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SIGRAFLEX® APX2 HOCHDRUCK

Multilayer high-strength sealing sheet made from natural graphite with stainless steel foil reinforcement for high-temperature applications



SIGRAFLEX APX2 HOCHDRUCK is a multilayer high-strength graphite sealing sheet – designed for high-temperature applications. The sheet is comprised of 0.5 mm thick layers of highly oxidation resistant SIGRAFLEX APX2 flexible graphite and 0.05 mm thick layers of stainless steel foil, manufactured with SIGRAFLEX HOCHDRUCK technology.

SIGRAFLEX APX2 HOCHDRUCK was developed for end users in the process industry to cover a broad range of demanding gasket requirements with a reliable and safe product. SIGRAFLEX APX2 HOCHDRUCK is specifically designed for high temperature flat gasket applications.

Applications

- Operating temperatures range from -250°C up to 480°C depending on chemical resistance, and possibly to 580°C after consulting the manufacturer. Life time might be limited by actual equipment temperatures and operating conditions. Please refer to our technical guidelines regarding thermal stability.
- All common pipework and vessel flange designs as well as difficult and highly stressed sealed joints.
- For one-piece gasket designs up to an outside diameter of 1500 mm; for diameters above 1500 mm, for example two-layer structures with segmented sections and staggered joints are recommended
- For operating pressures from vacuum up to 250 bar
- For corrosive media
- Steam pipework and boilers in power generation plants
- Heat transfer oils and heating equipment
- Inspection glasses, pumps, fittings and valves
- Nuclear power generation plants
- Pulp and paper mills
- Existing plants



† Cross-section

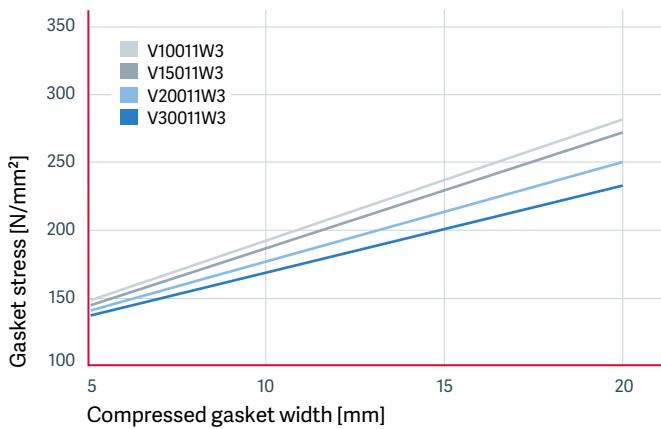
Properties

SIGRAFLEX APX2 HOCHDRUCK combines the outstanding characteristics of both SIGRAFLEX APX2 graphite foil and reinforced sheets manufactured with SIGRAFLEX HOCHDRUCK technology:

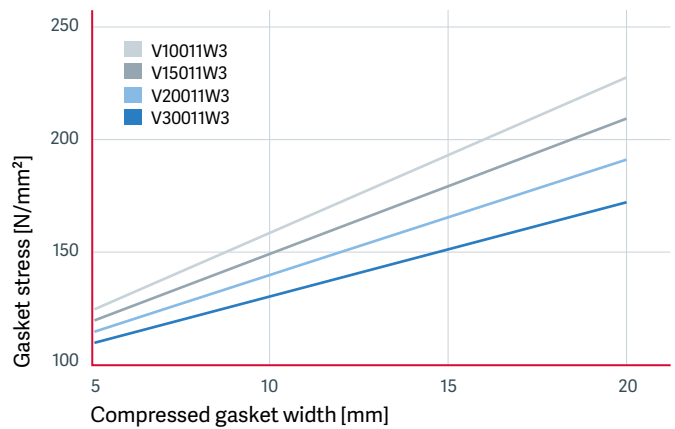
- Increased gasket life and improved operational safety due to very high oxidation resistance
- Reliable product characteristics for high plant security and availability
- Outstanding maximum permissible gasket stress

- Very high blow-out resistance and mechanical strength
- Very adaptable sealing material during gasket assembly
- Good chemical resistance
- Long-term stability of assembly load and gasket stress
- No measurable cold or warm flow characteristics up to the maximum permissible gasket stress
- No aging or embrittlement (no adhesives or binders)
- Very easy to cut into required sealing shapes, even with conventional cutting equipment/tools
- Asbestos-free (no associated health risks)

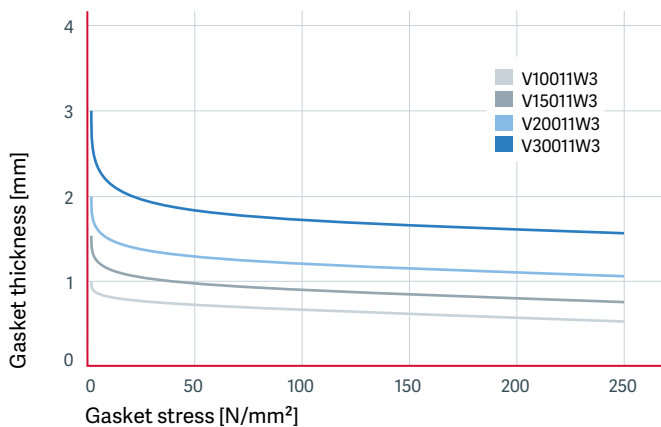
Typical maximum permissible gasket stress of SIGRAFLEX APX2 HOCHDRUCK at 20 °C



Typical maximum permissible gasket stress of SIGRAFLEX APX2 HOCHDRUCK at 300 °C



Compressibility of SIGRAFLEX APX2 HOCHDRUCK



Approvals/Test reports

- Fire safe according to API 607
- Blow-out resistance (TÜV at 2.5 times the nominal pressure)
- BAM oxygen

Assembly instructions

Our detailed assembly instructions are available on request.

Material data of SIGRAFLEX® APX2 HOCHDRUCK

Typical properties	Units	SIGRAFLEX			
		V10011W3	V15011W3	V20011W3	V30011W3
Thickness	mm	1.0	1.5	2.0	3.0
Dimensions	m	1.5 x 1.5	1.5 x 1.5	1.5 x 1.5	1.5 x 1.5
Bulk density of graphite	g/cm ³	1.1	1.1	1.1	1.1
Ash content of graphite (DIN 51903)	%	≤ 2.0	≤ 2.0	≤ 2.0	≤ 2.0
Purity	%	≥ 98	≥ 98	≥ 98	≥ 98
Total chloride content	ppm	≤ 25	≤ 25	≤ 25	≤ 25
Total halogen content	ppm	≤ 100	≤ 100	≤ 100	≤ 100
Total sulphur content	ppm	< 300	< 300	< 300	< 300
Oxidation rate in air at 670 °C (TGA)	%/h	≤ 1	≤ 1	≤ 1	≤ 1
Oxidation inhibitor		yes	yes	yes	yes
Passive corrosion inhibitor (ASTM F 2168-13)		yes	yes	yes	yes
Reinforcing steel sheet details		Smooth stainless steel foil			
ASTM material number		316 (L)	316 (L)	316 (L)	316 (L)
Thickness	mm	0.05	0.05	0.05	0.05
Number of sheets		1	2	3	5
Residual stress (DIN 52913)	$\sigma_{D 16 h, 300^\circ C, 50 N/mm^2}$ N/mm ²	≥ 45	≥ 45	≥ 45	≥ 45
Gasket factors (DIN E 2505 / DIN 28090-1)					
Gasket width	$b_D = 20 \text{ mm}$				
σ_{VU}	N/mm ²	20	20	20	20
m		1.3	1.3	1.3	1.3
σ_{VO}	N/mm ²	280	270	250	230
$\sigma_{BO \text{ at } 300^\circ C}$	N/mm ²	230	210	190	170
Gasket factors according to DIN EN 13555		see www.gasketdata.org			
Compression factors (DIN 28090-2)					
Compressibility	ϵ_{KSW} %	35	35	35	35
Recovery at 20 °C	ϵ_{KRW} %	5	5	5	5
Hot creep	ϵ_{WSW} %	< 3	< 3	< 3	< 3
Recovery at 300 °C	ϵ_{WRW} %	4	4	4	4
Young's modulus at 20 N/mm ² (DIN 28090-1)	N/mm ²	750	750	750	750
ASTM „m“-factor		2.5	2.5	2.5	2.5
ASTM „y“-factor	psi	3000	3000	3000	3000
Compressibility (ASTM F36)	%	35	35	35	35
Recovery (ASTM F36)	%	17	17	17	17
The gasket factor conversion formulas as per AD Merkblatt B7 are as follows		$k_0 \times K_D = \sigma_{VU} \times b_D$ $k_1 = m \times b_D$			

Definitions

σ_{VU}	Minimum gasket assembly stress. Recommended gasket assembly stress: $\geq 20 \text{ N/mm}^2$ 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_i and gasket factor m for test and in service ($\sigma_{BU} = p_i \times m$)	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
$\sigma_{BO \text{ at } 300^\circ C}$	Maximum permissible gasket stress in service	ϵ_{KSW}	Compression set under a gasket stress of 35 N/mm ²
m	$m = \sigma_{BU} / p_i$	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 acc. 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.

Product overview

Products	Characteristics	Recommended applications
SIGRAFLEX FOIL F.../C/E/Z/APX/APX2	Flexible, continuous	-250 °C to approx. 550 °C, for die-formed packing rings, 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 stainless steel foil	Pumps, fittings, gas supply and waste gas pipelines
SIGRAFLEX UNIVERSAL V...C2I	Reinforced with tanged stainless steel, impregnated	Pipework and vessels in the chemical and petrochemical industries and in power generation plants
SIGRAFLEX UNIVERSAL PRO V...C2I-P	Reinforced with tanged stainless steel, impregnated	TA Luft applications, for pipework and vessels in the chemical and petrochemical industries and in power generation plants
SIGRAFLEX SELECT V16010C3I	Reinforced with stainless steel foil, adhesive-free, impregnated	TA Luft applications, raised-face flanges, pipework in the chemical and petrochemical industries
SIGRAFLEX HOCHDRUCK V...Z3I	Multilayer material, reinforced with stainless steel foil, adhesive-free, impregnated	Universal sealing sheet, also for solving sealing problems in pipework, process equipment, tongue-and-groove flanges and non-standard joints in the chemical, petrochemical and nuclear industries and in power generation plants
SIGRAFLEX HOCHDRUCK PRO V...Z3I-P	Multilayer material, reinforced with stainless steel foil, adhesive-free, 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, petrochemical and nuclear industries and in power generation plants
SIGRAFLEX APX2 HOCHDRUCK V...W3	Multilayer material, reinforced with stainless steel foil, adhesive-free	Universal sealing sheet, also for solving sealing problems in high temperature applications in pipework, process equipment, tongue-and-groove flanges and non-standard joints in the chemical and petrochemical industries and in power generation plants
SIGRAFLEX MF V...MF	Adhesive-free laminate made of graphite, stainless steel and PTFE	Maximum requirements for sealability (TA Luft), safety and process hygiene; sealed joints in the chemical, petrochemical, pharmaceutical and food industries
SIGRAFLEX EMAIL V...Z3E	Reinforced with stainless steel foil, adhesive-free	PTFE-envelope gaskets for enameled pipework, vessels and stub connections, etc.



Additional information on our SIGRAFLEX sealing materials can be found under "Download Center" on our homepage.

www.sglgroup.com/sigraflex-downloads

TDS APX2_HOCHDRUCK_Sheet.00

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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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