SIGRAFLEX® HOCHDRUCK PRO

Multilayer high-strength gasket sheet made of SIGRAFLEX flexible graphite foil reinforced with flat stainless steel for extreme conditions

SIGRAFLEX HOCHDRUCK PRO is a multilayer high-strength gasket sheet comprised of thin layers of high-purity SIGRAFLEX flexible graphite foils reinforced with 0.05 mm thick stainless steel foils using our proven SIGRAFLEX HOCHDRUCK technology.

As a result, it has outstanding mechanical properties. The sheet is impregnated to reduce leakage and improve handling.

SIGRAFLEX HOCHDRUCK PRO allows end users in the process industry to cover almost their entire gasket requirements with a reliable and safe product.

↑ Cross-section

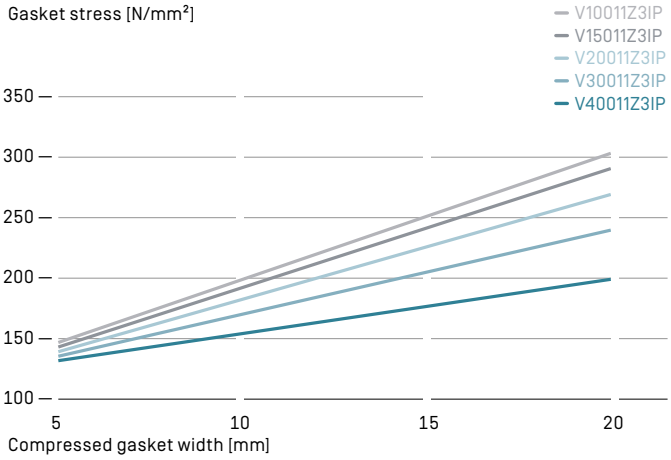
Applications

- For difficult and mechanically highly stressed sealed joints (in tongue-and-groove and flanges with special dimensions, process equipment, heat exchangers, etc.); also suitable for all common pipework and vessel flange designs
- 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
- Operating temperatures range from –250 °C up to 550 °C depending on chemical resistance. Life time might be limited at high temperatures. Consult the manufacturer when application temperatures exceed 450 °C. Please refer to our technical guideline regarding thermal stability.
- Chemical, petrochemical, refinery and nuclear industries
- Steam pipework and boilers in power generation plants
- Heat transfer oils and heating equipment
- Inspection glasses, pumps, fittings and valves
- Existing plants

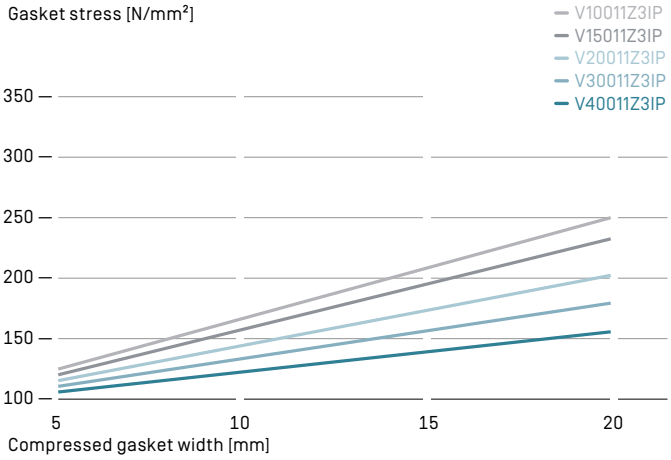
Properties

- Reduction in fugitive emissions due to high leak-tightness
- Complies with the TA Luft leakage requirements for all sheet thicknesses
- Outstanding maximum permissible gasket stress
- High operational reliability, increased plant availability
- Excellent oxidation resistance
- Very high blow-out resistance and 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 and antistick properties due to special impregnation
- No measurable cold or warm flow characteristics up to the maximum permissible gasket stress
- No aging or embrittlement (no adhesives or binders)
- Ease of processing
- Asbestos-free (no associated health risks)

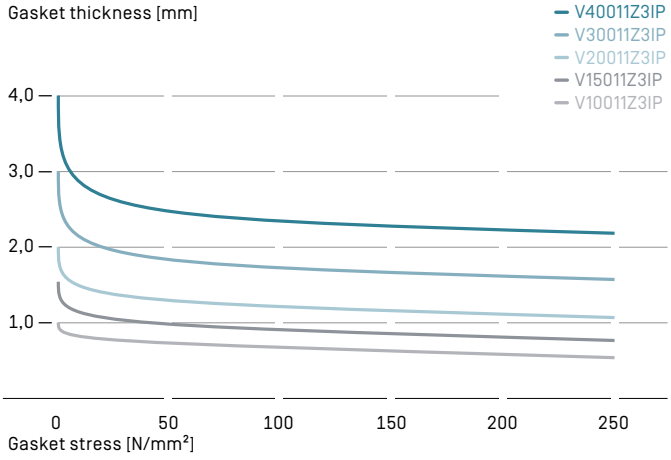
Typical maximum permissible gasket stress of SIGRAFLEX HOCHDRUCK PRO at 20 °C



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



Compressibility of SIGRAFLEX HOCHDRUCK PRO



Approvals/Test reports

Please see www.sigraflex.com/downloads for details

- TA Luft (VDI 2440/VDI 2200) for all thicknesses
- Fire safe according to API 607
- Blow-out safety HOBT (ASTM WK18046)
- BAM oxygen
- DVGW (DIN 3535-6)

Assembly instructions

Our detailed assembly instructions are available on request.

Material data of SIGRAFLEX® HOCHDRUCK PRO

Typical properties		Units	V10011Z3IP	V15011Z3IP	V20011Z3IP	V30011Z3IP	V40011Z3IP
Thickness		mm	1.0	1.5	2.0	3.0	4.0
Dimensions		m	1.5 x 1.5 1.0 x 1.0	1.5 x 1.5 1.0 x 1.0	1.5 x 1.5 1.0 x 1.0	1.5 x 1.5 1.0 x 1.0	1.5 x 1.5 1.0 x 1.0
Bulk density of graphite		g/cm³	1.1	1.1	1.1	1.1	1.1
Ash content of graphite (DIN 51903)		%	≤ 0.15	≤ 0.15	≤ 0.15	≤ 0.15	≤ 0.15
Purity		%	≥ 99.85	≥ 99.85	≥ 99.85	≥ 99.85	≥ 99.85
Total chloride content		ppm	≤ 10	≤ 10	≤ 10	≤ 10	≤ 10
Total halogen content		ppm	≤ 40	≤ 40	≤ 40	≤ 40	≤ 40
Total sulphur content		ppm	< 300	< 300	< 300	< 300	< 300
Oxidation rate in air at 670 °C (TGA)		%/h	< 4	< 4	< 4	< 4	< 4
Oxidation inhibitor			yes	yes	yes	yes	yes
Passive corrosion inhibitor (ASTM F 2168-13)			yes	yes	yes	yes	yes
Reinforcing steel sheet details					Smooth stainless steel foil		
	ASTM material number		316L	316L	316L	316L	316L
	Thickness	mm	0.05	0.05	0.05	0.05	0.05
	Number of sheets		2	3	4	6	9
Residual stress (DIN 52913)	$\sigma_{D\,16\,h,\,300\,°C,\,50\,N/mm^2}$	N/mm²	≥ 48	≥ 48	≥ 48	≥ 48	≥ 48
Gasket factors (DIN E 2505 / DIN 28090-1)							
Gasket width b_D = 20 mm at an internal pressure of							
$\sigma_{VU/0,1}$	10 bar	N/mm²	10	10	10	10	11
	16 bar	N/mm²	10	10	12	13	14
	25 bar	N/mm²	10	12	14	15	17
	40 bar	N/mm²	12	14	16	18	20
m			1.3	1.3	1.3	1.3	1.3
σ_{VO}		N/mm²	305	290	270	240	200
$\sigma_{BO\,at\,300\,°C}$		N/mm²	250	230	210	180	160
Gasket factors (DIN EN 13555)				see www.esadata.org or www.gasketdata.org			
Compression factors (DIN 28090-2)							
Compressibility	ε_{KSW}	%	35	35	35	35	35
Recovery at 20 °C	ε_{KRW}	%	5	5	5	5	5
Hot creep	ε_{WSW}	%	< 3	< 3	< 3	< 3	< 3
Recovery at 300 °C	ε_{WRW}	%	4	4	4	4	4
Young´s modulus at 20 N/mm² (DIN 28090-1)		N/mm²	750	750	750	750	750
ASTM	„m“-factor		2.5	2.5	2.5	2.5	2.5
	„y“-factor	psi	2000	2000	2000	2000	2000
Compressibility (ASTM F36)		%	37	37	37	37	37
Recovery (ASTM F36)		%	17	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

$\sigma_{VU/0,1}$	Minimum gasket assembly stress needed to comply with leakage class L 0.1 (according to DIN 28090-1) Recommended gasket assembly stress: ≥ 20 N/mm² up to σ_{BO}
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 ($\sigma_{BU} = p_i \times m$)
σ_{VO}	Maximum permissible gasket stress at 20 °C
$\sigma_{BO\,at\,300\,°C}$	Maximum permissible gasket stress in service
m	$m = \sigma_{BU}/p_i$
„m“-factor	Similar to m, but defined acc. 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/mm², max. gasket stress-bearing capacity under assembly conditions
ε_{KSW}	Compression set under a gasket stress of 35 N/mm²
ε_{KRW}	Gasket recovery after reduction in gasket stress from 35 N/mm² to 1 N/mm²
ε_{WSW}	Gasket creep compression under a gasket stress of 50 N/mm² at 300 °C after 16 h
ε_{WRW}	Recovery after reduction in gasket stress from 50 N/mm² to 1 N/mm²

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

Unless stated otherwise, all values are valid at room temperature, typical, non-binding and subject to change. Please note some values correspond to the graphite foil only. For engineering or design purposes please contact our technical sales team.

Product overview

Products	Characteristics	Recommended applications
SIGRAFLEX FOIL F.../C/E/Z/APX/APX2®	Flexible, soft, continuous	– 250 °C to approx. 550 °C, for die-formed packing rings, filler material for spiral wound gaskets, facing material for kammprofile and corrugated 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...C2IP	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...Z3IP	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.sigraflex.com/downloads

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