



FLEXITALLIC

Information Package and Data Sheets

Spiral Wound: Flexitallic

PROUD DISTRIBUTOR



INTRODUCTION

The concept of spiral wound gasket construction was originated by Flexitallic in 1912, inaugurating the beginning of a new era in safe, effective sealing. The primary purpose for this development was the increasingly severe temperatures and pressures used by U.S refinery operators in the first half of the century.

The necessity for a gasket to have the ability to recover cannot be over emphasized. The effects of various pressure and temperature fluctuations, the temperature differential across the flange face, together with bolt stress relaxation and creep, demand a gasket with adequate flexibility and recovery to maintain a seal even under these varying service conditions. The Flexitallic spiral wound gasket is the precision engineered solution to such problems, meeting the most exacting conditions of both temperature and pressure in flanged joints and similar assemblies and against virtually every known corrosive and toxic media.

This publication is designed to facilitate the specification and ordering of standard Flexitallic spiral wound gaskets. Dimensional data for the basic styles - Style CG, Style CGI, Style R, and Style RIR are detailed on respective tables.



Gasket Identification

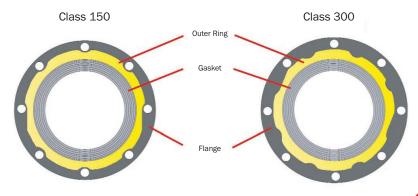
Gaskets are colour coded to help expedite the selection and identity of the gaskets you need. The colour on the outside edge of the centering ring identifies both the winding and filler materials.

The metallic winding material is designated by a solid colour. The filler materials are designated by colour stripes at equal intervals on the outside edge of the centering ring. Flexitallic colour coding meets the industry standard for metal and filler materials listed in ASME B16.20.

Solid C	colour Code
(Yellow)	304SS
(Green)	316LSS
(Maroon)	317L
(Turquoise)	321SS
(Blue)	347SS
(No Colour)	310SS
(No Colour)	304LSS
(No Colour)	309SS
(No Colour)	430SS
(Black)	Alloy 20
(Purple)	Titanium
(Gold)	Inconel 600/625
O (White)	Incoloy 800/825
(No Colour)	Inconel X750
(Beige)	Hastelloy C276
(Brown)	Hastelloy B2
(Red)	Nickel 200
(No Colour)	Zirconium
(Silver)	Carbon Steel
(Orange)	Monel
(No Colour)	Duplex

	Stripe Colour Code					
0	(White)	PTFE				
0	(Gray)	Flexicarb				
0	(Pink)	Flexite Super				
0	(Light Green)	Ceramic				
0	(Light Blue)	Thermiculite 835				

Multi-Class Spiral Wound Gasket



- One gasket accommodates both Class 150 and 300 flanges (Class 150 to 600 in NPS 1/2 through NPS 3)
- Reduces inventory requirements
- Easy to install ... Less than half the studs
- Multiple metal windings & fillers available
- Also available with inner rings

Available Gasket Materials

METAL WINDING STRIP AS STANDARD Stainless Steel type 304, 316L

OTHERS Stainless Steel type 304L, 309, 310, 316Ti, 317L, 321, 347, 430, 17-7PH ALLOY 20

MONEL TITANIUM NICKEL 200 **INCONEL**

type 600, 625, X-750 **HASTELLOY** type B-2, B-3, C276

INCOLOY

type 800, 825 **DUPLEX**

ZIRCONIUM TANTALUM COPPER

PHOS-BRONZE

FILLER MATERIAL

Flexicarb flexible graphite

Thermiculite 835

Flexite Super

PTFE

Mica

Ceramic

Non-sintered PTFE

Thermiculite, Flexitallic's proprietary high-temperature, sealing material is comprised of chemically exfoliated and thermally exfoliated vermiculite.

This revolutionary patented product simulates the structure of exfoliated graphite but with one notable exception...gaskets made with Thermiculite maintain their integrity, even at extreme temperatures.

Thermiculite is thermally stable, ensuring against thermal oxidation, at temperature in excess of 1800°F (Thermiculite 835).

GUIDE RING MATERIAL AS STANDARD Carbon Steel

OTHERS

Stainless Steel

type 304, 304L, 316, 316L, 316Ti, 310,

321, 347, 410, 600, 625

INCONEL

MONEL

TITANIUM NICKEL

INCOLOY

type 800, 825

ALLOY 20

HASTELLOY

type B-2, B-3, C276

NOTES

Selected materials should be compatible with operating temperatures and chemicals. If in doubt, contact Flexitallic Technical Department. 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 hazardous effects.

IDENTIFICATION REQUIREMENTS

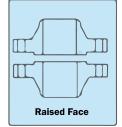
- Inner ring material stamped on inner ring or outer ring
- Nominal Pipe Size and pressure class. Not shown when gasket is manufactured to special dimensions
- Outer ring material when other than CS

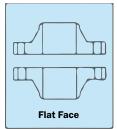
- Winding metal and filler material
- Manufactured to ASME B16.20 latest edition or applicable dimensional and quality specifications

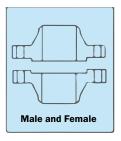


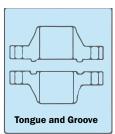
Selection Guide

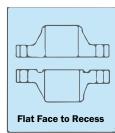
Flange Face



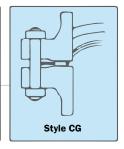




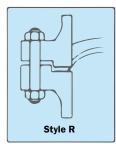


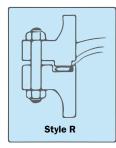


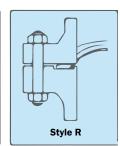






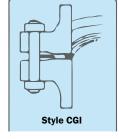






Recommended **Gasket Style**

For high pressure/tem perature duty also for gaskets with PTFE filler rrosive or fluctuating pressure or temperature ervice conditions











Published as an indication of which Flexitallic spiral wound gasket best suits different pipe flange configurations and service conditions.

*It is essential that Style R gaskets are fitted with a compression stop. Without a correctly dimensioned stop the gasket can easily be over-compressed resulting in failure. To provide a compression stop the depth of the tongue, groove or recess should be controlled to provide optimum compressed thickness with metal to metal contact on the flange faces.

Gasket Selection: What Style Of Gasket Should I Select?

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 of class 2500. See note towards end of document for inner ring requirements.

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. See note towards end of document for inner ring require-

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 of the gasket. Designed to prevent accumulation of solids, reduce turbulent flow of process fluids and minimize erosion at flange faces. Suitable for male and female pipe flanges.

Dimensional **Data**

STYLE CG & CGI GASKETS TO SUIT STANDARD RAISED FACE AND FLAT FACE FLANGES

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 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, and MIL-G-15342, latest revisions. When making an inquiry, refer to the proper government specification number.

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 B16.5 BS 1560 BS 10 ASME B16.47 SERIES B (API 605) ASME B16.47 SERIES B (MSS SP 44) BS 4504 DIN FLANGES JIS FLANGES

When Ordering Please Specify	Example
Gasket Style	Flexitallic Style "CGI" Spiral Wound Gasket
Nominal Pipe Size (NPS)	4"
Pressure Rating	Class 900
Gasket Standard	ASME B16.20
Winding Materials	316L/FLEXICARB (FG)
Outer Ring Material	Carbon Steel
Inner Ring Material	316L



Style $m{R}$ (for use with male and female tongue and groove asme B16.5 & BS 1560 flanges)

Standard style R gaskets embody all of the exclusive features of Flexitallic design for keeping all compression values in balance with bolting and for providing the adequate resilience to compensate for the variable stresses encountered in service. Standard Style R gaskets are manufactured to a nominal thickness of 0.125" (3.2mm). The optimum compression is in the range of 0.090" to 0.100" (2.3mm to 2.5mm) thick.

There are three types of Style R gaskets:

- 1) Style R-1 indicates gaskets for use with large male & female flanges
- 2) Style R-3 indicates gaskets for use with large tongue & groove
- 3) Style R-4 indicates gaskets for use with small tongue & 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 flanges 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 flanges 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

- 1/4" 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 NPS ½" R-1 and R-3 gaskets within the same pressure rating
- 34" interchangeable with all 34" 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.

5,000	Style R1 for Large Male and Female					Style R3 f	or Large To	ongue and	Groove	Style R4	for Small	Tongue and	d Groove			
NOM PIPE SIZE	Sealing Element Class 150 - 1500 Class 2500			Sealing Element Class 150 - 2500		Sealing Element Class 150 - 2500										
SIZE	11	D	OI	D	ID		C	D	10	D	(OD	11	0	(OD
1/4	1/2	12.7	1	25.4	-	1.0	-	140	1/2	12.7	1	25.4	-	-	-	(*)
1/2	1	25.4	1-3/8	34.9	13/16	20.6	1-3/8	34.9	1	25.4	1-3/8	34.9	1	25.4	1-3/8	34.9
3/4	1-5/16	33.3	1-11/16	42.9	1-1/16	27.0	1-11/16	42.9	1-5/16	33.3	1-11/16	42.9	1-5/16	33.3	1-11/16	42.9
1	1-1/2	38.1	2	50.8	1-1/4	31.8	2	50.8	1-1/2	38.1	2	50.8	1-1/2	38.1	1-7/8	47.6
1-1/4	1-7/8	47.6	2-1/2	63.5	1-5/8	41.3	2-1/2	63.5	1-7/8	47.6	2-1/2	63.5	1-7/8	47.6	2-1/4	57.2
1-1/2	2-1/8	54.0	2-7/8	73.0	1-7/8	47.6	2-7/8	73.0	2-1/8	54.0	2-7/8	73.0	2-1/8	54.0	2-1/2	63.5
2	2-7/8	73.0	3-5/8	91.1	2-3/8	60.3	3-5/8	92.1	2-7/8	73.0	3-5/8	92.1	2-7/8	73.0	3-1/4	82.6
2-1/2	3-3/8	85.7	4-1/8	104.8	3	76.2	4-1/8	104.8	3-3/8	85.7	4-1/8	104.8	3-3/8	85.7	3-3/4	95.3
3	4-1/4	108.0	5	127.0	3-3/4	95.3	5	127.0	4-1/4	108.0	5	127.0	4-1/4	108.0	4-5/8	117.5
3-1/2	4-3/4	120.7	5-1/2	139.7	+	-	-	(4)	4-3/4	120.7	5-1/2	139.7	4-3/4	120.7	5-1/8	130.2
4	5-3/16	131.8	6-3/16	157.2	4-3/4	120.7	6-3/16	157.2	5-3/16	131.8	6-3/16	157.2	5-3/16	131.8	5-11/16	144.5
4-1/2	5-11/16	144.5	6-3/4	171.5			-		5-11/16	144.5	6-3/4	171.5	-	-	100	
5	6-5/16	160.3	7-5/16	185.7	5-3/4	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	7-1/2	190.5	8-1/2	215.9	6-3/4	171.5	8-1/2	215.9	7-1/2	190.5	8-1/2	215.9	7-1/2	190.5	8	203.2
8	9-3/8	238.1	10-5/8	269.9	8-3/4	222.3	10-5/8	269.9	9-3/8	238.1	10-5/8	269.9	9-3/8	238.1	10	254.0
10	11-1/4	285.8	12-3/4	323.9	10-3/4	273.1	12-3/4	323.9	11-1/4	285.8	12-3/4	323.9	11-1/4	285.8	12	304.8
12	13-1/2	342.9	15	381.0	13	330.2	15	381.0	13-1/2	342.9	15	381.0	13-1/2	342.9	14-1/4	362.0
14	14-3/4	374.7	16-1/4	412.8	-	-	-		14-3/4	374.7	16-1/4	412.8	14-3/4	374.7	15-1/2	393.7
16	17	425.5	18-1/2	469.9	+	-	-	140	17	425.5	18-1/2	469.9	16-3/4	425.5	17-5/8	447.7
18	19-1/4	489.0	21	533.4	-	-	-	-	19-1/4	489.0	21	533.4	19-1/4	489.0	20-1/8	511.2
20	21	533.4	23	584.2	*			•	21	533.4	23	584.2	21	533.4	22	558.2
24	25-1/4	641.4	27-1/4	692.2	+	-	-	141	25-1/4	641.4	27-1/4	692.2	25-1/4	641.4	26-1/4	666.8

Technical Data

ASSEMBLY TECHNIQUES

Gasket Style Selection

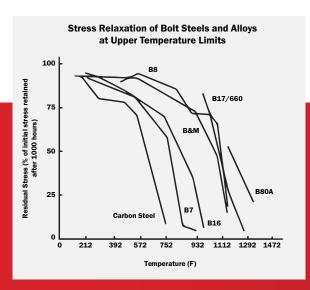
Ensure that the correct style of gasket has been selected for the appropriate application.

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



FLANGES

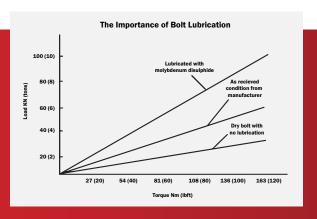
Check that the flange faces are clean, in good condition and with a turned surface finish within the following range Ra 3.2 to 6.3 micro metres (125 to 250 micro inches)

Tightening Procedures

Controlled tightening procedures should be used when installing spiral wound gaskets. Flexitallic recommends that the use of hydraulic tensioning equipment be considered where possible for bolt diameters 1-1/4" and above. Please refer to Flexitallic's Design Criteria for further technical information.

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 tightening methods Flexitallic recommends the use of molybdenum disulphide bolt lubrication or similar nickel based compound. Do not apply any lubricants when using PTFE coated fasteners, Consult with the coating manufacturers for product specific friction coefficients.





STYLE LS & LSI LOW STRESS RANGE OF SPIRAL WOUND GASKETS

The LS gasket offers the same high integrity seal associated with the spiral wound gasket however, the LS and LSI has been designed in such a way that compression and sealing requirements are achieved under very low seating stresses. These gaskets are intended for use on class 150 and 300 applications, where customers traditionally do not use spiral wound gaskets due to concerns about exceeding allowable design stresses.

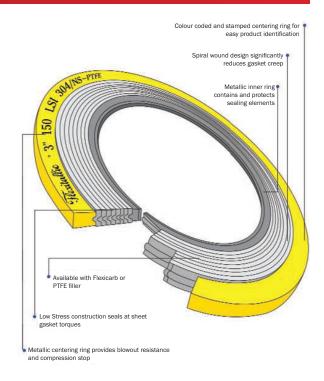
The traditional spiral wound gasket has its steel windings protruding above the compression stop; this requires a significant loading stress to compress the gasket to its optimum operating thickness. The LS and LSI gaskets have only soft Flexicarb or PTFE filler protruding above metal windings and guide ring; therefore as the gasket is compressed, the Flexicarb or PTFE filler is readily compressed thus producing the sealing mechanism at an earlier stage as compared to the conventionally manufactured spiral wound gasket.

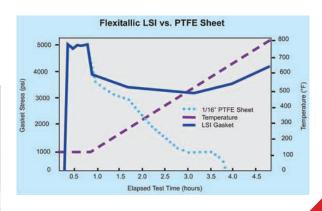
The LSI gasket retains more of its initial stress or tightness, even when subjected to high temperatures, unlike PTFE sheet gaskets. Available in a variety of metals, engineered to suit specific applications.

LOWER BOLT STRESS-REDUCED FUGITIVE EMISSIONS

Flexitallic recommended minimum bolt torque figures for use with the "LSI" gasket on ASME/B16.5 flanges.

NPS (IN.)	TORQUE FT.LBS.	NPS (IN.)	TORQUE FT.LBS.
1/2	25	5	83
3/4	25	6	83
1	25	8	83
1 1/4	25	10	133
1 1/2	25	12	133
2	50	14	204
2 1/2	50	16	204
3	50	18	295
3 1/2	50	20	296
4	50	24	417





Note: Minimum required torques may be even lower depending on gasket size and bolt materials. Please contact Flexitallic's technical department for more information.

^{*}Above torque values are for class 150 ASME flanges.

Thermiculite 835 Heat Treated Inconel X-750 Spiral Wound Gasket

INCREASED SAFETY. PROVEN RESULTS. PROVEN COST SAVINGS.

Severe cyclic conditions? For the most demanding cyclic conditions, the choice is Flexitallic's Thermiculite 835 Spiral Wound Gasket with Heat Treated Inconel X-750 winding. Differential thermal expansion and contraction of components in a bolted joint, due to the effects of cyclic conditions, requires that extra resiliency be built into the joint or the gasket to compensate for fluctuating load conditions.

Normal gasket materials do not provide sufficient resiliency, and therefore cannot compensate for the adverse effects of cyclic conditions. Special Heat Treated Inconel X-750 gasket materials have been developed by Flexitallic to ensure that joint integrity is maintained during thermal cycles.

In OEM and End User testing comparing the performance of standard 316L SS windings vs. Heat Treated Inconel X-750 winding material significantly increased the yield strength resulting in increased spring back before leakage, or usable recovery.



Thermiculite 835 Spiral Wound Gasket with heat treated Inconel X-750 Winding

Full Scale Test Results (averaged) Gasket Dimensions 40-5/8" x 42" x 0.175"							
Winding Material	316L SS	Heat Treated Inconel X-750					
Initial Thickness	0.178"	0.179"					
Compressed Thickness	0.122"	0.121"					
Total Springback	0.011"	0.013"					
Springback to Leakage @2500psi Test Pressure	0.0038"	0.0078"					

Note: When ordering this material it is important that you specify PRECIPITATION HARDENED INCONEL X750 WINDINGS, OR INCONEL X750HT.

Specify Flexitallic's proprietary precipitation hardened Inconel X-750 windings in applications where there are concerns about:

- Cyclic conditions
- Differential thermal expansion and contraction
- Radial shear
- Bolt relaxation
- Hot torqueing
- Mating flanges of dissimilar metals



Product Profile: Style CGI

USAGE: Flat and raised faced diameter flanges up to and inclusive of class 2500

Materials and Maximum T Limits							
Spiral Wound Filler Guide	Filler Type						
	Thermiculite 835	Flexicarb	PTFE	Flexite Super	Ceramic		
Maximum Temperature	1800°F	842°F	500°F	480°F	2300°F		
	982°C	450°C	260°C	249°C	1260°C		
Minimum Temperature	-400°F	-400°F	-300°F	-150°F	-150°F		
	-240°C	-240°C	-184°C	-101°C	-101°C		

Design Parameters						
Gasket Thickness	Maximum Inside Dimension	Recommended Flange Width	Recommended Compressed Thickness			
0.125"	up to 20"	1"	0.090"/0.100"			
0.125"	20" to 40"	3/4"	0.090"/0.100"			
0.175"	up to 40"	1"	0.125"/0.135"			
0.175"	40" to 60"	1"	0.125"/0.135"			
0.175"	60" to 70"	7/8"	0.125"/0.135"			
0.175"	70" to 75"	3/4"	0.125"/0.135"			
0.250"	90"	1"	0.180"/0.200"			
0.285"	185"	1"	0.200"/0.220"			

Tolerance Capabilities						
Gasket Diameter	Inside Diameter	Outside Diameter				
up to 10"	±1/64"	±1/32"				
10" to 24"	±1/32"	±1/16"				
24" to 60"	±3/64"	±1/16"				

Design Factors						
PVRC	Flexicarb/SS	Flexite/SS				
Gb (psi)	2300	2600				
а	0.237	0.230				
Gs (psi)	13	15				

ASME (AII)						
m	3					
у	10,000 psi					

REOUIRED SURFACE FINISH

• 125-250 Micro inch Ra

APPLICABLE STANDARDS

- ASME B16.20
- •BS3381
- Suited for ASME B16.5 and B16.47 series flanges

TECHNICAL BENEFITS

- Metallic winding suited for cyclic loading
- Outer ring center gasket
- Inner/outer ring provides additional blow-out strength
- Inner/outer ring provides a compression stop
- Prevents flange erosion
- Prevents inward buckling
- **Reduces turbulent flow**
- Recommended for high pressure/temperature applications

Product Profile: Style CG

USAGE: The style CG is a spiral wound gasket for flat and raised face diameter flanges up to and inclusive of class 2500

Materials and Maximum T Limits					
Spiral Wound Filler Guide	Filler Type				
	Thermiculite 835	Flexicarb	PTFE	Flexite Super	Ceramic
Maximum Temperature	1800°F	842°F	500°F	480°F	2300°F
	982°C	450°C	260°C	249°C	1260°C
Minimum Temperature	-400°F	-400°F	-300°F	-150°F	-150°F
	-240°C	-240°C	-184°C	-101°C	-101°C

Design Parameters					
Gasket Thickness	Maximum Inside Dimension	Recommended Flange Width	Recommended Compressed Thickness		
0.125"	up to 20"	1"	0.090"/0.100"		
0.125"	20" to 40"	3/4"	0.090"/0.100"		
0.175"	up to 40"	1"	0.125"/0.135"		
0.175"	40" to 60"	1"	0.125"/0.135"		
0.175"	60" to 70"	7/8"	0.125"/0.135"		
0.175"	70" to 75"	3/4"	0.125"/0.135"		
0.250"	90"	1"	0.180"/0.200"		
0.285"	185"	1"	0.200"/0.220"		

Tolerance Capabilities			
Gasket Diameter	Inside Diameter	Outside Diameter	
up to 10"	±1/64"	±1/32"	
10" to 24"	±1/32"	±1/16"	
24" to 60"	±3/64"	±1/16"	

Design Factors			
PVRC	Flexicarb/SS	Flexite/SS	
Gb (psi)	2300	2600	
а	0.237	0.230	
Gs (psi)	13	15	

ASME (AII)				
m	3			
V	10.000 psi			

REQUIRED SURFACE FINISH

• 125-250 Micro inch Ra

APPLICABLE STANDARDS

- ASME B16.20
- •BS3381
- Suited for ASME B16.5 and B16.47 series flanges