

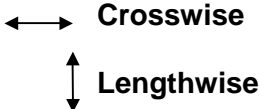
novatec LD14

engineered graphite with KEVLAR®

Facing Material for Cylinder Head Gaskets



Producer: **Frenzelit**
Material: **novatec LD 14**
Density g/cm³: 0,97
Sample: 3
Scale: 32 : 1

Position: 

- Application
- Softmaterial Technology
- Material Structure
- Vulcanisation
- Long term behavior

GASKETS

TECHNICAL TEXTILES

EXPANSION JOINTS

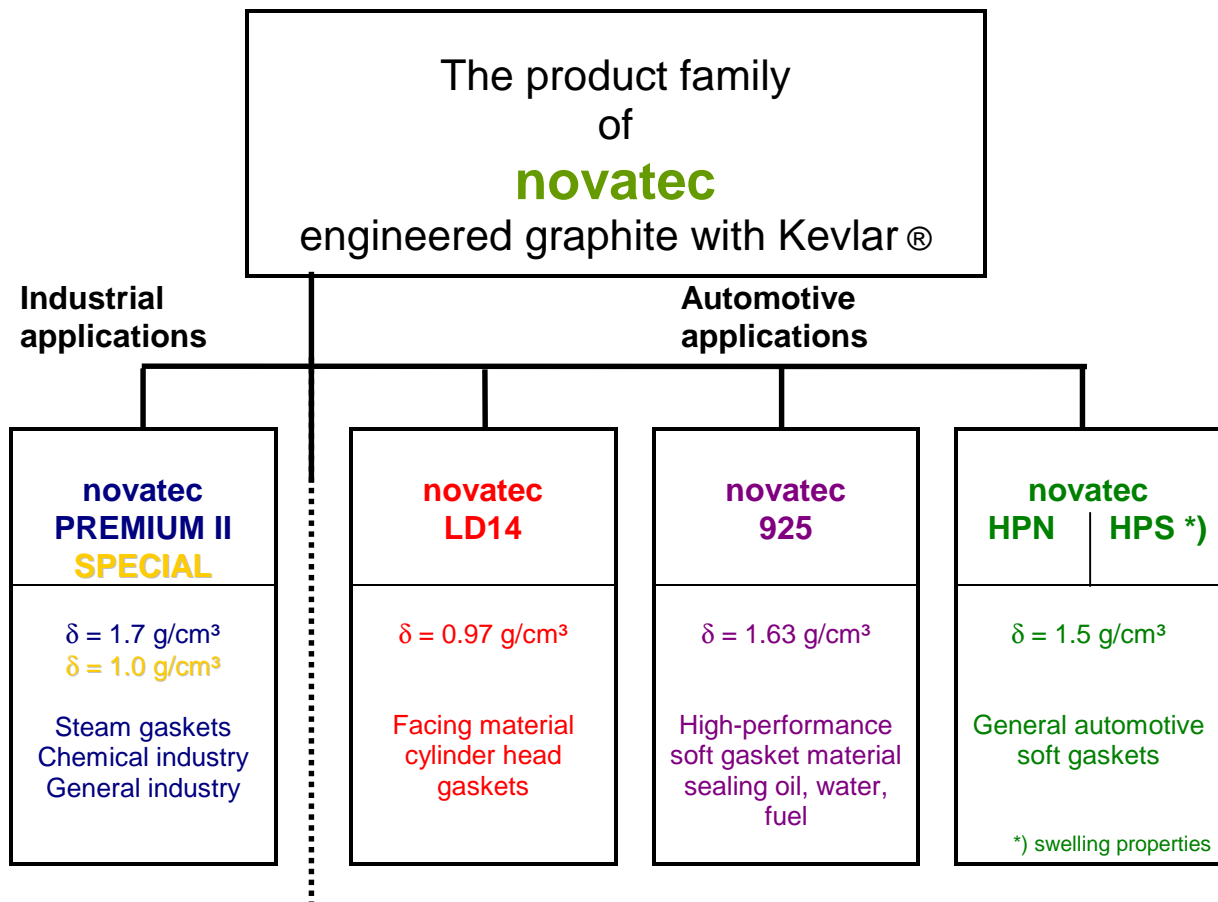
INSULATION

NEW MATERIALS

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 **Frenzelit**

creating
hightech
solutions



- **novatec** is entering a market section with a very strong competition between different kinds of non-asbestos materials, graphite and steel gaskets.
- This new technology of graphite material reinforced by Kevlar® fibers combines the best properties of both gasket technologies - graphite and fiber based - and opens engineers a very wide range of successful applications.
- **novatec**'s technical performance combined with a favourable pricing offers a very good chance of a successful market introduction.
- **Frenzelit** wants to offer help in all cases of application questions and can perhaps give support by special testing in their own test laboratories.
- The exchange of knowledge and experience with the customers is a great chance to optimise present or new products and to develop future material generations suitable for meeting the demands of the market.

novatec
engineered graphite with KEVLAR®

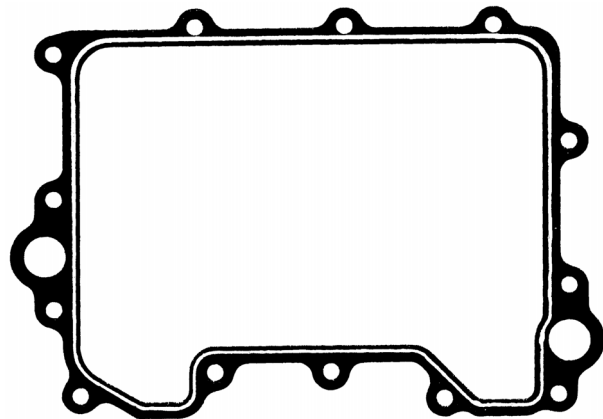
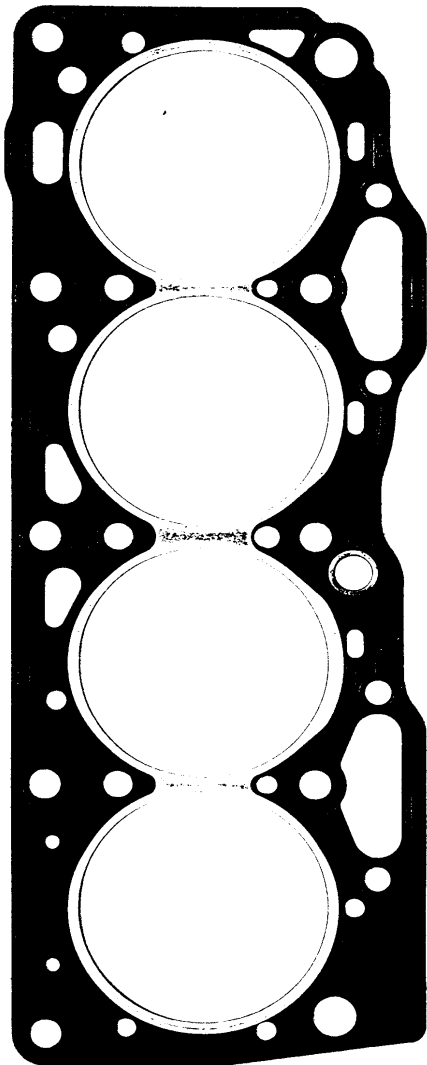
The new fiber reinforced compound material based on graphite for gaskets in the automotive market.

Application as cylinder head gaskets or engine soft gaskets.

High technology in combination of gasket materials with excellent mechanical and sealing characteristics.

Cost reduction in production by favourable material price and easy handling.

The first really world wide available standard Softmaterial technology.



Graphite

plus

KEVLAR

plus

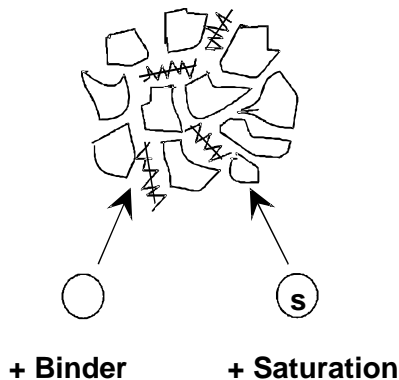
Know-how

novatec

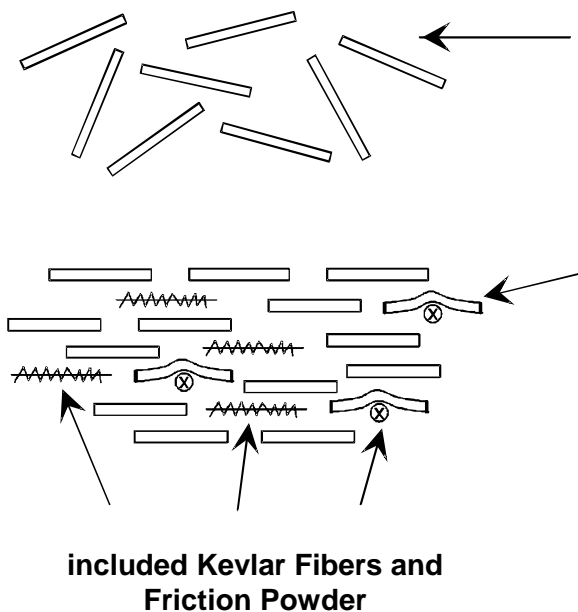
engineered graphite with KEVLAR®

novatec

Raw material recipe



Up to now Softmaterial gaskets are containing fillers without direction. The rolling process compress the material, but the remaining pores has to be closed by binders and a saturation process to guarantee zero leakage. Both ingredients let the material become too hard under long term-conditions.



The **novatec** contains graphite lamellas without direction. After the rolling process and in combination with the **KEVLAR fibers**, the **friction powder** and a very low percentage of **organic binders** the **novatec** is malleable to its final structure.

A constant elasticity is guaranteed by the included air bubbles.

Depending on the rolling density and the remaining pore volume a **saturation** process step is possible.

A **vulcanisation** step should be added after roll-on and sizing to stabilise the material structure by inside gluing and sticking **novatec** and the perforated steel core together.

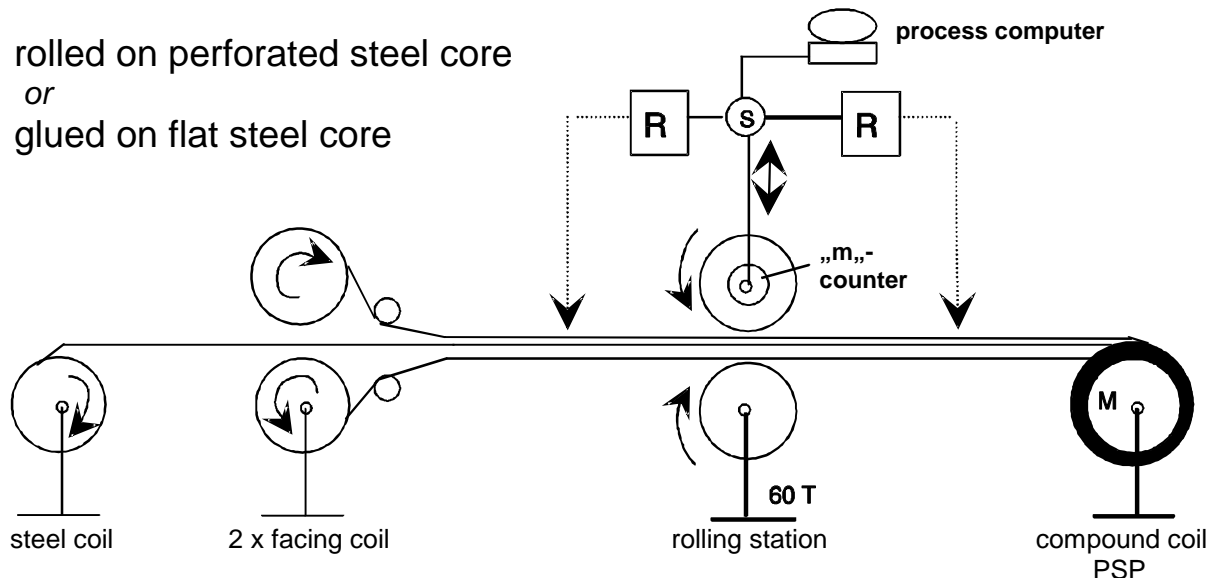
After roll-on and sizing the material shows plastic deformation. Elasticity can be given back by tempering.

This process technology guarantees **novatec**'s excellent long-time **stress resistance** and **elasticity** properties for a high performance gasket material.

novatec LD 14 Sandwich Technology

The softgasket facing material **novatec LD 14** can be produced on all common production lines.

rolled on perforated steel core
or
glued on flat steel core



Roll-on density **1.45 g/cm³**

cylinder head gaskets and softgaskets
oil or silicone saturation possible
high adaptability characteristic

1.60 g/cm³

cylinder head gaskets under high surface load
applicable without saturation

**up to
1.70 g/cm³**

high stress resistance
high temperature resistance

Silk screening with silicone or epoxy resin

for local increase of surface load is possible

Top coating with silicone or epoxy resin

for better micro-sealing and antisticking (customer) is possible

Factory-made antistick based on silicone or A310 (e.g. black)

as standard on rolls is available

novatec LD 14

Survey of processing steps

Step	Technical procedure for manufacturing cylinder head gaskets	
1	Production of the sandwich, rolling on perforated steel or glued on flat steel	
2	Cutting / pulling of fire ring eyelet	
3	Cutting / pulling of smaller eyelets (e.g. oil holes)	
4	Cutting of the gasket body	
5	Fitting / sizing / levelling of the fire ring, overstand calibration	
6	Fitting / sizing / levelling of the smaller eyelets	
7	Vulcanisation	(> 10' / 180 °C)
8	Silicone printing (2 sides)	+ curing
9	Impregnation (silicone or oil based)	+ curing
10	Top Coating (silicone or epoxy based)	+ curing
11	Visual inspection – final control	
12	Packaging / dispatch	

Please note:

The thermal treatments of steps 7 – 10 can be added up to determine the overall degree of vulcanisation (max. 30' / 180°C)

novatec LD 14 Curing / Vulcanisation

novatec LD 14 is a facing material for cylinder head gaskets and other high temperature applications. **Frenzelit** supply the material usually in low-vulcanised version.

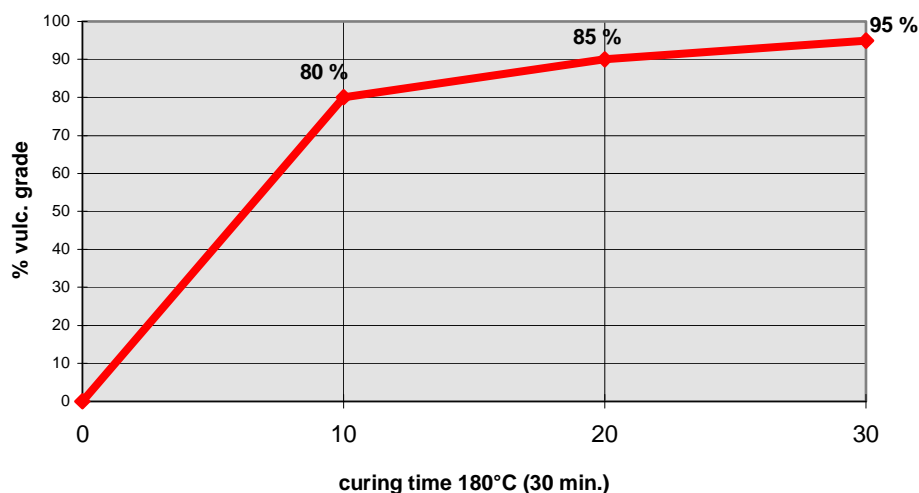
This provides the material a smooth and plastic deformation characteristic in the gap of the roll-on station during clamping to the steel of the sandwich. A low roll-on load is required and the facing connects effortlessly and stable with the perforated steel, without utilisation of a bonding agent.

The curing initialises the vulcanisation process and should be in the range of **> 160°C e.g. 180°C < 200°C** with a time range up to **30 min.**

novatec LD 14 needs to be vulcanised to increase tensile strength, oil, water, fuel resistance, spring back characteristic and stress resistance in high loaded areas outside sections close to the bolts and overstressed areas under and beneath the fire ring eyelet.

The best results are given by vulcanisation after assembling the fire ring and before applying an impregnation and the silicone printing or top coating.

The theoretical characteristic is similar to the following picture:



Curing longer or under to high temperature is not advisable !

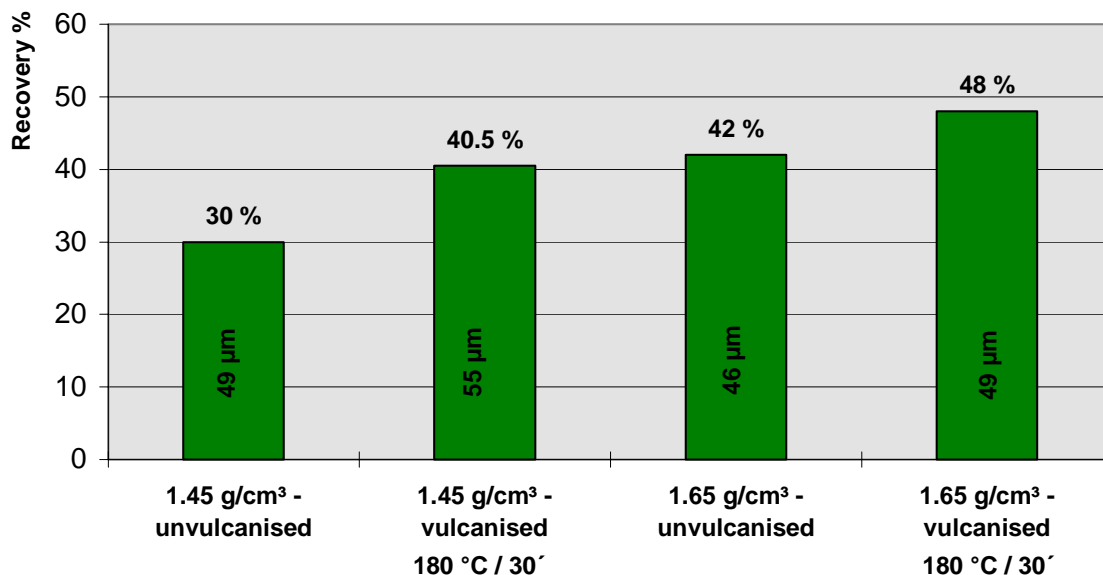
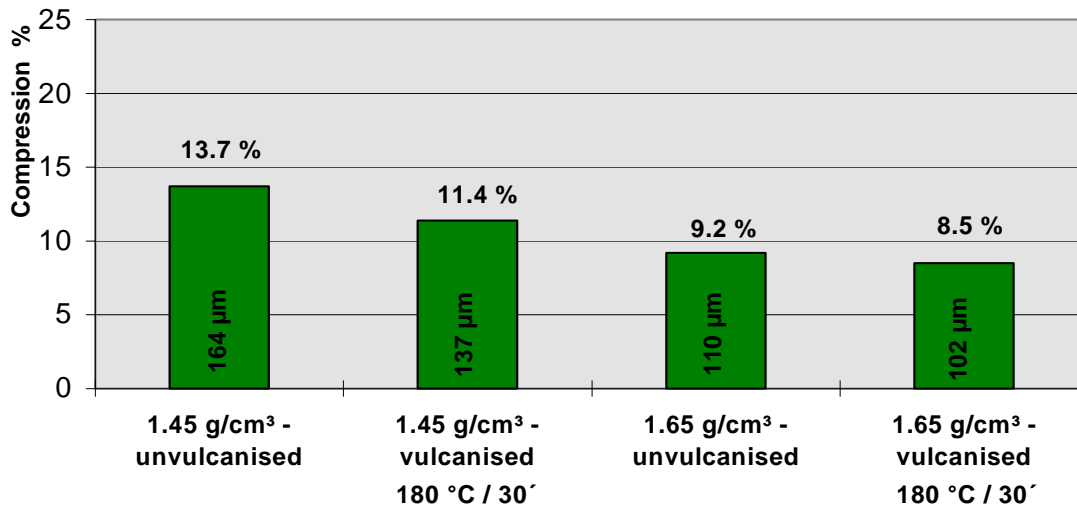
novatec LD 14 becomes harder due to the vulcanisation process with regard to compressibility and obtains a considerably higher recovery in % and μm . The resistance against media is definitely improved.

novatec LD 14

Curing/ Vulcanisation

2. Curing influence on gasket body characteristic:

Samples: novatec LD 14 on 0.20 mm tanged metal with a density of 1.45 g/cm³/ 1.65 g/cm³ rolled thickness of sandwich: 1.2 mm



Result:

novatec LD 14 becomes harder due to the vulcanisation process with regard to compressibility and obtains a considerably higher recovery in % and µm.

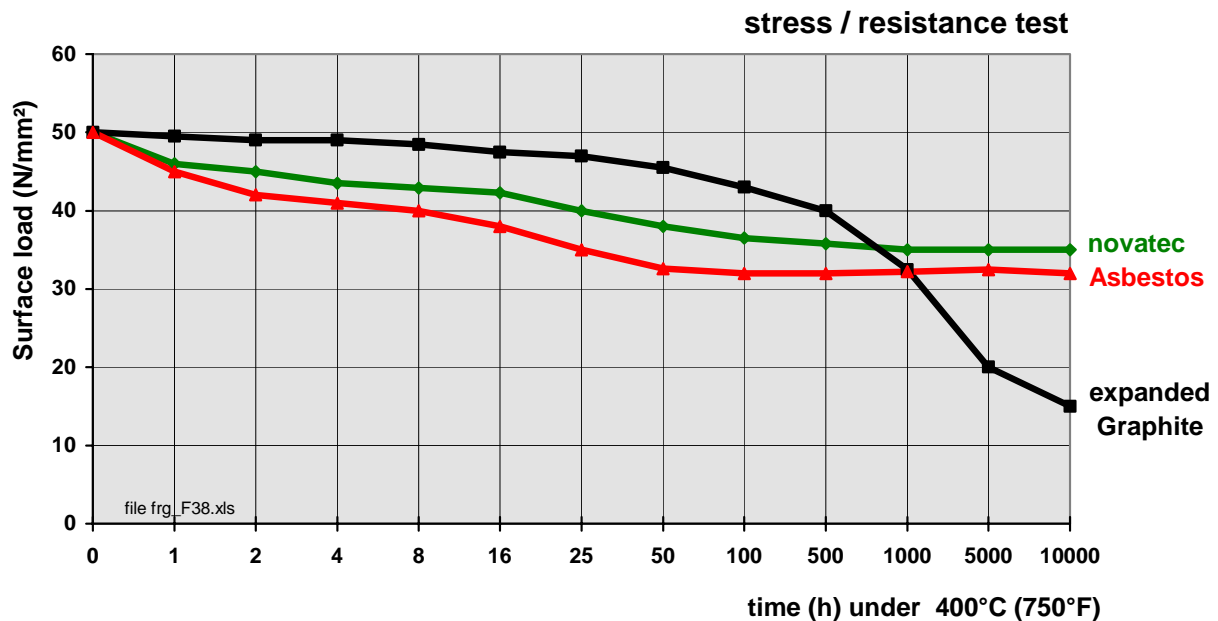
(all values are typical)

novatec LD 14

Stress Resistance 10.000 h / 400°C (750°F)

Samples:	novatec	Density 1,0 g/cm ³ , Thickness 1,6 mm
	expanded Graphite	Density 1,0 g/cm ³
	Asbestos	Density 1,8 g/cm ³

Test: Frenzelit **ASTM F38**
 stress resistance test
 ring sample 33 / 52 mm
 assembling load 50 N/mm²
 in a measurement bolt
 heating up to 400°C (750°F)
 (16-) 10.000 h warm setting



Results: The diagram allows an outlook on the excellent long term life time reserve under high temperature stress of **novatec**. After 500 h the **expanded Graphite** loses the very good stress resistance performance (oxidising?). Therefore the short time lab test with obvious better stress behaviour of the expanded graphite should be judged more critical. During the total testing time of 10.000 h the **novatec** is offering a higher remaining surface load than the old **Asbestos** Gasket Material.