

4410™ TwinHydrostatic™ Gas Seal

SEAL INSTALLATION

Preparation

Determine if the pump is in good condition.

A. Check the shaft or sleeve.

1. Remove all burrs and sharp corners, especially in areas where the O-ring has to slide. Cover threads and keyway slots with a thin tape to prevent cutting the O-ring. The distance from the face of the stuffing box to the center of the O-ring groove is .195" for large sizes and .219" for Xlarge sizes.
2. The shaft finish should be 32 microinches RA (0,8 microns) maximum. It should feel smooth if you run your fingernail along the shaft in the axial direction.
3. **Make sure the shaft or sleeve diameter is within tolerance (no more than +/- .002" [0,05 mm] from nominal).** Example: 1.750" shaft should not be larger than 1.752" or smaller than 1.748".
4. Use a dial indicator to measure the shaft runout in the area where the seal is to be installed. **Readings should not exceed .001" TIR per inch (0,001 mm TIR per millimeter) of shaft diameter.**
5. Place the dial indicator on the shaft and alternately push and pull the shaft axially to measure end play. End play should not exceed .005" (0,12 mm) TIR.
6. Protect the sleeve O-ring by lubricating the shaft with a clean silicone based lubricant as that provided with the seal.

B. Check the stuffing box.

1. The stuffing box face must be a maximum of 125 microinches RA (3,2 microns) for a gasket to seal.

2. Split case pumps will sometimes cause a step (misalignment) to occur on the stuffing box face. This step must be machined flat within 0.001" (0,03 mm).
3. Make sure the stuffing box is clean and clear along its entire length.
4. If possible, attach the base of a dial indicator to the shaft and rotate shaft and indicator slowly while reading the runout of the stuffing box face. Misalignment of the stuffing box face relative to the shaft should not exceed .002" TIR per inch (0,002 mm TIR per millimeter) of shaft diameter.

C. Check availability of clean dry gas supply.

1. The seal uses gas (Nitrogen) to seal the product from the environment and lubricate the seal face. 20 (twenty) SCFH supply gas must be available at 30 psi (2 bar) over the maximum stuffing box pressure not to exceed 150 psi (10 bar) and filtered to a maximum particle size of 3 microns (120 microinches). Alternate gas can be used for gas supply if it is compatible with the process product and the environment.

Installation

1. Check the chemical listing to determine if the O-rings installed in this seal are compatible with the fluid being sealed.
2. The dog point set screws go into the small holes in the sleeve. Do not disengage these screws from the sleeve when positioning the seal. The cup point set screws go through the larger holes in the sleeve. **IMPORTANT: There are three (3) 1/4 dog point set screws and 6 cup point set screws for sizes from 2 5/8" to 4 3/4" (65 mm – 120 mm)**

and three (3) 1/2" dog point set screws and 9 cup point set screws for sizes from 5" to 8" (125 mm – 200 mm).

3. To reposition or remove the seal, make sure the all centering clips and socket head cap screws are engaged. **IMPORTANT: There are 3 centering clips for sizes from 2 5/8" to 4 3/4" (65 mm – 120 mm) and 6 centering clips for sizes from 5" to 8" (125 mm – 200 mm).**
4. Centering clips have been preset at the factory. If for any reason you loosen or remove the centering clip cap screw, retighten as follows prior to installing the seal on the equipment: Tighten the cap screw finger tight. Then using a hex wrench, tighten the cap screw an additional 1/8 turn. This will approximate the 40 inch-pounds of torque for sizes 2 5/8" to 4 3/4" (65-120 mm), and 50 inch-pounds of torque for 5" to 8" (125-200 mm) set at the factory.
5. Make sure that the lip on the end of the gland is inside the inner centering clip groove and the lock ring lip engages the outer centering clip groove.
6. **CAUTION: The cup point set screws installed in the lock ring are hardened steel to insure that the seal maintains position with the higher axial loads associated with the use of gas seals. Slide the seal onto the shaft making sure the dog point set screws are engaged through the seal sleeve.**
7. Slide the completely assembled 4410 seal onto the shaft, by pushing on the lock ring. Make sure that all the set screws are engaged through the sleeve but do not protrude into the sleeve ID bore.

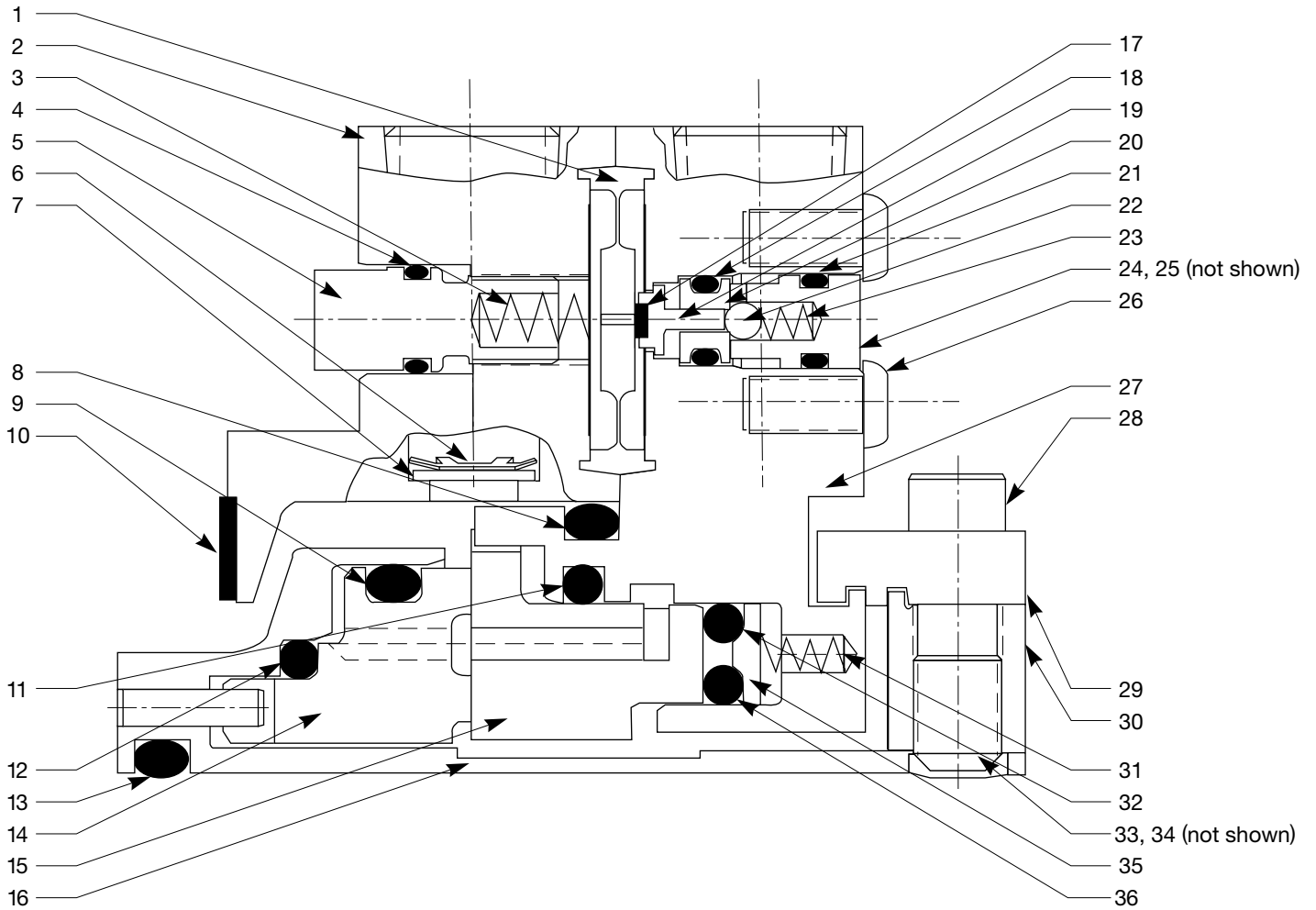
SEAL INSTALLATION

8. Reassemble the pump and make necessary shaft alignments and impeller adjustments.
9. Orient the flush connection to the location required. The port is plugged prior to shipping. **CAUTION:** Shipping plugs limit the dirt and contamination, which could enter the seal and cause seal malfunction. When plugs are removed ensure that dirt, liquid, and contamination do not enter the seal ports.
10. Piping connections should not be made prior to tightening the gland bolts.
11. Tighten the gland bolts evenly.
IMPORTANT: The gland bolts must be tightened before tightening the screws onto the shaft.
12. **IMPORTANT: All the dog point set screws must be tightened FIRST.** See step 14 on page 5 of the assembly instructions for location of dog point set screws. If rotation of the lock ring is required for tightening set screws, loosen or remove one centering clip. Once the dog point set screws are tightened, evenly tighten the cup point set screws to the shaft with the hex key provided. After all set screws have been tightened by hand, retighten the set screws with a torque wrench to 65 - 75 in-lbs for sizes from 2 5/8" to 4 3/4" (65 - 120 mm), and tighten screws to 120 - 135 in-lbs for sizes from 5" to 8" (125 - 200 mm).
13. Remove socket head cap screws and the centering clips. Retain for later use.
14. **IMPORTANT: It is important to make sure that the gland is properly centered over the sleeve.** To do this, turn the shaft by hand to make sure the seal turns freely. If you hear metal to metal contact within the seal, it was improperly centered. Re-install the centering clips finger tight. Loosen the gland bolts. Fully tighten clips. Loosen the set screws. Re-tighten the gland bolts. Re-tighten the set screws. Remove the clips. If metal to metal contact still exists check the centering of the stuffing box.
15. **THE GAS SUPPLY PORTS ARE 1/4" NPT. THE FLUSH CONNECTIONS ARE 1/4" NPT FOR SIZES FROM 2 5/8" TO 4 3/4" (65 mm – 120 mm) AND 3/8" NPT FOR THE SIZES FROM 5" TO 8" (125 mm – 200 mm).**
16. Determine if a flush/recirculation port is required. The flush connection is the NPT port on the outer diameter of the adapter housing (inner gland). If so, remove the shipping plug and connect the pump discharge or suction to the flush port using a recirculation line (bleed from discharge [API Plan 11] or connect to suction [API Plan 13]). This is recommended in seal applications where the gas supply may be lost during operation. Plug the flush port if no connection is used. This connection may also be used to monitor stuffing box pressure by installing a connection to a pressure gauge.
17. The gas supply port is marked with an "S" on the outer diameter of the gland. See steps 22 and 24 on page 6 of the assembly instructions for location of the gas supply port. Supply gas is to be connected to the gas supply port by removing the shipping plugs and installing a 1/4" NPT connection from the gas supply system. Purge the gas supply line prior to connecting to the seal port to insure it is free of contamination, dirt and liquid. Insure no burrs, restrictions or liquid legs are present in the supply line. Opposite the gas supply port are two 1/4" NPT gauge ports marked with "B" and "C" on the outer diameter of the gland, which may be utilized for monitoring the barrier and closing pressure respectively. See step 25 on page 6 of the assembly instructions for location of the pressure gauge ports.
IMPORTANT: The gas supply must be on whenever the pump is pressurized or contains product. Full pressure supply gas can be piped directly to the gas supply port. The seal Dual In-Gland Control System (DIGCS) will maintain the preset differential pressures between the barrier gas and process fluid (~ 20 psi), and between closing gas and process fluid (~ 25 psi) respectively.
IMPORTANT: The pressure differentials can be adjusted by tightening or loosening the hex head adjustment screws on the side of the adapter (inner gland housing)
18. Take all necessary precautions and follow normal safety procedures before starting the equipment.
19. The 4410 Barrier and closing pressure controls may be adjusted at startup to obtain optimum seal performance and gas usage. The hex head adjustment screws (5/16" for sizes from 2 5/8" to 4 3/4" (65 mm-120 mm); 7/16" for sizes from 5" to 8" (125 mm-200 mm) are located on the inner side of the seal housing and are marked with a "B" and "C" for barrier and closing adjustment respectively. The barrier gas pressure as referenced above must be above the vessel or stuffing box pressure in the range of 11 to 23 psi (0,7-1,6 Bar) differential. The closing pressure monitored on the "C" port must always be higher than the barrier pressure monitored on the "B" port. The flowmeter installed in the barrier gas supply line **should** indicate a flow (1 SCFH/0.5 NI/min minimum to 3 SCFH/1.5 NI/min) to the seal during operation. The barrier gas usage may vary during start-up and changing conditions and should not exceed 7 SCFH (3.5 NI/min). In the event of high barrier gas usage readings, after the gas seal system has stabilized, an adjustment of the "B" adjustment screw can be made to decrease the barrier gas pressure and therefore the usage. In the event of low barrier gas usage readings on the flowmeter an adjustment of the "C" adjustment screw can be made to decrease the closing gas pressure and therefore increase the gas usage. Do not decrease below the barrier gas pressure.

CAUTIONS

These instructions are general in nature. It is assumed that the installer is familiar with seals and certainly with the requirements of their plant for the successful use of mechanical seals. If in doubt, get assistance from someone in the plant who is familiar with seals or delay the installation until a seal representative is available. All necessary auxiliary arrangements for successful operation (heating, cooling, flushing) as well as safety devices must be employed. These decisions are to be made by the user. The chemical listing is intended as a **general** reference for this seal **only**. The decision to use this seal or any other Chesterton seal in a particular service is the customer's responsibility.

PARTS IDENTIFICATION



KEY

1 – Diaphragm	11 – Stationary O-ring	21 – Spring Cylinder O-ring	31 – Load Spring
2 – Adapter	12 – Rotary Support O-ring	22 – Ball	32 – Pusher OD O-ring
3 – Adjustment Spring	13 – Sleeve O-ring	23 – Ball Spring	33 – Cup Point Set Screw
4 – Adjustment Screw O-ring	14 – Rotary Face	24 – Spring Cylinder	34 – Dog Point Set Screw (Not shown)
5 – Adjustment Screw	15 – Stationary Face	25 – Gland Bolts (Not shown)	35 – Pusher
6 – Retaining Clip	16 – Sleeve Assembly	26 – Button Head Cap Screw	36 – Pusher ID O-ring
7 – Filter Disk	17 – Gasket (Diaphragm)	27 – Gland	37 – 1/4" Pipe Plug
8 – Inter Gland O-ring	18 – Seat O-ring	28 – Socket Head Cap Screw	38 – 1/4" Pipe Plug (Large)
9 – Rotary OD O-ring	19 – Actuator	29 – Centering Clip	3/8" Pipe Plug (X-large)
10 – Gasket	20 – O-ring Seat	30 – Lock Ring	39 – 1/4" Cap Plug

STANDARD MATERIALS[†]

FACES:

- Carbon rotary face/SiC stationary face (Wet or Dry Operation)
- Graphited SiC rotary face/Graphited SiC stationary face (Wet Operation only)

METAL PARTS:

- 316 SS body
- Hastelloy C* springs and drive pins
- Hardened set screws standard

ELASTOMERS:

- Fluorocarbon
- EPR
- Chemraz**
- Aflas***
- Kalrez****

*Haynes International, Inc. Registered Trademark.

**Greene, Tweed & Co. Registered Trademark.

***Asahi Glass Company Ltd. Registered Trademark.

****DuPont Registered Trademark.

†Other materials available upon request.

OPERATING LIMITS

SPEED RANGE:

- 0 to 1500 FPM (8mps) Wet Operation
- 0 to 360 FPM (2mps) Dry Operation

TEMPERATURE LIMITS:

- 300°F (150°C) Ethylene Propylene
- 400°F (205°C) Fluorocarbon, AFLAS***
- 500°F (260°C) Perfluoroelastomer

PRESSURE RANGE:

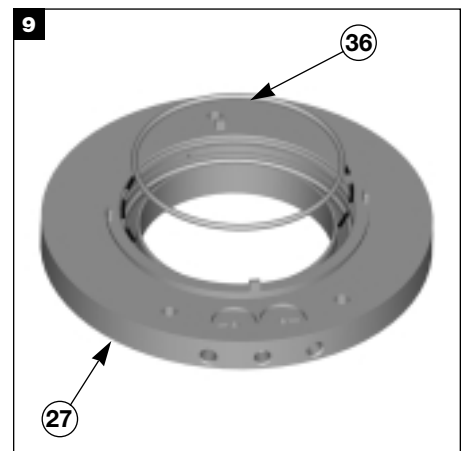
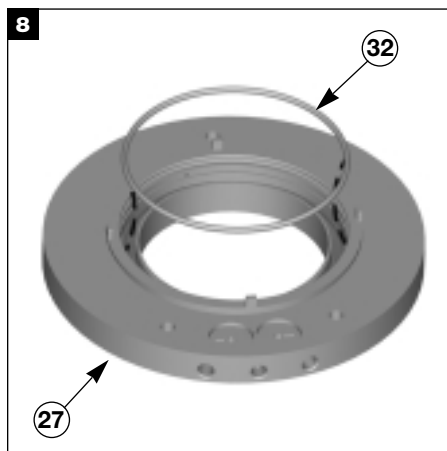
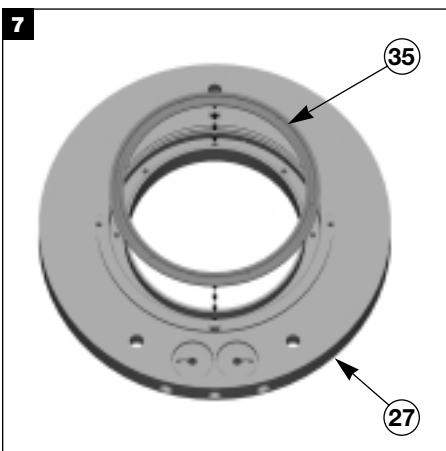
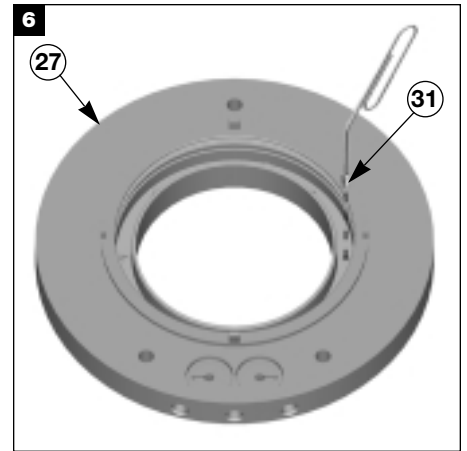
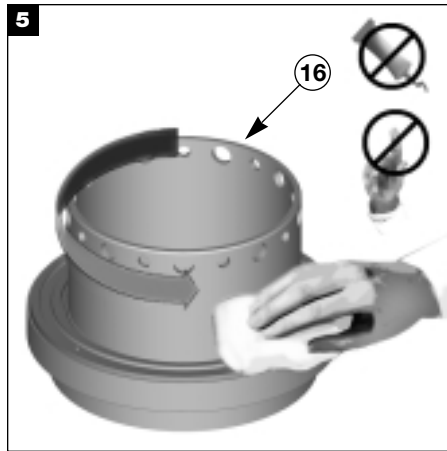
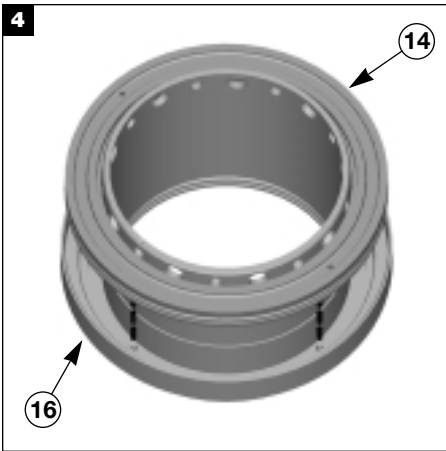
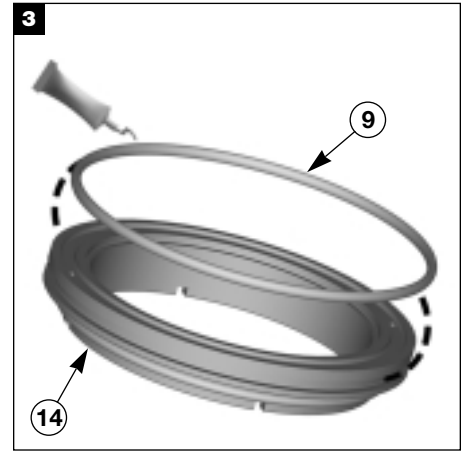
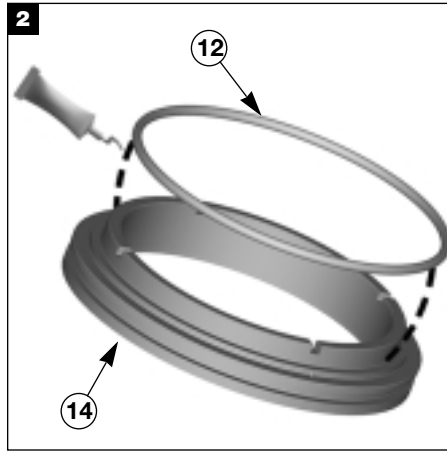
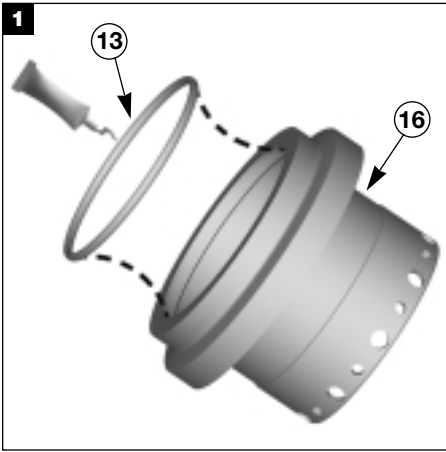
- Vacuum to 150 psig/10 Bar G

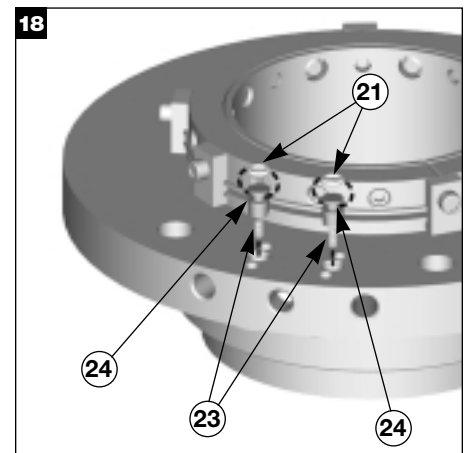
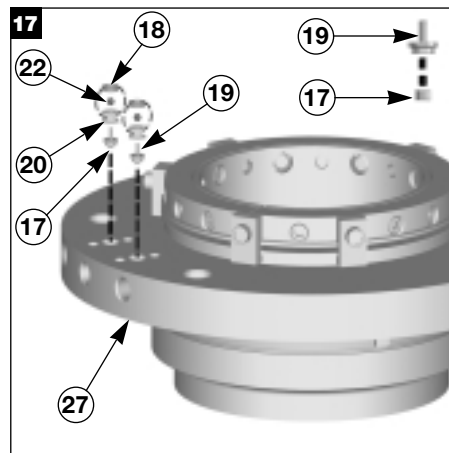
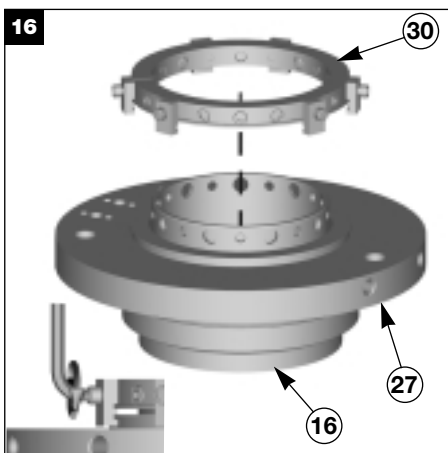
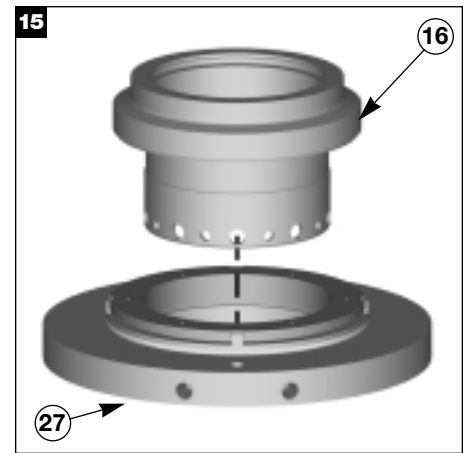
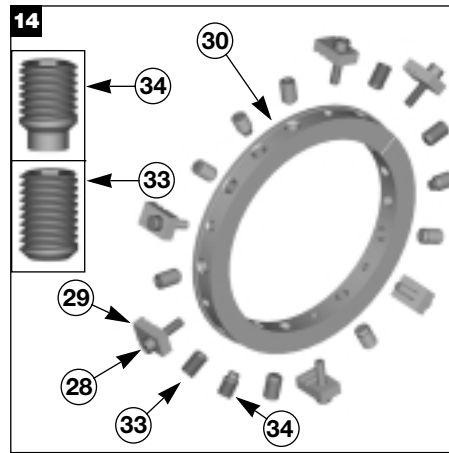
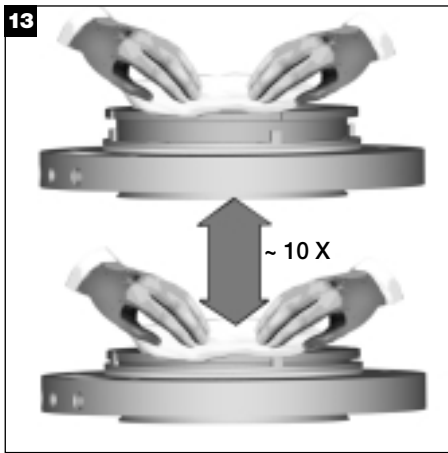
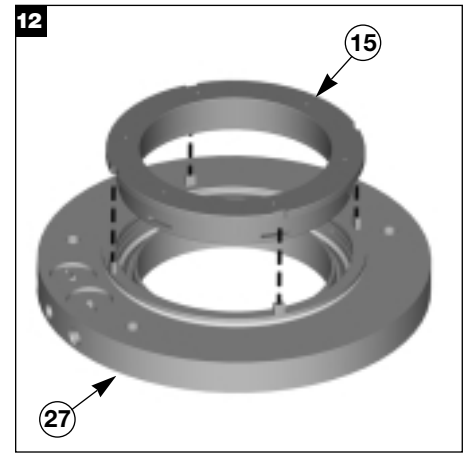
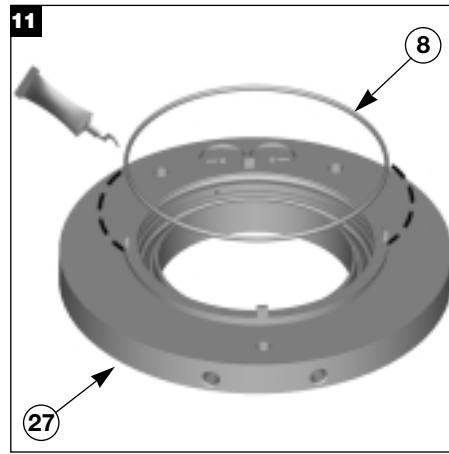
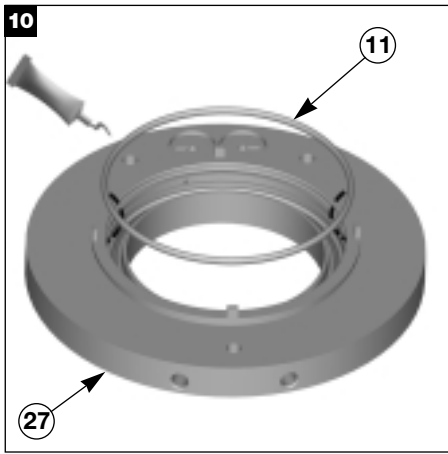
Gas lubricated WET Operation has liquid product in contact with the seal components.

Gas lubricated DRY Operation has gas product in the vicinity of the seal components.

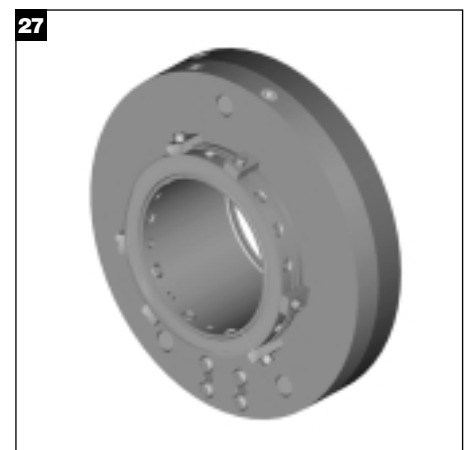
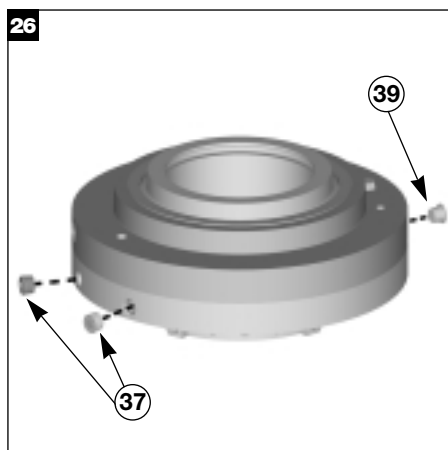
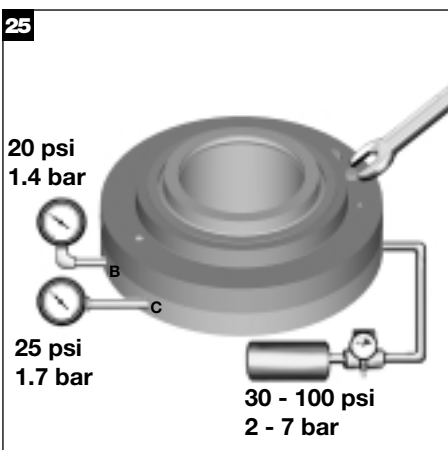
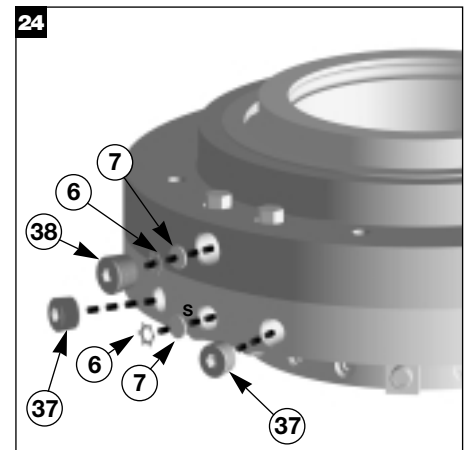
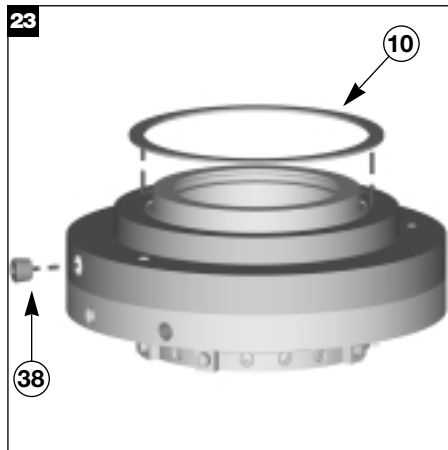
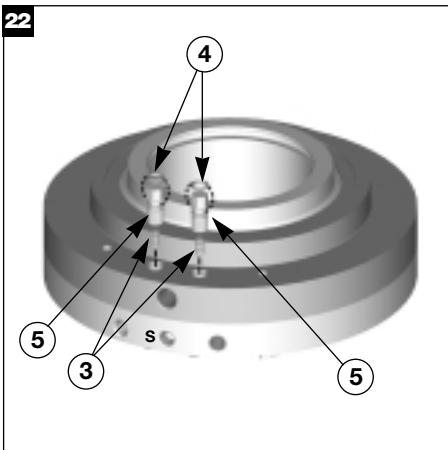
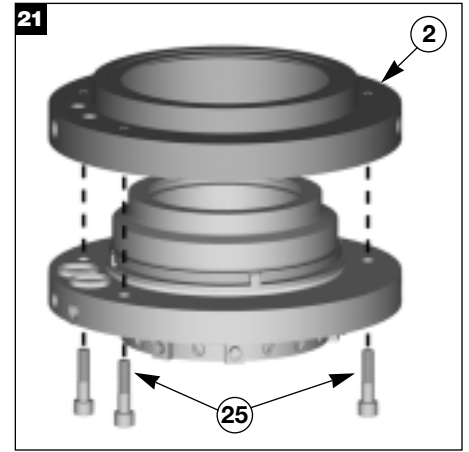
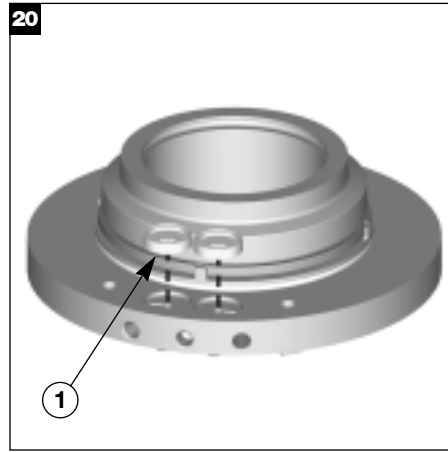
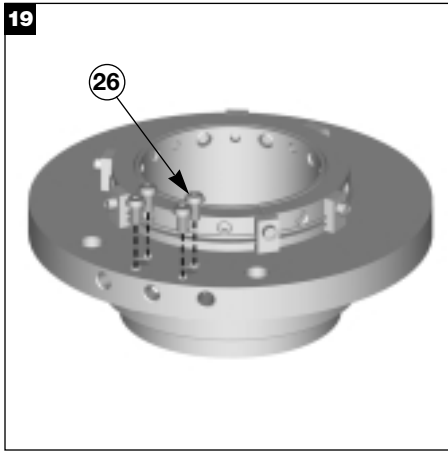
For conditions beyond these limits consult Chesterton application engineering.

SEAL ASSEMBLY

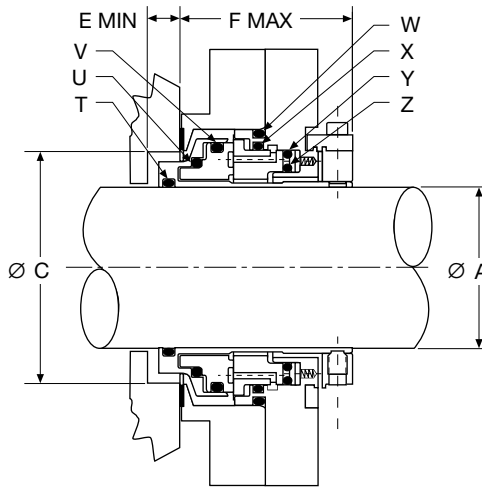
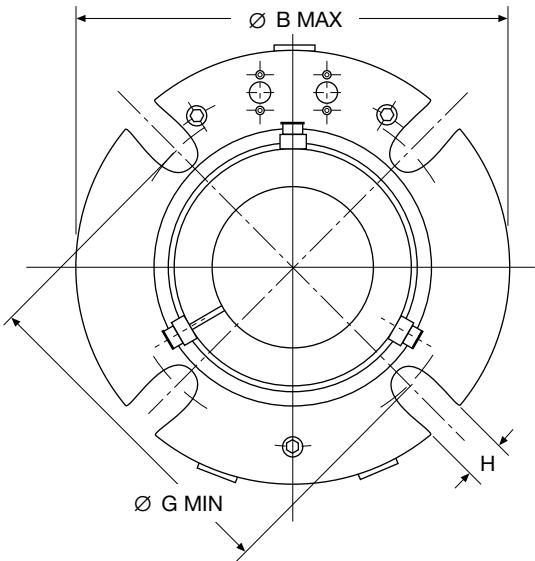




SEAL ASSEMBLY



4410 DIMENSIONAL DATA (INCH)



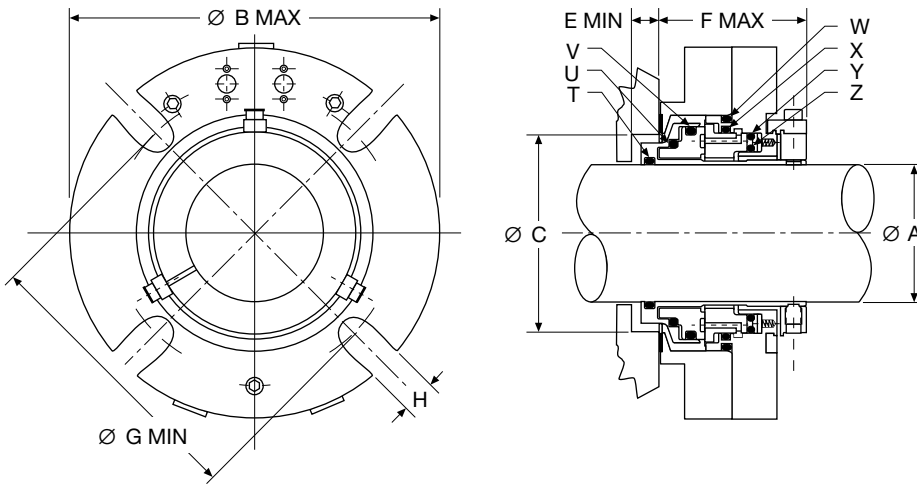
KEY (drawings & charts)

- A - Shaft Size
- B - Maximum Gland Diameter
- C - Stuffing Box Inside Diameter
- E - Required Stuffing Box Depth
- F - Outboard Seal Length
- G - Minimum Bolt Circle by Bolt Size
- H - Slot Width
- T - Sleeve O-ring
- U - Rotary Support O-ring
- V - Rotary OD O-ring
- W - Inter Gland O-ring
- X - Stationary O-ring
- Y - Pusher OD O-ring
- Z - Pusher ID O-ring

DASH NO.	SHAFT SIZE	GLAND OD	STUFFING BOX BORE		SB DEPTH	OB LENGTH	BOLT CIRCLE BY BOLT SIZE			SLOT WIDTH	O-RINGS								
											SHAFT	ROTARY		GLAND ADAPTER	STA.	PUSHER			
												SUPPORT	OD			W	X	Y	Z
A	B MAX	C MIN	C MAX	E MIN	F MAX	G MIN			H	T	U	V	W	X	Y	Z			
						1/2"	5/8"	3/4"											
-21	2.625	7.10	3.60	4.16	0.40	2.80	5.25	5.37		0.69	-231	-236	-240	-244	-241	-238	-235		
-22	2.750	7.22	3.73	4.29	0.40	2.80	5.38	5.50		0.69	-232	-237	-241	-245	-242	-239	-236		
-23	2.875	7.35	3.85	4.41	0.40	2.80	5.49	5.62		0.69	-233	-238	-242	-246	-243	-240	-237		
-24	3.000	7.47	3.98	4.57	0.40	2.80	5.69	5.81		0.69	-234	-239	-243	-247	-244	-241	-238		
-25	3.125	7.60	4.10	4.68	0.40	2.80	5.80	5.92		0.69	-235	-240	-244	-248	-245	-242	-239		
-26	3.250	7.72	4.23	4.82	0.40	2.80	5.94	6.06		0.69	-236	-241	-245	-249	-246	-243	-240		
-27	3.375	7.85	4.35	4.93	0.40	2.80	6.04	6.17	6.29	0.81	-237	-242	-246	-250	-247	-244	-241		
-28	3.500	7.97	4.48	5.07	0.40	2.80	6.18	6.31	6.43	0.81	-238	-243	-247	-251	-248	-245	-242		
-29	3.625	8.10	4.60	5.19	0.40	2.80	6.29	6.42	6.54	0.81	-239	-244	-248	-252	-249	-246	-243		
-30	3.750	8.22	4.73	5.30	0.40	2.80	6.38	6.51	6.63	0.81	-240	-245	-249	-253	-250	-247	-244		
-31	3.875	8.35	4.85	5.41	0.40	2.80	6.50	6.62	6.75	0.81	-241	-246	-250	-254	-251	-248	-245		
-32	4.000	8.47	4.98	5.57	0.40	2.80	6.68	6.81	6.93	0.81	-242	-247	-251	-255	-252	-249	-246		
-33	4.125	8.60	5.10	5.69	0.40	2.80	6.79	6.92	7.04	0.81	-243	-248	-252	-256	-253	-250	-247		
-34	4.250	8.72	5.23	5.82	0.40	2.80	6.93	7.05	7.18	0.81	-244	-249	-253	-257	-254	-251	-248		
-35	4.375	8.85	5.35	5.94	0.40	2.80	7.05	7.18	7.30	0.81	-245	-250	-254	-258	-255	-252	-249		
-36	4.500	8.97	5.48	6.07	0.40	2.80	7.18	7.30	7.43	0.81	-246	-251	-255	-259	-256	-253	-250		
-37	4.625	9.10	5.60	6.19	0.40	2.80	7.30	7.43	7.55	0.81	-247	-252	-256	-259	-257	-254	-251		
-38	4.750	9.22	5.73	6.33	0.40	2.80	7.46	7.59	7.71	0.81	-248	-253	-257	-260	-258	-255	-252		
							7/8"	1"	1 1/8"										
-40	5.000	11.15	6.32	7.55	0.60	4.00	9.17	9.30	9.42	†	-353	-361	-363	-263	-364	-362	-360		
-42	5.250	11.40	6.57	7.80	0.60	4.00	9.42	9.55	9.67	†	-355	-362	-364	-264	-365	-363	-361		
-44	5.500	11.65	6.82	8.05	0.60	4.00	9.67	9.80	9.92	†	-357	-363	-365	-265	-366	-364	-362		
-46	5.750	11.90	7.07	8.30	0.60	4.00	9.92	10.05	10.17	†	-359	-364	-366	-266	-367	-365	-363		
-48	6.000	12.15	7.32	8.55	0.60	4.00	10.17	10.30	10.42	†	-361	-365	-367	-267	-368	-366	-364		
-50	6.250	12.40	7.57	8.80	0.60	4.00	10.42	10.55	10.67	†	-362	-366	-368	-268	-369	-367	-365		
-52	6.500	12.65	7.82	9.05	0.60	4.00	10.67	10.80	10.92	†	-363	-367	-369	-269	-370	-368	-366		
-54	6.750	12.90	8.07	9.30	0.60	4.00	10.92	11.05	11.17	†	-364	-368	-370	-270	-371	-369	-367		
-56	7.000	13.15	8.32	9.55	0.60	4.00	11.17	11.30	11.42	†	-365	-369	-371	-271	-372	-370	-368		
-58	7.250	13.40	8.57	9.80	0.60	4.00	11.42	11.55	11.67	†	-366	-370	-372	-272	-373	-371	-369		
-60	7.500	13.65	8.82	10.05	0.60	4.00	11.67	11.80	11.92	†	-367	-371	-373	-273	-374	-372	-370		
-62	7.750	13.90	9.07	10.30	0.60	4.00	11.92	12.05	12.17	†	-368	-372	-374	-274	-375	-373	-371		
-64	8.000	14.15	9.32	10.55	0.60	4.00	12.17	12.30	12.42	†	-369	-373	-375	-274	-376	-374	-372		

† Note: 1. Bolt Circle Manufactured to Customer Specifications

4410 DIMENSIONAL DATA (METRIC)



KEY (drawings & charts)

- A - Shaft Size
- B - Maximum Gland Diameter
- C - Stuffing Box Inside Diameter
- E - Required Stuffing Box Depth
- F - Outboard Seal Length
- G - Minimum Bolt Circle by Bolt Size
- H - Slot Width
- T - Sleeve O-ring
- U - Rotary Support O-ring
- V - Rotary OD O-ring
- W - Inter Gland O-ring
- X - Stationary O-ring
- Y - Pusher OD O-ring
- Z - Pusher ID O-ring

SHAFT SIZE (METRIC)	SHAFT SIZE (INCH)	GLAND OD	STUFFING BOX BORE		SB DEPTH	OB LENGTH	BOLT CIRCLE BY BOLT SIZE			SLOT WIDTH	O-RINGS						
											SHAFT	ROTARY		GLAND ADAPTER	STA.	PUSHER	
												SUPPORT	OD			OD	ID
	A	B MAX	C MIN	C MAX	E MIN	F MAX	G MIN			H	T	U	V	W	X	Y	Z
							12 mm	16 mm	20 mm								
65 mm	2.559	180	91	106	10	71	133	136		18	-230	-236	-240	-244	-241	-238	-235
70 mm	2.756	183	95	109	10	71	137	140		18	-232	-237	-241	-245	-242	-239	-236
75 mm	2.953	190	101	116	10	71	144	148		18	-234	-239	-243	-247	-244	-241	-238
80 mm	3.150	196	107	122	10	71	151	154		18	-236	-241	-245	-249	-246	-243	-240
85 mm	3.346	199	111	125	10	71	153	157	160	21	-237	-242	-246	-250	-247	-244	-241
90 mm	3.543	206	117	132	10	71	160	163	166	21	-239	-244	-248	-252	-249	-246	-243
95 mm	3.740	209	120	135	10	71	162	165	168	21	-240	-245	-249	-253	-250	-247	-244
100 mm	3.937	215	126	141	10	71	170	173	176	21	-242	-247	-251	-255	-252	-249	-246
110 mm	4.331	225	136	151	10	71	179	182	186	21	-245	-250	-254	-258	-255	-252	-249
120 mm	4.724	234	145	161	10	71	189	193	196	21	-248	-253	-257	-260	-258	-255	-252
							22 mm	24 mm	28 mm								
125 mm	4.921	283	160	192	15	102	233	236	239	†	-353	-361	-363	-263	-364	-362	-360
130 mm	5.118	289	167	198	15	102	239	242	246	†	-354	-362	-364	-264	-365	-363	-361
135 mm	5.315	296	173	204	15	102	246	249	252	†	-356	-363	-365	-265	-366	-364	-362
140 mm	5.512	296	173	204	15	102	246	249	252	†	-358	-363	-365	-265	-366	-364	-362
145 mm	5.709	302	179	211	15	102	252	255	258	†	-359	-364	-366	-266	-367	-365	-363
150 mm	5.906	309	186	217	15	102	258	261	265	†	-361	-365	-367	-267	-368	-366	-364
155 mm	6.102	315	192	224	15	102	265	268	271	†	-362	-366	-368	-268	-369	-367	-365
160 mm	6.299	321	199	230	15	102	271	274	277	†	-362	-367	-369	-269	-370	-368	-366
165 mm	6.496	321	199	230	15	102	271	274	277	†	-363	-367	-369	-269	-370	-368	-366
170 mm	6.693	328	205	236	15	102	277	281	284	†	-364	-368	-370	-270	-371	-369	-367
175 mm	6.890	334	211	243	15	102	284	287	290	†	-365	-369	-371	-271	-372	-370	-368
180 mm	7.087	340	218	249	15	102	290	293	296	†	-366	-370	-372	-272	-373	-371	-369
185 mm	7.283	347	224	255	15	102	296	300	303	†	-366	-371	-373	-273	-374	-372	-370
190 mm	7.480	347	224	255	15	102	296	300	303	†	-367	-371	-373	-273	-374	-372	-370
195 mm	7.677	353	230	262	15	102	303	306	309	†	-368	-372	-374	-274	-375	-373	-371
200 mm	7.874	359	237	268	15	102	309	312	315	†	-369	-373	-375	-274	-376	-374	-372

† Note: 1. Bolt Circle Manufactured to Customer Specifications
 4410 and TwinHydrostatic are trademarks of A.W. Chesterton Company.

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