

19. Quad™-rings

The sealing principle of the Quad™-ring is nearly the same as the O-ring sealing. The initial sealing is achieved by the diametrical squeeze in a right angled groove. The system pressure itself creates a positive sealing force.

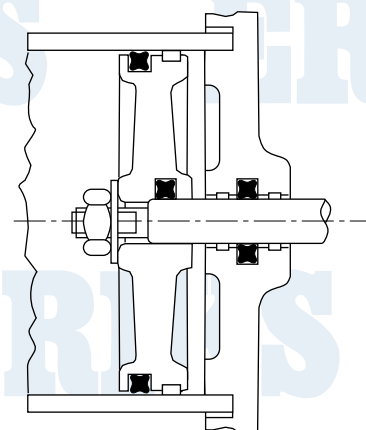
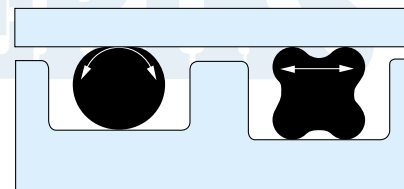
Following are some advantages of Quad™-rings:

- With Quad™-rings the standard grooves are deeper in comparison with O-ring glands. So the diametrical squeeze is lower than with O-rings. This makes dynamic sealing possible with reduced friction.
- The four lips of the Quad™-ring create more sealing capacity and at the same time a groove for lubrication, which is very favorable for dynamic sealing.
- The most important advantage of the Quad™-ring is the high stability for dynamic applications. In the situation that an O-ring rolls in the groove and creates torsion, a Quad™-ring will slide with no negative results.
- More resistant to spiral failure.

Note 1:
 It is recommended, especially for dynamic seals, to use the Quad™-ring with the largest possible cross section or thickness because thicker rings can withstand more tolerance variance. A 4-inch I.D. (100 mm) Quad™-ring is available with cross sections of .070 (1,78 mm), .103 (2,62 mm), .139 (3,53 mm), and .210 (5,33 mm). For dynamic applications use, if there is room, the largest cross section available (.210 / 5,33 mm).

Note 2:
 Because Quad™-ring glands have deeper grooves than O-rings, standard O-ring back-up rings cannot be used. The actual groove dimensions are needed to supply the correct sized machined back-up ring.

Note 3:
 Use FKM Quad™-rings with minimum stretch because FKM Quad™-rings have a smaller tolerance range than NBR Quad™-rings.



Standard cross sections of Quad™-rings

Application Range from vacuum to 6000 psi (400 bar, 40 MPa.). Over 750 psi (50 bar, 5 MPa.) when used in connection with back-up-rings. Speeds up to 1.6 ft/s (0.5 m/sec.) (reciprocating). Surface finish is the same as with O-ring applications. See page 15 and 24.

The temperature range is from -50°C up to +200°C (-60°F up to + 400°F) depending on the elastomer or compound. As with O-rings, many Quad™-rings are manufactured according the American Standards with inch dimensions and AS. numbers. To order Quad™-rings, add a "4" as a prefix to the O-ring's number.

19. Gland Design for Quad™-rings

Dynamic Applications with Quad™-rings

Spiral failure sometimes occurs on reciprocating O-rings. The conditions which cause this type of failure are those which cause segments of the O-ring to slide and other segments to roll simultaneously. The twisted seal is forced by the pressure into the sharp corner at the clearance gap. Rapid stress-aging can cause a rupture of the O-ring to start adjacent to the clearance gap. Motion of the O-ring causes the rupture to penetrate about half way through the cross section. Thus, when the O-ring is removed from the gland, it returns to its original shape and the rupture appears as a tight spiral around the cross section. One of the primary causes of spiral failure is by reciprocating speeds of less than one foot (0,3 m) per minute and on low or balanced pressure components. At this low speed, the sliding, or running, seal friction is very high relative to the break-out friction.

Therefore O-ring seals are not recommended for speeds less than 1 foot (0,3 m) per minute when the pressure difference is less than 400 psi (27,5 bar). A good solution to avoid spiral failure is the use of Quad™-rings.

Quad™-rings are used in many dynamic applications where O-rings provide less than satisfactory performance. The Quad™-ring is a four lobed seal. They are designed for improved seal lubrication and to prevent rolling of the seal, or spiral failure. Quad™-rings are dimensionally the same size corresponding to US standard AS568 O-ring numbers. Groove dimensions for the Quad™-ring are slightly different however, as less squeeze is required on the seal. Less squeeze means less friction and less wear on the seal.

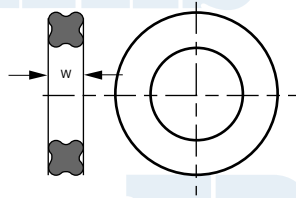


Fig. 1-36

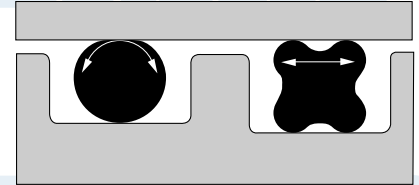


Fig. 1-37

19.A. Gland Design for Quad™-rings

Quad™-rings Gland Design Static/Dynamic (INCHES)

The following table shows the groove dimensions for Quad™-rings.

- If the Quad™-ring swells in the application, the groove width can be enlarged up to 15% max.
- For the Quad™-rings not listed, the groove dimensions are available upon request.

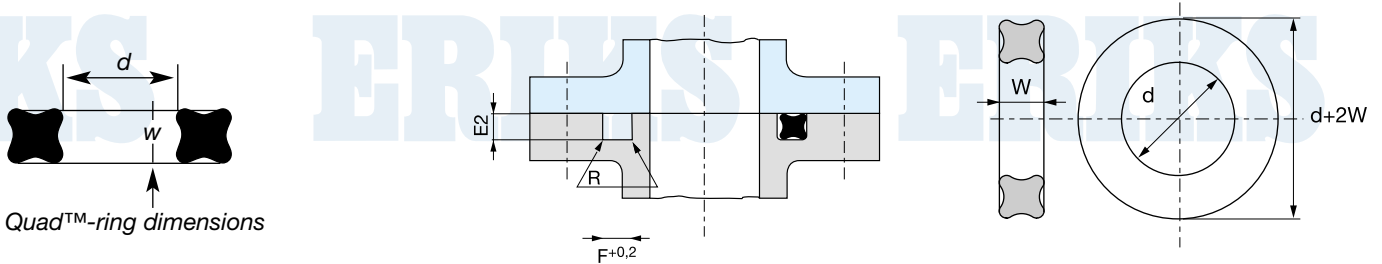
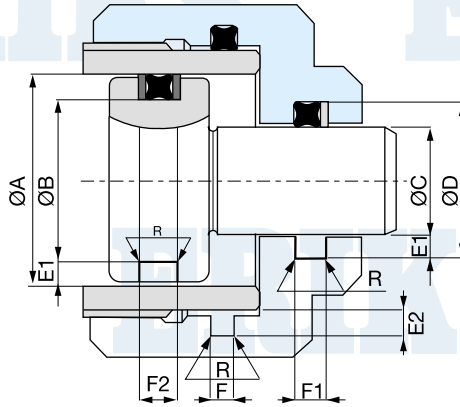


Table AS.8A Gland Dimensions (inches)

| Quad™-ring Size | Cross section *** W | Depth | | Width ** | | | Radius R | Max. Ø Clearance S max. |
|-----------------|------------------------|-------------|-------------|---------------------------|------------------------------|------------------------------|-------------|-------------------------------|
| | | Dynamic E1 | Static E2 | No backup ring F+ .008 | With Backup ring F1+ .008 | With Backup ring F2+ .008 | | |
| 4001 | .040 ± .003 | .031 ± .001 | .030 ± .001 | .047 | - | - | .004 | .002 |
| 4002 | .050 ± .003 | .039 ± .001 | .035 ± .001 | .055 | - | - | .006 | .002 |
| 4003 | .060 ± .003 | .051 ± .001 | .047 ± .001 | .067 | - | - | .010 | .003 |
| 4003 1/2 | .040 ± .003 | .031 ± .001 | .030 ± .001 | .047 | - | - | .004 | .002 |
| 4004 - 4050 | .070 ± .003 | .061 ± .001 | .056 ± .001 | .080 | .140 | .200 | .010 | .004 |
| 4102 - 4178 | .103 ± .003 | .094 ± .001 | .089 ± .001 | .115 | .170 | .230 | .015 | .006 |
| 4201 - 4284 | .139 ± .004 | .128 ± .001 | .122 ± .001 | .155 | .210 | .270 | .015 | .006 |
| 4309 - 4395 | .210 ± .005 | .196 ± .001 | .188 ± .001 | .240 | .310 | .375 | .020 | .008 |
| 4425 - 4475 | .275 ± .006 | .256 ± .001 | .244 ± .001 | .310 | .410 | .510 | .020 | .008 |

Note:

(**) In case of exceptional bending of the rod or shaft, the diameter of the bottom of the groove can be adjusted both in case of vacuum and high pressure.

(***) Similar to O-rings, the Quad™-rings need a squeeze of 10 to 15%.

For critical applications in combination with small cross sections it is recommended to compare squeeze with the actual dimensions and tolerances.

19.A. Gland Design for Quad™-rings

Quad™-rings Gland Design Static/Dynamic (METRIC)

The following table shows the groove dimensions for Quad™-rings.

- If the Quad™-ring swells in the application, the groove width can be enlarged up to 15% max.
- For the Quad™-rings not listed, the groove dimensions are available upon request.

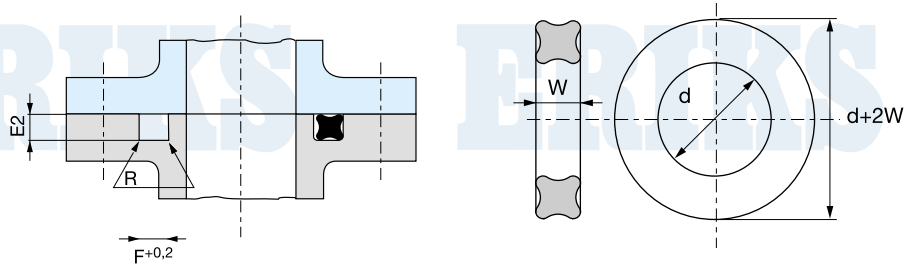
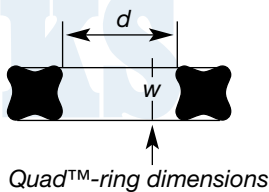
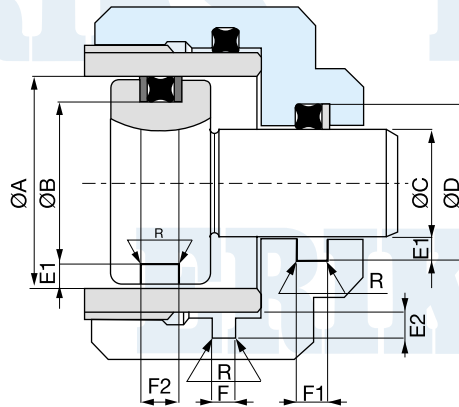


Table AS.8A Gland Dimensions (millimeters)

| Quad™-ring Size | Cross section *** W | Depth | | Width ** | | | Radius R | Max. Ø Clearance S max. |
|-----------------|------------------------|--------------|--------------|--------------------------|-----------------------------|------------------------------|-------------|-------------------------------|
| | | Dynamic E1 | Static E2 | No backup ring F+ 0,2 | With Backup ring F1+ 0,2 | With Backup ring F2 + 0,2 | | |
| 4001 | 1,02 + 0,08 | 0,8 + 0,025 | 0,75 + 0,025 | 1,2 | - | - | 0,1 | 0,05 |
| 4002 | 1,27 + 0,08 | 1,0 + 0,025 | 0,9 + 0,025 | 1,4 | - | - | 0,15 | 0,05 |
| 4003 | 1,52 + 0,08 | 1,3 + 0,025 | 1,2 + 0,025 | 1,7 | - | - | 0,25 | 0,08 |
| 4003 1/2 | 1,02 + 0,08 | 0,8 + 0,025 | 0,75 + 0,025 | 1,2 | - | - | 0,1 | 0,05 |
| 4004 - 4050 | 1,78 + 0,08 | 1,55 + 0,025 | 1,4 + 0,025 | 2,0 | 3,5 | 5,0 | 0,25 | 0,10 |
| 4102 - 4178 | 2,62 + 0,08 | 2,35 + 0,025 | 2,25 + 0,025 | 3,0 | 4,4 | 5,8 | 0,4 | 0,15 |
| 4201 - 4284 | 3,53 + 0,1 | 3,25 + 0,025 | 3,0 + 0,025 | 4,0 | 5,4 | 6,8 | 0,4 | 0,15 |
| 4309 - 4395 | 5,33 + 0,13 | 4,95 + 0,05 | 4,75 + 0,05 | 6,0 | 7,8 | 9,5 | 0,6 | 0,20 |
| 4425 - 4475 | 7,00 + 0,15 | 6,50 + 0,05 | 6,2 + 0,05 | 8,0 | 10,5 | 13,0 | 0,6 | 0,20 |

Other dimensions and elastomers are available upon request.

Note:

(**) In case of exceptional bending of the rod or shaft, the diameter of the bottom of the groove can be adjusted both in case of vacuum and high pressure.

(***) Similar to O-rings, the Quad™-rings need a squeeze of 10 to 15%.

For critical applications in combination with small cross sections it is recommended to compare squeeze with the actual dimensions and tolerances.

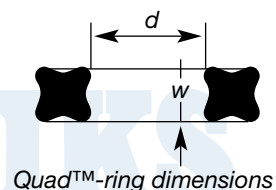
19.B. Precision Quad™-ring Standard Sizes

Nominal and Actual Dimensions

The following tables include nominal and actual dimensions, reflecting a slight built-in size reduction for effective sealing.

Tolerances

The standard seal tooling is dimensioned to the shrink characteristics of the standard NBR 70 hardness compound 36624. Because every rubber compound has its own shrink characteristics, slight deviations in dimensional tolerances will occur when standard seal tooling is used with materials other than the 36624 compound. The majority of the cases encountered involve rubber compounds with a higher shrink factor like a fluoroelastomer, resulting in an undersized seal. A slight adjustment in groove dimension may be required. Please contact the ERIKS Applications Engineers for tolerances when specifying materials other than the 36624 compound.



19.B. Precision Quad™-ring Standard Sizes

Standard Quad™-ring Sizes

| Size Only Part nr. | Nominal Sizes | | | Actual Sizes | | | | | | | | |
|-----------------------|---------------|-------|---------|--------------|---------|------|--------|------|----------|------|----------|------|
| | Rod | Bore | ID (in) | C/S (in) | ID (in) | +/- | ID(mm) | +/- | C/S (in) | +/- | C/S (mm) | +/- |
| 4001 | .031 | .093 | 1/32 | 1/32 | .029 | .004 | 0,74 | 0,10 | .040 | .003 | 1,02 | 0,08 |
| 4002 | .046 | .125 | 3/64 | 3/64 | .042 | .004 | 1,07 | 0,10 | .050 | .003 | 1,27 | 0,08 |
| 4003 | .062 | .156 | 1/16 | 1/16 | .056 | .004 | 1,42 | 0,10 | .060 | .003 | 1,52 | 0,08 |
| 4003 1/2 | .078 | .141 | 1/16 | 1/32 | .070 | .004 | 1,78 | 0,10 | .040 | .003 | 1,02 | 0,08 |
| 4004 | .078 | .203 | 5/64 | 1/16 | .070 | .005 | 1,78 | 0,13 | .070 | .003 | 1,78 | 0,08 |
| 4005 | .109 | .234 | 3/32 | 1/16 | .101 | .005 | 2,57 | 0,13 | .070 | .003 | 1,78 | 0,08 |
| 4006 | .125 | .250 | 1/8 | 1/16 | .114 | .005 | 2,90 | 0,13 | .070 | .003 | 1,78 | 0,08 |
| 4007 | .156 | .281 | 5/32 | 1/16 | .145 | .005 | 3,68 | 0,13 | .070 | .003 | 1,78 | 0,08 |
| 4008 | .187 | .312 | 3/16 | 1/16 | .176 | .005 | 4,47 | 0,13 | .070 | .003 | 1,78 | 0,08 |
| 4009 | .218 | .343 | 7/32 | 1/16 | .208 | .005 | 5,28 | 0,13 | .070 | .003 | 1,78 | 0,08 |
| 4010 | .250 | .375 | 1/4 | 1/16 | .239 | .005 | 6,07 | 0,13 | .070 | .003 | 1,78 | 0,08 |
| 4011 | .312 | .437 | 5/16 | 1/16 | .301 | .005 | 7,65 | 0,13 | .070 | .003 | 1,78 | 0,08 |
| 4012 | .375 | .500 | 3/8 | 1/16 | .364 | .005 | 9,25 | 0,13 | .070 | .003 | 1,78 | 0,08 |
| 4013 | .437 | .562 | 7/16 | 1/16 | .426 | .005 | 10,82 | 0,13 | .070 | .003 | 1,78 | 0,08 |
| 4014 | .500 | .625 | 1/2 | 1/16 | .489 | .005 | 12,42 | 0,13 | .070 | .003 | 1,78 | 0,08 |
| 4015 | .562 | .687 | 9/16 | 1/16 | .551 | .007 | 14,00 | 0,18 | .070 | .003 | 1,78 | 0,08 |
| 4016 | .625 | .750 | 5/8 | 1/16 | .614 | .009 | 15,60 | 0,23 | .070 | .003 | 1,78 | 0,08 |
| 4017 | .687 | .812 | 11/16 | 1/16 | .676 | .009 | 17,17 | 0,23 | .070 | .003 | 1,78 | 0,08 |
| 4018 | .750 | .875 | 3/4 | 1/16 | .739 | .009 | 18,77 | 0,23 | .070 | .003 | 1,78 | 0,08 |
| 4019 | .812 | .937 | 13/16 | 1/16 | .801 | .009 | 20,35 | 0,23 | .070 | .003 | 1,78 | 0,08 |
| 4020 | .875 | 1.000 | 7/8 | 1/16 | .864 | .009 | 21,95 | 0,23 | .070 | .003 | 1,78 | 0,08 |
| 4021 | .937 | 1.062 | 15/16 | 1/16 | .926 | .009 | 23,52 | 0,23 | .070 | .003 | 1,78 | 0,08 |
| 4022 | 1.000 | 1.125 | 1 | 1/16 | .989 | .010 | 25,12 | 0,25 | .070 | .003 | 1,78 | 0,08 |
| 4023 | 1.062 | 1.187 | 1-1/16 | 1/16 | 1.051 | .010 | 26,70 | 0,25 | .070 | .003 | 1,78 | 0,08 |
| 4024 | 1.125 | 1.250 | 1-1/8 | 1/16 | 1.114 | .010 | 28,23 | 0,25 | .070 | .003 | 1,78 | 0,08 |
| 4025 | 1.187 | 1.312 | 1-3/16 | 1/16 | 1.176 | .011 | 29,87 | 0,28 | .070 | .003 | 1,78 | 0,08 |
| 4026 | 1.250 | 1.375 | 1-1/4 | 1/16 | 1.239 | .011 | 31,47 | 0,28 | .070 | .003 | 1,78 | 0,08 |
| 4027 | 1.312 | 1.437 | 1-5/16 | 1/16 | 1.301 | .011 | 33,05 | 0,28 | .070 | .003 | 1,78 | 0,08 |
| 4028 | 1.375 | 1.500 | 1-3/8 | 1/16 | 1.364 | .013 | 34,65 | 0,33 | .070 | .003 | 1,78 | 0,08 |
| 4029 | 1.500 | 1.625 | 1-1/2 | 1/16 | 1.489 | .013 | 37,82 | 0,33 | .070 | .003 | 1,78 | 0,08 |
| 4030 | 1.625 | 1.750 | 1-5/8 | 1/16 | 1.614 | .013 | 41,00 | 0,33 | .070 | .003 | 1,78 | 0,08 |
| 4031 | 1.750 | 1.875 | 1-3/4 | 1/16 | 1.739 | .015 | 44,17 | 0,38 | .070 | .003 | 1,78 | 0,08 |
| 4032 | 1.875 | 2.000 | 1-7/8 | 1/16 | 1.864 | .015 | 47,35 | 0,38 | .070 | .003 | 1,78 | 0,08 |
| 4033 | 2.000 | 2.125 | 2 | 1/16 | 1.989 | .018 | 50,52 | 0,46 | .070 | .003 | 1,78 | 0,08 |
| 4034 | 2.125 | 2.250 | 2-1/8 | 1/16 | 2.114 | .018 | 53,70 | 0,46 | .070 | .003 | 1,78 | 0,08 |
| 4035 | 2.250 | 2.375 | 2-1/4 | 1/16 | 2.239 | .018 | 56,87 | 0,46 | .070 | .003 | 1,78 | 0,08 |
| 4036 | 2.375 | 2.500 | 2-3/8 | 1/16 | 2.364 | .018 | 60,05 | 0,46 | .070 | .003 | 1,78 | 0,08 |
| 4037 | 2.500 | 2.625 | 2-1/2 | 1/16 | 2.489 | .018 | 63,22 | 0,46 | .070 | .003 | 1,78 | 0,08 |
| 4038 | 2.625 | 2.750 | 2-5/8 | 1/16 | 2.614 | .020 | 66,40 | 0,51 | .070 | .003 | 1,78 | 0,08 |
| 4039 | 2.750 | 2.875 | 2-3/4 | 1/16 | 2.739 | .020 | 69,57 | 0,51 | .070 | .003 | 1,78 | 0,08 |
| 4040 | 2.875 | 3.000 | 2-7/8 | 1/16 | 2.864 | .020 | 72,75 | 0,51 | .070 | .003 | 1,78 | 0,08 |
| 4041 | 3.000 | 3.125 | 3 | 1/16 | 2.989 | .024 | 75,92 | 0,61 | .070 | .003 | 1,78 | 0,08 |
| 4042 | 3.250 | 3.375 | 3-1/4 | 1/16 | 3.239 | .024 | 82,27 | 0,61 | .070 | .003 | 1,78 | 0,08 |
| 4043 | 3.500 | 3.625 | 3-1/2 | 1/16 | 3.489 | .024 | 88,62 | 0,61 | .070 | .003 | 1,78 | 0,08 |
| 4044 | 3.750 | 3.875 | 3-3/4 | 1/16 | 3.739 | .027 | 94,97 | 0,69 | .070 | .003 | 1,78 | 0,08 |
| 4045 | 4.000 | 4.125 | 4 | 1/16 | 3.989 | .027 | 101,32 | 0,69 | .070 | .003 | 1,78 | 0,08 |
| 4046 | 4.250 | 4.375 | 4-1/4 | 1/16 | 4.239 | .030 | 107,67 | 0,76 | .070 | .003 | 1,78 | 0,08 |
| 4047 | 4.500 | 4.625 | 4-3/4 | 1/16 | 4.489 | .030 | 114,02 | 0,76 | .070 | .003 | 1,78 | 0,08 |
| 4048 | 4.750 | 4.875 | 4-3/4 | 1/16 | 4.739 | .030 | 120,37 | 0,76 | .070 | .003 | 1,78 | 0,08 |
| 4049 | 5.000 | 5.125 | 5 | 1/16 | 4.989 | .037 | 126,72 | 0,94 | .070 | .003 | 1,78 | 0,08 |
| 4050 | 5.250 | 5.375 | 5-1/4 | 1/16 | 5.239 | .037 | 133,07 | 0,94 | .070 | .003 | 1,78 | 0,08 |

19.B. Precision Quad™-ring Standard Sizes

Standard Quad™-ring Sizes

| Size Only | | Nominal Sizes | | | | Actual Sizes | | | | | | |
|-----------|-------|---------------|---------|----------|---------|--------------|--------|------|----------|------|----------|------|
| Part nr. | Rod | Bore | ID (in) | C/S (in) | ID (in) | +/- | ID(mm) | +/- | C/S (in) | +/- | C/S (mm) | +/- |
| 4102 | .062 | .250 | 1/16 | 3/32 | .049 | .005 | 1,24 | 0,13 | .103 | .003 | 2,62 | 0,08 |
| 4103 | .094 | .281 | 3/32 | 3/32 | .081 | .005 | 2,06 | 0,13 | .103 | .003 | 2,62 | 0,08 |
| 4104 | .125 | .312 | 1/8 | 3/32 | .112 | .005 | 2,85 | 0,13 | .103 | .003 | 2,62 | 0,08 |
| 4105 | .156 | .343 | 5/32 | 3/32 | .143 | .005 | 3,63 | 0,13 | .103 | .003 | 2,62 | 0,08 |
| 4106 | .187 | .375 | 3/16 | 3/32 | .174 | .005 | 4,42 | 0,13 | .103 | .003 | 2,62 | 0,08 |
| 4107 | .219 | .406 | 7/32 | 3/32 | .206 | .005 | 5,23 | 0,13 | .103 | .003 | 2,62 | 0,08 |
| 4108 | .250 | .437 | 1/4 | 3/32 | .237 | .005 | 6,02 | 0,13 | .103 | .003 | 2,62 | 0,08 |
| 4109 | .312 | .500 | 5/16 | 3/32 | .299 | .005 | 7,60 | 0,13 | .103 | .003 | 2,62 | 0,08 |
| 4110 | .375 | .562 | 3/8 | 3/32 | .362 | .005 | 9,20 | 0,13 | .103 | .003 | 2,62 | 0,08 |
| 4111 | .437 | .625 | 7/16 | 3/32 | .424 | .005 | 10,77 | 0,13 | .103 | .003 | 2,62 | 0,08 |
| 4112 | .500 | .687 | 1/2 | 3/32 | .487 | .005 | 12,37 | 0,13 | .103 | .003 | 2,62 | 0,08 |
| 4113 | .562 | .750 | 9/16 | 3/32 | .549 | .007 | 13,95 | 0,18 | .103 | .003 | 2,62 | 0,08 |
| 4114 | .625 | .812 | 5/8 | 3/32 | .612 | .009 | 15,55 | 0,23 | .103 | .003 | 2,62 | 0,08 |
| 4115 | .687 | .875 | 11/16 | 3/32 | .674 | .009 | 17,12 | 0,23 | .103 | .003 | 2,62 | 0,08 |
| 4116 | .750 | .937 | 3/4 | 3/32 | .737 | .009 | 18,72 | 0,25 | .103 | .003 | 2,62 | 0,08 |
| 4117 | .812 | 1.000 | 13/16 | 3/32 | .799 | .010 | 20,30 | 0,25 | .103 | .003 | 2,62 | 0,08 |
| 4118 | .875 | 1.062 | 7/8 | 3/32 | .862 | .010 | 21,90 | 0,25 | .103 | .003 | 2,62 | 0,08 |
| 4119 | .937 | 1.125 | 15/16 | 3/32 | .924 | .010 | 23,47 | 0,25 | .103 | .003 | 2,62 | 0,08 |
| 4120 | 1.000 | 1.187 | 1 | 3/32 | .987 | .010 | 25,07 | 0,25 | .103 | .003 | 2,62 | 0,08 |
| 4121 | 1.062 | 1.250 | 1-1/16 | 3/32 | 1.049 | .010 | 26,65 | 0,25 | .103 | .003 | 2,62 | 0,08 |
| 4122 | 1.125 | 1.312 | 1-1/8 | 3/32 | 1.112 | .010 | 28,25 | 0,25 | .103 | .003 | 2,62 | 0,08 |
| 4123 | 1.187 | 1.375 | 1-3/16 | 3/32 | 1.174 | .012 | 29,82 | 0,31 | .103 | .003 | 2,62 | 0,08 |
| 4124 | 1.250 | 1.437 | 1-1/4 | 3/32 | 1.237 | .012 | 31,42 | 0,31 | .103 | .003 | 2,62 | 0,08 |
| 4125 | 1.312 | 1.500 | 1-5/16 | 3/32 | 1.299 | .012 | 33,00 | 0,31 | .103 | .003 | 2,62 | 0,08 |
| 4126 | 1.375 | 1.562 | 1-3/8 | 3/32 | 1.362 | .012 | 34,60 | 0,31 | .103 | .003 | 2,62 | 0,08 |
| 4127 | 1.437 | 1.625 | 1-7/16 | 3/32 | 1.424 | .012 | 36,17 | 0,31 | .103 | .003 | 2,62 | 0,08 |
| 4128 | 1.500 | 1.687 | 1-1/2 | 3/32 | 1.487 | .012 | 37,77 | 0,31 | .103 | .003 | 2,62 | 0,08 |
| 4129 | 1.562 | 1.750 | 1-9/16 | 3/32 | 1.549 | .015 | 39,35 | 0,38 | .103 | .003 | 2,62 | 0,08 |
| 4130 | 1.625 | 1.812 | 1-5/8 | 3/32 | 1.612 | .015 | 41,00 | 0,38 | .103 | .003 | 2,62 | 0,08 |
| 4131 | 1.687 | 1.875 | 1-11/16 | 3/32 | 1.674 | .015 | 42,52 | 0,38 | .103 | .003 | 2,62 | 0,08 |
| 4132 | 1.750 | 1.937 | 1-3/4 | 3/32 | 1.737 | .015 | 44,12 | 0,38 | .103 | .003 | 2,62 | 0,08 |
| 4133 | 1.812 | 2.000 | 1-13/16 | 3/32 | 1.799 | .015 | 45,70 | 0,38 | .103 | .003 | 2,62 | 0,08 |
| 4134 | 1.875 | 2.062 | 1-7/8 | 3/32 | 1.862 | .015 | 47,30 | 0,38 | .103 | .003 | 2,62 | 0,08 |
| 4135 | 1.938 | 2.125 | 1-15/16 | 3/32 | 1.925 | .017 | 48,90 | 0,43 | .103 | .003 | 2,62 | 0,08 |
| 4136 | 2.000 | 2.187 | 2 | 3/32 | 1.987 | .017 | 50,47 | 0,43 | .103 | .003 | 2,62 | 0,08 |
| 4137 | 2.063 | 2.250 | 2-1/16 | 3/32 | 2.050 | .017 | 52,07 | 0,43 | .103 | .003 | 2,62 | 0,08 |
| 4138 | 2.125 | 2.312 | 2-1/8 | 3/32 | 2.112 | .017 | 53,65 | 0,43 | .103 | .003 | 2,62 | 0,08 |
| 4139 | 2.188 | 2.375 | 2-3/16 | 3/32 | 2.175 | .017 | 55,25 | 0,43 | .103 | .003 | 2,62 | 0,08 |
| 4140 | 2.250 | 2.437 | 2-1/4 | 3/32 | 2.237 | .017 | 56,82 | 0,43 | .103 | .003 | 2,62 | 0,08 |
| 4141 | 2.313 | 2.500 | 2-6/16 | 3/32 | 2.300 | .020 | 58,42 | 0,51 | .103 | .003 | 2,62 | 0,08 |
| 4142 | 2.375 | 2.562 | 2-3/8 | 3/32 | 2.362 | .020 | 60,00 | 0,51 | .103 | .003 | 2,62 | 0,08 |
| 4143 | 2.438 | 2.625 | 2-7/16 | 3/32 | 2.425 | .020 | 61,60 | 0,51 | .103 | .003 | 2,62 | 0,08 |
| 4144 | 2.500 | 2.687 | 2-1/2 | 3/32 | 2.487 | .020 | 63,17 | 0,51 | .103 | .003 | 2,62 | 0,08 |
| 4145 | 2.563 | 2.750 | 2-9/16 | 3/32 | 2.550 | .020 | 64,77 | 0,51 | .103 | .003 | 2,62 | 0,08 |
| 4146 | 2.625 | 2.812 | 2-5/8 | 3/32 | 2.612 | .020 | 66,34 | 0,51 | .103 | .003 | 2,62 | 0,08 |
| 4147 | 2.688 | 2.875 | 2-11/16 | 3/32 | 2.675 | .022 | 67,95 | 0,56 | .103 | .003 | 2,62 | 0,08 |
| 4148 | 2.750 | 2.937 | 2-3/4 | 3/32 | 2.737 | .022 | 69,52 | 0,56 | .103 | .003 | 2,62 | 0,08 |
| 4149 | 2.813 | 3.000 | 2-13/16 | 3/32 | 2.800 | .022 | 71,12 | 0,56 | .103 | .003 | 2,62 | 0,08 |
| 4150 | 2.875 | 3.062 | 2-7/8 | 3/32 | 2.862 | .022 | 72,70 | 0,56 | .103 | .003 | 2,62 | 0,08 |
| 4151 | 3.000 | 3.187 | 3 | 3/32 | 2.987 | .024 | 75,87 | 0,61 | .103 | .003 | 2,62 | 0,08 |
| 4152 | 3.250 | 3.437 | 3-1/4 | 3/32 | 3.237 | .024 | 82,22 | 0,61 | .103 | .003 | 2,62 | 0,08 |

19.B. Precision Quad™-ring Standard Sizes

Standard Quad™-ring Sizes

| Size Only Part nr. | Nominal Sizes | | Actual Sizes | | | | | | | | | |
|-----------------------|---------------|-------|--------------|----------|---------|------|--------|------|----------|------|----------|------|
| | Rod | Bore | ID (in) | C/S (in) | ID (in) | +/- | ID(mm) | +/- | C/S (in) | +/- | C/S (mm) | +/- |
| 4153 | 3.500 | 3.687 | 3-1/2 | 3/32 | 3.487 | .024 | 88,57 | 0,61 | .103 | .003 | 2,62 | 0,08 |
| 4154 | 3.750 | 3.937 | 3-3/4 | 3/32 | 3.737 | .028 | 94,92 | 0,71 | .103 | .003 | 2,62 | 0,08 |
| 4155 | 4.000 | 4.187 | 4 | 3/32 | 3.987 | .028 | 101,27 | 0,71 | .103 | .003 | 2,62 | 0,08 |
| 4156 | 4.250 | 4.437 | 4-1/4 | 3/32 | 4.237 | .030 | 107,62 | 0,76 | .103 | .003 | 2,62 | 0,08 |
| 4157 | 4.500 | 4.687 | 4-1/2 | 3/32 | 4.487 | .030 | 113,97 | 0,76 | .103 | .003 | 2,62 | 0,08 |
| 4158 | 4.750 | 4.937 | 4-3/4 | 3/32 | 4.737 | .030 | 120,32 | 0,76 | .103 | .003 | 2,62 | 0,08 |
| 4159 | 5.000 | 5.187 | 5 | 3/32 | 4.987 | .035 | 126,67 | 0,89 | .103 | .003 | 2,62 | 0,08 |
| 4160 | 5.250 | 5.437 | 5-1/4 | 3/32 | 5.237 | .035 | 133,02 | 0,89 | .103 | .003 | 2,62 | 0,08 |
| 4161 | 5.500 | 5.687 | 5-1/2 | 3/32 | 5.487 | .035 | 139,37 | 0,89 | .103 | .003 | 2,62 | 0,08 |
| 4162 | 5.750 | 5.937 | 5-3/4 | 3/32 | 5.737 | .035 | 145,72 | 0,89 | .103 | .003 | 2,62 | 0,08 |
| 4163 | 6.000 | 6.187 | 6 | 3/32 | 5.987 | .035 | 152,07 | 0,89 | .103 | .003 | 2,62 | 0,08 |
| 4164 | 6.250 | 6.437 | 6-1/4 | 3/32 | 6.237 | .040 | 158,42 | 1,02 | .103 | .003 | 2,62 | 0,08 |
| 4165 | 6.500 | 6.687 | 6-1/2 | 3/32 | 6.487 | .040 | 164,77 | 1,02 | .103 | .003 | 2,62 | 0,08 |
| 4166 | 6.750 | 6.937 | 6-3/4 | 3/32 | 6.737 | .040 | 171,12 | 1,02 | .103 | .003 | 2,62 | 0,08 |
| 4167 | 7.000 | 7.187 | 7 | 3/32 | 6.987 | .040 | 177,47 | 1,02 | .103 | .003 | 2,62 | 0,08 |
| 4168 | 7.250 | 7.437 | 7-1/4 | 3/32 | 7.237 | .045 | 183,82 | 1,14 | .103 | .003 | 2,62 | 0,08 |
| 4169 | 7.500 | 7.687 | 7-1/2 | 3/32 | 7.487 | .045 | 190,17 | 1,14 | .103 | .003 | 2,62 | 0,08 |
| 4170 | 7.750 | 7.937 | 7-3/4 | 3/32 | 7.737 | .045 | 196,52 | 1,14 | .103 | .003 | 2,62 | 0,08 |
| 4171 | 8.000 | 8.187 | 8 | 3/32 | 7.987 | .045 | 202,87 | 1,14 | .103 | .003 | 2,62 | 0,08 |
| 4172 | 8.250 | 8.437 | 8-1/4 | 3/32 | 8.237 | .050 | 209,22 | 1,27 | .103 | .003 | 2,62 | 0,08 |
| 4173 | 8.500 | 8.687 | 8-1/2 | 3/32 | 8.487 | .050 | 215,57 | 1,27 | .103 | .003 | 2,62 | 0,08 |
| 4174 | 8.750 | 8.937 | 8-3/4 | 3/32 | 8.737 | .050 | 221,92 | 1,27 | .103 | .003 | 2,62 | 0,08 |
| 4175 | 9.000 | 9.187 | 9 | 3/32 | 8.987 | .050 | 228,27 | 1,27 | .103 | .003 | 2,62 | 0,08 |
| 4176 | 9.250 | 9.437 | 9-1/4 | 3/32 | 9.237 | .055 | 234,62 | 1,40 | .103 | .003 | 2,62 | 0,08 |
| 4177 | 9.500 | 9.687 | 9-1/2 | 3/32 | 9.487 | .055 | 240,97 | 1,40 | .103 | .003 | 2,62 | 0,08 |
| 4178 | 9.750 | 9.937 | 9-3/4 | 3/32 | 9.737 | .055 | 247,32 | 1,40 | .103 | .003 | 2,62 | 0,08 |
| 4201 | .187 | .437 | 3/16 | 1/8 | .171 | .005 | 4,34 | 0,13 | .139 | .004 | 3,53 | 0,10 |
| 4202 | .250 | .500 | 1/4 | 1/8 | .234 | .005 | 5,94 | 0,13 | .139 | .004 | 3,53 | 0,10 |
| 4203 | .312 | .562 | 5/16 | 1/8 | .296 | .005 | 7,52 | 0,13 | .139 | .004 | 3,53 | 0,10 |
| 4204 | .375 | .625 | 3/8 | 1/8 | .359 | .005 | 9,12 | 0,13 | .139 | .004 | 3,53 | 0,10 |
| 4205 | .437 | .687 | 7/16 | 1/8 | .421 | .005 | 10,69 | 0,13 | .139 | .004 | 3,53 | 0,10 |
| 4206 | .500 | .750 | 1/2 | 1/8 | .484 | .005 | 12,29 | 0,13 | .139 | .004 | 3,53 | 0,10 |
| 4207 | .562 | .812 | 9/16 | 1/8 | .546 | .007 | 13,87 | 0,18 | .139 | .004 | 3,53 | 0,10 |
| 4208 | .625 | .875 | 5/8 | 1/8 | .609 | .009 | 15,47 | 0,23 | .139 | .004 | 3,53 | 0,10 |
| 4209 | .687 | .937 | 11/16 | 1/8 | .671 | .009 | 17,04 | 0,23 | .139 | .004 | 3,53 | 0,10 |
| 4210 | .750 | 1.000 | 3/4 | 1/8 | .734 | .010 | 18,64 | 0,25 | .139 | .004 | 3,53 | 0,10 |
| 4211 | .812 | 1.062 | 13/16 | 1/8 | .796 | .010 | 20,22 | 0,25 | .139 | .004 | 3,53 | 0,10 |
| 4212 | .875 | 1.125 | 7/8 | 1/8 | .859 | .010 | 21,82 | 0,25 | .139 | .004 | 3,53 | 0,10 |
| 4213 | .937 | 1.187 | 15/16 | 1/8 | .921 | .010 | 23,39 | 0,25 | .139 | .004 | 3,53 | 0,10 |
| 4214 | 1.000 | 1.250 | 1 | 1/8 | .984 | .010 | 24,99 | 0,25 | .139 | .004 | 3,53 | 0,10 |
| 4215 | 1.062 | 1.312 | 1-1/16 | 1/8 | 1.046 | .010 | 26,57 | 0,25 | .139 | .004 | 3,53 | 0,10 |
| 4216 | 1.125 | 1.375 | 1-1/8 | 1/8 | 1.109 | .012 | 28,17 | 0,31 | .139 | .004 | 3,53 | 0,10 |
| 4217 | 1.187 | 1.437 | 1-3/16 | 1/8 | 1.171 | .012 | 29,74 | 0,31 | .139 | .004 | 3,53 | 0,10 |
| 4218 | 1.250 | 1.500 | 1-1/4 | 1/8 | 1.234 | .012 | 31,34 | 0,31 | .139 | .004 | 3,53 | 0,10 |
| 4219 | 1.312 | 1.562 | 1-5/16 | 1/8 | 1.296 | .012 | 32,92 | 0,31 | .139 | .004 | 3,53 | 0,10 |
| 4220 | 1.375 | 1.625 | 1-3/8 | 1/8 | 1.359 | .012 | 34,52 | 0,31 | .139 | .004 | 3,53 | 0,10 |
| 4221 | 1.437 | 1.687 | 1-7/16 | 1/8 | 1.421 | .012 | 36,09 | 0,31 | .139 | .004 | 3,53 | 0,10 |
| 4222 | 1.500 | 1.750 | 1-1/2 | 1/8 | 1.484 | .015 | 37,69 | 0,38 | .139 | .004 | 3,53 | 0,10 |
| 4223 | 1.625 | 1.875 | 1-5/8 | 1/8 | 1.609 | .015 | 40,87 | 0,38 | .139 | .004 | 3,53 | 0,10 |
| 4224 | 1.750 | 2.000 | 1-3/4 | 1/8 | 1.734 | .015 | 44,04 | 0,38 | .139 | .004 | 3,53 | 0,10 |

19.B. Precision Quad™-ring Standard Sizes

Standard Quad™-ring Sizes

| Size Only | | Nominal Sizes | | | Actual Sizes | | | | | | | |
|-----------|--------|---------------|---------|----------|--------------|------|--------|------|----------|------|----------|------|
| Part nr. | Rod | Bore | ID (in) | C/S (in) | ID (in) | +/- | ID(mm) | +/- | C/S (in) | +/- | C/S (mm) | +/- |
| 4225 | 1.875 | 2.125 | 1-7/8 | 1/8 | 1.859 | .018 | 47,22 | 0,46 | .139 | .004 | 3,53 | 0,10 |
| 4226 | 2.000 | 2.250 | 2 | 1/8 | 1.984 | .018 | 50,39 | 0,46 | .139 | .004 | 3,53 | 0,10 |
| 4227 | 2.125 | 2.675 | 2-1/8 | 1/8 | 2.109 | .018 | 53,57 | 0,46 | .139 | .004 | 3,53 | 0,10 |
| 4228 | 2.250 | 2.500 | 2-1/4 | 1/8 | 2.234 | .020 | 56,74 | 0,51 | .139 | .004 | 3,53 | 0,10 |
| 4229 | 2.375 | 2.625 | 2-3/8 | 1/8 | 2.359 | .020 | 59,92 | 0,51 | .139 | .004 | 3,53 | 0,10 |
| 4230 | 2.500 | 2.750 | 2-1/2 | 1/8 | 2.484 | .020 | 63,09 | 0,51 | .139 | .004 | 3,53 | 0,10 |
| 4231 | 2.625 | 2.875 | 2-5/8 | 1/8 | 2.609 | .020 | 66,27 | 0,51 | .139 | .004 | 3,53 | 0,10 |
| 4232 | 2.750 | 3.000 | 2-3/4 | 1/8 | 2.734 | .024 | 69,44 | 0,61 | .139 | .004 | 3,53 | 0,10 |
| 4233 | 2.875 | 3.125 | 2-7/8 | 1/8 | 2.859 | .024 | 72,62 | 0,61 | .139 | .004 | 3,53 | 0,10 |
| 4234 | 3.000 | 3.250 | 3 | 1/8 | 2.984 | .024 | 75,79 | 0,61 | .139 | .004 | 3,53 | 0,10 |
| 4235 | 3.125 | 3.375 | 3-1/8 | 1/8 | 3.109 | .024 | 78,97 | 0,61 | .139 | .004 | 3,53 | 0,10 |
| 4236 | 3.250 | 3.500 | 3-1/4 | 1/8 | 3.234 | .024 | 82,14 | 0,61 | .139 | .004 | 3,53 | 0,10 |
| 4237 | 3.375 | 3.625 | 3-3/8 | 1/8 | 3.359 | .024 | 85,32 | 0,61 | .139 | .004 | 3,53 | 0,10 |
| 4238 | 3.500 | 2.750 | 3-1/2 | 1/8 | 3.484 | .024 | 88,49 | 0,61 | .139 | .004 | 3,53 | 0,10 |
| 4239 | 3.625 | 3.875 | 3-5/8 | 1/8 | 3.609 | .028 | 91,67 | 0,71 | .139 | .004 | 3,53 | 0,10 |
| 4240 | 3.750 | 4.000 | 3-3/4 | 1/8 | 3.734 | .028 | 94,84 | 0,71 | .139 | .004 | 3,53 | 0,10 |
| 4241 | 3.875 | 4.125 | 3-7/8 | 1/8 | 3.859 | .028 | 98,02 | 0,71 | .139 | .004 | 3,53 | 0,10 |
| 4242 | 4.000 | 4.250 | 4 | 1/8 | 3.984 | .028 | 101,19 | 0,71 | .139 | .004 | 3,53 | 0,10 |
| 4243 | 4.125 | 4.375 | 4-1/8 | 1/8 | 4.109 | .028 | 104,37 | 0,71 | .139 | .004 | 3,53 | 0,10 |
| 4244 | 4.250 | 4.500 | 4-1/4 | 1/8 | 4.234 | .030 | 107,54 | 0,76 | .139 | .004 | 3,53 | 0,10 |
| 4245 | 4.375 | 4.625 | 4-3/8 | 1/8 | 4.359 | .030 | 110,72 | 0,76 | .139 | .004 | 3,53 | 0,10 |
| 4246 | 4.500 | 4.750 | 4-1/2 | 1/8 | 4.484 | .030 | 113,89 | 0,76 | .139 | .004 | 3,53 | 0,10 |
| 4247 | 4.625 | 4.875 | 4-5/8 | 1/8 | 4.609 | .030 | 117,07 | 0,76 | .139 | .004 | 3,53 | 0,10 |
| 4248 | 4.750 | 5.000 | 4-3/4 | 1/8 | 4.734 | .030 | 120,24 | 0,76 | .139 | .004 | 3,53 | 0,10 |
| 4249 | 4.875 | 5.125 | 4-7/8 | 1/8 | 4.859 | .035 | 123,42 | 0,89 | .139 | .004 | 3,53 | 0,10 |
| 4250 | 5.000 | 5.250 | 5 | 1/8 | 4.984 | .035 | 126,59 | 0,89 | .139 | .004 | 3,53 | 0,10 |
| 4251 | 5.125 | 5.375 | 5-1/8 | 1/8 | 5.109 | .035 | 129,77 | 0,89 | .139 | .004 | 3,53 | 0,10 |
| 4252 | 5.250 | 5.500 | 5-1/4 | 1/8 | 5.234 | .035 | 132,94 | 0,89 | .139 | .004 | 3,53 | 0,10 |
| 4253 | 5.375 | 5.625 | 5-3/8 | 1/8 | 5.359 | .035 | 136,12 | 0,89 | .139 | .004 | 3,53 | 0,10 |
| 4254 | 5.500 | 5.750 | 5-1/2 | 1/8 | 5.484 | .035 | 139,29 | 0,89 | .139 | .004 | 3,53 | 0,10 |
| 4255 | 5.625 | 5.875 | 5-5/8 | 1/8 | 5.609 | .035 | 142,47 | 0,89 | .139 | .004 | 3,53 | 0,10 |
| 4256 | 5.750 | 6.000 | 5-3/4 | 1/8 | 5.734 | .035 | 145,64 | 0,89 | .139 | .004 | 3,53 | 0,10 |
| 4257 | 5.875 | 6.125 | 5-7/8 | 1/8 | 5.859 | .035 | 148,82 | 0,89 | .139 | .004 | 3,53 | 0,10 |
| 4258 | 6.000 | 6.250 | 6 | 1/8 | 5.984 | .035 | 151,99 | 0,89 | .139 | .004 | 3,53 | 0,10 |
| 4259 | 6.250 | 6.500 | 6-1/4 | 1/8 | 6.234 | .040 | 158,34 | 1,02 | .139 | .004 | 3,53 | 0,10 |
| 4260 | 6.500 | 6.750 | 6-1/2 | 1/8 | 6.484 | .040 | 164,69 | 1,02 | .139 | .004 | 3,53 | 0,10 |
| 4261 | 6.750 | 7.000 | 6-3/4 | 1/8 | 6.734 | .040 | 171,04 | 1,02 | .139 | .004 | 3,53 | 0,10 |
| 4262 | 7.000 | 7.250 | 7 | 1/8 | 6.984 | .040 | 177,39 | 1,02 | .139 | .004 | 3,53 | 0,10 |
| 4263 | 7.250 | 7.500 | 7-1/4 | 1/8 | 7.234 | .045 | 183,74 | 1,14 | .139 | .004 | 3,53 | 0,10 |
| 4264 | 7.500 | 7.750 | 7-1/2 | 1/8 | 7.484 | .045 | 190,10 | 1,14 | .139 | .004 | 3,53 | 0,10 |
| 4265 | 7.750 | 8.000 | 7-3/4 | 1/8 | 7.734 | .045 | 196,44 | 1,14 | .139 | .004 | 3,53 | 0,10 |
| 4266 | 8.000 | 8.250 | 8 | 1/8 | 7.984 | .045 | 202,79 | 1,14 | .139 | .004 | 3,53 | 0,10 |
| 4267 | 8.250 | 8.500 | 8-1/4 | 1/8 | 8.234 | .050 | 209,14 | 1,27 | .139 | .004 | 3,53 | 0,10 |
| 4268 | 8.500 | 8.750 | 8-1/2 | 1/8 | 8.484 | .050 | 215,49 | 1,27 | .139 | .004 | 3,53 | 0,10 |
| 4269 | 8.750 | 9.000 | 8-3/4 | 1/8 | 8.734 | .050 | 221,84 | 1,27 | .139 | .004 | 3,53 | 0,10 |
| 4270 | 9.000 | 9.250 | 9 | 1/8 | 8.984 | .050 | 228,19 | 1,27 | .139 | .004 | 3,53 | 0,10 |
| 4271 | 9.250 | 9.500 | 9-1/4 | 1/8 | 9.234 | .055 | 234,54 | 1,40 | .139 | .004 | 3,53 | 0,10 |
| 4272 | 9.500 | 9.750 | 9-1/2 | 1/8 | 9.484 | .055 | 240,89 | 1,40 | .139 | .004 | 3,53 | 0,10 |
| 4273 | 9.750 | 10.000 | 9-3/4 | 1/8 | 9.734 | .055 | 247,24 | 1,40 | .139 | .004 | 3,53 | 0,10 |
| 4274 | 10.000 | 10.250 | 10 | 1/8 | 9.984 | .055 | 253,59 | 1,40 | .139 | .004 | 3,53 | 0,10 |
| 4275 | 10.500 | 10.750 | 10-1/2 | 1/8 | 10.484 | .055 | 266,29 | 1,40 | .139 | .004 | 3,53 | 0,10 |

19.B. Precision Quad™-ring Standard Sizes

Standard Quad™-ring Sizes

| Size Only Part nr. | Nominal Sizes | | | Actual Sizes | | | | | | | | |
|-----------------------|---------------|--------|---------|--------------|---------|------|--------|------|----------|------|----------|------|
| | Rod | Bore | ID (in) | C/S (in) | ID (in) | +/- | ID(mm) | +/- | C/S (in) | +/- | C/S (mm) | +/- |
| 4276 | 11.000 | 11.250 | 11 | 1/8 | 10.984 | .065 | 278,99 | 1,65 | .139 | .004 | 3,53 | 0,10 |
| 4277 | 11.500 | 11.750 | 11-1/2 | 1/8 | 11.484 | .065 | 291,69 | 1,65 | .139 | .004 | 3,53 | 0,10 |
| 4278 | 12.000 | 12.250 | 12 | 1/8 | 11.984 | .065 | 304,39 | 1,65 | .139 | .004 | 3,53 | 0,10 |
| 4279 | 13.000 | 13.250 | 13 | 1/8 | 12.984 | .065 | 329,79 | 1,65 | .139 | .004 | 3,53 | 0,10 |
| 4280 | 14.000 | 14.250 | 14 | 1/8 | 13.984 | .065 | 355,19 | 1,65 | .139 | .004 | 3,53 | 0,10 |
| 4281 | 15.000 | 15.250 | 15 | 1/8 | 14.984 | .065 | 380,59 | 1,65 | .139 | .004 | 3,53 | 0,10 |
| 4282 | 16.000 | 16.250 | 16 | 1/8 | 15.955 | .075 | 405,26 | 1,91 | .139 | .004 | 3,53 | 0,10 |
| 4283 | 17.000 | 17.250 | 17 | 1/8 | 16.955 | .080 | 430,66 | 2,03 | .139 | .004 | 3,53 | 0,10 |
| 4284 | 18.000 | 18.250 | 18 | 1/8 | 17.955 | .085 | 456,06 | 2,16 | .139 | .004 | 3,53 | 0,10 |
| 4309 | .437 | .812 | 7/16 | 3/16 | .412 | .005 | 10,47 | 0,13 | .210 | .005 | 5,33 | 0,13 |
| 4310 | .500 | .875 | 1/2 | 3/16 | .475 | .005 | 12,07 | 0,13 | .210 | .005 | 5,33 | 0,13 |
| 4311 | .562 | .937 | 9/16 | 3/16 | .537 | .007 | 13,64 | 0,18 | .210 | .005 | 5,33 | 0,13 |
| 4312 | .625 | 1.000 | 5/8 | 3/16 | .600 | .009 | 15,24 | 0,23 | .210 | .005 | 5,33 | 0,13 |
| 4313 | .687 | 1.062 | 11/16 | 3/16 | .662 | .009 | 16,82 | 0,23 | .210 | .005 | 5,33 | 0,13 |
| 4314 | .750 | 1.125 | 3/4 | 3/16 | .725 | .010 | 18,42 | 0,25 | .210 | .005 | 5,33 | 0,13 |
| 4315 | .812 | 1.187 | 13/16 | 3/16 | .787 | .010 | 19,99 | 0,25 | .210 | .005 | 5,33 | 0,13 |
| 4316 | .875 | 1.250 | 7/8 | 3/16 | .850 | .010 | 21,59 | 0,25 | .210 | .005 | 5,33 | 0,13 |
| 4317 | .937 | 1.312 | 15/16 | 3/16 | .912 | .010 | 23,17 | 0,25 | .210 | .005 | 5,33 | 0,13 |
| 4318 | 1.000 | 1.375 | 1 | 3/16 | .975 | .010 | 24,77 | 0,25 | .210 | .005 | 5,33 | 0,13 |
| 4319 | 1.062 | 1.437 | 1-1/16 | 3/16 | 1.037 | .010 | 26,34 | 0,25 | .210 | .005 | 5,33 | 0,13 |
| 4320 | 1.125 | 1.500 | 1-1/8 | 3/16 | 1.100 | .012 | 27,94 | 0,31 | .210 | .005 | 5,33 | 0,13 |
| 4321 | 1.187 | 1.562 | 1-3/16 | 3/16 | 1.162 | .012 | 29,52 | 0,31 | .210 | .005 | 5,33 | 0,13 |
| 4322 | 1.250 | 1.625 | 1-1/4 | 3/16 | 1.225 | .012 | 31,12 | 0,31 | .210 | .005 | 5,33 | 0,13 |
| 4323 | 1.312 | 1.687 | 1-5/16 | 3/16 | 1.287 | .012 | 32,69 | 0,31 | .210 | .005 | 5,33 | 0,13 |
| 4324 | 1.375 | 1.750 | 1-3/8 | 3/16 | 1.350 | .012 | 34,29 | 0,31 | .210 | .005 | 5,33 | 0,13 |
| 4325 | 1.500 | 1.875 | 1-1/2 | 3/16 | 1.475 | .015 | 37,47 | 0,38 | .210 | .005 | 5,33 | 0,13 |
| 4326 | 1.625 | 2.000 | 1-5/8 | 3/16 | 1.600 | .015 | 40,64 | 0,38 | .210 | .005 | 5,33 | 0,13 |
| 4327 | 1.750 | 2.125 | 1-3/4 | 3/16 | 1.725 | .015 | 43,82 | 0,38 | .210 | .005 | 5,33 | 0,13 |
| 4328 | 1.875 | 2.250 | 1-7/8 | 3/16 | 1.850 | .015 | 46,99 | 0,38 | .210 | .005 | 5,33 | 0,13 |
| 4329 | 2.000 | 2.375 | 2 | 3/16 | 1.975 | .018 | 50,17 | 0,46 | .210 | .005 | 5,33 | 0,13 |
| 4330 | 2.125 | 2.500 | 2-1/8 | 3/16 | 2.100 | .018 | 53,34 | 0,46 | .210 | .005 | 5,33 | 0,13 |
| 4331 | 2.250 | 2.625 | 2-1/4 | 3/16 | 2.225 | .018 | 56,52 | 0,46 | .210 | .005 | 5,33 | 0,13 |
| 4332 | 2.375 | 2.750 | 2-3/8 | 3/16 | 2.350 | .018 | 59,69 | 0,46 | .210 | .005 | 5,33 | 0,13 |
| 4333 | 2.500 | 2.875 | 2-1/2 | 3/16 | 2.475 | .020 | 62,87 | 0,51 | .210 | .005 | 5,33 | 0,13 |
| 4334 | 2.625 | 3.000 | 2-5/8 | 3/16 | 2.600 | .020 | 66,04 | 0,51 | .210 | .005 | 5,33 | 0,13 |
| 4335 | 2.750 | 3.125 | 2-3/4 | 3/16 | 2.725 | .020 | 69,22 | 0,51 | .210 | .005 | 5,33 | 0,13 |
| 4336 | 2.875 | 3.250 | 2-7/8 | 3/16 | 2.850 | .020 | 72,39 | 0,51 | .210 | .005 | 5,33 | 0,13 |
| 4337 | 3.000 | 3.375 | 3 | 3/16 | 2.975 | .024 | 75,57 | 0,61 | .210 | .005 | 5,33 | 0,13 |
| 4338 | 3.125 | 3.500 | 3-1/8 | 3/16 | 3.100 | .024 | 78,74 | 0,61 | .210 | .005 | 5,33 | 0,13 |
| 4339 | 3.250 | 3.625 | 3-1/4 | 3/16 | 3.225 | .024 | 81,92 | 0,61 | .210 | .005 | 5,33 | 0,13 |
| 4340 | 3.375 | 3.750 | 3-3/8 | 3/16 | 3.350 | .024 | 85,09 | 0,61 | .210 | .005 | 5,33 | 0,13 |
| 4341 | 3.500 | 3.875 | 3-1/2 | 3/16 | 3.475 | .024 | 88,27 | 0,61 | .210 | .005 | 5,33 | 0,13 |
| 4342 | 3.625 | 4.000 | 3-5/8 | 3/16 | 3.600 | .028 | 91,44 | 0,71 | .210 | .005 | 5,33 | 0,13 |
| 4343 | 3.750 | 4.125 | 3-3/4 | 3/16 | 3.725 | .028 | 94,62 | 0,71 | .210 | .005 | 5,33 | 0,13 |
| 4344 | 3.875 | 4.250 | 3-7/8 | 3/16 | 3.850 | .028 | 97,79 | 0,71 | .210 | .005 | 5,33 | 0,13 |
| 4345 | 4.000 | 4.375 | 4 | 3/16 | 3.975 | .028 | 100,97 | 0,71 | .210 | .005 | 5,33 | 0,13 |
| 4346 | 4.125 | 4.500 | 4-1/8 | 3/16 | 4.100 | .028 | 104,14 | 0,71 | .210 | .005 | 5,33 | 0,13 |
| 4347 | 4.250 | 4.625 | 4-1/4 | 3/16 | 4.225 | .030 | 107,32 | 0,76 | .210 | .005 | 5,33 | 0,13 |
| 4348 | 4.375 | 4.750 | 4-3/8 | 3/16 | 4.350 | .030 | 110,49 | 0,76 | .210 | .005 | 5,33 | 0,13 |
| 4349 | 4.500 | 4.875 | 4-1/2 | 3/16 | 4.475 | .030 | 113,67 | 0,76 | .210 | .005 | 5,33 | 0,13 |

19.B. Precision Quad™-ring Standard Sizes

Standard Quad™-ring Sizes

| Size Only | | Nominal Sizes | | | | Actual Sizes | | | | | | |
|-----------|--------|---------------|---------|----------|---------|--------------|--------|------|----------|------|----------|------|
| Part nr. | Rod | Bore | ID (in) | C/S (in) | ID (in) | +/- | ID(mm) | +/- | C/S (in) | +/- | C/S (mm) | +/- |
| 4350 | 4.625 | 5.000 | 4-5/8 | 3/16 | 4.600 | .030 | 116,84 | 0,76 | .210 | .005 | 5,33 | 0,13 |
| 4351 | 4.750 | 5.125 | 4-3/4 | 3/16 | 4.725 | .030 | 120,02 | 0,76 | .210 | .005 | 5,33 | 0,13 |
| 4352 | 4.875 | 5.250 | 4-7/8 | 3/16 | 4.850 | .030 | 123,19 | 0,76 | .210 | .005 | 5,33 | 0,13 |
| 4353 | 5.000 | 5.375 | 5 | 3/16 | 4.975 | .037 | 126,37 | 0,94 | .210 | .005 | 5,33 | 0,13 |
| 4354 | 5.125 | 5.500 | 5-1/8 | 3/16 | 5.100 | .037 | 129,54 | 0,94 | .210 | .005 | 5,33 | 0,13 |
| 4355 | 5.250 | 5.625 | 5-1/4 | 3/16 | 5.225 | .037 | 132,72 | 0,94 | .210 | .005 | 5,33 | 0,13 |
| 4356 | 5.375 | 5.750 | 5-3/8 | 3/16 | 5.350 | .037 | 135,89 | 0,94 | .210 | .005 | 5,33 | 0,13 |
| 4357 | 5.500 | 5.875 | 5-1/2 | 3/16 | 5.475 | .037 | 139,07 | 0,94 | .210 | .005 | 5,33 | 0,13 |
| 4358 | 5.625 | 6.000 | 5-5/8 | 3/16 | 5.600 | .037 | 142,24 | 0,94 | .210 | .005 | 5,33 | 0,13 |
| 4359 | 5.750 | 6.125 | 5-3/4 | 3/16 | 5.725 | .037 | 145,42 | 0,94 | .210 | .005 | 5,33 | 0,13 |
| 4360 | 5.875 | 6.250 | 5-7/8 | 3/16 | 5.850 | .037 | 148,59 | 0,94 | .210 | .005 | 5,33 | 0,13 |
| 4361 | 6.000 | 6.375 | 6 | 3/16 | 5.975 | .037 | 151,77 | 0,94 | .210 | .005 | 5,33 | 0,13 |
| 4362 | 6.250 | 6.625 | 6-1/4 | 3/16 | 6.225 | .040 | 158,12 | 1,02 | .210 | .005 | 5,33 | 0,13 |
| 4363 | 6.500 | 6.875 | 6-1/2 | 3/16 | 6.475 | .040 | 164,47 | 1,02 | .210 | .005 | 5,33 | 0,13 |
| 4364 | 6.750 | 7.125 | 6-3/4 | 3/16 | 6.725 | .040 | 170,82 | 1,02 | .210 | .005 | 5,33 | 0,13 |
| 4365 | 7.000 | 7.375 | 7 | 3/16 | 6.975 | .040 | 177,17 | 1,02 | .210 | .005 | 5,33 | 0,13 |
| 4366 | 7.250 | 7.625 | 7-1/4 | 3/16 | 7.225 | .045 | 183,52 | 1,14 | .210 | .005 | 5,33 | 0,13 |
| 4367 | 7.500 | 7.875 | 7-1/2 | 3/16 | 7.475 | .045 | 189,87 | 1,14 | .210 | .005 | 5,33 | 0,13 |
| 4368 | 7.750 | 8.125 | 7-3/4 | 3/16 | 7.725 | .045 | 196,22 | 1,14 | .210 | .005 | 5,33 | 0,13 |
| 4369 | 8.000 | 8.375 | 8 | 3/16 | 7.975 | .045 | 202,57 | 1,14 | .210 | .005 | 5,33 | 0,13 |
| 4370 | 8.250 | 8.625 | 8-1/4 | 3/16 | 8.225 | .050 | 208,92 | 1,27 | .210 | .005 | 5,33 | 0,13 |
| 4371 | 8.500 | 8.875 | 8-1/2 | 3/16 | 8.475 | .050 | 215,27 | 1,27 | .210 | .005 | 5,33 | 0,13 |
| 4372 | 8.750 | 9.125 | 8-3/4 | 3/16 | 8.725 | .050 | 221,62 | 1,27 | .210 | .005 | 5,33 | 0,13 |
| 4373 | 9.000 | 9.375 | 9 | 3/16 | 8.975 | .050 | 227,97 | 1,27 | .210 | .005 | 5,33 | 0,13 |
| 4374 | 9.250 | 9.625 | 9-1/4 | 3/16 | 9.225 | .055 | 234,32 | 0,14 | .210 | .005 | 5,33 | 0,13 |
| 4375 | 9.500 | 9.875 | 9-1/2 | 3/16 | 9.475 | .055 | 240,67 | 0,14 | .210 | .005 | 5,33 | 0,13 |
| 4376 | 9.750 | 10.125 | 9-3/4 | 3/16 | 9.725 | .055 | 247,02 | 0,14 | .210 | .005 | 5,33 | 0,13 |
| 4377 | 10.000 | 10.375 | 10 | 3/16 | 9.975 | .055 | 253,37 | 0,14 | .210 | .005 | 5,33 | 0,13 |
| 4378 | 10.500 | 10.875 | 10-1/2 | 3/16 | 10.475 | .060 | 266,07 | 1,52 | .210 | .005 | 5,33 | 0,13 |
| 4379 | 11.000 | 11.375 | 11 | 3/16 | 10.975 | .060 | 278,77 | 1,52 | .210 | .005 | 5,33 | 0,13 |
| 4380 | 11.500 | 11.875 | 11-1/2 | 3/16 | 11.475 | .065 | 291,47 | 1,65 | .210 | .005 | 5,33 | 0,13 |
| 4381 | 12.000 | 12.375 | 12 | 3/16 | 11.975 | .065 | 304,17 | 1,65 | .210 | .005 | 5,33 | 0,13 |
| 4382 | 13.000 | 13.375 | 13 | 3/16 | 12.975 | .065 | 329,57 | 1,65 | .210 | .005 | 5,33 | 0,13 |
| 4383 | 14.000 | 14.375 | 14 | 3/16 | 13.975 | .070 | 354,97 | 1,78 | .210 | .005 | 5,33 | 0,13 |
| 4384 | 15.000 | 15.375 | 15 | 3/16 | 14.975 | .070 | 380,37 | 1,78 | .210 | .005 | 5,33 | 0,13 |
| 4385 | 16.000 | 16.375 | 16 | 3/16 | 15.955 | .075 | 405,26 | 1,91 | .210 | .005 | 5,33 | 0,13 |
| 4386 | 17.000 | 17.375 | 17 | 3/16 | 16.955 | .080 | 430,66 | 2,03 | .210 | .005 | 5,33 | 0,13 |
| 4387 | 18.000 | 18.375 | 18 | 3/16 | 17.955 | .085 | 456,06 | 2,16 | .210 | .005 | 5,33 | 0,13 |
| 4388 | 19.000 | 19.375 | 19 | 3/16 | 18.955 | .090 | 481,41 | 2,29 | .210 | .005 | 5,33 | 0,13 |
| 4389 | 20.000 | 20.375 | 20 | 3/16 | 19.955 | .095 | 506,81 | 2,41 | .210 | .005 | 5,33 | 0,13 |
| 4390 | 21.000 | 21.375 | 21 | 3/16 | 20.955 | .095 | 532,21 | 2,41 | .210 | .005 | 5,33 | 0,13 |
| 4391 | 22.000 | 22.375 | 22 | 3/16 | 21.955 | .100 | 557,61 | 2,54 | .210 | .005 | 5,33 | 0,13 |
| 4392 | 23.000 | 23.375 | 23 | 3/16 | 22.940 | .105 | 582,68 | 2,67 | .210 | .005 | 5,33 | 0,13 |
| 4393 | 24.000 | 24.375 | 24 | 3/16 | 23.940 | .110 | 608,08 | 2,79 | .210 | .005 | 5,33 | 0,13 |
| 4394 | 25.000 | 25.375 | 25 | 3/16 | 24.940 | .115 | 633,48 | 2,92 | .210 | .005 | 5,33 | 0,13 |
| 4395 | 26.000 | 26.375 | 26 | 3/16 | 25.940 | .120 | 658,88 | 3,05 | .210 | .005 | 5,33 | 0,13 |
| 4425 | 4.500 | 5.000 | 4-1/2 | 1/4 | 4.475 | .033 | 113,67 | 0,84 | .275 | .006 | 6,99 | 0,15 |
| 4426 | 4.625 | 5.125 | 4-5/8 | 1/4 | 4.600 | .033 | 116,84 | 0,84 | .275 | .006 | 6,99 | 0,15 |
| 4427 | 4.750 | 5.250 | 4-3/4 | 1/4 | 4.725 | .033 | 120,02 | 0,84 | .275 | .006 | 6,99 | 0,15 |
| 4428 | 4.875 | 5.375 | 4-7/8 | 1/4 | 4.850 | .033 | 123,19 | 0,84 | .275 | .006 | 6,99 | 0,15 |

19.B. Precision Quad™-ring Standard Sizes

Standard Quad™-ring Sizes

| Size Only Part nr. | Nominal Sizes | | | Actual Sizes | | | | | | | | |
|-----------------------|---------------|--------|---------|--------------|---------|------|--------|------|----------|------|----------|------|
| | Rod | Bore | ID (in) | C/S (in) | ID (in) | +/- | ID(mm) | +/- | C/S (in) | +/- | C/S (mm) | +/- |
| 4429 | 5.000 | 5.500 | 5 | 1/4 | 4.975 | .037 | 126,37 | 0,94 | .275 | .006 | 6,99 | 0,15 |
| 4430 | 5.125 | 5.625 | 5-1/8 | 1/4 | 5.100 | .037 | 129,54 | 0,94 | .275 | .006 | 6,99 | 0,15 |
| 4431 | 5.250 | 5.750 | 5-1/4 | 1/4 | 5.225 | .037 | 132,72 | 0,94 | .275 | .006 | 6,99 | 0,15 |
| 4432 | 5.375 | 5.875 | 5-3/8 | 1/4 | 5.350 | .037 | 135,89 | 0,94 | .275 | .006 | 6,99 | 0,15 |
| 4433 | 5.500 | 6.000 | 5-1/2 | 1/4 | 5.475 | .037 | 139,07 | 0,94 | .275 | .006 | 6,99 | 0,15 |
| 4434 | 5.625 | 6.125 | 5-5/8 | 1/4 | 5.600 | .037 | 142,24 | 0,94 | .275 | .006 | 6,99 | 0,15 |
| 4435 | 5.750 | 6.250 | 5-3/4 | 1/4 | 5.725 | .037 | 145,42 | 0,94 | .275 | .006 | 6,99 | 0,15 |
| 4436 | 5.875 | 6.375 | 5-7/8 | 1/4 | 5.850 | .037 | 148,59 | 0,94 | .275 | .006 | 6,99 | 0,15 |
| 4437 | 6.000 | 6.500 | 6 | 1/4 | 5.975 | .037 | 151,77 | 0,94 | .275 | .006 | 6,99 | 0,15 |
| 4438 | 6.250 | 6.750 | 6-1/4 | 1/4 | 6.225 | .040 | 158,12 | 1,02 | .275 | .006 | 6,99 | 0,15 |
| 4439 | 6.500 | 7.000 | 6-1/2 | 1/4 | 6.475 | .040 | 164,47 | 1,02 | .275 | .006 | 6,99 | 0,15 |
| 4440 | 6.750 | 7.250 | 6-3/4 | 1/4 | 6.725 | .040 | 170,82 | 1,02 | .275 | .006 | 6,99 | 0,15 |
| 4441 | 7.000 | 7.500 | 7 | 1/4 | 6.975 | .040 | 177,17 | 1,02 | .275 | .006 | 6,99 | 0,15 |
| 4442 | 7.250 | 7.750 | 7-1/4 | 1/4 | 7.225 | .045 | 183,52 | 1,14 | .275 | .006 | 6,99 | 0,15 |
| 4443 | 7.500 | 8.000 | 7-1/2 | 1/4 | 7.475 | .045 | 189,87 | 1,14 | .275 | .006 | 6,99 | 0,15 |
| 4444 | 7.750 | 8.250 | 7-3/4 | 1/4 | 7.725 | .045 | 196,22 | 1,14 | .275 | .006 | 6,99 | 0,15 |
| 4445 | 8.000 | 8.500 | 8 | 1/4 | 7.975 | .045 | 202,57 | 1,14 | .275 | .006 | 6,99 | 0,15 |
| 4446 | 8.500 | 9.000 | 8-1/2 | 1/4 | 8.475 | .055 | 215,27 | 1,40 | .275 | .006 | 6,99 | 0,15 |
| 4447 | 9.000 | 9.500 | 9 | 1/4 | 8.975 | .055 | 227,97 | 1,40 | .275 | .006 | 6,99 | 0,15 |
| 4448 | 9.500 | 10.000 | 9-1/2 | 1/4 | 9.475 | .055 | 240,67 | 1,40 | .275 | .006 | 6,99 | 0,15 |
| 4449 | 10.000 | 10.500 | 10 | 1/4 | 9.975 | .055 | 253,37 | 1,40 | .275 | .006 | 6,99 | 0,15 |
| 4450 | 10.500 | 11.000 | 10-1/2 | 1/4 | 10.475 | .060 | 266,07 | 1,52 | .275 | .006 | 6,99 | 0,15 |
| 4451 | 11.000 | 11.500 | 11 | 1/4 | 10.975 | .060 | 278,77 | 1,52 | .275 | .006 | 6,99 | 0,15 |
| 4452 | 11.500 | 12.000 | 11-1/2 | 1/4 | 11.475 | .065 | 291,47 | 1,52 | .275 | .006 | 6,99 | 0,15 |
| 4453 | 12.000 | 12.500 | 12 | 1/4 | 11.975 | .065 | 304,17 | 1,52 | .275 | .006 | 6,99 | 0,15 |
| 4454 | 12.500 | 13.000 | 12-1/2 | 1/4 | 12.475 | .065 | 316,87 | 1,52 | .275 | .006 | 6,99 | 0,15 |
| 4455 | 13.000 | 13.500 | 13 | 1/4 | 12.975 | .065 | 329,57 | 1,52 | .275 | .006 | 6,99 | 0,15 |
| 4456 | 13.500 | 14.000 | 13-1/2 | 1/4 | 13.475 | .070 | 342,27 | 1,78 | .275 | .006 | 6,99 | 0,15 |
| 4457 | 14.000 | 14.500 | 14 | 1/4 | 13.975 | .070 | 354,97 | 1,78 | .275 | .006 | 6,99 | 0,15 |
| 4458 | 14.500 | 15.000 | 14-1/2 | 1/4 | 14.475 | .070 | 367,67 | 1,78 | .275 | .006 | 6,99 | 0,15 |
| 4459 | 15.000 | 15.500 | 15 | 1/4 | 14.975 | .070 | 380,37 | 1,78 | .275 | .006 | 6,99 | 0,15 |
| 4460 | 15.500 | 16.000 | 15-1/2 | 1/4 | 15.475 | .070 | 393,07 | 1,78 | .275 | .006 | 6,99 | 0,15 |
| 4461 | 16.000 | 16.500 | 16 | 1/4 | 15.955 | .075 | 405,26 | 1,91 | .275 | .006 | 6,99 | 0,15 |
| 4462 | 16.500 | 17.000 | 16-1/2 | 1/4 | 16.455 | .075 | 417,96 | 1,91 | .275 | .006 | 6,99 | 0,15 |
| 4463 | 17.000 | 17.500 | 17 | 1/4 | 16.955 | .080 | 430,66 | 2,03 | .275 | .006 | 6,99 | 0,15 |
| 4464 | 17.500 | 18.000 | 17-1/2 | 1/4 | 17.455 | .085 | 443,36 | 2,16 | .275 | .006 | 6,99 | 0,15 |
| 4465 | 18.000 | 18.500 | 18 | 1/4 | 17.955 | .085 | 456,06 | 2,16 | .275 | .006 | 6,99 | 0,15 |
| 4466 | 18.500 | 19.000 | 18-1/2 | 1/4 | 18.455 | .085 | 468,76 | 2,16 | .275 | .006 | 6,99 | 0,15 |
| 4467 | 19.000 | 19.500 | 19 | 1/4 | 18.955 | .090 | 481,46 | 2,29 | .275 | .006 | 6,99 | 0,15 |
| 4468 | 19.500 | 20.000 | 19-1/2 | 1/4 | 19.455 | .090 | 494,16 | 2,29 | .275 | .006 | 6,99 | 0,15 |
| 4469 | 20.000 | 20.500 | 20 | 1/4 | 19.955 | .095 | 506,86 | 2,41 | .275 | .006 | 6,99 | 0,15 |
| 4470 | 21.000 | 21.500 | 21 | 1/4 | 20.955 | .095 | 532,26 | 2,41 | .275 | .006 | 6,99 | 0,15 |
| 4471 | 22.000 | 22.500 | 22 | 1/4 | 21.955 | .100 | 557,66 | 2,54 | .275 | .006 | 6,99 | 0,15 |
| 4472 | 23.000 | 23.500 | 23 | 1/4 | 22.940 | .105 | 582,68 | 2,67 | .275 | .006 | 6,99 | 0,15 |
| 4473 | 24.000 | 24.500 | 24 | 1/4 | 23.940 | .110 | 608,08 | 2,79 | .275 | .006 | 6,99 | 0,15 |
| 4474 | 25.000 | 25.500 | 25 | 1/4 | 24.940 | .115 | 633,48 | 2,92 | .275 | .006 | 6,99 | 0,15 |
| 4475 | 26.000 | 26.500 | 26 | 1/4 | 25.940 | .120 | 658,88 | 3,05 | .275 | .006 | 6,99 | 0,15 |

19.C. Gland Design for Rotating Quad™-ring Application

As already mentioned, the rotating speed of > 100 feet/mn (30m/min.) is critical. It is recommended to use radial lip seals like oil and grease shaft seals or PS-seals. However the compact installation of Quad™-rings with the roto principle can be used instead. It is expected that the shaft rotates in the stationary Quad™-ring.

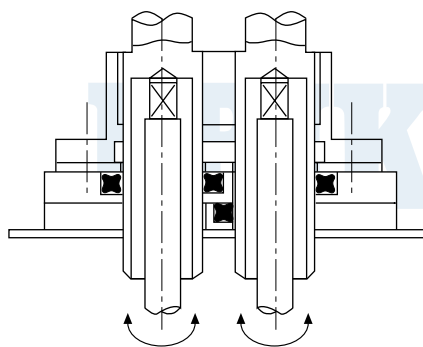
Surface Finish: X

Groove top and bottom X= 16 micro inches (0,4 µm Ra)

Groove sides X= 32 micro inches (0,8 µm Ra)

The next points need to be taken into consideration.

- The Gow-Joule effect. The Quad™-ring should not be installed in a stretched position around the shaft. The inner diameter of the Quad™-ring needs to be 2-5% larger than the diameter of the shaft.
- Do not install the Quad™-ring in a groove in the shaft. It can happen that the Quad™-ring will rotate with the shaft.
- Avoid applications with temperatures lower than -30°C or higher than +100°C (-22°F or higher than +212°F).
- Rotation speeds need to be limited to 6.5 ft/s (2m/sec.) and pressures to 150 psi (10 bar ,1 MPa).
- For higher pressures, up to 450 psi (30 bar, 3MPa) back-up rings must be used.
- Up to a diameter of 4 inches (100 mm), the cross section of the Quad™-ring needs to be limited on sizes .103 to .210 inch (2,62 to 5,33 mm). For larger shaft diameters >4 inches (>100 mm) , the cross section of the Quad™-ring has to be at least .275 inch (6,99 mm).
- The surface finish of the groove always has to be rougher than the surface finish of the shaft to avoid spinning.
- Lubrication of the Quad™-ring reduces the frictional force, keeps the seal cool, and reduces the tendency of the seal to harden.
- It is very important that the shaft construction have good bearings.
- For rotating application always use Quad™-rings in 80° or 90° shore A.



Ask for the ERIKS information on rotating Quad™-ring applications!