5

密封垫片
GASKETS

金属缠绕垫片

SPIRAL WOUND GASKETS

A requirement of any gasket is the ability to recover under variable loads. The effects of pressure and temperature fluctuations, the temperature difference across the flange face, together with flange rotation, bolt stress relaxation and creep, demand a gasket with adequate flexibility and recovery to maintain a seal under variable and uneven loading. The spiral wound gasket, invented by Flexitallic, meets these requirements.

A spiral wound gasket is manufactured by spirally winding a preformed metal strip and a filler on the outer periphery of metal winding mandrels. The winding mandrel outside diameter forms the inner diameter of the gasket and the laminations are continually wound until the required outer diameter is attained. Normal practice is to reinforce the inner and outer diameters with several plies of metal with no soft fillers being introduced. Our method of manufacture includes custom designed devices which provide control of gasket density that permit compression to the operating thickness under a specified load. This engineered product is thus "tailor made" to be compatible with the flanged closure in which it is to be used. For example, a closure designed for vacuum service may require a gasket of exactly the same dimensions as a closure designed for 1500 psi service. The closure designed for the vacuum service would have relatively light bolting indicating the necessity for a soft gasket, while the 1500 psi application would have heavy bolting indicating a relatively dense gasket. It is usually within our capability to satisfy both requirements.

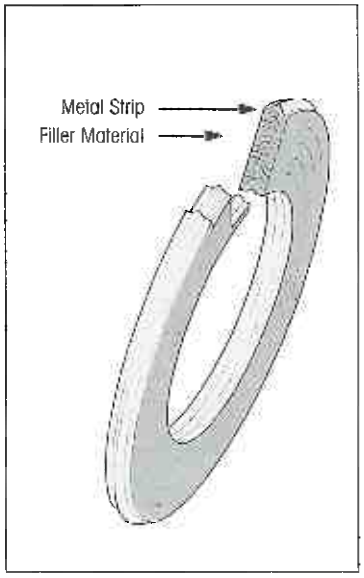
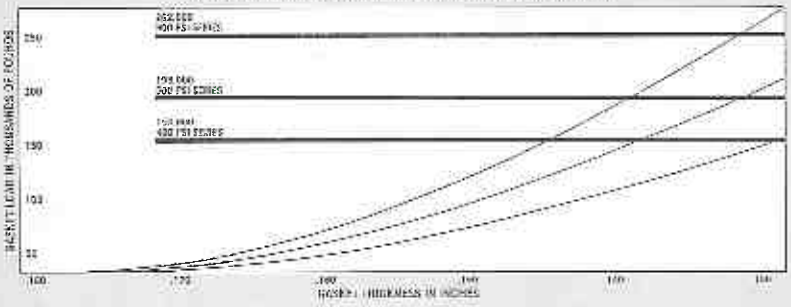
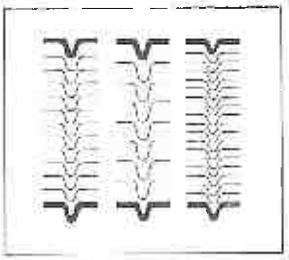


CHART NO. 1
GASKET COMPRESSION CHARACTERISTICS





GASKET DENSITY

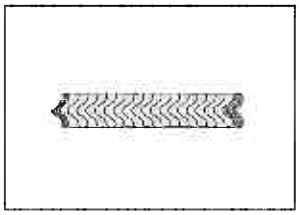
The service conditions under which a FLEXITALLIC spiral wound gasket is expected to hold its seal dictate the density of the gasket. Gaskets that have identical inside and outside diameters can be either hard or soft as shown on the left. The available compressive force is the basis for calculating the density of the gasket structure to support resulting bolting loads.

金属缠绕垫片

SPIRAL WOUND GASKETS

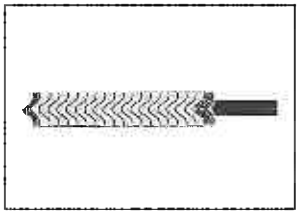
STYLE R

Basic construction type, inner and outer diameters are reinforced with several plies of metal without filler to give greater stability and better compression characteristics.
Suitable for tongue and groove or male and female or grooved to flat face flange assemblies.



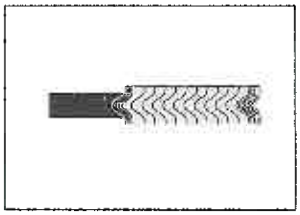
STYLE RIR

Solid inner metal ring acts as a compression stop and fills the annular space between flange bore and the inside diameter. Designed to prevent accumulation of solids, reduce turbulent flow of process fluids and minimize erosion of flange faces.
Suitable for male and female pipe flanges.



STYLE CG

Utilizes an external ring which accurately centres gasket on flange face; provides additional radial strength to prevent gasket blow-out and acts as a compression stop. A general purpose gasket suitable for use with flat face and raised face flanges.
Class 900 and above an internal ring is recommended.

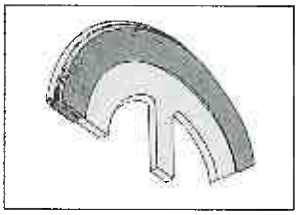


STYLE CGI

A Style CG gasket fitted with internal ring which gives an additional compression limiting stop and provides heat and corrosion barrier protecting gasket windings and preventing flange erosion. Suitable for use with flat face and raised face flanges and specified for high pressure/temperature service - class 900 and above or where corrosive or toxic media are present.

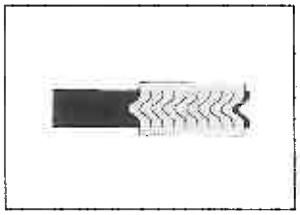
STYLE HX-RIR

The style HX-RIR is a variation of the style "RIR" spiral wound gasket, developed for use on heat exchanger TEMA type flange arrangements. In conjunction with an inner ring,the standard spiral wound construction also supports an outer wound steel nose, designed for the purpose of accurate gasket location. Available with or without pass partition bars.



STYLE LS*

ANOTHER NEW DEVELOPMENT FROM FLEXITALLIC. The style LS spiral wound gasket has been engineered by Flexitallic to provide an alternative to sheet gaskets in Class 150 and Class 300 service. Style LS gaskets have the inherent strength, resiliency and blowout resistance of spiral wound gaskets, yet require low bolt load for seating. They are manufactured with high purity Flexicarb flexible graphite filler or PTFE filler for optimum sealability, and are available for the full range of standard Class 150 and Class 300 flanges, as well as other non-standard low pressure flanges. Style LS gaskets are a safe, economical alternative to tanged flexible graphite gaskets.
*PATENT PENDING. * US PATENT 5161807. See page 36 for further details.



金属缠绕垫片

SPIRAL WOUND GASKETS

SPIRAL WOUND GASKET MATERIALS

METAL WINDING STRIP

Type 316L stainless steel
Type 304 stainless steel
Type 304L stainless steel
Type 309 stainless steel
Type 310 stainless steel
Type 316Ti stainless steel
Type 321 stainless steel
Type 347 stainless steel
Type 430 stainless steel
Type 17-7 PH stainless steel
Alloy 20
Monel*
Inconel 600*
Inconel 625*
Inconel X-750*
Hastelloy B2*
Hastelloy C276*
Incoloy 800*
Incoloy 825*
Titanium*
Nickel 200*
Duplex
Zirconium*
Tantalum*
Copper
Brass-Bronze
Carbon steel

Full details of specific materials are specified in the Metallic Gasket Materials selection of this publication See page 76

FILLER MATERIALS

FLEXICARB®

FLEXICARB is high purity flexible graphite with no binders or fillers. It exhibits superior sealability, and excellent resistance to a wide range of chemicals. FLEXICARB can be used at temperatures from cryogenics to 500 deg C (900 deg F) in an oxidising atmosphere, and up to 3300 deg C (6000 deg F) in a reducing or neutral atmosphere. Its unique combination of low permeability, inherent lubricity, and compressibility make FLEXICARB suitable for critical gas and vacuum service. Leachable chloride content of FLEXICARB is 100 ppm maximum. Available in standard, nuclear or corrosion inhibitor grades.

FLEXITE ™ SUPER

Thoroughly researched and developed by Flexitallic to meet industry's demand for an alternative to asbestos filled spiral-wound gaskets, and available only from Flexitallic. FLEXITE SUPER has temperature and chemical resistance similar to asbestos, while exhibiting superior sealability over asbestos-filled spiral-wound gaskets. It is available in all sizes, styles and pressure ratings, with compressibility and recovery characteristics equivalent to asbestos-filled spiral-wound gaskets. FLEXITE SUPER has been field-tested and proven, and can be used from cryogenics to temperatures in excess of 450 deg C (842 deg F) in steam, hydrocarbons, heat transfer fluids, alkaline solutions, solvents, aqueous and salt solutions, fuel oil, hydraulic oil, halogens, and general service in mild acids. FLEXITE SUPER is tested for leachable chlorides and meets the 200 parts per million requirements for total soluble chlorides.

金属缠绕垫片

SPIRAL WOUND GASKETS

SPIRAL WOUND GASKET FILLER MATERIALS

POLYTETRAFLUOROETHYLENE (PTFE)

PTFE is used as a filler material in FLEXITALLIC gaskets where extreme chemical inertness is required for temperatures ranging from cryogenic to 250 deg C (482 deg F). PTFE is unaffected by any known chemicals except molten alkali metals and fluorine precursors. Because of its low permeability, PTFE is also frequently used as a filler material on FLEXITALLIC gaskets in vacuum applications. Gaskets wound with PTFE should be fully confined either by fitting in a groove or providing both an external and internal ring.

CERAMIC FIBER PAPER

Consists of aluminium silicate fiber with an organic binder. This material has excellent high temperature stability to 1250 deg C (2300 deg F). It resists attack from most corrosive agents (except hydrofluoric and phosphoric acids) as well as concentrated alkalies.

ASBESTOS FILLERS

Although less commonly specified than FLEXITE SUPER and FLEXICARB fillers, a wide range of asbestos filler materials are available as follows: blue-dyed Canadian asbestos paper (Chrysotile) with a vegetable rubber latex binder content of 7%; compressed asbestos fiber (CAF) with a combination NR and SBR binder content of 12%, and various compressed asbestos sheet packings utilizing Buna S, Neoprene, or Buna N as a binder. FLEXITALLIC U.S. operations no longer supply asbestos filled spiral wound gaskets.

GASKET IDENTIFICATION GUIDE RING COLOUR CODING - COLOUR CODING FOR THE GASKETS YOU NEED

Gaskets are colour coded to help expedite the selection and identity of the gaskets you need. The colour of the outside edge of the centering ring identifies both the winding and filler materials. The metallic winding material is designated by a solid colour. The filler materials (except for Canadian asbestos) are designated by colour stripes at equal intervals on the outside edge of the centering ring. The Flexitallic colour code meets the industry standard for metal and filler materials which has been adopted by ASME B16.20 and the Metallic Gasket division of the Fluid Sealing Association.

METALLIC WINDING MATERIALS

MATERIAL	ABBREVIATION	COLOUR CODE
Carbon Steel	CRS	Silver
304 SS	304	Yellow
316 L SS	316 L	Green
316 Ti SS	316 Ti	Light Blue*
347 SS	347	Blue
321 SS	321	Turquoise
Monel 400®	MON	Orange
Nickel 200®	NI	Red
Titanium	TI	Purple
Alloy 20 (Carpenter 20)®	A-20	Black
Hastelloy B2®	HAST B	Brown
Hastelloy C276®	HAST C	Beige
Inconel 600®	INC 600	Gold
Inconel 625®	INC 625	Gold
Inconel X-750®	INC X 750	Light Grey*
Incoloy 800®	INC 800	White
Incoloy 825®	INC 825	White

*Note: these steels are not covered by ASME. Specified colours are chosen by Flexitallic to aid material identification.

NON-METALLIC MATERIALS

MATERIAL	ABBREVIATION	COLOUR CODE
Blue Dyed or White Chrysotile Asbestos	ASB	No Stripe
Teflon® (Poly-tetrafluorethylene)	PTFE	White Stripe
Flexite® Super	FLEXITE® SUPER	Pink Stripe
Flexicarb® (Flexible Graphite)	FLEXICARB®	Grey Stripe
Ceramic	CER	Light Green Stripe

石墨密封材料

FLEXICARB® GRAPHITE SEALING MATERIAL

Flexicarb is without doubt the premier sealing material on the market today. This pure exfoliated material provides excellent sealing characteristics, exhibiting outstanding chemical resistance, thermal stability and physical characteristics.

Flexicarb is a totally non - toxic graphite composition comprising in it's standard form of 95% or 98% carbon with no binder, respirable fibres, lubricating agent or additive.

THE PREMIER SEAL

Flexicarb's ability to flow into flange imperfections, self lubricating structure, exceptional chemical stability and temperature resistance make it the premier choice of sealing material in a wide range of Flexitallic products.

TYPICAL PROPERTIES - FLEXICARB (98%)

Melting Point:	3650 deg C (6602 deg F)
Tensile Strength:	6.5MN/m2 (800 p.s.i.)
Ash Content:	2%
Leachable Chloride ion content:	50 p.p.m. (Certificate on request)
Leachable Fluoride ion content:	50 p.p.m. (Certificate on request)
Temperature Range:	
Inert or Reducing atmospheres:	Cryogenic to 3,000 deg C (5400 deg F)
Oxidising atmospheres:	Cryogenic to 500 deg C (930 deg F)
Gas Permeability:	< 10-6 cm²/s
Specific Electrical Resistance:	
Parallel to surface:	10 Ω mm²/m
Perpendicular to surface:	600 Ω mm²/m
Thermal Conductivity:	
Parallel to surface:	220W/mK
Perpendicular to surface:	7W/mK

TEMPERATURE RESISTANCE

Flexicarb covers a wide temperature spectrum, from cryogenics through to elevated temperatures. Flexicarb can also be supplied with an inorganic passivating inhibitor to increase it's oxidation and corrosion resistance.

CHEMICAL STABILITY

The high purity Flexicarb is chemically inert to most medias, allowing for it's choice on the most critical of applications. (Please note it's limitations on oxidising compounds.)

NUCLEAR GRADE

For nuclear applications, Flexicarb is also available in a high purity 99.9% grade.

石墨密封垫片适用於多种化学原料

FLEXICARB® GRAPHITE SEALING MATERIAL

TABLE 4

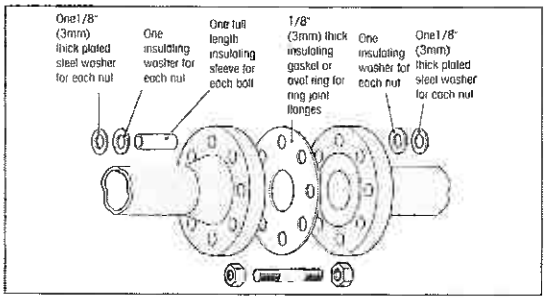
COMPATIBILITY OF CHEMICALS WITH FLEXICARB® FOIL

CHEMICAL	CONCENTRATION (% W/W) MAX.	FLUID TEMPERATURE
WATER		
BOILER FEED	ALL	500 deg C (932 deg F)
CONDENSATE	ALL	500 deg C (932 deg F)
SEA	ALL	500 deg C (932 deg F)
STEAM		
SATURATED	ALL	500 deg C (932 deg F)
SUPERHEATED	ALL	500 deg C (932 deg F)
ACIDS		
ACETIC ACID	ALL	500 deg C (932 deg F)
BORIC ACID	ALL	500 deg C (932 deg F)
CARBONIC ACID	ALL	500 deg C (932 deg F)
CITRIC ACID	ALL	500 deg C (932 deg F)
FORMIC ACID	ALL	500 deg C (932 deg F)
HYDROBROMIC ACID	ALL	500 deg C (932 deg F)
HYDROCHLORIC ACID	ALL	500 deg C (932 deg F)
HYDROFLUORIC ACID	ALL	500 deg C (932 deg F)
HYDROGEN CHLORIDE	ALL	500 deg C (932 deg F)
OXALIC ACID	ALL	500 deg C (932 deg F)
STEARIC ACID	ALL	500 deg C (932 deg F)
SULPHUR DIOXIDE	ALL	500 deg C (932 deg F)
ALKALIS		
AMMONIUM HYDROXIDE	ALL	500 deg C (932 deg F)
SODIUM HYDROXIDE	ALL	500 deg C (932 deg F)
POTASSIUM HYDROXIDE	ALL	500 deg C (932 deg F)
ORGANIC COMPOUNDS		
ACETONE	ALL	500 deg C (932 deg F)
ALCOHOL	ALL	500 deg C (932 deg F)
BENZENE	ALL	500 deg C (932 deg F)
BENZYL SULPHONIC ACID	ALL	500 deg C (932 deg F)
CARBON TETRACHLORIDE	ALL	500 deg C (932 deg F)
ETHYL CHLORIDE	ALL	500 deg C (932 deg F)
FATTY ACIDS	ALL	500 deg C (932 deg F)
FOLIC ACID	ALL	500 deg C (932 deg F)
GASOLINE	ALL	500 deg C (932 deg F)
KEROSENE	ALL	500 deg C (932 deg F)
MONOCHLOROBENZENE	ALL	500 deg C (932 deg F)
TRICHLOROETHYLENE	ALL	500 deg C (932 deg F)
HEAT TRANSFER FLUIDS		
DOWTHERM A	ALL	500 deg C (932 deg F)
MOBILTHERM	ALL	500 deg C (932 deg F)
PETROLEUM BASED	ALL	500 deg C (932 deg F)
THERMINOL-A	ALL	500 deg C (932 deg F)
SALT SOLUTIONS		
ALUM	ALL	500 deg C (932 deg F)
ALUMINIUM CHLORIDE	ALL	500 deg C (932 deg F)
AMMONIUM SULPHATE	ALL	500 deg C (932 deg F)
AMMONIUM THIOCYANATE	ALL	500 deg C (932 deg F)
CUPRIC CHLORIDE	ALL	500 deg C (932 deg F)
FERRIC CHLORIDE	ALL	500 deg C (932 deg F)
FERROUS SULPHATE	ALL	500 deg C (932 deg F)
NICKEL CHLORIDE	ALL	500 deg C (932 deg F)
STANNIC CHLORIDE	ALL	500 deg C (932 deg F)
ZINC SULPHATE	ALL	500 deg C (932 deg F)

When assessing the chemical compatibility of Flexicarb laminates, one must ensure that compatibility of the reinforcement is also considered.

绝缘垫片

INSULATING SETS

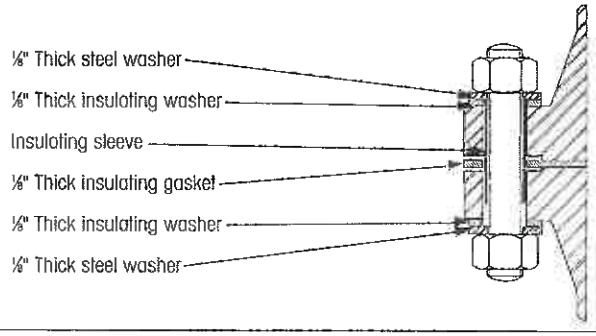


Insulating sets comprise of a phenolic laminate or neoprene faced phenolic laminate gasket (style NCA and NCB only) which is located between the flange sealing faces, phenolic laminate bolt sleeves, two insulating washers per bolt for maximum protection and two plated mild steel washers per bolt. Stainless steel washers can be supplied upon request.

Insulating sets are essentially used for pipeline flange corrosion protection, where a seal is required between dissimilar flange materials. The use of dissimilar metallic flanges with a conductive gasket material accompanied with a suitable electrolyte may set up a galvanic cell which will corrode the anodic metal. Insulating sets are also used to electrically isolate flange joints, preventing the flow of electrostatic charge along pipelines.

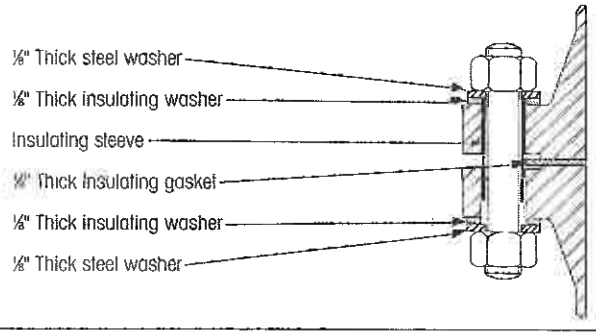
There are three standard styles of insulating sets available to suit raised face, flat face and ring grooved flanges, as follows;

STANDARD STYLES



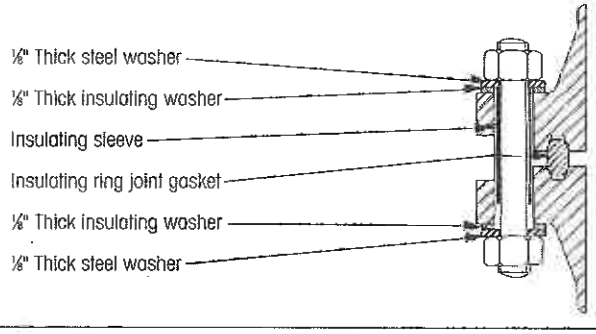
Style NCA

Full Face Gasket Insulating Set Assembly
Suitable for flat face and raised face flanges. This style minimises the ingress of conductive foreign matter between the portion of the flanges outside the raised faces and reduces the risk of bridging.



Style NCB

Inside Bolt Location Gasket Insulating Set Assembly
Utilises a central gasket which locates within the bolts.



Style NCC

Ring Joint Gasket Insulating Set Assembly
Insulating oval section ring joint will fit into a standard RTJ flange ring groove.

绝缘垫片

INSULATING GASKETS

It is also recommended that for complete electrical insulation protection, that self adhesive tape is wrapped around the outside diameter of the flange, to prevent the ingress of foreign matter.

With style NCA and NCB insulating sets, it is imperative that the bore of the gasket is equal to that of the pipe. This prevents foreign matter from accumulating is the annular space between the bore of the gasket and the bore of the pipe thus preventing bridging.

TYPICAL PROPERTIES

The phenolic laminate possesses good electrical insulating properties and corrosion resistance. Typical properties for 3 mm thick plain phenolic laminates are as follows;

Maximum Compressive Stress Flatwise	315 MPa (45,700 psi)
Electric Strength, Flatwise in oil at 90 deg C (190 deg F)	23 kV/cm (58 kV/in)
Maximum operating temperature	120 deg C (250 deg F)
Minimum operating temperature	-60 deg C (-76 deg F)

As standard Flexitallic insulating kits are dimensioned to suit schedule 80 pipe nominal wall thickness.

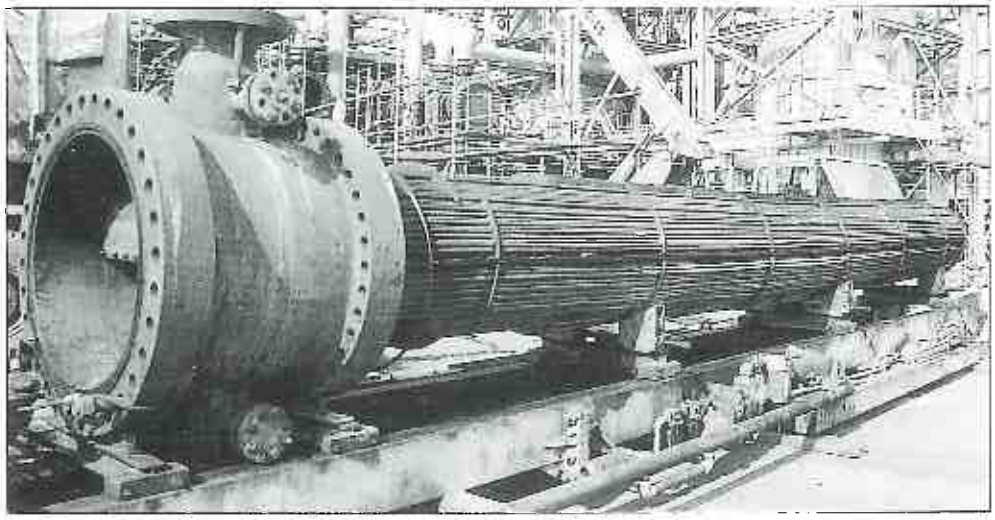
Insulating sets are suitable for use on standard and non-standard flange assemblies for pressure ratings up to and inclusive of class 2500.

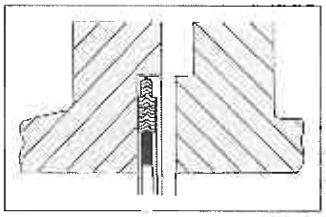
TYPICAL APPLICATIONS

Offshore installations, sea water environments, hydrocarbon service, chemical installations, oil refining pipeline applications requiring galvanic corrosion protection and electrical insulation.

换热器密封垫片

SPECIAL HEAT EXCHANGER GASKETS



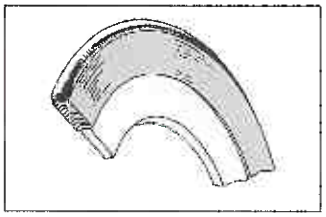


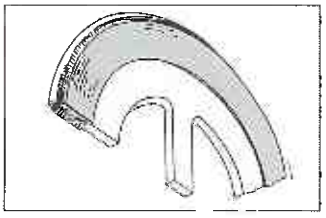
HX-RIR SPIRAL WOUND GASKETS
(ALTERNATIVES HE, HE-CG, HE-CGI)

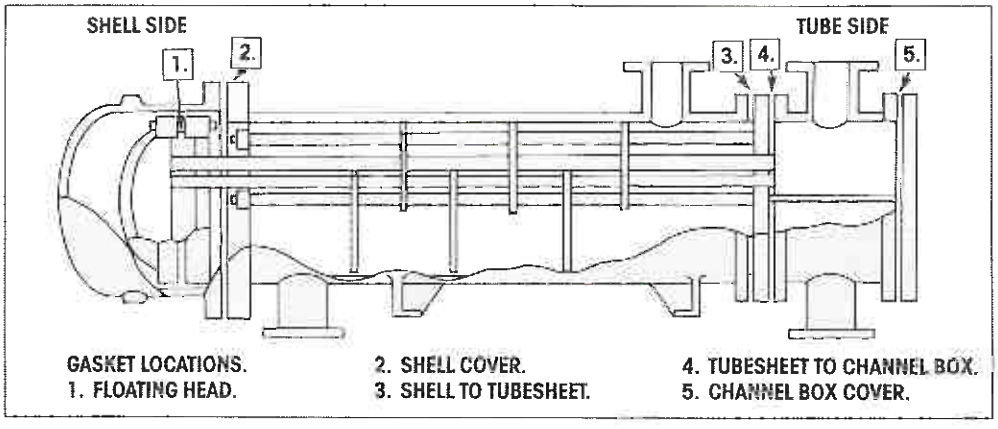
Flexitallic style HX-RIR spiral wound gaskets are primarily designed for TEMA male and female flanges and are custom built to suit the design conditions of individual heat exchanger vessels. These gaskets are available in an extensive range of materials.

The style HX-RIR spiral wound gasket incorporates several special features, as follows:

1. The outer wound nose to ensure correct sealing element location in the flange recess.
2. A spiral wound sealing element to ensure a positive seal under fluctuating temperature and pressure conditions.
3. A solid metal inner ring to protect the sealing element and act as a compression stop. As an optional extra, inner rings can also be supplied with nylon location screws to secure the gasket to the flange on assembly.
4. Can be supplied with pass partition bars in any configuration. Pass bars are secured to the inner ring and can be supplied in either solid metal or double jacketed construction.







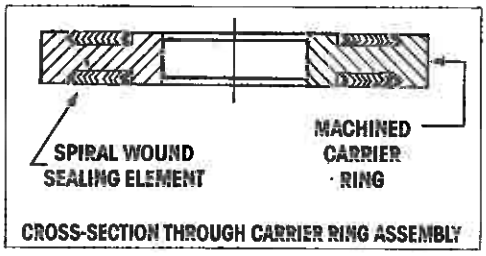
GASKET LOCATIONS.
1. FLOATING HEAD.
2. SHELL COVER.
3. SHELL TO TUBESHEET.
4. TUBESHEET TO CHANNEL BOX.
5. CHANNEL BOX COVER.

Heat exchangers with flat face or raised face flanges should utilize style CG and CGI spiral wound gaskets.

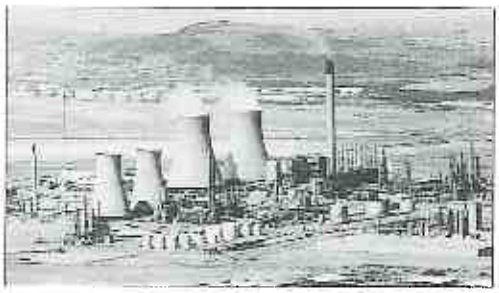
带金属环密封垫片

CARRIER RING GASKETS

The carrier ring concept consists of a solid stainless steel ring with a machined recess in each face. Spiral wound gaskets are then located in each of the machined recesses.

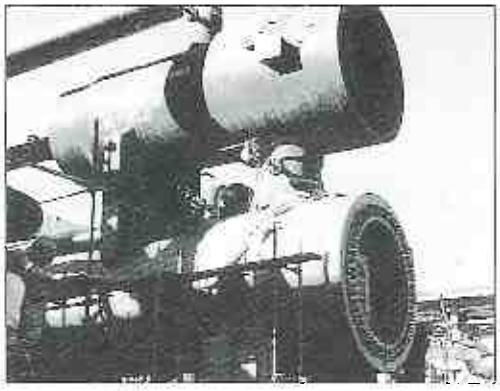


CROSS-SECTION THROUGH CARRIER RING ASSEMBLY



This type of arrangement has been successfully used in sealing problematic flanges and vessels in the nuclear, power and petrochemical industries. The major benefits of the carrier ring assembly are due to the double spiral wound gasket being present. This results in a very high recovery gasket, ensuring that the bolt load is maintained on the sealing elements when arduous pressure/temperature cycling occurs in service, thus maintaining a seal.

Carrier rings can be used on flat face, raised face or tongue and groove type flange, as well as non standard flange configurations. They can be supplied for both small and large diameter nominal bores up to class 2500 pressure rating. Carrier rings are also tailor made to suit specific flange arrangements and design conditions.



Photograph by courtesy of Lummus Heat Transfer Systems B.V., The Hague, Holland.

Typical Applications

The carrier ring concept has been extensively used in the power generation industries, petrochemical and nuclear industries. Typical applications are as follows:

Heat Exchanger

Operating Pressure: 2900 psi
Temperature: 200°C

H.P. Heaters

Operating Pressure: 700 psi
Temperature: 370°C

Materials utilized

316L/Flexicarb®
17-7PH/Flexicarb®
(Special high recovery material)

安装技术资料

USEFUL TECHNICAL DATA

Gasket Style Selection
Ensure that the correct style of gasket has been selected for the appropriate application.

Note:
Flexitallic recommended Style CG Spiral Wound Gaskets up to and including Class 600 rating. Style CGI Gaskets should be employed for pressure Classes 900 and above.

All PTFE filled Spiral Wound Gaskets for raised face and flat face flanges should utilize an inner and outer guide ring.

When using Style 'R' Spiral Wound Gaskets ensure that a compression stop is incorporated into the flange arrangement.

Required Gasket Compression
For optimum sealing performance Flexitallic Spiral Wound Gaskets should be compressed to the following thicknesses:

INITIAL GASKET THICKNESS	RECOMMENDED COMPRESSED THICKNESS
1.6mm (0.0625in)	1.3/1.4mm (0.050in/0.055in)
2.5mm (0.100in)	1.9/2.0mm (0.075in/0.080in)
3.2mm (0.125in)	2.3/2.5mm (0.090in/0.100in)
4.5mm (0.175in)	3.2/3.4mm (0.125in/0.135in)
6.4mm (0.250in)	4.6/5.1mm (0.180in/0.200in)
7.2mm (0.285in)	5.1/5.6mm (0.200in/0.220in)

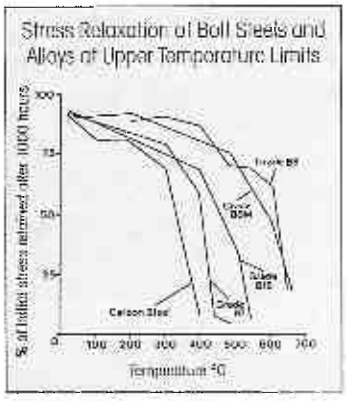
Spiral Wound Gaskets with internal or external guide rings i.e. Style CG and CGI, should be fully compressed to the guide ring. This will not damage the gasket or affect the sealing performance, since the rings are provided as a compression limiting stop.

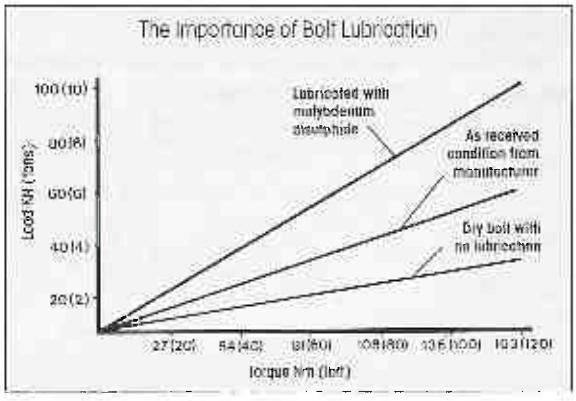
USEFUL ASSEMBLY TECHNIQUES

Flanges
Check that the flange faces are clean, in good condition and with a turned surface finish within the following range Ra 3.2 to 6.3 micro metres (125 to 250 micro inches).

Bolting
Ensure that the correct bolting material is utilized to suit the operating conditions, taking into account the limitation of low yield strength bolts.

Ensure that the use of bolt lubrication is employed. For torque type tightening methods Flexitallic recommends the use of molybdenum disulphide bolt lubrication or similar nickel based compound.





Tightening Procedures
Controlled tightening procedures should be employed when installing spiral wound gaskets. Flexitallic recommends that the use of hydraulic tensioning equipment be employed where possible for bolt diameters 1¼" and above.

Please refer to Flexitallic's Design Criteria for futher technical information.

合金罗栓扭力要求

USEFUL TECHNICAL DATA
TORQUE REQUIRED TO PRODUCE BOLT STRESS

The torque or turning effort required to produce a certain stress in bolting is dependent upon a number of conditions, some of which are:

1. Diameter of bolt.
2. Type and number of threads on bolt.
3. Material of bolt.
4. Condition of nut bearing surfaces.
5. Lubrication of bolt threads and nut bearing surfaces.

The tables below reflect the results of many tests to determine the relation between torque and bolt stress. Values are based on steel bolting well lubricated with a heavy graphite and oil mixture.

It was found that a non-lubricated bolt has an efficiency of about 50 per cent of a well lubricated bolt and also that different lubricants produce results varying between the limits of 50 and 100 per cent of the tabulated stress figures.

TORQUE DATA FOR USE WITH ALLOY STEEL STUD BOLTS
Load in Pounds on Stud Bolts when Torque Loads are Applied

NOMINAL DIAMETER OF BOLT (Inches)	NUMBER OF THREADS (Per Inch)	DIAMETER AT ROOT OF THREAD (Inches)	AREA AT ROOT OF THREAD Sq. Inch	STRESS 30,000 PSI Torque Ft/lbs	30,000 PSI Compression Lbs.	45,000 PSI Torque Ft/Lbs	45,000 PSI Compression Lbs.	60,000 PSI Torque Ft/Lbs	60,000 PSI Compression Lbs.
¼	20	.185	.027	4	810	6	1215	8	1620
5/16	18	.240	.045	8	1350	12	2025	16	2700
⅜	16	.294	.068	12	2040	18	3060	24	4080
7/16	14	.345	.093	20	2790	30	4185	40	5580
½	13	.400	.126	30	3780	46	5670	60	7560
9/16	12	.454	.162	45	4860	68	7290	90	9720
⅝	11	.507	.202	60	6060	90	9090	120	12120
¾	10	.620	.302	100	9060	150	13590	200	18120
⅞	9	.73	.419	160	12570	240	18855	320	25140
1	8	.836	.551	245	16530	368	24795	490	33060
1⅛	8	.935	.728	356	21840	533	32760	710	43680
1¼	8	1.088	.929	505	27870	758	41805	1010	55740
1⅜	8	1.213	1.155	680	34650	1020	51975	1360	69300
1½	8	1.338	1.405	900	42150	1350	63225	1800	84300
1⅝	8	1.460	1.680	1100	50400	1650	75600	2200	100800
1¾	8	1.585	1.980	1600	59400	2250	89100	3000	118800
1⅞	8	1.713	2.304	2000	69120	3000	103680	4000	138240
2	8	1.838	2.652	2200	79500	3300	119340	4400	159120
2¼	8	2.088	3.423	3180	102690	4770	154035	6360	205380
2½	8	2.338	4.292	4400	128760	6600	193140	8800	257520
2¾	8	2.588	5.259	5920	157770	8880	236655	11840	315540
3	8	2.838	6.324	7720	189720	11580	284580	15440	379440

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垫片材料表

AVAILABLE GASKET MATERIALS

METAL WINDING STRIP
AS STANDARD
Stainless Steel
- Type 316
- 304

OTHERS
Stainless Steel
- Type 304L
- 309
- 310
- 316Ti
- 321
- 347
- 430
- 17-7PH

ALLOY 20
MONEL®
TITANIUM®
NICKEL® 200
INCONEL® 600
625
X-750
HASTELLOY® B2
C276
INCOLOY® 800
825
DUPLEX
ZIRCONIUM®
TANTALUM®
COPPER
PHOS-BRONZE
CARBON STEEL

FILLER MATERIAL
AS STANDARD
Non Asbestos Flexite Super®

OTHERS
Flexicarb®*
Asbestos Paper
PTFE
Ceramic

*FLEXICARB FLEXIBLE GRAPHITE has been carefully researched and developed to meet industry's demand for a superior alternative to asbestos filler in spiral wound gaskets. FLEXICARB provides performance that is superior to asbestos, and has been field proven through years of actual service in critical applications throughout the world. FLEXICARB is pure graphite and is manufactured without the use of binders, resins or binders that could deteriorate at elevated temperature.

Hermetic spiral wound gaskets with FLEXICARB FLEXIBLE GRAPHITE filler are the state-of-the-art static seal and are specified throughout industry for the most critical as well as routine applications. FLEXICARB is the top-of-the-line alternative to asbestos filler in spiral wound gaskets.

FLEXICARB FLEXIBLE GRAPHITE is also available in the following products to meet all your sealing needs: bulk rolls, sheets, reinforced sheets, gasket tape and tape products and cut gaskets.

For specific details on FLEXICARB please contact our engineering department.

FLEXITE and FLEXICARB are registered trademarks of Flexitallic Ltd.

GUIDE RING MATERIAL
AS STANDARD
Carbon Steel

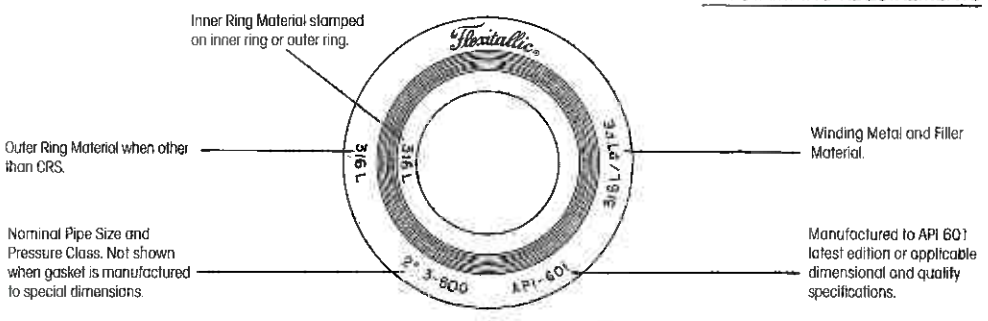
OTHERS
Stainless Steel
- Type 304
- 304L
- 316
- 316L
- 316Ti
- 310
- 321
- 347
- 410

INCONEL® 600
625
MONEL®
TITANIUM®
NICKEL
INCOLOY 800
ALLOY 20
INCOLOY® 825
HASTELLOY® B-2
C276

NOTE
Materials should be selected with regard to operating temperature and chemical compatibility.
If in doubt, contact Flexitallic Technical Department.

PTFE:
If PTFE is subjected to temperatures above 250°C (500°F) decomposition starts to occur slowly, increasing rapidly above 400°C (750°F). Care should be taken to avoid inhaling the resultant fumes, which may produce unpleasant effects.

API STAMPING REQUIREMENTS



QUALITY WORLDWIDE

垫片选择

Style CG

Utilizes an external ring which accurately centers gasket on flange face, provides additional radial strength to prevent gasket blow-out and acts as a compression stop.
A general purpose gasket suitable for use with flat face and raised face flanges up to and inclusive class 2500.
Above class 600 an internal ring is recommended.

Style CGI

A Style CG gasket fitted with internal ring which gives an additional compression limiting stop, and provides heat and corrosion barrier, protecting gasket windings and preventing flange erosion.
Suitable for use with flat face and raised face flanges and specified for high pressure/temperature service – class 900lb and above or where corrosive or toxic media are present.

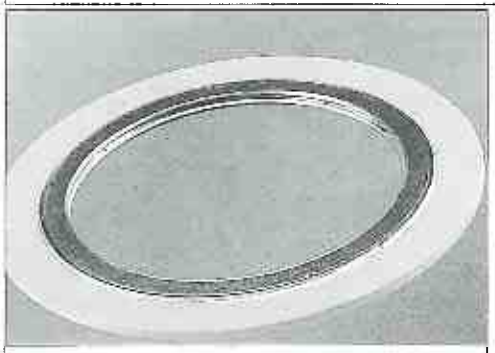
Style R

Basic construction type. Inner and outer diameters are reinforced with several plies of metal without filler to give greater stability and better compression and sealing characteristics.
Suitable for tongue and groove or male and female or grooved to flat face flange assemblies.

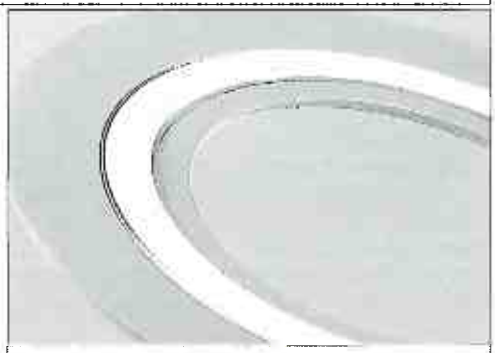
Style RIR

Solid inner metal ring acts as a compression stop and fills the annular space between flange bore and the inside diameter. Designed to prevent accumulation of solids, reduce turbulent flow of process fluids and minimize erosion of flange faces.
Suitable for male and female pipe flanges.

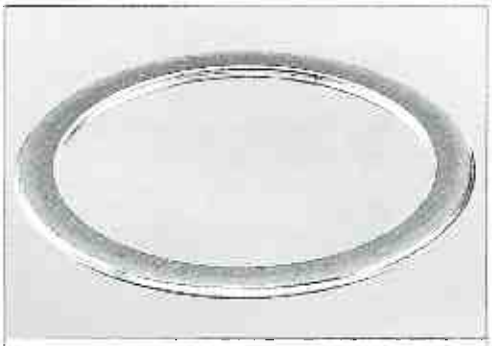
GASKET SELECTION What style of gasket should I select?



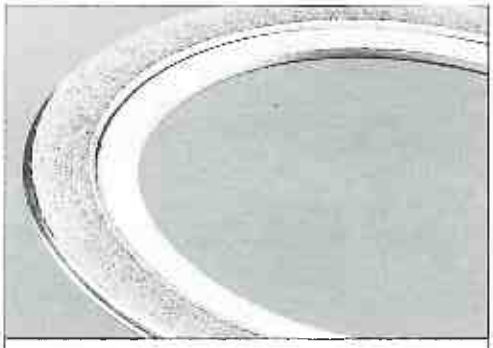
Style CG



Style CGI

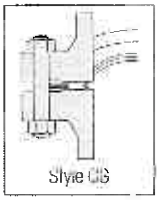
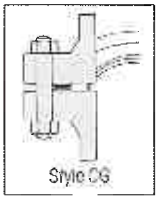
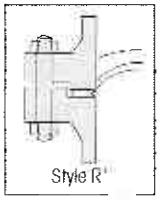
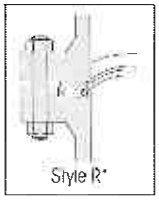
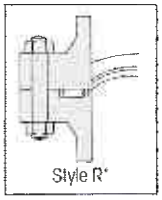
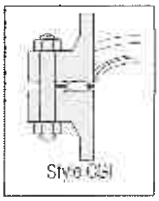
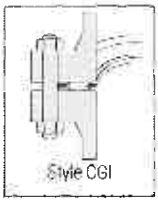
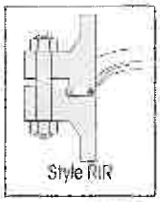


Style R



Style RIR

SELECTAGUIDE Published as an indication of which Flexitallic Spiral Wound Gasket best suits different pipe flange configurations and service conditions.

Flange Face	Raised Face	Flat Face	Male and Female	Tongue and Groove	Flat Face to Recess
Recommended Gasket Style For general duties	 Style CG	 Style CG	 Style R*	 Style R*	 Style R*
Recommended Gasket Style For high pressure/ temperature duty, also for gaskets with PTFE filler, corrosive or fluctuating pressure or temperature service conditions.	 Style CGI	 Style CGI	 Style RIR		

***NOTE**
It is essential that R Style gaskets operate with a compression stop. Without a correctly dimensioned stop the gasket can easily be overcompressed resulting in failure. To provide a compression stop the depth of the tongue, groove or recess is controlled to provide optimum compressed gasket thickness with metal to metal contact of the flange faces (see Page 30, Table 17).

Q U A L I T Y W O R L D W I D E

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SPECIAL GASKETS

Gaskets of special design can be engineered and fabricated using the same basic fundamentals of Flexitallic Spiral-Wound Gasket design and construction to cover a wide range of applications in installations for which there are no industry-wide equipment standards. Special gaskets have been designed for valves, pumps, compressors, turbines, boilers, heat exchangers, etc. Consult with Flexitallic engineers as early in the design stage as possible.

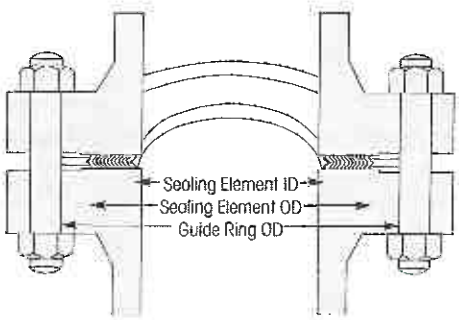
GOVERNMENT SPECIFICATIONS

Flexitallic Spiral-Wound Gaskets are available in accordance with Military Specifications MIL-G-24716, MIL-G-16265, MIL-G-21032 and MIL-G-15342, latest revisions. When making inquiry, please refer to the proper Government Specification number.

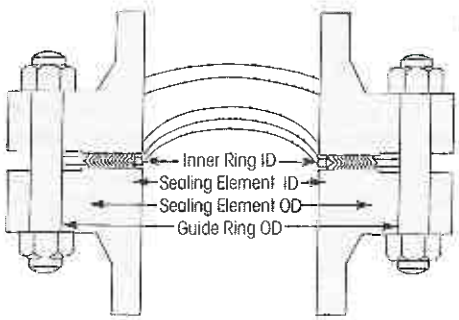
DIMENSIONAL DATA - STYLE CG & CGI GASKETS

TO SUIT STANDARD RAISED FACE AND FLAT FACE FLANGES

Style CG



Style CGI



All CG and CGI Gaskets for these standard flanges are 4.5mm (0.175in)* thick, fitted with 3.2mm (0.125in)* thick solid metal rings. *Unless otherwise stated.

Flexitallic style CG and CGI Spiral wound gaskets can be manufactured in accordance with all relevant gasket standards to suit the following flange designations.

Please note that gaskets for non-standard flanges are also readily available.

ASME/ANSI	B16.5
BS	1560
BS	10
API	605 (ASME B16.47 SERIES B)
MSS SP	44 (ASME B16.47 SERIES A)
BS	4504
DIN	FLANGES
JIS	FLANGES
FRENCH	NF STANDARD

WHEN ORDERING PLEASE SPECIFY	EXAMPLE
GASKET STYLE	FLEXITALLIC STYLE "CGI" SPIRAL WOUND GASKET
NOMINAL PIPE SIZE (NPS)	4"
PRESSURE RATING	CLASS 900
GASKET STANDARD	API 601
WINDING MATERIALS	316L/FLEXICARB
OUTER RING MATERIAL	CARBON STEEL
INNER RING MATERIAL	316 SS

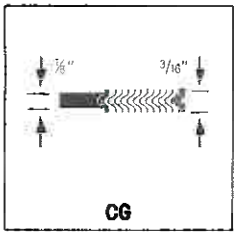
Please select correct gasket style for your particular application. See page 8 "Gasket Selection".

NOTE: Dimensions specified are to suit schedule 40 pipework as standard, contact the Flexitallic Technical Dept. for further information.

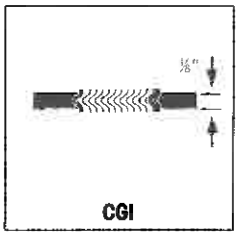
垫片尺寸表

STYLE CG & CGI* TO API 601

TO SUIT ASME/ANSI B16.5 FLANGES



CG



CGI

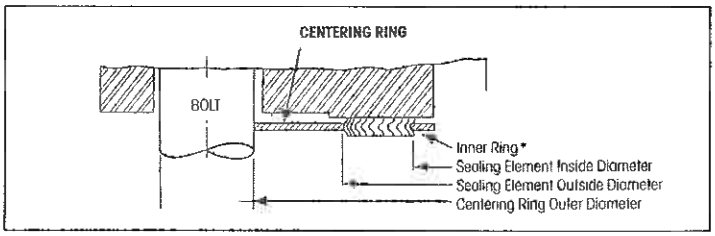


TABLE 1

NOM PIPE SIZE	OUTSIDE DIAMETER OF SEALING ELEMENT		INNER DIAMETER OF SEALING ELEMENT							OUTER DIAMETER OF CENTERING RING						
	CLASS 150, 300 400, 600	CLASS 900, 1500 2500	CLASS 150	CLASS 300	CLASS 400	CLASS 600	CLASS 900	CLASS 1500	CLASS 2500	CLASS 150	CLASS 300	CLASS 400	CLASS 600	CLASS MSS	CLASS 1500	CLASS 2500
¼	⅜	–	½	½	½	½	–	–	–	1¾	1¾	1¾	1¾	–	–	–
½	1⅛	1⅛	⅝	⅝	⅝	⅝	⅝	⅝	⅝	1⅞	2⅛	2⅛	2⅛	2½	2½	2¾
¾	1 9/16	1 9/16	1	1	1	1	1	1	1	2⅜	2⅝	2⅝	2⅝	2⅞	2¾	3
1	1⅜	1⅜	1⅛	1⅛	1⅛	1⅛	1⅛	1⅛	1⅛	2⅝	2⅞	2⅞	2⅞	3⅛	3⅛	3⅜
1¼	2⅜	2⅜	1⅜	1⅜	1⅜	1⅜	1 9/16	1 9/16	1 9/16	3	3¼	3¼	3¼	3½	3½	4⅛
1½	2¾	2¾	2⅛	2⅛	2⅛	2⅛	1⅞	1⅞	1⅞	3⅜	3⅝	3⅝	3⅝	3⅞	3⅝	4⅝
2	3⅛	3⅛	2⅝	2⅝	2⅝	2⅝	2 5/16	2 5/16	2 5/16	4⅛	4⅜	4⅛	4⅜	5⅛	5⅛	5⅜
2½	3⅝	3⅝	3⅛	3¼	3⅛	3¼	2⅝	2⅝	2⅝	4⅝	5⅛	5⅛	5⅛	6⅛	6⅛	6⅝
3	4¾	4¾	4	4	4	4	3¾	3¾	3⅝	5¾	5¾	5¾	5¾	6⅝	6⅜	7¼
3½	5⅛	5⅛	4⅝	4⅝	4⅛	4⅛	4⅛	4⅛	–	6¼	6⅝	6¾	6¾	7⅝	7¾	–
4	5⅝	5⅝	5	5	4¾	4¾	4⅛	4⅝	4⅝	6¾	7⅛	7	7⅛	8⅛	8⅛	9⅛
4½	6½	6½	5½	5½	5 5/16	5 5/16	5 5/16	5 5/16	–	7	7¾	7⅝	8¼	9⅜	9⅛	–
5	7	7	6⅛	6⅛	5 15/16	5 13/16	5 15/16	5⅝	5⅝	7¾	8⅛	8¾	9⅛	9⅜	10	11
6	8¼	8¼	7 5/16	7 5/16	6⅜	6⅜	6⅜	6⅜	6⅜	8¾	9⅜	9⅜	10⅛	11¾	11⅜	12⅛
8	10⅜	10⅜	9 7/16	9 7/16	8⅝	8⅝	8⅝	8½	8½	11	12⅛	12	12⅝	14⅜	13⅝	15⅛
10	12½	12¾	11 3/16	11 1/16	10 13/16	10 13/16	10⅝	10½	10⅝	13⅝	14¼	14⅛	15¾	17⅛	17⅛	18¾
12	14¾	14½	13⅜	13⅜	12⅜	12⅜	12⅜	12⅜	12½	16⅛	16⅜	16½	18	19⅜	20½	21⅜
14	16	15¾	14⅝	14⅝	14¼	14¼	14	14¼	–	17¾	19½	19	19⅜	20½	22¾	–
16	18¼	18	16⅝	16⅝	16¼	16¼	16¼	16	–	20⅛	21¼	21⅛	22¼	22⅝	25¼	–
18	20¾	20½	18 11/16	18 11/16	18½	18½	18¼	18¼	–	21⅝	23½	23¾	24⅜	25⅜	27¾	–
20	22¾	22½	20 11/16	20 11/16	20½	20½	20½	20¼	–	23⅝	25¾	25½	26⅜	27½	29¾	–
24	27	26¾	24¾	24½	24¾	24¾	24¾	24¼	–	28¼	30½	30¾	31½	33	35½	–

DIMENSIONS IN INCHES. API 601 WILL CHANGE TO AN ASME STANDARD WITHIN THE NEAR FUTURE.

*For Style CGI – see Table 3 for inner Ring dimensions

In accordance with API 601, Inner Rings are mandatory on the following flange designations (see Table 3).

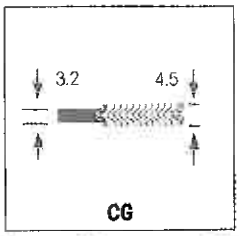
Class 900 – NPS 24 to 48
Class 1500 – NPS 12 to NPS 24
Class 2500 – NPS 4 to NPS 12

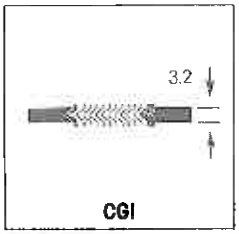
API 601 does not include dimensions for NPS ¼, 3½ or 4½, nor Class 400 Flanges up to NPS 3 and Class 900 Flanges up to NPS 2½.

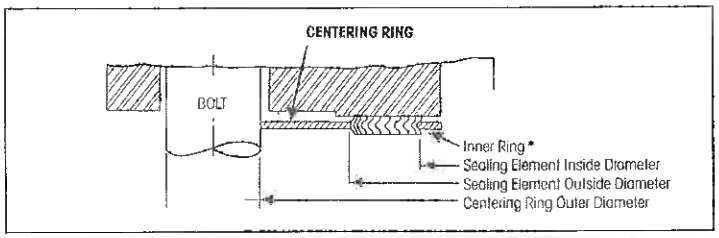
垫片尺寸表

STYLE CG & CGI* TO API 601

TO SUIT ASME/ANSI B16.5 FLANGES







TABLE

NOM PIPE SIZE	OUTSIDE DIAMETER OF SEALING ELEMENT		INNER DIAMETER OF SEALING ELEMENT							OUTER DIAMETER OF CENTERING RING						
	CLASS 150, 300 400, 600	CLASS 900, 1500 2500	CLASS 150	CLASS 300	CLASS 400	CLASS 600	CLASS 900	CLASS 1500	CLASS 2500	CLASS 150	CLASS 300	CLASS 400	CLASS 600	CLASS 900	CLASS 1500	CLASS 2500
¼	22.2	–	12.7	12.7	12.7	12.7	–	–	–	44.5	44.5	44.5	44.5	–	–	–
½	31.8	31.8	19.1	19.1	19.1	19.1	19.1	19.1	19.1	47.8	54.1	54.1	54.1	63.5	63.5	69.9
¾	39.6	39.6	25.4	25.4	25.4	25.4	25.4	25.4	25.4	57.2	66.8	66.8	66.8	69.9	69.9	76.2
1	47.8	47.8	31.8	31.8	31.8	31.8	31.8	31.8	31.8	66.8	73.2	73.2	73.2	79.5	79.5	85.9
1¼	60.5	60.5	47.8	47.8	47.8	47.8	39.6	39.6	39.6	76.2	82.6	82.6	82.6	88.9	88.9	104.9
1½	69.9	69.9	54.1	54.1	54.1	54.1	47.8	47.8	47.8	85.9	95.3	95.3	95.3	98.6	98.6	117.6
2	85.9	85.9	69.9	69.9	69.9	69.9	58.7	58.7	58.7	104.9	111.3	111.3	111.3	143.0	143.0	146.1
2½	98.6	98.6	82.6	82.6	82.6	82.6	69.9	69.9	69.9	124.0	130.3	130.3	130.3	165.1	165.1	168.4
3	120.7	120.7	101.6	101.6	101.6	101.6	95.3	92.2	92.2	136.7	149.4	149.9	149.4	168.4	174.8	196.9
3½	133.4	133.4	114.3	114.3	104.8	104.8	104.8	104.8	–	161.9	165.1	161.9	161.9	190.5	187.3	–
4	149.4	149.4	127.0	127.0	120.7	120.7	120.7	117.6	117.6	174.8	181.1	177.8	193.8	206.5	209.6	235.0
4½	165.1	165.1	139.7	139.7	134.9	134.9	134.9	134.9	–	177.8	196.9	193.7	209.6	238.1	231.8	–
5	177.8	177.8	155.7	155.7	147.6	147.6	147.6	143.0	143.0	196.9	215.9	212.9	241.3	247.7	254.0	279.4
6	209.6	209.6	182.6	182.6	174.8	174.8	174.8	171.5	171.5	222.3	251.0	247.7	266.7	289.1	282.7	317.5
8	263.7	257.3	233.4	233.4	225.6	225.6	222.3	215.9	215.9	279.4	308.1	304.8	320.8	358.9	352.6	387.4
10	317.5	311.2	287.3	287.3	274.6	274.6	276.4	266.7	270.0	339.9	362.0	358.9	400.1	435.1	435.1	476.3
12	374.7	366.3	339.9	339.9	327.2	327.2	323.9	323.9	317.5	409.7	422.4	419.1	457.2	498.6	520.7	549.4
14	406.4	400.1	371.6	371.6	362.0	362.0	355.6	362.0	–	450.9	485.9	482.6	492.3	520.7	577.9	–
16	463.6	457.2	422.4	422.4	412.8	412.8	412.8	406.4	–	514.4	539.8	536.7	565.2	574.8	641.4	–
18	527.1	520.7	474.7	474.7	469.9	469.9	463.6	463.6	–	549.4	596.9	593.9	612.9	638.3	704.9	–
20	577.9	571.5	525.5	525.5	520.7	520.7	520.7	514.4	–	606.6	654.1	647.7	682.8	696.5	755.7	–
24	685.8	679.5	628.7	628.7	628.7	628.7	628.7	616.0	–	717.6	774.7	768.4	790.7	838.2	901.7	–

DIMENSIONS IN MM. API 601 WILL CHANGE TO AN ASME STANDARD WITHIN THE NEAR FUTURE.

*For Style CGI – see Table 3 for Inner Ring dimensions

In accordance with API 601, Inner Rings are mandatory on the following flange designations (see Table 3).

Class 900 – NPS 24 to 48
Class 1500 – NPS 12 to NPS 24
Class 2500 – NPS 4 to NPS 12

API 601 does not include dimensions for NPS ¼, 3½ or 4½, nor Class 400 Flanges up to NPS 3 and Class 900 Flanges up to NPS 2½.

带内环之标准内径

STANDARD INSIDE DIAMETERS OF INNER RINGS FOR STYLE CGI GASKETS TO API 601 TO SUIT ASME/ANSI B16.5 FLANGES

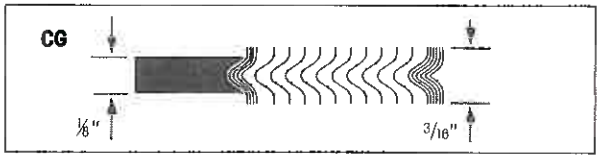
TABLE 3

NOM PIPE SIZE	PRESSURE CLASS													
	150		300		400		600		900		1500		2500	
½	9/16	14.3	9/16	14.3	9/16	14.3	5/16	14.3	9/16	14.3	9/16	14.3	9/16	14.3
¾	13/16	20.7	13/16	20.7	13/16	20.7	13/16	20.7	13/16	20.7	13/16	20.7	13/16	20.7
1	1 1/16	27.0	1 1/16	27.0	1 1/16	27.0	1 1/16	27.0	1 1/16	27.0	1 1/16	27.0	1 1/16	27.0
1¼	1½	38.1	1½	38.1	1½	38.1	1½	38.1	1 5/16	33.4	1 5/16	33.4	1 5/16	33.4
1½	1¾	44.5	1¾	44.5	1¾	44.5	1¾	44.5	1⅝	41.3	1⅝	41.3	1⅝	41.3
2	2 5/16	55.6	2 5/16	55.6	2 5/16	55.6	2 5/16	55.6	2 1/16	52.4	2 1/16	52.4	2 1/16	52.4
2½	2⅝	66.7	2⅝	66.7	2⅝	66.7	2⅝	66.7	2½	63.5	2½	63.5	2½	63.5
3	3 5/16	81.0	3 5/16	81.0	3 5/16	81.0	3 5/16	81.0	3 1/16	81.0	3 1/16	81.0	3 1/16	81.0
4	4 5/16	106.4	4 5/16	106.4	4 5/16	106.4	4 5/16	106.4	4 1/16	106.4	4 1/16	106.4	4 1/16	106.4
5	5 5/16	131.8	5 5/16	131.8	5 5/16	131.8	5 5/16	131.8	5 1/16	131.8	5 1/16	131.8	5 1/16	131.8
6	6 5/16	157.2	6 5/16	157.2	6 5/16	157.2	6 5/16	157.2	6 1/16	157.2	6 1/16	157.2	6 1/16	157.2
8	8½	215.9	8½	215.9	8¼	209.6	8¼	209.6	8¼	209.6	8⅛	206.4	7⅞	200.0
10	10 11/16	268.3	10 11/16	268.3	10½	260.4	10½	260.4	10¾	260.4	10⅛	258.0	9¾	247.7
12	12⅝	317.5	12⅝	317.5	12⅝	317.5	12⅝	317.5	12⅜	314.3	12⅜	314.3	11½	292.1
14	13¾	349.3	13¾	349.3	13¾	349.3	13¾	349.3	13½	342.9	13⅜	339.7	–	–
16	15¾	400.0	15¾	400.0	15¾	400.0	15¾	400.0	15½	393.7	15¼	387.4	–	–
18	17 11/16	449.3	17 11/16	449.3	17 11/16	449.3	17 11/16	449.3	17½	444.5	17¼	438.2	–	–
20	19 11/16	500.0	19 11/16	500.0	19 11/16	500.0	19 11/16	500.0	19½	495.3	19¼	489.0	–	–
24	23⅝	603.3	23⅝	603.3	23⅝	603.3	23⅝	603.3	23⅜	603.3	22¾	577.9	–	–

DIMENSIONS IN INCHES & MM. API 601 WILL CHANGE TO AN ASME STANDARD WITHIN THE NEAR FUTURE.

STYLE CG & CGI

TO SUIT ASME/ANSI B16.5 & BS 1560 SMALL DIAMETER SCREWED OR SLIP-ON FLANGES



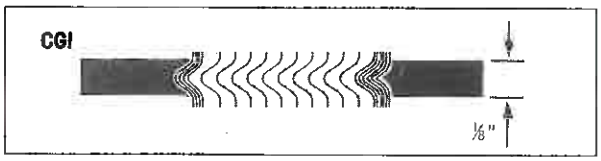


TABLE 4

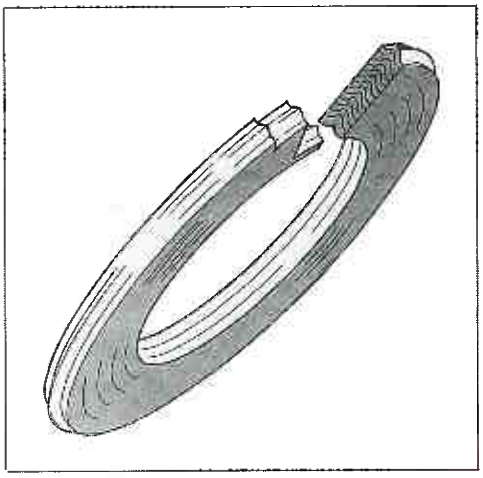
Nom Pipe Size	Inner Ring Inside Dia.		Sealing Element Inside Dia.		Sealing Element Outside Dia.		Guide Ring Outside Diameter Class 150		Class 300		Class 400		Class 600		Class 900		Class 1500	
¼		–	9/16	14.3	⅞	22.2	1¾	44.5	1¾	44.5	1¾	44.5	1¾	44.5	–	–	–	–
½	9/16	14.3	15/16	23.8	1¼	31.8	1⅞	47.6	2⅛	54.0	2⅛	54.0	2⅛	54.0	2½	63.5	2½	63.5
¾	13/16	20.6	1 3/16	30.2	1 9/16	39.7	2¼	57.2	2⅝	66.7	2⅝	66.7	2⅝	66.7	2¾	69.9	2¾	69.9
1	1 1/16	27.0	1 7/16	36.5	1⅞	47.6	2⅝	66.7	2⅞	73.0	2⅞	73.0	2⅞	73.0	3⅛	79.4	3⅛	79.4
1¼	1⅜	34.9	1⅞	47.6	2⅜	60.3	3	76.2	3⅜	82.6	3⅜	82.6	3⅜	82.6	3½	88.9	3½	88.9
1½	1⅝	41.3	2⅛	54.0	2⅝	69.9	3⅜	85.7	3¾	95.3	3¾	95.3	3¾	95.3	3⅞	98.4	3⅞	98.4

DIMENSIONS IN INCHES & MM.

NOTE: The above style CG & CGI spiral wound gaskets are dimensioned to suit existing screwed or slip-on flanges for NPS ¼ to 1½ ASME/ANSI B16.5 & BS 1560 flanges.

'R' 型垫片

DIMENSIONAL DATA - STYLE R GASKETS
TO SUIT MALE & FEMALE AND TONGUE & GROOVE FLANGES
TO ASME/ANSI B 16.5 & BS 1560



Standard Style R gaskets embody all the exclusive features of Flexitallic design for keeping compression values in balance with bolting and providing adequate resilience to compensate for variable stresses encountered in service. Standard Style R gaskets are manufactured to a nominal thickness of .125" (3.2mm). Optimum compression is in the range of .090" to .100" (2.3mm to 2.5mm) thick.

There are three types of Style R gaskets:
(a) Style R-1 indicates gaskets for use with large male and female flanges.*
(b) Style R-3 indicates gaskets for use with large tongue and groove flanges.
(c) Style R-4 indicates gaskets for use with small tongue and groove flanges.
*As a general rule, the use of Flexitallic Spiral-Wound Gaskets with small male and female flange facings is not recommended.

Dimensional limitations established by the proportions of the small tongue and groove facings limit the possibility of increasing gasket dimensions to improve the load carrying capacity in the higher pressure series. For this reason, it is suggested that large tongue and groove facings be selected for new construction when class 900, 1500 and 2500 flanges are to be used. Style R-4 gaskets may be compressed an additional amount when exposed to the higher bolt loads, but not to the degree that the gasket will be crushed due to the radial support provided by the confining groove.

Special Style R gaskets are adaptable to non-standard fittings and can be designed and manufactured according to specifications for high and low pressure applications and for severe corrosive conditions.

When ordering special Style R gaskets for non-standard fittings and for special applications, furnish complete data on *Flexitallic Gasket Engineering Data Form.*

NOTE – The following Style R gaskets are interchangeable:

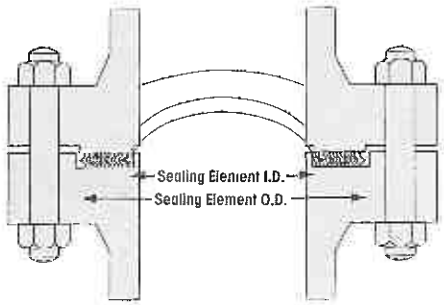
Style R-1 and R-3 gaskets
- ¼" sizes – Classes 150, 300, 400 and 600 are interchangeable.
- ½" sizes – Classes 150, 300, 400, 600, 900, 1500 and 2500 (R-3 only) are interchangeable.
- All R-1 and R-3 gaskets in Classes 300, 400 and 600 are interchangeable within their size category.
- All R-1 and R-3 gaskets in Classes 900 and 1500 are interchangeable within their size category.

Style R-4 gaskets
- ½" sizes – interchangeable with all ½" R-1 and R-3 gaskets within the same pressure rating.
- ¾" interchangeable with all ¾" R-1 and R-3 gaskets within the same pressure rating.
- All R-4 gaskets in Classes 300 through 2500 are interchangeable within their size category.

'R' 型垫片

STYLE R
TO SUIT ASME/ANSI B16.5 and BS1560 FLANGES

Style R



Flexitallic Style 'R' Spiral Wound Gaskets are dimensioned to suit existing ASME/ANSI B16.5 and BS 1560 tongue/groove flanges.

Standard 'R' gaskets are manufactured 3.2mm (0.125") thick. This is the recommended thickness for Style 'R' gaskets where limited space is available and small diameters and narrow widths are required.

NOTE: Style 'R' gaskets must be installed with a correctly dimensioned compression stop. For a standard 3.2mm (0.125") thick gasket, it should be compressed between the following limits 2.3 to 2.5mm (0.090" to 0.100").

TABLE 17

Nominal Pipe Size	Style R1 for Large Male and Female				Style R3 for Large Tongue and Groove				Style R4 for Small Tongue and Groove			
	Sealing Element Class 150-1500				Sealing Element Class 150-2500				Sealing Element Class 150-2500			
	ID		OD		ID		OD		ID		OD	
¼	½	12.7	1	25.4	–	–	–	–	½	12.7	1	25.4	–	–	–	–
½	1	25.4	1⅜	34.9	¾	20.6	1⅜	34.9	1	25.4	1⅜	34.9	1	25.4	1⅜	34.9
¾	1 1/16	33.3	1 11/16	42.9	1 1/16	27.0	1 11/16	42.9	1 1/16	33.3	1 11/16	42.9	1 1/16	33.3	1 11/16	42.9
1	1½	38.1	2	50.8	1¼	31.8	2	50.8	1½	38.1	2	50.8	1½	38.1	1⅞	47.6
1¼	1⅞	47.6	2½	63.5	1⅝	41.3	2½	63.5	1⅞	47.6	2½	63.5	1⅞	47.6	2¼	57.2
1½	2¼	54.0	2⅞	73.0	1⅞	47.6	2⅞	73.0	2¼	54.0	2⅞	73.0	2¼	54.0	2½	63.5
2	2⅝	73.0	3⅝	91.1	2⅜	60.3	3⅝	92.1	2⅝	73.0	3⅝	92.1	2⅝	73.0	3¼	82.6
2½	3⅜	85.7	4⅛	104.8	3	76.2	4⅛	104.8	3⅜	85.7	4⅛	104.8	3⅜	85.7	3¾	95.3
3	4¼	108.0	5	127.0	3¾	95.3	5	127.0	4¼	108.0	5	127.0	4¼	108.0	4⅝	117.5
3½	4¾	120.7	5½	139.7	–	–	–	–	4¾	120.7	5½	139.7	4¾	120.7	5⅛	130.2
4	5 5/16	131.8	6 3/16	157.2	4¾	120.7	6 3/16	157.2	5 5/16	131.8	6 3/16	157.2	5 5/16	131.8	5 11/16	144.5
4½	5 11/16	144.5	6¾	171.5	–	–	–	–	5 11/16	144.5	6¾	171.5	–	–	–	–
5	6 5/16	160.3	7 5/16	185.7	5¾	146.1	7 5/16	185.7	6 5/16	160.3	7 5/16	185.7	6 5/16	160.3	6 13/16	173.0
6	7½	190.5	8½	215.9	6¾	171.5	8½	215.9	7½	190.5	8½	215.9	7½	190.5	8	203.2
8	9⅜	238.1	10⅝	269.9	8¾	222.3	10⅝	269.9	9⅜	238.1	10⅝	269.9	9⅜	238.1	10	254.0
10	11⅜	285.8	12¾	323.9	10¾	273.1	12¾	323.9	11⅜	285.8	12¾	323.9	11⅜	285.8	12	304.8
12	13½	342.9	15	381.0	13	330.2	15	381.0	13½	342.9	15	381.0	13½	342.9	14¼	362.0
14	14¾	374.7	16¾	412.8	–	–	–	–	14¾	374.7	16¾	412.8	14¾	374.7	15½	393.7
16	16¾	425.5	18½	469.9	–	–	–	–	16¾	425.5	18½	469.9	16¾	425.5	17⅝	447.7
18	19¼	489.0	21	533.4	–	–	–	–	19¼	489.0	21	533.4	19¼	489.0	20⅛	511.2
20	21	533.4	23	584.2	–	–	–	–	21	533.4	23	584.2	21	533.4	22	558.2
24	25¼	641.4	27⅛	692.2	–	–	–	–	25¼	641.4	27⅛	692.2	25¼	641.4	26⅛	666.9

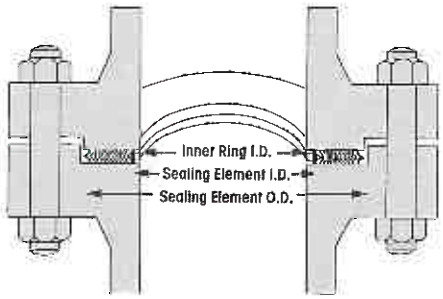
DIMENSIONS IN INCHES & MM.

NOTE: Style R3 for NPS ¼ are for class 150 to 600 only.
Style R3 for NPS 4½ are for class 150 to 1500 only.

'RIR' 型垫片

STYLE RIR
TO SUIT ASME/ANSI B16.5 and BS1560 FLANGES

Style RIR



Flexitalic Style 'RIR' Spiral Wound Gaskets are dimensioned to suit existing ASME/ANSI B16.5 and BS 1560 male/female flanges.

Standard 'RIR' gaskets are manufactured to 3.2mm (0.125") thick and fitted with a 2.3mm (0.090") thick solid metal inner ring.

TABLE 18

Nominal Pipe Size	Inner Ring ID		Large Male and Female Class 150-1500 Sealing Element ID		Class 150-1500 Sealing Element OD		Class 2500 Sealing Element ID		Class 2500 Sealing Element OD	
¼	–	–	½	12.7	1	25.4	–	–	–	–
½	⅝	14.3	1	25.4	1⅜	34.9	13/16	20.6	1⅜	34.9
¾	1 3/16	20.6	1 5/16	33.3	1 11/16	42.9	1 1/16	27.0	1 11/16	42.9
1	1 1/16	27.0	1½	38.1	2	50.8	1¼	31.8	2	50.8
1¼	1⅜	34.9	1⅞	47.6	2½	63.5	1⅝	41.3	2½	63.5
1½	1⅝	41.3	2⅛	54.0	2⅞	73.0	1⅞	47.6	2⅞	73.0
2	2 1/16	52.4	2⅝	73.0	3⅝	92.1	2⅜	60.3	3⅝	92.1
2½	2½	63.5	3⅜	85.7	4⅛	104.8	3	76.2	4⅛	104.8
3	3 1/16	77.8	4⅛	108.0	5	127.0	3¾	95.3	5	127.0
3½	3 9/16	90.5	4⅝	120.7	5½	139.7	–	–	–	–
4	4 1/16	103.2	5 1/16	131.8	6 3/16	157.2	4¾	120.7	6 3/16	157.2
4½	4 9/16	115.9	5 11/16	144.5	6¾	171.5	–	–	–	–
5	5 1/16	128.6	6 5/16	160.3	7 5/16	185.7	5¾	146.1	7 5/16	185.7
6	6 1/16	154.0	7½	190.5	8½	215.9	6¾	171.5	8½	215.9
8	8	203.2	9¾	238.1	10⅝	269.9	8¾	222.3	10⅝	269.9
10	10	254.0	11¾	285.8	12¾	323.9	10¾	273.1	12¾	323.9
12	11 15/16	303.2	13½	342.9	15	381.0	13	330.2	15	381.0
14	13½	342.9	14¾	374.7	16¾	412.8	–	–	–	–
16	15½	393.7	16¾	425.5	18⅞	469.9	–	–	–	–
18	17½	444.5	19¼	489.0	21	533.4	–	–	–	–
20	19½	495.3	21	533.4	23	584.2	–	–	–	–
24	23½	596.9	25¼	641.4	27½	692.2	–	–	–	–

'R' 型金屬密封环

RING TYPE JOINTS

The Ring Type Joint was initially developed for high pressure/temperature applications found in the petroleum industry, the main use being in the oil field on drilling and completion equipment. However, today this product range can also be found on valves and pipework assemblies, along with some high integrity pressure vessel joints.

Standard Ring Type Joints can be categorised into 3 groups :

STYLE R

Available in both oval and octagonal configurations, both types being inter-changeable on the modern flat bottomed type groove flanges.

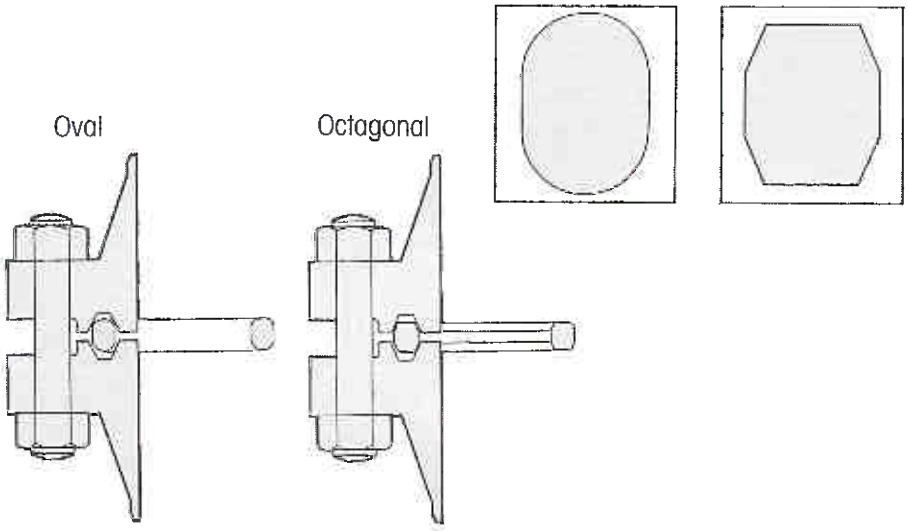
Standard Style R Ring Type Joints are manufactured in accordance with both API 6A and ANSI B16.20 size/ratings.

Oval

The oval profile provided the original ring joint design.

Octagonal

An adaptation of the oval design.



'R' 型金属密封环

STYLE R DIMENSIONS IN MILLIMETRES

RING NO.	PRESSURE CLASS RATINGS ANSI, BS & MSS					API (MPa)		PITCH DIAMETER OF RING	WIDTH OF RING	HEIGHT OF RING		APPROX. DISTANCE BETWEEN MADE UP FLANGES
	150	300/600	900	1500	2500	13.8/20.7	34.5			OVAL	OCTAGONAL	
	NOMINAL PIPE SIZE (inches)							P	A	B	F	
R11	–	1/2	–	–	–	–	–	34.13	6.35	11.1	9.5	–
R12		–	1/2	1/2	–	–		38.89	7.95	14.3	12.7	
R13	–	3/4	–	–	1/2		–	42.86	7.95	14.3	12.7	–
R14	–	–	3/4	3/4	–	–	–	44.45	7.95	14.3	12.7	–
R15	1	–	–	–	–	–		47.63	7.95	14.3	12.7	–
R16	–	1	1	1	3/4		–	50.80	7.95	14.3	12.7	–
R17	1 1/4	–			–	–	–	57.15	7.95	14.3	12.7	–
R18		1 1/4	1 1/4	1 1/4	1	–		60.33	7.95	14.3	12.7	–
R19	1 1/2	–	–	–	–		–	66.09	7.95	14.3	12.7	–
R20*	–	1 1/2	1 1/2	1 1/2	–	–	–	68.28	7.95	14.3	12.7	4.1
R21	–	–	–	–	1 1/4	–		72.23	11.11	17.5	15.9	
R22	2	–	–	–	–	–	–	82.55	7.95	14.3	12.7	–
R23*	–	2	–	–	1 1/2	2 1/8**	–	82.55	11.11	17.5	15.9	4.8
R24*	–	–	2	2	–	2 1/16	2	85.25	11.11	17.5	15.9	4.8
R25	2 1/2	–	–			–	–	101.60	7.95	14.3	12.7	–
R26*		2 1/2	–	–	2	2 9/16	–	101.60	11.11	17.5	15.9	4.8
R27*	–	–	2 1/2	2 1/2	–	(2 9/16)	2 9/16	107.95	11.11	17.5	15.9	–
R28	–	–			2 1/2	–	–	111.13	12.70	19.1	17.5	–
R29	3	–	–	–	–	–	–	114.30	7.95	14.3	12.7	–
R30†	–	3	–	–			–	117.48	11.11	17.5	15.9	
R31*	–	3	3	–	–	3 1/8	–	123.83	11.11	17.5	15.9	4.8
R32	–	–	–	–	3	–		127.00	12.70	19.1	17.5	–
R33	3 1/2	–	–	–			–	131.76	7.95	14.3	12.7	
R34		3 1/2		–	–	–	–	131.76	11.11	17.5	15.9	–
R35*	–	–	–	3	–	–	3 1/8	136.53	11.11	17.5	15.9	4.8
R36	4	–	–			–	–	149.23	7.95	14.3	12.7	–
R37*		4	4	–	–	4 1/16	–	149.23	11.11	17.5	15.9	4.8
R38	–	–	–	–	4			157.16	15.88	22.2	20.6	–
R39*	–			4	–	–	4 1/16	161.93	11.11	17.5	16.0	4.8
R40	5	–	–	–	–	–		171.45	7.95	14.3	12.7	–
R41*	–	5	5	–	–		–	180.98	11.11	17.5	15.9	4.8
R42				–	5	–	–	190.50	19.05	25.4	23.9	–
R43	6	–	–	–	–	–		193.68	7.95	14.3	12.7	–
R44*	–	–	–	5		–	–	193.68	11.11	17.5	15.9	4.8
R45*		6	6	–	–	5 1/8	–	211.14	11.11	17.5	15.9	4.8
R46*	–	–	–	6	–		5 1/16	211.14	12.70	19.1	17.5	4.8
R47*	–				6	–	–	228.60	19.05	25.4	23.9	4.1
R48	8	–	–	–	–	–	–	247.65	7.95	14.3	12.7	–
R49*	–	8	8	–	–	8	–	269.88	11.11	17.5	16.0	4.8
R50*		–	–	8	–	–	8	269.88	15.88	22.2	20.6	4.1
R51	–	–	–	–	8	–		279.40	22.23	28.6	27.0	–
R52	10				–	–	–	304.80	7.95	14.3	12.7	–
R53*	–	10	10	–	–	11	–	323.85	11.11	17.5	16.0	4.8
R54*	–	–	–	10	–		11	323.85	15.88	22.2	20.6	4.1
R55				–	10	–	–	342.90	28.58	36.5	34.9	
R56	12	–	–	–	–	–	–	381.00	7.95	14.3	12.7	–
R57*	–	12	12	–	–	13 5/8		381.00	11.11	17.5	16.0	4.8

*Denotes ring number specified in API 6A. Nominal Pipe sizes marked ** apply to class rating 13.8 only
Nominal Pipe sizes in brackets apply to class rating 20.7 only. †Ring no. R30 is suitable for lapped flanges only.

QUALITY WORLDWIDE

'R' 型金属密封环

STYLE R DIMENSIONS IN MILLIMETRES

RING NO.	PRESSURE CLASS RATINGS ANSI, BS & MSS 150	300/600	900	1500	2500	API (MPa) 13.8/20.7	34.5	PITCH DIAMETER OF RING P	WIDTH OF RING A	HEIGHT OF RING OVAL B	OCTAGONAL H	APPROX. DISTANCE BETWEEN MADE UP FLANGES
	NOMINAL PIPE SIZE (Inches)											
R58	–	–	–	12	–	–	–	381.00	22.23	28.6	27.0	–
R59	14	–	–	–	–		–	396.88	7.95	14.3	12.7	
R60	–	–			12	–	–	406.40	31.75	39.7	38.1	–
R61		14	–	–	–	–	–	419.10	11.11	17.5	15.9	–
R62	–	–	14	–	–			419.10	15.88	22.2	20.6	
R63*	–	–		14		–	–	419.10	25.40	33.3	31.8	5.6
R64	16	–	–	–	–	–	–	454.03	7.95	14.3	12.7	–
R65*	–	16	–	–	–	16¾**	–	469.90	11.11	17.5	16.0	4.8
R66*	–	–	16			(16)	–	469.90	15.88	22.2	20.6	4.1
R67		–	–	16	–	–	–	469.90	28.58	36.5	34.9	–
R68	18	–	–	–	–		–	517.53	7.95	14.3	12.7	
R69*	–	18			–	–	–	533.40	11.11	17.5	16.0	4.8
R70*		–	18	–	–	(18)	–	533.40	19.05	25.4	23.9	4.8
R71	–	–	–	18	–		–	533.40	28.58	36.5	34.9	–
R72	20			–	–	–	–	558.80	7.95	14.3	12.7	–
R73*		20	–	–	–	21 ¼**		584.20	12.7	19.1	17.5	4.8
R74*	–	–	20	–		(20¾)	–	584.20	19.05	25.4	23.9	4.8
R75	–			20	–	–	–	584.20	31.75	39.7	38.1	–
R76	24	–	–	–	–	–		673.10	7.95	14.3	12.7	
R77	–	24	–			–	–	692.15	15.88	22.2	20.6	–
R78			24	–	–	–	–	692.15	25.4	33.3	31.8	–
R79	–	–	–	24	–	–		692.15	34.93	44.5	41.3	
R80	22	–	–			–	–	615.95	7.95		12.7	–
R81		22	–	–	–	–	–	635.00	14.29	–	19.1	–
R82*	–	–	–	–	–		–	57.14	11.11	–	16.0	4.8
R84*	–	–				–	–	63.50	11.11		16.0	4.8
R85*	–	–	–	–	–	–	–	79.38	12.70	–	17.5	3.3
R86*	–	–	–	–	–		–	90.50	15.88	–	20.6	4.1
R87*	–				–	–	–	100.03	15.88	–	20.6	4.1
R88*	–	–	–	–	–	–		122.83	19.05	–	23.9	4.8
R89*	–	–	–			–	–	114.30	19.05		23.9	4.8
R90*			–	–	–	–	–	165.58	22.23	–	26.9	4.8
R91*	–	–	–	–	–			260.25	31.75	–	38.1	4.1
R92	–	–				–	–	228.60	11.11	17.5	16.0	–
R93	–	26	–	–	–	–	–	746.30	19.05	–	23.9	–
R94	–	28	–	–			–	800.10	19.05	–	23.9	–
R95	–	30		–	–	–	–	857.25	19.05	–	23.9	–
R96	–	32	–	–	–	–		914.40	22.23	–	27.0	
R97	–	34	–	–		–	–	965.20	22.23		27.0	–
R98		36	–	–	–	–	–	1019.18	22.23	–	27.0	–
R99*	–	–	–	–	–			234.95	11.11	–	16.0	4.8
R100	–	–	26			–	–	749.30	28.58		34.9	–
R101	–	–	28	–	–	–	–	800.10	31.75	–	38.1	–
R102	–	–	30	–	–		–	857.25	31.75	–	38.1	–
R103			32		–	–	–	914.40	31.75	–	38.1	–
R104	–	–	34	–	–	–		965.20	34.93	–	41.3	
R105	–	–	36	–	–		–	1022.35	34.93	–	41.3	–

*Denotes ring number specified in API 6A. Nominal Pipe sizes marked ** apply to class rating 13.8 only
Nominal Pipe sizes in brackets apply to class rating 20.7 only. †Ring no. R30 is suitable for lapped flanges only.