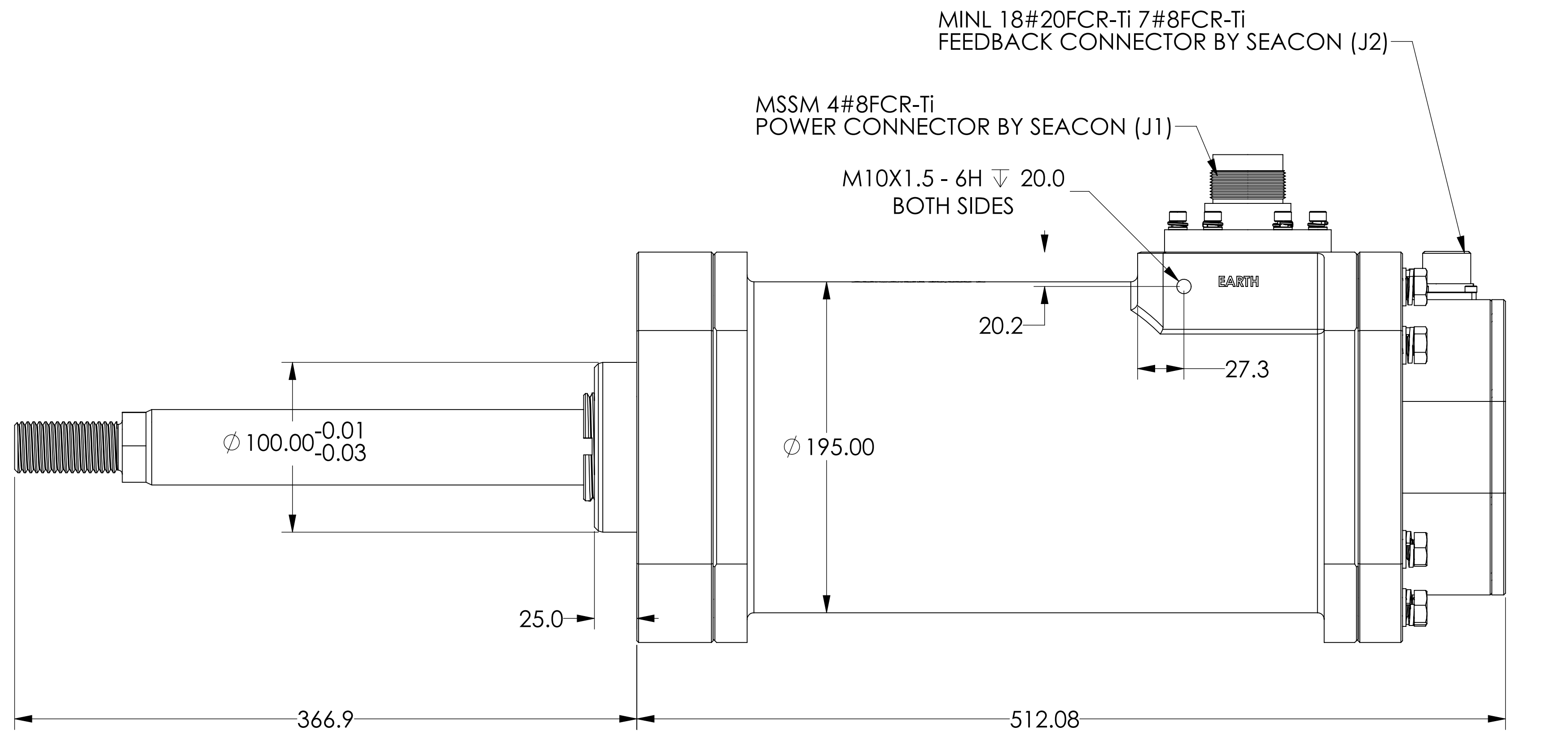
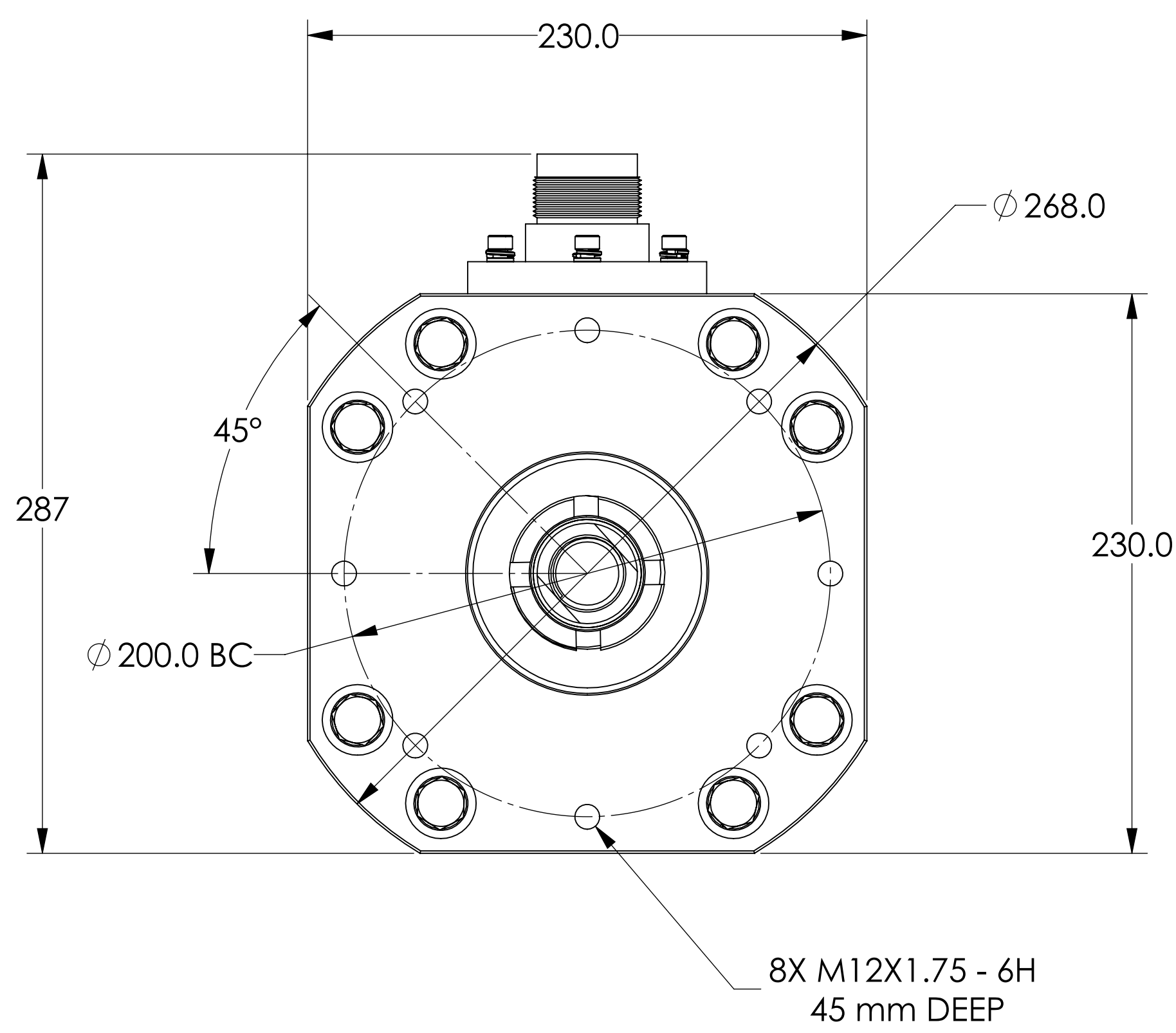
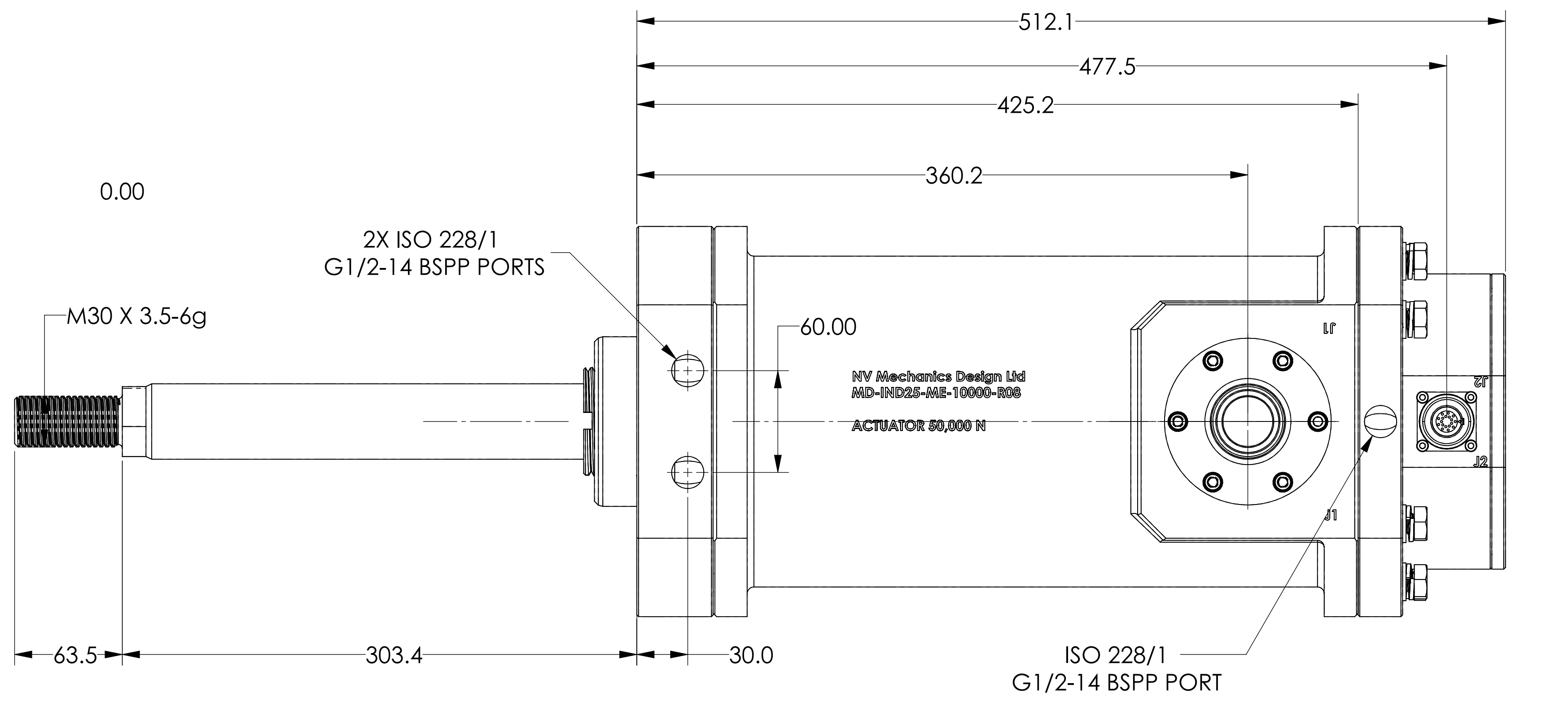


BILL OF MATERIALS							
ITEM #	Default/QTY	UOM	PART NUMBER	DESCRIPTION	MATERIAL DESCRIPTION	Vendor	SHELVE / LIFE
1	1	EA	MD-IND17-ME-20001-9	ACTUATOR BODY	TI-6AL-4V GR5	NV MECHANICS DESIGN	25 YEARS
2	1	EA	MD-IND17-ME-20002-6	FRONT END CAP	TI-6AL-4V GR5		25 YEARS
3	1	EA	MD-IND17-ME-20003-8	END CAP ACTUATOR	TI-6AL-4V GR5	NV MECHANICS DESIGN	25 YEARS
4	1	EA	MD-IND17-ME-10004-2	ACTUATOR ROD	SST 17-4PH-H1150	NV MECHANICS DESIGN	25 YEARS
5	1	EA	MD-IND17-ME-20005-2	RESOLVER END CAP	TI-6AL-4V GR5	NV MECHANICS DESIGN	25 YEARS
6	1	EA	MD-IND17-ME-20006-3	SEAL KEEPER	NICKEL ALUMINUM BRONZE	NV MECHANICS DESIGN	25 YEARS
7	1	EA	MINL 18#20FCR-Ti	MINL 18#20FCR-Ti SEACON CONNECTOR	TI-6AL-4V GR 5	INDAL	
8	16	EA	M 12 X 45 HEX HEAD	M 12 X 45 Hex Head Screw	TI-6AL-4V GR5	ALLIED TITANIUM - US 1-(360) 477-6271	25 YEARS
9	16	EA	M12 Ti SPLIT LOCK WASHER	M12 Ti SPLIT LOCK WASHER	TI-6AL-4V GR5	ALLIED TITANIUM - US 1-(360) 477-6271	25 YEARS
10	8	EA	M5 x 10 Ti SHCS	M5 x 10 Ti SOCKET HEAD CAP SCREW	TI-6AL-4V GR5	ALLIED TITANIUM - US 1-(360) 477-6271	25 YEARS
11	4	EA	M4 x 10 Ti SHCS	M4 x 10 Ti SOCKET HEAD CAP SCREW	TI-6AL-4V GR5	ALLIED TITANIUM - US 1-(360) 477-6271	25 YEARS
12	1	EA	O-RING 2-161	2-161 O-RING	VITON 75	MCMaster CARR - US 16308330300	20 YEARS
13	2	EA	O-RING 2-258	2-258 O-RING	VITON 75	MCMaster CARR - US 16308330300	20 YEARS
14	1	EA	15BRX700-F10AB	HAROWE RESOLVER		DELEVAN US 716.805.8171	
15	1	EA	ROLLER SCREW	ROLLER SCREW		SERVO SOLUTIONS INC US	15 YEARS
16	1	EA	MSSM 4#8HV-FCR-Ti	POWER CONNECTOR SEACON	TI-6AL-4V GR5	INDAL	
17	6	EA	M6 X 25 Ti SHCS	SOCKET CAP SCREW - M6 - 1 x 20MM	TI-6AL-4V GR5	ALLIED TITANIUM - US 1-(360) 477-6271	25 YEARS
18	2	EA	O-RING 2-228	2-228 O-RING	VITON 75	MCMaster CARR - US 16308330300	20 YEARS
19	16	EA	WASHER	M 12 FLAT WASHER	TI-6AL-4V GR5	ALLIED TITANIUM - US 1-(360) 477-6271	25 YEARS
20	6	EA	M6 FLAT WASHER	M6 FLAT WASHER	TI-6AL-4V GR 5	ALLIED TITANIUM - US 1-(360) 477-6271	25 YEARS
21	1	EA	THERMISTOR B59100M1120A070	Thermistor B59100M1120A070 TDK		DIGI KEY (TDK) - CANADA	25 YEARS
22	6	EA	M6 Split Lock Washer	M6 Split Lock Washer	TI-6AL-4V GR 5	ALLIED TITANIUM	25 YEARS

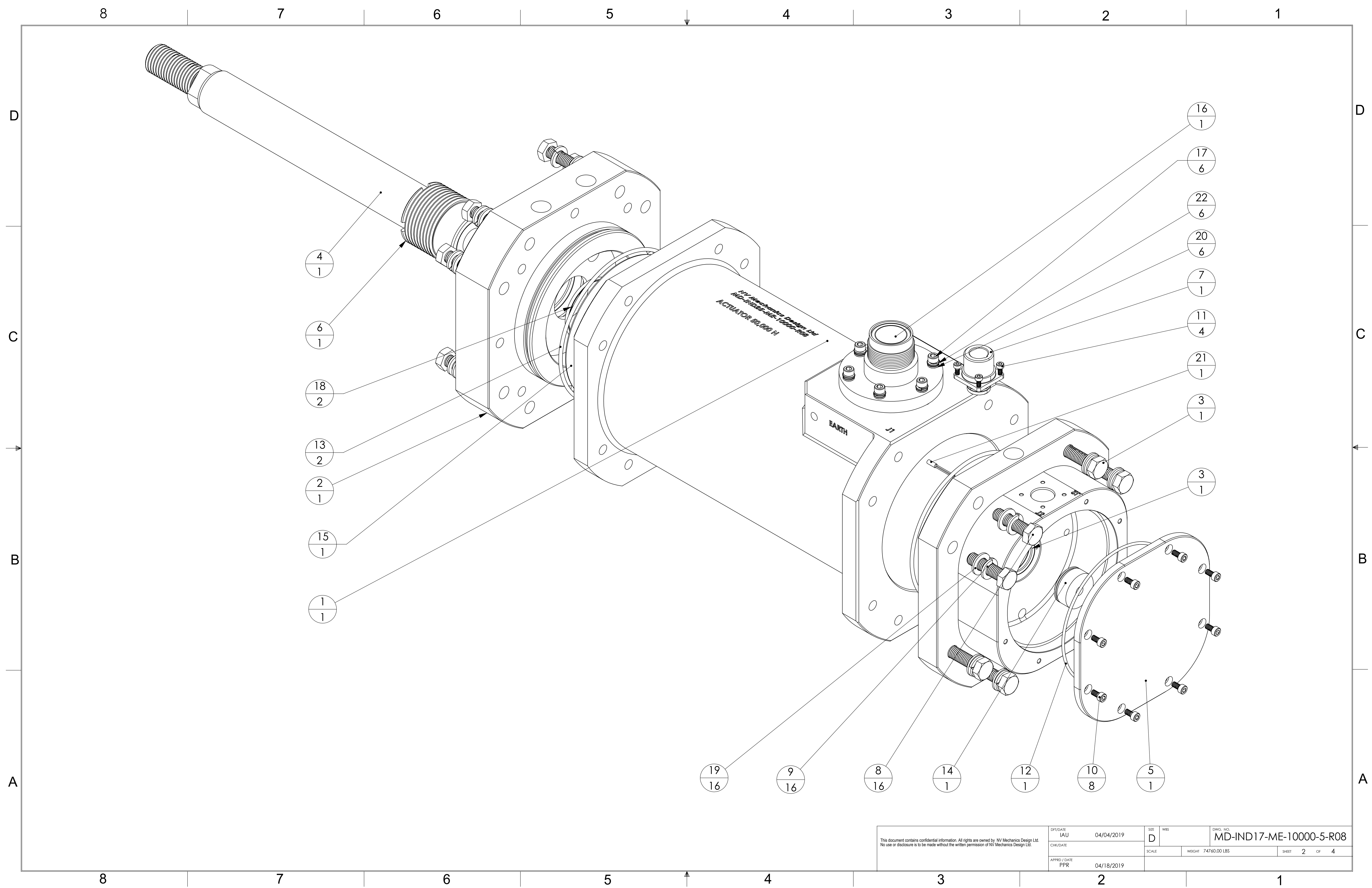


LINEAR ACTUATOR WEIGHT EMPTY - 74.75 KG (164.4 LBS)
 LINEAR ACTUATOR WEIGHT FULL OF OIL - 76.75 KG (168.8 LBS)

TOLERANCES unless otherwise noted				APPROVAL	
FRACTIONS	ANGLES	DECIMALS .XXX	DECIMALS .XX	DRF / DATE	
1/16"	±0.3°	±.005	±.050	IAU 04/04/2019	
Unless otherwise noted, all dimensions are in inches. DO NOT SCALE. Work to dimensions shown.				CHK / DATE	
FINISH				APPR / DATE	
INTERPRET PER				PPR 04/18/2019	
ANSI Y14.3 AND ANSI Y14.5M		DWG FILE NAME	PLOT DATE		
		MD-IND17-ME-10000-5-R08 \$LDDRW			
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SIZE	WBS	DWG. NO.	REV.		
D		MD-IND17-ME-10000-5-R08			
SCALE	WEIGHT	74760.00 LBS	SHEET	1	OF 4

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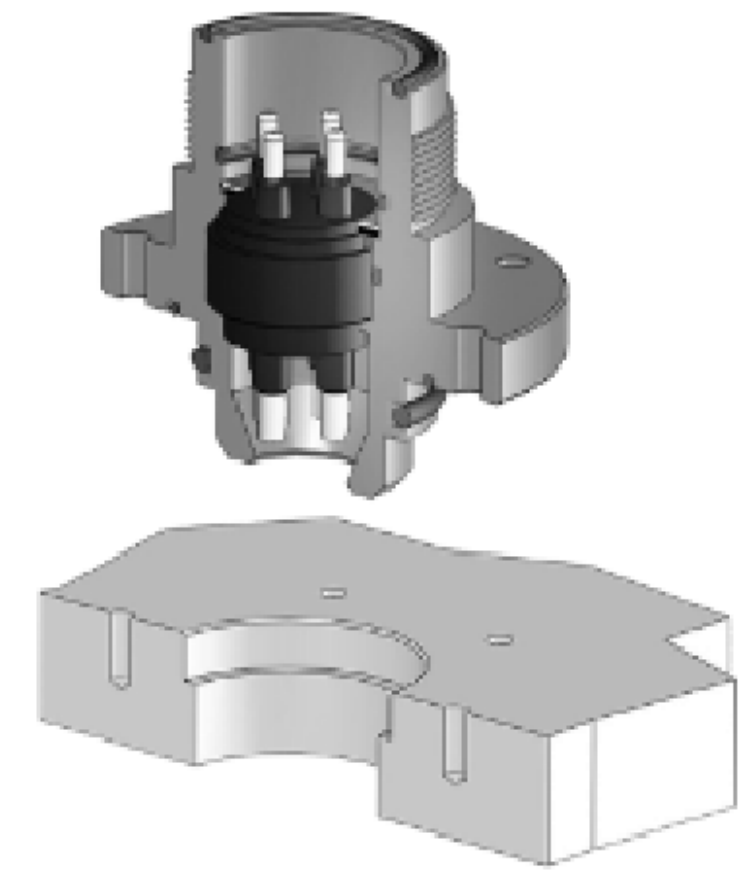
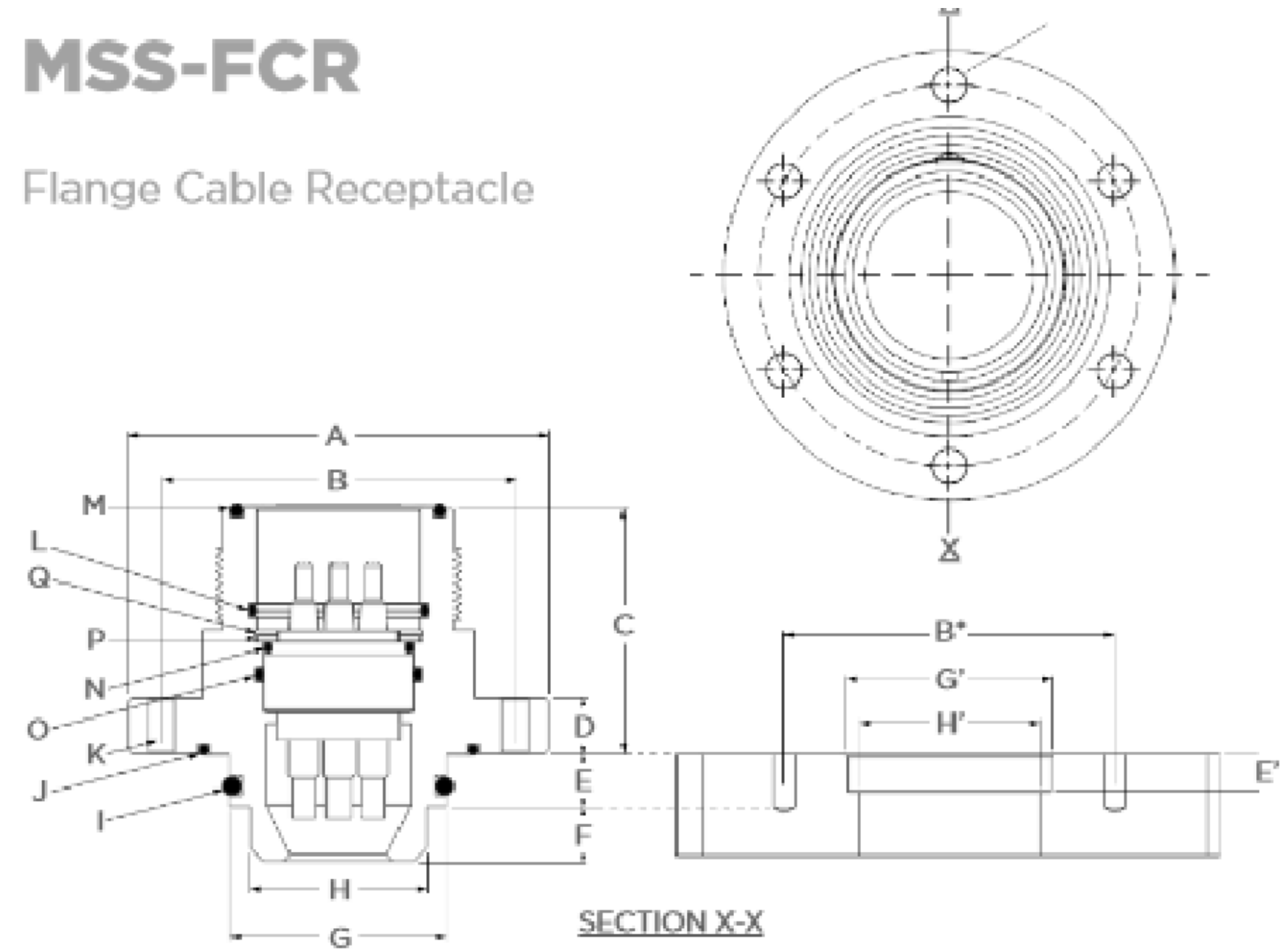
**LINEAR ACTUATOR
 INDAL TECHNOLOGIES
 SUBSEA BRAKE**



<small>This document contains confidential information. All rights are owned by NV Mechanics Design Ltd. No use or disclosure is to be made without the written permission of NV Mechanics Design Ltd.</small>		DTI/DATE IAU 04/04/2019	SIZE D	DWG. NO. MD-IND17-ME-10000-5-R08
		CHK/DATE PPR	SCALE 	WEIGHT 74760.00 LBS
		APPR'D / DATE PPR 04/18/2019	SHEET 2 OF 4	

MSS-FCR

Flange Cable Receptacle



G, K, L, M sizes have round keyway. O, P and Q have square keyway. However, with the Aluminum option all sizes have a square keyway. Refer to page pages 11-16 for contact configurations. G, K, L, M Aluminum connectors will not mate with Stainless Steel connectors.

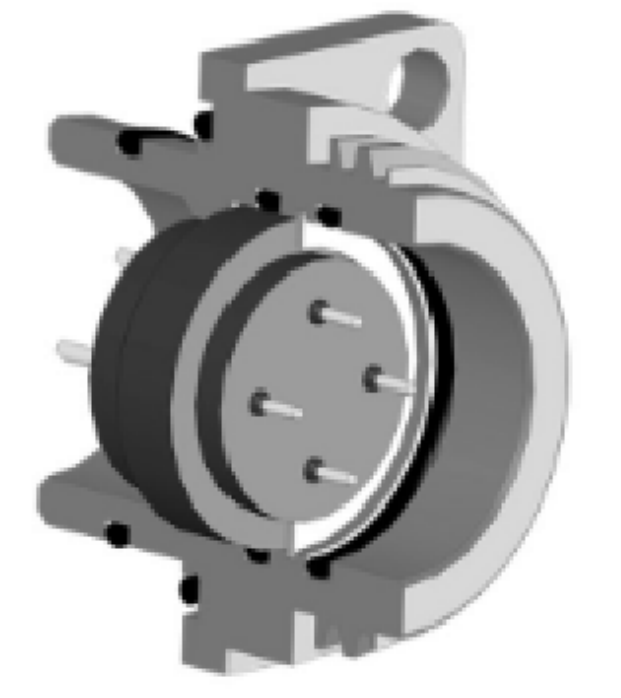
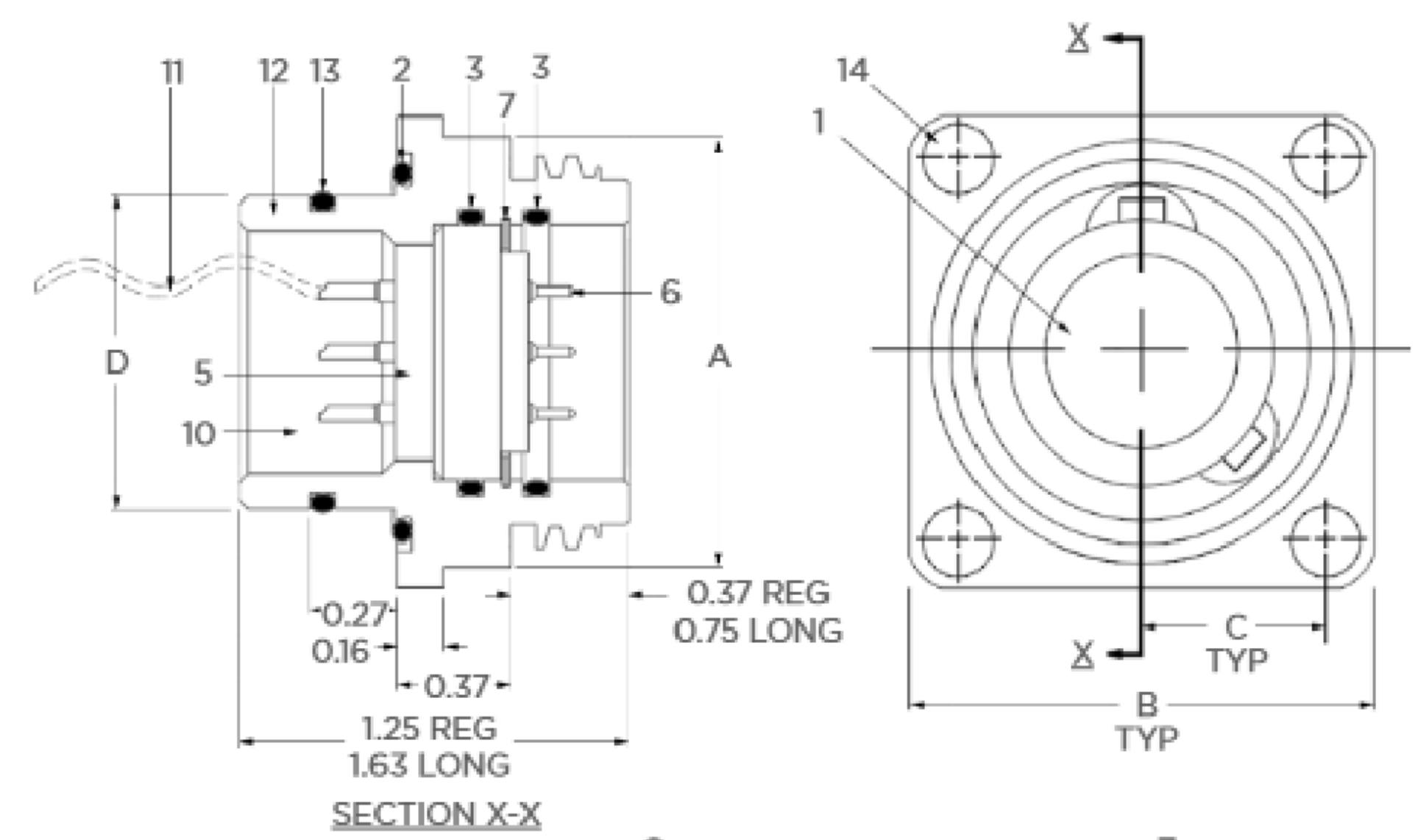
	A	B	C	D	E	F	G	H	I	J	K	L	M
Shell Diameter Size (In)													
Hole Circle (In)													
Height (In)													
Height (In)													
Height (In)													
Height (In)													
Diameter Max. (In)													
Diameter (In)													
O-Ring													
O-Ring													
Boit Size													
O-Ring													
O-Ring													

Mounting Dimensions

Shell Size	N O-Ring	O O-Ring	P Washer	Q Retaining Ring	E' Bore Depth Min. (In)	G' Bore Diameter (In)	H' Bore Min. (In)	Part Number
G	NONE	2-016	NONE	UR-62	0.385	0.812/0.814	0.750	MSSG-X-FCR-XXXX-XX
K	2-18	2-118	77-1-274	UR-106	0.385	1.062/1.064	0.890	MSSK-X-FCR-XXXX-XX
L	2-022	2-122	77-1-374	UR-131	0.520	1.312/1.314	1.140	MSSL-X-FCR-XXXX-XX
M	2-123	2-126	77-1-474	UR-150	0.520	2.000/2.002	1.780	MSSM-X-FCR-XXXX-XX
O	2-131	2-225	77-1-574	UR-187	0.520	2.500/2.502	2.140	MSSO-X-FCR-XXXX-XX
P	2-135	2-227	77-1-674	UR-212	0.520	2.750/2.752	2.406	MSSP-X-FCR-XXXX-XX
Q	2-141	2-230	77-1-774	UR-250	0.770	3.125/3.127	2.765	MSSQ-X-FCR-XXXX-XX

MIN-FCR

Flange Connector Receptacle



Shell Size	A Ø (In)	B Square (In)	Mounting Hole Location (In)	13 Retaining O-Ring D Ø (In)	2 Retaining O-Ring	3 Socket Head Screwcap O-Ring	Part Number			
D	0.75	0.87	0.335	0.373	2-010	VH-31	2-013	4-40 UNC-2A	2-011	MIND-X-FCR
E	0.87	1.00	0.387	0.498	2-012	VH-43	2-015	4-40 UNC-2A	2-013	MINE-X-FCR
G	1.00	1.12	0.453	0.685	2-015	UR50	2-018	4-40 UNC-2A	2-014	MING-X-FCR
K	1.12	1.25	0.510	0.748	2-016	UR62	2-019	6-32 UNC-2A	2-016	MINK-X-FCR
L	1.25	1.37	0.562	0.873	2-018	UR75	2-021	6-32 UNC-2A	2-018	MINL-X-FCR
M	1.37	1.50	0.593	0.998	2-020	UR81	2-023	8-32 UNC-2A	2-019	MINM-X-FCR
O	1.62	1.75	0.723	1.123	2-022	UR106	2-026	8-32 UNC-2A	2-023	MINO-X-FCR
P	1.75	1.87	0.777	1.248	2-024	UR118	2-028	8-32 UNC-2A	2-025	MINP-X-FCR
Q	1.87	2.00	0.831	1.373	2-026	UR137	2-029	10-24 UNC-2A	2-028	MINQ-X-FCR
R	2.00	2.12	0.884	1.498	2-028	UR150	2-029	10-24 UNC-2A	2-029	MINR-X-FCR
T	2.50	2.62	1.043	1.998	2-032	UR175	2-034	1/4-20 UNC-2A	2-031	MINT-X-FCR
U	2.75	2.87	1.113	2.248	2-034	UR200	2-036	1/4-20 UNC-2A	2-033	MINU-X-FCR
X	3.50	3.62	1.470	2.748	2-038	UR250	2-041	3/8-16 UNC-2A	2-037	MINX-X-FCR

TABLE A: REFERENCE DRAWINGS / DOCUMENTS		
LINE	DESCRIPTION	DRAWING / DOCUMENT NO.
1	FLUID SCHEMATIC	
2	WIRING DIAGRAM	MD-IND17-ME-10000-5-R03
3	CABLING DIAGRAM	
4	NETWORK DIAGRAM	
5	I/O LIST	

TABLE B: CONSUMABLES		
LINE	DESCRIPTION	PRODUCT
1	ANTI-CORROSION LUBRICATOR	USS ULTRA TEF-GEL
2	MARINE GRADE ANTI-SEIZE	LOCTITE LB 8023
3	O-RING LUBRICANT	DOW CORNING MOLYKOTE 55
4	THREAD LOCKER - STRONG	LOCTITE 263 (RED)
5	THREAD LOCKER - MEDIUM	LOCTITE 243 (BLUE)
6	THREAD LOCKER - MILD	USS ULTRA TEF-GEL
7	PAINT MARKER	
8	HEAT SHRINK TUBE	RAYCHEM RNF-100
9	HEAT SHRINK WIRE LABELS	DYMO 18051
10	1/4 INCH CABLE TIES	

TABLE C: TOOLS FOR MECHANICAL ASSEMBLY		
LINE	TOOL DESCRIPTION	DETAIL
1	COMBINATION WRENCHES	14mm, 22mm, 3/4in, 7/8in, 1 1/16in, 1-1/4in
2	SOCKETS	7/8in, 1-1/4in
3	TIGHT-CLEARANCE OFFSET SOCKETS (CROWS FOOT)	22mm, 7/8in
4	ALLEN KEYS / DRIVERS	2mm, 2.5mm, 5mm, 6mm, 1/8in
5	HELICAL-INSERT INSTALLATION TOOL	M6x1, M12x1.75
6	TORQUE WRENCH(S)	UP TO 217Nm

TABLE D: MECHANICAL ASSEMBLY INSTRUCTIONS		
LINE	DESCRIPTION	QMS PROCEDURE NO.
1	MECHANICAL ASSEMBLY AND TEST PROCEDURES	MD-QAM-PR-20
2	ULTRA TEF-GEL OR MARINE ANTI-SEIZE TO BE APPLIED TO FASTENER THREADS WITH A MECHANICAL RETENTION DEVICE.	
3	FASTENERS WITHOUT A MECHANICAL RETENTION DEVICE (LOCK WASHER, LOCKNUT, WEDGE LOCK WASHER) TO BE INSTALLED WITH LOCTITE 243 (BLUE).	
4	HELICAL INSERTS TO BE INSTALLED WITH LOCTITE 263 (RED).	
5	TORQUE FASTENERS ACCORDING TO THE GIVEN FASTENER TABLE AND PAINT MARK. (HYDRAULIC CARTRIDGE VALVES)	
6	TORQUE HYDRAULIC CARTRIDGE VALVES TO THE GIVEN CARTRIDGE VALVE TABLE AND PART MARK.	
7	INSPECT O-RINGS FOR DEFECTS AND REPLACE WHEN IN DOUBT.	
8	O-RINGS TO BE LUBRICATED DOW CORNING MOLYKOTE 55.	

TABLE E: TOOLS FOR ELECTRICAL ASSEMBLY		
LINE	TOOL DESCRIPTION	DETAIL
1	WIRE CUTTER	
2	WIRE STRIPPER, 24 AWG TO 16 AWG	
3	HEAT GUN (FOR HEAT SHRINK TUBING)	
4	JEWELERS SCREWDRIVER SET	
5	WIRE LABEL PRINTER	DYMO RHINO 5200
6	LEAD FREE SOLDER	KESTER P/N 24-7068-9716
8	LIQUID FLUX	RMA202-25 BY AIM OR 186-18 P/N 63-0018-0186 BY KESTER
10	SOLDERING IRON	
16	DIGITAL MULTIMETER	

TABLE F: ELECTRICAL ASSEMBLY INSTRUCTIONS		
LINE	DESCRIPTION	QMS PROCEDURE NO.
1	ELECTRICAL ASSEMBLY PROCEDURE	MD-QAM-PR-22
2	ALL INTERNAL WIRING IS TEFLON #18AWG UNLESS OTHERWISE STATED.	
4	WIRING WIRES COLOR AS PER TABLES BELOW	
5	RESOLVER WIRES TO BE SECURED WITH HEATSHRING AND CABLE CLAMP	
6	VERY IMPORTANT - FOLLOW COLOR CODE FOR EACH PHASE WIRING	
7	VERY IMPOTANT - WIRE RESOLVER AND THERMISTOR AS PER BELOW TABLE	

TORQUE TABLE FOR LUBRICATED SST FASTENERS		TORQUE TABLE FOR FITTINGS	
SIZE	TORQUE [Nm]	FITTING	TORQUE [Nm]
M2		G1/8	20
M2.5		G1/4	50
M3		G3/8	80
M4	2.3	G1/2	100
M5	4.6	G3/4	200
M6	7.8	G1	380
M8	19.1		
M10	38		
M12	66		

POWER CONNECTOR J1 PIN OUTS		
PIN NO	DESTINATION	COLOR
B2J1-1	BRAKE ACTUATOR PH U	BLACK
B2J1-2	BRAKE ACTUATOR PH V	RED
BSJ1-3	BRAKE ACTUATOR PH W	WHITE
B2J1-4	INTERSTITIAL EARTH	GREEN
FEEDBACK CONNECTOR J2 PIN OUTS		
PIN NO	DESTINATION	COLOR
B2J2-1	BRAKE RESOLVER S3	BLACK
B2J2-2	BRAKE RESOLVER S1	RED
BSJ2-3	BRAKE RESOLVER S4	BLUE
B2J2-4	BRAKE RESOLVER S2	YELLOW
B2J2-5	BRAKE RESOLVER R1	RED /WHITE
B2J2-6	BRAKE RESOLVER R2	YELLOW /WHITE
B2J2-7	BRAKE THERMISTOR 1	GREY
B2J2-8	BRAKE THERMISTOR2	GREY
B2J2-9	SPARE (OR NC)	
B2J2-10	SPARE (OR NC)	
B2J2-11	SPARE (OR NC)	
B2J2-12	SPARE (OR NC)	
B2J2-13	SPARE (OR NC)	
B2J2-14	SPARE (OR NC)	
B2J2-15	SPARE (OR NC)	
B2J2-16	SPARE (OR NC)	
B2J2-17	SPARE (OR NC)	
BSJ2-18	SPARE (OR NC)	

NOTE: FOR TESTING REQUIREMENTS, MD-IND17-PL-01_Test_Plan_R06

DFT/DATE		SIZE	WBS	DWG. NO.
CHK/DATE		D		MD-IND17-ME-10000-5-R06
APPRO / DATE		SCALE	WEIGHT	LBS
				SHEET 4 OF 4

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