

SIGRAFLEX® UNIVERSAL PRO

Impregnated TA Luft-Compliant Sealing Sheet
Made from Natural Graphite with
Tanged Stainless Steel Reinforcement

Expanded Graphite



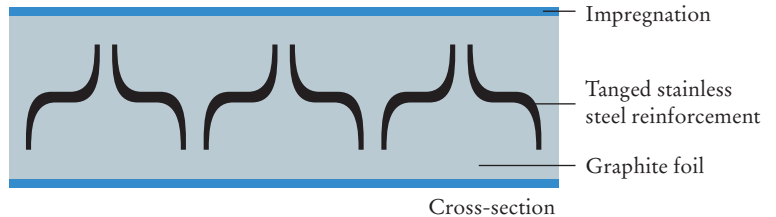
Broad Base. Best Solutions.

SIGRAFLEX® UNIVERSAL PRO

Our Contribution to Environmental Protection

SIGRAFLEX® UNIVERSAL PRO

is an adhesive-free graphite sealing sheet made from flexible graphite foil with one or two tanged 316 (L) stainless steel 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 for example two-layer structures with segmented sections and staggered joints
- ▶ 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 blow-out resistance and high mechanical strength
- ▶ Long-term stability of compressibility and recovery
- ▶ Good chemical resistance
- ▶ Very high fault tolerance
- ▶ High operational reliability and excellent oxidation resistance
- ▶ Good scratch resistance; antistick finish due to special impregnation
- ▶ No measurable cold or warm flow characteristics up to the maximum permissible gasket stress
- ▶ High thermal shock resistance
- ▶ No aging or embrittlement, owing to absence of adhesives or binders
- ▶ Asbestos-free, no associated health risks

Approvals

- ▶ TA Luft (VDI 2440/VDI 2200) for all thicknesses
- ▶ Fire safety according to API 607
- ▶ Blow-out resistance (TÜV at 2.5 times the nominal pressure)
- ▶ BAM oxygen
- ▶ DVGW (DIN 3535-6)



Assembly instructions

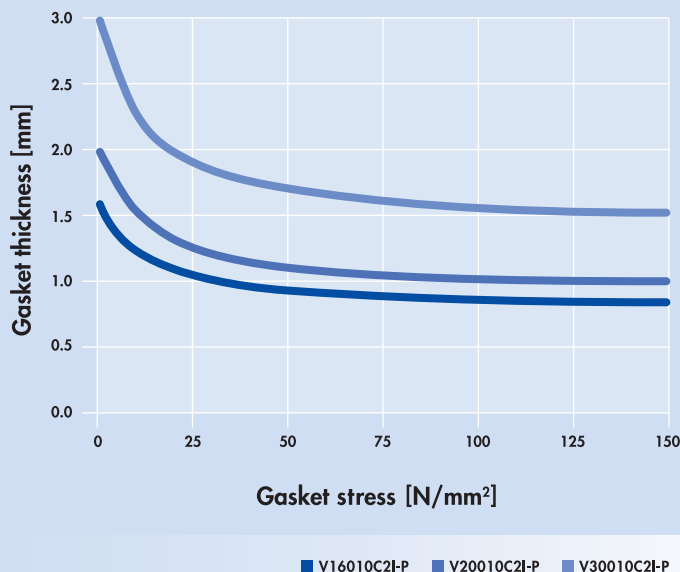
For assembly, use dry and undamaged gaskets only. Wet graphite gaskets must not be fitted unless first dried completely. The sealing faces must be clean, dry and free from grease. Do not use release agents! Position the gasket centrally and avoid any mechanical stress during assembly. An assembly aid can be used if necessary. To help 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. Firstly hand tighten the bolts, then in a cross-wise order, tighten the bolts 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, 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 without leakage channels.



Compressibility of SIGRAFLEX® UNIVERSALPRO



Forms supplied

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

Dimensions in mm

1500 x 1500 x 1.6
1500 x 1500 x 2.0
1500 x 1500 x 3.0

Types

V16010C2I-P
V20010C2I-P
V30010C2I-P

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

Material data of SIGRAFLEX® UNIVERSALPRO

Material type		V16010C2I-P	V20010C2I-P	V30010C2I-P
Thickness	mm	1.6	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	10	12
16 bar	N/mm ²	12	12	14
25 bar	N/mm ²	15	15	17
40 bar	N/mm ²	17	17	19
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}	%	< 5	
Recovery at 300°C	ϵ_{WRW}	%	3 - 6	
Young's modulus at 20 N/mm ² (DIN 28090-1)	N/mm ²	900		
ASTM	"m" factor	2.5		
	"y" factor	2000		
Compressibility	ASTM F36A-66	%		
Recovery		%		
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) Recommended gasket assembly stress: ≥ 20 N/mm ² up to σ_{BO}	k_0	In mm, factor for gasket assembly stress
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_1	In mm, factor for gasket stress in service
σ_{VO}	Maximum permissible gasket stress at 20°C	K_D	In N/mm ² , max. gasket stress-bearing capacity under assembly conditions
$\sigma_{BO, 300^\circ C}$	Maximum permissible gasket stress in service	ϵ_{KSW}	Compression set under a gasket stress of 35 N/mm ²
m	σ_{BU} / p_i	ϵ_{KRW}	Gasket recovery after reduction in gasket stress from 35 N/mm ² to 1 N/mm ²
"m" factor	Similar to m, but defined according to ASTM, hence different value	ϵ_{WSW}	Gasket creep compression under a gasket stress of 50 N/mm ² at 300°C after 16 h
"y" factor	Minimum gasket stress in psi	ϵ_{WRW}	Recovery after reduction in gasket stress from 50 N/mm ² to 1 N/mm ²

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® UNIVERSALPRO according to DIN EN 13555

L	PN	e _{G0}	Q _{min/L}	Q _{Smin/L}				e _{G0}	Q _{min/L}	Q _{Smin/L}			
				Q _{A=20}	Q _{A=40}	Q _{A=60}	Q _{A=80}			Q _{A=20}	Q _{A=40}	Q _{A=60}	Q _{A=80}
10 ⁻¹	10	2	< 10	< 10	< 10	< 10	< 10	3	< 10	< 10	< 10	< 10	< 10
10 ⁻¹	16	2	< 10	< 10	< 10	< 10	< 10	3	< 10	< 10	< 10	< 10	< 10
10 ⁻¹	25	2	< 10	< 10	< 10	< 10	< 10	3	< 10	< 10	< 10	< 10	< 10
10 ⁻¹	40	2	< 10	< 10	< 10	< 10	< 10	3	< 10	< 10	< 10	< 10	< 10
10 ⁻²	10	2	< 10	< 10	< 10	< 10	< 10	3	10	< 10	< 10	< 10	< 10
10 ⁻²	16	2	10	< 10	< 10	< 10	< 10	3	12	< 10	< 10	< 10	< 10
10 ⁻²	25	2	13	< 10	< 10	< 10	< 10	3	15	10	< 10	< 10	< 10
10 ⁻²	40	2	16	< 10	< 10	< 10	< 10	3	18	12	< 10	< 10	< 10

Relaxation ratio P_{QR}

P _{QR}	e _{G0}	RT		150 °C		300 °C	
		2	3	2	3	2	3
30	0.97	0.97	0.91	0.92	0.88	0.90	
50	0.99	0.98	0.96	0.96	0.95	0.95	
200/200/160	1.00		0.99		0.99		
180/160/140		1.00		0.99		0.99	

Max. allowable gasket stress Q_{Smax}

e _{G0}	Q _{Smax}	RT	150 °C	300 °C
		2	> 200	> 200
3	180	160	140	

Secant unloading modulus E_s

E _s	e _{G0}	RT		150 °C		300 °C	
		2	3	2	3	2	3
20	392	358	435	447	471	414	
30	565	629	675	649	657	586	
40	827	789	996	941	849	811	
50	1123	1265	1010	1136	1191	1300	
60	1230	1326	1308	1314	1380	1191	
80	1710	1786	1938	1836	1532	1747	
100	2090	2328	2117	2255	2138	1949	
120	2461	2679	2135	2674	2412	2893	
140	2495	3182	2723	3149	2482	2981	
160	2811	3293	2960	3675	2448		
180	3194	4090	3006				
200	3661		3106				







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 assembly gasket stress
Q _S	[MPa]	Gasket stress
Q _{Smin/L}	[MPa]	Minimum gasket stress in service
Q _{Smax}	[MPa]	Maximum allowable 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 chemical and petrochemical 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 chemical and petrochemical 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 chemical and petrochemical 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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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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