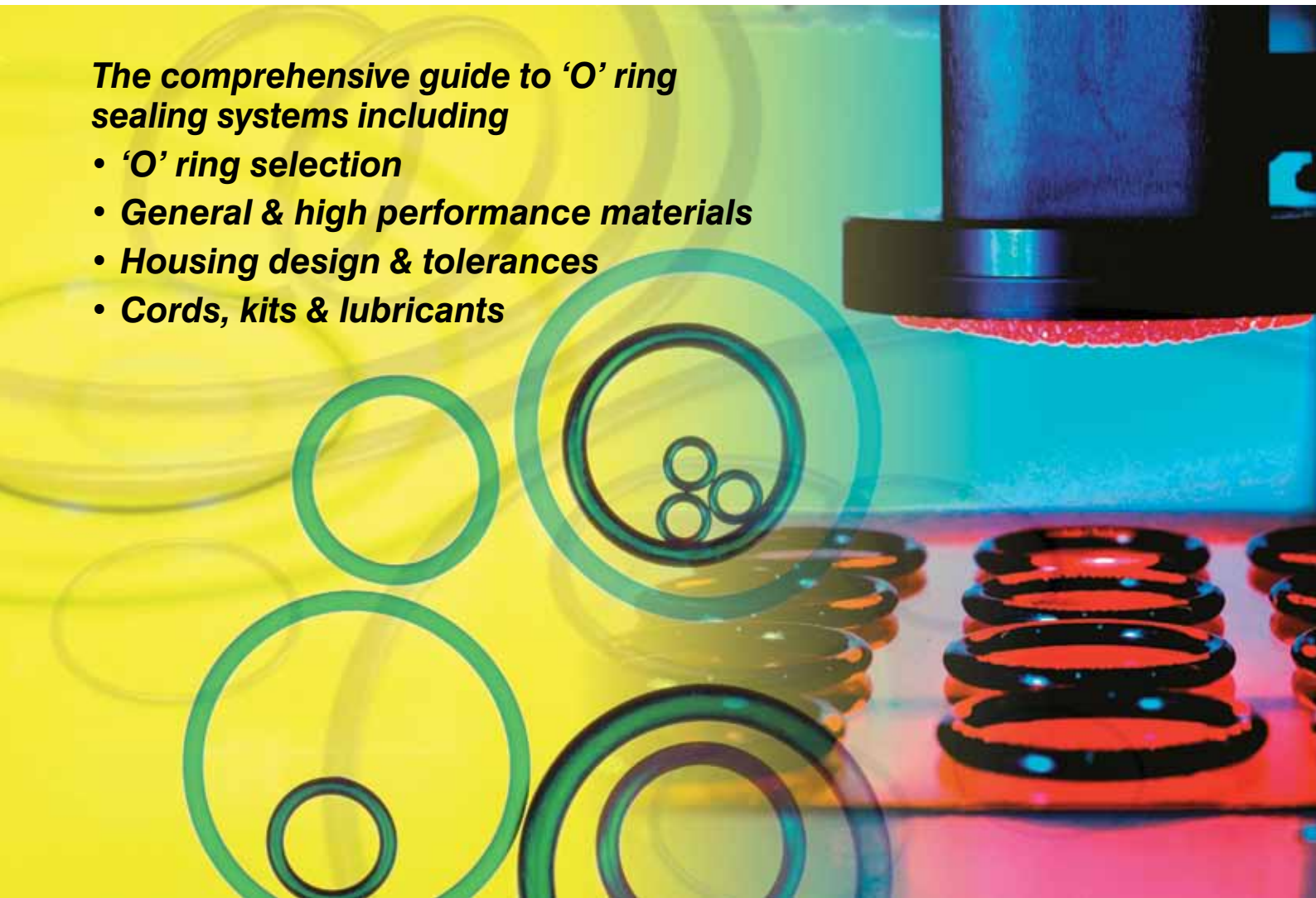


'O' Ring Guide

Issue 7

The comprehensive guide to 'O' ring sealing systems including

- ***'O' ring selection***
- ***General & high performance materials***
- ***Housing design & tolerances***
- ***Cords, kits & lubricants***



'O' Ring Guide



Introduction

The 'O' ring, or toroidal seal, is an exceptionally versatile sealing device. Applications, ranging from garden hose couplings to aerospace or oil and gas duties, make it the world's most popular volume-produced seal.

'O' rings offer many benefits to designers, engineers, maintenance staff and plant operators, they:

- Suit many static and dynamic applications.
- Are very compact and occupy little space.
- Seal efficiently in both directions.
- Can work between -65°C and +325°C when made of elastomer — according to material type.
- Can function at temperatures down to -200°C when made of PTFE.

Today, the design engineer is faced with a bewildering array of 'O' ring statistics and advice. In this guide we simplify the design data, give concise information on materials and facilitate part selection for specification and ordering purposes.

'O' ring stocks & availability

We stock many thousands of types and sizes of 'O' rings in our most popular materials — including rapid gas decompression (RGD) resistant grades — ready for same day despatch.

If the rings you want are not available off-the-shelf, we can precision manufacture them within hours, if necessary. With our 'lean' manufacturing plant and flexible production schedules, we can meet industry's most urgent requests.

Quality

Standards and approvals

Our Quality System is third-party certified to the latest versions of both the Aerospace standard BS EN 9100 and to BS EN ISO 9001.

Moreover, we are regularly assessed and quality approved by a wide range of industry bodies and individual customers, including multinational corporations, utilities and government organisations. An ISO 2230 compliant package is offered as standard.

We also hold test equipment for all relevant BS, ISO, ASA, API, ANSI, DIN, DTD and NATO standards. Certificates of conformity are supplied on request.

In-house facilities include specialised equipment for rapid gas decompression (RGD) testing, including qualification to Norsok M-710 Annex B and BS EN ISO 23936-2 Annex B (see page 11).

Packaging and labelling is available to customers' individual specifications.

Material Safety Data Sheets (MSDS) are available that cover every product we supply.

'O' Ring Guide



Quality production and inspection

Our Materials Technology Centre houses one of Europe's most advanced facilities for elastomer batch production. At its heart is a computer-controlled internal mixer that holds formulae for all our elastomeric compounds — well over 300 in total.

Together with on-line rheometer testing, this gives us complete batch traceability, regardless of any release certificate requirements.

The post-curing of silicone and fluorocarbon elastomers is also under microprocessor control for temperature and time. Each cure cycle is recorded and is traceable as a vital link in our quality chain.

Every 'O' ring manufactured by James Walker is visually inspected by a dedicated human inspector, or an automated optical inspection system, to the appropriate grade requirements of BS ISO 3601-3. Each production batch of seals is further dimensionally verified using our highly accurate and reproducible optical inspection systems.

These state-of-the-art optical systems are the Micro-Vu and fully-automated Basler Vario2, both of which offer sub-micron resolution with exceptional repeatability.



Micro-Vu optical inspection system



Basler Vario2 fully-automated inspection system

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How to use this guide



Selecting an 'O' ring

This guide contains four size charts:

- **Chart 50:** including BS 1806, SAE AS 586, and BS ISO 3601-1 (non-aerospace). *Note: BS 1806 has been superseded by BS ISO 3601-1 and BS ISO 3601-2.*
- **Aerospace sizes to BS ISO 3601-1.**
- **Chart 72:** metric sizes to BS 4518.
- **Chart 17000:** James Walker inch sizes.

To match an existing 'O' ring

If your existing 'O' ring has a reference of BS 1806, BS ISO 3601-1, SAE AS 568, or BS 4518:

- 1) **Refer to Chart 50** for BS 1806, BS ISO 3601-1 (non-aerospace), and SAE AS568. Then quote appropriate James Walker number.
- 2) **Refer to Aerospace Sizes to BS ISO 3601-1** for rings to this aerospace standard. Then quote the appropriate size code.
- 3) **Refer to Chart 72** for BS 4518. Then quote the appropriate James Walker number.

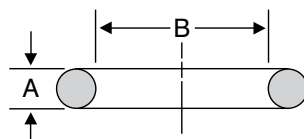
If you have a **JW Chart 17000** reference for an 'O' ring, please quote that number.

Diameter sections 'A' used in charts

| Chart 50 (BS 1806, BS ISO 3601-1, SAE AS 568) | Aerospace sizes to BS ISO 3601-1 | Chart 72 (BS 4518) | Chart 17000 |
|-----------------------------------------------------------|-------------------------------------------|-----------------------|----------------|
| 0.070" 1.78mm | 0.071" 1.80mm | 1.6mm | 0.063" |
| 0.103" 2.62mm | 0.104" 2.65mm | 2.4mm | 0.094" |
| 0.139" 3.53mm | 0.140" 3.55mm | 3.0mm | 0.125" |
| 0.210" 5.33mm | 0.209" 5.30mm | 5.7mm | 0.188" |
| 0.275" 6.99mm | 0.276" 7.00mm | 8.4mm | 0.250" |

If only the size is known

- 1) Obtain diameter section A of 'O' ring.
- 2) Consult table (above) to find the Chart that covers the appropriate diameter section A.
- 3) Consult appropriate Chart (pages 13-23), under the specific diameter section A.
- 4) Obtain inside diameter B of ring.
- 5) Refer to column on Chart that lists B and identify your existing 'O' ring.
- 6) Quote the appropriate part number.



'O' ring diameter section A and inside diameter B.

If 'O' ring is a non-standard size

Please contact our Technical Support Team. We have in excess of 6000 'O' ring moulds in our library, and are certain we can help.

To fit an existing housing

- 1) Refer to diagrams on page 29.
- 2) Select the one that matches your housing.
- 3) Obtain from existing housing the critical dimensions shown on selected diagram.
- 4) Refer to housing tables on page 30. These show BS 1806/SAE AS 568 in both inch and metric units, and BS 4518 in metric with more data on pages 21-22.
- 5) Cross reference the dimensions on housing tables.
- 6) Read off diameter section A, and consult the appropriate Chart under that specific diameter section.
- 7) Refer to column that shows housing diameter (coded as selected diagram on page 29) and identify the one that matches yours.
- 8) Quote appropriate part number.

How to use this guide



For new applications

- 1) Refer to Design sections, pages 27-31, for guidance with regard to applications.
- 2) For aerospace equipment, select 'O' ring from **Aerospace Sizes to BS ISO 3601-1**, pages 17-20.
- 3) For general metric equipment, select 'O' ring from **Chart 72**, pages 21-22.
- 4) If the metric size you require is not available from **Chart 72**, then select from the metric columns in **Chart 50**, pages 13-16.
- 5) For general inch sizes, use **Chart 50**, or **Chart 17000** on page 23.

Selecting a back-up ring

One or more back-up rings are used to prevent extrusion of an elastomeric 'O' ring under arduous operating conditions.

Our standard back-up rings are machined in PTFE and normally supplied in single turn or spiral form. See page 12 for more details on back-up rings.

Back-up rings for use with James Walker 'O' ring number

Refer to *How to order* section on page 7 for precise specification details relating to back-up rings for **Chart 50**, **Chart 72** and **Chart 17000** applications.

Back-up ring for use with existing 'O' ring

- 1) Identify appropriate Chart and part number for existing 'O' ring. *(Note: If a standard 'O' ring has been used on a non-standard shaft or cylinder — ie, compressed or stretched into place — the equivalent standard back-up ring must not be used as it cannot be stretched or squeezed in the same way.)*

- 2) Refer to *How to order* section on page 7 for precise specification details.

Back-up ring for use with non-standard size 'O' ring

Please contact our Technical Support Team for recommendations on the correct back-up ring.

Back-up ring for a new application

- 1) Select the 'O' ring you require from our Charts, using the method outlined earlier on this page.
- 2) Refer to *How to order* section on page 7 for precise specification details.

How to use this guide

Selecting a material

Stocked material grades

| Standard compound reference | Rubber type | Specifications | Stocked | Colour | ASTM D2000 reference |
|-----------------------------|-----------------------------|----------------------|---------|--------|-----------------------------------------------------------|
| PB80 | 'Medium' nitrile (NBR) | BS6996 Grade BO80 | ✓ | Black | ASTM D2000 M2BG 810, B14, EF11 , EF21, EO14, EO34. |
| EP18/H/75 | Ethylene-propylene (EPM) | | ✓ | Black | ASTM D2000 M3BA 810, A14, B13, Z1. Z1: Hardness 75±5 IRHD |
| FR10/80 | Fluorocarbon (FKM) | DTD 5612A Grade 80** | ✓ | Black | ASTM D2000 M6HK 810, A1-10, B36 |
| FR25/90* | Fluorocarbon (FKM) | | ✓ | Black | ASTM D2000 M7HK 914, B38, Z1* |
| FR58/90* | Fluorocarbon (FKM) | | ✓ | Black | ASTM D2000 M3HK 910, A1-10, B38, Z1* |
| Elast-O-Lion® 101* | Hydrogenated nitrile (HNBR) | | ✓ | Black | |
| Elast-O-Lion® 180 | Hydrogenated nitrile (HNBR) | | ✓ | Black | |
| Elast-O-Lion® 985* | Hydrogenated nitrile (HNBR) | | ✓ | Black | |
| SIL 80/2 | Silicone (VMQ) | BS F153 Grade 80 | ✓ | White | ASTM D2000 7GE 805, A19, B37, EO36, Z1 Z1: colour white |

*These grades are compounded for Rapid Gas Decompression (RGD) resistance: please consult our Technical Support Team for specific details.

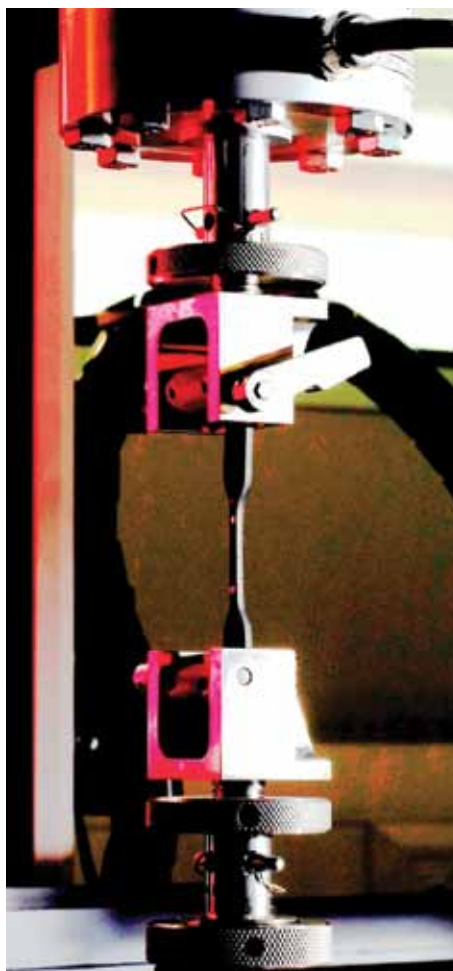
** All DTD specifications have been declared obsolescent.

Red: Please specify on your enquiry or order if you want 'O' rings to meet these specifications.

The *Stocked material grades* table, above, gives details of our nine most widely demanded stocked materials. We recommend that you use one of these, wherever possible, for your 'O' rings. Full details of all readily available materials and their chemical compatibility are given on pages 8-12.

'O' ring sizes shown on Chart 50, Aerospace sizes to BS ISO 3601-1, Chart 72, and Chart 17000 are supplied without mould charges.

If you have any doubts about materials selection, please contact our Technical Support Team for recommendations.



How to use this guide

How to order

The following information and examples will help you to order the correct 'O' ring and back-up ring for specific applications. For critical applications, including those requiring FEP encapsulated 'O' rings, we recommend that you state the following details to enable us to ensure suitability:

- Pressures and pressure media.
- Operating temperatures.
- Static, or dynamic operation with speed.
- Housing type.
- Tolerances.
- Any other important factors.

'O' rings

Standard sizes Charts 50, 72 & 17000:

please state the JW number followed by material reference. *If no material or application conditions are specified, we will supply our PB80 nitrile grade.*

EXAMPLE: JW 50-001 PB80.

Aerospace sizes to BS ISO 3601-1:

please use the following example, where XXXX denotes Size Code, YYY denotes ID, and ZZZ denotes cross-section diameter.

EXAMPLE: 'O' ring – BS ISO 3601-1A-XXXX – YYY x ZZZ – S, in FR10/80 to DTD 5612A Grade 80.

Other sizes: please state ID, cross-section diameter and material.

EXAMPLE: ID 49.4mm, DS 4.1mm, PB80

Back-up rings

Back-up rings are supplied in spiral form unless single turn is stated. Also, they are supplied in PTFE unless otherwise stated.

Back-up ring for Chart 50 inch sizes: for back-up rings to fit inch size shafts and cylinders, state the JW number for the 'O' ring. Also indicate spiral or single turn, and material.

EXAMPLE: For a JW 50-433 (0.275" diameter section) 'O' ring on a 5½" OD shaft or 6" ID cylinder, order JW 50-433 PTFE spiral back-up ring.



Back-up rings for Chart 50 metric sizes:

When ordering back-up rings to match our suggested Chart 50 metric shaft and cylinder sizes, please use:

- Prefix **150** for shaft applications.
- Prefix **250** for cylinder applications.
- Also indicate spiral or single turn and material.

(The reason is that 'O' rings can be stretched or squeezed slightly — see *General design notes* on pages 27-28 — but the back-up ring must be manufactured exactly to suit the shaft or cylinder.)

EXAMPLE 1: For 140mm OD shaft, order JW 150-433 PTFE spiral back-up ring.

EXAMPLE: For 155mm ID cylinder, order JW 250-433 PTFE spiral back-up ring.

Back-up rings for Aerospace Sizes to BS

ISO 3601-1: Please contact our Technical Support Team for back-up rings to BS ISO 3601-4.

Back-up rings for Chart 72: When ordering back-up rings (which cover those to BS 5106) please state the same JW 72 number as the 'O' ring. Also indicate spiral or single turn, and material.

EXAMPLE: JW 72-1393-57 PTFE spiral back-up ring.

Back-up rings for other sizes: When ordering back-up rings to match 'O' rings that are not listed in our charts, please state the following:

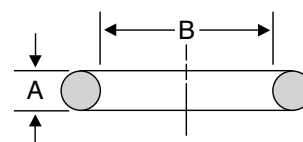
- 1) Spiral or single turn, and material.
- 2) Back-up ring dimensions, if known, or
- 3) 'O' ring inside diameter B; 'O' ring section diameter A; shaft or cylinder diameter (C or D); housing width and depth (E and F) — see page 29.

EXAMPLE: PTFE spiral back-up ring to use with a 49.4mm ID x 4.1mm DS 'O' ring on a 50mm diameter shaft. Housing width 7.1mm, depth 3.5mm.

Note: Back-up rings are manufactured to suit housing sizes, rather than 'O' ring sizes. Therefore back-up rings cannot be supplied based on 'O' ring dimensions alone.

Subsequent orders

When re-ordering from James Walker, please state the Re-Order Part Number (eg, OB03400X) shown on our documentation that acknowledges your previous order. This will ensure the swiftest service.



'O' ring diameter section A and inside diameter B.

Materials & properties

General materials

Note: Materials for stocked 'O' rings are **printed in red**. For specific details please see *Selecting a material* on page 6.

Nitrile — acrylonitrile-butadiene (NBR)

Stocked grade: PB80

We have a very wide range of compounds based on various acrylonitrile/butadiene ratios. Higher nitrile content generally gives better hydrocarbon resistance, whereas lower acrylonitrile content gives better low temperature flexibility. Our PB range is suitable for use with mineral oils — particularly hydraulic types — as well as water and some solvents. Our Proteus range is generally suitable for aqueous food applications, but please consult our Technical Support Team on specific applications before ordering.

Chloroprene (CR) — eg, neoprene

These general purpose elastomers are largely unaffected by sunlight and atmospheric ageing. They give satisfactory service in many media, such as mineral lubricating oils and greases, dilute acids and alkalis, and some solvents.

Natural rubber (NR)

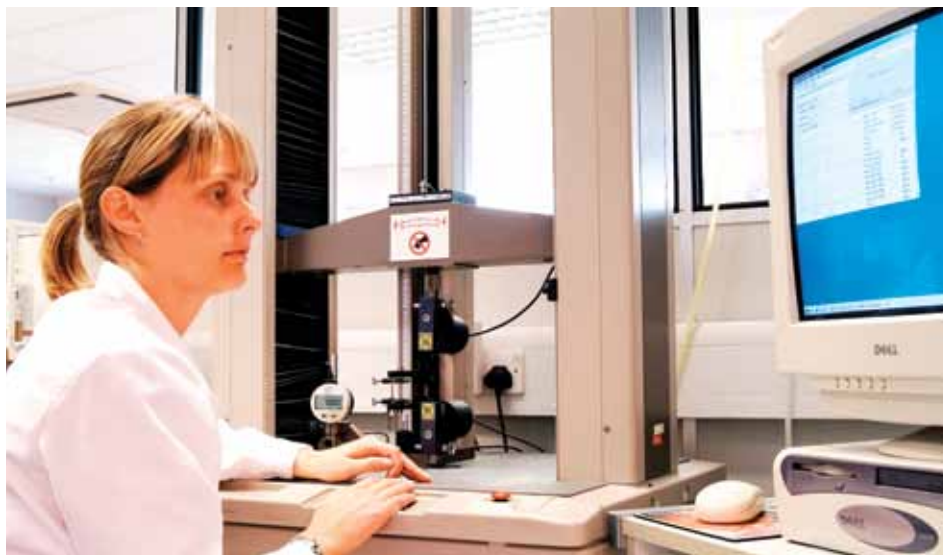
Materials based on natural rubber have high strength and high resilience with good abrasion resistance. They are suitable for use with hot and cold water, ammonia, ethylene glycol, and dilute acids and alkalis. Limited resistance to heat, weathering, and oils has reduced the use of natural rubbers in favour of synthetic elastomers.

Ethylene-propylene (EPM, EPDM)

Stocked grade: EP18/H/75

These compounds have excellent resistance to weathering, ozone, hot and cold water and steam. Grades are available for use with water up to 180°C, making them ideal for steam-raising plant. These materials also display resistance to aliphatic phosphate-ester hydraulic fluids, acids, alkalis, salt solutions, alcohols, glycols and silicone oils.

'O' rings in our EP62 range of materials have been WRAS approved for potable water applications, with cold and hot water up to 85°C.



Butyl — isobutene-isoprene (IIR)

Butyl elastomer has similar chemical resistance to ethylene-propylene. Very low gas permeability makes butyl popular for vacuum and high-pressure gas applications. It must **not** be used with mineral oils.

Epichlorhydrin (ECO)

Compounds based on this elastomer have good resistance to mineral oils, fuels and ozone. Corrosive properties and poor compression set resistance limit the use of these materials for sealing applications.

Chlorosulphonyl polyethylene (CSM)

These elastomers show excellent resistance to weathering and give good service in many media. They are **not** recommended for dynamic seals as compression set resistance is limited.

Polyurethane (AU, EU)

Stress relaxation at above 50°C often precludes these elastomers from 'O' ring *sealing* applications. However many polyurethane 'O' rings are used in drive transmissions where their tensile strength, elongation characteristics and wear resistance prove invaluable.

These materials also have excellent resistance to weathering and oxygen, and good resistance to hydrocarbon fuels and mineral oils. Resistance to acids is low, and some grades are affected by water and humidity.

Fluorosilicone (FVMQ, FMQ)

Fluorosilicone grades are available for applications involving hydrocarbon oils, petroleum fuels, and mineral-based hydraulic fluids. This material is primarily used for static seals in aerospace fuel systems. It has similar mechanical limitations to silicone.

Silicone (VMQ)

Stocked grade: SIL 80/2

Many grades of silicone elastomer are available. They offer good resistance to weathering, and compression set at high temperatures, plus excellent electrical resistance. Their use is limited by high gas permeability, low tensile strength and poor resistance to tear and abrasion. Some grade are suitable for food applications.

Materials & properties

High performance materials

Fluoroelastomers (FKM) — eg, Viton®, Tecnoflon®, Dyneon® base polymers Stocked grades: FR10/80, FR25/90, FR58/90

Fluoroelastomers operate efficiently under severe chemical conditions and at higher temperatures where many other seal materials cannot survive. According to grade, they are well suited to arduous applications involving:

- Temperature capabilities ranging from -41°C to +250°C, depending on grade.
- Petroleum fuels and mineral-based hydraulic fluids.
- Many solvents.

We have developed numerous grades of fluoroelastomers, including the following:

General purpose fluoroelastomers

FR10: Dipolymer-based range with hardnesses of 50 to 90 IRHD. These grades are ideal for general applications and meet UK Ministry of Defence (DTD) low compression set specifications.

FR17: Terpolymer-based range with hardnesses of 65 to 95 IRHD. It has enhanced chemical resistance and better low temperature flexibility characteristics than FR10, although these properties are — to some extent — at the expense of compression set resistance.

FR44: Dipolymer-based range with hardnesses of 50 to 90 IRHD. It comes in a distinctive shade of green for easy identification. These low compression set grades meet many regularly used specifications.

Special fluoroelastomer grades

Many grades are available for specific duties, including the following:

FR68/90: First of our new generation of oil and gas materials. This low compression set elastomer offers excellent resistance to rapid gas decompression (RGD), plus excellent resistance to sour gas (H₂S), amines and steam/hot water. We are market leader in the design and manufacture of seals for RGD environments (see page 11).

FR58/90 & 98: These terpolymer-based grades resist rapid gas decompression (RGD) as described on page 11, and have good all round elastomeric properties.

FR25: Tetrapolymer-based range with hardnesses of 70 to 90 IRHD. It offers fluid resistance approaching that of our FR10 range, together with improved low temperature characteristics. FR25/90 is compounded for RGD resistant duties down to -41°C. FR25/90 has excellent resistance to sour gas (H₂S).

FR64/70 & 80: Dipolymer-based grades that offer enhanced performance in steam, hot water and mineral acids.

LR5853: Tetrapolymer-based range with hardnesses of 80, 90 and 98 IRHD. It has enhanced fluid resistance, especially with methanol and gasoline-alcohol blends that affect other fluoroelastomers. These grades stiffen below -5°C, thus LR6316 and FR25 are recommended for low temperature applications.

LR6316: Available in hardnesses of 75 and 90 IRHD, this compound is based on a special tetrapolymer with a similar fluid resistance to LR5853, plus improved low temperature characteristics for service down to -29°C.

Aflas® (FEPM)

These compounds have resistance to lubricants and some fuels approaching that of fluorocarbon dipolymers but, in addition, are suitable for sour gas duties or where amines and high temperature water or steam are used.

AF85: Available in hardnesses of 70, 80 and 90 IRHD. Typical maximum service temperature is 200°C although higher temperatures can be sustained in some media: eg, 260°C in steam. Other special grades are available, such as AF69/90 that is compounded for rapid gas decompression (RGD) resistance.

Kalrez® — perfluoroelastomer (FFKM)

These materials offer almost universal chemical resistance, with grades available for continuous duties up to 325°C. James Walker is Authorised Distributor in the UK, Ireland and France for the design, supply and technical support of sealing and fluid handling parts made from DuPont™ Kalrez®.

Fluolion® (PTFE)

Fluolion® is James Walker's registered trade name for products manufactured in PTFE. The chemical resistance of virgin PTFE is almost universal — with the exception of molten alkali metals, fluorine gas and elemental fluorine. These chemical properties make PTFE the ideal material for 'O' ring back-up rings.

The flow characteristics of PTFE under stress are a disadvantage in 'O' rings.

Elast-O-Lion® — hydrogenated nitrile (HNBR)

Stocked grades: Elast-O-Lion® 101, 180, 985

Elast-O-Lion® is James Walker's registered trade name for its range of high-performance hydrogenated nitrile compounds.

These materials have the excellent oil/fuel resistance of traditional nitrile (NBR) elastomers with a similar ACN content. They also have superior mechanical properties and can sustain higher service temperatures: eg, 180°C in oil. In addition, they display superior resistance to aggressive fluids such as sour (H₂S) crude oil, lubricating oil additives and amine corrosion inhibitors. Fully saturated grades of HNBR have excellent resistance to ozone.

Four ranges are suitable for 'O' ring manufacture, with various acrylonitrile contents from low to ultra high, and hardnesses from 60 to 90 IRHD.

Two grades — Elast-O-Lion 101 and 985 — are extremely well proven in oilfield applications, where mechanical strength, plus resistance to rapid gas decompression (RGD) and chemical attack, is required.

Temperature capability is between -55°C and +180°C, depending on material grade and application.

Materials & properties

Guide to material use

| MATERIAL TYPE | | Resistance to | | | | | | | | | | | | | | | | | | | | Hydraulic fluids fire resistant | | | Temperature range (°C) | | Available to the latest issue of the following specifications | | | | | | | | |
|------------------------------|----------|---------------|--------------------|---------------------------|----------------|----------------|----------------|----------------|----------------------|--------|----------------|--------------------------|-------------------------|--------------------------|----------|----------------------|--------------------------------|-------------------------|----------------------------|----------------------------------|------------------------|---------------------------------|------------------------------|-----|------------------------|---------------------|---------------------------------------------------------------|---------------------|------|------------------|------------------|------------------|----------------------|--------------------------------------------------------------------------|-----------------------------------------------|
| | | Air or oxygen | Water – up to 80°C | Dilute acids – above 80°C | Dilute alkalis | Lower alcohols | Aldehydes | Amines | Chlorinated solvents | Ethers | Ketones | Hydrocarbons – aliphatic | Hydrocarbons – aromatic | Leaded petrol (gasoline) | Kerosene | Animal oils and fats | Lubricating oils – diesel oils | Silicone oils – mineral | Vegetable oils – synthetic | Hydraulic fluids – mineral based | Water in oil emulsions | Phosphate esters – glycol based | Phosphate esters – aliphatic | Low | High – continuous | High – intermittent | | Hardness range IRHD | | | | | | | |
| Acrylic | ACM | 2 | 4 | 4 | 4 | 4 | 4 | 4 | 3 | 3 | 4 | 1 | 3 | 1 | 1 | 1 | 1 | 1 | 2 | 1 | 1 | 1 | 4 | 4 | 4 | 4 | 4 | 4 | –20 | 150 | 175 | 80 | BS 3227 | | |
| Aflas® | FEPM | 1 | 1 | 1 ^F | 1 | 1 | 1 | 1 | 1 | 3 | 4 | 4 | 1 | 3 | 2 | 1 | 1 | 1 | 1 | 2 | 1 | 1 | 1 | 2 | 1 | 1 | 1 | 2 | 0 | 200 | 230 ^F | 70 - 90 | | | |
| Butyl | IIR | 1 | 1 | 2 | 1 | 1 | 1 | 1 | 1 | 4 | 4 | 1 | 4 | 4 | 4 | 4 | 2 | 4 | 4 | 4 | 1 | 3 | 4 | 4 | 4 | 4 | 1 | 2 | 2 | –35 | 120 | 150 | | 60 - 70 | |
| Chlorosulphonyl polyethylene | CSM | 2 | 1 | 3 | 4 | 1 | 1 | 3 | 4 | 4 | 4 | 4 | 3 | 4 | 4 | 4 | 3 | 3 | 4 | 4 | 1 | 2 | 2 | 4 | 4 | 3 | 1 | 4 | 4 | –30 | 120 | 150 | | 65 - 80 | |
| Elast-O-Lion® | HNBR | 1 | 1 | 1 | 1 | 2 | 1 | 2 | 1 | 2 | 4 | 4 | 1 | 3 | 2 | 1 | 1 | 2 | 1 | 1 | 1 | 1 | 1 | 4 | 2 | 2 | 2 | 3 | 4 | –25 ^A | 150 | 170 | 50 - 90 | DEF STAN 02-337 | |
| Epichlorohydrin | ECO | 2 | 1 | 2 | 3 | 2 | 2 | 4 | 1 | 4 | 4 | 4 | 3 | 4 | 1 | 1 | 1 | 1 | 1 | 4 | 1 | 1 | 1 | 4 | 2 | 2 | 2 | 4 | 4 | –30 | 150 | 175 | 70 - 90 | BS F 156, 162 | |
| Ethylene-propylene | EPM/EPDM | 1 | 1 | 1 | 2 | 1 | 1 | 1 | 2 | 4 | 3 | 1 | 1 | 4 | 4 | 4 | 2 | 4 | 4 | 4 | 1 | 3 | 4 | 4 | 4 | 4 | 1 | 1 | 2 | –45 | 120 | 150 ^B | 50 - 90 | | |
| Fluolion® | PTFE | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | –200 | 250 | | | | | |
| Fluoroelastomers | FKM | 1 | 1 | 3 | 1 | 2 | 4 ^C | 4 ^C | 4 ^C | 1 | 3 ^C | 4 ^C | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 2 | 1 | 1 | 1 | 2 | 1 | 1 | 2 | 1 | 1 | –15 ^D | 200 | 230 ^D | 50 - 98 | | DEF STAN 02-337, *DTD 5543, 5603, 5612, 5613. |
| Fluorosilicone | FVMQ | 1 | 1 | 2 | 3 | 2 | 1 | 4 | 4 | 2 | 3 | 4 | 1 | 1 | 2 | 1 | 1 | 2 | 1 | 2 | 1 | 1 | 2 | 2 | 2 | 2 | 3 | 3 | –60 | 180 | 200 | 60 - 80 | BS F 154 | | |
| Kalrez® | FFKM | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | –40 | 325 | | 70 - 95 | SAE AMS 7257 | | |
| Natural rubber | NR | 3 | 1 | 2 | 3 | 2 | 2 | 3 | 2 | 4 | 4 | 4 | 4 | 4 | 4 | 4 | 4 | 4 | 4 | 1 | 4 | 4 | 4 | 4 | 4 | 4 | 3 | 4 | 4 | –50 | 100 | 120 | 40 - 85 | BS 1154 | |
| Neoprene | CR | 1 | 1 | 2 | 3 | 1 | 1 | 3 | 2 | 4 | 4 | 4 | 4 | 2 | 4 | 3 | 2 | 2 | 3 | 2 | 3 | 1 | 3 | 3 | 4 | 4 | 4 | 3 | 4 | 4 | –40 | 120 | 150 | 40 - 90 | BS 2752 |
| Nitrile | NBR | 2 | 1 | 2 | 3 | 2 | 1 | 3 | 2 | 3 | 4 | 4 | 1 | 3 | 2 | 1 | 1 | 2 | 1 | 2 | 1 | 1 | 1 | 4 | 3 | 3 | 1 | 4 | 4 | –30 ^A | 120 | 150 | 40 - 90 | BS 2751, 6996, 6997, DEF STAN 02-337, *DTD 5509, 5594, 5595, 5606, 5607. | |
| Polyurethane | AU/EU | 1 | 4 | 4 | 4 | 4 | 4 | 4 | 4 | 3 | 2 | 4 | 2 | 4 | 2 | 2 | 2 | 3 | 2 | 4 | 1 | 2 | 1 | 4 | 4 | 4 | 4 | 4 | 4 | –15 | 85 | 100 | 55 - 95 ^E | BS F 152, 153, 159 | |
| Silicone | VMQ | 1 | 1 | 2 | 3 | 2 | 1 | 2 | 2 | 4 | 4 | 3 | 3 | 4 | 4 | 4 | 2 | 4 | 3 | 3 | 4 | 1 | 4 | 3 | 3 | 4 | 2 | 2 | 3 | –65 | 200 | 250 | 40 - 80 | | |

Key

- 1 Very good**
2 Good
3 Fair
4 Not recommended

* These specifications have been declared OBSOLESCE.

^A Low acrylonitrile content grades are available for temperatures down to -46°C.

^B EPM grades are available for hot water service up to +180°C.

^C Fluoroelastomer grades are available that offer resistance to these chemicals.

^D Fluoroelastomer grades are available for temperatures down to -41°C and up to +250°C intermittent.

^E Polyurethane grades are also available in hardnesses from 60 to 74 Shore D.

^F Some Aflas® grades will work at temperatures to +260°C in hot water and steam.

Note: These figures are for guidance only. Service life will depend on type of application, whether static or dynamic, specific pressure medium, temperature cycle, time of exposure, etc. In general, the low temperatures quoted are at atmospheric pressure and may change at elevated pressures.

Service grades

'O' rings precision moulded by James Walker are supplied with quality acceptance criteria as follows:

- **Standard supply: Grade N** of BS ISO 3601-3 *Fluid power systems — O-rings — Part 3: Quality acceptance criteria*.
- **Grade S:** This higher grade is provided when required — typically for aerospace, critical industrial or automotive applications.

- **Grade CS** (Critical Services) is also available. This is typically for critical aerospace and medical duties. Please discuss your requirements with our Technical Support Team.

Commercial quality 'O' rings (page 25) and items in our 'O' ring kits (page 26) are normally supplied to Grade N.



Note: For cross sections below 0.8mm or above 8.4mm, please contact our Technical Support Team.

Materials & properties

Rapid gas decompression

Although rapid gas decompression (RGD) — previously known as explosive decompression (ED) — is a phenomenon generally found in the oil and gas industry, it can occur in any application where there is a rapid drop in gas pressure. Such damage is found in sealing applications ranging from paint guns and fire extinguishers to marine stern glands and systems containing refrigerants.

How damage occurs

RGD damage is structural failure in the forms of blistering, internal cracking and splits, caused when the gas pressure, to which a seal is exposed, rapidly reduces from high to low. Although no strict rules apply, damage should be considered in a gas or dissolved gas system when pressure is greater than 5MPa (725psi), and decompression exceeds 1MPa (145psi) per hour.

The elastomeric parts in a system are, to a greater or lesser degree, susceptible to the permeation and diffusion of gases dissolving in their surface. In time, the elastomer becomes saturated with gases.

Under these conditions — as long as the gas pressure in the elastomer remains at equilibrium with the ambient pressure — there is minimal, if any, damage. Thus, no deterioration in performance of the elastomeric part occurs (unless caused by other factors, eg chemical or thermal degradation or extrusion damage).

When external gas pressure is removed or pressure fluctuations occur, large pressure gradients are created between the interior and surface of the component. This pressure differential may be balanced by the gas diffusing /permeating out of the elastomer, especially if any external constraints are not removed.

But, if the elastomer cannot resist crack or blister growth during the permeation process, then structural failure will result.

Rapid gas decompression damage can manifest itself in various ways — anything from internal splits that are not visible on the surface of the seal, to surface blisters, fractures and complete fragmentation.



James Walker's RGD materials test laboratory

Leader in RGD-resistant elastomers

We have conducted intensive materials development programmes over the past 30 years to help industry overcome RGD problems. Much of this work is carried out in collaboration with plant manufacturers, oil/gas operators and research bodies.

We offer RGD resistant elastomers, which are validated by James Walker Technology Centre. Specific grades are tested and approved by oilfield operators and equipment manufacturers, with several qualified to Norsok M-710 Annex B and BS EN ISO 23936-2 Annex B.

The formulation, mixing, quality control and processing of these compounds is rigorously controlled. Today they are rated as benchmarks by which others are judged. Albeit each compound has a broad range of applications capability, their particular features are as follows:

- **FR68/90** — this fluorocarbon-based material is the first in our new generation of oil and gas elastomers. With new polymer architecture, it offers low compression set, excellent RGD resistance, plus enhanced resistance to sour gas, amines and steam. It is Norsok rated up to at least 8.4mm cross section 'O' rings.
- **FR58/90** — fluorocarbon terpolymer (FKM) material with excellent chemical and thermal properties, plus good RGD resistance. It is widely approved and

specified for oilfield duties, and has also achieved the highest Norsok rating of 0000 with 5.33mm section 'O' rings.

- **FR25/90** — a fluorocarbon tetrapolymer (FKM) that combines improved low temperature capability with excellent chemical properties. It offers excellent RGD resistance, and has achieved the highest Norsok rating of 0000 with 6.99mm and 5.33mm section 'O' rings.
- **Elast-O-Lion® 101** — an hydrogenated nitrile (HNBR) grade with high mechanical strength and wear resistance. It has good resistance to many oilfield chemicals, including H₂S and amine corrosion inhibitors. It is resistant to RGD and approved to many oilfield specifications. It achieved the highest Norsok rating of 0000 with 6.99mm section 'O' rings.
- **Elast-O-Lion® 985** — our hydrogenated nitrile (HNBR) grade with a temperature capability down to -55°C, but offering reduced mechanical properties and RGD resistance when compared to Elast-O-Lion 101.
- **AF69/90** — An Aflas® (FEPM) based RGD-resistant grade with excellent resistance to oilfield media and steam.

For detailed information on RGD-resistant grades see: *Elastomeric seals & components for the Oil & Gas Industry*.

Materials & properties

FEP encapsulated 'O' rings

These have a core of elastomer that is completely covered with a seamless sheath of fluorinated ethylene propylene (FEP). The core is normally fluorocarbon (FKM) or silicone (VMQ).

Encapsulated 'O' rings are generally used when:

- A standard elastomeric 'O' ring has inadequate chemical resistance for a specific application, and
- A solid PTFE 'O' ring does not offer sufficient elasticity for reliable, long-term fluid sealing.

They are used where high levels of chemical resistance or hygiene are needed — typically in petrochemical, chemical, food or pharmaceutical plant.

Although FEP encapsulated 'O' rings are most suited to static duties, they may be used with slow short movements on rotary applications such as valve stem sealing.



Their advantages are manifold, including:

- Excellent chemical resistance to a wide range of media. *Please contact our Technical Support Team for details.*
- Operational temperature ranges of:
-60°C to +200°C with silicone core.
-20°C to +200°C with fluorocarbon core.
- Low friction and low 'stick-slip' effect.
- Far greater elasticity than solid PTFE.

Our FEP encapsulated 'O' rings are fully interchangeable with standard 'O' rings.

However, due to the FEP sheath, they are less flexible than elastomeric rings and have limited stretch with higher permanent deformation. Auxiliary tools may be needed to facilitate efficient fitting.

Back-up rings

Back-up rings are installed to prevent the extrusion of the 'O' ring. They are manufactured from Fluolion® PTFE (virgin or filled), and PEEK™.

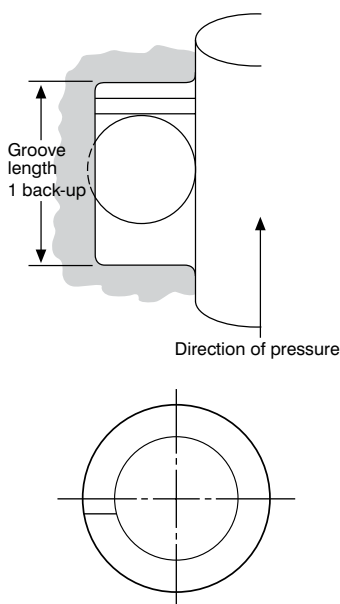
They are recommended for applications where:

- System pressure exceeds 10MPa (1450psi), or 'O' rings of low strength elastomer are used, or
- Adverse mechanical conditions exist.

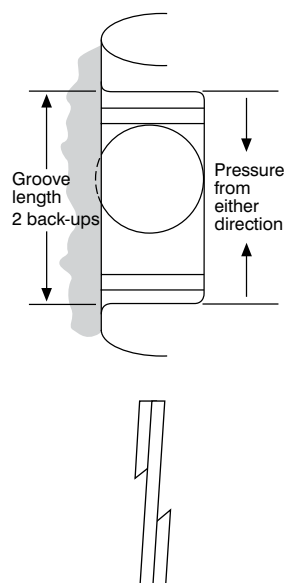
Please consult our Technical Support Team if system pressure exceeds 42MPa (6092psi).

Two back-up rings — one either side of the 'O' ring in its housing — are needed when the application is double-acting.

Our back-up rings are usually supplied as a spiral of two turns. This enables the back-up ring to be opened with ease for fitting over a shaft and ensures the 'O' ring is supported around its entire diameter.



Single-turn back-up rings can also be supplied, and these are usually endless to ensure good support. However, they can be scarf split if required, although we do not recommend this because extrusion can occur at the split.



Back-up rings less than 3mm ID are available only as a single turn — 3mm ID is the smallest size suitable for machining as a two-turn spiral.

Chart 50: inch & metric sizes

James Walker Chart 50 reflects the standards in many countries, particularly those of the UK and USA. For ordering details, please see page 7.

Reference numbers printed in **red** indicate sizes covered by:

- **BS 1806:** Dimensions of toroidal sealing rings ('O' rings) and their housings (inch sizes),
- **BS ISO 3601-1:** Fluid power systems — 'O' rings Part 1: Inside diameters, cross-sections, tolerances and designation codes, and
- **SAE AS 568:** American National Standard Aerospace size standard for 'O' rings.

Although the basic range is in inches, the 'O' rings can of course be used for sealing metric dimensioned components. Chart 50 includes suggested metric shaft and cylinder sizes for which each individual 'O' ring is suitable. (Note: these figures are NOT merely direct metric conversions of inch sizes. Also, separate ranges of back-up rings are available for metric shafts and cylinders — see page 7 for ordering references.)

BS ISO 3601 sizes & tolerances

BS 1806 has been superseded by **BS ISO 3601-1** (dimensions) and **BS ISO 3601-2** (housings), but BS 1806 is still widely referenced by industry. The size codes in BS ISO 3601-1 (non-aerospace) are, with a few exceptions, the same as BS 1806. However, there are two tolerance bands, **Class A** and **Class B**, with the tighter tolerances of Class A equating to BS 1806. Our **Chart 50** meets the **Class A** tolerances.

The **A** suffix size codes in BS 1806 (eg, 445A) do not appear as standard sizes in BS ISO 3601-1, but have been retained in Chart 50 as they are still requested.

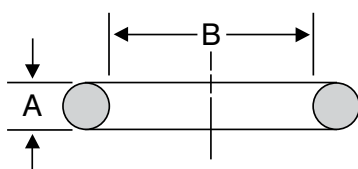
Using a size code reference such as 445A can result in different size seals being supplied depending on whether BS 1806 or BS ISO 3601-1 is involved. For example, using BS ISO 3601-1, a reference of 445A would indicate a size code of 445 with Class A tolerances.

Thus, when ordering an A suffix size code from BS 1806, it is important to quote BS 1806 and not just the size code.

* Static/dynamic applications

An asterisk symbol (*) denotes that the ring is suitable for both dynamic and static applications. Other sizes are not recommended for dynamic duties.

Housing details can be referred to on pages 29-31.



'O' ring diameter section A and inside diameter B.

Refer to page 29 for List of Symbols

| James Walker Number | INCH DIAMETERS | | | METRIC DIAMETERS (mm) | | |
|--------------------------------------------------------|----------------|---------|--------|-----------------------|---------|--------|
| | Inside Dia. B | C, P, T | D, Q | Inside Dia. B | Shaft C | Cyl. D |
| 0.040 ±0.003" (1.02 ±0.08mm) Diameter Section A | | | | | | |
| 50-001 | 0.029 ±0.004 | 1/32 | 3/32 | 0.74 ±0.10 | 0.8 | 2.5 |
| " 606 | 0.070 ±0.005 | 5/64 | 9/64 | 1.78 ±0.13 | 2 | 3.6 |
| " 607 | 0.100 " | 7/64 | 11/64 | 2.54 " | 2.8 | 4.5 |
| 0.050 ±0.003" (1.27 ±0.08mm) Diameter Section A | | | | | | |
| 50-002 | 0.042 ±0.004 | 3/64 | 0.130 | 1.07 ±0.10 | 1.2 | 3.3 |
| 0.060 ±0.003" (1.52 ±0.08mm) Diameter Section A | | | | | | |
| 50-003 | 0.056 ±0.004 | 1/16 | 11/64 | 1.42 ±0.10 | 1.5 | 4.1 |
| 0.070 ±0.003" (1.78 ±0.08mm) Diameter Section A | | | | | | |
| 50-004* | 0.070 ±0.005 | 5/64 | 13/64 | 1.78 ±0.13 | 2 | 5 |
| " 005* | 0.101 " | 7/64 | 15/64 | 2.57 " | 2.8 | 6 |
| " 006* | 0.114 " | 1/8 | 1/4 | 2.90 " | 3 | 6.2 |
| " 801* | 0.125 " | 9/64 | 17/64 | 3.18 " | 3.5 | 6.5 |
| " 007* | 0.145 " | 5/32 | 9/32 | 3.68 " | 4 | 7 |
| " 008* | 0.176 " | 3/16 | 5/16 | 4.47 " | 4.5 | 8 |
| " 802* | 0.188 " | 13/64 | 21/64 | 4.76 " | 5 | 8.5 |
| " 009* | 0.208 " | 7/32 | 11/32 | 5.28 " | 5.5 | 9 |
| " 010* | 0.239 " | 1/4 | 3/8 | 6.07 " | 6 | 9.5 |
| " 803* | 0.250 " | 17/64 | 29/64 | 6.35 " | 6.5 | 9.8 |
| " 610* | 0.266 " | 9/32 | 13/32 | 6.75 " | 7 | 10 |
| " 011* | 0.301 " | 5/16 | 7/16 | 7.65 " | 7.5 | 11 |
| " 804* | 0.313 " | 21/64 | 29/64 | 7.94 " | 8 | 11.5 |
| " 611* | 0.344 " | 11/32 | 15/32 | 8.73 " | 9 | 12 |
| " 012* | 0.364 " | 3/8 | 1/2 | 9.25 " | 9.5 | 12.5 |
| " 013 | 0.426 " | 7/16 | 9/16 | 10.82 " | 11 | 14.2 |
| " 806 | 0.438 " | 29/64 | 37/64 | 11.11 " | 11.5 | 14.5 |
| " 014 | 0.489 " | 1/2 | 5/8 | 12.42 " | 12.5 | 16 |
| " 015 | 0.551 ±0.007 | 9/16 | 11/16 | 14.00 ±0.18 | 14 | 17.5 |
| " 016 | 0.614 ±0.009 | 5/8 | 3/4 | 15.60 ±0.23 | 15.5 | 19 |
| " 017 | 0.676 " | 11/16 | 13/16 | 17.17 " | 17 | 20.5 |
| " 018 | 0.739 " | 3/4 | 7/8 | 18.77 " | 19 | 22.5 |
| " 019 | 0.801 " | 13/16 | 15/16 | 20.35 " | 20 | 24 |
| " 020 | 0.864 " | 7/8 | 1 | 21.95 " | 22 | 25.5 |
| " 021 | 0.926 " | 15/16 | 11/8 | 23.52 " | 23 | 27 |
| " 022 | 0.989 ±0.010 | 1 | 11/8 | 25.12 ±0.25 | 25 | 29 |
| " 023 | 1.051 " | 11/8 | 13/8 | 26.70 " | 27 | 30 |
| " 024 | 1.114 " | 11/8 | 11/4 | 28.30 " | 28 | 32 |
| " 025 | 1.176 ±0.011 | 13/8 | 15/8 | 29.87 ±0.28 | 30 | 34 |
| " 026 | 1.239 " | 11/4 | 13/8 | 31.47 " | 31 | 35 |
| " 027 | 1.301 " | 15/16 | 17/16 | 33.05 " | 32 | 37 |
| " 028 | 1.364 ±0.013 | 13/8 | 11/2 | 34.65 ±0.33 | 35 | 38 |
| 517 | 1.428 " | 17/16 | 19/16 | 36.27 " | 36 | 40 |
| " 029 | 1.489 " | 11/2 | 15/8 | 37.82 " | 38 | 42 |
| 519 | 1.553 " | 19/16 | 111/16 | 39.45 " | 39 | 43 |
| " 030 | 1.614 " | 15/8 | 13/4 | 41.00 " | 40 | 45 |
| " 031 | 1.739 ±0.015 | 13/4 | 17/8 | 44.17 ±0.38 | 44 | 48 |
| " 032 | 1.864 " | 17/8 | 2 | 47.35 " | 47 | 51 |
| " 033 | 1.989 ±0.018 | 2 | 21/8 | 50.52 ±0.46 | 50 | 55 |
| " 034 | 2.114 " | 21/8 | 21/4 | 53.70 " | 53 | 58 |
| " 035 | 2.239 " | 21/4 | 23/8 | 56.87 " | 56 | 61 |
| " 036 | 2.364 " | 23/8 | 21/2 | 60.05 " | 60 | 65 |
| " 037 | 2.489 " | 21/2 | 23/4 | 63.22 " | 63 | 67 |
| " 038 | 2.614 ±0.020 | 23/4 | 23/2 | 66.40 ±0.51 | 65 | 70 |
| " 039 | 2.739 " | 23/4 | 27/8 | 69.57 " | 69 | 75 |
| " 040 | 2.864 " | 27/8 | 3 | 72.75 " | 70 | 77 |
| " 041 | 2.989 ±0.024 | 3 | 31/8 | 75.92 ±0.61 | 75 | 80 |
| 532 | 3.110 " | 31/8 | 31/4 | 78.99 " | 78 | 85 |
| " 042 | 3.239 " | 31/4 | 33/8 | 82.27 " | 80 | 88 |
| 534 | 3.360 " | 33/8 | 31/2 | 85.34 " | 85 | 90 |
| " 043 | 3.489 " | 31/2 | 33/4 | 88.62 " | 88 | 95 |
| 536 | 3.610 ±0.027 | 33/4 | 31/2 | 91.69 ±0.69 | 90 | 98 |
| " 044 | 3.739 " | 33/4 | 37/8 | 94.97 " | 95 | 100 |
| 538 | 3.860 " | 37/8 | 4 | 98.04 " | 98 | 102 |
| " 045 | 3.989 " | 4 | 41/8 | 101.32 " | 100 | 105 |
| " 540 | 4.110 " | 41/8 | 41/4 | 104.39 " | 104 | 110 |
| " 046 | 4.239 ±0.030 | 41/4 | 43/8 | 107.67 ±0.76 | 107 | 112 |
| 542 | 4.360 " | 43/8 | 41/2 | 110.74 " | 110 | 115 |
| " 047 | 4.489 " | 41/2 | 43/4 | 114.02 " | 114 | 120 |
| 544 | 4.610 " | 43/4 | 43/4 | 117.09 " | 116 | 122 |
| " 048 | 4.739 " | 43/4 | 47/8 | 120.37 " | 120 | 125 |
| 546 | 4.860 ±0.037 | 47/8 | 5 | 123.44 ±0.94 | 123 | 130 |
| " 049 | 4.989 " | 5 | 51/8 | 126.72 " | 125 | 132 |
| 548 | 5.095 " | 51/8 | 51/4 | 129.41 " | 130 | 135 |
| " 050 | 5.239 " | 51/4 | 53/8 | 133.07 " | 132 | 138 |

Chart 50: inch & metric sizes

Refer to page 29 for List of Symbols

| James Walker Number | INCH DIAMETERS | | | METRIC DIAMETERS (mm) | | |
|--------------------------------------------------------|----------------|-----------------|-----------------|-----------------------|---------|--------|
| | Inside Dia. B | C, P, T | D, Q | Inside Dia. B | Shaft C | Cyl. D |
| 0.070 ±0.003" (1.78 ±0.08mm) Diameter Section A | | | | | | |
| 50-550 | 5.345 ±0.037 | 5 $\frac{5}{8}$ | 5 $\frac{1}{2}$ | 135.76 ±0.94 | 135 | 140 |
| " 551 | 5.470 " | 5 $\frac{1}{2}$ | 5 $\frac{5}{8}$ | 138.94 " | 138 | 145 |
| " 552 | 5.595 " | 5 $\frac{5}{8}$ | 5 $\frac{3}{4}$ | 142.11 " | 140 | 148 |
| " 553 | 5.720 " | 5 $\frac{3}{4}$ | 5 $\frac{7}{8}$ | 145.29 " | 145 | 150 |
| " 554 | 5.845 " | 5 $\frac{7}{8}$ | 6 | 148.46 " | 148 | 155 |
| " 555 | 5.970 " | 6 | 6 $\frac{1}{8}$ | 151.64 " | 150 | 158 |
| " 556 | 6.095 ±0.040 | 6 $\frac{1}{8}$ | 6 $\frac{1}{4}$ | 154.81 ±1.02 | 155 | 160 |
| " 557 | 6.220 " | 6 $\frac{1}{4}$ | 6 $\frac{3}{8}$ | 157.99 " | 158 | 162 |
| " 558 | 6.345 " | 6 $\frac{3}{8}$ | 6 $\frac{1}{2}$ | 161.16 " | 160 | 165 |
| " 559 | 6.470 " | 6 $\frac{1}{2}$ | 6 $\frac{3}{4}$ | 164.34 " | 165 | 170 |
| " 560 | 6.595 " | 6 $\frac{3}{4}$ | 6 $\frac{7}{8}$ | 167.51 " | 167 | 172 |
| " 561 | 6.720 " | 6 $\frac{7}{8}$ | 7 | 170.69 " | 170 | 175 |
| " 562 | 6.845 " | 7 | | 173.86 " | 174 | 180 |
| 0.103 ±0.003" (2.62 ±0.08mm) Diameter Section A | | | | | | |
| 50 -102* | 0.049 ±0.005 | $\frac{1}{16}$ | $\frac{1}{4}$ | 1.24 ±0.13 | 1.5 | 6 |
| " 103* | 0.081 " | $\frac{3}{32}$ | $\frac{9}{32}$ | 2.06 " | 2.3 | 7 |
| " 104* | 0.112 " | $\frac{1}{8}$ | $\frac{5}{16}$ | 2.84 " | 3 | 7.5 |
| " 105* | 0.143 " | $\frac{9}{32}$ | $\frac{11}{32}$ | 3.63 " | 4 | 8.5 |
| " 106* | 0.174 " | $\frac{3}{16}$ | $\frac{3}{8}$ | 4.42 " | 4.5 | 9.5 |
| " 107* | 0.206 " | $\frac{7}{32}$ | $\frac{13}{32}$ | 5.23 " | 5.5 | 10 |
| " 108* | 0.237 " | $\frac{1}{4}$ | $\frac{7}{16}$ | 6.02 " | 6 | 11 |
| " 109* | 0.299 " | $\frac{5}{16}$ | $\frac{1}{2}$ | 7.59 " | 7.5 | 12.5 |
| " 110* | 0.362 " | $\frac{3}{8}$ | $\frac{9}{16}$ | 9.19 " | 9.5 | 14 |
| " 613* | 0.391 " | $\frac{13}{32}$ | $\frac{19}{32}$ | 9.92 " | 10 | 15 |
| " 111* | 0.424 " | $\frac{7}{16}$ | $\frac{5}{8}$ | 10.77 " | 11 | 16 |
| " 614* | 0.469 " | $\frac{15}{32}$ | $\frac{23}{32}$ | 11.91 " | 11.5 | 17 |
| " 112* | 0.487 " | $\frac{1}{2}$ | $\frac{11}{16}$ | 12.37 " | 12 | 17.5 |
| " 807* | 0.500 ±0.007 | — | — | 12.70 ±0.18 | 12.5 | 17.8 |
| " 615* | 0.516 " | $\frac{33}{64}$ | $\frac{45}{64}$ | 13.10 " | 13 | 18 |
| " 113* | 0.549 " | $\frac{9}{16}$ | $\frac{3}{4}$ | 13.94 " | 14 | 19 |
| " 616* | 0.594 " | $\frac{19}{32}$ | $\frac{25}{32}$ | 15.08 " | 15 | 20 |
| " 114* | 0.612 ±0.009 | $\frac{5}{8}$ | $\frac{13}{16}$ | 15.54 ±0.23 | 15.5 | 20.5 |
| " 809* | 0.625 " | $\frac{41}{64}$ | $\frac{53}{64}$ | 15.88 " | 16 | 21 |
| " 115* | 0.674 " | $\frac{11}{16}$ | $\frac{7}{8}$ | 17.12 " | 17 | 22 |
| " 810* | 0.688 " | $\frac{45}{64}$ | $\frac{57}{64}$ | 17.46 " | 17.5 | 22.5 |
| " 617* | 0.703 " | $\frac{23}{32}$ | $\frac{29}{32}$ | 17.86 " | 18 | 23 |
| " 116* | 0.737 " | $\frac{3}{4}$ | $\frac{15}{16}$ | 18.72 " | 19 | 24 |
| " 117 | 0.799 ±0.010 | $\frac{13}{16}$ | 1 | 20.29 ±0.25 | 20 | 25.5 |
| " 812 | 0.813 " | $\frac{53}{64}$ | $\frac{11}{8}$ | 20.64 " | 20.5 | 26 |
| " 118 | 0.862 " | $\frac{7}{8}$ | $\frac{11}{16}$ | 21.89 " | 21 | 27 |
| " 813 | 0.875 " | $\frac{57}{64}$ | $\frac{15}{16}$ | 22.23 " | 22 | 27.5 |
| " 119 | 0.924 " | $\frac{15}{16}$ | $\frac{11}{8}$ | 23.47 " | 23 | 28.5 |
| " 814 | 0.938 " | $\frac{61}{64}$ | $\frac{15}{16}$ | 23.81 " | 23.5 | 29 |
| " 120 | 0.987 " | 1 | $\frac{13}{16}$ | 25.07 " | 25 | 30 |
| " 121 | 1.049 " | $\frac{11}{16}$ | $\frac{11}{4}$ | 26.64 " | 27 | 32 |
| " 122 | 1.112 " | $\frac{13}{16}$ | $\frac{15}{16}$ | 28.24 " | 28 | 34 |
| " 123 | 1.174 ±0.012 | $\frac{13}{16}$ | $\frac{13}{8}$ | 29.82 ±0.30 | 30 | 35 |
| " 124 | 1.237 " | $\frac{11}{4}$ | $\frac{13}{16}$ | 31.42 " | 31 | 37 |
| " 125 | 1.299 " | $\frac{13}{16}$ | $\frac{11}{2}$ | 32.99 " | 32 | 38 |
| " 126 | 1.362 " | $\frac{13}{8}$ | $\frac{15}{16}$ | 34.59 " | 35 | 40 |
| " 127 | 1.424 " | $\frac{17}{16}$ | $\frac{15}{8}$ | 36.17 " | 36 | 42 |
| " 128 | 1.487 " | $\frac{11}{2}$ | $\frac{11}{16}$ | 37.77 " | 38 | 43 |
| " 129 | 1.549 ±0.015 | $\frac{19}{16}$ | $\frac{13}{4}$ | 39.34 ±0.38 | 39 | 45 |
| " 130 | 1.612 " | $\frac{15}{8}$ | $\frac{13}{16}$ | 40.94 " | 40 | 47 |
| " 131 | 1.674 " | $\frac{11}{16}$ | $\frac{15}{8}$ | 42.52 " | 42 | 48 |
| " 132 | 1.737 " | $\frac{3}{4}$ | $\frac{15}{16}$ | 44.12 " | 44 | 50 |
| " 133 | 1.799 " | $\frac{11}{32}$ | 2 | 45.69 " | 45 | 51 |
| " 134 | 1.862 " | $\frac{17}{8}$ | $\frac{21}{16}$ | 47.29 " | 47 | 53 |
| " 135 | 1.925 ±0.017 | $\frac{15}{16}$ | $\frac{21}{8}$ | 48.90 ±0.43 | 48 | 55 |
| " 136 | 1.987 " | 2 | $\frac{23}{16}$ | 50.47 " | 50 | 56 |
| " 137 | 2.050 " | $\frac{21}{16}$ | $\frac{21}{4}$ | 52.07 " | 52 | 58 |
| " 138 | 2.112 " | $\frac{21}{8}$ | $\frac{25}{16}$ | 53.64 " | 53 | 60 |
| " 139 | 2.175 " | $\frac{23}{16}$ | $\frac{25}{8}$ | 55.25 " | 55 | 61 |
| " 140 | 2.237 " | $\frac{21}{4}$ | $\frac{27}{16}$ | 56.82 " | 56 | 62 |
| " 141 | 2.300 ±0.020 | $\frac{25}{16}$ | $\frac{27}{8}$ | 58.42 ±0.51 | 58 | 65 |
| " 142 | 2.362 " | $\frac{23}{8}$ | $\frac{29}{16}$ | 59.99 " | 60 | 66 |
| " 143 | 2.425 " | $\frac{27}{16}$ | $\frac{29}{8}$ | 61.60 " | 61 | 67 |
| " 144 | 2.487 " | $\frac{27}{8}$ | $\frac{21}{16}$ | 63.17 " | 63 | 69 |
| " 145 | 2.550 " | $\frac{29}{16}$ | $\frac{23}{4}$ | 64.77 " | 65 | 70 |

* See Static/dynamic applications, page 13

| James Walker Number | INCH DIAMETERS | | | METRIC DIAMETERS (mm) | | |
|--------------------------------------------------------|----------------|-------------------|-------------------|-----------------------|---------|--------|
| | Inside Dia. B | C, P, T | D, Q | Inside Dia. B | Shaft C | Cyl. D |
| 0.103 ±0.003" (2.62 ±0.08mm) Diameter Section A | | | | | | |
| " 146 | 2.612 ±0.020 | 2 $\frac{5}{8}$ | 2 $\frac{13}{16}$ | 66.34 ±0.51 | 66 | 72 |
| " 147 | 2.675 ±0.022 | 2 $\frac{11}{16}$ | 2 $\frac{1}{2}$ | 67.95 ±0.56 | 68 | 74 |
| " 148 | 2.737 " | 2 $\frac{3}{4}$ | 2 $\frac{5}{16}$ | 69.52 " | 69 | 75 |
| " 149 | 2.800 " | 2 $\frac{13}{16}$ | 3 | 71.12 " | 70 | 77 |
| " 150 | 2.862 " | 2 $\frac{7}{8}$ | 3 $\frac{1}{16}$ | 72.69 " | 72 | 78 |
| " 640 | 2.924 ±0.024 | 2 $\frac{15}{16}$ | 3 $\frac{1}{8}$ | 74.27 ±0.61 | 74 | 80 |
| " 151 | 2.987 " | 3 | 3 $\frac{3}{16}$ | 75.87 " | 75 | 82 |
| " 641 | 3.049 " | 3 $\frac{1}{16}$ | 3 $\frac{1}{4}$ | 77.44 " | 77 | 85 |
| " 642 | 3.174 " | 3 $\frac{3}{16}$ | 3 $\frac{3}{8}$ | 80.62 " | 80 | 87 |
| " 152 | 3.237 " | 3 $\frac{1}{4}$ | 3 $\frac{1}{2}$ | 82.22 " | 82 | 88 |
| " 643 | 3.299 " | 3 $\frac{5}{16}$ | 3 $\frac{1}{2}$ | 83.79 " | 84 | 90 |
| " 153 | 3.487 " | 3 $\frac{1}{2}$ | 3 $\frac{11}{16}$ | 88.57 " | 88 | 95 |
| " 154 | 3.737 ±0.028 | 3 $\frac{3}{4}$ | 3 $\frac{5}{16}$ | 94.92 ±0.71 | 95 | 100 |
| " 155 | 3.987 " | 4 | 4 $\frac{1}{16}$ | 101.27 " | 100 | 110 |
| " 156 | 4.237 ±0.030 | 4 $\frac{1}{4}$ | 4 $\frac{1}{16}$ | 107.62 ±0.76 | 107 | 115 |
| " 157 | 4.487 " | 4 $\frac{1}{2}$ | 4 $\frac{1}{16}$ | 113.97 " | 114 | 120 |
| " 158 | 4.737 " | 4 $\frac{3}{4}$ | 4 $\frac{15}{16}$ | 120.32 " | 120 | 130 |
| " 159 | 4.987 ±0.035 | 5 | 5 $\frac{1}{16}$ | 126.67 ±0.89 | 125 | 135 |
| " 160 | 5.237 " | 5 $\frac{1}{4}$ | 5 $\frac{1}{8}$ | 133.02 " | 132 | 140 |
| " 161 | 5.487 " | 5 $\frac{1}{2}$ | 5 $\frac{1}{4}$ | 139.37 " | 138 | 145 |
| " 162 | 5.737 " | 5 $\frac{3}{4}$ | 5 $\frac{1}{2}$ | 145.72 " | 145 | 155 |
| " 163 | 5.987 " | 6 | 6 $\frac{1}{16}$ | 152.07 " | 150 | 160 |
| " 164 | 6.237 ±0.040 | 6 $\frac{1}{4}$ | 6 $\frac{1}{8}$ | 158.42 ±1.02 | 158 | 165 |
| " 165 | 6.487 " | 6 $\frac{1}{2}$ | 6 $\frac{1}{4}$ | 164.77 " | 165 | 170 |
| " 166 | 6.737 " | 6 $\frac{3}{4}$ | 6 $\frac{15}{16}$ | 171.12 " | 170 | 180 |
| " 167 | 6.987 " | 7 | 7 $\frac{1}{16}$ | 177.47 " | 177 | 185 |
| " 168 | 7.237 ±0.045 | 7 $\frac{1}{4}$ | 7 $\frac{1}{16}$ | 183.82 ±1.14 | 183 | 190 |
| " 169 | 7.487 " | 7 $\frac{1}{2}$ | 7 $\frac{11}{16}$ | 190.17 " | 190 | 200 |
| " 170 | 7.737 " | 7 $\frac{3}{4}$ | 7 $\frac{5}{16}$ | 196.52 " | 195 | 205 |
| " 171 | 7.987 " | 8 | 8 $\frac{1}{16}$ | 202.87 " | 200 | 210 |
| " 172 | 8.237 ±0.050 | 8 $\frac{1}{4}$ | 8 $\frac{1}{16}$ | 209.22 ±1.27 | 208 | 215 |
| " 173 | 8.487 " | 8 $\frac{1}{2}$ | 8 $\frac{15}{16}$ | 215.57 " | 215 | 225 |
| " 174 | 8.737 " | 8 $\frac{3}{4}$ | 8 $\frac{3}{8}$ | 221.92 " | 220 | 230 |
| " 175 | 8.987 " | 9 | 9 $\frac{1}{16}$ | 228.27 " | 225 | 235 |
| " 176 | 9.237 ±0.055 | 9 $\frac{1}{4}$ | 9 $\frac{1}{8}$ | 234.62 ±1.40 | 235 | 240 |
| " 177 | 9.487 " | 9 $\frac{1}{2}$ | 9 $\frac{11}{16}$ | 240.97 " | 240 | 250 |
| " 178 | 9.737 " | 9 $\frac{3}{4}$ | 9 $\frac{15}{16}$ | 247.32 " | 245 | 255 |
| 0.139 ±0.004" (3.53 ±0.10mm) Diameter Section A | | | | | | |
| 50 -201* | 0.171 ±0.005 | $\frac{3}{16}$ | $\frac{7}{16}$ | 4.34 ±0.13 | 4.5 | 11 |
| " 202* | 0.234 " | $\frac{1}{4}$ | $\frac{5}{8}$ | 5.94 " | 6 | 12.5 |
| " 203* | 0.296 " | $\frac{5}{16}$ | $\frac{9}{16}$ | 7.52 " | 7.5 | 14 |
| " 204* | 0.359 " | $\frac{3}{8}$ | $\frac{5}{8}$ | 9.12 " | 9.5 | 16 |
| " 205* | 0.421 " | $\frac{7}{16}$ | $\frac{11}{16}$ | 10.69 " | 11 | 17.5 |
| " 206* | 0.484 " | $\frac{1}{2}$ | $\frac{3}{4}$ | 12.29 " | 12.5 | 19 |
| " 207* | 0.546 ±0.007 | $\frac{9}{16}$ | $\frac{13}{16}$ | 13.87 ±0.18 | 14 | 20.5 |
| " 208* | 0.609 ±0.009 | $\frac{5}{8}$ | $\frac{7}{8}$ | 15.47 ±0.23 | 15.5 | 22 |
| " 209* | 0.671 " | $\frac{11}{16}$ | $\frac{13}{8}$ | 17.04 " | 17 | 24 |
| " 210* | 0.734 ±0.010 | $\frac{3}{4}$ | 1 | 18.64 ±0.25 | 19 | 25 |
| " 211* | 0.796 " | $\frac{13}{16}$ | $\frac{11}{8}$ | 20.22 " | 20 | 28 |
| " 212* | 0.859 " | $\frac{7}{8}$ | $\frac{11}{8}$ | 21.82 " | 22 | 29 |
| " 213* | 0.921 " | $\frac{15}{16}$ | $\frac{13}{16}$ | 23.39 " | 23 | 30 |
| " 214* | 0.984 " | 1 | $\frac{11}{4}$ | 24.99 " | 25 | 32 |
| " 618* | 1.016 " | $\frac{11}{32}$ | $\frac{19}{32}$ | 25.80 " | 26 | 33 |
| " 215* | 1.046 " | $\frac{11}{16}$ | $\frac{15}{16}$ | 26.57 " | 27 | 34 |
| " 216* | 1.109 ±0.012 | $\frac{13}{16}$ | $\frac{13}{8}$ | 28.17 ±0.30 | 28 | 35 |
| " 217* | 1.171 " | $\frac{13}{16}$ | $\frac{17}{16}$ | 29.74 " | 30 | 36 |
| " 218* | 1.234 " | $\frac{11}{4}$ | $\frac{11}{2}$ | 31.34 " | 31 | 38 |
| " 219* | 1.296 " | $\frac{15}{16}$ | $\frac{15}{8}$ | 32.92 " | 32 | 40 |
| " 220* | 1.359 " | $\frac{13}{8}$ | $\frac{15}{8}$ | 34.52 " | 35 | 42 |
| " 221* | 1.421 " | $\frac{17}{16}$ | $\frac{11}{16}$ | 36.09 " | 36 | 43 |
| " 222* | 1.484 ±0.015 | $\frac{11}{2}$ | $\frac{13}{4}$ | 37.69 ±0.38 | 38 | 45 |
| " 824 | 1.563 " | $\frac{13}{16}$ | $\frac{13}{8}$ | 39.69 " | 39 | 47 |
| " 223 | 1.609 " | $\frac{15}{8}$ | $\frac{13}{8}$ | 40.87 " | 40 | 48 |
| " 825 | 1.625 " | — | — | 41.28 " | 41 | 49 |
| " 826 | 1.688 " | $\frac{11}{16}$ | $\frac{15}{16}$ | 42.86 " | 42 | 50 |
| " 224 | 1.734 " | $\frac{13}{4}$ | 2 | 44.04 " | 43 | 51 |
| " 827 | 1.750 " | — | — | 44.45 " | 44 | 52 |
| " 828 | 1.813 " | $\frac{13}{16}$ | $\frac{21}{16}$ | 46.04 " | 45 | 53 |
| " 225 | 1.859 ±0.018 | $\frac{17}{8}$ | $\frac{21}{8}$ | 47.22 ±0.46 | 46 | 54 |
| " 829 | 1.875 " | — | — | 47.63 " | 47 | 55 |
| " 830 | 1.938 " | $\frac{15}{16}$ | $\frac{23}{16}$ | 49.21 " | 48 | 56 |
| " 226 | 1.984 " | 2 | $\frac{21}{4}$ | 50.39 " | 49 | 58 |
| " 831 | 2.000 " | — | — | 50.80 " | 50 | 59 |

Chart 50: inch & metric sizes

Refer to page 29 for List of Symbols

| James Walker Number | INCH DIAMETERS | | | METRIC DIAMETERS (mm) | | |
|--------------------------------------------------------|----------------|---------------------------------|---------------------------------|-----------------------|---------|--------|
| | Inside Dia. B | C, P, T | D, Q | Inside Dia. B | Shaft C | Cyl. D |
| 0.139 ±0.004" (3.53 ±0.10mm) Diameter Section A | | | | | | |
| " 832 | 2.063 ±0.018 | 2 ¹ / ₁₆ | 2 ⁵ / ₁₆ | 52.39 ±0.46 | 52 | 60 |
| " 227 | 2.109 " | 2 ¹ / ₁₆ | 2 ⁵ / ₁₆ | 53.57 " | 53 | 61 |
| " 833 | 2.125 " | — | — | 53.98 " | 54 | 62 |
| " 834 | 2.188 " | 2 ³ / ₁₆ | 2 ⁷ / ₁₆ | 55.56 " | 55 | 63 |
| " 228 | 2.234 ±0.020 | 2 ¹ / ₄ | 2 ¹ / ₂ | 56.74 ±0.51 | 56 | 64 |
| " 835 | 2.250 " | — | — | 57.15 " | 57 | 65 |
| " 836 | 2.313 " | 2 ⁵ / ₁₆ | 2 ⁹ / ₁₆ | 58.74 " | 58 | 66 |
| " 229 | 2.359 " | 2 ⁵ / ₁₆ | 2 ⁹ / ₁₆ | 59.92 " | 59 | 67 |
| " 837 | 2.375 " | — | — | 60.33 " | 60 | 68 |
| " 838 | 2.438 " | 2 ⁷ / ₁₆ | 2 ¹¹ / ₁₆ | 61.91 " | 61 | 69 |
| " 230 | 2.484 " | 2 ¹ / ₂ | 2 ³ / ₄ | 63.09 " | 62 | 70 |
| " 839 | 2.500 " | — | — | 63.50 " | 63 | 71 |
| " 840 | 2.563 " | 2 ⁹ / ₁₆ | 2 ¹³ / ₁₆ | 65.09 " | 64 | 72 |
| " 231 | 2.609 " | 2 ⁵ / ₈ | 2 ⁷ / ₈ | 66.27 " | 65 | 73 |
| " 841 | 2.625 " | — | — | 66.68 " | 66 | 74 |
| " 842 | 2.688 " | 2 ¹¹ / ₁₆ | 2 ¹⁵ / ₁₆ | 68.26 " | 67 | 75 |
| " 232 | 2.734 ±0.024 | 2 ³ / ₄ | 3 | 69.44 ±0.61 | 68 | 76 |
| " 843 | 2.750 " | — | — | 69.85 " | 69 | 77 |
| " 844 | 2.813 " | 2 ¹³ / ₁₆ | 3 ¹ / ₁₆ | 71.44 " | 70 | 79 |
| " 233 | 2.859 " | 2 ⁷ / ₈ | 3 ¹ / ₈ | 72.62 " | 71 | 80 |
| " 845 | 2.875 " | — | — | 73.04 " | 72 | 81 |
| " 846 | 2.938 " | 2 ¹⁵ / ₁₆ | 3 ³ / ₁₆ | 74.61 " | 74 | 82 |
| " 234 | 2.984 " | 3 | 3 ¹ / ₄ | 75.79 " | 75 | 85 |
| " 235 | 3.109 " | 3 ¹ / ₈ | 3 ⁵ / ₈ | 78.97 " | 78 | 88 |
| " 236 | 3.234 " | 3 ¹ / ₄ | 3 ¹ / ₂ | 82.14 " | 80 | 90 |
| " 237 | 3.359 " | 3 ³ / ₈ | 3 ⁷ / ₈ | 85.32 " | 85 | 95 |
| " 238 | 3.484 " | 3 ¹ / ₂ | 3 ³ / ₄ | 88.49 " | 88 | 98 |
| " 239 | 3.609 ±0.028 | 3 ⁵ / ₈ | 3 ⁷ / ₈ | 91.67 ±0.71 | 90 | 100 |
| " 240 | 3.734 " | 3 ³ / ₄ | 4 | 94.84 " | 95 | 102 |
| " 241 | 3.859 " | 3 ⁷ / ₈ | 4 ¹ / ₈ | 98.02 " | 98 | 105 |
| " 242 | 3.984 " | 4 | 4 ¹ / ₄ | 101.19 " | 100 | 110 |
| " 243 | 4.109 " | 4 ¹ / ₈ | 4 ³ / ₈ | 104.37 " | 104 | 112 |
| " 244 | 4.234 ±0.030 | 4 ¹ / ₄ | 4 ¹ / ₂ | 107.54 ±0.76 | 107 | 115 |
| " 245 | 4.359 " | 4 ³ / ₈ | 4 ⁵ / ₈ | 110.72 " | 110 | 120 |
| " 246 | 4.484 " | 4 ¹ / ₂ | 4 ³ / ₄ | 113.89 " | 114 | 122 |
| " 247 | 4.609 " | 4 ⁵ / ₈ | 4 ⁷ / ₈ | 117.07 " | 116 | 125 |
| " 248 | 4.734 " | 4 ³ / ₄ | 5 | 120.24 " | 120 | 130 |
| " 249 | 4.859 ±0.035 | 4 ⁷ / ₈ | 5 ¹ / ₈ | 123.42 ±0.89 | 123 | 132 |
| " 250 | 4.984 " | 5 | 5 ¹ / ₄ | 126.59 " | 125 | 135 |
| " 251 | 5.109 " | 5 ¹ / ₈ | 5 ³ / ₈ | 129.77 " | 130 | 138 |
| " 252 | 5.234 ±0.035 | 5 ¹ / ₄ | 5 ¹ / ₂ | 132.94 ±0.89 | 132 | 140 |
| " 253 | 5.359 " | 5 ³ / ₈ | 5 ⁵ / ₈ | 136.12 " | 135 | 145 |
| " 254 | 5.484 " | 5 ¹ / ₂ | 5 ³ / ₄ | 139.29 " | 138 | 148 |
| " 255 | 5.609 " | 5 ⁵ / ₈ | 5 ⁷ / ₈ | 142.47 " | 140 | 150 |
| " 256 | 5.734 " | 5 ³ / ₄ | 6 | 145.64 " | 145 | 155 |
| " 257 | 5.859 " | 5 ⁷ / ₈ | 6 ¹ / ₈ | 148.82 " | 148 | 158 |
| " 258 | 5.984 " | 6 | 6 ¹ / ₄ | 151.99 " | 150 | 160 |
| " 259 | 6.234 ±0.040 | 6 ¹ / ₄ | 6 ¹ / ₂ | 158.34 ±1.02 | 158 | 170 |
| " 260 | 6.484 " | 6 ¹ / ₂ | 6 ³ / ₄ | 164.69 " | 165 | 175 |
| " 261 | 6.734 " | 6 ³ / ₄ | 7 | 171.04 " | 170 | 180 |
| " 262 | 6.984 " | 7 | 7 ¹ / ₄ | 177.39 " | 177 | 185 |
| " 263 | 7.234 ±0.045 | 7 ¹ / ₄ | 7 ¹ / ₂ | 183.74 ±1.14 | 183 | 195 |
| " 264 | 7.484 " | 7 ¹ / ₂ | 7 ³ / ₄ | 190.09 " | 190 | 200 |
| " 265 | 7.734 " | 7 ³ / ₄ | 8 | 196.44 " | 195 | 205 |
| " 266 | 7.984 " | 8 | 8 ¹ / ₄ | 202.79 " | 200 | 210 |
| " 267 | 8.234 ±0.050 | 8 ¹ / ₄ | 8 ³ / ₄ | 209.14 ±1.27 | 208 | 220 |
| " 268 | 8.484 " | 8 ³ / ₄ | 8 ¹ / ₂ | 215.49 " | 215 | 225 |
| " 269 | 8.734 " | 8 ³ / ₄ | 9 | 221.84 " | 220 | 230 |
| " 270 | 8.984 " | 9 | 9 ¹ / ₄ | 228.19 " | 225 | 235 |
| " 271 | 9.234 ±0.055 | 9 ¹ / ₄ | 9 ¹ / ₂ | 234.54 ±1.40 | 235 | 245 |
| " 272 | 9.484 " | 9 ¹ / ₂ | 9 ³ / ₄ | 240.89 " | 240 | 250 |
| " 273 | 9.734 " | 9 ³ / ₄ | 10 | 247.24 " | 245 | 255 |
| " 274 | 9.984 " | 10 | 10 ¹ / ₄ | 253.59 " | 250 | 265 |
| " 275 | 10.484 " | 10 ¹ / ₂ | 10 ³ / ₄ | 266.29 " | 265 | 275 |
| " 276 | 10.984 ±0.065 | 11 | 11 ¹ / ₄ | 278.99 ±1.65 | 275 | 290 |
| " 277 | 11.484 " | 11 ¹ / ₂ | 11 ³ / ₄ | 291.69 " | 290 | 300 |
| " 278 | 11.984 " | 12 | 12 ¹ / ₄ | 304.39 " | 300 | 315 |
| " 279 | 12.984 " | 13 | 13 ¹ / ₄ | 329.79 " | 330 | 340 |
| " 280 | 13.984 " | 14 | 14 ¹ / ₄ | 355.19 " | 350 | 365 |
| " 281 | 14.984 " | 15 | 15 ¹ / ₄ | 380.59 " | 380 | 390 |
| " 282 | 15.955 ±0.075 | 16 | 16 ¹ / ₄ | 405.26 ±1.91 | 400 | 415 |
| " 283 | 16.955 ±0.080 | 17 | 17 ¹ / ₄ | 430.66 ±2.03 | 430 | 440 |
| " 284 | 17.955 ±0.085 | 18 | 18 ¹ / ₄ | 456.06 ±2.16 | 455 | 465 |

| James Walker Number | INCH DIAMETERS | | | METRIC DIAMETERS (mm) | | |
|-------------------------------------------------|----------------|---------------------------------|--------------------------------|-----------------------|---------|--------|
| | Inside Dia. B | C, P, T | D, Q | Inside Dia. B | Shaft C | Cyl. D |
| 0.210 ±0.005" (5.33 ±0.13mm) Diameter Section A | | | | | | |
| 50-309* | 0.412 ±0.005 | 7 ¹ / ₁₆ | 1 ¹ / ₁₆ | 10.46±0.13 | 11 | 20.5 |
| " 310* | 0.475 " | 1 ¹ / ₂ | 7 ¹ / ₈ | 12.07 " | 12.5 | 22 |
| " 311* | 0.537 ±0.007 | 9 ¹ / ₁₆ | 1 ¹ / ₈ | 13.64±0.18 | 14 | 23.5 |
| " 312* | 0.600 ±0.009 | 5 ¹ / ₈ | 1 | 15.24±0.23 | 15.5 | 25 |
| " 313* | 0.662 " | 1 ¹ / ₈ | 1 ¹ / ₁₆ | 16.81 " | 17 | 27 |
| " 314* | 0.725 ±0.010 | 3 ¹ / ₄ | 1 ¹ / ₈ | 18.42±0.25 | 19 | 28.5 |
| " 315* | 0.787 " | 1 ³ / ₁₆ | 1 ¹ / ₁₆ | 19.99 " | 20 | 30 |
| " 316* | 0.850 " | 7 ¹ / ₁₆ | 1 ¹ / ₄ | 21.59 " | 22 | 31.5 |
| " 317* | 0.912 " | 1 ⁵ / ₁₆ | 1 ¹ / ₈ | 23.16 " | 23 | 33 |
| " 318* | 0.975 " | 1 | 1 ³ / ₈ | 24.77 " | 25 | 35 |
| " 319* | 1.037 " | 1 ¹ / ₁₆ | 1 ¹ / ₁₆ | 26.34 " | 27 | 36.5 |
| " 320* | 1.100 ±0.012 | 1 ¹ / ₈ | 1 ¹ / ₂ | 27.94 ±0.30 | 28 | 38 |
| " 321* | 1.162 " | 1 ¹ / ₁₆ | 1 ¹ / ₁₆ | 29.51 " | 30 | 40 |
| " 322* | 1.225 " | 1 ¹ / ₄ | 1 ¹ / ₈ | 31.12 " | 31 | 42 |
| " 323* | 1.287 " | 1 ¹ / ₁₆ | 1 ¹ / ₁₆ | 32.69 " | 32 | 43 |
| " 324* | 1.350 " | 1 ³ / ₈ | 1 ¹ / ₄ | 34.29 " | 35 | 45 |
| " 325* | 1.475 ±0.015 | 1 ¹ / ₂ | 1 ¹ / ₈ | 37.47 ±0.38 | 38 | 48 |
| " 326* | 1.600 " | 1 ³ / ₄ | 2 | 40.64 " | 40 | 52 |
| " 327* | 1.725 " | 1 ³ / ₄ | 2 ¹ / ₈ | 43.82 " | 42 | 55 |
| " 328* | 1.850 " | 1 ⁷ / ₈ | 2 ¹ / ₄ | 46.99 " | 45 | 58 |
| " 329* | 1.975 ±0.018 | 2 | 2 ³ / ₈ | 50.17 ±0.46 | 50 | 62 |
| " 330* | 2.100 " | 2 ¹ / ₄ | 2 ¹ / ₂ | 53.34 " | 52 | 65 |
| " 331* | 2.225 " | 2 ¹ / ₄ | 2 ³ / ₄ | 56.52 " | 56 | 68 |
| " 332* | 2.350 " | 2 ³ / ₈ | 2 ³ / ₄ | 59.69 " | 60 | 70 |
| " 333* | 2.475 ±0.020 | 2 ¹ / ₂ | 2 ³ / ₈ | 62.87 ±0.51 | 63 | 75 |
| " 334* | 2.600 " | 2 ³ / ₈ | 3 | 66.04 " | 65 | 78 |
| " 335* | 2.725 " | 2 ³ / ₄ | 3 ¹ / ₈ | 69.22 " | 68 | 80 |
| " 336* | 2.850 " | 2 ³ / ₄ | 3 ¹ / ₄ | 72.39 " | 70 | 83 |
| " 619* | 2.938 ±0.024 | 2 ¹⁵ / ₁₆ | 3 ³ / ₁₆ | 74.61 ±0.61 | 72 | 85 |
| " 337* | 2.975 " | 3 | 3 ³ / ₈ | 75.57 " | 75 | 88 |
| " 338* | 3.100 " | 3 ¹ / ₈ | 3 ¹ / ₂ | 78.74 " | 78 | 90 |
| " 620* | 3.141 " | — | — | 79.78 " | 80 | 92 |
| " 339* | 3.225 " | 3 ¹ / ₄ | 3 ³ / ₈ | 81.92 " | 82 | 95 |
| " 340* | 3.350 " | 3 ³ / ₈ | 3 ³ / ₄ | 85.09 " | 85 | 98 |
| " 341* | 3.475 " | 3 ¹ / ₂ | 3 ³ / ₈ | 88.27 " | 88 | 100 |
| " 621* | 3.531 ±0.028 | 3 ³ / ₁₆ | 3 ¹ / ₁₆ | 89.69 ±0.71 | 90 | 101 |
| " 342* | 3.600 " | 3 ³ / ₈ | 4 | 91.44 " | 92 | 102 |
| " 343* | 3.725 " | 3 ³ / ₄ | 4 ¹ / ₈ | 94.62 " | 95 | 105 |
| " 344* | 3.850 " | 3 ³ / ₄ | 4 ¹ / ₄ | 97.79 " | 98 | 108 |
| " 622* | 3.938 " | 3 ¹⁵ / ₁₆ | 4 ³ / ₁₆ | 100.01 " | 100 | 110 |
| " 345* | 3.975 " | 4 | 4 ³ / ₈ | 100.97 " | 101 | 112 |
| " 346* | 4.100 " | 4 ¹ / ₄ | 4 ¹ / ₂ | 104.14 " | 104 | 115 |
| " 347* | 4.225 ±0.030 | 4 ¹ / ₄ | 4 ³ / ₈ | 107.32 ±0.76 | 107 | 118 |
| " 623* | 4.313 " | 4 ¹ / ₁₆ | 4 ¹ / ₁₆ | 109.54 " | 109 | 120 |
| " 348* | 4.350 " | 4 ¹ / ₄ | 4 ¹ / ₄ | 110.49 " | 110 | 121 |
| " 349* | 4.475 " | 4 ¹ / ₂ | 4 ⁷ / ₈ | 113.67 " | 114 | 125 |
| " 350 | 4.600 " | 4 ³ / ₈ | 5 | 116.84 " | 116 | 128 |
| " 860 | 4.625 " | — | — | 117.48 " | 117 | 130 |
| " 351 | 4.725 " | 4 ³ / ₄ | 5 ¹ / ₈ | 120.02 " | 120 | 131 |
| " 861 | 4.750 " | — | — | 120.65 " | 121 | 132 |
| " 352 | 4.850 " | 4 ⁷ / ₈ | 5 ¹ / ₄ | 123.19 " | 123 | 134 |
| " 862 | 4.875 ±0.037 | — | — | 123.83 ±0.94 | 124 | 135 |
| " 353 | 4.975 " | 5 | 5 ³ / ₈ | 126.37 " | 125 | 137 |
| " 863 | 5.000 " | — | — | 127.00 " | 127 | 138 |
| " 354 | 5.100 " | 5 ¹ / ₈ | 5 ¹ / ₂ | 129.54 " | 129 | 140 |
| " 864 | 5.125 " | — | — | 130.18 " | 130 | 141 |
| " 355 | 5.225 " | 5 ¹ / ₄ | 5 ³ / ₈ | 132.72 " | 132 | 143 |
| " 865 | 5.250 " | — | — | 133.35 " | 133 | 145 |
| " 356 | 5.350 " | 5 ³ / ₈ | 5 ³ / ₄ | 135.89 " | 135 | 146 |
| " 866 | 5.375 " | — | — | 136.53 " | 136 | 148 |
| " 357 | 5.475 " | 5 ¹ / ₂ | 5 ⁷ / ₈ | 139.07 " | 138 | 150 |
| " 867 | 5.500 " | — | — | 139.70 " | 140 | 151 |
| " 358 | 5.600 " | 5 ³ / ₄ | 6 | 142.24 " | 142 | 153 |
| " 868 | 5.625 " | — | — | 142.88 " | 143 | 155 |
| " 359 | 5.725 " | 5 ³ / ₄ | 6 ¹ / ₈ | 145.42 " | 145 | 156 |
| " 869 | 5.750 " | — | — | 146.05 " | 146 | 158 |
| " 360 | 5.850 " | 5 ⁷ / ₈ | 6 ¹ / ₄ | 148.59 " | 148 | 160 |
| " 870 | 5.875 " | — | — | 149.23 " | 149 | 162 |
| " 361 | 5.975 " | 6 | 6 ³ / ₈ | 151.77 " | 150 | 165 |
| " 644 | 6.100 ±0.040 | 6 ³ / ₈ | 6 ¹ / ₂ | 154.94 ±1.02 | 155 | 168 |

Chart 50: inch & metric sizes

Refer to page 29 for List of Symbols

| James Walker Number | INCH DIAMETERS | | | METRIC DIAMETERS (mm) | | |
|--------------------------------------------------------|----------------|---------|------|-----------------------|---------|--------|
| | Inside Dia. B | C, P, T | D, Q | Inside Dia. B | Shaft C | Cyl. D |
| 0.210 ±0.005" (5.33 ±0.13mm) Diameter Section A | | | | | | |
| " 362 | 6.225 ±0.040 | 6¼ | 6¾ | 158.12 ±1.02 | 158 | 170 |
| " 645 | 6.350 " | 6¾ | 6¾ | 161.29 " | 160 | 172 |
| " 363 | 6.475 " | 6½ | 6¾ | 164.47 " | 165 | 175 |
| " 646 | 6.600 " | 6¾ | 7 | 167.64 " | 167 | 180 |
| " 364 | 6.725 " | 6¾ | 7½ | 170.82 " | 170 | 182 |
| " 647 | 6.850 " | 6¾ | 7¼ | 173.99 " | 174 | 185 |
| " 365 | 6.975 " | 7 | 7¾ | 177.17 " | 177 | 190 |
| " 366 | 7.225 ±0.045 | 7¼ | 7¾ | 183.52 ±1.14 | 183 | 195 |
| " 367 | 7.475 " | 7½ | 7¾ | 189.87 " | 190 | 200 |
| " 368 | 7.725 " | 7¾ | 8¾ | 196.22 " | 195 | 210 |
| " 369 | 7.975 " | 8 | 8¾ | 202.57 " | 200 | 215 |
| " 370 | 8.225 ±0.050 | 8¼ | 8¾ | 208.92 ±1.27 | 208 | 220 |
| " 371 | 8.475 " | 8½ | 8¾ | 215.27 " | 215 | 230 |
| " 372 | 8.725 " | 8¾ | 9¾ | 221.62 " | 220 | 235 |
| " 373 | 8.975 " | 9 | 9¾ | 227.97 " | 225 | 240 |
| " 374 | 9.225 ±0.055 | 9¼ | 9¾ | 234.32 ±1.40 | 235 | 245 |
| " 375 | 9.475 " | 9½ | 9¾ | 240.67 " | 240 | 255 |
| " 376 | 9.725 " | 9¾ | 10¾ | 247.02 " | 245 | 260 |
| " 377 | 9.975 " | 10 | 10¾ | 253.37 " | 250 | 265 |
| " 378 | 10.475 ±0.060 | 10½ | 10¾ | 266.07 ±1.52 | 265 | 280 |
| " 379 | 10.975 " | 11 | 11¾ | 278.77 " | 275 | 290 |
| " 380 | 11.475 ±0.065 | 11½ | 11¾ | 291.47 ±1.65 | 290 | 305 |
| " 381 | 11.975 " | 12 | 12¾ | 304.17 " | 300 | 315 |
| " 382 | 12.975 " | 13 | 13¾ | 329.57 " | 330 | 340 |
| " 383 | 13.975 ±0.070 | 14 | 14¾ | 354.97 ±1.78 | 350 | 370 |
| " 384 | 14.975 " | 15 | 15¾ | 380.37 " | 380 | 395 |
| " 385 | 15.955 ±0.075 | 16 | 16¾ | 405.26 ±1.91 | 400 | 420 |
| " 386 | 16.955 ±0.080 | 17 | 17¾ | 430.66 ±2.03 | 430 | 445 |
| " 387 | 17.955 ±0.085 | 18 | 18¾ | 456.06 ±2.16 | 455 | 470 |
| " 388 | 18.955 ±0.090 | 19 | 19¾ | 481.46 ±2.29 | 480 | 500 |
| " 389 | 19.955 ±0.095 | 20 | 20¾ | 506.86 ±2.41 | 505 | 525 |
| " 390 | 20.955 " | 21 | 21¾ | 532.26 " | 530 | 550 |
| " 391 | 21.955 ±0.100 | 22 | 22¾ | 557.66 ±2.54 | 555 | 575 |
| " 392 | 22.940 ±0.105 | 23 | 23¾ | 582.68 ±2.67 | 580 | 600 |
| " 393 | 23.940 ±0.110 | 24 | 24¾ | 608.08 ±2.79 | 605 | 625 |
| " 394 | 24.940 ±0.115 | 25 | 25¾ | 633.48 ±2.92 | 630 | 650 |
| " 395 | 25.940 ±0.120 | 26 | 26¾ | 658.88 ±3.05 | 655 | 675 |
| 0.275 ±0.006" (6.99 ±0.15mm) Diameter Section A | | | | | | |
| 50-425* | 4.475 ±0.033 | 4½ | 5 | 113.67 ±0.84 | 114 | 127 |
| " 624* | 4.516 " | 4½ | 5½ | 114.70 " | 115 | 128 |
| " 426* | 4.600 " | 4¾ | 5½ | 116.84 " | 116 | 130 |
| " 427* | 4.725 " | 4¾ | 5¼ | 120.02 " | 120 | 135 |
| " 428* | 4.850 " | 4¾ | 5¾ | 123.19 " | 123 | 137 |
| " 625* | 4.906 ±0.037 | 4¾ | 5½ | 124.62 ±0.94 | 125 | 138 |
| " 429* | 4.975 " | 5 | 5½ | 126.37 " | 126 | 140 |
| " 430* | 5.100 " | 5½ | 5¾ | 129.54 " | 130 | 145 |
| " 431* | 5.225 " | 5¼ | 5¼ | 132.72 " | 132 | 147 |
| " 626* | 5.297 " | 5¾ | 5¾ | 134.54 " | 135 | 148 |
| " 432* | 5.350 " | 5¾ | 5¾ | 135.89 " | 136 | 150 |
| " 433* | 5.475 " | 5½ | 6 | 139.07 " | 140 | 155 |
| " 434* | 5.600 " | 5¾ | 6¼ | 142.24 " | 142 | 158 |
| " 435* | 5.725 " | 5¾ | 6¼ | 145.42 " | 145 | 160 |
| " 436* | 5.850 " | 5¾ | 6¾ | 148.59 " | 148 | 162 |
| " 437* | 5.975 " | 6 | 6½ | 151.77 " | 150 | 165 |
| " 872* | 6.125 ±0.040 | 6¾ | 6¾ | 155.58 ±1.02 | 155 | 170 |
| " 438* | 6.225 " | 6¼ | 6¼ | 158.12 " | 158 | 172 |
| " 627* | 6.281 " | 6¾ | 6¾ | 159.54 " | 160 | 175 |
| " 874* | 6.375 " | 6¾ | 6¾ | 161.93 " | 162 | 178 |
| " 439* | 6.475 " | 6½ | 7 | 164.47 " | 165 | 180 |
| " 628* | 6.563 " | 6¾ | 7½ | 166.69 " | 166 | 181 |
| " 876* | 6.625 " | 6¾ | 7¾ | 168.28 " | 168 | 182 |
| " 440* | 6.725 " | 6¾ | 7¼ | 170.82 " | 170 | 185 |
| " 878* | 6.875 " | 6¾ | 7¾ | 174.63 " | 175 | 190 |
| " 441* | 6.975 " | 7 | 7½ | 177.17 " | 177 | 192 |
| " 880* | 7.125 ±0.045 | 7¾ | 7¾ | 180.98 ±1.14 | 180 | 195 |
| " 442* | 7.225 " | 7¼ | 7¼ | 183.52 " | 183 | 200 |
| " 882* | 7.375 " | 7¾ | 7¾ | 187.33 " | 187 | 202 |
| " 443* | 7.475 " | 7½ | 8 | 189.87 " | 190 | 205 |
| " 884* | 7.625 " | 7¾ | 8¾ | 193.68 " | 193 | 208 |
| " 444* | 7.725 " | 7¾ | 8¼ | 196.22 " | 195 | 210 |
| " 886* | 7.875 " | 7¾ | 8¾ | 200.03 " | 200 | 215 |

| James Walker Number | INCH DIAMETERS | | | METRIC DIAMETERS (mm) | | |
|--------------------------------------------------------|----------------|---------|------|-----------------------|---------|--------|
| | Inside Dia. B | C, P, T | D, Q | Inside Dia. B | Shaft C | Cyl. D |
| 0.275 ±0.006" (6.99 ±0.15mm) Diameter Section A | | | | | | |
| " 445* | 7.975 ±0.045 | 8 | 8½ | 202.57 ±1.14 | 202 | 220 |
| " 445A | 8.225 ±0.055 | 8¾ | 8¾ | 208.92 ±1.40 | 208 | 225 |
| " 446 | 8.475 " | 8½ | 9 | 215.27 " | 215 | 230 |
| " 446A | 8.725 " | 8¾ | 9¼ | 221.62 " | 220 | 240 |
| " 447 | 8.975 " | 9 | 9½ | 227.97 " | 225 | 245 |
| " 447A | 9.225 " | 9¼ | 9¾ | 234.32 " | 235 | 250 |
| " 448 | 9.475 " | 9½ | 10 | 240.67 " | 240 | 260 |
| " 448A | 9.725 " | 9¾ | 10¼ | 247.02 " | 245 | 265 |
| " 449 | 9.975 " | 10 | 10½ | 253.37 " | 250 | 270 |
| " 449A | 10.225 ±0.060 | 10¼ | 10¾ | 259.72 ±1.52 | 260 | 275 |
| " 450 | 10.475 " | 10½ | 11 | 266.07 " | 265 | 280 |
| " 450A | 10.725 " | 10¾ | 11¼ | 272.42 " | 270 | 290 |
| " 451 | 10.975 " | 11 | 11½ | 278.77 " | 275 | 295 |
| " 451A | 11.225 " | 11¼ | 11¾ | 285.12 " | 285 | 300 |
| " 452 | 11.475 " | 11½ | 12 | 291.47 " | 290 | 310 |
| " 452A | 11.725 " | 11¾ | 12¼ | 297.82 " | 295 | 315 |
| " 453 | 11.975 " | 12 | 12½ | 304.17 " | 300 | 320 |
| " 648 | 12.225 " | 12¼ | 12¾ | 310.52 " | 310 | 325 |
| " 454 | 12.475 " | 12½ | 13 | 316.87 " | 315 | 330 |
| " 649 | 12.725 " | 12¾ | 13¼ | 323.22 " | 320 | 340 |
| " 455 | 12.975 " | 13 | 13¾ | 329.57 " | 330 | 345 |
| " 650 | 13.225 ±0.070 | 13¾ | 13¾ | 335.92 ±1.78 | 335 | 350 |
| " 456 | 13.475 " | 13½ | 14 | 342.27 " | 340 | 360 |
| " 457 | 13.975 " | 14 | 14½ | 354.97 " | 350 | 370 |
| " 458 | 14.475 " | 14½ | 15 | 367.67 " | 365 | 385 |
| " 459 | 14.975 " | 15 | 15½ | 380.37 " | 380 | 400 |
| " 460 | 15.475 " | 15½ | 16 | 393.07 " | 390 | 410 |
| " 461 | 15.955 ±0.075 | 16 | 16½ | 405.26 ±1.91 | 400 | 420 |
| " 462 | 16.455 " | 16½ | 17 | 417.96 " | 415 | 435 |
| " 463 | 16.955 ±0.080 | 17 | 17½ | 430.66 ±2.03 | 430 | 450 |
| " 464 | 17.455 ±0.085 | 17½ | 18 | 443.36 ±2.16 | 440 | 460 |
| " 465 | 17.955 " | 18 | 18½ | 456.06 " | 455 | 470 |
| " 466 | 18.455 " | 18½ | 19 | 468.76 " | 465 | 485 |
| " 467 | 18.955 ±0.090 | 19 | 19½ | 481.46 ±2.29 | 480 | 500 |
| " 468 | 19.455 " | 19½ | 20 | 494.16 " | 495 | 510 |
| " 469 | 19.955 ±0.095 | 20 | 20½ | 506.86 ±2.41 | 505 | 525 |
| " 470 | 20.955 " | 21 | 21½ | 532.26 " | 530 | 550 |
| " 471 | 21.955 ±0.100 | 22 | 22½ | 557.66 ±2.54 | 555 | 575 |
| " 472 | 22.940 ±0.105 | 23 | 23½ | 582.68 ±2.67 | 580 | 600 |
| " 473 | 23.940 ±0.110 | 24 | 24½ | 608.08 ±2.79 | 605 | 625 |
| " 474 | 24.940 ±0.115 | 25 | 25½ | 633.48 ±2.92 | 630 | 650 |
| " 475 | 25.940 ±0.120 | 26 | 26½ | 658.88 ±3.05 | 655 | 675 |

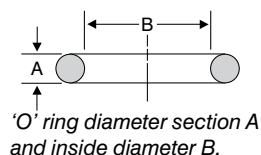
'O' rings for pipe fittings

The chart below gives details of 'O' rings for use with inch Unified Standard threads. The sizes are specified in SAE AS 568: Aerospace Size Standard for 'O' rings.

| James Walker Number | INCH SIZES | | METRIC CONVERSIONS (mm) | |
|---------------------|--------------------|-------------------|-------------------------|-------------------|
| | Diameter Section A | Inside Diameter B | Diameter Section A | Inside Diameter B |
| 50-901 | 0.056 ±0.003 | 0.185 ±0.005 | 1.42 ±0.08 | 4.70 ±0.13 |
| " 902 | 0.064 " | 0.239 " | 1.63 " | 6.07 " |
| " 903 | 0.064 " | 0.301 " | 1.63 " | 7.65 " |
| " 904 | 0.072 " | 0.351 " | 1.83 " | 8.92 " |
| " 905 | 0.072 " | 0.414 " | 1.83 " | 10.52 " |
| " 906 | 0.078 " | 0.468 " | 1.98 " | 11.89 " |
| " 907 | 0.082 " | 0.530 ±0.007 | 2.08 " | 13.46 ±0.18 |
| " 908 | 0.087 " | 0.644 ±0.009 | 2.21 " | 16.36 ±0.23 |
| " 909 | 0.097 " | 0.706 " | 2.46 " | 17.93 " |
| " 910 | 0.097 " | 0.755 " | 2.46 " | 19.18 " |
| " 911 | 0.116 ±0.004 | 0.863 " | 2.95 ±0.10 | 21.92 " |
| " 912 | 0.116 " | 0.924 " | 2.95 " | 23.47 " |
| " 913 | 0.116 " | 0.986 ±0.010 | 2.95 " | 25.04 ±0.25 |
| " 914 | 0.116 " | 1.047 " | 2.95 " | 26.59 " |
| " 916 | 0.116 " | 1.171 " | 2.95 " | 29.74 " |
| " 918 | 0.116 " | 1.355 ±0.012 | 2.95 " | 34.42 ±0.30 |
| " 920 | 0.118 " | 1.475 ±0.014 | 3.00 " | 37.47 ±0.36 |
| " 924 | 0.118 " | 1.720 " | 3.00 " | 43.69 " |
| " 928 | 0.118 " | 2.090 ±0.018 | 3.00 " | 53.09 ±0.46 |
| " 932 | 0.118 " | 2.337 " | 3.00 " | 59.36 " |

Aerospace sizes to BS ISO 3601-1

BS ISO 3601-1 'O' rings for aerospace applications use housings identified in BS EN 3748 Aerospace series 'O' ring grooves: Dimensions. Please contact our Technical Support Team for advice.



| BS ISO 3601-1 Size code | Size B A (mm) | INSIDE DIAMETER | | | |
|-----------------------------------------------------------|---------------------|-------------------|-------------------|-------------------|-------------------|
| | | B nom. (mm) | Tolerance (mm) | B nom. (in) | Tolerance (in) |
| 1.80 mm ± 0.08 mm (0.071 in ±0.003 in) Diameter Section A | | | | | |
| A0018 | 1.8 x 1.8 | 1.80 | ±0.13 | 0.071 | ±0.005 |
| A0020 | 2 x 1.8 | 2.00 | " | 0.079 | " |
| A0022 | 2.24 x 1.8 | 2.24 | " | 0.088 | " |
| A0025 | 2.5 x 1.8 | 2.50 | " | 0.098 | " |
| A0028 | 2.8 x 1.8 | 2.80 | " | 0.110 | " |
| A0032 | 3.15 x 1.8 | 3.15 | " | 0.124 | " |
| A0036 | 3.55 x 1.8 | 3.55 | " | 0.140 | " |
| A0038 | 3.75 x 1.8 | 3.75 | " | 0.148 | " |
| A0040 | 4 x 1.8 | 4.00 | " | 0.157 | " |
| A0450 | 4.5 x 1.8 | 4.50 | " | 0.177 | " |
| A0490 | 4.87 x 1.8 | 4.87 | " | 0.192 | " |
| A0050 | 5 x 1.8 | 5.00 | " | 0.197 | " |
| A0052 | 5.2 x 1.8 | 5.20 | " | 0.205 | " |
| A0053 | 5.3 x 1.8 | 5.30 | " | 0.209 | " |
| A0056 | 5.6 x 1.8 | 5.60 | " | 0.220 | " |
| A0060 | 6 x 1.8 | 6.00 | " | 0.236 | " |
| A0063 | 6.3 x 1.8 | 6.30 | " | 0.248 | " |
| A0067 | 6.7 x 1.8 | 6.70 | " | 0.264 | " |
| A0069 | 6.9 x 1.8 | 6.90 | ±0.14 | 0.272 | ±0.006 |
| A0071 | 7.1 x 1.8 | 7.10 | " | 0.280 | " |
| A0075 | 7.5 x 1.8 | 7.50 | " | 0.295 | " |
| A0080 | 8 x 1.8 | 8.00 | " | 0.315 | " |
| A0085 | 8.5 x 1.8 | 8.50 | ±0.15 | 0.335 | " |
| A0088 | 8.75 x 1.8 | 8.75 | " | 0.344 | " |
| A0090 | 9 x 1.8 | 9.00 | " | 0.354 | " |
| A0095 | 9.5 x 1.8 | 9.50 | " | 0.374 | " |
| A0100 | 10 x 1.8 | 10.00 | " | 0.394 | " |
| A0106 | 10.6 x 1.8 | 10.60 | ±0.16 | 0.417 | " |
| A0112 | 11.2 x 1.8 | 11.20 | " | 0.441 | " |
| A0118 | 11.8 x 1.8 | 11.80 | ±0.17 | 0.465 | ±0.007 |
| A0125 | 12.5 x 1.8 | 12.50 | " | 0.492 | " |
| A0132 | 13.2 x 1.8 | 13.20 | " | 0.520 | " |
| A0140 | 14 x 1.8 | 14.00 | ±0.18 | 0.551 | " |
| A0150 | 15 x 1.8 | 15.00 | " | 0.591 | " |
| A0160 | 16 x 1.8 | 16.00 | ±0.19 | 0.630 | " |
| A0170 | 17 x 1.8 | 17.00 | ±0.20 | 0.669 | ±0.008 |
| A0180 | 18 x 1.8 | 18.00 | " | 0.709 | " |
| A0190 | 19 x 1.8 | 19.00 | ±0.21 | 0.748 | " |
| A0200 | 20 x 1.8 | 20.00 | " | 0.787 | " |
| A0212 | 21.2 x 1.8 | 21.20 | ±0.22 | 0.835 | ±0.009 |
| A0224 | 22.4 x 1.8 | 22.40 | ±0.23 | 0.882 | " |
| A0236 | 23.6 x 1.8 | 23.60 | ±0.24 | 0.929 | " |
| A0250 | 25 x 1.8 | 25.00 | " | 0.984 | " |
| A0258 | 25.8 x 1.8 | 25.80 | ±0.25 | 1.016 | ±0.010 |
| A0265 | 26.5 x 1.8 | 26.50 | " | 1.043 | " |
| A0280 | 28 x 1.8 | 28.00 | ±0.26 | 1.102 | " |
| A0300 | 30 x 1.8 | 30.00 | " | 1.181 | " |
| A0315 | 31.5 x 1.8 | 31.50 | ±0.28 | 1.240 | ±0.011 |
| A0325 | 32.5 x 1.8 | 32.50 | ±0.29 | 1.280 | " |
| A0335 | 33.5 x 1.8 | 33.50 | " | 1.319 | " |

| BS ISO 3601-1 Size code | Size B A (mm) | INSIDE DIAMETER | | | |
|-----------------------------------------------------------|---------------------|-------------------|-------------------|-------------------|-------------------|
| | | B nom. (mm) | Tolerance (mm) | B nom. (in) | Tolerance (in) |
| 1.80 mm ± 0.08 mm (0.071 in ±0.003 in) Diameter Section A | | | | | |
| A0345 | 34.5 x 1.8 | 34.50 | ±0.30 | 1.358 | ±0.012 |
| A0355 | 35.5 x 1.8 | 35.50 | ±0.31 | 1.398 | " |
| A0365 | 36.5 x 1.8 | 36.50 | " | 1.437 | " |
| A0375 | 37.5 x 1.8 | 37.50 | ±0.32 | 1.476 | ±0.013 |
| A0387 | 38.7 x 1.8 | 38.70 | " | 1.524 | " |
| A0400 | 40 x 1.8 | 40.00 | ±0.33 | 1.575 | " |
| A0412 | 41.2 x 1.8 | 41.20 | ±0.34 | 1.622 | " |
| A0425 | 42.5 x 1.8 | 42.50 | ±0.35 | 1.673 | ±0.014 |
| A0437 | 43.7 x 1.8 | 43.70 | " | 1.720 | " |
| A0450 | 45 x 1.8 | 45.00 | ±0.36 | 1.772 | " |
| A0475 | 47.5 x 1.8 | 47.50 | ±0.38 | 1.870 | ±0.015 |
| A0500 | 50 x 1.8 | 50.00 | ±0.39 | 1.969 | " |
| A0530 | 53 x 1.8 | 53.00 | ±0.41 | 2.087 | ±0.016 |
| A0560 | 56 x 1.8 | 56.00 | ±0.42 | 2.205 | ±0.017 |
| A0600 | 60 x 1.8 | 60.00 | ±0.45 | 2.362 | ±0.018 |
| A0630 | 63 x 1.8 | 63.00 | ±0.46 | 2.480 | " |
| A0670 | 67 x 1.8 | 67.00 | ±0.49 | 2.638 | ±0.019 |
| A0710 | 71 x 1.8 | 71.00 | ±0.51 | 2.795 | ±0.020 |
| A0750 | 75 x 1.8 | 75.00 | ±0.53 | 2.953 | ±0.021 |
| A0800 | 80 x 1.8 | 80.00 | ±0.56 | 3.150 | ±0.022 |
| A0850 | 85 x 1.8 | 85.00 | ±0.59 | 3.346 | ±0.023 |
| A0900 | 90 x 1.8 | 90.00 | ±0.62 | 3.543 | ±0.024 |
| A0950 | 95 x 1.8 | 95.00 | ±0.64 | 3.740 | ±0.025 |
| A1000 | 100 x 1.8 | 100.00 | ±0.67 | 3.937 | ±0.026 |
| A1060 | 106 x 1.8 | 106.00 | ±0.71 | 4.173 | ±0.028 |
| A1120 | 112 x 1.8 | 112.00 | ±0.74 | 4.409 | ±0.029 |
| A1180 | 118 x 1.8 | 118.00 | ±0.77 | 4.646 | ±0.030 |
| A1250 | 125 x 1.8 | 125.00 | ±0.81 | 4.921 | ±0.032 |
| 2.65 mm ± 0.09 mm (0.104 in ±0.004 in) Diameter Section A | | | | | |
| B0045 | 4.5 x 2.65 | 4.50 | ±0.13 | 0.177 | ±0.005 |
| B0053 | 5.3 x 2.65 | 5.30 | " | 0.209 | " |
| B0060 | 6 x 2.65 | 6.00 | " | 0.236 | " |
| B0069 | 6.9 x 2.65 | 6.90 | ±0.14 | 0.272 | ±0.006 |
| B0080 | 8 x 2.65 | 8.00 | " | 0.315 | " |
| B0090 | 9 x 2.65 | 9.00 | ±0.15 | 0.354 | " |
| B0095 | 9.5 x 2.65 | 9.50 | " | 0.374 | " |
| B0100 | 10 x 2.65 | 10.00 | " | 0.394 | " |
| B0106 | 10.6 x 2.65 | 10.60 | ±0.16 | 0.417 | " |
| B0112 | 11.2 x 2.65 | 11.20 | " | 0.441 | " |
| B0118 | 11.8 x 2.65 | 11.80 | ±0.17 | 0.465 | ±0.007 |
| B0125 | 12.5 x 2.65 | 12.50 | " | 0.492 | " |
| B0132 | 13.2 x 2.65 | 13.20 | " | 0.520 | " |
| B0140 | 14 x 2.65 | 14.00 | ±0.18 | 0.551 | " |
| B0150 | 15 x 2.65 | 15.00 | " | 0.591 | " |
| B0160 | 16 x 2.65 | 16.00 | ±0.19 | 0.630 | " |
| B0170 | 17 x 2.65 | 17.00 | ±0.20 | 0.669 | ±0.008 |
| B0180 | 18 x 2.65 | 18.00 | " | 0.709 | " |
| B0190 | 19 x 2.65 | 19.00 | ±0.21 | 0.748 | " |
| B0200 | 20 x 2.65 | 20.00 | " | 0.787 | " |
| B0212 | 21.2 x 2.65 | 21.20 | ±0.22 | 0.835 | ±0.009 |
| B0224 | 22.4 x 2.65 | 22.40 | ±0.23 | 0.882 | " |
| B0236 | 23.6 x 2.65 | 23.60 | ±0.24 | 0.929 | " |
| B0250 | 25 x 2.65 | 25.00 | " | 0.984 | " |
| B0258 | 25.8 x 2.65 | 25.80 | ±0.25 | 1.016 | ±0.010 |
| B0265 | 26.5 x 2.65 | 26.50 | " | 1.043 | " |
| B0280 | 28 x 2.65 | 28.00 | ±0.26 | 1.102 | " |
| B0300 | 30 x 2.65 | 30.00 | ±0.27 | 1.181 | ±0.011 |
| B0315 | 31.5 x 2.65 | 31.50 | ±0.28 | 1.240 | " |

Aerospace sizes to BS ISO 3601-1

| BS ISO 3601-1 Size code | Size B A (mm) | INSIDE DIAMETER | | | |
|-------------------------------|---------------------|-------------------|-------------------|-------------------|-------------------|
| | | B nom. (mm) | Tolerance (mm) | B nom. (in) | Tolerance (in) |

2.65 mm ± 0.09 mm (0.104 in ± 0.004 in) Diameter Section A

| | | | | | |
|-------|-------------|--------|-------|-------|--------|
| B0325 | 32.5 x 2.65 | 32.50 | ±0.29 | 1.280 | ±0.011 |
| B0335 | 33.5 x 2.65 | 33.50 | " | 1.319 | " |
| B0345 | 34.5 x 2.65 | 34.50 | ±0.30 | 1.358 | ±0.012 |
| B0355 | 35.5 x 2.65 | 35.50 | ±0.31 | 1.398 | " |
| B0365 | 36.5 x 2.65 | 36.50 | " | 1.437 | " |
| B0375 | 37.5 x 2.65 | 37.50 | ±0.32 | 1.476 | ±0.013 |
| B0387 | 38.7 x 2.65 | 38.70 | " | 1.524 | " |
| B0400 | 40 x 2.65 | 40.00 | ±0.33 | 1.575 | " |
| B0412 | 41.2 x 2.65 | 41.20 | ±0.34 | 1.622 | ±0.013 |
| B0425 | 42.5 x 2.65 | 42.50 | ±0.35 | 1.673 | ±0.014 |
| B0437 | 43.7 x 2.65 | 43.70 | " | 1.720 | " |
| B0450 | 45 x 2.65 | 45.00 | ±0.36 | 1.772 | " |
| B0462 | 46.2 x 2.65 | 46.20 | ±0.37 | 1.819 | ±0.015 |
| B0475 | 47.5 x 2.65 | 47.50 | ±0.38 | 1.870 | " |
| B0487 | 48.7 x 2.65 | 48.70 | " | 1.917 | " |
| B0500 | 50 x 2.65 | 50.00 | ±0.39 | 1.969 | " |
| B0515 | 51.5 x 2.65 | 51.50 | ±0.40 | 2.028 | ±0.016 |
| B0530 | 53 x 2.65 | 53.00 | ±0.41 | 2.087 | " |
| B0545 | 54.5 x 2.65 | 54.50 | ±0.42 | 2.146 | ±0.017 |
| B0560 | 56 x 2.65 | 56.00 | " | 2.205 | " |
| B0580 | 58 x 2.65 | 58.00 | ±0.44 | 2.283 | " |
| B0600 | 60 x 2.65 | 60.00 | ±0.45 | 2.362 | ±0.018 |
| B0615 | 61.5 x 2.65 | 61.50 | " | 2.421 | " |
| B0630 | 63 x 2.65 | 63.00 | ±0.46 | 2.480 | " |
| B0650 | 65 x 2.65 | 65.00 | ±0.48 | 2.559 | ±0.019 |
| B0670 | 67 x 2.65 | 67.00 | ±0.49 | 2.638 | " |
| B0690 | 69 x 2.65 | 69.00 | ±0.50 | 2.717 | ±0.020 |
| B0710 | 71 x 2.65 | 71.00 | ±0.51 | 2.795 | " |
| B0730 | 73 x 2.65 | 73.00 | ±0.52 | 2.874 | " |
| B0750 | 75 x 2.65 | 75.00 | ±0.53 | 2.953 | ±0.021 |
| B0800 | 80 x 2.65 | 80.00 | ±0.56 | 3.150 | ±0.022 |
| B0850 | 85 x 2.65 | 85.00 | ±0.59 | 3.346 | ±0.023 |
| B0900 | 90 x 2.65 | 90.00 | ±0.62 | 3.543 | ±0.024 |
| B0950 | 95 x 2.65 | 95.00 | ±0.64 | 3.740 | ±0.025 |
| B1000 | 100 x 2.65 | 100.00 | ±0.67 | 3.937 | ±0.026 |
| B1060 | 106 x 2.65 | 106.00 | ±0.71 | 4.173 | ±0.028 |
| B1120 | 112 x 2.65 | 112.00 | ±0.74 | 4.409 | ±0.029 |
| B1180 | 118 x 2.65 | 118.00 | ±0.77 | 4.646 | ±0.030 |
| B1250 | 125 x 2.65 | 125.00 | ±0.81 | 4.921 | ±0.032 |
| B1320 | 132 x 2.65 | 132.00 | ±0.85 | 5.197 | ±0.033 |
| B1400 | 140 x 2.65 | 140.00 | ±0.89 | 5.512 | ±0.035 |
| B1500 | 150 x 2.65 | 150.00 | ±0.95 | 5.906 | ±0.037 |
| B1600 | 160 x 2.65 | 160.00 | ±1.00 | 6.299 | ±0.039 |
| B1700 | 170 x 2.65 | 170.00 | ±1.06 | 6.693 | ±0.042 |
| B1800 | 180 x 2.65 | 180.00 | ±1.11 | 7.087 | ±0.044 |
| B1900 | 190 x 2.65 | 190.00 | ±1.17 | 7.480 | ±0.046 |
| B2000 | 200 x 2.65 | 200.00 | ±1.22 | 7.874 | ±0.048 |
| B2120 | 212 x 2.65 | 212.00 | ±1.29 | 8.346 | ±0.051 |
| B2240 | 224 x 2.65 | 224.00 | ±1.35 | 8.819 | ±0.053 |
| B2300 | 230 x 2.65 | 230.00 | ±1.39 | 9.055 | ±0.055 |
| B2360 | 236 x 2.65 | 236.00 | ±1.42 | 9.291 | ±0.056 |
| B2430 | 243 x 2.65 | 243.00 | ±1.46 | 9.567 | ±0.057 |
| B2500 | 250 x 2.65 | 250.00 | ±1.49 | 9.843 | ±0.059 |

| BS ISO 3601-1 Size code | Size B A (mm) | INSIDE DIAMETER | | | |
|-------------------------------|---------------------|-------------------|-------------------|-------------------|-------------------|
| | | B nom. (mm) | Tolerance (mm) | B nom. (in) | Tolerance (in) |

3.55 mm ± 0.10 mm (0.140 in ± 0.004 in) Diameter Section A

| | | | | | |
|-------|-------------|--------|-------|-------|--------|
| C0140 | 14 x 3.55 | 14.00 | ±0.18 | 0.551 | ±0.007 |
| C0150 | 15 x 3.55 | 15.00 | " | 0.591 | " |
| C0160 | 16 x 3.55 | 16.00 | ±0.19 | 0.630 | " |
| C0170 | 17 x 3.55 | 17.00 | ±0.20 | 0.669 | ±0.008 |
| C0180 | 18 x 3.55 | 18.00 | " | 0.709 | " |
| C0190 | 19 x 3.55 | 19.00 | ±0.21 | 0.748 | " |
| C0200 | 20 x 3.55 | 20.00 | " | 0.787 | " |
| C0212 | 21.2 x 3.55 | 21.20 | ±0.22 | 0.835 | ±0.009 |
| C0224 | 22.4 x 3.55 | 22.40 | ±0.23 | 0.882 | " |
| C0236 | 23.6 x 3.55 | 23.60 | ±0.24 | 0.929 | " |
| C0250 | 25 x 3.55 | 25.00 | " | 0.984 | " |
| C0258 | 25.8 x 3.55 | 25.80 | ±0.25 | 1.016 | ±0.010 |
| C0265 | 26.5 x 3.55 | 26.50 | " | 1.043 | " |
| C0280 | 28 x 3.55 | 28.00 | ±0.26 | 1.102 | " |
| C0300 | 30 x 3.55 | 30.00 | ±0.27 | 1.181 | ±0.011 |
| C0315 | 31.5 x 3.55 | 31.50 | ±0.28 | 1.240 | " |
| C0325 | 32.5 x 3.55 | 32.50 | ±0.29 | 1.280 | " |
| C0335 | 33.5 x 3.55 | 33.50 | " | 1.319 | " |
| C0345 | 34.5 x 3.55 | 34.50 | ±0.30 | 1.358 | ±0.012 |
| C0355 | 35.5 x 3.55 | 35.50 | ±0.31 | 1.398 | " |
| C0365 | 36.5 x 3.55 | 36.50 | " | 1.437 | " |
| C0375 | 37.5 x 3.55 | 37.50 | ±0.32 | 1.476 | " |
| C0387 | 38.7 x 3.55 | 38.70 | " | 1.524 | ±0.013 |
| C0400 | 40 x 3.55 | 40.00 | ±0.33 | 1.575 | " |
| C0412 | 41.2 x 3.55 | 41.20 | ±0.34 | 1.622 | " |
| C0425 | 42.5 x 3.55 | 42.50 | ±0.35 | 1.673 | ±0.014 |
| C0437 | 43.7 x 3.55 | 43.70 | " | 1.720 | " |
| C0450 | 45 x 3.55 | 45.00 | ±0.36 | 1.772 | " |
| C0462 | 46.2 x 3.55 | 46.20 | ±0.37 | 1.819 | ±0.015 |
| C0475 | 47.5 x 3.55 | 47.50 | ±0.38 | 1.870 | " |
| C0487 | 48.7 x 3.55 | 48.70 | " | 1.917 | " |
| C0500 | 50 x 3.55 | 50.00 | ±0.39 | 1.969 | " |
| C0515 | 51.5 x 3.55 | 51.50 | ±0.40 | 2.028 | ±0.016 |
| C0530 | 53 x 3.55 | 53.00 | ±0.41 | 2.087 | " |
| C0545 | 54.5 x 3.55 | 54.50 | ±0.42 | 2.146 | ±0.017 |
| C0560 | 56 x 3.55 | 56.00 | " | 2.205 | " |
| C0580 | 58 x 3.55 | 58.00 | ±0.44 | 2.283 | " |
| C0600 | 60 x 3.55 | 60.00 | ±0.45 | 2.362 | ±0.018 |
| C0615 | 61.5 x 3.55 | 61.50 | " | 2.421 | " |
| C0630 | 63 x 3.55 | 63.00 | ±0.46 | 2.480 | " |
| C0650 | 65 x 3.55 | 65.00 | ±0.48 | 2.559 | ±0.019 |
| C0670 | 67 x 3.55 | 67.00 | ±0.49 | 2.638 | " |
| C0690 | 69 x 3.55 | 69.00 | ±0.50 | 2.717 | ±0.020 |
| C0710 | 71 x 3.55 | 71.00 | ±0.51 | 2.795 | " |
| C0730 | 73 x 3.55 | 73.00 | ±0.52 | 2.874 | " |
| C0750 | 75 x 3.55 | 75.00 | ±0.53 | 2.953 | ±0.021 |
| C0775 | 77.5 x 3.55 | 77.50 | ±0.55 | 3.051 | ±0.022 |
| C0800 | 80 x 3.55 | 80.00 | ±0.56 | 3.150 | " |
| C0825 | 82.5 x 3.55 | 82.50 | ±0.57 | 3.248 | " |
| C0850 | 85 x 3.55 | 85.00 | ±0.59 | 3.346 | ±0.023 |
| C0875 | 87.5 x 3.55 | 87.50 | ±0.60 | 3.445 | ±0.024 |
| C0900 | 90 x 3.55 | 90.00 | ±0.62 | 3.543 | " |
| C0925 | 92.5 x 3.55 | 92.50 | ±0.63 | 3.642 | ±0.025 |
| C0950 | 95 x 3.55 | 95.00 | ±0.64 | 3.740 | " |
| C0975 | 97.5 x 3.55 | 97.50 | ±0.66 | 3.839 | ±0.026 |
| C1000 | 100 x 3.55 | 100.00 | ±0.67 | 3.937 | " |

Aerospace sizes to BS ISO 3601-1

| BS ISO 3601-1 Size code | Size B A (mm) | INSIDE DIAMETER | | | |
|-------------------------------|---------------------|-------------------|-------------------|-------------------|-------------------|
| | | B nom. (mm) | Tolerance (mm) | B nom. (in) | Tolerance (in) |

3.55mm ± 0.10 mm (0.140 in ±0.004 in) Diameter Section A

| | | | | | |
|-------|------------|--------|-------|--------|--------|
| C1030 | 103 x 3.55 | 103.00 | ±0.69 | 4.055 | ±0.027 |
| C1060 | 106 x 3.55 | 106.00 | ±0.71 | 4.173 | ±0.028 |
| C1090 | 109 x 3.55 | 109.00 | ±0.72 | 4.291 | " |
| C1120 | 112 x 3.55 | 112.00 | ±0.74 | 4.409 | ±0.029 |
| C1150 | 115 x 3.55 | 115.00 | ±0.76 | 4.528 | ±0.030 |
| C1180 | 118 x 3.55 | 118.00 | ±0.77 | 4.646 | " |
| C1220 | 122 x 3.55 | 122.00 | ±0.80 | 4.803 | ±0.031 |
| C1250 | 125 x 3.55 | 125.00 | ±0.81 | 4.921 | ±0.032 |
| C1280 | 128 x 3.55 | 128.00 | ±0.83 | 5.039 | ±0.033 |
| C1320 | 132 x 3.55 | 132.00 | ±0.85 | 5.197 | " |
| C1360 | 136 x 3.55 | 136.00 | ±0.87 | 5.354 | ±0.034 |
| C1400 | 140 x 3.55 | 140.00 | ±0.89 | 5.512 | ±0.035 |
| C1450 | 145 x 3.55 | 145.00 | ±0.92 | 5.709 | ±0.036 |
| C1500 | 150 x 3.55 | 150.00 | ±0.95 | 5.906 | ±0.037 |
| C1550 | 155 x 3.55 | 155.00 | ±0.98 | 6.102 | ±0.039 |
| C1600 | 160 x 3.55 | 160.00 | ±1.00 | 6.299 | " |
| C1650 | 165 x 3.55 | 165.00 | ±1.03 | 6.496 | ±0.041 |
| C1700 | 170 x 3.55 | 170.00 | ±1.06 | 6.693 | ±0.042 |
| C1750 | 175 x 3.55 | 175.00 | ±1.09 | 6.890 | ±0.043 |
| C1800 | 180 x 3.55 | 180.00 | ±1.11 | 7.087 | ±0.044 |
| C1850 | 185 x 3.55 | 185.00 | ±1.14 | 7.283 | ±0.045 |
| C1900 | 190 x 3.55 | 190.00 | ±1.17 | 7.480 | ±0.046 |
| C1950 | 195 x 3.55 | 195.00 | ±1.20 | 7.677 | ±0.047 |
| C2000 | 200 x 3.55 | 200.00 | ±1.22 | 7.874 | ±0.048 |
| C2120 | 212 x 3.55 | 212.00 | ±1.29 | 8.346 | ±0.051 |
| C2180 | 218 x 3.55 | 218.00 | ±1.32 | 8.523 | ±0.052 |
| C2240 | 224 x 3.55 | 224.00 | ±1.35 | 8.819 | ±0.053 |
| C2300 | 230 x 3.55 | 230.00 | ±1.39 | 9.055 | ±0.055 |
| C2360 | 236 x 3.55 | 236.00 | ±1.42 | 9.291 | ±0.056 |
| C2500 | 250 x 3.55 | 250.00 | ±1.49 | 9.843 | ±0.059 |
| C2580 | 258 x 3.55 | 258.00 | ±1.54 | 10.157 | ±0.061 |
| C2650 | 265 x 3.55 | 265.00 | ±1.57 | 10.433 | ±0.062 |
| C2800 | 280 x 3.55 | 280.00 | ±1.65 | 11.024 | ±0.065 |
| C2900 | 290 x 3.55 | 290.00 | ±1.71 | 11.417 | ±0.067 |
| C3000 | 300 x 3.55 | 300.00 | ±1.76 | 11.811 | ±0.069 |
| C3070 | 307 x 3.55 | 307.00 | ±1.80 | 12.087 | ±0.071 |
| C3150 | 315 x 3.55 | 315.00 | ±1.84 | 12.402 | ±0.072 |
| C3350 | 335 x 3.55 | 335.00 | ±1.95 | 13.189 | ±0.077 |
| C3550 | 355 x 3.55 | 355.00 | ±2.06 | 13.976 | ±0.081 |

5.30 mm ± 0.13 mm (0.209 in ±0.005 in) Diameter Section A

| | | | | | |
|-------|------------|-------|-------|-------|--------|
| D0375 | 37.5 x 5.3 | 37.50 | ±0.32 | 1.476 | ±0.012 |
| D0387 | 38.7 x 5.3 | 38.70 | " | 1.524 | ±0.013 |
| D0400 | 40 x 5.3 | 40.00 | ±0.33 | 1.575 | " |
| D0412 | 41.2 x 5.3 | 41.20 | ±0.34 | 1.622 | " |
| D0425 | 42.5 x 5.3 | 42.50 | ±0.35 | 1.673 | ±0.014 |
| D0437 | 43.7 x 5.3 | 43.70 | " | 1.720 | " |
| D0450 | 45 x 5.3 | 45.00 | ±0.36 | 1.772 | " |
| D0462 | 46.2 x 5.3 | 46.20 | ±0.37 | 1.819 | ±0.015 |
| D0475 | 47.5 x 5.3 | 47.50 | ±0.38 | 1.870 | " |
| D0487 | 48.7 x 5.3 | 48.70 | " | 1.917 | " |
| D0500 | 50 x 5.3 | 50.00 | ±0.39 | 1.969 | " |
| D0515 | 51.5 x 5.3 | 51.50 | ±0.40 | 2.028 | ±0.016 |
| D0530 | 53 x 5.3 | 53.00 | ±0.41 | 2.087 | " |
| D0545 | 54.5 x 5.3 | 54.50 | ±0.42 | 2.146 | ±0.017 |
| D0560 | 56 x 5.3 | 56.00 | " | 2.205 | " |
| D0580 | 58 x 5.3 | 58.00 | ±0.44 | 2.283 | " |
| D0600 | 60 x 5.3 | 60.00 | ±0.45 | 2.362 | ±0.018 |
| D0615 | 61.5 x 5.3 | 61.50 | " | 2.421 | " |

| BS ISO 3601-1 Size code | Size B A (mm) | INSIDE DIAMETER | | | |
|-------------------------------|---------------------|-------------------|-------------------|-------------------|-------------------|
| | | B nom. (mm) | Tolerance (mm) | B nom. (in) | Tolerance (in) |

5.30mm ± 0.13 mm (0.209 in ±0.005 in) Diameter Section A

| | | | | | |
|-------|------------|--------|-------|-------|--------|
| D0630 | 63 x 5.3 | 63.00 | ±0.46 | 2.480 | ±0.018 |
| D0650 | 65 x 5.3 | 65.00 | ±0.48 | 2.559 | ±0.019 |
| D0670 | 67 x 5.3 | 67.00 | ±0.49 | 2.638 | " |
| D0690 | 69 x 5.3 | 69.00 | ±0.50 | 2.717 | ±0.020 |
| D0710 | 71 x 5.3 | 71.00 | ±0.51 | 2.795 | " |
| D0730 | 73 x 5.3 | 73.00 | ±0.52 | 2.874 | " |
| D0750 | 75 x 5.3 | 75.00 | ±0.53 | 2.953 | ±0.021 |
| D0775 | 77.5 x 5.3 | 77.50 | ±0.55 | 3.051 | ±0.022 |
| D0800 | 80 x 5.3 | 80.00 | ±0.56 | 3.150 | " |
| D0825 | 82.5 x 5.3 | 82.50 | ±0.57 | 3.248 | " |
| D0850 | 85 x 5.3 | 85.00 | ±0.59 | 3.346 | ±0.023 |
| D0875 | 87.5 x 5.3 | 87.50 | ±0.60 | 3.445 | ±0.024 |
| D0900 | 90 x 5.3 | 90.00 | ±0.62 | 3.543 | " |
| D0925 | 92.5 x 5.3 | 92.50 | ±0.63 | 3.642 | ±0.025 |
| D0950 | 95 x 5.3 | 95.00 | ±0.64 | 3.740 | " |
| D0975 | 97.5 x 5.3 | 97.50 | ±0.66 | 3.839 | ±0.026 |
| D1000 | 100 x 5.3 | 100.00 | ±0.67 | 3.937 | " |
| D1030 | 103 x 5.3 | 103.00 | ±0.69 | 4.055 | ±0.027 |
| D1060 | 106 x 5.3 | 106.00 | ±0.71 | 4.173 | ±0.028 |
| D1090 | 109 x 5.3 | 109.00 | ±0.72 | 4.291 | " |
| D1120 | 112 x 5.3 | 112.00 | ±0.74 | 4.409 | ±0.029 |
| D1150 | 115 x 5.3 | 115.00 | ±0.76 | 4.528 | ±0.030 |
| D1180 | 118 x 5.3 | 118.00 | ±0.77 | 4.646 | " |
| D1220 | 122 x 5.3 | 122.00 | ±0.80 | 4.803 | ±0.031 |
| D1250 | 125 x 5.3 | 125.00 | ±0.81 | 4.921 | ±0.032 |
| D1280 | 128 x 5.3 | 128.00 | ±0.83 | 5.039 | ±0.033 |
| D1320 | 132 x 5.3 | 132.00 | ±0.85 | 5.197 | " |
| D1360 | 136 x 5.3 | 136.00 | ±0.87 | 5.354 | ±0.034 |
| D1400 | 140 x 5.3 | 140.00 | ±0.89 | 5.512 | ±0.035 |
| D1450 | 145 x 5.3 | 145.00 | ±0.92 | 5.709 | ±0.036 |
| D1500 | 150 x 5.3 | 150.00 | ±0.95 | 5.906 | ±0.037 |
| D1550 | 155 x 5.3 | 155.00 | ±0.98 | 6.102 | ±0.039 |
| D1600 | 160 x 5.3 | 160.00 | ±1.00 | 6.299 | " |
| D1650 | 165 x 5.3 | 165.00 | ±1.03 | 6.496 | ±0.041 |
| D1700 | 170 x 5.3 | 170.00 | ±1.06 | 6.693 | ±0.042 |
| D1750 | 175 x 5.3 | 175.00 | ±1.09 | 6.890 | ±0.043 |
| D1800 | 180 x 5.3 | 180.00 | ±1.11 | 7.087 | ±0.044 |
| D1850 | 185 x 5.3 | 185.00 | ±1.14 | 7.283 | ±0.045 |
| D1900 | 190 x 5.3 | 190.00 | ±1.17 | 7.480 | ±0.046 |
| D1950 | 195 x 5.3 | 195.00 | ±1.20 | 7.677 | ±0.047 |
| D2000 | 200 x 5.3 | 200.00 | ±1.22 | 7.874 | ±0.048 |

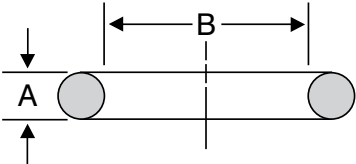
7.00 mm ± 0.15 mm (0.276 in ±0.006 in) Diameter Section A

| | | | | | |
|-------|---------|--------|-------|-------|--------|
| E1090 | 109 x 7 | 109.00 | ±0.72 | 4.291 | ±0.028 |
| E1120 | 112 x 7 | 112.00 | ±0.74 | 4.409 | ±0.029 |
| E1150 | 115 x 7 | 115.00 | ±0.76 | 4.528 | ±0.030 |
| E1180 | 118 x 7 | 118.00 | ±0.77 | 4.646 | " |
| E1220 | 122 x 7 | 122.00 | ±0.80 | 4.803 | ±0.031 |
| E1250 | 125 x 7 | 125.00 | ±0.81 | 4.921 | ±0.032 |
| E1280 | 128 x 7 | 128.00 | ±0.83 | 5.039 | ±0.033 |
| E1320 | 132 x 7 | 132.00 | ±0.85 | 5.197 | " |
| E1360 | 136 x 7 | 136.00 | ±0.87 | 5.354 | ±0.034 |
| E1400 | 140 x 7 | 140.00 | ±0.89 | 5.512 | ±0.035 |
| E1450 | 145 x 7 | 145.00 | ±0.92 | 5.709 | ±0.036 |
| E1500 | 150 x 7 | 150.00 | ±0.95 | 5.906 | ±0.037 |
| E1550 | 155 x 7 | 155.00 | ±0.98 | 6.102 | ±0.039 |
| E1600 | 160 x 7 | 160.00 | ±1.00 | 6.299 | " |

Aerospace sizes to BS ISO 3601-1

| BS ISO 3601-1 Size code | Size B A B A (mm) | INSIDE DIAMETER | | | |
|-----------------------------------------------------------|----------------------------|-------------------|-------------------|-------------------|-------------------|
| | | B nom. (mm) | Tolerance (mm) | B nom. (in) | Tolerance (in) |
| 7.00 mm ± 0.15 mm (0.276 in ±0.006 in) Diameter Section A | | | | | |
| E1650 | 165 x 7 | 165.00 | ±1.03 | 6.496 | ±0.041 |
| E1700 | 170 x 7 | 170.00 | ±1.06 | 6.693 | ±0.042 |
| E1750 | 175 x 7 | 175.00 | ±1.09 | 6.890 | ±0.043 |
| E1800 | 180 x 7 | 180.00 | ±1.11 | 7.087 | ±0.044 |
| E1850 | 185 x 7 | 185.00 | ±1.14 | 7.283 | ±0.045 |
| E1900 | 190 x 7 | 190.00 | ±1.17 | 7.480 | ±0.046 |
| E1950 | 195 x 7 | 195.00 | ±1.20 | 7.677 | ±0.047 |
| E2000 | 200 x 7 | 200.00 | ±1.22 | 7.874 | ±0.048 |
| E2060 | 206 x 7 | 206.00 | ±1.26 | 8.110 | ±0.050 |
| E2120 | 212 x 7 | 212.00 | ±1.29 | 8.346 | ±0.051 |
| E2180 | 218 x 7 | 218.00 | ±1.32 | 8.523 | ±0.052 |
| E2240 | 224 x 7 | 224.00 | ±1.35 | 8.819 | ±0.053 |
| E2300 | 230 x 7 | 230.00 | ±1.39 | 9.055 | ±0.055 |
| E2360 | 236 x 7 | 236.00 | ±1.42 | 9.291 | ±0.056 |
| E2430 | 243 x 7 | 243.00 | ±1.46 | 9.567 | ±0.057 |
| E2500 | 250 x 7 | 250.00 | ±1.49 | 9.843 | ±0.059 |
| E2580 | 258 x 7 | 258.00 | ±1.54 | 10.157 | ±0.061 |
| E2650 | 265 x 7 | 265.00 | ±1.57 | 10.433 | ±0.062 |
| E2720 | 272 x 7 | 272.00 | ±1.61 | 10.709 | ±0.063 |
| E2800 | 280 x 7 | 280.00 | ±1.65 | 11.024 | ±0.065 |
| E2900 | 290 x 7 | 290.00 | ±1.71 | 11.417 | ±0.067 |
| E3000 | 300 x 7 | 300.00 | ±1.76 | 11.811 | ±0.069 |
| E3070 | 307 x 7 | 307.00 | ±1.80 | 12.087 | ±0.071 |
| E3150 | 315 x 7 | 315.00 | ±1.84 | 12.402 | ±0.072 |
| E3250 | 325 x 7 | 325.00 | ±1.90 | 12.795 | ±0.075 |
| E3350 | 335 x 7 | 335.00 | ±1.95 | 13.189 | ±0.077 |
| E3450 | 345 x 7 | 345.00 | ±2.00 | 13.583 | ±0.079 |
| E3550 | 355 x 7 | 355.00 | ±2.06 | 13.976 | ±0.081 |
| E3650 | 365 x 7 | 365.00 | ±2.11 | 14.370 | ±0.083 |
| E3750 | 375 x 7 | 375.00 | ±2.16 | 14.764 | ±0.085 |
| E3870 | 387 x 7 | 387.00 | ±2.23 | 15.236 | ±0.088 |
| E4000 | 400 x 7 | 400.00 | ±2.29 | 15.748 | ±0.090 |

BS ISO 3601-1 'O' rings for aerospace applications use housings identified in BS EN 3748 *Aerospace series 'O' ring grooves: Dimensions*. Please contact our Technical Support Team for advice.



'O' ring diameter section A and inside diameter B.



Chart 72: metric sizes

James Walker Chart 72 covers:

- **BS 4518:** Metric dimensions of toroidal sealing rings (O rings) and their housings.

If the metric size you want is not available, please use the metric columns in **Chart 50** or **Aerospace sizes to BS ISO 3601-1**.

Chart 72 back-up rings cover sizes that include those in:

- **BS 5106:** Dimensions of spiral anti-extrusion back-up rings and their housings.

| Pneumatic & static plug housing details to BS 4518 | | | |
|-------------------------------------------------------------------------------------|---------------------|--------------------------------------|---------------------|
| For applications requiring back-up rings, use dynamic housing sizes on pages 30-31. | | | |
| | Pneumatic | Static plug | |
| Diameter section A (mm) | Radial depth F (mm) | Groove width E (mm) 'O' ring only | Radial depth F (mm) |
| 2.4 | 2.13 / 2.20 | 3.1 / 3.3 | 1.84 / 1.97 |
| 3.0 | 2.70 / 2.77 | 3.7 / 3.9 | 2.35 / 2.50 |
| 4.1 | 3.73 / 3.82 | 5.0 / 5.2 | 3.30 / 3.45 |
| 5.7 | 5.22 / 5.38 | 6.4 / 6.6 | 4.70 / 4.95 |
| 8.4 | 7.75 / 7.96 | 9.0 / 9.2 | 7.20 / 7.50 |

For flange applications, the values of groove inside and outside diameters (V and W — see Figure 13 on page 29) are shown on **Chart 72**.

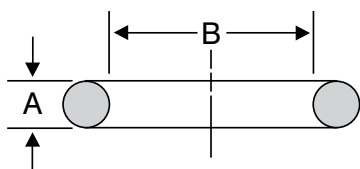
BS EN ISO 286-2 tolerances H11, h11 are given on page 31.

Housing details can be referred to on pages 29-31.

* Static/dynamic applications

An asterisk symbol (*) denotes that the ring is suitable for both dynamic and static applications. Other sizes are not recommended for dynamic duties.

All **Chart 72** dimensions are in millimetres (mm).



'O' ring diameter section A and inside diameter B.

Refer to page 29 for List of Symbols

| James Walker Number | Diameters | | | Flange Groove Diameters | | | |
|---------------------------------------|---------------|------|--------|-------------------------|---------|-------------------|-------|
| | Inside Dia. B | C, T | Cyl. D | Internal Pressure | | External Pressure | |
| | | | | V max | W (H11) | V (h11) | W min |
| 1.6 ±0.08mm Diameter Section A | | | | | | | |
| 72-0031-16 | 3.1 ±0.15 | 3.5 | 6 | 1.0 | 6.3 | 3.5 | 7.5 |
| " 0041-16 | 4.1 " | 4.5 | 7 | 2.3 | 7.3 | 4.5 | 8.5 |
| " 0051-16 | 5.1 " | 5.5 | 8 | 3.3 | 8.3 | 5.5 | 9.5 |
| " 0061-16 | 6.1 " | 6.5 | 9 | 4.3 | 9.3 | 6.5 | 10.5 |
| " 0071-16 | 7.1 " | 7.5 | 10 | 5.8 | 10.3 | 7.5 | 11.5 |
| " 0081-16 | 8.1 " | 8.5 | 11 | 6.8 | 11.3 | 8.5 | 12.5 |
| " 0091-16 | 9.1 " | 9.5 | 12 | 7.8 | 12.3 | 9.5 | 13.5 |
| " 0101-16 | 10.1 ±0.20 | 10.5 | 13 | 8.8 | 13.3 | 10.5 | 14.5 |
| " 0111-16 | 11.1 " | 11.5 | 14 | 9.8 | 14.3 | 11.5 | 15.5 |
| " 0121-16 | 12.1 " | 12.5 | 15 | 10.8 | 15.3 | 12.5 | 16.5 |
| " 0131-16 | 13.1 " | 13.5 | 16 | 11.8 | 16.3 | 13.5 | 17.5 |
| " 0141-16 | 14.1 " | 14.5 | 17 | 12.8 | 17.3 | 14.5 | 18.5 |
| " 0151-16 | 15.1 " | 15.5 | 18 | 14.0 | 18.3 | 15.5 | 19.5 |
| " 0161-16 | 16.1 " | 16.5 | 19 | 15 | 19.3 | 16.5 | 20.5 |
| " 0171-16 | 17.1 " | 17.5 | 20 | 16 | 20.3 | 17.5 | 21.5 |
| " 0181-16 | 18.1 ±0.25 | 18.5 | 21 | 17 | 21.3 | 18.5 | 22.5 |
| " 0191-16 | 19.1 " | 19.5 | 22 | 18 | 22.3 | 19.5 | 23.5 |
| " 0221-16 | 22.1 " | 22.5 | 25 | 21 | 25.3 | 22.5 | 26.5 |
| " 0251-16 | 25.1 " | 25.5 | 28 | 24 | 28.3 | 25.5 | 29.5 |
| " 0271-16 | 27.1 " | 27.5 | 30 | 26 | 30.3 | 27.5 | 31.5 |
| " 0291-16 | 29.1 " | 29.5 | 32 | 28 | 32.3 | 29.5 | 33.5 |
| " 0321-16 | 32.1 ±0.30 | 32.5 | 35 | 31 | 35.3 | 32.5 | 36.5 |
| " 0351-16 | 35.1 " | 35.5 | 38 | 34 | 38.3 | 35.5 | 39.5 |
| " 0371-16 | 37.1 " | 37.5 | 40 | 36 | 40.3 | 37.5 | 41.5 |
| 2.4 ±0.08mm Diameter Section A | | | | | | | |
| 72-0036-24* | 3.6 ±0.15 | 4 | 8 | — | 8.4 | 4 | 10 |
| " 0046-24* | 4.6 " | 5 | 9 | 1.0 | 9.4 | 5 | 11 |
| " 0056-24* | 5.6 " | 6 | 10 | 2.5 | 10.4 | 6 | 12 |
| " 0066-24* | 6.6 " | 7 | 11 | 4.0 | 11.4 | 7 | 13 |
| " 0076-24* | 7.6 " | 8 | 12 | 5.0 | 12.4 | 8 | 14 |
| " 0086-24* | 8.6 " | 9 | 13 | 6.4 | 13.4 | 9 | 15 |
| " 0096-24* | 9.6 " | 10 | 14 | 7.4 | 14.4 | 10 | 16 |
| " 0106-24* | 10.6 ±0.20 | 11 | 15 | 8.4 | 15.4 | 11 | 17 |
| " 0116-24* | 11.6 " | 12 | 16 | 9.5 | 16.4 | 12 | 18 |
| " 0126-24* | 12.6 " | 13 | 17 | 10.5 | 17.4 | 13 | 19 |
| " 0136-24* | 13.6 " | 14 | 18 | 11.5 | 18.4 | 14 | 20 |
| " 0146-24* | 14.6 " | 15 | 19 | 12.5 | 19.4 | 15 | 21 |
| " 0156-24* | 15.6 " | 16 | 20 | 13.5 | 20.4 | 16 | 22 |
| " 0166-24* | 16.6 " | 17 | 21 | 14.5 | 21.4 | 17 | 23 |
| " 0176-24* | 17.6 " | 18 | 22 | 15.5 | 22.4 | 18 | 24 |
| " 0186-24 | 18.6 ±0.25 | 19 | 23 | 16.5 | 23.4 | 19 | 25 |
| " 0196-24 | 19.6 " | 20 | 24 | 17.5 | 24.4 | 20 | 26 |
| " 0206-24 | 20.6 " | 21 | 25 | 18.5 | 25.4 | 21 | 27 |
| " 0216-24 | 21.6 " | 22 | 26 | 19.5 | 26.4 | 22 | 28 |
| " 0246-24 | 24.6 " | 25 | 29 | 22.5 | 29.4 | 25 | 31 |
| " 0276-24 | 27.6 " | 28 | 32 | 25.5 | 32.4 | 28 | 34 |
| " 0296-24 | 29.6 " | 30 | 34 | 27.5 | 34.4 | 30 | 36 |
| " 0316-24 | 31.6 ±0.30 | 32 | 36 | 29.5 | 36.4 | 32 | 38 |
| " 0346-24 | 34.6 " | 35 | 39 | 32.5 | 39.4 | 35 | 41 |
| " 0356-24 | 35.6 " | 36 | 40 | 33.5 | 40.4 | 36 | 42 |
| " 0376-24 | 37.6 " | 38 | 42 | 35.5 | 42.4 | 38 | 44 |
| " 0396-24 | 39.6 " | 40 | 44 | 37.5 | 44.4 | 40 | 46 |
| " 0416-24 | 41.6 " | 42 | 46 | 39.5 | 46.4 | 42 | 48 |
| " 0446-24 | 44.6 " | 45 | 49 | 42.5 | 49.4 | 45 | 51 |
| " 0456-24 | 45.6 " | 46 | 50 | 43.5 | 50.4 | 46 | 52 |
| " 0476-24 | 47.6 " | 48 | 52 | 45.5 | 52.4 | 48 | 54 |
| " 0496-24 | 49.6 " | 50 | 54 | 47.5 | 54.4 | 50 | 56 |
| " 0516-24 | 51.6 ±0.40 | 52 | 56 | 49.5 | 56.4 | 52 | 58 |
| " 0546-24 | 54.6 " | 55 | 59 | 52.5 | 59.4 | 55 | 61 |
| " 0556-24 | 55.6 " | 56 | 60 | 53.5 | 60.4 | 56 | 62 |
| " 0576-24 | 57.6 " | 58 | 62 | 55.5 | 62.4 | 58 | 64 |
| " 0586-24 | 58.6 " | 59 | 63 | 56.5 | 63.4 | 59 | 65 |
| " 0596-24 | 59.6 " | 60 | 64 | 57.5 | 64.4 | 60 | 66 |
| " 0616-24 | 61.6 " | 62 | 66 | 59.5 | 66.4 | 62 | 68 |
| " 0626-24 | 62.6 " | 63 | 67 | 60.5 | 67.4 | 63 | 69 |
| " 0646-24 | 64.6 " | 65 | 69 | 62.5 | 69.4 | 65 | 71 |
| " 0676-24 | 67.6 " | 68 | 72 | 65.5 | 72.4 | 68 | 74 |
| " 0696-24 | 69.6 " | 70 | 74 | 67.5 | 74.4 | 70 | 76 |

Chart 72: metric sizes

Refer to page 29 for List of Symbols

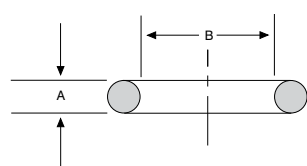
| James Walker Number | Diameters | | | Flange Groove Diameters | | | | |
|--------------------------------|---------------|-------|--------|-------------------------|---------|-------------------|-------|-----|
| | Inside Dia. B | C, T | Cyl. D | Internal Pressure | | External Pressure | | |
| | | | | V max | W (H11) | V (h11) | W min | |
| 3.0 ±0.10mm Diameter Section A | | | | | | | | |
| 72-0195-30* | 19.5 | ±0.25 | 20 | 25 | 17 | 25 | 20 | 28 |
| " 0215-30* | 21.5 | " | 22 | 27 | 19 | 27 | 22 | 30 |
| " 0225-30* | 22.5 | " | 23 | 28 | 20 | 28 | 23 | 31 |
| " 0245-30* | 24.5 | " | 25 | 30 | 22 | 30 | 25 | 33 |
| " 0255-30* | 25.5 | " | 26 | 31 | 23 | 31 | 26 | 34 |
| | | | | | | | | |
| " 0265-30* | 26.5 | " | 27 | 32 | 24 | 32 | 27 | 35 |
| " 0275-30* | 27.5 | " | 28 | 33 | 25 | 33 | 28 | 36 |
| " 0295-30* | 29.5 | " | 30 | 35 | 27 | 35 | 30 | 38 |
| " 0315-30* | 31.5 | ±0.30 | 32 | 37 | 29 | 37 | 32 | 40 |
| " 0325-30* | 32.5 | " | 33 | 38 | 30 | 38 | 33 | 41 |
| | | | | | | | | |
| " 0345-30* | 34.5 | " | 35 | 40 | 32 | 40 | 35 | 43 |
| " 0355-30* | 35.5 | " | 36 | 41 | 33 | 41 | 36 | 44 |
| " 0365-30* | 36.5 | " | 37 | 42 | 34 | 42 | 37 | 45 |
| " 0375-30* | 37.5 | " | 38 | 43 | 35 | 43 | 38 | 46 |
| " 0395-30* | 39.5 | " | 40 | 45 | 37 | 45 | 40 | 48 |
| | | | | | | | | |
| " 0415-30* | 41.5 | " | 42 | 47 | 39 | 47 | 42 | 50 |
| " 0425-30* | 42.5 | " | 43 | 48 | 40 | 48 | 43 | 51 |
| " 0445-30* | 44.5 | " | 45 | 50 | 42 | 50 | 45 | 53 |
| " 0495-30* | 49.5 | " | 50 | 55 | 47 | 55 | 50 | 58 |
| " 0545-30 | 54.5 | ±0.40 | 55 | 60 | 52 | 60 | 55 | 63 |
| | | | | | | | | |
| " 0555-30 | 55.5 | " | 56 | 61 | 53 | 61 | 56 | 64 |
| " 0575-30 | 57.5 | " | 58 | 63 | 55 | 63 | 58 | 66 |
| " 0595-30 | 59.5 | " | 60 | 65 | 57 | 65 | 60 | 68 |
| " 0625-30 | 62.5 | " | 63 | 68 | 60 | 68 | 63 | 71 |
| " 0645-30 | 64.5 | " | 65 | 70 | 62 | 70 | 65 | 73 |
| | | | | | | | | |
| " 0695-30 | 69.5 | " | 70 | 75 | 57 | 75 | 70 | 78 |
| " 0745-30 | 74.5 | " | 75 | 80 | 72 | 80 | 75 | 83 |
| " 0795-30 | 79.5 | " | 80 | 85 | 77 | 85 | 80 | 88 |
| " 0845-30 | 84.5 | ±0.50 | 85 | 90 | 82 | 90 | 85 | 93 |
| " 0895-30 | 89.5 | " | 90 | 95 | 87 | 95 | 90 | 98 |
| | | | | | | | | |
| " 0945-30 | 94.5 | " | 95 | 100 | 92 | 100 | 95 | 103 |
| " 0995-30 | 99.5 | " | 100 | 105 | 97 | 105 | 100 | 108 |
| " 1045-30 | 104.5 | " | 105 | 110 | 102 | 110 | 105 | 113 |
| " 1095-30 | 109.5 | " | 110 | 115 | 107 | 115 | 110 | 118 |
| " 1145-30 | 114.5 | " | 115 | 120 | 112 | 120 | 115 | 123 |
| | | | | | | | | |
| " 1195-30 | 119.5 | " | 120 | 125 | 117 | 125 | 120 | 128 |
| " 1245-30 | 124.5 | ±0.60 | 125 | 130 | 122 | 130 | 125 | 133 |
| " 1295-30 | 129.5 | " | 130 | 135 | 127 | 135 | 130 | 138 |
| " 1345-30 | 134.5 | " | 135 | 140 | 132 | 140 | 135 | 143 |
| " 1395-30 | 139.5 | " | 140 | 145 | 137 | 145 | 140 | 148 |
| | | | | | | | | |
| " 1445-30 | 144.5 | " | 145 | 150 | 142 | 150 | 145 | 153 |
| " 1495-30 | 149.5 | " | 150 | 155 | 147 | 155 | 150 | 158 |
| " 1545-30 | 154.5 | " | 155 | 160 | 152 | 160 | 155 | 163 |
| " 1595-30 | 159.5 | " | 160 | 165 | 157 | 165 | 160 | 168 |
| " 1645-30 | 164.5 | " | 165 | 170 | 162 | 170 | 165 | 173 |
| | | | | | | | | |
| " 1695-30 | 169.5 | " | 170 | 175 | 167 | 175 | 170 | 178 |
| " 1745-30 | 174.5 | " | 175 | 180 | 172 | 180 | 175 | 183 |
| " 1795-30 | 179.5 | " | 180 | 185 | 177 | 185 | 180 | 188 |
| " 1845-30 | 184.5 | ±0.80 | 185 | 190 | 182 | 190 | 185 | 193 |
| " 1895-30 | 189.5 | " | 190 | 195 | 187 | 195 | 190 | 198 |
| | | | | | | | | |
| " 1945-30 | 194.5 | " | 195 | 200 | 192 | 200 | 195 | 203 |
| " 1995-30 | 199.5 | " | 200 | 205 | 197 | 205 | 200 | 208 |
| " 2095-30 | 209.5 | " | 210 | 215 | 207 | 215 | 210 | 218 |
| " 2195-30 | 219.5 | " | 220 | 225 | 217 | 225 | 220 | 228 |
| " 2295-30 | 229.5 | " | 230 | 235 | 227 | 235 | 230 | 238 |
| | | | | | | | | |
| " 2395-30 | 239.5 | " | 240 | 245 | 237 | 245 | 240 | 248 |
| " 2445-30 | 244.5 | " | 245 | 250 | 242 | 250 | 245 | 253 |
| " 2495-30 | 249.5 | " | 250 | 255 | 247 | 255 | 250 | 258 |
| 5.7 ±0.12mm Diameter Section A | | | | | | | | |
| 72-0443-57* | 44.3 | ±0.30 | 45 | 55 | 41 | 55 | 45 | 59 |
| " 0453-57* | 45.3 | " | 46 | 56 | 42 | 56 | 46 | 60 |
| " 0493-57* | 49.3 | " | 50 | 60 | 46 | 60 | 50 | 64 |
| " 0523-57* | 52.3 | ±0.40 | 53 | 63 | 49 | 63 | 53 | 67 |
| " 0543-57* | 54.3 | " | 55 | 65 | 51 | 65 | 55 | 69 |
| | | | | | | | | |
| " 0553-57* | 55.3 | " | 56 | 66 | 52 | 66 | 56 | 70 |
| " 0593-57* | 59.3 | " | 60 | 70 | 56 | 70 | 60 | 74 |
| " 0623-57* | 62.3 | " | 63 | 73 | 59 | 73 | 63 | 77 |
| " 0643-57* | 64.3 | " | 65 | 75 | 61 | 75 | 65 | 79 |
| " 0693-57* | 69.3 | " | 70 | 80 | 66 | 80 | 70 | 84 |

| James Walker Number | Diameters | | | Flange Groove Diameters | | | | |
|--------------------------------|---------------|-------|--------|-------------------------|---------|-------------------|-------|-----|
| | Inside Dia. B | C, T | Cyl. D | Internal Pressure | | External Pressure | | |
| | | | | V max | W (H11) | V (h11) | W min | |
| 5.7 ±0.12mm Diameter Section A | | | | | | | | |
| 72-0743-57* | 74.3 | " | 75 | 85 | 71 | 85 | 75 | 89 |
| " 0793-57* | 79.3 | " | 80 | 90 | 76 | 90 | 80 | 94 |
| " 0843-57* | 84.3 | ±0.50 | 85 | 95 | 81 | 95 | 85 | 99 |
| " 0893-57* | 89.3 | " | 90 | 100 | 86 | 100 | 90 | 104 |
| " 0943-57* | 94.3 | " | 95 | 105 | 91 | 105 | 95 | 109 |
| | | | | | | | | |
| " 0993-57* | 99.3 | " | 100 | 110 | 96 | 110 | 100 | 114 |
| " 1043-57* | 104.3 | " | 105 | 115 | 101 | 115 | 105 | 119 |
| " 1093-57* | 109.3 | " | 110 | 120 | 106 | 120 | 110 | 124 |
| " 1143-57* | 114.3 | " | 115 | 125 | 111 | 125 | 115 | 129 |
| " 1193-57* | 119.3 | " | 120 | 130 | 116 | 130 | 120 | 134 |
| | | | | | | | | |
| " 1243-57* | 124.3 | ±0.60 | 125 | 135 | 121 | 135 | 125 | 139 |
| " 1293-57* | 129.3 | " | 130 | 140 | 126 | 140 | 130 | 144 |
| " 1343-57* | 134.3 | " | 135 | 145 | 131 | 145 | 135 | 149 |
| " 1393-57* | 139.3 | " | 140 | 150 | 136 | 150 | 140 | 154 |
| " 1443-57* | 144.3 | " | 145 | 155 | 141 | 155 | 145 | 159 |
| | | | | | | | | |
| " 1493-57 | 149.3 | " | 150 | 160 | 146 | 160 | 150 | 164 |
| " 1543-57 | 154.3 | " | 155 | 165 | 151 | 165 | 155 | 169 |
| " 1593-57 | 159.3 | " | 160 | 170 | 156 | 170 | 160 | 174 |
| " 1643-57 | 164.3 | " | 165 | 175 | 161 | 175 | 165 | 179 |
| " 1693-57 | 169.3 | " | 170 | 180 | 166 | 180 | 170 | 184 |
| | | | | | | | | |
| " 1743-57 | 174.3 | " | 175 | 185 | 171 | 185 | 175 | 189 |
| " 1793-57 | 179.3 | " | 180 | 190 | 176 | 190 | 180 | 194 |
| " 1843-57 | 184.3 | ±0.80 | 185 | 195 | 181 | 195 | 185 | 199 |
| " 1893-57 | 189.3 | " | 190 | 200 | 185 | 199 | 190 | 204 |
| " 1943-57 | 194.3 | " | 195 | 205 | 190 | 204 | 195 | 209 |
| | | | | | | | | |
| " 1993-57 | 199.3 | " | 200 | 210 | 195 | 209 | 200 | 214 |
| " 2093-57 | 209.3 | " | 210 | 220 | 205 | 219 | 210 | 224 |
| " 2193-57 | 219.3 | " | 220 | 230 | 215 | 229 | 220 | 234 |
| " 2293-57 | 229.3 | " | 230 | 240 | 225 | 239 | 230 | 244 |
| " 2393-57 | 239.3 | " | 240 | 250 | 235 | 249 | 240 | 254 |
| | | | | | | | | |
| " 2493-57 | 249.3 | " | 250 | 260 | 245 | 259 | 250 | 264 |
| " 2593-57 | 259.3 | ±1.00 | 260 | 270 | 255 | 269 | 261 | 274 |
| " 2693-57 | 269.3 | " | 270 | 280 | 265 | 279 | 271 | 285 |
| " 2793-57 | 279.3 | " | 280 | 290 | 275 | 289 | 281 | 295 |
| " 2893-57 | 289.3 | " | 290 | 300 | 285 | 299 | 291 | 305 |
| | | | | | | | | |
| " 2993-57 | 299.3 | " | 300 | 310 | 295 | 309 | 301 | 315 |
| " 3093-57 | 309.3 | ±1.50 | 310 | 320 | 305 | 319 | 311 | 325 |
| " 3193-57 | 319.3 | " | 320 | 330 | 315 | 329 | 321 | 335 |
| " 3393-57 | 339.3 | " | 340 | 350 | 335 | 349 | 341 | 355 |
| " 3593-57 | 359.3 | " | 360 | 370 | 355 | 369 | 361 | 375 |
| | | | | | | | | |
| " 3793-57 | 379.3 | " | 380 | 390 | 375 | 389 | 381 | 395 |
| " 3893-57 | 389.3 | " | 390 | 400 | 385 | 399 | 391 | 405 |
| " 3993-57 | 399.3 | " | 400 | 410 | 395 | 409 | 401 | 415 |
| " 4193-57 | 419.3 | ±2.00 | 420 | 430 | 415 | 429 | 422 | 436 |
| " 4393-57 | 439.3 | " | 440 | 450 | 435 | 449 | 442 | 456 |
| | | | | | | | | |
| " 4593-57 | 459.3 | " | 460 | 470 | 455 | 469 | 462 | 476 |
| " 4793-57 | 479.3 | " | 480 | 490 | 475 | 489 | 482 | 496 |
| " 4893-57 | 489.3 | " | 490 | 500 | 485 | 499 | 492 | 506 |
| " 4993-57 | 499.3 | " | 500 | 510 | 495 | 509 | 502 | 516 |
| | | | | | | | | |
| 8.4 ±0.15mm Diameter Section A | | | | | | | | |
| 72-1441-84* | 144.1 | ±0.60 | 145 | 160 | 140 | 160 | 145 | 165 |
| " 1491-84* | 149.1 | " | 150 | 165 | 145 | 165 | 150 | 170 |
| " 1541-84* | 154.1 | " | 155 | 170 | 150 | 170 | 155 | 175 |
| " 1591-84* | 159.1 | " | 160 | 175 | 155 | 175 | 160 | 180 |
| " 1641-84* | 164.1 | " | 165 | 180 | 160 | 180 | 165 | 185 |
| | | | | | | | | |
| " 1691-84* | 169.1 | " | 170 | 185 | 165 | 185 | 170 | 190 |
| " 1741-84* | 174.1 | " | 175 | 190 | 170 | 190 | 175 | 195 |
| " 1791-84* | 179.1 | " | 180 | 195 | 175 | 195 | 180 | 200 |
| " 1841-84* | 184.1 | ±0.80 | 185 | 200 | 180 | 200 | 185 | 205 |
| " 1891-84* | 189.1 | " | 190 | 205 | 185 | 205 | 190 | 210 |
| | | | | | | | | |
| " 1941-84* | 194.1 | " | 195 | 210 | 190 | 210 | 195 | 215 |
| " 1991-84* | 199.1 | " | 200 | 215 | 195 | 215 | 200 | 220 |
| " 2041-84* | 204.1 | " | 205 | 220 | 200 | 220 | 205 | 225 |
| " 2091-84* | 209.1 | " | 210 | 225 | 205 | 225 | 210 | 230 |
| " 2191-84* | 219.1 | " | 220 | 235 | 215 | 235 | 220 | 240 |
| | | | | | | | | |
| " 2291-84* | 229.1 | " | 230 | 245 | 225 | 245 | 230 | 250 |
| " 2341-84* | 234.1 | " | 235 | 250 | 230 | 250 | 235 | 255 |
| " 2391-84* | 239.1 | " | 240 | 255 | 235 | 255 | 240 | 260 |
| " 2491-84* | 249.1 | " | 250 | 265 | 245 | 265 | 250 | 270 |

Chart 17000: inch sizes

Refer to page 29 for List of Symbols

| INCH SIZES | | | |
|---------------------------------------------------|------------------|-----------|------------|
| James Walker Number | Dias. B, C, P, T | Tol. on B | Dias. D, Q |
| 0.063 ±0.003" Diameter Section A | | | |
| 17001 | 0.125 | ±0.004 | 0.250 |
| 17002 | 0.156 | " | 0.281 |
| 17003 | 0.188 | ±0.005 | 0.313 |
| 17004 | 0.219 | " | 0.344 |
| 17005 | 0.250 | " | 0.375 |
| 17006 | 0.281 | " | 0.406 |
| 17007 | 0.313 | " | 0.438 |
| 17008 | 0.344 | " | 0.469 |
| 17009 | 0.375 | " | 0.500 |
| 17010 | 0.406 | ±0.006 | 0.531 |
| 17011 | 0.438 | " | 0.563 |
| 17012 | 0.469 | " | 0.594 |
| 17013 | 0.500 | " | 0.625 |
| 0.094 ±0.003" Diameter Section A | | | |
| 17014* | 0.469 | ±0.006 | 0.656 |
| 17015* | 0.500 | " | 0.688 |
| 17016* | 0.531 | " | 0.719 |
| 17017* | 0.563 | " | 0.750 |
| 17018* | 0.594 | " | 0.781 |
| 17019* | 0.625 | " | 0.813 |
| 17020* | 0.656 | " | 0.844 |
| 17021* | 0.688 | " | 0.875 |
| 17022* | 0.719 | " | 0.906 |
| 17023* | 0.750 | " | 0.938 |
| 17024* | 0.781 | " | 0.969 |
| 17025* | 0.813 | ±0.008 | 1.000 |
| 17026* | 0.875 | " | 1.063 |
| 17027* | 0.938 | " | 1.125 |
| 17028* | 1.000 | " | 1.188 |



'O' ring diameter section A and inside diameter B.

| INCH SIZES | | | |
|---------------------------------------------------|------------------|-----------|------------|
| James Walker Number | Dias. B, C, P, T | Tol. on B | Dias. D, Q |
| 0.125 ±0.004" Diameter Section A | | | |
| 17029* | 1.000 | ±0.008 | 1.250 |
| 17030* | 1.063 | " | 1.313 |
| 17031* | 1.125 | " | 1.375 |
| 17032* | 1.188 | " | 1.438 |
| 17033* | 1.250 | " | 1.500 |
| 17034* | 1.313 | " | 1.563 |
| 17035* | 1.375 | " | 1.625 |
| 17036* | 1.438 | " | 1.688 |
| 17037* | 1.500 | ±0.011 | 1.750 |
| 17038* | 1.563 | " | 1.813 |
| 17039* | 1.625 | " | 1.875 |
| 17040* | 1.688 | " | 1.938 |
| 17041* | 1.750 | " | 2.000 |
| 17042* | 1.813 | " | 2.063 |
| 17043* | 1.875 | " | 2.125 |
| 17044* | 1.938 | " | 2.188 |
| 17045* | 2.000 | " | 2.250 |
| 17046* | 2.125 | " | 2.375 |
| 17047* | 2.250 | " | 2.500 |
| 17048* | 2.375 | " | 2.625 |
| 17049* | 2.500 | " | 2.750 |
| 17050* | 2.625 | " | 2.875 |
| 17051* | 2.750 | " | 3.000 |
| 17052* | 2.875 | ±0.016 | 3.125 |
| 17053* | 3.000 | " | 3.250 |

James Walker originally developed this **Chart 17000** inch range of 'O' rings for the Royal Navy. However, its popularity has led to its use in many industries, and this is reflected in it being stocked in our four most popular materials.

If the inch size you want is not available in **Chart 17000**, please check the inch columns in **Chart 50** or **Aerospace sizes to BS ISO 3601-1**.

| INCH SIZES | | | |
|---------------------------------------------------|------------------|-----------|------------|
| James Walker Number | Dias. B, C, P, T | Tol. on B | Dias. D, Q |
| 0.188 ±0.005" Diameter Section A | | | |
| 17054* | 3.000 | ±0.016 | 3.375 |
| 17055* | 3.125 | " | 3.500 |
| 17056* | 3.250 | " | 3.625 |
| 17057* | 3.375 | " | 3.750 |
| 17058* | 3.500 | " | 3.875 |
| 17059* | 3.625 | " | 4.000 |
| 17060* | 3.750 | " | 4.125 |
| 17061* | 3.875 | " | 4.250 |
| 17062* | 4.000 | " | 4.375 |
| 17063* | 4.125 | " | 4.500 |
| 17064* | 4.250 | " | 4.625 |
| 17065* | 4.375 | " | 4.750 |
| 17066* | 4.500 | " | 4.875 |
| 17067* | 4.625 | " | 5.000 |
| 17068* | 4.750 | " | 5.125 |
| 17069* | 4.875 | " | 5.250 |
| 17070* | 5.000 | " | 5.375 |
| 17071* | 5.125 | ±0.021 | 5.500 |
| 17072* | 5.250 | " | 5.625 |
| 17073* | 5.375 | " | 5.750 |
| 17074* | 5.500 | " | 5.875 |
| 17075* | 5.625 | " | 6.000 |
| 17076* | 5.750 | " | 6.125 |
| 17077* | 5.875 | " | 6.250 |
| 17078* | 6.000 | " | 6.375 |

Housing details can be referred to on pages 29-31.

* Static/dynamic applications

An asterisk symbol (*) denotes that the ring is suitable for both dynamic and static applications. Other sizes are not recommended for dynamic duties.

| INCH SIZES | | | |
|---------------------------------------------------|------------------|-----------|------------|
| James Walker Number | Dias. B, C, P, T | Tol. on B | Dias. D, Q |
| 0.250 ±0.006" Diameter Section A | | | |
| 17079* | 6.000 | ±0.021 | 6.500 |
| 17080* | 6.250 | " | 6.750 |
| 17081* | 6.500 | " | 7.000 |
| 17082* | 6.750 | " | 7.250 |
| 17083* | 7.000 | " | 7.500 |
| 17084* | 7.250 | ±0.030 | 7.750 |
| 17085* | 7.500 | " | 8.000 |
| 17086* | 7.750 | " | 8.250 |
| 17087* | 8.000 | " | 8.500 |
| 17088 | 8.250 | " | 8.750 |
| 17089 | 8.500 | " | 9.000 |
| 17090 | 8.750 | " | 9.250 |
| 17091 | 9.000 | " | 9.500 |
| 17092 | 9.250 | " | 9.750 |
| 17093 | 9.500 | " | 10.000 |
| 17094 | 9.750 | " | 10.250 |
| 17095 | 10.000 | " | 10.500 |
| 17096 | 10.250 | ±0.040 | 10.750 |
| 17097 | 10.500 | " | 11.000 |
| 17098 | 10.750 | " | 11.250 |
| 17099 | 11.000 | " | 11.500 |
| 17100 | 11.250 | " | 11.750 |
| 17101 | 11.500 | " | 12.000 |
| 17102 | 11.750 | " | 12.250 |
| 17103 | 12.000 | " | 12.500 |
| 17104 | 12.500 | " | 13.000 |
| 17105 | 13.000 | " | 13.500 |
| 17106 | 13.500 | " | 14.000 |
| 17107 | 14.000 | " | 14.500 |
| 17108 | 14.500 | " | 15.000 |
| 17109 | 15.000 | " | 15.500 |
| 17110 | 15.500 | " | 16.000 |
| 17111 | 16.000 | ±0.055 | 16.500 |
| 17112 | 16.500 | " | 17.000 |
| 17113 | 17.000 | " | 17.500 |
| 17114 | 17.500 | " | 18.000 |
| 17115 | 18.000 | " | 18.500 |
| 17116 | 18.500 | " | 19.000 |
| 17117 | 19.000 | " | 19.500 |
| 17118 | 19.500 | " | 20.000 |
| 17119 | 20.000 | ±0.075 | 20.500 |
| 17120 | 20.500 | " | 21.000 |
| 17121 | 21.000 | " | 21.500 |
| 17122 | 21.500 | " | 22.000 |
| 17123 | 22.000 | " | 22.500 |
| 17124 | 22.500 | " | 23.000 |
| 17125 | 23.000 | " | 23.500 |
| 17126 | 23.500 | " | 24.000 |
| 17127 | 24.000 | " | 24.500 |



Non-standard sizes

Methods of production

Using one of the following techniques, we are able to produce any size of 'O' ring you require.

Precision moulded

For this, our main method of production, we hold a growing inventory of over 6000 mould tools. We also have one of the largest presses of its type in Europe for moulding endless rings up to 2.2m (87 inch) diameter.

This press is used to produce high-integrity seals, including those for nuclear fuel transportation flasks. The nature of such an application demands stringent quality procedures. James Walker design technologists worked closely with our customer with this successful project.

Extruded & mould joined

This approach is particularly economical when a high degree of precision is unnecessary: for example, large diameter non-standard 'O' rings for static duties.

The ring is made from extruded cord by vulcanising the ends together in a mould tool. Rings must have a minimum section diameter of 3mm (0.12 inch) and a minimum ID of 200mm (7.9 inch). Maximum ID is unlimited.

NOTE: This method must not be confused with rings joined by contact adhesive. Generally, the use of such adhesives results in a less secure join, with operating temperature limits below that of the cord material.

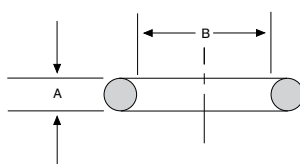
Mould & mould-joined

This method is used when the non-standard 'O' ring must have a diameter section to very close tolerances and a mould-join is acceptable.

It is often applied to sizes above 2.2m diameter, when two or more smaller rings are manufactured, then cut and mould-joined.

Tolerances for moulded 'O' rings of non-standard sizes

These tables show the tolerances on diameter section A and inside diameter B. They meet the requirements for non-standard sizes in BS ISO 3601-1.



Tolerances on Diameter Section A

| Nominal section mm / inch | | Limits mm / inch |
|------------------------------|---------------------|---------------------|
| Above | Up to and including | |
| - | 3.15 / 0.124 | ± 0.08 / 0.003 |
| 3.15 / 0.124 | 4.5 / 0.177 | ± 0.10 / 0.004 |
| 4.5 / 0.177 | 6 / 0.236 | ± 0.12 / 0.005 |
| 6 / 0.236 | 6.3 / 0.248 | ± 0.13 / 0.005 |
| 6.3 / 0.248 | 8.4 / 0.331 | ± 0.15 / 0.006 |
| 8.4 / 0.331 | 10 / 0.394 | ± 0.21 / 0.008 |
| 10 / 0.394 | 12.7 / 0.50 | ± 0.25 / 0.010 |

Tolerances on Inside Diameter B

| Internal diameter mm / inch | | Limits mm / inch |
|--------------------------------|---------------------|---------------------|
| Above | Up to and including | |
| - | 3 / 0.118 | ± 0.08 / 0.003 |
| 3 / 0.118 | 18 / 0.709 | ± 0.13 / 0.005 |
| 18 / 0.709 | 22 / 0.866 | ± 0.20 / 0.008 |
| 22 / 0.866 | 30 / 1.181 | ± 0.23 / 0.009 |
| 30 / 1.181 | 50 / 1.969 | ± 0.28 / 0.011 |
| 50 / 1.969 | 80 / 3.150 | ± 0.40 / 0.016 |
| 80 / 3.150 | 120 / 4.724 | ± 0.50 / 0.020 |
| 120 / 4.724 | 180 / 7.087 | ± 0.60 / 0.024 |
| 180 / 7.087 | 250 / 9.843 | ± 0.80 / 0.031 |
| 250 / 9.843 | 300 / 11.81 | ± 1.00 / 0.039 |
| 300 / 11.81 | 400 / 15.75 | ± 1.50 / 0.059 |
| 400 / 15.75 | 500 / 19.69 | ± 1.90 / 0.075 |
| 500 / 19.69 | 720 / 28.35 | ± 2.40 / 0.094 |
| 720 / 28.35 | 860 / 33.86 | ± 3.56 / 0.140 |
| 860 / 33.86 | 1010 / 39.76 | ± 4.06 / 0.160 |
| 1010 / 39.76 | 1165 / 45.87 | ± 4.57 / 0.180 |
| 1165 / 45.87 | 1325 / 52.17 | ± 5.08 / 0.200 |
| 1325 / 52.17 | 1700 / 66.95 | ± 6.00 / 0.236 |
| 1700 / 66.95 | - | ± 7.00 / 0.276 |

Note: For tolerances for extruded and mould-joined, and mould and mould-joined non-standard size 'O' rings, please consult our Technical Support Team.

Complementary products

Coloured materials

Where stocks of our precision-moulded 'O' rings are held by users in different black-coloured materials, it can be possible to select the wrong item for a specific application and cause an equipment malfunction.

To help overcome this, we offer the following non-black compounds:

Fluorocarbon (FKM) — green
Silicone (VMQ) — white or red.

Note that physical properties may vary from those of our standard materials. Please consult our Technical Support Team for specific recommendations.



'O' ring cord

We supply a large selection of 'O' ring cord in metric and inch cross sections in:

FR10/80 fluorocarbon (80 IRHD)
PB70 nitrile (70 IRHD)
EP21/E/80 ethylene-propylene (80 IRHD)
GN/W/70 chloroprene/neoprene (70 IRHD).

Standard cross sections:

| | |
|---------|------------|
| 1.6mm | 1/16 inch |
| 1.78mm | 0.070 inch |
| 2.0mm | 0.079 inch |
| 2.4mm | 3/32 inch |
| 2.62mm | 0.103 inch |
| 3.0mm | 0.118 inch |
| 3.18mm | 1/8 inch |
| 3.53mm | 0.139 inch |
| 4.0mm | 5/32 inch |
| 4.5mm | 0.177 inch |
| 4.76mm | 3/16 inch |
| 5.0mm | 0.197 inch |
| 5.33mm | 0.210 inch |
| 5.7mm | 0.224 inch |
| 6.0mm | 0.236 inch |
| 6.35mm | 1/4 inch |
| 6.99mm | 0.275 inch |
| 8.0mm | 5/16 inch |
| 8.73mm | 11/32 inch |
| 9.5mm | 3/8 inch |
| 10mm | 0.394 inch |
| 10.32mm | 13/32 inch |
| 11.1mm | 7/16 inch |
| 11.91mm | 15/32 inch |
| 12.7mm | 1/2 inch |



How supplied

'O' ring cord is available by the metre to any length.

Most of the elastomers and cord sizes are supplied from stock or on short lead times. Other sizes and elastomers are available on request.

All our 'O' ring cords are manufactured to BS 3734-1 and ISO 3302-1 tolerances, with Class E2 as standard.

Commercial quality 'O' rings

To complement our premium products, we supply general purpose 'commercial quality' 'O' rings for less critical duties.

These are available with:

- Competitive prices.
- Full traceability — on request.
- Wide range of materials and sizes.
- Any quantity from tens to millions.

Materials: we offer a comprehensive range including

Ethylene-propylene (EPM/EPDM)
Chloroprene/neoprene (CR)
Nitrile (NBR)
Polyurethane (AU/EU)
Silicone (VMQ)
Fluoroelastomer (FKM).

How supplied

Commercial 'O' rings are supplied to the following James Walker Chart sizes:

- JW46: covering BS 1806 & SAE AS 568.
- JW47: other metric sizes.
- JW48: metric sizes to BS4518.
- JW49: Japanese industry sizes.

Non-standard sizes are also available in commercial materials to suit specific requirements. Please contact our Technical Support Team to determine suitability.

Complementary products

'O' ring kits

These three boxed kits offer excellent value for money in terms of quantity, quality and convenience.

They are recommended for maintenance engineers and equipment refurbishers who need a good selection of nitrile (NBR) 'O' rings constantly available to suit general industrial applications.

The boxes are designed to withstand industrial maintenance activities, and have partitions to hold all items separately and securely. From the kit layouts, users can readily see when they are running low on a particular size of ring or cord.

'O' ring sealing kit — metric sizes

(JW order code ZL000186)

Box containing nitrile (NBR) elastomer rings of 70 IRHD:

- 404 rings in total.
- In 30 sizes ranging from 3mm ID x 2mm section, up to 45mm ID x 4mm section.

'O' ring sealing kit — inch sizes

(JW order code ZL000097)

Box containing nitrile (NBR) elastomer rings of 70 IRHD:

- 382 'O' rings in total.
- In 30 sizes ranging from 1/8 inch ID x 1/16 inch section, up to 1 3/4 inch ID x 3/16 inch section.

Service kit — 'O' ring cord

(JW order code ZL000275)

Box containing tools and nitrile (NBR) elastomer 'O' ring cord of 70 IRHD.

- 14 off 2m lengths: 1.78mm (0.070 inch) diameter, 2.0mm, 2.4mm, 2.62mm (0.103 inch), 3.0mm, 3.5mm, (0.138 inch), 4.0mm, 4.5mm, 5.0mm, 5.33mm (0.210 inch), 5.7mm, 6.0mm, 6.99mm (0.275 inch), 8.0mm.
- Tape measure, retractable blade knife, splicing aid, adhesive for forming rings, and full instructions.

Note: Rubber hardness values (IRHD) quoted are nominal.



Special packaging & kits

Special packaging and bagging can be provided for all our 'O' rings. These range from individual bagged rings, to complete sealing kits containing a variety of sizes and materials suitable for refurbishing a specific item of equipment.

Bags and kits can be custom-branded and over printed with dedicated part numbers to simplify ordering, stocking and issuing routines.



In addition, your company name and logo can be printed on the bag or label to provide a custom packaged kit with your own references. This will save additional repackaging if you are re-selling.

'O' ring lubricants

We recommend the following lubricants be applied lightly to 'O' rings before assembly (*but please note the important Exceptions*):

- **Molyon Grease** containing MoS₂, for operating temperatures from -20°C to +150°C.
- **Silicone Grease**, for operating temperatures from -50°C to +200°C.
- **Copper Anti-Seize Compound or Nickel Anti-Seize Compound**, for operating temperatures above +200°C.

Exceptions

DO NOT use mineral-based oil or grease, such as **Molyon** and **Anti-Seize Compounds** on seals made from natural rubber (NR), butyl (IIR) or ethylene-propylene (EPM/EPDM). Likewise, **DO NOT** use **Silicone Grease** or oil on seals made from silicone (VMQ) compounds.

General design notes

How 'O' rings work

Rubber has a very high bulk modulus and is therefore virtually incompressible. This means that an 'O' ring must be deformed on the diameter section to give it an initial sealing force within a housing (*Figure 1*).

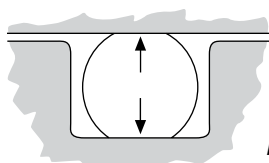


Figure 1

When system pressure is applied, the 'O' ring deforms further (*Figure 2*). But because of the initial squeeze, the sealing force always exceeds the force exerted on the 'O' ring by the system pressure.

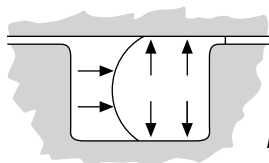


Figure 2

At higher pressures, back-up rings may be required to prevent 'O' ring extrusion (see *page 12*). Leakage problems often arise due to lack of initial squeeze, or the 'O' ring diameter section being too large for its housing.

Reciprocating applications

'O' rings marked with an asterisk (*) on our charts can be used for both static and light/medium reciprocating duties. Other sizes are not recommended for these dynamic applications.

Rotary applications

'O' rings may be used for rotating applications where peripheral speeds are low. Please contact our Technical Support Team for recommendations.

**Non-standard housing diameters**

Individual rings can be stretched or squeezed very slightly to fit housing diameters that do not match the dimensions specified on our 'O' ring size charts.

The amount of allowable deformation varies according to the application, as follows:

- **Groove in cylinder application:**
A maximum of 3 per cent squeeze is acceptable on an 'O' ring outside diameter to fit a shaft diameter C that is not covered by JW chart sizes. (See *Figs 7 & 8, page 29*.)
- **Groove in piston application:**
A maximum of 4 per cent stretch is acceptable on an 'O' ring inside diameter to fit a cylinder diameter D that is not covered by JW chart sizes. (See *Figs 9 & 10, page 29*.)
- **Flange and triangular groove applications:** A maximum of 2 per cent stretch is acceptable on an 'O' ring inside diameter when the seal is used on an external pressure flange, or housed in a triangular groove. (See *Fig 12, page 29*.)
Likewise, a maximum of 1 per cent squeeze is acceptable on an 'O' ring outside diameter when the seal is used on an internal pressure flange. (See *Fig 11, page 29*.)

Cylinder and piston housing tolerances

It is important that tolerances on housing diameters for cylinders and pistons meet the requirements of the formulae given on *page 29* (ie, dimensions C and D in *Figures 7 – 10*).

Surface finish of metal parts

For maximum seal life the surface finish of metal parts in contact with an 'O' ring should not exceed:

- 0.8 μ m (32 μ in) CLA or Ra for static parts.
- 0.4 μ m (16 μ in) CLA or Ra for moving parts.

A finish finer than 0.15 μ m (6 μ in) should be avoided in dynamic applications as a lubricating film may not be retained. For details of these finishes, please refer to BS 1134: *Assessment of surface texture*.

Diametral clearance G

Under no circumstances should the maximum total diametral clearance (G max) indicated on our housing tables (*pages 30-31*) be exceeded. This is to ensure that, if complete shaft offset occurs, the maximum extrusion gap at any point on the 'O' ring does not exceed G.

General design notes



Pressure restrictions

'O' rings are generally suitable for pressures up to 10MPa (1450psi). Where higher pressures are involved, we recommend the use of back-up rings as described on page 12.

For stuffing box applications we recommend piston-type grooves, although triangular grooves are generally acceptable for pressures below 10MPa (1450psi): see Figures 3 & 4.

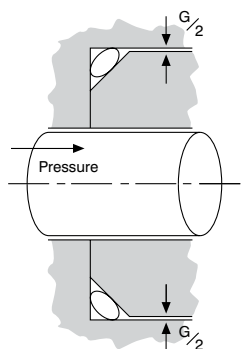


Figure 3

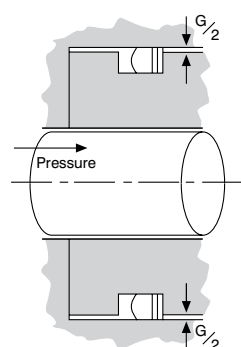


Figure 4

For flange applications, 'O' rings will normally be suitable for sealing pressures above 10MPa (1450psi) where metal-to-metal contact prevents extrusion.

Complex dynamic, high vacuum or high temperature duties

Groove dimensions quoted allow for expansion, swell and retention of interference over the longest possible seal life. However, these dimensions may not suit complex dynamic applications, static duties with high vacuum, or high temperature applications. Please contact our Technical Support Team for recommendations.

Seven useful hints

- Select the largest diameter section 'O' ring to fit the nominal groove size. This will absorb adverse tolerances in metal parts and aid durability, particularly in high temperature applications.
- Rapid gas decompression (RGD) environments are the exception — see page 11. To minimise gas permeation, the smallest possible diameter section, that does not compromise mechanical sealing efficiency, should be used. Please contact our Technical Support Team for recommendations.
- Consider how the 'O' ring will pass over other parts during assembly. Provide the lead-ins as recommended on page 29 (Figures 7 & 9), remove all burrs, and use thin fitting sleeves where appropriate.
- Smear seals lightly with a suitable lubricant before assembly (see page 26 for recommendations).
- On reciprocating applications always check whether a standard 'O' ring is suitable. Those suitable are indicated with an asterisk (*) in our product charts.
- With a cylinder or piston groove, where the 'O' ring inside diameter is less than three times the diameter section, a two-part recess — with component split at the 'O' ring housing — may be required to facilitate assembly. This is because it is impractical to stretch or squeeze the seal into position without causing damage.
- Always store 'O' rings under conditions that meet the requirements of BS ISO 2230: *Rubber products — Guidelines for storage*, or BS F 68: *Controlled storage of vulcanised rubbers for use in aerospace applications*.

Housing design

'O' ring design notes – Housings for general service

Housing arrangements

The following design descriptions and symbols are used throughout this guide

| | | | | | | | |
|----------|---------------------------------------------|------------|-------------------------------------|-----------|----------------------------------------|----------|--------------------------------------------------------------------------|
| A | 'O' ring sectional \varnothing (nominal). | G | Maximum diametral clearance. | M | Triangular groove chamfer depth/width. | T | Triangular groove inside \varnothing (Also Shaft \varnothing - C) |
| B | 'O' ring inside \varnothing (nominal). | H | Flange groove depth. | P | Flange groove inside \varnothing . | V | BS 4518 flange groove inside \varnothing . |
| C | Shaft \varnothing . | h11 | BS EN ISO 286-2 tolerance (shafts). | Q | Flange groove outside \varnothing . | W | BS 4518 flange groove outside \varnothing . |
| D | Cylinder \varnothing . | H11 | BS EN ISO 286-2 tolerance (holes). | R | Triangular groove radius (maximum). | X | Dovetail groove depth. |
| E | Groove width. | K | Minimum flange groove radial width. | R1 | Groove base corner radius (maximum). | Y | Dovetail groove radial width. |
| F | Groove radial depth. | L | Minimum spigot length. | R2 | Groove entrance corner radius. | | |

Figure 5: 'O' Ring

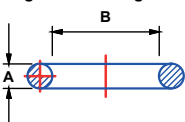
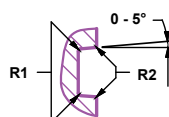
Figure 6: Groove corner radii and side tapers
(Applicable to Figures 7 to 13)

Figure 7: Groove in cylinder.

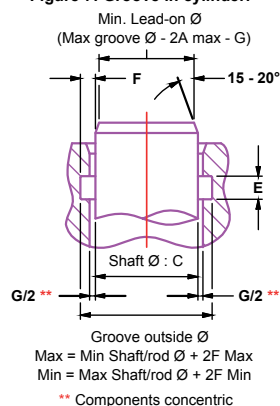
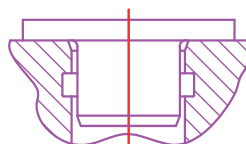
Figure 8: Plug groove in cylinder.
Terminology as for Figures 6 and 7.

Figure 9: Groove in piston.

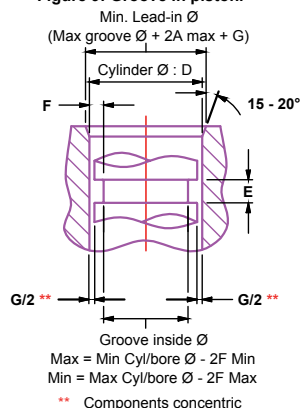
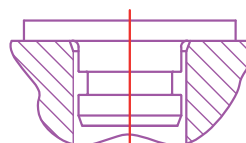
Figure 10: Plug groove in piston.
Terminology as for Figures 6 and 9

Figure 11: Groove in flange (Internal pressure)

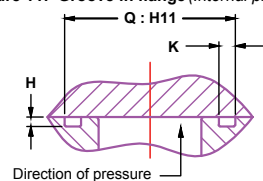


Figure 12: Groove in flange (External pressure)

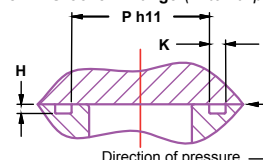


Figure 13: Groove in flange (Chart 72 only)

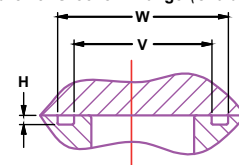
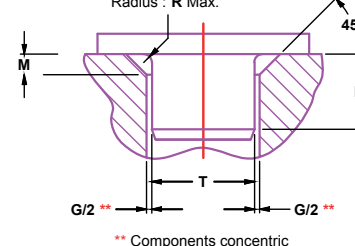
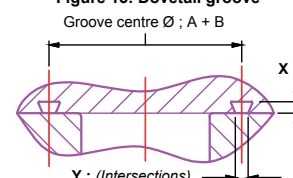
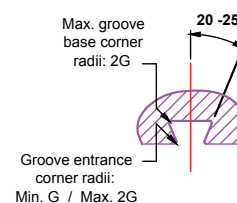
Figure 14: Triangular groove
Radius : R Max.

Figure 15: Dovetail groove

Figure 16:
Dovetail groove corner radii and side tapers
(Applicable to Figure 15)

Housing surface finish requirements.

The following details for surface finish are applicable for general duty applications only for a range of Standard JW Materials.
For specialised applications ie, cryogenic and light gases please consult JW Technology Centre for advice and recommendations.

Elastomer (rubbers & polyurethanes) materials

Static

Should not exceed 0.8 μ m Ra (32 μ in CLA).

Dynamic **

Should not exceed 0.4 μ m Ra (16 μ in CLA).

** In dynamic applications a surface finish finer than 0.15 μ m Ra (6 μ in CLA) must be avoided, as a stable lubricating film may not be established.

Thermoplastic (PTFEs etc.) materials

Static ***

0.1 to 0.8 μ m Ra (4 to 32 μ in CLA).

Dynamic ***

0.1 to 0.3 μ m Ra (4 to 12 μ in CLA).

*** Surface finishes finer than 0.1 μ m Ra (4 μ in CLA) must be avoided, particularly in dynamic applications, as a stable lubricating film may not be established.

For full details of these surface finishes please refer to **BS 1134: Assessment of surface texture**

Housing design

Figures in **red** relate to **BS 1806**, **BS 4518** and **BS 5106**. Please contact our Technical Support Team for housings to **BS ISO 3601-2**
Fluid power systems — 'O' rings — Part 2: Housing dimensions for general applications.

| Metric Groove Dimensions | | | | | | | | All dimensions in millimetres. | | | | | | | |
|--------------------------|----------------|------------|------------|----------------|-----------------------------|---------------|-------|--------------------------------|--------------|-------|--------------|-----------|-----------------|-------------|--|
| Diameter Section | Groove Width E | | | Radial Depth F | Diametrical Clearance G max | Flange Groove | | Triangular Groove | | | Groove Radii | | Dovetail Groove | | |
| A | 'O'ring only | +1 back-up | +2 back-up | | | Depth H | K min | L min | Chamfer M | R max | R1 max | R2 | Depth X | Width Y | |
| 1.0/1.02 | 1.5/1.6 | # | # | 0.81/0.86 | 0.11 | 0.7/0.8 | 1.8 | # | # | # | 0.2 | 0.11/0.22 | # | # | |
| 1.27 | 1.8/1.9 | # | # | 1.06/1.11 | 0.11 | 0.9/1.0 | 2.1 | # | # | # | 0.3 | 0.11/0.22 | # | # | |
| 1.5/1.52 | 2.1/2.2 | # | # | 1.26/1.32 | 0.12 | 1.1/1.2 | 2.4 | 3.0 | 2.08/2.20 | 0.8 | 0.3 | 0.12/0.24 | # | # | |
| 1.6 | 2.3/2.5 | 3.7/3.9 | 5.0/5.2 | 1.18/1.25 | 0.12 | 1.2/1.3 | 2.4 | 4.0 | 2.20/2.32 | 0.8 | 0.2 | 0.20/0.40 | 1.37/1.43 | 1.34/1.40 | |
| 1.78 | 2.3/2.5 | 3.8/3.9 | 5.3/5.4 | 1.52/1.57 | 0.13 | 1.3/1.5 | 2.4 | 4.8 | 2.41/2.54 | 0.8 | 0.8 | 0.13/0.25 | 1.50/1.56 | 1.50/1.56 | |
| 2.0 | 2.6/2.7 | 4.1/4.2 | 5.6/5.7 | 1.72/1.79 | 0.12 | 1.6/1.7 | 2.8 | 4.0 | 2.71/2.83 | 1.0 | 0.4 | 0.12/0.24 | 1.65/1.72 | 1.70/1.77 | |
| 2.4 | 3.2/3.4 | 4.6/4.8 | 6.0/6.2 | 1.97/2.09 | 0.14 | 1.7/1.8 | 3.7 | 5.0 | 3.30/3.42 | 1.3 | 0.5 | 0.20/0.40 | 1.96/2.04 | 2.05/2.13 | |
| 2.5 | 3.2/3.3 | 4.7/4.8 | 6.2/6.3 | 2.17/2.25 | 0.13 | 2.0/2.1 | 3.4 | 5.0 | 3.46/3.59 | 1.3 | 0.5 | 0.13/0.26 | 2.05/2.13 | 2.15/2.23 | |
| 2.62 | 3.5/3.7 | 5.0/5.1 | 6.5/6.6 | 2.31/2.39 | 0.13 | 2.1/2.3 | 3.6 | 6.4 | 3.68/3.81 | 1.0 | 0.8 | 0.13/0.25 | 2.16/2.24 | 2.26/2.34 | |
| 3.0 | 4.0/4.2 | 5.4/5.6 | 6.8/7.0 | 2.50/2.65 | 0.15 | 2.2/2.3 | 4.5 | 6.0 | 4.20/4.32† | 2.0 | 1.0 | 0.20/0.40 | 2.46/2.55† | 2.58/2.67 | |
| 3.5/3.53 | 4.7/4.9 | 6.2/6.4 | 7.7/7.9 | 3.10/3.18 | 0.15 | 2.8/3.0 | 4.8 | 7.9 | 4.95/5.08† | 1.5 | 0.8 | 0.13/0.25 | 2.89/2.99† | 3.03/3.13 | |
| 4.0 | 5.1/5.3 | 6.6/6.8 | 8.1/8.3 | 3.52/3.62 | 0.15 | 3.2/3.4 | 5.5 | 8.0 | 5.75/5.90 | 2.0 | 0.8 | 0.15/0.30 | 3.32/3.42† | 3.48/3.58 | |
| 4.1 | 5.5/5.7 | 7.1/7.3 | 8.7/8.9 | 3.50/3.67 | 0.16 | 3.1/3.2 | 6.0 | 8.0 | 5.60/5.72† | 2.5 | 1.0 | 0.20/0.40 | 3.39/3.50† | 3.59/3.70 | |
| 4.5 | 5.8/6.0 | 7.6/7.8 | 9.4/9.6 | 3.96/4.07 | 0.16 | 3.7/3.9 | 6.0 | 9.0 | 6.45/6.61 | 2.3 | 0.9 | 0.16/0.32 | 3.74/3.85† | 3.92/4.03 | |
| 5.0 | 6.4/6.6 | 8.2/8.4 | 10.0/10.2 | 4.42/4.54 | 0.16 | 4.1/4.3 | 6.7 | 10.0 | 7.18/7.34 | 2.5 | 1.0 | 0.16/0.32 | 4.23/4.35 | 4.37/4.49 | |
| 5.33 | 7.0/7.2 | 8.8/9.0 | 10.6/10.8 | 4.67/4.78 | 0.18 | 4.3/4.5 | 7.1 | 11.1 | 7.49/7.62 | 2.3 | 0.8 | 0.13/0.25 | 4.54/4.67 | 4.64/4.77 | |
| 5.7 | 7.5/7.7 | 9.3/9.5 | 11.1/11.3 | 4.95/5.18 | 0.18 | 4.4/4.5 | 8.1 | 10.0 | 7.80/7.92† | 3.0 | 1.0 | 0.20/0.40 | 4.80/4.94 | 4.98/5.12 | |
| 6.0 | 7.8/8.0 | 9.6/9.8 | 11.4/11.6 | 5.31/5.45 | 0.18 | 5.0/5.2 | 7.9 | 12.0 | 8.64/8.82 | 3.0 | 1.2 | 0.18/0.36 | 5.02/5.16 | 5.25/5.39 | |
| 6.99/7.0 | 9.4/9.6 | 12.0/12.2 | 14.6/14.8 | 6.22/6.35 | 0.20 | 5.9/6.1 | 9.4 | 14.3 | 10.03/10.16 | 2.5 | 0.8 | 0.13/0.25 | 5.85/6.01 | 6.12/6.28 | |
| 8.0 | 10.7/10.9 | 13.3/13.5 | 15.9/16.1 | 7.09/7.27 | 0.20 | 6.7/6.9 | 10.6 | 16.0 | 11.61/11.81 | 4.0 | 1.6 | 0.20/0.40 | 6.70/6.88 | 7.01/7.19 | |
| 8.4 | 11.0/11.2 | 13.6/13.8 | 16.2/16.4 | 7.50/7.75 | 0.20 | 6.6/6.7 | 12.0 | 14.0 | 11.50/11.62† | 4.0 | 1.0 | 0.20/0.40 | 7.02/7.21 | 7.34/7.53 | |
| 9.0 | 12.3/12.5 | 15.6/15.8 | 18.9/19.1 | 7.97/8.17 | 0.21 | 7.5/7.7 | 12.1 | 18.0 | 13.08/13.29 | 4.5 | 1.8 | 0.21/0.42 | 7.54/7.74 | 7.89/8.09 | |
| 9.5/9.53 | 13.1/13.3 | 16.4/16.6 | 19.7/19.9 | 8.43/8.64 | 0.22 | 8.0/8.2 | 12.7 | 19.0 | 13.83/14.05 | 4.8 | 1.9 | 0.22/0.44 | 7.97/8.18 | 8.34/8.55 | |
| 10.0 | 13.8/14.0 | 17.1/17.3 | 20.4/20.6 | 8.89/9.10 | 0.23 | 8.4/8.6 | 13.3 | 20.0 | 14.58/14.81 | 5.0 | 2.0 | 0.23/0.46 | 8.41/8.62 | 8.80/9.01 | |
| 12.5/12.7 | 18.5/18.8 | 21.8/22.1 | 25.1/25.4 | 11.13/11.39 | 0.26 | 10.5/10.8 | 17.4 | 25.0 | 18.30/18.56 | 6.3 | 2.5 | 0.26/0.52 | 10.52/10.78 | 11.01/11.27 | |

| Inch Groove Dimensions | | | | | | | | All dimensions in inches. | | | | | | |
|------------------------|----------------|--------------|------------|----------------------|-----------------------------------|---------------|---------|---------------------------|------------|-----------|--------------|-----------|-----------------|-----------|
| Diameter Section | Groove Width E | | | Radial Depth F | Diametrical Clearance G max | Flange Groove | | Triangular Groove | | | Groove Radii | | Dovetail Groove | |
| | A | 'O'ring only | +1 back-up | | | +2 back-up | Depth H | K min | L min | Chamfer M | R max | R1 max | R2 | Depth X |
| 0.040 | .059/.063 | # | # | .032/.034 | .004 | .028/.032 | .068 | # | # | # | .008 | .004/.008 | # | # |
| 0.050 | .069/.073 | # | # | .042/.044 | .004 | .037/.041 | .078 | # | # | # | .010 | .004/.008 | # | # |
| 0.060 | .080/.085 | # | # | .051/.053 | .005 | .045/.050 | .091 | .120 | .082/.087 | .030 | .012 | .005/.010 | # | # |
| 0.063 | .084/.089 | .142/.147 | .200/.205 | .053/.055 | .005 | .047/.052 | .094 | .125 | .086/.091 | .031 | .013 | .005/.010 | .054/.056 | .053/.055 |
| 0.070 | .089/.099 | .147/.152 | .205/.210 | .060/.062 | .005 | .051/.061 | .095 | .188 | .095/.100 | .030 | .030 | .005/.010 | .059/.062 | .059/.062 |
| 0.094 | .121/.126 | .179/.184 | .237/.242 | .081/.084 | .005 | .075/.080 | .129 | .188 | .129/.134 | .047 | .019 | .005/.010 | .077/.080 | .080/.083 |
| 0.103 | .136/.146 | .194/.199 | .252/.257 | .091/.094 | .005 | .081/.091 | .140 | .250 | .145/.150 | .040 | .030 | .005/.010 | .085/.088 | .089/.092 |
| 0.125 | .159/.164 | .217/.222 | .275/.280 | .110/.114 | .005 | .102/.107 | .168 | .250 | .183/.188 | .063 | .025 | .005/.010 | .103/.107† | .107/.111 |
| 0.139 | .183/.193 | .241/.247 | .299/.305 | .122/.125 | .006 | .110/.120 | .190 | .313 | .195/.200† | .060 | .030 | .005/.010 | .115/.119† | .120/.124 |
| 0.188 | .240/.246 | .312/.318 | .384/.390 | .166/.171 | .006 | .155/.161 | .248 | .375 | .269/.275 | .094 | .038 | .006/.012 | .156/.161† | .163/.168 |
| 0.210 | .276/.286 | .348/.355 | .420/.427 | .184/.188 | .007 | .170/.180 | .280 | .438 | .295/.300 | .090 | .030 | .005/.010 | .179/.184 | .183/.188 |
| 0.250 | .328/.335 | .430/.437 | .532/.539 | .221/.227 | .007 | .207/.214 | .333 | .500 | .360/.367 | .125 | .050 | .007/.014 | .208/.214 | .218/.224 |
| 0.275 | .370/.380 | .472/.480 | .574/.582 | .245/.250 | .008 | .231/.241 | .370 | .563 | .395/.400 | .100 | .030 | .005/.010 | .230/.236 | .241/.247 |
| 0.375 | .514/.523 | .644/.653 | .774/.783 | .333/.341 | .009 | .314/.323 | .501 | .750 | .545/.554 | .188 | .075 | .009/.018 | .315/.323 | .329/.337 |
| 0.500 | .718/.728 | .848/.858 | .978/.988 | .446/.456 | .010 | .421/.431 | .674 | 1.000 | .733/.743 | .250 | .100 | .010/.020 | .421/.431 | .441/.451 |

Key: [Chart 50](#) [Chart 72](#) [Chart 17000](#)

Diameter section A indicated is too small for this groove type.

† These dimensions can be used only with moulded 'O' rings. Use tables for *Triangular groove sizes* and *Dovetail groove sizes* on page 31 for 'O' rings manufactured by other methods.

Housing design

BS EN ISO 286-2 Limits and Fits**Extract** (See Figures 11 – 13, page 29)

| Nom. | Diameter | Tolerance | |
|-------|---------------------|-----------|-----------|
| Above | up to and including | H11 | h11 |
| - | 3 | +0/+0.060 | -0/-0.060 |
| 3 | 6 | +0/+0.075 | -0/-0.075 |
| 6 | 10 | +0/+0.090 | -0/-0.090 |
| 10 | 18 | +0/+0.110 | -0/-0.110 |
| 18 | 30 | +0/+0.130 | -0/-0.130 |
| 30 | 50 | +0/+0.160 | -0/-0.160 |
| 50 | 80 | +0/+0.190 | -0/-0.190 |
| 80 | 120 | +0/+0.220 | -0/-0.220 |
| 120 | 180 | +0/+0.250 | -0/-0.250 |
| 180 | 250 | +0/+0.290 | -0/-0.290 |

continued

| Nom. | Diameter | Tolerance | |
|-------|---------------------|-----------|-----------|
| Above | up to and including | H11 | h11 |
| 250 | 315 | +0/+0.320 | -0/-0.320 |
| 315 | 400 | +0/+0.360 | -0/-0.360 |
| 400 | 500 | +0/+0.400 | -0/-0.400 |
| 500 | 630 | +0/+0.440 | -0/-0.440 |
| 630 | 800 | +0/+0.500 | -0/-0.500 |
| 800 | 1000 | +0/+0.560 | -0/-0.560 |
| 1000 | 1250 | +0/+0.660 | -0/-0.660 |
| 1250 | 1600 | +0/+0.780 | -0/-0.780 |
| 1600 | 2000 | +0/+0.920 | -0/-0.920 |
| 2000 | 2500 | +0/+1.100 | -0/-1.100 |
| 2500 | 3150 | +0/+1.350 | -0/-1.350 |

All dimensions in millimetres

For 'O' rings manufactured by extrusion

Triangular Groove Sizes

| Diameter Section A | Triangular Chamfer M |
|--------------------|----------------------|
| Metric (mm) | |
| 3.0 | 4.48/4.63 |
| 3.5/3.53 | 5.10/5.25 |
| 4.1 | 6.00/6.16 |
| 5.7 | 8.18/8.36 |
| 8.4 | 12.18/12.38 |
| Inch | |
| 0.139 | .201/.207 |

Dovetail Groove Sizes

| Diameter Section A | Dovetail Depth X |
|--------------------|------------------|
| Metric (mm) | |
| 3.0 | ¥ |
| 3.5/3.53 | ¥ |
| 4.0 | 3.48/3.58 |
| 4.1 | 3.59/3.70 |
| 4.5 | 3.88/3.99 |
| Inch | |
| 0.125 | ¥ |
| 0.139 | ¥ |
| 0.188 | .159/.164 |

¥ 'O' rings not suitable for dovetail grooves.

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Health warning: If PTFE or fluoroelastomer (eg, FKM, FFKM, FEPM) products are heated to elevated temperatures, fumes will be produced which may give unpleasant effects, if inhaled. Whilst some fumes are emitted below 250°C from fluoroelastomers or below 300°C from PTFE, the effect at these temperatures is negligible. Care should be taken to avoid contaminating tobacco with particles of PTFE or fluoroelastomer, or with PTFE dispersion, which may remain on hands or clothing. Material Safety Data Sheets (MSDS) are available on request.

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