Parker Hydraulics

Bulletin PM1626-11-M1/USA

Parker Pumps Parts & Service

Effective: Febuary, 2001
Supersedes: July, 1999

PVP Series Variable Volume Piston Pump Service Bulletin

Model
PVP60**** 11
PVP76**** 11

⚠ WARNING

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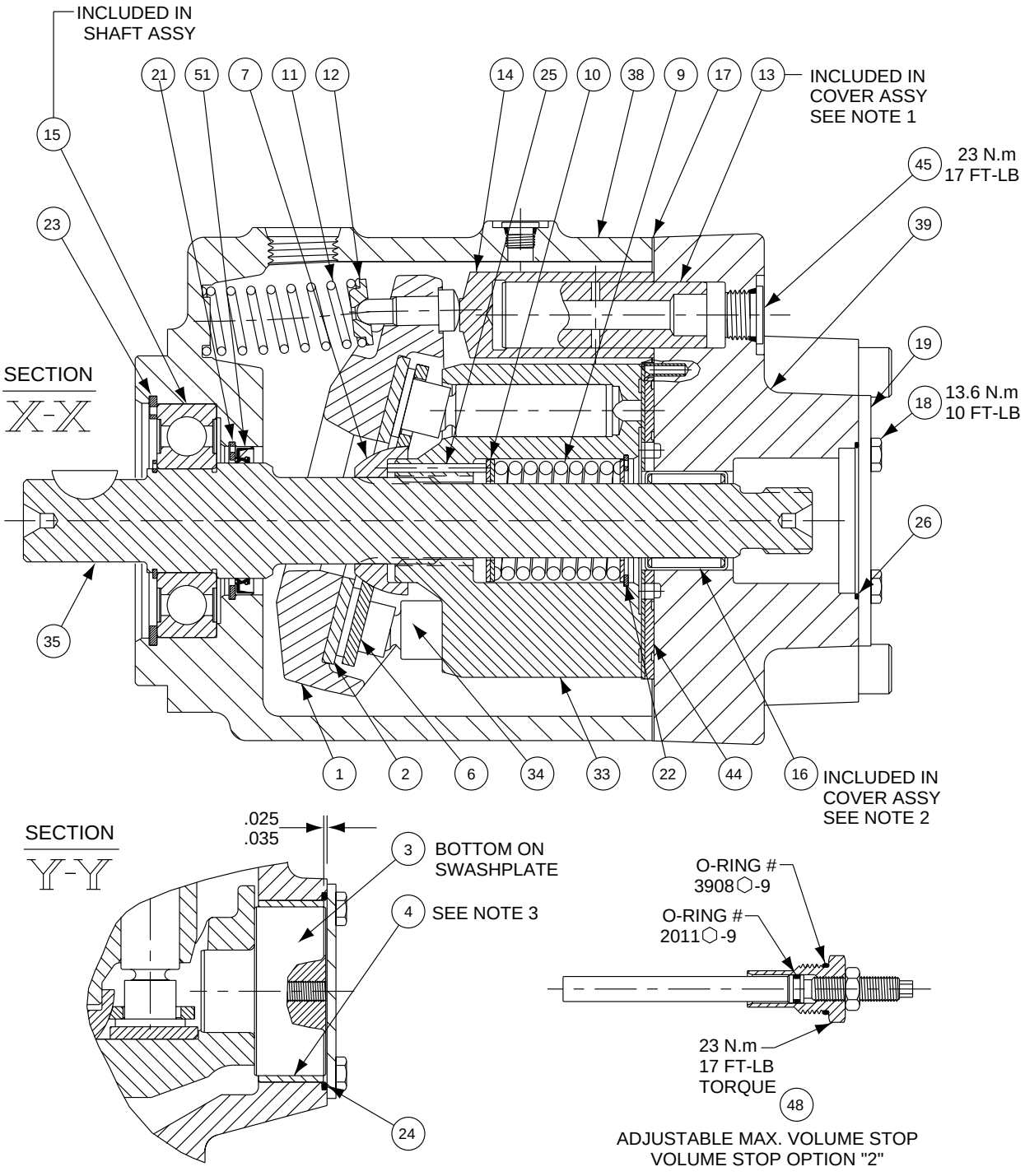
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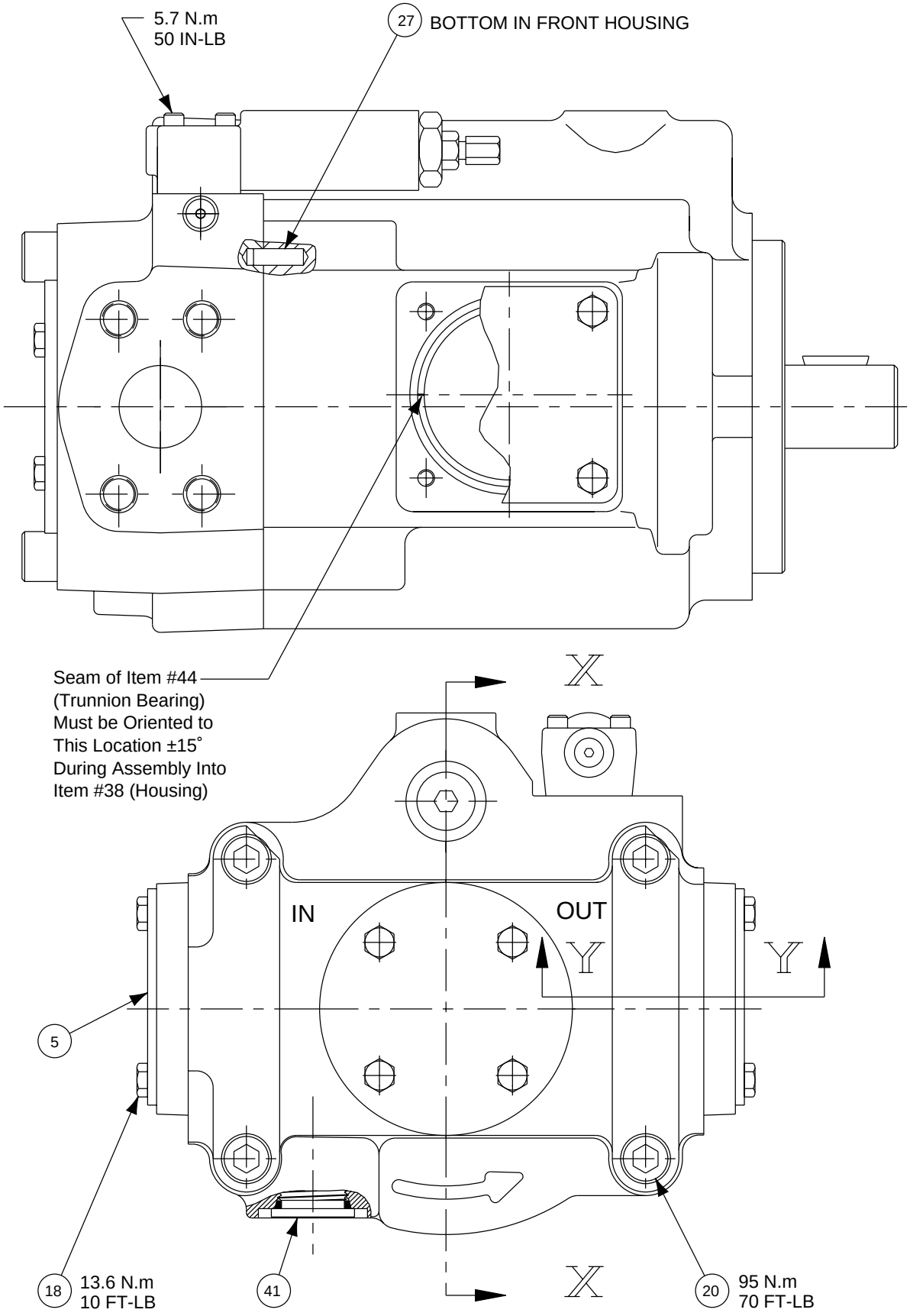
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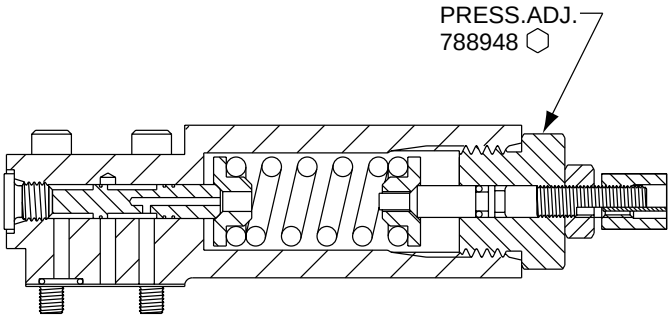
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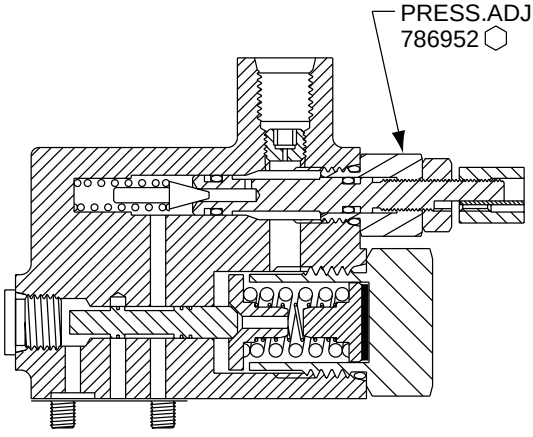
NOTE:

1. INSTALLED HT OF ITEM 13 (SERVO POST) ABOVE ITEM 39 (REAR COVER) TO BE 58.54/58.29 mm (2.305/2.295").
2. INSTALLED HT OF ITEM 16 (NEEDLE BRG) ABOVE ITEM 39 (REAR COVER) TO BE 3.30/3.81 mm (.130/.150").
3. INSTALL ITEM 4 (BUSHING) .63/.89 mm (.025/.035") BELOW HOUSING TRUNNION BOSS.
4. PUMPS SHOWN ARE RIGHT HAND (CW) ROTATION. LEFT HAND ROTATION PUMPS HAVE PRESSURE, SUCTION & COVER DRAIN PORT REVERSED. COMPENSATOR IS ALSO ON OPPOSITE SIDE.

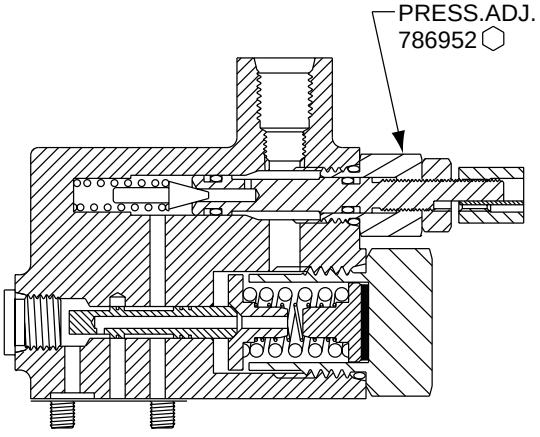

5.7 N.m
50 IN-LB
27
BOTTOM IN FRONT HOUSING
Seam of Item #44
(Trunnion Bearing)
Must be Oriented to
This Location ±15°
During Assembly Into
Item #38 (Housing)
X
IN
OUT
Y
Y
5
18
13.6 N.m
10 FT-LB
41
X
20
95 N.m
70 FT-LB



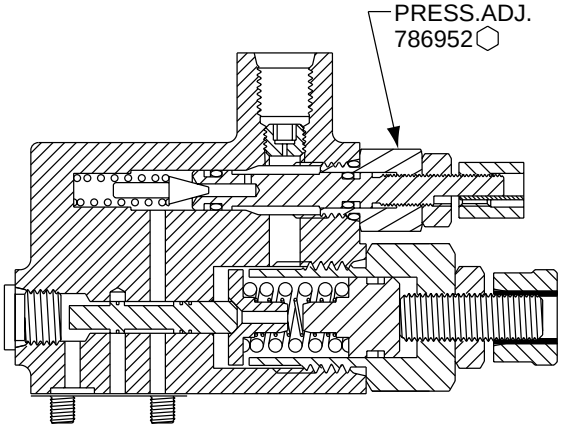
"OMIT" COMPENSATOR (STANDARD)
ITEM 54



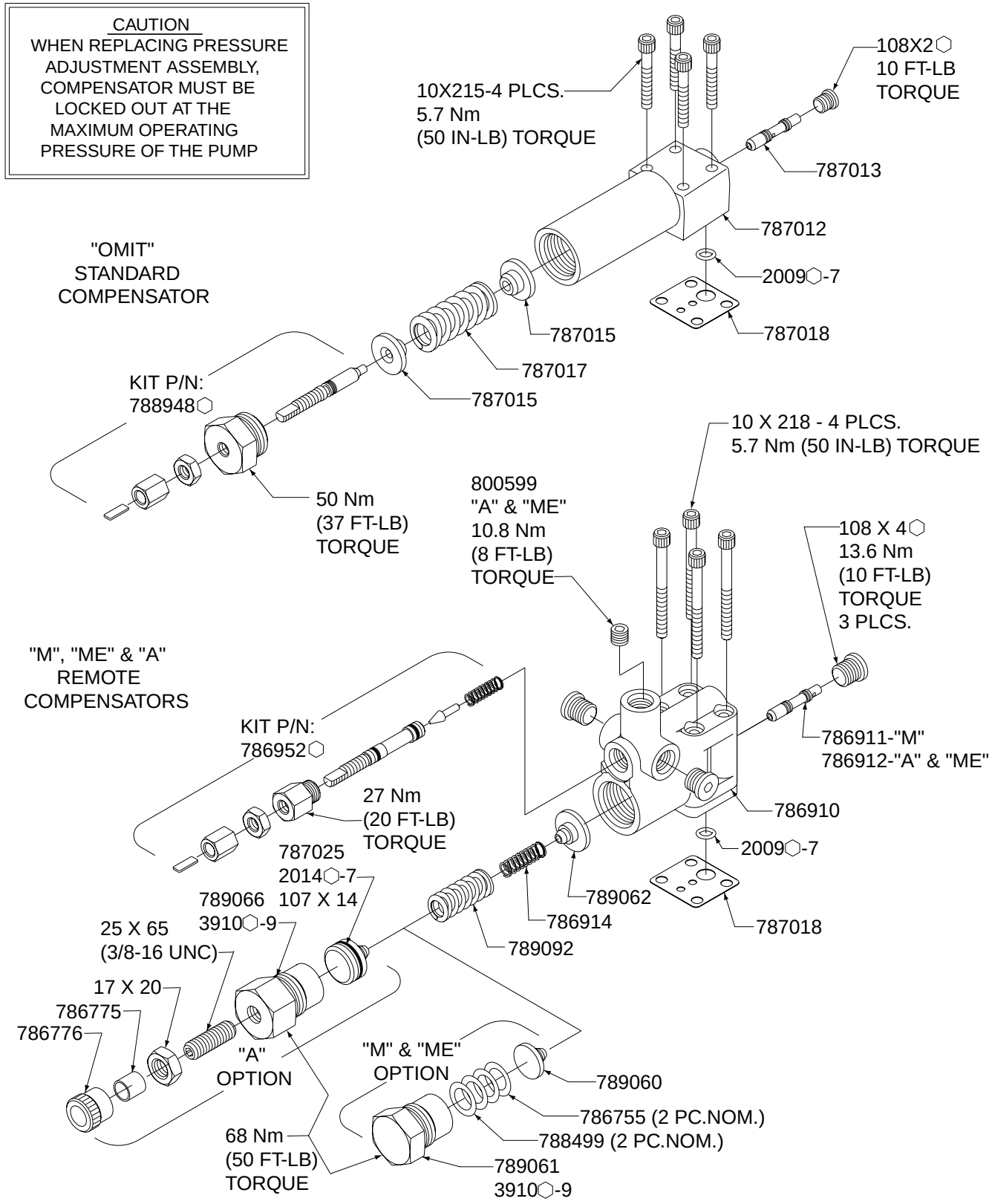
"ME" COMPENSATOR
(REMOTE W/EXTERNAL SENSE)
ITEM 56



REMOTE CONTROL OPTION "M"
REQUIRED W/POWER OPTION "HLM"
ITEM 55



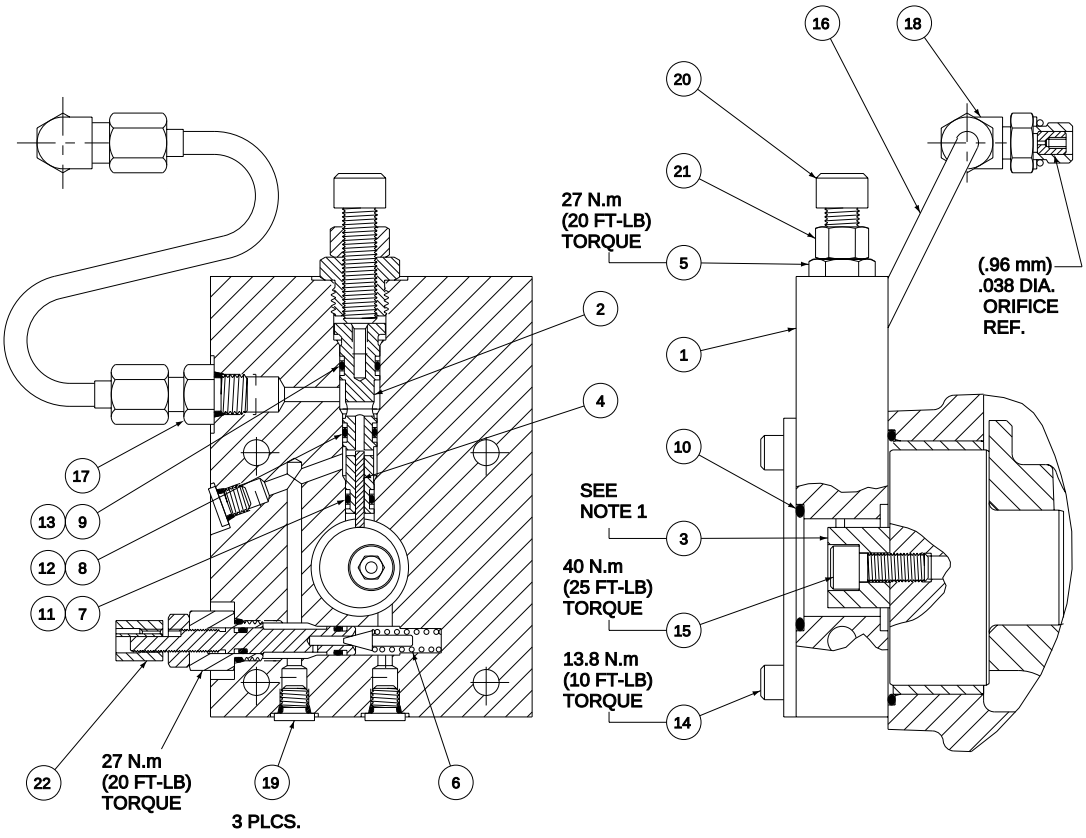
LOAD SENSE OPTION "A"
REQUIRED W/POWER OPTION "HLA"
ITEM 57


CAUTION
WHEN REPLACING PRESSURE ADJUSTMENT ASSEMBLY, COMPENSATOR MUST BE LOCKED OUT AT THE MAXIMUM OPERATING PRESSURE OF THE PUMP
10X215-4 PLCS.
5.7 Nm
(50 IN-LB) TORQUE
108X2⬡
10 FT-LB
TORQUE
787013
787012
2009⬡-7
787018
"OMIT"
STANDARD
COMPENSATOR
787015
787017
787015
KIT P/N:
788948⬡
50 Nm
(37 FT-LB)
TORQUE
10 X 218 - 4 PLCS.
5.7 Nm (50 IN-LB) TORQUE
800599
"A" & "ME"
10.8 Nm
(8 FT-LB)
TORQUE
108 X 4⬡
13.6 Nm
(10 FT-LB)
TORQUE
3 PLCS.
"M", "ME" & "A"
REMOTE
COMPENSATORS
KIT P/N:
786952⬡
27 Nm
(20 FT-LB)
TORQUE
786911-"M"
786912-"A" & "ME"
786910
2009⬡-7
787018
787025
2014⬡-7
107 X 14
789066
3910⬡-9
789062
786914
789092
25 X 65
(3/8-16 UNC)
17 X 20
786775
786776
"A"
OPTION
"M" & "ME"
OPTION
789060
786755 (2 PC.NOM.)
788499 (2 PC.NOM.)
68 Nm
(50 FT-LB)
TORQUE
789061
3910⬡-9

P/N: 788489⬡-COMPLETE HI-LO ASSEMBLY

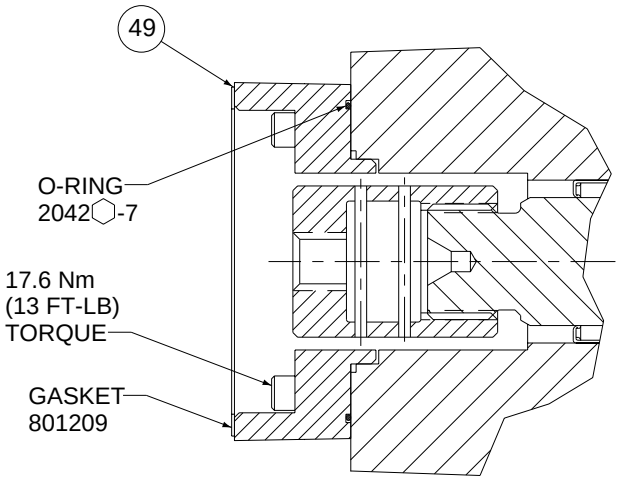
ITEM	PART NUMBER	QTY	DESCRIPTION
1	788328	1	HI-LO BODY
2	788713	1	HI-LO SLEEVE
3	787822	1	HP CONTROL CAM
4	787975	1	HI-LO SPOOL
5	787977	1	HI-LOW SLEEVE RET.
6	785170	1	SPRING
7	2008⬡-7	1	O-RING
8	2010⬡-7	1	O-RING
9	2011⬡-7	1	O-RING
10	2123⬡-7	1	O-RING
11	107X8	2	BACK-UP RING

ITEM	PART NUMBER	QTY	DESCRIPTION
12	107 X 10	2	BACK-UP RING
13	107 X 11	2	BACK-UP RING
14	10 X 227	4	1/4-20 X 1.5 CAP SCREW
15	787836	1	BOLT-SPECIAL
16	788479	1	TUBING ASSEMBLY
17	4F50X-S⬡	1	STRAIGHT CONNECTOR
18	787523⬡	1	ORIFICE FITTING
19	108 X 2⬡	3	-2 PLUG W/O-RING
20	10 X 89	1	3/8-24 X 1.25 CAP SCREW
21	16 X 42	1	JAM NUT
22	788947⬡	1	PRESS. ADJUST. KIT



NOTE:

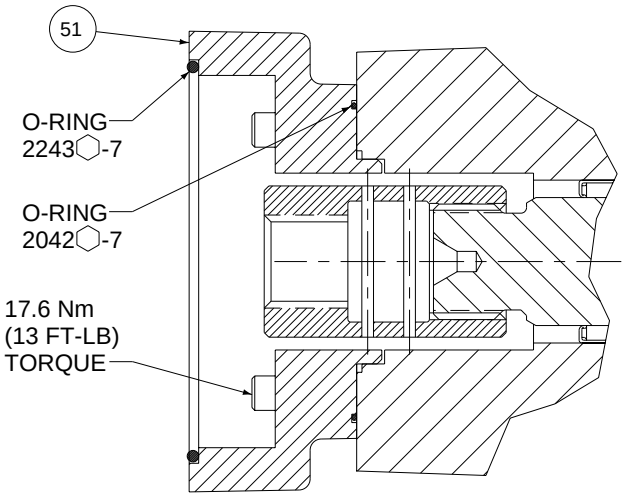
1. WITH THE PUMP AT FULL STROKE, INSTALL THE CAM (ITEM 3) CONCENTRIC WITH THE HOLE IN THE HI-LO BODY.
2. FOR PROPER OPERATION OF HI-LO TORQUE CONTROL (OPTIONS HLM & HLA) IT MUST BE USED WITH CORRESPONDING COMPENSATOR. "M" CONTROL FOR "HLM" AND "A" FOR "HLA".



THRU SHAFT VARIATIONS
"6A4","6A5" , "9A4","9A5"

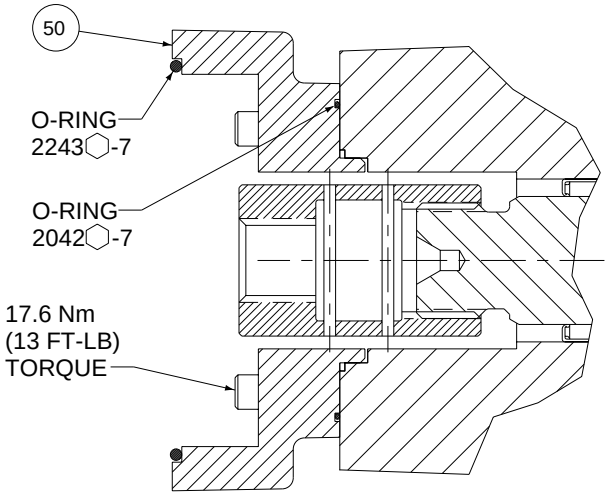
REAR PUMP CONFIGURATION:
- SAE A 2 BOLT
- 3.25 PILOT DIAMETER

"A4" - 9 TOOTH 16/32 PITCH
"A5" - 11 TOOTH 16/32 PITCH



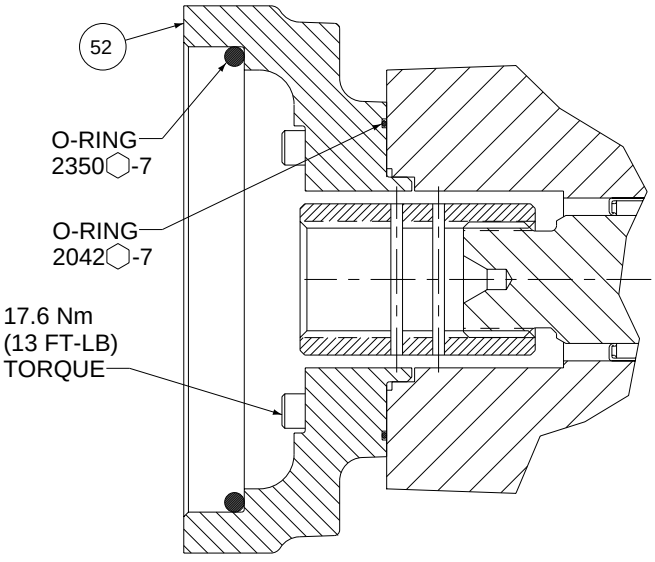
THRU SHAFT VARIATIONS
"6B4","9B4"

REAR PUMP CONFIGURATION:
- SAE B 2 BOLT
- 4.00 PILOT DIAMETER
- 15 TOOTH 16/32 PITCH



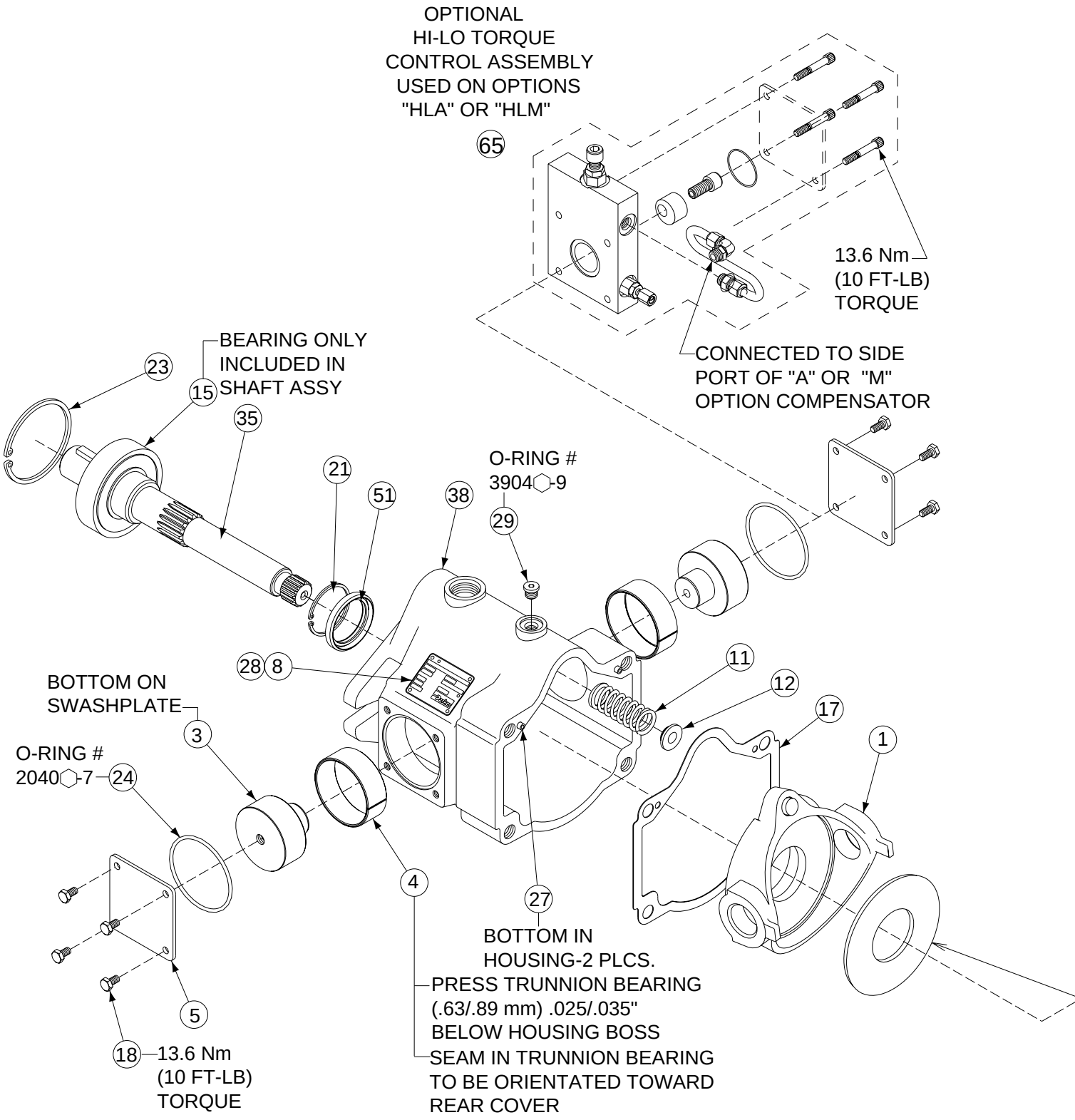
THRU SHAFT VARIATIONS
"6B3","9B3"

REAR PUMP CONFIGURATION:
- SAE B 2 BOLT
- 4.00 PILOT DIAMETER
- 13 TOOTH 16/32 PITCH



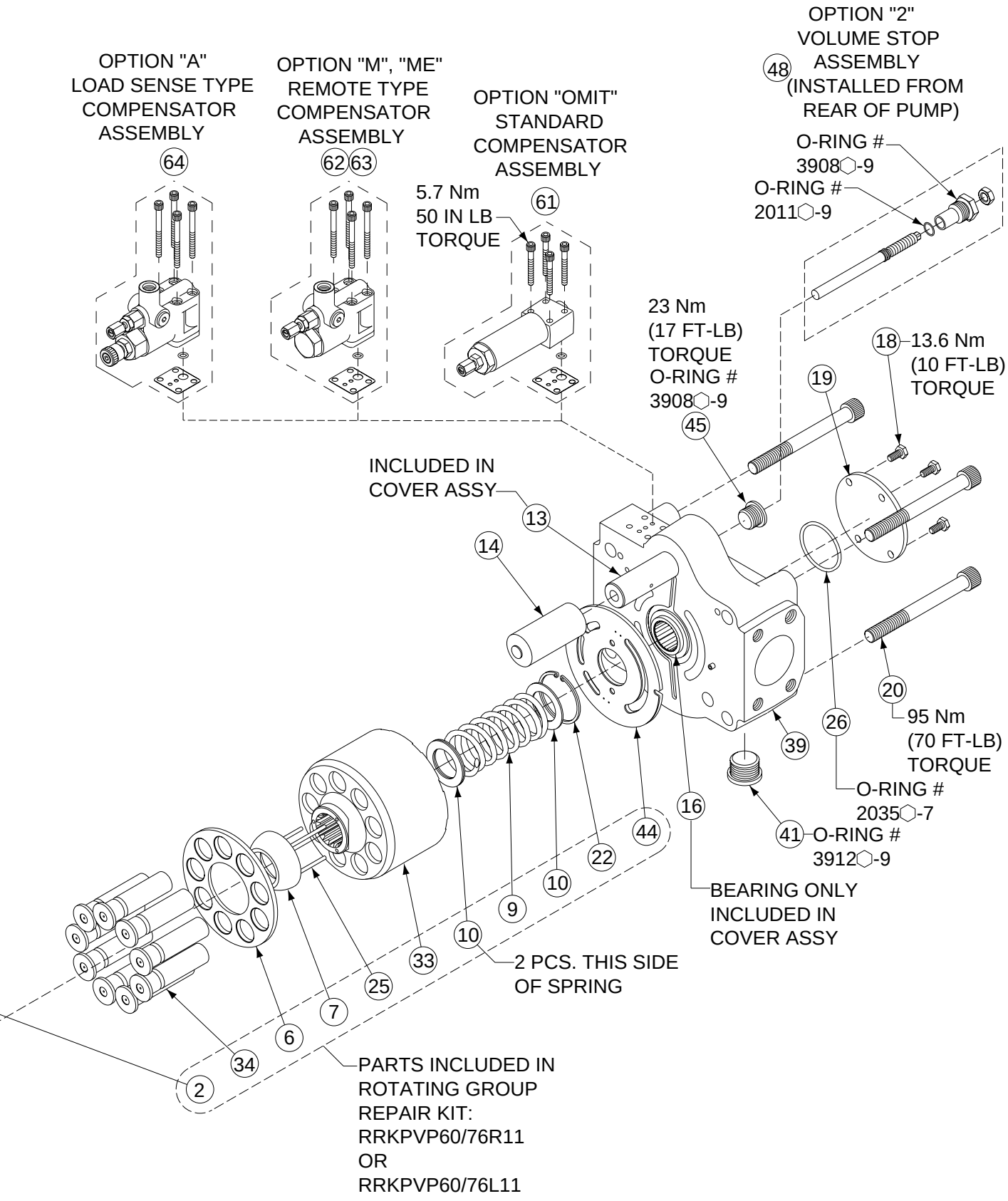
THRU SHAFT VARIATIONS
"6C3","9C3"

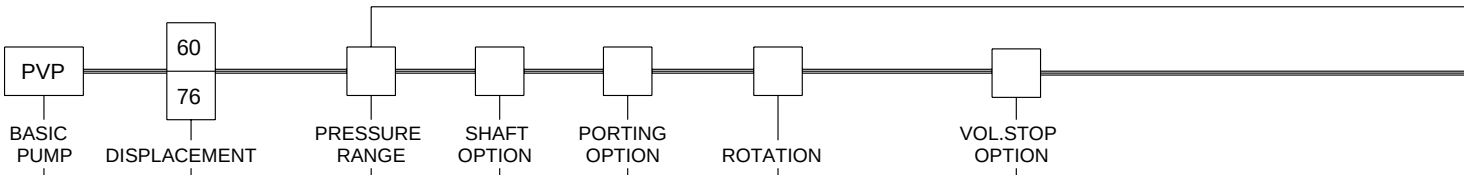
REAR PUMP CONFIGURATION:
- SAE C 2 BOLT
- 5.00 PILOT DIAMETER
- 14 TOOTH 12/24 PITCH



NOTE:

1. ILLUSTRATION SHOWS RIGHTHAND (CW) ROTATION PUMP. LEFTHAND (CCW) PUMPS WILL HAVE THE COMPENSATOR, OPTIONAL HI-LO CONTROL ON OPPOSITE SIDE, AND PORT PLATE KIDNEYS REVERSED.
2. SEAL KIT (SKPVP60/76⬡11) CONSISTS OF: ALL O-RINGS, GASKETS, AND SHAFT SEAL.


OPTION "A"
LOAD SENSE TYPE
COMPENSATOR
ASSEMBLY
64
OPTION "M", "ME"
REMOTE TYPE
COMPENSATOR
ASSEMBLY
62 63
OPTION "OMIT"
STANDARD
COMPENSATOR
ASSEMBLY
61
5.7 Nm
50 IN LB
TORQUE
OPTION "2"
VOLUME STOP
ASSEMBLY
48
(INSTALLED FROM
REAR OF PUMP)
O-RING #
3908⬡-9
O-RING #
2011⬡-9
23 Nm
(17 FT-LB)
TORQUE
O-RING #
3908⬡-9
45
18
13.6 Nm
(10 FT-LB)
TORQUE
19
INCLUDED IN
COVER ASSY
13
14
20
95 Nm
(70 FT-LB)
TORQUE
39
26
O-RING #
2035⬡-7
41
O-RING #
3912⬡-9
16
44
22
10
9
10
2 PCS. THIS SIDE
OF SPRING
33
25
7
6
34
2
BEARING ONLY
INCLUDED IN
COVER ASSY
PARTS INCLUDED IN
ROTATING GROUP
REPAIR KIT:
RRKPVP60/76R11
OR
RRKPVP60/76L11



	ITEM	PART NUMBER	QTY	DESCRIPTION
OMIT	47	108X8 ⬡	1	PLUG
2	48	788239 ⬡	1	VOL.STOP KIT

10	1000 PSI MAX COMP SETTING
20	2000 PSI MAX COMP SETTING
30	3000 PSI MAX COMP SETTING
36	3600 PSI MAX COMP SETTING

R	44	788123	1	PORT PLATE - CW
L	44	788124	1	PORT PLATE - CCW

	ITEM	PART NUMBER	QTY	DESCRIPTION
60	14	788976	1	SERVO PISTON PVP60
76	14	788121	1	SERVO PISTON PVP76

2	R	39	788235 ⬡	1	CVR ASS'Y FLNG-RH
	L	39	788236 ⬡	1	CVR ASS'Y FLNG-LH
8	R	39	788518 ⬡	1	CVR ASS'Y 6149-RH
	L	39	788519 ⬡	1	CVR ASS'Y 6149-LH
9	R	39	788237 ⬡	1	CVR ASS'Y METRIC-RH
	L	39	788238 ⬡	1	CVR ASS'Y METRIC-LH

	1	788102	1	SWASHPLATE ASS'Y
	2	788103	1	SLIPPER PLATE
	3	788115	2	TRUNNION PIN
	4	788137	2	TRUNNION BUSHING
	5	788134	2	TRUNNION COVER
	6	788113	1	SLIPPER RETAINER
	7	788114	1	BALL SEAT
	8	800511	1	NAMEPLATE
P	9	788135	1	BARREL SPRING
	10	788136	3	BARREL WASHER
	11	787780	1	SWASH PLATE SPRING
	12	787769	1	SWASH SPRING GUIDE
	13	788120	1	SERVO POST
V	15	788138	1	BALL BEARING
	16	788139	1	NEEDLE BEARING
	17	788133	1	HOUSING GASKET
	18	12X221	8	HEX BOLT
	19	787232	1	COVER PLATE
P	20	10X303	4	CAP SCREW
	21	56X329	1	RET.RING (SEAL)
	22	56X324	1	RET.RING (BARL)
	23	56X362	1	RET.RING (BRG OD)
	25	23X72	3	BARREL PIN
	27	99X127	2	ROLL PIN (HSNG)
	28	39X10	2	DRIVE SCREW
	33	788111	1	BARREL
	34	788089	9	PISTONS

OMIT	2	38	788105	1	HOUSING ASS'Y-SAE
		41	788207-12 ⬡	1	SHIPPING PLUG
B	8	38	788513	1	HOUSING ASS'Y-6149
		41	120X28	1	CAPLUG
C	9	38	788188	1	HOUSING ASS'Y-MIX
		41	120X28	1	CAPLUG
D	8	38	788818	1	HOUSING ASS'Y-6149
		41	120X28	1	CAPLUG
K	9	38	788189	1	HOUSING ASS'Y-METRIC
		41	120X28	1	CAPLUG

OMIT	35	788230	1	SHAFT ASS'Y-"C" STR
B	35	788231	1	SHAFT ASS'Y-"C" SPL
C	35	788232	1	SHAFT ASS'Y-"CC" STR
D	35	788233	1	SHAFT ASS'Y-"CC"SPL
K	35	788234	1	SHAFT ASS'Y-"K" KEYED

CAUTION

THESE SERVICE PARTS ARE INTENDED FOR USE IN HYDRAULIC PUMPS. INCORRECT INSTALLATION OR ASSEMBLY OF THESE PARTS COULD CAUSE THE PUMP OR PUMPS BEING REPAIRED TO FAIL IN SUBSEQUENT USE, OR THE OPERATE INCORRECTLY.

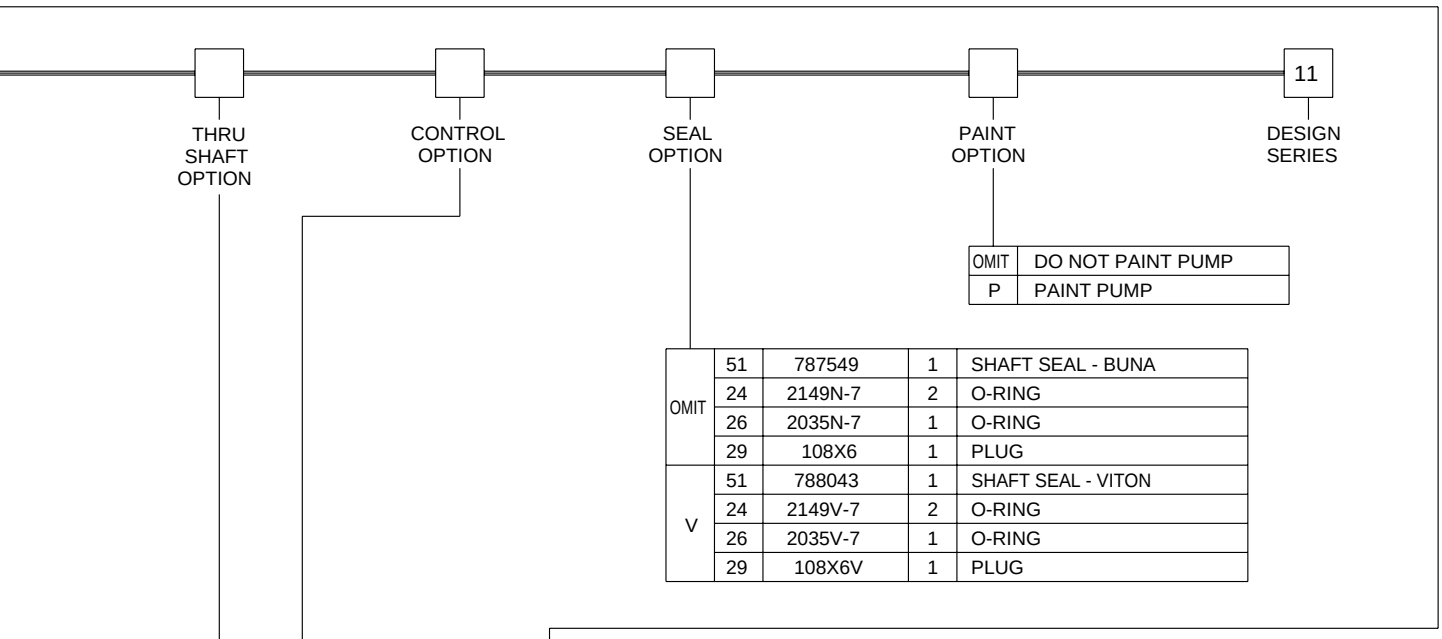
THE FOLLOWING PRECAUTIONS SHOULD BE FOLLOWED:

1.ALL PARTS SHOULD BE CLEANED AND THEN LIGHTLY COATED WITH MINERAL OIL,OR ANOTHER LUBRICATING FLUID COMPATIBLE WITH THE SYSTEM FLUID BEING USED,PRIOR TO ASSEMBLY.

2.THE PUMP SHOULD BE DISASSEMBLED,REPAIR,AND REASSEMBLED IN A CLEAN ENVIRONMENT.

3.USE PROPER TOOLS TO DISASSEMBLE AND REASSEMBLE THE PUMP.

4.IF YOU ARE UNCERTAIN HOW TO INSTALL THESE PARTS,YOU SHOULD OBTAIN ASSISTANCE EITHER FROM A PARKER-HANNIFIN DISTRIBUTOR,OR FROM THE FLUIDPOWER PUMP DIVISION.



OMIT	DO NOT PAINT PUMP
P	PAINT PUMP

OMIT	51	787549	1	SHAFT SEAL - BUNA
	24	2149N-7	2	O-RING
	26	2035N-7	1	O-RING
	29	108X6	1	PLUG
V	51	788043	1	SHAFT SEAL - VITON
	24	2149V-7	2	O-RING
	26	2035V-7	1	O-RING
	29	108X6V	1	PLUG

1	1000 PSI MAX COMP SETTING
2	2000 PSI MAX COMP SETTING
3	3000 PSI MAX COMP SETTING
36	3600 PSI MAX COMP SETTING

OMIT	61	787010⬡ -*	1	STANDARD COMP ASSY
M	62	787028⬡ -*	1	REMOTE COMP ASSY (INT)
ME	63	787029⬡ -*	1	REMOTE COMP ASSY (EXT)
A	64	787027⬡ -*	1	LOAD SENSE COMP ASSY
(2) HLM	65	788489⬡	1	HI-LO TORQUE ASSEMBLY
	62	787028⬡ -*	1	REMOTE COMP ASSY (INT)
(3) HLA	65	788489⬡	1	HI-LO TORQUE ASSEMBLY
	64	787027⬡ -*	1	LOAD SENSE COMP ASS'Y

NOTE:
WHEN ORDERING CONTROLS FOR METRIC VERSION PUMPS(OPTION 8)
ADDITIONAL METRIC SCREWS ARE REQUIRED.

CONTROL	PART NUMBER	QTY	DESCRIPTION
OMIT	210X105	4	CAPSCREW-M5X35MM
ALL OTHER	210X108	4	CAPSCREW-M5X50MM

NOTE:
WHEN ORDERING CONTROLS M,ME,A,C,H FOR METRIC VERSION PUMPS(OPTION 8)
ADDITIONAL ADAPTOR FITTING IS REQUIRED.

PORTING	PART NUMBER	QTY	DESCRIPTION
8	788517 ⬡	1	FITTING(ISO6149)
9	788157 ⬡	1	FITTING(1/4BSPP)

OMIT		78			NO THRU SHAFT
6	A4	79	788147 ⬡	1	"A" PILOT,9T SPLINE
	A5	79	788934 ⬡	1	"A" PILOT,11T SPLINE
	B3	81	788148 ⬡	1	"B" PILOT,13T SPLINE
	B4	83	788149 ⬡	1	"B" PILOT,15T SPLINE
	C3	85	788150 ⬡	1	"C" PILOT,14T SPLINE
9	A4	79	788203 ⬡	1	"A" PILOT,9T SPLINE
	A5	79	788935 ⬡	1	"A" PILOT,11T SPLINE
	B3	81	788202 ⬡	1	"B" PILOT,13T SPLINE
	B4	83	788201 ⬡	1	"B" PILOT,15T SPLINE
	C3	85	788200 ⬡	1	"C" PILOT,14T SPLINE

NOTES:

1 ⬡ O-RING COMPOUND DESIGNATION - ⬡ (OMIT)= NITRILE, (V)=VITON

(2) FOR PROPER OPERATION OF "HLM" CONTROL, IT MUST BE USED WITH A "M" OPTION COMPENSATOR ASSY.

(3) FOR PROPER OPERATION OF "HLA" CONTROL, IT MUST BE USED WITH A "A" OPTION COMPENSATOR ASSY.

4 SEAL KIT P/N: SKPVP60/76⬡11

ROTATING GROUP KIT P/N: RRKPVP60/76R11 (CW ROTATION)
RRKPVP60/76L11 (CCW ROTATION)

SERVICE NOTES:

- USE A CLEAN LUBRICANT(COMPATIBLE WITH THE WORKING FLUID)ON ALL PUMP COMPONENTS DURING ASSEMBLY.
- THOROUGHLY CLEAN THE RESERVOIR,SUCTION LINES,SUCTION STRAINER, DRAIN LINES,ETC.BEFORE RE-INSTALLING THE PUMP.

  MOST PREMATURE PUMP FAILURES OCCUR WHEN CONTAMINANTS FROM A PREVIOUS FAILURE HAVE NOT BEEN REMOVED FROM THE SYSTEM,OR CAUSE FOR PREVIOUS FAILURE IS STILL PRESENT(I.E.WATER IN OIL,FILTER BYPASSING,ETC.)
- ALWAYS FILL THE PUMP CASE WITH CLEAN FLUID BEFORE STARTING A NEW OR SERVICED PUMP.FOR FLOODED SUCTION,PURGE AIR FROM SUCTION LINES BY CRACKING THE INLET FITTING OR VENT PLUG ON PUMP.THIS SHOULD PREVENT AN AIRLOCK CONDITION AND ALLOW FOR FASTER PRIMING.
- STARTING THE PUMP SLOWLY BY JOGGING(OR TURNING OVER ENGINE WITHOUT ALLOWING IT TO START)WILL HELP THE PUMP PRIME AND MAKE IT EASIER TO DETERMINE WHEN PRIMING HAS OCCURED.
- START PUMP WITH AN OPEN CIRCUIT WHENEVER POSSIBLE.REDUCE THE COMPENSATOR TO ITS MINIMUM SETTING DURING START-UP.CYCLE THE PUMP ON AND OFF STROKE WHILE INCREASING THE COMPENSATOR TO ITS REQUIRED SETTING.

  THIS WILL ASSIST IN BREAK-IN OF NEW COMPONENTS AND HELP PURGE AIR FROM THE CASE.

BASIC TROUBLESHOOTING:

PUMP WILL NOT PRIME

- △ PUMP SHOULD PRIME WITHIN 30 SECONDS.IF IT DOES NOT, STOP
- △ CHECK FOR PROPER DRIVE ROTATION
- △ MAKE SURE PUMP SHAFT IS TURNING(I.E. KEY AT COUPLING HUBS IS ENGAGED)
- △ MAKE SURE RESERVOIR IS FULL
- △ CHECK FOR MAJOR SOURCES OF A SUCTION LEAK(VENT PLUG OPEN,SHAFT SEAL MISSING(PAVC),FLANGE NOT TIGHT,PINCHED O-RING AT FLANGE OR PUMP HOUSING)

CANNOT BUILD ANY PRESSURE

- △ MAKE SURE PUMP IS PRIMED
- △ CHECK ALIGNMENT,ESPECIALLY ON PAVC PUMPS WITHOUT"9"OPTION
- △ MAKE SURE SYSTEM IS NOT AN OPEN CIRCUIT.

  A PUMP PRODUCES FLOW,NOT PRESSURE.IT CAN ONLY LIMIT PRESSURE WHEN THE SYSTEM REQUIREMENT IS HIGHER THAN THE PUMP COMPENSATOR SETTING.

CAN ONLY BUILD A FEW HUNDRED PSI

- △ COMPENSATOR IS BACKED ALL THE WAY OUT
- △ THE REMOTE OR LOAD SENSE LINE IS VENTED
- △ CONTROL ORIFICE OR SPOOL IS PLUGGED
- △ INCORRECT COMPENSATOR SPOOL(PVP).
- △ PRESSURE CONTROL DART IS LODGED OPEN
- △ TORQUE CONTROL PLUG IS MISSING(PAVC)

PUMP WILL NOT COMPENSATE

- △ DIFFERENTIAL SPRING OVER-COMPRESSED(I.E. SPRING GUIDE DISLOCATED)
- △ CONTROL DRAIN LINE BLOCKED(PAVC)
- △ PRESSURE CONTROL STEM VENT HOLE IS PLUGGED
- △ CONTROL SPOOL TRAVEL IS HINDERED
- △ CONTROL ORIFICE IS MISSING(PAVC)
- △ SATURATION ORIFICE IS MISSING IN LOAD SENSE CIRCUIT

Offer of Sale

The items described in this document and other documents or descriptions provided by Parker Hannifin Corporation, its subsidiaries and its authorized distributors are hereby offered for sale at prices to be established by Parker Hannifin Corporation, its subsidiaries and its authorized distributors. This offer and its acceptance by any customer ("Buyer") shall be governed by all of the following Terms and Conditions. Buyer's order for any such items, when communicated to Parker Hannifin Corporation, its subsidiary or an authorized distributor ("Seller") verbally or in writing, shall constitute acceptance of this offer.

1. Terms and Conditions of Sale: All descriptions, quotations, proposals, offers, acknowledgments, acceptances and sales of Seller's products are subject to and shall be governed exclusively by the terms and conditions stated herein. Buyer's acceptance of any offer to sell is limited to these terms and conditions. Any terms or conditions in addition to, or inconsistent with those stated herein, proposed by Buyer in any acceptance of an offer by Seller, are hereby objected to. No such additional, different or inconsistent terms and conditions shall become part of the contract between Buyer and Seller unless expressly accepted in writing by Seller. Seller's acceptance of any offer to purchase by Buyer is expressly conditional upon Buyer's assent to all the terms and conditions stated herein, including any terms in addition to, or inconsistent with those contained in Buyer's offer, Acceptance of Seller's products shall in all events constitute such assent.

2. Payment: Payment shall be made by Buyer net 30 days from the date of delivery of the items purchased hereunder. Amounts not timely paid shall bear interest at the maximum rate permitted by law for each month or portion thereof that the Buyer is late in making payment. Any claims by Buyer for omissions or shortages in a shipment shall be waived unless Seller receives notice thereof within 30 days after Buyer's receipt of the shipment.

3. Delivery: Unless otherwise provided on the face hereof, delivery shall be made F.O.B. Seller's plant. Regardless of the method of delivery, however, risk of loss shall pass to Buyer upon Seller's delivery to a carrier. Any delivery dates shown are approximate only and Seller shall have no liability for any delays in delivery.

4. Warranty: Seller warrants that the items sold hereunder shall be free from defects in material or workmanship for a period of 18 months from date of shipment from Parker Hannifin Corporation. **THIS WARRANTY COMPRISES THE SOLE AND ENTIRE WARRANTY PERTAINING TO ITEMS PROVIDED HEREUNDER. SELLER MAKES NO OTHER WARRANTY, GUARANTEE, OR REPRESENTATION OF ANY KIND WHATSOEVER. ALL OTHER WARRANTIES, INCLUDING BUT NOT LIMITED TO, MERCHANTABILITY AND FITNESS FOR PURPOSE, WHETHER EXPRESS, IMPLIED, OR ARISING BY OPERATION OF LAW, TRADE USAGE, OR COURSE OF DEALING ARE HEREBY DISCLAIMED. NOTWITHSTANDING THE FOREGOING, THERE ARE NO WARRANTIES WHATSOEVER ON ITEMS BUILT OR ACQUIRED WHOLLY OR PARTIALLY, TO BUYER'S DESIGNS OR SPECIFICATIONS.**

5. Limitation Of Remedy: SELLER'S LIABILITY ARISING FROM OR IN ANY WAY CONNECTED WITH THE ITEMS SOLD OR THIS CONTRACT SHALL BE LIMITED EXCLUSIVELY TO REPAIR OR REPLACEMENT OF THE ITEMS SOLD OR REFUND OF THE PURCHASE PRICE PAID BY BUYER, AT SELLER'S SOLE OPTION. IN NO EVENT SHALL SELLER BE LIABLE FOR ANY INCIDENTAL, CONSEQUENTIAL OR SPECIAL DAMAGES OF ANY KIND OR NATURE WHATSOEVER, INCLUDING BUT NOT LIMITED TO LOST PROFITS ARISING FROM OR IN ANY WAY CONNECTED WITH THIS AGREEMENT OR ITEMS SOLD HEREUNDER, WHETHER ALLEGED TO ARISE FROM BREACH OF CONTRACT, EXPRESS OR IMPLIED WARRANTY, OR IN TORT, INCLUDING WITHOUT LIMITATION, NEGLIGENCE, FAILURE TO WARN OR STRICT LIABILITY.

6. Changes, Reschedules and Cancellations: Buyer may request to modify the designs or specifications for the items sold hereunder as well as the quantities and delivery dates thereof, or may request to cancel all or part of this order, however, no such requested modification or cancellation shall become part of the contract between Buyer and Seller unless accepted by Seller in a written amendment to this Agreement. Acceptance of any such requested modification or cancellation shall be at Seller's discretion, and shall be upon such terms and conditions as Seller may require.

7. Special Tooling: A tooling charge may be imposed for any special tooling, including without limitation, dies, fixtures, molds and patterns, acquired to manufacture items sold pursuant to this contract. Such special tooling shall be and remain Seller's property notwithstanding payment of any charges by Buyer. In no event will Buyer acquire any interest in apparatus belonging to Seller which is utilized in the manufacture of the items sold hereunder, even if such apparatus has been specially converted or adapted for such manufacture and notwithstanding any charges paid by Buyer. Unless otherwise agreed, Seller shall have the right to alter, discard or otherwise dispose of any special tooling or other property in its sole discretion at any time.

8. Buyer's Property: Any designs, tools, patterns, materials, drawings, confidential information or equipment furnished by Buyer or any other items which become Buyer's property, may be considered obsolete and may be destroyed by Seller after two (2) consecutive years have elapsed without Buyer placing an order for the items which are manufactured using such property, Seller shall not be responsible for any loss or damage to such property while it is in Seller's possession or control.

9. Taxes: Unless otherwise indicated on the face hereof, all prices and charges are exclusive of excise, sales, use, property, occupational or like taxes which may be imposed by any taxing authority upon the manufacture, sale or delivery of the items sold hereunder. If any such taxes must be paid by Seller or if Seller is liable for the collection of such tax, the amount thereof shall be in addition to the amounts for the items sold. Buyer agrees to pay all such taxes or to reimburse Seller therefore upon receipt of its invoice. If Buyer claims exemption from any sales, use or other tax imposed by any taxing authority, Buyer shall save Seller harmless from and against any such tax, together with any interest or penalties thereon which may be assessed if the items are held to be taxable.

10. Indemnity For Infringement of Intellectual Property Rights: Seller shall have no liability for infringement of any patents, trademarks, copyrights, trade dress, trade secrets or similar rights except as provided in this Part 10. Seller will defend and indemnify Buyer against allegations of infringement of U.S. Patents, U.S. Trademarks, copyrights, trade dress and trade secrets (hereinafter 'Intellectual Property Rights'). Seller will defend at its expense and will pay the cost of any settlement or damages awarded in an action brought against Buyer based on an allegation that an item sold pursuant to this contract infringes the Intellectual Property Rights of a third party. Seller's obligation to defend and indemnify Buyer is contingent on Buyer notifying Seller within ten (10) days after Buyer becomes aware of such allegations of infringement, and Seller having sole control over the defense of any allegations or actions including all negotiations for settlement or compromise. If an item sold hereunder is subject to a claim that it infringes the Intellectual Property Rights of a third party, Seller may, at its sole expense and option, procure for Buyer the right to continue using said item, replace or modify said item so as to make it noninfringing, or offer to accept return of said item and return the purchase price less a reasonable allowance for depreciation. Notwithstanding the foregoing, Seller shall have no liability for claims of infringement based on information provided by Buyer, or directed to items delivered hereunder for which the designs are specified in whole or part by Buyer, or infringements resulting from the modification, combination or use in a system of any item sold hereunder. The foregoing provisions of this Part 10 shall constitute Seller's sole and exclusive liability and Buyer's sole and exclusive remedy for infringement of Intellectual Property Rights. If a claim is based on information provided by Buyer or if the design for an item delivered hereunder is specified in whole or in part by Buyer, Buyer shall defend and indemnify Seller for all costs, expenses or judgments resulting from any claim that such item infringes any patent, trademark, copyright, trade dress, trade secret or any similar right.

11. Force Majeure: Seller does not assume the risk of and shall not be liable for delay or failure to perform any of Seller's obligations by reason of circumstances beyond the reasonable control of Seller (hereinafter 'Events of Force Majeure'). Events of Force Majeure shall include without limitation, accidents, acts of God, strikes or labor disputes, acts, laws, rules or regulations of any government or government agency, fires, floods, delays or failures in delivery of carriers or suppliers, shortages of materials and any other cause beyond Seller's control.

12. Entire Agreement/Governing Law: The terms and conditions set forth herein, together with any amendments, modifications and any different terms or conditions expressly accepted by Seller in writing, shall constitute the entire Agreement concerning the items sold, and there are no oral or other representations or agreements which pertain thereto. This Agreement shall be governed in all respects by the law of the State of Ohio. No actions arising out of the sale of the items sold hereunder or this Agreement may be brought by either party more than two (2) years after the cause of action accrues.

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Parker Hannifin Corporation
2745 Snapps Ferry Road
Greeneville, TN 37745 USA
Tel: (423) 639-8151
FAX: (423) 787-2418
Web site: http://www.parker.com

Bulletin PM1626-11-M1/USA