

SIGRAFLEX® HOCHDRUCK

Graphite Sealing Sheet with
High-Integrity Stainless Steel Foil Reinforcement for Extreme Conditions



SGL CARBON GROUP

SIGRAFLEX® HOCHDRUCK

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is a multilayer high-strength sheet material comprising 0.5 mm thick layers of high-quality graphite foil (type Z) and 0.05 mm thick stainless steel foil.

Depending on the sheet thickness required, several layers of graphite and stainless steel foil are joined together in a special process.

SIGRAFLEX HOCHDRUCK is a sealing material with excellent mechanical properties.

Applications

For gaskets meeting increased demands for operational reliability and sealability, notably:

- Requirements of the German Clean Air Act/TA Luft (gaskets with modified inner eyelet; for high gasket pressures without eyelet)

- Blow-out resistance

- Fire safety

For mechanically highly stressed sealed joints exposed to:

- Very high gasket pressures of over 300 N/mm² (see material data)
- Very high internal pressures of up to 250 bar.

For gaskets in tongue-and-groove flanges meeting DIN and ANSI standards:

- Recommended as one-piece gaskets up to 1500 mm outside diameter; over 1500 mm diameter as two-layer structures in segments

- It is recommended that the bolts be tightened up to the permitted limit.

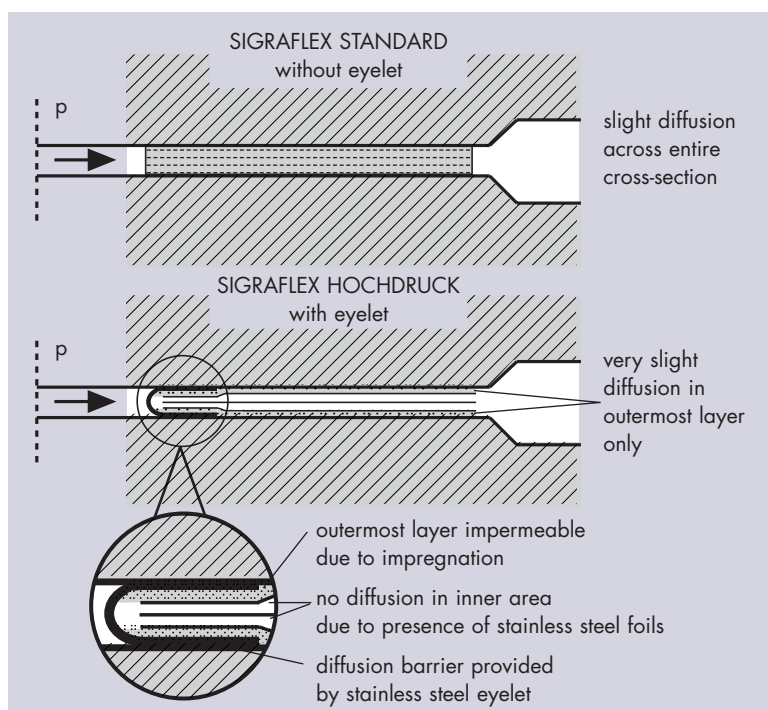
Examples of Application

Gaskets for:

- Chemical and petrochemical pipework and equipment with hot and/or corrosive media
- Steam pipework in power stations
- Heat transfer oil and heating facilities
- Inspection glasses, pumps, fittings and vessels
- Existing plants (after extended service)

How a SIGRAFLEX HOCHDRUCK gasket with eyelet works

Gaskets in this material with stainless steel eyelets make for much better sealability (see sketch).



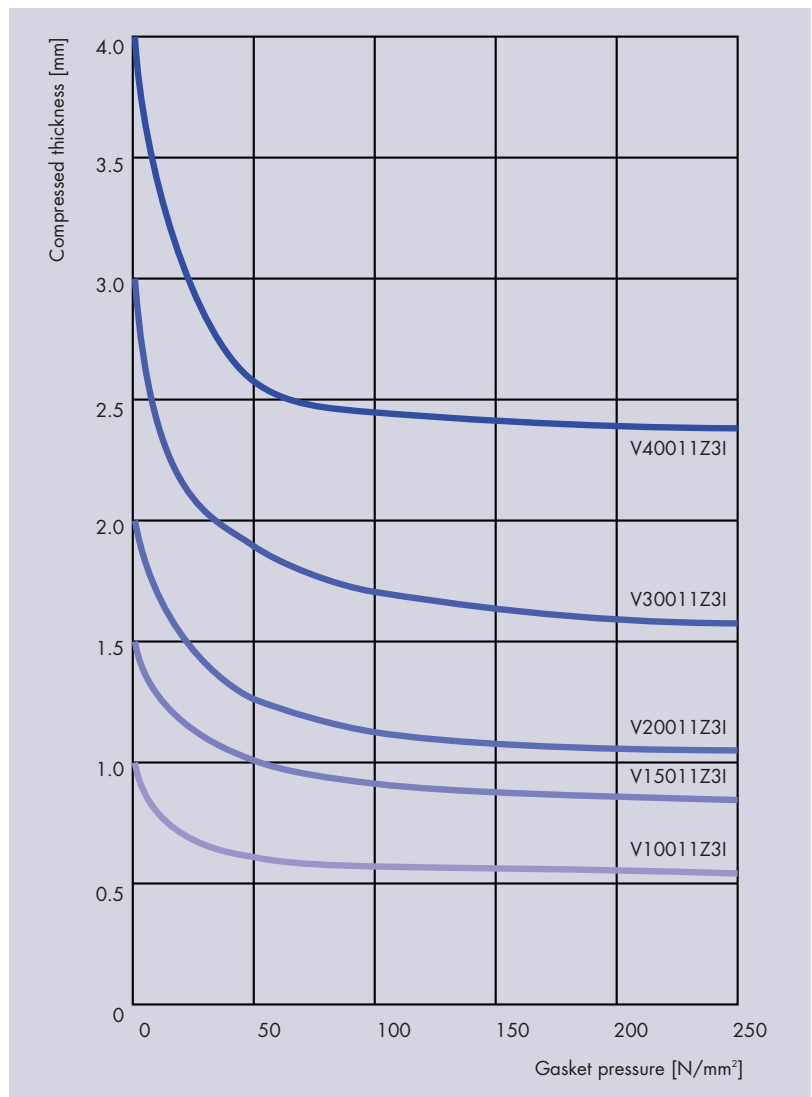
Properties

- Very high maximum permissible gasket pressure (no gasket destruction)
- Meets German Clean Air Act (VDI 2440) requirements on gaskets with modified inner eyelet (for tongue-and-groove gaskets without eyelet)
- Suitability for use at temperatures ranging from -250°C up to approx. 500°C. For applications at more than 400°C, users should request our advice
- High blow-out resistance
- High rigidity, resistance to buckling
- Long-term stability of compressibility and recovery over a wide temperature range
- No ageing or embrittlement, owing to absence of adhesives or binders
- No measurable cold or warm flow characteristics up to maximum permissible compressive stress
- Good scratch resistance, antistick finish due to impregnation
- Very good chemical resistance
- Excellent resistance to thermal shock
- Ease of handling and processing
- Absence of health hazard; asbestos-free

For details of the recovery behavior of gaskets, see brochure SIGRAFLEX® Products Manufactured from Flexible Graphite Foil.



Compressed thickness as a function of gasket pressure



Material Data

Material type		V10011Z3I	V15011Z3I	V20011Z3I	V30011Z3I	V40011Z3I	
Thickness	mm	1.0	1.5	2.0	3.0	4.0	
Bulk density of graphite	g/cm ³	1.1					
Ash content of graphite (DIN 51903)	%	≤ 0.15					
Total chloride content	ppm	≤ 20					
Stainless steel foil details							
ASTM material number		316 (L)					
Thickness	mm	0.05					
Number of foils		1	2	3	5	7	
Residual stress (DIN 52913)							
σ_D 16 h, 300°C, 50 N/mm ²	N/mm ²	> 48					
Gasket factors ¹⁾ (DIN E 2505 / DIN 28090-1)							
Gasket width $b_D=20$ mm at an internal pressure of							
$\sigma_{VU/0.1}$	10 bar	N/mm ²	10	10	10	12	14
	16 bar	N/mm ²	10	12	14	17	18
	25 bar	N/mm ²	10	14	16	20	22
	40 bar	N/mm ²	13	16	18	25	28
m			1.3	1.3	1.3	1.3	1.3
σ_{VO}		N/mm ²	305	290	270	240	200
σ_{BO} at 300°C		N/mm ²	250	230	210	180	160
ASTM ¹⁾							
"m" factor			2.5				
"y" factor		psi	3000				
Compression factors ¹⁾ (DIN 28090-2)							
Compressibility at 20°C	ϵ_{KSW}	%	30 – 40				
Recovery at 20°C	ϵ_{KRW}	%	4 – 5				
Hot creep during operation	ϵ_{WSW}	%	< 4				
Recovery at 300°C	ϵ_{WRW}	%	3 – 4				

¹⁾ Definitions:

$\sigma_{VU/0.1}$ Minimum gasket assembly pressure needed to comply with leakage class L 0.1 (according to DIN 28090-1)
Recommended gasket pressure for installation: ≥ 20 N/mm² up to σ_{BO}

σ_{BU} Minimum gasket pressure under service conditions, where σ_{BU} is the product of internal pressure p and gasket factor m for test and service conditions ($\sigma_{BU} = p \cdot m$)

σ_{VO} Maximum permissible gasket pressure at 20°C

σ_{BO} Maximum permissible gasket pressure under service conditions

m σ_{BU}/p

"m" factor Similar to m, but defined according to ASTM, hence different value

"y" factor Minimum gasket pressure in psi

ϵ_{KSW} Compression set under a pressure of 35 N/mm²

ϵ_{KRW} Gasket recovery after reduction in pressure from 35 N/mm² to 1 N/mm²

ϵ_{WSW} Gasket creep compression under a pressure of 50 N/mm² at 300°C after 16 h

ϵ_{WRW} Recovery after reduction in pressure from 50 N/mm² to 1 N/mm².

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

Approvals

- BAM
- Blow-out resistance (TÜV)
- DVGW
- Fire safety (BS 6755-2 and API 607)
- Germanischer Lloyd
- TA Luft (VDI 2440)
(with modified inner eyelet;
for tongue-and-groove
without eyelet)
- US Coastguard

Assembly Instructions

Use dry and undamaged gaskets.

The sealing faces must be clean, dry and free from grease. Do not use release agents.

Position the gasket correctly to avoid mechanical stresses during assembly. Make sure that the gasket is properly fitted in tongue-and-groove flanges.

Align the flanges as plane-parallel as possible. Tighten the bolts in cross-wise order, first to about 50 % of the maximum torque value, in the second stage to about 80 % and to the full value in the third stage but not before. All bolts must be tightened to the specified value; hence, the torque should be checked **repeatedly**.

Forms Supplied

SIGRAFLEX HOCHDRUCK sheets are available in the following dimensions and type designations. The sheets can also be supplied in dimensions of 1000 x 1000 mm.

Dimensions

HOCHDRUCK

1500 x 1500 x 1.0 mm

1500 x 1500 x 1.5 mm

1500 x 1500 x 2.0 mm

HOCHDRUCK AP

1500 x 1500 x 3.0 mm

1500 x 1500 x 4.0 mm

Typical Order

Ash content:

Bulk density of graphite:

Thickness:

Length:

Width:

Types

V10011Z3I

V15011Z3I

V20011Z3I

V30011Z3I

V40011Z3I

1500 x 1500 x 2.0 mm

V20011Z3I

Packaging

Depending on the quantity ordered, the sheets are supplied in cartons or on pallets with stackable frames and top cover. The sheets are protected against damage by inserted corrugated cardboard or foam rubber strips. The carton can take up to 50 kg, the pallet up to 1200 kg. The height of the frame structure is adjustable. The consignments can be arranged on the pallets to customers' individual wishes.

Carton:

1180 x 1180 x 60 mm

Pallet with stackable frames:





1090 x 1090 mm

1590 x 1590 mm

Other Relevant Publications

- SIGRAFLEX®, Products
Manufactured from
Flexible Graphite Foil
- Data sheets:
SIGRAFLEX® FOIL
SIGRAFLEX® STANDARD
SIGRAFLEX® ECONOMY
SIGRAFLEX® UNIVERSAL
SIGRAFLEX® UNIVERSAL PRO
SIGRAFLEX® SELECT
SIGRAFLEX® HOCHDRUCK PRO
SIGRAFLEX® MF
SIGRAFLEX® EMAIL
- SIGRAFLEX® H, High-Quality Sealing Sheet Made from Reinforced PTFE
- SIGRAFLEX®, Graphite Foils and Laminated Sheets for Thermal Insulation and Electric Heating Elements

Product Overview

Product	Characteristics	Recommended applications
SIGRAFLEX® FOIL F.....C / Z / APX	▲ Flexible, continuous	-250°C to approx. 500°C; for compressed packings, spiral-wound and kammprofile gaskets
SIGRAFLEX® STANDARD L.....CI	■ Unreinforced, impregnated	Large segmented gaskets; enamel or glass flanges; highly corrosive media
SIGRAFLEX® ECONOMY V.....C4	■ Reinforced with bonded s/s foil	Pumps; fittings; gas; offshore; waste gas pipelines
SIGRAFLEX® UNIVERSAL V.....C2I	■ Reinforced with perforated s/s sheet, impregnated	Pipework and vessels in the chemical and petrochemical industries and in power stations
SIGRAFLEX® UNIVERSAL PRO V.....C2I-P 	■ Reinforced with perforated s/s sheet, impregnated	For applications subject to the German TA Luft (Clean Air Act); 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 applications subject to the German TA Luft (Clean Air Act); raised-face flanges; pipework in the chemical and petrochemical industries
SIGRAFLEX® HOCHDRUCK V.....Z3I	■ High-integrity ● multilayer laminate, impregnated	Universal gasket for solving sealing problems in pipework, process equipment, tongue-and-groove flanges and special-dimension sealed joints in the chemical and petrochemical industries and in power stations
SIGRAFLEX® HOCHDRUCK PRO V.....Z3I-P 	■ High-integrity multilayer laminate, impregnated	Universal gasket sheet for applications subject to the German TA Luft (Clean Air Act) and solving sealing problems in pipework, process equipment, tongue-and-groove flanges and special-dimension sealed 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 (German TA Luft), safety, chemical resistance and process hygiene; sealed joints in the chemical, 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 subject to the German Clean Air Act

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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