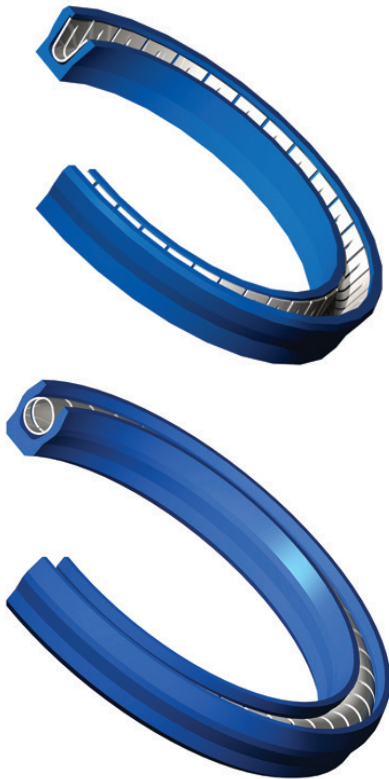




MSE® Seal

Versatile Sealing Performance



Applications

- Aircraft engines
- Brakes
- Fuel controls, pumps, valves
- Gearboxes
- Hydraulic systems
- APUs (Auxiliary Power Units)
- Scrapers across various platforms
- Static seals in utility and landing gear actuation systems
- Oxygen systems
- Cryo coolers

Metal Spring Energized Seals

The MSE® seal's superior designed dual-lip body offers improved sealing performance. An unlimited number of custom-engineered MSE® configurations are available. Greene Tweed's MSE® seals:

- Are machined not molded, resulting in lower costs and quicker turnaround time compared to molded elastomeric seals
- Fit most types of o-ring grooves with an open configuration*
- Offer unlimited shelf life
- Are available in sizes from 0.110 inch to 60 inches in diameter
- Are available in different spring designs
- Can be produced in custom sizes

**MSE® seals are not typically installable in closed grooves.*

Features and Benefits

- Low friction
 - Precise and uniform movement without stick/slip
 - Low power absorption and torque requirements
 - Friction can be adjusted and controlled
 - Can run dry or lubricated giving a long service life
- Able to withstand corrosive environments
 - Virtually unlimited media service with one seal
 - Will not contaminate sensitive media
- Wide temperature performance envelope
 - Cryogenic to 550°F (288°C), giving excellent performance at extreme temperatures
- Operates effectively at pressures from vacuum to 19,000 psi (1,300 bar)

**External pressurized arrangements are available. Contact GT engineering.*



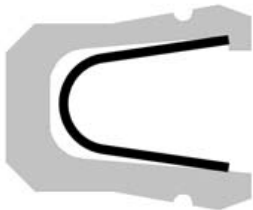
MSE® Design

The MSE® seal 2000 series uses a cantilever-type stainless steel spring to act as an energizer during low-pressure situations. The spring compensates for seal wear in dynamic applications and overcoming the non-resilient nature of PTFE materials. Calculated spring force is applied directly over the sealing lips, creating a leak-free seal without causing excessive friction and wear. As pressure is applied the spring cavity is pressure energized, assisting the spring load. The dual-lip cover is designed to provide primary sealing at the outermost contact point and secondary sealing at the innermost contact point.

MSE® Series

Series 2000 or 2060 – Dual-lip seals are energized by a medium load metal finger spring designed for general use under static or dynamic conditions. Temperature range of -65°F to 550°F (-54°C to 288°C), surface speeds up to 250 ft/min., and pressures up to 60,000 psi. Available in rod and piston designs.

2060 Series (Dual Sealing Lip)



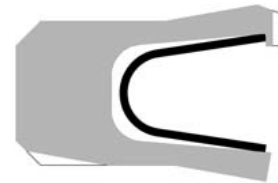
Series 2001 or 2061 – The scraper lip design is best suited for non-lubricated applications or where abrasive media are present and space limited. The scraper lip keeps abrasive media from getting between the seal and hardware, decreasing abrasion. Available in rod and piston designs.

2061 Series (Scraper Lip)



Series 2301 or 2361 – The series is preferred for high-temperature/high-pressure scraper applications. Rod types use one backup gland width. Note: Piston-type arrangements are available upon request.

2361 Series



Series 2100 or 2160 – The flanged Series 2100 dual-lip seal is intended for use in lubricated applications or where the seal can be prelubricated. The flange helps prevent seal rotation, a major cause in rotary seal failure. For abrasive media or where dry sealing is required, the Series 2101 (2161) is the preferred choice. The scraper lip keeps abrasive media from getting between the seal and the shaft, thus decreasing abrasion.

2160 Series (Flanged Version)



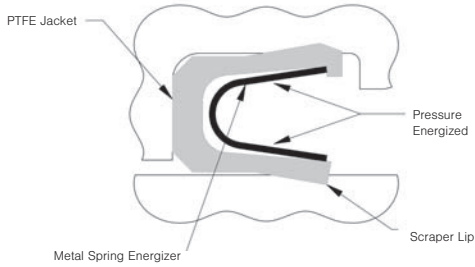
2161 Series (Flanged Version)



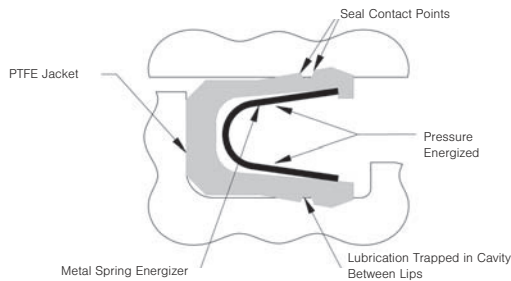
Series I2000 or 2060 – MSE internal pressure face seals are intended for both static and dynamic applications. However, whenever possible, it is recommended that dynamic sealing should be accomplished with a radial-type seal.



Finger Spring Energized MSE® in Gland – Scraper Configuration



Finger Spring Energized MSE® in Gland – Seal Configuration

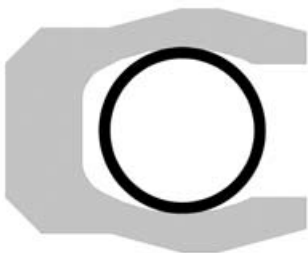


I2060 Series (Internally Pressurized)



Series 3000 or 3060 – Series 3000 seals are energized by a high-loading coil spring and are intended for temps from 270°F to 550°F (-168°C to 288°C). Series 3000 seals are mainly designed for static applications but will work under dynamic conditions with surface speeds up to 100 ft/min. Configurations: rod, piston, flanged, and face seals.

3060 Series (STD)



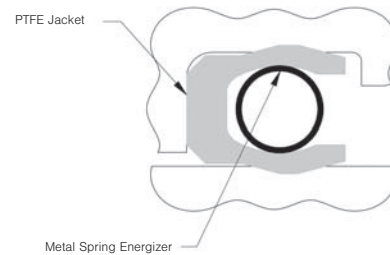
3160 Series (Flanged)



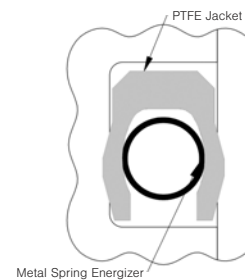
I3060 Series (Internally Pressurized)



Coil Spring in Gland



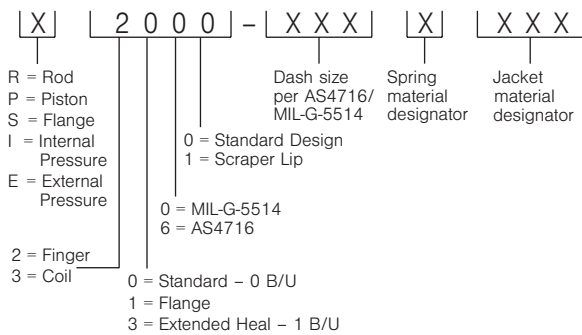
SFS (Static Face Seal) Coil Spring in Gland



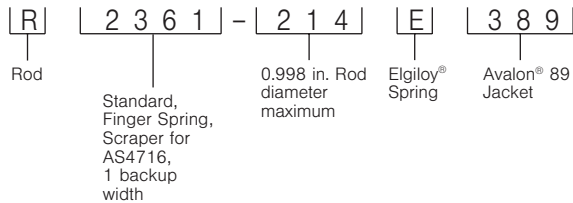


MSE® Part Numbering System

The part numbering system requires the use of the material designator tables found in the next column. For nonstandard designs, contact Greene Tweed engineering.



Part Numbering Example



Contact your local Greene Tweed representative for specific recommendations to suit higher performance requirements.

Material Designator Tables

| Code | Spring Material | Series 2000 | Series 3000 | Max. Recommended Temp. Range |
|------|-----------------|-------------|-------------|------------------------------|
| S | 301 SS | Standard | Available* | 500°F (260°C) |
| P | 17-7 PH SS | | Standard | 500°F (260°C) |
| E | Elgiloy® | Standard | Standard | 500°F (260°C) |

*Contact Greene Tweed engineering for availability.

| Code | Jacket Material |
|------|-----------------|
| 301 | Avalon® 01 |
| 043 | Avalon® 07 |
| 019 | Avalon® 09 |
| 344 | Avalon® 44 |
| 069 | Avalon® 50 |
| 357 | Avalon® 57 |
| 379 | Avalon® 69 |
| 389 | Avalon® 89 |

See Greene Tweed Surface Finish guidelines.

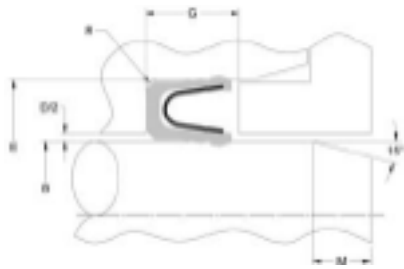


Seal Configuration

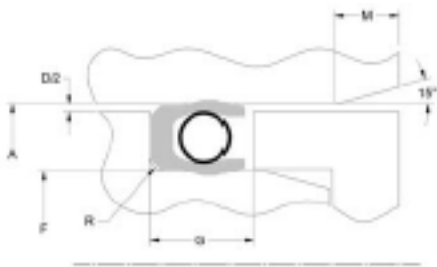
Special consideration should be given to applications that require sealing at temperatures below -65°F (-54°C). The thermal contraction of PTFE materials must be overcome to ensure positive sealing. This is best accomplished by 1) trapping the PTFE on the flanged OD to prevent shrinkage away from the hardware, and 2) geometry changes in the jacket and spring design to ensure positive loading. Both are accomplished by flanged seal designs.

Gland Dimensions

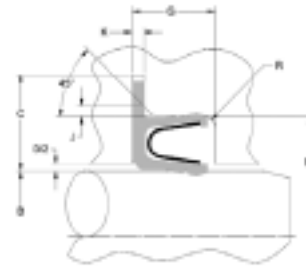
Seal Groove – Rod



Seal Groove – Piston



Seal Groove – Flange



| Flanged Seals | | | |
|---------------|-------------|-------|-------------|
| Dash No. | C | J | K |
| -006 – 028 | 0.156/0.160 | 0.015 | 0.010/0.013 |
| -110 – 149 | 0.186/0.190 | 0.020 | 0.016/0.020 |
| -210 – 247 | 0.218/0.255 | 0.025 | 0.024/0.027 |
| -325 – 349 | 0.343/0.350 | 0.035 | 0.028/0.032 |
| -425 – 460 | 0.437/0.445 | 0.045 | 0.041/0.045 |

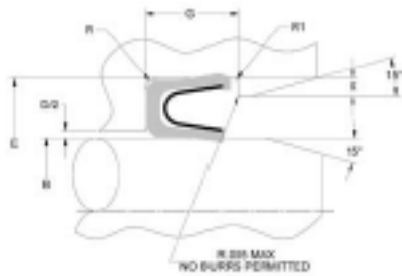
| Rod and Piston Groove | |
|-----------------------|-------|
| Dash No. | M |
| -006 – 028 | 0.075 |
| -110 – 149 | 0.100 |
| -210 – 247 | 0.120 |
| -325 – 349 | 0.150 |
| -425 – 460 | 0.190 |

Note: See gland tables for rod and piston diameters and gland widths.

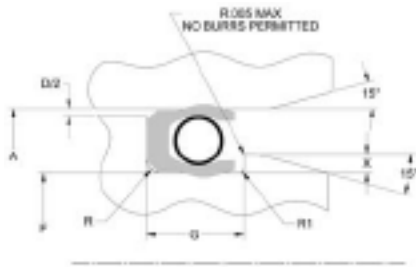


Gland Dimensions

Click Fit Groove — Rod

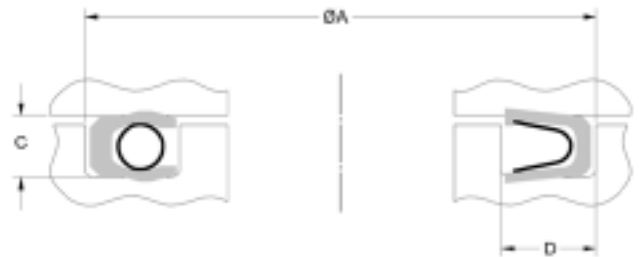


Click Fit Groove — Piston



Static Face Seal Gland*

SFS (Static Face Seal) Finger Spring in Gland



*Note: Reference for dimensional information on next page.

Click Fit Groove Dimensions (in Inches)

| Dash No.* | Nominal CX | Recommended Max Gland Lip Radius R1 | X | |
|------------|------------|-------------------------------------|------------|--------|
| | | | Dimensions | TOL. |
| -006 - 028 | 0.070 | 0.005 | 0.017 | ±0.001 |
| -110 - 149 | 0.103 | 0.007 | 0.021 | ±0.001 |
| -210 - 247 | 0.139 | 0.007 | 0.021 | ±0.001 |
| -325 - 349 | 0.210 | 0.009 | 0.032 | ±0.002 |
| -425 - 460 | 0.275 | 0.012 | 0.042 | ±0.002 |

*Note: For numbers -006 through -015 and -110 through -114, a two-piece gland is recommended.



Internal Pressure Face Seals Dimensional Information (in Inches)

| Dash No. | $\varnothing A^{+0.000}_{-0.005}$ | C ± 0.001 | D $+0.010_{-0.000}$ |
|----------|-----------------------------------|---------------|---------------------|
| 012* | 0.504 | 0.057 | 0.094 |
| 013* | 0.566 | | |
| 014* | 0.629 | | |
| 015* | 0.691 | | |
| 016* | 0.754 | | |
| 017* | 0.816 | | |
| 018* | 0.879 | | |
| 019 | 0.941 | | |
| 020 | 1.004 | | |
| 021 | 1.066 | | |
| 022 | 1.129 | | |
| 023 | 1.191 | | |
| 024 | 1.254 | | |
| 025 | 1.316 | | |
| 026 | 1.379 | | |
| 027 | 1.441 | | |
| 028 | 1.504 | | |
| 113 | 0.755 | 0.090 | 0.141 |
| 114 | 0.818 | | |
| 115 | 0.880 | | |
| 116 | 0.943 | | |
| 117 | 1.005 | | |
| 118 | 1.068 | | |
| 119 | 1.130 | | |
| 120 | 1.193 | | |
| 121 | 1.255 | | |
| 122 | 1.318 | | |
| 123 | 1.380 | | |
| 124 | 1.443 | | |
| 125 | 1.505 | | |
| 126 | 1.568 | | |
| 127 | 1.630 | | |
| 128 | 1.693 | | |
| 129 | 1.755 | | |
| 130 | 1.818 | | |
| 131 | 1.880 | | |
| 132 | 1.943 | | |
| 133 | 2.005 | | |
| 134 | 2.068 | | |
| 135 | 2.131 | | |
| 210 | 1.012 | 0.122 | 0.188 |
| 211 | 1.074 | | |
| 212 | 1.137 | | |
| 213 | 1.199 | | |
| 214 | 1.262 | | |
| 215 | 1.324 | | |
| 216 | 1.387 | | |
| 217 | 1.449 | | |
| 218 | 1.512 | | |
| 219 | 1.574 | | |

| Dash No. | $\varnothing A^{+0.000}_{-0.005}$ | C ± 0.001 | D $+0.010_{-0.000}$ |
|----------|-----------------------------------|---------------|---------------------|
| 220 | 1.637 | 0.122 | 0.188 |
| 221 | 1.699 | | |
| 222 | 1.762 | | |
| 223 | 1.887 | | |
| 224 | 2.012 | | |
| 225 | 2.137 | | |
| 226 | 2.262 | | |
| 227 | 2.387 | | |
| 228 | 2.512 | | |
| 229 | 2.637 | | |
| 230 | 2.762 | | |
| 231 | 2.887 | | |
| 232 | 3.012 | | |
| 233 | 3.137 | | |
| 234 | 3.262 | | |
| 235 | 3.387 | | |
| 236 | 3.512 | | |
| 237 | 3.637 | | |
| 238 | 3.762 | | |
| 239 | 3.887 | | |
| 240 | 4.012 | | |
| 241 | 4.137 | | |
| 242 | 4.262 | | |
| 243 | 4.387 | | |
| 244 | 4.512 | | |
| 245 | 4.637 | | |
| 246 | 4.762 | | |
| 247 | 4.887 | | |
| 328 | 2.270 | 0.187 | 0.281 |
| 329 | 2.395 | | |
| 330 | 2.520 | | |
| 331 | 2.645 | | |
| 332 | 2.770 | | |
| 333 | 2.895 | | |
| 334 | 3.020 | | |
| 335 | 3.145 | | |
| 336 | 3.270 | | |
| 337 | 3.395 | | |
| 338 | 3.520 | | |
| 339 | 3.645 | | |
| 340 | 3.770 | | |
| 341 | 3.895 | | |
| 342 | 4.020 | | |
| 343 | 4.145 | | |
| 344 | 4.270 | | |
| 345 | 4.395 | | |
| 346 | 4.520 | | |
| 347 | 4.645 | | |
| 348 | 4.770 | | |
| 349 | 4.895 | | |

*Coil spring will go from 012 – 028 but finger spring will only go as small as 019.

Greene Tweed

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