

# SIGRAFLEX® STANDARD

Impregnated Sealing Sheet  
Made from Natural Graphite

## Expanded Graphite



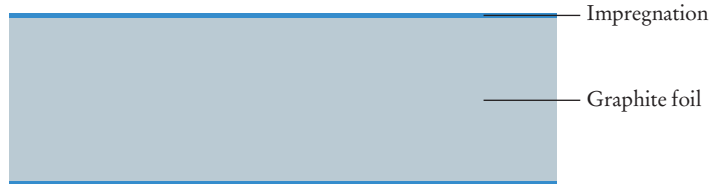
**Broad Base. Best Solutions.**

# SIGRAFLEX® STANDARD

## High Performance and Safety in Sealing Systems

### SIGRAFLEX® STANDARD

is a homogeneous sealing sheet made from flexible graphite. The sealing sheet is impregnated to reduce leakage and improve handling.



Cross-section

### Applications

- ▶ For raised-face flanges meeting DIN EN 1514 and DIN 2690
- ▶ For enamelled flanges and inspection glasses
- ▶ For emergency repairs and complicated configurations
- ▶ For internal pressures of up to 40 bar
- ▶ For highly corrosive media such as HCl, thanks to its excellent chemical resistance
- ▶ 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

### Properties

- ▶ Excellent oxidation resistance
- ▶ Very high fault tolerance during assembly and operation
- ▶ Excellent 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 the absence of adhesives or binders
- ▶ Ease of cutting and punching
- ▶ Asbestos-free, no associated health risks



### Approvals

- ▶ BAM oxygen
- ▶ DVGW (DIN 3535-6)
- ▶ KTW (TZW)

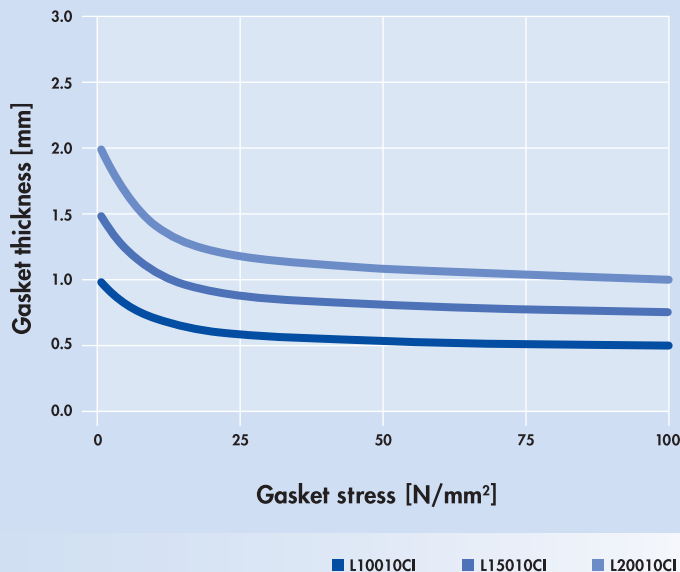
### Assembly instructions

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.



### Compressibility of SIGRAFLEX® STANDARD



### Forms supplied

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

#### Dimensions in mm

1000 x 1000 x 1.0  
1000 x 1000 x 1.5  
1000 x 1000 x 2.0

#### Types

L10010CI  
L15010CI  
L20010CI



## Material data of SIGRAFLEX® STANDARD

Material type		L10010CI	L15010CI	L20010CI	
Thickness	mm	1.0	1.5	2.0	
Dimensions	m	1.0 x 1.0			
Bulk density of graphite	g/cm <sup>3</sup>	1.0			
Ash content of graphite (DIN 51903)	%	≤ 2.0			
Total chloride content	ppm	≤ 25			
Residual stress (DIN 52913) $\sigma_D$ 16 h, 300°C, 50 N/mm <sup>2</sup>	N/mm <sup>2</sup>	≥ 47			
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 <sup>2</sup>	11	12	14
	16 bar	N/mm <sup>2</sup>	13	15	17
	25 bar	N/mm <sup>2</sup>	16	19	22
	40 bar	N/mm <sup>2</sup>	20	26	30
$m$			1.3	1.3	1.3
$\sigma_{VO}$		N/mm <sup>2</sup>	160	140	120
$\sigma_{BO}$ at 300°C		N/mm <sup>2</sup>	140	120	100
Compression factors (DIN 28090-2)					
Compressibility	$\epsilon_{KSW}$	%	40 - 50		
Recovery at 20°C	$\epsilon_{KRW}$	%	4 - 6		
Hot creep	$\epsilon_{WSW}$	%	< 3		
Recovery at 300°C	$\epsilon_{WRW}$	%	3 - 4		
Young's modulus at 20 N/mm <sup>2</sup> (DIN 28090-1)		N/mm <sup>2</sup>	700		
ASTM	"m" factor		2		
	"y" factor	psi	1500		
Compressibility		%	40 - 50		
Recovery	ASTM F36	%	15 - 20		
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
$\sigma_{BU}$	Recommended gasket assembly stress: $\geq 20$ N/mm <sup>2</sup> up to $\sigma_{BO}$	$k_1$	In mm, factor for gasket stress in service
	Minimum gasket assembly stress in service, where $\sigma_{BU}$ 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 <sup>2</sup> , max. gasket stress-bearing capacity under assembly conditions
$\sigma_{VO}$	Maximum permissible gasket stress at 20°C	$\epsilon_{KSW}$	Compression set under a gasket stress of 35 N/mm <sup>2</sup>
$\sigma_{BO, 300^\circ C}$	Maximum permissible gasket stress in service	$\epsilon_{KRW}$	Gasket recovery after reduction in gasket stress from 35 N/mm <sup>2</sup> to 1 N/mm <sup>2</sup>
$m$	$\sigma_{BU} / p_i$	$\epsilon_{WSW}$	Gasket creep compression under a gasket stress of 50 N/mm <sup>2</sup> at 300°C after 16 h
"m" factor	Similar to $m$ , but defined according to ASTM, hence different value	$\epsilon_{WRW}$	Recovery after reduction in gasket stress from 50 N/mm <sup>2</sup> to 1 N/mm <sup>2</sup>
"y" factor	Minimum gasket stress in psi		

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

## Gasket factors of SIGRAFLEX® STANDARD according to DIN EN 13555

L	PN	e <sub>G0</sub>	Q <sub>min/L</sub>	Q <sub>Smin/L</sub>			
				Q <sub>A</sub> = 20	Q <sub>A</sub> = 40	Q <sub>A</sub> = 60	Q <sub>A</sub> = 80
10 <sup>-1</sup>	10	2	< 10	< 10	< 10	< 10	< 10
10 <sup>-1</sup>	16	2	< 10	< 10	< 10	< 10	< 10
10 <sup>-1</sup>	25	2	< 10	< 10	< 10	< 10	< 10
10 <sup>-1</sup>	40	2	12	< 10	< 10	< 10	< 10
10 <sup>-2</sup>	10	2	25		< 10	< 10	< 10
10 <sup>-2</sup>	16	2	34		22	< 10	< 10
10 <sup>-2</sup>	25	2	43			19	< 10
10 <sup>-2</sup>	40	2	55			48	21

### Relaxation ratio P<sub>QR</sub>

P <sub>QR</sub>	RT	150 °C	300 °C
Q <sub>S</sub> / e <sub>G0</sub>	2	2	2
30	0.97	0.92	0.88
50	0.98	0.95	0.94
120/120/100	0.99	0.98	0.97

### Max. permissible gasket stress Q<sub>Smax</sub>

Q <sub>Smax</sub>	RT	150 °C	300 °C
e <sub>G0</sub>			
2	120	120	100

### Secant unloading modulus E<sub>G</sub>

E <sub>G</sub>	RT	150 °C	300 °C
Q <sub>S</sub> / e <sub>G0</sub>	2	2	2
20	336	361	468
30	542	570	554
40	743	832	878
50	983	980	1136
60	1023	1164	1223
80	1598	1478	1651
100	1930	1831	1932
120	2507	2082	
140			
160			
180			
200			



#### Definitions

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

## Product overview

Product		Characteristics	Recommended applications
<b>SIGRAFLEX® FOIL</b> F....C/Z/APX	▲	Flexible, continuous	-250°C to approx. 550°C; for compressed packings, spiral-wound and kammprofile gaskets
<b>SIGRAFLEX® STANDARD</b> L....CI	■	Unreinforced, impregnated	Raised-face flanges; enamel or glass flanges; highly corrosive media
<b>SIGRAFLEX® ECONOMY</b> V....C4	■ ▲	Reinforced with bonded s/s** foil	Pumps; fittings; gas supply; waste gas pipelines
<b>SIGRAFLEX® UNIVERSAL</b> V....C2I	■	Reinforced with tanged s/s** foil, impregnated	Pipework and vessels in the petro-/chemical industries and in power stations
<b>SIGRAFLEX® UNIVERSAL PRO</b> 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
<b>SIGRAFLEX® SELECT</b> V16010C3I	●	High-integrity s/s** foil reinforcement, impregnated	For TA Luft* applications; raised-face flanges; pipework in the chemical and petrochemical industries
<b>SIGRAFLEX® HOCHDRUCK</b> 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
<b>SIGRAFLEX® HOCHDRUCK PRO</b> 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
<b>SIGRAFLEX® MF</b> 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
<b>SIGRAFLEX® EMAIL</b> 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 7NÄ a Printed in Germany

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### Expanded Graphite

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