

SIGRAFLEX® MF

Three-Component Gasket Made from Flexible Natural Graphite, Stainless Steel and PTFE for Minimum Leakage Rates and Maximum Safety

Expanded Graphite



Broad Base. Best Solutions.



SIGRAFLEX® MF

Our Contribution to Environmental Protection

SIGRAFLEX® MF

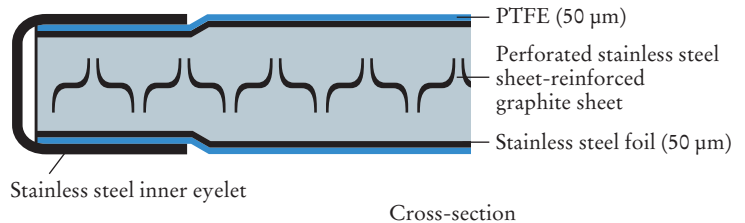
is a high-quality three-component gasket made from flexible graphite, stainless steel and PTFE. SIGRAFLEX MF combines the sealing properties of the three materials in one product. Owing to its expanded graphite core, SIGRAFLEX MF displays high long-term stability of compressibility and recovery, and adapts well to uneven flanges. The reinforcing stainless steel sheets ensure the high mechanical strength of the gasket. Moreover, the stainless steel foil/PTFE coating together with the inner eyelet provide excellent sealing properties. This innovative gasket system is thus another milestone toward reducing emissions reliably.

Applications

- ▶ For maximum requirements in terms of sealability (German Clean Air Act/TA Luft) and operational reliability (blow-out resistance, fire safety)
- ▶ In particular for applications involving toxic, inflammable, polluting or high-cost media
- ▶ For high demands imposed on process hygiene, e.g. in the pharmaceutical and food industries
- ▶ For applications that cannot tolerate sticking of the gasket to the flange
- ▶ Also for flanged joints capable of withstanding only low gasket stresses
- ▶ Suitable for use at temperatures ranging from -250 °C to 300 °C

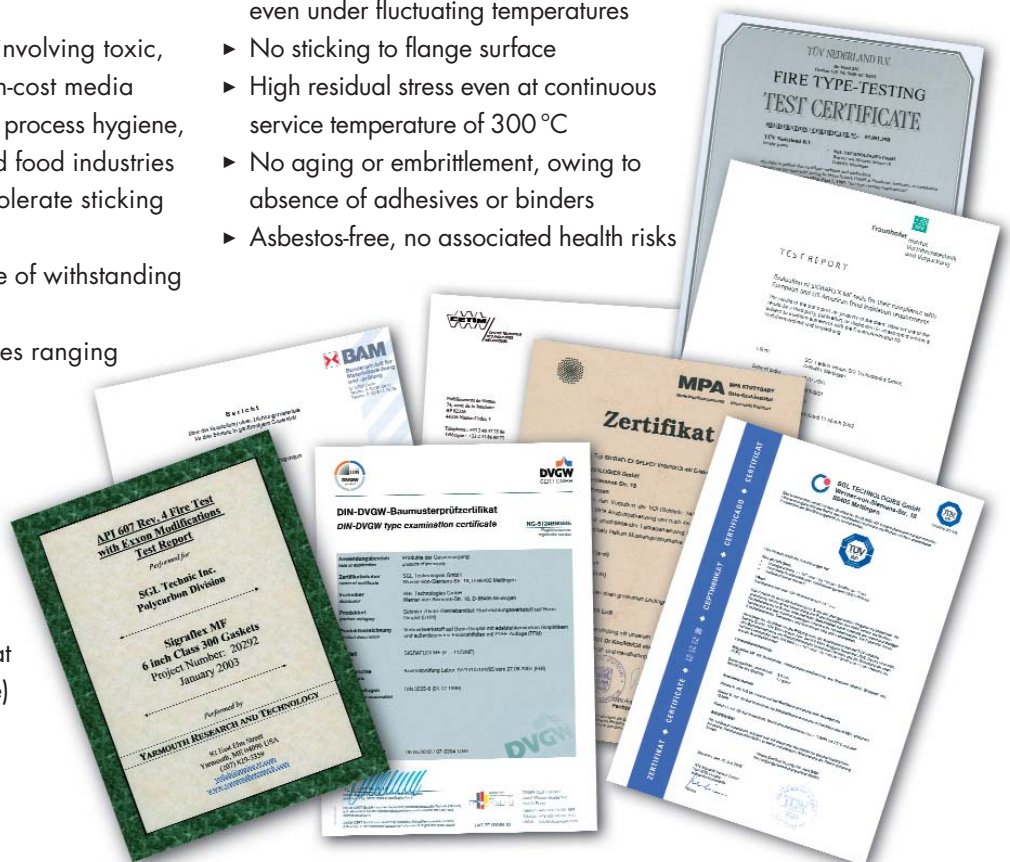
Approvals

- ▶ TA Luft (VDI 2440 / VDI 2200) even at 10 MPa
- ▶ Fire safety according to BS 6755-2 and API 607
- ▶ Blow-out resistance (TÜV Süd at 2.5 times the nominal pressure)
- ▶ HOBT test (CETIM)
- ▶ BAM oxygen
- ▶ DVGW (DIN 3535-6)
- ▶ FDA conformity



Properties

- ▶ Excellent sealability, even at low gasket stresses (complies with German Clean Air Act at 10 MPa)
- ▶ Savings in cost of ownership (media loss, down-times, assembly cost)
- ▶ Meets high demands on process hygiene / product purity (FDA conformity)
- ▶ High blow-out resistance and high mechanical strength
- ▶ High fault tolerance during assembly and operation
- ▶ Good chemical resistance
- ▶ Long-term stability of compressibility and recovery, even under fluctuating temperatures
- ▶ No sticking to flange surface
- ▶ High residual stress even at continuous service temperature of 300 °C
- ▶ No aging or embrittlement, owing to absence of adhesives or binders
- ▶ Asbestos-free, no associated health risks



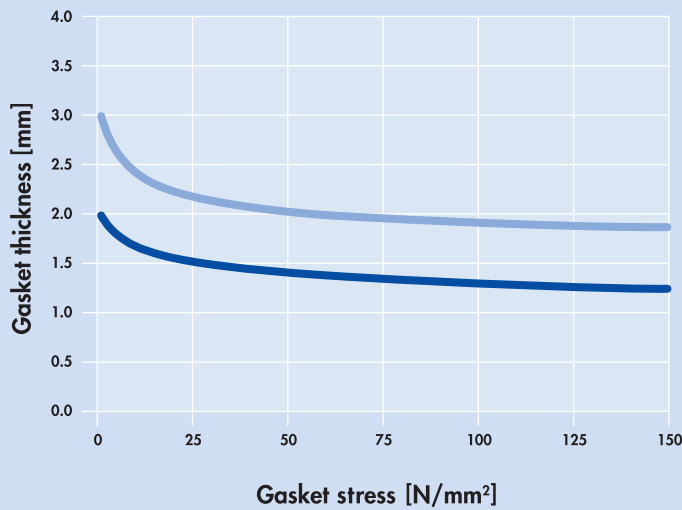
Assembly instructions

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® MF



■ V20011Z2MF ■ V30011Z2MF

Material data of SIGRAFLEX® MF

Material type		V20011Z2MF	V30011Z2MF
Thickness	mm	2	3
Bulk density of graphite	g/cm ³	1.1	
Ash content of graphite (DIN 51903)	%	≤ 0.15	
Total chloride content	ppm	≤ 10	
Reinforcing steel sheet details		Tanged stainless steel sheet	
ASTM material number		316 (L)	
Thickness	mm	0.1	
Number of sheets		1	2
Stainless steel foil / PTFE coating details		Flat stainless steel foil	
ASTM material no. Thickness Number of sheets		316 (L) 0.05 mm 2	
Material		PTFE (DYNEON™ TFM)	
Thickness Number of sheets		0.05 mm 2	
Stainless steel eyelet	ASTM material number	e. g. 316 Ti	
Residual stress (DIN 52913) σ_D 16 h, 300°C, 50 N/mm ²	N/mm ²	≥ 48	
Gasket factors (DIN E 2505 / DIN 28090-1)			
Gasket width $b_D = 20$ mm			
$\sigma_{VU/0.01}$ at an internal pressure of ≤ 40 bar	N/mm ²	10	
m		1.3	
σ_{VO}	N/mm ²	150	120
σ_{BO} at 300°C	N/mm ²	110	90
Compression factors (DIN 28090-2)			
Compressibility	ϵ_{KSW}	%	
Recovery at 20°C	ϵ_{KRW}	%	
Hot creep	ϵ_{WSW}	%	
Recovery at 300°C	ϵ_{WRW}	%	
Young's modulus at 20 N/mm ² (DIN 28090-1)	N/mm ²	900	
ASTM	"m" factor	2	
	"y" factor	psi	
Compressibility	ASTM F36	%	
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

$\sigma_{VU/0.01}$	Minimum gasket assembly stress needed to comply with leakage class L 0.01 (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 ($\sigma_{BU} = p \cdot m$)
σ_{VO}	Maximum permissible gasket stress at 20°C
$\sigma_{BO, 300°C}$	Maximum permissible gasket stress in service
m	σ_{BU} / p_i
"m" factor	Similar to m, but defined according to ASTM, hence different value
"y" factor	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/mm ² , max. gasket stress-bearing capacity under assembly conditions
ϵ_{KSW}	Compression set under a gasket stress of 35 N/mm ²
ϵ_{KRW}	Gasket recovery after reduction in gasket stress from 35 N/mm ² to 1 N/mm ²
ϵ_{WSW}	Gasket creep compression under a gasket stress of 50 N/mm ² at 300°C after 16 h
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® MF 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 ⁻²	10	2	< 10	< 10	< 10	< 10	< 10	3	< 10	< 10	< 10	< 10	< 10
10 ⁻²	16	2	< 10	< 10	< 10	< 10	< 10	3	< 10	< 10	< 10	< 10	< 10
10 ⁻²	25	2	< 10	< 10	< 10	< 10	< 10	3	< 10	< 10	< 10	< 10	< 10
10 ⁻²	40	2	< 10	< 10	< 10	< 10	< 10	3	< 10	< 10	< 10	< 10	< 10
10 ⁻³	10	2	< 10	< 10	< 10	< 10	< 10	3	< 10	< 10	< 10	< 10	< 10
10 ⁻³	16	2	< 10	< 10	< 10	< 10	< 10	3	< 10	< 10	< 10	< 10	< 10
10 ⁻³	25	2	< 10	< 10	< 10	< 10	< 10	3	< 10	< 10	< 10	< 10	< 10
10 ⁻³	40	2	< 10	< 10	< 10	< 10	< 10	3	< 10	< 10	< 10	< 10	< 10

Relaxation ratio P_{QR}

P _{QR}	e _{G0}	RT		150 °C		300 °C	
		2	3	2	3	2	3
30		0.98	0.97	0.93	0.93	0.87	0.88
50		0.98	0.98	0.94	0.94	0.86	0.88
200/160/120		0.99		0.95		0.91	
200/140/120			0.99		0.94		0.90

Max. permissible gasket stress Q_{Smax}

Q _{Smax}	e _{G0}	RT	150 °C	300 °C
		2	> 200	160
3	> 200	140	120	

Secant unloading modulus E_G

E _G	e _{G0}	RT		150 °C		300 °C	
		2	3	2	3	2	3
20		507	450	614	551	624	557
30		704	806	780	793	680	743
40		995	966	964	998	961	1029
50		1186	1367	1344	1303	1300	1255
60		1535	1442	1470	1494	1640	1367
80		2155	2054	1971	1939	2009	2029
100		2291	2617	2466	2640	2375	2528
120		2450	3018	2728	2867	2607	2968
140		3106	3153	3079	3374		
160		3054	3223	2673			
180		3266	4085				
200		3358	4193				







Definitions

E _G	[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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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".

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