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REINZ

Asbestos-Free Gasket Material AFM 30 For Refrigeration Compressors

REINZ-Dichtungs-GmbH
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REINZ

Dichtungen · Gaskets · Joints

REINZ-Dichtungs-GmbH

Copeland Corp.
1675 W., Campbell Rd.
Sidney, OHIO 45365-0669

U.S.A.

Attn: John Gephart, Product Engineering

406 27.01.88/VAI-Rp/Th

REINZ-AFM 30 Non-Asbestos Sealing Material
For Refrigeration Compressors

Dear Sir,

You are using to a wide extend gaskets cut by Industry Products of REINZ-Thermolit-K.

As we know, you are about to study the use of non-asbestos material on your compressors. We are, since a couple of months ago, about to make tests for that application and the test results are now available.

Enclosed please find a complete folder with the information which is on hand now. The figures show compared with that of Thermolit-K that REINZ-AFM 30 has quite good caracteristics.

We know as well that Industry Products have already ordered a few sample sheets of AFM 30 and maybe you have gaskets of non-asbestos materials of REINZ origin already under test.

If further to the information received with our folder you have any more questions, please contact us.

Very truly yours,

REINZ-Dichtungs-GmbH

Encl.:

REINZ-Dichtungs-GmbH

30
30

COP 0556

REINZ

22.01.88

VAI/PM/EMM

REINZ-AFM 30

Asbestos-free gasketing material for use in refrigeration compressors

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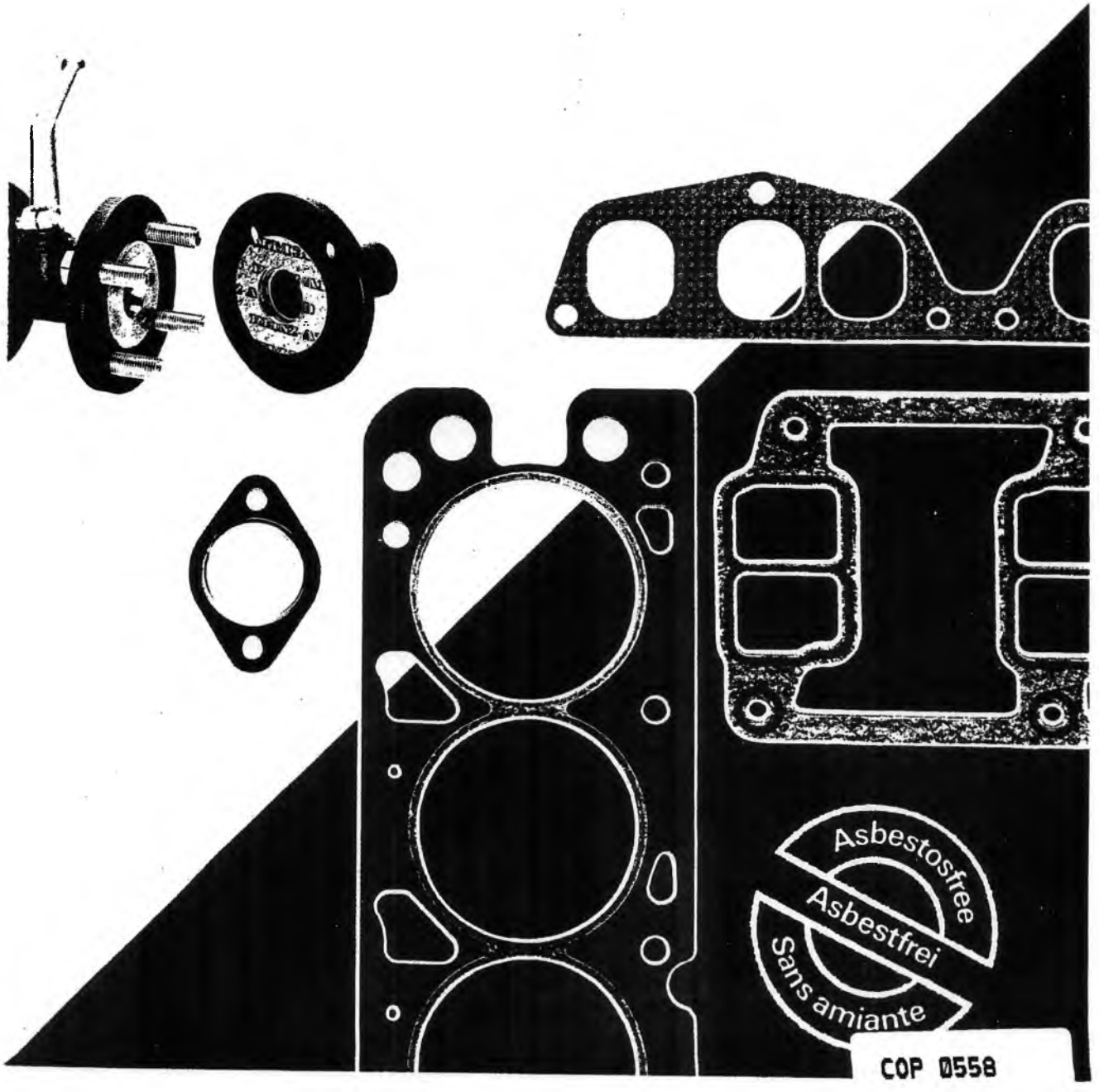
REINZ

Asbestos-Free Gasket Materials and Gaskets



COP 0558

Gaskets – the Asbestos-Free Future

Asbestos, for decades a constituent of many products, shall be used increasingly less in the future. Growing concern for the environment and more severe work safety regulations specify today's need for asbestos-free gaskets: A new requirement for gaskets – a challenge for manufacturers. We have followed suit and concentrated our efforts in research and development. To our customers' benefit. Because quality is our primary objective in asbestos-free products too.

Today REINZ offers a wide range of asbestos-free gasket materials and gaskets for many applications. Also special gaskets, e. g. gasket rings with metallic eyelet or with PTFE shield, are available in asbestos-free versions.

The REINZ product range of asbestos-free materials (AFM) enables one to find the proper gasket material suitable for a specific application. More than with conventional gasket materials, the structural design of the gasketed joint is of essential significance in selecting the proper material from asbestos-free products. The gasket design itself will be based on individual installation and operating conditions.

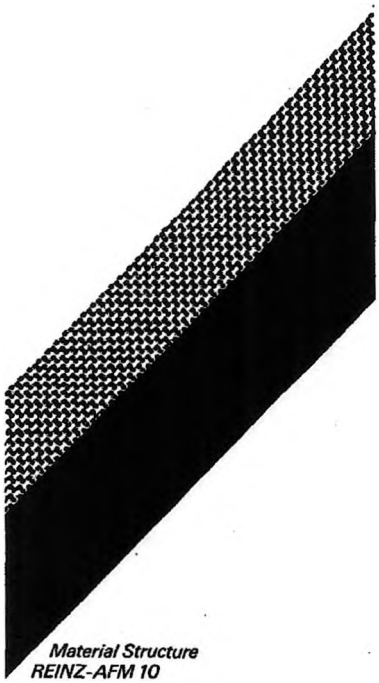
Asbestos-free REINZ gasket materials and gaskets prove that asbestos replacement does not have to compromise at the expense of safety and reliability. Some of the new materials even out-perform conventional asbestos containing products:

- their gas sealability is often better by far,
- their chemical resistance is better generally,
- the tendency to corrode sealing faces is minimized by a low content in soluble chlorides.

REINZ application engineers are at your service to help you in selecting the proper gasket material. They will work out a solution to your specific gasketing problem – naturally asbestos-free.

Asbestos-Free Gasket Materials with Metal Core

REINZ-AFM 10



Material Structure REINZ-AFM 10

Material Structure and Properties:
This material is an asbestos-free alternative to the performance proven cylinder head gasket material REINZ-WHS.
REINZ-AFM 10 consists of a pegged steel core with an asbestos-free paper sheet rolled onto both sides. Subsequent to gasket manufacturing operations, i. e. blanking and providing grommets, the gasket is treated with a silicone impregnation where the crosslinked impregnant acts among others as a binder.

Compared with rubber-bonded cylinder head gasket materials, REINZ-AFM 10 exhibits higher temperature resistance – a fact which is of more significance in asbestos-free than in asbestos containing material formulations. Because the material withstands high temperatures it offers also good stress resistance thus permitting a non-retorque design of cylinder head gaskets made from AFM 10. At the same time, however, AFM 10 offers compressibility and recovery characteristics which assure safe sealing of coolants and lubricants even under locally reduced unit loads.

Application:
Primarily for cylinder head gaskets in gasoline and diesel engines with high specific output and for gasketed joints under severe stress.

Technical Data (Sample Thickness 1.3 mm)

Compressibility and Recovery acc. to ASTM F 36, Proc. A	Swelling	Max. Unit Load at 300°C	Max. Operating Temperature
Compressibility 8 - 12 %	acc. to ASTM F 146 in ASTM-Oil No. 3 5 h, 150°C, Thickness Increase ≦ 5%	above 100 N/mm²	500°C
Recovery ≧ 50 %	Swelling in Water/ Antifreeze 1:1 24 h, 100°C, Thickness Increase ≦ 5 %		

Further Information: c. f. Technical Data Sheet No. 127
Nominal Thicknesses: 1.10 mm 1.30 mm 1.40 mm 1.50 mm 1.60 mm 1.70 mm 1.75 mm 1.90 mm

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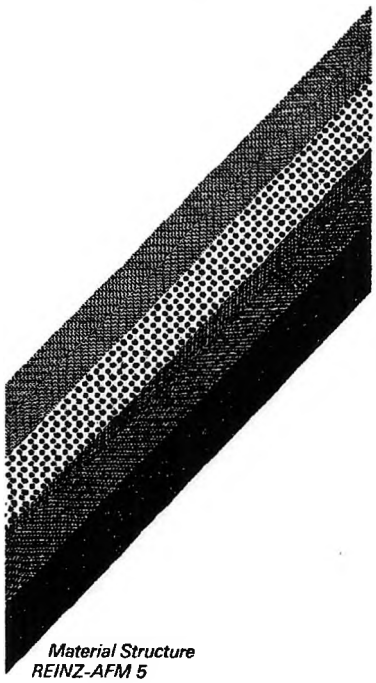
REINZ-AFM 5



Material Structure
REINZ-AFM 5

Material Structure and Properties:
The core of AFM 5 is a pegged steel sheet with steel wire netting applied to both sides. An asbestos-free soft material compound consisting of non-fibrous fillers and nitrile rubber is applied to penetrate the metallic laminate. This material concept does, therefore, not embody the usual asbestos substitution. Instead, the elastic properties inherent in asbestos fibres are obtained from a special laminate of various metallic layers.

The material features especially high temperature and stress resistance.

The relaxation characteristics of AFM 5 are better than those of the current asbestos containing gasket materials. The material is, therefore, particularly advantageous in non-retorque gasket designs.

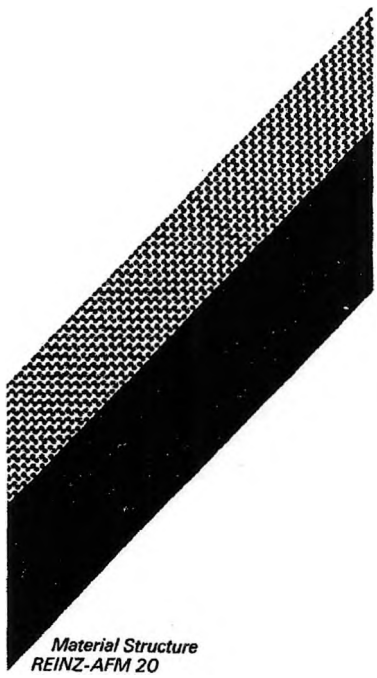
Application:
Due to its high temperature and stress resistance, AFM 5 is very suitable for use on gasketed joints under high mechanical and thermal stress. The material is used primarily for gaskets in exhaust systems. On account of the sophisticated material structure and manufacturing processes, AFM 5 is used as a cylinder head gasket material whenever materials with single layered core will no longer provide adequate stress and temperature resistance.

Technical Data (Sample Thickness 1.2 mm)

Stress Resistance acc. to DIN 52 913, 16 h, 300 °C	Compressibility and Recovery acc. to ASTM F 36, Proc. A	Swelling	Maximum Unit Load at 300 °C	Maximum Operating Temp.
~ 45 N/mm²	Compressibility 6 - 12 % Recovery ≧55 %	acc. to ASTM F 146 in ASTM-Oil No. 3 5 h, 150 °C Thickness Increase ≦5 % Swelling in Water/ Antifreeze 1:1 24 h, 100 °C Thickness Increase ≦ 3 %	above 100 N/mm²	600 °C

Further Information: c. f. Technical Data Sheet No. 123
Nominal Thicknesses: 1.00 mm 1.20 mm 1.30 mm 1.40 mm 1.50 mm 1.80 mm

REINZ-AFM 20



Material Structure
REINZ-AFM 20

Material Structure and Properties:
AFM 20 is an asbestos-free alternative to the widely used gasket materials REINZ-RST and REINZ-CAM 21.
It consists of a perforated steel sheet core both sides of which are provided with an asbestos-free soft material blend.

Mineral substances, aramid fibres and high-grade elastomers used as binder result in a denser structure than what is typical for asbestos fibres.

Application:
The material is suitable for cylinder head gaskets used in internal combustion engines and other gasketed joints under high thermal and mechanical stress. AFM 20 is mostly used whenever a material is needed for normal conditions, i. e. moderate to higher service.

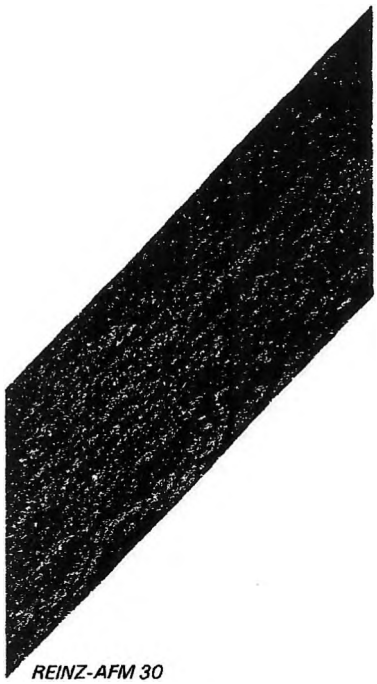
Technical Data (Sample Thickness 1.5 mm)

Stress Resistance acc. to DIN 52 913, 16 h, 300 °C	Compressibility and Recovery acc. to ASTM F 36, Proc. A	Swelling	Maximum Unit Load at 300 °C	Maximum Operating Temp.
~ 39 N/mm²	Compressibility 6 - 12 % Recovery ≧55 %	acc. to ASTM F 146 in ASTM-Oil No. 3 5 h, 150 °C Thickness Increase ≦10 % Swelling in Water/ Antifreeze 1:1 24 h, 100 °C Thickness Increase ≦5 %	above 100 N/mm²	400 °C

Further Information: c. f. Technical Data Sheet No. 125
Nominal Thicknesses: 0.75 mm 0.85 mm 1.00 mm 1.10 mm 1.20 mm 1.30 mm 1.40 mm 1.50 mm 1.60 mm 1.80 mm

Asbestos-Free
Soft Gasket Materials

REINZ-AFM 30



REINZ-AFM 30

Material Structure and Properties:
This high-grade material contains aramid fibres which are processed under elevated pressure and temperature with fillers and nitrile rubber as binder.

AFM 30 exhibits a good stress resistance. Moreover, the material features a very high gas sealability. Its maximum gas sealability is by far better than specified DIN requirements for CAF materials.

Application:
AFM 30 is designed for use in compressors, pipe lines, apparatus and combustion engines to seal off most transmission, hydraulic, refrigeration and motor oils as well as fuels, blends of water/antifreeze and corrosion inhibitors as well as alkalies and solvents.

Resistance to Media:
AFM 30 has a good chemical resistance. In acid resistance the material exceeds the performance of asbestos containing materials. Upon ASTM immersion tests, procedure F 146, the material shows a very good resistance against oils and fuels. Swelling is less than 10 %.

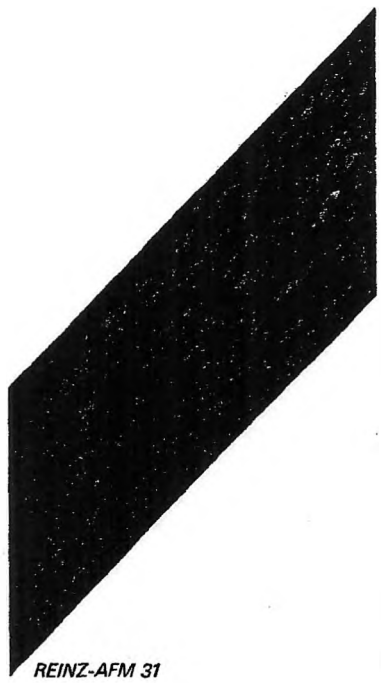
Approvals:
The „Bundesanstalt für Materialprüfung (BAM)" – German Federal Institute for Material Testing – has approved AFM 30 for use in flanges of copper, copper alloys or steel at oxygen pressures of up to 100 bar and an operating temperature of 75 °C.
The material has been tested by DVGW-Laboratories (Deutscher Verein des Gas- und Wasserfaches – German Association for Gas and Water Engineering) on the basis of DIN 3535, Section 6, and has been approved for use on gas fittings, gas appliances and gas pipes.

Technical Data (Sample Thickness 2.0 mm)

Stress Resistance acc. to DIN 52 913, 16 h, 300 °C	Compressibility and Recovery acc. to ASTM F 36, Proc. A	Sealability against Nitrogen acc. to DIN 3535, Sec. 6 FA	Maximum Operating Pressure	Maximum Operating Temp.*
~20 N/mm²	Compressibility 7 - 15 % Recovery ≧50 %	≦0.1 cm³/min	100 bar	400 °C

Further Information: c. f. Technical Data Sheet No. 271
Nominal Thicknesses: 0.30 mm 0.50 mm 0.75 mm 1.00 mm 1.50 mm 2.00 mm 3.00 mm

REINZ-AFM 31



REINZ-AFM 31

Material Structure and Properties:
AFM 31 is an asbestos-free soft gasket material composed of aramid fibres, fillers and nitrile rubber as binder. The material features high compressibility and flexibility which guarantees efficient sealing even under locally low unit loads. In gas sealability the material exceeds asbestos containing materials.

Application:
Internal combustion engines, transmissions, axles, compressors, pipe lines and apparatus where low unit loads prevail.

Resistance to Media:
AFM 31 is resistant to motor, transmission, refrigeration oil, fuels and solvents.

Technical Data (Sample Thickness 2.0 mm)

Compressibility and Recovery acc. to ASTM F 36, Proc. A	Swelling acc. to ASTM F 146	Sealability against Nitrogen acc. to DIN 3535, Sec. 6 FA	Maximum Operating Pressure	Maximum Operating Temp.*
Compressibility 14 - 23 % Recovery ≧50 %	in ASTM-Oil No. 3 5 h, 150 °C Thickness Increase ≦10 % in ASTM-Fuel B 5 h, RT Thickness Increase ≦15 %	≦0.1 cm³/min	80 bar	400 °C

Further Information: c. f. Technical Data Sheet No. 272
Nominal Thicknesses: 0.30 mm 0.50 mm 0.75 mm 1.00 mm 1.50 mm 2.00 mm 3.00 mm

* The maximum operating temperature depends on media and installation conditions.
The value indicated represents a limit.
Whenever there is doubt, contact us and let us know exact operating conditions.

COP 0561

REINZ-AFM 32

REINZ-AFM 32

Material Structure and Properties:
AFM 32 contains aramid fibres which are processed with fillers and nitrile rubber as a binder to form a high quality gasket material.

The material features very good stress resistance and tensile strength. It therefore fully complies with respective requirements for asbestos containing materials.

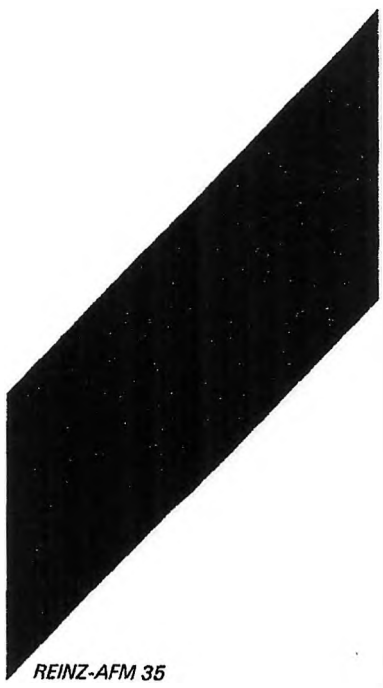
Application:
For gasketed joints in compressors, pipe lines, apparatus, transmissions and internal combustion engines where compressive stresses are relatively high.

Resistance to Media:
Compared with AFM 30, this material offers even higher resistance in contact with transmission, hydraulic, refrigeration and motor oils as well as with fuels, blends from water with antifreeze and corrosion inhibitors, alkalies and solvents.

Technical Data (Sample Thickness 2.0 mm)

Stress Resistance acc. to DIN 52 913, 16 h, 300 °C	Compressibility and Recovery acc. to ASTM F 36, Proc. A	Sealability against Nitrogen acc. to DIN 3535, Sec. 6 FA	Maximum Operating Pressure	Maximum Operating Temp.*
~25 N/mm²	Compressibility 6 - 12 % Recovery ≧50 %	≦0.2 cm³/min	150 bar	400 °C

Further Information: c. f. Technical Data Sheet No. 273
Nominal Thicknesses: 0.30 mm 0.50 mm 0.75 mm 1.00 mm 1.50 mm 2.00 mm 3.00 mm



REINZ-AFM 35

REINZ-AFM 35

Material Structure and Properties:
The major constituent of conventional CAF gaskets, asbestos, has been replaced in this material formulation by man-made fibres which are bonded with nitrile rubber. The material features an even higher compressibility and flexibility than AFM 31.

Application:
Gasketed joints where components are easily deformed at relatively low unit loads, e. g. on valve covers, oil pans, covers.

Resistance to Media:
AFM 35 is resistant to refrigeration, motor, transmission and hydraulic fuels, blends of water/antifreeze and corrosion inhibitors, to water and air.

Technical Data (Sample Thickness 2.0 mm)

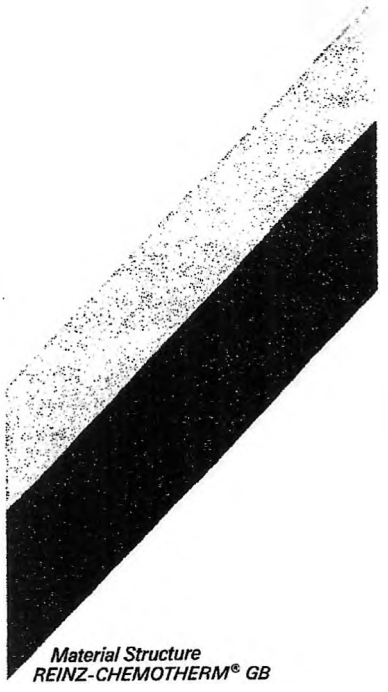
Compressibility and Recovery acc. to ASTM F 36, Proc. A	Swelling acc. to ASTM F 146	Sealability against Nitrogen acc. to DIN 3535, Sec. 6 FA	Maximum Operating Pressure	Maximum Operating Temp.*
Compressibility 15 - 25 % Recovery ≧55 %	in ASTM-Oil No. 3 5 h, 150 °C Thickness Increase ≦15 % in ASTM-Fuel B 5 h, RT Thickness Increase ≦ 30 %	≦0.1 cm³/min	70 bar	400 °C

Further Information: c. f. Technical Data Sheet No. 274
Nominal Thicknesses: 0.30 mm 0.50 mm 0.75 mm 1.00 mm 1.50 mm 2.00 mm 3.00 mm

* The maximum operating temperature depends on media and installation conditions.
The value indicated represents a limit.
Whenever there is doubt, contact us and let us know exact operating conditions.

Other Miscellaneous Asbestos-Free Gasket Materials and Gaskets

REINZ-CHEMOTHERM®



Material Structure REINZ-CHEMOTHERM® GB

Material Structure:
REINZ-CHEMOTHERM® is a gasket material laminate composed of a core with graphite foil applied to both sides. As a core material, rust and acid resistant steel or non-ferrous metals as well as stress resistant and gas-tight non-metallic materials may be used. The laminate with plain core (preferably stainless steel 1.4541) and graphite foil on both sides is available as "REINZ-CHEMOTHERM® GB". The laminate with pegged steel core and graphite foil on both sides is sold under the name "REINZ-CHEMOTHERM® SP".

Application:
To seal critical joints in nuclear engineering, cryogenics and for all gasketed joints under cycling thermal and mechanical stresses.

Resistance to Media:
Graphite foil withstands practically most organic and inorganic substances, liquid or in gaseous state except for strongly oxidizing chemicals and molten alkali metals and alkaline earth metals.

Technical Data (for Graphite Foil only)

Stress Resistance acc. to DIN 52 913	Compressibility and Recovery acc. to ASTM F 36, Proc. A	Sealability against Nitrogen acc. to DIN 3535, Sec. 6 GR	Maximum Operating Pressure	Maximum Operating Temp.
~ 49 N/mm²	Compressibility 38 - 50 % Recovery ≧10 %	<0.2 cm³/min	700 bar	−240 up to +550 °C −240 up to +2000 °C*

Approvals and Further Information: c. f. Technical Data Sheet No. 641

* in absence of oxidizing atmosphere

Designation	Material		Applicable up to bar	Applicable up to °C	Form of Delivery: Sheets	Form of Delivery: Gaskets	Form of Delivery: Rolls	Data Sheet No.
REINZOLOID FS 53	Impregnated gasket material on cellulose basis		10	120	x	x	x	631
REINZ-BS 69, 72, 79	Elastomer bonded cellulose fibres	BS 69 BS 72, 79	10 8	150		x	x	661
REINZ-Rubber-Cork RGC 749	Rubber cork with chloroprene rubber as binder		5	120	x	x		312
REINZ-Rubber-Cork RGC 210, RGC 257, RGC 275	Rubber cork with nitrile rubber as binder	RGC 210 RGC 257 RGC 275	40 20 40	135 120 135	x x x	x x x		321
REINZ-Armstrong-Rubber-Cork DC 113, DK 153	Rubber cork with chloroprene rubber as binder	DC 113 DK 153	40 10	120 120	x	x x	x	331
REINZ-Armstrong-Accopac CS 301, CN 705	Cellulose cork with styrene butadiene resp. nitrile rubber binder		25	120	x	x	x	521
REINZ Metal Gaskets	Ring-joints, lens-shaped, welded ring gaskets acc. to DIN, ANSI, API		350	850		x		911-918
REINZ Spiral Wound Gaskets	of stainless steel or other materials, filler ribbon of PTFE or graphite		250 250	300 600		x x		921-927
REINZ Screen-Printed Gaskets	Sealant of various polymers on substrate or as "pure print"		300	200		x		Special Leaflet
REINZOPLAST®	Spreadable, non-hardening PU sealant		*	300				Special Leaflet

* depends on installation conditions

REINZ

REINZ Precision Gasketing Worldwide

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Reinzstraße 3-7
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REINZ

Technical Data Sheet 271

REINZ-AFM 30

Material

REINZ-AFM 30 is an asbestos free, oil and solvent resistant gasket material. It contains aramid fibres and other, high temperature resistant, asbestos substitutes which are processed with synthetic binders under elevated pressure and temperature.

Application

in compressors, pipe lines, apparatus, combustion engines. To seal off a large number of transmission, hydraulic, refrigeration and motor oils as well as fuels, blends of water/antifreeze and corrosion inhibitors, alkalies and solvents.

REINZ-AFM 30 has been approved by the "Bundesanstalt für Materialprüfung (BAM)" - German Federal Institute for Material Testing - for use in flanges of oxygen carrying steel pipes with an internal pressure of up to 100 bar and an operating temperature of up to 75 °C.

Form of delivery

Gaskets according to drawing, dimensions given or other agreement.

Sheets 1500 x 1500 mm (standard size)

Nominal thicknesses

0.25 mm 0.30 mm 0.50 mm 0.75 mm
1.00 mm 1.50 mm 2.00 mm 3.00 mm

Other material thicknesses upon agreement.

Tolerances acc. to DIN 3754

Surfaces

The material is also available with graphite coating on one or on both sides.

...

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Telex (17)731106
Telefax 0731/719089

Technical Data
(Thickness of specimen 2.0 mm)

Density		g/cm³	1.7 - 1.9
Ignition loss acc. to DIN 52 911		%	≦ 36
Tensile strength			
acc. to ASTM F 104	across grain	N/mm²	≧ 10
acc. to DIN 52 910 (conditioning acc. to DIN 52 913)	across grain	N/mm²	≧ 7
Stress resistance acc. to DIN 52 913 16 h, 300 °C		N/mm²	~20
Compressibility and recovery acc. to ASTM F 36, procedure A			
compressibility		%	7 - 15
recovery		%	≧ 50
Sealability against nitrogen acc. to DIN 3535, section 6FA		cm³/min	≦ 0.1
Swelling acc. to ASTM F 146			
in ASTM-Oil No. 3 5 h, 150 °C			
thickness increase		%	≦ 10
weight increase		%	≦ 10
in ASTM Fuel B, 5 h, 20 °C			
thickness increase		%	≦ 10
weight increase		%	≦ 10
Minimum unit load acc. to REINZ Test Method 503, TDS 734			
To seal nitrogen (leakage rate approx. 0.2 cm³/min)			
at internal pressures of		bar	5 10 20 40
required minimum unit load		N/mm²	19 25 27 30
Maximum operating temperature		°C	400
Maximum operating pressure		bar	100

REINZ-AFM 30 complies with:
DIN 3535, part 6 FA (DVGW-Reg. No. 86.01 e 070)

The data quoted above have been compiled to our best knowledge. The technical data quoted are valid for material as delivered without any additional treatment. In view of the multiplicity of operating and installation conditions they can serve only as a general guide line. They, therefore, cannot serve as the basis for any warranty claims. The maximum operating temperature depends on media and operating conditions. Whenever in doubt, please check with us and let us have the exact operating requirements.

Edition 10/87 supersedes all prior editions

COP 0565