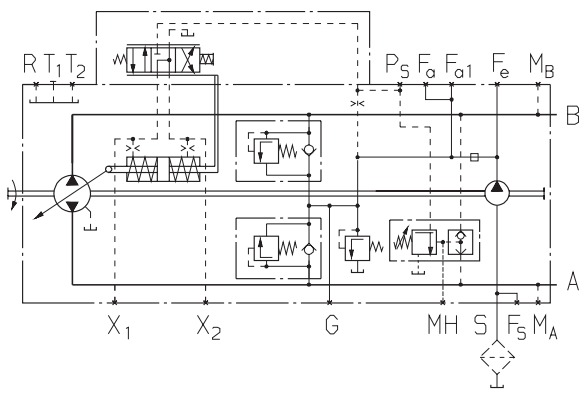




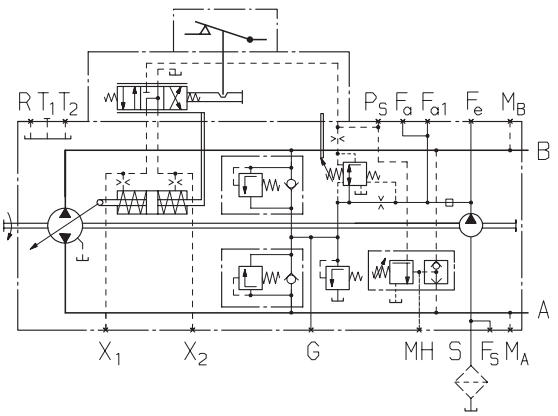
Technical data for neutral position switch

Load performance	20A (continuous)
Switch performance	15A / 32V (DC)
	4A / 32V (AC - inductive)

Standard model



Model with DA control valve and neutral position switch



EP Proportional Electrical Control

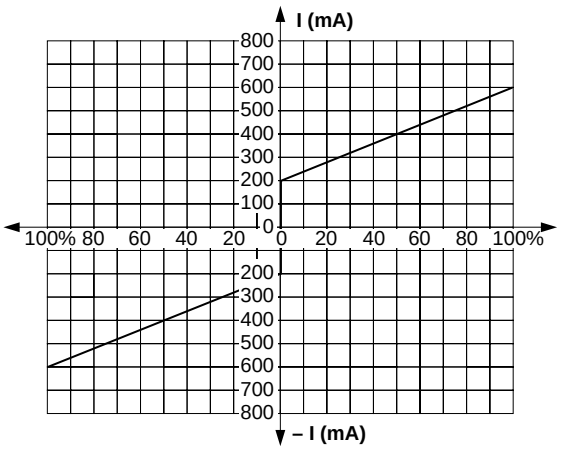
The flow output of the pump is infinitely varied in the range of 0 to 100%, proportional to an electrical current, in the range of 200–600 mA at 24 volts DC, supplied to solenoid a or b. (A current of 400 to 1200 mA is required for the 12 volt solenoids.

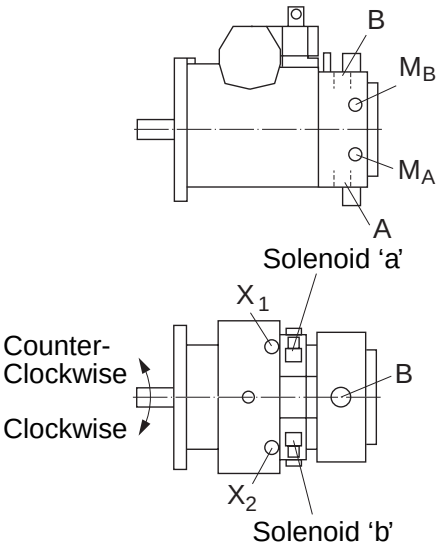
The electrical energy is converted to a force acting on the control spool. The spool then directs control oil in and out of the stroking piston to stroke the pump as required. A feedback lever, connected to the stroking piston, maintains the pump flow for any given current within the control range.

Proportional amplifiers MDSD, PVR-PVRS and special function amplifier EDA are available to control the proportional solenoids. As well, electronic control of the solenoids can be achieved by using a microcontroller with software that is programmed to perform special functions for custom applications.

Data Table – AA4VG…EP
Direction of rotation – Control – Thruput flow direction

Direction of Rotation	Size	Solenoid	Control Pressure	Direction of Flow	Operating Pressure
Clockwise	40, 56	a	X_1	A to B	M_B
		b	X_2	B to A	M_A
	71, 90, 125, 180	a	X_1	B to A	M_A
		b	X_2	A to B	M_B
Counter–Clockwise	40, 56	a	X_1	B to A	M_A
		b	X_2	A to B	M_B
	71, 90, 125, 180	a	X_1	A to B	M_B
		b	X_2	B to A	M_A

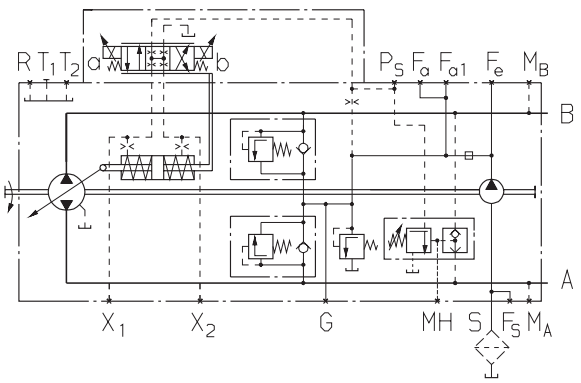




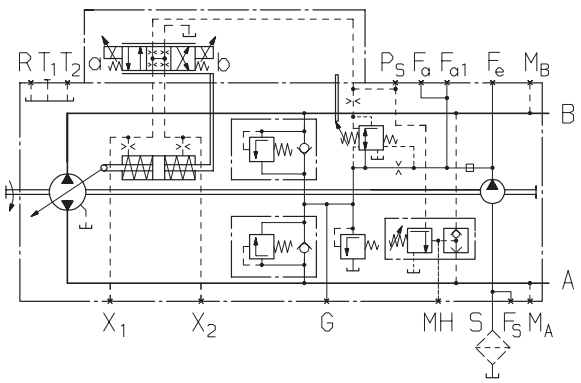
Control current (24 vdc;EP2): I=200–600 mA
Begin of control: I=200 mA (V_{g0})
End of control: I=600 mA ($V_{g\,max}$)
Control current (12 vdc;EP1): I=400–1200 mA
Begin of control: I=400 mA (V_{g0})
End of control: I=1200 mA ($V_{g\,max}$)

If the pump is also fitted with a DA control valve, automotive control of the vehicle transmission is possible.
For DA control valve see page 12,13, 28, & 29.

Standard model



Model with DA control valve



DA Hydraulic Control Speed Dependent

Pilot pressure from the DA regulating cartridge is directed to the stroking piston of the pump by a 4/3 way directional valve. Pump displacement is infinitely variable in each direction of flow, proportional to both pump drive speed and discharge pressure. Flow direction (i.e.-Machine forward or reverse) is controlled by energizing solenoid a or b (refer to flow direction data table at right).

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 pump operating curve, increasing system pressure causes the pump to swivel back towards a smaller displacement.

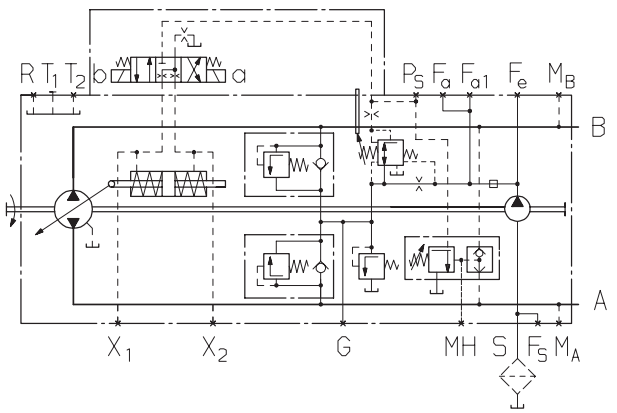
A relatively constant torque input to the pump is achieved by this combination of de-stroking the pump as the operating pressure increases and the response to the “pull-down” of the prime mover (reduced pilot pressure).

Any additional power requirements, such as implement hydraulics, may result in engine pull down. This leads to a reduction in pilot pressure and therefore pump displacement (i.e-power). The power thus released is then available to supply that demanded by the implement hydraulics. Automatic power division and full utilization of available power is thus achieved for both the vehicle transmission and the implement hydraulics.

Minimizing the engine pull down provides optimum usage of the available drive power. This can be achieved by “partial inching”, using the adjustable regulating cartridge with lever (catalog code options 3 and 5). With partial inching, the DA cartridge is mechanically coupled to the accelerator pedal. This means that when a certain engine speed is reached, (movement of the accelerator pedal), the control curve is offset parallel to the engine speed curve.

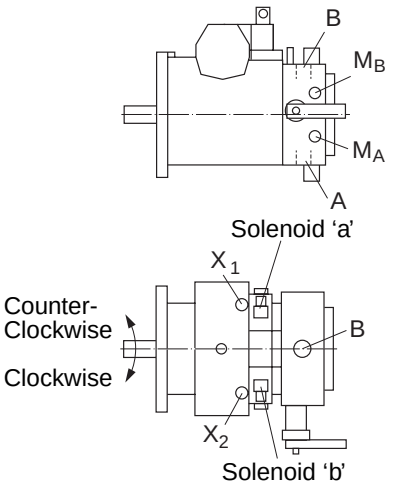
*Application of the DA Control is only appropriate on certain types of vehicle drive systems, and requires a careful review of the engine and vehicle parameters to ensure that the pump is set up correctly. All DA applications **must** therefore be reviewed by a Rexroth Application Engineer.*

Hydraulic Control, Speed Dependent (DA)
control valve, mech. adjustable with control lever
DA1D3/DA2D3



Data Table – AA4VG…DA
Direction of rotation – Control – Thruput flow direction

Direction of Rotation	Size	Solenoid	Control Pressure	Direction of Flow	Operating Pressure
Clockwise	40, 56	a	X_2	B to A	M_A
		b	X_1	A to B	M_B
	71, 90, 125, 180	a	X_2	A to B	M_B
		b	X_1	B to A	M_A
Counter–Clockwise	40, 56	a	X_2	A to B	M_B
		b	X_1	B to A	M_A
	71, 90, 125, 180	a	X_2	B to A	M_A
		b	X_1	A to B	M_B



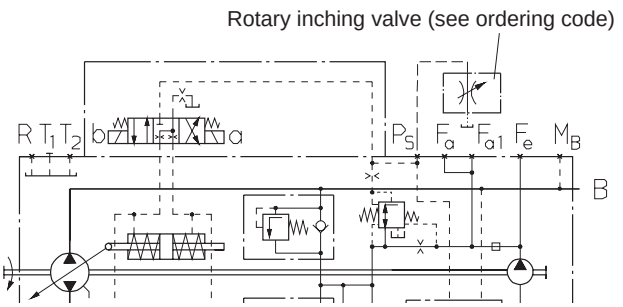
Rotary Inching Valve
This valve is used to provide vehicle inching function, and is used in conjunction with the DA Regulating Cartridge with fixed adjustment.

It permits the pilot pressure (speed dependent) to be reduced as necessary, independently of the pump drive speed, controlled by rotation of the inching lever.

Maximum angle of lever operation is 90°. The position of the lever is optional (inching operation clockwise or counter-clockwise).

The valve is mounted separately from the pump and connected to the P_S port. Maximum line length should be limited to approximately 2 meters (79″).

Hydraulic Control, Speed Dependent (DA)
with separate rotary inching valve



DA Hydraulic Control Speed Dependent

Function and control of DA valves.

Rotary Inching Valve
The rotary inch valve is to be ordered separately.

Size	Ordering Code
40, 56, 71, 90	438 553/470.05.31.01
125	438 554/470.05.31.02
180	438 555/470.05.31.03

Please state your requirements in clear text: Inching, clockwise or counter-clockwise operation of the lever (this is determined on assembly).
Attention: The rotary inch valve can be used independently from the control device.

DA regulating cartridge, fixed adjustment (2)
Pilot pressure is generated in relation to drive speed. There are no provisions for inching with this cartridge. The pump is factory preset as determined by engine/vehicle requirements.

DA regulating cartridge, mechanically adjustable w/lever (3)
Pilot pressure is generated in relation to drive speed. The pump is factory preset as determined by engine/vehicle requirements. Pilot pressure may be reduced (independently of drive speed) as required, by operation of the control lever (inching function).

Maximum angle of lever operation is 70°. The position of the lever is optional (inching operation clockwise or counter-clockwise).

Hydraulic inching valve (4, 5)
This valve is used to provide vehicle inching function, and is used in conjunction with the DA Regulating Cartridge, either with fixed adjustment or mechanically adjustable with lever.

Model with throttle valve used on Size 40, 56, & 71.

Model with pressure reducing valve used on size 90, 125, & 180.

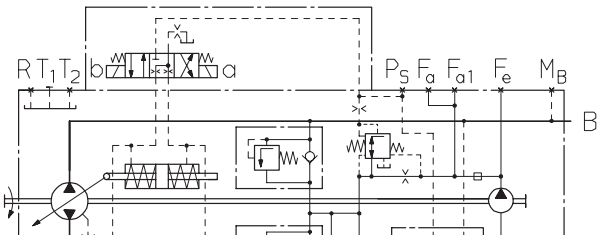
It permits the pilot pressure (speed dependent) to be reduced as necessary, independently of the pump drive speed, by applying a hydraulic pressure at Port Z. This is normally supplied from the vehicle braking system using the brake fluid of the power brakes.

Master controller TH7 as inching valve (7)
This valve is used to provide vehicle inching function, and is used in conjunction with the DA control valve, fixed setting.

Any reduction of control pressure, independent from the input speed through the mechanical operation of the master controller TH7.

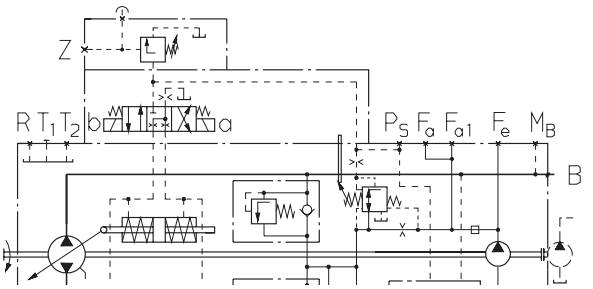
The master controller is installed separately from the pump connected with the pump by 2 hydraulic control lines at ports P_s and Y. The master controller is to be ordered separately (see data sheet RE 64558)

Hydraulic Control, Speed Dependent (DA)
fixed setting, DA1D2/DA2D2

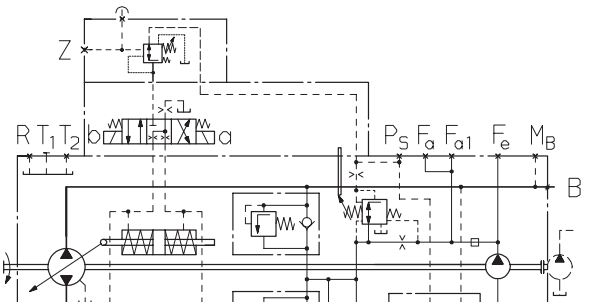


Hydraulic Control, Speed Dependent (DA)
mechanically adjustable with control lever, with hydraulic inching valve, DA1D5/DA2D5

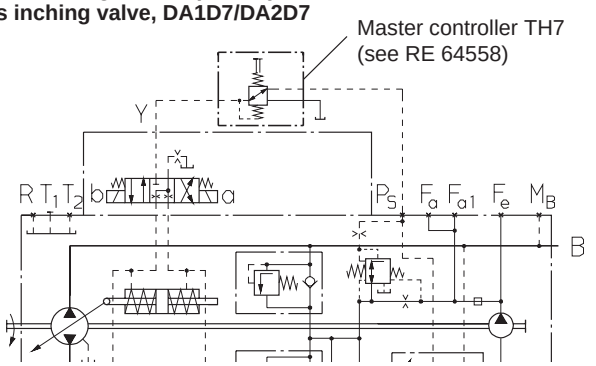
with throttle valve
Sizes 40...71



with pressure reducing valve
Sizes 90...180



Hydraulic Control, Speed Dependent (DA)
fixed setting, with separately installed master controller TH7 as inching valve, DA1D7/DA2D7



EZ Electrical Control Non-Proportional

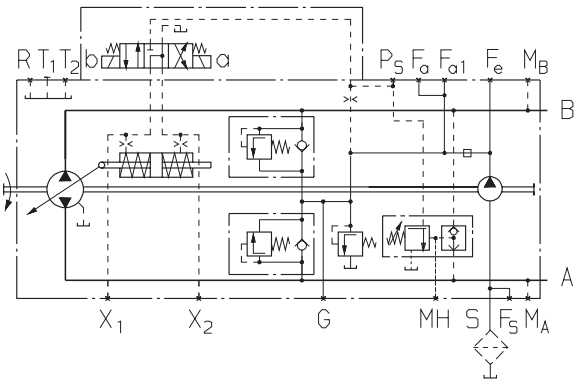
By energizing either solenoid a or b, internal control pressure is connected directly to the stroking piston, and the pump swivels to maximum displacement.

With the EZ control pump flow is switchable from zero flow (neither solenoid energized) to maximum flow. Flow direction is determined by which solenoid is energized (please refer to the data table at the top of page 12).

EZ1 . . . . . 12 vdc solenoids
EZ2 . . . . . 24 vdc solenoids

Pressure Cut-Off: Refer to page 8.

Standard model



DG Hydraulic Control Direct Operated

Pumps supplied with the DG control have no control module. The module is replaced by a cover plate.

Pump output is controlled by hydraulic control pressure (P_{st}), typically supplied by a remote pilot controller, applied directly to the stroking piston through either the X_1 or X_2 port. The DG control is not a positive displacement control, as there is no control feedback device.

While pump displacement is infinitely variable between 0 and 100%, a given swashplate position can be affected by system pressure and/or pump drive speed, as well as the stroking piston centering springs.

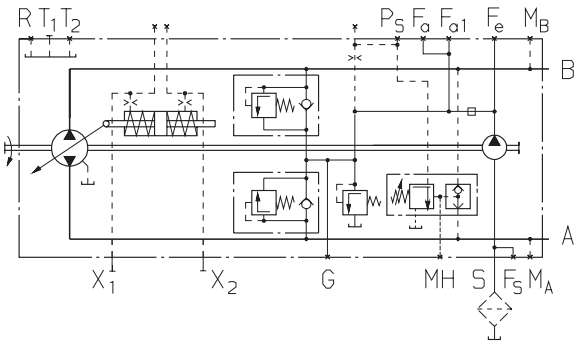
Flow direction is determined by which pilot port is pressurized (please refer to the data table at the top of page 9; Control Pressure column-X_1; X_2).

Nominal characteristics:

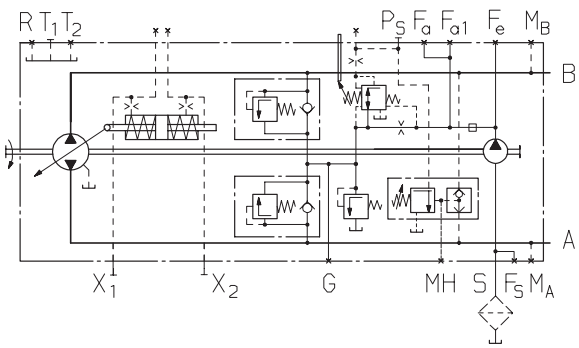
Begin of regulation-$P_{st\,min}$ . . . . . 5–8 bar (73–116 psi)
End of regulation (full stroke)-$P_{st\,max}$. 22–25 bar (320–363 psi)

Application of the DG Control is only appropriate on certain types of vehicle drive systems, and requires a careful review of the engine and vehicle parameters to ensure that the pump is set up correctly. All DG applications should be reviewed by a Rexroth Application Engineer.

Standard model



Standard model with DA control valve

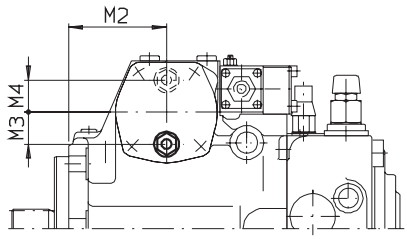


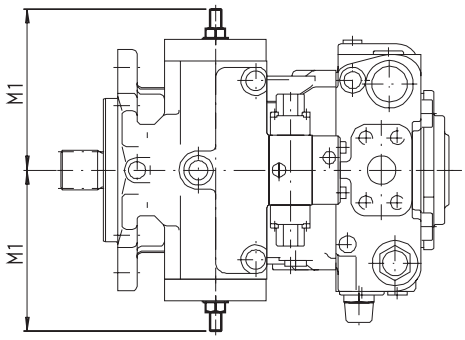
Mechanical Stroke Limiter...M

Adjustment screws to both $V_{g\,max}$ – values

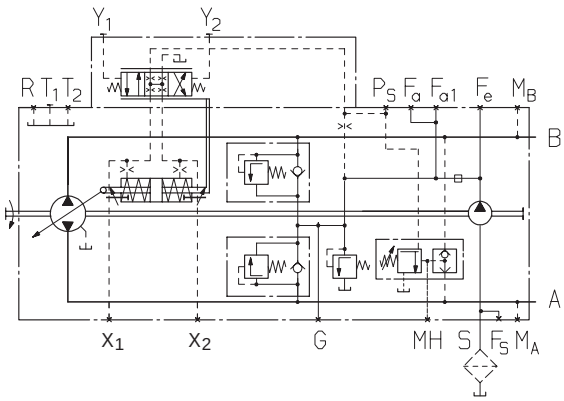
Dimensions in mm (in)

Size	M1	M2	M3	M4
40	110.6 max. (4.35)	38.1 (1.50)	24.0 (0.94)	–
56	130.5 max. (5.13)	44.0 (1.73)	25.5 (1.00)	–
71	135.4 max. (5.33)	86.3 (3.39)	–	28.5 (1.12)
90	147.0 max. (5.78)	95.7 (3.76)	31.5 (1.24)	
125	162.0 max. (6.37)	104.5 (4.11)	–	35.5 (1.39)
180	181.6 max (7.14)	138.7 (5.46)	38.0 (1.49)	–





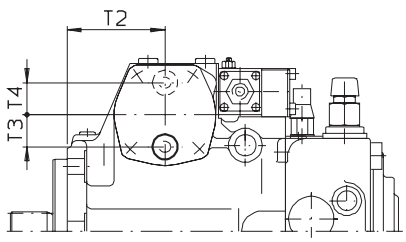
Circuit Diagram



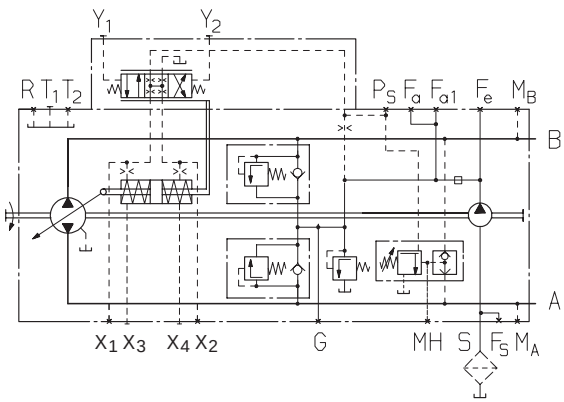
Ports X_3 and X_4 for Positioning Pressure...T

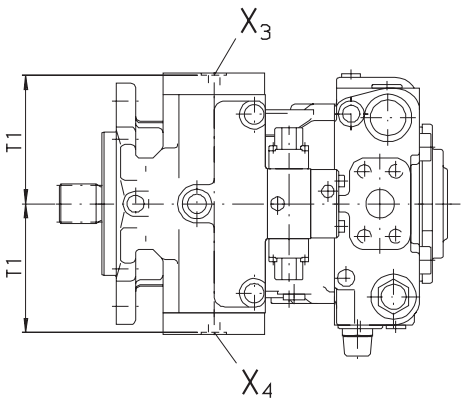
Dimensions in mm (in)

Size	T1	T2	T3	T4	X3, X4
40	92 (3.62)	38.1 (1.5)	–	24 (0.94)	7/16" – 20UNF-2B
56	104.5 (4.11)	44 (1.7)	–	25 (0.98)	7/16" – 20UNF-2B
71	113.5 (4.46)	86.3 (3.4)	28 (1.10)	–	7/16" – 20UNF-2B
90	111.5 (4.38)	95.7 (3.7)	–	30 (1.18)	7/16" – 20UNF-2B
125	136 (5.35)	104.5 (4.1)	34 (1.33)	–	7/16" – 20UNF-2B
180	146.5 (5.76)	138.7 (5.5)	–	35 (1.37)	7/16" – 20UNF-2B



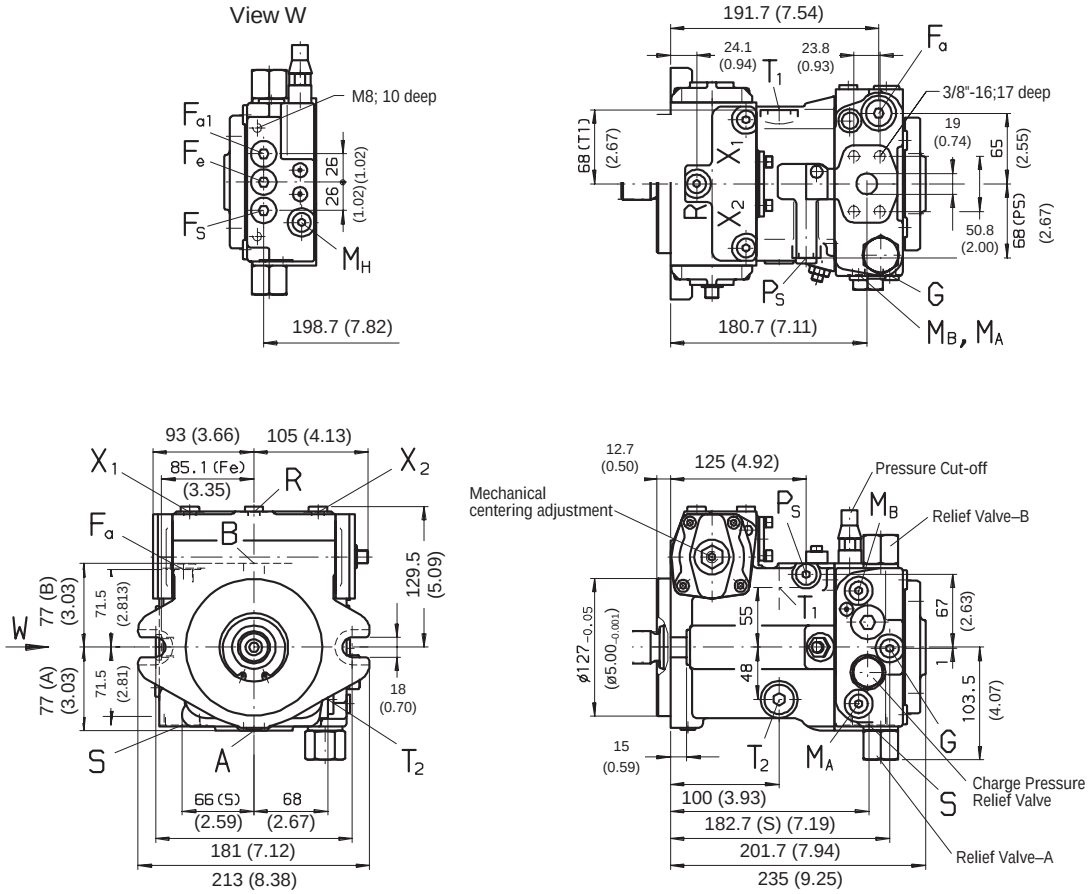
Circuit Diagram





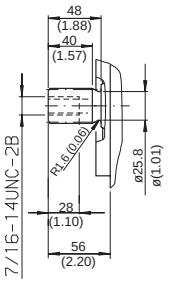
Unit Dimensions...Size 40: dimensions in millimeters (inches)

Pump configuration without control module: Type NV

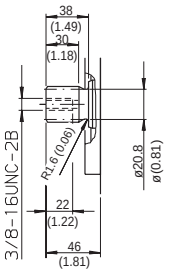


Shaft Options

S
Splined shaft
SAE 1¼″
14 tooth 12/24 Pitch
Flat root side fit
Tolerance Class 5
ANSI B92.1a-1976



U
Splined shaft
SAE 1″
15 tooth 16/32 Pitch
Flat root side fit
Tolerance Class 5
ANSI B92.1a-1976

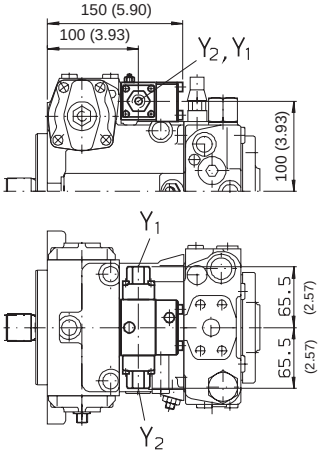


Connections

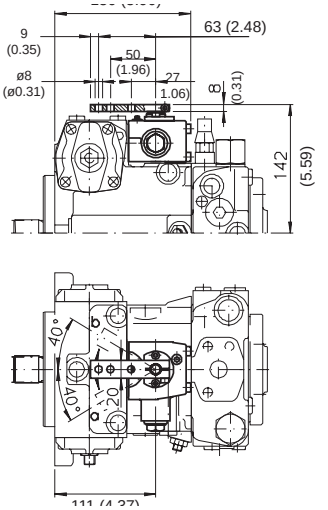
A, B	High pressure ports ¾″ SAE 420 bar (6000 psi–Code 62)	
T_1	Case drain or filling port	⅞″-14 UNF-2B; 17 deep
T_2	Case drain port	⅞″-14 UNF-2B; 17 deep
M_A	Gauge port–sys. pressure A	7/16″-20 UNF-2B; 12 deep
M_B	Gauge port–sys. pressure B	7/16″-20 UNF-2B; 12 deep
R	Case vent port	7/16″-20 UNF-2B; 12 deep
S	Charge suction port	1 5/16″-12 UN-2B; 20 deep
X_1, X_2	Stroking pressure ports (before orifice)	7/16″-20 UNF-2B; 12 deep
G	Charge pressure gauge port	7/16″-20 UNF-2B; 12 deep
Y_1, Y_2	Pilot pressure ports (only for HD control)	9/16″-18 UNF-2B; 12 deep
P_s	Control pressure gauge port	9/16″-18 UNF-2B; 12 deep
F_a	Filter Outlet	¾″-16 UNF-2B; 12 deep
F_{a1}	Filter Outlet (filter assembly)	M18 x 1.5; 12 deep
F_e	Filter Inlet	M18 x 1.5; 12 deep
F_s	Port from filter to suction line (cold start)	M18 x 1.5; 12 deep
M_H	Gauge port–high pressure	7/16″-20 UNF-2B; 12 deep

Unit Dimensions...Size 40: dimensions in millimeters (inches)

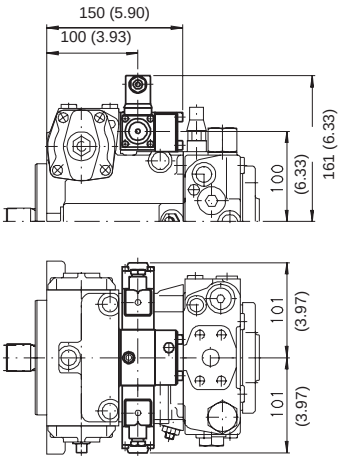
Hydraulic Control–Pilot Operated: Type HD



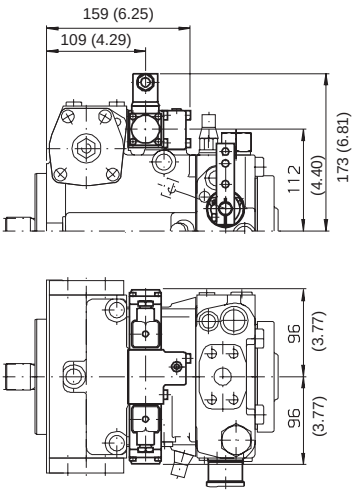
Rotary Manual Servo Control: Type HW



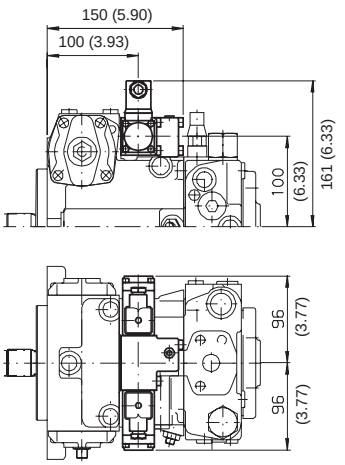
Electrical Control–Proportional: Type EP



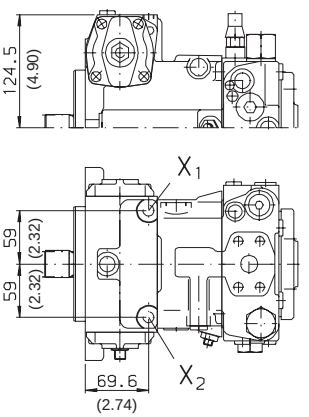
Electrical Control–Non Proportional: Type DA



Electrical Control–Non Proportional: Type EZ

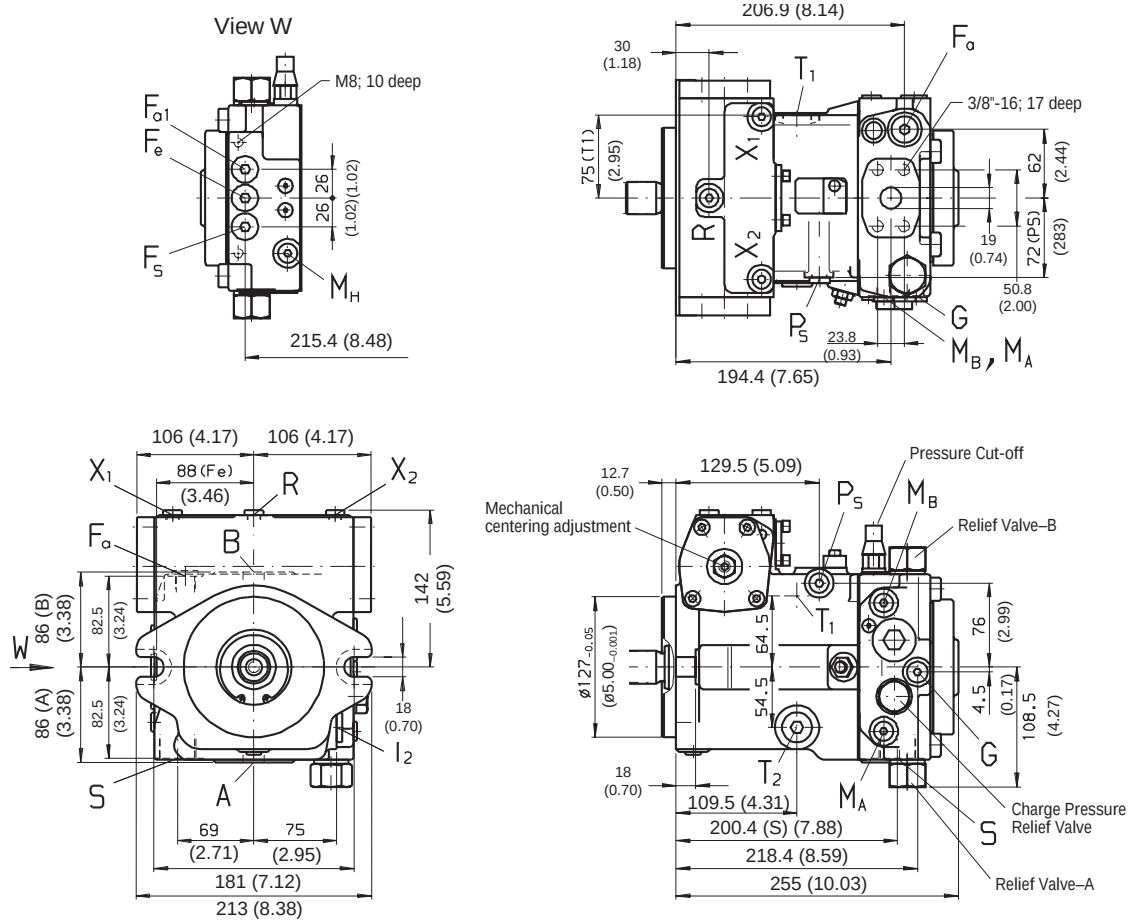


Hydraulic Control–Direct Operated: Type DG



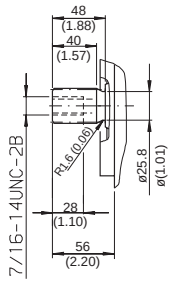
Unit Dimensions...Size 56: dimensions in millimeters (inches)

Pump configuration without control module: Type NV

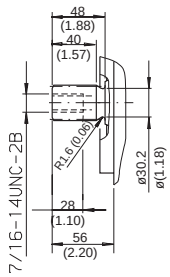


Shaft Options

S
Splined shaft
SAE 1¼″
14 tooth 12/24 Pitch
Flat root side fit
Tolerance Class 5
ANSI B92.1a-1976



T
Splined shaft
SAE 1⅜″
21 tooth 16/32 Pitch
Flat root side fit
Tolerance Class 5
ANSI B92.1a-1976

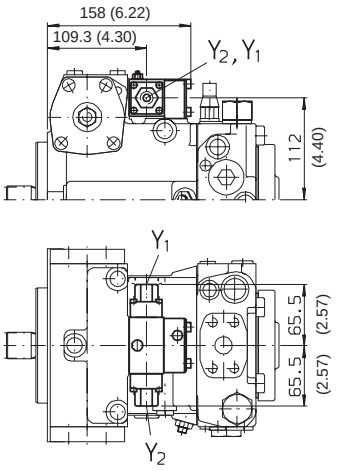


Connections

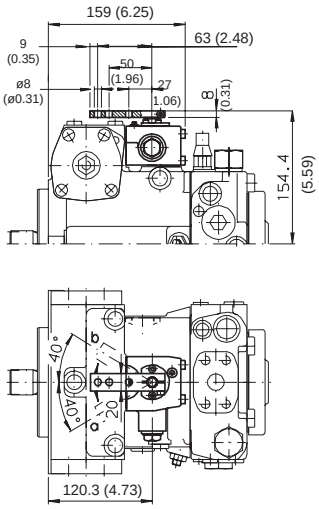
A, B	High pressure ports ¾″ SAE 420 bar (6000 psi–Code 62)	
T_1	Case drain or filling port	1 1/16″-12 UN-2B; 20 deep
T_2	Case drain port	1 1/16″-12 UN-2B; 20 deep
M_A	Gauge port–sys. pressure A	7/16″-20 UNF-2B; 12 deep
M_B	Gauge port–sys. pressure B	7/16″-20 UNF-2B; 12 deep
R	Case vent port	7/16″-20 UNF-2B; 12 deep
S	Charge suction port	1 5/16″-12 UN-2B; 20 deep
X_1, X_2	Stroking pressure ports (before orifice)	7/16″-20 UNF-2B; 12 deep
G	Charge pressure gauge port	9/16″-18 UNF-2B; 12 deep
Y_1, Y_2	Pilot pressure ports (only for HD control)	9/16″-18 UNF-2B; 13 deep
P_s	Control pressure gauge port	9/16″-18 UNF-2B; 12 deep
F_a	Filter Outlet	¾″-16 UNF-2B; 12 deep
F_{a1}	Filter Outlet (filter assembly)	M18 x 1.5; 12 deep
F_e	Filter Inlet	M18 x 1.5; 12 deep
F_s	Port from filter to suction line (cold start)	M18 x 1.5; 12 deep
M_H	Gauge port–high pressure	7/16″-20 UNF-2B; 12 deep

Unit Dimensions...Size 56: dimensions in millimeters (inches)

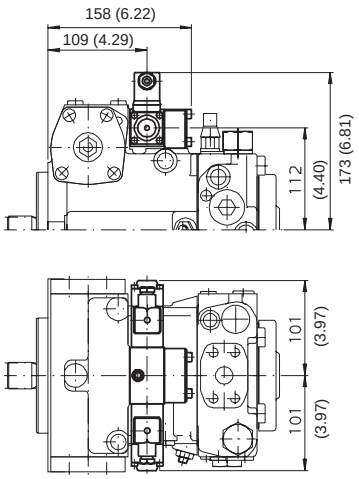
Hydraulic Control–Pilot Operated: Type HD



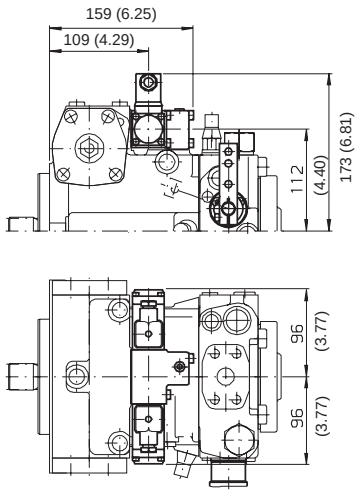
Rotary Manual Servo Control: Type HW



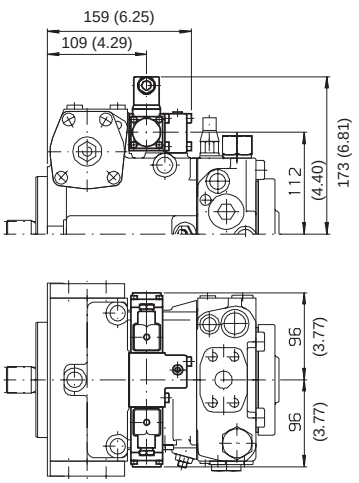
Electrical Control–Proportional: Type EP



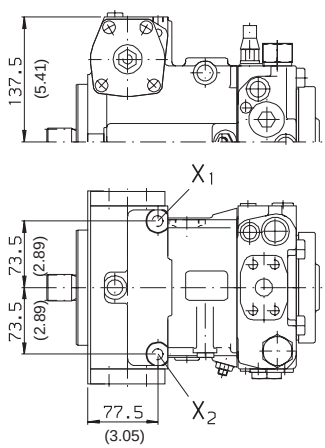
Electrical Control–Non Proportional: Type DA



Electrical Control–Non Proportional: Type EZ

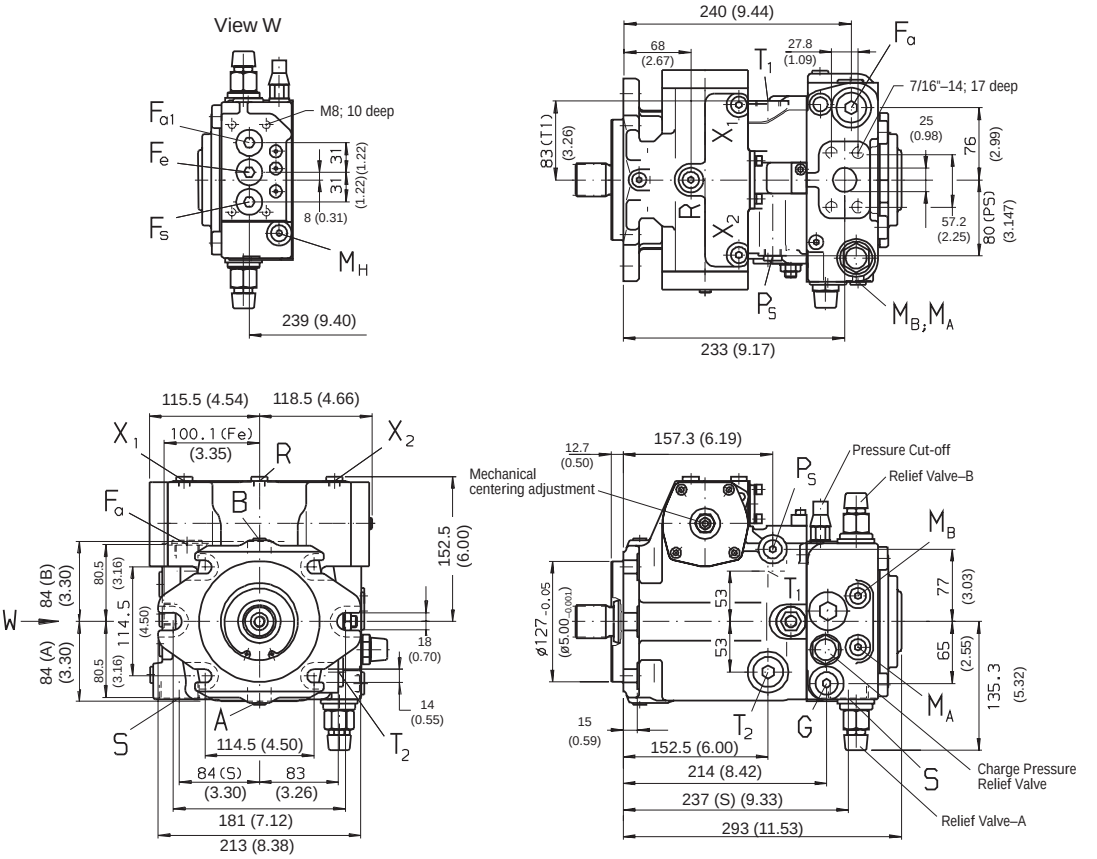


Hydraulic Control–Direct Operated: Type DG



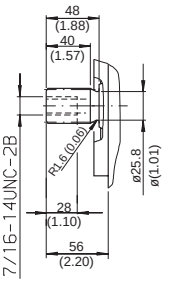
Unit Dimensions...Size 71: dimensions in millimeters (inches)

Pump configuration without control module: Type NV

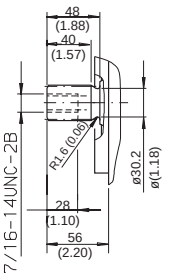


Shaft Options

S
Splined shaft
SAE 1¼″
14 tooth 12/24 Pitch
Flat root side fit
Tolerance Class 5
ANSI B92.1a-1976



T
Splined shaft
SAE 1⅜″
21 tooth 16/32 Pitch
Flat root side fit
Tolerance Class 5
ANSI B92.1a-1976

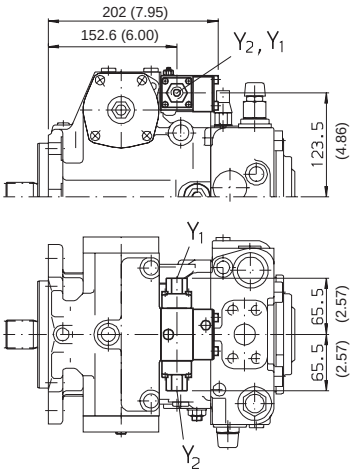


Connections

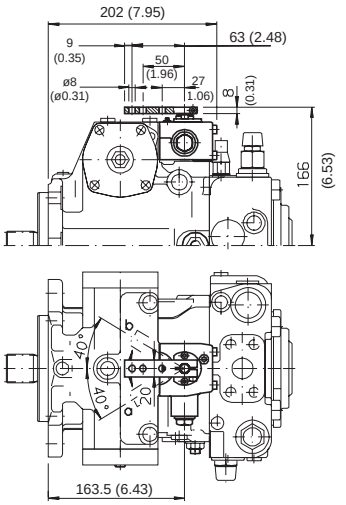
A, B	High pressure ports 1″ SAE 420 bar (6000 psi–Code 62)	
T_1	Case drain or filling port	1 1/16″-12 UN-2B; 20 deep
T_2	Case drain port	1 1/16″-12 UN-2B; 20 deep
M_A	Gauge port–sys. pressure A	7/16″-20 UNF-2B; 12 deep
M_B	Gauge port–sys. pressure B	7/16″-20 UNF-2B; 12 deep
R	Case vent port	7/16″-20 UNF-2B; 12 deep
S	Charge suction port	1 5/8″-12 UN-2B; 20 deep
X_1, X_2	Stroking pressure ports (before orifice)	7/16″-20 UNF-2B; 12 deep
G	Charge pressure gauge port	¾″-16 UNF-2B; 15 deep
Y_1, Y_2	Pilot pressure ports (only for HD control)	9/16″-18 UNF-2B; 13 deep
P_s	Control pressure gauge port	9/16″-18 UNF-2B; 13 deep
F_a	Filter Outlet	1 1/16″-12 UN-2B; 16 deep
F_{a1}	Filter Outlet (filter assembly)	M22 x 1.5; 14 deep
F_e	Filter Inlet	M22 x 1.5; 14 deep
F_s	Port from filter to suction line (cold start)	M22 x 1.5; 14 deep
M_H	Gauge port–high pressure	7/16″-20 UNF-2B; 12 deep

Unit Dimensions...Size 71: dimensions in millimeters (inches)

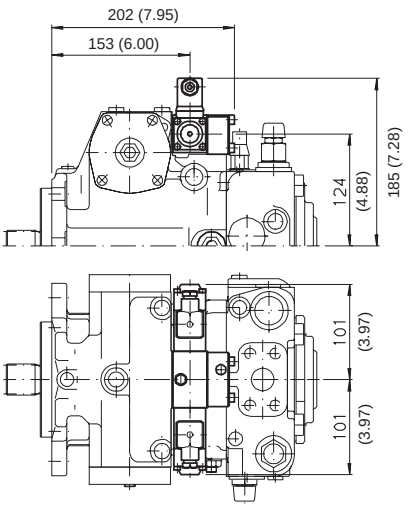
Hydraulic Control–Pilot Operated: Type HD



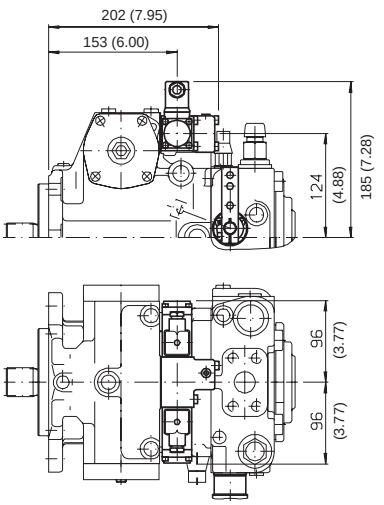
Rotary Manual Servo Control: Type HW



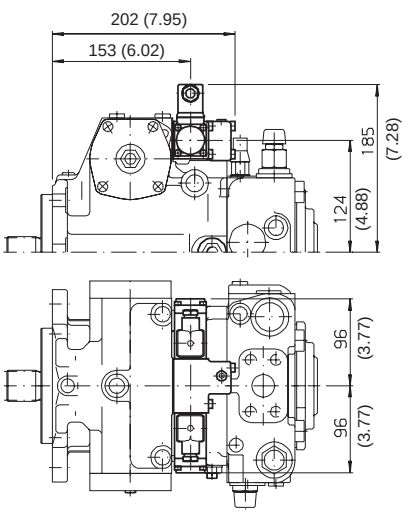
Electrical Control–Proportional: Type EP



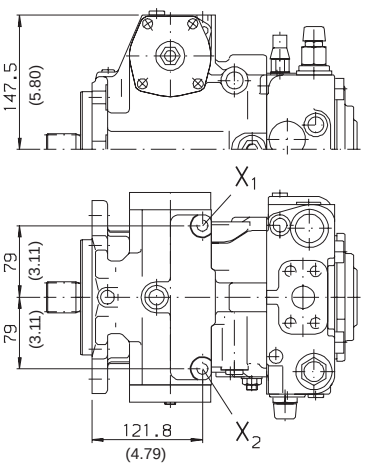
Electrical Control–Non Proportional: Type DA



Electrical Control–Non Proportional: Type EZ

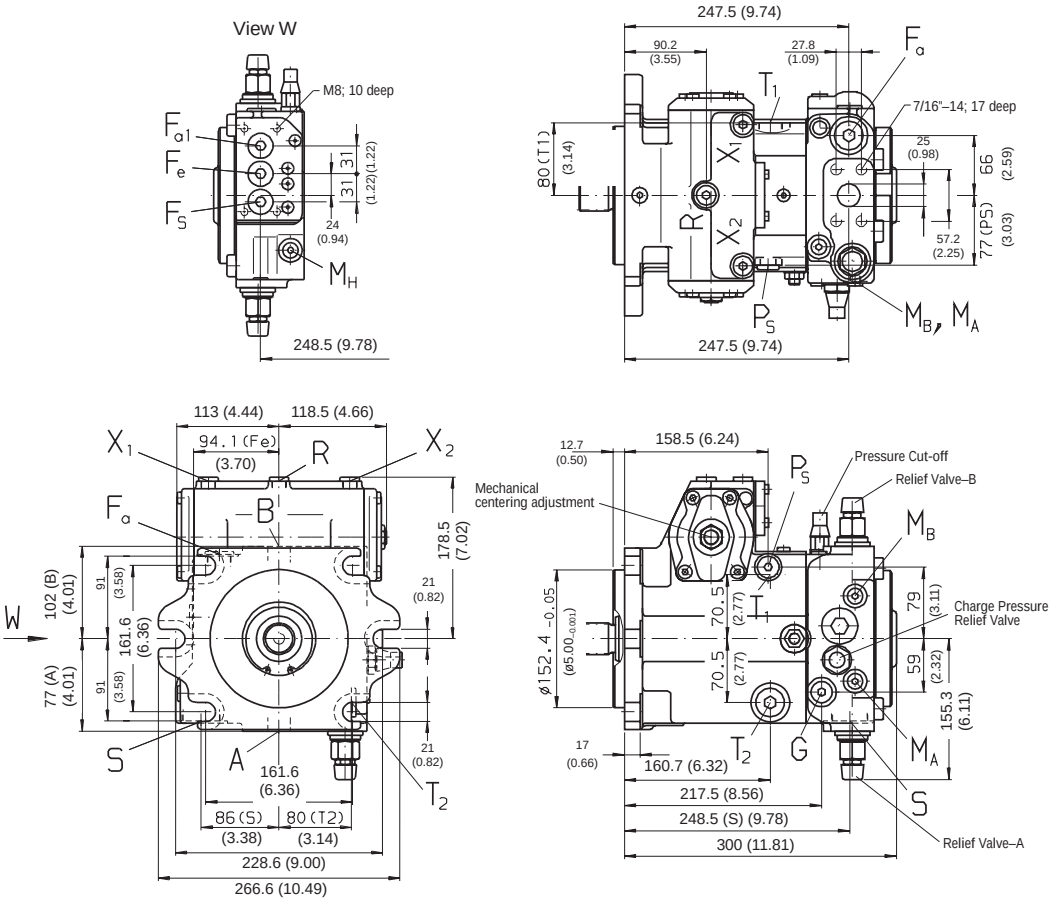


Hydraulic Control–Direct Operated: Type DG



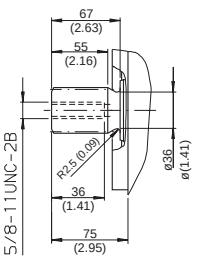
Unit Dimensions...Size 90: dimensions in millimeters (inches)

Pump configuration without control module: Type NV

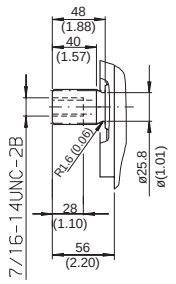


Shaft Options

S
Splined shaft
SAE 1¾″
13 tooth 8/16 Pitch
Flat root side fit
Tolerance Class 5
ANSI B92.1a-1976



U
Splined shaft
SAE 1¼″
14 tooth 12/24 Pitch
Flat root side fit
Tolerance Class 5
ANSI B92.1a-1976

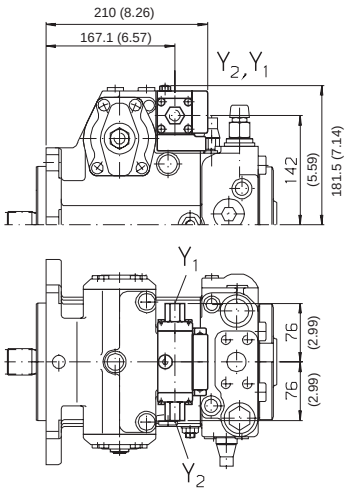


Connections

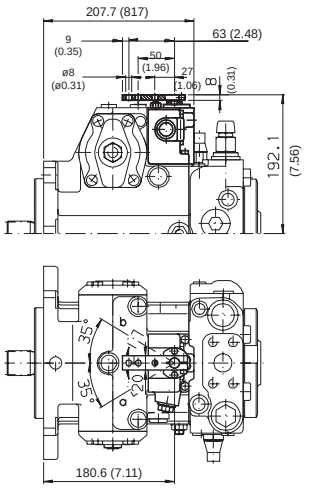
A, B	High pressure ports 1″ SAE 420 bar (6000 psi–Code 62)	
T_1	Case drain or filling port	1 1/16″-12 UN-2B; 20 deep
T_2	Case drain port	1 1/16″-12 UN-2B; 20 deep
M_A	Gauge port–sys. pressure A	7/16″-20 UNF-2B; 12 deep
M_B	Gauge port–sys. pressure B	7/16″-20 UNF-2B; 12 deep
R	Case vent port	9/16″-18 UNF-2B; 13 deep
S	Charge suction port	1 5/8″-12 UN-2B; 20 deep
X_1, X_2	Stroking pressure ports (before orifice)	9/16″-18 UNF-2B; 13 deep
G	Charge pressure gauge port	¾″-16 UNF-2B; 15 deep
Y_1, Y_2	Pilot pressure ports (only for HD control)	9/16″-18 UNF-2B; 13 deep
P_s	Control pressure gauge port	¾″-16 UNF-2B; 15 deep
F_a	Filter Outlet	1 1/16″-12 UN-2B; 16 deep
F_{a1}	Filter Outlet (filter assembly)	M22 x 1.5; 14 deep
F_e	Filter Inlet	M22 x 1.5; 14 deep
F_s	Port from filter to suction line (cold start)	M22 x 1.5; 14 deep
M_H	Gauge port–high pressure	7/16″-20 UNF-2B; 12 deep

Unit Dimensions...Size 90: dimensions in millimeters (inches)

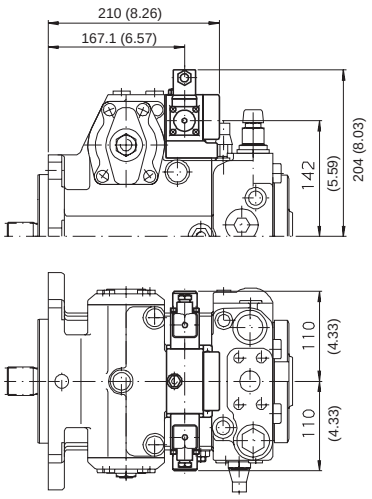
Hydraulic Control–Pilot Operated: Type HD



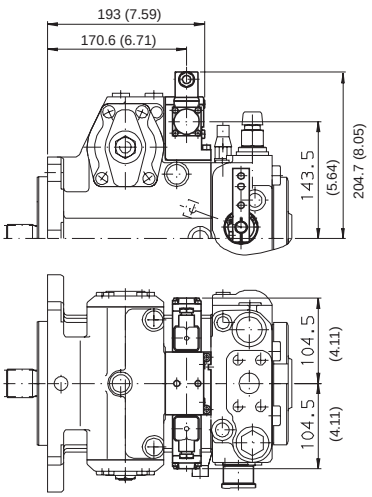
Rotary Manual Servo Control: Type HW



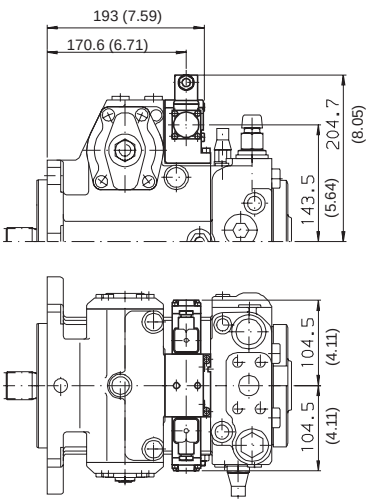
Electrical Control–Proportional: Type EP



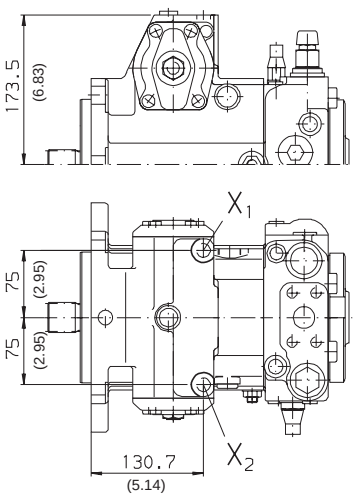
Electrical Control–Non Proportional: Type DA



Electrical Control–Non Proportional: Type EZ

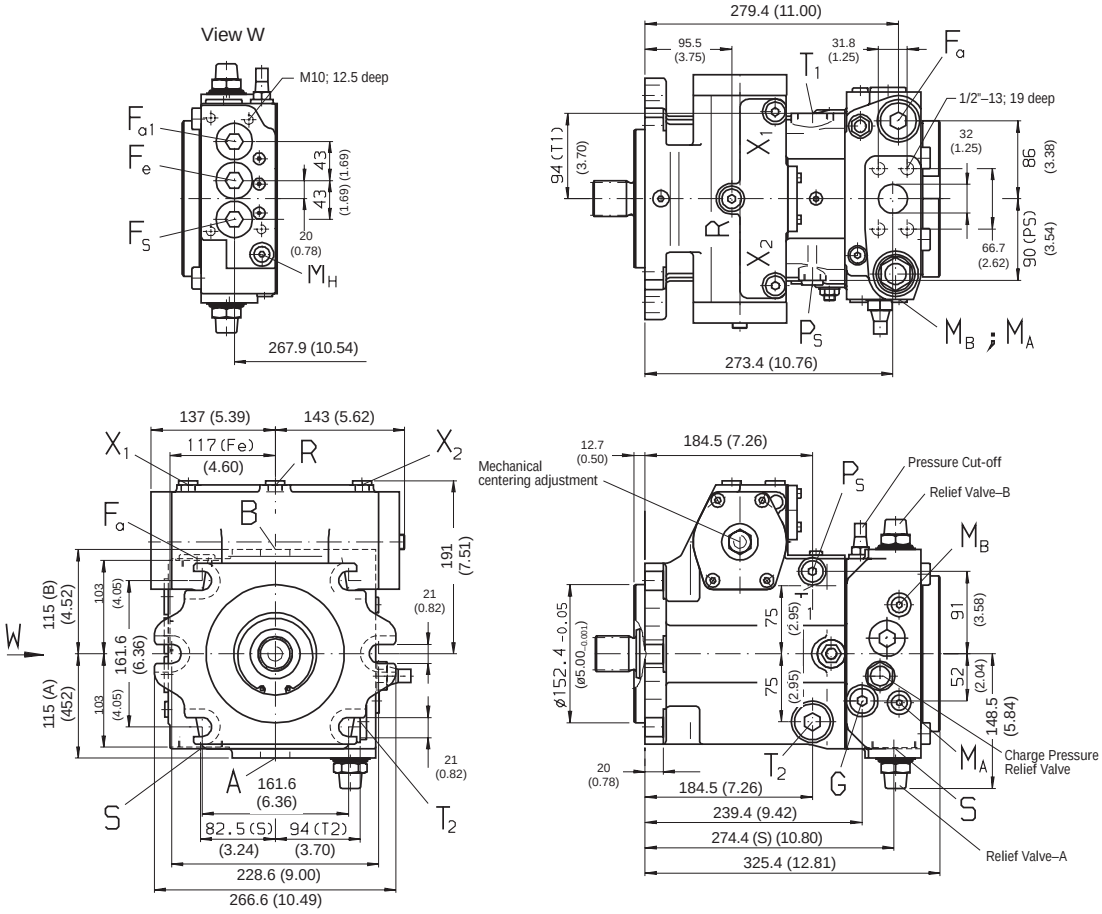


Hydraulic Control–Direct Operated: Type DG



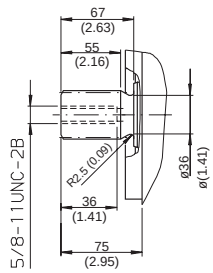
Unit Dimensions...Size 125: dimensions in millimeters (inches)

Pump configuration without control module: Type NV

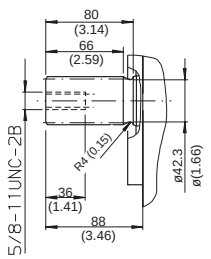


Shaft Options

S
Splined shaft
SAE 1 ¾″
13 tooth 8/16 Pitch
Flat root side fit
Tolerance Class 5
ANSI B92.1a-1976



T
Splined shaft
SAE 2″
15 tooth 8/16 Pitch
Flat root side fit
Tolerance Class 5
ANSI B92.1a-1976

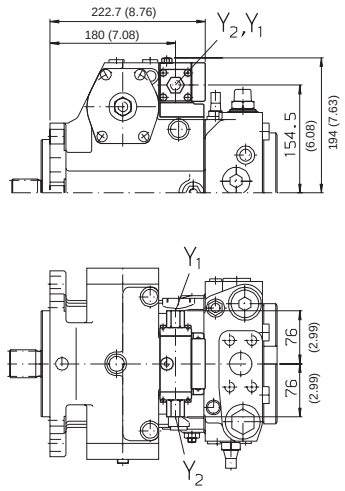


Connections

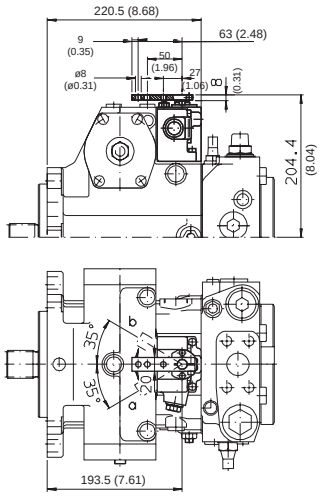
A, B	High pressure ports 1¼″ SAE 420 bar (6000 psi–Code 62)	
T_1	Case drain or filling port	1⁵⁄₁₆″-12 UN-2B; 20 deep
T_2	Case drain port	1⁵⁄₁₆″-12 UN-2B; 20 deep
M_A	Gauge port–sys. pressure A	⁷⁄₁₆″-20 UNF-2B; 12 deep
M_B	Gauge port–sys. pressure B	⁷⁄₁₆″-20 UNF-2B; 12 deep
R	Case vent port	⁹⁄₁₆″-18 UNF-2B; 13 deep
S	Charge suction port	1⅞″-12 UN-2B; 20 deep
X_1, X_2	Stroking pressure ports (before orifice)	⁹⁄₁₆″-18 UNF-2B; 13 deep
G	Charge pressure gauge port	⅞″-14 UNF-2B; 17 deep
Y_1, Y_2	Pilot pressure ports (only for HD control)	⁹⁄₁₆″-18 UNF-2B; 13 deep
P_s	Control pressure gauge port	¾″-16 UNF-2B; 15 deep
F_a	Filter Outlet	1⁵⁄₁₆″-12 UN-2B; 18 deep
F_{a1}	Filter Outlet (filter assembly)	M33 x 2; 18 deep
F_e	Filter Inlet	M33 x 2; 18 deep
F_s	Port from filter to suction line (cold start)	M33 x 2; 18 deep
M_H	Gauge port–high pressure	⁷⁄₁₆″-20 UNF-2B; 12 deep

Unit Dimensions...Size 125: dimensions in millimeters (inches)

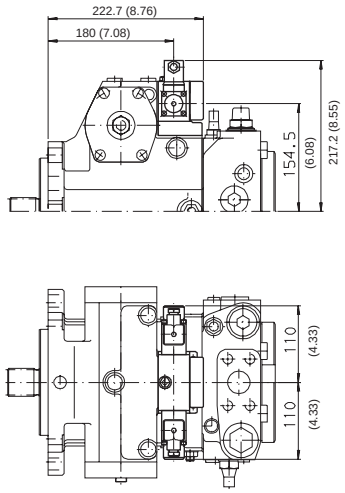
Hydraulic Control–Pilot Operated: Type HD



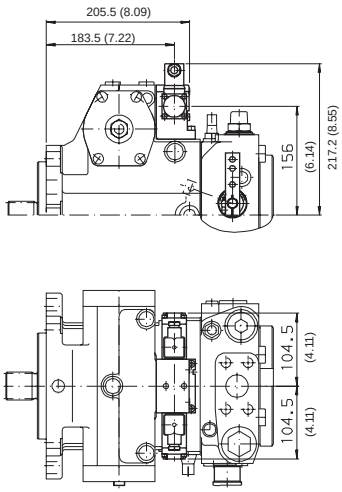
Rotary Manual Servo Control: Type HW



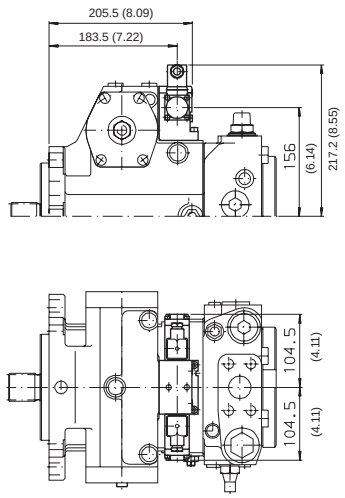
Electrical Control–Proportional: Type EP



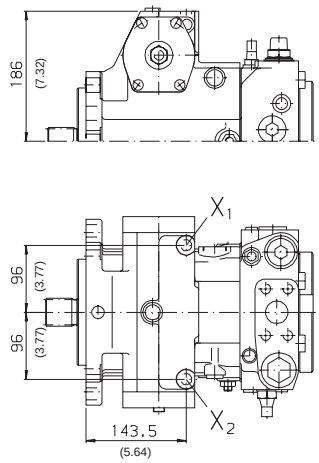
Electrical Control–Non Proportional: Type DA



Electrical Control–Non Proportional: Type EZ

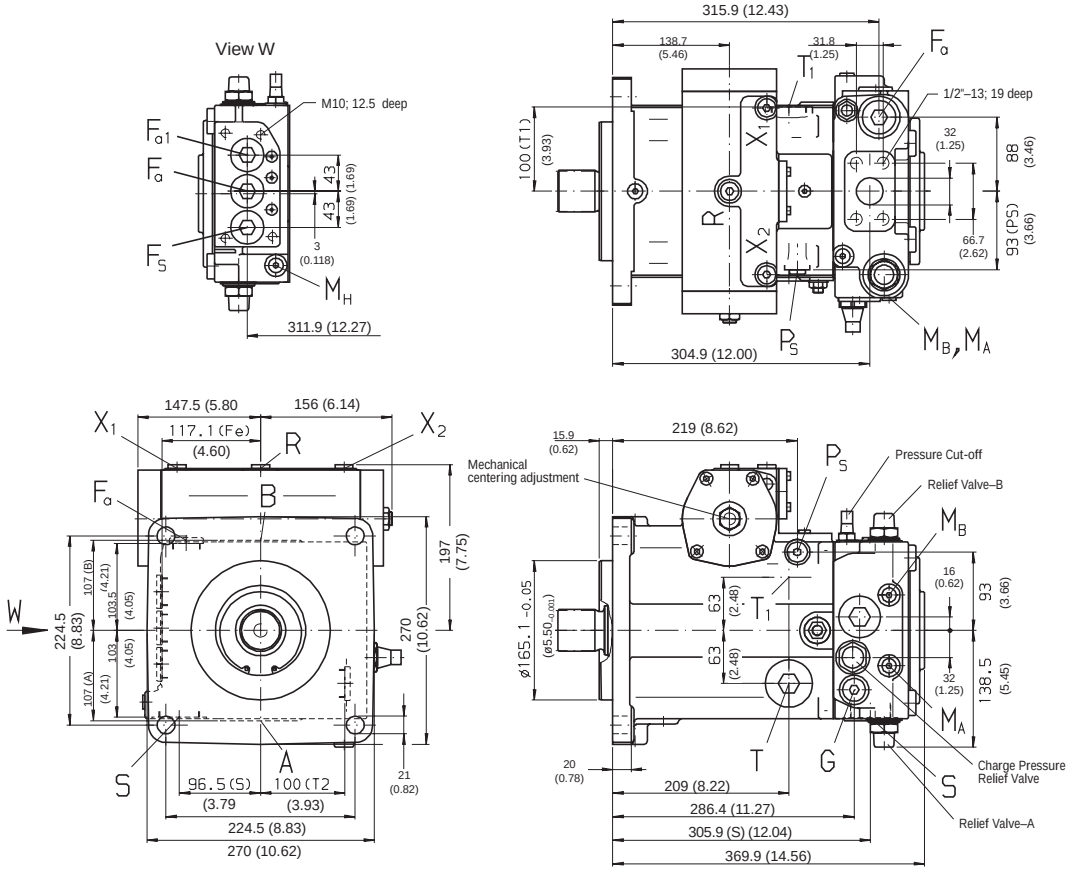


Hydraulic Control–Direct Operated: Type DG



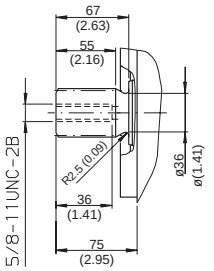
Unit Dimensions...Size 180: dimensions in millimeters (inches)

Pump configuration without control module: Type NV

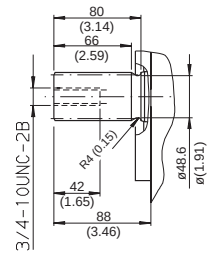


Shaft Options

S
Splined shaft
SAE 1 ¾″
13 tooth 8/16 Pitch
Flat root side fit
Tolerance Class 5
ANSI B92.1a-1976



T
Splined shaft
SAE 2 ¼″
17 tooth 8/16 Pitch
Flat root side fit
Tolerance Class 5
ANSI B92.1a-1976

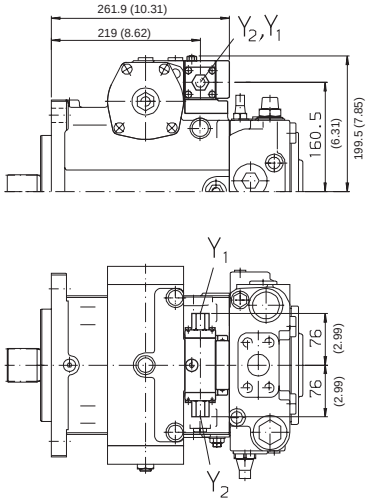


Connections

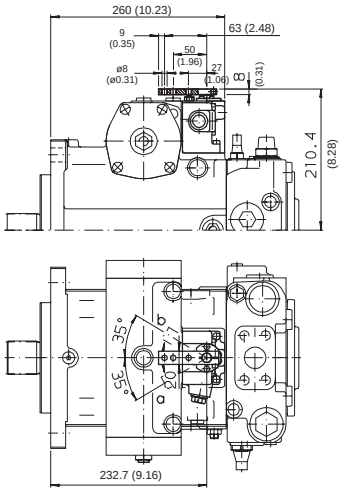
A, B	High pressure ports 1¼″ SAE 420 bar (6000 psi–Code 62)	
T_1	Case drain or filling port	1⅝″-12 UN-2B; 20 deep
T_2	Case drain port	1⅝″-12 UN-2B; 20 deep
M_A	Gauge port–sys. pressure A	7/16″-20 UNF-2B; 12 deep
M_B	Gauge port–sys. pressure B	7/16″-20 UNF-2B; 12 deep
R	Case vent port	9/16″-18 UNF-2B; 13 deep
S	Charge suction port	1⅞″-12 UN-2B; 20 deep
X_1, X_2	Stroking pressure ports (before orifice)	9/16″-18 UNF-2B; 13 deep
G	Charge pressure gauge port	⅞″-14 UNF-2B; 17 deep
Y_1, Y_2	Pilot pressure ports (only for HD control)	9/16″-18 UNF-2B; 13 deep
P_s	Control pressure gauge port	9/16″-18 UNF-2B; 13 deep
F_a	Filter Outlet	1 5/16″-12 UN-2B; 18 deep
F_{a1}	Filter Outlet (filter assembly)	M33 x 2; 18 deep
F_e	Filter Inlet	M33 x 2; 18 deep
F_s	Port from filter to suction line (cold start)	M33 x 2; 18 deep
M_H	Gauge port–high pressure	7/16″-20 UNF-2B; 12 deep

Unit Dimensions...Size 180: dimensions in millimeters (inches)

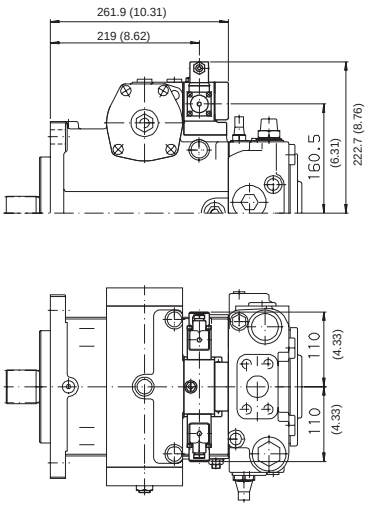
Hydraulic Control–Pilot Operated: Type HD



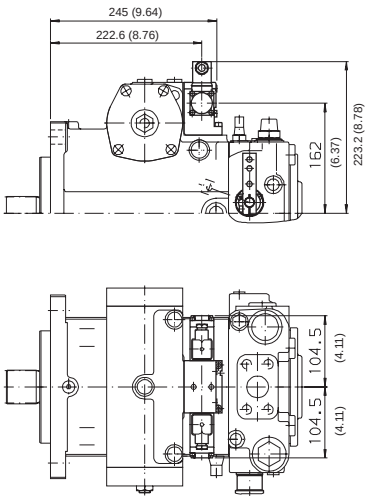
Rotary Manual Servo Control: Type HW



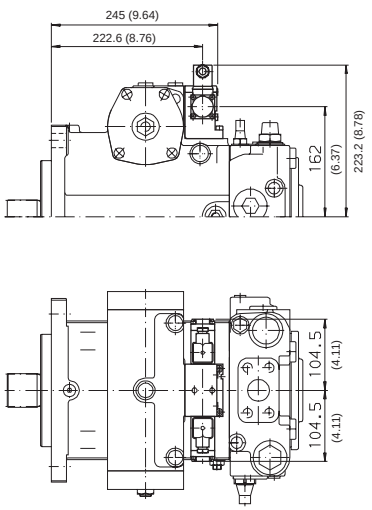
Electrical Control–Proportional: Type EP



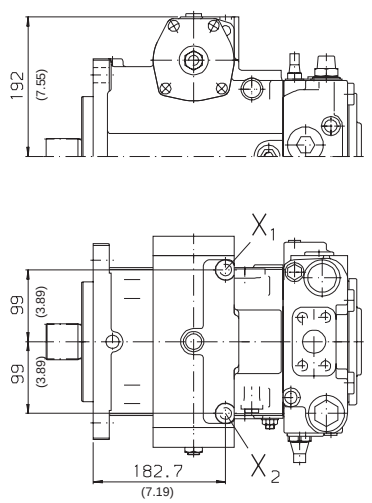
Electrical Control–Non Proportional: Type DA



Electrical Control–Non Proportional: Type EZ



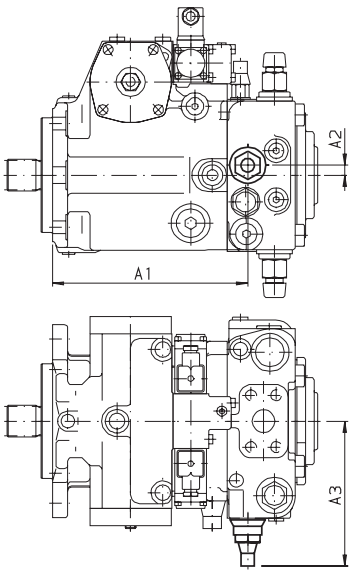
Hydraulic Control–Direct Operated: Type DG



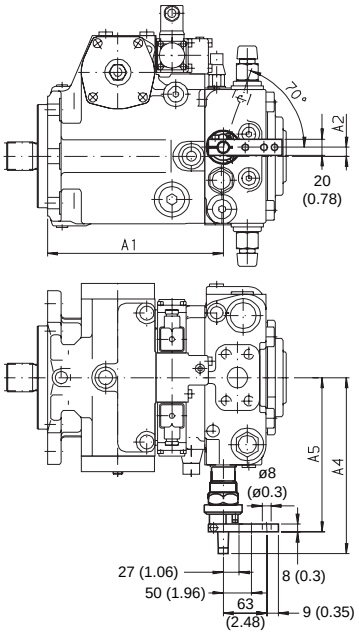
Unit Dimensions, DA Control Valves: dimensions in millimeters (inches)

In an automotive transmission, the DA regulating cartridge is used in conjunction with the direct controlled hydraulic DA Control. However, pumps with HD, HW, or EP controls can also be equipped with a DA regulating cartridge. This provides an automatic transmission function (speed dependent, high pressure control), that can be overridden (see the description of the DA Control on Page 12). The maximum flow will then be determined by the setting of the displacement control.

DA Cartridge, fixed adjustment (2)

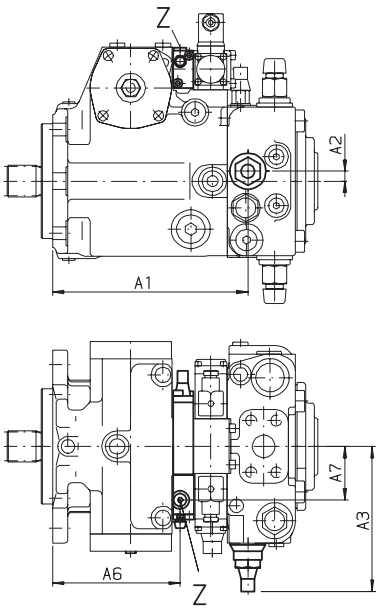


DA Cartridge, mechanically adjustable with lever (3)



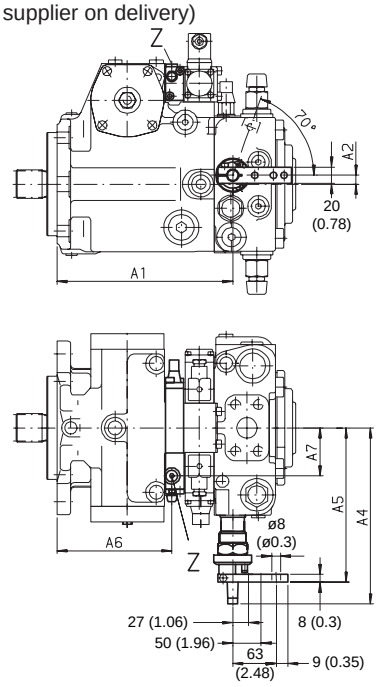
DA Cartridge, fixed adjustment and hydraulic inching valve connected (4) (only for pumps with DA control device)

Z pilot pressure port port M10 x 1; 8 deep
(plugged by supplier on delivery)



DA Cartridge, mechanically adjustable with lever and connected hydraulic inching valve (5) (only for pumps with DA control device)

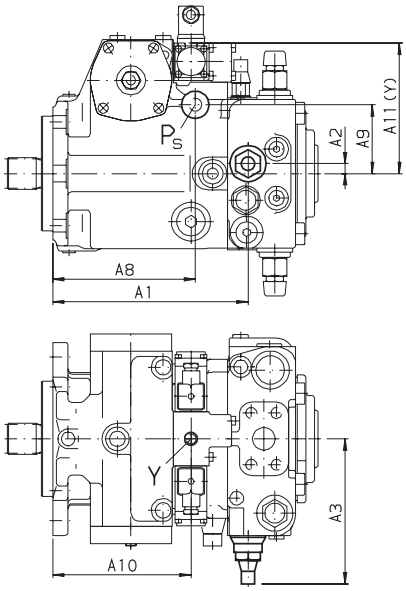
Z pilot pressure port port M10 x 1; 8 deep
(plugged by supplier on delivery)



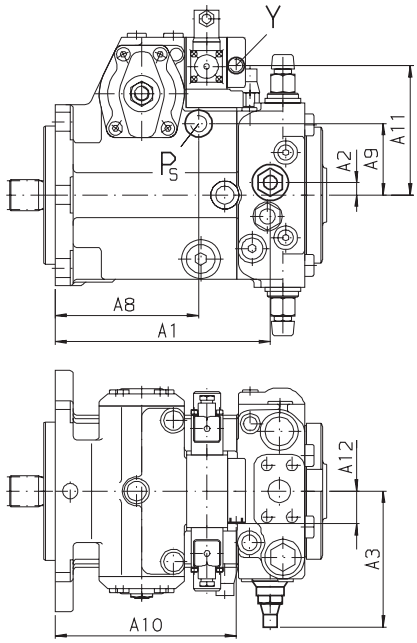
Unit Dimensions, DA Control Valves: dimensions in millimeters (inches)

DA Cartridge, fixed adjustment and connections for master controller TH7 (7)

Size 40...71



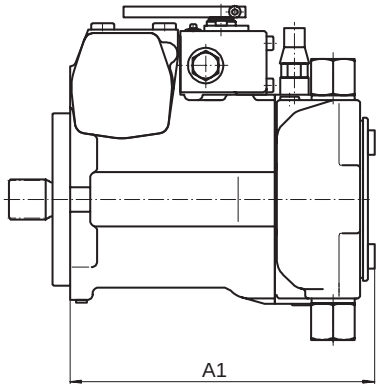
Size 90...180



Size	A1	A2	A3	A4	A5	A6	A7	A8	A9	A10	A11	A12	Y
40	181.7 (7.15)	23 (0.90)	157.0 (6.18)	177.7 (6.99)	159.2 (6.26)	88.9 (3.50)	59 (2.32)	125.0 (4.92)	67 (2.63)	91.9 (3.61)	119.6 (4.70)	–	M14 x 1.5; 12 Deep
56	197.4 (7.77)	24.5 (0.96)	149.5 (5.88)	172.0 (6.77)	153.5 (6.04)	97.8 (3.85)	59 (2.32)	129.5 (5.09)	76 (2.99)	100.8 (3.96)	132.1 (5.20)	–	M14 x 1.5; 12 Deep
71	215.5 (8.48)	11 (0.43)	160.0 (6.29)	197.0 (7.75)	170.0 (6.69)	141.0 (5.55)	59 (2.32)	157.3 (6.19)	76 (2.99)	144.8 (5.70)	143.5 (5.64)	–	M14 x 1.5; 12 Deep
90	237.5 (9.35)	14 (0.55)	145.5 (5.72)	182.5 (7.18)	155.5 (6.12)	185.6 (7.30)	66.5 (2.61)	159.0 (6.25)	79 (3.11)	201.6 (7.93)	122.5 (4.82)	48.5 (1.90)	M14 x 1.5; 12 Deep
125	266.9 (10.50)	17 (0.66)	163.5 (6.43)	181.0 (7.12)	162.5 (6.39)	198.5 (7.81)	66.5 (2.61)	184.5 (7.26)	91 (3.58)	214.5 (8.44)	135.0 (5.31)	48.5 (1.90)	M14 x 1.5; 12 Deep
180	292.9 (11.53)	16 (0.62)	164.5 (6.47)	187.5 (7.38)	169.0 (6.65)	237.7 (9.35)	66.5 (2.61)	219.0 (8.62)	93 (3.66)	253.7 (9.98)	141.0 (5.55)	48.5 (1.90)	M14 x 1.5; 12 Deep

Dimensions for Through Drives: dimensions in millimeters (inches)

Without charge pump & without through drive (N00)

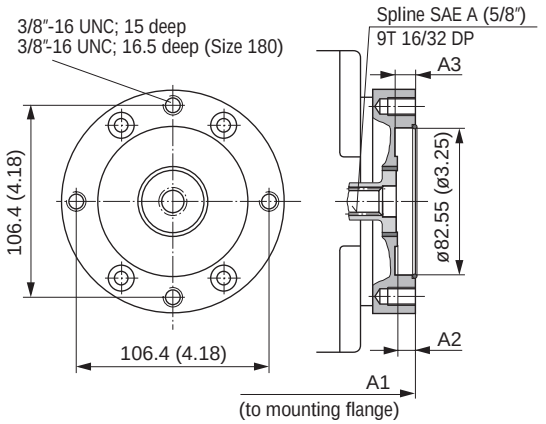


Size	A1
40	220.2 (8.66)
56	239.4 (9.42)
71	279.1 (10.98)
90	287.0 (11.29)
125	320.9 (12.63)
180	370.9 (14.60)

With Charge Pump & without through drive (F00)

Standard design; see unit dimensions pages 16...27

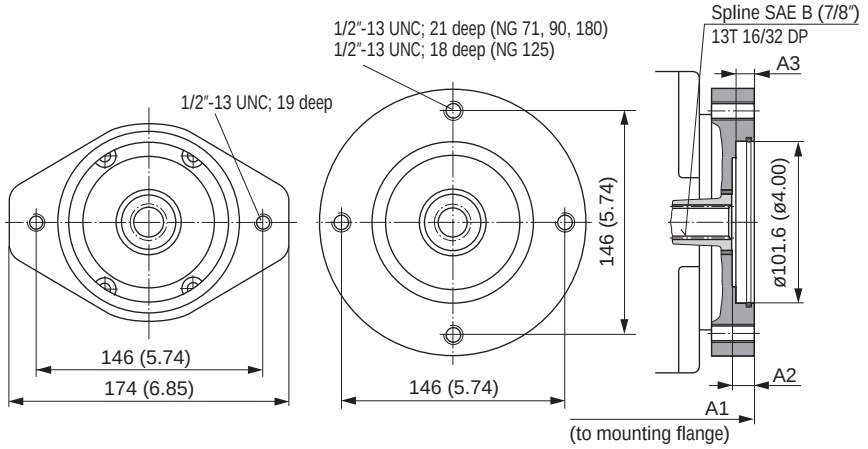
Through-Drive: SAE 'A' (F01/K01)



Size	A1 (F01)	A1 (K01)	A2	A3
40	239.7	234	9	10
	(9.42)	(9.21)	(0.35)	(0.39)
56	261.4	254.7	10	11
	(10.29)	(10.02)	(0.39)	(0.43)
71	297.6	297.4	9	10
	(11.71)	(11.70)	(0.35)	(0.39)
90	304.0	303.8	9	8
	(11.96)	(11.96)	(0.35)	(0.31)
125	330.9	330.7	10.5	9
	(13.02)	(13.01)	(0.41)	(0.35)
180	378.4	378.2	7.5	7.5
	(14.89)	(14.88)	(0.29)	(0.29)

Through-Drive: SAE 'B' (F02/K02)

Size 40, 56 **Size 71, 90, 125, 180**

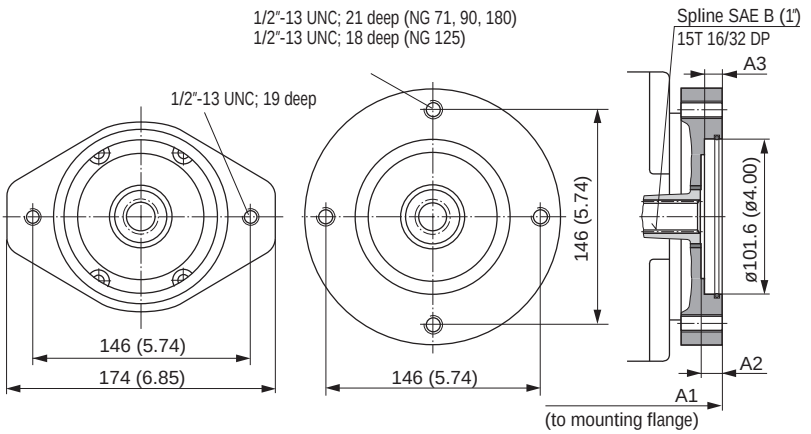


Size	A1	A2	A3
40	240.7	11	11
	(9.47)	(0.43)	(0.43)
56	262.4	12	11
	(10.33)	(0.47)	(0.43)
71	300.6	13	9.8
	(11.83)	(0.51)	(0.38)
90	305.0	9	11
	(12.00)	(0.35)	(0.43)
125	330.9	10	11
	(13.02)	(0.39)	(0.43)
180	381.4	10.3	10.5
	(15.01)	(0.40)	(0.41)

Suitable for mounting:
Variable pump AA10VO28
Variable pump AA10VG18

Through-Drive: SAE 'B-B' (F04/K04)

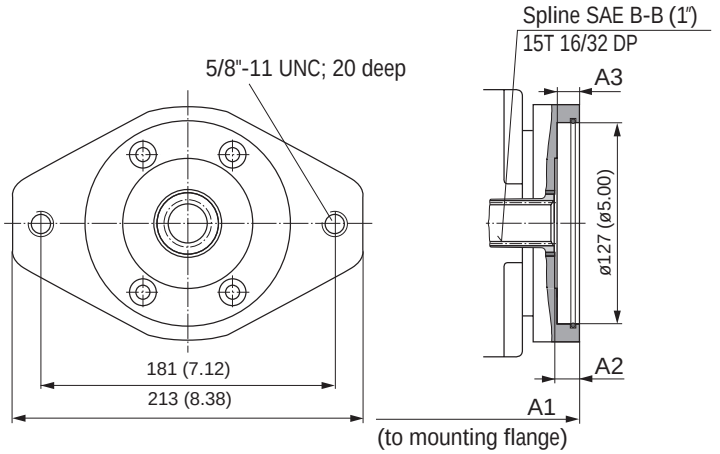
Size 40, 56 **Size 71, 90, 125, 180**



Size	A1	A2	A3
40	240.7	11	11
	(9.47)	(0.43)	(0.43)
56	262.4	12	11
	(10.33)	(0.47)	(0.43)
71	300.6	13	9.8
	(11.83)	(0.51)	(0.38)
90	305.0	9	11
	(12.00)	(0.35)	(0.43)
125	330.9	10	11
	(13.02)	(0.39)	(0.43)
180	381.4	10.3	10.5
	(15.01)	(0.40)	(0.41)

Suitable for mounting:
- Variable pump AA4VG28
- Variable pump AA10VG28
- Variable pump AA10VG45
- Variable pump AA10VO45
- Variable pump AA11VO40

Through-Drive: Flange SAE 'C'; Spline SAE 'B-B' (F09/K09)

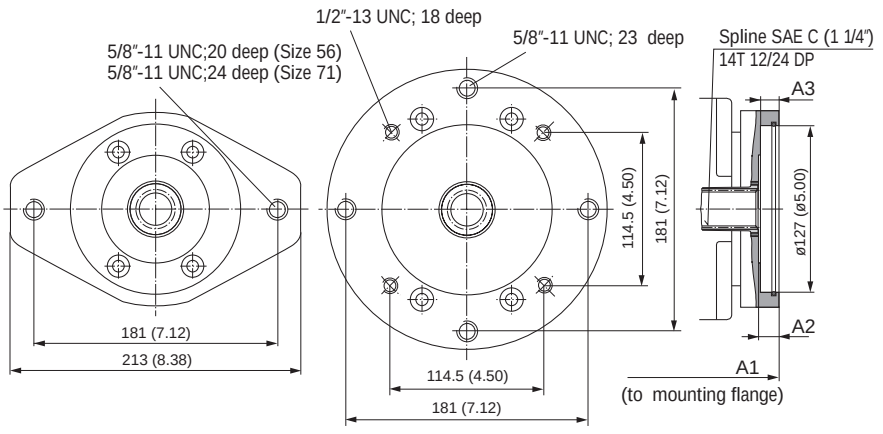


Size	A1	A2	A3
40	240.7	11	11
	(9.47)	(0.43)	(0.43)

Suitable for mounting:
- Variable pump AA4VG40

Through-Drive: SAE 'C' (F07/K07)

Size 56, 71 **Size 90, 125, 180**①



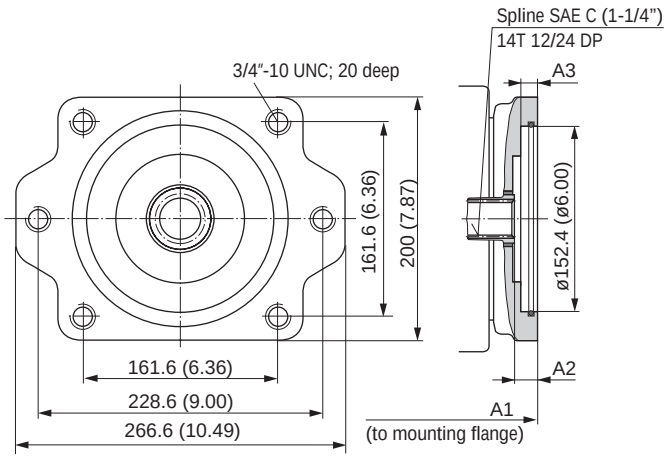
Size	A1	A2	A3
56	266.4	15	14
	(10.48)	(0.59)	(0.55)
71	303.6	16	13.5
	(11.95)	(0.62)	(0.53)
90	308.9	13	14
	(12.16)	(0.51)	(0.55)
125	335.9	15	15.5
	(13.22)	(0.59)	(0.61)
180	384.4	13.3	14
	(15.13)	(0.52)	(0.55)

Suitable for mounting:
- Variable pump AA4VG40
- Variable pump AA4VG56
- Variable pump AA4VG71
- Variable pump AA10VO71
- Variable pump AA11VO60

① Size 180 only with SAE 2-bolt flange

Dimensions for Through Drives: dimensions in millimeters (inches)

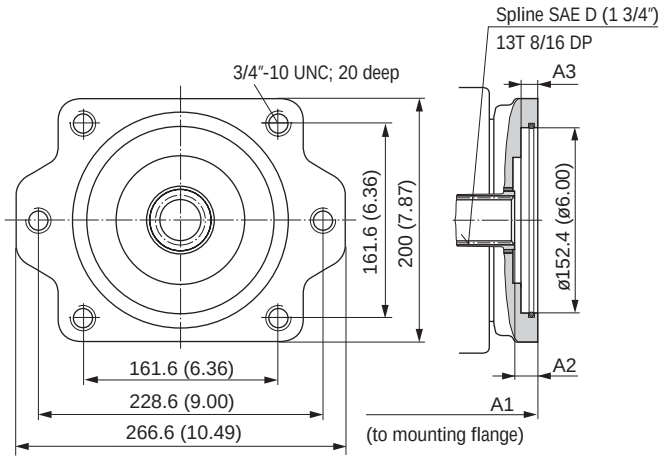
Through-Drive: Flange SAE 'D'; Spline SAE C (Fxx, Kxx)



Size	A1	A2	A3
90	309.0	12	14
	(12.16)	(0.47)	(0.55)

Suitable for mounting:
Variable pump AA4VG90
with U shaft

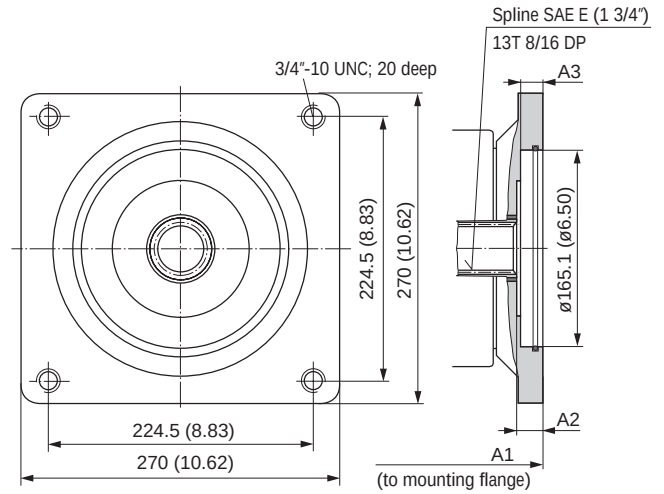
Through-Drive: SAE 'D' (F69/K69)



Size	A1	A2	A3
125	343.9	18	14
	(13.53)	(0.70)	(0.55)
180	391.9	20.9	18
	(15.42)	(0.82)	(0.70)

Suitable for mounting:
Variable pump AA4VG90
Variable pump AA4VG125
Variable pump AA10VO140
Variable pump AA11VO95
Variable pump AA11VO130

Through-Drive: Flange SAE 'E'; Spline SAE 'D' (F72/K72)



Size	A1	A2	A3
180	391.9	20.9	18
	(15.42)	(0.82)	(0.70)

Suitable for mounting:
Variable pump AA4VG180
Variable pump AA11VO160
Variable pump AA11VO200
Variable pump AA11VO250

Input and Through-Drive Shaft Torque Limits

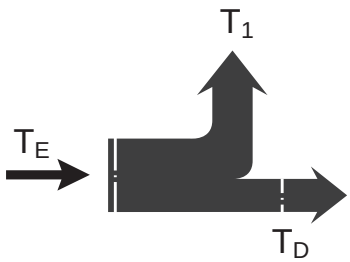
Size				40	56	71	
Corner torque (at V_{gmax} and Δp = 400 bar)①	T_{max}	Nm		254	356	451	
		Lb-Ft		187	263	333	
Through-drive torque limit	$T_{D\,lim}$	Nm		314	521	660	
		Lb-Ft		232	384	487	
Input torque limit ②							
With shaft code **S**	$T_{E\,lim}$	Nm		602	602	602	
		Lb-Ft		444	444	444	
SAE (ANSI B92.1a-1976)		Spline		(1¼"-14T 12/24DP)	(1¼"-14T 12/24DP)	(1¼"-14T 12/24DP)	
With shaft code **T**	$T_{E\,lim}$	Nm		–	970	970	
		Lb-Ft		–	715	715	
SAE (ANSI B92.1a-1976)		Spline		–	(1⅜"-21T 16/32DP)	(1⅜"-21T 16/32DP)	
With shaft code **U** ③	$T_{E\,lim}$	Nm		314	–	–	
		Lb-Ft		232	–	–	
SAE (ANSI B92.1a-1976)		Spline		(1"-15T 16/32DP)	–	–	
Size				**90**	**125**	**180**	
Corner torque (at V_{gmax} and Δp = 400 bar)①	T_{max}	Nm		572	795	1144	
		Lb-Ft		422	586	844	
Through-drive torque limit	$T_{D\,lim}$	Nm		882	1110	1760	
		Lb-Ft		651	819	1298	
Input torque limit ②							
With shaft code **S**	$T_{E\,lim}$	Nm		1640	1640	1640	
		Lb-Ft		1210	1210	1210	
SAE (ANSI B92.1a-1976)		Spline		(1¾"-13T 8/16DP)	(1¾"-13T 8/16DP)	(1¾"-13T 8/16DP)	
With shaft code **T**	$T_{E\,lim}$	Nm		–	2670	4070	
		Lb-Ft		–	1969	3002	
SAE (ANSI B92.1a-1976)		Spline		–	(2"-15T 8/16DP)	(2¼"-17T 8/16DP)	
With shaft code **Z**	$T_{E\,lim}$	Nm		912	–	–	
		Lb-Ft		673	–	–	
(DIN 5480)		Spline		(W35x2x30x16x9g)	–	–	

① Theoretical values; efficiencies not considered
② Drive shafts without side load
③ Shaft 'U' is only permissible as the input shaft in the **2nd pump** of a combination pump of the same size

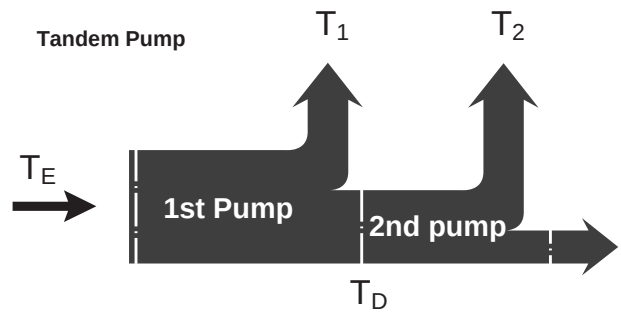
Abbreviations and formulas:

T_D = Max. permissible through drive torque (Nm)
T_E = Max. permissible input torque at the drive shaft (Nm)
T_1 = Torque required for first pump $= \frac{1.59 \cdot V_{g1} \cdot \Delta p_1}{100 \cdot \eta_{mh}}$ (Nm)
T_2 = Torque required for second pump $= \frac{1.59 \cdot V_{g2} \cdot \Delta p_2}{100 \cdot \eta_{mh}}$ (Nm)
V_{g1} = Pump displacement per rev–1st pump (cm³)
V_{g2} = Pump displacement per rev–2nd pump (cm³)
Δp_1 = Differential pressure–1st pump (bar)
Δp_2 = Differential pressure–2nd pump (bar)
η_{mh} = Mechanical-hydraulic efficiency

Single Pump



Tandem Pump



Combination Pump: dimensions in millimeters (inches)

Combination pumps provide two independent closed circuits without the need for splitter gear boxes.
When ordering combination pumps the individual model codes should be connected by a '+' sign:

Code: Pump #1 (front pump) **+** Code: Pump #2 (rear pump)

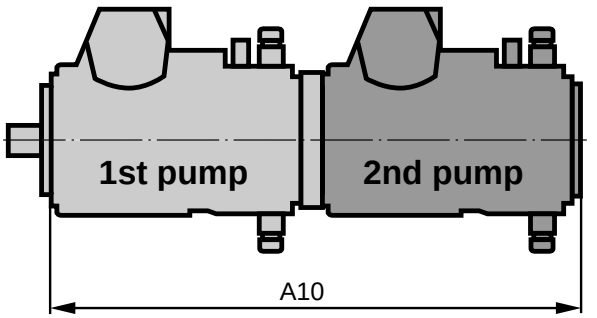
Code example: AA4VG 56 EP1D1/32 R – P**T**C 52 **F07**3S **+** AA4VG 56 EP1D1/32 R – P**S**C 52 F003S

External support for combination pumps of the same frame size is not required, if the dynamic acceleration does not exceed 10g (=98.1 m/s²).

The 4-bolt mounting flange is recommended for size 71 and larger pumps.

Combination pump of the same size
(2nd pump without through drive and with auxiliary pump, F00)

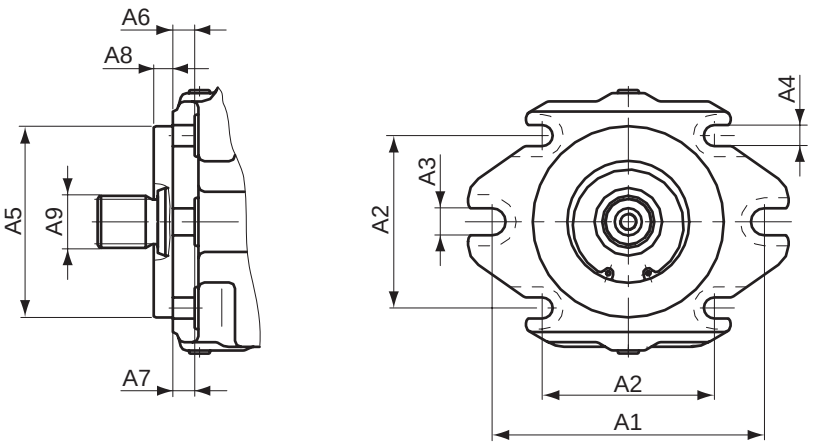
Size	40	56	71	90	125	180
A10	475.5	521.2	596.4	608.8	669.1	764
	(18.72)	(20.51)	(23.48)	(23.96)	(26.34)	(30.07)



Mounting flanges & shaft options (of single and combination pumps)

											Combination pump of same size		
										Single pump	1st Pump		2nd Pump
Size	**Mtg. flange**	**A1**	**A2**	**A3**	**A4**	**A5**	**A6**	**A7**	**A8**	**A9**	**A9**	**Through drive**	**A9**
40	SAE C (2-Bolt)	181 (7.12)	–	18 (0.7)	–	ø127 (ø5.00)	–	15 (0.6)	12.7 (0.50)	S (SAE 1¼")	S (SAE 1¼")	F09/K09	U (SAE 1")
56	SAE C (2-Bolt)	181 (7.12)	–	18 (0.7)	–	ø127 (ø5.00)	–	18 (0.7)	12.7 (0.50)	S (SAE 1¼")	T (SAE 1⅜")	F07/K07	S (SAE 1¼")
71	SAE C (2+4-Bolt)	181 (7.12)	114.6 (5.51)	18 (0.7)	14 (0.5)	ø127 (ø5.00)	15 (0.6)	15 (0.6)	12.7 (0.50)	S (SAE 1¼")	T (SAE 1⅜")	F07/K07	S (SAE 1¼")
90	SAE D (2+4-Bolt)	228.6 (9.00)	161.4 (6.35)	22 (0.9)	21 (0.8)	ø152.4 (ø6.00)	17 (0.7)	20 (0.8)	12.7 (0.50)	S (SAE 1¾")	S (SAE 1¾")	F73/K73	Z (W35)
125	SAE D (2+4-Bolt)	228.6 (9.00)	161.4 (6.35)	22 (0.9)	21 (0.8)	ø152.4 (ø6.00)	20 (0.8)	20 (0.8)	12.7 (0.50)	S (SAE 1¾")	T (SAE 2")	F69/K69	S (SAE 1¾")
180	SAE E (4-Bolt)	–	224.5 (8.83)	–	21 (0.8)	ø165.1 (ø6.50)	22 (0.9)	–	15.9 (0.6)	S (SAE 1¾")	T (SAE 2¼")	F72/K72	S (SAE 1¾")

Mounting Flange

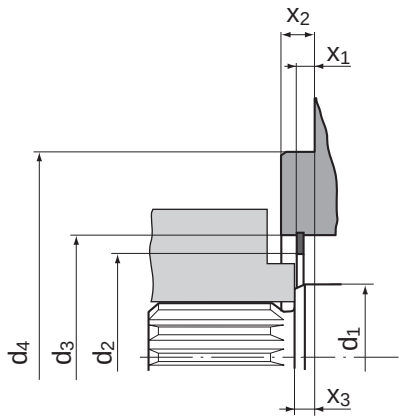


Installation Situation for Coupling Assembly

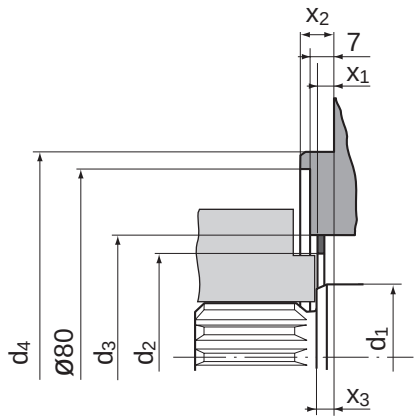
In order to assure that rotating parts (coupling hub) and fixed parts (housing circlip) do not contact each other the installation situations are described in this data sheet have to be observed. The installation situation depend upon the sizes and the spline.

For SAE spline shaft (shaft S or T) the outer diameter of the coupling hub must be smaller than the inner diameter of the circlip d_3 at the zone of the drive shaft shoulder (measure $X_2 - X_3$).

SAE Spline



Sizes 56–180



Size 40 only

Size	ød1	ød2 min	ød3	ød4	x1	x2	x3
40	40	51.4	$63_{\pm 0.1}$	127	$4.3^{+0.2}$	$12.7_{-0.5}$	
	(1.57)	(2.02)	$(2.48_{\pm 0.003})$	(5.00)	$(0.16^{+0.007})$	$(0.50_{-0.019})$	
56	40	54.4	$68_{\pm 0.1}$	127	$7.0^{+0.2}$	$12.7_{-0.5}$	
	(1.57)	(2.14)	$(2.67_{\pm 0.003})$	(5.00)	$(0.27^{+0.007})$	$(0.50_{-0.019})$	
71	45	66.5	$81_{\pm 0.1}$	127	$7.0^{+0.2}$	$12.7_{-0.5}$	$8^{+0.9}_{-0.6}$
	(1.77)	(2.61)	$(3.18_{\pm 0.003})$	(5.00)	$(0.27^{+0.007})$	$(0.50_{-0.019})$	
90	50	66.5	$81_{\pm 0.1}$	152.4	$6.8^{+0.2}$	$12.7_{-0.5}$	$(0.31^{+0.03}_{-0.02})$
	(1.96)	(2.61)	$(3.18_{\pm 0.003})$	(6.00)	$(0.26^{+0.007})$	$(0.50_{-0.019})$	
125	55	76.3	$91_{\pm 0.1}$	152.4	$7.0^{+0.2}$	$12.7_{-0.5}$	
	(2.16)	(3.00)	$(3.58_{\pm 0.003})$	(6.00)	$(0.27^{+0.007})$	$(0.50_{-0.019})$	
180	60	88	$107_{\pm 0.1}$	165.1	$7.4^{+0.2}$	$15.9_{-0.5}$	
	(2.36)	(3.46)	$(4.21_{\pm 0.003})$	(6.50)	$(0.29^{+0.007})$	$(0.62_{-0.019})$	

Specifications, descriptions, and illustrative material shown herein were as accurate as known at the time this publication was printed. Rexroth reserves the right to discontinue models or options at any time or to change specifications, materials, or designs without notice and without incurring obligation.

Optional equipment and accessories may add cost to the basic unit, and some options are available only in combination with certain models or other options.

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