



High-pressure gasket material
made from **expanded graphite** for maximum
performance and perfect handling.
novaphit® SSTC^{TA-L} and novaphit® MST



GASKETS

TECHNICAL TEXTILES

EXPANSION JOINTS

INSULATION

NEW MATERIALS



creating
hightech
solutions

Environmental protection optimised by gaskets of maximum quality throughout the company

High-quality gaskets make a major contribution to protection of the environment. Rules like the German regulations about air pollution (“TA Luft”) specify demanding sealing criteria. It is particularly important that these criteria are met in applications involving media that endanger the environment and are harmful to health.

Demonstration of the high quality of novaphit® MST and novaphit® SSTC^{TA-L} in component testing

The component test involves leakage measurement following 48 hours of exposure to a temperature of 300 °C. The leakage limit is $1 \cdot 10^{-4}$ mbar · l / (s · m). Up to now, this has been the most important criterion for determining the quality of a gasket material.

Many years of practical experience with gaskets have, however, shown that the quality of the gasket material depends on other criteria too. They include mechanical properties as well as long-term temperature resistance at the same time as effective sealing for a long period of time. It is apparent from this that excellent gasket material performance is determined by the combination of several different properties.

Focus on the entire sealing system: VDI 2290

There are more detailed regulations that are designed to make sure the requirements of TA Luft are satisfied more specifically. The quality of the overall gasket connection is influenced not only by the properties of the gasket material but also by the installation situation. The current VDI directive 2290 is based to a particularly large extent on a comprehensive approach to the creation of a sealing system. The importance of expert installation is stressed just as much as the need for accurate design calculations.

Gasket design in accordance with DIN EN 1591

DIN EN 1591-1 is explicitly recommended for the design and calculation of gasket systems. Attention is also drawn to use of the design sealing class $L_{0,01}$ in VDI 2290.

Thanks to their optimum performance, novaphit® MST and novaphit® SSTC^{TA-L} enable gasket connections to be established that meet the strict criteria of TA Luft and VDI 2290. By supplying novaphit® MST and novaphit® SSTC^{TA-L}, Frenzelit creates the basis for carrying out company-wide standardisation at a maximum quality level.

Frenzelit is involved in the production process from the mine to the finished product.



High-quality graphite gaskets made from high-quality graphite

novaphit® gaskets made from expanded pure graphite are suitable for high chemical, thermal and mechanical stresses. They do their job reliably even when there are extreme fluctuations in conditions. novaphit® gaskets do not contain any bonding agents, incidentally.

There can be substantial differences in the quality of expanded graphite. An explanation is given below of how expanded graphite is made and what criteria need to be met as quality features.

Where does graphite come from?

Graphite is obtained in both open-cast and underground mines. The choice of the mine already decides the subsequent quality level. The grinding and cleaning operations that follow are just as important.

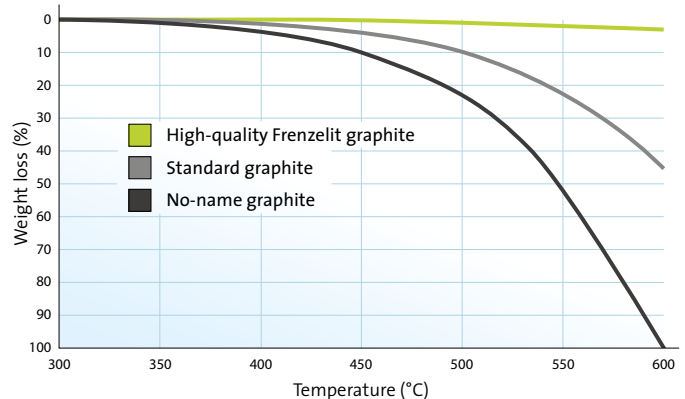
What happens in the expanding process?

The ground basic graphite is expanded in a thermal process, in which the volume of the graphite is increased many times over. A flexible and soft graphite film is produced from a "brittle" graphite powder.

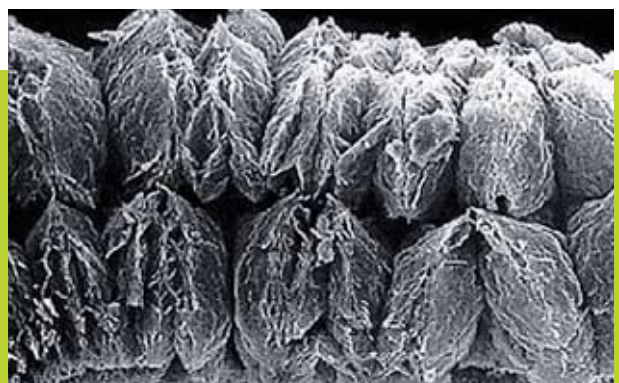
Oxidation resistance is the most important quality feature of graphite gaskets

The efficiency of the graphite is defined essentially by its oxidation resistance. The common assumption that graphite quality is determined solely by a specific degree of purity is not correct. On the contrary: it is essential to determine the oxidation properties of the graphite exactly, because even graphite films of the highest purity level may not be resistant enough to oxidation. Thanks to careful selection of the basic graphite and 100 % incoming goods checks of this and other properties, only high-quality graphite is used in the novaphit® SSTC^{TA-L} and novaphit® MST production process.

Weight loss as an indication of the oxidation resistance of pure graphite film (99%)



Flake graphite Source: Graphit Kropfmühl AG



Expanded graphite Source: Graphit Kropfmühl AG

Material profile of novaphit® SSTC^{TA-L}

Advantages of the expanded metal insert used

Gasket material made from expanded graphite (purity level 99 %) with internal impregnation and an acid-resistant expanded metal insert made from chrome-nickel steel (material no. 1.4404 / AISI 316L).

Expanded metal made from acid-resistant stainless steel
Rust- and acid-resistant material (material no. 1.4404).

Thickness of the expanded metal insert used

Stretching the stainless steel film used (original thickness 0.15 mm) leads to a three-dimensional structure with a projected height of about 0.4 mm, as a result of which chambering of the gasket core is achieved.

Geometry of the stainless steel insert

- Better exploitation of the surface pressure available to compact the graphite, because no “peaks” need to be levelled. Installation of the gasket is completed faster.
- No undercutting in the insert material. The graphite film encloses the insert completely.
- Optimised surface pressure distribution by comparison with other insert concepts. This is demonstrated impressively by the self-contained lines of higher surface pressure (see the Fuji Film photo of novaphit® SSTC^{TA-L} with expanded metal).
- Favourable grid geometry (diamond dimension = 3.0 mm) makes it possible to produce gaskets of very narrow width reliably.
- Easy cuttability. Handling benefits in manual and in-house finishing.
- Considerably lower risk of layer separation when bending occurs. Even in such a case, the graphite film is pressed around the insert again completely when pressure is

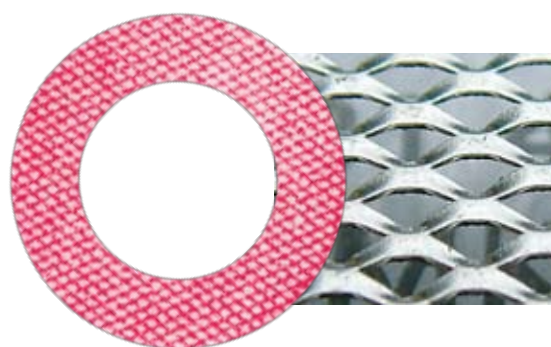
applied to the gasket during installation in the flange, i.e. greater tolerance when mistakes are made in installation.

- Repeated bending of the insert is irreversible because of strain hardening, i.e. the insert recovers and is actively involved in the sealing operation! This guarantees greater security in the gasket connection, particularly at higher surface pressure levels.
- Another advantage of the new novaphit® SSTC^{TA-L} in direct comparison with smooth metal inserts is its open insert design principle. This means that not merely the outer graphite layer but rather that a considerably thicker layer is available to compensate for flange damage.

Fuji Film photos

Sensitivity: medium
Gasket thickness: 2,0 mm
Surface pressure: 30 N/mm²

Frenzelit graphite gasket novaphit® SSTC^{TA-L} with expanded metal



Graphite gasket with tanged metal



Graphite gasket with smooth metal



Material profile of novaphit® MST

Advantages of the unique combination of expanded metal and smooth metal inserts

Multilayer gasket material made from expanded graphite (purity level 99.5 %) with several expanded metal and smooth metal inserts made from stainless steel (material no. 1.4404 / AISI 316L) and intelligent internal impregnation.

Outstanding adaptability

The logical arrangement of the stainless steel inserts is the special feature of novaphit® MST. 0.5 mm of graphite alternates with stainless steel 1.4404. Expanded metal is, however, chosen for the outer layers on each side. The open structure of the expanded metal makes the gasket more adaptable, because the two outer graphite layers can be used to compensate for flange unevenness.

New dimension in internal impregnation performance

Systematic improvement in the effectiveness of the internal impregnation has made it possible to use graphite films with optimised initial density. The sealing properties are at the same time increased as a result, while adaptability is significantly better.

Gasket deformation of about 43 % is achieved with surface pressure of only 20 MPa. Compared with standard multilayer laminates, which reach only about 23 %, this means that adaptability is 87 % higher.

Excellent handling

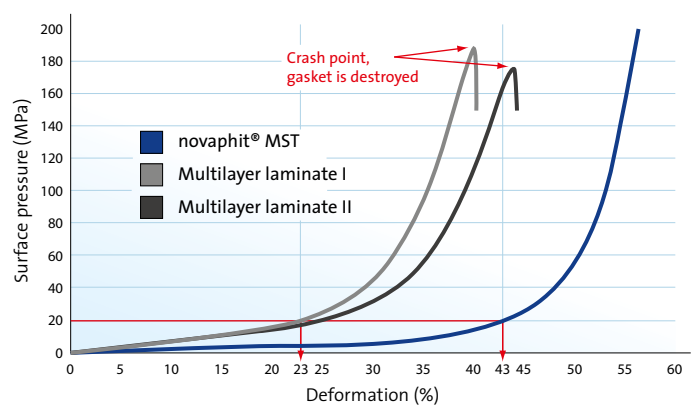
Thanks to the multilayer structure, gaskets made from novaphit® MST have extremely good dimensional stability properties and do not buckle. This can be an advantage over single-layer, reinforced graphite gaskets.

Very simple processing

The thickness of the individual stainless steel inserts (0.05 mm) has been chosen carefully to make sure that extremely reliable and simple processing is possible by all standard methods.

- Punching
- Plotting
- Water jet cutting
- Cutting with circular saws
- Cutting with metal shears and even
- Cutting with scissors

Compression chart according to DIN 28090-1

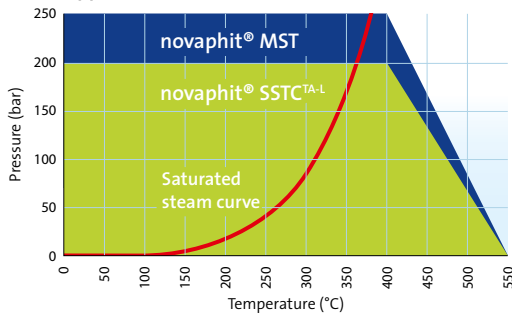


Technical information

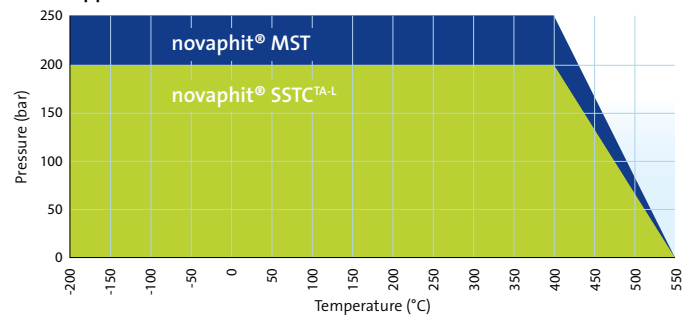
Application recommendations, depending on the pressure and temperature

The application recommendations for different temperature and pressure levels in the graphs apply to a gasket thickness of 2.0 mm and with smooth flanges. Higher limits are possible when thinner gaskets are used!

Application recommendation for water/steam



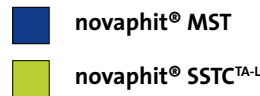
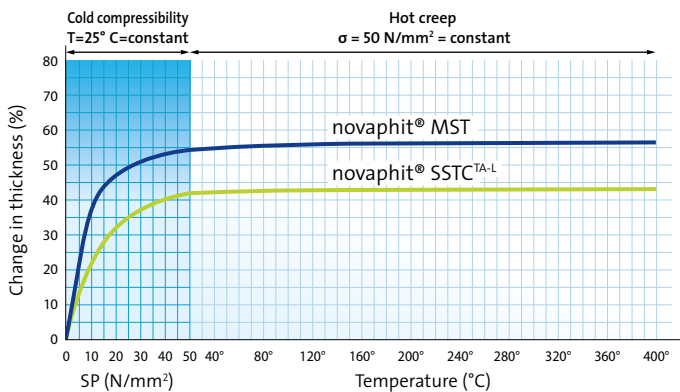
Application recommendation for other media*



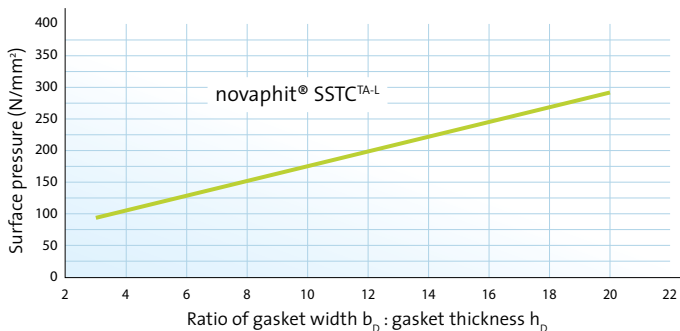
* Example for the most common other media. More detailed data for individual cases are available in the Frenzelit novaDISC program or you can contact our application engineering specialists.

Compression set - Temp-Test

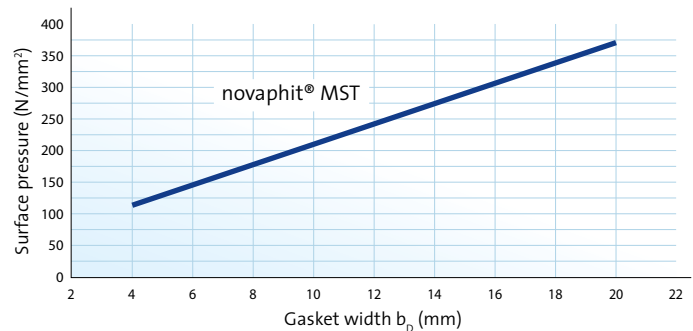
up to 50 N/mm² and 400 °C



Maximum surface pressure, after installation, with smooth sealing faces*



* The maximum surface pressure can be increased by a factor of approximately 1.5 in the case of tongue and groove flanges



* Multilayer structure means that the gasket thickness does not play a role

Warranty exclusion

In view of the variety of different installation and operating conditions and application and process engineering options, the information given in this prospectus can only provide approximate guidance. There is as a result no basis for warranty claims.

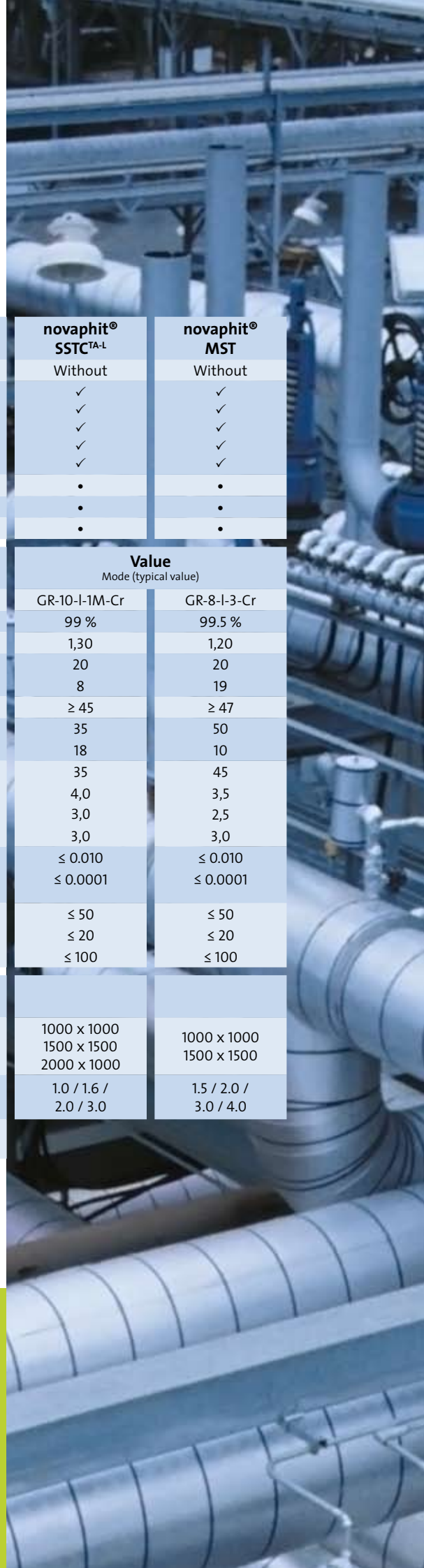
Material data

General information			novaphit® SSTC ^{TA-L}	novaphit® MST
Binders			Without	Without
Approvals		DVGW TA Luft Firesafe (DIN EN ISO 10497, API607, BS6755) BAM (O ₂ : 200 °C / 130 bar, including liquid O ₂) Germanischer Lloyd	✓ ✓ ✓ ✓ ✓	✓ ✓ ✓ ✓ ✓
Colour		graphite	•	•
Printed		Platinum grey	•	•
Sheet size and thickness tolerances		according to DIN 28 091-1	•	•
Physical properties	Test standard	Unit	Value	
Gasket thickness 2.0 mm			Mode (typical value)	
Identification	DIN 28 091-4		GR-10-I-1M-Cr	GR-8-I-3-Cr
Purity level / graphite			99 %	99.5 %
Density	DIN 28 090-2	[g/cm ³]	1,30	1,20
Tensile strength	longitudinal	DIN 52 910	20	20
	transverse	DIN 52 910	8	19
Residual stress $\sigma_{dE/16}$	bei 300 °C	DIN 52 913	≥ 45	≥ 47
Compressibility	ASTM F 36 J	[%]	35	50
Recovery	ASTM F 36 J	[%]	18	10
Cold compressibility ϵ_{KSW}	DIN 28 090-2	[%]	35	45
Cold recovery ϵ_{KRW}	DIN 28 090-2	[%]	4,0	3,5
Hot creep $\epsilon_{WSW/300}$	DIN 28 090-2	[%]	3,0	2,5
Hot recovery $\epsilon_{WRW/300}$	DIN 28 090-2	[%]	3,0	3,0
Specific leakage rate	DIN 3535-6	[mg/(s·m)]	≤ 0.010	≤ 0.010
Leakage TA Luft Component testing 30 MPa, 300 °C, 1 bar Helium	VDI 2200	[mbar·l/(s·m)]	≤ 0.0001	≤ 0.0001
Total chloride content	DIN 28 090-2	[ppm]	≤ 50	≤ 50
Leachable chloride content	FZT PV-001-133	[ppm]	≤ 20	≤ 20
Total fluoride and chloride		[ppm]	≤ 100	≤ 100
Product data				
Dimensions		[mm]	1000 x 1000 1500 x 1500 2000 x 1000	1000 x 1000 1500 x 1500
Thicknesses		[mm]	1.0 / 1.6 / 2.0 / 3.0	1.5 / 2.0 / 3.0 / 4.0
Further dimensions and thicknesses are available on request.				

Do you have any questions about your application?

The gasket information service will help you:

gaskets@frenzelit.de



Good for people and the environment.

Frenzelit has obtained certification that the company complies with the requirements of ISO 9001, ISO/TS 16949 and ISO 14001. This means complete transparency in all areas and therefore gives our customers a high degree of security.

Quality management

ISO 9001

ISO/TS 16949

Environmental management

ISO 14001

Installation instructions

- Clean the surfaces that being sealed and remove traces of old gaskets without damaging the flange surface.
- Check the flange surfaces for parallelity and evenness; make adjustments if necessary.
- Before installing them, check gaskets that have been stored in dry conditions for cracks, surface damage, dimensional accuracy and – in the case of gaskets with bolt holes - congruence of the hole pattern with the flange.
- Do not use any sealing agents! Fit gaskets dry and grease-free!
- Check the condition of the screws before fitting them and use new screws if necessary.
- When installing the gasket pretighten the bolts equally and carefully by hand first. (Attention: Never tighten the first bolt too much!)
- Tighten the screws with a suitable tool. Apply the specified torque diagonally in several stages.

The novaphit® product family

	Professional Technology	Emission Control
Multilayer		novaphit® MST
1 insert	novaphit® SSTC novaphit® SSTC ^{TRD 401} novaphit® EXTRA	novaphit® SSTC ^{TA-L}
Without an insert	novaphit® VS	
Film	novaphit® M High-purity graphite film (purity level >99%), e.g. as a soft layer for Kammprofile gaskets for maximum sealing performance (a data sheet is available on request)	novaphit® XC Internally impregnated, high-purity graphite film (purity level >99%), e.g. as a soft layer for Kammprofile gaskets for maximum sealing performance (a data sheet is available on request)

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