

2020



# H.S. WHITE CORPORATION

GASKETS & CUSTOM  
CUT RUBBER



EXCEPTIONAL QUALITY | LARGE INVENTORY  
SAME DAY SHIPPING  
1.800.327.8575

# HSW HITE

provides gaskets in all types of materials in a wide variety of shapes and sizes. We serve an extensive spectrum of industries and with over 80 years of experience, we have the expertise to advise you on the best ways to make sure your products are effectively sealed while remaining safe under pressure.



## INDUSTRIES SERVED

### Aerospace

Many different materials are used and specific material call-outs are crucial for this industry. Gaskets require certificates of conformance, including batch numbers and cure dates with full traceability.

### Automotive

Nitrile and Viton™ (FKM), are commonly used materials because of their oil and fuel resistance. EPDM is commonly used for door seals and graphite/non-asbestos materials can be used in the combustion areas of an engine. Silicone is also used for high temperature applications.

### Chemical/Petrochemical

Spiral wound, metal graphite and PTFE gaskets provide superior performance for highly corrosive and high temperature applications.

### Electrical

Cork, Neoprene, EPDM, and Nitrile materials can be used for sealing and ventilating electrical enclosures, circuit board support pads, mounting, switchgear and transformer components.

### Food Processing

Silicone is used frequently as it is stable at high temperatures and also inhibits bacterial growth. For steam or other high pressure applications, non asbestos and/or graphite material may also be used. Other materials include FDA approved elastomers including EPDM and PTFE which offers chemical and UV resistance, and other white food grade rubbers.

## Oil & Gas

High temperature and high pressure environments require special materials including spiral wound, ring type and non-asbestos materials.

## Pharmaceutical

Silicone and PTFE are the most commonly used materials for drug processing and conveyor belting. These materials provide a clean environment and low bacterial growth.

## Pumping

Shaft seals, valve seals and packings are made from Neoprene and EPDM. Nitrile, Viton™ (FKM), PTFE, and non-asbestos materials can also be used for more corrosive applications.

## Rail

EPDM, Nitrile, non-asbestos, and Viton™ (FKM) are commonly used for manway gaskets to seal against fuel, oil and water.

## Water/Drinking Water

NSF / ANSI 61 Certified gasket material is the preferred choice in the potable water industry. Other materials used include Red Rubber (SBR) and compressed non-asbestos for waste water services.





# CAPABILITIES

GASKETS , SEALS &  
RUBBER STRIPPING



+ CNC KNIFE CUTTING

+ DIE CUTTING

+ STRIPPING

+ CUSTOM DESIGN





# CNC KNIFE CUTTING

## CUSTOM CUTTING CAPABILITIES

### **CNC KNIFE CUTTING:**

Designed for quick turnaround of large scale non-metallic materials, the CNC Knife Cutting Machine uses advanced technology to ensure precision and accuracy on single or large production runs.

### **DIE CUTTING:**

Our top-performing, versatile cutting press cuts both roll or sheet form materials with high trolley displacement speed, low energy consumption and excellent reliability allowing for great cutting quality at cost-effective prices.

### **STRIPPING:**

Hard to find, hand-cut stripping of rubber materials in lengths of up to 50 feet. All types of synthetic rubbers available.

### **CUSTOM:**

H.S. White delivers custom gaskets manufacturing to a wide range of industries. From marine applications to electrical to appliances, we offer the cutting abilities and technology required to create the exact gasket you need for your project.



# GASKET MATERIALS

We take pride in manufacturing quality gasket products that deliver the premium performance your business demands.



## RUBBER

NEOPRENE

NITRILE

EPDM

SILICONE

CSM/HYPALON®

SBR RED RUBBER

SBR CI

TAN PURE GUM RUBBER

FKM/VITON®

BUTYL

CORRUGATED RUBBER MATTING

CLOSED CELL FOAM

FDA GRADE

## OTHER MATERIALS

SPIRAL WOUND

KLINGERSIL

PTFE/TEFLON®

GRAPHITE (TANG/FOIL)

CORK

COMPRESSED FIBER

## SPECIALTY

PHENOLIC

NSF CERTIFIED WATERSIL®

NSF 61 CERTIFIED EPDM

**\*PSA BACKING AVAILABLE**

## MIL-SPEC MATERIALS

In addition to our stocked sheet rubber gasket materials, H.S. White also offers Military Specification Grade gasket products. Specifically designed to meet the demanding requirements of the U.S. Military, our certified MIL-Spec materials have excellent electrical, physical, out-gassing, flammability, temperature-resistance and environmental properties.

### NITRILE CI TYPE 98

ASTM D2000-M5-BG-607-A14-B14-EO34

### SBR CI TYPE 96

ASTM D2000 M2-AA-603-A13-B13-EA14

### NEOPRENE CI TYPE 87

ASTM D2000 M2-BC-607-A14-B14-C12-F17

MIL R-6855, Class 1 NITRILE Grade 40 & 60								
Thickness Inches	Width Inches	Durometer Hardness Shore A $\pm 5$	Tensile psi	Elongation %	Compound	Temperature	Wt. Per Lin. Foot 36"	Finish
1/16 thru 1/4	48	40	1100	450	Nitrile	-55° to 180°F	1/8" - 3.07 lbs	Smooth
1/16 thru 1/4	48	60	1300	300	Nitrile	-55° to 180°F	1/8" - 3.07 lbs	Smooth
MIL R-6855, Class 1 NEOPRENE Grade 40 & 60								
Thickness Inches	Width Inches	Durometer Hardness Shore A $\pm 5$	Tensile psi	Elongation %	Compound	Temperature	Wt. Per Lin. Foot 48"	Finish
1/16 thru 1/4	48	40	1300	500	Neoprene	-55° to 180°F	1/8" - 3.6 lbs	Smooth
1/16 thru 1/4	48	60	1500	300	Neoprene	-55° to 180°F	1/8" - 3.6 lbs	Smooth
MIL G-1149, Type 1 Class 1 NEOPRENE BLEND Grade 50								
Thickness Inches	Width Inches	Durometer Hardness Shore A $\pm 5$	Tensile psi	Elongation %	Compound	Temperature	Wt. Per Lin. Foot 48"	Finish
1/16 thru 1/4	48	50	1000	300	SBR Blend	-20° to 170°F	1/8" - 3.33 lbs	Smooth
MIL R-2765, 1 NITRILE Grade 45								
Thickness Inches	Width Inches	Durometer Hardness Shore A $\pm 5$	Tensile psi	Elongation %	Compound	Temperature	Wt. Per Lin. Foot 36"	Finish
1/16 thru 1/4	48	45	1000	300	Nitrile	-20° to 170°F	1/8" - 3.33 lbs	Smooth

# TYPES OF GASKET MATERIAL

The Function of a Gasket is to create and maintain a static seal between two stationary, imperfect surfaces of a mechanical system, designed to contain a wide variety of liquids or gases. The gasket must be able to maintain this seal under all the operating conditions of the system including extremes of temperature and pressure. The performance of the gasket is affected by a number of factors. All of these factors must be taken into consideration when selecting a gasket.

## NON-METALLIC

Non-metallic gaskets can be made from CNAF (Compressed non-asbestos fibre), PTFE, Rubber, Teflon or Graphite. These gaskets compress easily with low tension bolting. They're generally used for low pressure applications and low temperatures. One exception is graphite gaskets, which can be used for temperatures as high as 460 degrees centigrade.



## METALLIC

Metal is used for ring type joints in high-pressure applications, such as oil and gas supply production. RTJs are also used on valves and pipework, assemblies in refineries and other process industries. They seal by an initial line contact or a wedging action as the compressive forces are applied. Metal ring type gaskets are available with oval and octagonal cross sections. Octagonal include the BX type designed to seal pressure up to 20,000 psi, in accordance with API 6A pressure ratings.



## COMPOSITE

Composite gaskets are a combination of metal and non-metal material based on service requirement. Spiral wound, Metal Jacketed, and Kamprofile gaskets are well known in the composite gasket category. They're used in a wide range of pressure and temperature services.

Composite gaskets are cost effective as compared to metal gaskets, but careful handling is required. Composite gaskets are used on raised face, male-female, and tongue-and-groove flanges.



A flange leak results in loss of product and energy, sometimes with disastrous consequences. No plant operator wants leaking of toxic or hazardous material that can harm humans or the environment. The right type of gasket helps to achieve a reliable seal to prevent leakage from the flange joints.



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**H.S. White** has the technology to automate just about any shape required for your application. Non-metallic materials are available in widths up to 60 inches and sheet lengths of up to 50 feet depending on the product. For oversized gaskets, H.S. White has the capability of creating custom segmented gaskets for ease of handling and installation.

In order to ensure a successful seal many factors must be considered. The gasket material must be resilient and rugged enough to overcome any irregularities in the mating surfaces; resist extrusion and creep; and prevent blowouts under various operating conditions. Material thickness is also important when choosing a non-metallic gasket. The thinnest material that a flange application will allow should be considered however, the material should be thick enough to compensate for any surface irregularities or flange parallelism. Thinner gaskets can handle an increased level of bolt load and will reduce the amount of bolt stress that is lost due to relaxation. Additionally, thinner material reduces the gasket area which limits the amount exposed to attack from internal pressure and/or an aggressive application.

H.S. White suggests contacting one of our knowledgeable team members to select the correct material for your application. There are a number of gasketing materials available and new materials emerge often. Material specifications are also available in our literature and on our website to assist in proper material selection.

In addition to choosing the correct gasketing material, proper installation is crucial to ensure a leak free BFJA (Bolt Flange Joint Assembly). Most commonly, when there are leaks in a flange, it is assumed that it is due to a “gasket failure” however, that is rarely the case. The vast majority of the time, leakage occurs as a result of improper installation. Follow these basic guidelines when installing a gasket in a BFJA:

1) Properly inspect the gasket to ensure it is in good condition. The dimensions should be verified including the I.D., O.D., Bolt pattern (if applicable), and the thickness of the gasket. A visual inspection of the flange sealing surface should also be done to ensure it is free of any debris, lubricants and/or defects. All fasteners should meet the requirements including material, length, thread pitch and nut thickness. Lubricants should not be used to temporarily hold a gasket in place.

2) Align the gasket properly to be concentric with the flange ID and avoid protrusion into piping flow path, ensure gasket remains in proper place during assembly and that flanges are properly aligned and parallel to each other.

3) Bolts must be tightened in incremental steps to arrive at the target stress level using a properly calibrated load control device such as a torque wrench, or a stud tensioner. During the incremental torquing steps, it is good practice to measure the flange gap at a minimum of four points at 90 degrees to each other around the flange OD at each step to assure even loading.

Note: For soft gasket materials, one of the major factors is the creep relaxation of the gasket. Creep effects are accentuated at elevated temperatures, with the net result that the compressive load on the gasket is reduced, thus increasing the possibility of a leak. Consequently, UIP International, Inc recommends that fasteners should be re-torqued (to the recommended torque at ambient temperature before the process is energized) 24 hours after the initial assembly.

**\*\*H.S. White strongly encourages the reader to reference FSA/ESA document (FSA0009) FSA/ESA Gasket Installation Procedures**

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# RUBBER

## **NEOPRENE (CHLOROPRENE):**

A general purpose elastomeric compound with low temperature flexibility and good oil resistance. Good resistance to weather, ozone, natural aging, alkalis, salts and acids. Cloth-inserted also available.

## **NITRILE (BUNA-N):**

Strong resistance to petroleum-based and hydraulic fluids, aromatic and aliphatic hydrocarbons and gasoline over a wide range of temperatures. Good resistance to caustics and salts. Cloth-inserted also available.

## **EPDM:**

Ethylene propylene diene monomer rubber, better known as EPDM, exhibits excellent resistance to extreme temperatures, acids, ozone, oxygen, sunlight, alkalis, and ketones.

## **FKM/VITON®:**

A versatile and popular high-performance synthetic rubber, Fluorocarbon elastomer has good resistance to oils, fuel, chlorinated solvents, aliphatic and aromatic hydrocarbons and strong acids. Highly flexible and oxidation resistant with low gas permeability.

## **SILICONE:**

Highly resistant to extreme temperatures with excellent UV and ozone resistance. Non-toxic, chemically inert and fungus resistant.

## **CSM/HYPALON®:**

CSM has high resistance to most chemicals. It resists weathering, sunlight, ozone, oils and commercial fuels such as diesel and kerosene.

## **SBR RED RUBBER:**

An economical and general purpose co-polymer of Styrene and Butadiene, exhibiting excellent abrasion, heat and impact resistance. Highly impermeable, serving as an excellent barrier against gases and liquids.

## **SBR RED RUBBER CI:**

Cloth inserted red rubber offers maximum conformity and deformation resistance. Fabric reinforced rubber presents good dimensional stability under high compression loads.

## **TAN PURE GUM RUBBER:**


Gum rubber is extremely flexible, elastic and durable. Resistant to salts, ammonia, acids and alkalis, it offers good tear strength and is made from FDA approved ingredients.

## **BUTYL:**

Exceptionally low gas and moisture permeability and outstanding resistance to heat aging, weather, ozone, chemical attack, flexing, abrasion and tearing. Resistant to hydraulic fluids and has excellent electrical insulation performance.

## **CLOSED CELL FOAM (SPONGE RUBBER):**

An economical rubber with excellent compression properties. Absorbs shock and vibration. Impermeable to air and water with good resistance to solvents.



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## FDA GRADE RUBBER

### **WHITE FDA GRADE NEOPRENE:**

A non-toxic and non-marking elastomer made from FDA grade material. Versatile option for food and beverage, pharmaceutical and cosmetics manufacturing. Good abrasive qualities and excellent resistance to weathering and ozone conditions.

### **WHITE FDA GRADE NITRILE:**

FDA rated material compatible in the food service, pharmaceutical and cosmetic industries. Good oil and abrasion resistance, non-toxic and non-marking. It has a superior level of resistance against synthetic and natural grease products and increased durability making it the rubber of choice for food safety.

### **WHITE FDA GRADE EPDM:**

Made from FDA-approved ingredients, White EPDM offers a smooth finish, good resiliency to abrasion and repels oily and greasy food products.

### **FDA GRADE SILICONE:**

While silicone is inherently non-toxic, only our specially formulated grade of silicone is made for consumables. Food grade silicone is often used in food processing, packaging and preparation applications. It can also be found in laboratory and medical environments.

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## OTHER MATERIALS

### **SPIRAL WOUND GASKETS:**

Precision-engineered solution for flanged joints, heat exchangers, boiler handholes, manholes and other high temperature, high pressure applications—providing resistance to virtually every known corrosive and toxic element.

### **PTFE/TEFLON®:**

Highly flexible, strong, and able to perform in extreme temperatures. Strong chemical and corrosion resistance. Long product life. Often used in the chemical industry.

### **GRAPHITE (TANG/FOIL):**


Excels in extreme conditions, withstanding heat, pressure, and aggressive chemicals. High dimensional stability in high temperatures and pressure fluctuations. Tang-inserted, foil-inserted and other types available.

### **CORK/CORK RUBBER BLEND:**

A hybrid family of materials combined with rubbers such as silicone, nitrile or neoprene. Compressible, flexible, with excellent anti-vibration characteristics and oil, solvent and fuel resistance.

### **COMPRESSED FIBER:**

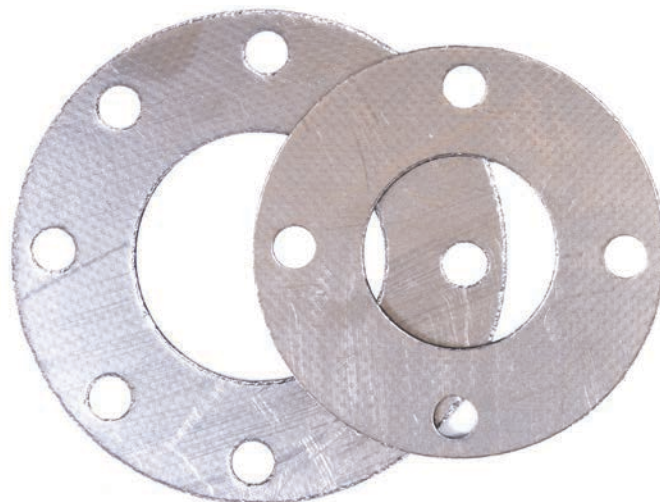
There are many types of compressed fiber gasket options offering a wide temperature range for various applications. Blended non-asbestos fibers with elastomeric binders.



# GASKET DIMENSIONS

## FULL FACE FOR 125/150# ANSI FLANGES

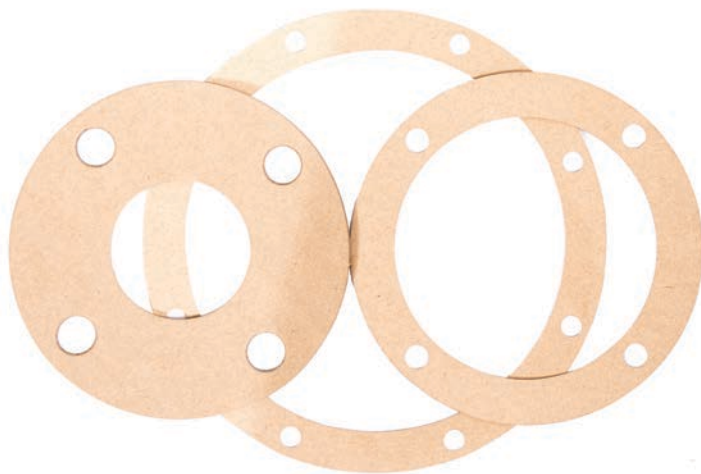
NOMINAL PIPE SIZE	GASKET I.D.	GASKET O.D.	# OF BOLT HOLES	BOLT HOLE DIAMETER	BOLT CIRCLE DIAMETER
1/2"	13/16"	3-1/2"	4	5/8"	2-3/8"
3/4"	1-1/16"	3-7/8"	4	5/8"	2-3/4"
1"	1-5/16"	4-1/4"	4	5/8"	3-1/8"
1-1/4"	1-5/8"	4-5/8"	4	5/8"	3-1/2"
1-1/2"	1-7/8"	5"	4	5/8"	3-7/8"
2"	2-3/8"	6"	4	3/4"	4-3/4"
2-1/2"	2-7/8"	7"	4	3/4"	5-1/2"
3"	3-1/2"	7-1/2"	4	3/4"	6"
3-1/2"	4"	8-1/2"	8	3/4"	7"
4"	4-1/2"	9"	8	3/4"	7-1/2"
5"	5-9/16"	10"	8	7/8"	8-1/2"
6"	6-5/8"	11"	8	7/8"	9-1/2"
8"	8-5/8"	13-1/2"	8	7/8"	11-3/4"
10"	10-3/4"	16"	12	1"	14-1/4"
12"	12-3/4"	19"	12	1"	17"
14"	14"	21"	12	1-1/8"	18-3/4"
16"	16"	23-1/2"	16	1-1/8"	21-1/4"
18"	18"	25"	16	1-1/4"	22-3/4"
20"	20"	27-1/2"	20	1-1/4"	25"
22"	22"	29-1/2"	20	1-3/8"	27-1/4"
24"	24"	32"	20	1-3/8"	22-3/4"





## FULL FACE FOR 250/300# ANSI FLANGES

NOMINAL PIPE SIZE	GASKET I.D.	GASKET O.D.	# OF BOLT HOLES	BOLT HOLE DIAMETER	BOLT CIRCLE DIAMETER
1"	1-5/16"	4-7/8"	4	3/4"	3-1/2"
1-1/4"	1-21/32"	5-1/4"	4	3/4"	3-7/8"
1-1/2"	1-29/32"	6-1/8"	4	3/4"	4-1/2"
2"	2-3/8"	6-1/2"	8	7/8"	5"
2-1/2"	2-7/8"	7-1/2"	8	7/8"	5-7/8"
3"	3-1/2"	8-1/4"	8	7/8"	6-5/8"
3-1/2"	4"	9"	8	7/8"	7-1/4"
4"	4-1/2"	10"	8	7/8"	7-7/8"
5"	5-9/16"	11"	8	7/8"	9-1/4"
6"	6-5/8"	12-1/2"	12	7/8"	10-5/8"
8"	8-5/8"	15"	12	1"	13"
10"	10-3/4"	17-1/2"	16	1-1/8"	15-1/4"
12"	12-3/4"	20-1/2"	16	1-1/4"	17-3/4"
14"	14"	23"	20	1-1/4"	20-1/4"
16"	16"	25-1/2"	20	1-3/8"	22-1/2"
18"	18"	28"	24	1-3/8"	24-3/4"
20"	20"	30-1/2"	24	1-3/8"	27"
22"	22"	33"	24	1-5/8"	29-1/4"
24"	24"	36"	24	1-5/8"	32"



RING GASKET FOR 125/150# ANSI PIPE FLANGE			RING GASKET FOR 250/300# ANSI PIPE FLANGE		
NOMINAL PIPE SIZE	GASKET I.D.	GASKET O.D.	NOMINAL PIPE SIZE	GASKET I.D.	GASKET O.D.
1/2"	27/32	1-7/8	1/2"	27/32	2-1/8
3/4"	1-1/16	2-1/4	3/4"	1-1/16	2-5/8
1"	1-5/16	2-5/8	1"	1-5/16	2-7/8
1-1/4"	1-21/32	3	1-1/4"	1-21/32	3-1/4
1-1/2"	1-29/32	3-3/8	1-1/2"	1-29/32	3-3/4
2"	2-3/8	4-1/8	2"	2-3/8	4-3/8
2-1/2"	2-7/8	4-7/8	2-1/2"	2-7/8	5-1/8
3"	3-1/2	5-3/8	3"	3-1/2	5-7/8
3-1/2"	4	6-3/8	3-1/2"	4	6-1/2
4"	4-1/2	6-7/8	4"	4-1/2	7-1/8
4-1/2"	5	7	4-1/2"	5	7-5/8
5"	5-9/16	7-3/4	5"	5-9/16	8-1/2
6"	6-5/8	8-3/4	6"	6-5/8	9-7/8
7"	7-5/8	10	7"	7-5/8	10-7/8
8"	8-5/8	11	8"	8-5/8	12-1/8
10"	10-3/4	13-3/8	10"	10-3/4	14-1/4
12"	12-3/4	16-1/8	12"	12-3/4	16-5/8
14"	14-3/4	17-3/4	14"	14-3/4	19-1/8
16"	16	20-1/4	16"	16	21-1/4
18"	18	21-5/8	18"	18	23-1/2
20"	20	23-7/8	20"	20	25-3/4
22"	22	26	22"	22	27-5/8
24"	24	28-1/4	24"	24	30-1/2



## FULL FACE GASKET FOR DIN PN 10 FLANGES (MM)

NOMINAL BORE	GASKET I.D.	GASKET O.D.	# OF BOLT HOLES	BOLT HOLE DIAMETER	BOLT CIRCLE DIAMETER
10	18	90	4	14	60
15	22	95	4	14	65
20	28	105	4	14	75
25	35	115	4	14	85
32	43	140	4	18	100
40	49	150	4	18	110
50	61	165	4	18	125
65	77	185	8	18	145
80	90	200	8	18	160
100	115	220	8	18	180
125	141	250	8	18	210
150	169	285	8	18	240
200	220	340	8	26	295
250	274	405	12	26	355
300	325	460	12	26	410
350	356	520	16	26	470
400	407	580	16	30	525
450	458	640	20	30	585
500	508	715	20	33	650
600	610	840	20	36	770



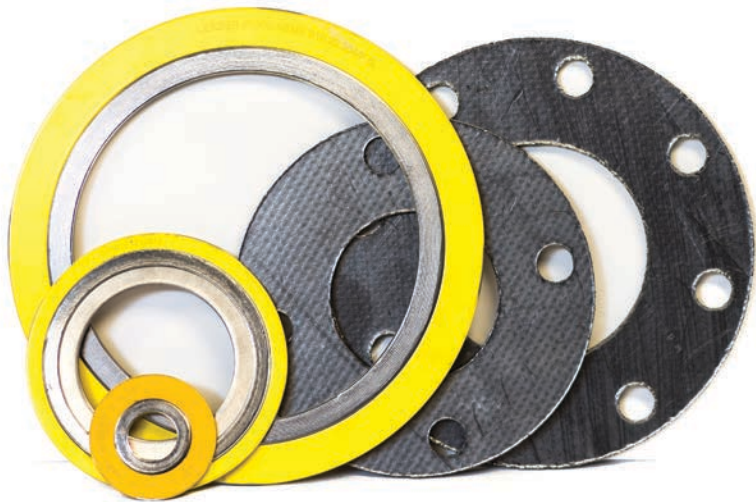
## FULL FACE GASKET FOR DIN PN 16 FLANGES (MM)

NOMINAL BORE	GASKET I.D.	GASKET O.D.	# OF BOLT HOLES	BOLT HOLE DIAMETER	BOLT CIRCLE DIAMETER
10	18	90	4	14	60
15	22	95	4	14	65
20	28	105	4	14	75
25	35	115	4	14	85
32	43	140	4	18	100
40	49	150	4	18	110
50	61	165	4	18	125
65	77	185	8	18	145
80	90	200	8	18	160
100	115	220	8	18	180
125	141	250	8	18	210
150	169	285	8	18	240
200	220	340	8	26	295
250	274	405	12	26	355
300	325	460	12	26	410
350	356	520	16	26	470
400	407	580	16	30	525
450	458	640	20	30	585
500	508	715	20	33	650
600	610	840	20	36	770





NOMINAL BORE	PN 10 Ring Gasket (MM)		PN 16 Ring Gasket (MM)	
	GASKET I.D.	GASKET O.D.	GASKET I.D.	GASKET O.D.
10	18	45	18	45
15	22	50	22	50
20	28	60	28	60
25	35	70	35	70
32	43	82	43	82
40	49	92	49	92
50	61	107	61	107
65	77	127	77	127
80	90	142	90	142
100	115	162	115	162
125	141	192	141	192
150	169	218	169	218
200	220	273	220	273
250	274	328	274	329
300	325	378	325	384
350	356	438	356	444
400	407	489	407	492
450	458	539	458	555
500	508	594	508	617
600	610	695	610	734



## NAVY DRILL GASKET FOR 150# FLANGES

NOMINAL PIPE SIZE	GASKET O.D.	# OF BOLT HOLES	BOLT HOLE DIAMETER	BOLT CIRCLE DIAMETER
1/2"	3-3/16	3	9/16	2-7/16
3/4"	3-13/16	4	9/16	2-11/16
1"	4-1/4	4	9/16	3-1/8
1-1/4"	4-1/2	4	9/16	3-3/8
1-1/2"	5-1/16	6	9/16	3-15/16
2"	5-9/16	6	9/16	4-7/16
2-1/2"	6-1/8	6	9/16	5
3"	6-5/8	8	9/16	5-1/2
3-1/2"	7-3/16	8	9/16	6-1/16
4"	7-11/16	8	9/16	6-9/16
5"	9-1/16	10	11/16	7-13/16
6"	10-1/8	12	11/16	8-7/8
8"	12-3/8	14	11/16	11-1/16
10"	15	15	13/16	13-7/16
12"	17-5/8	18	13/16	16-1/16
14"	19-1/8	19	15/16	17-3/8
16"	21-3/16	20	15/16	19-7/8
18"	23-1/4	22	15/16	21-1/2
20"	25-13/16	24	1-1/16	23-13/16
22"	27-7/8	26	1-1/16	25-7/8
24"	30	28	1-1/16	28

# HOW TO BOLT FLANGES

Bolting should be of sufficient strength to achieve proper compression of the gasket, to not only seal the joint, but to maintain the seal without exceeding the yield strength of the bolts being used. Torque values are based on using ASTM A193 Grade B7 studs and 2H heavy hex nuts lubricated with never seize. Since sheet gasket materials have micropores, they must be sufficiently compressed to reduce porosity. Without adequate compression the system pressure can force the contained fluid into the gasket and degrade it. Therefore, when installing the gasket it is important that good technique be followed including cleaning the flanges, inspecting the flange face and the bolts and bringing the flanges together parallel and in stages. Many field problems arise from improperly installed gaskets. According to the Fluid Sealing Association (FSA,) incorrect tightness is the leading reason gasketed joints fail. This can be prevented by following good bolting practice.

## TORQUE

After installing a new gasket or seal it's essential to tighten the fasteners with a torque wrench that's been recently calibrated. Without this, it is impossible to know if the joint has been tightened to the required level. Friction between the nut, washers, flange faces and thread increases the torque measured at the wrench, possibly resulting in insufficient clamping force being applied to the gasket. Avoid this by applying a thin, uniform coating of high quality lubricant to the underside of bolt heads, nuts and washers and the thread itself. Take care to keep it off the gasket.

## TIGHTENING SEQUENCE

The gasket must be compressed uniformly to avoid material displacement. It's also important to avoid deforming the flange faces. There are two aspects to consider: the bolt pattern and the tightening sequence.

## BOLT PATTERN

To bring the joint together, fasteners should be tightened in opposite pairs. Start at 12 o'clock and then move to 6 o'clock. Then halve the angle between them, moving to the 3 and 9 o'clock pair. Halve the angle again, going to the pair closest to 1:30 and 7:30. Keep repeating until every bolt has been tightened.

## TIGHTENING SEQUENCE

Following the pattern described above, insert the bolts and run up the nuts by hand.

Set the torque wrench to 30% of full torque and, using the pattern, tighten each fastener.

Repeat with the torque wrench at 60%.

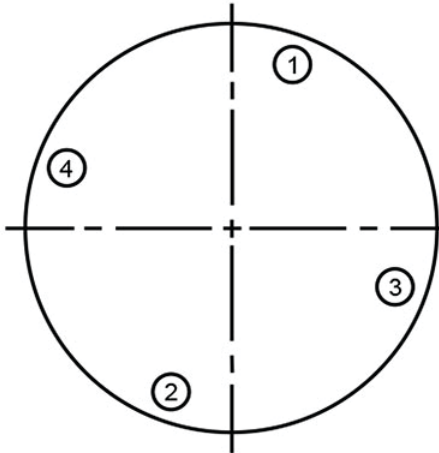
Repeat again with the torque wrench at 100%.

Make a final pass, this time in a circumferential direction, ensuring each fastener is at the required torque.

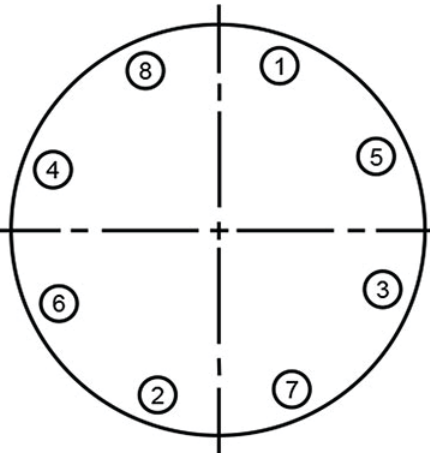
## DO THE JOB ONCE

Replacing gaskets and seals can be expensive, so whenever joints are made in pipes and ducting it's important to ensure they don't leak. One factor in achieving a good joint is to follow good bolting practice. Control the torque applied, the bolting pattern and the tightening sequence to avoid leaks.

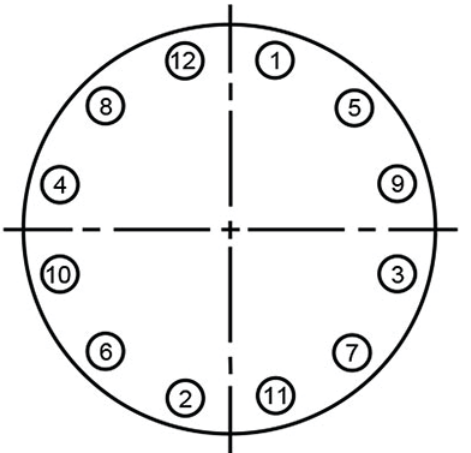
# BOLT TORQUE SEQUENCE



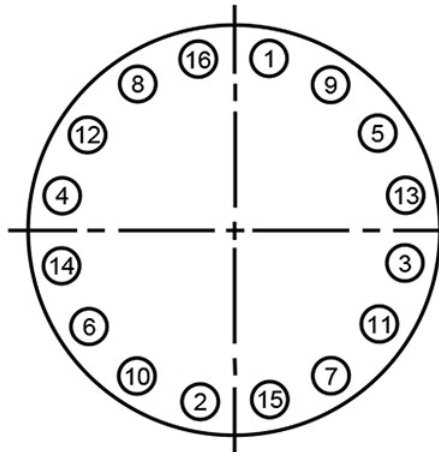
4-bolt



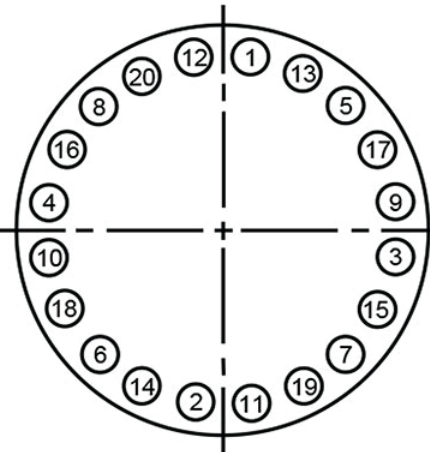
8-bolt



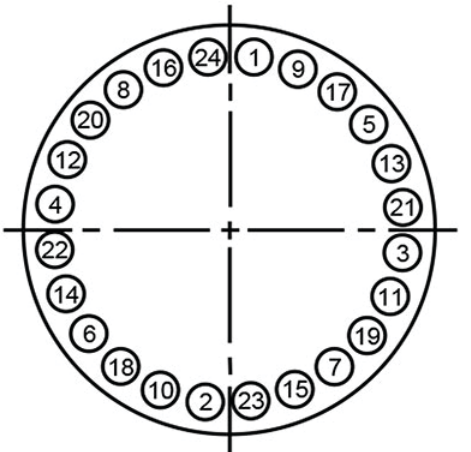
12-bolt



16-bolt



20-bolt



24-bolt



# RUBBER PROPERTIES

Rubbers or elastomers are mixed with various chemicals in order to provide the reinforcement and curing ingredients required to produce the physical properties necessary for the service conditions.

Polymers Most Commonly Used in Sheet Rubber			
ASTM Designation D1418-79	Common Name	Composition	General Properties
NR	Natural	Isoprene, natural	Excellent physical properties including abrasion and low temperature resistance. Poor resistance to petroleum-based fluids.
IR	Polyisoprene	Isoprene, synthetic	Similar to natural rubber
SBR	SBR	Styrene-butadiene	Good physical properties and abrasion resistance. Poor resistance to petroleum based-fluids.
CR	Neoprene	Chloroprene	Good weathering resistance. Flame retarding. Moderate resistance to petroleum-based fluids. Good physical properties.
NBR	Buna N	Nitrile-butadiene	Excellent resistance to petroleum-based fluids. Good physical properties
IIR	Butyl	Isobutene-Isoprene	Very good weathering resistance. Excellent dielectric properties. Low permeability to air. Good physical properties. Poor resistance to petroleum-based fluids.
EPDM EPM	Ethylene-propylene rubbers	Ethylene-propylene-diene Ethylene-propylene	Excellent ozone, chemical, and aging resistance. Poor resistance to petroleum-based fluids.
FPM or FKM	Viton®, Flourel	Hexaflouro-propylene-vinyl-idene fluoride	Excellent oil and air resistance at both high and low temperatures. Very good chemical resistance.

\*From Rubber Manufacturers Association Sheet Rubber Handbook, 3rd Edition

## General Properties of Common Polymers Used in Sheet Rubber

	<b>Neoprene</b>	<b>Nitrile</b>	<b>EPDM</b>	<b>SBR</b>	<b>CI</b>	<b>Pure Gum</b>	<b>Silicone</b>	<b>Viton</b>	<b>CSM</b>
<b>Heat Aging</b>	Good	Good	Excellent	Good	Good	Good	Excellent	Excellent	Good
<b>Abrasion Resistance</b>	Excellent	Excellent	Very Good	Good	Good	Excellent	Poor	Fair	Fair
<b>Compression Set</b>	Fair	Fair	Fair	Good	Good	Good	Fair	Good	Good
<b>Resilience</b>	Excellent	Good	Good	Good	Good	Outstanding	Fair	Fair	Fair
<b>Tear</b>	Good	Good	Good	Fair	Good	Good	Good	Fair	Fair
<b>Flame Resistance</b>	Excellent	Poor	Very Poor	Very Poor	Very Poor	Very Poor	Fair	Good	Good
<b>Weathering</b>	Very Good	Fair	Excellent	Fair	Fair	Fair	Good	Excellent	Excellent
<b>Ozone Resistance</b>	Very Good	Very Poor	Good	Fair	Fair	Poor	Good	Excellent	Excellent
<b>Gas Permeability Resistance</b>	Good	Good	Good	Good	Good	Good	Poor	Poor	Poor
<b>Oil Resistance</b>	Good	Very Good	Very Poor	Poor	Poor	Very Poor	Fair	Good	Fair
<b>Gas Resistance</b>	Good	Excellent	Very Poor	Poor	Poor	Very Poor	Poor	Poor	Poor
<b>Acid Resistance</b>	Good	Good	Good	Fair	Fair	Good	Poor	Good	Good
<b>Alkalai Resistance</b>	Good	Good	Good	Fair	Fair	Good	Poor	Good	Good

### Please Note:

The general properties shown in the chart on the general properties chart are not intended to be used to make final choices for a specific application. Exposure to heat, sunlight, chemicals, ozone and oils, as well as pressure, tension, binding, stretching and folding, will affect the performance of a rubber product.

Suitability must be determined by a qualified professional.

# CONDITIONS OF SALE

**General:** These Conditions of Sale ("Conditions") apply to the sale of goods by H.S. White Corporation. ("Seller"). The Seller will not be bound by any other agreements, contract, modification or waiver of these Conditions unless expressly approved in writing by an authorized employee or agent of Seller.

**Delivery:** Unless otherwise agreed in writing, delivery is F.O.B. Seller's warehouse for sales from Seller's stock, and delivery is F.O.B. Purchaser's warehouse for direct container shipments. Regardless of whether delivery is F.O.B. Seller's warehouse or Purchaser's warehouse, the responsibility for payment of freight, insurance, duty and other costs shall be determined by the agreed terms of the particular sale. Seller has choice of routing and may deliver goods in more than one lot. Each lot shall be deemed a separate contract and paid for separately. Any delivery made within thirty (30) days of the agreed date shall constitute timely delivery and delivery of goods any time thereafter shall be timely delivered unless Seller receives written notice of cancellation by certified or registered mail five days prior to shipment. Seller shall be permitted quantity variations of ten percent (10%) more or less than specified, with the price being adjusted accordingly.

**Freight Policy:** Seller prepays shipments of \$2500 to any one (1) continental U.S.A. location on shipments from warehouse.

**Prices:** All prices shown on Seller's catalogs or other price lists are subject to change without notice. If Seller's costs are increased between the date Purchaser's order is accepted and the date of delivery by increases in transportation costs, port dues, wharfage, tolls, loading charges, insurance rates, import or export taxes, customs duties, customers appraisals, currency conversion rates, or governmental action of any kind, Seller may increase the price accordingly by notifying Purchaser.

**Payment Terms:** Seller's payment terms are ½% 10 net days from invoice date or 30 days net.

**Taxes:** Seller's prices do not include any applicable Federal, State or local property, license, privilege, sales, use, excise, gross receipts or other like taxes which may be now or hereafter applicable to, measured by, or imposed upon or with respect to this transaction, the goods, their sale, value or use, or any services performed in connection therewith, which taxes will be paid by Purchaser.

**Set-offs:** Neither Purchaser nor any affiliated company or assignee shall have the right to set off against any amounts which may become payable to the Seller under this contract or otherwise, for amounts which the Seller may allegedly or in fact owe the Purchaser or any affiliated company or assignee, whether arising out of this contract or otherwise.

**Force Majeure:** Seller shall not be liable for loss, damage, detention or delay due to war, riots, civil insurrection or acts of the common enemy, fire, flood, strikes or labor difficulties, acts of civil or military authority including governmental laws, orders, priorities or regulations, acts of the purchaser, embargo, car shortage, wrecks or delay in transportation, inability to obtain necessary labor, material or manufacturing facilities, or other causes beyond the reasonable control of the Seller. In the event such delays exceed ninety (90) days, Purchaser shall have the option to cancel its order upon written notice to the Seller prior to shipment.

**Return of Goods:** Purchaser may not cancel or modify any order except upon payment to the Seller of such damages, handling charges or other cancellation charges as may be mutually agreed in advance between the parties in writing.

**Warranties:** Seller warrants that the goods conform to the written description, if any given to Purchaser by Seller, and that the goods are free from defects in workmanship and material at the time of shipment by

Seller. Seller warrants no length or measure of service unless expressly agreed in writing by Seller. This Warranty shall not apply to goods which have been destroyed, lost, disposed of or are otherwise unavailable for inspection by Seller.

**THE SELLER MAKES NO OTHER WARRANTY OR REPRESENTATION AND EXPRESSLY DISCLAIMS ALL OTHER WARRANTIES EXPRESSED OR IMPLIED INCLUDING ANY WARRANTY OF MERCHANTABILITY OR FITNESS FOR A PARTICULAR PURPOSE. NO REPRESENTATIONS OR PROMISES BEYOND THOSE STATED HEREIN.**

**Limitation of Liability:** In the event it is finally determined that the Seller has breached its warranty, Purchaser's sole and exclusive remedy is to require Seller to replace such goods without charge or refund that portion of the price allocatable to such goods, whichever Seller elects at its option. In no event will Seller be liable to Purchaser or to any third party or any other person for any consequential, incidental, indirect, special or punitive damages arising from any cause whatsoever, whether or not such loss or damage is based on contract, warranty, negligence, indemnity, strict liability or otherwise. Under no circumstances will the aggregate liability of Seller to Purchaser and/or other persons exceed the sales price of the goods in question.

**Return of Goods:** Purchaser may return goods only upon approval by the Seller, evidenced by valid returned goods authorization (RGA) number issued to Purchaser by Seller. If approved, conforming goods shall be subject to a handling charge equal to 20% of the purchase price. Purchaser shall bear the cost of return freight and risk of loss of the goods. In the event that the returned goods are found by Seller to be non-conforming and a credit, adjustment or replacement is allowed, Seller shall refund Purchaser's cost of return transportation.

**Charge on Overdue Accounts:** A charge of 1½% per month or the highest rate permitted by law shall be payable on all overdue accounts.

**Assignment:** This contract may not be assigned by Purchaser without the prior written consent of Seller.

**Severability:** In the event that any provision of this contract is held invalid by a court of competent jurisdiction, the remaining terms shall remain in full force and effect.

**Claims and Limitation on Actions:** Claims of non-conformity or defect must be made by certified mail, return receipt requested, within sixty (60) days of Purchaser's receipt of the goods and any such claims not timely made in this manner shall be considered waived by purchaser. Any lawsuit or other action brought by Purchaser to enforce any claim or alleged claim against Seller with respect to goods sold by Seller to purchaser must be commenced within one (1) year after the alleged cause of action against Seller has accrued, notwithstanding a long applicable statute of limitations under law.

**Damage and Shortage Claims:** All claims for concealed loss or damage should be reported immediately to our Customer Service Department. All claims for damage and shortage via common carrier must be filed by consignee direct with carrier. Claims must be filed within 15 days of receipt of shipment.

**Governing Law:** These conditions shall be construed in accordance with the laws of the State of Florida, and the respective rights and obligations of the Purchaser and Seller will be governed by the laws of the State of Florida.

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