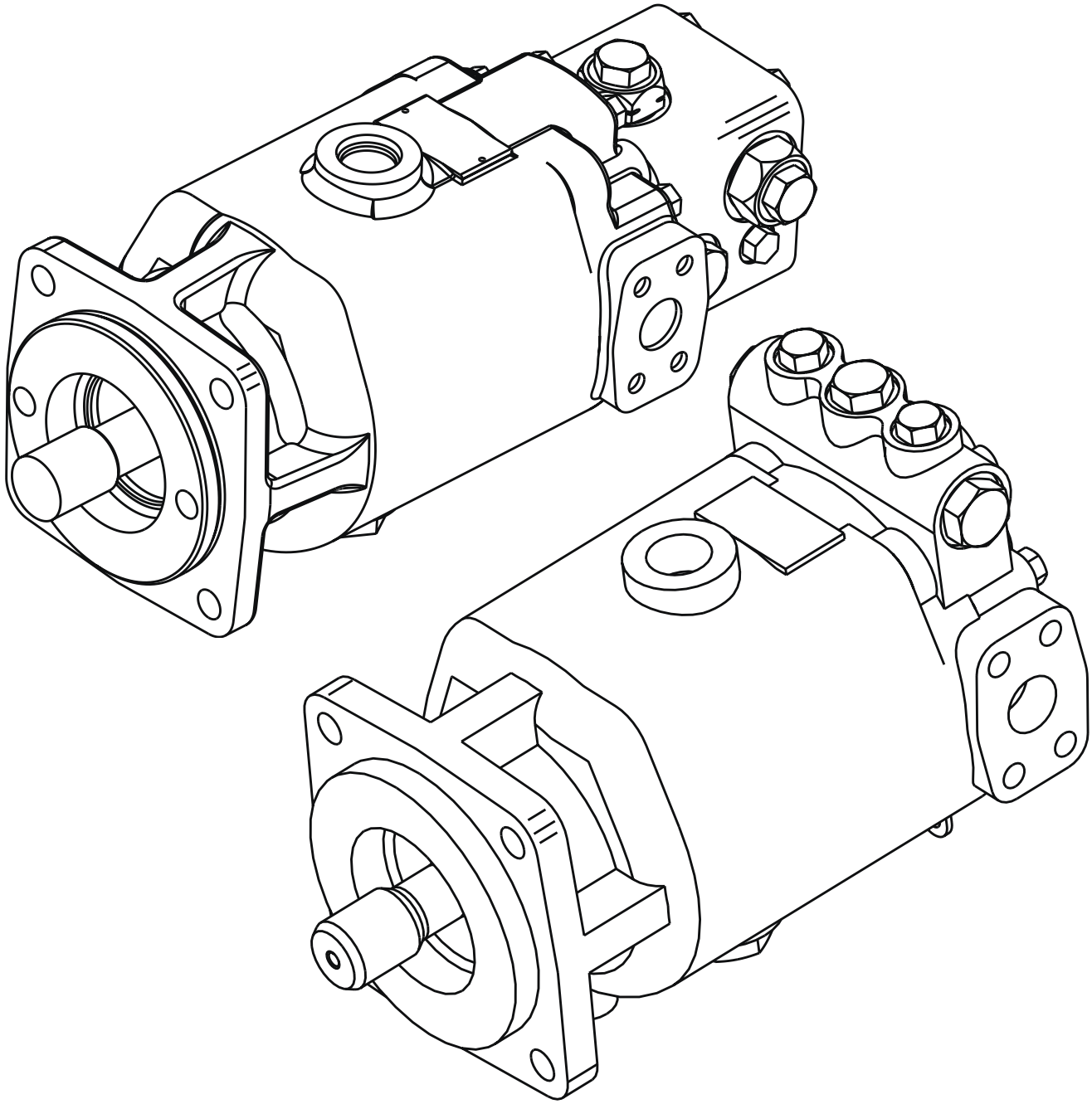
Hydraulics

Series 1 Heavy Duty Hydrostatic Fixed Displacement Motors

Parts and Service

Model 3331/3333
Model 3931/3933
Model 4631/4631
Model 5431/5433
Model 6431/6433



AX433168867782en-000101

Series 1
Hydrostatic
Fixed Motor

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Introduction

This manual will provide you with service information and procedures for disassembly and reassembly of Danfoss Series 1 Heavy Duty Hydrostatic Fixed Displacement Motors – Models 33, 39, 46, 54, and 64. Procedures outlined in this manual will allow you to better service your motors and obtain the best results possible. To ensure accuracy of repair and prevent part loss or damage, certain components or subassemblies are disassembled, inspected, and reassembled when removed from the motor.

Note: All requests or inquiries must be accompanied by the complete model and serial number.

Important: Cleanliness is extremely important when repairing a hydrostatic pump or motor. Before disconnecting the lines, clean foreign material from exterior of unit. Work in a clean area. Clean all metal parts in clean solvent. Blow parts dry with air. Don't wipe parts with cloth or paper towel, because lint or other matter could cause damage. Check all mating surfaces. Replace any parts that have scratches or burrs that could cause leakage. Don't use coarse grit paper, files or grinders on parts.

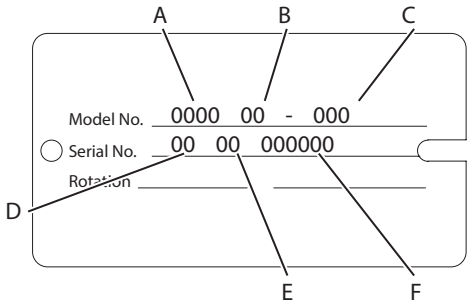
Note: All torque specifications are for lubricated threads. Bolts for gasketed surfaces should be checked for proper torque.

A good service policy is to replace all old seals with new seals whenever unit is disassembled. Lubricate seals (except metal sealing surfaces of shaft seal assembly) with petroleum jelly. Use only clean, recommended oil when assembling unit. See Hydrostatic Fluid Recommendations on page 28-29 or publication 03-401 and 03-405.

ID Tag

Refer to specific motor assembly part listings for your Danfoss motor when ordering replacement parts. Parts Lists are available from Danfoss. Sample tag shows motor identification.

When ordering replacement parts, you must include the following information:



A - Displacement (cu.in./rev.)
- 0033 = 3.3
- 0039 = 3.9
- 0046 = 4.6
- 0054 = 5.4
- 0064 = 6.4

B - Identifies Type of Product
- 31 = Fixed Displacement Motor with Face Seal
- 33 = Fixed Displacement Motor with Lip Seal

C - Identifies Specific Unit Configuration

D - Month of Manufacture

E - Year of Manufacture

F - Specific Serial Number of Unit

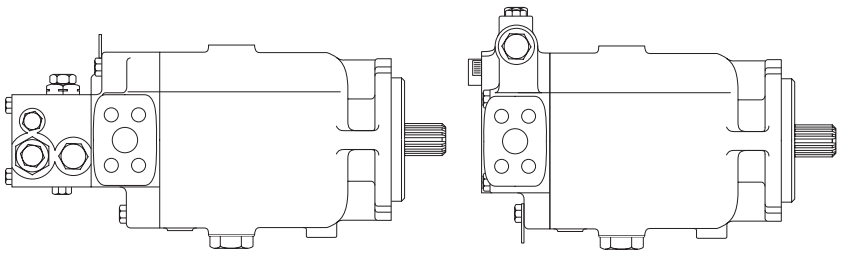
Tools Required

- Stationary Seal Puller (1/4 in. x 20 UNC capscrew, 3 to 4 in. long)
- Retaining Ring Pliers, No. 5 or 7
- Breaker Bar or Ratchet Wrench
- 1-3/8 in. Hex Wrench
- 1 in. Hex Wrench
- 9/16 in. Socket
- 5/8 in. Socket
- Torque Wrench (200 lb-ft capacity)
- 1/4 in. Hex Bit Socket
- 1/4 in. Hex Key
- Loctite® No. 271
- Pliers
- Punch
- Magnetic Base Indicator
- Hammer
- Bearing Press or Driver
- Light Petroleum Jelly
- Cleaning Solvent
- Micrometer or Vernier Calipers
- Small Screwdriver (1/8 in. blade)
- Clean Lint Free Rags

Special Tools needed (shown on pages 26 and 27).

- Bearing Cone Driver
- Rotating Seal Puller
- Limit Stop for Bearing Cone Installation
- Headless 5/16 in. Cap Screws, 5 to 6 in. Long (2)
- Low Clearance Bearing Puller

Parts
Assembly Drawing



Motors with Valve Blocks

Motors with Integral Shuttle and Low Pressure Relief Valves

End Cover with Integral Shuttle and Low Pressure Relief Valve

or

End Cover with Valve Block

990709-000
Lip Seal
Motors P/N XX33-XXX
(Current version)

or

990231-000
Face Seal
Motors P/N XX31-XXX

Parts

Table 1.0 Parts List

ITEM NO.	PART NO.	QTY.	DESCRIPTION	REFERENCE PAGES
1	See Table 2.0	1	Output Drive Shaft Subassembly for Motors with Lip Seal XX33-XXX (Current Production)	6
1	See Table 2.1	1	Output Drive Shaft Subassembly for Motors with Face Seal XX31-XXX	6-8
2	See Table 3.1	1	End Cover Subassembly for Motors with Integral Shuttle and Low Pressure Relief Valve	9
3	See Table 4.0, 4.1	1	End Cover for Motors with Valve Block Subassembly	10
3	See Table 4.2	1	Valve Block Subassembly	10
4	See Table 6.0	1	Fixed Motor Housing Subassembly	13
5	See Table 4.0	2	Hex Head Bolt 3/8-16 GR 8	9
6	See Table 4.0	4	Hex Head Bolt 3/8-16 GR 8	9
6	See Table 4.0	6	Hex Head Bolt 3/8-16 GR 8	9
7	See Table 4.0	4	Hex Head Bolt 3/8-16 GR 5	9
8	8775-021	1	Square Cut Seal Ring	
9	8765-118	2	O-ring	
10	101129-000	2	Back-up Ring	
13	103224-000	1	End Cover Gasket (model 33/39/46)	
13	103877-000	1	End Cover Gasket (model 54/64)	
14	98202-000	3	Dowel Pin (5/16 x 5/8 long)	
15	103230-000	1	33/39 Motor Valve Plate	
15	104189-000	1	46 Motor Valve Plate	
15	105104-000	1	54 Motor Valve Plate	
15	105099-000	1	64 Motor Valve Plate	
16	See Table 7.0		End Cover Bearing Shims	13
17	See Table 6.0	1	Bearing Cup*	13
18	See Table 6.0	1	Bearing Cone*	13
19	See Table 5.0-5.2	1	Rotating Group Subassembly	12
21	See Table 7.0	1	Seal Kit for Motors with Lip Seal only XX33-XXX (Current Production)	13
21	See Table 7.0	1	Seal Kit for Motors with Face Seal only XX31-XXX	13
23	See Table 7.0	1	Retaining Ring for Lip Seal	13
24	96558-000	2	Lifting Strap (models 33/39/46)	
24	96559-000	2	Lifting Strap (models 54/64)	
25	103223-000	2	Sealing Washer	
31	104511-300	2	Cap Screw, Socket Hd 3/8-16	
35	95912-300	2	Cap Screw, Socket Hd 5/16-18	

*Cannot be purchased separately.

Parts

Drive Shaft

(Item 1)

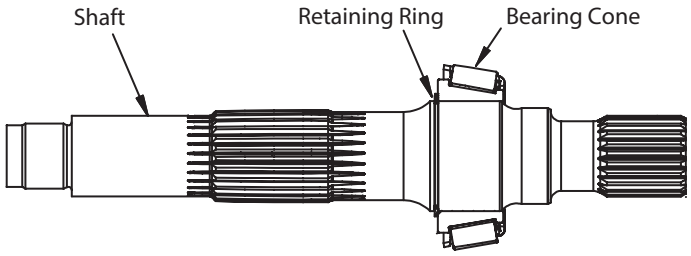


Table 2.0 Output Drive Shaft Assembly For Motors XX33-XXX (Lip Seal Design)

Models 3333-3933-4633

SHAFT ASSEMBLY	SHAFT	BEARING CONE	RETAINING RING		DESCRIPTION
112459-000	112458-000	103227-000	103222-188		23 Tooth, 16/32 Pitch Spline
112463-000	112462-000	103227-000	103222-188		20 Tooth, 16/32 Pitch Spline (3/8-24) UNF x [.75] DP
112465-000	112464-000	103227-000	103222-188		21 Tooth, 16/32 Pitch Spline
112467-000	112466-000	103227-000	103222-188		14 Tooth, 12/24 Pitch Spline
112480-000	112479-000	103227-000	103222-188		14 Tooth, 12/24 Pitch Spline Speed Sensor
112482-000	112481-000	103227-000	103222-188		21 Tooth, 16/32 Pitch Spline Speed Sensor
112498-000	112497-000	103227-000	103222-188		1.5 Diameter Straight with [.3750] X [2.5] Square key
112500-000	112499-000	103227-000	103222-188		19 Tooth, 16/32 Pitch Spline
112504-000	112503-000	103227-000	103222-188		1.375 Diameter Tapered W/ [.375] X [1.00] Square key
112506-000	112505-000	103227-000	103222-188		14 Tooth, 12/24 Pitch Spline (3/8-24) UNF x [.75] DP
112508-000	112507-000	103227-000	103222-188		23 Tooth, 16/32 Pitch SplinePitch Spline (3/8-24) UNF x [.75] DP
112510-000	112509-000	103227-000	103222-188		19 Tooth, 16/32, Pitch Spline Speed Sensor
112519-000	112518-000	103227-000	103222-188		20 Tooth, 16/32, Pitch Spline Speed Sensor
112521-000	112520-000	103227-000	103222-188		1.5 Diameter Straight W/ [.3750] X [2.5] Square key, (3/8-24) UNF x [.75] DP
112525-000	112524-000	103227-000	103222-188		1.5 Tapered with [.375] X [1.00] Square key
114289-000	114288-000	103227-000	103222-188		21 Tooth, 16/32 Pitch Spline (M10 x 1.5 threaded hole)

MODELS 5433-6433

SHAFT ASSEMBLY	SHAFT	BEARING CONE	RETAINING RING		DESCRIPTION
112484-000	112483-000	103808-000	103222-200		14 Tooth, 12/24 Pitch Spline
113201-000	113201-000	103808-000	103222-200		23 Tooth, 16/32 Pitch Spline
113338-000	113337-000	103808-000	103222-200		21 Tooth, 16/32 Pitch Spline
113344-000	113343-000	103808-000	103222-200		23 Tooth, 16/32, Pitch Spline Speed Sensor
113346-000	113345-000	103808-000	103222-200		23 Tooth, 16/32 Pitch Spline (3/8-24) UNF x [.75] DP
113348-000	113347-000	103808-000	103222-200		1.375 Diameter Tapered W/ [.375] X [1.00] Square Key
113350-000	113349-000	103808-000	103222-200		1.5 Diameter Straight W/ [.3750] X [2.5] Square Key
113352-000	113251-000	103808-000	103222-200		21 Tooth, 16/32, Pitch Spline Speed Sensor
113356-000	113355-000	103808-000	103222-200		14 Tooth 12/24 Pitch Spline Speed Sensor
113358-000	113357-000	103808-000	103222-200		1.5 Diameter Straight W/ [.3750] X [2.5] Square Key, (3/8-24) UNF x [.75] DP
113360-000	113359-000	103808-000	103222-200		21 Tooth, 16/32 Pitch Spline (3/8-24) UNF x [.75] DP
113362-000	113361-000	103808-000	103222-200		[1.500] Diameter Straight W/ [.3750] X [2.5] Square KeySpeed Sensor
113364-000	113363-000	103808-000	103222-200		21 Tooth, 16/32 Pitch Spline W/ (M10 x 1.5 threaded hole)
113811-000	113810-000	103808-000	103222-200		14 Tooth, 122/24 Pitch Spline (3/8-24) UNF x [.75] DP
114816-000	114815-000	103808-000	103222-200		19 Tooth, 16/32 Pitch Spline

Parts

Drive Shaft

(item 1)

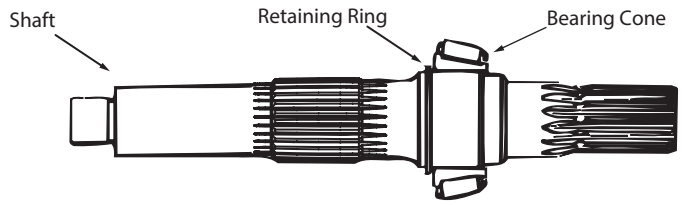


Table 2.1 Output Drive Shaft Assembly For Motors XX31-XXX (Face Seal Design)

MODEL 3331-3931

SHAFT ASSEMBLY	SHAFT	BEARING CONE	RETAINING RING	DESCRIPTION
103226-000	103229-000	103227-000	103222-188	21 Tooth, 16/32, Pitch Spline
104378-000	104396-000	103227-000	103222-188	14 Tooth, 12/24 Pitch Spline
105197-000	105196-000	103227-000	103222-188	14 Tooth, 12/24 Pitch Spline, Speed Sensor
105353-000	105352-000	103227-000	103222-188	21 Tooth, 16/32, Pitch Spline, Speed Sensor
105380-000	105379-000	103227-000	103222-188	[1.500] Diameter Straight W/ [.3750] X [2.5] Square Key
105391-000	105392-000	103227-000	103222-188	19 Tooth, 16/32, Pitch Spline
105426-000	105427-000	103227-000	103222-188	[1.500] Diameter Straight W/ [.3750] X [2.5] Square Key
105451-000	105450-000	103227-000	103222-188	[1.375] Diameter Taper W/ [.375] X [1.00] Woodruff Key
107519-000	107518-000	103227-000	103222-188	14 Tooth, 12/24 Pitch Spline, 3/8-24
110106-000	110098-000	103227-000	103222-188	23 Tooth, 16/32, Pitch Spline, 3/8-24 UNF x [.75] DP
111122-000	111121-000	103227-000	103222-188	19 Tooth, 16/32, Pitch Spline, Speed Sensor

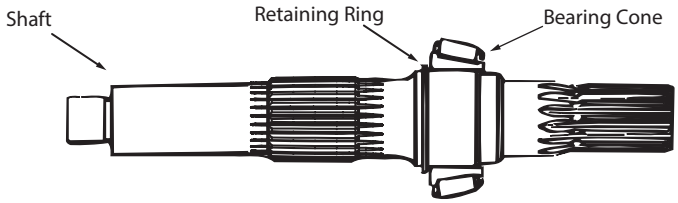
Model 4631

SHAFT ASSEMBLY	SHAFT	BEARING CONE	RETAINING RING	DESCRIPTION
103579-000	103577-000	103227-000	103222-188	23 Tooth, 16/32, Pitch Spline
104190-000	104192-000	103227-000	103222-188	14 Tooth 12/24, Pitch Spline
105123-000	105121-000	103227-000	103222-188	21 Tooth, 16/32, Pitch Spline, Speed Sensor
105364-000	105365-000	103227-000	103222-188	20 Tooth, 16/32, Pitch Spline, 3/8-24 UNF x [.75] DP
105449-000	105448-000	103227-000	103222-188	19 Tooth, 16/32, Pitch Spline
106910-000	106909-000	103227-000	103222-188	20 Tooth, 16/32, Pitch Spline, Speed Sensor
107315-000	107314-000	103227-000	103222-188	[1.500] Diameter Straight W/ [.3750] X [2.5] Square key, 3/8-24 UNF x [.75] DP
109261-000	109260-000	103227-000	103222-188	14 Tooth 12/24, Pitch Spline, Speed Sensor
110107-000	110099-000	103227-000	103222-188	23 Tooth, 16/32, Pitch Spline, 3/8-24
111052-000	111051-000	103227-000	103222-188	[1.500] Diameter Taper W/ [.375] X [1.00] Square Key
111780-000	111779-000	103227-000	103222-188	19 Tooth, 16/32, Pitch Spline, Speed Sensor

Parts

Drive Shaft

(item 1)



Output Drive Shaft Assembly For Motors XX31-XXX (Face Seal Design)

Model 5431

SHAFT ASSEMBLY	SHAFT	BEARING CONE	RETAINING RING	DESCRIPTION
105052-000	105057-000	103808-000	103222-200	14 Tooth 12/24, Pitch Spline
105060-000	105061-000	103808-000	103222-200	21 Tooth, 16/32, Pitch Spline
105070-000	105071-000	103808-000	103222-200	23 Tooth, 16/32, Pitch Spline, Speed Sensor
105170-000	105167-000	103808-000	103222-200	23 Tooth, 16/32, Pitch Spline
105331-000	105332-000	103808-000	103222-200	23 Tooth, 16/32, Pitch Spline W/ 3/8-24 UNF x [.75] DP
105335-000	105336-000	103808-000	103222-200	[1.500] Diameter Straight W/ [.375] X [2.5] Square key
106143-000	106142-000	103808-000	103222-200	21 Tooth, 16/32, Pitch Spline, Speed Sensor
108211-000	108203-000	103808-000	103222-200	[1.500] Diameter Straight W/ [.375] X [2.5] Square key, 3/8-24 UNF x [.75] DP
110692-000	110691-000	103808-000	103222-200	21 Tooth, 16/32, Pitch Spline W/ 3/8-24 UNF x [.75] DP
111602-000	111601-000	103808-000	103222-200	21 Tooth, 16/32, Pitch Spline W/ M10 X 1.5 threaded hole

MODEL 6431

SHAFT ASSEMBLY	SHAFT	BEARING CONE	RETAINING RING	DESCRIPTION
104640-000	105053-000	103808-000	103222-200	21 Tooth, 16/32, Pitch Spline
105062-000	105063-000	103808-000	103222-200	21 Tooth, 16/32, Pitch Spline
105066-000	105067-000	103808-000	103222-200	23 Tooth, 16/32, Pitch Spline
105270-000	105269-000	103808-000	103222-200	23 Tooth, 16/32, Pitch Spline, Speed Sensor
105356-000	105357-000	103808-000	103222-200	[1.500] Diameter Straight W/ [.3750] X [2.5] Square key
107355-000	107354-000	103808-000	103222-200	[1.500] Diameter Straight W/ [.3750] X [2.5] Square key, 3/8-24 UNF x [.75] DP
107632-000	107631-000	103808-000	103222-200	23 Tooth, 16/32, Pitch Spline, 3/8-24 UNF x[.75] DP
111141-000	111142-000	103808-000	103222-200	[1.500] Diameter Straight W/ [.3750] X [2.5] Square key
111591-000	111590-000	103808-000	103222-200	21 Tooth, 16/32, Pitch Spline, Speed Sensor
113438-000	113437-000	103808-000	103222-200	14 Tooth 12/24, Pitch Spline

Parts

End Cover

(Item 2)

Table 3.0 End Cover Bolt Matrix

ITEM NO.	PART NO.	QTY.	DESCRIPTION
5	103090-150	2	Hex Head Bolt 3/8-16 GR 8 (models 33/39/46)
5	103091-200	2	Hex Head Bolt 3/8-16 GR 8 (models 54/64)
6	103090-275	4	Hex Head Bolt 3/8-16 GR 8 (models 33/39/46)
6	103091-300	4	Hex Head Bolt 3/8-16 GR 8 (models 54/64)
7	95863-400	4	Hex Head Bolt 3/8-16 GR 5 (Valve Block)
31	104511-300	2	Hex Head Bolt 3/8-16 (Integral Shuttle)

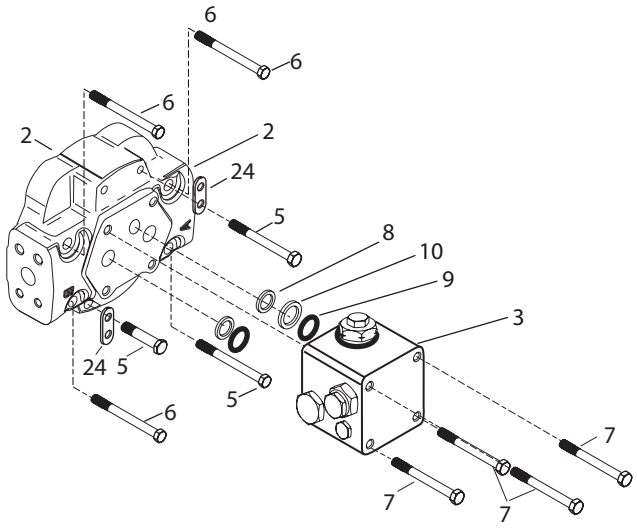


Table 3.1 End Cover with Integral Shuttle and Low Pressure Relief Valve

ITEM NO.	PART NO.	QTY.	DESCRIPTION
A	104635-000	2	Shuttle Valve Plug/O-ring
B	101730-00	2	Shuttle Spring (Low–Rate)
B	102530-000	2	Shuttle Spring (High–Rate)
C	101727-000	2	Shuttle Valve
D	102418-000	1	Shuttle Spool
E	25090-008	1	Gauge Port Plug/O-ring
F	25090-006	2	Gauge Port Plug/O-ring
G	104634-000	1	Plunger
H	See table 3.3	1	Low Pressure Relief Valve Spring
I	104659-XXX	A/R	Low Pressure Relief Valve Shims
J	104657-000	1	Low Pressure Relief Valve Plug/O-ring
K	8785-010	2	O-ring

A/R – As Required

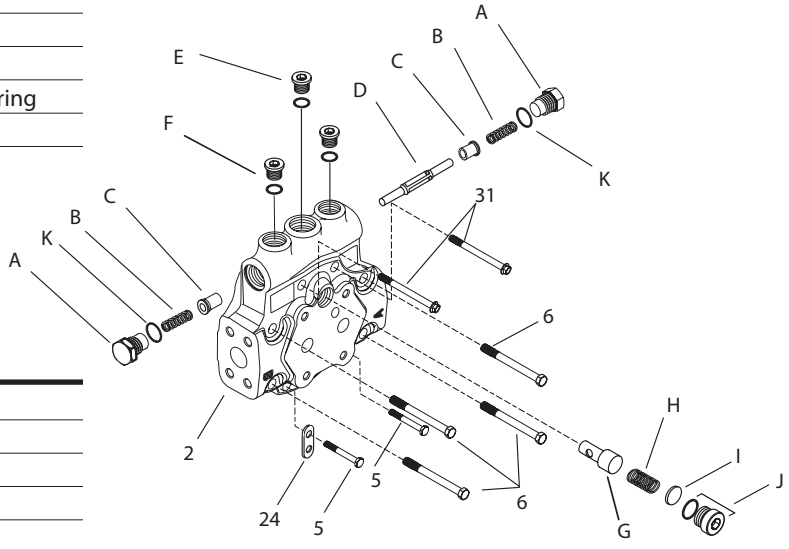


Table 3.2 Low Rate Shuttle Valve Service Kit Motors with Integral Shuttle

Kit No. 990851-000

ITEM NO.	PART NO.	QTY.	DESCRIPTION
A	104635-000	2	Shuttle Valve Plug/O-ring
B	101730-000	2	Shuttle Spring (Low–Rate)
C	101727-000	2	Shuttle Valve
D	102418-000	1	Shuttle Spool
K	8785-010	2	O-ring

Table 3.3 Low Pressure Relief Valve Spring (Integral Shuttle Motor Design)

SPRING P/N	PRESSURE SETTING RANGE bar[lbf/in ^{2}]
104658-000	11,0 [160]- 16,5[240]
110272-000	19,3[280] - 20,7[300]

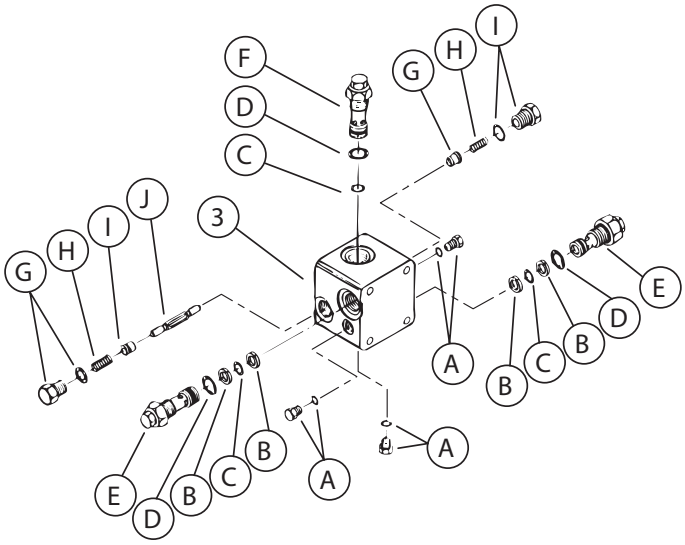
Parts

Valve Block

(Item 3)

Table 4.0 Valve Block Subassembly

ITEM NO.	P/N	QTY.	DESCRIPTION
A	25090-004	3	Gauge Port Plug/O-ring
B	96083-062	4	Back-up Ring
C	8765-017	3	O-ring
D	8785-010	3	O-ring
E	(See Table 4.2)	2	High Pressure Relief Cartridge 101047-XXX
F	(See Table 4.2)	1	Low Pressure Relief Cartridge 101048-XXX
G	101727-000	2	Shuttle Valve
H	(See Table 4.2)	2	Shuttle Spring
L	101729-000	2	Shuttle Valve Plug/O-ring
J	102418-000	1	Shuttle Spool



Ta ble 4.1

Low Pressure Relief Valve Setting Designation

PA RT NUMBER-XXX	bar [lbf/in ^{2}]
XXXXX-016	= 11 [160]
XXXXX-020	= 13,7 [200]
XXXXX-022	= 15,2 [220]
XXXXX-024	= 16,5 [240]
XXXXX-026	= 17,9 [260]
XXXXX-028	= 19,3 [280]

Table 4.2

High Pressure Relief Valve Setting Designation

PA RT NUMBER-XXX	bar [lbf/in ^{2}]
XXXXX-150	= 103,4 [1500]
XXXXX-200	= 137,9 [2000]
XXXXX-250	= 172,4 [2500]
XXXXX-300	= 206,8 [3000]
XXXXX-350	= 241,3 [3500]
XXXXX-400	= 275,8 [4000]
XXXXX-450	= 310,3 [4500]
XXXXX-500	= 344,7 [5000]
XXXXX-525	= 379,2 [5200]
XXXXX-550	= 396,4 [5500]
XXXXX-600	= 413,7 [6000]
XXXXX-650	= 448,1 [6500]*
XXXXX-675	= 465,4 [6750]*

*Do not set this pressure level without Danfoss Engineering approval

Parts

Valve Block Kits

Table 4.3 Valve Block Subassembly

VALVE BLOCK S/A	BLOCK	*HPRV A-PORT	*HPRV B-PORT	LPRV	SHUTTLE SPRING	DESCRIPTION
101732-XXX	107131-000	101047-XXX	101047-XXX	101048-016	101730-000	160 psi, LPRV, High Rate
102687-XXX	107131-000	101047-XXX	101047-XXX	101048-022	101730-000	220 psi, LPRV, High Rate
102769-XXX	107131-000	101047-XXX	101047-XXX	101048-020	101730-000	200 psi, LPRV, High Rate
103062-XXX	107131-000	101047-XXX	101047-XXX	103355-016	101730-000	160 psi, Orifice LPRV, Low Rate
103071-XXX	107131-000	101047-XXX	101047-XXX	101048-028	101730-000	280 psi, LPRV, High Rate
103533-XXX	107131-000	103114-XXX	103114-XXX	101048-028	101730-000	280 psi, LPRV, High Rate, HPRV w/THD. Retainer
104923-XXX	107131-000	103114-XXX	103114-XXX	103355-016	101730-000	160 psi, Orifice LPRV, Low Rate, HPRV w/THD. Retainer
104955-XXX	107131-000	103114-XXX	103114-XXX	101048-016	101730-000	160 psi, LPRV, High Rate, HPRV w/THD. Retainer
105941-XXX	107131-000	101047-XXX	101047-XXX	101048-028	102530-000	280 psi, LPRV, High Rate
105963-XXX	107131-000	103114-XXX	103114-XXX	103355-022	102530-000	220 psi, Orifice, LPRV, Low Rate HPRV w/THD. Retainer
105964-XXX	107131-000	103114-XXX	103114-XXX	101048-028	102530-000	280 psi, LPRV, High Rate, HPRV w/THD. Retainer
106707-XXX	101731-000	101047-XXX	101047-XXX	101048-018	101730-000	180 psi, LPRV, High Rate
107134-000	–	–	–	–	–	End Cover Sealing Plate
107149-XXX	107131-000	103114-XXX	103114-XXX	103355-016	102530-000	160 psi, Orifice LPRV, Low Rate, HPRV w/THD. Retainer
107196-XXX	107131-000	101047-XXX	101047-XXX	103072-030	101730-000	300 psi, LPRV, High Rate
110618-XXX	107131-000	101047-XXX	101047-XXX	101048-024	101730-000	240 psi, LPRV, High Rate

*Note: High pressure relief setting XXX=lbf/in

Table 4.4 Low Rate Shuttle Valve Service Kit

Kit No. 990202-000

ITEM NO.	PART NO.	QTY.	DESCRIPTION
1	8785-010	2	Tube Fitting, O-ring
2	101729-000	2	Valve plug
3	102530-000	2	Shuttle Valve Spring
4	102418-000	1	Shuttle Spool
5	101727-000	2	Shuttle Valve

Table 4.5 Shuttle Valve Service Kit
For Valve Block S/A (High Rate Shuttle Spring)

Kit No. 990071-000

ITEM NO.	PART NO.	QTY.	DESCRIPTION
1	8785-010	2	Tube Fitting, O-ring
2	101729-000	2	Valve Plug
3	102418-000	1	Shuttle Spool
4	101730-000	2	Shuttle Valve Spring
5	101727-000	2	Shuttle Valve

Table 4.6 Valve Block Sealing Kit

Kit No. 990029-001

ITEM NO.	PART NO.	QTY.	DESCRIPTION
1	101129-000	2	Back-up Ring
2	8765-118	2	O-ring
3	8775-018	1	Seal Ring
4	8775-021	1	Seal Ring

Table 4.7 High Pressure Relief Valve Seal Kit

Kit No. 990104-000

ITEM NO.	PART NO.	QTY.	DESCRIPTION
1	8785-014	1	Tube Fitting, O-ring
2	8770-0117	2	Back-up ring
3	8765-117	1	O-ring

Table 4.8 High Pressure Relief w/Thd. Retainer
Seal Kit

Kit No. 990554-000

ITEM NO.	PART NO.	QTY.	DESCRIPTION
1	8785-008	1	Tube Fitting, O-ring
2	8785-014	1	Tube Fitting, O-ring
3	8770-020	2	Back-up ring
4	8765-020	1	O-ring

Table 4.9 End Cover Sealing Plate Kit

Kit No. 990003-001

ITEM NO.	PART NO.	QTY.	DESCRIPTION
1	107134-000	1	End cover Sealing Plate
2	095863-150	4	Hex head Bolts
3	008765-118	2	O-Ring
4	101129-000	2	Backup Ring
5	008775-021	1	Sealing Ring

Parts

Rotating Group

(Item 19)

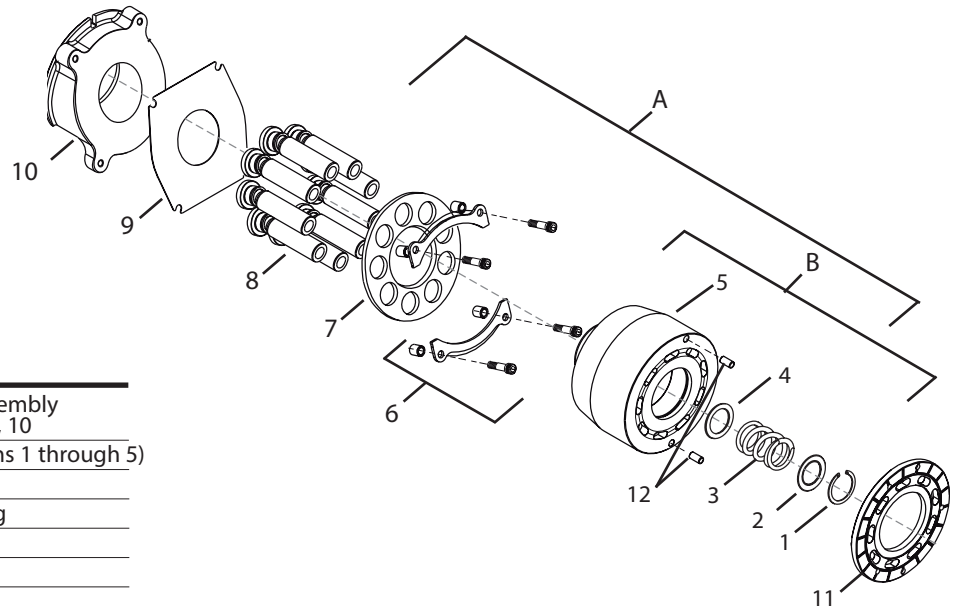


Table 5.0 Rotating Group Subassembly

Models 3331/3333

Subassembly 103247-000

ITEM	PART NO.	QTY.	DESCRIPTION
A	103239-000		Rotating Group Subassembly Include all except item 9, 10
B	990412-000	1	Barrel Kit (includes items 1 through 5)
1	103278-200	1	Retaining Ring
2	103242-000	1	Spacer Cyl Barrel Spring
3	103240-000	1	Cylinder Barrel Spring
4	103243-000	1	Spacer Shaft Spring
5	103245-000	1	Barrel and Sleeve S/A
6	990416-000	1	Hold-down Kit (See Table 6.2)
7	103244-000	1	Shoe Retainer Plate
8	101073-000	9	Shoe Piston Subassembly
9	103236-000	1	Fixed Clr Thrust Plate
10	103248-000	1	Swashplate Subassembly
11	103241-000	1	Bearing Plate
12	98202-000	2	Dowel Pin(5/16 x 5/8 long)

Models 3931/3933

Subassembly 103234-000

ITEM	PART NO.	QTY.	DESCRIPTION
A	103239-000		Rotating Group Subassembly Include all except item 9, 10
B	990412-000	1	Barrel Kit (includes items 1 through 5)
1	103278-200	1	Retaining Ring
2	103242-000	1	Spacer Cyl Barrel Spring
3	103240-000	1	Cylinder Barrel Spring
4	103243-000	1	Spacer Shaft Spring
5	103245-000	1	Barrel and Sleeve S/A
6	990416-000	1	Hold-down Kit (See Table 6.2)
7	103244-000	1	Shoe Retainer Plate
8	101073-000	9	Shoe Piston Subassembly
9	103236-000	1	Fixed Clr Thrust Plate
10	103238-000	1	Swashplate Subassembly
11	103241-000	1	Bearing Plate
12	98202-000	2	Dowel Pin (5/16 x 5/8 long)

Model 5431/5433

Subassembly 103874-000

ITEM	PART NO.	QTY.	DESCRIPTION
A	103851-000	1	Rotating Group Subassembly Include all except item 9, 10
B	990414-000	1	Barrel Kit (includes items 1 through 5)
1	103278-225	1	Retaining Ring
2	103815-000	1	Spacer Cyl Barrel Spring
3	103813-000	1	Cylinder Barrel Spring
4	103816-000	1	Spacer Shaft Spring
5	103854-000	1	Barrel and Sleeve S/A
6	990417-000	1	Hold-down Kit (See Table 6.2)
7	103853-000	1	Shoe Retainer Plate
8	101077-000	9	Shoe Piston Subassembly
9	103809-000	1	Fixed Clr Thrust Plate
10	103872-000	1	Swashplate Subassembly
11	103852-000	1	Bearing Plate
12	98202-000	2	Dowel Pin (5/16 x 5/8 long)

Model 4631/4633

Subassembly 106607-000

ITEM	PART NO.	QTY.	DESCRIPTION
A	106608-000	1	Rotating Group Subassembly Include all except item 9, 10
B	990413-000	1	Barrel Kit (includes items 1 through 5)
1	103278-200	1	Retaining Ring
2	103242-000	1	Spacer Cyl Barrel Spring
3	103240-000	1	Cylinder Barrel Spring
4	103243-000	1	Spacer Shaft Spring
5	104195-000	1	Barrel and Sleeve S/A
6	990416-000	1	Hold-down Kit (See Table 6.2)
7	104211-000	1	Shoe Retainer Plate
8	106609-000	9	Shoe Piston Subassembly
9	103236-000	1	Fixed Clr Thrust Plate
10	103238-000	1	Swashplate Subassembly
11	104198-000	1	Bearing Plate
12	98202-000	2	Dowel Pin (5/16 x 5/8 long)

Model 6431/6433

Subassembly 103871-000

ITEM	PART NO.	QTY.	DESCRIPTION
A	103812-000	1	Rotating Group Subassembly Include all except item 9, 10
B	990415-000	1	Barrel Kit (includes items 1 through 5)
1	103278-225	1	Retaining Ring
2	103815-000	1	Spacer Cyl Barrel Spring
3	103813-000	1	Cylinder Barrel Spring
4	103816-000	1	Spacer Shaft Spring
5	103821-000	1	Barrel and Sleeve Subassembly
6	990417-000	1	Hold-down Kit (See Table 6.2)
7	103817-000	1	Shoe Retainer Plate
8	103818-000	9	Shoe Piston Subassembly
9	103809-000	1	Fixed Clr Thrust Plate
10	103872-000	1	Swashplate Subassembly
11	103814-000	1	Bearing Plate
12	98202-000	2	Dowel Pin (5/16 x 5/8 long)

Parts

Motor Housing

(Item 4)

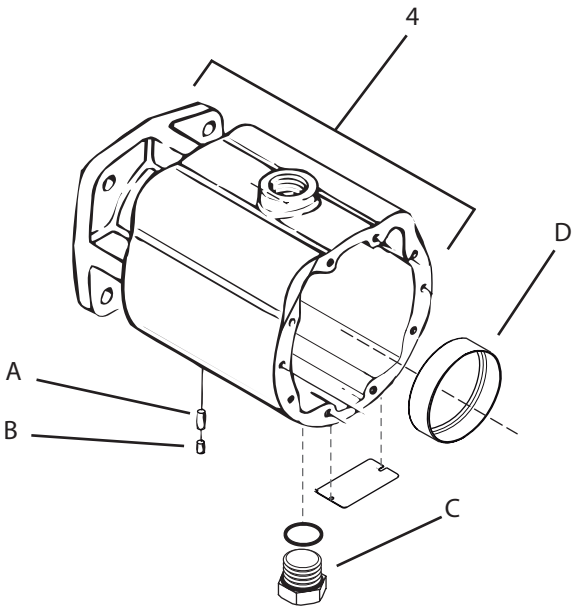


Table 6.0 Fixed Housing Subassembly

(Item 4)

PA RT NO.	MODEL	DESCRIPTION
112612-000	33-39-46	Main Housing
112611-000	33-39-46	Main Housing
112613-000	33-39-46	Main Housing
112614-000	33-39-46	Main Housing
112615-000	33-39-46	Main Housing
112616-000	33-39-46	Main Housing
4998770-001	33-39-46	Main Housing
113336-000	54-64	Main Housing
113339-000	54-64	Main Housing
113340-000	54-64	Main Housing
114237-000	54-64	Main Housing

Table 6.1 Motor Housing Subassembly

ITEM	QTY.	DESCRIPTION	MODEL	PART N0.
A	1	Dowel Pin		95904-100
B	1	Socket Pipe Plug (1/8-27)		95653-012
C	1	Case Drain Plug/O-ring		25090-012
D	1	Bearing Cup	33-39-46	103232-000
			54-64	103807-000

Parts

Kits

(Item 4)

Table 7.0 Service Kits

Shaft Bearing

MODEL	PART NO.	DESCRIPTION
33-46	990014-000	End Cover Bearing Kit
54-64	990016-000	End Cover Bearing Kit
33-46	990089-000	Mounting Flange Bearing Kit
54-64	990387-000	Mounting Flange Bearing Kit

End Cover Shim Kits

MODEL	PART NO.	DESCRIPTION
33-46	990017-000	End Cover Shim Kit
54-64	990019-000	End Cover Shim Kit

Overhaul Gasket Kits

MODEL	PART NO.	DESCRIPTION
33-46	990092-001	Overhaul Gasket Kit
54-64	990094-001	Overhaul Gasket Kit

Shaft Seal Kits

990709-000 Shaft Seal Kit (Lip Design)

For Models 3333/3933/4633/5433/6433

PA RT NO.	QTY.	DESCRIPTION
108395-000	1	Drive Shaft Seal
101680-250	1	Retaining Ring
107836-000	1	Spacer

990231-000 Shaft Seal Kit (Mechanical Face Seal)

For Models 3331/3931/4631/5431/6431

PA RT NO.	QTY.	DESCRIPTION
102591-000	1	Stationary Seal S/A
96108-281	1	Retaining Ring
102419-000	1	Rotating Seal
104166-131	1	O-Ring

Speed Sensor Kits

Magnetic Speed Sensor Kit
Kit No. 9900002-000

QTY	PART NO.	DESCRIPTION
1	106524-000	Speed Pickup
1	105129-000	Washer
1	105132-062	Threaad Seal
1	04-07-707	Installation Instructions

Hall Effect Speed Sensor
Assembly P/N 109823-000

(Ref. Installation Instructions 4-416)

Quadrature Speed Sensor
Kit No.9900121-001

QTY	PART NO.	DESCRIPTION
1	114264-001	Quadrature speed Sensor(two speed signals in quadrature with 1 pulse per target tooth)
1	E-MOPI-TI-002-E	Installation Instructions

Quadrature Speed Sensor
Kit No.9900121-002

QTY	PART NO.	DESCRIPTION
1	114264-002	Quadrature speed Sensor (2-pulse per target tooth signal and 1 directional signal)
1	E-MOPI-TI-002-E	Installation Instructions

Disassembly

Shaft Seal

1. Remove the shaft seal following the procedure for your type of seal.
There are two types of shaft seals. Depending on the part number of your motor, either type of seal may have been used. A unit MUST be serviced with the same type of seal as was originally installed. The seals are not interchangeable.

Note: Thoroughly clean the exterior of the unit before dis assembly. Make sure all open ports are sealed.

Important: Clean surface area around stationary seal assembly.

Motors Having Lip Seal (xx33-xxx Part Number Configuration)

a. Using a pair of retaining ring pliers, remove retaining ring.

b. Use a punch and hammer to punch a hole in the shaft seal.

c. Install a 3-inch sheet metal screw with the point blunted into the punched hole just far enough to pull the shaft seal out of its pocket.

d. Carefully insert the blade of a flat screw driver behind the seal and pry out the seal taking care not to damage the output drive shaft.



STEP A



STEP B



STEP C





STEP D

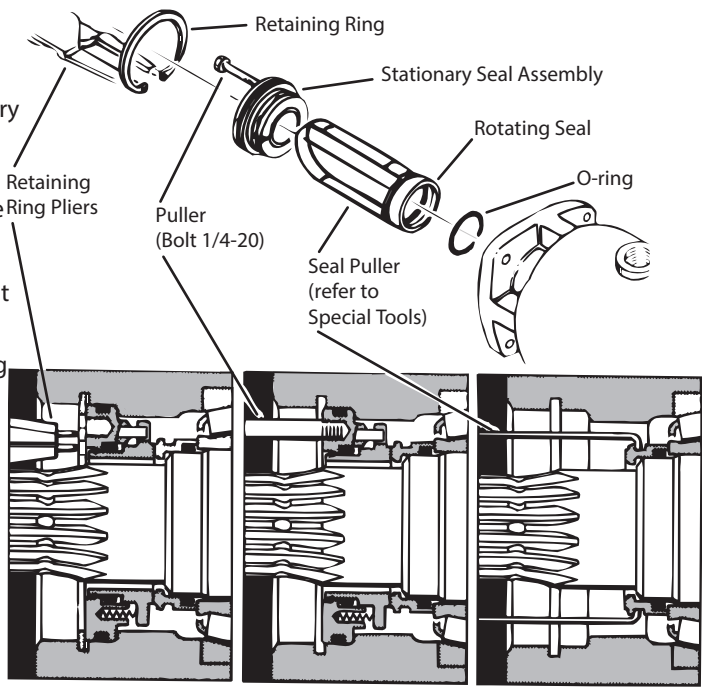
Motors Having Face Seal (xx31-xxx Part Number Configuration)

a. Using a pair of retaining ring pliers, remove retaining ring.

b. Insert 1/4x20 bolt into the threaded hold of the stationary seal assembly to pull assembly from mounting flange.

c. Using rotating seal puller (see special tools), grip outside diameter of bronze rotating seal. Remove seal from output drive shaft.

d. O-ring may remain in rotating seal recess. If not found in recess, remove O-ring from output drive shaft.



Seal all open ports. Thoroughly clean exterior of motor before disassembly.

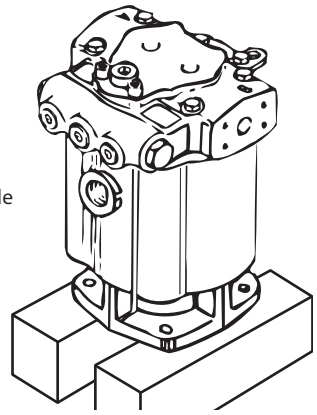
Cleanliness is extremely important when repairing a hydrostatic pump or motor. Work in a clean area, as the level of cleanliness maintained when repairing the unit may affect performance. After washing the parts with clean solvent, blow dry the parts with filtered, moisture free air. Inspect all mating surfaces. Replace all damaged parts. Do not use grit paper, files or grinders on finished parts.

Whenever a unit is disassembled, it is a good service policy to replace all seals. Lubricate the seals with petroleum jelly. Use only clean, recommended oil when assembling the unit. See Hydrostatic Fluid Recommendations on page 28-29 or publication No. 03-401 & 03-405 for recommended fluids.

> ⚠ CAUTION: Disconnect or disable all electrical or mechanical power to the pump before beginning work.

Valve Block/ Integral Shuttle End Cover

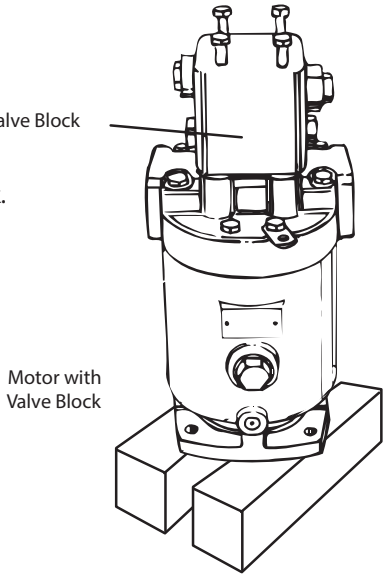
1. There are two types of Series 1 hydrostatic motors. If your motor has an integral shuttle and low pressure relief valve, go to step 14 on page 16. If you have a motor with a valve block, continue with step 2.



Motors with Valve Block Disassembly

2. Position the motor on its mounting flange as shown. Loosen all the relief valves and plugs in the valve block. Remove the four bolts that hold the valve block to the motor. Then remove the valve block.

3. Remove O-rings and back-up rings from mounting face of valve block.



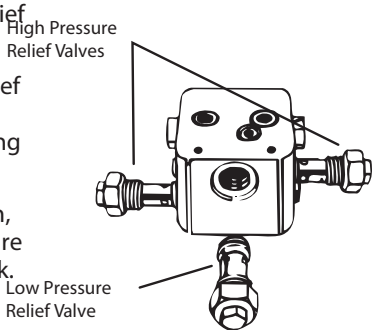
4. Using a 1-3/8 in. hex wrench, remove the low pressure relief valve cartridge.

   Note: The low pressure relief valve doesn't have back-up rings. There is only one O-ring in the lower groove.

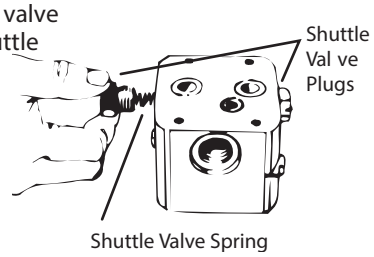
5. Using a 1-3/8 in. hex wrench, remove the two high pressure relief valves from valve block.

   Note: The high pressure relief valves have two white back-up rings and one O-ring in the lower groove.

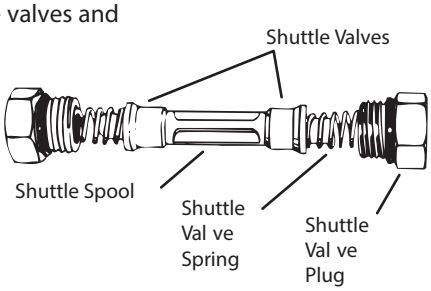
   High and low pressure relief settings are preset at the factory. Stamping on cartridge identifies setting. See examples.



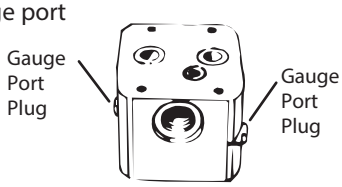
6. Using a 1 in. hex wrench, remove the two shuttle valve plugs. Then remove shuttle valve springs.



7. Remove shuttle valves and shuttle spool.

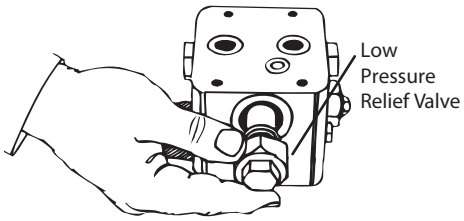


8. Remove the three gauge port plug assemblies.



13. Install low pressure relief valve. Torque valve to 75 lb-ft [100 Nm].

Continue with step 19, page 15.



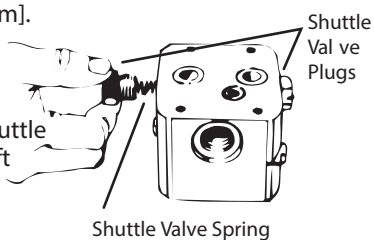
Ta ble 8.0 Torque Specifications – lb-ft [Nm]

WHERE USED	MODEL 33-39-46	MODEL 54-64
Gauge Port Plug Assembly	16 [22]	16 [22]
Shuttle Cap	68 [92]	68 [92]
High Pressure Relief Valve	25 [34]	25 [34]
Low Pressure Relief Valve	75 [100]	75 [100]
End Cover Bolts – Grade 8	39 [53]	63 [85]
Relief Valve (Feathering)	25 [34]	25 [34]
Socket Pipe Plug	16 [22]	16 [22]
Valve Block Mounting Bolts	28 [38]	28 [38]

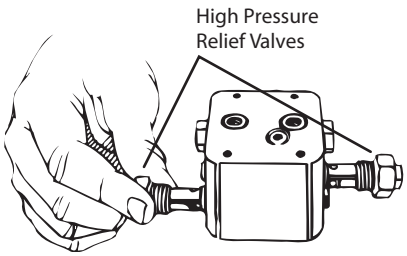
Assembly

Assembly of Valve Block

9. Install the three gauge port plug assemblies. Torque to 16 lb-ft [22Nm].
10. Install shuttle spool and shuttle valves in valve block.
11. Install shuttle valve springs and shuttle valve plugs. Torque plugs to 68 lb-ft [92Nm].



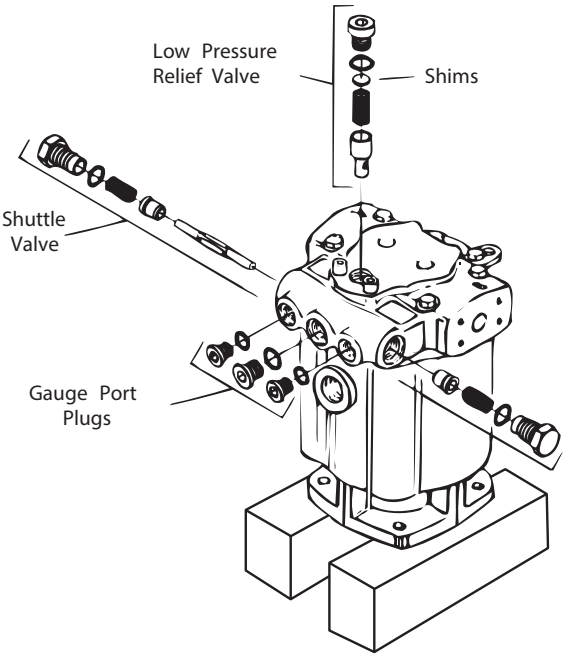
12. Install the two high pressure relief valves. Torque to 25 lb-ft [34 Nm].



Motor with Integral Shuttle and Low Pressure Relief Valve

14. Position the motor on its mounting flange as shown.
15. Using a 1-3/8 in hex wrench, remove the low pressure relief valve.

    Note: Retain the shims, they are used to adjust the relief setting.
16. Using a 1 in. hex wrench, remove the shuttle valve plugs.
17. Remove shuttle valves and shuttle spool.
18. Remove the gauge port plugs.



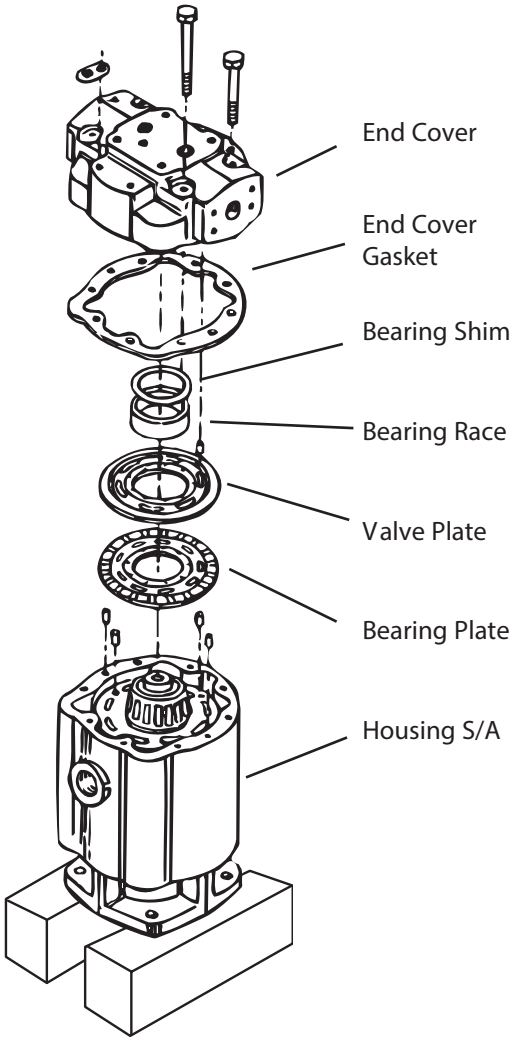
End Cover

The procedure is the same for either end cover.

19. Remove eight hex bolts from end cover.

    Caution: Internal parts are spring loaded. To avoid internal part damage, remove six bolts leaving two bolts opposite each other tight. Gradually and evenly remove the two remaining bolts.
20. Carefully remove end cover, gasket and the two end cover dowel pins.

    Caution: Remove any parts (valve plate, bearing cup, or shims) that may have stuck to the end cover. Be careful not to drop any.
21. Remove rear bearing cup from end cover, using a slight twisting motion. Bearing cup is slip-fit into end cover.
22. Remove and retain rear bearing shims from end cover. Shims are used to adjust shaft bearing end play of motor output shaft.



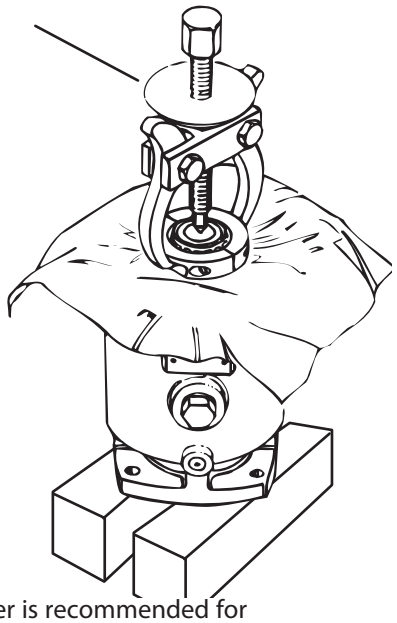
Rotating Group

Use extreme care when handling all close tolerance internal parts of motor. Keep parts clean.

23. Remove end cover gasket and dowel pins from motor housing. Gasket may have remained on end cover during removal.
24. Remove bearing plate and pins from cylinder barrel. If using a small screwdriver to pry bearing plate from cylinder barrel, make sure bearing plate and barrel surfaces are not scratched or damaged.

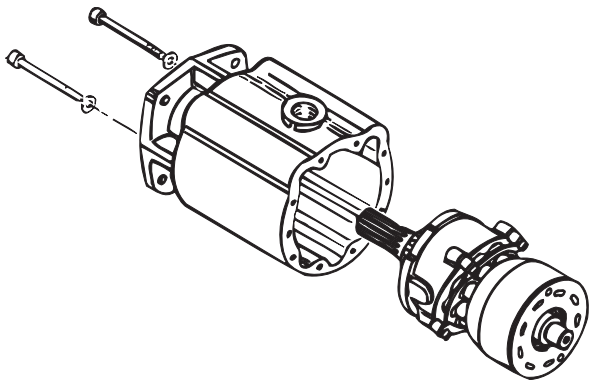
    Important: Handle the bearing plate and valve plates with extreme care. They are lapped to extremely close tolerances for flatness.
25. Install bearing puller and remove bearing from output shaft (refer to Special Tools).

Hub Puller and Low Clearance Bearing Puller (refer to Special Tools)

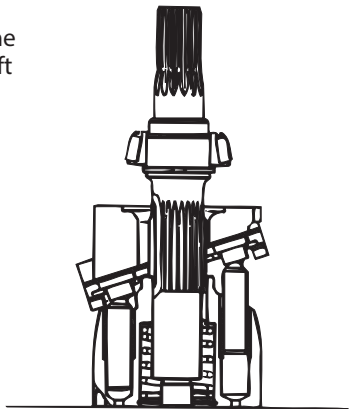


Low clearance bearing puller is recommended for removal of end cover bearing cone. The bearing puller pulls against bearing rollers, not against inner cup. It is designed to prevent bearing cone and cylinder barrel face from being damaged when bearing is removed. Low clearance between end cover bearing and cylinder barrel makes it difficult to use any other type of bearing puller.

26. Carefully reposition motor on its side. Using 1/4 in hex bit socket, remove the two cap screws that hold swashplate in the housing.
27. Remove and discard sealing washers from cap screws. Replace with new sealing washers.
28. Push inward on shaft assembly to dislodge the swashplate from its pocket in housing.
29. Carefully remove output shaft/cylinder barrel assembly from housing.



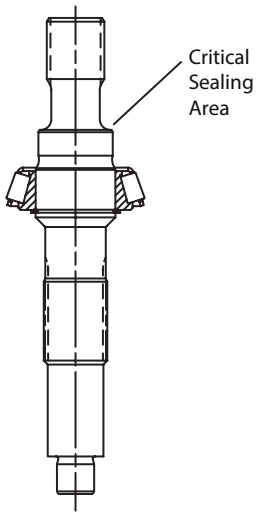
30. Position the shaft/cylinder barrel subassembly with the shaft facing up. Carefully lift out the output drive shaft subassembly.



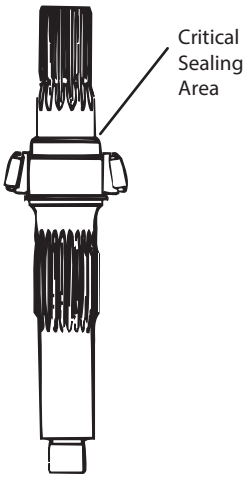
31. When bearing cone must be replaced, use a press to remove cone from shaft subassembly.

    Important: When removing or installing bearing cone, do not damage shaft sealing area (stepped area between bearing journal and output drive shaft splines). This area is critical for sealing the shaft seal.

31.a. You must use special stop limit tool (refer to Special Tools) when installing new cone.

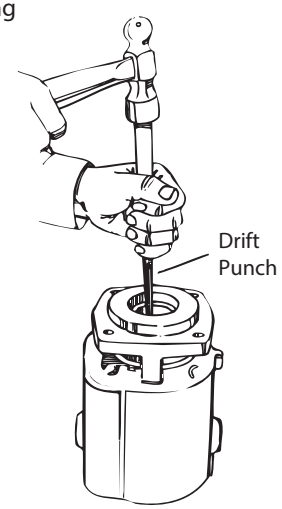


Units Having Lip Seal
(xx33-xxx Part Number
Configuration)



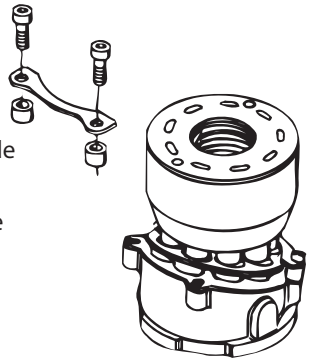
Units Having Face Seal
(xx31-xxx Part Number
Configuration)

32. If bearing cup needs replacing, carefully remove the cup using a hammer and drift punch.



33. Reposition cylinder barrel/swashplate with the swashplate on the bottom. Using a 1/4-inch hex key, remove the cap screws from the retaining strap on one side of the swashplate.

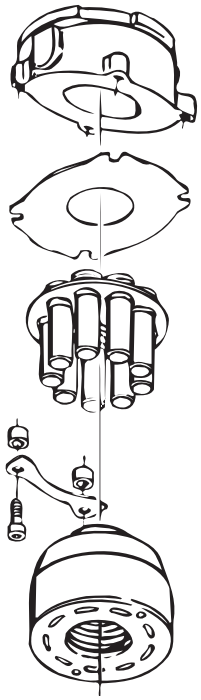
    Loosen the cap screws on the other retaining strap to make it easier to remove cylinder barrel from the swashplate.



34. Carefully reposition cylinder barrel/swashplate with swashplate facing up. Remove the swashplate by lifting slightly and sliding it over to disengage from the retaining strap.

35. Remove cap screws, retaining strap, spacers and thrust plate from swashplate.

36. Disassemble cylinder barrel subassembly. Place it on a clean protective surface for inspection and cleaning.

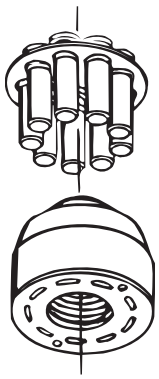


Rotating Group

Before reassembly, clean all parts and assemblies in clean solvent and blow them dry with compressed air. Inspect and replace all scratched or damaged parts. When reworking parts. Do not use coarse grit paper, files or grinders on any finished surfaces. Replace all gaskets and O-rings.

Lubricate O-rings with petroleum jelly for retention during reassembly. Freely lubricate all bearings and finished part surfaces with clean hydraulic fluid. This will provide required start-up lubrication for moving parts.

1. Lubricate and install shoe retainer plate and piston shoes in cylinder barrel subassembly. After installation, freely lubricate brass shoe faces with clean hydraulic fluid.



Check Fixed Clearance

2. Before assembling motor any further, you must check the fixed clearance of motor.

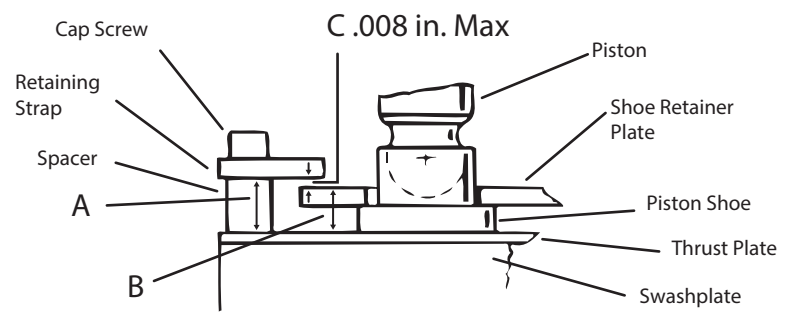
   Measure the height of retaining strap spacer with a micrometer or vernier calipers.

   There are two fixed spacer heights – one for the 33, 39, 46 units and one for the 54, 64 units. Spacers are critical to the unit design and may not be interchanged.

3. Measure combined thickness of both piston shoe flange and shoe retainer plate. Subtracting this measurement from spacer height gives fixed clearance of unit.

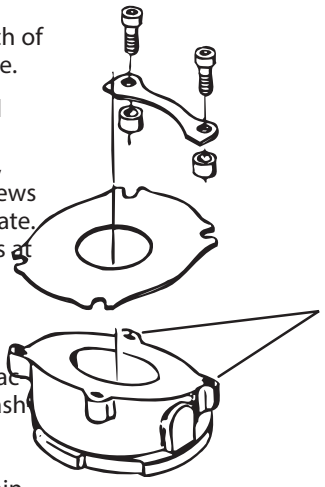
4. Fixed clearance must not exceed .008 inches [,20 mm]. If fixed clearance exceeds .009 inches [,02 mm], replace worn parts, (i.e., piston shoe subassemblies, thrust plate, retaining strap and/or shoe retainer plate).

Note: An alternate method of checking fixed clearance is with the use of a feeler gauge. If using this method, make sure gauge is inserted between retaining strap and shoe retainer plate only. Piston shoe faces could be damaged if gauge is inserted between piston shoe and thrust plate.



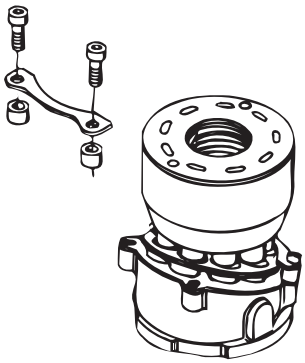
A (Spacer Height) – B (Shoe Flange + Retainer Plate) = C (Fixed Clearance .008 Max)

3. Apply one or two drops of Loctite® No. 271 in first or second thread down in each of the four holes in swashplate.
4. Lightly lubricate and install thrust plate, aligning cap screw holes. Install spacers, retaining strap and cap screws on one side of the swashplate. DO NOT tighten cap screws at this time.
5. Place cylinder barrel Subassembly on clean, flat surface with piston shoes facing up. Carefully install swashplate on cylinder barrel by slightly lifting the side without retaining strap. Slide swashplate over to engage installed retaining strap around piston retainer.

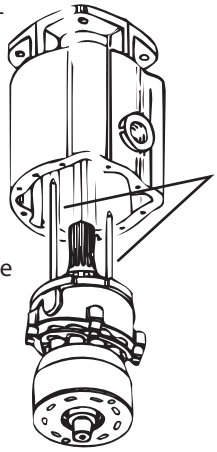


Loctite parts must contact only those surfaces intended for assembly. Wipe excess Loctite from swashplate with non-petroleum base solvent applied to cloth. Do not apply Loctite to threads more than 15 minutes before installing cap screws. If Loctite stands for more that 15 minutes, repeat application. If repeating application, it is not necessary to remove previously applied Loctite.

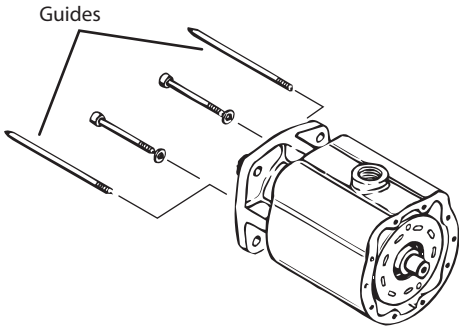
6. Carefully reposition cylinder barrel/swashplate with the swashplate down. Install the remaining spacers, retaining strap and cap screws. Tighten all four cap screws 16-19 lb-ft [22 to 26 Nm].



7. Carefully reposition cylinder barrel/swashplate with cylinder barrel face on a clean, flat surface. Lubricate and install output drive shaft subassembly into cylinder barrel subassembly.
8. Install two headless 5/16 inch cap screws, five to six inches long, in swashplate to use as guides (refer to Special Tools).
9. Aligning pin in housing with notch in swashplate, carefully slide housing over output drive shaft/swashplate/cylinder barrel subassembly.



10. Holding cylinder barrel subassembly carefully in position in housing, reposition motor on its side. Remove headless cap screws used as guides.
11. Install new sealing washers on the two swashplate cap screws. Install the cap screws in swashplate. Tighten to 20 to 24 lb-ft [27 to 33 Nm].

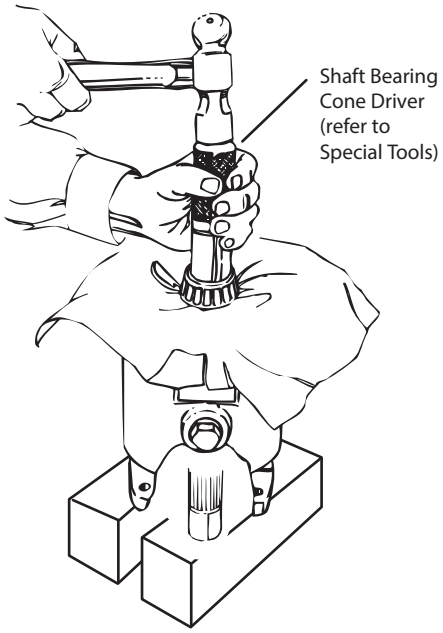


⚠ CAUTION

12. Carefully reposition and support motor on mounting flange. Support output shaft in a slightly raised position.

    Using a press or bearing cone driver (refer to Special Tools), install end cover bearing cone on output shaft.

    Bearing cone must seat against shoulder of output shaft.



End Cover

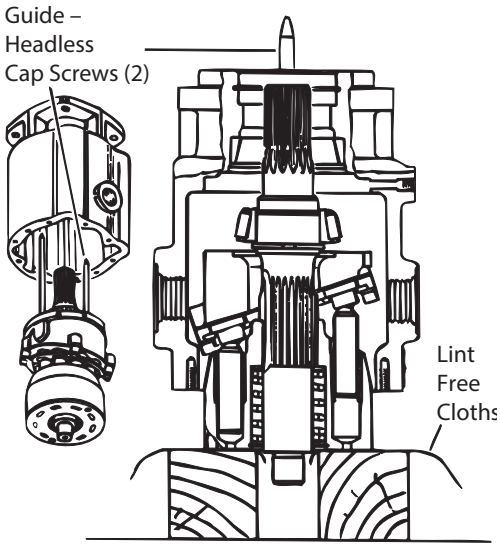
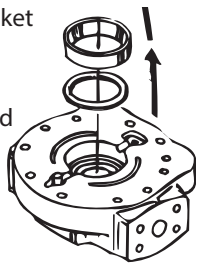
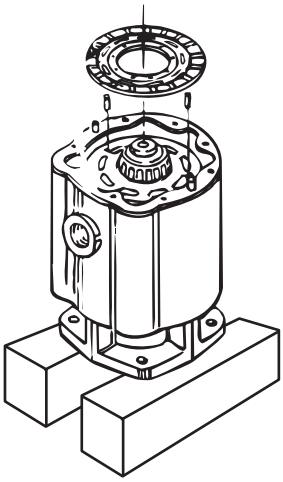


Figure 23

13. Install two dowel pins and gasket on end cover.
14. Lubricate and install bearing shims and bearing cup into end cover.



16. After adjusting end play, reposition motor on mounting flange and remove end cover.
17. Install two dowel pins in face of cylinder barrel subassembly. Freely lubricate bearing plate with dowel pins and install it on cylinder barrel subassembly.



Check Output Shaft End Play

15. You must check the end play of the output drive shaft subassembly.

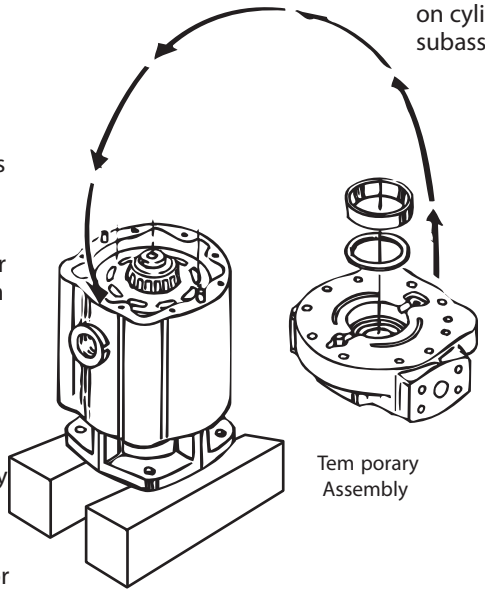
    Install the end cover without installing either valve or bearing plates. This eliminates spring tension against the output shaft.

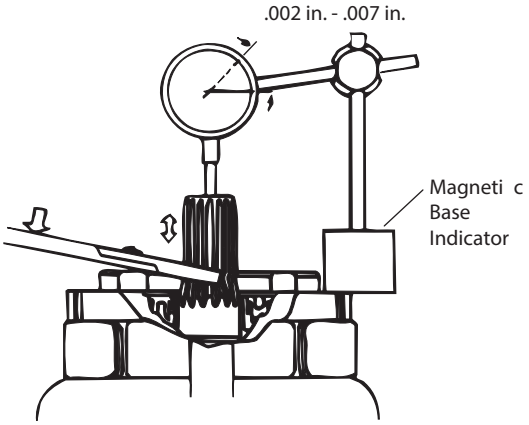
    Install cap screws in end cover and slowly and evenly tighten them. On models 33/39/46 torque cap screws to 39 lb-ft [53 Nm]. On models 54/64, torque to 63 lb-ft [85 Nm].

    Place and support motor assembly on end cover. Gently tap output shaft inward with hammer.

    Install magnetic base indicator on mounting flange with gauge on output shaft end. Use pliers to grip output shaft as low as possible. Pry upward to determine shaft end play. Indicator must read .002 to .007 inches [,05 to ,17 mm] shaft end play.

    If end play is incorrect, adjust by adding or removing shims under bearing cup located in end cover.





Shaft Seal Installation

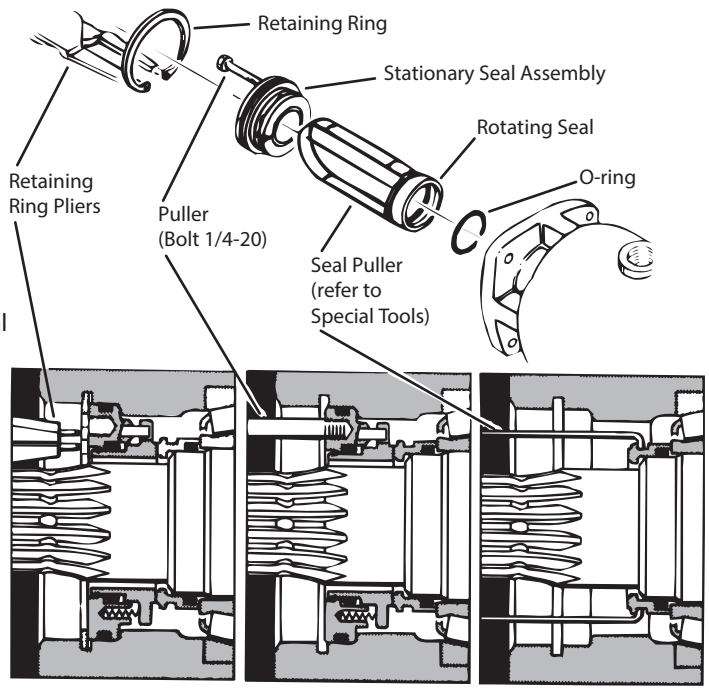
For best sealing results, clean the metal-to-metal seal surfaces. The cleaner must evaporate and not leave any residue, and must be compatible with Viton.

Do not touch these surfaces. Coat with clean, filtered oil before reassembly.

Note: There are two types of shaft seals. Depending on the date of manufacture, either type of seal may have been used. A unit MUST be serviced with the same type of seal as was originally installed. The seals are not interchangeable.

Units Having Face Seal (xx31-xxx Part Number Configuration)

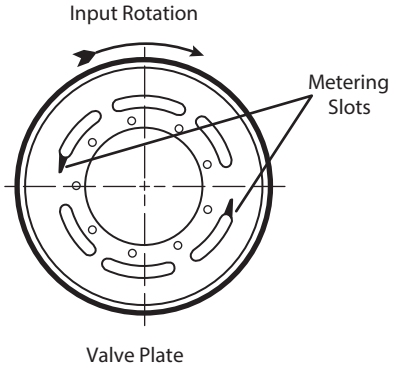
22. Reinstall the shaft seal following the procedure for your type of seal.
    a. Lubricate O-ring seal of rotating seal. Then install rotating seal with seal puller. Ensure rotating seal O-ring is placed inside the rotating seal before assembly onto the output drive shaft.
    b. Lubricate O-ring seal of stationary seal subassembly. Then install stationary seal subassembly.
    c. Using a No. 5 or No. 7 retaining ring pliers, install retaining ring (beveled side of ring out).

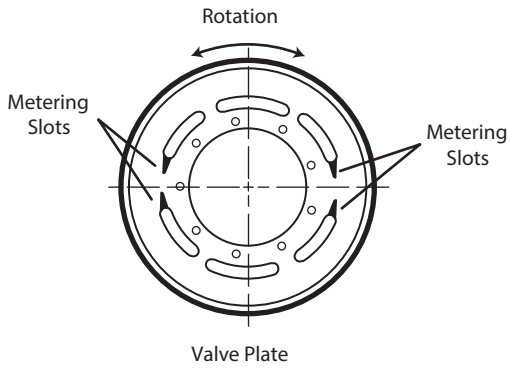


If you have a motor with a face seal, use the following procedure. If you have a motor with a lip seal, use the procedure on page 24.

Pump valve plates are all uni-directional and motor valve plates are bi-directional. The pump valve plate is identified by two metering slots and rotates clockwise. The motor valve plate has four metering slots and is bi-directional. Pump and motor valve plates are not interchangeable.

Note: Use extreme care when handling all close tolerance internal parts of motor. Keep parts clean.

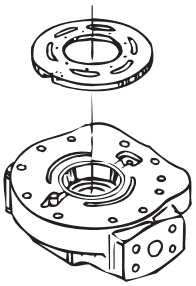


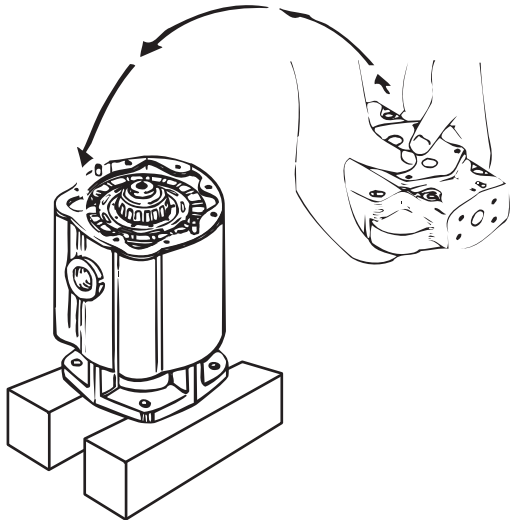


18. Install valve plate dowel pin in the face of end cover.
19. Using petroleum jelly, lightly coat side of valve plate facing the end cover to hold valve plate during assembly. Install valve plate over bearing cup, aligning it with dowel pin. Valve parts must rest flat and be flush with end cover.
20. Holding the valve plate firmly in position, install end cover on housing.
21. Install cap screws in end cover. Tighten them slowly and evenly.

    Torque the cap screws in a star pattern. Models 33/39/46 should be torqued to 39 lb-ft [53 Nm]. Models 54/64 should be torqued to 63 lb-ft [85 Nm].

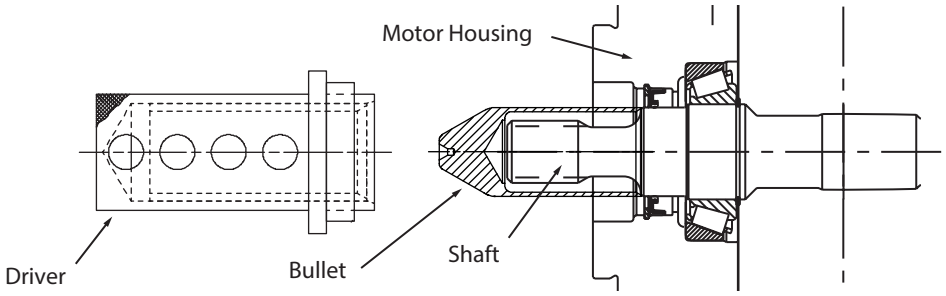
    Torque each screw a second time to compensate for gasket compression set.





Units Having Lip Seal (xx33-xxx Part Number Configuration)

Note: Lip seal kits come with a shaft seal, retaining ring, and spacer. The spacer is only required for units that have extensive use in the field. The spacer puts the seal in a new location on the shaft sealing area. If using the spacer, install the spacer between the shaft seal and the retaining ring in step f.



Ensure the shaft sealing surface and housing seal bore are clean and free of all dirt and debris to avoid introducing any contaminants into unit.

1. Grease the inside surface of seal that contacts shaft.
2. Select correct bullet and driver. Bullet and drive shaft chamfer must align with each other leaving no gap between the bullet and shaft. Bullet should pilot on shaft diameter so bullet cannot shift side to side, allowing step between bullet and shaft seal diameter.
3. Press the new, greased shaft seal over a shaft bullet. Closed face of the shaft seal faces the closed end of the bullet.
4. With the shaft seal on the bullet, insert bullet over drive shaft and into the seal pocket. Take care to ensure seal is properly aligned with housing bore as seal is pressed in to minimize chance of damaging seal.
5. Using the driver and a mallet, push the seal until the tool bottoms on the pilot of flange.
6. Remove the tool and insert the retaining ring into the seal pocket. A spacer is required, whenever there is a significant groove in the shaft from the seal. (A maximum of two spacers may be used before the shaft must be replaced), place it between the shaft seal and the retaining ring.
7. Using the tool and mallet, drive the seal, spacer(as required if using, and retaining ring in until the retaining ring snaps into place in the groove.

Valve Block/ Integral Valves

If your motor has an integral shuttle and low pressure relief valve, go to step 25.

If you have a motor with a valve block, continue with step 23.

Motor with Valve Block

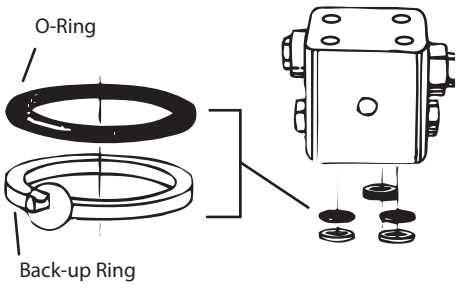
23. Install O-rings and back-up rings on valve block.

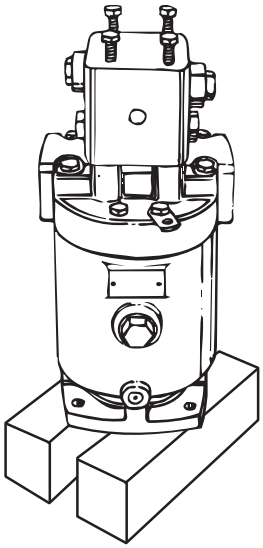
    The high pressure ports require an O-ring and back-up ring. The O-ring goes on first, then the back-up ring. The curved side of ring goes toward the O-ring.

    Install square-cut ring in low pressure drain port of valve block.

    Note: Be careful not to damage O-rings and back-up rings. Use clean petroleum jelly to hold O-rings and back-up rings in place during block installation.

24. Position valve block on end cover. Install four hex bolts. Torque bolts 28 lb-ft [38 Nm].





Motor with Integral Shuttle and Low Pressure Relief Valve

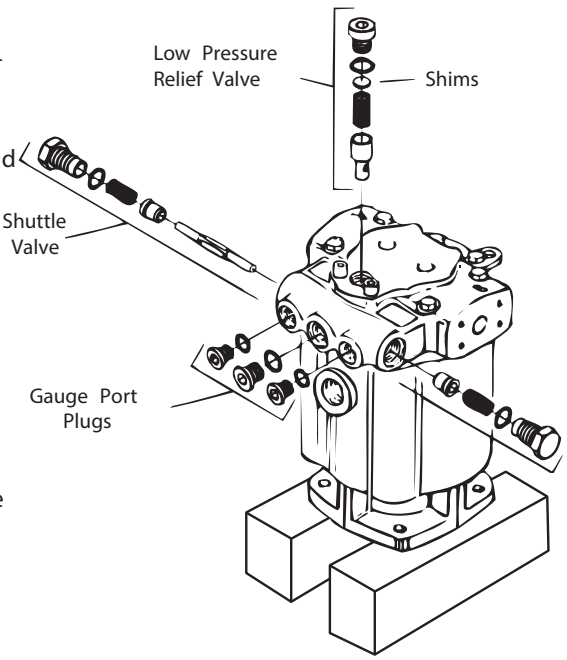
25. Install two outer gauge port plug assemblies.
    Torque to 25 - 31 lb-ft [18 - 23 Nm].

    Install center gauge port plug assembly.
    Torque to 40 - 48 lb-ft [30 - 35 Nm].

26. Lubricate and install shuttle spool and shuttle valves. The smaller ends face the center of the spool.

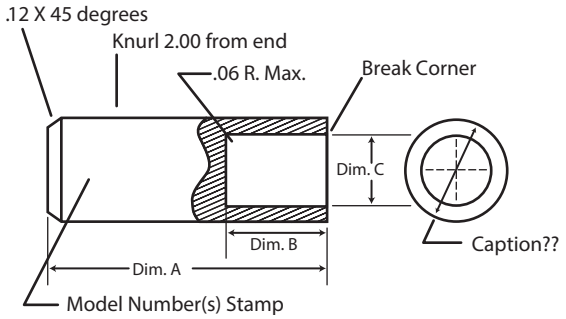
27. Install the shuttle valve springs and plugs.
    Torque to 68 - 82 lb-ft [50 - 60 Nm].

28. Install the low pressure relief valve plunger and spring. Lubricate and insert the shims in the relief valve plug. Install the plug over the spring, making sure the shims are not dislodged. Screw the plug in and torque to 68 - 82 lb-ft [50 - 60 Nm].



Special Tools

Bearing Cone Driver (End Cover end)



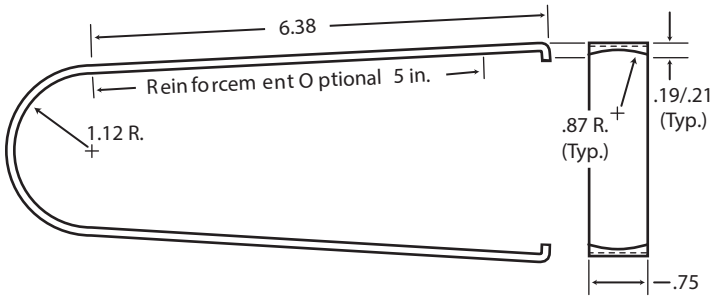
Dimensions

MODEL	A	B	C	D
33/39/46	4.0	1.5*	1.01	1.25
54/64	4.0	1.5*	1.30	1.48

*1.5 in. from shaft with splined drive for B pad Charge Pump

Material: C.R.S., Hardern to Rc 50-55

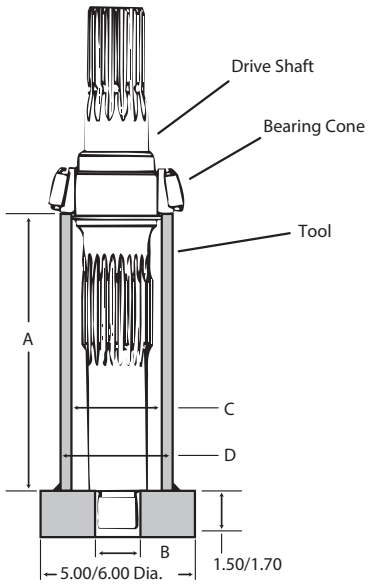
Rotating Seal Puller



Available from Owatonna Tool Co. No. CAS - 1844

Material: SAE 1074 Spring Steel 16 Ga. x .75 Wide

Limit Stop for Bearing Cone Installation



Dimensions

MODEL	A	B	C	D
33/39/46	5.803	1.00/1.20	2.20/2.30	3.00 Min.
54/64	6.682	1.30/1.32	2.20/2.30	3.00 Min.

Material: Steel

Headless Cap Screw



5/16 - 18 UNC Cap Screw – 2 Required
Remove head and grind end into cone

Torque Specifications – lb-ft [Nm]

WHERE USED	MODEL 33-39-46	MODEL 54-64
End Cover Bolts – Grade 8	39 [53]	63 [85]
Relief Valve (Low Press.)	75 [100]	75 [100]
Relief Valve (High Press.)	25 [34]	25 [34]
Shuttle Cap	68 [92]	68 [92]
Socket Pipe Plug	16 [22]	16 [22]
Valve Block Mounting Bolts	28 [38]	28 [38]

Shaft Seal Installation Tools

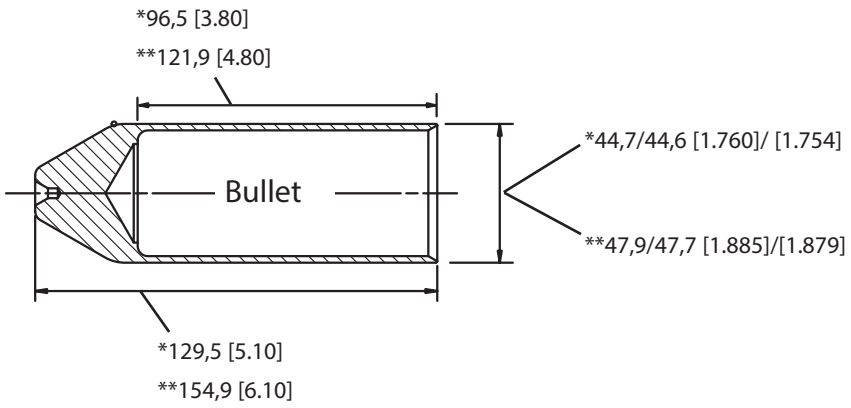
Bullet/Driver Selection

Each seal requires use of a specific bullet and driver. Check measurements and/or part numbers of bullet and driver to determine the correct bullet and driver to use for your unit.

Measurements are expressed in standard mm[Inch].

*(units using seal 108395-000)

**(units using seal 110192-000)

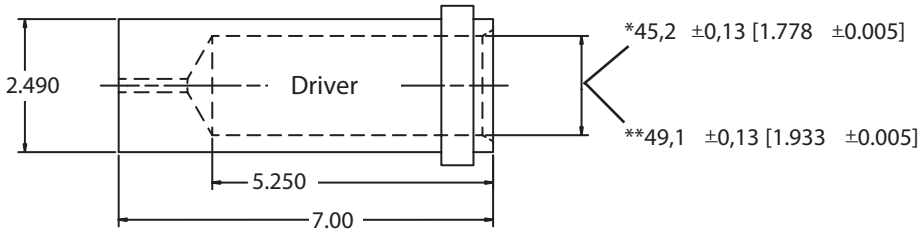


Units using seal 108395-000

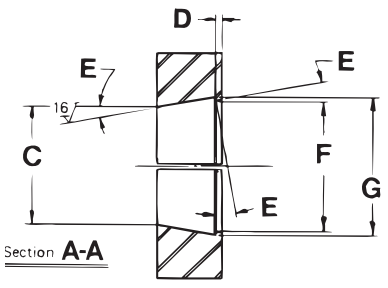
SEAL ID	BULLET	DRIVER
1.750	4994026-001	4994028-001

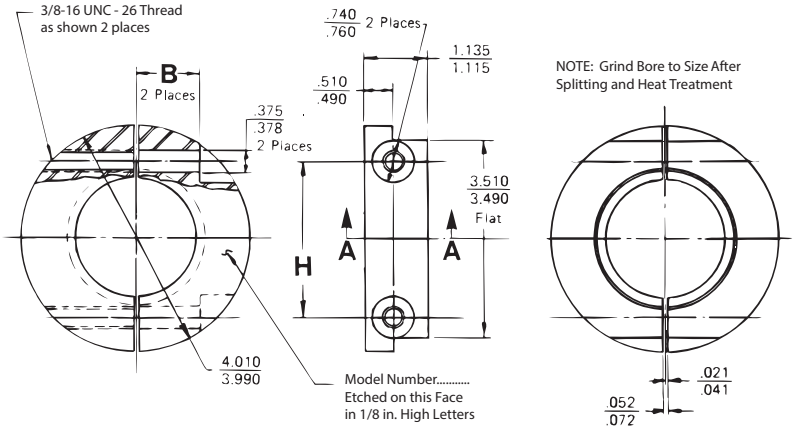
Units using seal 110192-000

SEAL ID	BULLET	DRIVER
1.875	4994027-001	4994028-002



Low Clearance Bearing Cone Puller





Dimensions

MODEL	PART NO.	B	C	Ø Ref	D	E	F Ø	G Ø
33/39/46	990469-001	1.060 1.010	1.565	.132 .003	13°0'±0°-15'	1.910 ±.003	2.023 ±.003
54/64	990469-002	1.250 1.210	2.071	.128 .003	10°0'±0°-15'	2.313 ±.003	2.435 ±.003
54/64	990469-003	1.250 1.210	1.603	.138 .003	20°0'±0°-15'	2.226 ±.003	2.321 ±.003

Material: Stentor 45 - 55 R $_C$ Heat Treat

Hydraulic Fluid Recommendations

Introduction

The ability of Danfoss hydrostatic components to provide the desired performance and life expectancy depends largely on the fluid used. One of the most important characteristics to consider when choosing a fluid to be used in a hydraulic system is viscosity. Viscosity choice is always a compromise; the fluid must be thin enough to flow easily but thick enough to seal and maintain a lubricating film between bearing and sealing surfaces. Viscosity requirements are specified later in this document.

Vi scosity and Temperature

Fluid temperature affects viscosity. In general, as the fluid warms it gets thinner and viscosity decreases. The opposite is true when fluid cools.

When choosing a fluid, consider the start-up and operating temperatures of the hydrostatic system. Generally, the fluid is thick when the hydraulic system is started. With movement, the fluid warms to a point where the cooling system begins to operate. From then on, the fluid is maintained at the temperature for which the hydrostatic system was designed.

In actual applications this sequence varies; hydrostatic systems are used in many environments from very cold to very hot. Cooling systems also vary from very elaborate to very simple, so ambient temperature may affect operating temperature

Cleanliness

Cleanliness of the fluid is extremely important. Danfoss recommends that the fluid used in its hydrostatic components be maintained at ISO Cleanliness Code 18/13 per SAE J1165. The code allows a maximum of 2500 particles per milliliter greater than 5µm and a maximum of 80 particles per milliliter greater than 15µm. When components with different cleanliness requirements are used in the same system, the cleanest standard should be applied.
A reputable filter supplier can supply filter information.

Fluid Maintenance

Maintaining correct fluid viscosity and cleanliness level is essential for all hydrostatic systems. Field testing and monitoring are the only ways to get accurate measurements of system cleanliness. Test and establish fluid maintenance schedules designed to meet the viscosity and cleanliness requirements.

Fluid Selection

Premium grade petroleum based hydraulic fluids will provide the best performance. These fluids typically contain additives that are beneficial. Danfoss recommends fluids that contain anti-wear agents, rust inhibitors, anti-foaming agents, and oxidation inhibitors. Premium grade petroleum-based hydraulic fluids carry an ISO VG rating.

SAE grade crankcase oils may be used, but it should be noted that these oils may not contain all of the recommended additives. Using crankcase oils may increase fluid maintenance requirements.

Hydraulic fluids that contain V.I. (viscosity index) improvers, sometimes called multi-viscosity oils, may be used. These V.I.-improved fluids are known to “shear-down” with use. Their actual viscosity drops below the rated value. Fluid maintenance must be increased if V.I.-improved fluids are used. Automotive automatic transmission fluids contain V.I. improvers.

Synthetic fluids may be used. A reputable fluid supplier can provide information on synthetic fluids.
Review applications that require the use of synthetic fluids with your Danfoss representative.

Hydraulic Fluid Recommendations

Viscosity/Cleanliness Guidelines

MINIMUM	OPTIMUM RANGE	ISO CLEANLINESS MAXIMUM	REQUIREMENTS
10cSt [60 SUS]	16 - 39 cSt [80 - 180 SUS]	2158 cSt [10,000 SUS]	18/13

Additional Notes:

- Fluids too thick to flow in cold weather start-ups will cause pump cavitation and possible damage. Motor cavitation is not a problem during cold start-ups. Thick oil can cause high case pressures which in turn cause shaft seal problems.
- If the color of the fluid has become black, it is possible an overheating problem exists.
- If the fluid becomes milky, water contamination may be a problem.
- Take fluid level reading when the system is cold.
- Contact your Danfoss representative if you have specific questions about the fluid requirements.

RATING WITH BIODEGRADABLE OIL	COMMENTS
80% of normal pressure rating listed for mineral oils.	82° C (180° F) max fluid temp (unit) 71° C (160° F) max fluid temp (reservoir)

Biodegradable Oil (Vegetable) Guidelines

Additional Notes:

- Viscosity and ISO cleanliness requirements must be maintained as outlined.
- Based on limited product testing to date, no reduction in unit life is expected when operating at the pressure ratings indicated above.
- Vegetable oil is miscible with mineral oil. However, only the vegetable oil content is biodegradable. Systems being converted from mineral oil to vegetable oil should be repeatedly flushed with vegetable oil to ensure 100% biodegradability.
- Specific vegetable oil products may provide normal unit life when operating at pressure ratings higher than those indicated above.

Note:

A reputable supplier can help you make the best selection of hydraulic fluid for use in Danfoss hydrostatic products.For satisfactory operation, the following recommendations apply:

- The filter system used in the hydraulic circuit must be capable of maintaining the fluid at ISO Cleanliness Code 18/13 per SAE J1165. This code allows a maximum of 2500 particles per milliliter greater than 5µm and a maximum of 80 particles per milliliter greater than 15µm.
- At normal operating temperatures, optimum viscosity ranges are from 80–180 SUS [16–39 cSt]. Viscosity should never fall below 60 SUS [10cSt] and, at the lowest expected startup temperature, should not exceed 10,000 SUS [2158 cSt].
- The fluid should contain anti-wear agents, rust inhibitors, and anti-foaming agents.

Note: If the fluid becomes black or milky, an overheating or water contamination problem exists. Take fluid level readings when the fluid is cold.

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