

SIGRAFLEX® UNIVERSAL

Impregnated Sealing Sheet in Natural Graphite
with Tanged Stainless Steel Sheet Reinforcement

Expanded Graphite



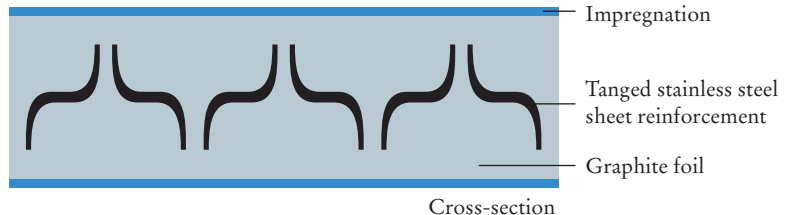
Broad Base. Best Solutions.

SIGRAFLEX® UNIVERSAL

High Performance and Safety in Sealing Systems

SIGRAFLEX® UNIVERSAL

is an adhesive-free graphite sealing sheet made from flexible graphite foil with one or two tanged 316 (L) stainless steel sheet reinforcements. The sealing sheet is impregnated to reduce leakage and improve handling.



Applications

- ▶ For all common pipework and vessel flange designs
- ▶ Recommended for one-piece gaskets up to 1500 mm outside diameter; for diameters over 1500 mm as two-layer structures with segmented sections and staggered joints, for instance
- ▶ For internal pressures ranging from vacuum to 100 bar
- ▶ For corrosive media
- ▶ Suitable for a broad range of temperatures from -250°C to approx. 550°C; for applications at more than 450°C, users should request our advice
- ▶ Gaskets for the chemical, petrochemical and refinery industries
- ▶ Steam pipework in power stations and heating facilities
- ▶ Existing plants

Properties

- ▶ High operational reliability and excellent oxidation resistance
- ▶ High blow-out resistance and high mechanical strength
- ▶ Very high fault tolerance during assembly and operation
- ▶ Good chemical resistance
- ▶ Long-term stability of compressibility and recovery, even under fluctuating temperatures
- ▶ Good scratch resistance; antistick finish due to special impregnation
- ▶ No measurable cold or warm flow characteristics up to the maximum permissible gasket stress
- ▶ No aging or embrittlement, owing to absence of adhesives or binders
- ▶ Asbestos-free, no associated health risks

Approvals

- ▶ Fire safety according to BS 6755-2
- ▶ Blow-out resistance (TÜV at 2.5 times the nominal pressure)
- ▶ BAM oxygen
- ▶ BAM ethylene oxide/propylene oxide
- ▶ Germanischer Lloyd
- ▶ DVGW (DIN 3535-6)



Assembly instructions

For assembly, use dry and undamaged gaskets only. Wet graphite gaskets must not be fitted unless first dried completely. The sealing faces must be clean, dry and free from grease. Do not use release agents! Position the gasket centrally and avoid mechanical stresses during assembly. An assembly aid can be used if necessary. To facilitate assembly in difficult positions, the gasket may be fixed by using a commercially available adhesive. However, the adhesive should be applied sparingly at a few points only.

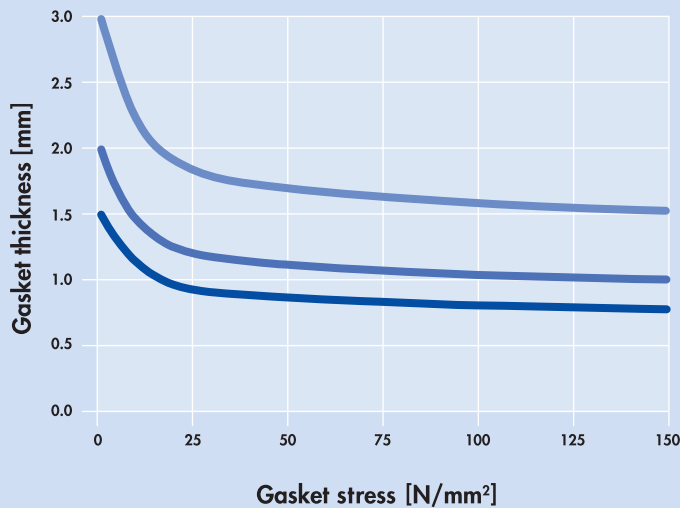
Align the flanges as plane-parallel as possible. First hand-tighten the bolts and then tighten the bolts in a crosswise order to about 50% of the maximum torque value, in the second stage to about 80% and to the full value in the third stage. All bolts must be tightened to the specified bolt load, so the torque must be checked repeatedly. Our detailed assembly instructions are available on request.



Our patented, overlap-free laser welding process allows sheets of up to 1500 mm width without leakage channels



Compressibility of SIGRAFLEX® UNIVERSAL



■ V15010C2I ■ V20010C2I ■ V30010C2I

Forms supplied

SIGRAFLEX UNIVERSAL sheets are available in the following dimensions and type designations:

Dimensions in mm

- 1500 x 1500 x 1.5
- 1500 x 1500 x 2.0
- 1500 x 1500 x 3.0

Types

- V15010C2I
- V20010C2I
- V30010C2I

The sheets can also be supplied in dimensions of 1000 x 1000 mm.

Material data of SIGRAFLEX® UNIVERSAL

Material type		V15010C2I	V20010C2I	V30010C2I
Thickness	mm	1.5	2.0	3.0
Dimensions	m	1.5 x 1.5 / 1.0 x 1.0		
Bulk density of graphite	g/cm ³	1.0		
Ash content of graphite (DIN 51903)	%	≤ 2.0		
Total chloride content	ppm	≤ 25		
Reinforcing steel sheet details		Tanged stainless steel sheet		
ASTM material number		316 (L)		
Thickness	mm	0.1		
Number of sheets		1	1	2
Residual stress (DIN 52913) σ_D 16 h, 300°C, 50 N/mm ²	N/mm ²	≥ 45		
Gasket factors (DIN E 2505/DIN 28090-1)				
Gasket width $b_D = 20$ mm				
$\sigma_{VU/0.1}$ at an internal pressure of				
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
Compression factors (DIN 28090-2)				
Compressibility ϵ_{KSW}	%	35 - 45		
Recovery at 20°C ϵ_{KRW}	%	4 - 6		
Hot creep ϵ_{WSW}	%	< 4		
Recovery at 300°C ϵ_{WRW}	%	2 - 4	3 - 5	3 - 5
Young's modulus at 20 N/mm ² (DIN 28090-1)	N/mm ²	850		
ASTM "m" factor		2.5	2.5	2.5
"y" factor	psi	3000	2000	2000
Compressibility	%	35 - 45		
Recovery	%	15 - 25		
The gasket factor conversion formulas as per AD Merkblatt B7 are as follows:		$k_0 \cdot K_D = \sigma_{VU} \cdot b_D$ $k_1 = m \cdot b_D$		

Definitions

$\sigma_{VU/0.1}$	Minimum gasket assembly stress needed to comply with leakage class L 0.1 (according to DIN 28090-1)	k_0	In mm, factor for gasket assembly stress
	Recommended gasket assembly stress: ≥ 20 N/mm ² up to σ_{BO}	k_1	In mm, factor for gasket stress in service
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 ($\sigma_{BU} = p \cdot m$)	K_D	In N/mm ² , max. gasket stress-bearing capacity under assembly conditions
σ_{VO}	Maximum permissible gasket stress at 20°C	ϵ_{KSW}	Compression set under a gasket stress of 35 N/mm ²
$\sigma_{BO, 300^\circ C}$	Maximum permissible gasket stress in service	ϵ_{KRW}	Gasket recovery after reduction in gasket stress from 35 N/mm ² to 1 N/mm ²
m	σ_{BU} / p_i	ϵ_{WSW}	Gasket creep compression under a gasket stress of 50 N/mm ² at 300°C after 16 h
"m" factor	Similar to m, but defined according to ASTM, hence different value	ϵ_{WRW}	Recovery after reduction in gasket stress from 50 N/mm ² to 1 N/mm ²
"y" factor	Minimum gasket stress in psi		

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

Gasket factors of SIGRAFLEX® UNIVERSAL according to DIN EN 13555

L	PN	e _{G0}	Q _{min/L}	Q _{Smin/L}			
				Q _{A=20}	Q _{A=40}	Q _{A=60}	Q _{A=80}
10 ⁻¹	10	2	< 10	< 10	< 10	< 10	< 10
10 ⁻¹	16	2	< 10	< 10	< 10	< 10	< 10
10 ⁻¹	25	2	< 10	< 10	< 10	< 10	< 10
10 ⁻¹	40	2	10	< 10	< 10	< 10	< 10
10 ⁻²	10	2	19	17	< 10	< 10	< 10
10 ⁻²	16	2	27		< 10	< 10	< 10
10 ⁻²	25	2	35		22	< 10	< 10
10 ⁻²	40	2	44			20	11

Relaxation ratio P_{QR}

P _{QR}	RT	150 °C	300 °C
Q _S / e _{G0}	2	2	2
30	0.98	0.92	0.91
50	0.98	0.96	0.93
200/200/160	1.00	0.99	0.99

Max. permissible gasket stress Q_{Smax}

Q _{Smax}	RT	150 °C	300 °C
e _{G0}			
2	> 200	> 200	160

Secant unloading modulus E_s

E _s	RT	150 °C	300 °C
Q _S / e _{G0}	2	2	2
20	405	491	524
30	627	756	750
40	798	778	860
50	1035	1225	1097
60	1196	1181	1511
80	1797	1747	1597
100	2186	2268	1922
120	2393	2647	2440
140	2449	2364	2742
160	2517	2498	2693
180	2836	2743	
200	3141	2664	



Definitions

E _s	[MPa]	Secant unloading modulus of the gasket
e _{G0}	[mm]	Gasket thickness
L	[mg/(s·m)]	Leakage class
PN	[bar]	Nominal pressure
Q _A	[MPa]	Gasket assembly stress
P _{QR}		Relaxation ratio for stiffness C = 500 kN/mm
Q _{min/L}	[MPa]	Minimum gasket assembly stress
Q _S	[MPa]	Gasket stress
Q _{Smin/L}	[MPa]	Minimum gasket stress in service
Q _{Smax}	[MPa]	Maximum permissible gasket stress before damage occurs
RT		Room temperature
Further values on request.		

Product overview

Product		Characteristics	Recommended applications
SIGRAFLEX® FOIL F....C/Z/APX	▲	Flexible, continuous	-250°C to approx. 550°C; for compressed packings, spiral-wound and kammprofile gaskets
SIGRAFLEX® STANDARD L....CI	■	Unreinforced, impregnated	Raised-face flanges; enamel or glass flanges; highly corrosive media
SIGRAFLEX® ECONOMY V....C4	■ ▲	Reinforced with bonded s/s** foil	Pumps; fittings; gas supply; waste gas pipelines
SIGRAFLEX® UNIVERSAL V....C2I	■	Reinforced with tanged s/s** foil, impregnated	Pipework and vessels in the petro-/chemical industries and in power stations
SIGRAFLEX® UNIVERSAL PRO V....C2I-P	■	Reinforced with tanged s/s** foil, impregnated	For TA Luft* applications; for pipework and vessels in the petro-/chemical industries and in power stations
SIGRAFLEX® SELECT V16010C3I	●	High-integrity s/s** foil reinforcement, impregnated	For TA Luft* applications; raised-face flanges; pipework in the chemical and petrochemical industries
SIGRAFLEX® HOCHDRUCK V....Z3I	■	High-integrity multilayer laminate, impregnated	Universal sealing sheet, also for solving sealing problems in pipework, process equipment, tongue-and-groove flanges and non-standard joints in the petro-/chemical industries and in power stations
SIGRAFLEX® HOCHDRUCK PRO V....Z3I-P	■	High-integrity multilayer laminate, impregnated	Universal sealing sheet for TA Luft* applications, also for solving sealing problems in pipework, process equipment, tongue-and-groove flanges and non-standard joints in the petro-/chemical industries and in power stations
SIGRAFLEX® MF V....Z2MF	●	High-integrity laminate made of graphite, s/s** and PTFE	Maximum requirements for sealability (TA Luft*), safety, chemical resistance and process hygiene; sealed joints in the chemical and petrochemical, pharmaceutical and food industries
SIGRAFLEX® EMAIL V....Z3E	■	High-integrity s/s** foil reinforcement	PTFE-envelope gaskets in enameled pipework, vessels, stub connections, etc.

Forms supplied: ▲ roll or tape ■ sheet material ● gasket with inner eyelet, for applications requiring TA Luft approval

* TA Luft: German Clean Air Act ** s/s: stainless steel

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11 2009/0 9NÄ a Printed in Germany

This information is based on our present state of knowledge and is intended to provide general notes on our products and their uses. It should therefore not be construed as guaranteeing specific properties of the products described or their suitability for a particular application. Any existing industrial property rights must be observed. The quality of our products is guaranteed under our "General Conditions of Sale".

Expanded Graphite

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