

HALE AP FLEX SERIES PUMP

GEARBOX POSITION - VERTICAL, DISCHARGE POSITION - 1, ENGINE ROTATION AND OPTIONAL GEARBOX COOLER SHOWN

NOTES:

- PRIMING SYSTEM, DISCHARGE & SUCTION VALVES, PRESSURE RELIEF VALVES & CONTROLLERS AND THERMAL RELIEF VALVES ARE AVAILABLE.
- USE SAE 50 LONG-LIFE SYNTHETIC MANUAL TRANSMISSION FLUID MEETING ONE OR MORE OF THE FOLLOWING SPECIFICATIONS.
 - API MT-1
 - EATON PS-164 Rev. 7
 - MACK TO-A Plus
 - MERITOR 0-81
 - NAVISTAR / INTERNATIONAL TMS 6816
 - ROCKWELL / EATON / FULLER CD-50 (PS-081)
 - ZF FreedomLine
- FILL GEARBOX UNTIL OIL LEVEL INDICATOR WINDOW IS 1/2 TO 3/4 FULL. APPROXIMATE OIL CAPACITY IS 1.5 QUART [1.4 LITER].
- ALL METRIC FASTENERS TO HAVE A MINIMUM PROPERTY CLASS 8.8. ALL SAE FASTENERS TO HAVE A MINIMUM GRADE 5 SPECIFICATION.
- PUMP ASSEMBLY MOUNTING:
 - MOUNTING SHOULD BE FROM BOTH VOLUTE AND GEARBOX.
 - PUMP MOUNTING SUPPORT SHOULD BE VIA THE PUMP VOLUTE MOUNTING HOLES (3 MIN.).
 - GEARBOX MOUNTING SUPPORT SHOULD BE FROM THE STUDS PROVIDED (3 MIN.).
 - CONSIDERATION MUST BE TAKEN NOT TO TRANSMIT LOADS OR TWISTING MOMENTS TO OR THROUGH PUMP ASSEMBLY FROM CHASSIS, FRAME, BODY WORK, SUCTION AND DISCHARGE PIPING CONNECTIONS.
- REFER TO "MAXIMUM TORQUE VALUES" AND "THREAD LOCKS & SEALANTS" TABLES WHEN INSTALLING THREADED COMPONENTS.

PUMP MODEL & SERIAL NUMBER

4x STUD
M10x1.5 - 6g
SEE NOTES 4 & 5

0.375 [9.53] KEY

OIL FILL & BREATHER
SEE NOTES 2 & 3

OPTIONS AND ACCESSORIES	
OPTION	DRAWING NUMBER
ESP PRIMING PUMP	PL821
PVG PRIMING VALVE	PL480
SPV PRIMING VALVE	PL828
PUMP SHIFT INDICATOR LIGHTS	PL825
GEARBOX POSITIONS	FSG-PL-01483, SHT 2
DISCHARGE POSITIONS	FSG-PL-01483, SHT 2
FLEX SERIES GEARBOX ASSEMBLY	FSG-PL-01481

INPUT SHAFT - INERTIA WITH PUMPED WATER		
CALCULATIONS FOR INPUT SHAFT DOES NOT INCLUDE MATING DRIVE FLANGE, DRIVE COUPLING, YOKES, OR DRIVELINE. CUSTOMER OR SUPPLIER MUST PROVIDE MASS MOMENTS OF INERTIA FOR ADDITIONAL DRIVELINE COMPONENTS		
PUMP MODEL	INERTIA (UNITS)	
	(LB-FT ²)	(kg-m ²)
AP-37F	7.556	0.3184
AP-29F	4.774	0.2012
AP-26F	3.888	0.1638
AP-23F	3.205	0.1351
AP-19F	2.238	0.0943
AP-16F	1.752	0.0738
AP-13F	1.195	0.0503
AP-11F	0.959	0.0404

GEAR RATIOS & PUMP MODELS	
PUMP MODEL	GEAR RATIO
AP*-37F	3.74
AP*-29F	2.91
AP*-26F	2.60
AP*-23F	2.33
AP*-19F	1.90
AP*-16F	1.64
AP*-13F	1.31
AP*-11F	1.14

PUMP WEIGHT (DRY):
IRON VERSION: 125 LBS [57 kg]
BRONZE VERSION: 136 LBS [62 kg]

REPRESENTS CENTER OF GRAVITY

MAXIMUM INPUT RPM			
WARNING EXCEEDING THESE LIMITS OR FAILURE TO FOLLOW THE RECOMMENDATIONS OUTLINED ON THIS DRAWING COULD DAMAGE THE PUMP AND RESULT IN PERSONAL INJURY.			
PUMP MODEL	MAX GEARBOX INPUT RPM	PUMP MODEL	MAX GEARBOX INPUT RPM
AP-37F	2210	AP-19F	4340
AP-29F	2840	AP-16F	5020
AP-26F	3180	AP-13F	6320
AP-23F	3540	AP-11F	6720**

SEE HALE TORQUE LIMIT CHART F-72 FOR ADDITIONAL DATA.
MAXIMUM ALLOWABLE HYDRODYNAMIC PRESSURE: 400 PSIG; **340 PSIG
MAXIMUM ALLOWABLE HYDROSTATIC PRESSURE: 500 PSIG

HALE TYPE AP/AP-GB PUMP MODEL IDENTIFICATION

THE HALE TYPE AP/AP-GB PUMP IS AVAILABLE WITH MULTIPLE DRIVE RATIOS TO ADAPT TO A WIDE VARIETY OF APPLICATIONS. THE RATING, RATIO AND DRIVE UNIT TYPE DETERMINE THE MODEL NUMBER. FOR EXAMPLE:

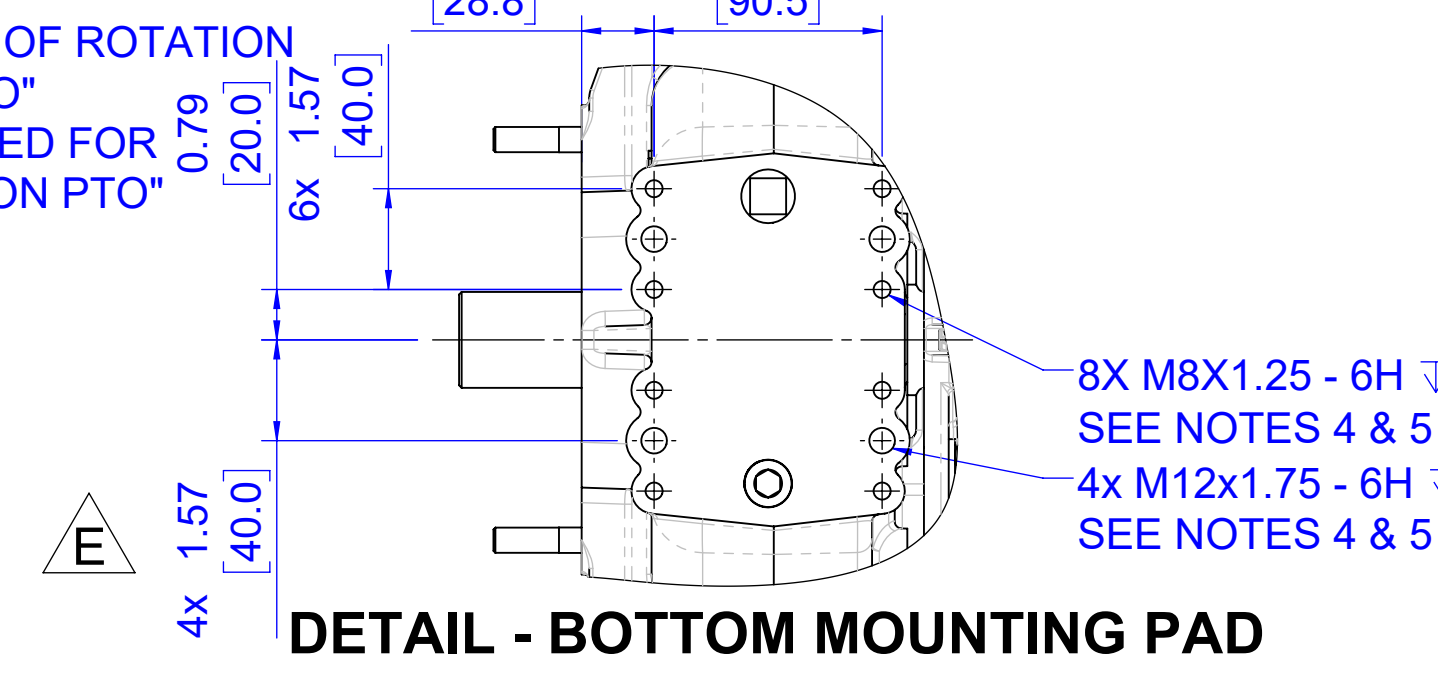
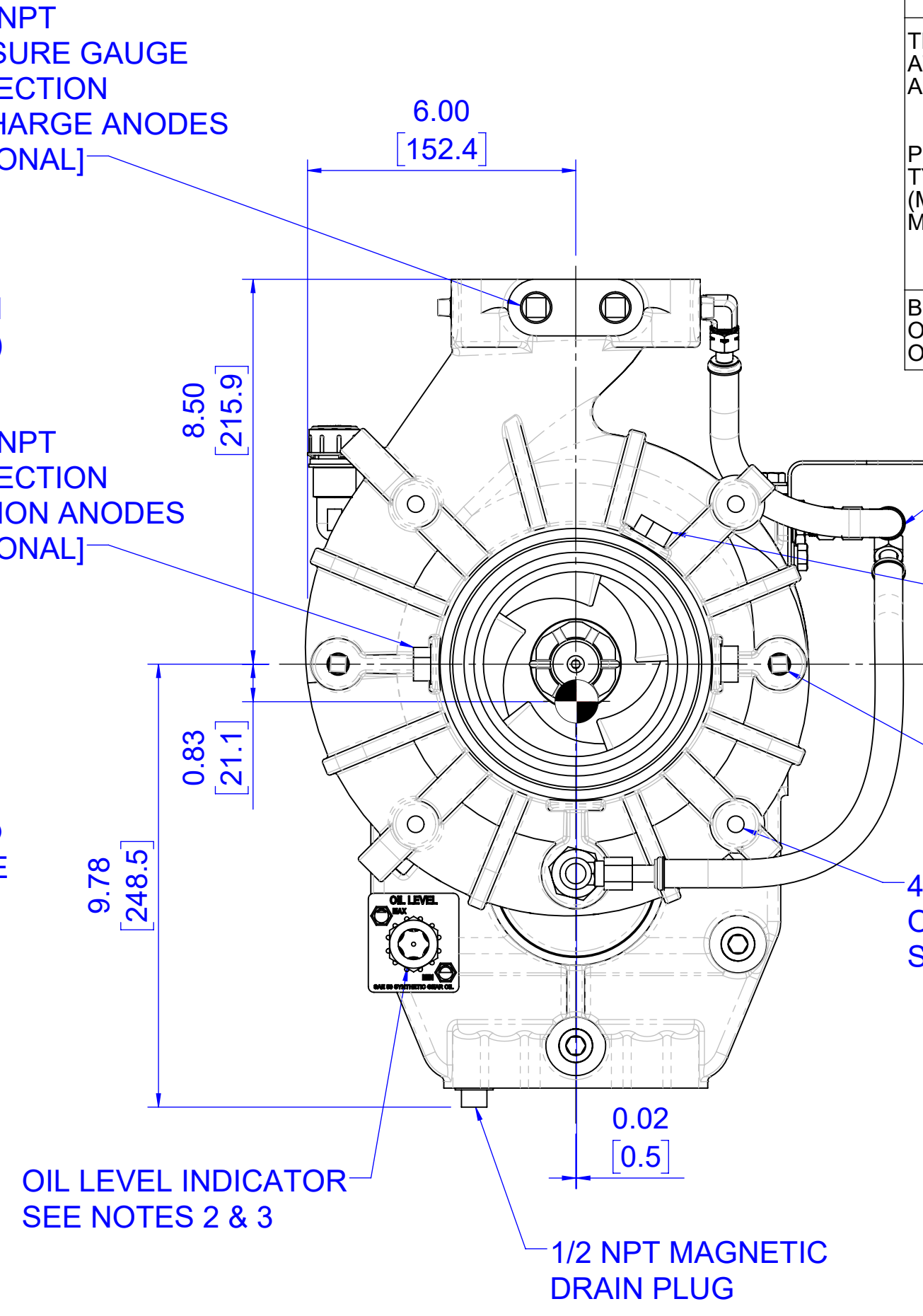
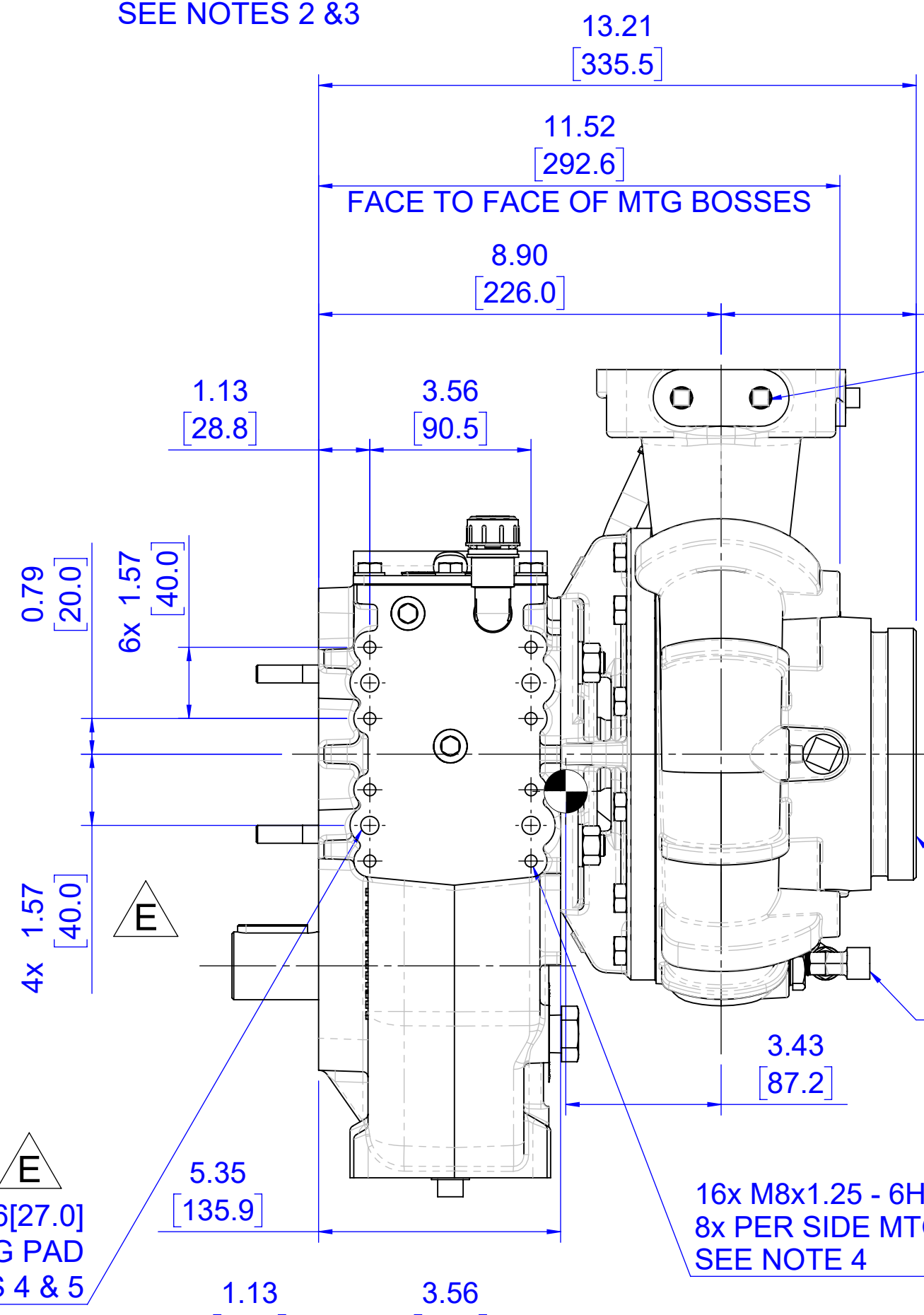
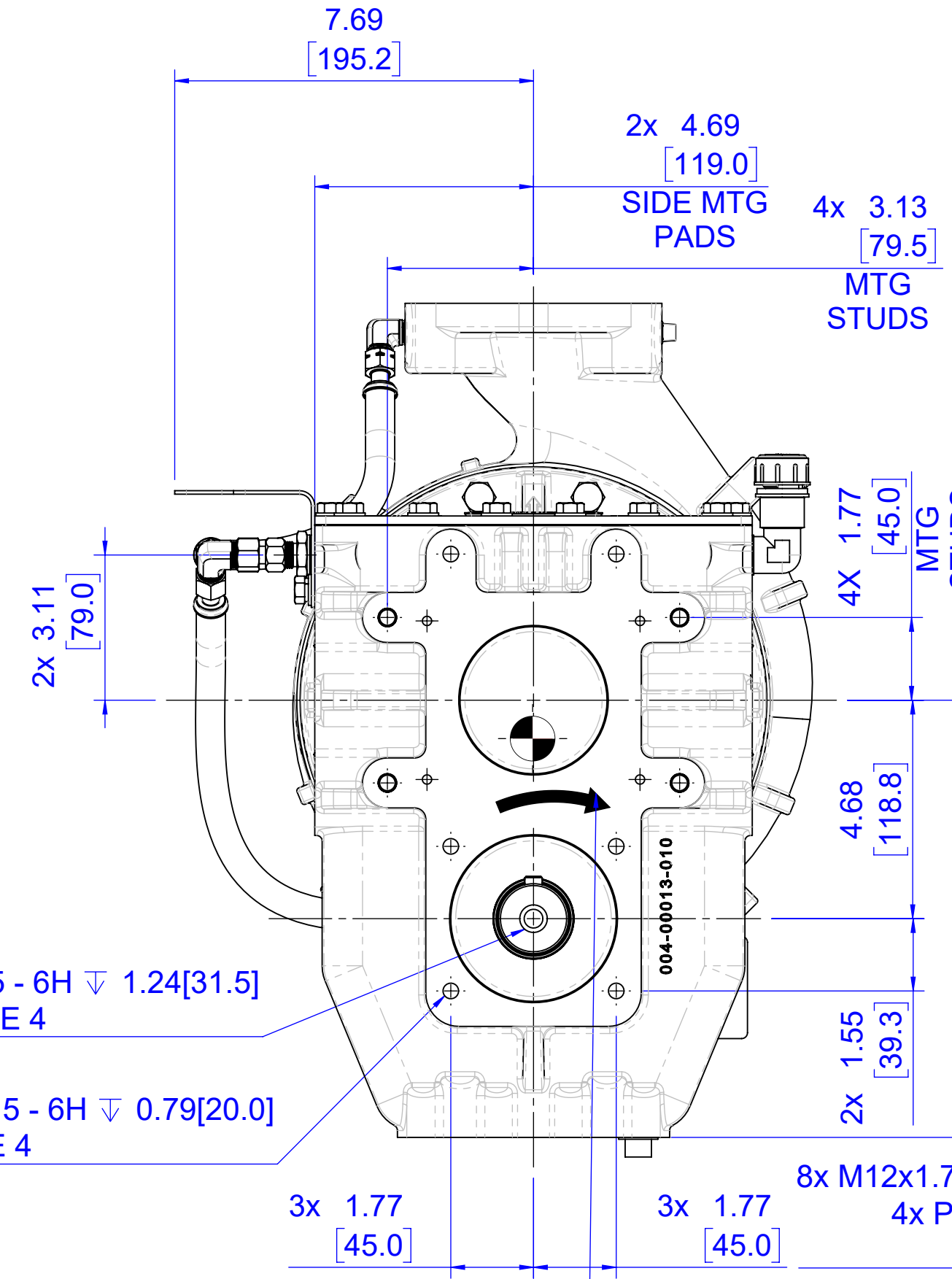
AP IDENTIFICATION (GPM)				AP IDENTIFICATION (L/S)			
AP(M)	50	-23	E	AP(M)	31	GB	-23 E
PUMP TYPE (M=ENGINE MOUNT)	RATED CAPACITY GPM	DRIVE RATIO (2.33 = 23)	GEARBOX TYPE	PUMP TYPE (M=ENGINE MOUNT)	RATED CAPACITY - L/S	GB FOR 31 LPS LS FOR 32 LPS	DRIVE RATIO (2.33 = 23) GEARBOX TYPE

BE SURE TO INCLUDE THE MODEL NUMBER AND SERIAL NUMBER WHEN ORDERING PARTS OR REQUESTING INFORMATION. THE MODEL / SERIAL NUMBER PLATE IS LOCATED ON TOP OF GEAR DRIVE AS SHOWN IN DRAWING.

THREAD LOCKS & SEALANTS	
COMPONENT	LOCTITE # (OR EQUIVALENT)
STUDS IN ALUMINUM, OIL SEALS, END CAPS, & CLEARANCE RINGS	680
NUTS & BOLTS WITHOUT LOCKWASHERS	243
NPT / BSP FITTINGS & PLUGS	580

MAXIMUM TORQUE VALUES		
SIZE	STUDS & THREADS IN ALUMINUM	NUTS ON STUDS & THREADS IN ALUMINUM
M8 x 1.25	12 LB-FT [16 Nm]	9 LB-FT [12 Nm]
M10 x 1.50	24 LB-FT [32 Nm]	17 LB-FT [23 Nm]
M12 x 1.75	40 LB-FT [54 Nm]	29 LB-FT [39 Nm]

OTHERWISE, FOLLOW STANDARD TORQUE VALUES PER MATERIAL & GRADE / CLASS OF FASTENER.



INSTALLATION

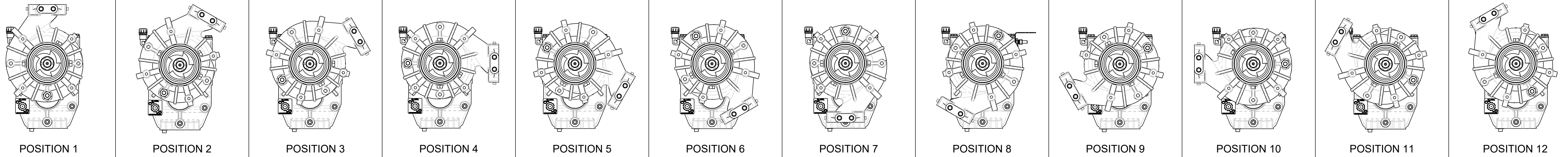
REVISIONS						
ECN	REV.	ZONE	CHANGED FROM	BY	DATE	APVD
4704	C		REMOVED M8x1.25 STUD FROM BOM FOR CONSISTENCY ON ALL FLEX SERIES PUMPS & ANODE QTY. WAS CHANGED TO 4 ON SHEET 4.	MB	28JAN2019	JS2
5177	D	D4, F3, L11	INCREASED 4X M10 INPUT SIDE MOUNTING STUD LENGTH TO 35MM; ADDED TORQUE AND THREAD LOCK TABLES	AJG	11AUG2020	KTN
5426	E	A12, A8, C12, D11, E, E7	ADDED M12 X 1.75 - 6H MOUNTING HOLE DETAILS & NOTES	KTN	15APR2021	TAM

UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES TOLERANCE FOR INCHES DIMENSIONS:
X: ±0.04
X.X: ±0.02
X.XX: ±0.01
X.XXX: ±0.005
ANGLES: ±0.25°
SURFACE TEXTURE IN µm RA REMOVE ALL BURRS AND SHARP EDGES, 0.01MAX

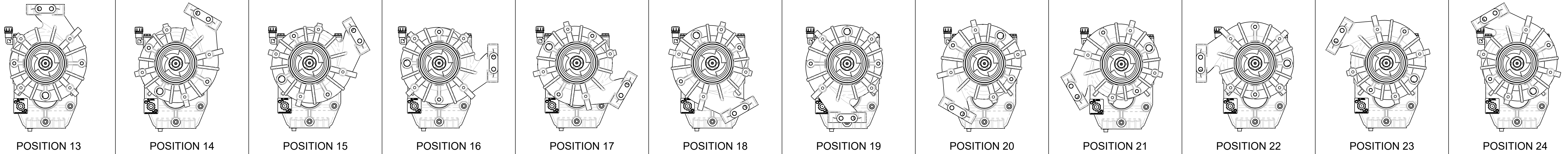
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FSG OF IDEXX CORPORATION		HALE GODIVA Class1	
MATERIAL	TITLE	PUMP ASSEMBLY, AP FLEX SERIES	
MADE FROM	DRAWN	TAM	SIZE D
FINISH	APPROVED	DLM	DRAWING NUMBER
PROJECT	DATE	05MAR2018	SCALE 1:3
			REV E
			SHEET 1 OF 6

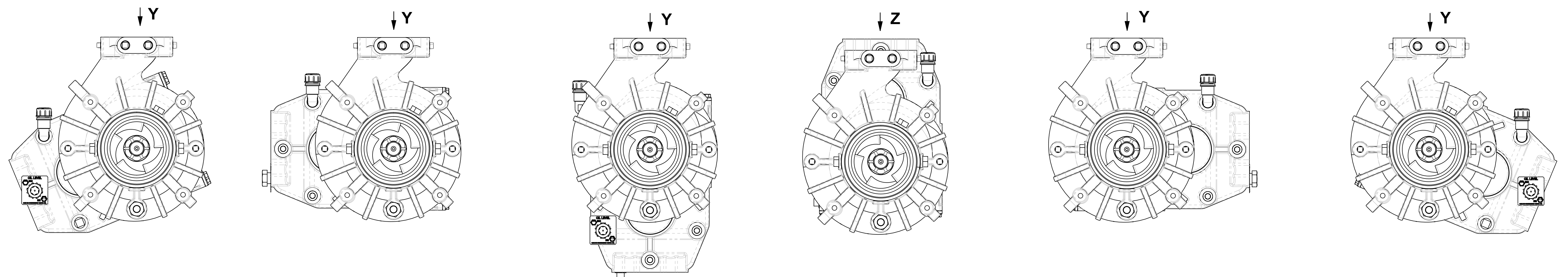
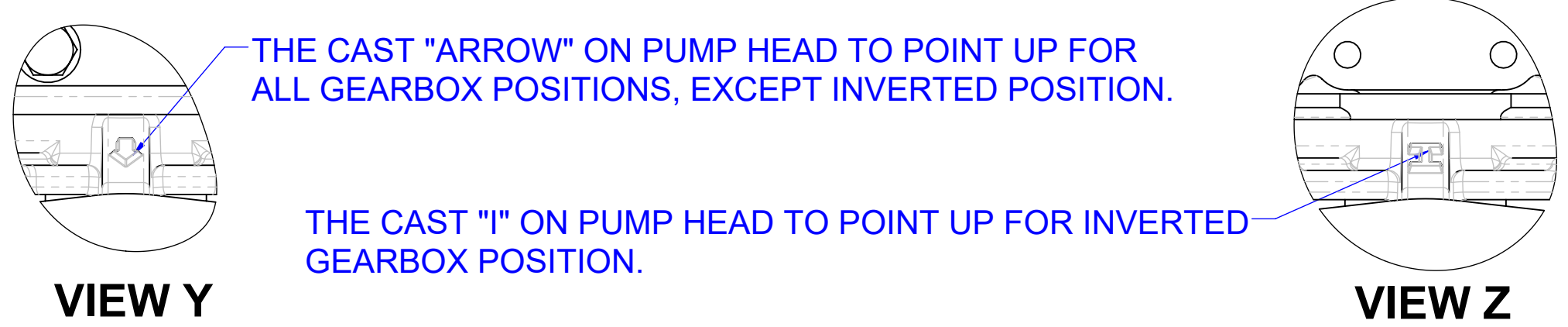
ENGINE ROTATION VOLUTE POSITION



OPPOSITE ENGINE ROTATION VOLUTE POSITION



GEARBOX POSITIONS



HORIZONTAL LH - 22.5°
(NOT AVAILABLE WITH ENGINE MOUNT)

HORIZONTAL LH

VERTICAL
(PUMP OVER INPUT)

INVERTED
(INPUT OVER PUMP)

HORIZONTAL RH

HORIZONTAL RH - 22.5°
(NOT AVAILABLE WITH ENGINE MOUNT)

GEARBOX AND DISCHARGE POSITIONS

UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES TOLERANCE FOR INCHES DIMENSIONS:
 X: ±0.04
 X.X: ±0.02
 X.XX: ±0.01
 X.XXX: ±0.005
 ANGLES: ±0.25°
 SURFACE TEXTURE IN µm Ra
 REMOVE ALL BURRS AND SHARP EDGES, 0.01MAX

FSG OF IDEX CORPORATION
 MATERIAL
 MADE FROM
 FINISH
 PROJECT

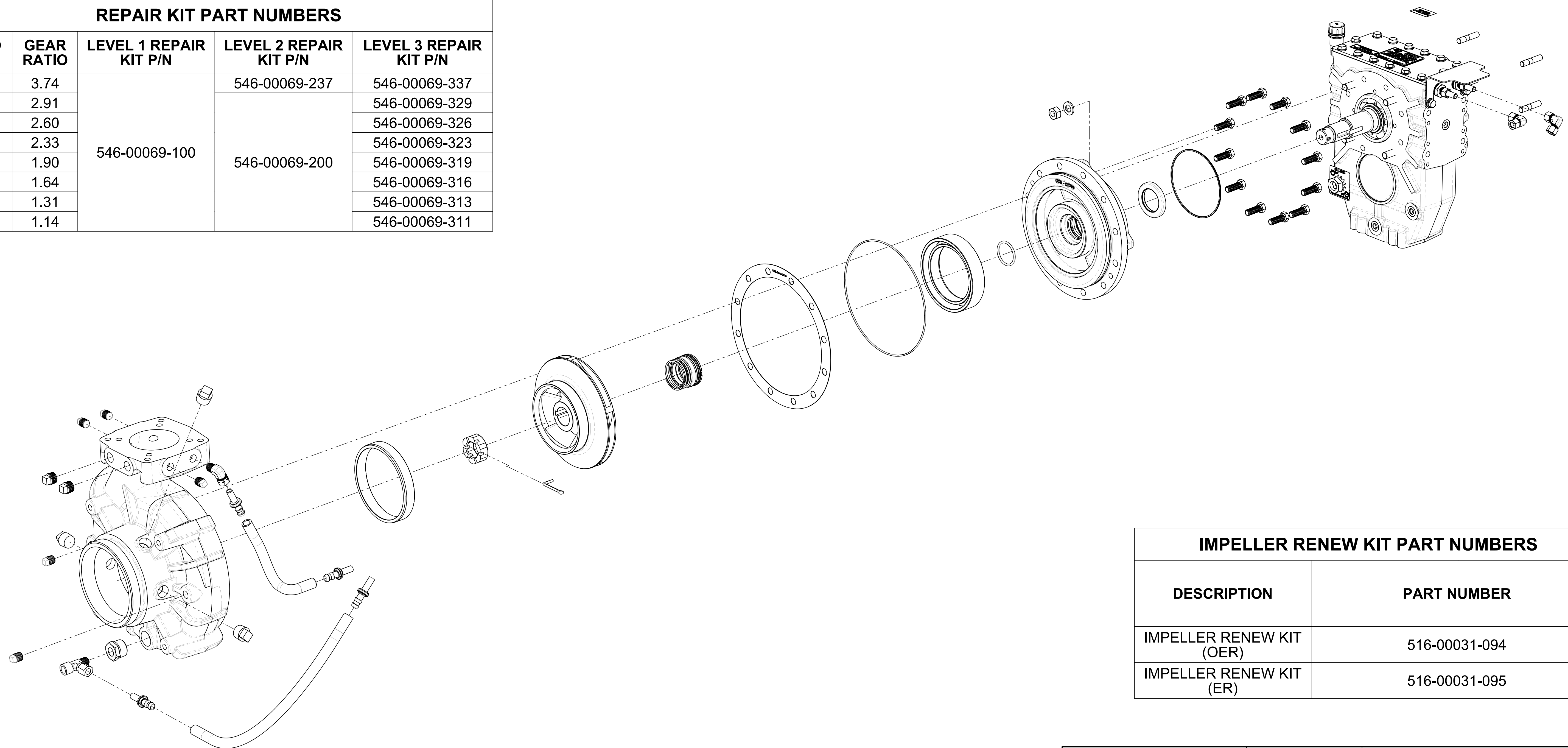
HALE GODIVA Class 1
 TITLE
 PUMP ASSEMBLY, AP FLEX SERIES
 DRAWN TAM
 APPROVED DLM
 DATE 05MAR2018
 SIZE D
 SCALE 1:7
 DRAWING NUMBER
 FSG-PL-01483
 REV E
 SHEET 2 OF 6

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NOTES:





1. LEVEL 1 REPAIR KIT PROVIDES EVERYTHING NEEDED TO CHANGE SEALS.
2. LEVEL 2 REPAIR KIT PROVIDES LEVEL 1 AND ITEMS NEEDED FOR BEARINGS.
3. LEVEL 3 REPAIR KIT PROVIDES LEVEL 1 & 2 AND ITEMS TO REPLACE GEARS.
4. IMPELLER RENEW KIT PROVIDES LEVEL 1 REPAIR KIT AND ITEMS TO REPLACE IMPELLER.
5. REFER TO TECHNICAL MANUAL (FSG-MNL-00184) AND "MAXIMUM TORQUE VALUES" AND "THREAD LOCKS & SEALANTS" TABLES ON SHEET 1 WHEN INSTALLING THREADED COMPONENTS, OIL SEALS/CAPS, OR CLEARANCE RINGS.

REPAIR KIT PART NUMBERS				
RATIO NAME	GEAR RATIO	LEVEL 1 REPAIR KIT P/N	LEVEL 2 REPAIR KIT P/N	LEVEL 3 REPAIR KIT P/N
-37F	3.74	546-00069-100	546-00069-237	546-00069-337
-29F	2.91		546-00069-329	
-26F	2.60		546-00069-326	
-23F	2.33		546-00069-323	
-19F	1.90		546-00069-200	546-00069-319
-16F	1.64		546-00069-316	
-13F	1.31		546-00069-313	
-11F	1.14		546-00069-311	

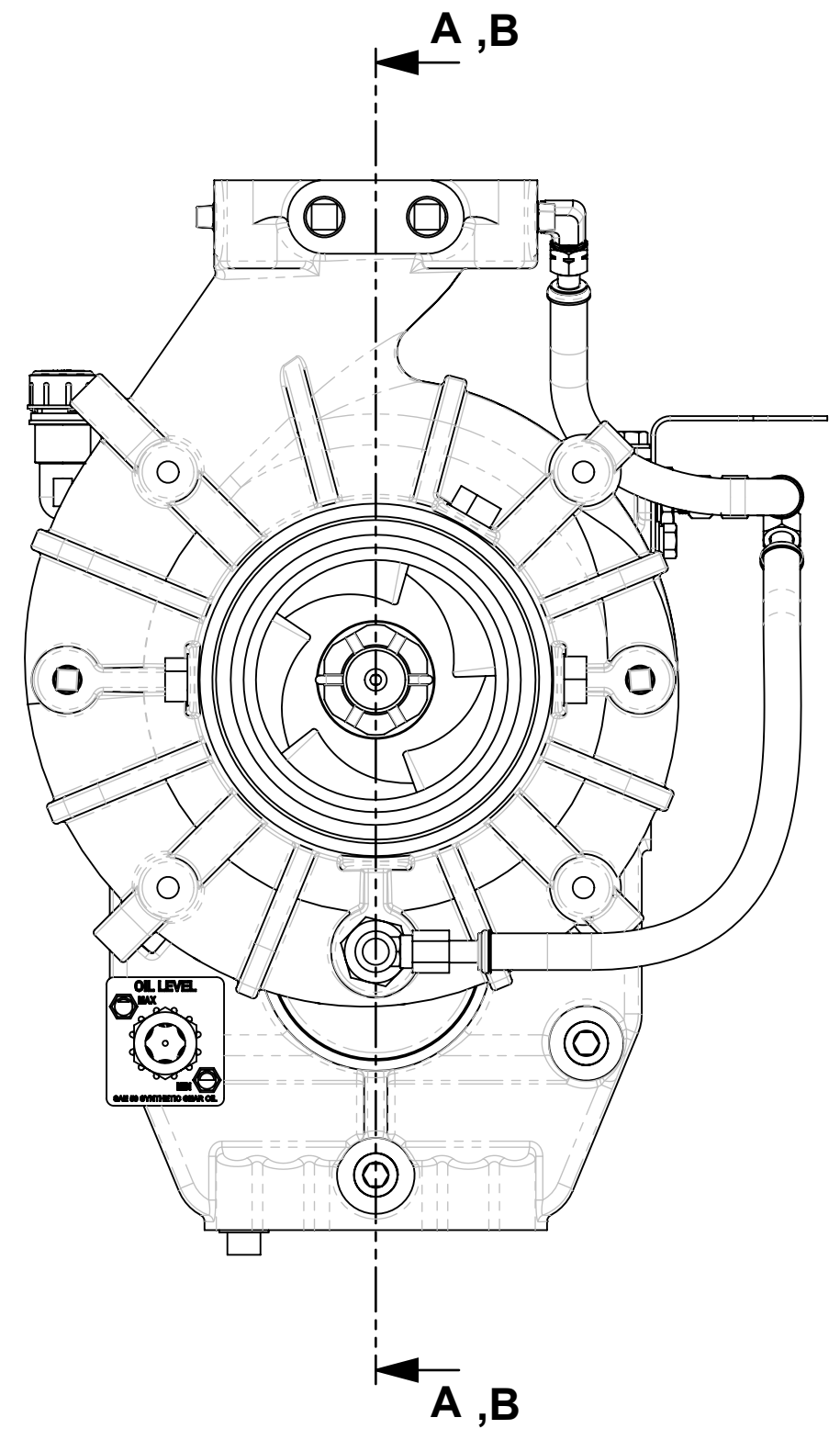


IMPELLER RENEW KIT PART NUMBERS	
DESCRIPTION	PART NUMBER
IMPELLER RENEW KIT (OER)	516-00031-094
IMPELLER RENEW KIT (ER)	516-00031-095

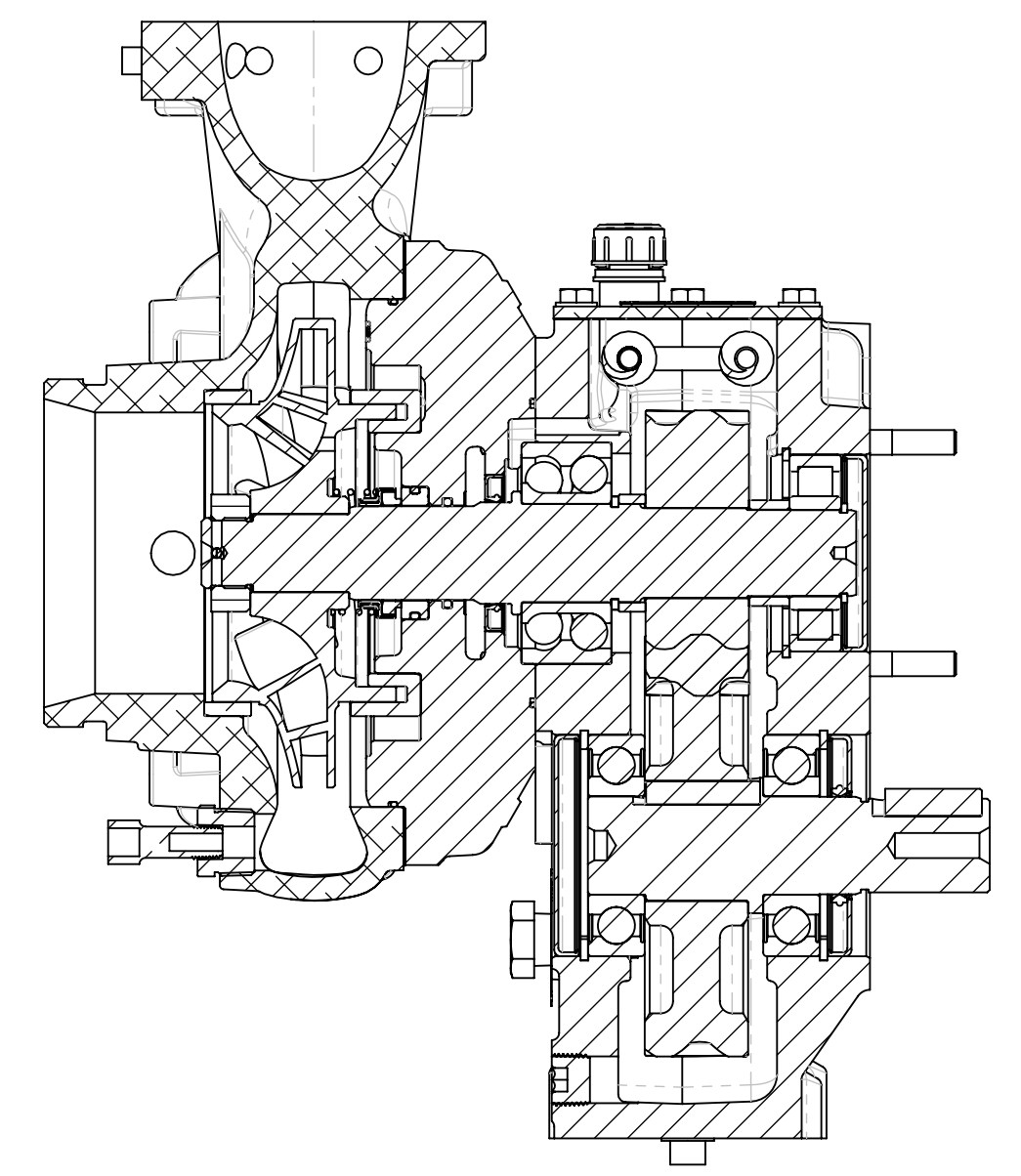
REPAIR PART KITS IDENTIFICATION

UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES TOLERANCE FOR INCHES DIMENSIONS: X: ±0.04 X.X: ±0.02 X.XX: ±0.01 X.XXX: ±0.005 ANGLES: ±0.25° SURFACE TEXTURE IN µm Ra REMOVE ALL BURRS AND SHARP EDGES, 0.01MAX	FSG OF  IDEX CORPORATION		  		
	MATERIAL		TITLE		
	MADE FROM		PUMP ASSEMBLY, AP FLEX SERIES		
	FINISH		DRAWN	TAM	SIZE
PROJECT		APPROVED	DLM	D	FSG-PL-01483
COPYRIGHT © NOT TO BE REPRODUCED OR USED TO MAKE OTHER DRAWINGS OR MACHINERY		DATE	05MAR2018	SCALE	1:3
					REV
					E
					SHEET
					3 OF 6

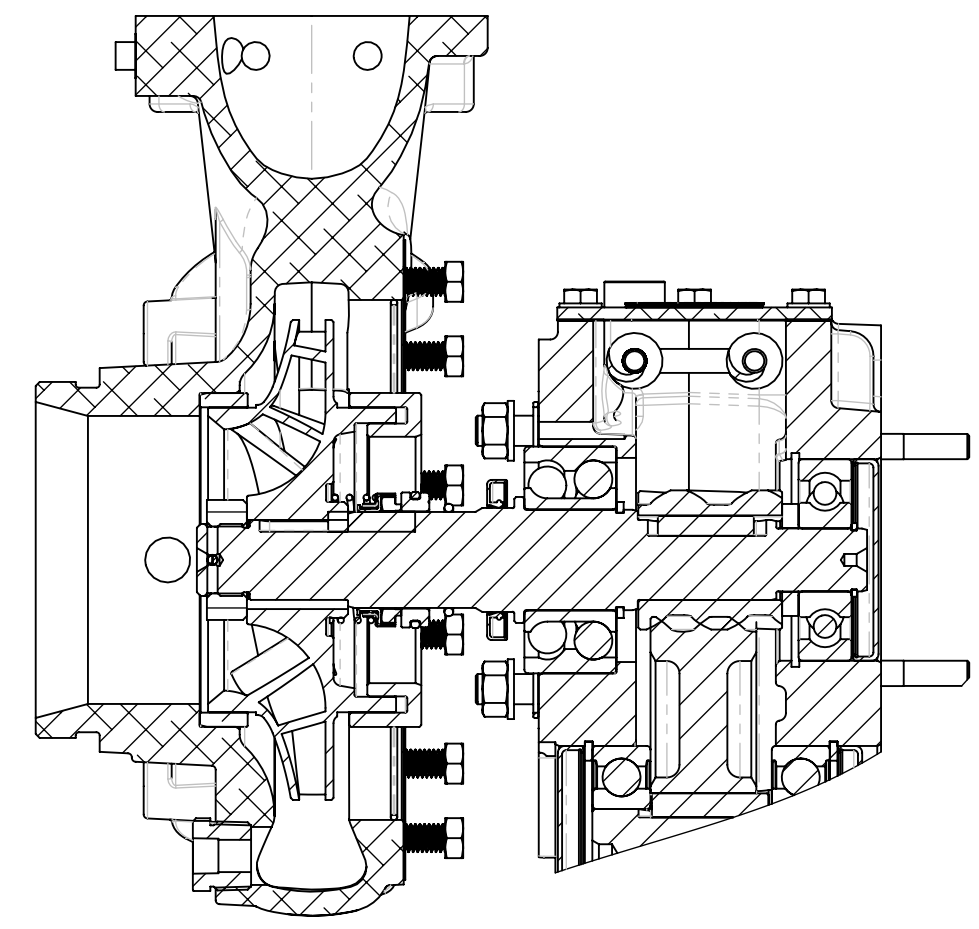
ITEM NO.	PART NUMBER	DESCRIPTION	QTY.
1	001-0760-00-0	AP Volute Body	1
	001-0760-01-0	VOLUTE BODY, AP ENG ROT, BRONZE	1
	001-0750-00-0	VOLUTE BODY, AP OPP ENG ROT	1
	001-0750-01-0	VOLUTE BODY, AP OPP ENG ROT, BRONZE	1
2	321-0150-05-0	AP CLEARANCE RING	1
3	110-7040-00-0	NUT, IMPELLER	1
4	016-0950-00-0	IMPELLER, (AS PURCHASED), AP ENG ROT	1
	016-0940-00-0	IMPELLER, (AS PURCHASED), AP OPP ENG ROT	1
5	296-5023-00-0	MECHANICAL SEAL	1
6	046-0440-00-0	GASKET HP-W323	1
7	040-1700-00-0	O-RING	1
8	321-00014-000	RING, REAR, WRAP AROUND, AP-F	1
9	040-2220-10-0	O-Ring, TBP Mechanical Seal PTFE	1
10	002-00019-001	HEAD, PUMP, AP/MBP-F	1
	002-00019-003	HEAD, PUMP, AP/MBP-F, BRONZE	1
11	MS35/10	NUT, FULL M12	4
12	MS29/8	WASHER, SPR SQ M12	4
13	296-00019-000	SEAL, OIL, VITON	1
14	040-1580-00-0	O-RING, AS568-158, NITRILE	1
15	018-1812-25-0	SCREW, 7/16-14 X 1.25, GR8	12
	018-1812-12-0	SCREW, 7/16-14 X 1.25, SST, BRZ PUMP	12
16	FSG-PL-01481	HALE FLEX SERIES GEARBOX	1
17	101-0900-00-0	ENGINE ROTATION DECAL	1
	101-0900-01-0	OPPOSITE ENG ROTATION DECAL	1
18	082-0318-02-0	ELBOW, 3/8 COMP X 3/8 COMP, 90 DEG	2
	082-3071-02-0	TEE, 3/8 CPRSN UNION (NOT SHOWN)	
19	064-5070-01-0	PIN-5/32X2L SST COTTER	1
20	082-0303-02-0	ELBOW - 3/8 MNPT X 3/8 CPRSN	1
21	340-0490-00-0	HOSE, COOLER, RETURN, QTY. 3.5 FT	1
22	082-3028-00-0	FITTING 3/8 HOSE BARB x 3/8 TUBE	4
23	082-0333-02-0	TEE, 3/8 COMP RUN X 1/4 MNPT BR	1
24	082-0513-00-0	BUSHING, 3/4 MNPT X 1/4 FNPT	1
	082-0513-02-0	BUSHING, 3/4 MNPT X 1/4 FNPT, BRZ PUMP	
25	217-0201-00-0	1/4 NPT SQUARE HEAD STEEL PLUG	5
	217-0201-01-0	1/4 NPT SQUARE HEAD PLUG, BRZ PUMP	
26	217-0401-00-0	PLUG, SQU, 1/2 NPT	3
	217-0401-01-0	PLUG, SQU, 1/2 NPT, BRZ PUMP	
	029-0110-00-0	ANODE (OPTIONAL)	
	217-0301-00-0	PLUG-3/8 NPT SQUARE HEAD	
27	217-0301-01-0	PLUG-3/8 NPT SQUARE HEAD, BRZ PUMP	2



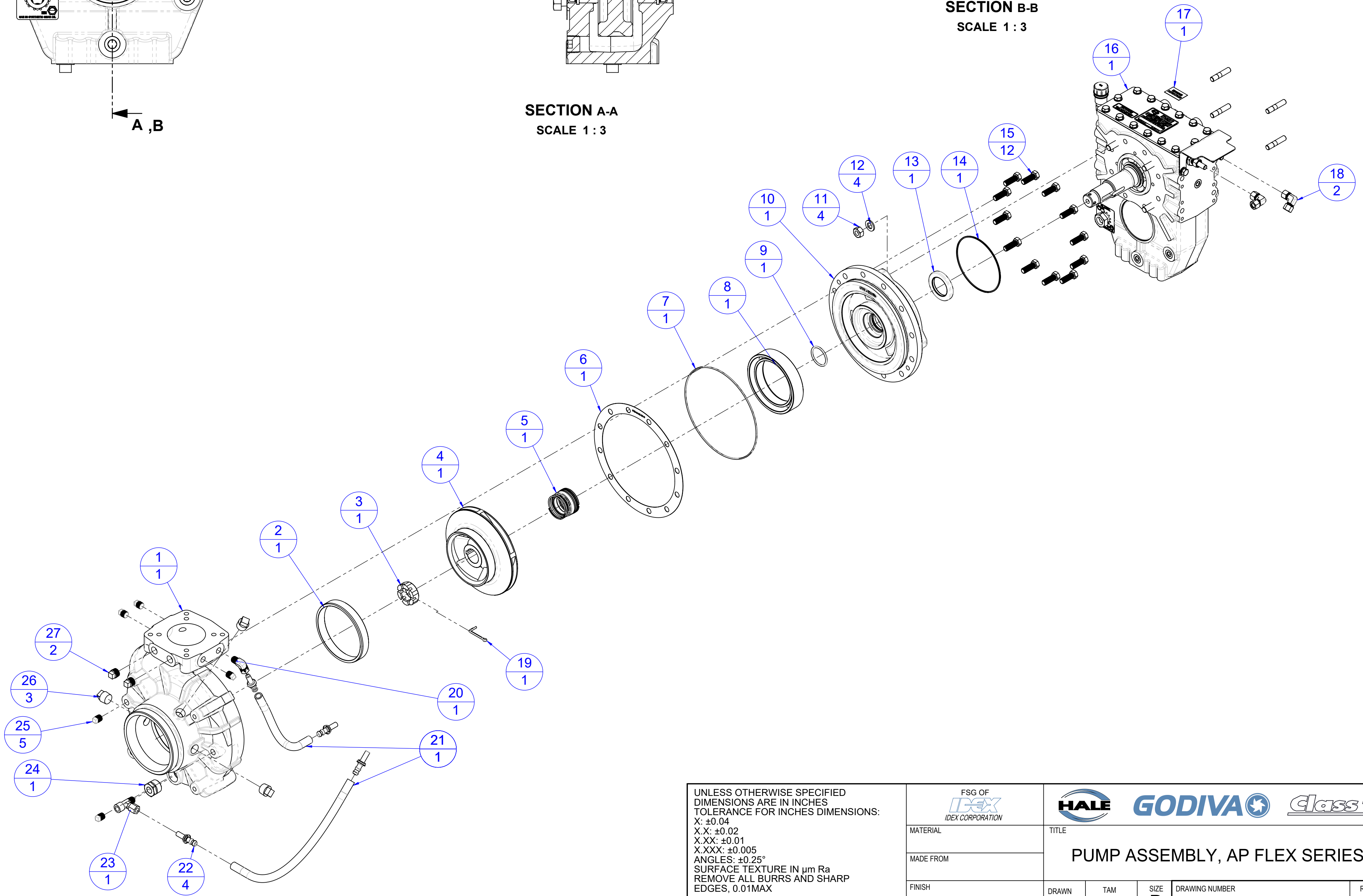
IF IN DOUBT ASK



SECTION A-A
SCALE 1:3



SECTION B-B
SCALE 1:3



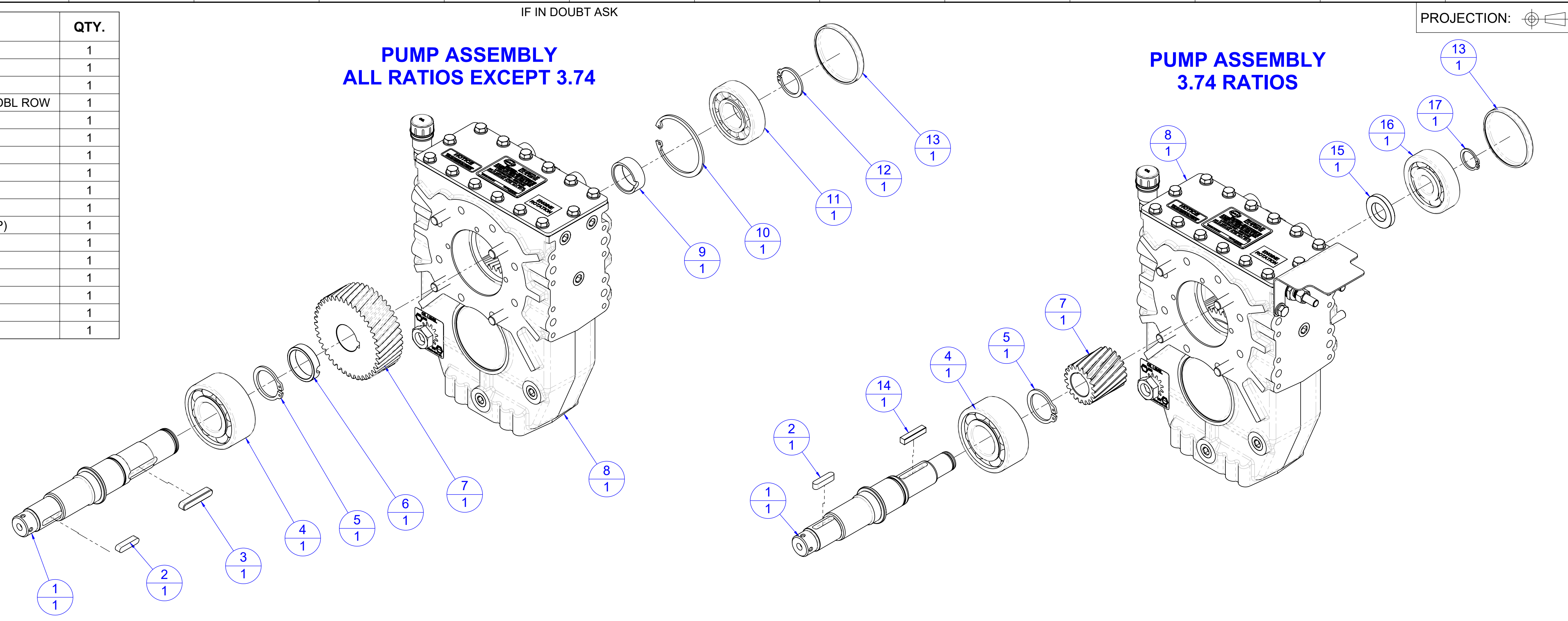
NOTES:
1. REFER TO TECHNICAL MANUAL (FSG-MNL-00184) AND "MAXIMUM TORQUE VALUES" AND "THREAD LOCKS & SEALANTS" TABLES ON SHEET 1 WHEN INSTALLING THREADED COMPONENTS, OIL SEALS, OR CLEARANCE RINGS.

PARTS IDENTIFICATION PUMP HEAD GROUP

UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES TOLERANCE FOR INCHES DIMENSIONS: X: ±0.04 X.X: ±0.02 X.XX: ±0.01 X.XXX: ±0.005 ANGLES: ±0.25° SURFACE TEXTURE IN µm Ra REMOVE ALL BURRS AND SHARP EDGES, 0.01MAX		FSG OF IDEX CORPORATION		HALE GODIVA Class 1	
MATERIAL		TITLE PUMP ASSEMBLY, AP FLEX SERIES			
MADE FROM		DRAWN TAM		SIZE D	
FINISH		APPROVED DLM		DRAWING NUMBER FSG-PL-01483	
PROJECT		DATE 05MAR2018		SCALE 1:5	
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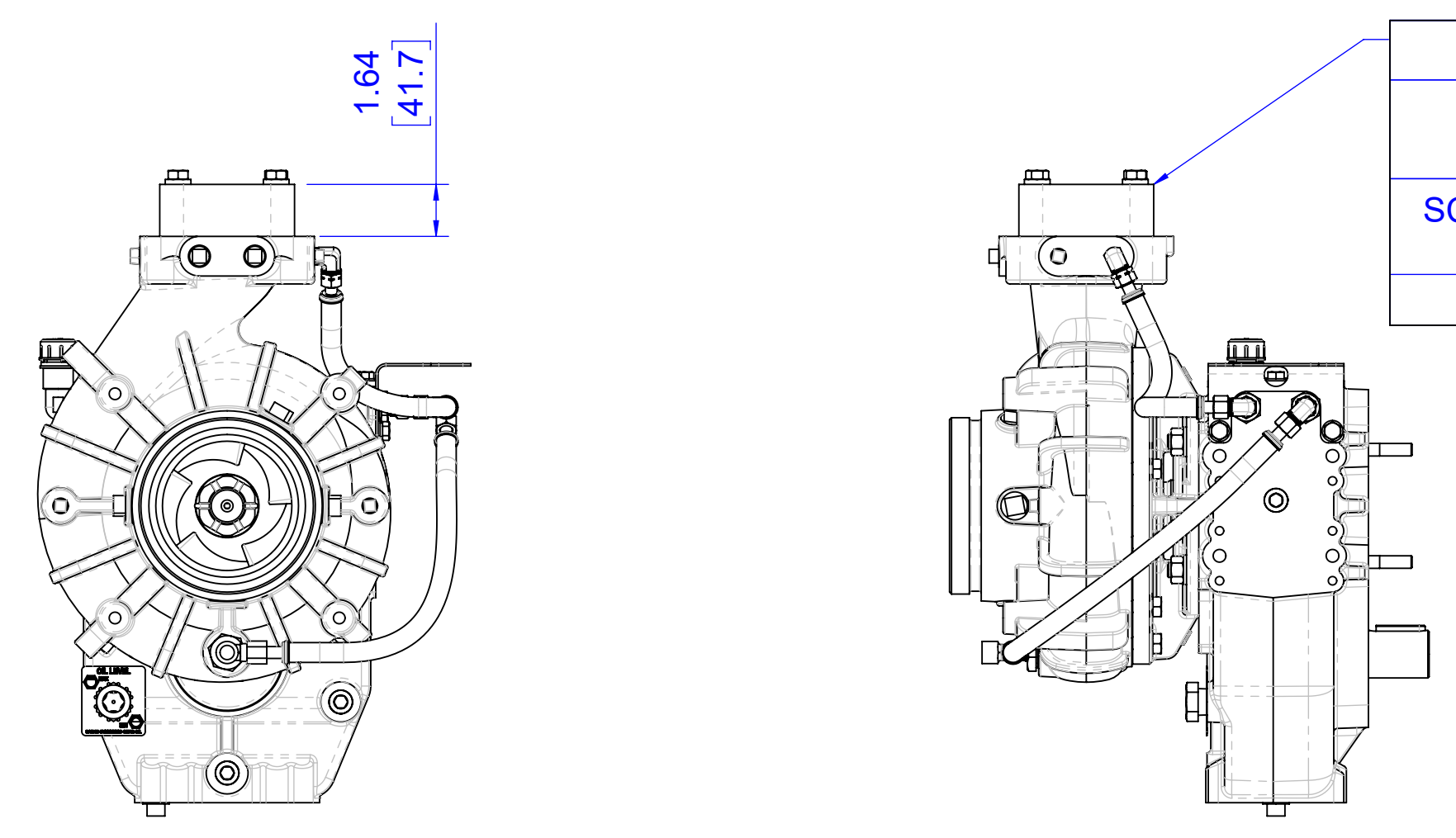
ITEM NO.	PART NUMBER	DESCRIPTION	QTY.
1	037-00028-000	SHAFT, PUMP, AP-F	1
2	017-0581-00-0	KEY	1
3	017-00015-000	KEY, 3/8 x 3/8 x 2.07, RE	1
4	250-00010	BEARING, 5308CS, ANGULAR CONTACT, DBL ROW	1
5	077-1560-05-0	RETAINING RING	1
6	159-00059-000	SPACER, GEAR	1
7	031-2250-00-0	GEAR, PINION, 42T, 1.14:1	1
8	FSG-PL-01481	HALE FLEX SERIES GEARBOX	1
9	159-2250-00-0	SPACER, GEARBOX, BORG	1
10	077-3150-00-0	RETAINING RING	1
11	250-8307-00-0	ROLLER BEARING (SKF RN307ECP)	1
12	077-1370-05-0	RETAINING RING	1
13	217-1300-00-0	ENDCAP, 80X10EC	1
14	017-0210-00-0	KEY, DRIVE SHAFT, P75-95X	1
15	159-00053-000	SPACER, GEAR, 3.74 RATIO	1
16	250-00013-000	BEARING, BALL, 405S	1
17	077-0980-05-0	78S98, RETAINING RING	1

ITEM 7 TABLE PUMP GEAR PART NUMBER			
RATIO NAME	GEAR RATIO	PUMP GEAR P/N (GEAR TEETH)	MATING GEAR P/N (GEAR TEETH)
-37F	3.74	031-1880-00-0 (19T)	031-00012-000 (71T)
-29F	2.91	031-2190-00-0 (23T)	031-2260-00-0 (67T)
-26F	2.60	031-2200-00-0 (25T)	031-2270-00-0 (65T)
-23F	2.33	031-2210-00-0 (27T)	031-2280-00-0 (63T)
-19F	1.90	031-2220-00-0 (31T)	031-2290-00-0 (59T)
-16F	1.64	031-2230-00-0 (34T)	031-2300-00-0 (56T)
-13F	1.31	031-2240-00-0 (39T)	031-2310-00-0 (51T)
-11F	1.14	031-2250-00-0 (42T)	031-2320-00-0 (48T)



PARTS IDENTIFICATION PUMP SHAFT GROUP

NOTES:
1. REFER TO TECHNICAL MANUAL (FSG-MNL-00184) AND "MAXIMUM TORQUE VALUES" AND "THREAD LOCKS & SEALANTS" TABLES ON SHEET 1 WHEN INSTALLING THREADED COMPONENTS OR OIL SEALS/CAPS.



3 INCH NPT FLANGE		
FLANGE	CAST IRON	115-0080-00-0
	BRONZE	115-0080-01-0
SCREW, 7/16-14 X 2.50 LG ZPLTD GR8	CAST IRON	018-1824-25-0
	BRONZE	
RING, SEAL	142-0390-00-0	

DISCHARGE CONNECTION OPTION

UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES TOLERANCE FOR INCHES DIMENSIONS: X: ±0.04 X.X: ±0.02 X.XX: ±0.01 X.XXX: ±0.005 ANGLES: ±0.25° SURFACE TEXTURE IN µm Ra REMOVE ALL BURRS AND SHARP EDGES, 0.01MAX	FSG OF IDEX IDEX CORPORATION		HALE GODIVA Class 1		
	MATERIAL		TITLE PUMP ASSEMBLY, AP FLEX SERIES		
	MADE FROM		DRAWN	TAM	SIZE D
	FINISH		APPROVED	DLM	SCALE 1:3
PROJECT		DATE	05MAR2018	DRAWING NUMBER FSG-PL-01483	
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HALE AP FLEX SERIES PUMP

GEARBOX POSITION - INVERTED, DISCHARGE POSITION - 1,
ENGINE ROTATION AND OPTIONAL GEARBOX COOLER SHOWN

NOTES:

- REFER TO "MAXIMUM TORQUE VALUES" AND "THREAD LOCKS & SEALANTS" TABLES ON SHEET 1 WHEN INSTALLING THREADED COMPONENTS.

IF IN DOUBT ASK

MAXIMUM INPUT RPM

WARNING
EXCEEDING THESE LIMITS OR FAILURE TO FOLLOW THE RECOMMENDATIONS OUTLINED ON THIS DRAWING COULD DAMAGE THE PUMP AND RESULT IN PERSONAL INJURY.

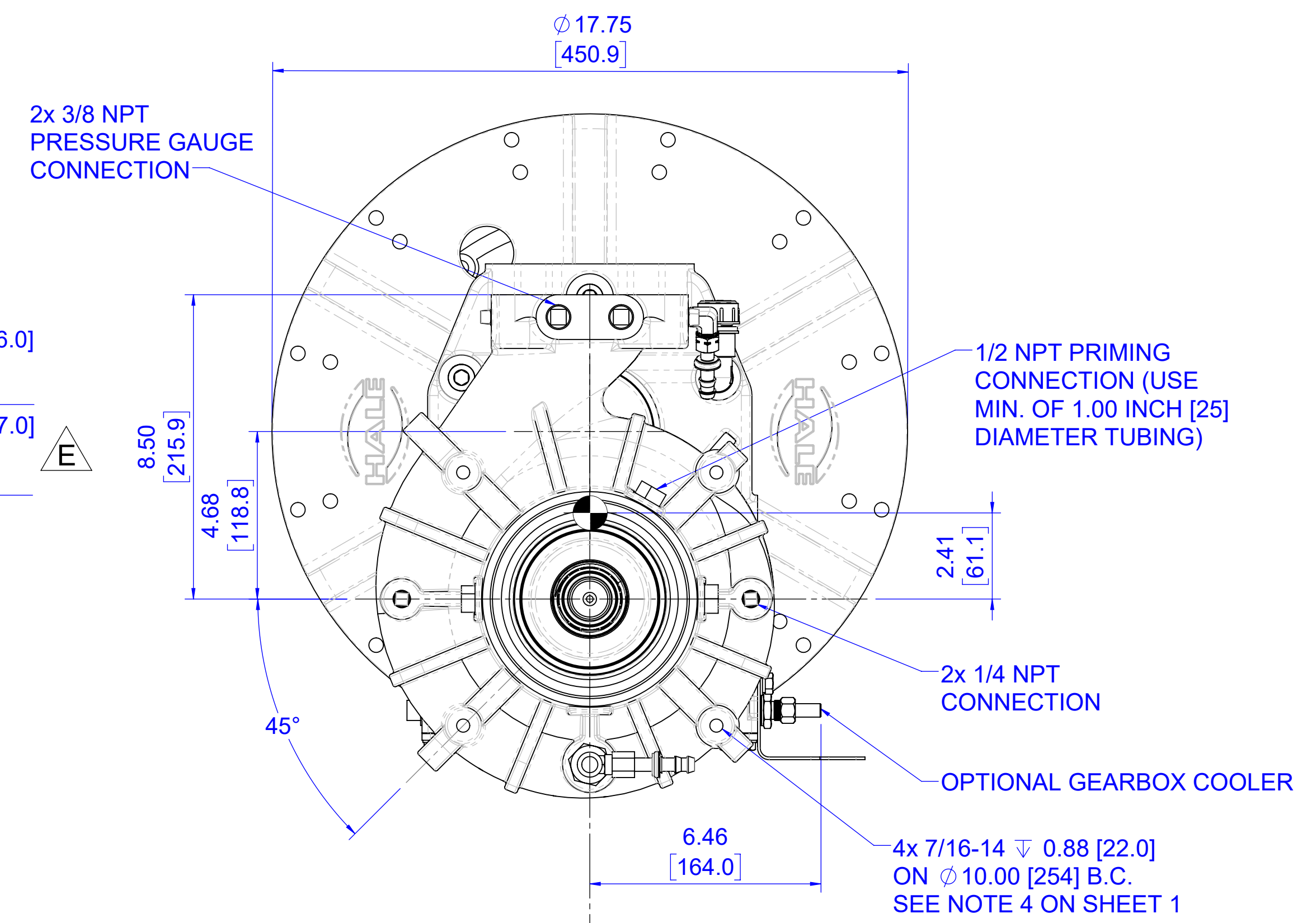
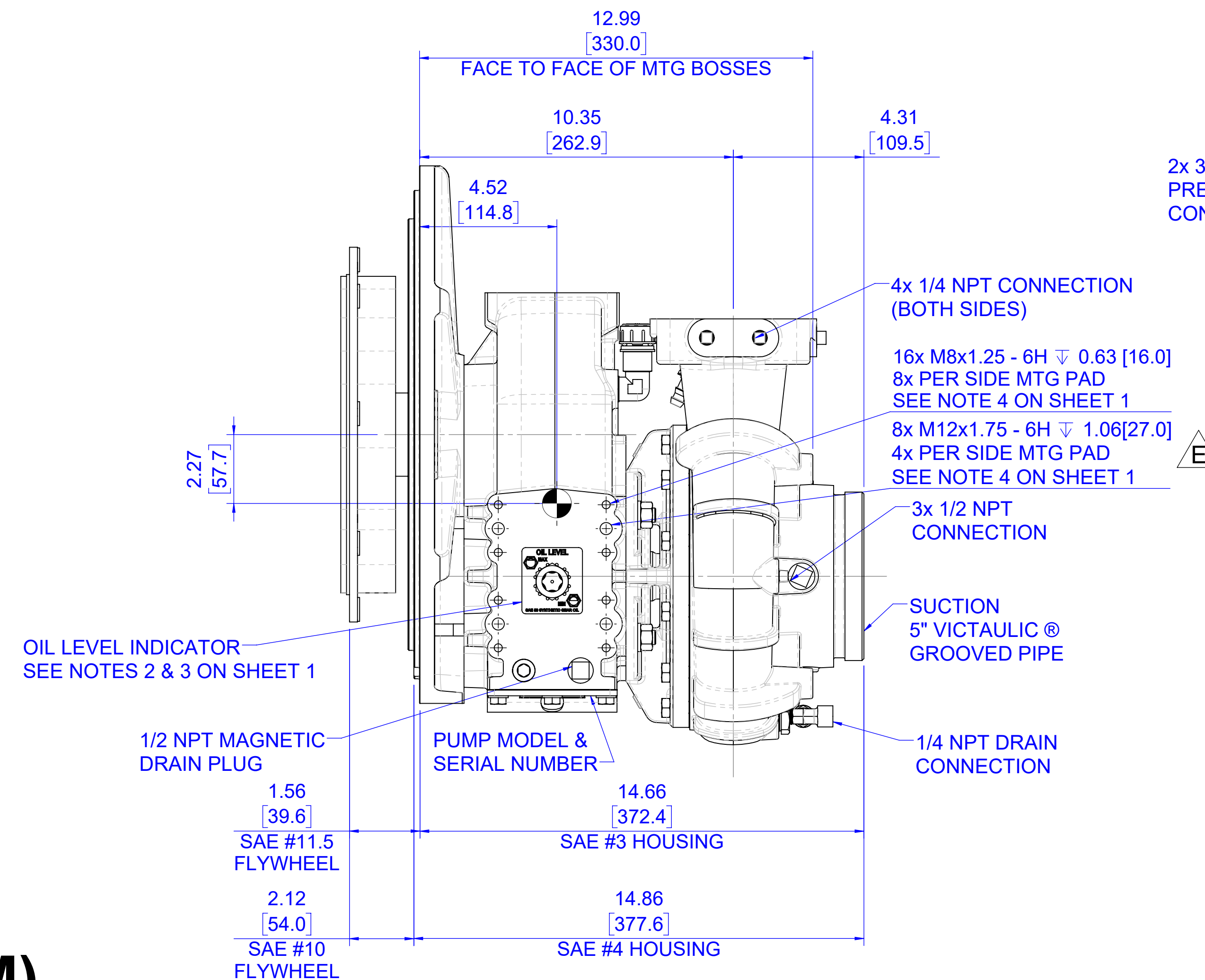
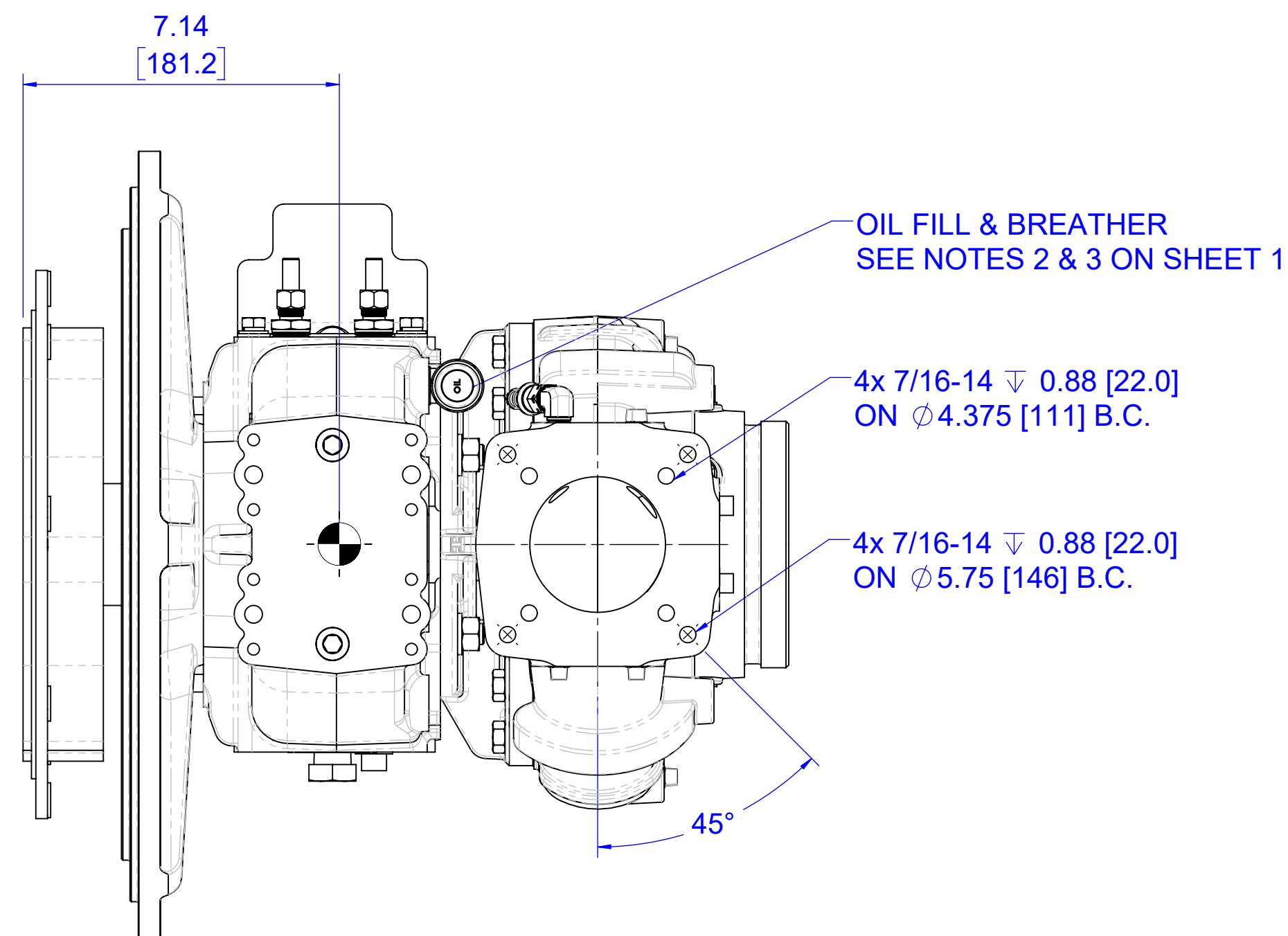
MAXIMUM ALLOWABLE ENGINE SPEED: 4000 RPM (DRIVE CPLNG)
MAXIMUM ALLOWABLE HYDRODYNAMIC PRESSURE: 400 PSIG; **340 PSIG
MAXIMUM ALLOWABLE HYDROSTATIC PRESSURE: 500 PSIG

PROJECTION: 

COMPLIANCE NOTE:
15 CFR 738.6 These items are controlled by the U.S. Government and authorized for export only to the country of ultimate destination for which the ultimate consignee or end-user's license is required. They may not be re-exported, transferred, or otherwise disposed of to any other country or to any person other than the authorized consignee or end-user, unless the consignee or end-user has been licensed or otherwise authorized by U.S. Government agencies. The term "ultimate consignee" means the person or entity that is the ultimate recipient of the goods, services, or technology. These items are trademarks and copy within intellectual property of IDEX and its subsidiaries, and may not be reproduced or modified without the express written permission of IDEX Corp.

PUMP WEIGHT (DRY):
IRON VERSION: 170 LBS [77 kg]
BRONZE VERSION: 181 LBS [82 kg]

 REPRESENTS CENTER OF GRAVITY



ENGINE MOUNT (M) INSTALLATION

UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES TOLERANCE FOR INCHES DIMENSIONS:
X: ± 0.04
X.X: ± 0.02
X.XX: ± 0.01
X.XXX: ± 0.005
ANGLES: $\pm 0.25^\circ$
SURFACE TEXTURE IN $\mu\text{m Ra}$
REMOVE ALL BURRS AND SHARP EDGES, 0.01MAX

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FSG OF IDEX CORPORATION		HALE GODIVA Class 1	
MATERIAL	TITLE		
MADE FROM	PUMP ASSEMBLY, AP FLEX SERIES		
FINISH	DRAWN	TAM	SIZE
PROJECT	APPROVED	DLM	D
	DATE	05MAR2018	SCALE
			1:3
DRAWING NUMBER		REV	E
FSG-PL-01483		SHEET	6 OF 6

REVISIONS				
ECN	REV.	ZONE	BY	DATE
1				
2				
3				