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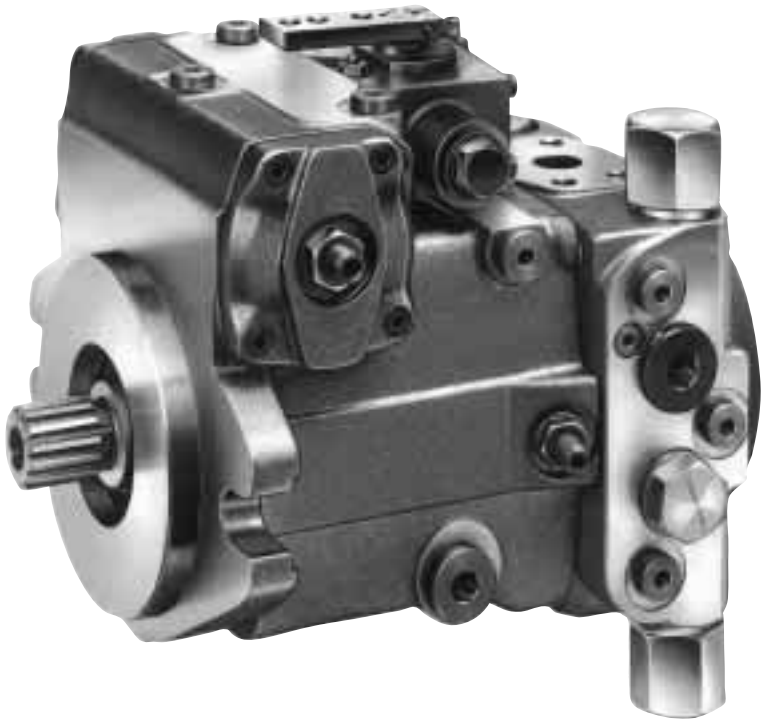
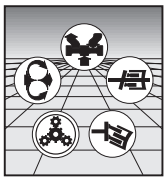
Application &
Service Manual

AA4VG

Series 3.2
Size 28…250



RA 92003-S
11.97



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Ordering of Parts

For Rexroth to supply the correct parts for your unit, please include all of the following information along with your parts order.

Model Code
Serial Number
Unit Number
Part Name
Part Number

Due to modifications and improvements to our products, minor changes can occur to the parts, even though the type code may not necessarily reflect these changes. The type number and serial number will guarantee that the correct parts for your unit are supplied.

Ordering Example

To order a replacement rotary group for an AA4VG variable displacement pump having the above nameplate, the following information would be required.

+	**Model Code**	**AA4VG125NVD1/32LPSFN001S**
+	**Serial Number**	**G2014680**
+	**Unit Number**	**5454-005-002**
*	**Part Name**	**Charge Pressure Relief Valve**
*	**Part Number**	**HU00434856**

+ This information is taken from the nameplate on the pump.
* This information is taken from the Application and Service Manual.

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Ordering Code

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 $V_{g\,max}$ (cm³)	**28**	**40**	**56**	**71**	**90**	**125**	**180**	**250**
Size 28, see RA 92002								
Size 250, see RA 92000								

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

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Axial Piston Unit
Operation
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Regulating Cartridge
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Direction of Rotation

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			**40**	**56**	**71**	**90**	**125**	**180**	
Shaft		**Flange**							
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	4000...6100 psi	without bypass	●	●	–	–	–	–	**3**
Direct operated, fixed setting		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**

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.

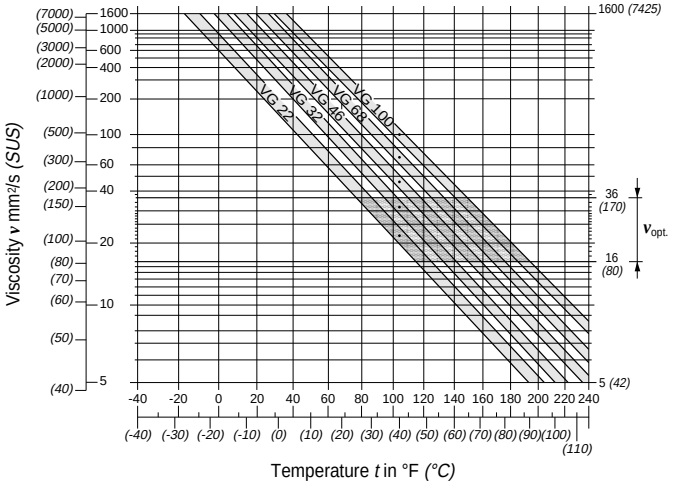
Operating Viscosity Range
In order to obtain optimum efficiency and service life, we recommend that the operating viscosity (at normal loop operating temperature) be selected from within the range:

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≥0.8 bar abs. (6.3 in-Hg.)
at cold start . . . . . p≥0.5 bar abs. (15.2 in-Hg.)

Technical Data

AA4VG Specifications *(Theoretical values; rounded)*

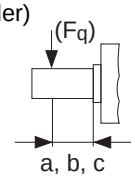
Size					40	56	71	90	125	180
Displacement	Variable pump		$V_{g\,max}$	cm^3/rev	40	56	71	90	125	180
				in^3/rev	2.44	3.42	4.33	5.49	7.63	10.98
	Charge pump		V_{gH}	cm^3/rev	8.4	11.1	18.7	18.7	25.7	36.9
				in^3/rev	0.51	0.68	1.14	1.14	1.56	2.25
Speed	max. rpm at $V_{g\,max}$		$n_{max\,cont}$	rpm	4000	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

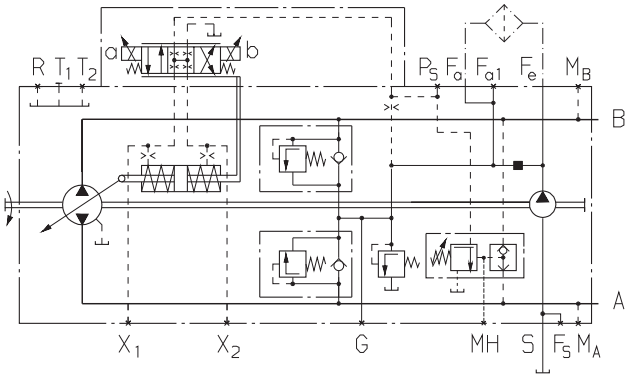
Charge Pressure Filtration…D (Ports Fe & Fa)

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

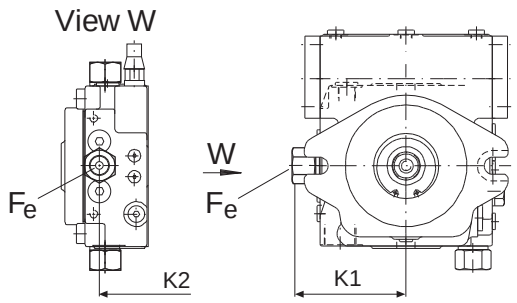
Filter element pressure drop (line mounted filter):
at ν=141 SUS (30 cSt); $n=n_{max}$ . . . . . $\Delta p \leq 1$ bar (14.5 psi)
at cold start . . . . . $\Delta p_{max}=3$ bar (43.5 psi)
(valid for entire speed range n_{min}–n_{max})

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	K2	F_e
40	112	198.7	¾"-16 UNF-2B; 15 deep
56	115	215.4	¾"-16 UNF-2B; 15 deep
71	134	239.0	1 1/16"-12 UN; 20 deep
90	128	248.5	1 1/16"-12 UN; 20 deep
125	147	267.9	1 5/16"-12 UN-2B; 20 deep
180	148	311.9	1 5/16"-12 UN-2B; 20 deep

Charge Pressure Filtration…K (with cold start valve)

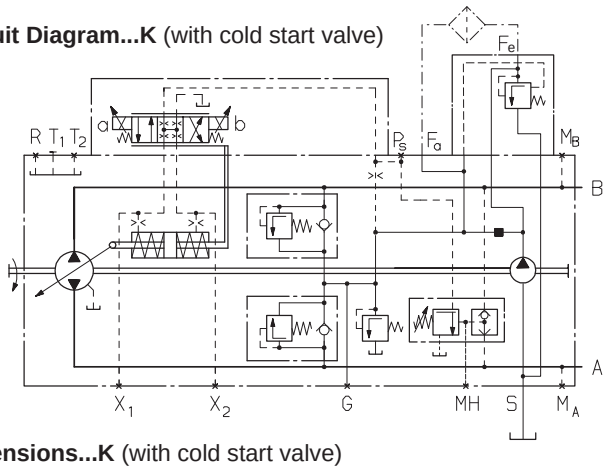
Similar to option D, except with cold start valve, providing filter bypass function and charge pump protection.

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

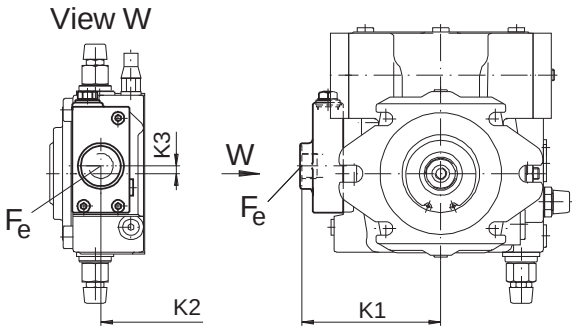
Port F_e. . . . . To line mounted filter
Port F_a. . . . . From line mounted filter

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)

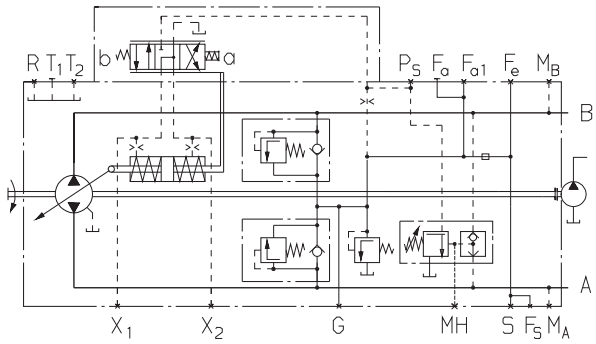


Size	K1	K2	K3	F_e
40	122.5	198.7	0	¾"-16 UNF-2B; 15 deep
56	125.5	215.4	0	¾"-16 UNF-2B; 15 deep
71	145.5	239.0	8	1 1/16"-12 UN; 20 deep
90	139.5	248.5	24	1 1/16"-12 UN; 20 deep
125	172.0	267.9	20	1 5/16"-12 UN-2B; 20 deep
180	173.0	311.9	3	1 5/16"-12 UN-2B; 20 deep

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)

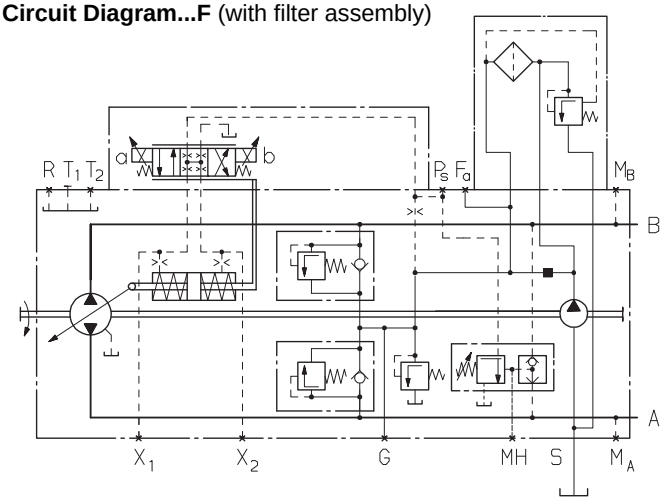
Filter type: . . . . . .Filter **without** bypass

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).

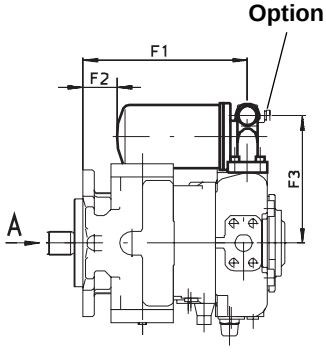
Circuit Diagram...F (with filter assembly)



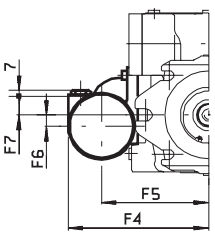
Dimensions...F, P, L, M (with filter assembly)

Size	F1	F2	F3	F4	F5	F6	F7	F8	F9	F10
40	198.7	46.7	160	175	135	0	42	78.5	122	125
56	215.4	63.4	163	178	138	0	42	78.5	122	125
71	239	50	185	203.5	155	16	29	65.5	109	112
90	248.5	59.4	179	197.5	149	0	53	89.5	133	136
125	267.9	62.8	201	219.5	171	0	53	89.5	133	136
180	311.9	37.9	202	220.4	171.9	17	36	72.5	116	119

Option L, M



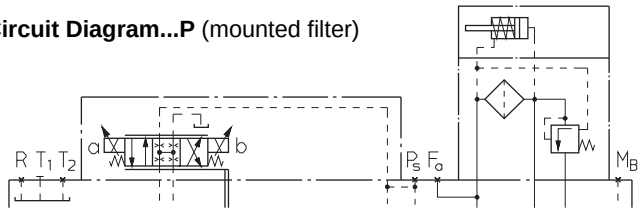
Option F



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. . . . . $\Delta p = 3$ bar (43.5 psi)

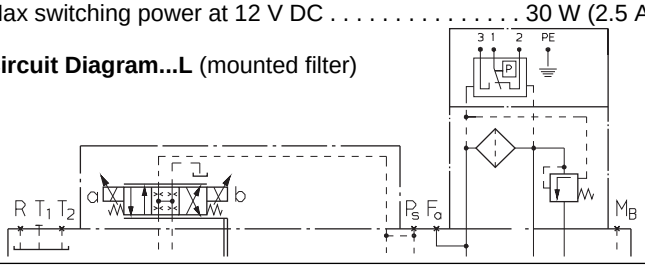
Circuit Diagram...P (mounted filter)



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. . . . . $\Delta p = 3$ 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)

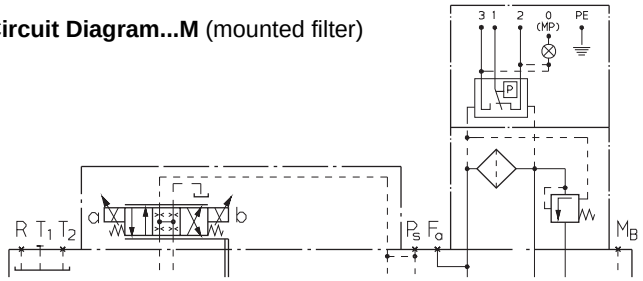
Circuit Diagram...L (mounted filter)



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

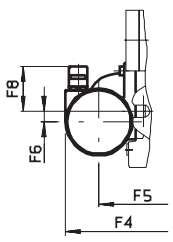
Similar to option F, except model M includes visual and electrical contamination indicator. Indication: ep. and visual by lamp.
Indicator switching pressure. . . . . $\Delta p = 3$ bar (43.5 psi)
Max switching power at 24 V DC . . . . . 60 W (2.5 A)
Max switching power at 12 V DC . . . . . 30 W (2.5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

Circuit Diagram...M (mounted filter)

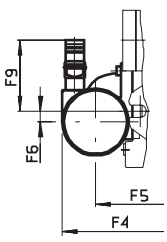


View A, rotated 90°

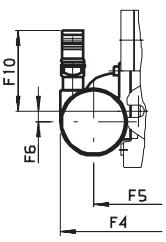
Option P



Option L

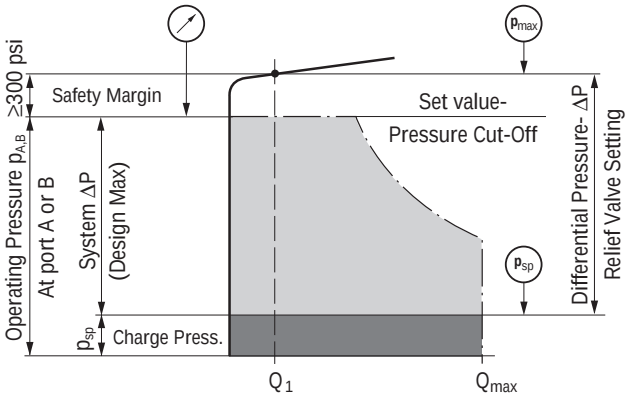


Option M



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

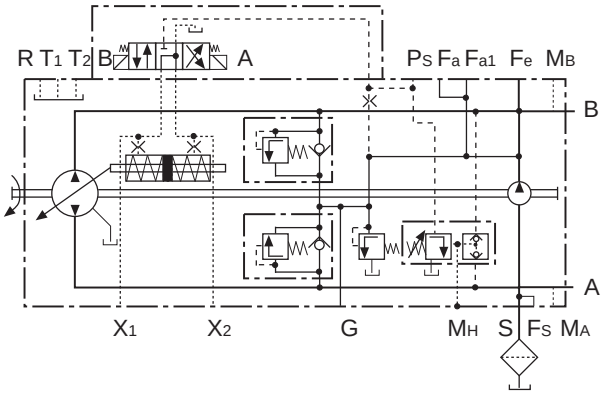
The pressure cut-off valve varies the swashplate angle, as required, to limit the maximum pressure at port A or B.

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

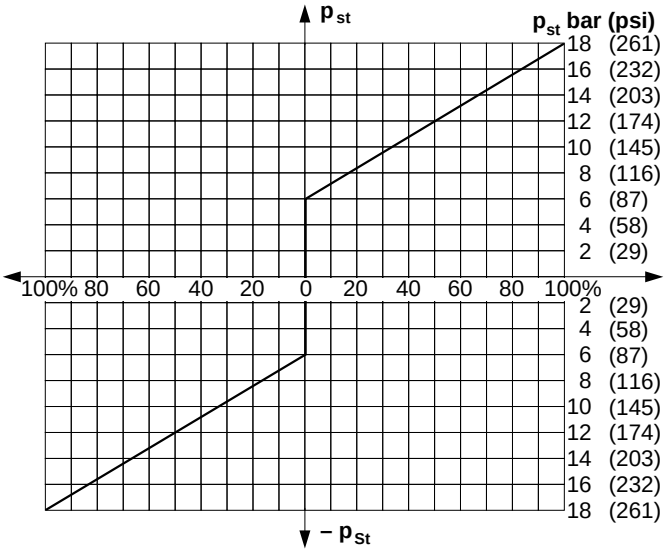
HD Hydraulic Pilot Control

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.

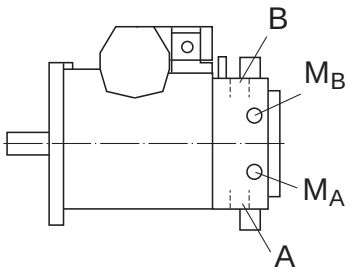


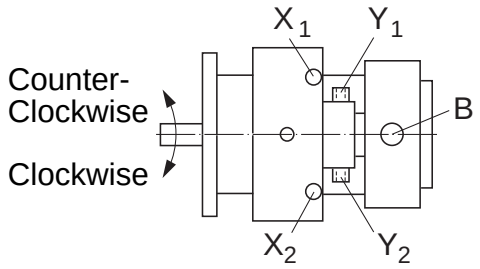
Pilot pressure p_{st}: 6–18 bar (87–261 psi) at ports Y_1, Y_2
Begin of regulation: 6 bar (87 psi)
End of regulation: 18 bar (261 psi)

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.

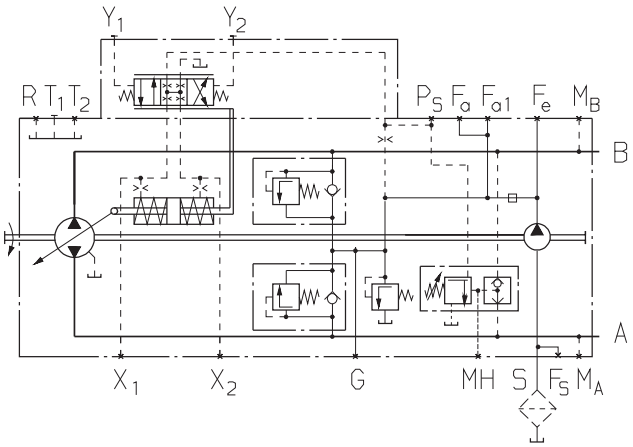
Data Table – AA4VG…HD
Direction of rotation – Control – Output flow direction

		Size	Pilot Pressure	Control Pressure	Direction of Flow	Operating Pressure
Direction of Rotation	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

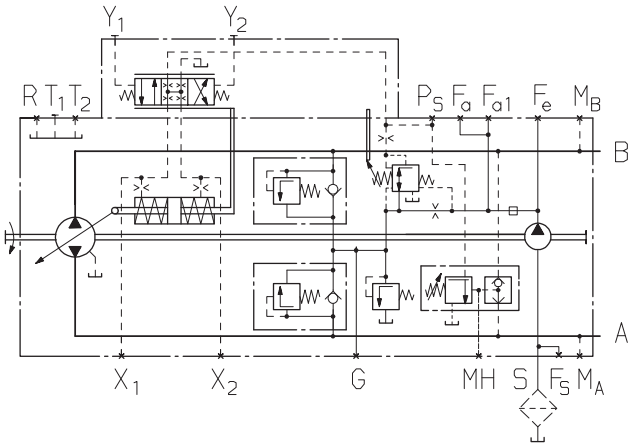




Standard model



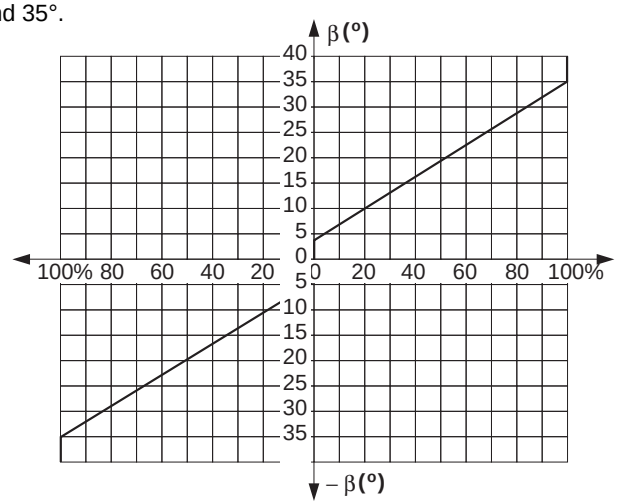
Model with DA control valve



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°

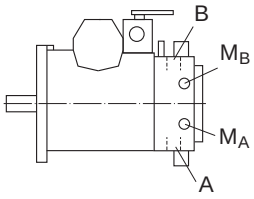
Required lever torque: 85–210 Ncm (7.5–19 lb-in)
Maximum lever torque: 250 Ncm (22 lb-in)

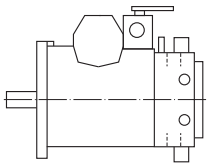
If the pump is also fitted with a DA valve, automotive control of the vehicle transmission is also possible.
For DA control valve see page 12, 13, 28, & 29.
For pressure cut-off see page 8.

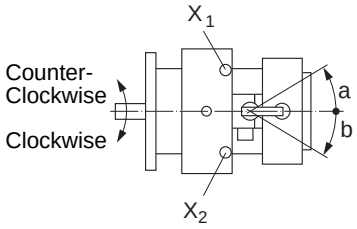
Option: Neutral position switch...HWDL
When the HW control lever is in the neutral position, the neutral position switch is closed. The switch opens if the control lever is moved out of neutral in either direction.
The neutral position switch provides a safety function for systems that require zero flow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

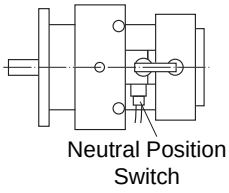
Data Table – AA4VG…HW
Direction of rotation – Control – Output flow direction

		Size	Lever Direction	Control Pressure	Direction of Flow	Operating Pressure
Direction of Rotation	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





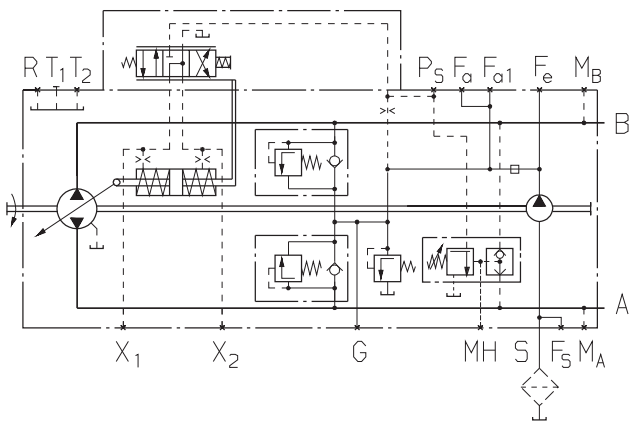




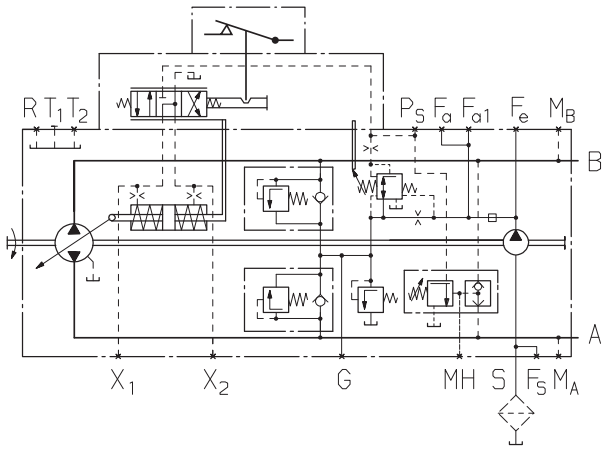
Technical data for neutral position switch

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

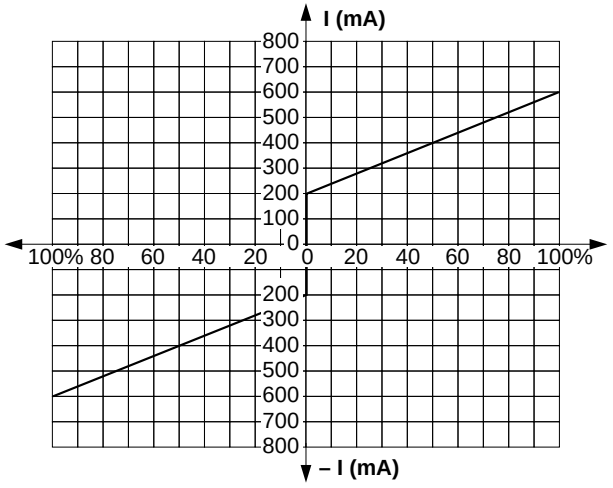
The flow output of the pump is infinitely varied in the range of 0 to 100%, proportional to an electrical current, in the range of 200–600 mA at 24 volts DC, supplied to solenoid a or b. (A current of 400 to 1200 mA is required for the 12 volt solenoids.

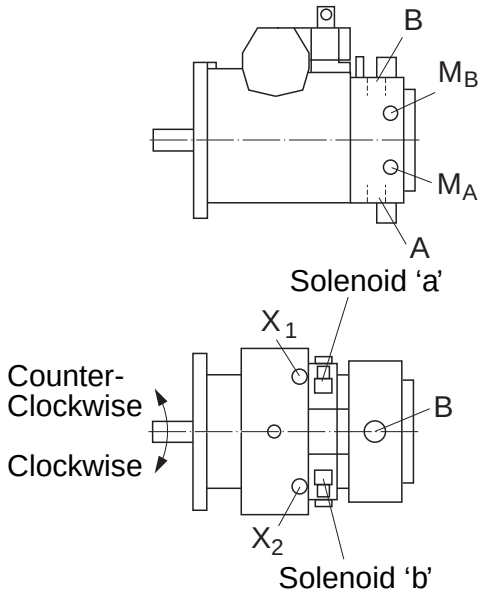
The electrical energy is converted to a force acting on the control spool. The spool then directs control oil in and out of the stroking piston to stroke the pump as required. A feedback lever, connected to the stroking piston, maintains the pump flow for any given current within the control range.

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 – Output 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

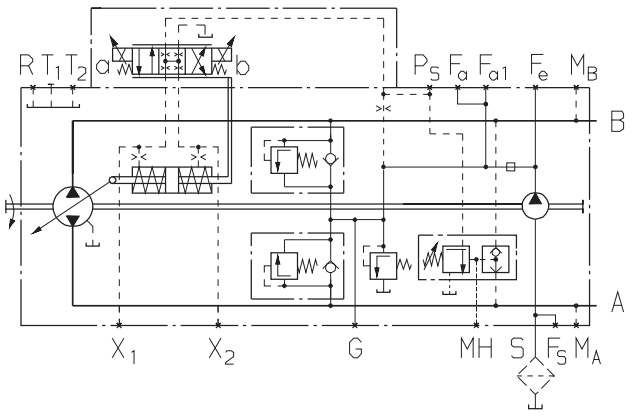




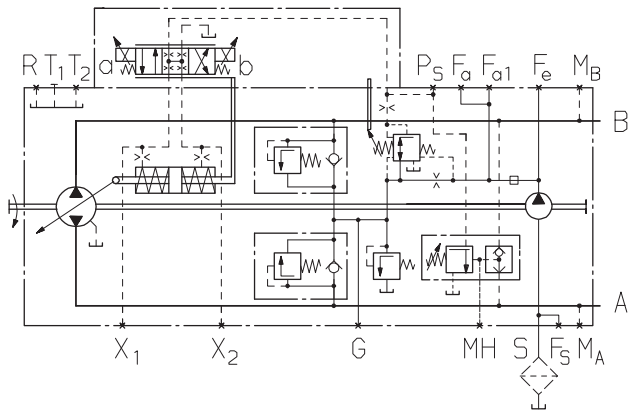
Control current (24 vdc;EP2): I=200–600 mA
Begin of control: I=200 mA (V_{g0})
End of control: I=600 mA ($V_{g\,max}$)
Control current (12 vdc;EP1): I=400–1200 mA
Begin of control: I=400 mA (V_{g0})
End of control: I=1200 mA ($V_{g\,max}$)

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.

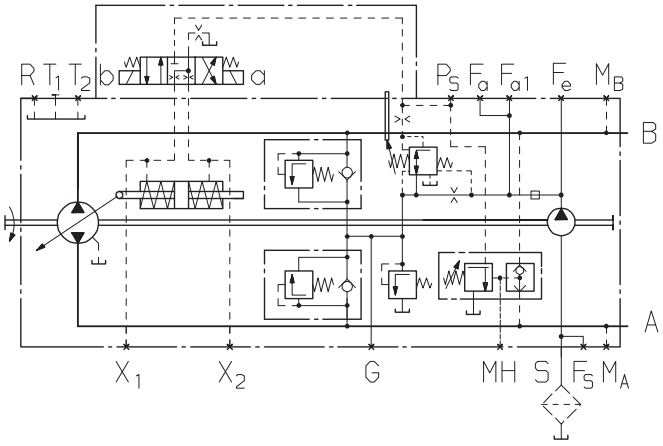
A relatively constant torque input to the pump is achieved by this combination of de-stroking the pump as the operating pressure increases and the response to the “pull-down” of the prime mover (reduced pilot pressure).

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.

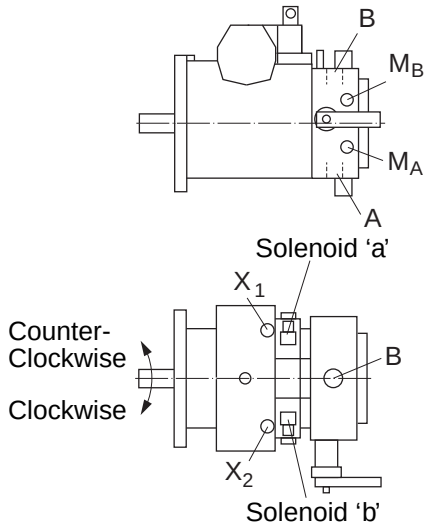
*Application of the DA Control is only appropriate on certain types of vehicle drive systems, and requires a careful review of the engine and vehicle parameters to ensure that the pump is set up correctly. All DA applications **must** therefore be reviewed by a Rexroth Application Engineer.*

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



Data Table – AA4VG…DA
Direction of rotation – Control – Output 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



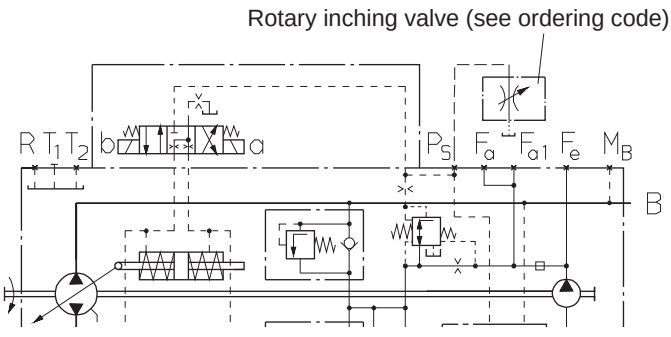
Rotary Inching Valve
This valve is used to provide vehicle inching function, and is used in conjunction with the DA Regulating Cartridge with fixed adjustment.

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.

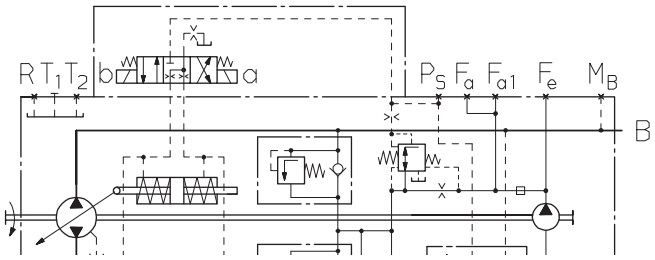
It permits the pilot pressure (speed dependent) to be reduced as necessary, independently of the pump drive speed, by applying a hydraulic pressure at Port Z. This is normally supplied from the vehicle braking system using the brake fluid of the power brakes.

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.

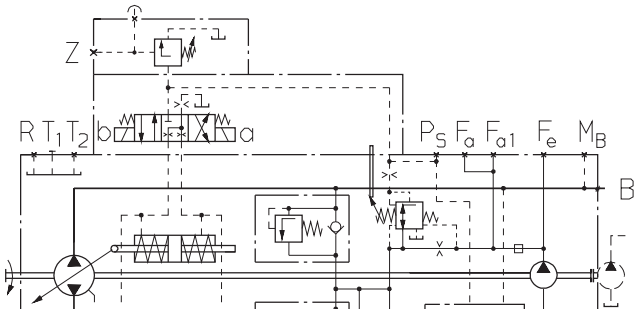
The master controller is installed separately from the pump connected with the pump by 2 hydraulic control lines at ports P_s and Y. The master controller is to be ordered separately (see data sheet RE 64558)

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

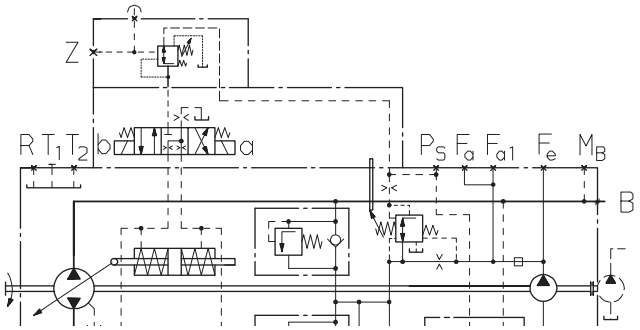


**Hydraulic Control, Speed Dependent (DA)
mechanically adjustable with control lever, with hydraulic inching valve, DA1D5/DA2D5**

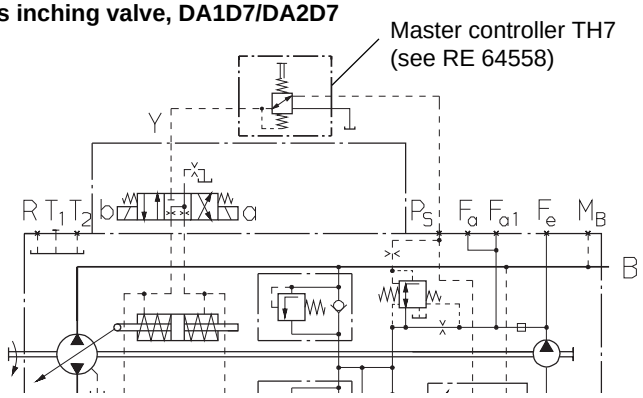
**with throttle valve
Sizes 40...71**



**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

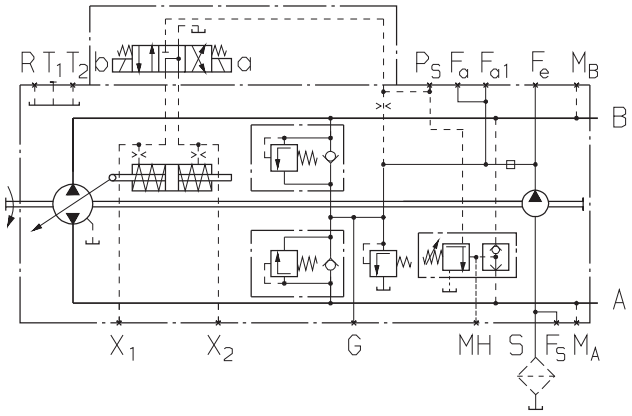
By energizing either solenoid a or b, internal control pressure is connected directly to the stroking piston, and the pump swivels to maximum displacement.

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.

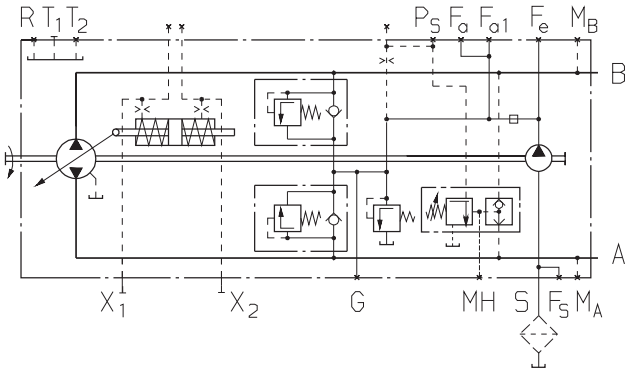
Flow direction is determined by which pilot port is pressurized (please refer to the data table at the top of page 9; Control Pressure column-X_1; X_2).

Nominal characteristics:

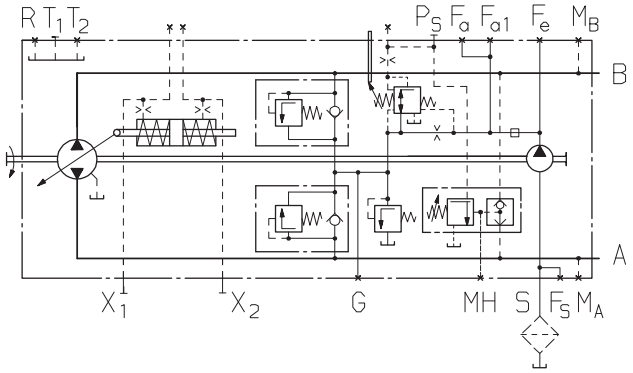
Begin of regulation-$P_{st\,min}$ . . . . . 5–8 bar (73–116 psi)
End of regulation (full stroke)-$P_{st\,max}$. 22–25 bar (320–363 psi)

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

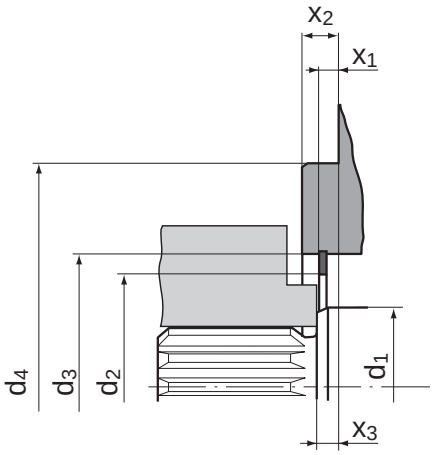


Installation Situation for Coupling Assembly

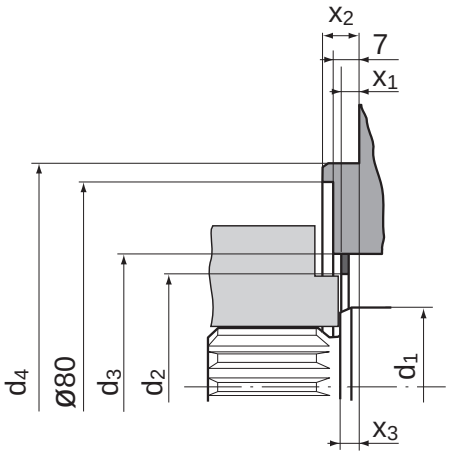
In order to assure that rotating parts (coupling hub) and fixed parts (housing circlip) do not contact each other the installation situations are described in this data sheet have to be observed. The installation situation depend upon the sizes and the spline.

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	$4.3^{+0.2}$	$12.7_{-0.5}$	$8^{+0.9}_{-0.6}$
56	40	54.4	$68_{\pm 0.1}$	127	$7.0^{+0.2}$	$12.7_{-0.5}$	
71	45	66.5	$81_{\pm 0.1}$	127	$7.0^{+0.2}$	$12.7_{-0.5}$	
90	50	66.5	$81_{\pm 0.1}$	152.4	$6.8^{+0.2}$	$12.7_{-0.5}$	
125	55	76.3	$91_{\pm 0.1}$	152.4	$7.0^{+0.2}$	$12.7_{-0.5}$	
180	60	88	$107_{\pm 0.1}$	165.1	$7.4^{+0.2}$	$15.9_{-0.5}$	

Combination Pump

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)

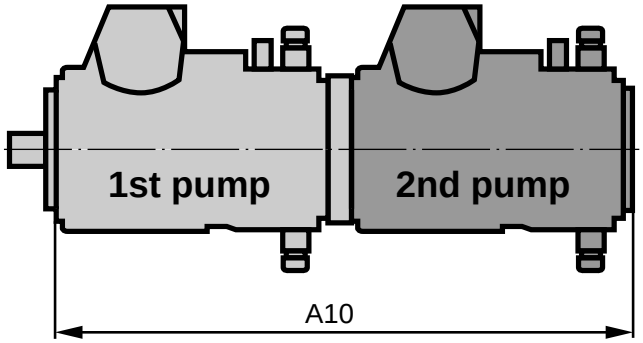
Code example: AA4VG 56 EP1D1/32 R – P**T**C 52 **F07**3S **+** AA4VG 56 EP1D1/32 R – P**S**C 52 F003S

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)

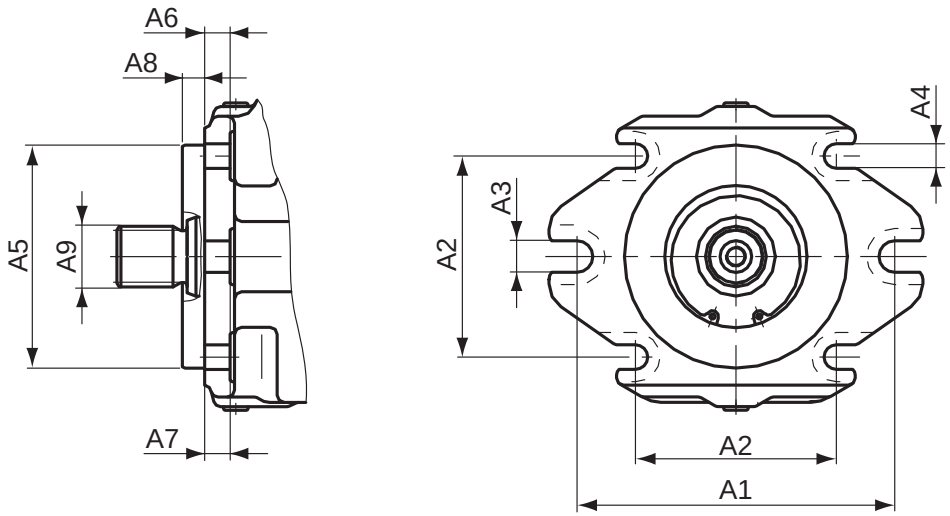
Size	40	56	71	90	125	180
A10	475.5	521.2	596.4	608.8	669.1	764



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	–	18	–	ø127	–	15	12.7	S (SAE 1¼")	S (SAE 1¼")	F09/K09	U (SAE 1")
56	SAE C (2-Bolt)	181	–	18	–	ø127	–	18	12.7	S (SAE 1¼")	T (SAE 1⅜")	F07/K07	S (SAE 1¼")
71	SAE C (2+4-Bolt)	181	114.6	18	14	ø127	15	15	12.7	S (SAE 1¼")	T (SAE 1⅜")	F07/K07	S (SAE 1¼")
90	SAE D (2+4-Bolt)	228.6	161.4	22	21	ø152.4	17	20	12.7	S (SAE 1¾")	S (SAE 1¾")	F73/K73	Z (W35)
125	SAE D (2+4-Bolt)	228.6	161.4	22	21	ø152.4	20	20	12.7	S (SAE 1¾")	T (SAE 2")	F69/K69	S (SAE 1¾")
180	SAE E (4-Bolt)	–	224.5	–	21	ø165.1	22	–	15.9	S (SAE 1¾")	T (SAE 2¼")	F72/K72	S (SAE 1¾")

Mounting Flange



Start-Up Procedure

The following procedure has been developed based on experience with most types of applications, however certain applications may require a departure from or variation to this procedure.

For the start-up of new or overhauled installations.

1. If the prime mover is:

   Internal combustion engine: (Diesel, gasoline or LP)- Remove the coil wire, close the injector rack or leave the gas turned off and turn the engine over until the charge pressure reaches 50 psi or more.

   Electric Motor: Jog the starting circuit until the charge pressure reaches 50 psi or more.

2. Start the prime mover, and if possible, maintain a pump speed of approximately 750 rpm for 5 minutes. This will allow the system to be filled.

3. Listen for any abnormal noises.

4. Check for oil leaks.

5. Run prime mover to 1800 rpm. (Adjust to the design speed if less than 1800 rpm.)

6. Set charge and pilot pressure as required for the application. (Refer to circuit schematic)

7. For the HD control, bleed the pilot lines by loosening the connections at Y_1 and Y_2 and then actuate the remote control unit in both directions until oil seeps from the connections.

8. Retighten all connections.

9. Operate the control to work the hydrostatic transmission at approximately 20% of maximum speed.

10. Deaerate system by venting a bleed valve or by cracking the highest connection until fluid seeps out without bubbles.

11. Check fluid level and add fluid if necessary.

12. Continue operating transmission and gradually increase to full speed, still with no load.

13. With controls neutralized, check for creep in neutral. If evident, center the control in accordance with the instructions in the pump service manual.

14. Check that the controls are connected so that the transmission operates in the correct direction related to the control input.

15. Continue to monitor all pressure gauges and correct any irregularities.

16. Apply brakes and set high pressure relief valves (and pressure override if installed) to levels required for the application by stroking the pump to approximately 20% of maximum displacement.

17. Check security of high pressure connections.

18. Check oil level and temperature.

19. Remove and inspect high pressure filter elements, if so equipped. Replace with new elements.

20. Operate transmission under no load conditions for about 15 minutes to stabilize the temperature and remove any residual air from the fluid.

21. Again remove and inspect high pressure filter elements, if so equipped. If clean, the high pressure, bi-direction filters may be removed from the circuit. If contamination is still evident, fit new elements and continue flushing until the system is clean.

22. Replace the elements in the charge pump suction or pressure filter, whichever is installed.

23. Operate the transmission under full and normal load conditions.

24. Erratic operation may indicate there is still air trapped in the system. By working the pump control to one or both sides the remaining air can be eliminated. The system is free of air when all functions can be operated smoothly and when the oil in the reservoir is no longer aerated. (Usually less than 1 hour of operation).

Note:

If, after following the Pre-Start and Start-up procedures, the transmission does not perform correctly, refer to the relevant sections of the trouble-shooting procedures on pages 20–23.

Troubleshooting Procedure

To aid in troubleshooting, refer also to the diagnostic port connections for test gauge installation information. Procedure assumes gauges are installed.

This procedure was written to aid the troubleshooter in following a logical approach to a system fault.

1…Transmission does not Drive with the Prime Mover Running

1.1	Is there oil in the reservoir?	No Yes	Fill reservoir. Proceed to step1.2.
1.2	Is engine clutch engaged?	No Yes	Engage clutch. Proceed to step 1.3.
1.3	Is the hydraulic piping in accordance with the hydraulic circuit?	No Yes	Correct the piping. Proceed to step 1.4.
1.4	Is the pump direction of rotation correct?	No Yes	Fit pump having the correct direction of rotation. Proceed to step 1.5.
1.5	Is there a broken pipe, loose fitting or burst hose?	No Yes	Proceed to step 1.6. Repair the fault.
1.6	Are the brakes released?	No Yes	Check brake release circuit or mechanism. Proceed to step 1.7.

Charge Pump & Relief Valve

1.7	Is there any charge pressure at port G?	No Yes	Proceed to step 1.10. Proceed to step 1.8.
1.8	Is the charge pressure at least 300 psi while the pump is running at normal operating speed?	No Yes	Proceed to step 1.9. Proceed to step 1.19.
1.9	Can charge pressure be adjusted by adding or removing relief valve spring shims or by adjusting charge pressure relief valve setting screw if so equipped.	No Yes	Proceed to step 1.10. Adjust charge pressure to 300 psi and proceed to step 1.19.

Note: If flushing valve is used in circuit, it should set at 25 psi less than charge pump relief. Refer to data sheet on flushing valve for information and setting procedure.

1.10	Is the suction line shutoff?	No Yes	Open valve Proceed to step 1.11.
1.11	Is the charge pump suction pressure within the recommended limits? (0.8 bar abs or 6.3 in-Hg.)	No Yes	Proceed to step 1.12. Proceed to step 1.16.
1.12	Is the suction filter element plugged.	No Yes	Proceed to step 1.13. Replace filter element
1.13	Does the reservoir design ensure that suction pipe is always covered with oil.	No Yes	Correct the reservoir design. Proceed to step 1.14.
1.14	Is the suction pipe size adequate for the flow?	No Yes	Run at lower speed and return to point 1.7, or rework suction piping. Proceed to step 1.15.
1.15	Is the reservoir air breather blocked or undersized?	No Yes	Proceed to step 1.16. Clean or Replace air breather.
1.16	Remove charge pressure relief valve cartridge and inspect. Is it damaged?	No Yes	Refit cartridge and proceed to step 1.17. Fit a new cartridge and return to step 1.7.
1.17	Remove and inspect charge pump assembly. Is it damaged?	No Yes	Proceed to step 1.18. Repair or replace damaged components and return to step 1.7.
1.18	Is the charge pump installed for correct direction of rotation?	No Yes	Refit charge pump. Return to step 1.7. With proper charge pressure, and transmission still does not operate, proceed to step 1.19.

Pump Control

1.19	Is control medium connected to pump control? HD…pilot pressure HW…mechanical cable or linkage. EP…12 or 24 volts dc, electrical current.	No Yes	Connect appropriate medium and check that control signal is actually being applied to the pump control valve. Proceed to step 1.20.
1.20	If variable displacement motors are installed, is maximum displacement selected? (If not done automatically).	No Yes	Select maximum displacement. Proceed to step 1.21.
1.21	Actuate the control in both directions. Does pump stroke? Does it go to full stroke?	No Yes	Refer to the pump service manual and then proceed to step 1.22. Operate the transmission.
1.22	Remove stroking orifices in X_1 and X_2. Stroke the pump in both directions. Do the pressures at X1 and X2 Alternate between 30 and 250 psi during cycle?	No Yes	Remove control module and replace it with a new unit. Repeat step 1.21. Proceed to step 1.23

Troubleshooting Procedure

1…Transmission does not Drive with the Prime Mover Running (Continued from page 20)

1.23	Is the pressure at port R less than 2 bar abs. or 30 psia?	No	Repipe pump case drain line so that case pressure at port R is less than 8 bar abs. or 30 psia. Return to step 1.21.
		Yes	Proceed to step 1.24.
1.24	Stroke pump in both directions. Does any pressure greater than 350 psi alternate between parts M_A and M_B?	No	Verify that loading of the pump will cause system pressure to increase above charge pressure. Proceed to step 1.19.
		Yes	Proceed to step 1.25.
1.25	Is it possible to adjust high pressure relief valves using the 0…10,000 psi gages at MA and MB to monitor pressure? (Refer to relief valve adjustment).	No	Replace high pressure relief valve cartridges and return to step 1.21.
		Yes	Adjust high pressure relief valves to required or design pressure. Proceed to step 1.26.
1.26	Actuate Control in both directions. Does transmission run?	No	Check if motor sizing is adequate for application. Check for mechanical faults in the drive beyond the motor shaft.
		Yes	operate the transmission.

2…Transmission Drive is Sluggish or Erratic

2.1	Is the control medium in good condition? For example: control medium is not in good condition if: HD…control-air in pilot lines. HW…Control-sticking cable or linkage. EP…Control-fluctuating control current.	No	Rectify the control fault. HD…Bleed pilot lines. HW…Lubricate or free the cable or linkage. EP…Check control current.
		Yes	Proceed to step 2.2.
2.2	Are the brakes fully released?	No	Check brake release circuit or mechanism.
		Yes	Proceed to step 2.3.
2.3	Are the stroking time orifices correctly sized for the application?	No	Remove the plugs in ports X_1 and X_2 and remove control orifices with 3mm allen wrench, for size 71 and a 5mm allen wrench for size 250. Try various sizes until desired pump stroking rate is attained.
		Yes	Proceed to step 2.4.
2.4	With HD control, is the control curve of the remote pilot valve correctly matched to the pump?	No	Change spring to suit.
		Yes	Proceed to step 2.5.
2.5	Does the charge pressure fluctuate more than 30 psi when stroking the pump?	No	Proceed to step 2.9.
		Yes	Proceed to step 2.6.
2.6	If the charge pump output is used to operate auxiliary functions, do these other functions cause fluctuations in charge pressure?	No	Proceed to step 2.8.
		Yes	Proceed to step 2.7.
2.7	Isolate the auxiliary function and run the transmission. Are the charge pressure fluctuations reduced or eliminated?	No	Proceed to step 2.8
		Yes	Operate transmission and return to step 2.1.
2.8	Are there system pressure fluctuations which are synchronous with the charge pressure fluctuations?	No	Proceed to step 2.9.
		Yes	Determine the cause of system pressure fluctuations.
2.9	If variable displacement motor is used, is the motor stroking time correct for the application?	No	Add motor stroking time adjustment valve or orifice to the variable motor, or modify the control circuit to provide desired stroking time.

Troubleshooting Procedure

3…Transmission Drives in One Direction Only

3.1	With control lines lines switched does pump drive in opposite direction only?	No Yes	Proceed to step 3.2. Control signal from one side does not work properly. Repair as necessary.
3.2	With control lines still switched does pump drive in initial direction only?	No Yes	proceed to step 3.3. Problem is one side of control module or the pump. Proceed to step 3.3.
3.3	Is there control pressure or current from both control lines?	No Yes	Correct control signal problem. Proceed to step 3.4.
3.4	Check flushing valve (If Installed). Is shuttle spool stuck in one position?	No Yes	(Not installed) Proceed to step 3.5. Remove flushing valve and clean or replace.
3.5	Switch relief valves. does transmission drive in other direction only?	No Yes	Proceed to step 3.6. Repair or replace relief valve on nondriving side.
3.6	Replace control module and reconnect control lines. Does pump operate properly?	No Yes	Replace or repair pump. Operate transmission.

4…Transmission Drives in the Wrong Direction

4.1	Pump with HD control.		Switch control lines on ports Y_1 and Y_2.
4.2	Pump with EP Control.		Switch electrical connectors on solenoids A & B.
4.3	Pump with HW Control.		Rework linkage or cable to give correct drive direction.

5…Pump Does Not Find or Hold Neutral (Also refer to pages 24 & 25)

5.1	Does pump return to neutral with control lines removed?	No Yes	Proceed to step 5.2. Check control for electrical signal problem (EP control) or back pressure in the pilot lines (HD Control).
5.2	Check mechanical centering of pump and control per pages 24 & 25. Does pump return to neutral with control lines removed?	No Yes	Repair or replace pump. Replace control module if needed. Operate transmission.

6…Transmission Drives at a High Noise Level

6.1	Are the drive gearboxes filled with correct grade of oil?	No Yes	Fill gearbox with correct grade of oil to the prescribed level. Proceed to step 6.2.
6.2	Is the drive coupling correctly installed and aligned?	No Yes	Install coupling per manufacturer's instructions and tolerances. Proceed to step 6.3.
6.3	Is rigid piping connected to the pump and motor?	No Yes	Proceed to step 6.4 Install short length of hose between pressure ports and the system piping.
6.4	Is the suction pressure at the charge pump inlet within recommended limits?	No Yes	Return to step 1.7. Proceed to step. 6.5.
6.5	Is there air in the hydraulic oil? This may be indicated by foaming or milky colored oil.	No Yes	Proceed to step 6.6. Deaerate the oil and inspect system for cause of air induction.
6.6	Is the hydraulic motor operating at excessive speed?	Yes	Check motor sizing in relation to available oil flow from the pump. Check motor minimum displacement. See page 20.

Troubleshooting Procedure

7…Transmission Operates at a Higher Than Normal Temperature

7.1	Is the operating temperature above 195˚F?	No	195˚F is the upper limit. If temperature is close to 195˚F, the oil cooler may need to be cleaned.
		Yes	Proceed to step 7.3.
7.2	Is the hydraulic motor stalling intermittently?	No	Proceed to 7.3.
		Yes	Hydraulic oil is being heated through system relief valves. Shut down system and rectify cause of the motor stall.
7.3	Does temperature remain above 195˚F after cleaning oil cooler?	No	Operate transmission. Check oil cooler more often.
		Yes	Proceed to step 7.4.
7.4	Check differential pressure across oil cooler as compared to the manufacturer's specs at charge pump flow. Is ΔP higher than it should be?	No	Proceed to step 7.5
		Yes	Check piping from oil cooler to reservoir. Check for plugged or damaged oil cooler.
Note:	See page 7 for case pressure rating.		
7.5	Disconnect pump case drain from oil cooler and check flow from charge pump. Is flow normal?	No	Refer to charge pump removed and inspection procedure.
		Yes	Check oil cooler location.

8…Pump Does Not Develop Maximum Horsepower (Flow & Pressure)

8.1	Does charge pressure meet specification	No	Return to step 1.9.
		Yes	Proceed to 8.2.
8.2	Is the case pressure less than 2 bar abs or 30 psia?	No	Check sizing of return line from T port of pump and cooler sizing related to flow.
		Yes	Proceed to 8.3.
8.3	Are high pressure relief valves adjusted to the required pressure so that they do not by-pass?	No	Adjust or replace relief valve cartridge.
		Yes	Replace the pump.
Note:	If pressure override valve is fitted to pump, check that pressure setting is sufficient for the application.		

Charge Pressure Relief Valve Adjustment

For AA4VG28…AA4VG56

With pressure gauge installed at G port run pump at normal operating speed and temperature. If pressure is low, remove relief valve and add shim(s). If pressure is high, remove relief valve and take shim(s) out.

Note: 1mm = 56.5 psi (3.9 bar)

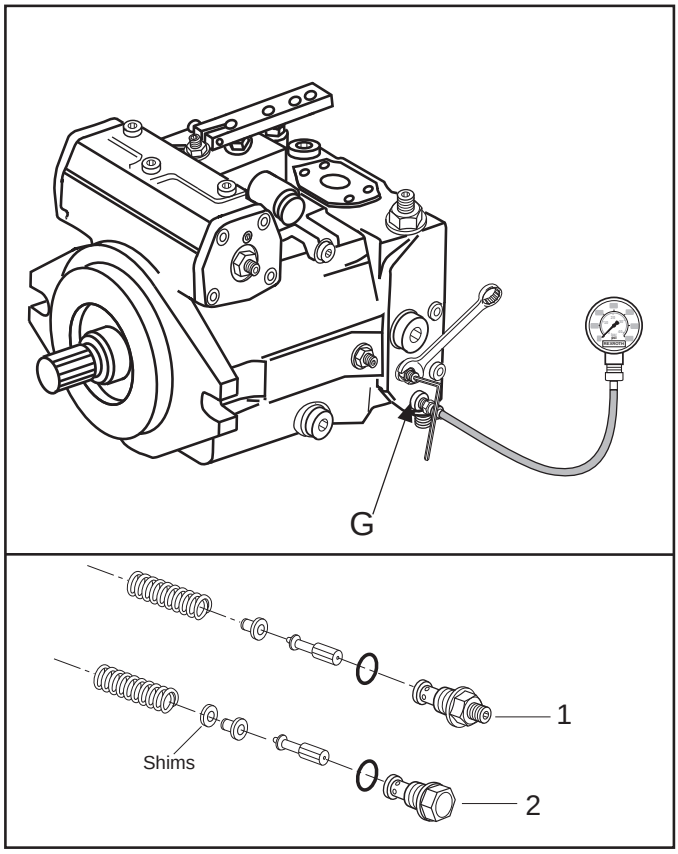
For AA4VG71…AA4VG250

With pressure gage installed at G port run pump at normal operating speed and temperature. If pressure is low loosen jam nut and turn set screw clockwise. If pressure is high loosen jam nut and turn set screw counterclockwise.

Note: 1 turn = 55 psi (3.8 bar) for sizes 71 thru 125.

Note: 1 turn = 43.5 psi (3.0 bar) for sizes 180 thru 250.

Pump Size	Allen Wrench	Box Wrench	Wrench To Remove
28 - 56	N/A	N/A	27 mm
71 - 125	5 mm	17 mm	27 mm
180 - 250	5 mm	17 mm	32 mm



1. Adjustable charge pressure relief valve for sizes 71…180.
2. Shim charge relief for sizes 28 and 56.

Mechanical Centering of Pump

Preparation for Adjustment

The control piston has strong centering springs to ensure that once the pump is adjusted for the neutral position it will always return to neutral. If an adjustment is necessary follow the steps listed below.

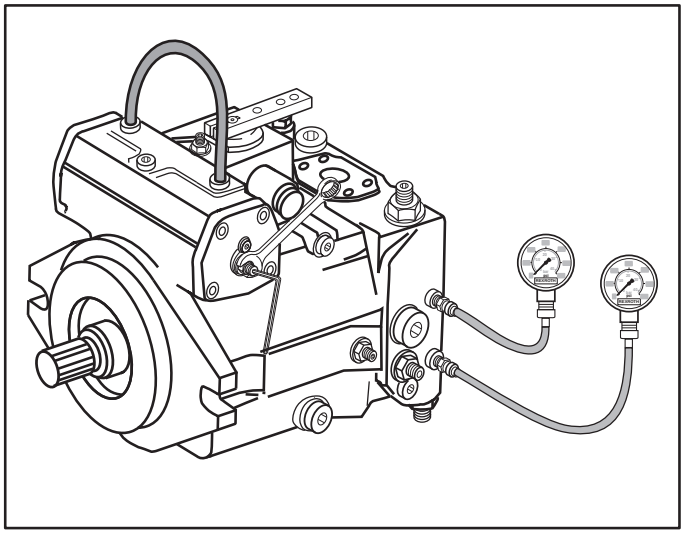
To ensure there is equal pressure on both sides of the control module during the centering operation, it is necessary to connect the X_1 and X_2 ports together by means of hose or tubing (No less than a 1/4 inch ID). The port sizes are as follows:

Size 28…90	7/16”-20 UNF
Size 125 & 250	9/16”-18 UNF

Pump Size	Allen Wrench	Wrench
28…56	6 mm	19 mm
71…90	6 mm	24 mm
125…250	8 mm	24 mm

With pressure gages installed at M_A and M_B, and with A and B ports blocked (or motor stalled), and with the pump running, loosen the jam nut. Turn the mechanical centering adjusting screw until 1000 psi is read on M_A or M_B then turn screw opposite direction until 1000 psi is read on other pressure port. Turn the screw back, splitting the distance between the previous two positions. This should be the neutral position. Pressure on M_A and M_B should be equal.

Tighten jam nut, stop the pump drive, remove the hose connecting ports X_1 and X_2.



Hydraulic Centering of Control Modules

Preparation for Adjustment

When control modules are exchanged or replaced, it is generally necessary to center the new module. This is done by running the pump with gauges installed at ports X_1, X_2, M_A and M_B. Release the jam nut and turn the adjustment screw on top of the control module valve body.

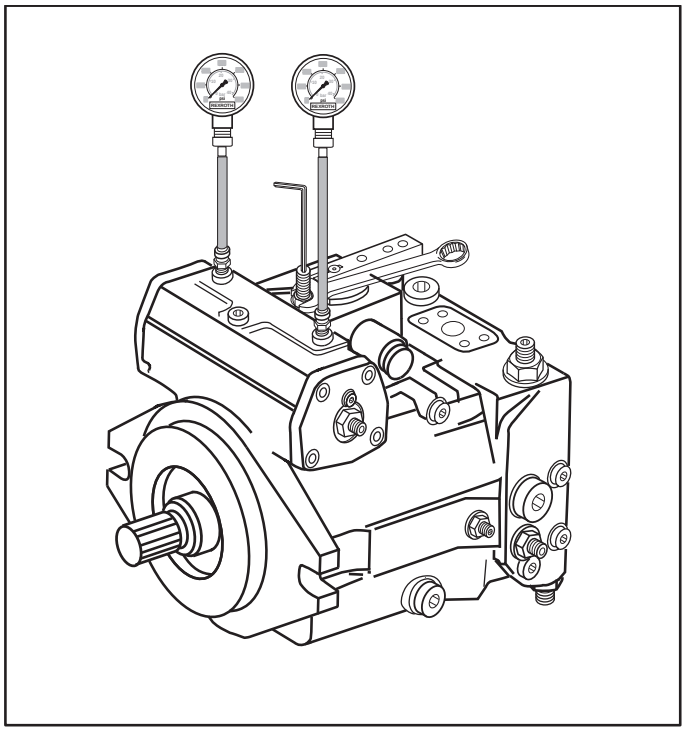
The adjustment screw is an eccentric, therefore, turning more than 90° in either direction will have no further centering effect, and could cause damage to the eccentric pin.

Pump Size	Allen Wrench	Wrench
28…71	Screw Driver	10 mm
90…250	4mm	13 mm

Centering the HD Control Module

With Y_1 and Y_2 ports vented to atmosphere, neutral position of the HD control is correctly adjusted when any or all of the following conditions exist:

1. Approximately, when equal control pressures are obtained at control pressure ports X_1 and X_2.
2. The hydraulic motor does not turn when the brake is released.
3. Charge pressure is registered equally at ports M_A and M_B, when flow output of the pump is deadheaded against a locked motor, or a valve.



Centering the HW Control Module

With the control lever allowed to freely spring to its center position,the HW control module is correctly adjusted when any or all of the following conditions exist:

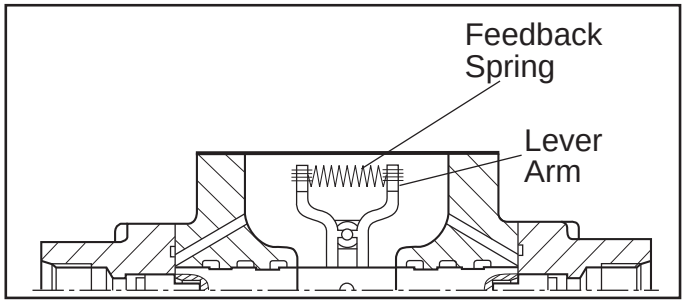
1. Approximately, when equal control pressures are obtained at control pressure ports X_1 and X_2.
2. The hydraulic motor does not turn when the brake is released.
3. Charge pressure is registers equally at ports M_A and M_B, when flow output of the pump is deadheaded against a locked motor, or a valve.

Centering the EP Control Module

With no electrical signal to solenoids A and B, (remove both plug-in connectors), the EP control module is correctly adjusted when any or all of the following conditions exist:

1. Approximately, when equal control pressures are obtained at control pressure ports X_1 and X_2.
2. The hydraulic motor does not turn when the brake is released.
3. Charge pressure is registered equally at ports M_A and M_B, when the flow output of the pump is deadheaded against a locked motor or a valve.

If difficulties are encountered in obtaining neutral position of the HD or EP control modules, check that the ends of the control spring are correctly located in the grooves near the end of the feedback lever arms.



Pressure Override Valve Adjustment

Function of Pressure Override

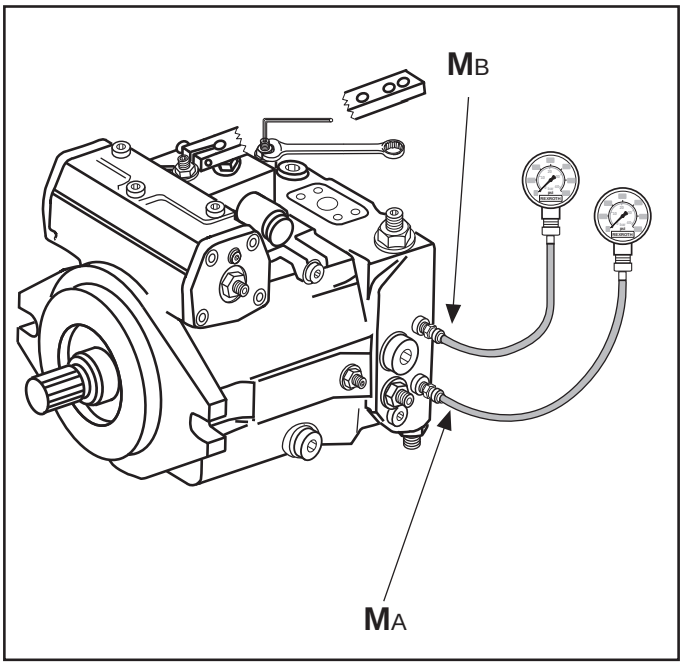
The pressure override valve varies the swashplate angle, as required, to limit the maximum pressure at port A or B. The override valve prevents continuous dumping of excessive flow, at load pressure, through the cross port relief valves contained in the pump. This eliminates unnecessary heating of the oil and protects the pump and motor from heavy-handed operators, or, if the the drive stalls causing the pump to deadhead. The pressure override valve should be adjusted to a pressure at least 500 psi less than the setting of the main relief valves.

Adjustment Procedure

1. Neutralize the pump control and turn P.O.R. adjusting screw counterclockwise, all the way out.
2. Stroke the pump fully in either direction, then turn the P.O.R. adjusting screw in (clockwise) until the desired pressure setting is achieved.
3. Stroke the pump for opposite flow direction to that used in step 7 and check the operation of the P.O.R. Equal maximum pressures should be seen both sides of center.

Note: One turn of screw equals 1200 psi.

Note: All adjustments require a 4 mm allen wrench and a 13 mm box wrench.



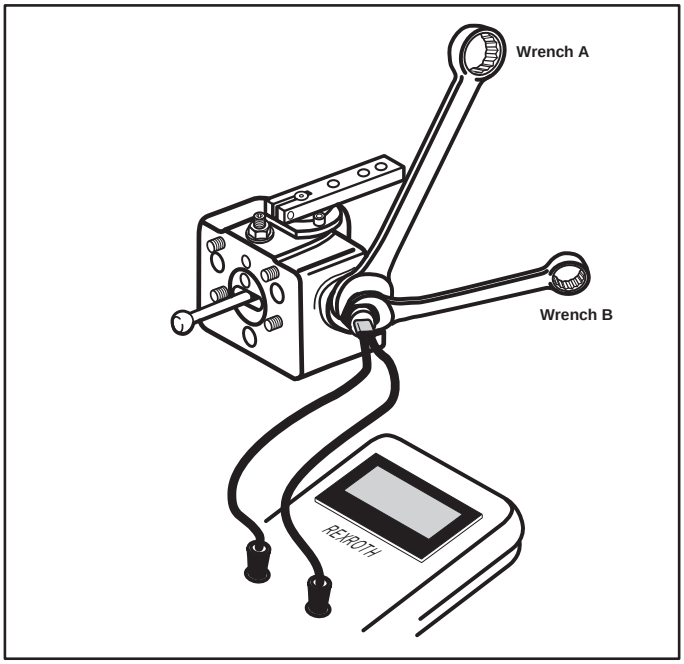
Adjustment of P.O.R. valve on pumps with remote hydraulic pilot control (type HD), manual rotary servo (type HW), and proportional electric control (type EP).

Neutral Start Switch Adjustment Procedure

Note: Before adjusting neutral start switch pump should be centered.

1. To adjust neutral safety switch, disconnect linkage from control handle and connect an ohm meter across the to leads from the neutral safety switch adjust the ohm meter to read continuity.
2. Then loosen the jam nut with wrench A and turn the switch (wrench B) in until you lose Continuity.
3. Then back the switch out until you complete the circuit and tighten jam nut.
4. Block vehicle to prevent movement. Return HW control to neutral. Install gages in M_A and M_B and start engine. Slowly bring pump on stroke, switch must open before pressure is developed in M_A or M_B port.

Note: All adjustments require a 23 mm box wrench and a 30 mm box wrench.

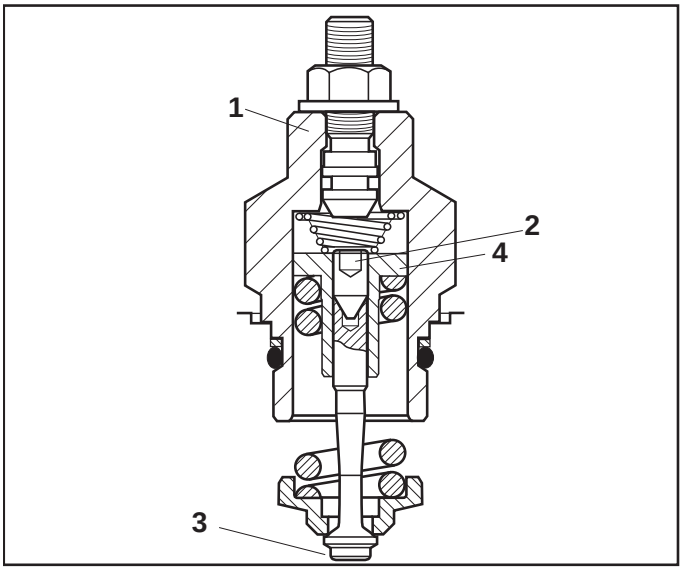


High Pressure Relief Valve Adjustments

High Pressure Relief Valve Adjustment Procedure
AA4VG40 & AA4VG56

1. Remove relief valve cover from pump (ref. item 1).
2. Loosen jam screw (ref. item 2).
3. Holding spring loading nut (ref. item 4) adjust valve spindle (ref. item 3). One turn equals approx. 630 psi (44 bar).
4. After adjustment is completed tighten jam screw (ref. item 2) to 5 ft-lbs. (7 Nm).
5. Install relief valve assembly into pump, tighten cover (ref. item 1) to 66 ft-lbs. (90 Nm).

Note: All high pressure relief valve adjustments on size 40 and 56 to be done with a 3 mm allen wrench and a 5 mm box wrench.



High pressure relief valve with tow option used in AA4VG40 and AA4VG56

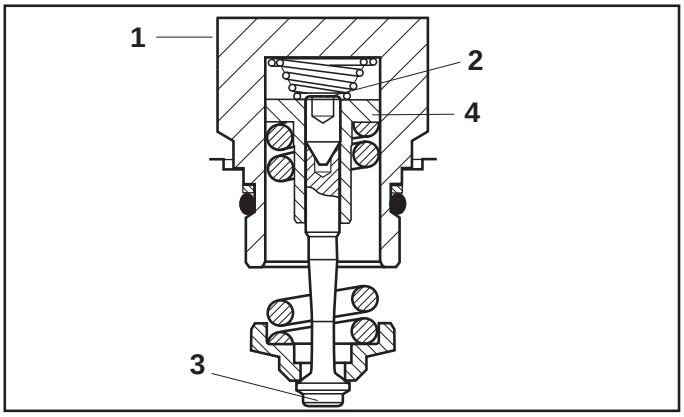
High Pressure Relief Valve Adjustment Procedure
AA4VG71...AA4VG250

Following is a suggested procedure for adjusting the relief valves. It is assumed that high pressure gauges are connected to ports M_A and M_B. Some applications may require a slight departure from the procedure.

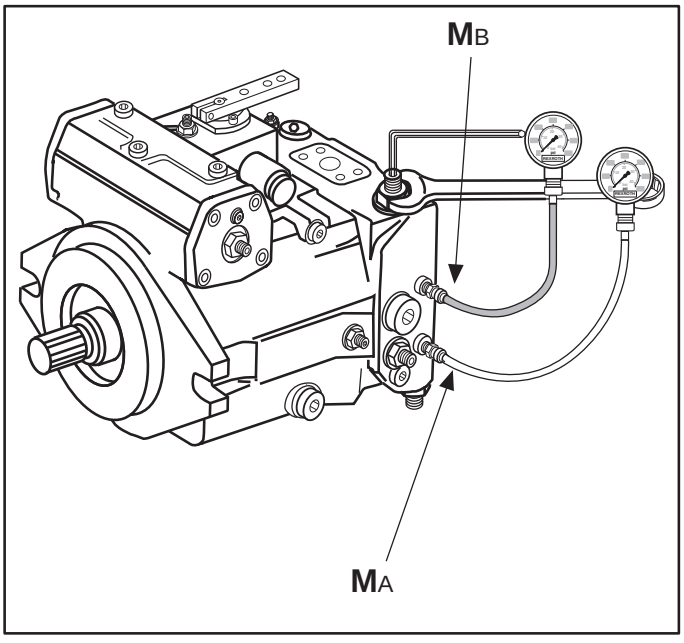
1. Block the output flow from the high pressure ports A & B, or lock the hydraulic motor by applying the brake.
2. Turn both high pressure relief valve adjusting screws counterclockwise until the spring tension is completely relieved, then turn both adjusting screws one full turn clockwise.
3. Turn the P.O.R. adjusting screw in (clockwise) until firm resistance is encountered. Do not force the adjustment beyond this point.
4. Stroke the pump to approximately 20 percent of full flow in one direction and adjust the high pressure relief for that flow direction to a pressure which is 500 psi higher than the required P.O.R. pressure setting. For the AA4VG71 and AA4VG90 one turn equals 2200 psi (150 bar).
5. Repeat step 4 for the opposite direction of flow.

Note: Perform steps 4 & 5 as quickly as possible to prevent overheating of the pump. Flow should not be permitted to spill over the high pressure relief valves for longer than 10 seconds, especially at higher pressures.

Note: High pressure relief valve adjustments on size 71 and 90 to be done with a 11 mm box wrench and a 19 mm box wrench, 125 and 180 to be done with a 5 mm allen wrench and a 17 mm box wrench.



High pressure relief valve with out tow option used in AA4VG40 and AA4VG56

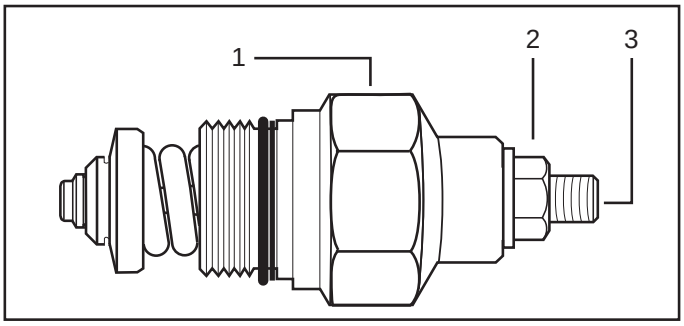


Engagement of Relief Valve Tow Option

Tow Option Engagement for AA4VG40 and AA4VG56
To actuate tow option loosen lock nut (ref. item 2). Turn tow option engagement screw (ref item 3) in six turns and tighten lock nut.

To disengage tow option loosen lock nut and turn tow option screw all the way out until it stops.

Note: Use a 4 mm allen wrench and a 13 mm box wrench to adjust.

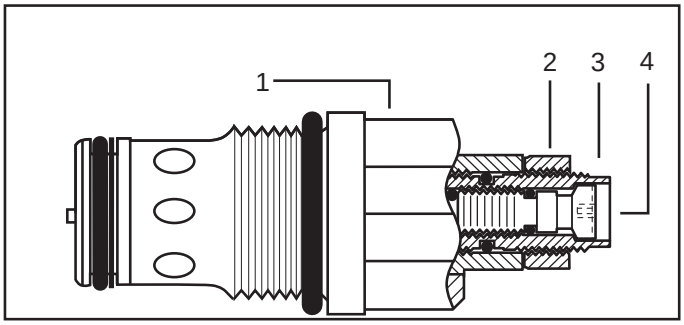


Relief valve for AA4VG40 and AA4VG56.
1…Nut used to torque relief valve into port block.
2…Lock nut for tow option engagement.
3…Tow option engagement screw.

Tow Option Engagement for AA4VG71 and AA4VG90
To actuate tow option turn tow option engagement screw (ref. item 4) out three turns.

To disengage tow option turn tow option engagement screw in until it stops.

Note: Use a 4 mm allen wrench to adjust.



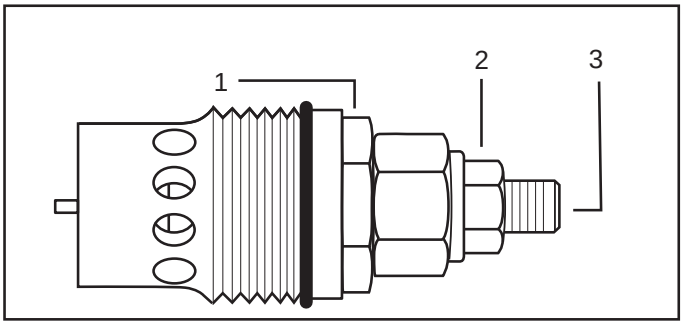
Relief valve for AA4VG71 and AA4VG90.
1…Nut used to torque relief valve into port block.
2…Lock nut for high pressure relief adjustment.
3…Adjustment screw for high pressure adjustment.
4…Tow option engagement screw.

Tow option Engagement for AA4VG125 and AA4VG180
To actuate tow option turn relief valve (ref. item 1) out two turns.

To disengage tow option tighten relief valve.

Note: Use a 36 mm box wrench to adjust.

Note: Tow options are meant to be used for a short time period only. Tow options are not to be used for extended tows.



Relief valve for AA4VG125 and AA4VG180.
1…Nut used to torque relief valve into port block and engage-tow option.
2…Lock nut for high pressure relief adjustment.
3…Adjustment Screw for high pressure relief adjustment.

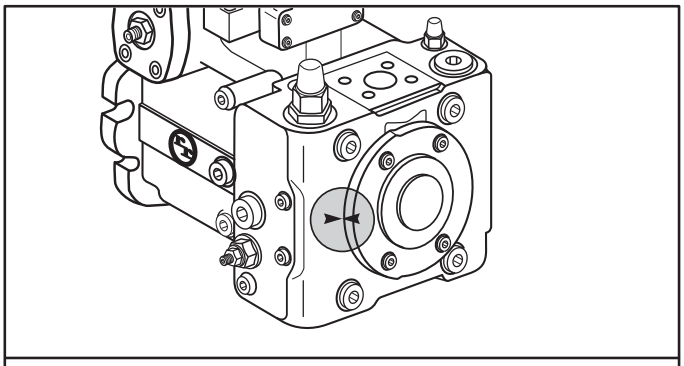
Torque Specs for Relief Valves into Port Block

Pump Size	Wrench Size	Torque
28…56	32 mm	66 ft.lb. (90 Nm)
71…90	32 mm	110 ft.lb. (150 Nm)
125…180	36 mm	147 ft.lb. (200 Nm)

Warning: Tow option bypasses high pressure relief valves. Catastrophic motor damage can occur if hydraulic circuit empties or overheats.

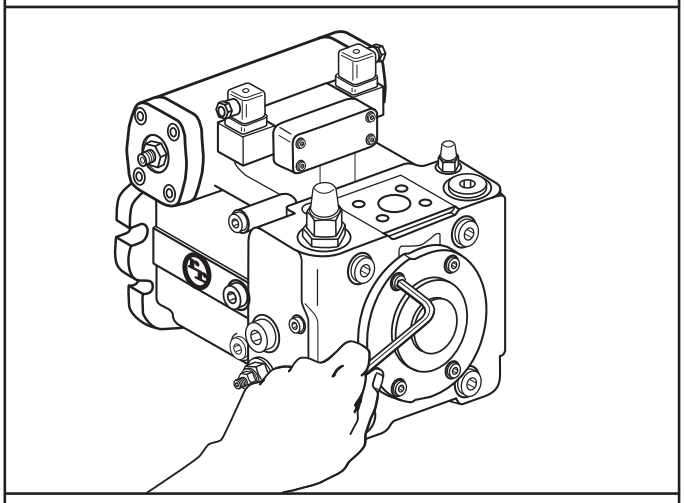
Removal and Inspection of Charge Pump

Before removing cap screws, mark the position of the charge pump housing and separator plate in relation to the port block.



Loosen screws with metric allen wrench.

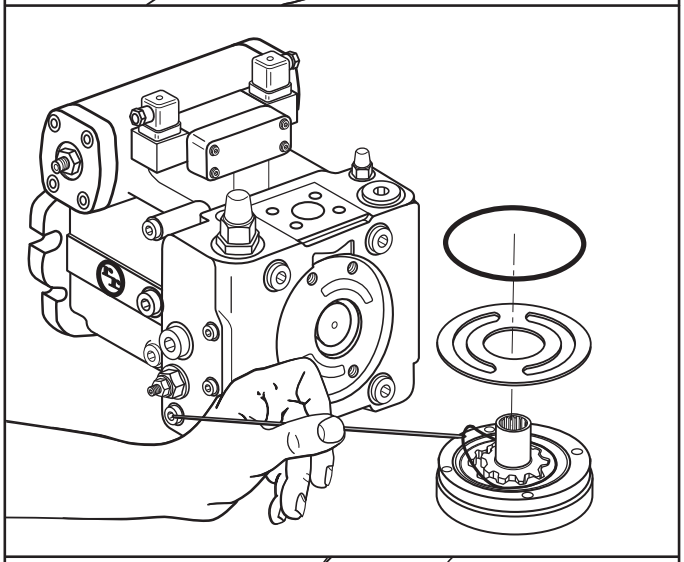
Pump Size	Allen Wrench
28…125	6 mm
180…250	10 mm



Remove charge pump housing and inspect for wear or damage to gear set and O-ring seals. Grease O-rings prior to reassembly. Make sure O-rings are completely seated in their grooves.

Withdraw pinion shaft and inspect gear teeth and bearing surfaces for abnormal wear.

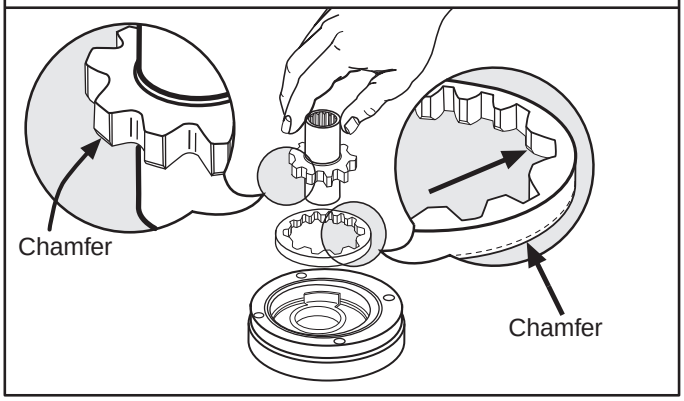
When reassembling, make sure chamfer (on outer edge of driven gear and drive gear) is installed into housing per illustration.



Torque value for bolts when replacing charge pump.

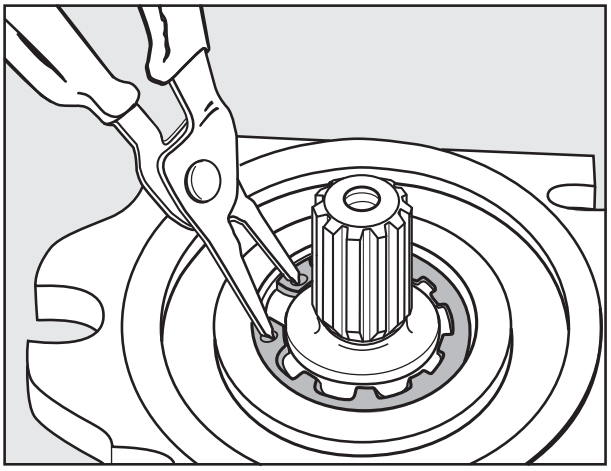
Pump Size	Torque
28…125	18 ft-lbs (24 Nm)
180…250	62 ft-lbs (24 Nm)

Note: If serious wear or damage has occurred to one component, the complete charge pump assembly must be replaced because they are matched components.



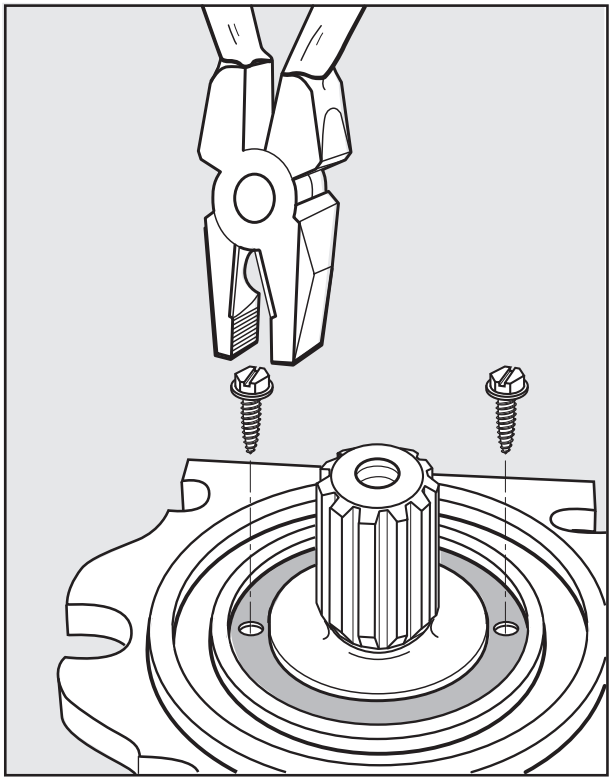
Removal and Installation of Shaft Seal

Remove the retaining ring with snap ring pliers.

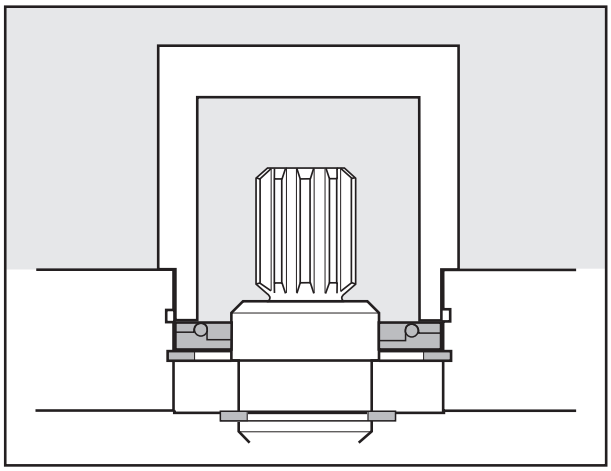


Screw in sheet metal screw into the holes fitted with rubber.

Pull out shaft seal with pliers.

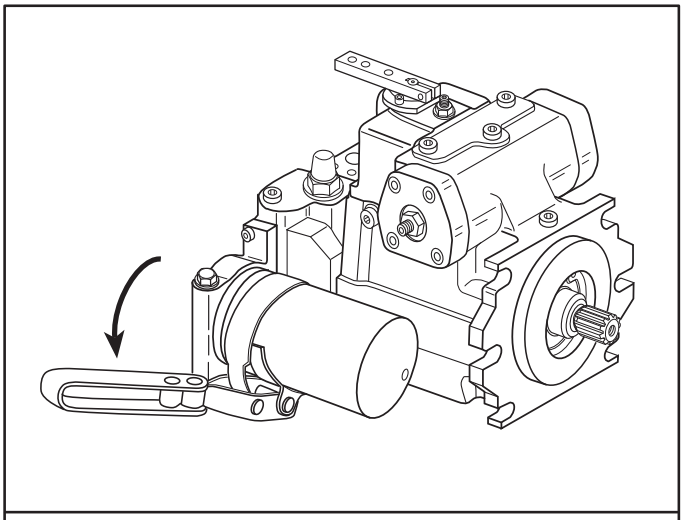


Press-in shaft seal with bushing to the stop.
Then replace snap ring.

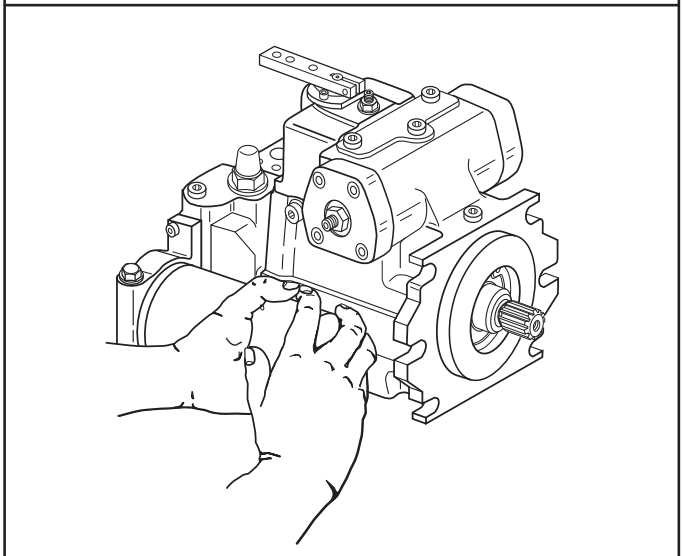


Changing Charge Filter

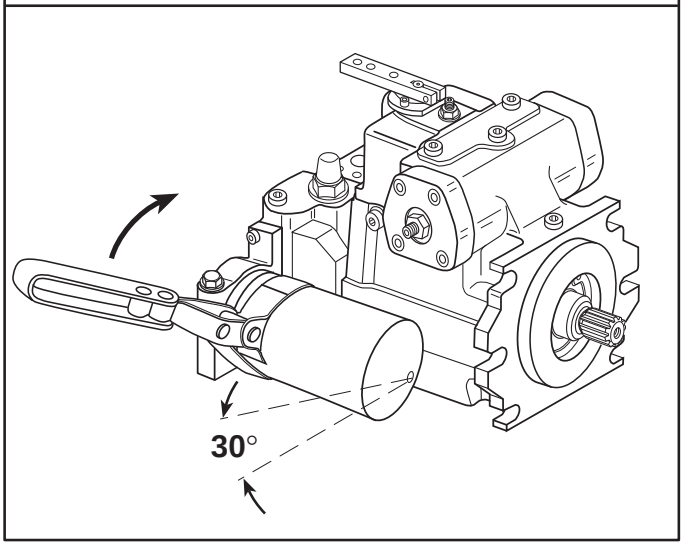
Remove charge filter (turn counter clockwise) with filter wrench.



Apply a small amount of oil to seal.
Screw on new filter (Clockwise) until seal touches housing.



Turn charge filter 30 degrees (clockwise) to tighten.



Routine Maintenance

The AA4VG variable pumps are relatively maintenance free. Maintenance work is confined to the system, by way of oil changes and renewal of filter elements. Both of these measures promote system cleanliness. Monitoring and periodic maintenance of the system can prevent premature breakdowns and repairs. Under normal application conditions, the following maintenance intervals are suggested:

1. Renewal of Filter Elements

a. After commissioning.
b. At every 500 operating hours, or when filter indicator shows a dirty element.
c. With suction filtration, the filter element should be renewed as soon as a charge pump inlet pressure of less than -3.2 psi (0.8 bar absolute) becomes evident with the transmission in warm running condition (indicates contamination).
d. With charge flow filtration, watch for high pressure differential across the filter element (Refer to filter manufacturer's specifications).

Caution: Only filter elements capable of meeting or exceeding the fluid cleanliness level requirements (reference page 9) should be used.
Note: Paper inserts cannot be cleaned; use throwaway catridges (maintain a stock).

2. Hydraulic Oil Change

a. After 2000 operating hours (1st oil change).
b. Thereafter every 2000 operating hours or annually irrespective of operating hours achieved.

The oil change should be carried out with the system in warm running condition. Before re-filling, the reservoir should be cleaned to remove any sludge.

Caution: Rags or other threading material must not be used.

Note: The recommended interval between oil changes is based on various factors and should be carried out according to the type of fluid, the degree of aging and contamination of the fluid. The water content is also a contributory factor.

Under application conditions with a heavy occurrence of dust or severe temperature fluctuations the intervals between oil changes should be shortened accordingly.

Caution: Practical experience shows that most maintenance errors occur during an oil change due to:

a. Use of an unsuitable hydraulic oil.
b. Use of oil contaminated due to faulty storage.
c. Failure to clean reservoir.
d. Inadequate cleanliness when filling (dirty drums or containers).

3. Leakage Inspection

a. After commissioning.
b. The complete transmission (pump, motor and all pipelines, filters, valves, etc.) should be checked for leakage at regular intervals.

Caution: Leaking joints and connections must only be tighened in pressure less conditions

4. Cleanliness Inspection

The oil tank breather should be regularly cleaned of dirt and dust to prevent clogging. The cooling surfaces should be cleaned at the same time.

Caution: If hose couplings are used in the high pressure lines, it is imperative that the utmost care be taken that no foreign bodies infiltrate the oil circuit when coupling and uncoupling (danger of damage to rotary group, and even possibility of total breakdown).

5. Oil level Inspection

Inspect oil level in reservoir after commissioning, thereafter daily.

Caution: Top up only with specified oil type. Do not mix fluids.

Hydraulic Fluid

Most good quality, mineral oil based, hydraulic fluids exhibiting the following characteristics are suitable for use in a Rexroth hydrostatic transmission.

Good antiwear performance
Resistant to oxidation depredation
Protection against rust and corrosion
Resistance to foaming
Ability to separate water rapidly
Suitable for widely varying temperature conditions
good low temperature flow properties
Retains viscosity-temperature characteristics in service
Universally available

The prime consideration in the selection of hydraulic fluid is the expected oil temperature extremes that will be experienced in service. The extremes should be considered when selecting a fluid, so that the most suitable temperature-viscosity characteristics are obtained.

The fluid chosen should permit the system to operate within the following viscosity ranges.

Maximum viscosity at start-up . . . . . 4600 SUS (1000 cSt)
Normal operating viscosity range . . . . 66–464 SUS (12–100 cSt)
Optimum viscosity range . . . . . 81–141 SUS (16–30 cSt)
Absolute minimum viscosity . . . . . 60 SUS (10 c St)

When the fluid viscosity is greater than 1000 SUS (216 c St) the transmission should be operated at reduced speed until the oil has been warmed to a temperature of 40°F (4.5°C).

For applications that will operate near the extremes of viscosity and/or temperature, the fluid manufacturer should be consulted for assistance in selection of the most suitable type and grade of fluid for your application.

Rexroth strongly recommends the selection and use of fluids from reputable and established suppliers.

Replacement Subassemblies and Parts

Control Modules

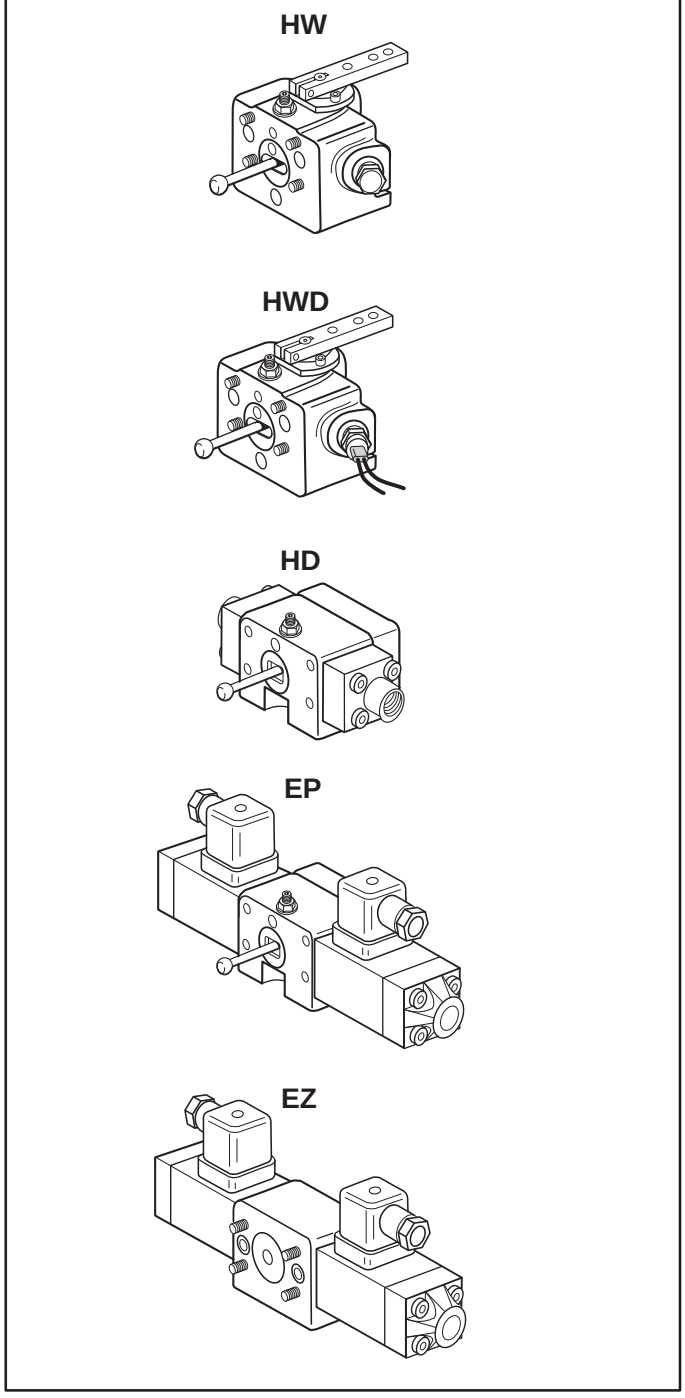
Control Module	Size 28	40	56
HW	HU00606886	HU00606886	HU00606888
HWD	HU00607224	HU00607224	HU00607226
HD	HU00601717	HU00601717	HU00433487
EP1	HU00601622	HU00601622	HU00429169
EP2	HU00601621	HU00601621	HU00429168
EZ1	HU00600074	HU00600074	HU00600074
EZ2	HU00600076	HU00600076	HU00600076

Control Module	Size 71	90	125
HW	HU00606891	HU00608523	HU00608522
HWD	HU00607228	HU00608526	HU00608525
HD	HU00429114	HU00602225	HU00602238
EP1	HU00428139	HU00602227	HU00602236
EP2	HU00428138	HU00602226	HU00602237
EZ1	HU00600074	HU00437191	HU00437191
EZ2	HU00600076	HU00437190	HU00437190

Control Module	Size 180	250
HW	HU00608521	HU02008008
HWD	HU00608524	▲
HD	HU00602245	▲
EP1	HU00602248	HU02007246
EP2	HU00602247	HU02007245
EZ1	HU00437191	HU00437191
EZ2	HU00437190	HU00437190

Note: To add neutral start switch to an existing HW control add kit 5400-635-009

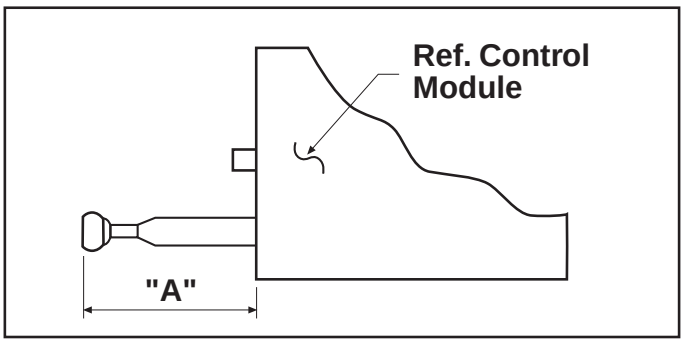
▲ Part numbers not released at time of printing



Control Module Size

Control module housing for sizes AA4VG28…AA4VG71 and AA4VG90…AA4VG250 are the same. To determine size of control module feedback lever length (dimension “A”) can be measured. To convert control modules within a housing size feed back levers can be changed (Reference page 33).

Pump Size	“A” Dimension
28…40	See page 33
56	1.45 in. (36.8 mm)
71	See page 33
90	1.36 in. (34.5 mm)
125	1.55 in. (39.4 mm)
180	2.15 in. (54.6 mm)
250	2.88 in. (73.2 mm)

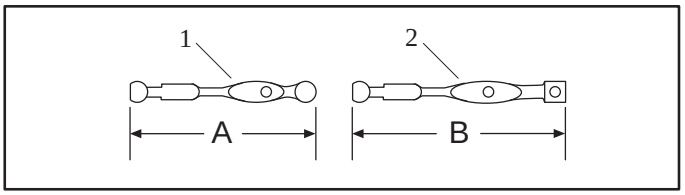


Replacement Subassemblies and Parts

Control Module Size

Control module housing for sizes AA4VG28, AA4VG40, AA4VG56 and AA4VG71 are the same. To determine size of control module feedback lever length (dimension “A” or “B”) can be measured. To convert control modules within a housing size feedback levers can be changed (Reference page 33).

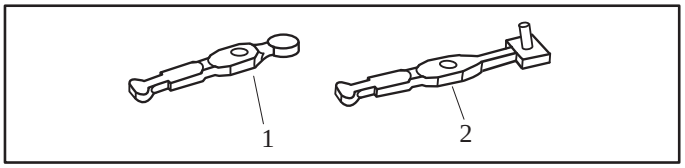
Pump Size	“A” Dimension	“B” Dimension
28…40	2.27 in. (57.7 mm)	2.62 in. (66.5 mm)
71	2.31 in. (58.7 mm)	2.66 in. (67.5 mm)



Feedback Control Levers.
1…Feedback lever for HW control.
2…Feedback lever for HD and EP controls.

Feedback Levers

Pump Size	Feedback lever HW Control	Feedback lever HD & EP Control
28…40	HU00432448	HU00432509
56	HU00432489	HU00430310
71	HU00432256	HU00430319
90	HU02008032	HU00436442
125	HU02008033	HU00445730
180	HU02008034	HU02008036
250	HU02008006	HU02006296

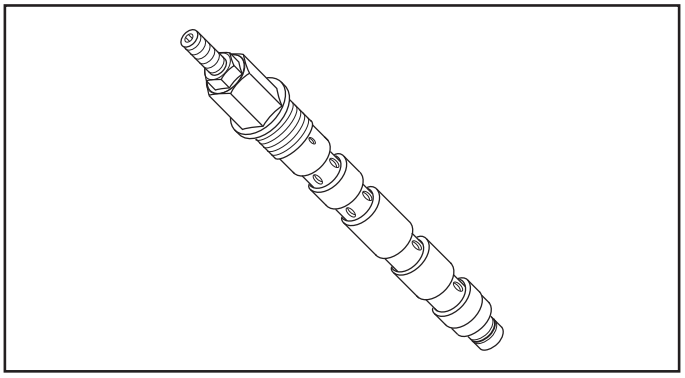


Feedback Control Levers.
1…Feedback lever for HW control.
2…Feedback lever for HD and EP controls.

Pressure Override Valve Part Numbers

Pump Size	Pressure Override Valve
28	HU00447281
40	HU00447281
56	HU00446763
71	HU00437084
90	HU00437363
125	HU00433834
180	HU00433834
250	▲

▲ Part numbers not released at time of printing

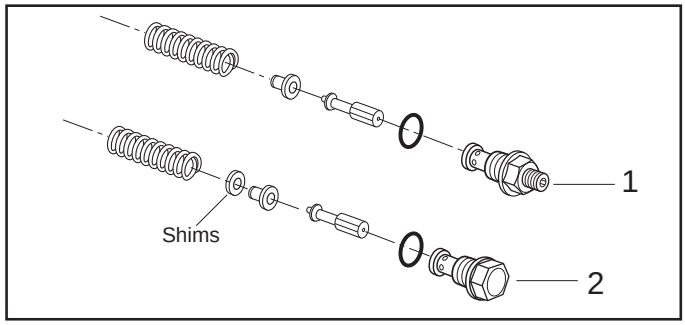


Pressure Override Valve

Charge Pressure Relief Valves

Pump Size	Pressure Range	Part Number
28	215…435 psi (15…30 bar)	5400-635-007①
40	215…435 psi (15…30 bar)	5400-635-007①
56	215…435 psi (15…30 bar)	5400-635-007①
71	215…435 psi (15…30 bar)	HU00434856
90	215…435 psi (15…30 bar)	HU00434856
125	215…435 psi (15…30 bar)	HU00434856
180	215…435 psi (15…30 bar)	HU00437151
250	215…435 psi (15…30 bar)	HU00437151

① Adjustment kit 5400-635-007 consists of charge pressure relief valve HU00434636 and shims.



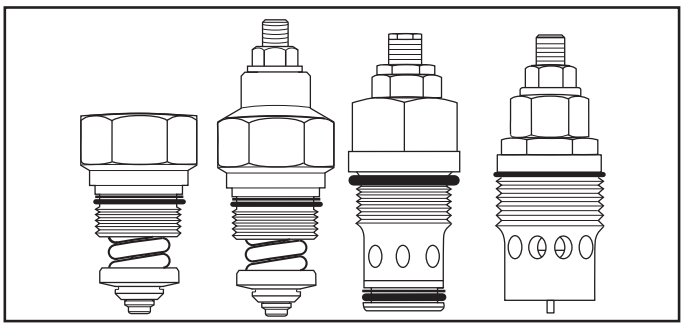
Charge Pressure Relief Valves
1…Adjustable Charge relief for sizes 71 thru 180.
2…Shim charge relief for sizes 40 and 56 only, 1 mm equals 56 psi (3.9 bar).

Replacement Subassemblies and Parts

High Pressure Relief Valve Part Numbers

Pump Size	Part Number	Pressure Range	Type of Relief Valve
40	HU00447133	3600-6000 psi	Direct acting without tow option
	HU00447134	3600-6000 psi	Direct acting with tow option
56	HU00429458	3600-6000 psi	Direct acting without tow option
	HU00434301	3600-6000 psi	Direct acting with tow option
71…90	HU02600466	1450-6000 psi	Pilot operated with tow option
125…180	HU00832121	1450-6000 psi	Pilot operated with tow option
250	▲	▲	▲

▲ Part number not released at time of printing



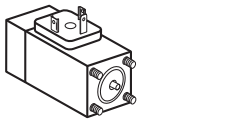
High Pressure relief valves for AA4VG28…AA4VG180

EP Solenoids (Proportional)

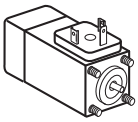
Pump Size	24 Volts DC	12 Volts DC
All	HU00441692	HU00441691

EZ Solenoids (Non-Proportional)

Pump Size	24 Volts DC	12 Volts DC
All	HU00428266	HU00428265



Type EP

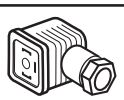


Type EZ

Plug-in Connectors

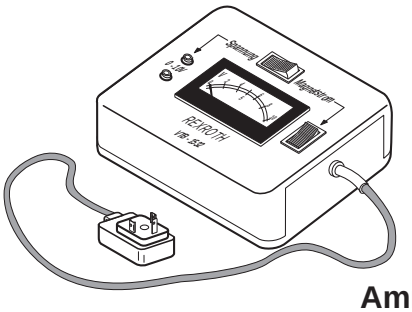
Pump Size	Gray	Black
All	HU00152503	HU0085290

Plug in Connectors



Ammeter with Sandwich Plug

Pump Size	Part Number
All EP Controls	5956-001-018



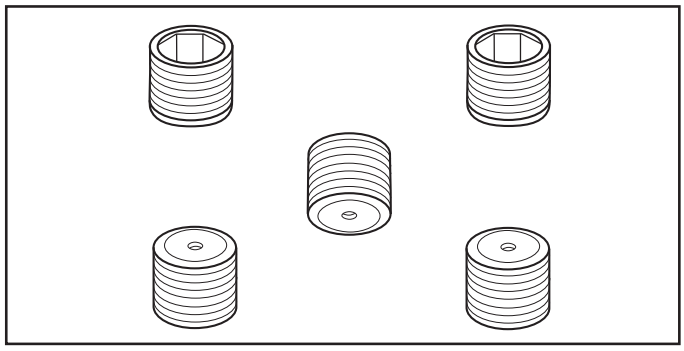
Ammeter

Stroking Time Orifices for Sizes 28…71

Part Number	Orifice Size	Thread Size
HU00156492	0.8 mm DIA.	M 6
HU00156493	1.0 mm DIA.	M 6
HU00156494	1.2 mm DIA.	M 6
HU00156495	1.4 mm DIA.	M 6
HU00156496	1.6 mm DIA.	M 6
HU00156497	1.8 mm DIA.	M 6

Stroking Time Orifices for Sizes 90…250

Part Number	Orifice Size	Thread Size
HU00426701	0.8 mm DIA.	M 10
HU00426702	0.9 mm DIA.	M 10
HU00426700	1.0 mm DIA.	M 10
HU00426703	1.2 mm DIA.	M 10
HU00426704	1.4 mm DIA.	M 10
HU00426705	1.6 mm DIA.	M 10
HU00426706	1.8 mm DIA.	M 10
HU00426707	2.0 mm DIA.	M 10
HU00426708	2.2 mm DIA.	M 10
HU00439372	2.4 mm DIA.	M 10
HU00426709	2.5 mm DIA.	M 10



Stroking Time Orifices

Replacement Subassemblies and Parts

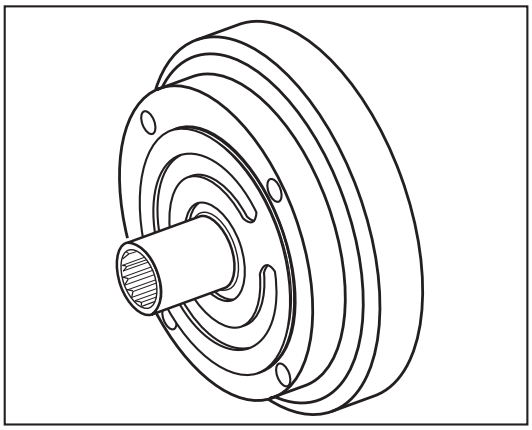
Charge Pumps and Through Drives

Type Code	AA4VG28	AA4VG40	AA4VG56	AA4VG71
F00	▲	HU00606688	HU00606382	HU00606657
F01	▲	HU00606691	HU00606386	HU00606655
F02	▲	HU00606694	HU00606390	HU00606661
F04	▲	HU00606700	HU00606393	HU00606658
F09	▲	HU00606687	❍	❍
F07	▲	❍	HU00606379	HU00606660
F69	▲	❍	❍	❍
F73	▲	❍	❍	❍

Type Code	AA4VG90	AA4VG125	AA4VG180	AA4VG250
F00	HU00606811	HU00606320	HU00606233	▲
F01	HU00606803	HU00606309	HU00606225	▲
F02	HU00606809	HU00606312	HU00606228	▲
F04	HU00606807	HU00606314	HU00606226	▲
F09	❍	❍	❍	▲
F07	HU00606801	HU00606317	HU00606214	▲
F69	❍	HU00606330	HU00606245	▲
F73	HU00606805	❍	❍	▲

❍ Not Available

▲ Part numbers not released at time of printing.



Charge Pump

Seal Kits and Shaft Seals for AA4VG/32 – Size 28…250

	Seal Kits			Shaft Seal	
Pump Size	AA4VG/32…P Buna	AA4VG/32…V FPM	AA4VG/32…N FPM Shaft Seal with Buna Seals	Buna	FPM
28	5470-635-023	5470-635-024	5470-635-025	HU00830425	HU00830742
40	5410-635-033	5410-635-035	5410-635-034	HU00831285	HU00831284
56	5420-635-028	5420-635-031	5420-635-029	HU00830970	HU00830976
71	5430-635-025	5430-635-027	5430-635-026	HU00830971	HU00830977
90	5440-635-033	5440-635-040	5440-635-038	HU00830972	HU00830978
125	5450-635-031	5450-635-033	5450-635-032	HU00830974	HU00830980
180	5480-635-007	5480-635-009	5480-635-008	HU00830973	HU00830979
250	❍	5460-635-022	5460-635-023	❍	HU02600118

❍ Not Available

Charge Pressure Filtration Kits and Filter Elements

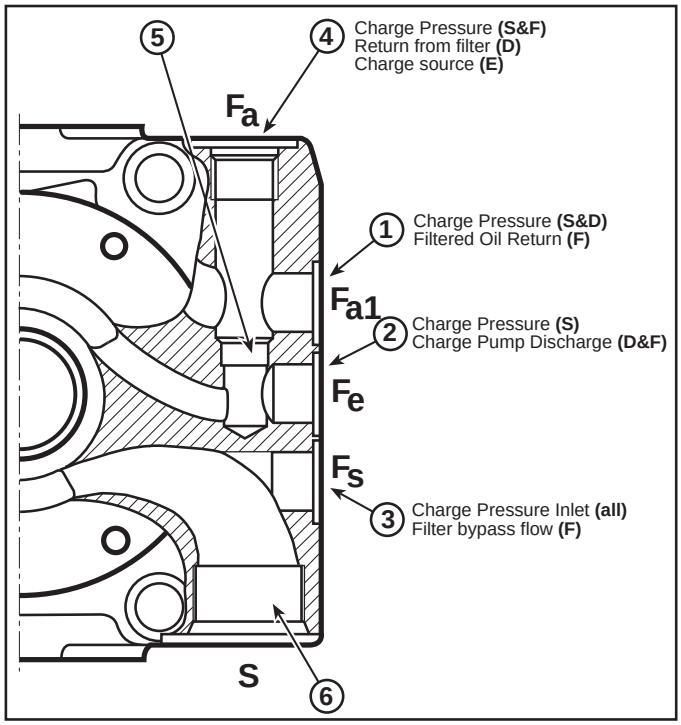
Pump Size	"F" Standard	"P" Visual Indicator	"L" Electrical Indicator	"M" Visual & Electrical Indicator	Filter Element Only	Cold Starting Valve
28	▲	▲	▲	▲	▲	▲
40…56	HU00434508	HU00441717	HU00606914	HU00606305	HU00830024	HU02007002
71…90	HU00434509	HU00446438	HU00434984	N/A	HU00157926	HU02006412
125	HU00434510	HU00447605	HU00601330	HU00602557	HU00157926	HU02006413
180	HU00434511	HU00600111	HU00447472	HU00606008	HU00157956	HU02006413
250	▲	▲	▲	▲	▲	▲

▲ Part numbers not released at time of printing

Filtration Configurations for AA4VG, Series 32

Filtration Configuration	Port Configuration	AA4VG40 AA4VG56		AA4VG71 AA4VG90		AA4VG125 AA4VG180	
		Port Size	Part Number	Port Size	Part Number	Port Size	Part Number
Suction Filtration "S"	1 Plugged	M18 x 1.5	76116-010	M22 x 1.5	76116-009	M33 x 2	76116-008
	2 Plugged	M18 x 1.5	76116-010	M22 x 1.5	76116-009	M33 x 2	76116-008
	3 Plugged	M18 x 1.5	76116-010	M22 x 1.5	76116-009	M33 x 2	76116-008
	4 Plugged	3/4" - 16 UN	76107-008	1 1/16" - 12 UN	76107-012	1 5/16" - 12 UN	76107-016
	5 Open	M14 x 1.5		M18 x 1.5		M20 x 1.5	
	6 Open	1 5/16" - 12 UN		1 5/8" - 12 UN		1 7/8" - 12 UN	
Charge Pressure Filtration "D"	1 Plugged	M18 x 1.5	76116-010	M22 x 1.5	76116-009	M33 x 2	76116-008
	2 Open	3/4" - 16 UN	HU00607033①	1 1/16" - 12 UN	HU00448824①	1 5/16" - 12 UN	HU00442847①
	3 Plugged	M18 x 1.5	76116-010	M22 x 1.5	76116-009	M33 x 2	76116-008
	4 Open	3/4" - 16 UN		1 1/16" - 12 UN		1 5/16" - 12 UN	
	5 Plugged	M14 x 1.5	76117-001	M18 x 1.5	76117-007	M20 x 1.5	76117-008
	6 Open	1 5/16" - 12 UN		1 5/8" - 12 UN		1 7/8" - 12 UN	
Mounted Filter "F" or Cold Start Valve "K"	1 Open	M18 x 1.5	Filter Port	M22 x 1.5	Filter Port	M33 x 2	Filter Port
	2 Open	M18 x 1.5	Filter Port	M22 x 1.5	Filter Port	M33 x 2	Filter Port
	3 Open	M18 x 1.5	Filter Port	M22 x 1.5	Filter Port	M33 x 2	Filter Port
	4 Plugged	3/4" - 16 UN	76107-008	1 1/16" - 12 UN	76107-012	1 5/16" - 12 UN	76107-016
	5 Plugged	M14 x 1.5	76117-001	M18 x 1.5	76117-007	M20 x 1.5	76117-008
	6 Open	1 5/16" - 12 UN		1 5/8" - 12 UN		1 7/8" - 12 UN	
External Charge Supply "E"	1 Plugged	M18 x 1.5	76116-010	M22 x 1.5	76116-009	M33 x 2	76116-008
	2 Plugged	M18 x 1.5	76116-010	M22 x 1.5	76116-009	M33 x 2	76116-008
	3 Plugged	M18 x 1.5	76116-010	M22 x 1.5	76116-009	M33 x 2	76116-008
	4 Open	3/4" - 16 UN		1 1/16" - 12 UN		1 5/16" - 12 UN	
	5 Open	M14 x 1.5		M18 x 1.5		M20 x 1.5	
	6 Plugged	1 5/16" - 12 UN	76107-016	1 5/8" - 12 UN	76107-020	1 7/8" - 12 UN	76107-024

① Adapts metric "Fe" port to SAE size indicated.



Note Page:

Note Page:

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