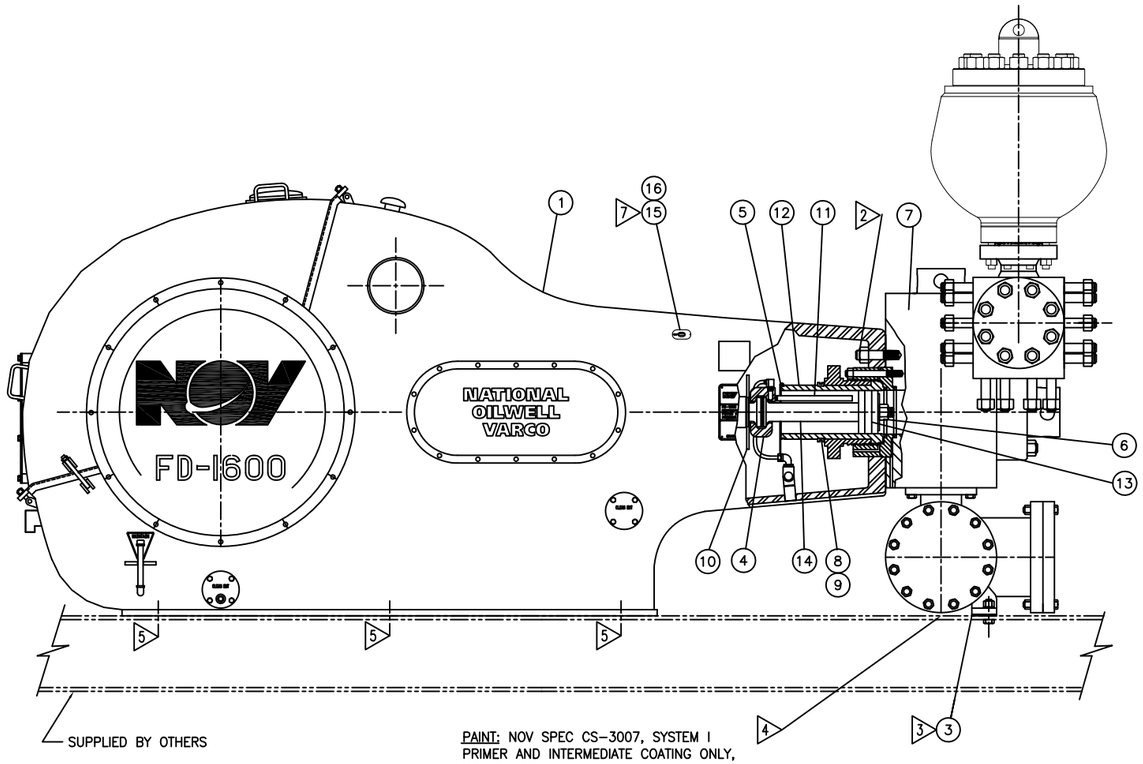
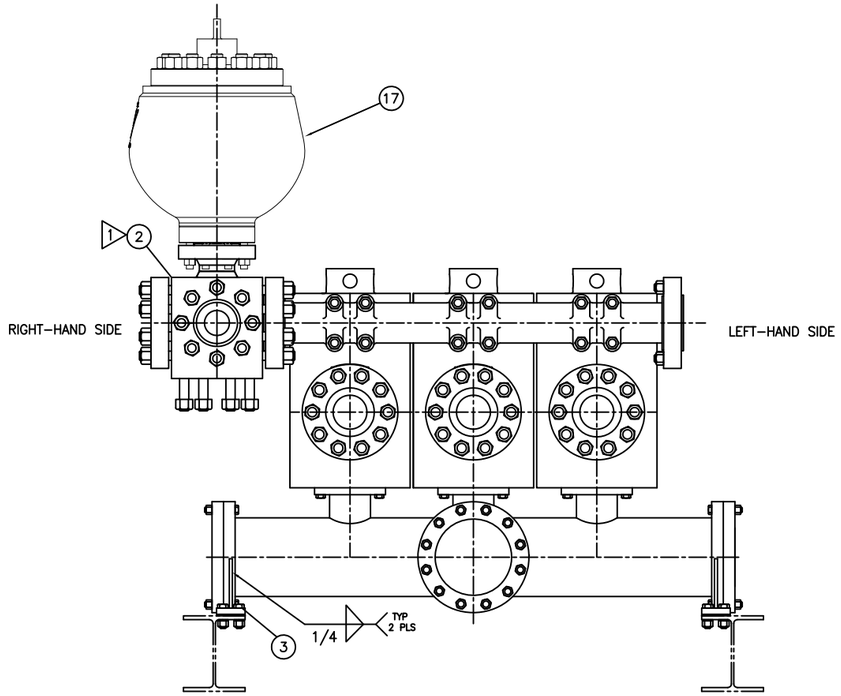




PAINT: NOV SPEC CS-3007, SYSTEM I PRIMER AND INTERMEDIATE COATING ONLY, NO TOP COAT.

NOTES:

1. DISCHARGE STRAINER CROSS IS TO BE MOUNTED ON RIGHT-HAND SIDE OF DISCHARGE MANIFOLD AS VIEWED FROM POWER END OF PUMP. (SEE ABOVE)

2. 1-1/2-8 TORQUE 1575-1625 LB-FT LUBRICATED.

3. IMPORTANT!

   ITEM 3 (FOOT SUPPORT ASSEMBLY) IS TO BE FINISH WELDED TO THE SUCTION MANIFOLD AFTER THE PUMP FRAME HAS BEEN PROPERLY SHIMMED AND BOLTED DOWN TO ITS FINAL UNITIZING SKID. THE FOOT SUPPORT MAY BE "TACK WELDED" FOR LATER RE-INSTALLATION OR ELSE SHIPPED LOOSE WITH THE PUMP AND INSTALLED WHEN THE PUMP IS THEN UNITIZED TO THE SKID.

4. IMPORTANT!

   BEFORE SECURING PUMP TO UNITIZED SKID, PLEASE SEE NOV DRAWING 6316-0284-00 AND VERIFY THE NOMINAL ½" CLEARANCE BETWEEN THE O.D. OF THE SUCTION MANIFOLD AND THE TOP OF THE UNITIZED SKID AS SHOWN ON THAT PRINT.

5. IMPORTANT!

   BEFORE SECURING PUMP TO UNITIZED SKID, MAKE SURE SUPPORT IS LEVEL AND ADEQUATE AT BOLTING LOCATIONS. IF SUPPORT IS NOT LEVEL AND ADEQUATE, SHIM TIGHT AT BOLTING LOCATIONS TO ENSURE LEVEL SUPPORT, OTHERWISE MISALIGNMENT ISSUES MAY OCCUR. THE SHIMS ON ALL INSTALLATIONS SHOULD EXTEND THE FULL WIDTH OF THE SKID BEAM FLANGES AND HAVE A MINIMUM LENGTH OF 12" [305MM]. PLEASE SEE INSTALLATION INSTRUCTIONS IN THE STANDARD FD-1600 OPERATION MANUAL, DOCUMENT NUMBER EPL-1911.

6. IMPORTANT!

   BEFORE PUMP IS TO BE SHIPPED, PUMP MUST UNDERGO AND SATISFACTORILY PASS FAT PROCEDURE D291290410-6.

! WARNING !

IMPROPER INSTALLATION OF ITEM 3 (FOOT SUPPORT ASSEMBLY) CAN RESULT IN SEVERE MISALIGNMENT, PARTICULARLY IN THE FLUID END AREA. THIS WILL RESULT IN RAPID WEAR ON THE LINER, PISTON, AND ROD SYSTEM AS WELL AS POSSIBLY CAUSING OTHER ISSUES THROUGHOUT THE PUMP.

7. RFID TAG (ITEM 15) IS TO BE INSTALLED AT PUMP UNITIZATION.

BILL OF MATERIAL

QTY REQ'D	PART NO.	DESCRIPTION	ITEM NO.
1	10950096-001	DAMPENER, PULSATION (5000 PSI)	17
2	7178025	SCREW, NO.2 X 1/4" LG. TYPE U ROUND HEAD DRIVE	16
1	10666074-001	UHF NAMEPLATE, RIGMS-RFID	15
3	1551703	ROD, PISTON, 1-1/2" BORE	14
3	012180394	PISTON, 6"	13
3	05499600HP	LINER WITH STOP, 6" HIGH PRESSURE	12
3	0-7601-2588-50	NIPPLE, PIPE, GALV 1/2 X 13 LONG	11
3	0-6316-0093-00	BAFFLE DISC	10
3	0-6316-0333-00	LOCK RING, LINER	9
3	0-7602-1600-44	O-RING, LOCK RING	8
1	0-6316-1002-01	FLUID END ASSEMBLY	7
3	6308243	NUT, 1-1/2" ESNA	6
3	0-6316-0164-00	END COVER, LINER	5
3	0-6316-0107-11	CLAMP, PISTON ROD	4
2	0-6316-0284-00	FOOT SUPPORT, SUCTION MANIFOLD	3
1	0-6317-0125-10	ACCESSORY MANIFOLD, DISCHARGE	2
1	0-6316-1001-03	POWER END COMPLETE	1
—	0-6316-1000-03	FD-1600 TRIPLEX PUMP GENERAL ASSEMBLY (CONSISTS OF THE FOLLOWING)	—

PRODUCT:	FD-1600	
END ITEM:		
NEXT ASSY:		
SIMILAR TO:		
WT LBS:		
FINISH		
UNLESS OTHERWISE SPECIFIED TOL <± .06 250 MIN TOL ≥± .06 1000 MAX		

UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES.
TOLERANCES ARE:
XX ±.1 ANGLES ±1/2 DEG
XXX ±.03 FRACTIONS ±1/8
XXXX ±.010 BREAK EDGES .02/.03
DO NOT SCALE DRAWING

	CURRENT	INITIAL
DRAWN		
CHECKED		
APPVD		
DATE	05-MAY-14	6-30-06

RIG SOLUTIONS
MECHANICAL ENGINEERING

THIS DOCUMENT CONTAINS PROPRIETARY AND CONFIDENTIAL INFORMATION WHICH BELONGS TO NATIONAL OILWELL VARCO, L.P., ITS AFFILIATES OR SUBSIDIARIES (ALL COLLECTIVELY REFERRED TO HEREINAFTER AS "NOV"). IT IS LOANED FOR LIMITED PURPOSES ONLY AND REMAINS THE PROPERTY OF NOV. REPRODUCTION, IN WHOLE OR IN PART, OR USE OF THIS DESIGN OR DISTRIBUTION OF THIS INFORMATION TO OTHERS IS NOT PERMITTED WITHOUT THE EXPRESS WRITTEN CONSENT OF NOV. THIS DOCUMENT IS TO BE RETURNED TO NOV UPON REQUEST OR UPON COMPLETION OF THE USE FOR WHICH IT WAS LOANED. THIS DOCUMENT AND THE INFORMATION CONTAINED AND REPRESENTED HEREIN IS THE COPYRIGHTED PROPERTY OF NOV.

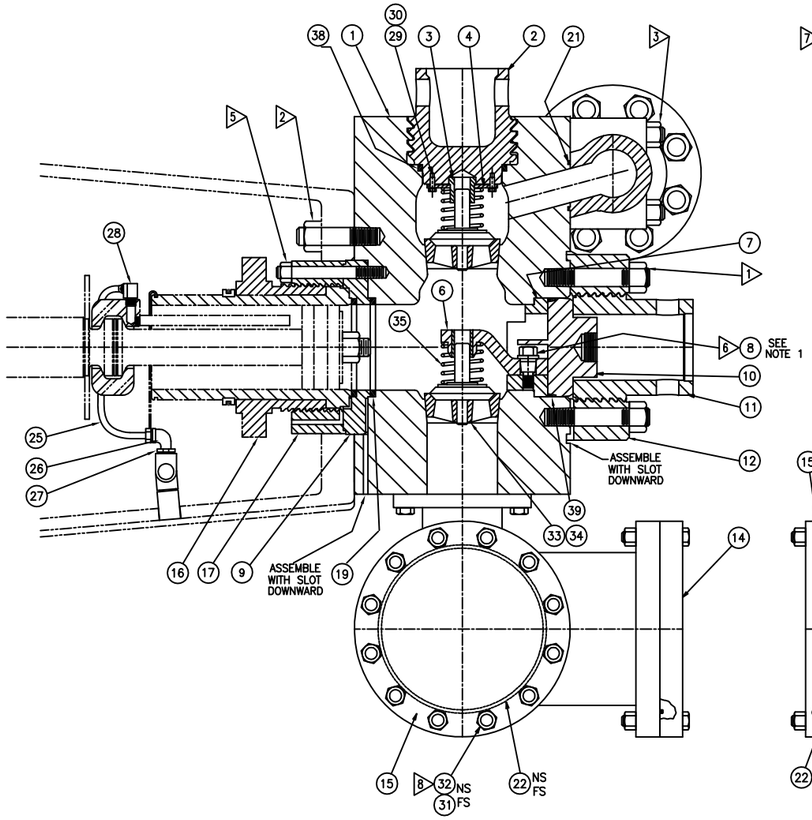
NATIONAL OILWELL VARCO

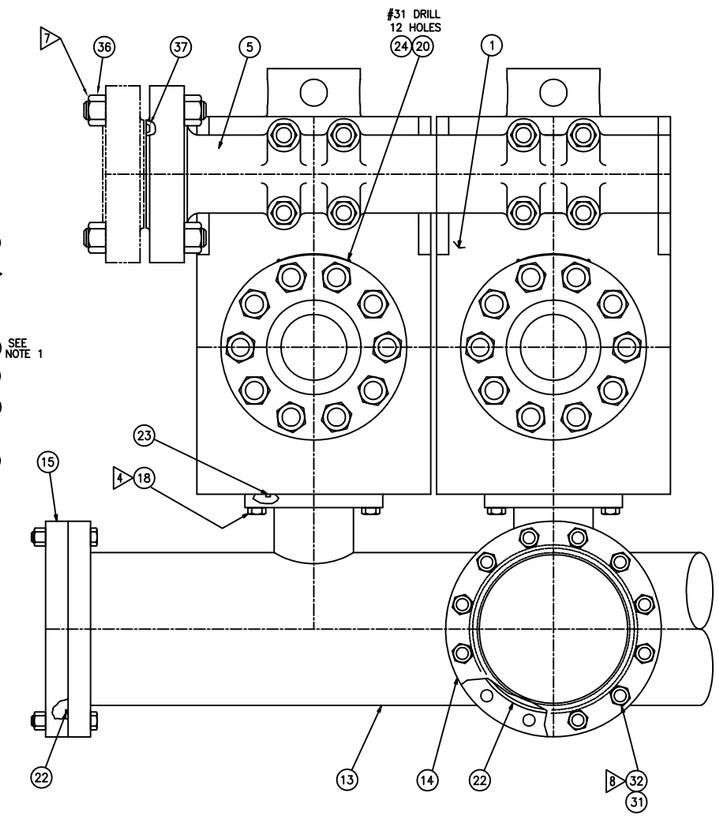
TITLE:
GENERAL ASSEMBLY
FD-1600 PUMP

SCALE:	PROJECTION:	SIZE:	SHT:
1:12		D	1 OF 1

DWG NO. 6316-1000-03-DOS REV: M

GENERATED IN ACAD
DCF0022_D1 (REV E)





TORQUE NUTS TO THESE VALUES			
SYM	LB–FT	THREAD	DESCRIPTION
1	1575–1625	1–1/2 – 8	CYL. THREAD RING TO BLOCK
2	1575–1625	1–1/2 – 8	FLUID END TO FRAME
3	950–1000	1–1/4 – 8	DISCHARGE ~~MANIFOLD TO~~ BLOCK
4	220–250	7/8 – 9	SUCTION MANIFOLD TO BLOCK
5	470–510	1" – 8	LINER THREAD RING TO BLOCK
6	300–340	7/8 – 9	LOWER VALVE GUIDE LOCK BOLT
7	1575–1625	1–1/2 – 8	DISCHARGE MANIFOLD FLANGE
8	184–194	1" – 8	SUCTION MANIFOLD FLANGE

NOTES:

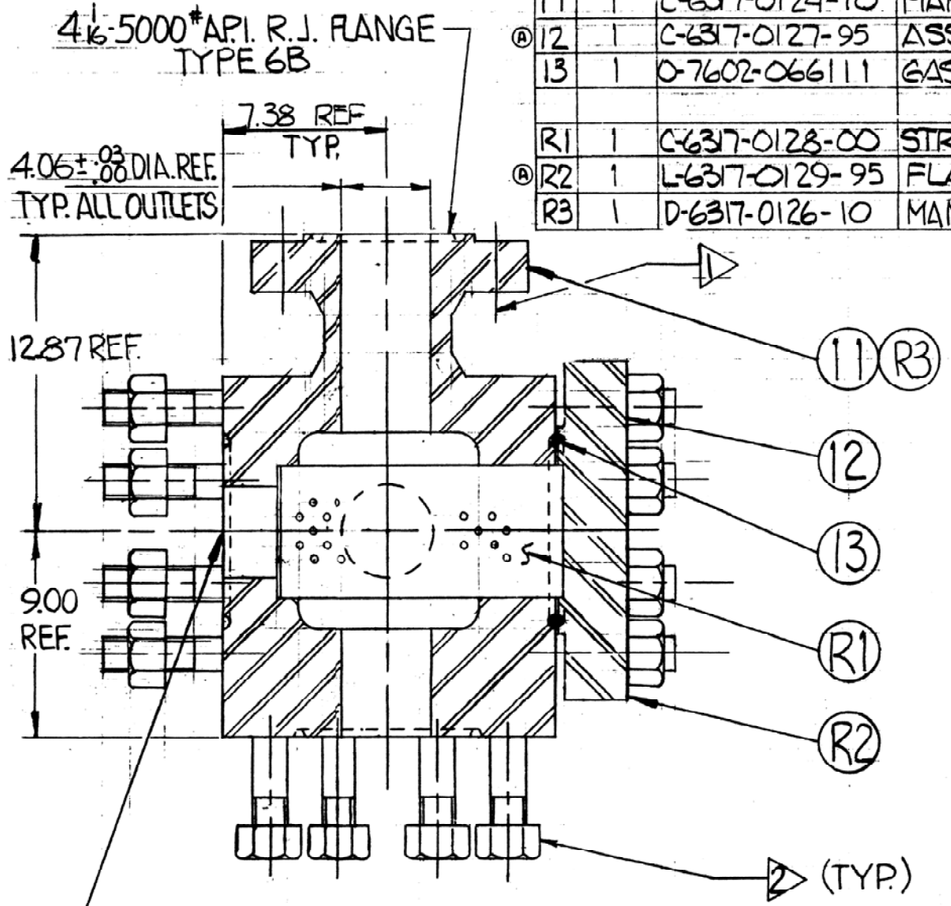
1. BOX WRENCH AND WRENCH EXTENSION TO TIGHTEN VALVE GUIDE LOCK BOLT, ITEM 8.

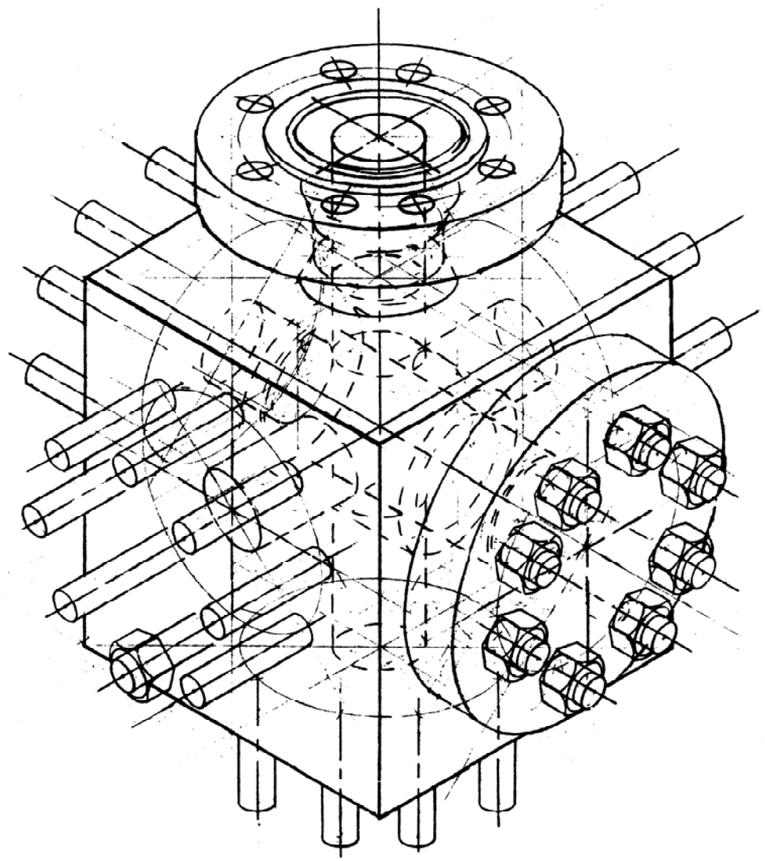
QTY REQ'D	PART NO.	DESCRIPTION	ITEM NO.
		BILL OF MATERIAL	
3	0–6316–0369–00	SEAL, CYLINDER HEAD	39
3	0–6316–0092–00	SEAL, VALVE COVER	38
2	6908040	RING, OVAL JOINT	37
16	0–7601–1260–47	STUD W/ NUTS 1–1/2–8 X 10"	36
6	055413397	SPRING (CP), VALVE	35
6	061101507	SEAT, VALVE	34
6	060155042	VALVE	33
36	0–7601–0630–20	NUT, HEX, HEAVY 1–8UNC	32
36	7000534	SCREW, HEX HD CAP 1–8UNC X 5 LG	31
72	7822095	WIRE, SAFETY, SST, TYPE 302	30
12	0–7501–0051–00	SCREW, RETAINER	29
3	0–7601–2090–40	ADAPTER, ELBOW, 90°, HOSE	28
3	0–7601–2530–40	BUSHING, PIPE, 1 X 1/2, GALV	27
3	0–7601–2570–89	ELBOW, STREET 1/2 X 90°, GALV	26
3	0–7503–0230–49	HOSE ASSEMBLY, 1/2" X 23" LG.	25
12	0–7601–1060–06	SCREW, DRIVE NO.6 X 3/8 LG	24
3	0–7602–1600–61	O–RING	23
3	7817600–456	O–RING	22
3	0–7602–1600–25	O–RING	21
3	0–7506–0378–00	PLATE, INFORMATION	20
3	0–6316–0373–00	SEAL, LINER	19
18	0–7601–0333–30	SCREW, HEX HD CAP 7/8–9UNC X 2–1/2 GR 5	18
3	0–6316–0366–00	RING, THREAD, LINER	17
3	0–6316–0367–20	LOCK, LINER	16
1	0–6317–0074–00	FLANGE, BLIND, SUCTION	15
1	0–6316–0105–00	FLANGE, SUCTION	14
1	0–6316–0201–00	MANIFOLD, SUCTION	13
3	0–6316–0361–90	RING, THREAD, CYLINDER	12
3	0–6316–0362–90	CYLINDER HEAD	11
3	0–6316–0364–90	PLUG, CYLINDER HEAD	10
3	0–6316–0365–00	WEAR PLATE	9
3	0–6316–0360–00	BOLT, LOCK (VALVE GUIDE)	8
3	0–6316–0363–00	RING, ALIGNMENT	7
3	0–6316–0354–00	GUIDE, VALVE, LOWER W/ BUSHING	6
1	0–6316–0043–90	MANIFOLD, DISCHARGE	5
3	0–6397–0603–00	RETAINER, VALVE GUIDE	4
3	0–6397–0575–00	GUIDE, VALVE, UPPER	3
3	0–6316–0039–90	COVER, VALVE POT	2
3	0–6316–0357–30	FLUID END, STUDDED	1
—	0–6316–1002–01	FLUID END ASSEMBLY (CONSISTS OF THE FOLLOWING)	—

PRODUCT:	FD–1600	UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES. TOLERANCES ARE:	NATIONAL OILWELL VARCO
END ITEM:		XX ±.1 ANGLES ±1/2 DEG	TITLE: FLUID END ASSEMBLY FD–1600 TRIPLEX PUMP
NEXT ASSY:		XXX ±.03 FRACTIONS ±1/16	
SIMILAR TO:	6316–0375–30	XXXX ±.010 BREAK EDGES .02/.03	
WT LBS:		DO NOT SCALE DRAWING	
FINISH		CURRENT / INITIAL	
UNLESS OTHERWISE SPECIFIED TOL. < 6.66 250 / TOL. ≥ 6.66 1000		DRAWN	
		CHECKED	
		APPVD	
		DATE 9–15–09 / 6–28–06	
RIG SOLUTIONS MECHANICAL ENGINEERING		SCALE: 1:4 PROJECTION: MOD: E SHT: 1 of 1	
		DWG NO. 6316–1002–01–DOS REV: A	

DRAWN IN ACAD
RS–MECH_E–TPL–001

ITEM NO	QTY REQ'D	PART NO	PART NAME	MATERIAL DESCRIPTION	MATERIAL CODE	SYM.
11	1	C-6317-0124-10	MANIF, STUD ASSY			
Ⓐ 12	1	C-6317-0127-95	ASSY, STRAINER			
13	1	O-7602-066111	GASKET	RING JOINT R-44		
R1	1	C-6317-0128-00	STRAINER			
Ⓐ R2	1	L-6317-0129-95	FLANGE, BLIND			
R3	1	D-6317-0126-10	MANIFOLD BLOCK			





1 REF STUD NUT TORQUE, 950-1000 FT LBS (1 1/4-8 THD).

2 REF STUD NUT TORQUE, 1575-1625 FT LBS (1 1/2-8 THD).

Ⓡ 3 ITEMS R2 & R3 SHALL REMAIN TRACEABLE PER QUALITY CONTROL MANUAL 7515-0010-00 SECTION 2.0.

PRODUCT:	UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES. TOLERANCES ARE: X.X ±.1 ANGLES ±1/2 DEG X.XX ±.03 FRACTIONS ±1/8 X.XXX ±.010 BREAK EDGES .02/.03 DO NOT SCALE DRAWING		
END ITEM:		CURRENT	INITIAL
NEXT ASSY:	DRAWN		
SIMILAR TO:	CHECKED		
WT LBS:	APPVD		
FINISH	DATE		
UNLESS OTHERWISE SPECIFIED TOL ≤± .06 MIN 250 TOL ≥± .06 MAX 1000			

THIS DOCUMENT CONTAINS PROPRIETARY AND CONFIDENTIAL INFORMATION WHICH BELONGS TO NATIONAL OILWELL VARCO L.P. ITS AFFILIATES OR SUBSIDIARIES (ALL COLLECTIVELY REFERRED TO HEREINAFTER AS "NOV"). IT IS LOANED FOR LIMITED PURPOSES ONLY AND REMAINS THE PROPERTY OF NOV. REPRODUCTION, IN WHOLE OR IN PART, OR USE OF THIS DESIGN OR DISCLOSURE OF THIS INFORMATION TO OTHERS IS NOT PERMITTED WITHOUT THE EXPRESS WRITTEN CONSENT OF NOV. THIS DOCUMENT IS TO BE RETURNED TO NOV UPON REQUEST OR UPON COMPLETION OF THE USE FOR WHICH IT WAS LOANED. THIS DOCUMENT AND THE INFORMATION CONTAINED AND REPRESENTED HEREIN IS THE CONFIRMED PROPERTY OF NOV.

RIG SOLUTIONS
MECHANICAL ENGINEERING

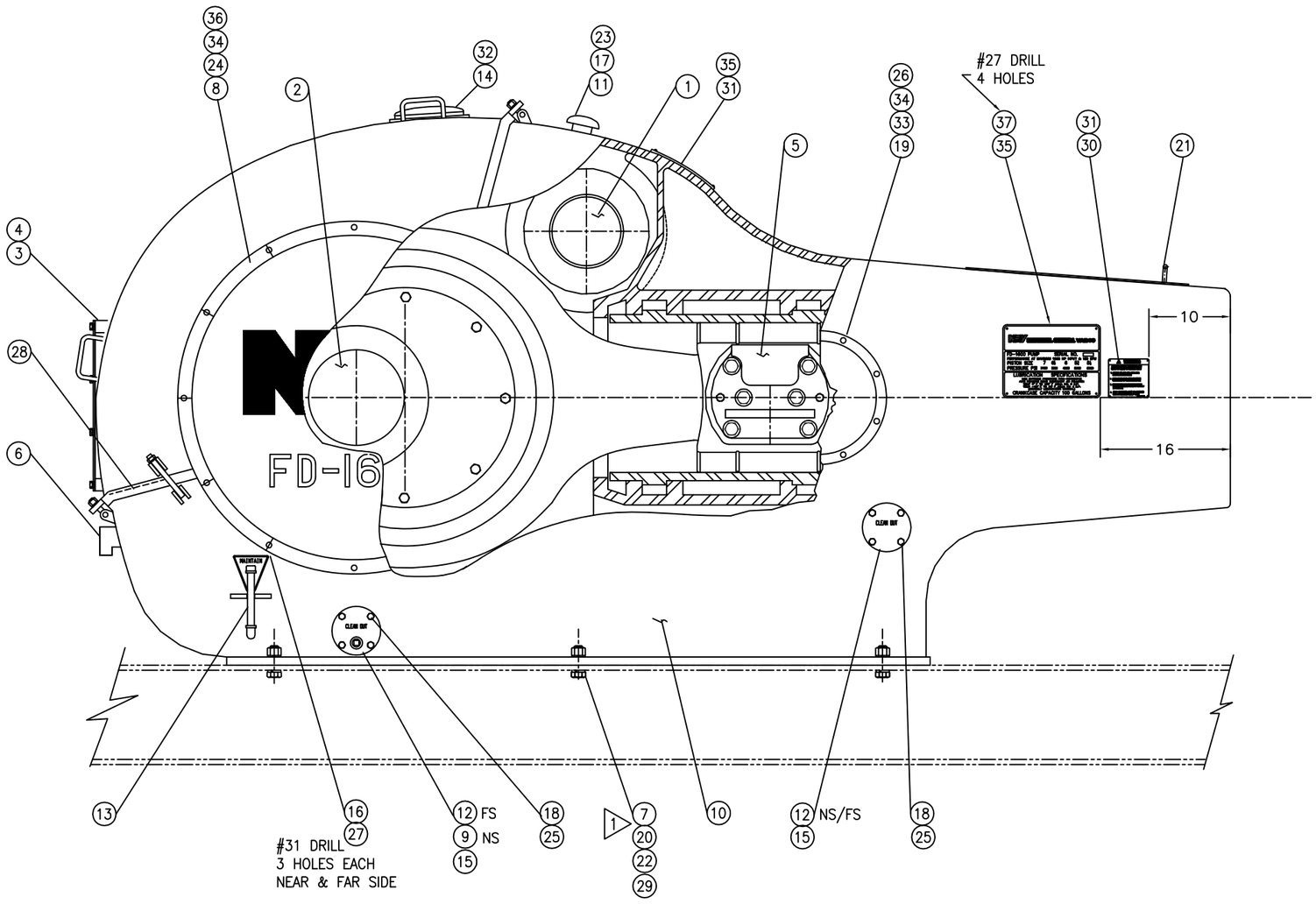
NATIONAL OILWELL VARCO

TITLE: DISCHARGE ACCESSORY MANIFOLD ASSEMBLY

SCALE	PROJECTION	SIZE	SHT
NONE		D	1 OF 1

DWG NO. 6317-0125-10-DOS REV: B

DRAWN IN ACAD DCF0022_D1 (REV E)



NOTE:

1 TORQUE TO 885 LB-FT (DRY)

BILL OF MATERIAL

QTY REQ'D	PART NO.	DESCRIPTION	ITEM NO.
—	0-6316-1001-03	POWER END COMPLETE, DBL HELIX (CONSISTS OF THE FOLLOWING)	—
1	0-6316-0098-20	PINION SHAFT ASSEMBLY, DBL HELIX	1
1	0-6316-1001-02	CRANKSHAFT ASSEMBLY	2
1	0-6316-0126-00	PLATE, COVER	3
1	0-6316-0127-00	GASKET, PLATE	4
1	0-6316-0183-00	CROSSHEAD ASSEMBLY	5
1	0-6316-0227-10	LUBRICATION ASSEMBLY	6
1	0-6316-0259-00	SHIM SET	7
2	0-6316-0042-43	COVER, MAIN BEARING	8
1	0-6316-0349-00	CLEAN OUT COVER (PLUGGED)	9
1	0-6316-0693-00	MACHINED FRAME ASSEMBLY	10
1	0-6397-0186-00	BREATHER CAP	11
1	0-6397-0264-00	CLEAN OUT COVER	12
2	0-6397-0668-00	OIL INDICATOR	13
2	0-7502-0103-00	GASKET, DOOR	14
4	0-7502-0581-00	GASKET, COVER	15
2	0-7506-0032-00	NAME PLATE, OIL LEVEL	16
1	0-7507-0200-00	STUD, BREATHER CAP	17
16	0-7601-0330-51	SCREW, CAP, HEX HD 1/2 X 1 1/2	18
2	0-6316-0045-10	COVER, CROSSHEAD DOOR	19
6	0-7601-0338-08	SCREW, CAP, HEX HD 1"-8 X 3 1/2 GR 8	20
1	0-7510-0128-40	COVER, ROD CHAMBER	21
6	0-7601-0720-17	NUT, LOCK, HEAVY 1"-8	22
1	0-7602-1071-13	ELEMENT, FILTER, MICRON (BREATHER CAP)	23
24	0-7601-0330-77	SCREW, HEX HD CAP 5/8 X 1-3/4	24
16	0-7601-1330-04	WASHER, PLAIN, NARROW 1/2	25
2	0-6316-0047-00	GASKET, DOOR, CROSSHEAD	26
1	0-7601-1060-06	DRIVE SCREW, #6 X 3/8	27
19	0-7602-5940-00	GASKET, STRIP, 19'-0"	28
6	0-7601-1430-03	WASHER, HARDENED 1"	29
1	G2407274	PLATE, WARNING	30
8	7178025	SCREW, DRIVE #2 X 1-1/2	31
2	0-7510-0202-00	INSPECTION DOOR ASSEMBLY	32
28	0-7601-0330-76	SCREW, HEX HD CAP 5/8 X 1-1/2	33
52	7600040	WASHER, PLAIN 5/8	34
1	0-7506-0419-51	NAME PLATE, SERIAL NO.	35
2	0-6316-0049-00	GASKET, COVER, MAIN BEARING	36
4	0-7601-1060-09	DRIVE SCREW, #8 X 5/8	37

PRODUCT:	FD-1600	UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES. TOLERANCES ARE: X.X ±.1 ANGLES ±1/2 DEG; X.XX ±.03 FRACTIONS ±1/16; X.XXX ±.010 BREAK EDGES .02/.03. DO NOT SCALE DRAWING	
END ITEM:			
NEXT ASSY:			
SIMILAR TO:			
WT LBS:			
FINISH: UNLESS OTHERWISE SPECIFIED TOL < ±.06 250 / TOL ≥ ±.06 1000		CURRENT / INITIAL	
	DRAWN		
	CHECKED		
	APPVD		
	DATE	6-17-08	6-30-06

THIS DOCUMENT CONTAINS PROPRIETARY AND CONFIDENTIAL INFORMATION WHICH BELONGS TO NATIONAL OILWELL VARCO, L.P., ITS AFFILIATES OR SUBSIDIARIES (ALL COLLECTIVELY REFERRED TO HEREINAFTER AS "NOV"). IT IS LOANED FOR LIMITED PURPOSES ONLY AND REMAINS THE PROPERTY OF NOV. REPRODUCTION, IN WHOLE OR IN PART, OR USE OF THIS DESIGN OR DISTRIBUTION OF THIS INFORMATION TO OTHERS IS NOT PERMITTED WITHOUT THE EXPRESS WRITTEN CONSENT OF NOV. THIS DOCUMENT IS TO BE RETURNED TO NOV UPON REQUEST OR UPON COMPLETION OF THE USE FOR WHICH IT WAS LOANED. THIS DOCUMENT AND THE INFORMATION CONTAINED AND REPRESENTED HEREIN IS THE COPYRIGHTED PROPERTY OF NOV.

RIG SOLUTIONS
MECHANICAL ENGINEERING

NATIONAL OILWELL VARCO

TITLE: POWER END COMPLETE (DBL HELIX) FD-1600

SCALE:	PROJECTION:	SIZE:	SHT:
1:8		D	1 OF 1

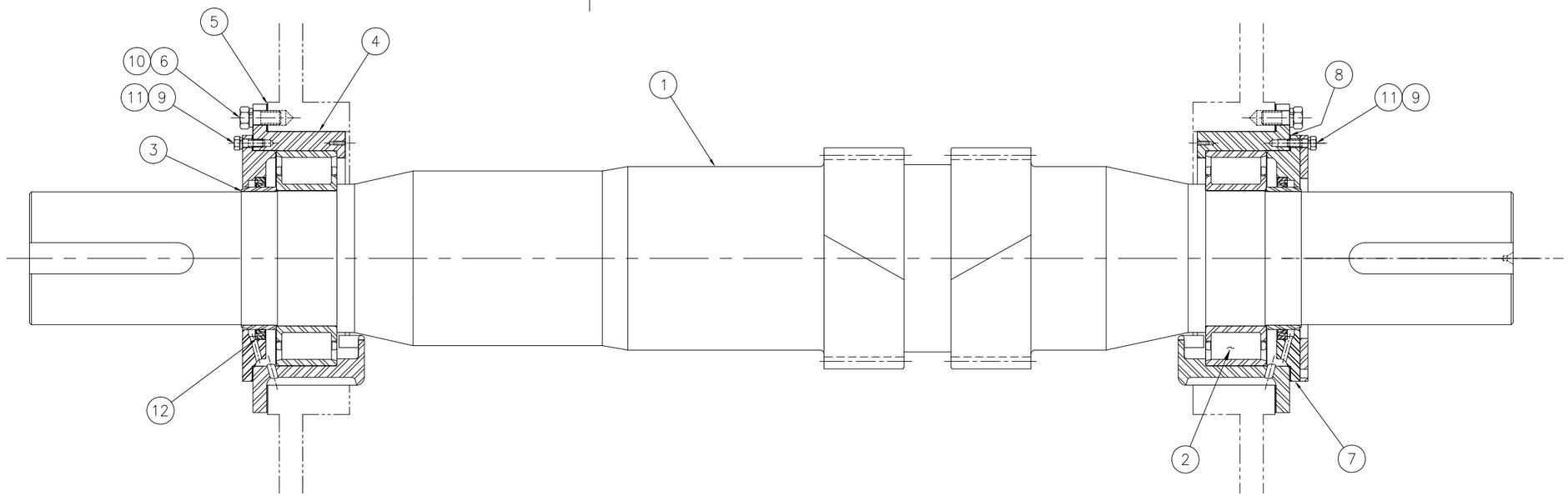
DWG NO. 6316-1001-03-DOS REV: B

DRAWN IN ACAD
RS-MECH_D-TPL-001

DWG No. 6316-0098-20	SHT 1

LTR	DESCRIPTION OF CHANGE	MADE / CHKD	DATE	APPROVED
A	REDRAWN IN AUTOCAD	DHZ / RDS	8-10-06	RDS

FLUID END



QTY REQ'D	PART NO.	DESCRIPTION /MATERIAL /SPECIFICATION	ITEM NO.
2	0-7602-2131-18	SEAL, OIL	12
12	7619050	WASHER, REG SPRING LOCK 1/2 CAD PL	11
16	0-7601-1320-19	WASHER, LOCK 7/8	10
12	700030511	SCREW, HEX HD CAP 1/2 X 1-1/2 GR 5 CAD PL	9
2	0-7502-0841-00	CARRIER, GASKET	8
2	0-6317-0023-00	CARRIER, OIL SEAL	7
16	0-7601-0336-00	SCREW, HEX HD CAP 7/8 X 2 GR 5	6
2	0-7502-0840-00	GASKET, CARRIER	5
2	0-6317-0024-00	CARRIER, BEARING	4
2	0-6301-0002-00	RING, WEAR, OIL SEAL	3
2	0-7602-0212-67	BEARING	2
1	0-6316-0027-02	SHAFT, PINION, DOUBLE HELIX	1

LIST OF MATERIAL

PROPRIETARY INFORMATION

THIS DOCUMENT CONTAINS PROPRIETARY AND CONFIDENTIAL INFORMATION WHICH BELONGS TO NATIONAL-OILWELL, L.P.. IT IS LOANED FOR LIMITED PURPOSES ONLY AND REMAINS THE PROPERTY OF NATIONAL-OILWELL, L.P.. REPRODUCTION, IN WHOLE OR IN PART, OR USE OF THIS DESIGN OR DISTRIBUTION OF THIS INFORMATION TO OTHERS IS NOT PERMITTED WITHOUT THE EXPRESS WRITTEN CONSENT OF NATIONAL-OILWELL, L.P.. THIS DOCUMENT IS TO BE RETURNED TO NATIONAL-OILWELL, L.P. UPON REQUEST AND IN ANY EVENT UPON COMPLETION OF THE USE FOR WHICH IT WAS LOANED. THIS DOCUMENT AND THE INFORMATION CONTAINED AND REPRESENTED HEREIN IS THE COPYRIGHTED PROPERTY OF NATIONAL-OILWELL, L.P..

APPLICABLE SPECS

UNLESS OTHERWISE SPECIFIED

DIMENSIONS ARE IN INCHES	DIMENSIONAL TOL.
BREAK SHARP CORNERS	FRACTIONS ±1/16
FILLET RADII	X.XXX ±.010
CONCENTRICITY	X.XX ± .06
SQUARENESS	X.X ± .1
PARALLELISM	ANGLE ±.50 DEGREE
RFS EXCEPT WHEN (M) MODIFIED	SURFACE RMS 250

SIMILAR TO

NEXT ASS'Y 0-6316-1001-03

MATERIAL SPEC

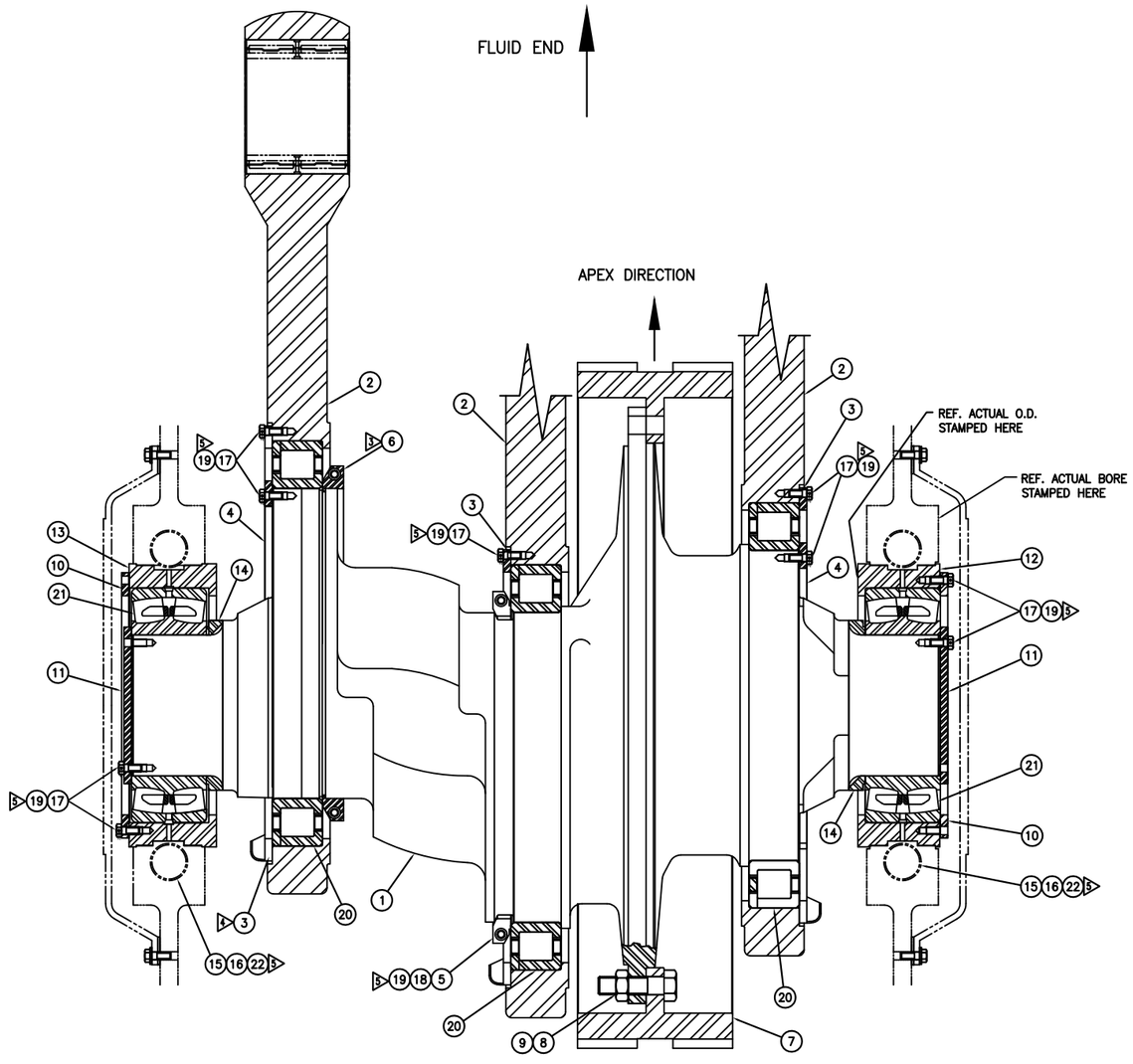
DESIGNED BY	DATE
DRAWN BY EDG	DATE 1-29-98
CHECKED BY MRL	DATE 1-29-98
P.E. APPROVAL	DATE

NOV NATIONAL OILWELL VARCO

TITLE
PINION SHAFT ASSY (DBL HELIX)
FB-1600

SIZE	DRAWING No.	REV
D	6316-0098-20-DOS	A

SCALE	EST WT	SHEET
1:4	2873#	1 OF 1



NOTES:

1. SHIM TO OBTAIN NET FIT OF .004" TIGHT BETWEEN CARRIERS AND FRAME. REFER TO 6399-0066-00 FOR DETAILS.
2. TORQUE MAIN BEARING BOLTS TO 9,750 FT. LBS. CHECK ROLLERS TO BE SURE NO MORE THAN 4 ARE TIGHT (EXCEPT AT BOTTOM DUE TO WEIGHT) . ZERO TIGHT ROLLERS IS OK.

△3 1. ASSEMBLE RETAINER ITEM 6 SNUG.
2. INSTALL BEARING HARD AGAINST RETAINER.
3. LET BEARING COOL TO ROOM TEMPERATURE.
4. TIGHTEN SAFETY WIRE RETAINER BOLTS.

△4 INSTALL WITH OIL SCOOP AT BOTTOM. TYP. 3 PLACES.

△5 SEE LOCKWIRE INSTALLATION DRAWING Y108-48.

QTY REQ'D	PART NO.	DESCRIPTION	ITEM NO.
—	0-6316-1001-02	CAST CRANKSHAFT ASSY (CONSISTS OF THE FOLLOWING)	—
1	0-6316-0021-01	CRANKSHAFT	1
2	0-6316-0023-00	STRAP, ECCENTRIC	2
3	0-6316-0034-00	RETAINER, BEARING	3
2	0-6316-0070-00	RETAINER, BEARING	4
1	0-6316-0071-00	RETAINER, BEARING (MATCHED SET)	5
1	0-6317-0176-00	RETAINER, BEARING	6
1	0-6316-0030-02	GEAR, RING (DOUBLE HELIX)	7
12	7000695-11	CAPSCREW, 1-1/2"-6 X 5" LG. C.P. GR 5 HEX HEAD	8
12	6308240	NUT, 1-1/2" - 6 ESNA	9
2	0-6316-0032-00	RETAINER, BEARING	10
2	0-6316-0031-00	RETAINER, INNER	11
1	0-6316-0037-00	CARRIER, BEARING	12
1	0-6316-0288-00	CARRIER, BEARING	13
2	0-6316-0091-00	SPACER	14
4	0-6316-0077-00	BOLT, MAIN BEARING HOUSING	15
4	0-6316-0097-00	SHIM SET	16
70	0-7501-0004-00	CAPSCREW, 5/8-11 X 1-1/2" LG. DRILLED HEX HEAD	17
2	0-7501-1256-00	SCREW, 5/8" - 11 SOCKET DRILLED HEAD	18
1	Z6001	WIRE, SAFETY TIE X 80 FEET	19
2	0-7602-0212-68	BEARING, ECCENTRIC	20
2	0-7602-0201-37	BEARING, MAIN	21
1	0-7602-5230-00	WIRE, 11 GA X 96" STAINLESS STEE TIE	22

BILL OF MATERIAL

PRODUCT: FD-1600
END ITEM:
NEXT ASSY:
SIMILAR TO: 6316-0099-00
WT LBS:
FINISH
UNLESS OTHERWISE SPECIFIED TOL < ±.06 TOL ≥ ±.06 250 1000

UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES. TOLERANCES ARE: XX ±.1 ANGLES ±1/2 DEG XXX ±.03 FRACTIONS ±1/16 XXXX ±.010 BREAK EDGES .02/.03 DO NOT SCALE DRAWING

	CURRENT	INITIAL
DRAWN		
CHECKED		
APPVD		
DATE	19-MAR-13	29 JUN 06

RIG SOLUTIONS MECHANICAL ENGINEERING

THIS DOCUMENT CONTAINS PROPRIETARY AND CONFIDENTIAL INFORMATION WHICH BELONGS TO NATIONAL OILWELL VARCO, L.P., ITS AFFILIATES OR SUBSIDIARIES (ALL COLLECTIVELY REFERRED TO AS "NOV"). IT IS LOANED TO THE RECIPIENT IN CONFIDENCE AND MUST NOT BE COPIED OR USED FOR ANY PURPOSE, IN WHOLE OR IN PART, WITHOUT THE PRIOR WRITTEN CONSENT OF NOV. BY ACCEPTANCE OF THIS DOCUMENT THE RECIPIENT AGREES THAT THE CONFIDENTIAL INFORMATION CONTAINED HEREIN WILL BE GOVERNED BY THE TERMS OF ANY CONFIDENTIALITY AGREEMENT EXECUTED BY THE RECIPIENT AND NOV. IF NO SUCH AGREEMENT EXISTS, THE INFORMATION CONTAINED HEREIN SHALL BE GOVERNED BY THE TERMS OF THE LICENSE. THIS DOCUMENT AND THE INFORMATION CONTAINED ARE CONSIDERED WORKS OF NOV, AS DEFINED BY THE U.S. COPYRIGHT ACT, 17 U.S.C. 101, AND SHALL BE CONSIDERED THE PROPERTY OF NOV. ALL RIGHTS RESERVED.

NATIONAL OILWELL VARCO

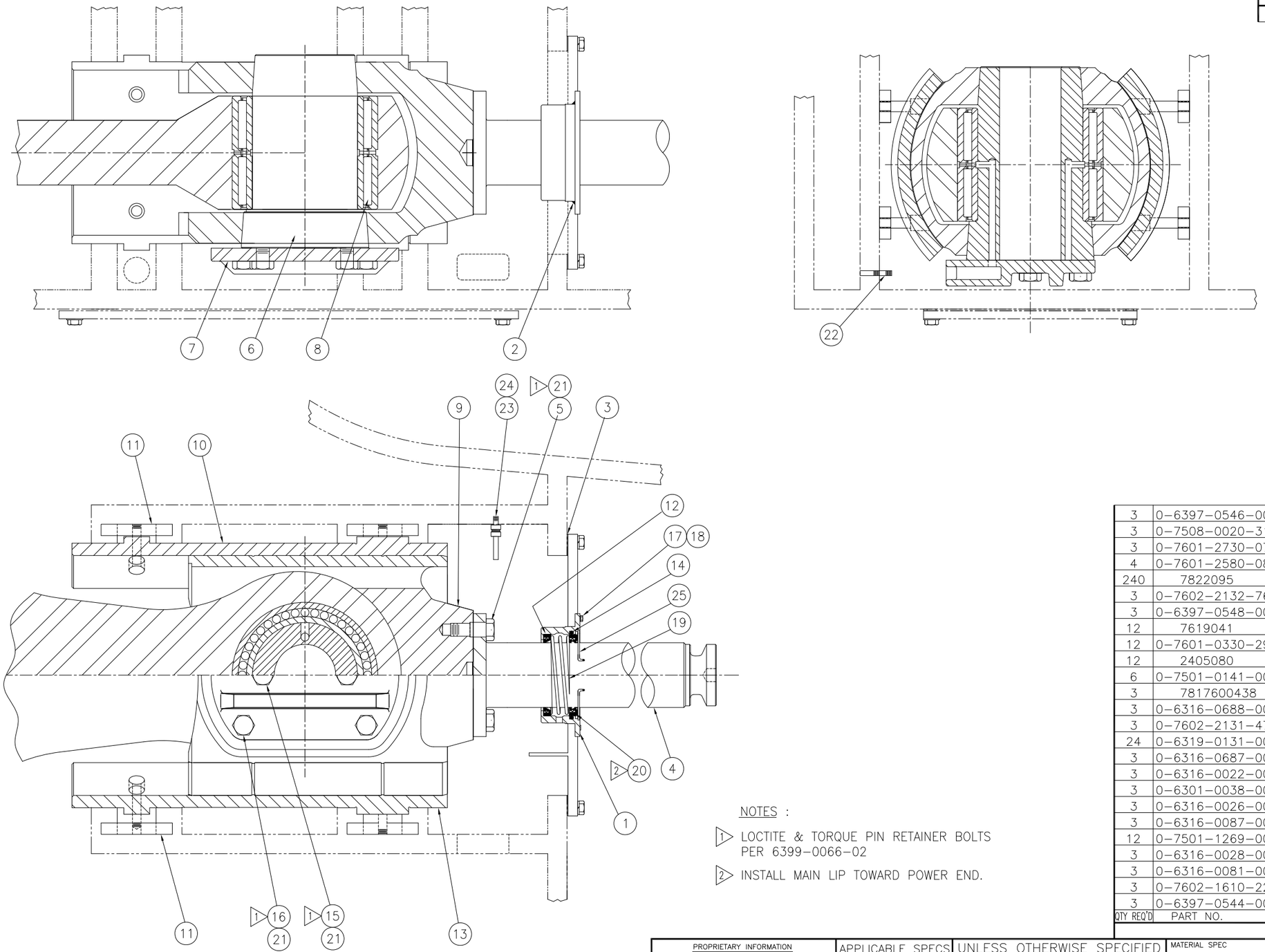
TITLE: CRANKSHAFT ASSEMBLY, CAST FD-1600 TRIPLEX MUD PUMP

SCALE: 1:4 PROJECTION: SIZE: E SHT: 1 of 1
DWG NO. 6316-1001-02-DOS REV: C

DRAWN IN ACAD
RS-MECH_E-TPL-001

DWG No. 6316-0183-00	SHT

LTR	DESCRIPTION OF CHANGE	MADE / CHKD	DATE	APPROVED
N	RDWN FOR NOV LOGO/BOM UPDATED	DHZ / RDS	5-17-06	RDS



NOTES :

1. LOCTITE & TORQUE PIN RETAINER BOLTS PER 6399-0066-02
2. INSTALL MAIN LIP TOWARD POWER END.

QTY REQ'D	PART NO.	DESCRIPTION /MATERIAL /SPECIFICATION	ITEM NO.
3	0-6397-0546-00	SPRING, LOCK	25
3	0-7508-0020-31	COPPER TUBING ASSEMBLY	24
3	0-7601-2730-07	CONNECTOR, COPPER TBG WTHD 202 X 6	23
4	0-7601-2580-08	NIPPLE, PIPE 3/8 X 2	22
240	7822095	WIRE, SAFETY SST TYPE 302	21
3	0-7602-2132-76	SEAL, OIL	20
3	0-6397-0548-00	SPRING, STUFFING BOX	19
12	7619041	WASHER, REG SPRING 3/8 CAD PL	18
12	0-7601-0330-29	SCREW, HEX HD CAP 3/8-16 X 7/8	17
12	2405080	SCREW, DRLD HD CAP 1-8 X 2-1/2 GR 5 CAD PL	16
6	0-7501-0141-00	SCREW, DRLD HD CAP 1-8 X 2-1/4 GR 5	15
3	7817600438	O-RING, RUBBER ARP568-438	14
3	0-6316-0688-00	GUIDE ASSEMBLY, LOWER	13
3	0-7602-2131-47	SEAL, OIL	12
24	0-6319-0131-00	PLATE, LOCKING	11
3	0-6316-0687-00	GUIDE ASSEMBLY, UPPER	10
3	0-6316-0022-00	CROSSHEAD	9
3	0-6301-0038-00	BEARING, CROSSHEAD	8
3	0-6316-0026-00	RETAINER, PIN	7
3	0-6316-0087-00	PIN, CROSSHEAD	6
12	0-7501-1269-00	SCREW, DRLD HD CAP 1-8 X 2-1/2	5
3	0-6316-0028-00	EXTENSION, CROSSHEAD	4
3	0-6316-0081-00	GASKET, PLATE	3
3	0-7602-1610-22	O-RING	2
3	0-6397-0544-00	STUFFING BOX, DIAPHRAGM	1

LIST OF MATERIAL

PROPRIETARY INFORMATION

THIS DOCUMENT CONTAINS PROPRIETARY AND CONFIDENTIAL INFORMATION WHICH BELONGS TO NATIONAL-OILWELL, L.P.. IT IS LOANED FOR LIMITED PURPOSES ONLY AND REMAINS THE PROPERTY OF NATIONAL-OILWELL, L.P.. REPRODUCTION, IN WHOLE OR IN PART, OR USE OF THIS DESIGN OR DISTRIBUTION OF THIS INFORMATION TO OTHERS IS NOT PERMITTED WITHOUT THE EXPRESS WRITTEN CONSENT OF NATIONAL-OILWELL, L.P.. THIS DOCUMENT IS TO BE RETURNED TO NATIONAL-OILWELL, L.P. UPON REQUEST AND IN ANY EVENT UPON COMPLETION OF THE USE FOR WHICH IT WAS LOANED. THIS DOCUMENT AND THE INFORMATION CONTAINED AND REPRESENTED HEREIN IS THE COPYRIGHTED PROPERTY OF NATIONAL-OILWELL, L.P..

APPLICABLE SPECS

UNLESS OTHERWISE SPECIFIED

DIMENSIONS ARE IN INCHES	DIMENSIONAL TOL.
BREAK SHARP CORNERS	FRACTIONS ±1/16
FILLET RADII	X.XXX ±.010
CONCENTRICITY	X.XX ± .06
SQUARENESS	X.X ± .1
PARALLELISM	ANGLE ±.50 DEGREE
RFS EXCEPT WHEN (M) MODIFIED	SURFACE RMS 250

SIMILAR TO

NEXT ASS'Y

MATERIAL SPEC

DESIGNED BY	DATE
DRAWN BY TAB	DATE 11-1-71
CHECKED BY J.O.	DATE 11-1-71
P.E. APPROVAL P.V.	DATE 12-10-98

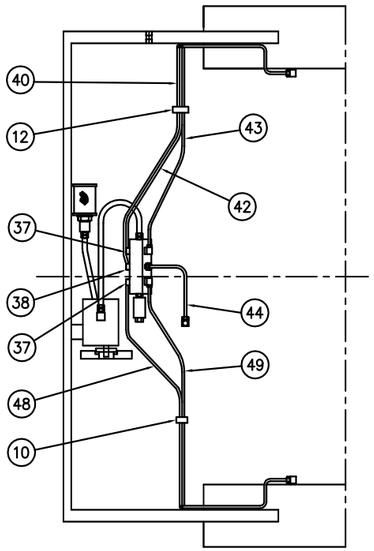
NOV NATIONAL OILWELL VARCO

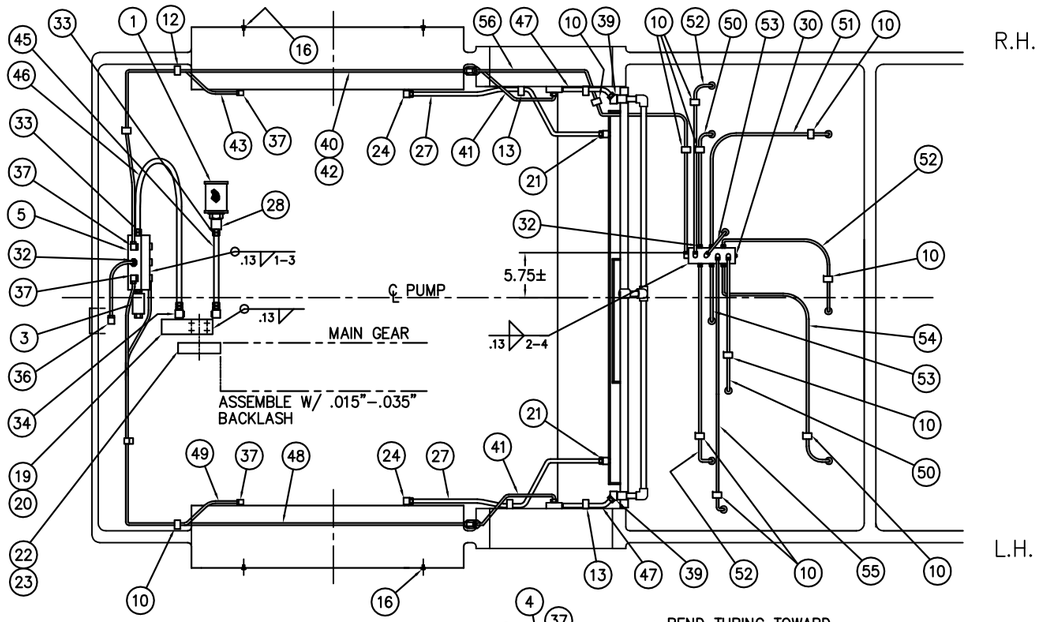
TITLE

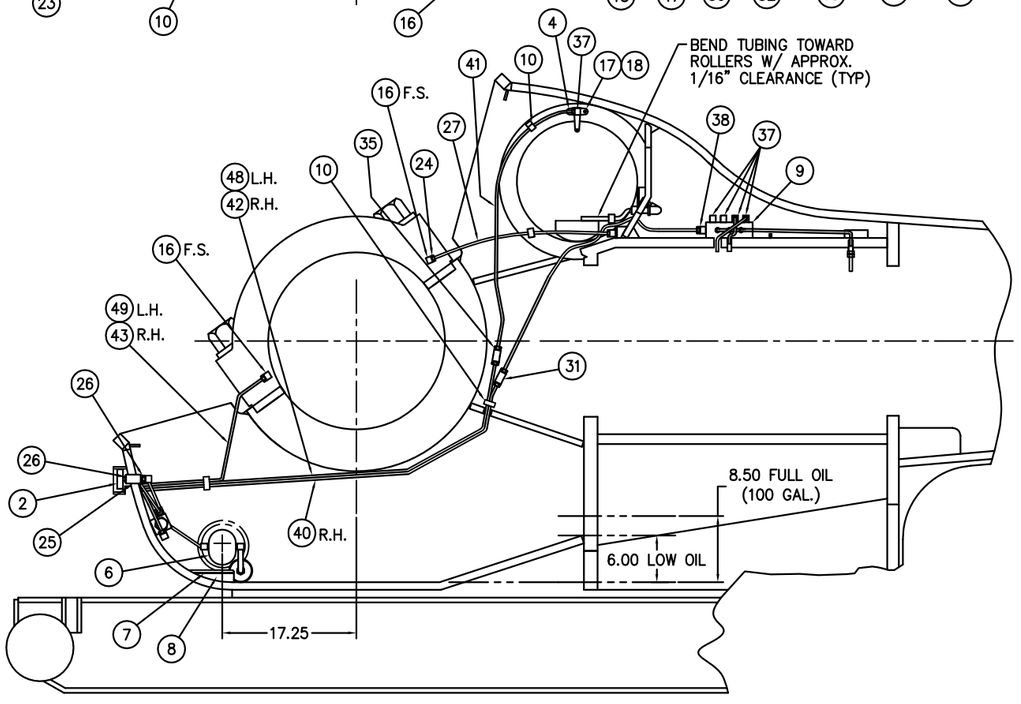
CROSSHEAD ASSEMBLY F-1600 SERIES PUMP

SIZE	DRAWING No.	REV
D	6316-0183-00-DOS	N

SCALE	EST WT	SHEET
1:4		1 OF 1



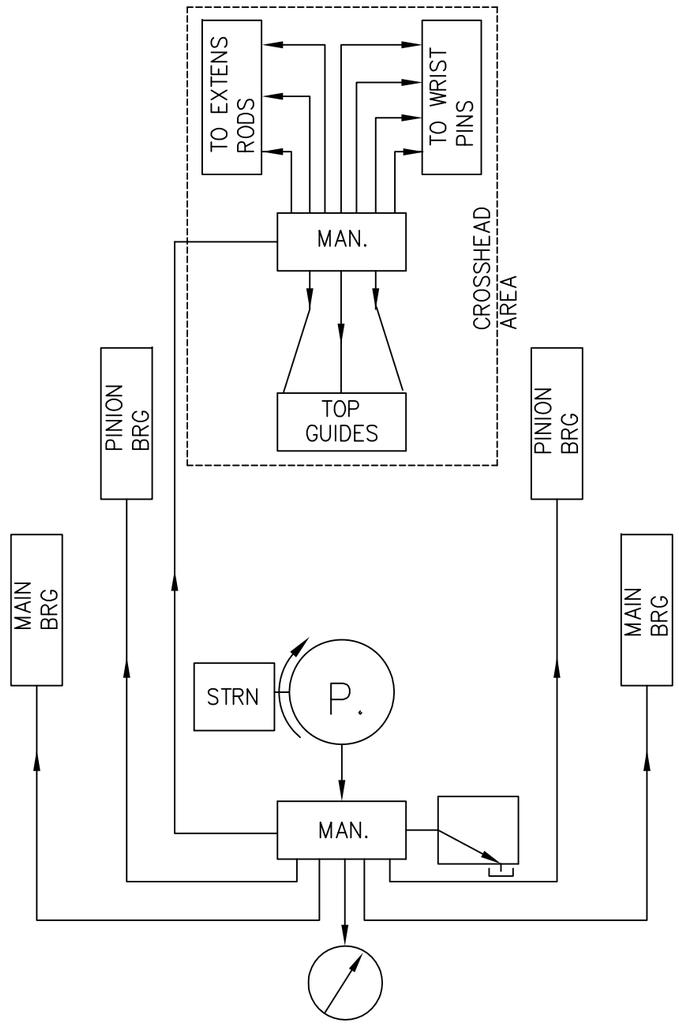




QTY	PART NUMBER	DESCRIPTION	MATERIAL	ITEM
–	6316-0227-10	LUBRICATION ASSY, POWER END (CONSISTS OF THE FOLLOWING)		–
1	7602-1070-03	FILTER, AIR		1
1	7602-1150-98	GAUGE (0-160 PSI), OIL PRESSURE		2
1	7602-2914-78	RELIEF VALVE		3
2	6397-0316-01	OIL, JET		4
1	6920-0259-00	MANIFOLD		5
1	7602-1830-82	LUBE OIL PUMP WITHOUT RELIEF VALVE		6
1	6319-0095-00	SHIM SET		7
1	6316-0124-00	OIL PUMP MOUNTING PLATE		8
1	6316-0169-00	MANIFOLD (X-HED)		9
19	7602-0721-46	3/8" TUBING CLAMP (SINGLE)		10
2	7514-0231-00	3/8" TUBING CLAMP (TRIPLE)		12
4	7514-0007-00	1/2" TUBING CLAMP (SINGLE)		13
4	7601-2590-94	1/4"-18 CTSK ALLEN HEAD PIPE PLUG		16
4	7601-0330-03	1/4"-20 X 3/4" HX CAPSCREW		17
4	7601-1320-38	1/4" LOCK WASHER		18
4	7601-0330-32	3/8"-16 X 1-1/2" HX CAPSCREW		19
4	7619041	3/8" LOCK WASHER		20
2	7601-2730-08	1/2" INV CONNECTOR		21
1	7504-0002-00	KEY 3/16" SQ X 1"		23
1	6316-0689-00	OIL PUMP GEAR		22
1	7601-2750-35	ELBOW, 90° MALE		24
1	7601-2550-27	1/2" PIPE COUPLING (3000#)		25
2	7601-2530-04	1/2" X 1/8" BUSHING		26
2	7508-0240-37	1/2" COPPER TUBING ASSEMBLY		27
1	7601-2550-85	1/2" STD PIPE COUPLING		28

BILL OF MATERIAL

PRODUCT:	UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES. TOLERANCES ARE: X.X ±.1 ANGLES ±1/2 DEG; X.XX ±.03 FRACTIONS ±1/16; X.XXX ±.010 BREAK EDGES .02/.03. DO NOT SCALE DRAWING	THIS DOCUMENT CONTAINS PROPRIETARY AND CONFIDENTIAL INFORMATION WHICH BELONGS TO NATIONAL OILWELL VARCO, L.P., ITS AFFILIATES OR SUBSIDIARIES (ALL COLLECTIVELY REFERRED TO HEREINAFTER AS "NOV"). IT IS LOANED FOR LIMITED PURPOSES ONLY AND REMAINS THE PROPERTY OF NOV. REPRODUCTION, IN WHOLE OR IN PART, OR USE OF THIS DESIGN OR DISTRIBUTION OF THIS INFORMATION TO OTHERS IS NOT PERMITTED WITHOUT THE EXPRESS WRITTEN CONSENT OF NOV. THIS DOCUMENT IS TO BE RETURNED TO NOV UPON REQUEST OR UPON COMPLETION OF THE USE FOR WHICH IT WAS LOANED. THIS DOCUMENT AND THE INFORMATION CONTAINED AND REPRESENTED HEREIN IS THE COPYRIGHTED PROPERTY OF NOV.	NATIONAL OILWELL VARCO
END ITEM:			
NEXT ASSY:			
SIMILAR TO: 6316-0125-00			TITLE: LUBRICATION ASSEMBLY POWER END (DOUBLE HELIX)
WT LBS:	CURRENT / INITIAL		
FINISH	DRAWN		RIG SOLUTIONS MECHANICAL ENGINEERING
UNLESS OTHERWISE SPECIFIED TOL < ±.06 TOL ≥ ±.06 250 1000	CHECKED		SCALE: NONE PROJECTION: SIZE: D SHT: 1 OF 2
	APPVD		DWG NO. 6316-0227-10-DOS REV: C
	DATE 15 JUN 10 / 29 JAN 98		DRAWN IN ACAD RS-MECH_D-TPL-001



PRESSURE LUBE SCHEMATIC

ITEM	DESCRIPTION	PART NUMBER	REQ'D
56	3/8" COPPER TUBING ASSEMBLY	7508-0330-028	1
55	5/16" COPPER TUBING ASSEMBLY	7508-0400-22	1
54	5/16" COPPER TUBING ASSEMBLY	7508-0470-22	1
53	5/16" COPPER TUBING ASSEMBLY	7508-0090-22	2
52	5/16" COPPER TUBING ASSEMBLY	7508-0300-22	3
51	5/16" COPPER TUBING ASSEMBLY	7508-0360-22	1
50	5/16" COPPER TUBING ASSEMBLY	7508-0200-22	2
49	5/16" COPPER TUBING ASSEMBLY	7508-0630-19	1
48	5/16" COPPER TUBING ASSEMBLY	7508-0910-19	1
47	1/2" COPPER TUBING ASSEMBLY	7508-0120-40	2
46	5/8" COPPER TUBING ASSEMBLY	7508-0270-45	1
45	5/8" COPPER TUBING ASSEMBLY	7508-0130-45	1
44	5/16" COPPER TUBING ASSEMLBY	7508-0120-19	1
43	5/16" COPPER TUBING ASSEMBLY	7508-0490-19	1
42	5/16" COPPER TUBING ASSEMBLY	7508-0770-19	1
41	5/16" COPPER TUBING ASSEMBLY	7508-0320-19	2
40	3/8" COPPER TUBING ASSEMBLY	7508-0770-28	1
39	MALE ELBOW - 45°	7601-2750-27	2
38	MALE ELBOW	7601-2750-06	2
37	MALE ELBOW	7601-2750-05	14
36	MALE ELBOW	7601-2750-04	1
35	UNION	7601-2810-02	2
34	MALE ELBOW	7601-2752-00	2
33	MALE CONNECTOR	7601-2730-86	2
32	MALE CONNECTOR	7601-2730-04	5
31	UNION	7601-2810-03	1
30	1/4" PIPE PLUG	7601-2590-76	1

PRODUCT:
END ITEM:
NEXT ASSY:
SIMILAR TO: 6316-0227-10
WT LBS:
FINISH
UNLESS OTHERWISE SPECIFIED
TOL < ±.06 250
TOL ≥ ±.06 1000

UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES.
TOLERANCES ARE:
X.X ±.1 ANGLES ±1/2 DEG
X.XX ±.03 FRACTIONS ±1/16
X.XXX ±.010 BREAK EDGES .02/.03
DO NOT SCALE DRAWING

	CURRENT	INITIAL
DRAWN		
CHECKED		
APPVD		
DATE	15 JUN 10	29 JAN 98

THIS DOCUMENT CONTAINS PROPRIETARY AND CONFIDENTIAL INFORMATION WHICH BELONGS TO NATIONAL OILWELL VARCO, L.P., ITS AFFILIATES OR SUBSIDIARIES (ALL COLLECTIVELY REFERRED TO HEREINAFTER AS "NOV"). IT IS LOANED FOR LIMITED PURPOSES ONLY AND REMAINS THE PROPERTY OF NOV. REPRODUCTION, IN WHOLE OR IN PART, OR USE OF THIS DESIGN OR DISTRIBUTION OF THIS INFORMATION TO OTHERS IS NOT PERMITTED WITHOUT THE EXPRESS WRITTEN CONSENT OF NOV. THIS DOCUMENT IS TO BE RETURNED TO NOV UPON REQUEST OR UPON COMPLETION OF THE USE FOR WHICH IT WAS LOANED. THIS DOCUMENT AND THE INFORMATION CONTAINED AND REPRESENTED HEREIN IS THE COPYRIGHTED PROPERTY OF NOV.

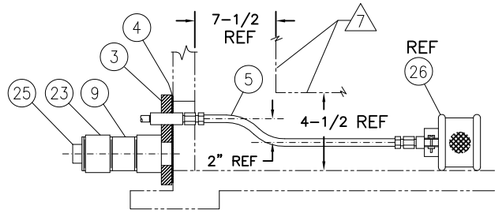
RIG SOLUTIONS
MECHANICAL ENGINEERING

NATIONAL OILWELL VARCO

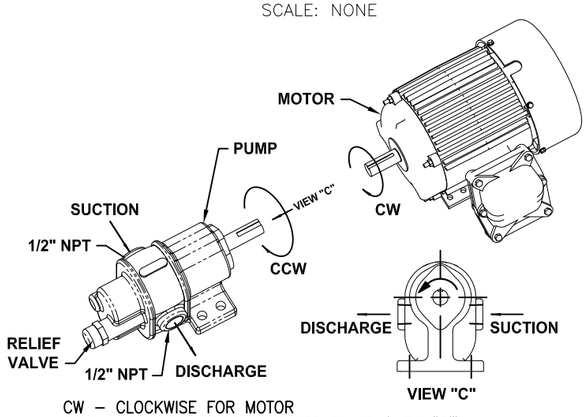
TITLE:
LUBRICATION ASSEMBLY
POWER END (DOUBLE HELIX)

SCALE: NONE | PROJECTION: | SIZE: D | SHT: 2 OF 2
DWG NO. 6316-0227-10-DOS | REV: C

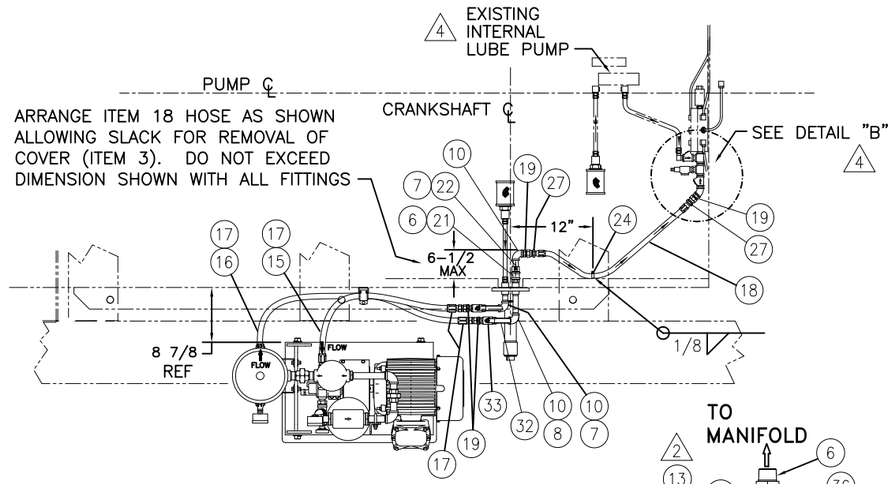
DRAWN IN ACAD
RS-MECH_D-TPL-001

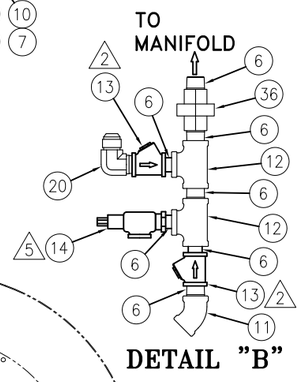


SECTION B–B
SCALE: NONE

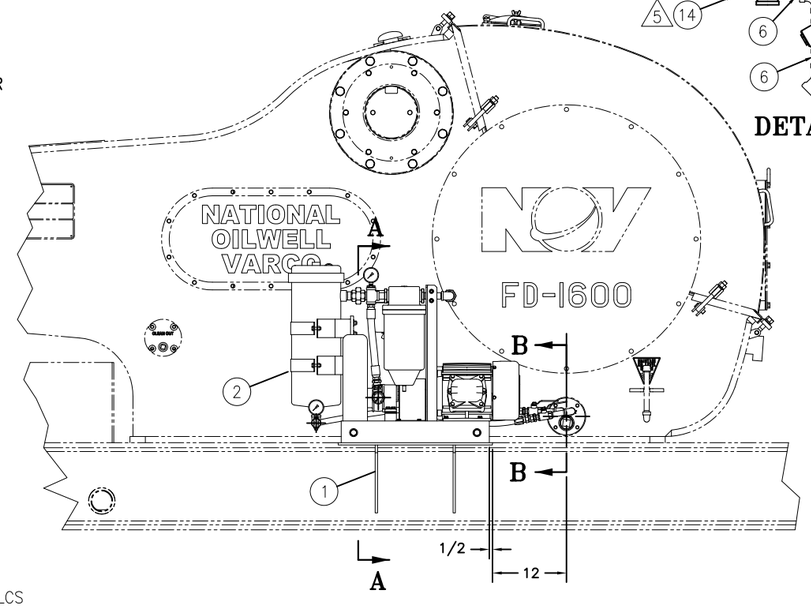


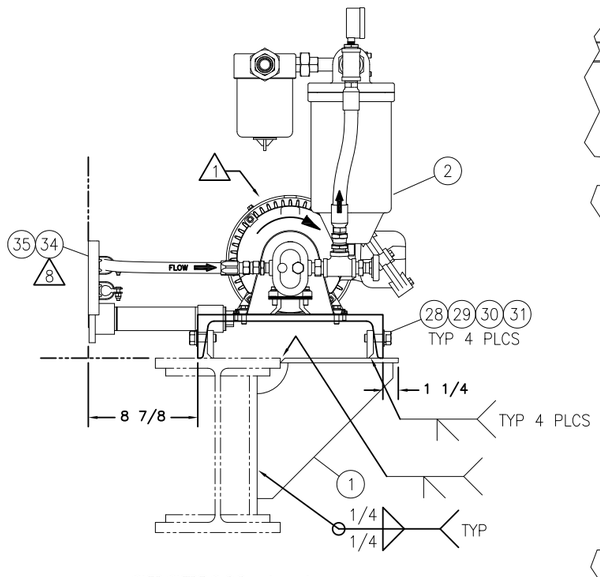
1 CW – CLOCKWISE FOR MOTOR
CCW – COUNTER CLOCKWISE FOR PUMP (VIEW "C")
THE ROTATION IS VIEWED FROM SHAFT END FOR PUMP AND MOTOR
PUMP DISCHARGE IS ALWAYS ON THE SIDE TOWARDS
WHICH THE TOP OF SHAFT ROTATES.
RELIEF VALVE IS ALWAYS ON THE DISCHARGE SIDE.



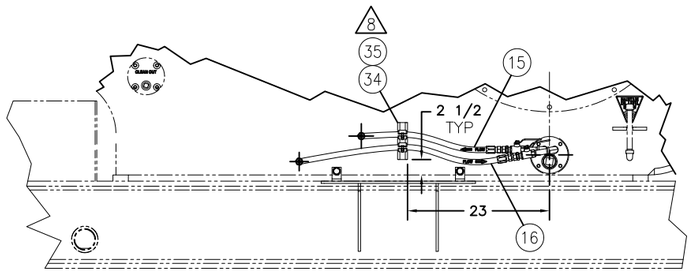


DETAIL "B"





SECTION A–A
SCALE: 2X



NOTES:

1. B&S PUMP AND MOTOR ROTATION MUST BE AS SHOWN.
2. INSTALL CHECK VALVES, ITEM 13, TO ALLOW FREE FLOW FROM LUBE PUMPS TO DISCHARGE MANIFOLD.
3. WIRING & CONTROLS BY OTHERS.
4. THIS INSTALLATION REQUIRES MODIFICATION TO STANDARD INTERNAL LUBE SYSTEM: REPOSITION INTERNAL LUBE PUMP DISCHARGE TUBE TO CONNECT AS SHOWN. ORIENT FITTINGS 11, 12, 13, 14 & 20 TO LAY NEAR AND PARALLEL TO FRAME BACK PLATE OF THE PUMP.
5. SYSTEM RELIEF VALVE(S), ITEM 14, ARE SET AT 40 PSI.
7. APPROXIMATE LOW POINT OF ECCENTRIC STRAP.
8. LOCATE AND WELD UNISTRUT CHANNEL TO PUMP FRAME.
9. 10702595–001 AS SHOWN. USED WITH STANDARD SKIDS.
   10702595–002 IS THE SAME LESS (ITEM 1). USED WITH SKIDS WITH WALKWAYS.

QTY REQ'D		BILL OF MATERIAL		
–002	–001	PART NUMBER	DESCRIPTION	MATERIAL ITEM
1	1	7820619	UNION, STD PIPE 1/2"	36
1	1	10539638–001	CHANNEL, ANCHOR 1–5/8" X 7/8" X 12GA, 6" LG	35
2	2	7802352	CLAMP, PIPE 1/2"	34
2	2	78101081	VALVE, BALL APOLLO 70–103–01 1/2" BRZ	33
2	2	6817052G	NIPPLE, STD PIPE 1/2" X 3" LG GALV	32
4	4	7621040	WASHER, FLAT 5/8" N TYPE A 1.312 OD CD PL	31
4	4	7619058	WASHER, REG SPG LOCK 5/8" CD PL	30
4	4	7000396–11	SCREW, HEX HD CAP 5/8"–11 X 1–3/4" LG GR5 CD PL	29
4	4	615654	CLIP, GUARD	28
2	2	7805131	FITTING	27
REF	REF	0–7602–1070–03	FILTER, OIL, CLAMP TYPE 1" (FURNISHED WITH 6316–0444–00)	26
REF	REF	0–7601–2590–03	PLUG, PIPE SQ HEAD 1–1/2" (FURNISHED WITH 6316–0443–00)	25
1	1	0–7514–0011–00	CLAMP ASSY	24
1	1	6806012G	COUPLING, STD STEEL 1–1/2" GALV	23
1	1	0–7601–2270–73	NIPPLE	22
1	1	0–7601–2270–82	COUPLING, 1/2 QUICK FEMALE	21
1	1	7804859	ELBOW	20
4	4	7800203	ADAPTER	19
1	1	6100038	HOSE, 84" LG	18
4	4	7805885	FITTING, HOSE	17
1	1	6100041	HOSE, 40" LG	16
1	1	6100041	HOSE, 30" LG	15
1	1	0–7602–2914–78	VALVE RELIEF, CIRCLE SEAL	14
2	2	0–7602–2910–30	VALVE, CHECK, 1/2"	13
2	2	6888004	TEE, STD MI PIPE 1/2"	12
1	1	6828004	ELBOW, STD M.I. 45 DEG 1/2"	11
2	2	6826004G	ELBOW, STD M.I. 90 DEG 1/2" GALV	10
1	1	0–7601–2587–85	NIPPLE, STD PIPE 1–1/2" X 8" LG GALV	9
2	2	6817050G	NIPPLE, STD PIPE 1/2" X 4" LG GALV	8
2	2	6817046G	NIPPLE, STD PIPE 1/2" X 2" LG GALV	7
8	8	6817044G	NIPPLE, PIPE 1/2" X CLOSE GALV	6
1	1	0–6316–0444–00	STRAINER & TUBE ASSY	5
1	1	0–7502–0581–00	GASKET, COVER, CLEAN OUT	4
1	1	0–6316–0443–00	COVER, CLEAN OUT	3
1	1	1262028	PUMP ASSY, EXT LUBE OIL W/MAG & COALESCING FILTERS – 460V NEMA	2
–	1	10702616–001	SUPPORT, EXT LUBE PUMP	1

PRODUCT: FD–1600
END ITEM:
NEXT ASSY:
SIMILAR TO: 6316–0445–04
WT LBS: 410
FINISH
UNLESS OTHERWISE SPECIFIED TOL < ±.06 250 TOL ≥ ±.06 1000

UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES.
TOLERANCES ARE:
X.X ±.1 ANGLES ±1/2 DEG
X.XX ±.03 FRACTIONS ±1/16
X.XXX ±.010 BREAK EDGES .02/.03
DO NOT SCALE DRAWING

	CURRENT	INITIAL
DRAWN		–
CHECKED		–
APPVD		–
DATE		15–NOV–12

THIS DOCUMENT CONTAINS PROPRIETARY AND CONFIDENTIAL INFORMATION WHICH BELONGS TO NATIONAL OILWELL VARCO, L.P., ITS AFFILIATES OR SUBSIDIARIES (ALL COLLECTIVELY REFERRED TO HEREINAFTER AS "NOV"). IT IS LOANED FOR LIMITED PURPOSES ONLY AND REMAINS THE PROPERTY OF NOV. REPRODUCTION, IN WHOLE OR IN PART, OR USE OF THIS DESIGN OR DISTRIBUTION OF THIS INFORMATION TO OTHERS IS NOT PERMITTED WITHOUT THE EXPRESS WRITTEN CONSENT OF NOV. THIS DOCUMENT IS TO BE RETURNED TO NOV UPON REQUEST OR UPON COMPLETION OF THE USE FOR WHICH IT WAS LOANED. THIS DOCUMENT AND THE INFORMATION CONTAINED AND REPRESENTED HEREIN IS THE COPYRIGHTED PROPERTY OF NOV.

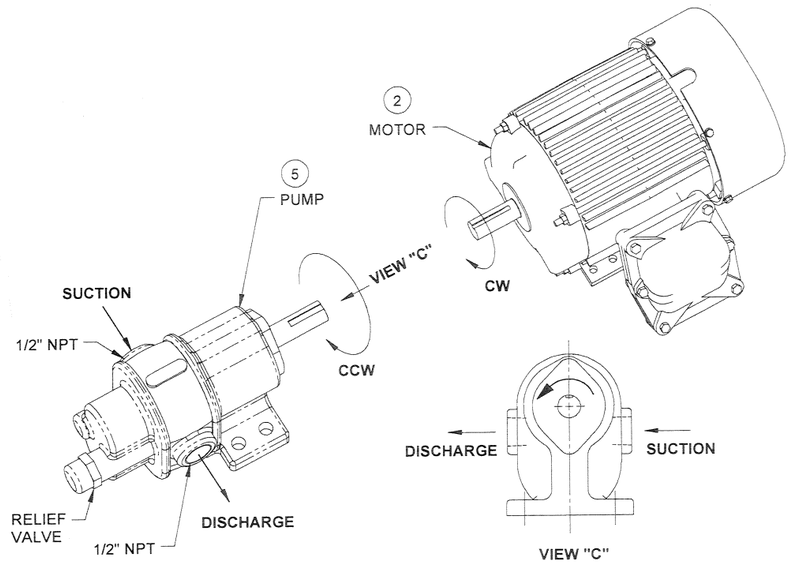
RIG SOLUTIONS
MECHANICAL ENGINEERING

NATIONAL OILWELL VARCO

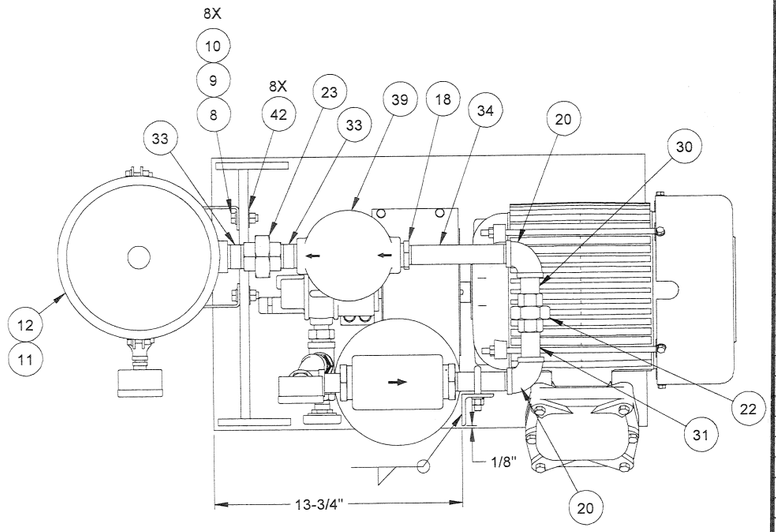
TITLE: EXTERNAL LUBE SYSTEM, 460V NEMA, FD–1600 RMBD SGL

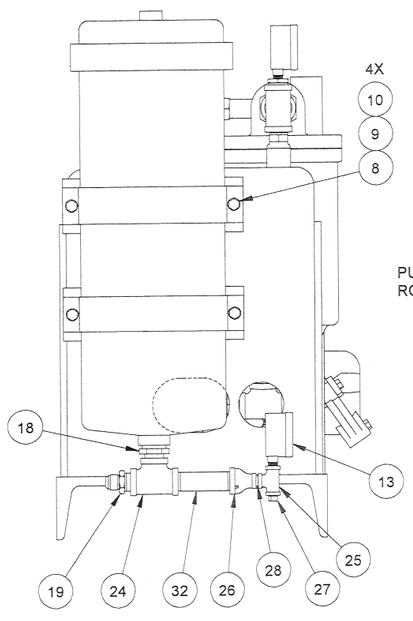
SCALE: 1:12 PROJECTION: SIZE: D SHT: 1 OF 1
DWG NO. 10702595–DOS REV: 01

DRAWN IN ACAD
RS–MECH_D–TPL–001

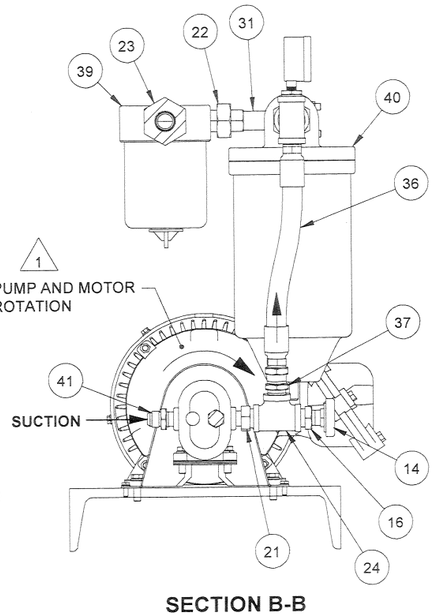


1 CW - CLOCKWISE FOR MOTOR
CCW - COUNTER CLOCKWISE FOR PUMP (VIEW "C")
THE ROTATION IS VIEWED FROM SHAFT END FOR PUMP AND MOTOR
PUMP DISCHARGE IS ALWAYS ON THE SIDE TOWARDS
WHICH THE TOP OF SHAFT ROTATES.
RELIEF VALVE IS ALWAYS ON THE DISCHARGE SIDE.

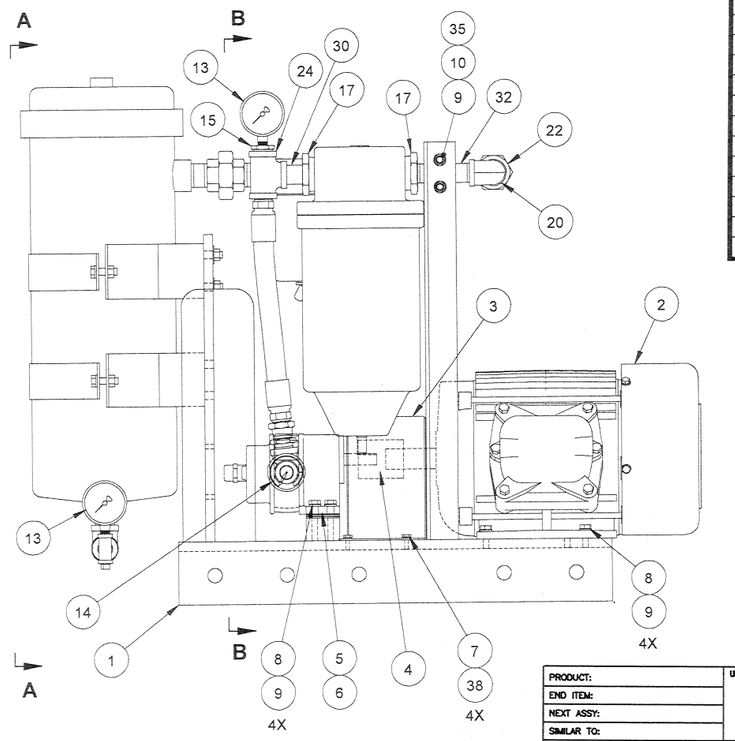




VIEW A-A



SECTION B-B



BILL OF MATERIAL			
ITEM	REQ'D	PART NO.	DESCRIPTION
--	--	1262028	EXTERNAL LUBE OIL PUMP ASSEMBLY (CONSISTS OF THE FOLLOWING)
1	1	1295325	BASE, EXTERNAL LUBE PUMP
2	1	7812684	MOTOR, 1-1/2 HP 230/460V 3PH 60HZ ELECTRIC
3	1	06-510-607	GUARD, COUPLING (OSHA)
4	1	68-103-991	COUPLING, 5/8" X 1-1/8"
5	1	7815926	PUMP, ½" NPT LUBE OIL
6	1	45-194-207	SHIM SET (CONSISTS OF 45-194-208 & 06-015-462)
7	4	7000105-11	CAPSCREW, ¼" – 20 X 5/8" LG. GR 5 CAD PLATED HEX HD.
8	20	7000209-11	CAPSCREW, 3/8" X 1-1/4" LG. GR 5 CAD PLTATED HEX HD.
9	22	7619041	WASHER, 3/8" REG. CAD. PLATED SPRING LOCK
10	14	6300062	NUT, 3/8" – 16 UNC CAD PLATED HEX
11	REF.	64-212-848	ELEMENT, FILTER
12	1	64-212-832	CARTRIDGE, OIL FILTER
13	2	78-684-250	THERMOMETER (0 – 250 DEG. F.), 3" DIAL X ½" NPT S.S.
14	1	78-256-532	GAUGE (0-200 PSI/KPA), 2-1/2" DIAL X ¼" BTM
15	1	6800060	BUSHING, ¾" X ¼" STD. C.I. HEX
16	1	86-061-010	BUSHING, ¾" X ½" STD. M.I. HEX
17	2	6800123	BUSHING, 1-1/2" X ¾" STD. M.I. HEX
18	2	6800084	BUSHING, 1" X ¾" STD. M.I. HEX
19	1	7800217	ADAPTER, ¾" X 5/8" STEEL
20	2	6826006	ELBOW, ¾" X 90 DEG. STD. M.I.
21	1	7828010	ADAPTER, ¾" X ½" STEEL
22	1	6881060	UNION, ¾" STD. PIPE
23	1	6881080	UNION WITH BRASS SEAT, 1" 150# STD. PIPE
24	3	6888006	TEE, ¾" NPT STD. M.I. PIPE
25	1	6888002	TEE, ¼" STD. M.I. PIPE
26	1	86-600-008	REDUCER, ¾" X ¼" STD. M.I.
27	1	6874002	PLUG, ¼" STD. SOLID SQUARE HEAD
28	1	6820024	NIPPLE, ¼" X CLOSE EXTRA STRONG PIPE
29	1	6817066	NIPPLE, ¾" X CLOSE STD. PIPE
30	2	6817067	NIPPLE, ¾" X 2" LG. STD. PIPE
31	1	6817068	NIPPLE, ¾" X 2-1/2" LG. PIPE
32	2	6817070	NIPPLE, ¾" X 4" LG. PIPE
33	2	6817074	NIPPLE, 1" X 2" LG. PIPE
34	1	86-425-022	NIPPLE, ¾" X 6-1/2" LG. STD. PIPE
35	1	45-804-150	U-BOLT, 3/8"
36	1	45-804-717	HOSE ASSEMBLY, ¾"
37	1	64-289-324	ADAPTER, ¾"
38	4	7619033	WASHER, ¼" REG. CAD PLATED SPIRNG LOCK
39	1	64-212-003	FILTER, MAGENTIC OIL
40	1	7805858	FILTER, 1-1/2" NPT COALESCING OIL
41	1	7800203	ADAPTER, ½" X 5/8" STEEL
42	8	7621026	WASHER, 3/8" W TYPE A 1.000 OD CAD PLATED FLAT

NOTES:

1. USE PIPE THREAD SEALANT ON ALL PIPE THREAD CONNECTIONS.
2. PAINT PER NOV SPEC CS-3007 SYSTEM "I".
3. WIRE TAG ASSEMBLY WITH PART NO. "1262028" AND REVISION.

PRODUCT:	
END ITEM:	
NEXT ASSY:	
SIMILAR TO:	
WT LBS:	335
FINISH	
UNLESS OTHERWISE SPECIFIED TOL <± .06 250 MIN; TOL >± .06 1000 MAX	

UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES.
TOLERANCES ARE:
X.X ±.1 ANGLES ±1/2 DEG
X.XX ±.03 FRACTIONS ±1/8
X.XXX ±.010 BREAK EDGES .02/.03
DO NOT SCALE DRAWING

	CURRENT	INITIAL
DRAWN		
CHECKED		
APPVD		
DATE		

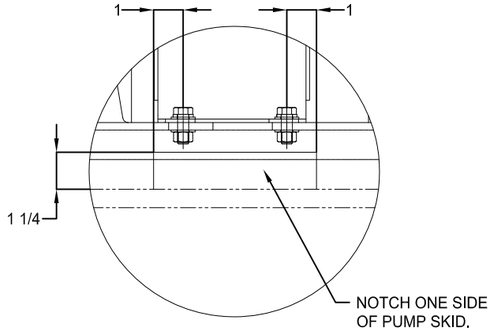
THIS DOCUMENT CONTAINS PROPRIETARY AND CONFIDENTIAL INFORMATION WHICH BELONGS TO NATIONAL OILWELL VARCO, L.P., ITS AFFILIATES OR SUBSIDIARIES (ALL COLLECTIVELY REFERRED TO HEREINAFTER AS "NOV"), IT IS LOANED FOR LIMITED PURPOSES ONLY AND REMAINS THE PROPERTY OF NOV. REPRODUCTION, IN WHOLE OR IN PART, OR USE OF THIS DESIGN OR DISTRIBUTION OF THIS INFORMATION TO OTHERS IS NOT PERMITTED WITHOUT THE EXPRESS WRITTEN CONSENT OF NOV. THIS DOCUMENT IS TO BE RETURNED TO NOV UPON REQUEST OR UPON COMPLETION OF THE USE FOR WHICH IT WAS LOANED. THIS DOCUMENT AND THE INFORMATION CONTAINED AND REPRESENTED HEREIN IS THE COPYRIGHTED PROPERTY OF NOV.

NOV NATIONAL OILWELL VARCO

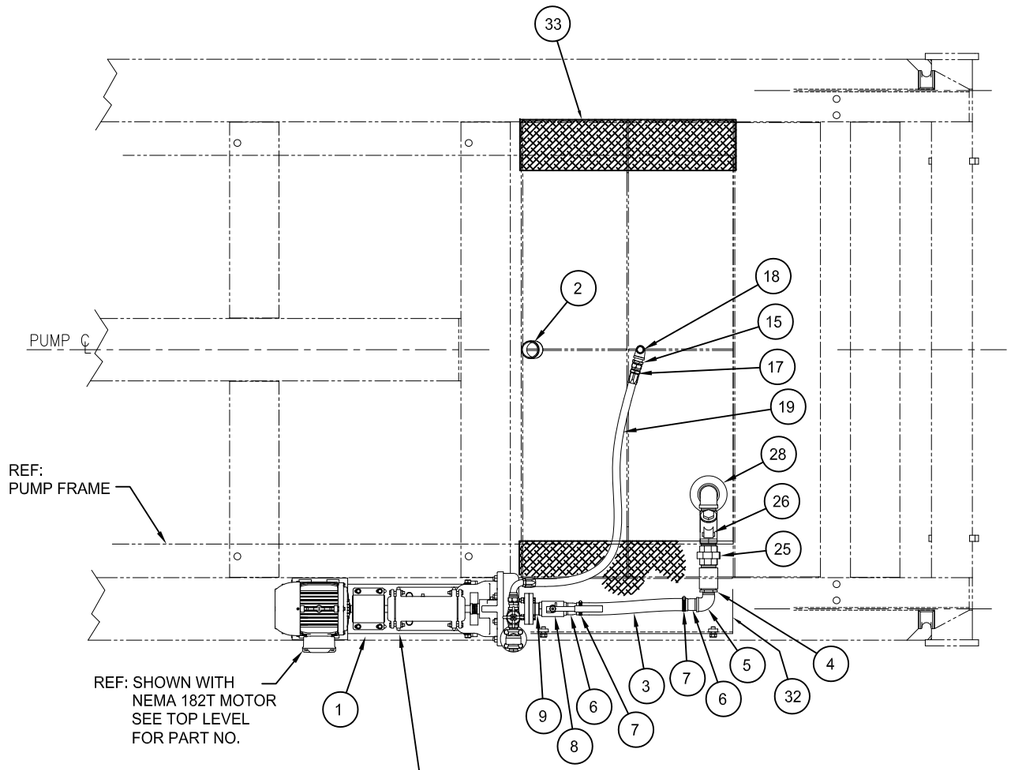
TITLE:
EXT. LUBE OIL PUMP ASSEMBLY
WITH MAGNETIC & COALESCING FILTERS

SCALE:	PROJECTION:	SIZE: D	SHT: 1 OF 1
DWG NO. 1262028-DOS			REV: E

DCF0022_D1 (REV E)



DETAIL B



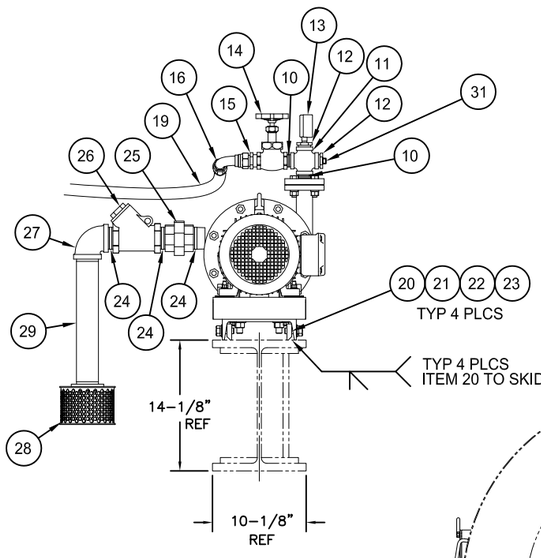
NOTES:

1. PART NO. 10649573–001 TO CONSIST OF THE ITEMS BELOW:

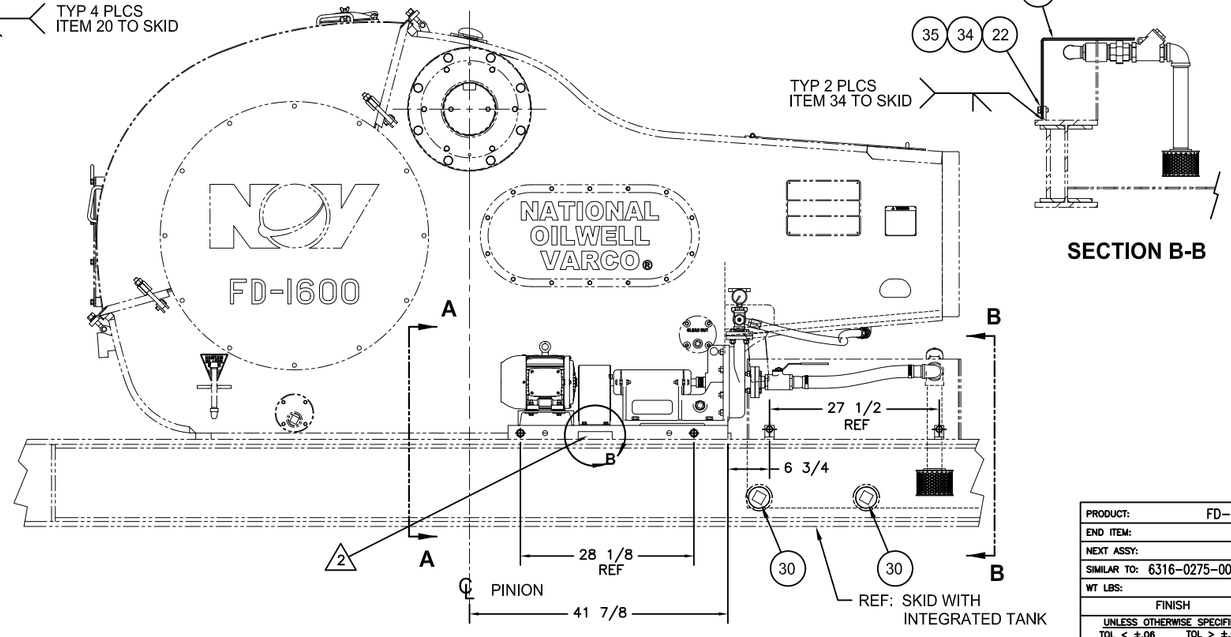
2. PUMP ASSEMBLY TO BE REMOVED TO CUT OUT NOTCH. ONCE PERFORMED, PUMP ASSEMBLY TO BE PLACED AS SHOWN.

2	7000394–11	CAPSCREW, 5/8"–11UNC X 1–1/4" LG GR5 C.P. HEX HEAD	35
2	615654	CLIP, GUARD	34
1	6316–0720–00	COVER, TANK END, EXTERNAL LUBE SIDE	33
1	6316–0719–00	COVER, TANK END, LINER SPRAY SIDE	32
1	6874002G	PLUG, 1/4" GALV. STD SOLID SQUARE HEAD	31
4	6873024G	PLUG, 3" GALV. STD CORED SQUARE HEAD	30
1	6817130	NIPPLE, 2" X 15" LG. STD. PIPE	29
1	7818506	STRAINER, 2" NPT SUCTION OIL	28
1	6826016G	ELBOW, 2" X 90 DEG. GALV. STD M.I.	27
1	7500333	VALVE, 2" SWING CHECK 125#	26
1	7820626G	UNION, 2" GALV. STD. M.I.	25
3	6817119G	NIPPLE, 2" X CLOSE GALV. STD. PIPE	24
4	7000395–11	CAPSCREW, 5/8"–11UNC X 1–1/2" LG GR5 CAD PLTD HEX HEAD	23
6	7619058	WASHER, 5/8" REG CAD PLATED SPRING LOCK	22
4	7621040	WASHER, 5/8" N TYPE A 1.312 OD CAD PLATED FLAT	21
4	607089	CLIP, GUARD	20
1	6100050–16	HOSE, 1" X 45" LG	19
1	6829008G	ELBOW, 1" X 90 DEG. GALV. STD M.I. STREET	18
1	7805083	HOSE FITTING, 1" STEEL	17
1	7804358	ELBOW, 1" STEEL HOSE FITTING	16
2	7800076	ADAPTER, 1" HOSE FITTING	15
1	0–7602–2910–19	VALVE, 1" GLOBE	14
1	7806002	GAUGE (0–100 PSI/KGC), 2–1/2" X 1/4" LM PRESSURE	13
2	6800081SST	BUSHING, 1" X 1/4" STD. STAINLESS STEEL HEX	12
1	6859008G	CROSS, 1" GALV. STD. PIPE	11
2	6817073G	NIPPLE, 1–1/2" X CLOSE GALV. STD. PIPE	10
1	6817108G	NIPPLE, 1–1/2" X 2" LG. GALV. STD. PIPE	9
1	7500843	VALVE (150 PSI), 1–1/2" NPT BRONZE BALL	8
2	0–7602–0720–04	CLAMP, HOSE SCREW DRIVE (1–13/16" TO 2–3/4" CLAMP DIA)	7
2	6825009	NIPPLE, 1–1/2" NPT BRASS COMBINATION HOSE	6
1	6829012G	ELBOW, 1–1/2" X 90 DEG. STD M.I. GALV. STREET	5
1	6800164G	BUSHING, 2" X 1–1/2" GALV. STD. C.I. HEX	4
1	0–7601–3240–00	HOSE, 1–1/2' ID X 1.97" OD X 20" LG. 200#	3
1	0–7601–2582–38	NIPPLE, 2–1/2" X 8" LG GALV. STD. PIPE	2
1	1290448	PUMP ASSEMBLY, LINER SPRAY LESS NEMA MOTOR	1
–	0–6316–0275–14	LINER SPRAY SYSTEM W/INT. TANK (CONSISTS OF THE FOLLOWING)	–
QTY	PART NUMBER	DESCRIPTION MATERIAL	ITEM

BILL OF MATERIAL



VIEW A-A
SCALE: 1:8



SECTION B-B

PRODUCT:	FD–1600	UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES. TOLERANCES ARE:	
END ITEM:		XX ±.1	ANGLES ±1/2 DEG
NEXT ASSY:		X.XX ±.03	FRACTIONS ±1/16
SIMILAR TO:	6316–0275–00/–12	X.XXX ±.010	BREAK EDGES .02/.03
WT LBS:	400	DO NOT SCALE DRAWING	
FINISH		CURRENT	INITIAL
UNLESS OTHERWISE SPECIFIED TOL < ±.06	TOL ≥ ±.06	DRAWN	
250	1000	CHECKED	
		APPVD	
		DATE	22 JAN 14 / 27–MAR–12

THIS DOCUMENT CONTAINS PROPRIETARY AND CONFIDENTIAL INFORMATION WHICH BELONGS TO NATIONAL OILWELL VARCO, L.P., ITS AFFILIATES OR SUBSIDIARIES (ALL COLLECTIVELY REFERRED TO HEREINAFTER AS "NOV"). IT IS LOANED FOR LIMITED PURPOSES ONLY AND REMAINS THE PROPERTY OF NOV. REPRODUCTION, IN WHOLE OR IN PART, OR USE OF THIS DESIGN OR DISTRIBUTION OF THIS INFORMATION TO OTHERS IS NOT PERMITTED WITHOUT THE EXPRESS WRITTEN CONSENT OF NOV. THIS DOCUMENT IS TO BE RETURNED TO NOV UPON REQUEST OR UPON COMPLETION OF THE USE FOR WHICH IT WAS LOANED. THIS DOCUMENT AND THE INFORMATION CONTAINED AND REPRESENTED HEREIN IS THE COPYRIGHTED PROPERTY OF NOV.

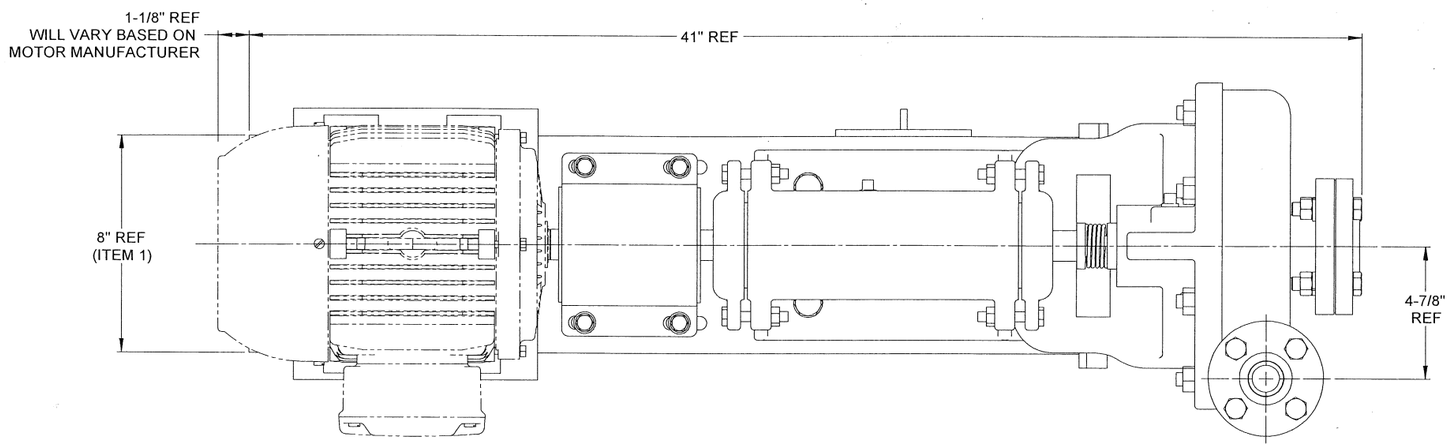
RIG SOLUTIONS
MECHANICAL ENGINEERING

NOV NATIONAL OILWELL VARCO

TITLE:
LINER SPRAY SYSTEM
FD–1600 W/ INTEGRATED TANK

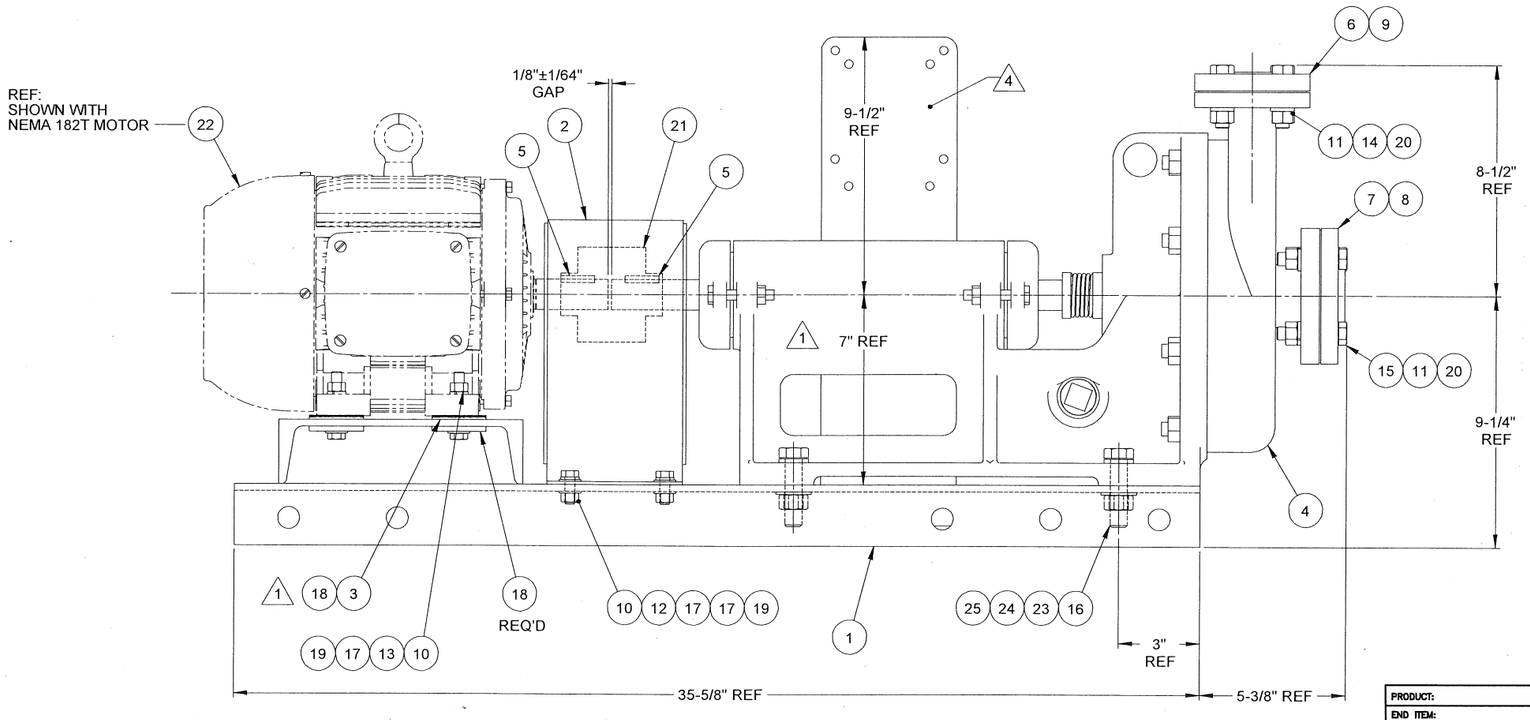
SCALE:	1:12	PROJECTION:	SIZE: D	SHT:	1 OF 1
DWG NO.	6316–0275–14–DOS			REV:	03

DRAWN IN ACAD
RS–MECH_D–TPL–001



BILL OF MATERIAL			
ITEM	REQ'D	PART NO.	DESCRIPTION
–	–	1290448	LINER SPRAY PUMP ASSEMBLY LESS NEMA MOTOR (CONSISTS OF THE FOLLOWING)
1	1	1292285	BASE, MOTOR / PUMP
2	1	1261940	GUARD, COUPLING
3	4	29-001-153	SHIM SET
4	1	609102009IT40	PUMP, 1 X 1-1/2 CENTRIFUGAL
5	2	2401860	KEY, ¼" X ¼" X 1-1/4" LG.
6	1	5902091	FLANGE, 1" ASA 150# THREADED FLAT FACE
7	1	5902172	FLANGE, 1-1/2" ADA 150# THREADED FLAT FACE
8	1	6010036	GASKET (1/16" THK), 1-1/2" 150# FULL FACE FLANGE
9	1	6010037	GASKET (1/16" THK), 1" 150# FULL FACE FLANGE
10	8	6300062	NUT, 3/8" – 16 UNC CAD PLATED HEX
11	8	6300081	NUT, ½" – 13 UNC CAD PLATED HEX
12	4	7000208-11	CAPSCREW, 3/8" – 16 X 1" LG. GR 5 C.P. HEX HEAD
13	4	7000213-11	CAPSCREW, 3/8" – 16 X 1-1/2" LG. GR 5 C.P. HEX HEAD
14	4	7000307-11	CAPSCREW, ½" – 13 X 2" LG. GR 5 C.P. HEX HEAD
15	4	7000309-11	CAPSCREW, ½" – 13 X 2-1/4" LG. GR 5 C.P. HEX HEAD
16	4	7000399-11	CAPSCREW, 5/8" – 11 X 2-1/2" LG. GR 5 C.P. HEX HEAD
17	12	7621024	WASHER, 3/8" N TYPE A 0.812" O.D. CAD PLATED FLAT
18	8	M291296029	SPACER, 3/16" MOTOR / PUMP BASE
19	8	7619041	WASHER, 3/8" REG CAD PLATED SPRING LOCK
20	8	7619050	WASHER, 1/2" REG CAD PLATED SPRING LOCK
21	1	7802327	COUPLING, FLEX
22	REF.	*	MOTOR, ELECTRIC
23	4	7619058	WASHER, 5/8" REG CAD PLATED SPRING LOCK
24	4	7621040	WASHER, 5/8" N TYPE A 1.312 OD CAD PLATED FLAT
25	4	6300103	NUT, 5/8" – 11 UNC CAD PLATED HEX

* SEE TOP LEVEL ASSEMBLY BILL OF MATERIAL.



NOTES:

1. DUE TO VARIANCES FROM PUMP MANUFACTURER THE 7" REF DIMENSION CAN VARY AS MUCH AS 7-3/16" HIGH.
   AT ASSEMBLY MEASURE ACTUAL PUMP SHAFT HEIGHT TO BASE.
   IF MEASURES 7-3/16" USE ITEM 18 (SPACER) AND SHIM AS NECESSARY.

   NOTE: ITEM 18 (SPACER) MAY OR MAY NOT BE NEEDED

2. WIRE TAG ASSEMBLY WITH PART NUMBER AND REVISION.
3. PAINT PER NOV SPEC CS-3007 SYS " I ".
4. MOUNTING FOR OPTIONAL SAFETY FEATURE:

   10781367-001 LOW PRESSURE TRANSMITTER - CE/ATEX

   10745310-001 LOW PRESSURE SWITCH - CE/ATEX

   10746308-001 LOW PRESSURE SWITCH

PRODUCT:			
END ITEM:			
NEXT ASSY:			
SIMILAR TO:			
WT LBS: 240		CURRENT	INITIAL
FINISH	DRAWN		
UNLESS OTHERWISE SPECIFIED TOL ≤ .06 MIN 250 TOL ≥ .06 MAX 1000	CHECKED		
	APPVD		
	DATE		

UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES.
TOLERANCES ARE:
XX ±.1 ANGLES ±1/2 DEG
XXX ±.03 FRACTIONS ±1/8
XXXX ±.010 BREAK EDGES .02/.03
DO NOT SCALE DRAWING

THIS DOCUMENT CONTAINS PROPRIETARY AND CONFIDENTIAL INFORMATION WHICH BELONGS TO NATIONAL OILWELL VARCO, L.P., ITS AFFILIATES OR SUBSIDIARIES (ALL COLLECTIVELY REFERRED TO HEREINAFTER AS "NOV"). IT IS LOANED FOR LIMITED PURPOSES ONLY AND REMAINS THE PROPERTY OF NOV. REPRODUCTION, IN WHOLE OR IN PART, OR USE OF THIS DESIGN OR DISTRIBUTION OF THIS INFORMATION TO OTHERS IS NOT PERMITTED WITHOUT THE EXPRESS WRITTEN CONSENT OF NOV. THIS DOCUMENT IS TO BE RETURNED TO NOV UPON REQUEST OR UPON COMPLETION OF THE USE FOR WHICH IT WAS LOANED. THIS DOCUMENT AND THE INFORMATION CONTAINED AND REPRESENTED HEREIN IS THE COPYRIGHTED PROPERTY OF NOV.

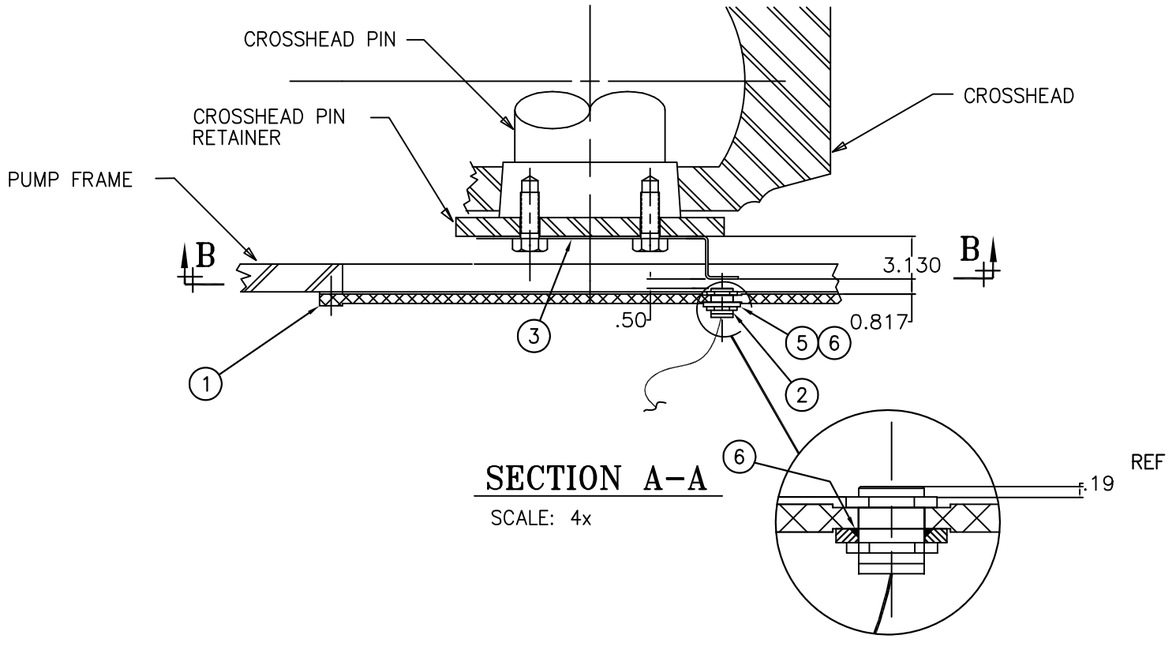
NATIONAL OILWELL VARCO

TITLE:
LINER SPRAY PUMP ASSEMBLY LESS NEMA MOTOR

SCALE:	PROJECTION:	SIZE:	SHT:
		D	1 OF 1

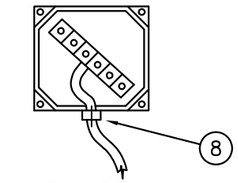
DWG NO. 1290448-DOS REV: B

DCF0022_D1 (REV E)

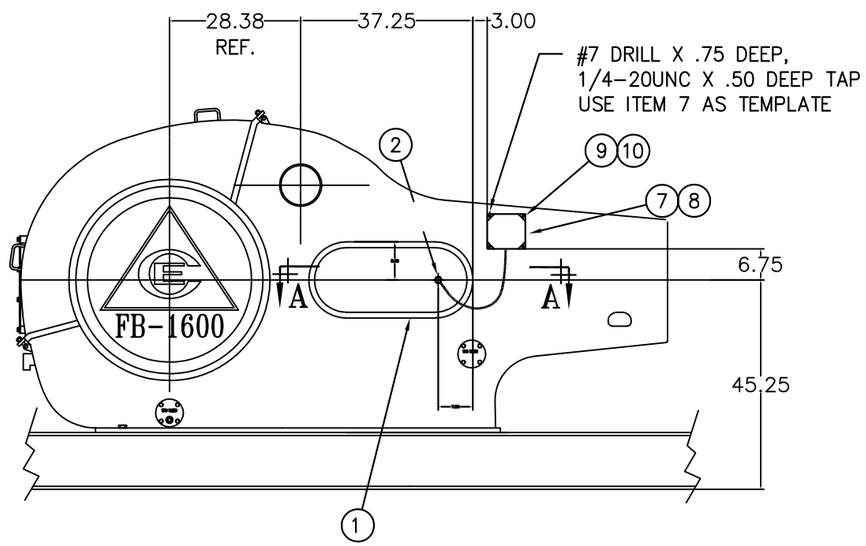


SECTION A-A

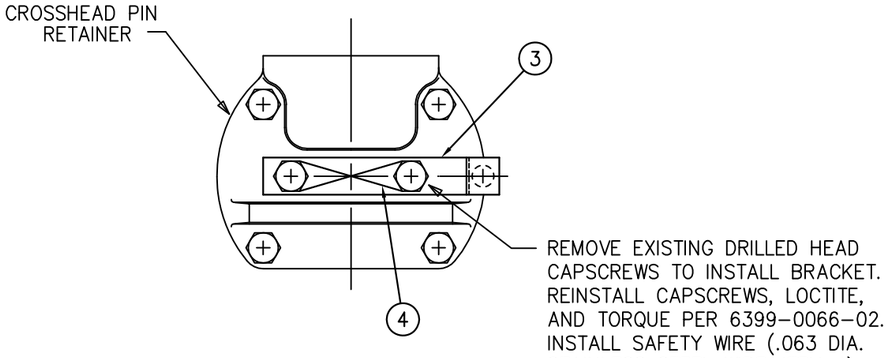
SCALE: 4x



DETAIL ITEM 7



SCALE: 16x



SECTION B-B

SCALE: 4x

REQ'D.	PART NO.	DESCRIPTION	ITEM
—	0-6911-2730-80	STROKE COUNTER INSTALLATION (CONSISTS OF THE FOLLOWING)	—
1	7818533	SWITCH, PROXIMITY	2
1	0-6316-0045-06	RE-WORK FOR STROKE COUNTER, XHD DOOR	1
1	99-607-217	O-RING, 1-3/16 X 1-7/16 BUNA "N" 70 DURO.	6
1	0-6316-0527-00	WASHER, SEAL	5
1	7822095	WIRE, .051 DIA. X 2 FT. LG. TYPE 302 ANN. S.S. SAFETY	4
1	0-6911-2729-50	BRACKET, STROKE COUNTER SENSOR	3
4	0-7601-4517-49	GLAND, 20MM ENTRY CABLE	8
4	0-7601-0330-03	CAPSCREW, 1/4"-20 X 3/4" LG. GR2 HEX HEAD	9
4	0-7601-1320-38	WASHER,1/4" PLAIN MED SPRING LOCK	10
1	0001-0568-14	JUNCTION BOX	7

BILL OF MATERIAL

PRODUCT:
END ITEM:
NEXT ASSY:
SIMILAR TO:
WT LBS:
FINISH
UNLESS OTHERWISE SPECIFIED
TOL < ±.06 250
TOL ≥ ±.06 1000

UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES.
TOLERANCES ARE:
X.X ±.1 ANGLES ±1/2 DEG
X.XX ±.03 FRACTIONS ±1/16
X.XXX ±.010 BREAK EDGES .02/.03
DO NOT SCALE DRAWING

	CURRENT	INITIAL
DRAWN		
CHECKED		
APPVD		
DATE	15 MAY 09	5-12-95

THIS DOCUMENT CONTAINS PROPRIETARY AND CONFIDENTIAL INFORMATION WHICH BELONGS TO NATIONAL OILWELL VARCO, L.P., ITS AFFILIATES OR SUBSIDIARIES (ALL COLLECTIVELY REFERRED TO HEREINAFTER AS "NOV"). IT IS LOANED FOR LIMITED PURPOSES ONLY AND REMAINS THE PROPERTY OF NOV. REPRODUCTION, IN WHOLE OR IN PART, OR USE OF THIS DESIGN OR DISTRIBUTION OF THIS INFORMATION TO OTHERS IS NOT PERMITTED WITHOUT THE EXPRESS WRITTEN CONSENT OF NOV. THIS DOCUMENT IS TO BE RETURNED TO NOV UPON REQUEST OR UPON COMPLETION OF THE USE FOR WHICH IT WAS LOANED. THIS DOCUMENT AND THE INFORMATION CONTAINED AND REPRESENTED HEREIN IS THE COPYRIGHTED PROPERTY OF NOV.

RIG SOLUTIONS
MECHANICAL ENGINEERING

NATIONAL OILWELL VARCO

TITLE: STROKE COUNTER INSTALLATION FD-1600 PUMP

SCALE: 1:4 | PROJECTION: | SIZE: D | SHT: 1 OF 1

DWG NO. 6911-2730-80-DOS | REV: C

DRAWN IN ACAD
RS-MECH_D-TPL-001

REV	DESCRIPTION OF CHANGE

PRECHARGING RECOMMENDATION:

APPROXIMATELY 50% OF ANTICIPATED SUCTION PRESSURE WITH MAXIMUM PRECHARGE OF 10 PSIG (69 KPa).

ANY TYPE OF AUTO TIRE INFLATION EQUIPMENT MAY BE USED TO CHARGE DAMPENER. LIKEWISE AN AUTO TIRE GAUGE MAY BE USED TO CHECK THE PRESSURE.

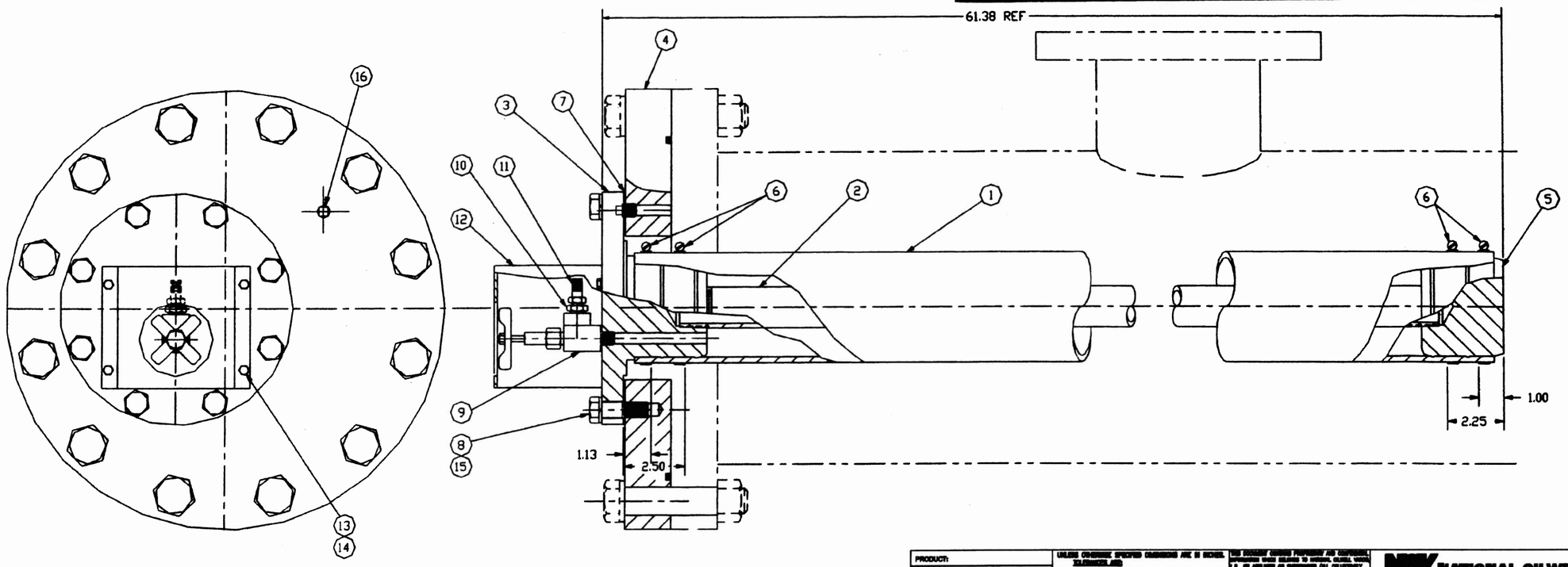
IF DESIRED PRESSURE IS EXCEEDED, BLEED OFF PRESSURE BY DEPRESSING PIN IN CENTER OF VALVE STEM, ITEM 11.

4. INSTALL CLAMPS, ITEM 6, TO DIMENSIONS SHOWN AND TIGHTEN TO 35-40 LB-IN.

5. LEAK TEST ASSEMBLED DESURGER BY APPLYING 20 PSI AIR PRESSURE TO BLADDER FOR 30 MINUTES.

BILL OF MATERIAL

ITEM	REQ'D	PART NO.	DESCRIPTION
—	—	6922-0062-00	SD-8 SUCTION DESURGER ASSEMBLY (CONSISTS OF THE FOLLOWING)
1	1	6922-0054-00	BLADDER
2	1	6922-0066-00	ROD, SUPPORT
3	1	6922-0063-00	FLANGE, CHARGING
4	1	6922-0048-01	FLANGE, ADAPTER
5	1	6922-0065-00	PLUG, END
6	4	7602-072130	CLAMP, HOSE
7	1	6022-0053-00	GASKET
8	8	7601-033077	CAPSCREW, 5/8" X 1-3/4" LG. HEX HEAD
9	1	7602-291077	VALVE, 1/4" NEEDLE
10	1	7601-253001	BUSHING, 1/4" X 1/8" HEX HEAD PIPE
11	1	7602-291805	VALVE WITH VALVE STEM, 1/8" TANK
12	1	6922-0067-00	GUARD, VALVE
13	4	7601-033001	CAPSCREW, 1/4" - 20 X 1/2" LG. HEX HEAD
14	4	7601-132038	WASHER, 1/4" LOCK
15	8	7601-132030	WASHER, 5/8" LOCK
16	1	7601-259008	PLUG, 1/4" PIPE



PRODUCT:
END ITEM:
NEXT ASSY:
SIMILAR TO:
WT LBS:
FINISH
UNLESS OTHERWISE SPECIFIED TOL ≤ .05 250 TOL > .05 1000

UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES. TOLERANCES ARE: X.X ±.1 ANGLES ±1/2 DEG X.XX ±.03 FRACTIONS ±1/8 X.XXX ±.010 BREAK EDGES .02/.05 DO NOT SCALE DRAWING

	CURRENT	INITIAL
DRAWN		
CHECKED		
APP'VD		
DATE		

THE CONCEPTS EMBODIED THEREIN ARE OWNED BY NATIONAL OILWELL VARCO L.P. OR AFFILIATES OF NATIONAL OILWELL VARCO L.P. AND ARE NOT TO BE USED, REPRODUCED, COPIED OR DISCLOSED TO OTHERS WITHOUT THE EXPRESS WRITTEN PERMISSION OF NOV.

RIG SOLUTIONS
MECHANICAL ENGINEERING

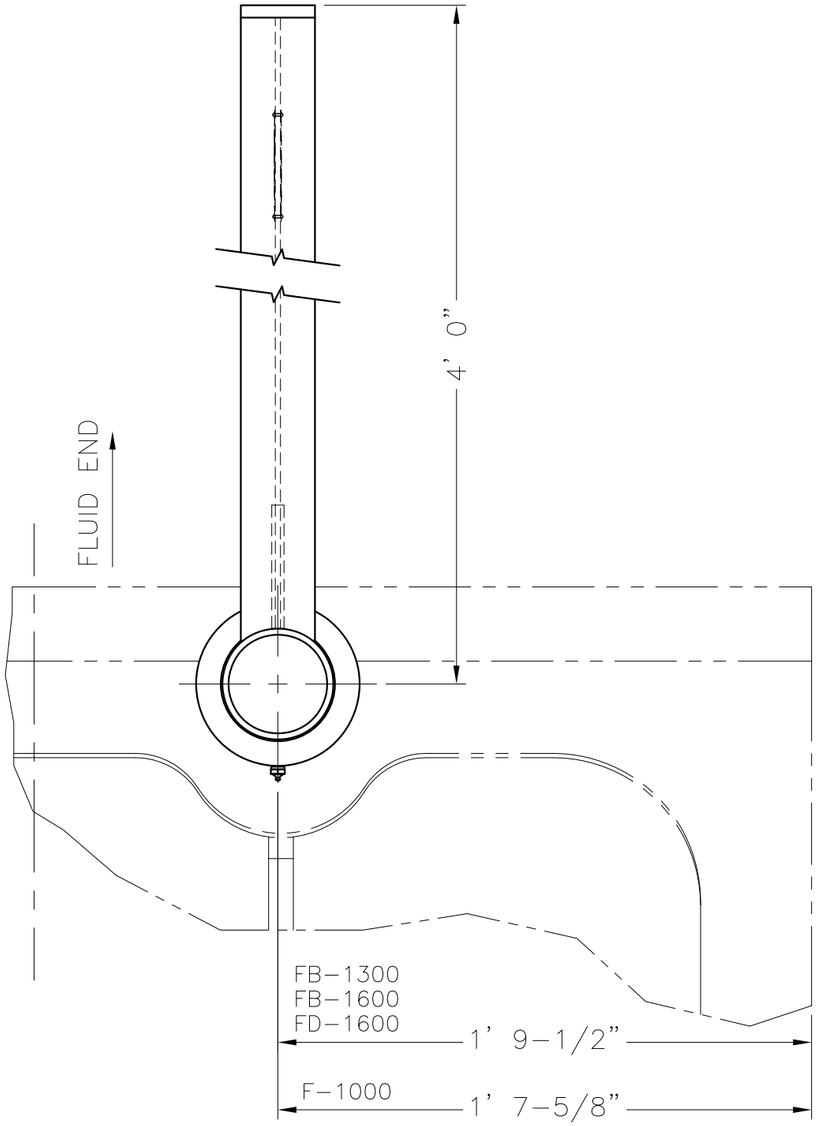
NOV NATIONAL OILWELL VARCO

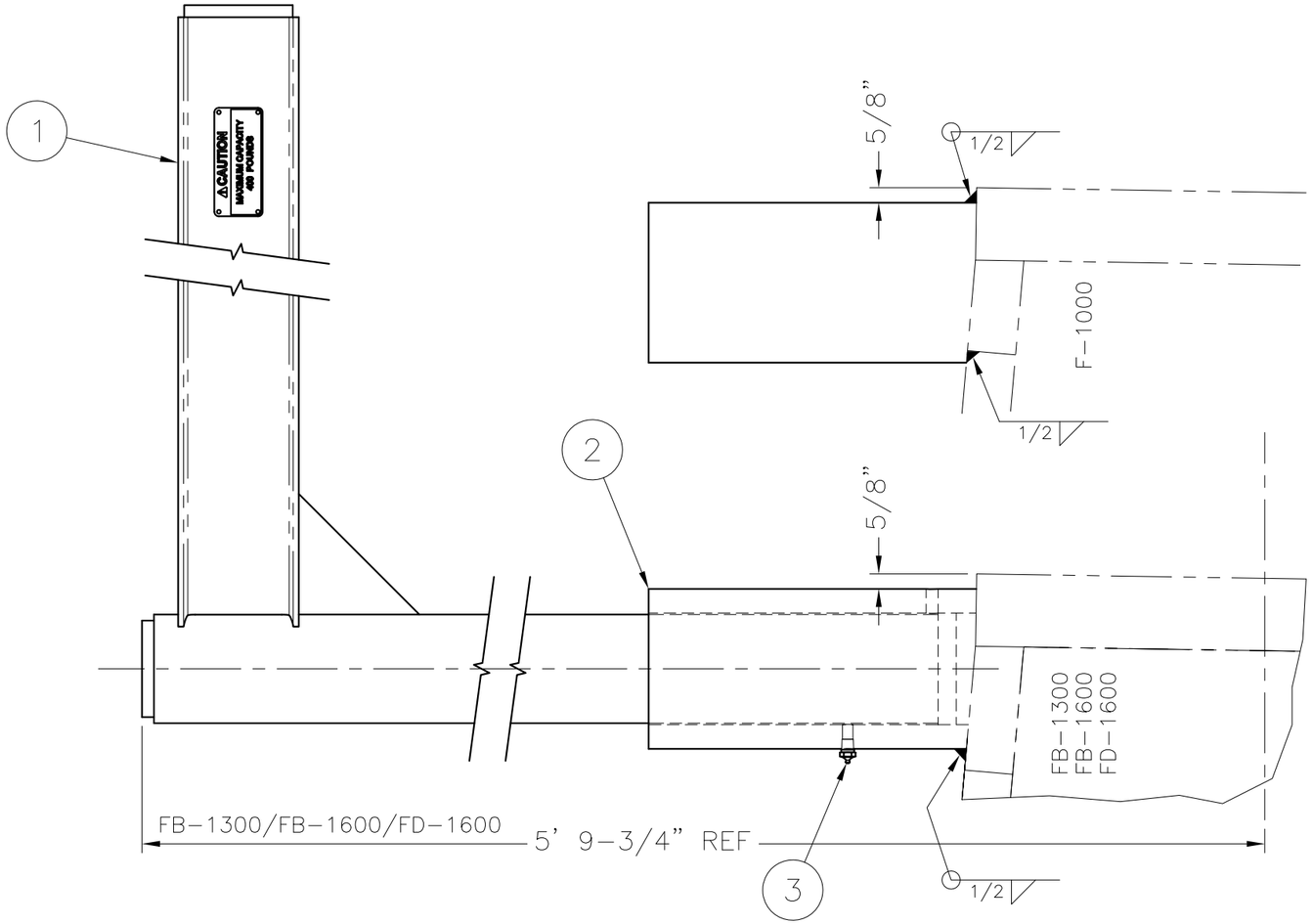
TITLE: SD-8 SUCTION DESURGER ASSEMBLY
TRIPLEX MUD PUMPS

SCALE: NONE | PROJECTION | SIZE: D | SHT: 1 of 1

DWG NO. 6922-0062-00-DOS | REV: H

DRAWN IN ACAD DCF0022_D1 (REV E)





QTY	PART NUMBER	DESCRIPTION	MATERIAL	ITEM
1	10047813-001	FITTING, GREASE, STRAIGHT, .25NPT (74181)		3
1	10003132-001	SUPPORT, CRANE (6316-0019-00)		2
1	10003131-001	CRANE, SERVICE (6316-0014-00)		1

BILL OF MATERIAL

PROCEDURE:
1. WELD SUPPORT TO PUMP.
2. APPLY 600 lb. TEST LOAD FOLLOWING 10624814-PRO.
3. MAGNAFLUX WELD ON SUPPORT (2).

		CURRENT	INITIAL
PRODUCT:	DRAWN		
END ITEM:	CHECKED		
NEXT ASSY:	APPVD		
SIMILAR TO:	DATE	14-OCT-13	5-4-79
WT LBS:			
FINISH			

UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES.
TOLERANCES ARE:
X.X ±.1 ANGLES ± 1/2 DEG
X.XX ±.03 FRACTIONS ±1/16
X.XXX ±.010 BREAK EDGES .02/.03
DO NOT SCALE DRAWING

UNLESS OTHERWISE SPECIFIED
TOL < ±.06 TOL ≥ ±.06
250 1000

THIS DOCUMENT CONTAINS PROPRIETARY AND CONFIDENTIAL INFORMATION WHICH BELONGS TO NATIONAL OILWELL VARCO, L.P., ITS AFFILIATES OR SUBSIDIARIES (ALL COLLECTIVELY REFERRED TO HEREINAFTER AS "NOV"). IT IS LOANED FOR LIMITED PURPOSES ONLY AND REMAINS THE PROPERTY OF NOV. REPRODUCTION, IN WHOLE OR IN PART, OR USE OF THIS DESIGN OR DISTRIBUTION OF THIS INFORMATION TO OTHERS IS NOT PERMITTED WITHOUT THE EXPRESS WRITTEN CONSENT OF NOV. THIS DOCUMENT IS TO BE RETURNED TO NOV UPON REQUEST OR UPON COMPLETION OF THE USE FOR WHICH IT WAS LOANED. THIS DOCUMENT AND THE INFORMATION CONTAINED AND REPRESENTED HEREIN IS THE COPYRIGHTED PROPERTY OF NOV.

RIG SOLUTIONS
MECHANICAL ENGINEERING

NATIONAL OILWELL VARCO

TITLE:
FLUID END EXPENDABLE SERVICING CRANE (LESS HOIST)

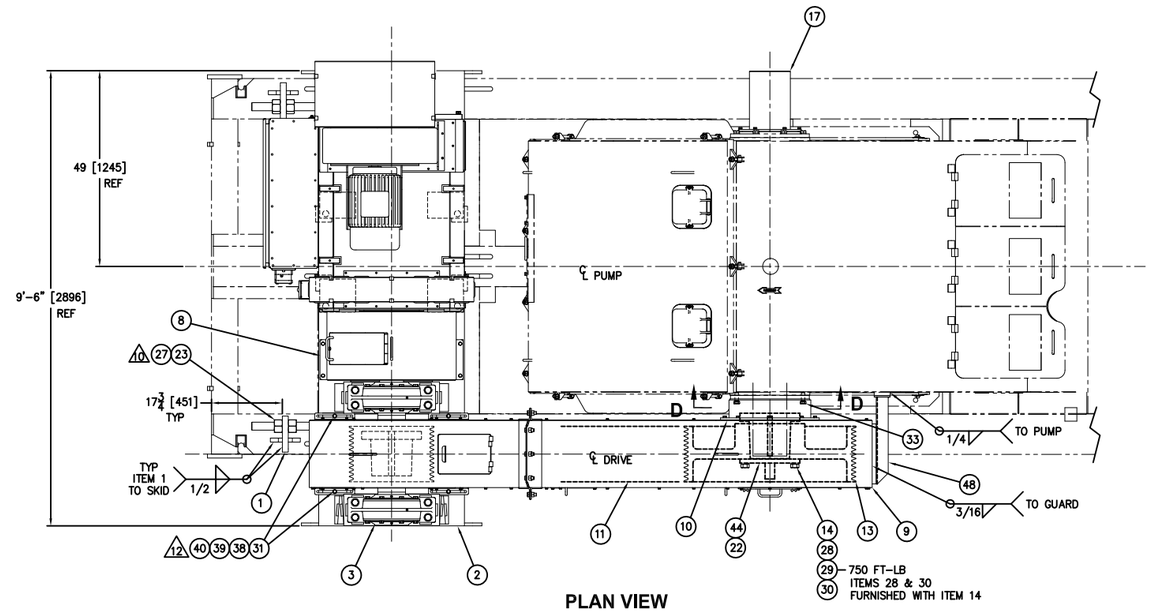
SCALE:	PROJECTION:	SIZE:	SHT:
1:6		B	1 OF 1

DWG NO. 6316-0020-20-DOS REV: D

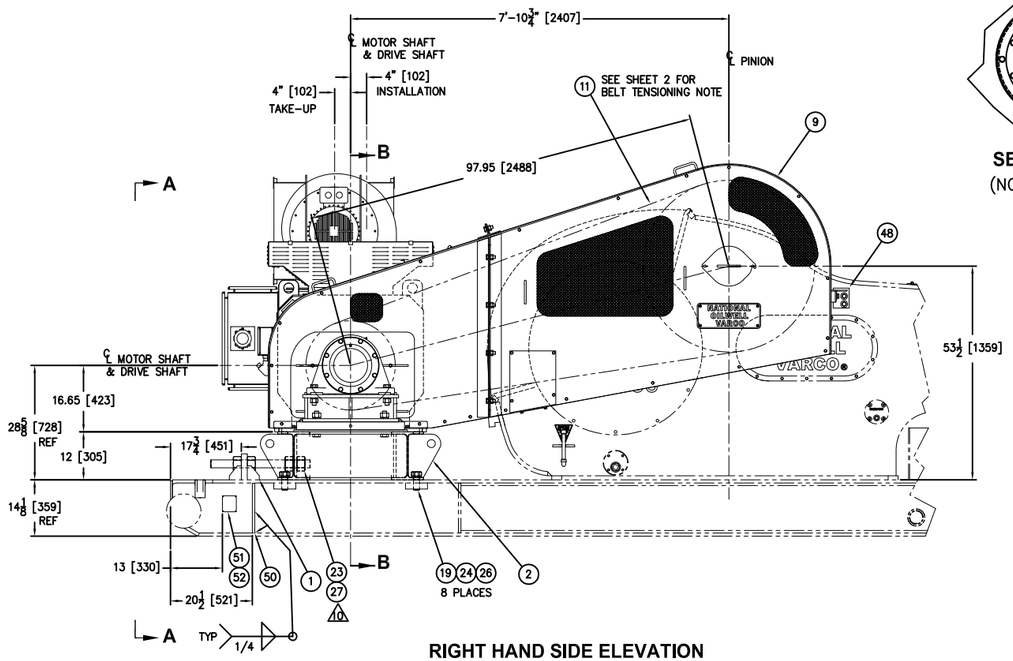
DRAWN IN ACAD
RS-MECH_B-TPL-001

TOOL LIST
FOR F-1600 SERIES TRIPLEX MUD PUMPS

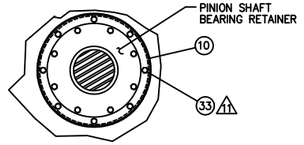
REQ'D	PART NO.	DESCRIPTION
—	6316-0250-02	TOOL LIST FOR F-1600 SERIES PUMPS (CONSISTS OF THE FOLLOWING)
1	7602-3010-59	SNAP ON SOCKET (FOR MAIN BEARING HOUSING BOLTS)
1	6397-0691-00	BAR, VALVE COVER
1	7602-3010-09	SOCKET (FOR 1-1/2" HVY. HEX NUTS) (CYLINDER THRD. RING & BLOCK TO FRAME)
1	7602-3010-22	SOCKET (FOR 1-1/4" HVY. HEX NUTS) (DISCHARGE MANIFOLD)
1	7602-3010-05	BAR, SLIDING
1	7602-3010-48	PLUG, SLIDING
1	7602-3010-07	8" EXTENSION
1	6316-0277-00	WRENCH, CYLINDER HEAD
1	7602-3010-63	ADAPTER
1	7602-3010-61	SOCKET (FOR 1" STD. HEX NUT) (LINER THREAD RING)
1	7602-3010-65	WRENCH, 12 POINT BOX (FOR VALVE GUIDE LOCK BOLT)
1	6316-0392-00	EXTENSION, WRENCH (FOR PART NO. 7602-3010-65)



PLAN VIEW



RIGHT HAND SIDE ELEVATION



SECTION D-D
(NOT TO SCALE)

NOTES:

1. INSTALL HALF OF GEAR COUPLING INTO THE MOTOR HUB.
2. INSERT, FORCE FIT, ALL SLEEVES ONTO THE DRIVESHAFT AS SHOWN IN THE DRIVE-SHAFT SUB-ASSEMBLY.
3. ASSEMBLE FIXED AND FLOAT PILLOW BLOCK BEARINGS AS SHOWN. BOTH BEARINGS ARE AN INTERFERENCE FIT ONTO THE SHAFT. ALSO, THE TAPERED END OF SHAFT IS AN INTERFERENCE FIT INTO THE OTHER HALF OF GEAR COUPLING.
4. DURING INSTALLATION FILL PILLOW BLOCK HOUSINGS 1/3 TO 1/2 FULL (DO NOT EXCEED 1/2 FULL) WITH A HIGH QUALITY GRADE #1 EP GREASE.
5. WITH BASE PLATES (ITEMS 6 AND 7) AND PEDESTALS (ITEMS 4 & 5) CORRECTLY IN PLACE, ASSEMBLE GEAR COUPLING AS SHOWN ON SECTION B-B. USE SHIMS (ITEM 37) TO CO-AXIALLY ALIGN DRIVE SHAFT TO THE MOTOR SHAFT PER ALIGNMENT IN NOTE 6.
6. GEAR COUPLING ALIGNMENT:
   MAXIMUM PARALLEL MISALIGNMENT .010 T.I.R.
   MAXIMUM ANGULAR MISALIGNMENT .010 T.I.R.
7. AFTER ALIGNMENT, WELD BASE BASE PLATES (ITEM 6), TO THE MOTOR SKID (ITEM 2). WITH KESYTOP HELD TIGHTLY AGAINST ITS ADJACENT COMPONENT, WELD 1/4" FILLET TO THE FOLLOWING:
   A. WELD KEYSTOP (ITEM 21) TO THE TOP OF PEDESTALS (ITEM 4 & 5)
   B. WELD KEYSTOP (ITEM 21) TO THE HALF-INCH THICK BASE PLATE (ITEM 6)
   C. WELD KEYSTOP (ITEM 21) TO THE TWO-INCH THICK BASE PLATE (ITEM 7)
8. DIMENSIONS IN [ ] ARE IN MILLIMETERS.
9. AFTER ALIGNMENT OF DRIVESHAFT ASSEMBLY TO DRIVE MOTOR WELD KEYSTOPS (ITEM 20) TO MOTOR SKID (ITEM 2) AS SHOWN.
10. APPLY KOPR-KOTE THREAD LUBRICANT TO THREADS OF ADJUSTMENT SCREWS (ITEM 23).
11. REPLACE EXISTING SCREWS IN BEARING RETAINER WITH ITEM 33, AND TIE-WIRE TOGETHER.
12. ATTACH PADS (ITEM 31) & FASTENERS TO BELT GUARD (ITEM 9), LOCATE & ATTACH GUARD TO PUMP. WELD PADS (ITEM 31) TO MOTOR SKID (ITEM 2) AS SHOWN.
13. DRIVE KIT (ITEM 49) TO CONSISTS OF ITEMS 11, 12, 13 & 16.

BILL OF MATERIAL

QTY	PART NUMBER	DESCRIPTION	MATERIAL	ITEM
2	10731183-001	PLATE, WARNING		53
12	717802530	SCREW, DRIVE RD HD #2 X 1/4" TYPE U 305 SST		52
1	1289563	PLATE, NAME INDEPENDENT DRIVE		51
2	3126300	PLT, 5/8" GENL STK ASTM A36, 4-3/4" X 12-7/16" LG		50
1	10657121-001	KIT, DRIVE ASSY, FD-1600 RMBD SINGLE MOTOR		49
1	10652380-001	SUPPORT ASSY, BELT GUARD RH		48
4	7621068	WASHER, FLAT 1-1/2" N TYPE A 3.000 OD CD PL		47
12	700652808	SCREW, HEX SOC HD CAP, 1"-14UNS X 3 1/2" LG		46
6	700030711	SCREW, HEX HD CAP 1/2"-13UNC X 2" LG GR5 CD PL		45
4	10649256-001	SCREW, HEX HD CAP 1-1/8"-7UNC X 5-3/4" LG GR8 CD PL		44
8	7619090	WASHER, REG SPG LOCK 1-1/8" CD PL		43
8	6300186	NUT, HEX HVY 1-1/8"-7UNC ASTM A194 GR 2H CD PL		42
4	700056721	SCREW, HEX HD CAP 1-1/8"-7 X 3-3/4" LG GR8 CD PL		41
4	7621032	WASHER, FLAT 1/2" N TYPE A 1.062 OD CD PL		40
12	700030411	SCREW, HEX HD CAP 1/2"-13 X 1-1/4" LG GR5 CD PL		39
12	7619050	WASHER, REG SPG LOCK 1/2" CD PL		38
4	10641535-001	SHIM SET, PILLOW BLOCK		37
8	7619081	WASHER, REG SPG LOCK 1" CD PL		36
8	7635016	WASHER, FLAT HARD 1.062 ID X 2.00 OD X .134 THK F436 CD PL		35
8	75518308	NUT, HEX HVY 1"-8 UNC 2H CD PL		34
8	2405110	SCREW, DR HD HEX HD CAP 7/8"-9 X 2-1/2" LG GR5 CD PL		33
8	7000532-21	SCREW, HEX HD CAP 1"-8UNC X 4-1/2" LG GR8 CD PL		32
4	10632899-001	MOUNTING PAD, BELT GUARD		31
1	REF	SCREW, HEX SOC CUP PT SET 1"-8 X 3" LG (7027526)		30
4	10652360-001	SCREW, HEX HD CAP 1-1/8" 7UNC X 12-1/2" LG GR5 CD PL		29
4	REF	WASHER, REG SPG LOCK 1-1/8" CD PL (7619090)		28
8	6300328	NUT, HEX HVY 2" - 4UNC GR2 2H CD PL		27
8	700068711	SCREW, HEX HD CAP 1-1/2" 6UNC X 3-1/2" LG GR5 CD PL		26
4	700069321	SCREW, HEX HD CAP 1-1/2" 6UNC X 5" LG GR8 CD PL		25
12	7619114	WASHER, REG SPG LOCK 1-1/2" CD PL		24
2	0-7507-3576-00	SCREW, MOTOR ADJUSTING		23
1	0-6911-3033-00	BAR, EXTENSION (NOT SHOWN)		22
18	2401830	KEYSTOP, 1/2 SQ X 3" LONG (PILLOW BLK & PEDESTAL)		21
4	10633359-001	KEYSTOP, L-SHAPED (MOTOR)		20
8	1260460	BLOCK, MOTOR HOLD DOWN (MOTOR SKID)		19
4	6300240	NUT, HEX HVY 1-1/2 6UNC A 194 2H		18
1	0-6317-0103-00	COVER, PINION SHAFT SAFETY		17
REF	0-6911-3032-10	SPIDER, MANUAL PUMP ROTATING		16
				15
1	0-7602-1280-80	HUB, QD TYPE "W"		14
REF	10634162-001	SHEAVE, 43" OD 8V-12 GROOVE		13
REF	10609811-001	SHEAVE, 22.4 OD, 8V-12 GRV		12
REF	10649287-001	BELT, ARAMID FIBER, 12-STRAND/8VP3000		11
1	10636861-001	BONNET, V-BELT GUARD		10
1	10636848-001	GUARD, V-BELT		9
1	10695434-001	GUARD, COUPLING		8
1	10625460-001	PLATE, BASE, 2" THICK		7
2	10624263-001	PLATE, BASE, 1/2" THICK		6
1	10651731-001	PEDESTAL, PILLOW BLOCK, FIXED		5
1	10651730-001	PEDESTAL, PILLOW BLOCK, FLOAT		4
1	10696042-001	DRIVESHAFT ASSEMBLY, F/ LARGE MOTOR HUB		3
1	10648304-001	SKID, MOTOR		2
2	10652376-001	BRACKET, BOLT SPACER		1

PRODUCT: FD-1600
END ITEM:
NEXT ASSY:
SIMILAR TO: 10639759-ASM
WT LBS: 6,750
FINISH
UNLESS OTHERWISE SPECIFIED TOL < 6.09 TOL ≥ 6.09 250 1000

UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES. TOLERANCES ARE:
X.X ±.1 ANGLES ±1/2 DEG
X.XX ±.03 FRACTIONS ±1/16
X.XXX ±.010 BREAK EDGES .02/.03
DO NOT SCALE DRAWING

	CURRENT	INITIAL
DRAWN		
CHECKED		
APPVD		
DATE	06-MAR-13	10-DEC-12

THE ACCOUNT CONTAINS PROPRIETARY AND CONFIDENTIAL INFORMATION OWNED BY NATIONAL OILWELL VARCO, L.P. IT IS PROVIDED ON A CONFIDENTIAL BASIS, AND IS NOT TO BE DISCLOSED, COPIED, TRANSMITTED, OR USED IN CONNECTION WITH ANY BID OR CONTRACT WITH ANY PERSON OR ENTITY OTHER THAN NATIONAL OILWELL VARCO, L.P. OR ITS AUTHORIZED AGENTS, EXCEPT WITH THE EXPRESS PRIOR WRITTEN CONSENT OF NATIONAL OILWELL VARCO, L.P. BY ACCEPTANCE OF THIS DRAWING, YOU AGREE TO BE BOUND BY THE FOREGOING RESTRICTIONS. YOU AGREE TO USE THE INFORMATION CONTAINED IN THIS DRAWING FOR THE SOLE PURPOSE OF QUOTING OR MANUFACTURING THE EQUIPMENT OR SERVICES SPECIFIED HEREIN AND FOR NO OTHER PURPOSE. YOU AGREE TO RETURN OR DESTROY ANY COPIES OF THIS DRAWING IN YOUR POSSESSION OR CONTROL UPON REQUEST BY NATIONAL OILWELL VARCO, L.P. OR UPON COMPLETION OF THE PURPOSE FOR WHICH IT WAS LOANED. THIS AGREEMENT SHALL BE GOVERNED BY THE LAWS OF THE STATE OF TEXAS. THE PROPERTY RIGHTS IN THIS DRAWING ARE NOT EXCLUSIVE. IT IS NOT EXPRESSLY PROPERTY OF NOV.

RIG SOLUTIONS
MECHANICAL ENGINEERING

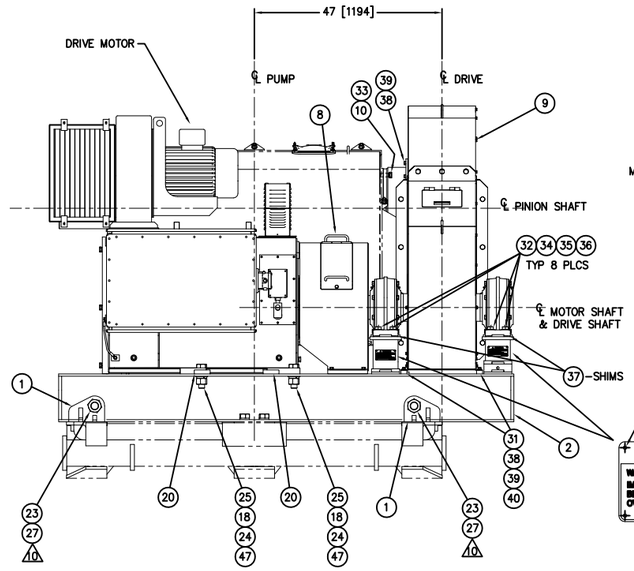
NATIONAL OILWELL VARCO

TITLE: DRIVE ASSY, FD-1600 RMBD SINGLE MTR CM632UUT W/LRG HUB

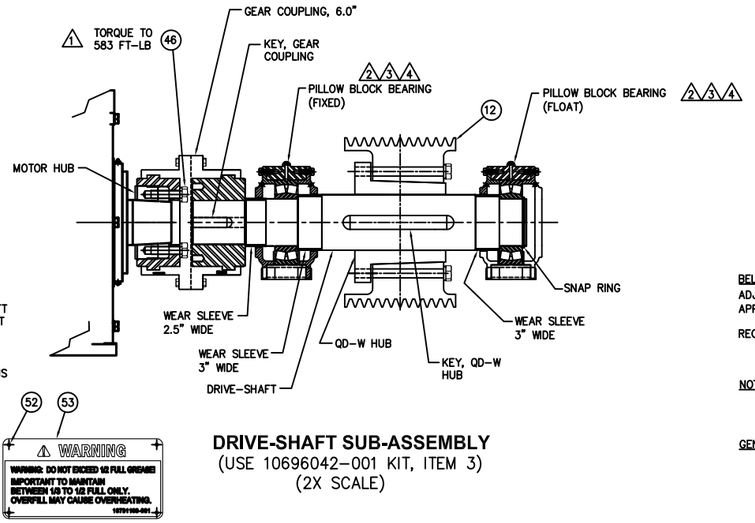
SCALE: 1:12 PROJECTION: SIZE: C SHT: 1 of 2

DWG NO. 10706968-DOS REV: 02

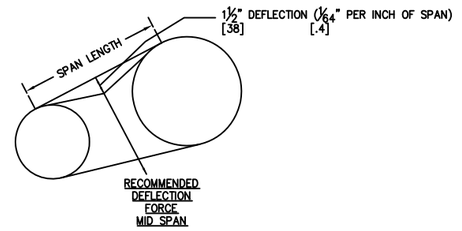
DRAWN IN ACAD
RS-MECH_E-TPL-001



VIEW A-A
(POWER END)



DRIVE-SHAFT SUB-ASSEMBLY
(USE 10696042-001 KIT, ITEM 3)
(2X SCALE)



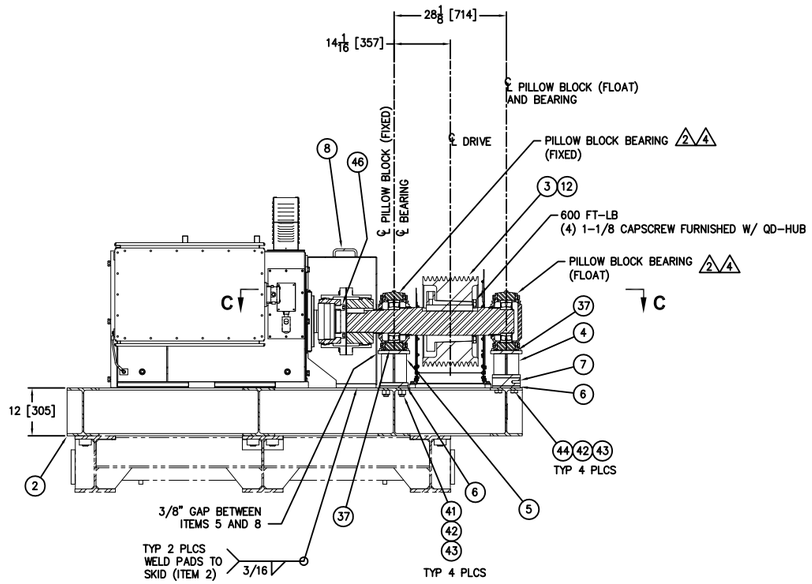
BELT TENSIONING MEASUREMENT BY DEFLECTION

ADJUST BELT TENSION SO THAT RECOMMENDED DEFLECTION FORCE APPLIED IN CENTER OF BELT SPAN DEFLECTS BELT (ITEM 23) BY ¾" [.19]

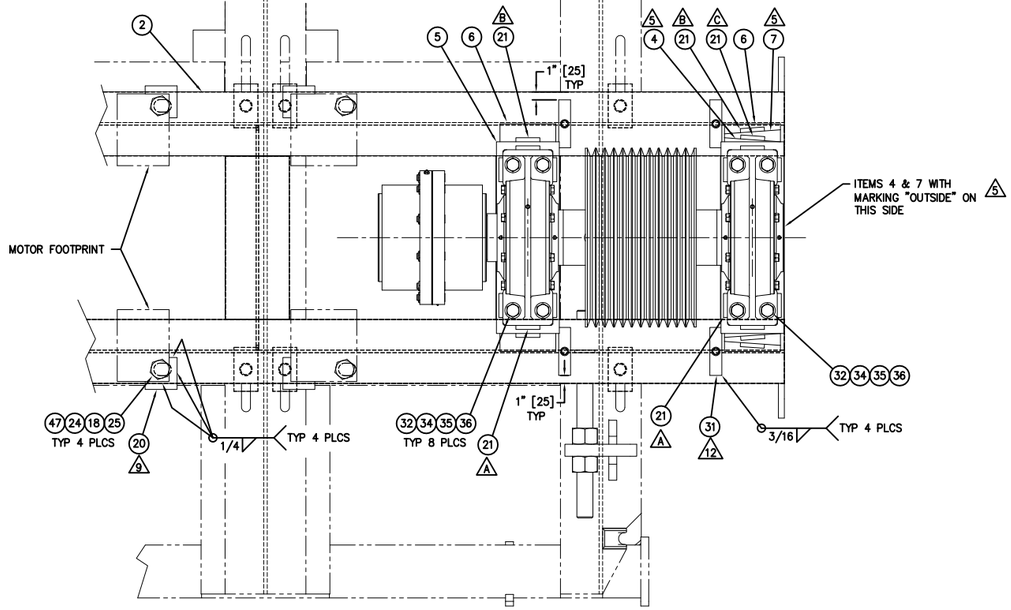
RECOMMENDED DEFLECTION FORCE:
MINIMUM DEFLECTION FORCE=175 LBS PER 8 STRAND BELT [79.4 Kg]
MAXIMUM DEFLECTION FORCE=246 LBS PER 8 STRAND BELT [111.6 Kg]

NOTE: LAY A STEEL BAR OR A NARROW BLOCK OF WOOD ACROSS ONE 8 WIDE TORQUE TEAM PLUS BELT AND APPLY THE DEFLECTION FORCE TO THE BAR SO THAT ALL OF THE INDIVIDUAL STRANDS IN THE BELT ARE DEFLACTED THE SAME AMOUNT.

GENERAL RULE: THE BEST V BELT TENSION IS THE LOWEST TENSION AT WHICH THE BELTS WILL NOT SLIP UNDER THE HIGHEST LOAD CONDITION.



SECTION B-B
(BELT GUARD NOT SHOWN)

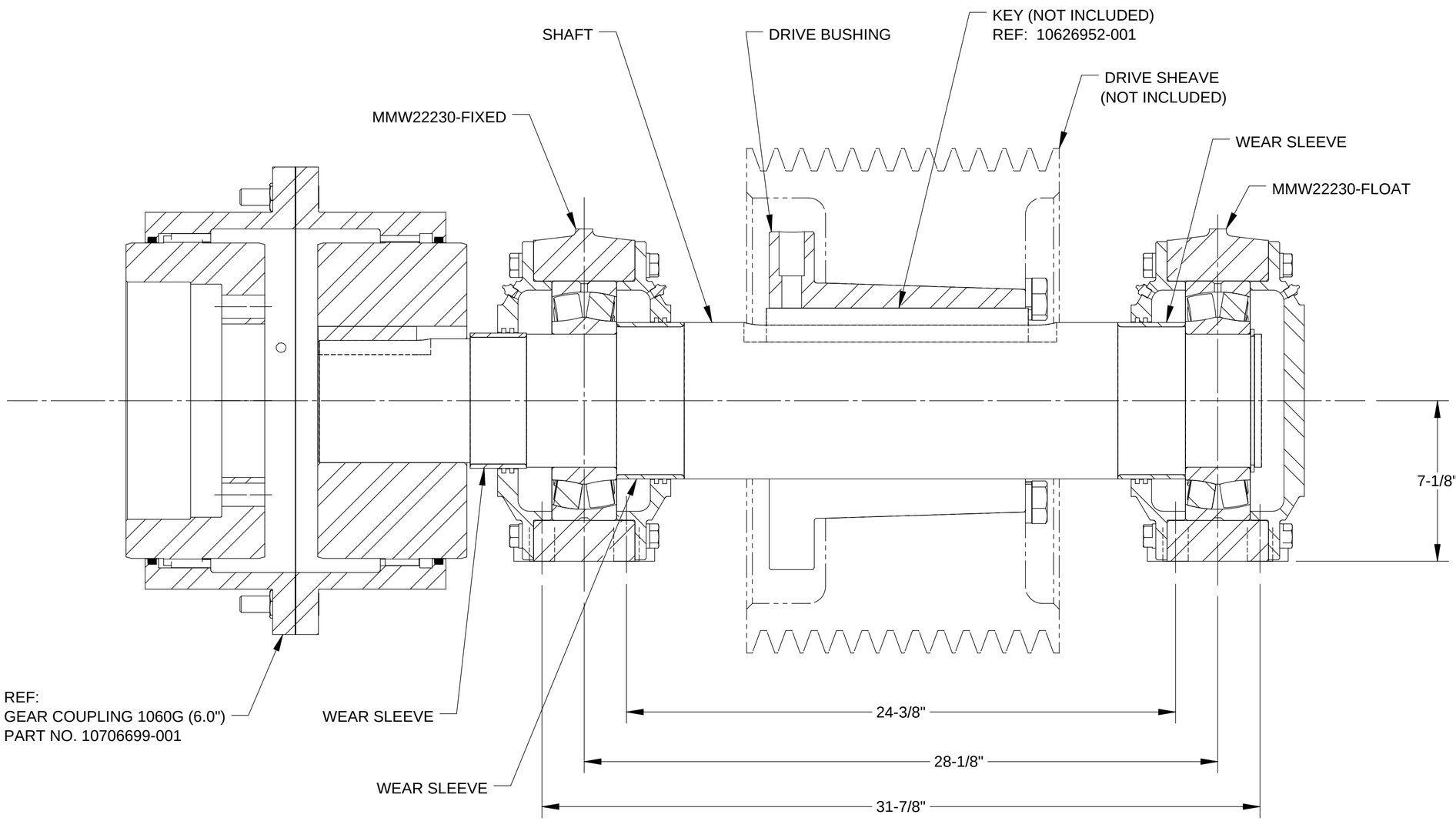


SECTION C-C
2X SCALE

SCALE:	1:12	PROJECTION:	SIZE: E	SHT:	2 OF 2
DWG NO.	10706968-DOS			REV:	02

DRAWN IN ACAD
RS-MECH_E-TPL-001-02

REV	DESCRIPTION OF CHANGE	MADE	CHKD	DATE	APPD



NOTES:

1. ALL DIMENSIONS ARE FOR REFERENCE ONLY.

2. THIS DRAWING REPRESENTS AN ASSEMBLY OF KITTED PARTS FURNISHED BY THE VENDOR.
   THIS ASSEMBLY CONSISTS OF ALL THE SAME COMPONENTS AS
   PART NO. 10639419-001 (FOR SMALL MOTOR HUB)
   WITH THE EXCEPTION OF THE GEAR COUPLING.

3. IDENTIFY KIT WITH PART NO. "10696042-001" AND REVISION.

4. ALL PARTS TO HAVE LONG TERM STORAGE PROTECTION.

5. SUGGESTED VENDOR:
   NATIONAL PETROLEUM OILFIELD PRODUCTS
   10650 WEST LITTLE YORK ROAD
   HOUSTON, TX 77041
   PH: 713-466-4040

PRODUCT:	TRIPLEX PUMPS
END ITEM:	
NEXT ASSY:	
SIMILAR TO:	10639419-001
WT LBS:	2450
FINISH	
UNLESS OTHERWISE SPECIFIED	
TOL < ±.06	TOL ≥ ±.06
250	1000

UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES.
TOLERANCES ARE:
X.X ±.1 ANGLES ±.50 DEG
X.XX ±.03 FRACTIONS ±1/16
X.XXX ±.010 BREAK EDGES .02/.03
DO NOT SCALE DRAWING

	CURRENT	INITIAL
DRAWN		
CHECKED		
APPVD		
DATE		07-DEC-12

THIS DOCUMENT CONTAINS PROPRIETARY AND CONFIDENTIAL INFORMATION WHICH BELONGS TO NATIONAL OILWELL VARCO, L.P., ITS AFFILIATES OR SUBSIDIARIES (ALL COLLECTIVELY REFERRED TO HEREINAFTER AS "NOV"). IT IS LOANED FOR LIMITED PURPOSES ONLY AND REMAINS THE PROPERTY OF NOV. REPRODUCTION, IN WHOLE OR IN PART, OR USE OF THIS DESIGN OR DISTRIBUTION OF THIS INFORMATION TO OTHERS IS NOT PERMITTED WITHOUT THE EXPRESS WRITTEN CONSENT OF NOV. THIS DOCUMENT IS TO BE RETURNED TO NOV UPON REQUEST OR UPON COMPLETION OF THE USE FOR WHICH IT WAS LOANED. THIS DOCUMENT AND THE INFORMATION CONTAINED AND REPRESENTED HEREIN IS THE COPYRIGHTED PROPERTY OF NOV.

RIG SOLUTIONS
MECHANICAL ENGINEERING

NOV NATIONAL OILWELL VARCO

TITLE:
DRIVESHAFT ASSY, F/ LARGE MOTOR HUB, RMBD SINGLE MTR

SCALE: 1:4	PROJECTION:	SIZE: C	SHT: 1 OF 1		
DWG NO. 10696042-DOS			REV: 01		

DRAWN IN SW
RS-MECH_C-TPL-001