

novaplan 3050

Facing material for Cylinder Head Gaskets



Supplier: **Frenzelit**
Material: **novaplan 3050**
Density g/cm³: **1.12**
Sample: **1**
Scale: **30 : 1**

Position: \longleftrightarrow Transverse
 \updownarrow Longitudinal

$\frac{3}{4}$ **Application**

$\frac{3}{4}$ **Soft material technology**

$\frac{3}{4}$ **Material structure**

$\frac{3}{4}$ **Sandwich technology**

$\frac{3}{4}$ **Survey of processing**

$\frac{3}{4}$ **Typical mechanical characteristics**

GASKET

TECHNICAL TEXTILE

EXPANSION JOINT

INSULATION

NEW MATERIAL

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Facing material for Cylinder Head Gaskets

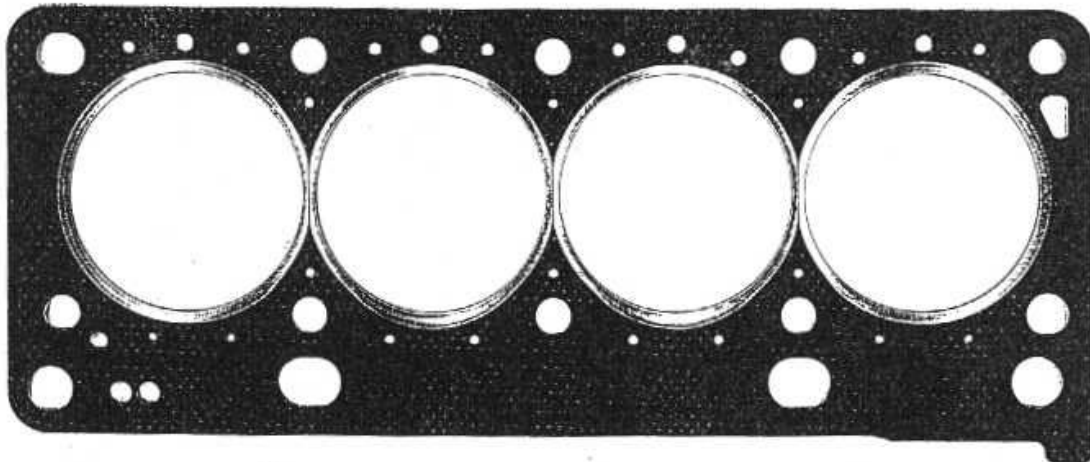
A non-asbestos compound material of the 2nd generation for the automotive gasket market.

Application as cylinder head gasket or for general secondary sealing tasks. In particular for high temperature applications.

Suitable for saturation and saturation-free production processes.

Sealing the modern generation of high performance gasoline and diesel engines.

The softmaterial with a wide application range and excellent price / performance ratio.



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Gasket examples of use

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Material description

Material description: The softgasket material **novaplan 3050** is used for the production of cylinder head gaskets and soft gaskets.

It consists of

- aramid fibres
- rockwool
- anorganic fillers
- NBR binder

This compound material is bound with the NBR-binder when partially vulcanised. The pores are of medium size. This is the basis for good impregnating features with the usual oils or silicone oils after roll-on and a further compression on perforated metal.

The roll-on density for gaskets to be impregnated is approx. 1.5 g/cm³. The pore volume of approx. 30% should be filled with the impregnations up to 50-55% in order to reach a high-quality cross-sectional tightness and a sufficient hardness.

If a roll-on density of 1.63 g/cm³ is reached the adaptability (see diagrams compressibility, curves on compression) is slightly lower, but the stress relaxation (see diagram Break Point Test) is higher. Moreover, this final density area allows to work without an impregnation. In the combination of the mentioned roll-on density with an impregnation it is quite possible to reach a CHG performance for an EURO III immission level.

In any case a **vulcanisation** step is necessary and should be conducted after rolling and fire ring calibration but before an intend impregnation.

The conditions for vulcanisation are 180°C for 20-30 min. The heat treatments after impregnation, screen printing and / or surface coating can partly be taken into account.

The material can be combined without any restrictions in terms of the usual materials for **screen printing**, such as silicone or epoxy resins or a full-surface **coating** on the basis of silicone resins. Additionally a very attractive Top Coating (A310 black or other colours) is available on the rolls ex works.

The diagrams of this brochure are to provide additional information on the main mechanical characteristics of **novaplan 3050** and to be of support in the initial usage of cylinder head gaskets. Tests by the customers are inevitable though. Moreover, **Frenzelit** can assist you concerning installation thicknesses, weights per unit area or pore volume and further questions in the technology of gaskets.

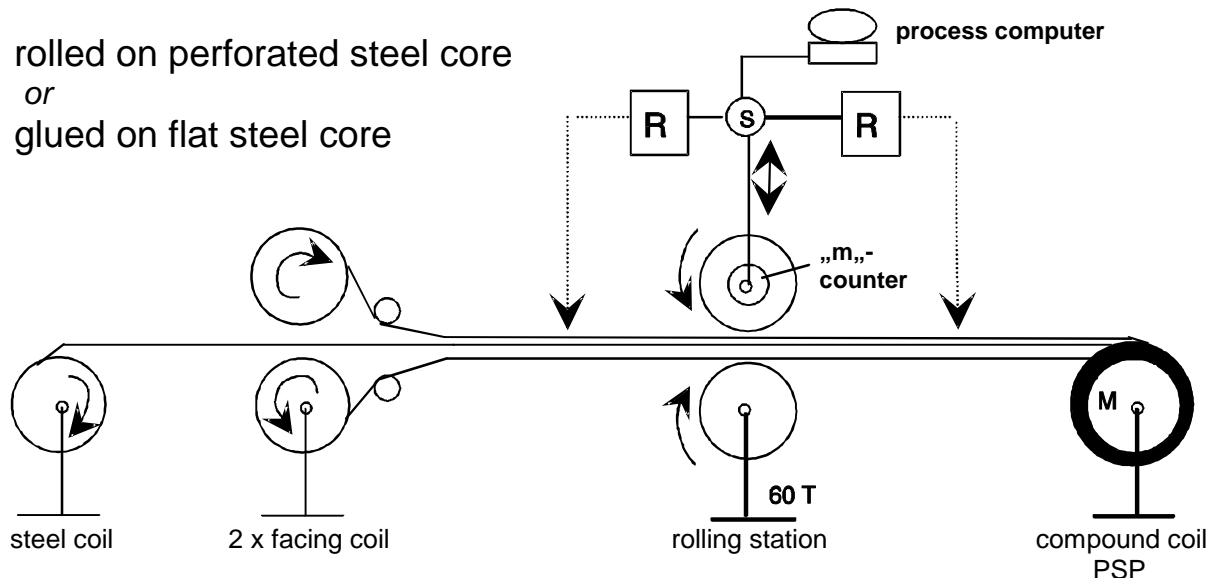
Summary of the material properties of novaplan 3050:

- CHG's with medium-sized pores of the second non-asbestos generation
- favourable price/performance ratio
- can be used with or without impregnation
- available from medium hard to hard (EURO III level)
- to be used in Otto carburetor or Diesel engines

novaplan 3050 Sandwich Technology

The softgasket facing material **novaplan 3050** can be produced on all common production lines.

rolled on perforated steel core
or
glued on flat steel core



Roll-on density **1.53 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

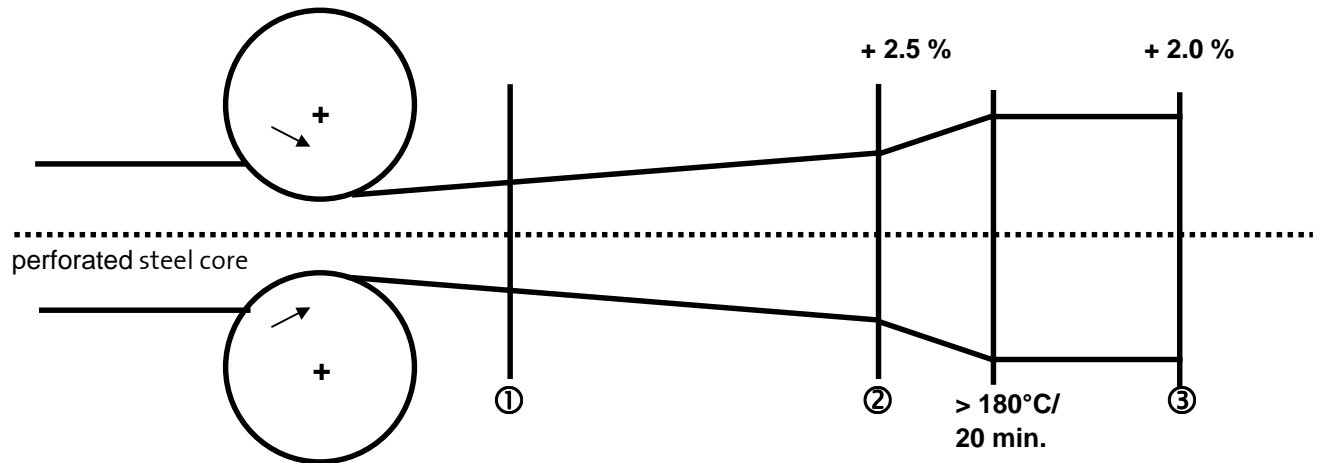
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Selection & Calculation of the right sandwich thickness

$$\text{Density [g/cm}^3] = \frac{2 \times \text{grammage [g/m}^2]}{1000 (\text{thickness sandwich} - \text{thickness steel [mm]})}$$

Example ex works

$$1.600 \text{ g/cm}^3 = \frac{2 \times 1080 \text{ g/m}^2}{1000 \times (1.60 - 0.25 \text{ mm})}$$



Condition 1 After **roll-on** (1 min.)
 thickness = 1.53 mm
 density = 1.687 g/cm³ (Frenzelit reference value)

Condition 2 After **storage** (2 days) in the stock
 thickness swell of sandwich appr. **1.0 %**
 thickness = 1.57 mm
 density = 1.638 g/cm³

Condition 3 After additional **vulcanisation** (20-30 min. / 180 °C)
 thickness swell of sandwich appr. **0.5 %**
 thickness = 1.60 mm
 density = 1.600 g/cm³

The engine type determines the performance values like compressibility and recovery of the sandwich. And these values are determined by the density of the rolled-on facing material.

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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)

novaplan 3050 Curing / Vulcanisation

novaplan 3050 is a facing material for cylinder head gaskets and other high temperature applications. **Frenzelit** supply the material usually in unvulcanised version.

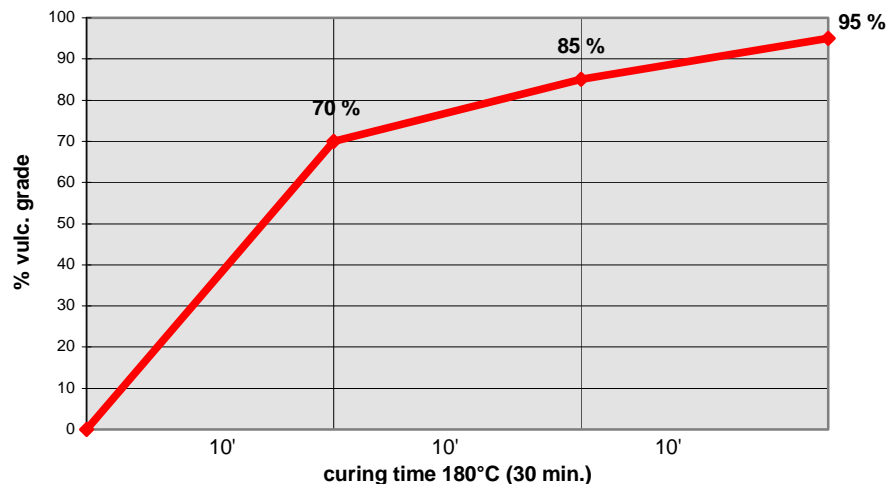
This provides the material a smooth and plastic deformation characteristic in the gap of the rolling station during clamping to the steel of the sandwich. A low rolling load is required and the facing connects effortlessly and stable with the perforated steel, without utilisation of a bonding agent.

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

novaplan 3050 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 !

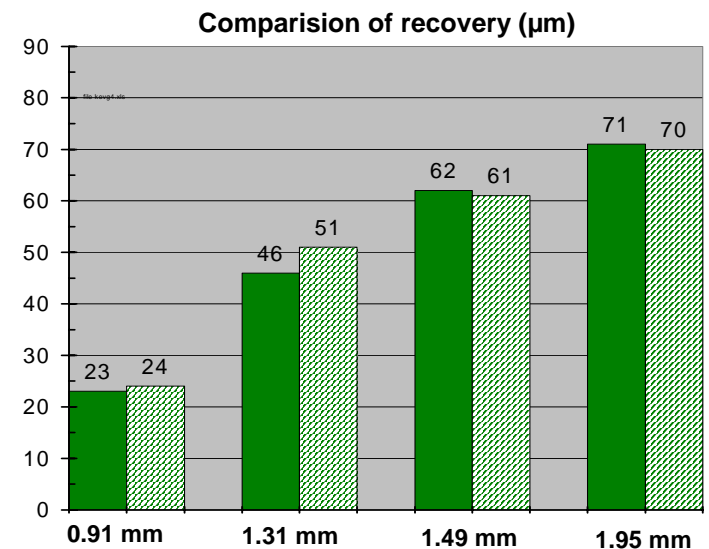
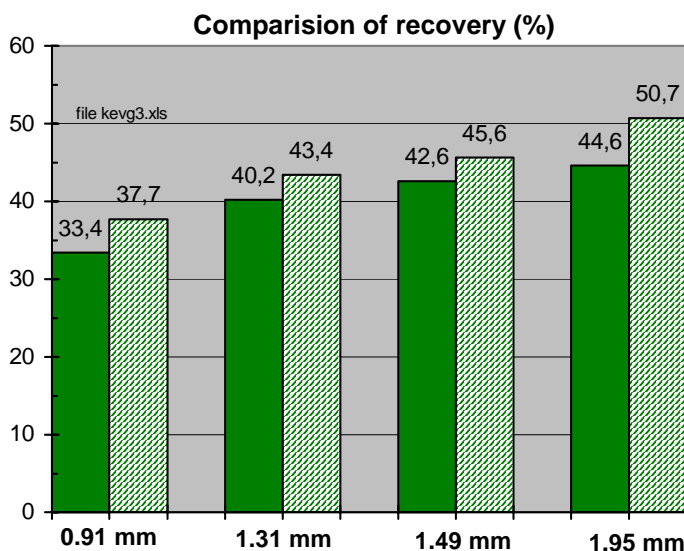
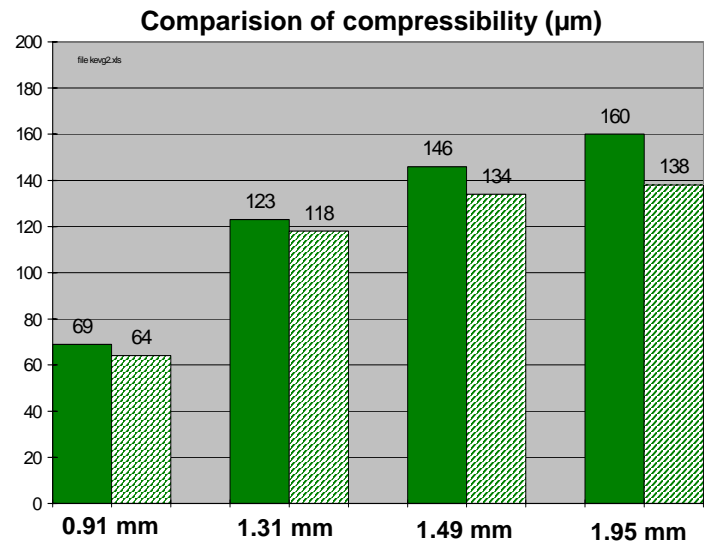
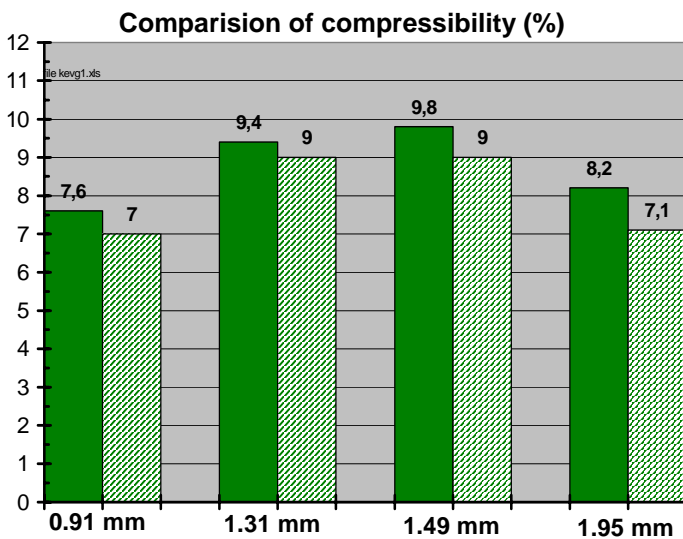
novaplan 3050 becomes harder due to the vulcanisation process with regard to compressibility and obtains a considerably higher recovery in % and μm . The resistance against media is definitely improved.

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Compressibility / Recovery ASTM F 36 J

Samples: novaplan 3050 rolled on perforated steel core 0.25 mm, installation thicknesses 0.91 / 1.31 / 1.49 / 1.95 mm, roo-on density 1.63 g/cm³, without impregnation or coating, vulcanised

new after production and after ageing 20 h / 120°C:



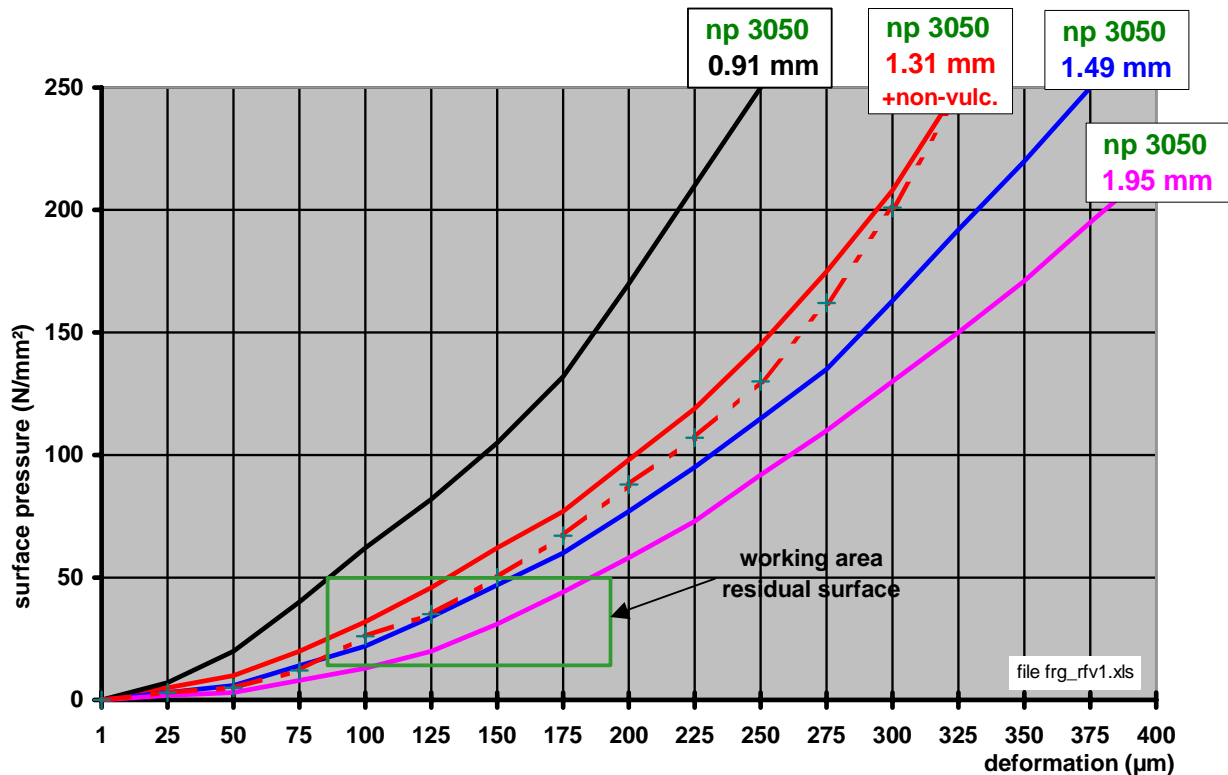
Result: novaplan 3050 is a facing material for cylinder head gaskets starting from a thickness of 1.2 mm with a good compressibility and adaptability. The values of recovery given are relevant in practice and remain almost unchanged even after tempering of the material for a longer period of time (µm).

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Cold deformation curves gasket body

Samples: **novaplan 3050** rolled on perforated steel core 0.25 mm,
 installation thicknesses 0.91 / 1.31 / 1.49 / 1.95 mm
 density 1.63 g/cm³,
 without silicone impregnation or coating, vulcanised
 additional information thickness 1.31 mm non-vulcanised

Test : **Frenzelit load / deformation curve**
 3 samples 33.3 x 10 = 1000 mm²
 p = 1 -> 250 N/mm²,
 gliding cold setting at more than 50 min
 comparison of values with adjustment!



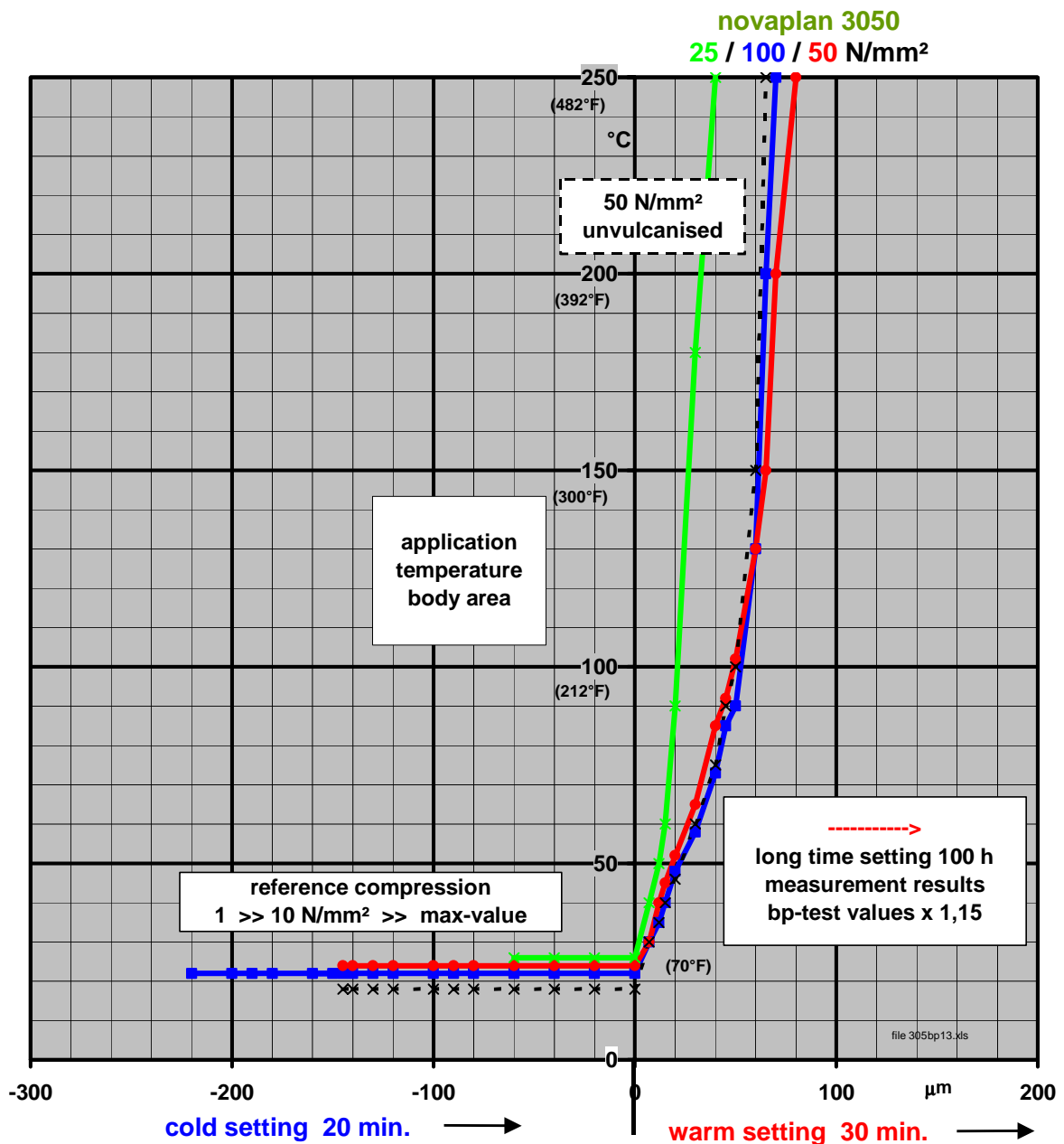
Result: **novaplan 3050** with a density 1.63 g/cm³ and not-impregnated is a harder facing material with an **adaptability relevant in practice** and **without a detectable yield point** even up to very high loads.
 A gasket thickness lower than 1.2 mm results in disadvantages concerning the deformation.
 The unvulcanised version is slightly more adaptable if used with low surface pressures, e.g. for exhaust gaskets.

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Break Point Test at gasket body

Comparison correlated to different surface pressures

Samples: novaplan 3050 rolled on perforated steel core 0.25 mm, installation thicknesses 1.31 mm, density 1.63 g/cm³, without silicone impregnation or coating, vulcanised. additional information of the unvulcanised sample 50 N/mm²



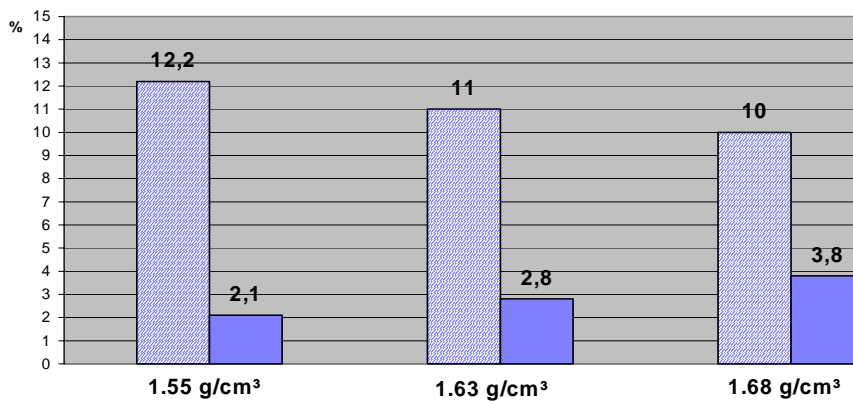
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Media resistance / swelling effects

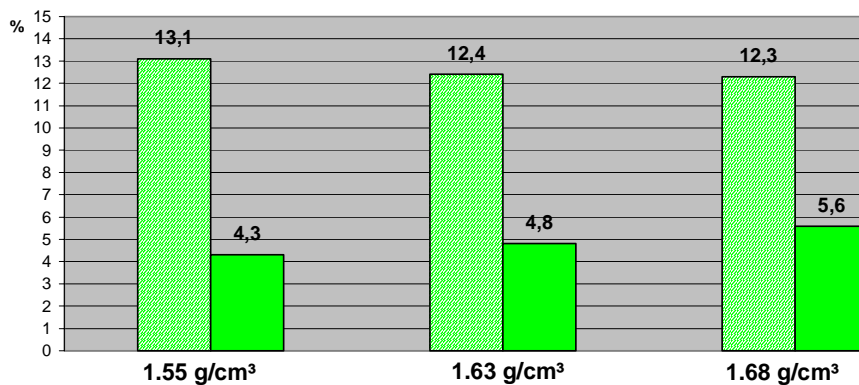
Comparison to different roll-on densities

Samples: SW **novaplan 3050**, thickness 1.6 mm, density 1.55 g/cm³
 SW **novaplan 3050**, thickness 1.6 mm, density 1.63 g/cm³
 SW **novaplan 3050**, thickness 1.6 mm, density 1.68 g/cm³

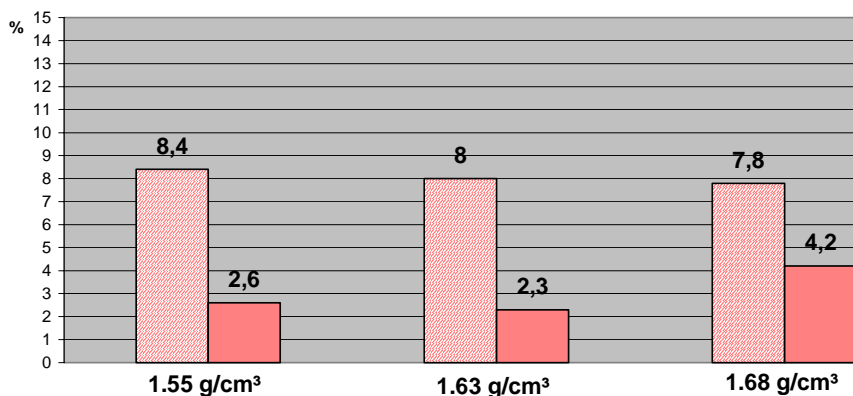
a) ASTM oil III 5h/ 150°C: weight increase / thickness increase (%)



b) Water / Antifreeze 50 : 50 5 h/ 100°C: weight increase / thickness increase (%)



c) ASTM Fuel B 5 h/ 23°C: weight increase / thickness increase (%)



(Typical values)