NOTES: UNLESS OTHERWISE SPECIFIED

1. DIMENSIONS AND TOLERANCES AS PER ASME Y14.5M–1994.
2. * INDICATES DIMENSIONS AND/OR FEATURES MODIFIED ON CURRENT REVISION LEVEL.
3. DIMENSIONS REFLECT STANDARD MFG TOLERANCES.
4. WEIGHTS ARE APPROXIMATE AND MAY VARY BASED ON MANUFACTURER'S MATERIALS AND PUMP CONFIGURATION.
5. THIS PUMP MAY HAVE TAPPED HOLES IN THE SUCTION FLANGE PER ASME B73.1.

- For Baseplate Grouting details, see document: "Griswold 811_IOM"
- For Maximum Allowable Nozzle Load data, see document: "Griswold 811 Max Allowable Nozzle Load Data"
- There is no seal piping provided with these pumps. All Griswold 811 pumps supplied on this project have Taper Bore seal chambers that do not require any flush. The vanes in the seal chamber provide flow which cool and lubricate the seal faces. API Plan 03 is the applicable piping plan.
- For Pump Curve and Data Sheet, see below document.
- Pump Rotation: CW, viewed from coupling

REV.	DESCRIPTION	BY	CHK.	APP.	DATE
A	RELEASED INTO PRODUCTION SEE ECN #G00994	–	–	–	–

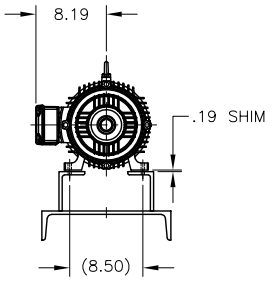
CUSTOMER Evoqua Water Technologies Canada Ltd.
END USER World Energy
PO NUMBER 4500021987
SERIAL NO 0040232254, 0040232255
ITEM NO 19-P-054A, 19-P-054B
SERVICE Anaerobic Reactor HX Pumps

LIQUID Water, Waste - Temp. 90-110 deg F, SP.GR 1.00, Viscosity 1.0 cP, pH: 6.0 - 9.0

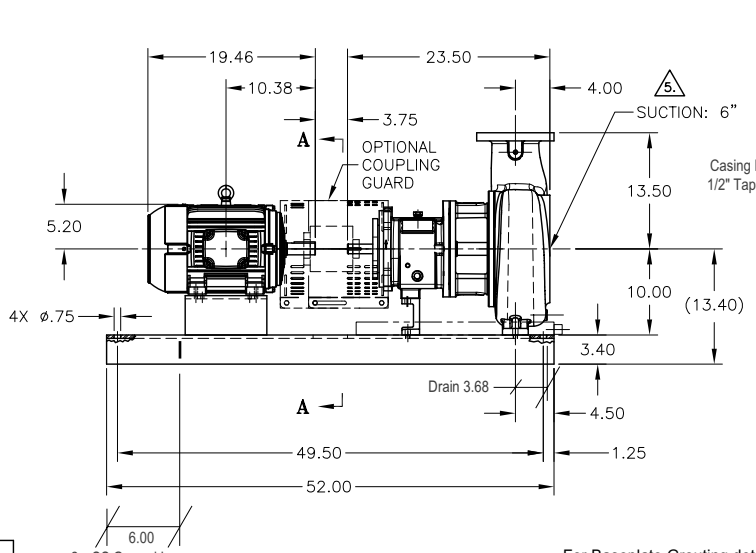
CAPACITY 420.0 USGPM MAWP 250.0 psig @ 100 deg F
HEAD 28.0 ft MDMT -20 deg F

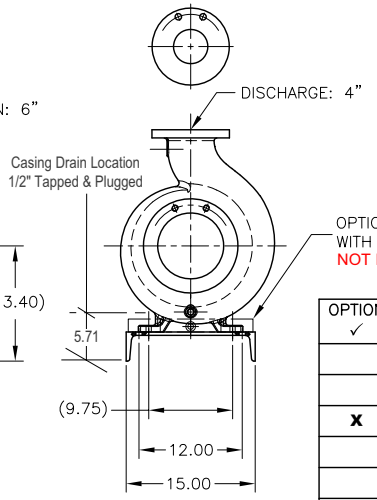
MOTOR DETAILS Teco-Westinghouse 5.0 HP, 1200 RPM 3ph/60Hz/460V, 215T, 1.15SF, TEFC, IEEE841, VFD suitable Class 1, Division 2, Groups BCD, T3C

MECHANICAL SEAL John Crane 5611Q; XO581O581 Reference John Crane Drawing No. H-SP-38072



VIEW A–A





ITEM	DESC.	4. WEIGHT/LBS
PUMP	6x4–10H (A80)	327
MOTOR	215T	183
BASEPLATE	252	147
GUARD	COUPLING	12

For Baseplate Grouting details, see document: "Griswold 811_IOM"

For Maximum Allowable Nozzle Load data, see document: "Griswold 811 Max Allowable Nozzle Load Data"

OPTION ✓	AVAILABLE OPTIONS
	PUMP MATERIAL
	N6 DUCTILE IRON
X	N6 DUCTILE IRON CASE / CD4MCU IMPELLER
	91 STAINLESS STEEL
	20 HASTELLOY
	X4 CD4MCU SS
	OTHER
	BASEPLATE
X	ASTM A36 STEEL
	STAINLESS STEEL
	COMPOSITE CONSTRUCTION
	DRIP PAN
	ASTM A36 STEEL
	STAINLESS STEEL
	COUPLING GUARD
X	CARBON STEEL
	STAINLESS STEEL
	ALUMINUM
	FLANGE FACE
X	FLAT FACE
	RAISED FACE

FLANGE OPTION DIMENSIONS

OPTION ✓	NOMINAL PIPE SIZE	FLANGE DIAMETER	BOLT CIRCLE DIAMETER	NO. OF BOLTS	DIAMETER OF BOLTS	BOLT HOLE	FLANGE
X	4" ASME 150# (SHOWN)						DISCHARGE
	4.00	9.00	7.50	8	0.63	0.75	
	6" ASME 150# (THD)						SUCTION
	6.00	11.00	9.50	8	0.75	.750–10 UNC–2B	
	4" ASME 300#						DISCHARGE
	4.00	10.00	7.88	8	0.75	0.88	
	6" ASME 300# (THD)						SUCTION
	6.00	12.50	10.62	12	0.75	.750–10 UNC–2B	
	100 mm DIN PN16						DISCHARGE
	100 mm	220 mm	180 mm	8	16 mm	19 mm	
	150 mm DIN PN16 (THD)						SUCTION
	150 mm	285 mm	240 mm	8	20 mm	M20 x 2.5 6H	

CERTIFIED FOR CONSTRUCTION

ONLY WHEN SIGNED

Signature
Date 13-Jan-2023

Customer World Energy c/o Evoqua Water Technologies

Customer P.O. # 4500021987

DO NOT SCALE DRAWING
UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES TOLERANCES ARE:
DECIMALS .XX ± –
.XXX ± –
ANGLES ± –
SCALE – SHEET 1 OF 1

GRISWOLD PUMP COMPANY
22569 VAN BUREN STREET
GRAND TERRACE, CA 92313-5607
PHONE: (800) 843-9222 / (229) 226-5255
WWW.GRISWOLDPUMP.COM

TITLE
6x4–10H (A80)
252 BASE, 215T MTR, MD PF

DRAWN BY	Kunal	DATE	11/29/16	ASSY. NO. –
CHECKED BY	R.Schwartz	DATE	12/15/16	DRAWING NO. LG1229 REV. D
APPROVED BY	R.Beach	DATE	12/15/16	

REVISED 03–01–2012

Installing and Grouting Base

Note:

Before the baseplate is installed, it is advisable to thoroughly clean the underside to enable the grouting to adhere to it. Do not use oil-based cleaners since grout will not bond to it.

Once the concrete pad has cured, the baseplate can be carefully lowered over the anchor bolts. Place shims or tapered wedges under the baseplate at each of the anchor bolt positions to provide about 0.75" – 1.50" clearance between the base and the foundation. Adjust shims/wedges to level the baseplate. **Since there may be some flexibility in the baseplate, we must perform an initial alignment prior to grouting to ensure that a final alignment can be achieved. See section covering Alignment of Pump/Driver Shafts.** Potential problems here include bowing and/or twisting of the baseplate. If gross misalignment is observed, shims/wedges may have to be added under the mid-point of the base or the shims/wedges at the corners may have to be adjusted to eliminate any twist. If the driver feet are bolt-bound for horizontal alignment, it may be necessary to loosen the pump hold-down bolts and shift the pump and driver to attain horizontal alignment. When alignment has been achieved, lightly tighten the anchor bolts. The anchor bolts should not be fully tightened until the grout has set.

Grouting furnishes support for the pump unit baseplate providing rigidity, helping to dampen any vibration and serves to distribute the weight of the pump unit over the foundation. To be effective, grouting must completely fill all voids under the baseplate. For proper adhesion or bonding, all areas of the baseplate that will be in contact with the grout should be thoroughly cleaned. See note above. The grout must be non-shrinking. Follow the directions of the grout manufacturer for mixing. Proceed with grouting as follows:

Note:

If the size of the equipment or the layout of the installation require it, grouting can be done in two steps as long as the first step is allowed to cure completely before the second step is applied

1. Build a sturdy form on the foundation around the baseplate to contain the grout.
2. Soak the top of the concrete foundation pad thoroughly. Remove surface water before pouring.
3. Pour the grout through the hole(s) in the top and/or through the open ends of the channel steel baseplate, eliminating air bubbles by tapping, using a vibrator or pumping the grout into place. If necessary, drill vent holes into the top of the base to evacuate air.
4. Allow grout to set completely, usually a minimum of 48 hours.
5. Tighten foundation anchor bolts.
6. Re-check alignment to ensure that there have been no changes.
7. After the grout has dried thoroughly, apply an oil base paint to shield the grout from air and moisture.

You may then proceed to connect suction and discharge piping

Maximum Allowable Forces and Moments

Griswold 811 ASME B73.1 process pumps meet or exceed the allowable nozzle load requirements shown in ANSI/HI 9.6.2. This document describes the calculations to validate a set of nozzle loads for each pump based on the pump type, material, temperature, and installation method.

Consult Griswold engineering concerning the feasibility of applying nozzle loads that exceed the requirements stated within this document. Analyses can be performed to qualify any custom combination of nozzle loads with an acceptance criteria based on calculated pump distortion and case stresses.

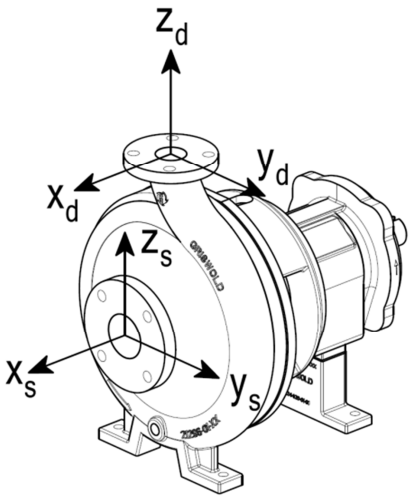


Figure 1: Coordinate System

The following steps are based on ANSI/HI 9.6.2. All information necessary to complete the calculations can be found below. For complete details refer to the standard.

a. Record the appropriate material/temperature correction factor from Table 1.

b. Refer to Table 2 and record the correction factors applicable, considering the pump installation method.

c. Compare the material/temperature correction factor determined in step (a) against the "Tables 3 & 4" correction factor obtained in step (b). The lesser of these two correction factors shall be multiplied to the appropriate values found in Table 3. Record these values as $F_{xs\_T3\_adj}$, $F_{ys\_T3\_adj}$, etc.

d. Compare the material/temperature correction factor determined in step (a) against the "Tables 3 & 4" correction factor obtained in step (b). The lesser of these two correction factors shall be multiplied to the appropriate values found in Table 4. Record these values as $F_{xs\_T4\_adj}$, $F_{ys\_T4\_adj}$, etc.

e. Using Table 5, identify the frame size of the pump of interest for use with Table 6 and Table 7.

f. Multiply the appropriate row of Table 6 with the "Tables 6 & 7" correction factor obtained in step (b) and record these values as $F_{ys\_T6\_adj}$, $M_{xs\_T6\_adj}$, etc.

g. Scale the appropriate row of Table 7 with the "Tables 6 & 7" correction factor obtained in step (b) and record these values as $F_{ys\_T7\_adj}$, $M_{xs\_T7\_adj}$, etc.

h. Compare the recorded T3_adj values to the recorded T4_adj, T6_adj and T7_adj values. If any of these values is less than the T3_adj value for a particular variable then replace the T3_adj value with that value. For example: if it is found that $M_{ys\_T6\_adj}$ is less than $M_{ys\_T3\_adj}$, $M_{ys\_T4\_adj}$, and $M_{ys\_T7\_adj}$, then assign $M_{ys\_T3\_adj}$ the value of $M_{ys\_T6\_adj}$.

i. Establish the nozzle loads that are to be evaluated against this standard considering the load coordinate system shown in Figure 1. Record these values as F_{xs}, F_{ys}, F_{zs}, M_{xs}, M_{ys}, M_{zs}, F_{xd}, F_{yd}, F_{zd}, M_{xd}, M_{yd} and M_{zd} where, for example, F_{xs} represents the force on the x-axis applied to the suction nozzle. As another example, M_{yd} represents the moment about the y-axis applied to the discharge nozzle.

j. Using the values obtained from the following steps, calculate the results of Equation Set 1, Equation 2 and Equation 3. If all equations are satisfied than the proposed nozzle loads from step (i) are deemed acceptable. If any one of the equations is not satisfied, either reduce 1 or more nozzle loads and repeat the calculations or contact Griswold engineering to determine the feasibility of qualifying the pump for the higher loads.

Maximum Allowable Forces and Moments

		Material Group No. and Description:							
				Austenitic Steels					
		1.0	1.1	2.1	2.2	2.3		2.8	
Temp. (°C)	**Temp. (°F)**	**Ductile Iron**	**Carbon Steel**	**Type 304**	**Type 316, Type 317**	**Type 304L**	**Type 316L**	**Duplex**	**Super Duplex**
-29	-20	0.89	1.00	1.00	1.00	0.83		1.00	
38	100	0.89	1.00	1.00	1.00	0.83		1.00	
93	200	0.83	0.94	0.83	0.86	0.70		1.00	
149	300	0.78	0.91	0.74	0.78	0.63		1.00	
204	400	0.73	0.88	0.65	0.72	0.58		0.98	
260	500	0.69	0.83	0.60	0.67	0.53		0.92	
316	600	0.65	0.76	0.58	0.63	0.50		0.84	
343	650	0.63	0.74	0.57	0.62	0.49		0.82	
371	700	---	0.74	0.56	0.60	0.48		0.79	

		Material Group No. and Description:					
		Nickel and Nickel Alloys					
		3.1	3.2	3.4	3.5	3.7	3.8
Temp. (°C)	**Temp. (°F)**	**Alloy 20**	**Nickel**	**Monel**	**Inconel**	**Hast. B**	**Hast. C**
-29	-20	0.83	0.50	0.83	1.00	1.00	1.00
38	100	0.83	0.50	0.83	1.00	1.00	1.00
93	200	0.77	0.50	0.74	0.93	1.00	1.00
149	300	0.73	0.50	0.69	0.89	1.00	1.00
204	400	0.67	0.50	0.67	0.85	0.98	0.98
260	500	0.65	0.50	0.66	0.83	0.92	0.92
316	600	0.63	0.50	0.66	0.80	0.84	0.84
343	650	0.63	---	0.66	0.78	0.82	0.82
371	700	0.62	---	0.66	0.77	0.79	0.79

Table 1: Pump Temperature and Material Adjustment Values

	Correction Factor For Use On:	
	Tables 3 & 4	**Tables 6 & 7**
Grouted Metal Baseplate (Anchored Down)	1	1
Ungrouted Metal Baseplate (Anchored Down)	1	0.8
Grouted Nonmetal Baseplate (Anchored Down)	0.8	0.8
Ungrouted Nonmetal Baseplate (Anchored Down)	0.7	0.7
Stilt-Mounted Baseplate	1	0.9

Table 2: Pump Mounting Correction Factors

Maximum Allowable Forces and Moments

	Suction						Discharge					
	Forces, lbf (N)			Moments, lbf·ft (N·m)			Forces, lbf (N)			Moments, lbf·ft (N·m)		
Pump Size	Fxs_T3	Fys_T3	Fzs_T3	Mxs_T3	Mys_T3	Mzs_T3	Fxd_T3	Fyd_T3	Fzd_T3	Mxd_T3	Myd_T3	Mzd_T3
1.5x1-6	1050 (4671)	750 (3336)	750 (3336)	720 (976)	170 (230)	170 (230)	800 (3559)	1350 (6005)	3000 (13345)	410 (556)	410 (556)	410 (556)
1.5x1-8	1050 (4671)	1210 (5382)	1210 (5382)	720 (976)	190 (258)	190 (258)	800 (3559)	1350 (6005)	3000 (13345)	360 (488)	360 (488)	360 (488)
LF 1.5x1-8	1050 (4671)	1210 (5382)	1210 (5382)	720 (976)	190 (258)	190 (258)	800 (3559)	1350 (6005)	3000 (13345)	360 (488)	360 (488)	360 (488)
2x1-10	2340 (10409)	960 (4270)	960 (4270)	1270 (1722)	220 (298)	220 (298)	1400 (6228)	1350 (6005)	3250 (14457)	660 (895)	660 (895)	660 (895)
LF 2x1-10	2340 (10409)	960 (4270)	960 (4270)	1270 (1722)	220 (298)	220 (298)	1400 (6228)	1350 (6005)	3250 (14457)	660 (895)	660 (895)	660 (895)
3x1.5-6	1050 (4671)	1240 (5516)	1250 (5560)	900 (1220)	490 (664)	490 (664)	800 (3559)	1350 (6005)	3000 (13345)	500 (678)	550 (746)	510 (691)
3x1.5-8	1050 (4671)	1240 (5516)	1050 (4671)	900 (1220)	490 (664)	490 (664)	800 (3559)	1350 (6005)	3000 (13345)	440 (597)	440 (597)	440 (597)
3x1.5-10	2700 (12010)	1350 (6005)	1500 (6672)	1300 (1763)	420 (569)	420 (569)	1400 (6228)	1350 (6005)	3250 (14457)	370 (502)	370 (502)	370 (502)
3x1.5-13	2700 (12010)	1350 (6005)	1500 (6672)	1300 (1763)	670 (908)	670 (908)	1400 (6228)	1350 (6005)	3250 (14457)	530 (719)	530 (719)	530 (719)
LF 3x1.5-13	2700 (12010)	1350 (6005)	1500 (6672)	1300 (1763)	670 (908)	670 (908)	1400 (6228)	1350 (6005)	3250 (14457)	530 (719)	530 (719)	530 (719)
3x2-6	1050 (4671)	750 (3336)	750 (3336)	720 (976)	170 (230)	170 (230)	800 (3559)	1350 (6005)	3000 (13345)	410 (556)	410 (556)	410 (556)
3x2-8	2700 (12010)	1350 (6005)	1500 (6672)	1300 (1763)	600 (813)	60 (81)	1400 (6228)	1350 (6005)	3250 (14457)	660 (895)	660 (895)	660 (895)
3x2-10	2700 (12010)	1350 (6005)	1480 (6583)	1300 (1763)	310 (420)	310 (420)	1400 (6228)	1350 (6005)	3250 (14457)	560 (759)	560 (759)	560 (759)
3x2-13	1920 (8541)	1230 (5471)	1230 (5471)	1300 (1763)	350 (475)	350 (475)	1400 (6228)	1350 (6005)	3250 (14457)	1200 (1627)	1270 (1722)	690 (936)
4x3-8	2700 (12010)	1350 (6005)	1500 (6672)	1300 (1763)	350 (475)	350 (475)	1400 (6228)	1350 (6005)	3250 (14457)	1200 (1627)	1460 (1979)	690 (936)
4x3-8G	2700 (12010)	1350 (6005)	1500 (6672)	1300 (1763)	350 (475)	350 (475)	1400 (6228)	1350 (6005)	3250 (14457)	1200 (1627)	1460 (1979)	690 (936)
4x3-10	2300 (10231)	1350 (6005)	1500 (6672)	1300 (1763)	310 (420)	310 (420)	1400 (6228)	1350 (6005)	3250 (14457)	1200 (1627)	1460 (1979)	690 (936)
4x3-10H	2300 (10231)	1350 (6005)	1500 (6672)	1300 (1763)	310 (420)	310 (420)	1400 (6228)	1350 (6005)	3250 (14457)	1200 (1627)	1460 (1979)	690 (936)
4x3-13	2700 (12010)	1350 (6005)	1500 (6672)	1300 (1763)	400 (542)	400 (542)	1400 (6228)	1350 (6005)	3250 (14457)	1200 (1627)	1500 (2034)	690 (936)
6x4-10G	2700 (12010)	1350 (6005)	1500 (6672)	1300 (1763)	1100 (1491)	1100 (1491)	1400 (6228)	1350 (6005)	3250 (14457)	1200 (1627)	1500 (2034)	690 (936)
6x4-10H	2700 (12010)	1350 (6005)	1500 (6672)	1300 (1763)	1100 (1491)	1100 (1491)	1400 (6228)	1350 (6005)	3250 (14457)	1200 (1627)	1500 (2034)	690 (936)
6x4-13	2700 (12010)	1350 (6005)	1500 (6672)	1300 (1763)	1300 (1763)	1100 (1491)	1400 (6228)	1350 (6005)	3250 (14457)	1200 (1627)	1500 (2034)	690 (936)
6x4-17	2700 (12010)	1350 (6005)	1500 (6672)	1300 (1763)	1300 (1763)	1100 (1491)	1400 (6228)	1350 (6005)	3250 (14457)	1200 (1627)	1500 (2034)	690 (936)
8x6-13	3500 (15569)	3180 (14145)	2000 (8896)	1500 (2034)	1170 (1586)	1170 (1586)	1500 (6672)	3000 (13345)	3500 (15569)	1250 (1695)	2840 (3851)	2840 (3851)
8x6-15	3500 (15569)	3180 (14145)	2000 (8896)	1500 (2034)	1480 (2007)	1480 (2007)	1500 (6672)	3000 (13345)	3500 (15569)	1250 (1695)	2840 (3851)	2840 (3851)
8x6-17	3500 (15569)	3180 (14145)	2000 (8896)	1500 (2034)	1480 (2007)	1480 (2007)	1500 (6672)	3000 (13345)	3500 (15569)	1250 (1695)	2840 (3851)	2840 (3851)
10x8-13	3500 (15569)	3180 (14145)	2000 (8896)	1500 (2034)	2000 (2712)	2915 (3952)	1500 (6672)	3000 (13345)	3500 (15569)	1250 (1695)	2840 (3851)	2840 (3851)
10x8-15	3500 (15569)	3180 (14145)	2000 (8896)	1500 (2034)	1130 (1532)	1130 (1532)	1500 (6672)	3000 (13345)	3500 (15569)	1250 (1695)	2840 (3851)	2840 (3851)
10x8-15G	3500 (15569)	3180 (14145)	2000 (8896)	1500 (2034)	1130 (1532)	1130 (1532)	1500 (6672)	3000 (13345)	3500 (15569)	1250 (1695)	2840 (3851)	2840 (3851)
10x8-16H	3500 (15569)	3180 (14145)	2000 (8896)	1500 (2034)	1130 (1532)	1130 (1532)	1500 (6672)	3000 (13345)	3500 (15569)	1250 (1695)	2840 (3851)	2840 (3851)
10x8-17	3500 (15569)	3180 (14145)	2000 (8896)	1500 (2034)	1130 (1532)	1130 (1532)	1500 (6672)	3000 (13345)	3500 (15569)	1250 (1695)	2840 (3851)	2840 (3851)

Table 3: Forces and Moments for use with Equation Set 1

Maximum Allowable Forces and Moments

	Suction						Discharge					
	Forces, lbf (N)			Moments, lbf·ft (N·m)			Forces, lbf (N)			Moments, lbf·ft (N·m)		
Pump Size	Fxs_T4	Fys_T4	Fzs_T4	Mxs_T4	Mys_T4	Mzs_T4	Fxd_T4	Fyd_T4	Fzd_T4	Mxd_T4	Myd_T4	Mzd_T4
1.5x1-6	2020 (8985)	750 (3336)	750 (3336)	1830 (2481)	170 (230)	170 (230)	2020 (8985)	1350 (6005)	6240 (27757)	410 (556)	410 (556)	410 (556)
1.5x1-8	2020 (8985)	1210 (5382)	1210 (5382)	1830 (2481)	190 (258)	190 (258)	2020 (8985)	1350 (6005)	6240 (27757)	360 (488)	360 (488)	360 (488)
LF 1.5x1-8	2020 (8985)	1210 (5382)	1210 (5382)	1830 (2481)	190 (258)	190 (258)	2020 (8985)	1350 (6005)	6240 (27757)	360 (488)	360 (488)	360 (488)
2x1-10	2340 (10409)	960 (4270)	960 (4270)	3640 (4935)	220 (298)	220 (298)	2020 (8985)	1350 (6005)	6240 (27757)	660 (895)	660 (895)	660 (895)
LF 2x1-10	2340 (10409)	960 (4270)	960 (4270)	3640 (4935)	220 (298)	220 (298)	2020 (8985)	1350 (6005)	6240 (27757)	660 (895)	660 (895)	660 (895)
3x1.5-6	2020 (8985)	1240 (5516)	2110 (9386)	2290 (3105)	490 (664)	490 (664)	2020 (8985)	1350 (6005)	6240 (27757)	550 (746)	550 (746)	550 (746)
3x1.5-8	2020 (8985)	1240 (5516)	1640 (7295)	2290 (3105)	490 (664)	490 (664)	2020 (8985)	1350 (6005)	6240 (27757)	440 (597)	440 (597)	440 (597)
3x1.5-10	2700 (12010)	1350 (6005)	1910 (8496)	3730 (5057)	420 (569)	420 (569)	1940 (8630)	1350 (6005)	6240 (27757)	370 (502)	370 (502)	370 (502)
3x1.5-13	2700 (12010)	1350 (6005)	3060 (13612)	3730 (5057)	670 (908)	670 (908)	2020 (8985)	1350 (6005)	6240 (27757)	530 (719)	530 (719)	530 (719)
LF 3x1.5-13	2700 (12010)	1350 (6005)	3060 (13612)	3730 (5057)	670 (908)	670 (908)	2020 (8985)	1350 (6005)	6240 (27757)	530 (719)	530 (719)	530 (719)
3x2-6	2020 (8985)	750 (3336)	750 (3336)	1830 (2481)	170 (230)	170 (230)	2020 (8985)	1350 (6005)	6240 (27757)	410 (556)	410 (556)	410 (556)
3x2-8	2700 (12010)	1350 (6005)	2490 (11076)	3730 (5057)	600 (813)	600 (813)	1970 (8763)	1350 (6005)	6240 (27757)	660 (895)	660 (895)	660 (895)
3x2-10	2700 (12010)	1350 (6005)	1480 (6583)	3730 (5057)	310 (420)	310 (420)	2020 (8985)	1350 (6005)	6240 (27757)	560 (759)	560 (759)	560 (759)
3x2-13	1920 (8541)	1230 (5471)	1230 (5471)	3730 (5057)	350 (475)	350 (475)	2020 (8985)	1350 (6005)	6240 (27757)	1460 (1979)	1460 (1979)	690 (936)
4x3-8	2700 (12010)	1350 (6005)	1840 (8185)	3730 (5057)	350 (475)	350 (475)	2020 (8985)	1350 (6005)	6240 (27757)	1460 (1979)	1460 (1979)	690 (936)
4x3-8G	2700 (12010)	1350 (6005)	1840 (8185)	3730 (5057)	350 (475)	350 (475)	2020 (8985)	1350 (6005)	6240 (27757)	1460 (1979)	1460 (1979)	690 (936)
4x3-10	2300 (10231)	1350 (6005)	1640 (7295)	3730 (5057)	310 (420)	310 (420)	2020 (8985)	1350 (6005)	6240 (27757)	1460 (1979)	1460 (1979)	690 (936)
4x3-10H	2300 (10231)	1350 (6005)	1640 (7295)	3730 (5057)	310 (420)	310 (420)	2020 (8985)	1350 (6005)	6240 (27757)	1460 (1979)	1460 (1979)	690 (936)
4x3-13	2700 (12010)	1350 (6005)	2390 (10631)	3730 (5057)	400 (542)	400 (542)	2020 (8985)	1350 (6005)	6240 (27757)	1730 (2346)	1730 (2346)	690 (936)
6x4-10G	2700 (12010)	1350 (6005)	6240 (27757)	3730 (5057)	1100 (1491)	1100 (1491)	2020 (8985)	1350 (6005)	6240 (27757)	3100 (4203)	3100 (4203)	690 (936)
6x4-10H	2700 (12010)	1350 (6005)	6240 (27757)	3730 (5057)	1100 (1491)	1100 (1491)	2020 (8985)	1350 (6005)	6240 (27757)	3100 (4203)	3100 (4203)	690 (936)
6x4-13	2700 (12010)	1350 (6005)	6240 (27757)	3730 (5057)	4980 (6752)	1100 (1491)	2020 (8985)	1350 (6005)	6240 (27757)	2150 (2915)	2150 (2915)	690 (936)
6x4-17	2700 (12010)	1350 (6005)	6240 (27757)	3730 (5057)	4980 (6752)	1100 (1491)	2020 (8985)	1350 (6005)	6240 (27757)	2150 (2915)	2150 (2915)	690 (936)
8x6-13	6360 (28291)	3180 (14145)	5080 (22597)	8970 (12162)	1170 (1586)	1170 (1586)	6360 (28291)	3180 (14145)	13460 (59873)	6780 (9192)	3850 (5220)	2840 (3851)
8x6-15	6360 (28291)	3180 (14145)	6680 (29714)	8970 (12162)	1480 (2007)	1480 (2007)	6360 (28291)	3180 (14145)	13460 (59873)	6560 (8894)	3720 (5044)	2840 (3851)
8x6-17	6360 (28291)	3180 (14145)	6680 (29714)	8970 (12162)	1480 (2007)	1480 (2007)	6360 (28291)	3180 (14145)	13460 (59873)	6560 (8894)	3720 (5044)	2840 (3851)
10x8-13	6360 (28291)	3180 (14145)	13460 (59873)	8970 (12162)	2450 (3322)	2150 (2915)	6360 (28291)	3180 (14145)	13460 (59873)	8970 (12162)	7220 (9789)	2840 (3851)
10x8-15	6360 (28291)	3180 (14145)	5130 (22819)	8970 (12162)	1130 (1532)	1130 (1532)	6360 (28291)	3180 (14145)	13460 (59873)	8970 (12162)	9060 (12284)	2840 (3851)
10x8-15G	6360 (28291)	3180 (14145)	5130 (22819)	8970 (12162)	1130 (1532)	1130 (1532)	6360 (28291)	3180 (14145)	13460 (59873)	8970 (12162)	9060 (12284)	2840 (3851)
10x8-16H	6360 (28291)	3180 (14145)	5130 (22819)	8970 (12162)	1130 (1532)	1130 (1532)	6360 (28291)	3180 (14145)	13460 (59873)	8970 (12162)	9060 (12284)	2840 (3851)
10x8-17	6360 (28291)	3180 (14145)	5130 (22819)	8970 (12162)	1130 (1532)	1130 (1532)	6360 (28291)	3180 (14145)	13460 (59873)	8970 (12162)	9060 (12284)	2840 (3851)

Table 4: Forces and Moments for use with Equation 2

Maximum Allowable Forces and Moments

Pump Size	Frame Size
1.5x1-6	Small
1.5x1-8	Small
LF 1.5x1-8	Small
2x1-10	Medium/Large
LF 2x1-10	Medium/Large
3x1.5-6	Small
3x1.5-8	Small
3x1.5-10	Medium/Large
3x1.5-13	Medium/Large
LF 3x1.5-13	Large
3x2-6	Small
3x2-8	Medium
3x2-10	Medium/Large
3x2-13	Medium/Large
4x3-8	Medium
4x3-8G	Medium
4x3-10	Medium/Large
4x3-10H	Medium/Large
4x3-13	Medium/Large
6x4-10G	Medium/Large
6x4-10H	Medium/Large
6x4-13	Medium/Large
6x4-17	XL
8x6-13	XL
8x6-15	XL
8x6-17	XL
10x8-13	XL
10x8-15	XL
10x8-15G	XL
10x8-16H	XL
10x8-17	XL

Table 5: Pump & Frame Sizes

	Suction					Discharge				
	Forces, lbf (N)		Moments, lbf·ft (N·m)			Forces, lbf (N)		Moments, lbf·ft (N·m)		
Pump Group	Fys_T6		Mxs_T6	Mys_T6	Mzs_T6	Fyd_T6		Mxd_T6	Myd_T6	Mzd_T6
Small Frame	-2000 (-8896)		900 (4003)	1200 (5338)	1250 (5560)	1500 (6672)		-500 (-2224)	1500 (6672)	1250 (5560)
Medium/Large Frames	-3500 (-15569)		1300 (5783)	1300 (5783)	3000 (13345)	2500 (11121)		-1200 (-5338)	1500 (6672)	3000 (13345)
XL Frame	-5000 (-22241)		1500 (6672)	2000 (8896)	4000 (17793)	3000 (13345)		-1250 (-5560)	5000 (22241)	4000 (17793)

Table 6: Y-axis Forces and Moments for use with Equation 3

	Suction						Discharge					
	Forces, lbf (N)			Moments, lbf·ft (N·m)			Forces, lbf (N)			Moments, lbf·ft (N·m)		
Pump Group	Fxs_T7		Fzs_T7	Mxs_T7	Mys_T7	Mzs_T7	Fxd_T7	Fyd_T7	Fzd_T7	Mxd_T7	Myd_T7	Mzd_T7
Small Frame	1050 (4671)		-1250 (-5560)	1500 (6672)	1200 (5338)	-2500 (-11121)	800 (3559)	2000 (8896)	-3000 (-13345)	1500 (6672)	1000 (4448)	-2500 (-11121)
Medium/Large Frames	3500 (15569)		-1500 (-6672)	1500 (6672)	1300 (5783)	-3500 (-15569)	1400 (6228)	2500 (11121)	-3250 (-14457)	1500 (6672)	2150 (9564)	-3500 (-15569)
XL Frame	3500 (15569)		-2000 (-8896)	1500 (6672)	4100 (18238)	-4000 (-17793)	3500 (15569)	4000 (17793)	-3500 (-15569)	1500 (6672)	5000 (22241)	-4000 (-17793)

Table 7: Z-axis Forces and Moments for use with Equation 3

Equation Set 1:

$$\left|\frac{F_{xs}}{F_{xs\_T3\_adj}}\right| \le 1 \quad \left|\frac{F_{ys}}{F_{ys\_T3\_adj}}\right| \le 1 \quad \left|\frac{F_{zs}}{F_{zs\_T3\_adj}}\right| \le 1 \quad \left|\frac{M_{xs}}{M_{xs\_T3\_adj}}\right| \le 1 \quad \left|\frac{M_{ys}}{M_{ys\_T3\_adj}}\right| \le 1 \quad \left|\frac{M_{zs}}{M_{zs\_T3\_adj}}\right| \le 1$$

$$\left|\frac{F_{xd}}{F_{xd\_T3\_adj}}\right| \le 1 \quad \left|\frac{F_{yd}}{F_{yd\_T3\_adj}}\right| \le 1 \quad \left|\frac{F_{zd}}{F_{zd\_T3\_adj}}\right| \le 1 \quad \left|\frac{M_{xd}}{M_{xd\_T3\_adj}}\right| \le 1 \quad \left|\frac{M_{yd}}{M_{yd\_T3\_adj}}\right| \le 1 \quad \left|\frac{M_{zd}}{M_{zd\_T3\_adj}}\right| \le 1$$

Equation 2:

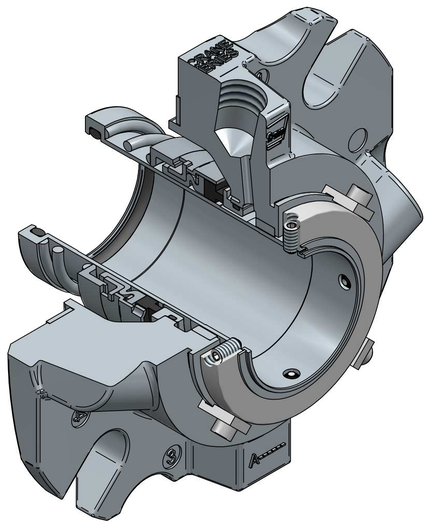
$$\left|\frac{F_{xs}}{F_{\mathrm{xs\_T4\_adj}}}\right| + \left|\frac{F_{ys}}{F_{\mathrm{ys\_T4\_adj}}}\right| + \left|\frac{F_{zs}}{F_{\mathrm{zs\_T4\_adj}}}\right| + \left|\frac{M_{xs}}{M_{\mathrm{xs\_T4\_adj}}}\right| + \left|\frac{M_{ys}}{M_{\mathrm{ys\_T4\_adj}}}\right| + \left|\frac{M_{zs}}{M_{\mathrm{zs\_T4\_adj}}}\right| +$$

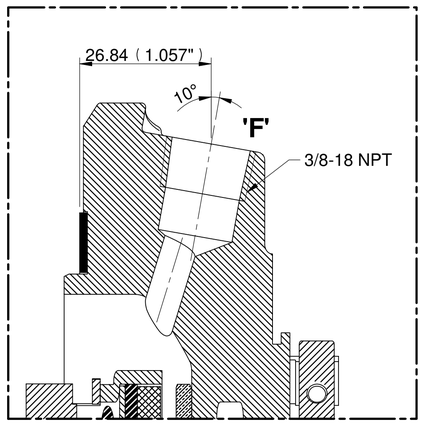
$$\left|\frac{F_{xd}}{F_{\mathrm{xd\_T4\_adj}}}\right| + \left|\frac{F_{yd}}{F_{\mathrm{yd\_T4\_adj}}}\right| + \left|\frac{F_{zd}}{F_{\mathrm{zd\_T4\_adj}}}\right| + \left|\frac{M_{xd}}{M_{\mathrm{xd\_T4\_adj}}}\right| + \left|\frac{M_{yd}}{M_{\mathrm{yd\_T4\_adj}}}\right| + \left|\frac{M_{zd}}{M_{\mathrm{zd\_T4\_adj}}}\right| \le 2$$

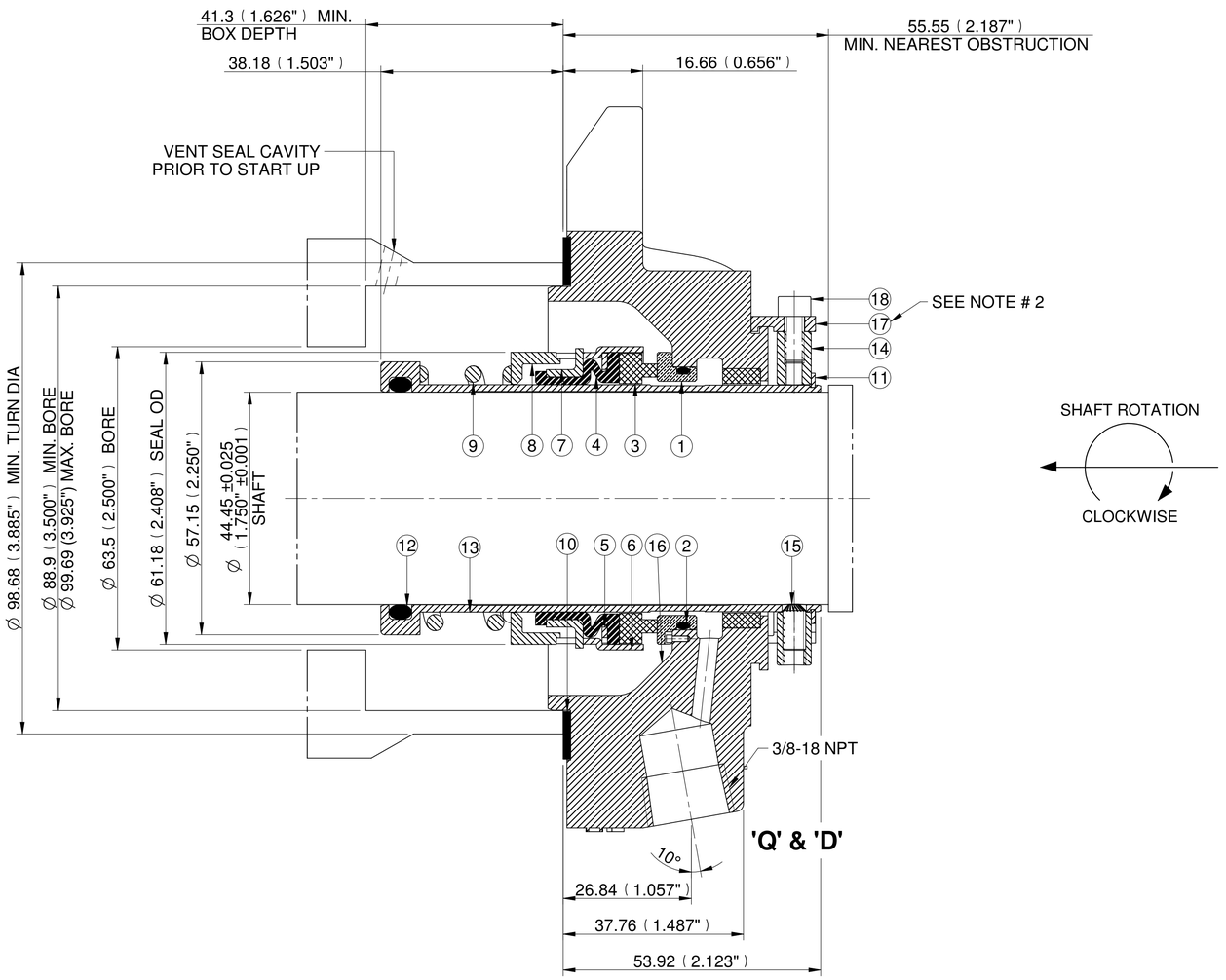
Equation 3:

$$\left(\frac{F_{ys}}{F_{\mathrm{ys\_T6\_adj}}} + \frac{M_{xs}}{M_{\mathrm{xs\_T6\_adj}}} + \frac{M_{ys}}{M_{\mathrm{ys\_T6\_adj}}} + \frac{M_{zs}}{M_{\mathrm{zs\_T6\_adj}}} + \frac{F_{yd}}{F_{\mathrm{yd\_T6\_adj}}} + \frac{M_{xd}}{M_{\mathrm{xd\_T6\_adj}}} + \frac{M_{yd}}{M_{\mathrm{yd\_T6\_adj}}} + \frac{M_{zd}}{M_{\mathrm{zd\_T6\_adj}}}\right)^2 + \left(\frac{F_{xs}}{F_{\mathrm{xs\_T7\_adj}}} + \frac{F_{zs}}{F_{\mathrm{zs\_T7\_adj}}} + \frac{M_{xs}}{M_{\mathrm{xs\_T7\_adj}}} + \frac{M_{ys}}{M_{\mathrm{ys\_T7\_adj}}} + \frac{M_{zs}}{M_{\mathrm{zs\_T7\_adj}}} + \frac{F_{xd}}{F_{\mathrm{xd\_T7\_adj}}} + \frac{F_{zd}}{F_{\mathrm{zd\_T7\_adj}}} + \frac{M_{xd}}{M_{\mathrm{xd\_T7\_adj}}} + \frac{M_{yd}}{M_{\mathrm{yd\_T7\_adj}}} + \frac{M_{zd}}{M_{\mathrm{zd\_T7\_adj}}}\right)^2 \le 1$$

DRAWING No.	ISSUE	MODIFICATIONS:
HSP-38072	**B**	A REV & RED 96-01481 ISSUE 'B' : GCN NO. 158499, REDRAWN IN 3D, PSC, 21MAR19







ITEM	DRAWING NUMBER	MAT'L CODE	DESCRIPTION	MATERIAL	QTY	SPARES
1	H-1751-717		MATING RING	SILICON CARBIDE	1	X
2	0000033		O RING	FLUOROELASTOMER	1	X
3	D-1875-121		PRIMARY RING **	SILICON CARBIDE	1	X
4	D-1875-163		BELLOWS	FLUOROELASTOMER	1	X
5	D-1875-312		DISC	316 S.S.	1	
6	D-1875-095		RETAINER	316 S.S.	1	
7	D-1875-030		DRIVE BAND	316 S.S.	1	
8	D-1876-849		ADAPTOR, SPRING	316 S.S.	1	
9	4090		SPRING ***	316 S.S.	1	X
10	H-1751-820		GASKET	G.F. CHEMLON	1	X
11	41018700002		SNAP RING	18-8 S.S.	1	X
12	0000224		O RING	FLUOROELASTOMER	1	X
13	H-1751-758		SLEEVE	316 S.S.	1	
14	H-1751-734		COLLAR	316 S.S.	1	
15	17103206000		SET SCREW CUP POINT	HARDENED 416 S.S	4	X
16	H-1751-824		GLAND PLATE ASSEMBLY ****	316 S.S./CARBON	1	
17	D-0002-684		SPACER	SINTERED 316 S.S.	4	X
18	21083206000		CAP SCREW SOCKET HD	316 S.S.	4	X

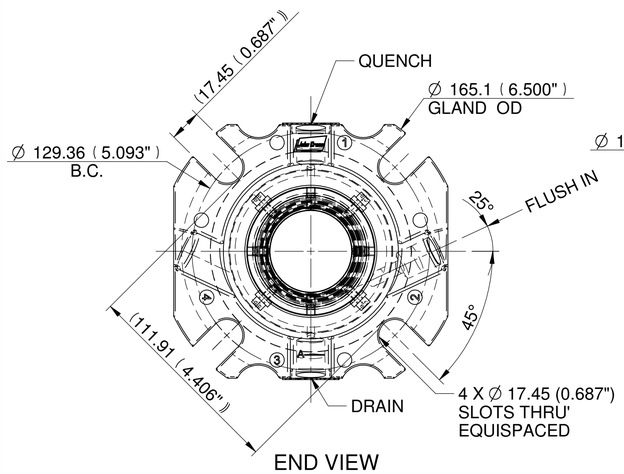
**
D-1875-121 CARBON
D-1875-819 MACHINED
D-1876-247 P90

***
4090 316 S.S.
2021 MONEL
0481 18-8 S.S.

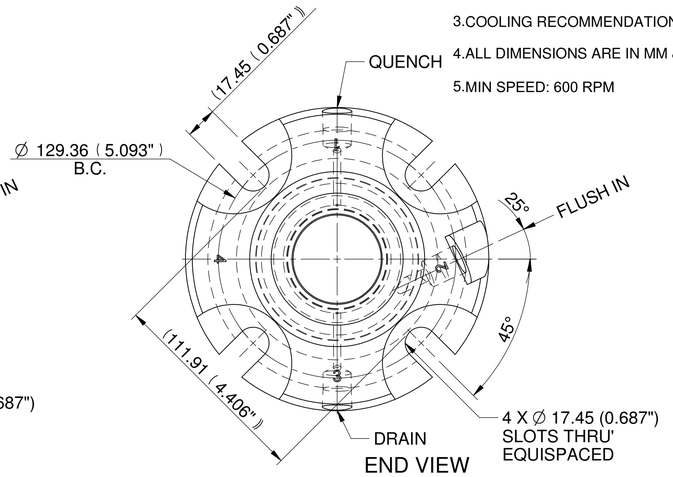
****
H-1751-824 CAST GLAND PLATE ASSEMBLY
H-1751-911 MACHINED GLAND PLATE ASSEMBLY

WARRANTY APPLIES TO DIMENSIONAL DATA ONLY - COMPLETE SERVICE DATA WAS NOT SUPPLIED

NOTE:
CAST GLAND PLATE DESIGNED TO FIT COOLING JACKETS ON STANDARD PUMPS



END VIEW
CAST GLAND PLATE



END VIEW
MACHINED GLAND PLATE

NOTES:
1.REFER TO JOHN CRANE SEAL AND INSTALLATION INSTRUCTIONS - FOR RECOMMENDED PRACTICE

2."SPACER (ITEM # 17) IS ONLY FOR THE PURPOSE OF PROPERLY LOCATING SEAL. AFTER GLAND PLATE, BEARING, SHAFT AND SEAL ARE LOCKED IN PLACE, SPACER MUST BE REMOVED BEFORE STARTING UNIT."

3.COOLING RECOMMENDATION: NO FLUSH REQUIRED.

4.ALL DIMENSIONS ARE IN MM & DIMENSIONS IN ( ) ARE IN INCHES UNLESS OTHERWISE STATED.

5.MIN SPEED: 600 RPM

FOR ALTERNATE ARRANGEMENTS SEE THE FOLLOWING DRAWINGS

SINGLE O-RING SEAL	HSP-38067
RUBBER BELLOWS SEAL	HSP-38071
METAL BELLOWS SEAL	HSP-38073
O-RING SEAL W/QUENCH	HSP-38068
RUBBER BELLOWS W/QUENCH	HSP-38072
METAL BELLOWS W/QUENCH	HSP-38074
DUAL O-RING SEAL	HSP-38069
DUAL METAL BELLOWS	HSP-38075
DUAL METAL BELLOWS WITH PUMPING RING	HSP-38076
DUAL O-RING SEAL WITH PUMPING RING	HSP-38070

SEAL ASS'Y NO.		BILL OF MATERIALS NUMBER	
IN : D-1876-957	ASSEMBLY	1-18	
	SEAL HEAD		
OUT:	SPARES KIT		
	DESCRIPTION	ITEMS	NUMBER

EQUIPMENT REFERENCE	SEAL DATA
OEM:	API PLAN: / API CODE:
EQUIPMENT TYPE:	INSTRUCTION MANUAL REF.
MODEL, FRAME / SIZE GRISWOLD 811 M 4x3-8 (A70)	MATERIAL CODE: X1 O58 1 X O58 1 316/316
SERIAL / DRAWING No.	
CUSTOMER INFORMATION	**SERVICE DATA**
CUSTOMER:	FLUID: WATER, WASTE
P.O. NUMBER: / PLANT ITEM NO:	BARRIER FLUID: NOT APP.
END USER:	CHAMBER PRESSURE: 6.6 PSIG
LOCATION:	SUCTION PRESSURE: 0.0 PSIG
PLANT:	DISCHARGE PRESSURE: 22.1 PSIG
REFERENCE DATA:	PROCESS TEMPERATURE: 90-120 DEG F
SEAL FLUSH RATE: / FLUID SYSTEM DRG:	SHAFT SPEED: 1,750 RPM / VAPOUR PRESSURE:
IPROJECTS NO:	SPECIFIC GRAVITY: 1.00 / VISCOSITY: 1.0 CP
SEAL SIZE: **Ø1.750"**	DE / NDE DRG NO:
SEAL TYPE: **5611Q SINGLE CARTRIDGE (BIG BORE)**	

SCALE	DATE	DRAWN	CHECKED	APPROVED	DESIGN AUTH.
1.6:1	**091096**	**SKN**	**TJS**	**JWH**	**US01EN**

john crane	DRAWING No.	ISSUE
	HSP-38072	**C**

A1

PERFORMANCE CURVES

6 x 4 - 10H A80 1200 RPM Curve: G-1216