

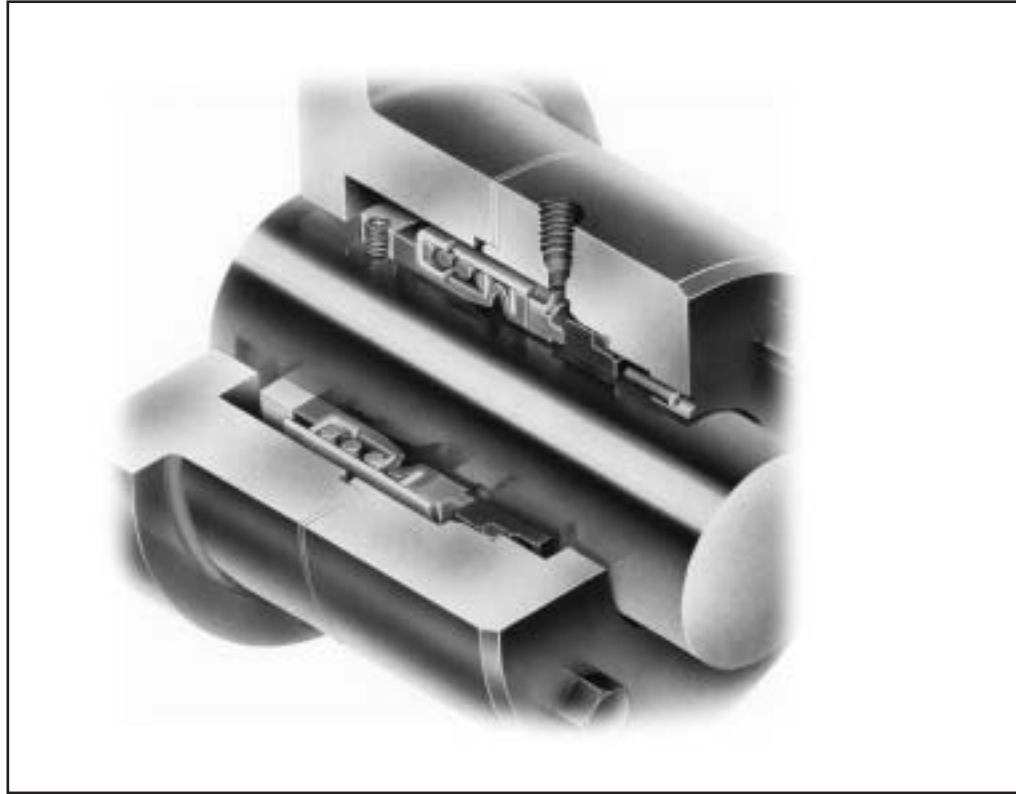


TYPE 502

Elastomer Bellows Seal

Industries Served

Chemical Processing
Conveyor and Industrial Equipment
Cryogenics
Food Processing
Gas Compression
Industrial Blowers and Fans
Marine
Mixers and Agitators
Nuclear Service
Offshore
Oil and Refinery
Paint and Ink
Petrochemical Processing
Pharmaceutical
Pipeline
Power Generation
Pulp and Paper
Water Systems
Wastewater Treatment
Water Desalination



Applications

The Type 502 is a full convolution elastomeric bellows seal designed for confined spaces and limited gland depths. Self-aligning feature compensates for excessive shaft end play and run-out.

- Industries include chemical processing, food processing, gas compression, marine, nuclear service, offshore, oil & refinery, paint & ink, petrochemical processing, pharmaceutical, pipeline, power generation, pulp and paper, wastewater, water desalination, water systems.
- All types of rotary equipment, pumps, marine, mixers, agitators, blowers, fans and compressors in a variety of service applications.
- Supplied completely assembled for fast installation and field repairable.
- Complies with DIN 24960, ISO 3069, and BS.5257:1975.

Operating conditions

Temperature: -40°C to +205°C
depending on materials used

Pressures: up to 40 bar g

Speed: up to 13 m/s

Fluids

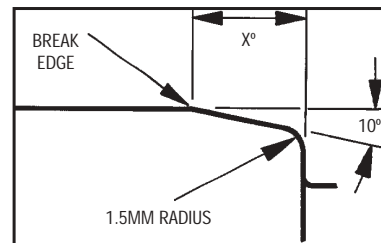
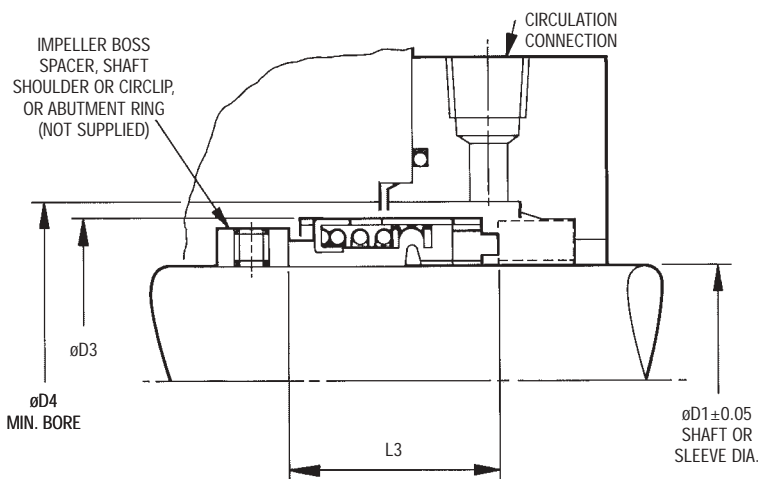
Paints and Inks
Water
Weak Acids

Design Features/Benefits

- **Fast Installation**
Completely assembled one-piece design for fast installation.
- **Unitised Design**
Unitised design incorporates positive retainer/key drive from bellows.
- **Non-Clogging, Single Coil Spring**
Provides greater dependability than multiple spring designs. Will not be affected by build-up of solids.
- **Compact Design**
Full convolution elastomeric bellows seal designed for confined spaces and limited gland depths. Self-aligning feature compensates for excessive shaft end play and run-out.

Elastomer Bellows Seal

Type 502 Typical Arrangement/Dimensional Data (mm)



For ease of installation, the lead-in edge of the shaft or sleeve should be chamfered as shown.

*Recommended chamfer lengths:

| | |
|--------------|--------|
| Seal Sizes | Dim. X |
| 14 to 68 mm | 3 mm |
| 70 to 100 mm | 8 mm |

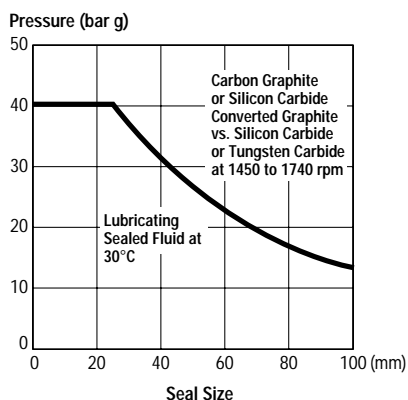
The working length for both single, L1K, and double, 2 x L1K, Type 502 seals conforms to DIN 24960 without special spacer pieces being needed.

Type 502 Dimensional Data (mm)

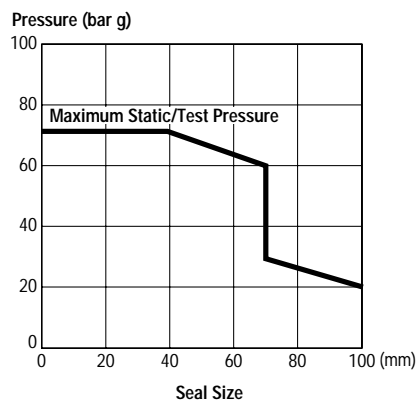
| Seal Size (mm) | Seal Size Code | D1 | D3 | D4 | D20 | | L3 |
|----------------------|----------------------|----|----|----|------|------|------|
| | | | | | Min. | Max. | |
| 14 | 0140 | 14 | 24 | 26 | 16.0 | 22.5 | 23.0 |
| 16 | 0160 | 16 | 26 | 28 | 18.0 | 24.5 | 23.0 |
| 18 | 0180 | 18 | 32 | 34 | 20.0 | 29.0 | 24.0 |
| 20 | 0200 | 20 | 34 | 36 | 22.0 | 31.0 | 24.0 |
| 22 | 0220 | 22 | 36 | 38 | 24.0 | 33.0 | 24.0 |
| 24 | 0240 | 24 | 38 | 40 | 26.0 | 35.2 | 26.7 |
| 25 | 0250 | 25 | 39 | 41 | 27.0 | 36.3 | 27.0 |
| 28 | 0280 | 28 | 42 | 44 | 30.0 | 39.5 | 30.0 |
| 30 | 0300 | 30 | 44 | 46 | 32.0 | 41.5 | 30.5 |
| 32 | 0320 | 32 | 46 | 48 | 34.0 | 43.5 | 30.5 |
| 33 | 0330 | 33 | 47 | 49 | 35.0 | 44.5 | 30.5 |
| 35 | 0350 | 35 | 49 | 51 | 37.0 | 46.5 | 30.5 |
| 38 | 0380 | 38 | 54 | 58 | 40.0 | 51.0 | 32.0 |
| 40 | 0400 | 40 | 56 | 60 | 42.0 | 53.0 | 32.0 |
| 43 | 0430 | 43 | 59 | 63 | 45.0 | 56.0 | 32.0 |
| 45 | 0450 | 45 | 61 | 65 | 47.0 | 58.0 | 32.0 |

| Seal Size (mm) | Seal Size Code | D1 | D3 | D4 | D20 | | L3 |
|----------------|----------------|-----|-----|-----|------|------|------|
| | | | | | Min. | Max. | |
| 48 | 0480 | 48 | 64 | 68 | 50.0 | 61.0 | 32.0 |
| 50 | 0500 | 50 | 66 | 70 | 52.0 | 63.2 | 34.0 |
| 53 | 0530 | 53 | 69 | 73 | 55.0 | 66.2 | 34.0 |
| 55 | 0550 | 55 | 71 | 75 | 57.0 | 68.2 | 34.0 |
| 58 | 0580 | 58 | 78 | 83 | 60.0 | 74.0 | 39.0 |
| 60 | 0600 | 60 | 80 | 85 | 62.0 | 76.0 | 39.0 |
| 63 | 0630 | 63 | 83 | 88 | 65.0 | 79.0 | 39.0 |
| 65 | 0650 | 65 | 85 | 90 | 67.0 | 81.0 | 39.0 |
| 70 | 0700 | 70 | 89 | 95 | † | † | 45.5 |
| 75 | 0750 | 75 | 96 | 104 | † | † | 45.5 |
| 80 | 0800 | 80 | 104 | 109 | † | † | 45.0 |
| 85 | 0850 | 85 | 108 | 114 | † | † | 45.0 |
| 90 | 0900 | 90 | 114 | 119 | † | † | 50.0 |
| 95 | 0950 | 95 | 118 | 124 | † | † | 50.0 |
| 100 | 1000 | 100 | 124 | 129 | † | † | 50.0 |

Pressure/Velocity (PV) Limits



Hydrostatic Pressure Limits



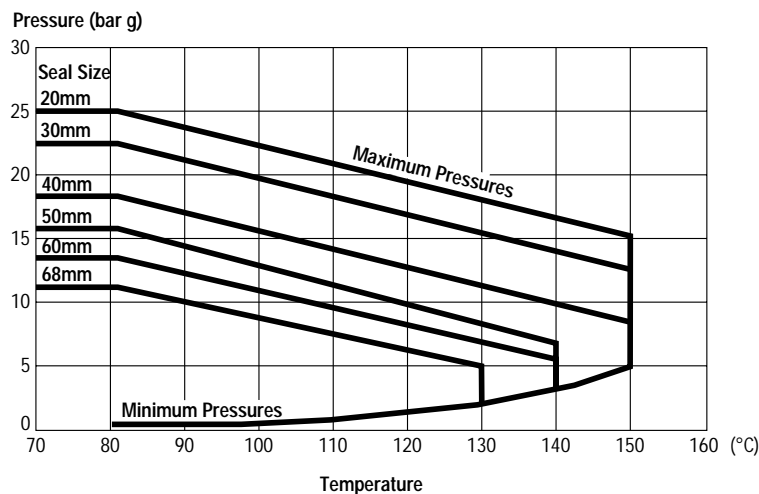
To determine the maximum pressure for the size of Type 502 seal required, multiply the pressure obtained from this table by the appropriate factors given in PV Multiplier Factors table. The maximum operating pressures shown apply under the following conditions: carbon graphite face/primary ring running against a silicon carbide or tungsten carbide seat/mating ring up to 1800 rpm, with a lubricating sealed fluid up to 80°C.



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Pressure/Temperature Limits for Hot Water



The graph shows maximum operating pressures/temperatures for seal sizes up to and including 68 mm when used with hot water above 80 °C.

These pressure capabilities are based on the use of a carbon graphite face, a tungsten carbide seal and ethylene propylene elastomers. The limits are valid for shaft speeds of 3600 rpm maximum, with uncooled product recirculation.

PV Multiplier Factors

| | Selection Considerations | Multiplier Factors |
|--------------------------|--|--------------------|
| Sealed Fluid Lubricity | Petrol, Kerosene or better | x 1.00 |
| | Water, Aqueous Solutions, Lighter Hydrocarbons (s.g. ≤0.65) | x 0.75 |
| Face and Seat Materials | Carbon v. Sintered Silicon Carbide or Silicon Carbide Converted Graphite v. Sintered Silicon Carbide | x 1.00 |
| | Tungsten Carbide v. Tungsten Carbide | x 0.80 |
| | Carbon v. Aluminium Oxide or Austenitic Cast Iron | x 0.60 |
| | Sintered Silicon Carbide v. Sintered Silicon Carbide | x 0.60 |
| | Sintered Silicon Carbide | x 0.50 |
| Sealed Fluid Temperature | up to 80°C | x 1.00 |
| | Above 80°C to 120°C | x 0.90 |
| | Above 120°C to 180°C | x 0.80 |
| | Above 180°C to 230°C | x 0.65 |
| Speed | up to 1800 rpm | x 1.00 |
| | Above 1800 to 3600 rpm | x 0.85 |

Example for Determining PV Limits:

Seal: 45mm diameter Type 502

Product: Water

Face and seat material: Carbon graphite v. aluminium oxide

Operating temperature: +10°C

Operating speed: 1750 rpm

Using Pressure/Velocity (PV) Limits table, the maximum pressure would be 28 bar g.

From PV Multiplier Factors table, apply the multiplier factors for the specific service requirements:

$28 \text{ bar g} \times 0.75 \times 0.60 \times 1.00 \times 1.00 = 12.6 \text{ bar g}$

Therefore for the example given the maximum operating pressure is 12.6 bar g.

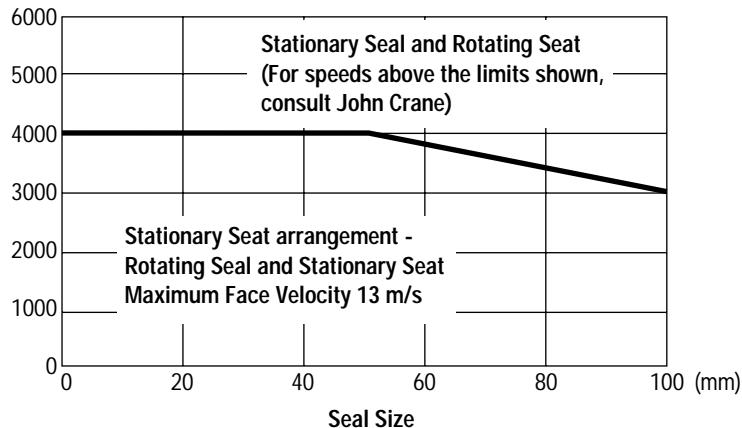


TYPE 502

Elastomer Bellows Seal

Speed Limits

Shaft Speed (rpm)



Rotating seals may be used at speeds up to 4000 rpm according to seal size. Above the limit shown, it is necessary to stationery mount the seal unit and use a rotating seat. This would necessitate a special arrangement and would not conform to DIN 24960.

Elastomer Temperature Limits

Compound

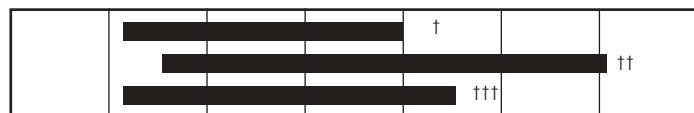
Temperature

(°C) -100 -50 0 50 100 150 200 250

Nitrile -40°C to +100°C

Fluorocarbon -30°C to +205°C

Ethylene Propylene* -40°C to +135°C



*Not to be used for hydrocarbons or mineral oils.

† For hydrocarbon duties the limit is +120°C.
†† For water duties the temperature should not exceed +135°C.
††† For water or steam duties the limit is +150°C.

Material Availability

| SEAL COMPONENTS | | MATERIALS | |
|---|--|---|--|
| Description | | Standard | Options |
| Bellows Seat O-Ring | | Nitrile Fluorocarbon Ethylene Propylene | |
| Face | | Silicon Carbide Converted Graphite Resin Impregnated Carbon Graphite | Antimony Impregnated Carbon Graphite |
| Retainer/Spring/Drive Ring Assembly (Metal Parts Set) Securing Ring ('BC' Seat) | | 316 Stainless Steel | |
| 'BO' Seat* 'BC' Seat* | | Austenitic Cast Iron (Ni-Resist) Aluminium Oxide Ceramic | Cobalt Bonded Tungsten Carbide Sintered Silicon Carbide |
| Abutment Ring† Setscrews† | | 316 Stainless Steel | |

*Seat types 'BP' or 'BD' can be used for applications requiring a secured and/or pinned seat, with PTFE, exfoliated graphite or elastomer seat ring.

†Optional parts: not supplied unless specially ordered.



TYPE 502

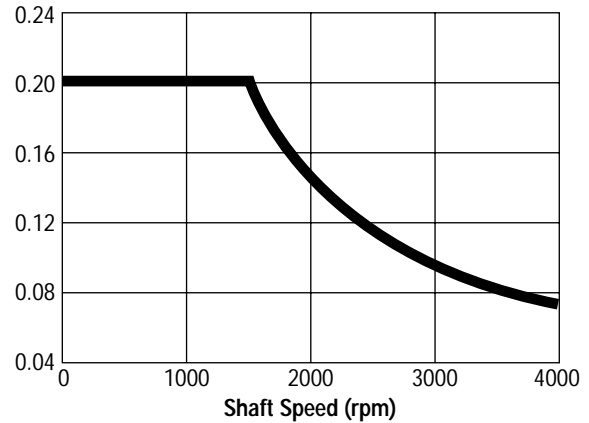
Elastomer Bellows Seal

Criteria for Installation

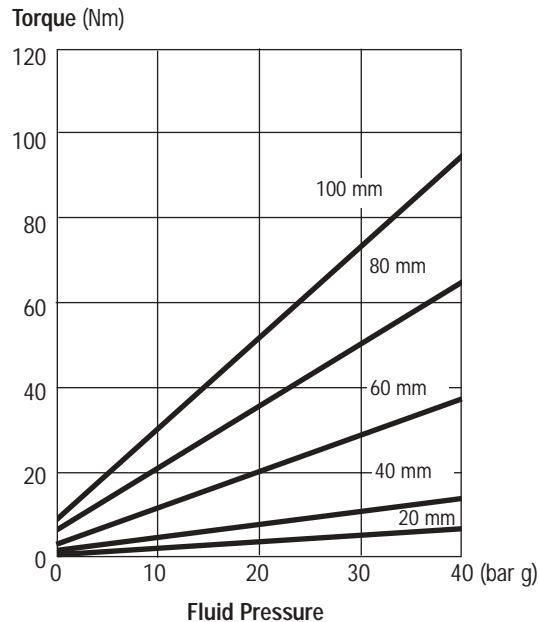
| Shaft/Sleeve | Limits |
|------------------------------------|--|
| Surface Finish | 0.8 to 1.2 μm Ra Fine Machined |
| Ovality/Out-of-Roundness | 0.1mm/ 0.004 in. |
| End Play/ Axial Float Allowance | 0.08mm/ 0.003 in. |
| Housing Squareness to Shaft | See Housing Squareness to Shaft table |

Housing Squareness to Shaft

Axial Run-Out (mm) F.I.M.



Breakout (Starting) Torque



The above specifications are given for general guidance only, and cannot be exact for every installation. The operating parameters shown are the recommended limits for continuous operation, and can be exceeded by a reasonable amount for limited periods. If the required performance for continuous operation is outside the specified limits, contact your John Crane Sales/Service Engineer.



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