Typical applications

Some common reasons why an isolating seal might be necessary are as follows:
- Process fluid is corrosive and would attack and destroy the instrument.
- Process fluid is solids laden, or viscous and could block the instrument element.
- Process fluid would solidify and immobilize the instrument element; i.e., freeze or polymerize.

A diaphragm seal, properly applied, accurately transmits process pressure seen by the diaphragm to the instrument. The instrument and instrument side of the diaphragm seal are liquid filled. Since the liquid is incompressible, the process pressure is hydraulically transmitted to the pressure sensitive element of the instrument. In diaphragm sealed systems it is necessary that no air or other gases, (free, or entrained) be present in the instrument fill liquid. The displacement capability of the diaphragm must exceed the displacement required by the instrument primary element. A certain amount of "slack", or reserve capacity in the diaphragm will allow the system to compensate for slight changes in seal fill fluid volume resulting from thermal expansion or contraction of the fluid.

Standard pressure and temperature

Diaphragm Seal designs are rated at 100 to 200 psig for non-metallic lower housings, and from 150 to 2,500 psig for metal lower housings. 5,000, 10,000 and 20,000 psig designs are available with metal lower housings. Temperature limitations depend on the materials of construction and the fill liquid chosen. The upper temperature limit for plastic materials range from 300°F to 400°F. In metal designs, fill liquids limit diaphragm seal applications to a maximum of 700°F, and a minimum of -60°F. Consult the factory for temperature limits in special applications.

Vacuum applications

While seals work well for most vacuum applications, successful operation of seals in high vacuum service is more difficult to achieve, since most fill liquids and filled systems contain microscopic amounts of air or entrained gases, which tend to expand their volume tremendously as a pressure of absolute zero is approached. This expansion destroys the principle upon which the seal operation is based; i.e., absolute constant fill liquid volume at any pressure.

When accurate transmission of low absolute pressures (5 PSIA vacuum) is necessary, extraordinary precautions must be taken in application and fill procedures. Consult the factory prior to application.
A Diaphragm Seal is a protective device used to isolate a pressure sensing instrument from the process fluid being monitored. A seal should be used when it is necessary to prevent the process fluid from entering the pressure instrument. Conoflow offers the Life-Gard® and Sano-Gard® Series of diaphragm seals.

**Life-Gard®**

The Life-Gard® Series is the most advanced and complete line of diaphragm seals offered. Configurations include threaded off-line, threaded in-line, flanged off-line, flanged "pancake," flanged in-line and a variety of socket weld, butt weld and saddle welded connections as well as custom designed seals. These seals are available in a wide variety of plastic, steels, stainless steels and exotic wetted materials.

**Sano-Gard®**

Sano-Gard® Sanitary Diaphragm Seals are designed to meet the food, beverage and pharmaceutical industries and other applications requiring sanitary and/or easily cleaned systems. Designs to fit all standard sanitary piping systems are available.

---

**CAUTION**

Avoid these common errors in application & selection of diaphragm seals

1. Diaphragm too small or too "stiff" to allow for thermal expansion of fill fluid, leading to zero shift and false pressure readings.

2. Process/ambient temperature exceed allowable service temperature range of the fill fluid.

3. Very low span in gauge pressure or differential pressure application which does not provide sufficient pressure differential energy to drive the instrument element plus the seal diaphragm and fill liquid column, without encountering unacceptable system errors.

4. Grossly unequal volumes on opposite sides of the differential instruments, leading to unacceptable zero shifting as a result of thermal expansion or contraction.

5. Fill liquid column(s) which develop static head pressure(s) too high relative to instrument span or zero suppression or elevation capability.

6. Capillary line length and fill fluid viscosity combine to drive up system response characteristic to an unacceptable lag time.

7. Vacuum span below 5 PSIA vacuum; necessary consideration not given to diaphragm spring constant and special fill procedures, with resulting lack of response and non-linearity in lower portion of span.

When accurate transmission of low absolute pressures (below 5 PSIA vacuum) is necessary, extraordinary precautions must be taken in application and fill procedures. Consult the factory prior to application.

---

**NOTE**

Diaphragm seals should be used after careful review by the user of the application, to insure that the advantages outweigh the potential disadvantages. Addition of a diaphragm and the sealed fill liquid to the original pressure sensing element can result in a decrease in system performance.
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   Fill Fluid Vapor Pressure Graphs .............................................. 36
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The 300 Series Diaphragm Seals

Performance Data
This series of seal utilizes a diaphragm that is welded to the upper housing. An important feature is that the upper housing can be separated from the lower housing without loss of fill fluid. The construction conforms to methods as described in ASME B20.2-1991 section 2.3. The standard upper housing is classified as Continuous Duty (see para. 2.3.2.1, ASME B40.2-1991).

Consideration should be given to gasket compatibility with process fluids and temperature. Table 300.1 lists applicable safe working temperatures.

Diaphragms with a diameter of 2.4" (60.96mm) are utilized in this series. See Table 300.2 for displacement curves and nominal ratings.

Table 300.3 indicates the volume of fill fluid within the body cavity based on 1/2" (12.70mm) engagement of the fitting in the instrument connection. This data is provided for error calculation attributed to expansion and contraction of fill fluids under varying temperature conditions.

The fitting method for this series is as defined in ASME B40.2 section 2.9.3.1.

Table 300.1 Flat Gaskets

<table>
<thead>
<tr>
<th>Material</th>
<th>Temperature Range</th>
</tr>
</thead>
<tbody>
<tr>
<td>Buna-N</td>
<td>-10 to +300°F (-23 to 149°C)</td>
</tr>
<tr>
<td>Teflon-TFE</td>
<td>0 to +140°F (-17 to 60°C)</td>
</tr>
<tr>
<td>Viton</td>
<td>-30 to +350°F (-34 to 176°C)</td>
</tr>
<tr>
<td>Grafite</td>
<td>-30 to +500°F (-34 to 260°C)</td>
</tr>
<tr>
<td>CGR2750 *1 (Standard)</td>
<td>-60 to +700°F (-51 to 371°C)</td>
</tr>
<tr>
<td>316 SS - Silver Plated *2</td>
<td>-60 to +700°F (-51 to 371°C)</td>
</tr>
<tr>
<td>Hast-C - Silver Plated *2</td>
<td>-60 to +700°F (-51 to 371°C)</td>
</tr>
</tbody>
</table>

Table 300.2

Pressure vs Displacement
2.400" diameter diaphragm

Table 300.3 Internal Volume

<table>
<thead>
<tr>
<th>Instrument Connection</th>
<th>$V_s$ Cubic Inches</th>
</tr>
</thead>
<tbody>
<tr>
<td>1/4&quot; AMINO (300A(3))</td>
<td>0.130</td>
</tr>
<tr>
<td>1/4&quot; AMINO (300B(3))</td>
<td>0.069</td>
</tr>
</tbody>
</table>

*1 CGR2750 is an organic fiber with a Nitrile binder. Standardly supplied unless other material is specified.

*2 These gaskets are offered for seals with pressure ratings of 5000 (34.50 MPa), 10000 (99.00 MPa) and 20000 (138.00 MPa) PSIG.

*3 These units were formerly designated as a Model 824A or 824B Series Diaphragm Seal.
Model 300A

Diaphragm Seals for Threaded Off-Line Process Connections
Standard Pressure Rating with Metal Lower Housings

Process Connection Sizes
1/4" NPT through 1-1/2" NPT

Pressure Ratings
1250, 2500 PSIG (8.63, 17.25 MPa)
(See Note A)

Dimensional Data
Process Connection Size

<table>
<thead>
<tr>
<th>1/8&quot; - 1/4&quot;</th>
<th>3/8&quot; - 1&quot;</th>
<th>1-1/4&quot; - 1-1/2&quot;</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td></td>
<td></td>
</tr>
<tr>
<td>3.5</td>
<td>3.5</td>
<td>3.5</td>
</tr>
<tr>
<td>(69)</td>
<td>(69)</td>
<td>(69)</td>
</tr>
<tr>
<td>B</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1.56</td>
<td>2.00</td>
<td>2.00</td>
</tr>
<tr>
<td>(40)</td>
<td>(51)</td>
<td>(51)</td>
</tr>
</tbody>
</table>

( ) Dimensions in millimeters

Standard Features and Options
This threaded connection, off-line seal has a diaphragm welded to the upper housing. This design allows for the use of diaphragm materials that are of weldable grade. The displacemnt capability of this series of diaphragm seals is 0.05 cubic inch utilizing a 2.4" (60.96) diameter diaphragm.

The standard pressure rating is 2500 PSIG (17.25 MPa) when Stainless Steel bolting is not required (See Note A). The Seal-off and Continuous Duty feature is standard and flushing ports are optional.

Standard instrument connection is 1/4" AminoCo. The 1/4" AminoCo is a straight thread and cone seat style instrument connection that reduces the amount of fill fluid in the body cavity reducing the amount of error caused by thermal expansion and contraction of fill fluid.

Offerings
Lower Materials: All metallic
Upper Materials: Carbon Steel or 316 Stainless Steel
Optional materials are Carpenter 20, Titanium and Monel - Refer to Control Engineering Data for Details.

Diaphragm Materials: All metallic
Bolting: Carbon Steel or 300 Series Stainless Steel (See Note A)

Note A: The use of 300 Series Stainless Steel bolts and nuts will reduce the pressure rating by 50%. When 300 Series Stainless Steel bolts and nuts are required and the maximum pressure rating must be maintained, then stainless steel high-strength bolts and nuts are necessary.
**Model 300A**

**Diaphragm Seals for Threaded Off-Line Process Connections**
**Reduced Pressure Rating for Non-Metallic Lower Housings**

**Process Connection Sizes**
1/4" NPT through 1-1/2" NPT

**Pressure Ratings**
200 PSIG (1.38 MPa) at 140°F (60°C) maximum

**Dimensional Data**

<table>
<thead>
<tr>
<th>Process Connection Size</th>
<th>PVC-Kynar-Polypropylene</th>
</tr>
</thead>
<tbody>
<tr>
<td>1/8&quot; - 1/4&quot;</td>
<td>3/8&quot; - 1&quot;</td>
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<tr>
<td>A</td>
<td>4.00 (102)</td>
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<tr>
<td></td>
<td>4.00 (102)</td>
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<td>B</td>
<td>2.00 (51)</td>
</tr>
<tr>
<td></td>
<td>2.00 (51)</td>
</tr>
<tr>
<td>C</td>
<td>2.00 (51)</td>
</tr>
</tbody>
</table>

( ) Dimensions in millimeters

**TEFLON LOWER HOUSING**

**Standard Features and Options**
This threaded connection, off-line seal has a diaphragm welded to the upper housing. This design allows for the use of diaphragm materials that are welded-grade. The displacement capability of this series of diaphragm seal is 0.05 cubic inches utilizing a 2.4" (60.96 mm) diameter diaphragm.

The standard pressure rating is 200 PSIG (1.38 MPa) with a maximum temperature of 140°F (60°C). Because of the strength of material, flushing ports are available. Teflon glass fill lowers, Teflon carbon filled and Virgin-Teflon will be supplied with a lower metal support plate to distribute bolt load and minimize cold flow. A Seal-off feature is standard.

**TEFLON LOWER HOUSING**

**CONTROL ENGINEERING DATA**

**DIAGRAM SEAL DESIGN**

| G | D1 = 300+ A threaded Off-Line |

**DIAGRAM MATERIALS**

All metallic

**BOLTING**
Carbon Steel or 300 Series Stainless Steel

**Notes:**
1. Standard diaphragm material is Tantalum for seal lower housings manufactured of KN, PV, PP, TC and TG. When customer requires a Carpenter 20, Monel or Titanium diaphragm, refer to Position 10 for proper upper housing material.
2. Teflon is standard for seal with lower housings manufactured KN, PP, PV, TC and TG.
3. When a Monel, Carpenter 20 or Titanium diaphragm is chosen in Position 8, then an equivalent upper housing is required.

**Offerings**

**Lower Materials:** All non-metallic

**Upper Materials:** Carbon Steel or 316 Stainless Steel

Optional materials are Carpenter 20, Titanium and Monel - refer to Control Engineering Data for Details

**Diaphragm Materials:** All metallic

**Bolting:** Carbon Steel or 300 Series Stainless Steel

**Note:** The use of 300 Series Stainless Steel bolts and nuts will not affect the maximum pressure rating.
**Diaphragm Seals for Threaded Off-Line Process Connections**

**Elevated Pressure Rating with Metal Lower Housings**

---

**Model 300A**

---

**Process Connection Sizes**

1/4" NPT through 1-1/2" NPT

**Pressure Ratings**

| 5000 | 10000 | 20000 PSIG (34.50, 69.00, 138.00 MPa) | (See Note A) |

---

**Dimensional Data**

**Process Connection Size**

<table>
<thead>
<tr>
<th>Pressure Rating</th>
<th>1/8&quot; - 1/4&quot;</th>
<th>3/8&quot; - 1&quot;</th>
<th>1-1/4&quot; - 1-1/2&quot;</th>
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</thead>
<tbody>
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<td>4.0</td>
<td>4.0</td>
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<td>2.25</td>
<td>2.25</td>
</tr>
<tr>
<td>10,000 A</td>
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<td>B</td>
<td>2.31</td>
<td>2.31</td>
<td>2.31</td>
</tr>
<tr>
<td>20,000 A</td>
<td>5.0</td>
<td>5.0</td>
<td>- -</td>
</tr>
<tr>
<td>B</td>
<td>2.25</td>
<td>2.25</td>
<td>- -</td>
</tr>
</tbody>
</table>

( ) Dimensions in millimeters

---

**Standard Features and Options**

- This threaded connection, off-line seal has a diaphragm welded to the upper housing. This design allows for the use diaphragm materials that are of weldable grade. The displacement capability of this series of diaphragm seal is 0.05 cubic inches utilizing a 2.4" (60.96 mm) diameter diaphragm.

- Pressure ratings of 5000, 10000, and 20000 PSIG (34.50, 69.00 and 138 MPa) are offered when 300 Series Stainless Steel bolting is not required (See Note A). The Seal-off feature is standard for these pressure ratings. Also available are flushing ports for the 5000 PSIG (34.50 MPa) rating only.

- Standard instrument connection is 1/4" Amino. The 1/4" Amino is a straight thread and cone seat style instrument connection that reduces the amount of fill fluid in the body cavity reducing the amount of error caused by thermal expansion and contraction of fill fluid.

---

**CONTROL ENGINEERING DATA**

**DICS Y 4 H 3 TOS A G N**

**CATALOG NUMBERS AS RECEIVED FOR THE 300A SERIES MUST CONTAIN FIFTEEN (15) CHARACTERS**

---

**Offerings**

**Lower Materials:** All metallic

**Upper Materials:** Carbon Steel or 316 Stainless Steel

Optional materials are Carpenter 20, Titanium and Monel. Refer to Control Engineering Data for details.

**Diaphragm Materials:** All metallic

**Bolting:** Carbon Steel or 300 Series Stainless Steel (See Note A)

---

**Notes:**

1. Standard diaphragm material is 316L Stainless Steel for seal with lower housing manufactured of CS, BS, BS and SL.
2. Standard diaphragm material is Titanium for seal lower housings manufactured of CS, TP and SL. When customer requires a Carpenter 20, Monel or Titanium diaphragm, refer to Position 10 for proper upper housing material.
3. When a Monel, Carpenter 20 or Titanium diaphragm is chosen in Position 8, then an equivalent upper housing material is required.
4. For 5000 PSIG (34.50 MPa) rated seals only.
5. Using Grade 5 bolts and grade 6 nuts will maintain the pressure rating chosen in Option 6.
6. When using 300 Series Stainless Steel bolts and nuts, the pressure rating will be reduced by 50%, refer to Option 5.
7. To maintain the pressure rating chosen in Option 6 when 300 Series Stainless Steel bolts and nuts are required, then high strength bolts and nuts will be necessary.

**Note A:** The use of 300 Series Stainless Steel bolts and nuts will reduce the pressure rating by 50%. When 300 Series Stainless Steel bolts and nuts are required and the maximum pressure rating must be maintained, then stainless steel high-strength bolts and nuts are necessary.
Model 360A Diaphragm Seals for Threaded Off-Line Process Connections
All Welded - Gasketless Design

Process Connection Sizes
1/4" NPT through 1-1/2" NPT

Pressure Ratings
2500 PSIG (17.25 MPa)

Dimensional Data
( ) Dimensions in millimeters

Standard Features and Options
This threaded connection, off-line seal is an all welded, gasketless design. The diaphragm and lower material offerings are 316L Stainless Steel, Hastelloy C-276, and Titanium. The displacement capability of this series of diaphragm seal is 0.05 cubic inches utilizing a 2.4" (60.96mm) diameter diaphragm.

The standard pressure rating is 2500 PSIG (17.25 MPa). The Seal-off feature is standard and flushing ports are optional.

Standard instrument connection is 1/4" Amino. The 1/4" Amino is a straight thread and cone seat style instrument connection that reduces the amount of fill fluid in the body cavity reducing the amount of error caused by thermal expansion and contraction of fill fluid.

Offerings
Lower Materials: 316 Stainless Steel, Hastelloy C, Titanium
Upper Materials: Carbon Steel or 316 Stainless Steel (See Note Below)
Diaphragm Materials: 316 Stainless Steel, Hastelloy C, Titanium
Note: When Titanium diaphragm and lower are required, a Titanium upper housing is standard.

CONTROL ENGINEERING DATA
DJT 4 U 4 E T 0 N

(11) FILL LIQUID
N = (Standard)

(10) FLUSH CONNECTION
0 = None (Standard)
1 = 1/8" NPT
2 = 1/4" NPT
3 = 1/4" NPT-DUAL

(9) UPPER HOUSING MATERIAL
C = Carbon Steel (Standard)
S = 316 Stainless Steel
T = Titanium (See Note 2)

(8) SEAL DIAPHRAGM MATERIAL
D = Hastelloy C-276
J = 316L Stainless Steel
E = Titanium (See Notes 1 and 2)

(7) SEAL INSTRUMENT CONNECTION
4 = 1/4" AMINCO with bleed

(6) THREADED PRESSURE RATING
U = 2500 PSIG (17.25 MPa)

(5) SEAL PROCESS CONNECTION
2 = 1/4" NPT
3 = 3/8" NPT
4 = 1/2" NPT
5 = 3/4" NPT
6 = 1" NPT
7 = 1-1/4" NPT
8 = 1-1/2" NPT

(3-4) LOWER HOUSING MATERIAL (WETTED)
HC = Hastelloy C-276
S6 = 316 Stainless Steel
TI = Titanium-Grade 4

(1-2) DIAPHRAGM SEAL DESIGN
DJ = 360A- Threaded Off-Line (All Welded - Gasketless Design)

Notes:
1. When a Titanium diaphragm is required, refer to Position 9 for proper upper housing material.
2. When a Titanium diaphragm is chosen in Position 9, then a Titanium upper housing is standard.
Process Connection Sizes
1/4" NPT through 1" NPT

Pressure Ratings
1250, 2500 PSIG (8.62, 17.25 MPa)
(See Note A)

Dimensional Data
Process Connection Size

<table>
<thead>
<tr>
<th></th>
<th>1/4&quot;</th>
<th>1/2&quot;</th>
<th>3/4&quot;*</th>
<th>1&quot;*</th>
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<tbody>
<tr>
<td></td>
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</tr>
<tr>
<td>J</td>
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<td>(54)</td>
<td>(60)</td>
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</tr>
<tr>
<td>K</td>
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<td>(71)</td>
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<td>L</td>
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<td>(89)</td>
<td>(89)</td>
<td>(89)</td>
<td>(89)</td>
</tr>
</tbody>
</table>

( ) Dimensions in millimeters

Standard Features and Options
This threaded connection, in-line seal has a
diaphragm welded to the upper housing.
Recommended for applications that require a
continuous flow of process across the
diaphragm to ensure that pressure sensing is
not inhibited by solids buildup. This design
allows for use of diaphragm materials that are
of a weldable grade. The displacement
capability of this series of diaphragm seal is
0.05 cubic inches utilizing a 2.4"(60.96mm)
diameter diaphragm. The upper housing can be
removed from the lower housing for inspection,
or cleaning of the diaphragm without loss of fill
fluid.

The standard pressure rating is 2500 PSIG
(17.25 MPa) when Stainless Steel bolting is not
required (See Note A). The Seal-off feature is
standard. A model 300J3 upper only assembly
can be purchased to fit existing lower
threads in line.

Offers
Lower Materials: All metallic
Upper Materials: Carbon Steel or 316
Stainless Steel
Optional Materials are Carpenter 20,
Titanium and Monel - Refer to Control
Engineering Data for details.

Diaphragm Materials: All metallic
Bolting: Carbon Steel or 300 Series Stainless
Steel (See Note A)

Note A: The use of 300 Series Stainless Steel
bolts and nuts will reduce the pressure rating
by 50%. When 300 Series Stainless Steel bolts
and nuts are required and the maximum
pressure rating must be maintained, then
stainless steel high strength bolts and nuts are
necessary.

CONTROL ENGINEERING DATA

<table>
<thead>
<tr>
<th></th>
<th>D2N2 6 U 2 N S C 0 C 0 N</th>
<th>(15) FILL LIQUID</th>
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</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>N = (Standard)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>(14) Plating</td>
</tr>
<tr>
<td></td>
<td></td>
<td>0 = None (Standard)</td>
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<tr>
<td></td>
<td></td>
<td>G = Gold Plating Diaphragm Only</td>
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<tr>
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<td>(13) TEFLON COATINGS</td>
</tr>
<tr>
<td></td>
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<td>R = Corrosion-Resistant Teflon Coated Diaphragm Only</td>
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<td>(12) BOLTING</td>
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<td>C = Carbon Steel, Grade 5 (See Note 6)</td>
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<td>S = 300 Series Stainless Steel (See Note 6)</td>
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<td>H = 300 Series Stainless Steel HI-Strength (See Note 7)</td>
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<td>(11) FUTURE OPTIONS</td>
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<td></td>
<td>C = Carbon Steel (Standard)</td>
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<td></td>
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<td>M = Monel (See Note 4)</td>
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<td>T = Carpenter 20 (See Note 5)</td>
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<td>T = Titanium (See Note 5)</td>
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<td>(9) SEAL GASKET MATERIAL</td>
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<td></td>
<td></td>
<td>B = Buna &quot;N&quot;</td>
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<td>G = Grafoil</td>
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<td></td>
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<td>T = Teflon (See note 3)</td>
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<td>(7) SEAL INSTRUMENTATION CONNECTION</td>
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<td>(6) THREADED PRESSURE RATING</td>
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<td>0 = 1250 PSIG (8.62 MPa) (See Note 6)</td>
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<td>U = 2500 PSIG (17.25 MPa)</td>
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<td>(5) SEAL PROCESS CONNECTION</td>
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<td></td>
<td></td>
<td>2 = 1/4&quot; NPT</td>
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<td></td>
<td>4 = 1/2&quot; NPT</td>
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<td>5 = 3/4&quot; NPT</td>
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<td>6 = 1&quot; NPT</td>
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<td>(4-4) LOWER HOUSING MATERIAL (WETTED)</td>
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<td></td>
<td></td>
<td>TI = Titanium Grade 4</td>
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<td>TP = Tantulon Plate (Wetted Surfaces Only)</td>
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<td>(For coding of upper housing only, refer to 300J3 Series Seal, Page 40)</td>
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CATALOG NUMBERS AS RECEIVED
FOR THE 300AM SERIES MUST CONTAIN FIFTEEN (15) CHARACTERS

Notes:
1. Standard diaphragm material is 316L Stainless Steel for seal
   with lower housing manufactured of SS, B4, B6, SF and SL.
2. Standard diaphragm material is tantalum for seal lower
   housings manufactured of C2, T4 and T1. When customer
   requires a Carpenter 20, Monel or Titanium diaphragm, refer
to Position 10 for proper upper housing material.
3. Teflon is standard for seal with lower housings manufactured
   of C2, T4 and T1.
4. When a Monel, Carpenter 20 or Titanium diaphragm is
   chosen in Position 8, then an equivalent upper housing is
   required.
5. Using Grade 5 bolts and grade 8 nuts will maintain the
   pressure rating chosen in Option 6.
6. When using 300 Series Stainless Steel bolts and nuts, the
   pressure rating will be reduced by 50%, refer to Option 6.
7. To maintain the pressure rating chosen in Option 6 when
   300 Series Stainless Steel bolts and nuts are required, then
   high strength bolts and nuts will be necessary.
Model 300B
Diaphragm Seals for Flanged Off-Line Process Connections
1" (25.40mm) and Larger

Process Connection Sizes
1" through 3"
ANSI Flange Ratings Up to 2500# (17.25 MPa)
Pressure Ratings
Conforms to Flange Ratings per ANSI B16.5
Flange Faces
Raised Face, Flat Face, Ring Type Joint, and Special Flange Faces are available, Consult the Factory

Dimensional Data
Process Connection Size

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</table>

(1) Dimensions in millimeters

Standard Features and Options
This flanged connection, off-line seal is a diaphragm welded to the upper housing. This design allows for the use diaphragm materials that are of a weldable grade. The displacement capacity of the series of diaphragm seal is 0.03 cubic inches utilizing a 2.4" (60.96mm) diameter diaphragm.

These seals are designed for direct connection to standard ANSI flanges in 1" through 3" sizes and up to 2500# ratings. Larger sizes are available upon request.

Due to the material strength of non-metals, the maximum pressure and temperature rating for this series seal is 200PSIG (1.38 MPa) at 140 degrees F (60 degrees C). However, for non-metallic lower is required (see Note 1 below). Flushing connections in metallic lower is optional. The seal-off features are standard.

Standard instrument connection is 1/4" Amino. The 1/4" Amino is a straight threaded cone seat style instrument connection that reduces the amount of fill fluid in the body cavity reducing the amount of error caused by thermal expansion and contraction of fill fluid.

Offerings
Lower Materials: All metallic and non-metallic (see Note 1)
Upper Materials: Carbon Steel or 316 Stainless Steel
Optional materials are Carback, 20, and Monel - Refer to Control Engineering Data for Details.

Sealhead Material: All metallic

Note 1: Non-metallic lower is not available for #1 through 3" sizes. The maximum pressure and temperature rating for non-metallic lower is 200PSIG (1.38 MPa) and 140 degrees F (60 degrees C), regardless of the rating flange size.

CONTROL ENGINEERING DATA

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<td>A</td>
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<td>Corrosion-Resistant Teflon Coated Diaphragm Only</td>
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<tr>
<td>B</td>
<td>Anti-Stick Teflon Coated Diaphragm and Lower Housing</td>
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<td>C</td>
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<td>M</td>
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<td>Carpenter 20 (See Notes 2 and 6)</td>
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<td>B</td>
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<tr>
<td>C</td>
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<td>Hastelloy C - Silver Plated (See Note 5)</td>
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<td>CRG2750 (See Note 3)</td>
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<td>Titanium Grade 4 (See Notes 2 and 6)</td>
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<td>(7) SEAL INSTRUMENT CONNECTION</td>
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<td>4</td>
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<td>(6) FLANGED PRESSURE RATING</td>
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<tr>
<td>1</td>
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<tr>
<td>2</td>
<td>300PSIG (2.07 MPa)</td>
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<td>3</td>
<td>600PSIG (6.14 MPa)</td>
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<tr>
<td>4</td>
<td>900PSIG (6.21 MPa)</td>
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<td>2500PSIG (17.25 MPa)</td>
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Notes:
1. Standard diaphragm material is 316L Stainless Steel for seals with lower housing manufactured of CS, S4, S6, SL, and SF.
2. Standard diaphragm material is Tantalum for seals with lower housing manufactured of C2, T1, PV, TC, PP, KN, TP and TT.
3. CRG2750 Gaskets are standard for all seal rated to 300# (2.07 MPa).
4. Standard gasket material for seals with lower housing manufactured of non-metallic material is Teflon.
5. 316 Stainless Steel and Hastelloy - Silver Plated gaskets are offered for seals with ratings 600# (4.14 MPa) and higher.
6. When a Monel, Carpenter 20 or Tantalum diaphragm is chosen in Position 6, then an equivalent upper housing is required.
7. Filling connections are not available with lower housing manufactured of a non-metallic material.
Model 300B
Diaphragm Seals for Flanged Off-Line Process Connections
Less than 1" (25.40mm)

Process Connection Sizes
1/2" and 3/4"

ANSI Flange Ratings Up to 2500# (17.25 MPa)

Pressure Ratings
Conforms to Flange Ratings per ANSI B16.5

Flange Faces
Raised Face, Flat Face, Ring Type Joint and Special Flange Faces are available, Consult the Factory

Dimensional Data

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<th>1/2&quot;</th>
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<tr>
<td>H</td>
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<td>1.69</td>
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Dimensions in millimeters

METALLIC LOWER HOUSING

NOT-METALLIC LOWER HOUSING

Standard Features and Options
This flanged connection, off-line seal has a diaphragm welded to the upper housing. This design allows for the use of diaphragm materials that are not a weldable grade. The displacement capability of this series of diaphragm seals is 0.05 cubic inches utilizing a 1.84 (60.96mm) diameter diaphragm.

These seals are designed for direct connection to standard ANSI flanges in 1/2" (12.7mm) and 3/4" (19.05mm) sizes and up to 2500# (17.25 MPa) ratings. The upper housing is bolted to the lower housing with sufficient load to maintain ANSI B16.5 pressure and temperature ratings (See Note 6). Because of the bolt circle location, as defined by ANSI B16.5, threaded flange studs are provided.

Due to the material strength of non-metallics, the maximum pressure and temperature rating for this series seal is 200 PSIG (1.36 MPa) at 140°F (60°C), when non-metallic lowers are required. Flushing connections in metallic lowers are optional.

The seal-off feature is standard.

A standard instrument connection is 1/4" Aminco. The 1/4" Aminco is a straight thread and core seal type instrument connection that reduces the amount of fill fluid in the body cavity reducing the amount of error caused by thermal expansion and contraction of fill fluid.

Offerings

Lower Materials: All metallic and non-metallic (See Note B below)

Upper Materials: Carbon Steel or 316 Stainless Steel Optional materials are Carpenter 20, Titanium and Monel - Refer to Control Engineering Data for Details.

Diaphragm Materials: All metallic

Bolting: Carbon Steel or 300 Series Stainless Steel (See Note A)

Notes: A. Flange ratings 600# (4.14 MPa) and higher will be supplied with high-strength stainless steel bolting to maintain X5 pressure rating when 300 Series Stainless Steel bolting is required.

B. Non-metallic lower housings are not available for flange ratings greater than 2000# (2.27 MPa). The maximum temperature and pressure rating for non-metallic lowers is 200 PSIG (1.36 MPa) and 140°F (60°C), regardless of the mating flange size.

CONTROL ENGINEERING DATA

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(15) FILL LIQUID
N = (Standard)

(14) FLATING OPTION
0 = None (Standard)
A = Anti-Stick Teflon Coated Diaphragm Only
R = Corrosion-Resistant Teflon Coated Diaphragm Only
B = Anti-Stick Teflon Diaphragm Housing
C = Corrosion-Resistant Teflon Coated Diaphragm and Lower Housing

(12) BOLTING
0 = None
C = Carbon Steel - Grade 5 (See Note 6)
S = 300 Series Stainless Steel (See Note 9)
H = 300 Series Stainless Steel Hi-Strength (See Note 10)

(11) FLUSH CONNECTION
0 = None
1 = 1/4" NPT
2 = 1/4" NPT
3 = 1/4" NPT-DUAL
4 = 1/4" AMINCO with bleed

(9) SEAL GASKET MATERIAL
A = None
B = Teflon (See Note 4)
C = 316 Stainless Steel - Silver Plated (See Note 5)
D = Monel 400 (See Note 6)
E = Nickel 200
F = 316L Stainless Steel (See Note 1)
G = Gracoil
H = Hastelloy C - Silver Plated (See Note 5)
I = Inconel 600
J = Monel 400 (See Note 6)
K = 316L Stainless Steel (See Note 1)
L = Titanium (See Note 2)
M = Titanium Grade 4 (See Note 3)

(8) SEAL INSTRUMENT CONNECTION
4 = 1/4" AMINCO with bleed

(6) FLANGED PRESSURE RATING

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<td>9</td>
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NOT-METALLIC LOWER HOUSING

Notes:
1. Standard diaphragm material is 316L Stainless Steel for seals with lower housing manufactured of CS, S4, S6, St, and SF.
2. Standard diaphragm material is Tantalum for seals with lower housing manufactured of CS, TI, TC, TO, P9, PN, TP and TG.
3. CGR750 Gaskets are standard for all seal rated to 300# (2.07 MPa).
4. Standard gasket material for seals with lower housing manufactured of non-metallic material is Teflon.
5. 316 Stainless Steel and Hastelloy - Silver Plated gaskets are offered for seals with ratings 600# (4.14 MPa) and higher.
6. When a Monel, Carpenter 20 or Titanium diaphragm is chosen in Position 8, then an equivalent upper housing is required.

7. Flushing connections are not available with lower housings manufactured of a non-metallic material.
8. Using grade 5 bolts will maintain the pressure rating chosen in Position 6.
9. When using 300 Series Stainless Steel bolts, the pressure rating will be reduced by 50% when the flange rating is 600# (4.14 MPa) and lower.
10. To maintain the pressure rating chosen in Position 6 when 300 Series Stainless Steel bolts are required, then high-strength stainless steel bolts will be necessary.

Flange ratings 600# (4.14 MPa) and higher will be supplied with high-strength stainless steel bolting to maintain ANSI pressure rating when 300 Series Stainless Steel bolts are required.
Model 360B
Diaphragm Seals for Flanged Off-Line Process Connections
All Welded - Gasketless Design
1" (25.40mm) and 1 1/2" (38.10mm)

Process Connection Sizes
1" and 1-1/2"
ANSI Flange Ratings Up to 600# (4.14 MPa)
Pressure Ratings
Conforms to Flange Ratings per ANSI B16.5
Flange Faces
Raised Face, Non-Serrated, 125-250 RMS

Dimensional Data
Process Connection Size

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( ) Dimensions in millimeters

CONTROL ENGINEERING DATA

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<td>(10) FLUSH CONNECTION</td>
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<td>2 = 1/4&quot; NPT</td>
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<td>3 = 1/4&quot; NPT - DUAL</td>
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<td>(9) UPPER HOUSING MATERIAL</td>
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<td>C = Carbon Steel (Standard)</td>
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<td>S = 316 Stainless Steel</td>
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<td>T = Titanium (See Notes 1 and 2)</td>
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<td>(8) SEAL DIAPHRAGM MATERIAL (See Note 1)</td>
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<td>D = Hastelloy C-276</td>
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<td>J = 316L Stainless Steel</td>
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<td>E = Titanium</td>
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<td>(7) SEAL INSTRUMENT CONNECTION</td>
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<td>(6) FLANGED PRESSURE RATING</td>
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<td>TI = Titanium-Grade 4</td>
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<td>DK = 360B - Flanged Off-Line (All Welded - Gasketless Design)</td>
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CATALOG NUMBERS AS RECEIVED FOR THE 360B SERIES MUST CONTAIN ELEVEN (11) CHARACTERS

Notes:
1. When a Titanium diaphragm is required, refer to Position 9 for proper upper housing material.
2. When a Titanium diaphragm is chosen in Position 9, then a Titanium upper housing is standard. The non-wetted flange will be 316 Stainless Steel.

Standard Features and Options
This flanged connection, off-line seal is an all welded, gasketless design. The raised face finish is supplied as a non-serrated surface to accommodate the use of spiral wound gaskets.

The diaphragm and lower material offerings are 316 Stainless Steel, Hastelloy C-276 and Titanium. The displacement capability of this series of diaphragm seal is 0.05 cubic inches utilizing a 2.4" (60.95mm) diameter diaphragm.

These seals are designed for direct connection to standard ANSI flanges in 1" (25.40mm) and 1-1/2" (38.10mm) sizes and up to 600# (4.14 MPa) ratings. A flushing connection is optional and the seal-off feature is standard.

Standard instrument connection is 1/4" Aminco. The 1/4" Aminco is a straight thread and core seat style instrument connection that reduces the amount of fill fluid in the body cavity reducing the amount of error caused by thermal expansion and contraction of fill fluid.

Offerings
Lower Materials: 316 Stainless Steel, Hastelloy C and Titanium
Upper Materials: Carbon Steel or 316 Stainless Steel (See Note Below)
(Optional material is Titanium. Refer to Control Engineering Data and Note below for details),
Diaphragm Materials: 316L Stainless Steel, Hastelloy C and Titanium
Note: When Titanium diaphragm and lowers are required, a Titanium upper housing is standard. A 316 Stainless Steel flange (non-wetted) will be supplied.
Process Connection Sizes
1-1/2" through 8"
ANSI Flange Ratings

Pressure Ratings
Conforms to Flange Ratings per ANSI B16.5

Flange Faces
Raised Face
Flat Face
Ring Type Joint

Standard Features and Options

The 300BX Series are custom designed seals with a diaphragm welded on the end of an extension. This extension permits the diaphragm to be located at a point in the process pipe or vessel where the fluid remains liquid. This design allows for the use of diaphragm materials that are of weldable grade. The displacement capability of this seal is determined by the diaphragm that will fit into the process pipe. These seals are designed for direct connection to standard ANSI flanges in 1-1/2" (38.20mm) through 8" (203.20mm) sizes and up to 2500 #17.25 MPa) ratings. The seal-off feature is standard.

Offerings

Lower Materials: All metallic (See Note 1)
Upper Materials: 316 Stainless Steel
Diaphragm Materials: All metallic

Note 4: Non-metallic lower housings are not available for this series. The non-wetted portion is not available in carbon steel. The raised face portion is considered a wetted area.

Diaphragm Seals With a 2.4" Diameter

Diameter Diaphragm or Larger

Diaphragm Seals With a 1.9" Diameter

Diaphragm or Smaller

Typical Diaphragm Seal Design With a Ring
Type Joint Flange
### Physical Dimension

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<th>Flange Diameter</th>
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<th>&quot;E&quot;</th>
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<th>Extension Diameter(4)</th>
<th>Diaphragm Diameter</th>
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<td>2&quot; 3&quot; 4&quot; 6&quot;</td>
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</table>

### Notes:
1. Other wetted materials available, consult the factory. Carbon steel wetted materials are not offered in this design.
2. Standard extension lengths are listed. Any specified length can be provided.
3. Other flange ratings available upon request.
4. Non-standard extension diameters available upon request.
Control Engineering Data

Catalog Numbers as Received for the 300J3 Series Must Contain Fifteen (15) Characters

Standard Features and Options
This saddle weld connection seal has a diaphragm welded to the upper housing. This design allows for the use of diaphragm materials that are of weldable grade. The displacement capability of this series of diaphragm seal is 0.05 cubic inches. Recommended for applications that require a continuous flow of process across the diaphragm to ensure that pressure sensing is not inhibited by solids buildup. Having the diaphragm welded to the upper housing permits removal of the lower housing for welding of lower, inspection, or clearing of the diaphragm without loss of fill fluid.

The upper housing is bolted to the lower housing with sufficient load to maintain ANSI B36.10 pressure and temperature ratings (See Note A).

The seal-off feature is standard. Available with a standard six hole or optional eight hole bolt pattern. An upper only assembly can be purchased to fit lower welded in line.

Offerings
Lower Materials: All metallic
Upper Materials: Carbon Steel or 316 Stainless Steel.

Optional materials are Carpenter 20, Titanium and Monel. Refer to Control Engineering Data for details.

Diaphragm Materials: All metallic
Bolting: Carbon Steel or 300 Series Stainless Steel (See Note A)

Note A: Pipe schedules greater than 40 will be supplied with high-strength stainless steel bolting to maintain ANSI pressure rating when stainless steel bolts are required.
Model 300J4
Diaphragm Seals for Saddle Weld Process Connections
Standard Pressure Rating with Metal Lower Housings

Process Connection Sizes
4" and larger
All Pipe Schedules

Pressure Ratings
Conforms to Pipe Schedule Ratings per ANSI B36.10

Dimensional Data

( ) Dimensions in millimeters

Standard Features and Options
This saddle weld connection seal has a diaphragm welded to the upper housing. This design allows for the use of diaphragm materials that are of weldable grade. The displacement capability of this series of diaphragm seal is 0.06 cubic inches. Recommended for applications that require a continuous flow of process across the diaphragm to assure that pressure sensing is not inhibited by solids buildup. Having the diaphragm welded to the upper housing permits removal of the lower housing for welding of lower, inspection, or cleaning of the diaphragm without loss of fill fluid.

The upper housing is bolted to the lower housing with sufficient load to maintain ANSI B36.10 pressure and temperature ratings (See Note A). The Seal-off feature is standard. Available with a standard six hole or optional eight hole bolt pattern. An upper only assembly can be purchased to fit lower weld-in line.

Offerings
Lower Materials: All metallic
Upper Materials: Carbon Steel or 316 Stainless Steel.
Optional materials are Carpenter 20, Titanium and Monel. Refer to Control Engineering Data for details.

Diaphragm Materials: All metallic
Bolting: Carbon Steel or 300 Series Stainless Steel (See Note A)

Note A: Pipe schedules greater than 40 will be supplied with high-strength stainless steel bolting to maintain ANSI pressure rating when stainless steel bolts are required.

CONTROL ENGINEERING DATA

DA = DAN2C J I ETHOCA 0 N

(1) FILL LIQUID
N = (Standard)

(14) PLATING OPTION
G = None (Standard)
G = Gold Plating of Diaphragm Only

(13) TEFLOM COATINGS
C = None (Standard)
A = Anti-Stack Teflon Coated Diaphragm Only
R = Corrosion-Resistant Teflon Coated Diaphragm Only

(12) BOLTING
D = None
C = Carbon Steel - Grade 5 (See Note 4)
S = 200 Series Stainless Steel (See Note 5)
H = 300 Series Stainless Steel (Hi-strength) (See Note 6)

(11) FUTURE OPTIONS
G = Not Applicable

(19) UPPER HOUSING MATERIAL
G = Carbon Steel (Standard)
S = 316 Stainless Steel
M = Monel (See Note 7)
Z = Carpenter 20 (See Notes 2 and 7)
T = Titanium (See Note 7)
A = Carbon Steel (6 bolt M and G pattern)
B = 316 Stainless Steel (6 bolt M and G pattern)
E = Monel (6 bolt M and G pattern) (See Note 7)
F = Carpenter 20 (6 bolt M and G pattern) (See Notes 2 and 7)
H = Titanium (6 bolt M and G pattern) (See Note 7)
J = Carbon Steel (8 bolt M and G pattern)
K = 316 Stainless Steel (8 bolt M and G pattern)
L = Monel (8 bolt M and G pattern) (See Note 7)
P = Carpenter 20 (8 bolt M and G pattern) (See Notes 2 and 7)
N = Titanium (8 bolt M and G pattern) (See Note 7)

(9) SEAL GASKET MATERIAL
G = None
B = Buna N
G = Grafoil
T = Teflon (See Note 3)
V = Viton
S = CS95750 (Standard)

(8) SEAL DIAPHRAGM MATERIAL
C = Carpenter 20 C8-3 (See Note 7)
H = Hastelloy B-2
D = Hastelloy C-276
I = Inconel 600
M = Monel 400 (See Note 7)
N = Nickel 200
J = 316L Stainless Steel (See Note 1)
T = Tantalum (See Note 2)
E = Titanium Grade 4 (See Note 7)

(7) SEAL INSTRUMENT CONNECTION

4 = 1/4" Amino

(6) PIPE SCHEDULE RATING
H = Schedule 5
I = Schedule 10
J = Schedule 40 (Standard)
K = Schedule 80
L = Schedule 160

(5) SEAL PROCESS CONNECTION
G = 4"

(4) LOWER HOUSING MATERIAL (WETTED)
C2 = Carpenter 20 C8-3
CS = Carbon Steel
HB = Hastelloy B-2
HO = Hastelloy C-276
I6 = Inconel 600
M4 = Monel 400
N2 = Nickel 200
S4 = 304 Stainless Steel
S6 = 316 Stainless Steel
SF = 304L Stainless Steel
SL = 316L Stainless Steel
TI = Titanium - Grade 4
GD = NO Lower Housing (Upper Housing Only)

1-9) DIAPHRAGM SEAL DESIGN
DA = 300J4 Saddle Welded In-Line

Notes:
1. Standard diaphragm material is 316L Stainless Steel for seats with lower housing manufactured of CS, S4, S6, SL and SF.
2. Standard diaphragm material is Tantalum for seats with lower housing manufactured of C2 and TI.
3. Teflon gaskets are standard for seats with lower housings manufactured of C2 and TI.
4. Using Grade 6 bolts will maintain the pipe schedule chosen in Position 6.
5. When using 300 Series Stainless Steel bolts, the maximum pressure rating will be reduced by 50% when the pipe schedule is greater than 40.
6. Pipe schedules greater than 40 will be supplied with high-strength stainless steel bolting to maintain ANSI pressure rating when stainless steel bolts are required.
7. When a Monel, Carpenter 20 or Titanium diaphragm is chosen in Position 8, then an equivalent upper housing material must be selected.
CONTROL ENGINEERING DATA

(15) FILL LIQUID
N = Standard
(14) PLATING OPTION
G = None (Standard)
Q = Gold Plating of Diaphragm Only
(13) TEFRON COATINGS
D = None (Standard)
R = Corrosion-Resistant Teflon Coated Diaphragm Only.
(12) BOLTING
0 = None
C = Carbon Steel - Grade 5 (See Note 4)
S = 300 Series Stainless Steel (See Note 5)
H = 300 Series Stainless Steel Hi-strength (See Note 6)
(11) FUTURE OPTIONS
0 = Not Applicable
(10) UPPER HOUSING MATERIAL
C = Carbon Steel (Standard)
S = 316 Stainless Steel
M = Monel (See Note 7)
(9) SEAL GASKET MATERIAL
G = None
B = Buna N
T = Teflon (See Note 3)
V = Viton
S = CFF2759 (Standard)
(8) SEAL DIAPHRAGM MATERIAL
C = Carpenter 20 C8-3 (See Notes 2 and 7)
H = Hastelloy B-2
D = Hastelloy C-276
I = Inconel 600
M = Monel 400 (See Note 7)
N = Nickel 200
J = 316L Stainless Steel (See Note 1)
T = Titanium (See Note 2)
E = Titanium Grade 4 (See Notes 2 and 7)
(7) SEAL INSTRUMENT CONNECTION
(6) PIPE SCHEDULE RATING
H = Schedule 5
I = Schedule 10
J = Schedule 40
K = Schedule 80
L = Schedule 160
(5) SEAL PROCESS CONNECTION
2 = 1/4" 
4 = 1/2" 
5 = 3/4" 
6 = 1"
(3) LOWER HOUSING MATERIAL (WETTED)
C2 = Carpenter 20 C8-3 
C3 = Carbon Steel 
H8 = Hastelloy B-2 
H = Hastelloy C-276 
I6 = Inconel 600 
M4 = Monel 400 
N2 = Nickel 200 
S4 = 304 Stainless Steel 
S6 = 316 Stainless Steel 
S = 304L Stainless Steel 
SL = 316L Stainless Steel 
T1 = Titanium - Grade 4
(1-2) DIAPHRAGM SEAL DESIGN
DC = 300L - Butt Welded In-Line
(For coding of upper housing only, refer to 300J3 Series Seal, Page 40.)

CATALOG NUMBERS AS RECEIVED
FOR THE 300L SERIES MUST CONTAIN
FIFTEEN (15) CHARACTERS

Notes:
1. Standard diaphragm material is 316L Stainless Steel for seals with lower housing manufactured of CS, S4, S6, SL and SF.
2. Standard diaphragm material is Tantalum for seals with lower housing manufactured of C2 and T1.
3. Teflon gaskets are standard for seals with lower housing manufactured of C2 and T1.
4. Using Grade 5 bolts will maintain the pipe schedule rating chosen in Position 6.
5. When using 300 Series Stainless Steel bolts, the maximum pressure rating will be reduced by 50% when the pipe schedule is greater than 40.
6. Pipe schedules greater than 40 will be supplied with high-strength stainless steel bolting to maintain ANSI pressure rating when stainless steel bolts are required.
7. When a Monel, Carpenter 20 or Titanium diaphragm is chosen in Position 6, an equivalent upper housing is required.

Standard Features and Options
This butt weld connection, in-line seal utilizes a diaphragm that is welded to the upper housing. This design allows for the use of diaphragm materials that are of a weldable grade. The displacement capability of this series of diaphragm seal is 0.05 cubic inches utilizing a 2.4" (60.96mm) diaphragm. Recommended for applications that require a continuous flow of process across the diaphragm to insure that pressure sensing is not inhibited by solids buildup. The upper housing can be removed from the lower housing for welding of lower, inspection, or cleaning of the diaphragm without loss of fill fluid.

The upper housing is bolted to the lower housing with sufficient load to maintain ANSI B36.10 pressure and temperature ratings (See Note A). The seal-off feature is standard. A model 300J3 upper only assembly can be purchased to fit existing lower units welded in line.

Offerings
Lower Materials: All metallic
Upper Materials: Carbon Steel or 316 Stainless Steel
Optional materials are Carpenter 20, Titanium and Monel - Refer to Control Engineering Data for Details.

Diaphragm Materials: All metallic
Bolting: Carbon Steel or 300 Series Stainless Steel (See Note A)

Note A: Pipe schedules greater than 40 will be supplied with high-strength stainless steel bolting to maintain ANSI pressure rating when stainless steel bolts are required.
Model 300M

Diaphragm Seals for Socket Welded In-Line Process Connections
Standard Pressure Rating with Metal Lower Housings

Process Connection Sizes
1/4" through 1"
All Pipe Schedules

Pressure Ratings
Conforms to Pipe Schedule Ratings per ANSI B36.10

Dimensional Data

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<td>(89)</td>
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(1) Dimensions in millimeters

Standard Features and Options
This socket weld connection, in-line seal utilizes a diaphragm that is welded to the upper housing. This design allows for the use of diaphragm materials that are of a weldable grade. The displacement capability of this series of diaphragm seal is 0.05 cubic inches utilizing a 2.4" (60.95mm) diaphragm. Recommended for applications that require a continuous flow of process across the diaphragm to insure that pressure sensing is not inhibited by solids buildup. The upper housing can be removed from the lower housing for welding of lower inspection, or cleaning of the diaphragm without loss of fill fluid.

The upper housing is bolted to the lower housing with sufficient load to maintain ANSI B36.10 pressure and temperature ratings (See Note A).

The seal-off feature is standard. A model 300J3 upper only assembly can be purchased to fit existing lower welded in-line.

Offerings
Lower Materials: All metallic
Upper Materials: Carbon Steel or 316 Stainless Steel

Optional materials are Carpenter 20, Titanium and Monel - Refer to Control Engineering Data for Details.

Diaphragm Materials: All metallic
Butting: Carbon Steel or 300 Series Stainless Steel (See Note A)

Note A: Pipe schedules greater than 40 will be supplied with high-strength stainless bolting to maintain ANSI pressure rating when stainless steel bolts are required.

CONTROL ENGINEERING DATA

CATALOG NUMBERS AS RECEIVED
FOR THE 300M SERIES MUST CONTAIN FIFTEEN (15) CHARACTERS

Notes:
1. Standard diaphragm material is 316L Stainless Steel for seals with lower housing manufactured of CS, S4, S8, SI, and SF.
2. Standard diaphragm material is Titanium for seals with lower housing manufactured of CS and TI.
3. Teflon gaskets are standard for seals with lower housing manufactured of C2 and TI.
4. When a Monel, Carpenter 20 or Titanium diaphragm is chosen in Position 8, then an equivalent upper housing is required.
5. Using Grade 5 bolts will maintain the pipe schedule rating chosen in Position 6.
6. When using 303 Series Stainless Steel bolts, the maximum pressure rating will be reduced by 5% when the pipe schedule is greater than 40.
7. Pipe schedules greater than 40 will be supplied with high-strength stainless steel bolting to maintain ANSI pressure rating when stainless steel bolts are required.
**Model 300N**

**Diaphragm Seals for Flanged In-Line Process Connections**

**Standard Pressure Rating with Metal Lower Housings**

### Process Connection Sizes

*1" through 3"

All Pipe Schedules and Flange Ratings

**Pressure Ratings**

Conforms to Pipe Schedule and Flange Ratings per ANSI B36.10 and ANSI B16.5

### Dimensional Data

**Process Connection Size**

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(1) Dimensions in millimeters

---

**CONTROL ENGINEERING DATA**

**DFHC9 N Z J B C O R A N**

(15) **FILL LIQUID**

N = (Standard)

(14) **PLATING OPTION**

G = None (Standard)

G = Gold Plating of Diaphragm Only

(13) **TEFLON COATINGS**

A = Anti-Stick Teflon Coated Diaphragm Only

R = Corrosion-Resistant Teflon Coated Diaphragm Only

(12) **BOLTING**

D = None

C = Carbon Steel - Grade 5 (See Note 5)

S = 300 Series Stainless Steel (See Note 6)

H = 300 Series Stainless Steel Hi-strength (See Note 7)

(11) **FUTURE OPTIONS**

0 = Not Applicable

(10) **UPPER HOUSING MATERIAL**

C = Carbon Steel (Standard)

S = 316 Stainless Steel

M = Monel (See Note 4)

2 = Carpenter 20 (See Notes 2 and 4)

T = Titanium (See Notes 2 and 4)

(9) **SEAL GASKET MATERIAL**

0 = None

B = Buna N

G = Gneitoll

T = Teflon (See Note 3)

S = CR2750 (Standard)

(8) **SEAL DIAPHRAGM MATERIAL**

C = Carpenter 20 CB-3 (See Notes 2 and 4)

H = Hastelloy 62B

D = Hastelloy C-276

I = Inconel 600

M = Monel 400 (See Note 4)

N = Nickel 200

J = 316L. Stainless Steel (See Note 1)

T = Titanum (See Note 2)

E = Titanium Grade 4 (See Notes 2 and 4)

(7) **SEAL INSTRUMENT CONNECTION**

4 = 1/4" Aminico

(6) **FLANGE/PIPE SCHEDULE**

M = 150# (1.03 MPa) Schedule 5

P = 150# (1.03 MPa) Schedule 40

S = 300# (4.14 MPa) Schedule 80

(5) **SEAL PROCESS CONNECTION**

x = 1.6

y = 2.0

z = 3.0

(3-4) **LOWER HOUSING MATERIAL (WETTED)**

G2 = Carpenter 20 CB-3

CS = Carbon Steel

HR = Hastelloy B-2

HC = Hastelloy C-276

Ni = Inconel 600

M4 = Monel 400

NC = Nickel 200

S4 = 304 Stainless Steel

S6 = 316 Stainless Steel

SF = 304L Stainless Steel

SL = 316L Stainless Steel

TI = Titanium - Grade 4

(1-2) **DIAPHRAGM SEAL DESIGN**

DF = 300N - Flanged In-Line

(For coding of upper housing only, refer to 300J3 Series Seal - Page 40)

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**NOTES:**

1. Standard diaphragm material is 316L Stainless Steel for seals with lower housing manufactured of CS, S4, S6, SL and SF.

2. Standard diaphragm material is Tantalum for seals with lower housing manufactured of C2 and TI.

3. Teflon gaskets are standard for seals with lower housings manufactured of C2 and TI.

4. When a Monel Carpenter 20 or Titanium diaphragm is chosen in Position 8, then an equivalent upper housing is required.

5. Using Grade 9 bolts will maintain the pipe schedule rating chosen in Position 8.

6. When using 300 Series Stainless Steel bolts, the maximum pressure rating will be reduced by 50% when the flange rating is 600# (4.14 MPa) and higher when the pipe schedule is greater than 40.

7. To maintain the pressure rating chosen in Option 6 when 300 Series Stainless Steel bolts are required, they can be used to maintain the maximum rating at these pressures and pipe schedules.

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The Seal-off feature is standard. A model 300J3 upper only assembly can be purchased to fit existing housings flanged in line.

**Offerings**

Lower Materials: All metallic

Upper Materials: Carbon Steel or 316 Stainless Steel

Optional materials are Carpenter 20, Titanium and Monel - Refer to Control Engineering Data for Details.

**Diaphragm Materials:**

- All metallic
- Bolting: Carbon Steel or 300 Series Stainless Steel (See Note A)

**Note A:** Consideration to stainless steel bolting must be given for pressure ratings above 600# (4.14 MPa) and/or pipe schedules greater than 40. When stainless steel bolts are required, high-strength stainless steel bolts must be used to maintain the maximum rating at these pressures and/or pipe schedules.
Model 300S
Diaphragm Seals for Socket Welded Off-Line Process Connections
Standard Pressure Rating with Metal Lower

Process Connection Sizes
1/4" through 1"
All Pipe Schedules
Pressure Ratings
Conforms to Pipe Schedule Ratings per ANSI B36.10

Dimensional Data
Process Connection Size

<table>
<thead>
<tr>
<th></th>
<th>1-6&quot; - 1/4&quot;</th>
<th>3-5&quot; - 1&quot;</th>
<th>1-1/4&quot; - 1-1/2&quot;</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>3.5</td>
<td>3.5</td>
<td>3.5</td>
</tr>
<tr>
<td></td>
<td>(89)</td>
<td>(89)</td>
<td>(89)</td>
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<tr>
<td>B</td>
<td>2.0</td>
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<td>2.0</td>
</tr>
<tr>
<td></td>
<td>(51)</td>
<td>(51)</td>
<td>(51)</td>
</tr>
</tbody>
</table>

(1) Dimensions in millimeters

Standard Features and Options
This socket weld connection, off-line seal utilizes a diaphragm that is welded to the upper housing. This design allows for the use of diaphragm materials that are of weldable grade. The displacement capability of this series of diaphragm seal is 0.05 cubic inches utilizing a 2.4" (60.96mm) diaphragm. The upper housing can be removed from the lower housing for welding of lower, inspection, or cleaning of the diaphragm without loss of fill fluid.

The upper housing is bolted to the lower housing with sufficient load to maintain ANSI B36.10 pressure and temperature ratings (See Note A below).

The seal-off feature is standard.

Offerings
Lower Materials: All metallic
Upper Materials: Carbon Steel or 316 Stainless Steel
Optional materials are Carpenter 20, Titanium and Monel - Refer to Control Engineering Data for Details.

Diaphragm Materials: All metallic
Bolting: Carbon Steel or 300 Series Stainless Steel (See Note A)

Note: A. Pipe schedules greater than 40 will be supplied with high strength stainless steel bolting to maintain ANSI pressure rating when stainless steel bolts are required.

CONTROL ENGINEERING DATA
DHS 64 K 2 HG S 0 C R G N

(15) FILL LIQUID
N = (Standard)
(14) PLATING OPTION
G = Gold Plating of Diaphragm Only
(13) TEFLON COATINGS
0 = None (Standard)
A = Anti-Stick Teflon Coated Diaphragm Only
R = Corrosion-Resistant Teflon Coated Diaphragm Only.
(12) BOLTING
0 = None
G = Carbon Steel - Grade 5 (See Note 4)
S = 300 Series Stainless Steel (See Note 5)
H = 300 Series Stainless Steel (Hi-strength) (See Note 6)
(11) FUTURE OPTIONS
0 = Not Applicable
(10) UPPER HOUSING MATERIAL
C = Carbon Steel (Standard)
S = 316 Stainless Steel
M = Monel (See Note 7)
2 = Carpenter 20 (See Notes 2 and 7)
T = Titanium (See Notes 2 and 7)
(9) SEAL GASKET MATERIAL
0 = Not Applicable
B = Buna N
G = Grapril
T = Teflon (See Note 3)
V = Viton
S = C-372/750 (Standard)
(8) SEAL DIAPHRAGM MATERIAL
C = Carpenter 20 CB-3 (See Notes 2 and 7)
H = Hastelloy B-2
D = Hastelloy C-276
I = Inconel 600
M = Monel 400 (See Note 7)
N = Nickel 200
J = 316L Stainless Steel (See Note 1)
T = Titanium
E = Titanium Grade 4 (See Notes 2 and 7)
(7) SEAL INSTRUMENT CONNECTION
A = 1/4" Air/no
(6) PIPE SCHEDULE RATING
H = Schedule 5
I = Schedule 10
J = Schedule 40
K = Schedule 80
L = Schedule 160
(5) SEAL PROCESS CONNECTION
2 = 1/4"  
4 = 1/2"  
6 = 3/4"  
0 = No Lower Housing (Upper Housing Only)
(4-3) LOWER HOUSING MATERIAL (WETTED)
C2 = Carpenter 20CB-3
C3 = Carbon Steel
HB = Hastelloy B-2
HC = Hastelloy C-276
H6 = Inconel 600
M4 = Monel 400
N3 = Nickel 200
S4 = 304 Stainless Steel
St = 316 Stainless Steel
SF = 304L Stainless Steel
SL = 316L Stainless Steel
TI = Titanium - Grade 4
00 = No Lower Housing (Upper Housing Only)
(1-2) DIAPHRAGM SEAL DESIGN
DHS-300S - Socket Welded Off-Line

CATALOG NUMBERS AS RECEIVED FOR THE 300S SERIES MUST CONTAIN FIFTEEN (15) CHARACTERS.

Notes:
1. Standard diaphragm material is 316L Stainless Steel for seals with lower housing manufactured of C3, S4, S6, S8, and SF.
2. Standard diaphragm material is Tantalum for seals with lower housing manufactured of C3 and TI.
3. Teflon gaskets are standard for seals with lower housings manufactured of C2 and TI.
4. Using Grade 3 bolts will maintain the pipe schedule rating chosen in Position 6.
5. When using 300 Series Stainless Steel bolts, the maximum pressure rating will be reduced by 50% when the pipe schedule is greater than 40.
6. Pipe schedules greater than 40 will be supplied with high strength stainless steel bolting to maintain ANSI pressure rating when stainless steel bolts are required.
7. When a Monel, Carpenter 20 or Titanium diaphragm is chosen in Position 8, then an equivalent upper housing material is required.
Performance Data

This series of seal utilizes a diaphragm that is welded to the upper housing which permits removal from the system without the loss of fill fluid. The construction conforms to methods as described in the ASME standard B20.2-1991 section 2.3. The standard upper housing is classified as Continuous Duty (see para. 2.3.2.1, ASME B40.2-1991). This seal mates directly to an ANSI B16.5 3" process flange.

Consideration should be given to O-ring compatibility with process fluids and temperature when a Tantalum diaphragm is required. Listed below in Table 300BP/BT.1 are applicable safe working temperatures.

Diaphragms with a diameter of 4.81" (121.74mm) are utilized in this series. See Table 300BP/BT.2 for displacement curves and nominal ratings.

Table 300BP/BT.2 indicates the volume of fill fluid within the body cavity based on 1/2" (12.70mm) engagement of the fitting in the instrument connection. This data is provided for error calculation attributed to expansion and contraction of fill fluids under varying temperature conditions.

The filling method for this series is as defined in ASME B40.2 section 2.9.3.1.

Table 300BP/BT.1 "O" Rings

<table>
<thead>
<tr>
<th>Material</th>
<th>Temperature Range</th>
</tr>
</thead>
<tbody>
<tr>
<td>Buna-N</td>
<td>-10 to +300°F (-23 to 149°C)</td>
</tr>
<tr>
<td>Teflon-TFE</td>
<td>0 to +100°F (-17 to 38°C)</td>
</tr>
<tr>
<td>Viton</td>
<td>-30 to +350°F (-34 to 176°C)</td>
</tr>
</tbody>
</table>

Table 300BP/BT.3 Internal Volume

<table>
<thead>
<tr>
<th>Instrument connection</th>
<th>Cubic Inches</th>
</tr>
</thead>
<tbody>
<tr>
<td>1/4&quot; NPT 300BP</td>
<td>0.439</td>
</tr>
<tr>
<td>1/4&quot; NPT 300BT</td>
<td>0.389</td>
</tr>
<tr>
<td>1/2&quot; NPT 300B1</td>
<td>0.580</td>
</tr>
</tbody>
</table>

Pressure vs Displacement

4.81" diameter diaphragm

Displacement (cubic inches)
Model 300BP Diaphragm Seals for Flanged Off-Line Process Connections
3" (76.20mm) 150# and 3" (76.20mm) 300#

Process Connection Sizes
3" ANSI Flange Ratings 150# and 300#
Other flange ratings available, consult the factory.

Pressure Ratings
Conforms to Flange Ratings per ANSI B16.5
Flange Faces
Raised Face

Dimensional Data

() Dimensions in millimeters

Standard Features and Options
This flanged connection, off-line seal has a diaphragm welded to a stainless steel body. This design allows for the use of diaphragm materials that are of a weldable grade. The displacement capability of this series of diaphragm seal is 0.25 cubic inches utilizing a 4.61" (122.17mm) diameter diaphragm. These seals are designed for direct connection to standard raised face ANSI flanges in 3" (76.20mm) sizes, with 150# and 300# ratings. Available with or without blind mounting flanges. When a tantalum diaphragm is required the 300BP O-ring style is supplied. The seal-off feature is standard.

Offerings
Body Materials: 316 Stainless Steel
Blind Flange Materials: Carbon Steel or 316 Stainless Steel
Diaphragm Materials: All metallic except Tantalum
Instrument Connection: 1/4" NPT

Note:
1. When a Monel diaphragm is chosen in position B, then a Monel body is required.
Process Connection Sizes
3" ANSI Flange Ratings 150# and 300#
Other flange ratings available, consult the factory

Pressure Ratings
Conforms to Flange Ratings per ANSI B16.5

Flange Faces
Raised Face

Dimensional Data

( ) Dimensions in millimeters

Standard Features and Options
This flanged connection, off-line seal has a diaphragm welded to a stainless steel body. When tantalum diaphragms are required, the metallurgical properties prohibit the use of a weld ring as a gasketing surface. An O-ring supported by a non-wetted support ring is then used. The displacement capability of this series of diaphragm seal is 0.25 cubic inches utilizing a 4.00" (101.60mm) diameter diaphragm. These seals are designed for direct connection to standard raised face ANSI flanges in 3" (76.20mm) sizes, with 150# and 300# ratings. The standard O-ring material is Teflon. The seal-off feature is standard, available with or without blind mounting flanges.

Offerings
Body Materials: 316 Stainless Steel
Blind Flange Materials: Carbon Steel or 316 Stainless Steel
Diaphragm Materials: Tantalum
O-Ring Materials: Teflon, Buna N or Viton
Instrument Connection: 1/4" NPT

CONTROL ENGINEERING DATA

DSS6B11TZCORG  

(15) FILL LIQUID
N = Not Filled
(14) PLATING OPTIONS
0 = None (Standard)
G = Gold Plating Diaphragm Only
(13) TFEFLON COATING
0 = None (Standard)
A = Anti-Stick Teflon Coated Diaphragm Only
R = Corrosion-Resistant Teflon Coated Diaphragm Only
(12) FUTURE OPTION
0 = Not Applicable
(11) FUTURE OPTION
0 = Not Applicable
(10) BLIND FLANGE MATERIAL (BACK-UP FLANGE)
C = Carbon Steel
S = 316 Stainless Steel
0 = Not Applicable (No back-up flange required)
(9) O-RING MATERIAL
Z = O-Ring Teflon (Standard)
B = Buna N
T = Teflon
(8) SEAL DIAPHRAGM MATERIAL
T = Tantalum
(7) SEAL INSTRUMENT CONNECTION
1 = 1/4" NPTF-2 with bleed
(6) FLANGED PRESSURE RATING
1 = 150# RF
4 = 300# RF
(5) SEAL PROCESS CONNECTION
B = 3"
(3-4) BODY MATERIAL
S6 = 316 Stainless Steel
(1-2) DIAPHRAGM SEAL DESIGN
D5 = 300BP Flanged Pancake

CATALOG NUMBERS AS RECEIVED FOR THE 300BP SERIES MUST CONTAIN FIFTEEN (15) CHARACTERS.
Model 300BT  Diaphragm Seals for Flanged Off-Line Process Connections
3" (76.20mm) 150# and 3" (76.20mm) 300#

Process Connection Sizes
3" ANSI Flange Ratings 150# and 300#
Other flange ratings available, consult the factory

Pressure Ratings
Conforms to Flange Ratings per ANSI B16.5

Flange Faces
Raised Face
Flat Face

Dimensional Data

(15) FILL LIQUID
N = (Standard)

(14) PLATING OPTIONS
0 = None (Standard)
G = Gold Plating Diaphragm Only

(13) TEFLOM COATING
0 = None (Standard)
A = Anti-Stick Teflon Coated Diaphragm Only
R = Corrosion-Resistant Teflon Coated Diaphragm Only

(12) FUTURE OPTION
0 = Not Applicable

(11) FUTURE OPTION
0 = Not Applicable

(10) HOUSING MATERIAL
C = Carbon Steel
S = 316 Stainless Steel
M = Monel 400 (See Note 1)

(9) FUTURE OPTION
0 = Not Applicable

(8) SEAL DIAPHRAGM MATERIAL
H = Hastelloy B2
D = Hastelloy C-276
I = Inconel 600
M = Monel 400 (See Note 1)
N = Nickel 200
J = 316L Stainless Steel

(7) SEAL INSTRUMENT CONNECTION
4 = 1/4" Aminco

(6) FLANGED PRESSURE RATING
1 = 150# RF
X = 150# FF
4 = 300# RF
W = 300# FF

(5) SEAL PROCESS CONNECTION
B = 3"

(3-4) FUTURE OPTION
00 = Not applicable

(1-2) DIAPHRAGM SEAL DESIGN
D7 = 300BT Flanged "T" type

Note:
1. When a Monel diaphragm is chosen in position 8, then a Monel body is required.

( ) Dimensions in millimeters

Standard Features and Options
This flanged connection, off-line seal has a diaphragm welded to a carbon steel or stainless steel body. This is a single piece design, similar to the 300SP Series, with a cost and installation advantage. The displacement capability of this series of diaphragm seal is 0.25 cubic inches utilizing a 4.81" (122.17mm) diameter diaphragm. These seals are designed for direct connection to standard raised face ANSI flanges in 3" (76.20mm) sizes, with 150# and 300# ratings. When a Tantalum diaphragm is required, the 300BT O-ring style is required. The seal-off feature is standard.

Offerings
Body Materials: Carbon Steel or 316 Stainless Steel
Diaphragm Materials: All metallic except Tantalum
Instrument Connection: 1/4" Aminco
Model 300BT

Diaphragm Seals for Flanged Off-Line Process Connections
Tantalum Diaphragm 3" (76.20mm) 150# and 3" (76.20mm) 300#

Process Connection Sizes
3" ANSI Flange Ratings 150# and 300#
Other flange ratings available, consult the factory

Pressure Ratings
Conforms to Flange Ratings per ANSI B16.5

Flange Faces
Raised Face

Dimensional Data

( ) Dimensions in millimeters

Standard Features and Options
This flanged connection, off-line seal has a diaphragm welded to a carbon steel or stainless steel body. This is a single piece design. similar to the 300EP Series, with a cost and installation advantage. When tantalum diaphragms are required, the metallurgical properties prohibit the use of a weld ring as a gasketing surface. An O-ring supported by a non-wetted support ring is then used. The displacement capability of this series of diaphragm seal is 0.25 cubic inches utilizing a 4.00" (101.60mm) diameter diaphragm. These seals are designed for direct connection to standard raised face ANSI flanges in 3" (76.20mm) sizes, with 150# and 300# ratings. The standard O-ring material is Teflon. The seal-off feature is standard.

Offerings
Body Materials: Carbon Steel or 316 Stainless Steel
Diaphragm Materials: Tantalum
O-Ring Materials: Teflon, Buna N and Viton
Instrument Connection: 1/4" Aminco

CONTROL ENGINEERING DATA

D700 X 2 T Z C O O A G N

(15) FILL LIQUID
N = (Standard)

(14) PLATING OPTIONS
0 = None (Standard)
G = Gold Plating Diaphragm Only

(13) TEFLOW COATING
0 = None (Standard)
A = Anti-Stick Teflon Coated Diaphragm Only
R = Corrosion-Resistant Teflon Coated Diaphragm Only

(12) FUTURE OPTION
0 = Not Applicable

(11) FUTURE OPTION
0 = Not Applicable

(10) HOUSING MATERIAL
C = Carbon Steel
S = 316 Stainless Steel

(9) O-RING MATERIAL
Z = O-Ring Teflon
B = Buna N
T = Teflon

(8) SEAL DIAPHRAGM MATERIAL
T = Tantalum

(7) SEAL INSTRUMENT CONNECTION
4 = 1/4" Aminco

(6) FLANGED PRESSURE RATING
1 = 150# RF
X = 150# FF
4 = 300# RF
W = 300# FF

(5) SEAL PROCESS CONNECTION
B = 3"

(3-4) FUTURE OPTION
00 = Not applicable

(1-2) DIAPHRAGM SEAL DESIGN
D7 = 300BT Flanged "T" Type

CATALOG NUMBERS AS RECEIVED
FOR THE 300BT SERIES MUST CONTAIN FIFTEEN (15) CHARACTERS.
The 600 Series Diaphragm Seals

Performance Data

This series of seal utilizes a diaphragm that is welded to the upper housing. An important feature is that the upper housing can be separated from the lower housing without loss of fill fluid. The construction conforms to methods as described in the ASME standard B20.2-1991 section 2.3. The standard upper housing is classified as Continuous Duty (see para. 2.3.2.1, ASME B40.2-1991).

Consideration should be given to gasket compatibility with process fluids and temperature. Table 600.1 lists applicable safe working temperatures.

Diaphragms with a diameter of 4.0" (101.60mm) are utilized in this series. See Table 600.2 for displacement curves and nominal ratings.

Table 600.3 indicates the volume of fill fluid within the body cavity based on 1/2" (12.70mm) engagement of the fitting in the instrument connection. This data is provided for error calculation attributed to expansion and contraction of fill fluids under varying temperature conditions.

The filling method for this series is as defined in ASME B40.2 section 2.9.3.1.

Table 600.1 Flat Gaskets

<table>
<thead>
<tr>
<th>Material</th>
<th>Temperature Range</th>
</tr>
</thead>
<tbody>
<tr>
<td>Buna-N</td>
<td>-10 to +600°F (-23 to 149°C)</td>
</tr>
<tr>
<td>Teflon-TFE</td>
<td>0 to +140°F (-17 to 140°C)</td>
</tr>
<tr>
<td>Viton</td>
<td>-30 to +350°F (-34 to 176°C)</td>
</tr>
<tr>
<td>Grafoil</td>
<td>-30 to +500°F (-34 to 260°C)</td>
</tr>
<tr>
<td>CGR2750 *(1) (Standard)</td>
<td>-60 to +700°F (-51 to 371°C)</td>
</tr>
<tr>
<td>316 SS - Silver Plated *(2)</td>
<td>-80 to +700°F (-51 to 371°C)</td>
</tr>
<tr>
<td>Hast-C - Silver Plated *(2)</td>
<td>-80 to +700°F (-51 to 371°C)</td>
</tr>
</tbody>
</table>

Table 600.3 Internal Volume

<table>
<thead>
<tr>
<th>Instrument Connection</th>
<th>Cubic Inches</th>
</tr>
</thead>
<tbody>
<tr>
<td>NPT</td>
<td></td>
</tr>
<tr>
<td>1/4&quot;</td>
<td>0.130</td>
</tr>
<tr>
<td>1/4&quot;</td>
<td>0.135</td>
</tr>
</tbody>
</table>

*(1) CGR2750 is an organic fiber with a Nitrile binder. Standardly supplied unless other material is specified.
*(2) These gaskets are offered for seals with pressure ratings of 5000 (34.50 MPa), 10000 (69.00 MPa) and 20000 (138.00 MPa) PSIG which are optionally supplied.
(3) These units were formerly designated as a Model 640A or 640B Series Diaphragm Seal.

Table 600.2

Pressure vs Displacement

<table>
<thead>
<tr>
<th>Pressure (inches water)</th>
<th>0.00</th>
<th>0.04</th>
<th>0.08</th>
<th>0.12</th>
<th>0.16</th>
<th>0.20</th>
<th>0.24</th>
</tr>
</thead>
<tbody>
<tr>
<td>Displacement (cubic inches)</td>
<td>22</td>
<td>20</td>
<td>18</td>
<td>16</td>
<td>14</td>
<td>12</td>
<td>10</td>
</tr>
</tbody>
</table>

4.000" diameter diaphragm
Process Connection Sizes
1/4" NPT through 2" NPT
Pressure Ratings
750, 1500 PSIG (5.15, 10.35 MPa) (See Note A)

Dimensional Data

<table>
<thead>
<tr>
<th>Process Connection Sizes</th>
<th>1/4&quot; - 1-1/2&quot; Process</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>5.50</td>
</tr>
<tr>
<td>B</td>
<td>2.12</td>
</tr>
</tbody>
</table>

( ) Dimensions in millimeters

Standard Features and Options
This threaded connection, off-line seal has a diaphragm welded to the upper housing. This design allows for the use of diaphragm materials that are of a weldable grade. The displacement capability of this series of diaphragm seal is 0.25 cubic inches utilizing a 4.0" (101.60 mm) diameter diaphragm.

Designed for sealed systems requiring low sensitivity to thermal expansion and contraction of fill fluid. This seal provides greater accuracy when higher volumetric displacements are required.

The standard pressure rating is 1500 PSIG (10.35 MPa) when Stainless Steel bolting is not required (See Note 1). The Seal-Off feature is standard and flushing ports are optional.

Standard instrument connection is 1/4" Amino. The 1/4" Amino is a straight thread and cone seat style instrument connection that reduces the amount of fill fluid in the body cavity reducing the amount of error caused by thermal expansion and contraction of fill fluid.

Offerings
Lower Materials: All metallic
Upper Materials: Carbon Steel or 316 Stainless Steel

Optional Materials: Carpenter 20, Titanium and Monel - Refer to Control Engineering Data for details.

Diaphragm Materials: All metallic
Bolting: Carbon Steel or 300 Series Stainless Steel (See Note A)

Note A: The use of 300 Series Stainless Steel bolts and nuts will reduce the pressure rating by 50%. When 300 Series Stainless Steel bolts and nuts are required and the maximum pressure rating must be maintained, then stainless steel high-strength bolts and nuts are necessary.

CONTROL ENGINEERING DATA

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<th>DSO</th>
<th>C0C0N</th>
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<td>(1)</td>
<td>FILL LIQUID</td>
<td></td>
<td></td>
</tr>
<tr>
<td>N = (Standard)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>(14)</td>
<td>Plating Options</td>
<td></td>
<td></td>
</tr>
<tr>
<td>G = Gold Plating Diaphragm Only</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>(13)</td>
<td>TEFLOL COATINGS</td>
<td></td>
<td></td>
</tr>
<tr>
<td>A = Anti-Stick Teflon Coated Diaphragm Only</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>R = Corrosion-Resistant Teflon Coated Diaphragm Only</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>B = Anti-Stick Teflon Coated and Lower Housing</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>C = Corrosion-Resistant Teflon Coated and Lower Housing</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>(12)</td>
<td>BOLTING</td>
<td></td>
<td></td>
</tr>
<tr>
<td>0 = None (Standard)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1 = 1/8&quot; NPT</td>
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<td></td>
<td></td>
</tr>
<tr>
<td>2 = 1/4&quot; NPT</td>
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<td></td>
<td></td>
</tr>
<tr>
<td>3 = 1/4&quot; NPT- DUAL</td>
<td></td>
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</tr>
<tr>
<td>(10)</td>
<td>UPPER HOUSING MATERIAL</td>
<td></td>
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</tr>
<tr>
<td>C = Carbon Steel (Standard)</td>
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<td></td>
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</tr>
<tr>
<td>S = 316 Stainless Steel</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>M = Monel (See Note 4)</td>
<td></td>
<td></td>
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<tr>
<td>E = Titanium (See Note 4 and 7)</td>
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<td></td>
</tr>
<tr>
<td>(9)</td>
<td>SEAL GASKET MATERIAL</td>
<td></td>
<td></td>
</tr>
<tr>
<td>V = Viton</td>
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</tr>
<tr>
<td>S = CPG 2750 (Standard)</td>
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<tr>
<td>(8)</td>
<td>SEAL DIAPHRAGM MATERIAL</td>
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<td></td>
</tr>
<tr>
<td>C = Carpenter 20 (See Note 4 and 7)</td>
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<td></td>
<td></td>
</tr>
<tr>
<td>H = Hastelloy B2</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>D = Hastelloy C-276</td>
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<td></td>
<td></td>
</tr>
<tr>
<td>I = Inconel 600</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>J = 316L Stainless Steel (See Note 6)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>T = Tantalum</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>E = Titanium (See Note 4 and 7)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>(7)</td>
<td>SEAL INSTRUMENT CONNECTION</td>
<td></td>
<td></td>
</tr>
<tr>
<td>4 = 1/4&quot; Amino with bleed</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>(6)</td>
<td>THREADED PRESSURE RATING</td>
<td></td>
<td></td>
</tr>
<tr>
<td>H = 250 PSIG (1.71 MPa) (See Note 2)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>X = 1500 PSIG (10.35 MPa)</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Notes:
1. Using Grade 5 bolts and Grade 8 nuts will maintain the pressure rating chosen in Option 6.
2. When using 300 Series Stainless Steel bolts and nuts, the pressure rating will be reduced by 50%, refer to Option 6.
3. To maintain the pressure rating chosen in Option 6 when 300 Series Stainless Steel bolts and nuts are required, then high-strength bolts and nuts will be necessary.
4. When a Monel, Carpenter 20 or Titanium diaphragm is chosen then an equivalent upper housing is required.
5. Teflon is standard for seal with lower housing manufactured of Carbon Steel or 1/4" Amino.
6. Standard diaphragm material is 316L Stainless Steel for seal with lower housing manufactured of Carbon Steel or 1/4" Amino.
7. Standard diaphragm material is Tantalum for seal lower housing manufactured of Carbide Steel or 1/4" Amino.

When customer requires a Carpenter 20, Monel or Titanium diaphragm, refer to Position 10 for proper upper housing material.
**Model 600A** Diaphragm Seals for Threaded Off-Line Process Connections Reduced Pressure Rating for Non-Metallic Lower Housings

**Process Connection Sizes**
1/4" NPT through 2" NPT

**Pressure Ratings**
200 PSIG (1.38 MPa) at 140°F (60°C) maximum

### Dimensional Data
**Process Connection Size**

<table>
<thead>
<tr>
<th>PVC - KYNAR - POLYPROPYLENE 1/4&quot; - 1-1/2&quot;</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
</tr>
<tr>
<td></td>
</tr>
<tr>
<td>B</td>
</tr>
<tr>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>TEFLOW -GLASS - CARBON 1/4&quot; - 1-1/2&quot;</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
</tr>
<tr>
<td></td>
</tr>
<tr>
<td>B</td>
</tr>
<tr>
<td></td>
</tr>
</tbody>
</table>

(1) Dimensions in millimeters

---

**Standard Features and Options**

This threaded connection, off-line seal has a diaphragm welded to the upper housing. This design allows for the use of diaphragm materials that are of a weldable grade. The displacement capability of this series of diaphragm seals is 0.25 cubic inches utilizing a 4.0" (101.60mm) diameter diaphragm.

Designed for sealed systems requiring low sensitivity to thermal expansion and contraction of fill fluid. This seal provides greater accuracy when higher volumetric displacements are required.

The standard pressure rating is 200 PSIG (1.38 MPa) with a maximum temperature of 140°F (60°C). Because of the strength of the material, flushing ports are not available. Teflon glass filled lower will be supplied with a lower metal support plate to distribute bolt load and minimize cold flow. A Seal-off feature is standard.

Standard instrument connection is 1/4" Amino. The 1/4" Amino is a straight thread and cone seat style instrument connection that reduces the amount of fill fluid in the bore cavity reducing the amount of error caused by thermal expansion and contraction of fill fluid.

---

**Offerings**

**Lower Materials:** All non-metallic

**Upper Materials:** Carbon Steel or 316 Stainless Steel

Optional Materials are Carpenter 20, Titanium and Monel - Refer to Control Engineering Data for details.

**Diaphragm Materials:** All metallic

**Bolting:** Carbon Steel or 300 Series Stainless Steel

**Note:** The use of 300 Series Stainless Steel bolts and nuts will not affect the maximum pressure rating.
**Model 600B**

**Diaphragm Seals for Flanged Off-Line Process Connections**

2" (50.80mm) and Larger

---

**PROCESS CONNECTION SIZES**

2" and 3"

**ANSI Flange Ratings Up to 2500# (17.25 MPa)**

**Pressure Ratings**

Conforms to Flange Ratings per ANSI B16.5

**Flange Faces**

Raised Face, Flat Face, Ring Type Joint, Special Flange Faces available, Consult the Factory.

---

**DIMENSIONAL DATA**

**Process Connection Size**

150#

<table>
<thead>
<tr>
<th>E</th>
<th>F</th>
<th>G</th>
<th>H</th>
</tr>
</thead>
<tbody>
<tr>
<td>5.02</td>
<td>2.63</td>
<td>1.82</td>
<td>3.82</td>
</tr>
<tr>
<td>7.50</td>
<td>3.22</td>
<td>1.70</td>
<td>5.00</td>
</tr>
<tr>
<td></td>
<td>152</td>
<td>67</td>
<td>46</td>
</tr>
<tr>
<td></td>
<td>(111)</td>
<td>(69)</td>
<td>(43)</td>
</tr>
<tr>
<td>150#</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

300#

<table>
<thead>
<tr>
<th>E</th>
<th>F</th>
<th>G</th>
<th>H</th>
</tr>
</thead>
<tbody>
<tr>
<td>5.50</td>
<td>2.75</td>
<td>2.07</td>
<td>3.62</td>
</tr>
<tr>
<td>8.25</td>
<td>2.32</td>
<td>1.88</td>
<td>5.00</td>
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<tr>
<td></td>
<td>165</td>
<td>70</td>
<td>43</td>
</tr>
<tr>
<td></td>
<td>(210)</td>
<td>(59)</td>
<td>(43)</td>
</tr>
<tr>
<td>300#</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

(1) Dimensions in millimeters

---

**CONTROL ENGINEERING DATA**

H2 HC 12 HVC O O 0 0 N

- **FILL LIQUID**
  - N = (Standard)
- **FLATTING OPTION**
  - 0 = None (Standard)
- **GOLD FLAT TOP**
  - G = Gold Plating of Diaphragm Only
- **TEFLON COATINGS**
  - 0 = None (Standard)
  - A = Anti-Sick Teflon Coated Diaphragm Only
  - R = Corrosion-Resistant Teflon Coated Diaphragm Only
  - B = Anti-Sick Teflon Coated Diaphragm and Lower Housing
  - C = Corrosion-Resistant Teflon Coated Diaphragm and Lower Housing
- **FUTURE OPTION**
  - 0 = Not Applicable
- **FLUSH CONNECTION (See Note 7)**
  - 1 = 1/8" NPT
  - 2 = 1/4" NPT
  - 3 = 1/4" NPT-DUAL
- **UPPER HOUSING MATERIAL**
  - O = Carbon Steel (Standard)
  - S = 316 Stainless Steel
  - M = Monel (See Note 6)
  - T = Carpenter 20 (See Notes 2 and 6)
  - F = Titanium (See Notes 2 and 6)
- **SEAL GASKET MATERIAL**
  - A = None
  - B = 316 Stainless Steel - Silver Plated (See Note 5)
  - C = Hastelloy C - Silver Plated (See Note 5)
  - G = Graphite
  - T = Teflon (See Note 4)
  - V = Viton
  - S = CQR2750 (See Note 3)
- **DIAPHRAGM MATERIAL**
  - C = Carpenter 20 CB-3 (See Notes 2 and 6)
  - H = Hastelloy B-2
  - D = Hastelloy C-276
  - I = Inconel 600
  - M = Monel 400 (See Note 6)
  - N = Nickel 200
  - J = 318L Stainless Steel (See Note 1)
  - T = Tantalum (See Note 5)
  - E = Titanium Grade 4 (See Notes 2 and 6)
- **SEAL INSTRUMENT CONNECTION**
  - 1 = 1/8" AMINO with closed
  - X = 1/4" AMINO with closed
- **FLANGED PRESSURE RATING**
  - 1 = 150#RF (1.05 MPa)
  - 2 = 300#RF (2.07 MPa)
  - 4 = 600#RF (4.14 MPa)
  - 8 = 1,200#RF (17.25 MPa)
  - F = 2500#RF (17.25 MPa)
- **SEAL PROCESS CONNECTION**
  - S = 2"
  - B = 2"
  - C = 4"
  - D = No Lower Housing (Upper Housing Only)

---

**NOTES:**

1. Standard diaphragm material is 316L Stainless Steel for seals with lower housing manufactured of CS, S4, S6, SL and SS.

2. Standard diaphragm material is Tantalum for seals with lower housing manufactured of C2, TL PV, TC, PP, KN, TP and TC.

3. CQR2750 Gaskets are standard for all seal rated to 300# (2.07 MPa).

4. Standard gasket material for seals with lower housing manufactured of non-metallic material is Teflon.

5. 316 Stainless Steel and Hastelloy - Silver Plated gaskets are offered for seals with ratings 600# (4.14 MPa) and higher.

6. When a Monel, Carpenter 20 or Titanium diaphragm is chosen in Position 8, an equivalent upper housing material is required.

7. Flushing connections are not available with lower housings manufactured of a non-metallic material.
**Model 600B**

**Diaphragm Seals for Flanged Off-Line Process Connections**

Less than 2" (50.80)****

### CONTROL ENGINEERING DATA

<table>
<thead>
<tr>
<th>H2HC6</th>
<th>42DSC000N</th>
</tr>
</thead>
</table>

---

**Process Connection Sizes**

- 1/2", 3/4", 1" and 1 1/2"
- ANSI Flange Ratings Up to 2500# (17.25 MPa)
- Pressure Ratings
  - Conforms to Flange Ratings per ANSI B16.5 (See Note A)

**Flange Faces**

- Raised Face, Flat Face, Ring Type Joint, Special Flange Faces available, Consult the Factory

**Dimensional Data**

**Process Connection Size**

<table>
<thead>
<tr>
<th>E</th>
<th>F</th>
<th>G</th>
<th>H</th>
</tr>
</thead>
<tbody>
<tr>
<td>1/2&quot;</td>
<td>(140)</td>
<td>(57)</td>
<td>(51)</td>
</tr>
<tr>
<td>1&quot;</td>
<td>(140)</td>
<td>(57)</td>
<td>(51)</td>
</tr>
<tr>
<td>1 1/2&quot;</td>
<td>(140)</td>
<td>(57)</td>
<td>(51)</td>
</tr>
</tbody>
</table>

---

**E-150**

<table>
<thead>
<tr>
<th>E</th>
<th>F</th>
<th>G</th>
<th>H</th>
</tr>
</thead>
<tbody>
<tr>
<td>1/2&quot;</td>
<td>(140)</td>
<td>(57)</td>
<td>(51)</td>
</tr>
<tr>
<td>1&quot;</td>
<td>(140)</td>
<td>(57)</td>
<td>(51)</td>
</tr>
<tr>
<td>1 1/2&quot;</td>
<td>(140)</td>
<td>(57)</td>
<td>(51)</td>
</tr>
</tbody>
</table>

---

**Standard Features and Options**

This flanged connection, off-line seal has a diaphragm welded to the upper housing. The design allows for the use of diaphragm materials that are a match to the process. The displacement capacity of this series of diaphragm seal is 0.25 cubic inches utilizing a 0.04" (1.04 MPa) diameter diaphragm. The seal is designed for sealed systems requiring low sensitivity to thermal expansion and contraction of the fill fluid. This seal provides greater accuracy when higher volumetric displacements are required.

These seals are designed for direct connection to standard ANSI flanges in 1/2" through 1 1/2" sizes and up to 250# (17.27 MPa) ratings. The upper housing is bolted to the lower housing with sufficient load to maintain ANSI B16.5 pressure at an operating temperature (See Note A). Due to the load design location, it is designed to ANSI B16.5, threaded flange stud are provided.

Due to the material strength of non-metallics, the maximum pressure and temperature for this series seal is 200 PSIG (1.38 MPa) at 140°F (60°C), when non-metallic liners are required (See Note B). Flushing connections are not available with lower housings manufactured of non-metallic materials.

**Flushing connections are optional for metallic lower housings.**

**Standard Instrument connection is 1/4" Amico.**

**Amico is a straight thread and one seat style instrument connection that reduces the amount of fill fluid in this body cavity reducing the amount of error caused by thermal expansion and contraction of fill fluid.**

---

**Notes:**

A. Flange ratings 600# (4.14 MPa) and higher will be shipped with high strength stainless bolt to maintain ANSI pressure rating when 300 Series Stainless Steel bolts are required.

B. Non-metallic lower housings are not available for flange ratings greater than 200# (0.7 MPa). The maximum temperature and pressure rating for this series seal is 200 PSIG (1.38 MPa) at 140°F (60°C), when non-metallic liners are required (See Note B). Flushing connections are not available with non-metallic lower housings.

---

**Non-METALLIC LOWER HOUSING**

**Standard Instrument connection is 1/4" Amico.**

**Amico is a straight thread and one seat style instrument connection that reduces the amount of fill fluid in this body cavity reducing the amount of error caused by thermal expansion and contraction of fill fluid.**

---

**Notes:**

1. Standard diaphragm material is 316L Stainless Steel for seals with lower housing manufactured of CS, S4, S6, SL and SF.

2. Standard diaphragm material is Tantalum for seals with lower housings manufactured of CS, TI, PV, TC, PP, KN, TP and TG.

3. CSR2750 Gaskets are standard for all seal rated to 300# (2.07 MPa).

4. 316 Stainless Steel and Hastelloy - Silver Plated gaskets are offered for seals with ratings 600# (4.14 MPa) and higher.

5. When a Monel, Carpenter 20 or Ti alloys diaphragm is chosen in Position 8, an equivalent upper housing material is required.

6. Using grade 5 bolts will maintain the pressure rating chosen in Position 5.

7. When using 300 Series Stainless Steel bolts, the pressure rating will be reduced by 50% when the flange ratings is 600# (4.14 MPa) or higher.

8. To maintain the pressure rating chosen in Position 6 when 300 Series Stainless Steel bolts are required, then high-strength stainless steel bolts will be necessary. Flange ratings 600# (4.14 MPa) and higher will be supplied with high-strength stainless steel bolts to maintain ANSI pressure rating when 300 Series Stainless Steel bolts are required.
Model 600TW

Diaphragm Seals for Flanged Off-Line Process Connections
Designed to Fit "WEDGE" Flow Measurement Piping

Process Connection Sizes
*WEDGE Flow Measurement Piping

Pressure Ratings
1500 PSIG (10.35 MPa)

Dimensional Data

<table>
<thead>
<tr>
<th>CONTROL ENGINEERING DATA</th>
</tr>
</thead>
<tbody>
<tr>
<td>600TW7095</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>BODY MATERIAL</th>
<th>DIAPHRAGM MATERIAL</th>
</tr>
</thead>
<tbody>
<tr>
<td>7000 = 316 Stainless Steel</td>
<td>316L Stainless Steel</td>
</tr>
<tr>
<td>7095 = 316 Stainless Steel</td>
<td>Hastelloy C-276</td>
</tr>
<tr>
<td>7243 = Hastelloy C-276</td>
<td>Hastelloy C-276</td>
</tr>
</tbody>
</table>

600TW = Flanged Off-Line (Wedge Flow Measurement Piping)

Notes:
1. Other body and diaphragm materials available, consult the factory.
2. Instrument connection is 1/4" Aminco.

( ) Dimensions in millimeters

Standard Features and Options
This flanged connection, off-line seal has a diaphragm welded to the upper housing. This design allows for the use of diaphragm materials that are of a weldable grade. The displacement capability of this series of diaphragm seal is 0.25 cubic inches utilizing a 3.00" (76.20mm) diameter diaphragm. Designed for sealed system used in conjunction with "wedge" flow measurement piping. This seal is provided as an upper assembly only. Process bolting or gaskets are not provided.

Offerings
Body Materials: 316 Stainless Steel or Hastelloy C
Other materials available, consult the factory.
Diaphragm Materials: 316L Stainless Steel or Hastelloy C. Other materials available, consult the factory.

CATALOG NUMBERS AS RECEIVED FOR THE 600TW SERIES MUST CONTAIN NINE (9) CHARACTERS
Performance Data
This series of seal is an all-welded construction which allows removal from the system without loss of fill fluid. The construction conforms to methods as described in the ASME standard B20.2-1991, section 2.3.12. The standard upper housing is classified as Continuous Duty (see para. 2.3.2.1, ASME B40.2-1991).

Diaphragms with a diameter of 1.4", 1.9", and 2.4" (35.56, 48.26 and 60.96mm) are utilized in this series. See Table 700.1 for displacement curves and nominal ranges.

Table 700.2 indicates the volume of fill fluid within the body cavity based on 1/2" (12.70mm) engagement of the fitting in the instrument connection. This data is provided for error calculation attributed to expansion and contraction of fill fluids under varying temperature conditions.

The filling method for this series is as defined in ASME B40.2 section 2.9.3.1.

<table>
<thead>
<tr>
<th>Table 700.2 Internal Volume</th>
<th>Cubic Inches</th>
</tr>
</thead>
<tbody>
<tr>
<td>1/4&quot; NPT (6.35mm) 1.4&quot; (35.56mm) Diaphragm</td>
<td>0.171</td>
</tr>
<tr>
<td>1/4&quot; NPT (6.35mm) 1.9&quot; (48.26mm) Diaphragm</td>
<td>0.187</td>
</tr>
<tr>
<td>1/4&quot; NPT (6.35mm) 2.4&quot; (60.96mm) Diaphragm</td>
<td>0.220</td>
</tr>
</tbody>
</table>

Table 700.1 - 1.4"

Pressure vs Displacement

Table 700.1 - 1.9"

Pressure vs Displacement

Table 700.1 - 2.4"

Pressure vs Displacement

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Error Calculations

The following information can be useful in prediction of "worst case" errors when diaphragm seals are applied to both gage pressure and differential pressure instruments.

These calculations assume uniform gradual heating of the entire filled system. In most cases the temperature at the diaphragm seal will be different from the temperature of the pressure instrument. If temperature gradients exist, temperature weighting may be applied.

Reductions in fill fluid volume reduce errors. It is best to minimize volume whenever possible. In differential applications it is recommended to keep the volume of the high and low pressure legs identical.

Elastomer diaphragms have very low errors, but have unpredictable spring rates. Consideration should also be given to elastomer temperature limitations.

There are a number of factors that determine the amount of error created by temperature changes; the error (Err) can be expressed by the following equation:

$$\text{Err} = (\Delta T)(E_t)(R_s)(V_T)$$

expressed in inches H₂O

Where:

$$\Delta T = \text{The number of degrees of the temperature change (°F).}$$

$$E_t = \text{The coefficient of thermal expansion of the fill liquid (the volumetric change constant of the fill liquid per °F).}$$

$$R_s = \text{The spring rate of the process diaphragm (inches H₂O pressure change/inch² of fill liquid volume change).}$$

$$V_T = \text{The total volume of the fill fluid in the diaphragm seal system (inches³).}$$

The above equation is simplified by assuming that the entire fill liquid volume is exposed to the same temperature shift ($\Delta T$). In reality, each element of the seal system (seal diaphragm cavity, capillary and instrument device) will be influenced a different amount due to temperature changes. Therefore, a more rigorous examination of the error would require that the liquid expansion in each element of the system be examined; for purposes of this approach the error equation can be expanded as follows:

$$\text{Err} = (\Delta T_p \times V_s) + (\Delta T_p \times V_p \times L)$$

(expressed in inches H₂O)

Where:

$$V_T = V_s + V_pL + V_D$$

$$V_T = \text{Total volume of filled system (inches³)}$$

$$V_s = \text{Volume of seal (inches³)}$$

$$V_p = \text{Volume of capillary (inches³/foot of length)}$$

$$V_D = \text{Volume of transmitter (inches³)}$$

$$L = \text{Length of capillary (feet)}$$

$$\Delta T_s = \text{Change in temperature of liquid in seal (°F)}$$

$$\Delta T_p = \text{Change in temperature of liquid in capillary (°F)}$$

$$\Delta T_D = \text{Change in temperature of liquid in inst. device (°F)}$$

In order to analyze the significance of these temperature induced errors, it is helpful to express the error as a % of measured span. This can easily be done by the following equation:

$$\text{Error %} = \frac{\text{Err}}{\text{Measured Span (in inches H₂O)}} \times 100$$

### Table I. Fill Fluid Expansion Factors

<table>
<thead>
<tr>
<th>Fill Fluid</th>
<th>$E_t$ (1/°F)</th>
<th>Temperature Range (°F)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Glycerine</td>
<td>0.000294</td>
<td>30 - 300</td>
</tr>
<tr>
<td>Silicone 209-10</td>
<td>0.000600</td>
<td>-50 - 450</td>
</tr>
<tr>
<td>Silicone 704</td>
<td>0.000444</td>
<td>30 - 520</td>
</tr>
<tr>
<td>Silicone 710</td>
<td>0.000430</td>
<td>30 - 700</td>
</tr>
<tr>
<td>Silicone 550</td>
<td>0.000520</td>
<td>-40 - 550</td>
</tr>
<tr>
<td>Silicote 510</td>
<td>0.000633</td>
<td>-60 - 400</td>
</tr>
<tr>
<td>Fluorolube FS-5</td>
<td>0.000486</td>
<td>-40 - 500</td>
</tr>
<tr>
<td>Silicone 200-350</td>
<td>-40 - 300</td>
<td></td>
</tr>
<tr>
<td>Halocarbon Oil 6.3</td>
<td>-40 - 400</td>
<td></td>
</tr>
<tr>
<td>Ethylene Glycol</td>
<td>-30 - 300</td>
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<tr>
<td>Propylene Glycol</td>
<td>-50 - 200</td>
<td></td>
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<tr>
<td>Sytherm 800</td>
<td>-40 - 450</td>
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</table>

### Table II. Diaphragm Spring Rates and Volumes

<table>
<thead>
<tr>
<th>Diaphragm Diameter</th>
<th>Applicable Series</th>
<th>$R_s$</th>
<th>$V_s$</th>
</tr>
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<tbody>
<tr>
<td>1.38</td>
<td>300BX, 700</td>
<td>10,000</td>
<td>(a)</td>
</tr>
<tr>
<td>1.90</td>
<td>300BX, 700</td>
<td>2,600</td>
<td>(a)</td>
</tr>
<tr>
<td>2.40</td>
<td>300J3</td>
<td>800</td>
<td>0.18</td>
</tr>
<tr>
<td></td>
<td>300J4</td>
<td></td>
<td>0.19</td>
</tr>
<tr>
<td></td>
<td>300BX, 700</td>
<td>800</td>
<td>0.19</td>
</tr>
<tr>
<td></td>
<td>300AB-Aminco</td>
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<td>0.07</td>
</tr>
<tr>
<td>2.50</td>
<td>3005X, 700</td>
<td>800</td>
<td>(a)</td>
</tr>
<tr>
<td>3.00</td>
<td>300BX, 700</td>
<td>240</td>
<td>(a)</td>
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<td>4.00</td>
<td>3005X, 700</td>
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<td></td>
<td>600AB-Aminco</td>
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<td>0.13</td>
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<tr>
<td>4.80</td>
<td>300BP</td>
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<td>300BT Aminco</td>
<td>40</td>
<td>0.41</td>
</tr>
</tbody>
</table>

(a) Varies depending on seal configuration.
(b) This data is based on 316L diaphragms, and an average of the most common seal configurations.

### Table III. Transmitter Volume

<table>
<thead>
<tr>
<th>Transmitter Model #</th>
<th>Internal Volume (inches³)</th>
</tr>
</thead>
<tbody>
<tr>
<td>340 A/V</td>
<td>0.28</td>
</tr>
<tr>
<td>340 D/E/F</td>
<td>0.89</td>
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<tr>
<td>340 D/E/F With Low Volume Flange</td>
<td>0.038</td>
</tr>
</tbody>
</table>

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ACCESSORIES

Through Moore Products Company, ITT Conoflow offers two different mounting arrangements for diaphragm seals.

For direct mounting, a small capillary tube is used to connect the transmitter to the diaphragm seal. This capillary is then encapsulated in a 300 series stainless steel pipe which is welded to both the transmitter and the diaphragm seal.

For remote mount applications, capillary lines in any specified length are offered. Manufactured of 300 Series Stainless Steel, these capillaries feature an all tig welded construction. Maximum pressure rating for the capillary lines offered is 10000 PSIG (69.00 MPa). Higher pressure ratings are available. Refer to Table II.

CONTROL ENGINEERING DATA

(10) CALIBRATION (TYPE OF INSTRUMENT - SEE NOTE 5)

N = Not applicable (No Fill)
1 = 4 to 20 mA Transmitter - Controller
2 = D/A Transmitter - Controller
S = G/P Transmitter - Controller

(9) FILL LIQUID AND TEMPERATURE LIMIT (SEE NOTES 3 AND 4)

N = Not applicable (No Fill)
P = Pure Glycerine (Food Grade)
S = Silicone D.C. 200-10
1 = Silicone D.C. 704
2 = Silicone D.C. 710
3 = Silicone D.C. 250
4 = Silicone D.C. 510
D = Silicone D.C. 200-300CC
F = Fluorocube FS-3 (See Note 1)
H = Halocarbon 6.3 (See Note 1)
E = Ethylene Glycol (Anti-Freeze)
B = Propylene Glycol (Pharmaceutical Grade - USP)
A = Nodax M,20
M = Mineral Oil
X = Fill Fluid (Specified by the customer - See Note 2)

(8) CAPILLARY O.D. AND WALL THICKNESS

A = 1/8" (3.17mm) O.D. x 0.025" (0.64mm) Wall
N = Direct Mount

(7) MATERIAL OF CONSTRUCTION

A = 300 Series Stainless Steel with Stainless Steel Armor
Q = Not Applicable (Direct Mount)
P = 300 Series Stainless Steel with PVC Armor

(6-8) CONNECTION LINES (SEE NOTES 1-2)

(MAXIMUM PRESSURE RATING 10000 PSIG (69.00 MPa))

<table>
<thead>
<tr>
<th>Length</th>
<th>O.D.</th>
<th>Wall</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 foot</td>
<td>6</td>
<td>0.025</td>
</tr>
<tr>
<td>10 feet</td>
<td>6</td>
<td>0.025</td>
</tr>
<tr>
<td>15 feet</td>
<td>6</td>
<td>0.025</td>
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<tr>
<td>20 feet</td>
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<tr>
<td>25 feet</td>
<td>6</td>
<td>0.025</td>
</tr>
<tr>
<td>30 feet</td>
<td>6</td>
<td>0.025</td>
</tr>
<tr>
<td>35 feet</td>
<td>6</td>
<td>0.025</td>
</tr>
<tr>
<td>40 feet</td>
<td>6</td>
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<tr>
<td>45 feet</td>
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<td>0.025</td>
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<td>50 feet</td>
<td>6</td>
<td>0.025</td>
</tr>
<tr>
<td>55 feet</td>
<td>6</td>
<td>0.025</td>
</tr>
<tr>
<td>60 feet</td>
<td>6</td>
<td>0.025</td>
</tr>
<tr>
<td>65 feet</td>
<td>6</td>
<td>0.025</td>
</tr>
<tr>
<td>70 feet</td>
<td>6</td>
<td>0.025</td>
</tr>
<tr>
<td>75 feet</td>
<td>6</td>
<td>0.025</td>
</tr>
<tr>
<td>80 feet</td>
<td>6</td>
<td>0.025</td>
</tr>
</tbody>
</table>

(2) PRESSURE INSTRUMENT CONNECTION

1 = 1/4" NPT Male
2 = 1/2" NPT Male
4 = 1/4" Amino

(1) DIAPHRAGM SEAL INSTRUMENT CONNECTION

A = 1/4" NPT Male
E = 1/4" Amino

Notes:

1. Customer to specify exact capillary length when ordering. Otherwise maximum length is assumed.
2. For capillary lengths over 75 feet, consult the factory.
3. Not to be used in contact with aluminum or magnesium.
4. Other fill fluids available, consult the factory.
5. Customer must specify exact calibration data. Otherwise functional performance only is verified.
Fill fluids should be selected by carefully considering their physical properties at the extremes of the ambient and process temperature to which they will be subjected. Fill fluids must also be chemically compatible with the process fluid to avoid potentially hazardous reaction in the event of diaphragm failure. Typically, hydrocarbon based liquids must not be used with strong oxidizers, such as oxygen, chlorine, hydrogen peroxide or nitric acid. For these special applications, an inert liquid such as Fluorolube or Halocarbon are available. Fill fluids diluted with or containing water will not be supplied by ITT Conoflow. The presence of water in filled systems can cause gross inaccuracies.

Notes:
1. Not to be used in contact with aluminum or magnesium.
2. Information to be advised.

<table>
<thead>
<tr>
<th>Fill Fluid (Food Grade)</th>
<th>Temperature Limits</th>
<th>Specific Gravity</th>
<th>Viscosity -c.s. + 76°F (24°C)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pure Glycerine</td>
<td>+30 to +300°F (-1 to +149°C)</td>
<td>1.26</td>
<td>100</td>
</tr>
<tr>
<td>Silicone D.C. 200</td>
<td>-50 to +450°F (-45 to +232°C)</td>
<td>.93</td>
<td>10</td>
</tr>
<tr>
<td>Silicone D.C. 704</td>
<td>+30 to +520°F (+21 to +271°C)</td>
<td>1.07</td>
<td>40</td>
</tr>
<tr>
<td>Silicone D.C. 710</td>
<td>+30 to +700°F (+17 to +266°C)</td>
<td>1.11</td>
<td>500</td>
</tr>
<tr>
<td>Silicone D.C. 550</td>
<td>-40 to +550°F (-40 to +316°C)</td>
<td>1.07</td>
<td>125</td>
</tr>
<tr>
<td>Silicone D.C. 510</td>
<td>-60 to +400°F (-60 to +400°C)</td>
<td>.99</td>
<td>50</td>
</tr>
<tr>
<td>Silicone D.C. 200-350</td>
<td>+0 to +300°F (-17 to +149°C)</td>
<td>.97</td>
<td>350</td>
</tr>
</tbody>
</table>

(See Note 1)

| Fluorolube FS-5         | -40 to +500°F (-40 to 260°C) | 1.87             | 5.5                           |
| Halocarbon Oil 6.3      | -40 to +400°F (-40 to +149°C) | 1.87             | 6.3                           |
| Ethylene Glycol         | -30 to +300°F (-34 to +149°C) | 1.10             | 30                            |
| Propylene Glycol        | -50 to +200°F (-45 to +93°C)  | 1.03             | 42.6                          |
| Syltherm 800            | -40 to +450°F (-40 to 399°C)  | .93              | 10.7                          |
| Mineral Oil             | (Note 2)                      | .85              | (Note 2)                      |
| Neobee M-20             | -4 to +320°F (-20 to +160°C)  | .92              | 9.5cP                         |

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Vacuum Applications

If diaphragm seals are sized appropriately to provide adequate displacement, most vacuum applications can be achieved. An important consideration is the vapor pressure point of the fill fluid. If the combination of pressure and temperature reach the vapor pressure point, accuracy will become unpredictable. The following graphs indicate the vapor pressure points of commonly used fill fluids for vacuum applications.

[Graphs showing vapor pressure vs. temperature for different fill fluids]
Model 700C  Sanitary Diaphragm Seals for Sanitary Piping Systems

Instrument Connection Sizes
1/4" NPT

Pressure Ratings
Determined by Piping System Clamp Rating

Dimensional Data
See drawings below.

Standard Features and Options
This clamped, off-line seal has a diaphragm welded to the upper housing. Designed to ensure that the surfaces exposed to the process are virtually crack and crevice free. The diaphragm and wetted materials are 316 Stainless Steel. The displacement capability of this seal is determined by the diaphragm diameter that the process pipe will accommodate. Due to the limited displacement capability of some of the sanitary pipe sizes, careful consideration should be used when choosing the appropriate size.

* Models indicated meet the requirement of the 3A Sanitary Standard.

Offerings
Upper Materials: 316 Stainless Steel
Diaphragm Materials: 316L Stainless Steel (4)

Note: ITT Conflow does not regularly supply associated pipe clamps or gaskets.

CONTROL ENGINEERING DATA

<table>
<thead>
<tr>
<th>SEAL TYPE</th>
<th>SIZE</th>
<th>PIPING SYSTEM</th>
<th>CONNECTOR (SEE NOTES 1 AND 2)</th>
</tr>
</thead>
<tbody>
<tr>
<td>700C-1152N</td>
<td>1 1/2&quot;</td>
<td>Ladish &quot;Tri-Clamp&quot; (3)</td>
<td>Clamp</td>
</tr>
<tr>
<td>700C-120</td>
<td>2</td>
<td>Cherry Burrell &quot;S&quot; Line</td>
<td>Clamp</td>
</tr>
<tr>
<td>700C-130</td>
<td>3&quot;</td>
<td>G &amp; H GC Fast Clamp</td>
<td>Clamp</td>
</tr>
<tr>
<td>700C-220</td>
<td>2&quot;</td>
<td>CB &quot;I&quot; Line</td>
<td>Clamp</td>
</tr>
<tr>
<td>700C-230</td>
<td>3&quot;</td>
<td></td>
<td></td>
</tr>
<tr>
<td>700C-240</td>
<td>4&quot;</td>
<td></td>
<td></td>
</tr>
<tr>
<td>700C-320</td>
<td>2&quot;</td>
<td>Cherry Burrell &quot;G&quot; Line</td>
<td>Clamp</td>
</tr>
<tr>
<td>700C-420</td>
<td>2&quot;</td>
<td>G &amp; H GC &quot;H&quot; Line</td>
<td>Clamp</td>
</tr>
<tr>
<td>700C-520</td>
<td>2&quot;</td>
<td>APC &quot;Quick Connect&quot;</td>
<td>Clamp</td>
</tr>
<tr>
<td>700A-628</td>
<td>2&quot;</td>
<td>Anheuser Busch</td>
<td>814C-Nut</td>
</tr>
<tr>
<td>700A-826</td>
<td>2&quot;</td>
<td></td>
<td>814C-Nut</td>
</tr>
<tr>
<td>700D-820</td>
<td>2&quot;</td>
<td>Ashcroft Replacement</td>
<td>Ring</td>
</tr>
</tbody>
</table>

700C-EX = Welded in line all systems. This seal is custom designed to fit almost any piping system and utilizes clamping and other connectors as specified by the customer.

Notes:
1. Clamp nuts or rings and gaskets are not normally supplied by ITT Conflow.
2. Maximum operating pressure of the system is determined by the clamping device. IMPORTANT - For higher pressure clamps (1000 PSIG (6.90 MPa) or higher), consult the factory for product specifications.
3. When ordering a diaphragm seal for a Tri-Clamp piping system utilizing a 13mHP (high pressure) clamp, then add the suffix "7481" to the catalog number.
4. Standard wetted surface finish is 32Ra. For wetted surface finishes of 20Ra (electro-polished), add suffix "7605" to the catalog number.

---

700C-100*

700C-200*

700C-300*

700C-400*

700C-500*

700A-600*

7000-800*

700-C-EX

Custom designed to fit almost any piping system and utilizing clamping or other connectors as required by customer.
The primary concern in determining pressure ratings is the clamp load of the bolts and nuts. Coniflow offers carbon steel, stainless steel, and high-strength stainless steel bolts/nuts.

Using Carbon Steel Grade 5 bolts and Grade 8 nuts will maintain the maximum pressure rating of the seal.

The use of 300 Series Stainless Steel bolts and nuts will reduce the pressure rating by 50%.

When 300 Series Stainless Steel bolts and nuts are required and the maximum pressure rating must be maintained, then stainless steel high-strength bolts are necessary.

When bolt through mounting is not feasible, then flange studs are provided.

The following torque values are for SAE Grade 5 Steel shank bolts, dry lubricated, using SAE Grade 8 Nuts or internally threaded mating parts.

<table>
<thead>
<tr>
<th>Bolt Size</th>
<th>Torque FT-LB</th>
<th>Torque IN-LB</th>
</tr>
</thead>
<tbody>
<tr>
<td>1/4-20</td>
<td>8</td>
<td>95</td>
</tr>
<tr>
<td>1/4-28</td>
<td>10</td>
<td>120</td>
</tr>
<tr>
<td>5/16-18</td>
<td>17</td>
<td>204</td>
</tr>
<tr>
<td>5/16-24</td>
<td>19</td>
<td>228</td>
</tr>
<tr>
<td>3/8-16</td>
<td>29</td>
<td>348</td>
</tr>
<tr>
<td>3/8-24</td>
<td>35</td>
<td>420</td>
</tr>
<tr>
<td>7/16-14</td>
<td>47</td>
<td>564</td>
</tr>
<tr>
<td>7/16-20</td>
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<td>72</td>
<td>864</td>
</tr>
<tr>
<td>1/2-20</td>
<td>85</td>
<td>1020</td>
</tr>
<tr>
<td>9/16-12</td>
<td>103</td>
<td>1236</td>
</tr>
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<tr>
<td>5/8-11</td>
<td>142</td>
<td>1704</td>
</tr>
<tr>
<td>5/8-18</td>
<td>168</td>
<td>2016</td>
</tr>
</tbody>
</table>

The following torque values are for 304 Stainless Steel shank bolts, dry lubricated; using 304 Stainless Steel nuts or internally threaded mating parts.

<table>
<thead>
<tr>
<th>Bolt Size</th>
<th>Torque FT-LB</th>
<th>Torque IN-LB</th>
</tr>
</thead>
<tbody>
<tr>
<td>1/4-2</td>
<td>5</td>
<td>60</td>
</tr>
<tr>
<td>1/4-28</td>
<td>6</td>
<td>72</td>
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<tr>
<td>5/16-18</td>
<td>10</td>
<td>120</td>
</tr>
<tr>
<td>5/16-24</td>
<td>12</td>
<td>144</td>
</tr>
<tr>
<td>3/8-16</td>
<td>18</td>
<td>216</td>
</tr>
<tr>
<td>3/8-24</td>
<td>22</td>
<td>264</td>
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<tr>
<td>7/16-14</td>
<td>29</td>
<td>348</td>
</tr>
<tr>
<td>7/16-20</td>
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<tr>
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<td>540</td>
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