SIGRAFLEX® UNIVERSAL

Sealing Sheet Made from Impregnated Graphite
with Perforated Stainless Steel Sheet Reinforcement

SGL CARBON GROUP

Applications

- For gaskets meeting DIN 2690 in raised-face flanges; recommended as one-piece gasket; over 1500 mm diameter as two-layer structure in segments
- For high internal pressures up to 100 bar and high gasket pressures up to 140 N/mm²
- For very impermeable and highly stressed, blow-out-resistant sealing joints, we recommend a stainless steel inner eyelet
- For piping with corrosive media and high temperatures; for heat transfer oil and heating facilities; for existing plants, vessels and steam lines; for exhaust manifolds
- For corrosive media thanks to its excellent resistance to chemicals; limits imposed by stainless steel sheet reinforcement

Any existing industrial property rights must be observed.

The application limits illustrated are conservative recommendations, which can be exceeded under favorable conditions.

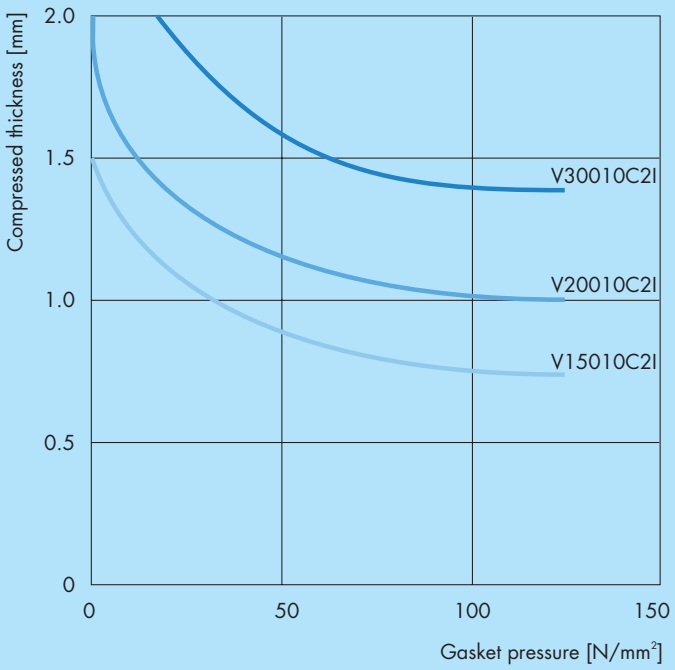
Examples:
Determination of maximum permissible gasket pressure under service conditions σ_{BO}:

Specified: 300°C → 140 N/mm²

Determination of optimum gasket pressure σ_{OPT}:

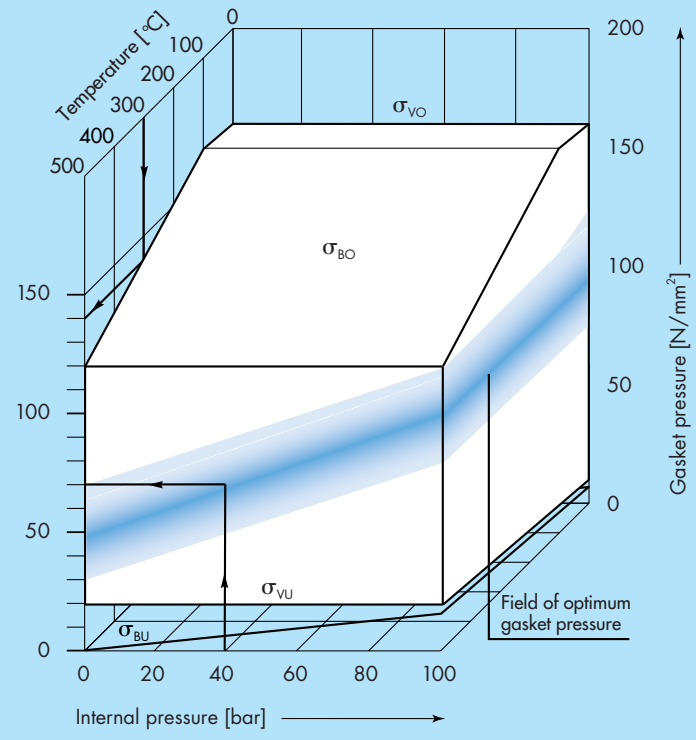
Specified: 40 bar → 70 N/mm²

Compressed thickness as a function of gasket pressure



For details of the recovery behavior of gaskets, see brochure SIGRAFLEX®, Products manufactured from flexible graphite foil.

Recommended field of application for gaskets meeting DIN 2690



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Properties

- With perforated stainless steel sheet reinforcement; easy to handle
- Low permeability to gases, impermeable to liquids
- Low diffusion rates, high blow-out resistance and high mechanical strength of gaskets with stainless steel inner eyelets
- Good scratch resistance, virtually no sticking to other materials due to resin impregnation
- Can be used from cryogenic temperatures up to about 500°C depending on installation and operating conditions
- Good resistance to chemicals
- Good shear strength
- Asbestos-free, presents no health hazard
- No ageing or embrittlement, because of absence of binders
- Long-term stability of compressibility and recovery over a wide temperature range
- No measurable cold or warm flow up to maximum permissible compressive stress
- Good resistance to thermal shock

Approvals

- BAM tests
- DVGW
- Fire Safety, BS 6755
- Type tests by Germanischer Lloyd

Assembly instructions

Use dry and undamaged gaskets. Moist graphite gaskets must not be fitted unless first dried, e.g. on a radiator or in a drying chamber.

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. An assembly aid – e.g. a flange spreading device – should be used if necessary.

Flanges should be aligned as plane-parallel as possible. Flange bolts should be tightened in cross-wise order, first to approx. 50 % of the maximum torque value, in the second stage to approx. 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**.

Material data

Material type			V15010C2I	V20010C2I	V30010C2I
Thickness		mm	1.5	2.0	3.0
Bulk density of graphite		g/cm³	1.0		
Ash content of graphite (DIN 51903)		%	≤ 2.0		
Total chloride content of graphite		ppm	≤ 50		
Reinforcing sheet details					
ASTM material number			316 (L)		
Thickness		mm	0.1		
Number of sheets			1	1	2
Residual stress (DIN 52913)					
σ_D 16 h, 300°C, 50 N/mm²		N/mm²	> 48	> 48	> 45
Gasket factors[1] (DIN E 2505 / DIN 28090-1)					
Specimen width b_D=20 mm	at an internal pressure of				
$\sigma_{VU/0.1}$	10 bar	N/mm²	10	12	18
	16 bar	N/mm²	14	15	23
	25 bar	N/mm²	17	18	30
	40 bar	N/mm²	20	22	35
m			1.3	1.3	1.3
σ_{VO}		N/mm²	180	160	140
$\sigma_{BO\ at\ 300°C}$		N/mm²	160	140	120
ASTM "m" factor			2.5	2.5	2.5
"y" factor		psi	3000	2000	2000
Compression factors (DIN 28090-2[1])					
Compressibility	ε_{KSW}	%	35 – 45		
Recovery at 20°C	ε_{KRW}	%	4 – 6		
Hot creep during operation	ε_{WSW}	%	< 4		
Recovery at 300°C	ε_{WRW}	%	2 – 4	3 – 5	3 – 5
Young's modulus (DIN 28090)		N/mm²	950		
Compressibility	ASTM F36A-66	%	30 – 35	30 – 40	
Recovery		%	15 – 20	15 – 20	

[1] Definitions:

$\sigma_{VU/0.1}$	Minimum gasket assembly pressure needed to comply with leakage class L 0.1 (according to DIN 28090-1)
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
$\sigma_{BO,\ 300°C}$	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.

Forms supplied

SIGRAFLEX UNIVERSAL sheets are available in the following dimensions with the stated type designations. On request, the sheets can also be supplied in the dimensions of 1000 x 1000 mm.

Outside dimensions	Types
1500 x 1500 x 1.0 mm	V10010C21
1500 x 1500 x 1.5 mm	V15010C21
1500 x 1500 x 2.0 mm	V20010C21
1500 x 1500 x 3.0 mm	V30010C21

Typical order

Ash content of graphite	≤ 2.0 %
Bulk density of graphite	1.0 g/cm³
Thickness	3.0 mm
Length	1500 mm
Width	1500 mm
1500 x 1500 x 3.0 mm	V30010C21

Packaging

Depending on the quantity ordered, the sheets are supplied in cartons or on pallets with stackable frames and top cover. The sheet edges are protected against damage by inserted foam rubber strips or corrugated cardboard. 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.

Outside dimensions (mm):

Carton
1180 x 1180 x 60

Pallet with stackable frames
1090 x 1090
1590 x 1590

Other relevant publications

- SIGRAFLEX®, Products manufactured from flexible graphite foil
- Data sheets:
  SIGRAFLEX® FOIL
  SIGRAFLEX® STANDARD
  SIGRAFLEX® ECONOMY
  SIGRAFLEX® UNIVERSAL *PRO*
  SIGRAFLEX® SELECT
  SIGRAFLEX® HOCHDRUCK
  SIGRAFLEX® MF
  SIGRAFLEX® EMAIL
- SIGRAFLON® H, High-quality sealing sheet made from reinforced PTFE
- SIGRAFLEX®, Graphite foils and laminated sheets for thermal insulation and electric heating elements

Product survey

Product	Characteristics	Recommended applications
SIGRAFLEX® FOIL F..... C / Z / APX	▲ Flexible, continuous	-250°C to approx. 500°C, briefly up to 900°C; for compressed packings, spiral-wound and kamm-profile 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 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 Clean Air Act; raised-face flanges; pipework in the chemical and petrochemical industries
SIGRAFLEX® HOCHDRUCK V.....Z3I	■ High-integrity ● multilayer composite, 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; for applications subject to the German Clean Air Act (for raised-face flanges with inner eyelet, for tongue-and-groove flanges without inner eyelet)
SIGRAFLEX® MF V.....Z2MF	■ High-integrity ● composite made of graphite, stainless steel and PTFE	Maximum requirements in terms of sealability (German Clean Air Act), 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

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