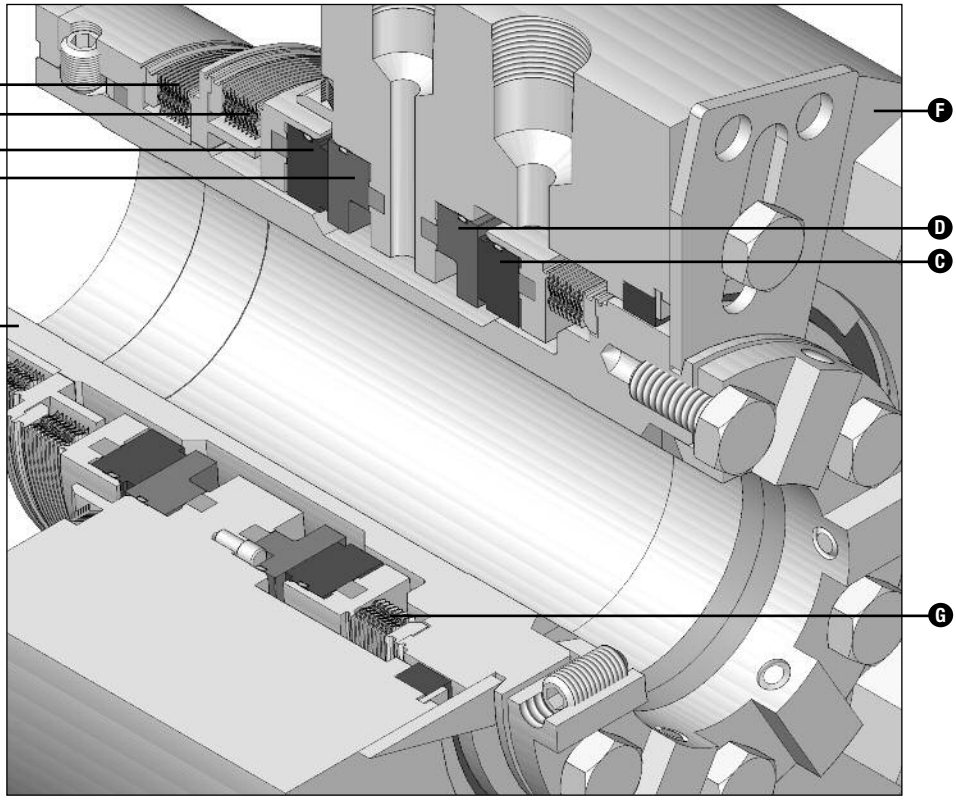
TYPE 2874NE

NON-CONTACTING, NON-ELASTOMER, METAL BELLOWS, OUTWARD PUMPING

Technical Specification

A – Lower Inner Bellows Assembly
B – Upper Inner Bellows Assembly
C – Primary Ring
D – Mating Ring
E – Sleeve
F – Gland Plate
G – Outer Bellows Assembly



Outward Pumping Spiral Grooves

Featuring John Crane's Centrifugal Advantage

Product Description

- Non-contacting, internally pressurized outward pumping dual welded metal bellows cartridge seal that permits reliable operation in high-temperature services
- 0.0 Fugitive Emissions for Maximum Achievable Control Technology (MACT) compliance for sealing higher temperature, volatile, or hazardous fluids
- For use in API 610 pump and larger bore seal chambers.
- API 682/ISO 21049 qualified
- Elastomer-free seal handles a wide range of applications
- Eliminates problems associated with coking barrier fluids and fouled heat exchangers

Performance Capabilities

- Temperature: -100°F to 800°F/-75°C to 425°C
- Pressure: vacuum to 230 psi(g)/16 bar(g) barrier pressure (Consult pressure rating limit.)
- Speed: 1450 rpm minimum / 3600 rpm maximum (For speeds outside this range, contact John Crane .)
- End Play/Axial Float Allowance:
  Sizes > 1.57"/40mm: +/0.040"-/1.02mm
  Sizes ≤ 1.57"/40mm: +/0.030"-/0.76mm
- Runout: 0.002"/0.05mm FIM Max.

Design Features

- Centrifiugal advantage: process fluid at the OD of the bellows
- Pressure balanced design withstands full reverse pressurization
- Static secondary seals have high-temperature capability and eliminate the cost of expensive perfluoroelastomers
- Edge-welded metal bellows
- Dual mating ring arrangement meets API 682 design requirements
- Spiral groove technology for superior operating performance

Barrier Consumption

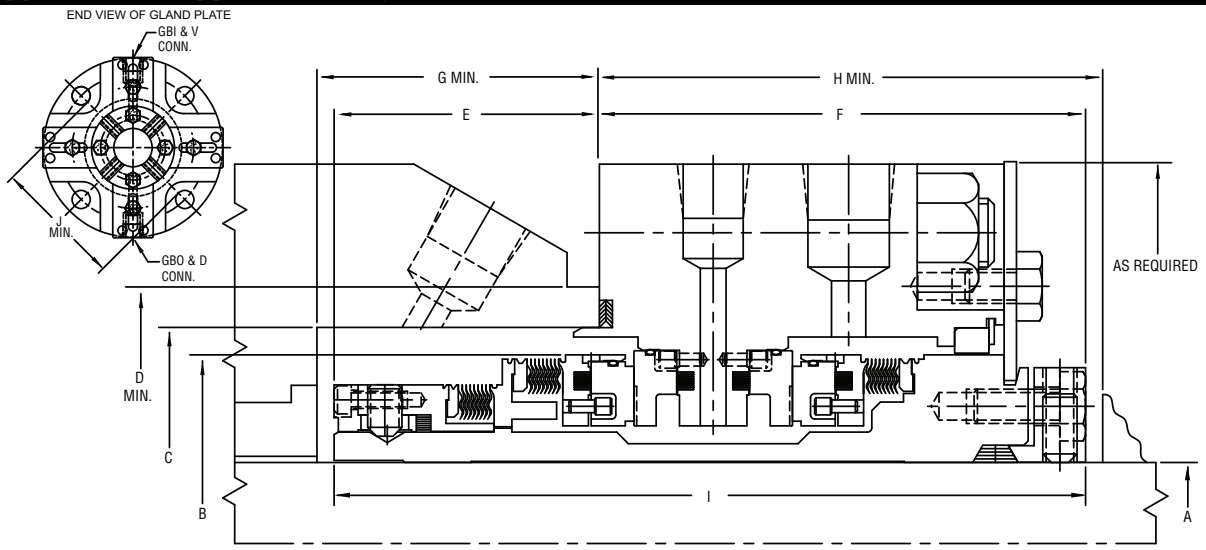
The Type 2874NE uses inert barrier gas to lubricate the seal faces. The inboard seal is operated at 2 bar/30 psi differential and the outboard seal operates at full pressure differential. It is estimated that 75% of total barrier consumption passes outboard into the atmosphere. The barrier consumption of the Type 2874NE can be estimated as 16 normal liters of barrier gas per 100mm of shaft circumference, per hour, per bar of barrier pressure (one standard cubic foot of barrier gas per inch of shaft circumference, per hour, per 100 psi(g) of barrier pressure). Actual consumption rates may vary. More specific values are available from John Crane Engineering.

TYPE 2874NE

NON-CONTACTING, NON-ELASTOMER, METAL BELLOWS, OUTWARD PUMPING

Technical Specification

Type 2874NE Typical Arrangement



Type 2874NE Dimensional Data (inches)

API 610/682 SEAL CHAMBER NUMBER	A		B	C		D	E	F	G	H	I	J
1	20.0mm/0.571-0.945"	+.0000 -.0005	2.375	2.7559	+.0012 -.0000	3.345	1.703	3.787	1.828	3.912	5.490	3.435
2	30.0mm/0.946-1.320"	+.0000 -.0005	2.750	3.1496	+.0012 -.0000	3.739	1.934	3.546	2.059	3.671	5.480	3.829
3	40.0mm/1.321-1.695"	+.0000 -.0006	3.125	3.5433	+.0014 -.0000	4.133	2.196	3.282	2.321	3.407	5.478	4.223
4	50.0mm/1.696-2.070"	+.0000 -.0006	3.625	3.9370	+.0014 -.0000	4.527	1.994	4.130	2.119	4.255	6.124	4.617
5	60.0mm/2.071-2.570"	+.0000 -.0008	4.188	4.7244	+.0014 -.0000	5.314	2.165	3.990	2.290	4.115	6.155	5.404
6	70.0mm/2.571-2.945"	+.0000 -.0008	4.625	5.1181	+.0016 -.0000	5.708	2.299	3.945	2.424	4.070	6.244	5.798
7	80.0mm/2.946-3.320	+.0000 -.0008	5.063	5.5118	+.0016 -.0000	6.102	2.635	4.205	2.756	4.330	6.840	6.192
8	90.0mm/3.321-3.945"	+.0000 -.0009	5.750	6.2992	+.0016 -.0000	6.890	2.435	4.433	2.559	4.558	6.868	6.980
9	100.0mm/3.946-4.195"	+.0000 -.0009	6.000	6.6929	+.0016 -.0000	7.283	2.493	4.375	2.618	4.500	6.868	7.464
10	110.0mm/4.196-4.695"	+.0000 -.0009	6.500	7.0866	+.0016 -.0000	7.676	2.835	4.471	2.953	4.596	7.306	7.838

Type 2874NE Dimensional Data (mm)

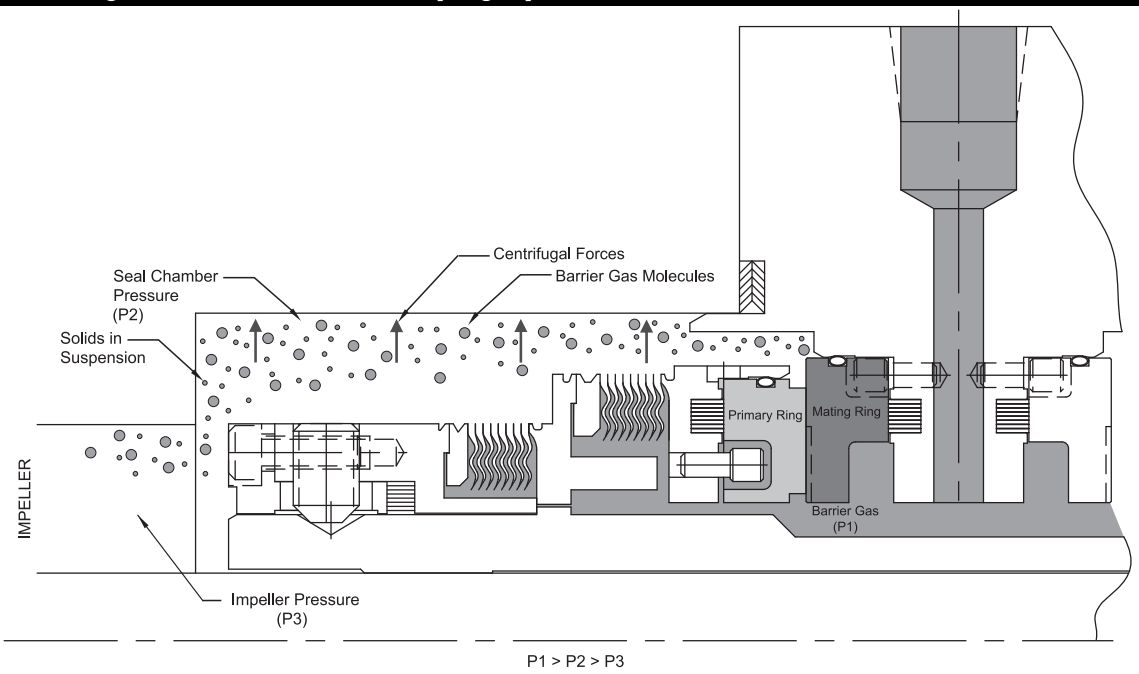
API 610/682 SEAL CHAMBER NUMBER	A		B	C		D	E	F	G	H	I	J
1	20.0	+.0000 -.0127	60.33	70.0	+.0305 -.0000	84.96	43.26	96.19	46.43	99.36	139.45	87.25
2	30.0	+.0000 -.0127	69.85	80.0	+.0305 -.0000	94.97	49.12	90.07	52.30	93.24	139.19	97.26
3	40.0	+.0000 -.0152	79.4	90.0	+.0254 -.0000	105.0	55.8	83.4	59.0	86.5	139.1	107.3
4	50.0	+.0000 -.0152	92.1	100.0	+.0254 -.0000	115.0	50.6	104.9	53.8	108.1	155.5	117.3
5	60.0	+.0000 -.0203	106.4	120.0	+.0304 -.0000	135.0	55.0	101.3	58.2	104.5	156.3	137.3
6	70.0	+.0000 -.0203	117.5	130.0	+.0304 -.0000	145.0	58.4	100.2	61.6	103.4	158.6	147.3
7	80.0	+.0000 -.0203	128.6	140.0	+.0304 -.0000	155.0	66.9	106.8	70.0	110.0	173.7	157.3
8	90.0	+.0000 -.0220	146.1	160.0	+.0400 -.0000	175.0	61.8	112.6	65.0	115.8	174.4	177.3
9	100.0	+.0000 -.0220	152.4	170.0	+.0400 -.0000	185.0	63.3	111.1	66.5	114.3	174.4	189.6
10	110.0	+.0000 -.0220	165.1	180.0	+.0400 -.0000	195.0	72.0	113.6	75.0	116.7	185.6	199.1

TYPE 2874NE

NON-CONTACTING, NON-ELASTOMER, METAL BELLOWS, OUTWARD PUMPING

Technical Specification

Non-Contacting ID to OD Barrier Pumping Spiral Grooves



The Type 2874NE uses spiral groove technology developed and patented by John Crane. The mating rings are micro-machined with a spiral groove pattern that is designed to pump the barrier gas from the seal ID to the seal OD. The Sealide-C primary rings seal against the un-grooved sealing dam of the mating rings. The inner face pair is pressurized on the inside diameter to a pressure differential of 2 bar/30 psi minimum. The outboard seal faces handle full differential pressure and also pump from the seal ID to the seal OD. The outboard seal pumps inert barrier gas into the atmosphere.

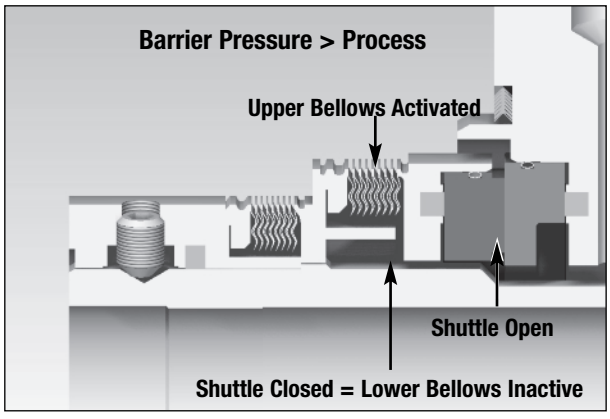
When the pump shaft turns, a band of high pressure barrier gas is created between the seal faces. This lifts the seal faces and creates a non-contacting dynamic seal. No friction, no heat, no wear, and no cooling requirements provide a sealing technology that is revolutionary. The stiff ring of compressed barrier gas exiting the seal interface creates a highly effective dry seal.

Centrifugal Advantage: The rotating bellows assembly creates centrifugal action to spin-off any particles keeping the seal head assembly clean and flexible.

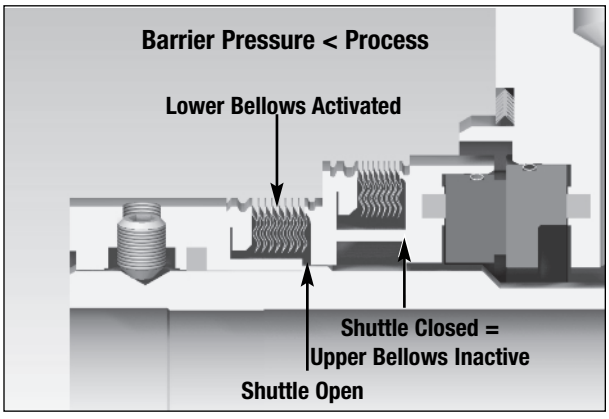
Reverse Pressure Capability

The Type 2874NE pressure balanced design ensures full reverse pressure containment capability. In the event of a temporary loss of barrier pressure where seal chamber pressure exceeds barrier gas pressure, the Type 2874NE will continue to seal the process fluid protecting the barrier chamber and system from exposure to the process fluid. Lubrication is provided to the seal faces as long as there is process fluid between them.

Normal Operation Mode



Reverse Pressure Mode

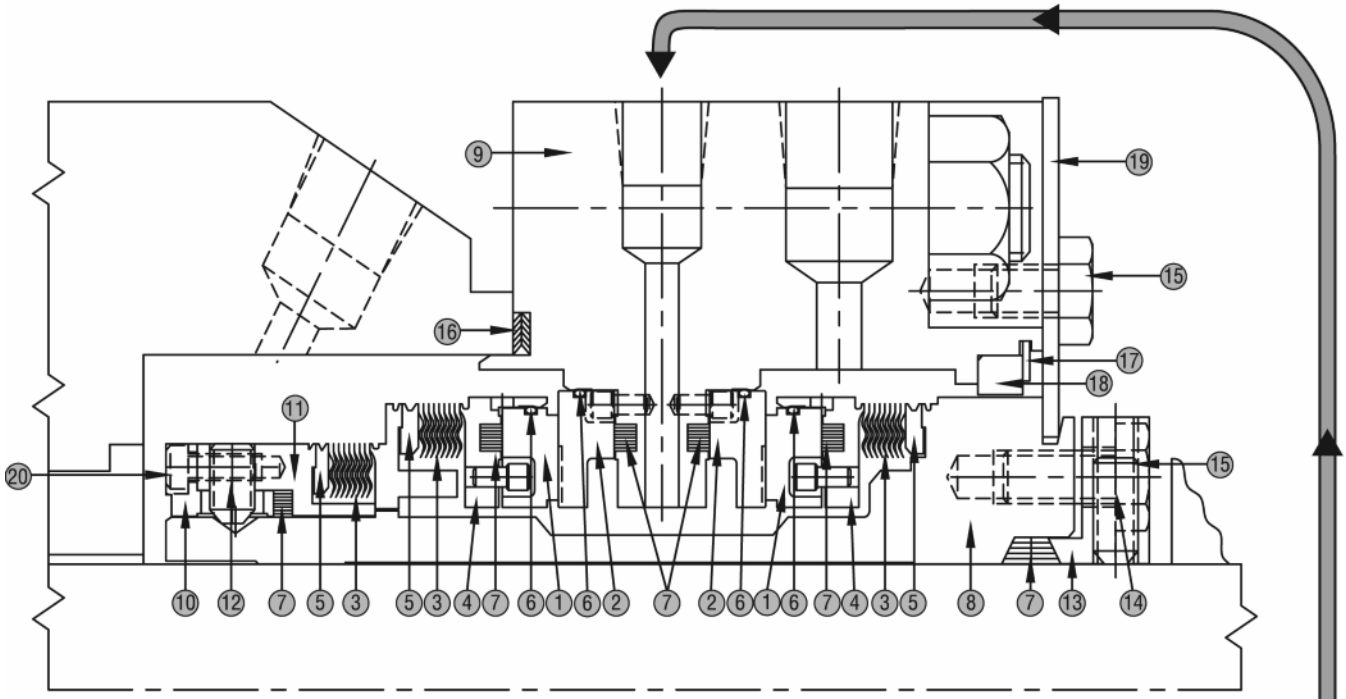


TYPE 2874NE

NON-CONTACTING, NON-ELASTOMER, METAL BELLOWS, OUTWARD PUMPING

Technical Specification

Type 2874NE Components



Materials of Construction

SEAL COMPONENTS	MATERIALS	
Description	**Standard**	**Options**
1- Primary Ring	Sealide-C™	—
2- Mating Ring	Silicon Carbide*	Tungsten Carbide
3- Bellows	Alloy 718 (UNS N07718)	—
4- Primary Ring Adapter	Alloy 625 (UNS N06625)	—
5- Adapter	Alloy 625	—
6- Canted Spring	Alloy C-276 (UNS N10276)	—
7- Static Seals	Flexible Graphite	—
8- Sleeve	316L SS (UNS S31603)	—
9- Gland	316 SS (UNS 31600)	—
10- Compression Ring	316 Stainless Steel	—
11- Drive Collar	316L SS	—
12- Set Screw	316 SS	—
13- Packing Follower	316 SS	—
14- Outer Set Screw	Hardened Alloy Steel	—
15- Hex Head Cap Screw	316 SS	—
16- Gland Gasket	Spiral Wound Metal Gasket	—
17- Snap Ring	302 SS	—
18- Bushing (optional)	Carbon	—
19- Spacer	302 SS	—
20- Socket Head Cap Screw	316 SS	—

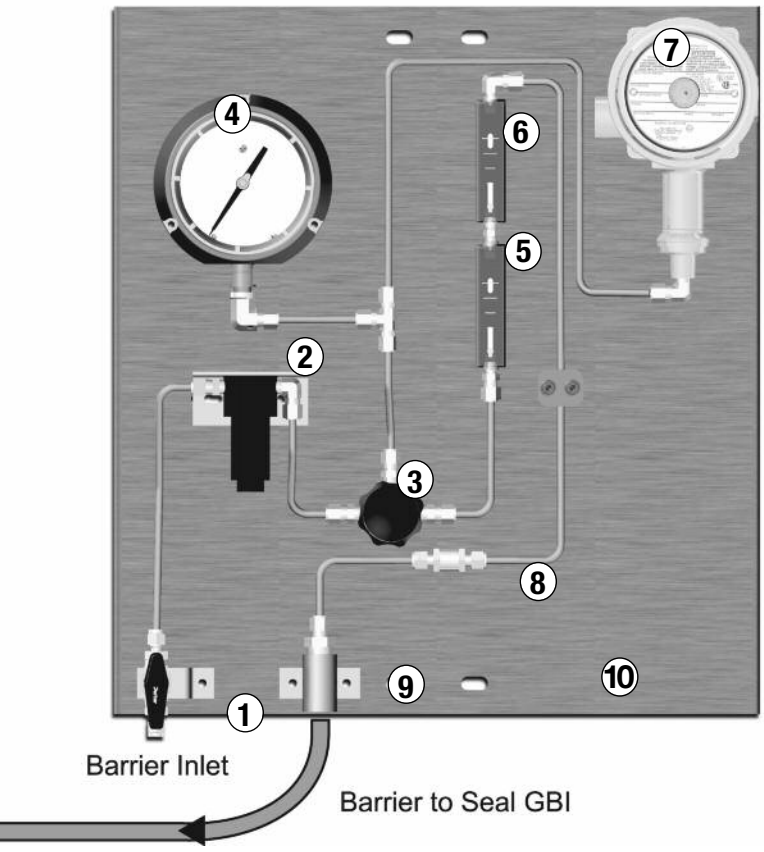
*Silicon Carbide Mating Ring recommended for steam barrier.

TYPE 2874NE

NON-CONTACTING, NON-ELASTOMER, METAL BELLOWS, OUTWARD PUMPING

Technical Specification

Type 2874NE Gas Control Panel



STANDARD COMPONENTS

1 - Isolating Ball Valve - 316 SS

2 - Coalescing Filter - 316 SS

3 - Pressure Regulator - 316 SS
(low pressure option Aluminum)

4 - Gauge - Phenolic/316 SS

5 - Flow Indicator - Low Range

6 - Flow Indicator - High Range

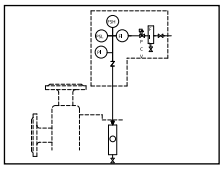
7 - Pressure Switch
15A 125/240/480 (SPDT)

8 - Check Valve - 316 SS
(High-Temperature)

9 - Connection to Seal

10 - Back Panel - 304 SS

Note: Engineered gas panels can be configured to customer requirements.



API 682/ISO 21049 3NC
Plan 74 Compliant

Gas

In a double seal arrangement inert gas (normally nitrogen) is supplied to the seal and maintained at a pressure higher than the seal chamber pressure. Standard instruments and controls have been arranged to deliver clean dry barrier gas at a pressure specified by the operator. Elements of the control panel are connected via 316 SS seamless tubing.

- The coalescing filter is intended to remove moisture and contaminants from the barrier gas supply. Use of the filter will deliver clean dry nitrogen to the seal filtered to 0.3 – 0.6 micron nominal.
- The pressure regulator is used to set barrier pressure on the seal cartridge at 30 psi to 50 psi/2 to 3.45 bar above seal chamber pressure.
- The pressure gauge will indicate the pressure provided to the mechanical seal.
- Rotometers are intended to indicate flow. They are not intended to be a precise measure of barrier consumption. John Crane can provide empirical barrier consumption data upon request.
- The pressure switch is intended to indicate loss of barrier pressure and provide an output signal.
- Downstream of the pressure switch, barrier gas flows through a one way check valve. The check valve has a 1/3 psi/0.02 bar cracking pressure and protects the gas panel and nitrogen system from reverse flow.
- For high-temperature processes, be sure to use the appropriately rated check valves and flow meters.
- Instrumentation is mounted to a 304 SS panel as standard and NEMA enclosures are available. Instrumentation can be augmented to deliver specific information. Contact John Crane for options.

*Consult John Crane for details regarding steam barrier gas applications.

TYPE 2874NE

NON-CONTACTING, NON-ELASTOMER, METAL BELLOWS, OUTWARD PUMPING

Technical Specification

Welded Metal Bellows

Bellows design features:

- Optimum 45° tilt angle
- Three-sweep radius
- Nesting ripple plate design
- Static secondary seal
- Light spring loads

Bellows Benefits:

- Uniform plate rigidity and stress distribution
- Enhanced fatigue strength
- Pressure-balanced by design
- Eliminates problems associated with dynamic O-rings

Welded Metal Bellows

Sealide-C Advanced Silicon Carbide Composite Primary Ring

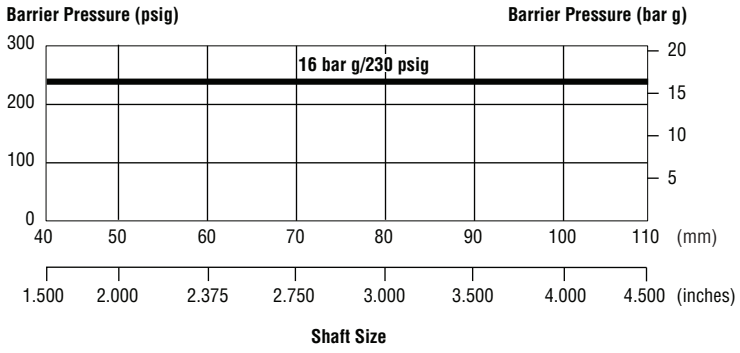
Sealide-C is a state-of-the-art, sintered silicon carbide with low friction and the inherent lubricity of free graphite. This silicon carbide is a tough, hard, heat resistant, long wearing, inert seal face material. When compared with other seal face materials, Sealide-C enhances seal face pairing during system upsets, loss of barrier, and slower-speed start-ups.

Static Carbon Graphite Secondary Seals

The Type 2874NE is an elastomer-free seal that utilizes chemically inert static carbon graphite secondary seals. These chemically inert secondary seals are perfect for higher temperature applications, enhanced chemical compatibility, and can handle a wider range of applications effectively while eliminating the cost of expensive perfluoroelastomers.

The static carbon graphite seals solve problems in applications when dynamic O-rings are prone to attack or when restrictive movement (hang-up) from the sealing environment occurs. O-ring performance may be affected by process contamination, swelling, degradation, thermal gradients, dry-nitrogen environments and polymerization.

Pressure Rating Limits



- Differential Barrier Gas Pressure minimum 2 bar/30 psi > seal chamber pressure.

The basic pressure rating is based on a standard seal installed according to the criteria given in this data sheet at a minimum speed of 1450 rpm, and according to generally accepted industrial practices.

Contact John Crane for process services outside this range and with more detailed application information in order to obtain the actual dynamic pressure rating.

NOTE:

1. For steam barrier applications contact John Crane.

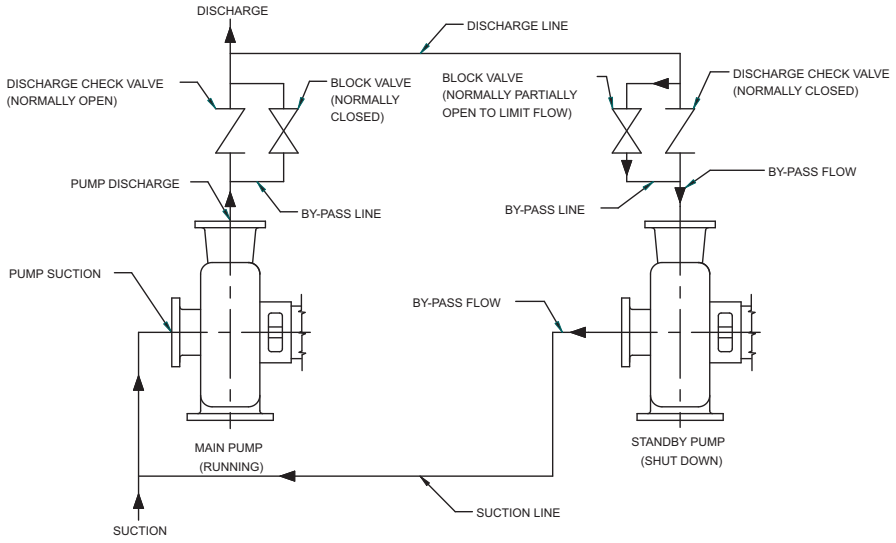
TYPE 2874NE

NON-CONTACTING, NON-ELASTOMER, METAL BELLOWS, OUTWARD PUMPING

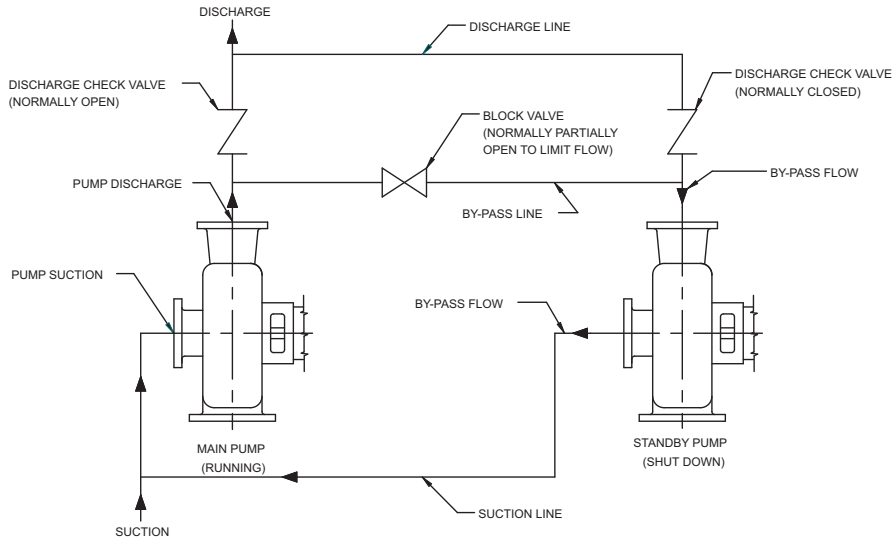
Technical Specification

Piping Options for Hot Standby Pumps

HOT BY-PASS FOR A STANDBY PUMP - OPTION 1



HOT BY-PASS FOR A STANDBY PUMP - OPTION 2



Often Gas lubricated seals are installed on primary and standby pumps. Above are the recommended piping plans that allow standby pumps to manage barrier collection in static conditions. Both diagrams offer continuous circulation of pumped fluid in order to maintain temperature and avoid cavitation upon start-up of stand by equipment. Detailed information and recommendations for specific applications are available from John Crane Engineering.

TYPE 2874NE

NON-CONTACTING, NON-ELASTOMER, METAL BELLOWS, OUTWARD PUMPING

Technical Specification

North America
United States of America
Tel: 1-847-967-2400
Fax: 1-847-967-3915

Europe
United Kingdom
Tel: 44-1753-224000
Fax: 44-1753-224224

Latin America
Brazil
Tel: 55-11-3371-2500
Fax: 55-11-3371-2599

Middle East & Africa
United Arab Emirates
Tel: 971-481-27800
Fax: 971-488-62830

Asia Pacific
Singapore
Tel: 65-6518-1800
Fax: 65-6518-1803

If the products featured will be used in a potentially dangerous and/or hazardous process, your John Crane representative should be consulted prior to their selection and use. In the interest of continuous development, John Crane Companies reserve the right to alter designs and specifications without prior notice. It is dangerous to smoke while handling products made from PTFE. Old and new PTFE products must not be incinerated. ISO 9001 and ISO14001 Certified, details available on request.

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