

SIGRAFLEX® UNIVERSAL

Gasket Sealing Sheet made from Impregnated Graphite with Tanged 316L Stainless Steel Reinforcement



Quality first solutions

www.agaus.com.au

Sigraflex® Universal is a High Performance sheet gasket material offering safety and reliability for your sealing requirements. Sigraflex® Universal is manufactured using high quality graphite foil combined with either one or two tanged 316L stainless steel sheet reinforcements which are bonded together using a unique, totally adhesive free process. The sheet is then impregnated to reduce gas leakage/permeability and improve scratch resistance.

APPLICATIONS

- For Corrosive Media
- For all Common Pipework and Vessel Flange Designs
- For High Internal Pressures ranging from Vacuum to 100 Bar
- Broad Temperature range from cryogenic at -250°C to approx. 550°C subject to chemical resistance. For applications >450°C users should request our advice
- Recommended for one piece gaskets up to 1500mm OD; for diameters over 1500mm as a two layer gasket in segmented sections with staggered joints

EXAMPLES OF APPLICATION

- Steam Pipework in Power Stations
- Boilers, Feed Lines & Vessel Gaskets
- Heat Transfer Oil and Heating Facilities
- Gaskets for Inspection Glasses, Pumps, Fittings and Vessels
- Power Stations, Refineries, Chemical and Petrochemical Plants
- Chemical and Petrochemical Pipework and Equipment with Hot and/or Corrosive Media

PROPERTIES

- High Operational Reliability and Excellent Oxidation Resistance
- High Blowout Resistance and High Mechanical Strength
- Low Permeability to Gases, Impermeable to Liquids
- Low Diffusion Rates
- Good Scratch Resistance; Anti Stick Surfaces
- Broad Temperature range from cryogenic at -250°C to approx. 550°C subject to chemical resistance, installation and operating conditions. For applications >450°C users should request our advice
- Good shear strength
- Presents no health hazard
- No Ageing or Embrittlement, because of the Absence of Adhesives and Binders
- Long-term stability of compressibility and recovery over a wide temperature range even under fluctuating temperatures
- Good Chemical Resistance
- No Measurable Cold or Warm Flow up to the maximum permissible gasket stress
- Good resistance to thermal shock



Phone: 1300 098 060

Web: www.agaus.com.au

REV. JAN. 2011

510R40513AGDOCg

THIS INFORMATION SHOULD NOT BE TREATED AS A SUBSTITUTE FOR SPECIFIC TECHNICAL ADVICE. ASSOCIATED GASKETS DOES NOT GIVE SUCH ADVICE & CANNOT WARRANT THE PERFORMANCE OR SUITABILITY OF PRODUCTS FOR PARTICULAR APPLICATIONS.

Associated Gaskets Pty Ltd providing Quality first solutions

Thickness	mm	1.5mm	2.0mm	3.0mm
Material Code		V15010C21	V20010C21	V30010C21
Bulk Density of Graphite	g/cm ³	1.0		
Ash Content of Graphite (DIN 51903)	%	≤ 2.0		
Total Chloride Content	ppm	≤ 25		
Reinforcing Sheet Details				
ASTM Material Number	ASTM	316 (L)		
Thickness	mm	0.1		
Number of Reinforcing Sheets		1	1	2
Residual Stress (DIN 52913), σ_D 16h, 300°C, 50 N/mm ²	N/mm ²	≥ 45		
Gasket Factors (DIN E 2505/DIN 28090-1) Gasket Width $b_D = 20\text{mm}$ at an internal pressure of:				
$\sigma_{Vu/0.1}$ 10 bar	N/mm ²	10	12	18
16 bar	N/mm ²	14	15	23
25 bar	N/mm ²	17	18	30
40 bar	N/mm ²	20	22	35
m		1.3	1.3	1.3
σ_{VO}	N/mm ²	180	160	140
σ_{BO} at 300°C	N/mm ²	160	140	120
ASTM "m" factor		2.5	2.5	2.5
"y" factor (stress)	psi	3000	2000	2000
Compression Factors DIN 28090-2				
Compressibility ϵ_{KSW}	%	35 - 45		
Recovery at 20°C ϵ_{KRW}	%	4 - 6		
Hot Creep During Operation ϵ_{WSW}	%	< 4		
Recovery at 300°C ϵ_{WRW}	%	2 - 4	3 - 5	3 - 5
Young's Modulus @ 20 N/mm ² (DIN 28090-1)	N/mm ²	850		
Compressibility ASTM F36A-66	%	35 - 45		
Recovery ASTM F36A-66	%	15 - 25		
Gasket factor conversion formulas as per AD Merkblatt B7 are as follows:		$k_0 \cdot K_D = \sigma_{Vu} \cdot b_D$ $k_1 = m \cdot b_D$		

1) Definitions

- $\sigma_{Vu/0.1}$: Minimum gasket assembly stress needed to comply with leakage class L 0.1 (according to DIN 28090-1)
- σ_{BU} : Minimum gasket assembly stress in service, where σ_{BU} is the product of internal pressure p and gasket factor m for test and in service conditions ($\sigma_{BU} = p \cdot m$) **Recommended Gasket Assembly Stress: ≥ 20 N/mm² up to σ_{BO}**
- σ_{VO} : Maximum permissible gasket stress at 20°C
- $\sigma_{BO}, 300^\circ\text{C}$: Maximum permissible gasket stress in service conditions
- m : σ_{BU}/p_i
- "m" factor : Similar to m, but defined according to ASTM, hence different value
- "y" stress : Minimum gasket stress in psi
- k_0 : In mm, factor for gasket assembly stress
- k_1 : In mm, factor for gasket stress in service
- K_D : In N/mm², maximum gasket stress-bearing capacity under assembly conditions
- b_D : Gasket Width
- ϵ_{KSW} : Compression set under a gasket stress of 35 N/mm²
- ϵ_{KRW} : Gasket recovery after reduction in gasket stress from 35 N/mm² to 1 N/mm²
- ϵ_{WSW} : Gasket creep compression under a gasket stress of 50 N/mm² at 300°C after 16 h
- ϵ_{WRW} : Recovery after reduction in gasket stress from 50 N/mm² to 1 N/mm²

The percentage changes in thickness of ϵ_{KSW} , ϵ_{KRW} , ϵ_{WSW} , and ϵ_{WRW} are relative to the initial thickness of the gasket



Phone: 1300 098 060

Web: www.agaus.com.au

REV. JAN. 2011

510R40513AGDOCg

THIS INFORMATION SHOULD NOT BE TREATED AS A SUBSTITUTE FOR SPECIFIC TECHNICAL ADVICE. ASSOCIATED GASKETS DOES NOT GIVE SUCH ADVICE & CANNOT WARRANT THE PERFORMANCE OR SUITABILITY OF PRODUCTS FOR PARTICULAR APPLICATIONS.

Associated Gaskets Pty Ltd providing Quality first solutions

APPROVALS

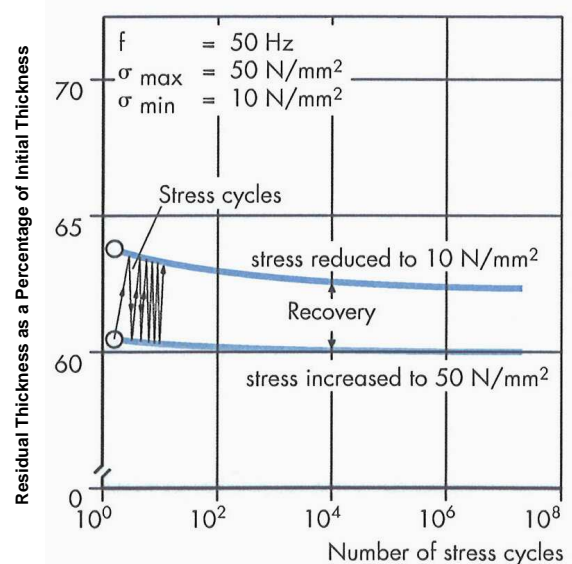
- Fire Safety to BS 6755-2
- Blow Out Resistance (TÜV @ 2.5 times Nominal Pressure)
- Germanischer Lloyd
- DVGW (DIN 3535-6)
- US Coast Guard
- BAM Oxygen
- BAM Ethylene Oxide
- BAM Propylene Oxide



MECHANICAL AND PHYSICAL PROPERTIES

SIGRAFLEX has extraordinary stability in vibrating machinery.

This is illustrated by the following example:
A gasket stress of 50 N/mm² reduces the initial thickness of SIGRAFLEX UNIVERSAL by about 60%.
this preliminary stress the material is subjected to vibrating stresses ranging from 10 to 50 N/mm².
Its power of recovery is retained even after 10⁷ stress alternation cycles, when no more than very slight creep compression is observed.



Behavior of Sigraflex Universal under Vibrating Stress



Phone: 1300 098 060

Web: www.agaus.com.au

REV. JAN. 2011

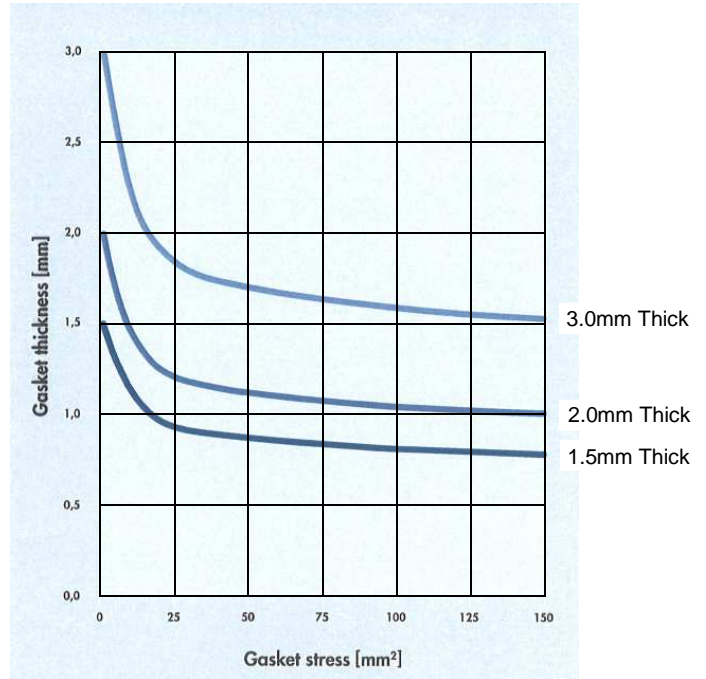
510R40513AGDOCg

THIS INFORMATION SHOULD NOT BE TREATED AS A SUBSTITUTE FOR SPECIFIC TECHNICAL ADVICE. ASSOCIATED GASKETS DOES NOT GIVE SUCH ADVICE & CANNOT WARRANT THE PERFORMANCE OR SUITABILITY OF PRODUCTS FOR PARTICULAR APPLICATIONS.

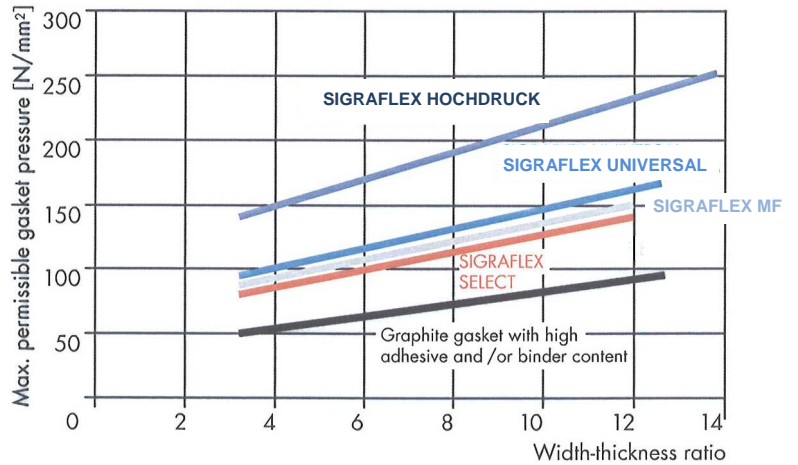
Associated Gaskets Pty Ltd providing Quality first solutions

MECHANICAL AND PHYSICAL PROPERTIES Continued

Compressibility of Sigraflex Universal
Depending on Gasket Thickness and
Gasket Stress under Service Conditions



Maximum Permissible Gasket Pressure
for Gaskets made from Reinforced
Sigraflex Sheets of 2mm Thickness
as Determined at 300°C in accordance
with DIN 28090-1. Note: As the gasket
width-to-thickness ratio increases so too
does the maximum permitted pressure.



Phone: 1300 098 060

Web: www.agaus.com.au

REV. JAN. 2011

510R40513AGDOCg

THIS INFORMATION SHOULD NOT BE TREATED AS A SUBSTITUTE FOR SPECIFIC TECHNICAL ADVICE. ASSOCIATED GASKETS DOES NOT GIVE SUCH ADVICE & CANNOT WARRANT THE PERFORMANCE OR SUITABILITY OF PRODUCTS FOR PARTICULAR APPLICATIONS.

Associated Gaskets Pty Ltd providing Quality first solutions

ASSEMBLY INSTRUCTIONS

Installation:

- Make sure that the sealing faces are in proper condition. Any rust or other deposits present on the sealing faces must be removed by carefully scraping the surfaces in circumferential direction.
- The sealing faces must be clean, dry and free from grease. Release agents or grease must not be used.
- Use dry and undamaged gaskets only.
- To facilitate installation, the gasket may be fixed to the cover by using a commercial adhesive, however the adhesive should be applied sparingly at a few points only.
- The bolts and the corresponding nut supporting faces must be lubricated and turn freely.
- Align the flanges as plane parallel as possible
- Flange bolts should first be hand tightened, then tighten in a crosswise order to about 50% of the maximum torque value, in the second stage to about 80% and to the full value in the third stage. All bolts must be tightened to the specified bolt load, so the torque value must be checked repeatedly and the bolts retightened if necessary.
- To ensure safe and reliable operation, SIGRAFLEX® gaskets should be subjected to a pressure exceeding the minimum gasket assembly pressure (VU) as specified in the above. For SIGRAFLEX® HOCHDRUCK gaskets, the minimum gasket assembly pressure is 20 N/mm² to comply with leakage class L 0.1.
- **Rule of thumb:** SIGRAFLEX® gaskets can be compressed to about 60% of the initial thickness: A 2mm thick SIGRAFLEX® HOCHDRUCK gasket, for instance, should be compressed to a residual thickness of about 1.1 to 1.2 mm.

Operation:

- As a general rule, SIGRAFLEX® gaskets are suitable for use within a temperature range extending from cryogenic to very high values. At temperatures of about 400°C or more, thermal stability as a function of installation and service conditions should be considered separately for each individual case.
- At temperatures above 400°C, the graphite material undergoes oxidation in the presence of atmospheric oxygen. This is evident from a barely measurable weight loss (over weeks or even months), which increases as the temperature rises.
- The oxidation rate is governed by the graphite quality, operational data, gasket temperature, service medium and atmospheric oxygen supply.
- For applications at more than about 400°C we therefore recommend users to seek the advice of the gasket supplier or SGL CARBON's technical service.
- As it is difficult to assess the weight loss by oxidation and the associated relaxation of the gasketed joint concerned, we usually recommend that bolt tension at such high temperatures be checked after a few weeks of operation and the bolts be retightened if necessary.
- To further extend the service life of gaskets employed at such temperatures, it is advisable to use outer eyelets as a protection against oxidization.
- Heat resistant bolt materials such as 24CrMo5 or 21CrMoV57 should be used for operation at high temperatures.



Phone: 1300 098 060

Web: www.agaus.com.au

REV. JAN. 2011

510R40513AGDOCg

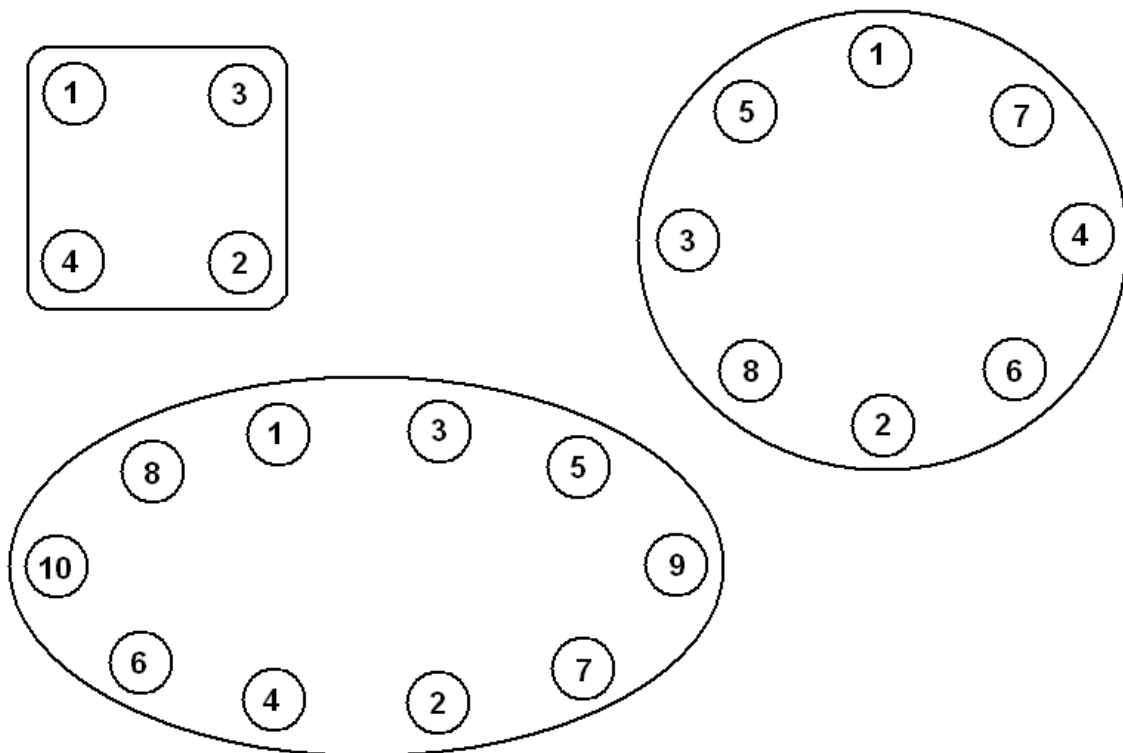
THIS INFORMATION SHOULD NOT BE TREATED AS A SUBSTITUTE FOR SPECIFIC TECHNICAL ADVICE. ASSOCIATED GASKETS DOES NOT GIVE SUCH ADVICE & CANNOT WARRANT THE PERFORMANCE OR SUITABILITY OF PRODUCTS FOR PARTICULAR APPLICATIONS.

Associated Gaskets Pty Ltd providing Quality first solutions

BOLT TIGHTENING PATTERNS FOR VARIOUS FLANGE SHAPES

Using correct bolt tightening procedures assures uniform clamp load on the joint, resulting in optimized sealability and longevity. Improper procedures lead to unnecessary flange distortion or cocking, low clamp loads and poor sealability. Recommended bolt tightening sequences for standard flanges are shown below. The intent is to work evenly back and forth around the joint to result in the most uniform loading. With rectangular or oblong flanges, the bolt sequence works from the centre to the outer extremes of the pattern.

In all cases, it is recommended to tighten the bolts in several increments of torque. After hand tightening the fasteners to loose assemble the flanges, the targeted bolt torque is achieved in three steps of approximately 1/3, 2/3 and full bolt torque. A final pass following the same sequence will then assure uniform bolt loads around the flange. Obviously, this is best accomplished by the use of a torque wrench or hydraulic as opposed to "feel". The threads should be in good condition, clean and lubricated.



Phone: 1300 098 060

Web: www.agaus.com.au

REV. JAN. 2011

510R40513AGDOCg

THIS INFORMATION SHOULD NOT BE TREATED AS A SUBSTITUTE FOR SPECIFIC TECHNICAL ADVICE. ASSOCIATED GASKETS DOES NOT GIVE SUCH ADVICE & CANNOT WARRANT THE PERFORMANCE OR SUITABILITY OF PRODUCTS FOR PARTICULAR APPLICATIONS.

Associated Gaskets Pty Ltd providing Quality first solutions