KLINGERSIL® C-4243
Universal gasket material for general applications

Gasket material for liquids and gases at lower pressure and temperatures.
Good chemical resistance against water and oil.

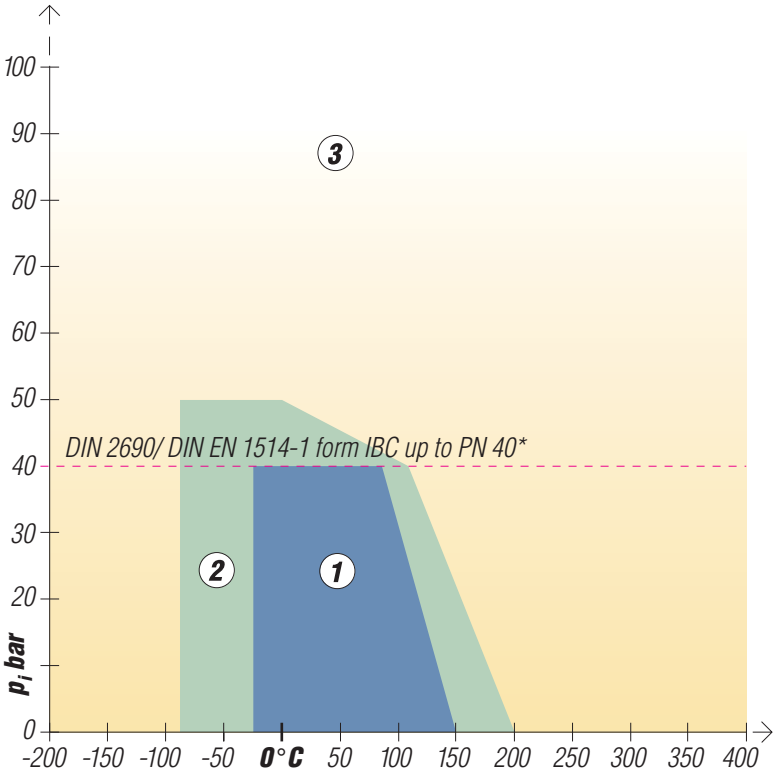
Basis
Gasket material based on organic fibres bound with NBR.

Klinger Hot and Cold Compression Test Method
The Klinger Hot Compression Test was developed by Klinger as a method to test the load bearing capabilities of gasket materials under hot and cold conditions.

In contrast to the BS 7531 and DIN 52913 tests, the Klinger Compression test maintains a constant gasket stress throughout the entire test. This subjects the gasket to more severe conditions.

The thickness decrease is measured at an ambient temperature of 23°C after applying the gasket load. This simulates assembly.

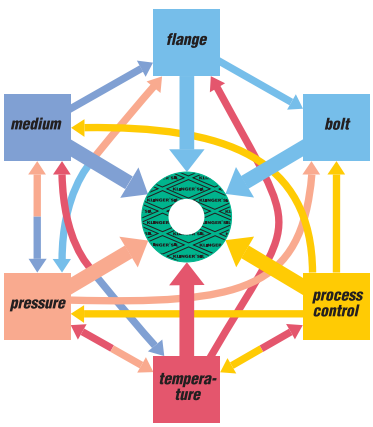
Temperatures up to 300°C are then applied and the additional thickness decrease is measured.This simulates the first start up phase.



*Gaskets according to DIN 2690 are only standardised up to PN 40 and gasket thickness 2 mm.

The many, varied demands placed on gaskets
A common perception is that the suitability of a gasket for any given application depends upon the maximum temperature and pressure conditions. This is not the case.

Maximum temperature and pressure values alone can not define a material's suitability for an application.



These limits are dependent upon a multiplicity of factors as shown in the diagram below.

It is always advisable to consider these factors when selecting a material for a given application.

Selecting gaskets with pT diagrams
The Klinger pT diagram provides guidelines for determining the suitability of a particular gasket material for a specific application based on the operating temperature and pressure only.

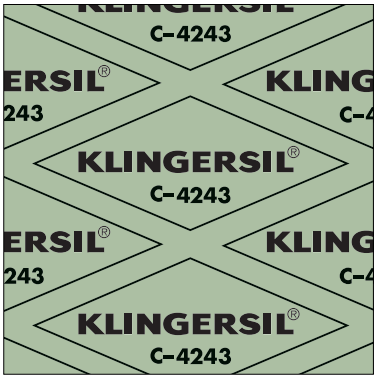
Additional stresses such as fluctuating load may significantly affect the suitability of a gasket in the application and must be considered separately. Always refer to the chemical resistance of the gasket to the fluid.

Areas of Application
(1) In area one, the gasket material is normally suitable subject to chemical compatibility

(2) In area two, the gasket materials may be suitable but a technical evaluation is recommended.

(3) In area three, do not install the gasket without a technical evaluation.

KLINGERSIL® C-4243
Technical data



Typical values			
Compressibility ASTM F 36 J		%	8
Recovery ASTM F 36 J	min	%	55
Stress relaxation DIN 52913	50 MPa, 16 h/175°C	MPa	24
Klinger cold/hot compression,	thickness decrease at 23°C	%	10
50 MPa	thickness decrease at 200°C	%	25
Tightness acc. to DIN 3535/6		mg/s x m	< 0.1
Thickness increase ASTM F 146	oil JRM 903: 5 h/150 °C	%	5
	fuel B: 5 h/20 °C	%	7
Density		g/cm³	1.75

Important points to be observed

With heightened awareness of safety and environmental issues, reducing leaks from flanged assemblies has become a major priority for industry. It is therefore important for companies who use gaskets to choose the correct material for the job and install and maintain it correctly to ensure optimum performance.

A flanged joint will remain tight as long as the surface pressure in service is higher than the minimum surface pressure required to achieve the necessary levels of tightness but is lower than the maximum permissible surface pressure.But increasingly high demands on the tightness requirements for flanged joints (e.g. Tightness class L 0.1 in accordance with DIN 28090) necessitate the application of high loads on the gasket material in order to meet these stringent requirements.

If the gasket is to be subjected to non-static loading and stress fluctuations due to temperature and pressure cycling, it is advisable to select a gasket material which is less prone to embrittlement with increasing temperatures (e.g. KLINGERgraphite laminate, KLINGERtop-chem or KLINGERtop-sil).

In cyclic loading conditions we recommend a minimum surface stress of 30 MPa and that the gasket should be as thin as is practicable.

For safety reasons never re-use gaskets.

Dimensions of the standard sheets

Sizes:
1000 x 1500 mm, 2000 x 1500 mm.
Thicknesses:
0.5 mm, 1.0 mm, 1.5 mm, 2.0 mm, 3.0 mm;
other thicknesses and sizes on request.
Tolerances:
thickness ± 10%, length ± 50 mm, width ± 50 mm

Surfaces

KLINGERSIL® gasket materials are generally furnished with surfaces of low adhesion. On request, graphite facings and other surface finishes on one or both sides are also available.

Function and durability

The performance and service life of KLINGER gaskets depend in large measure on proper storage and fitting, factors beyond the manufactor's control. We can, however, vouch for the excellent quality of our products.

With this in mind, please also observe our installation instructions.

KLINGER EXPERT®
Powerful sealing calculation with online help on CD-ROM

Subject to technical alterations.
Status: February 2004

Certified according to DIN EN ISO 9001:2000

KLINGERSIL® C-4324
Universal gasket material for general applications

Universal high-pressure gasket for a wide range of suitable applications.

Basis
Gasket material bound with NBR, based on a combination of synthetic high-tech fibres. Resistant to water, oils, hydrocarbons and many other chemicals.

Klinger Hot and Cold Compression Test Method
The Klinger Hot Compression Test was developed by Klinger as a method to test the load bearing capabilities of gasket materials under hot and cold conditions.

In contrast to the BS 7531 and DIN 52913 tests, the Klinger Compression test maintains a constant gasket stress throughout the entire test. This subjects the gasket to more severe conditions.

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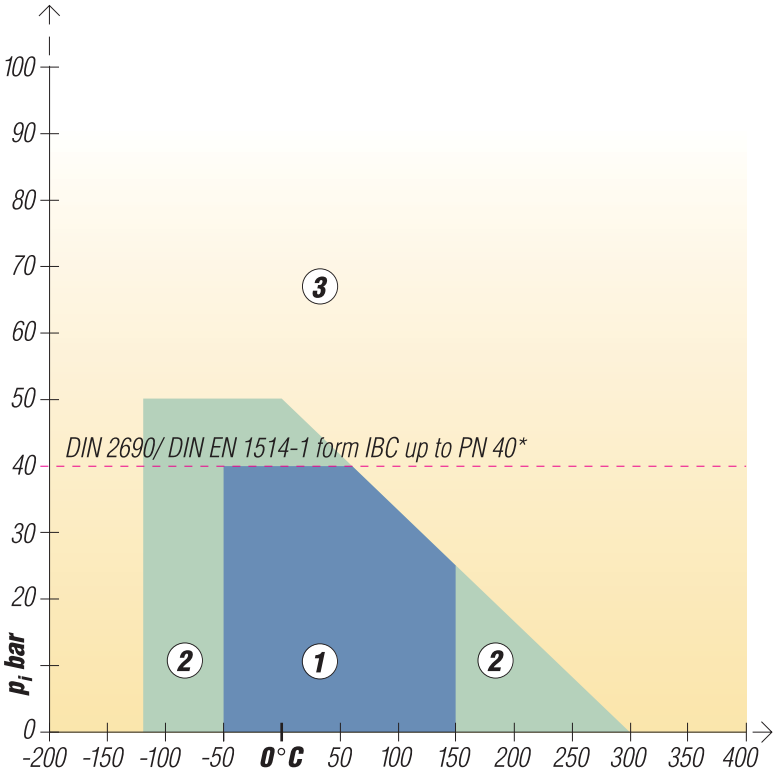
Temperatures up to 300°C are then applied and the additional thickness decrease is measured.This simulates the first start up phase.



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The many, varied demands placed on gaskets
A common perception is that the suitability of a gasket for any given application depends upon the maximum temperature and pressure conditions. This is not the case.

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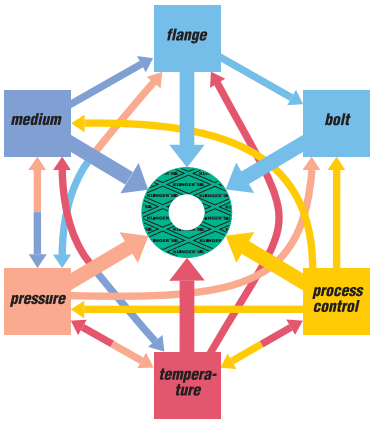

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Selecting gaskets with pT diagrams
The Klinger pT diagram provides guidelines for determining the suitability of a particular gasket material for a specific application based on the operating temperature and pressure only.

Additional stresses such as fluctuating load may significantly affect the suitability of a gasket in the application and must be considered separately. Always refer to the chemical resistance of the gasket to the fluid.

Areas of Application
(1) In area one, the gasket material is normally suitable subject to chemical compatibility

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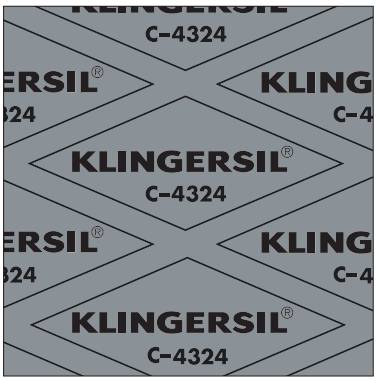
KLINGERSIL® C-4324
Technical data



Typical values			
Compressibility ASTM F 36 J		%	10
Recovery ASTM F 36 J	min	%	55
Stress relaxation DIN 52913	50 MPa, 16 h/300 °C	MPa	20
Stress relaxation BS 7531		MPa	23
Klinger Hot Compression 50 MPa	thickness decrease at 23 °C	%	10
	thickness decrease at 300 °C	%	25
Tightness acc. DIN 3535/6		mg/s x m	< 0.1
Thickness increase ASTM F 146	oil JRM 903: 5 h/150 °C	%	0-5
	fuel B: 5 h/23 °C	%	0-10
Density		g/cm³	1.85

Important points to be observed

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Tests and approvals

DVGW approval no. NG-5123BL0244, SVGW-permit, KTW recommendation, WRC approval.

KLINGER EXPERT®
Powerful sealing calculation with online help on CD-ROM

Subject to technical alterations.
Status: February 2004

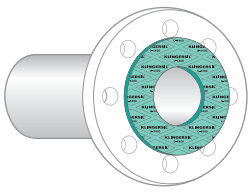
Certified according to DIN EN ISO 9001:2000

Rich. Klinger Dichtungstechnik
GmbH & Co KG
Am Kanal 8-10
A-2352 Gumpoldskirchen, Austria
Tel ++43 (0) 2252/62599-137
Fax ++43 (0) 2252/62599-296
e-mail: mueller@klinger.co.at
http://www.klinger.co.at

KLINGER®

KLINGERSIL® C-4400

A Universal Material for Safe and Reliable Sealing



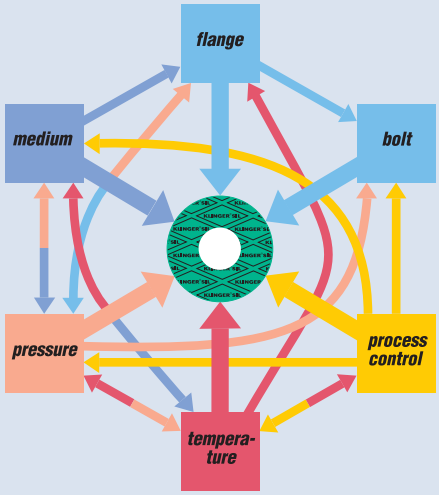
KLINGERSIL® C-4400
Aramid fibres bonded with NBR.
Resistant to oils, water, steam, gases, salt solutions, fuels, alcohols, moderate organic and inorganic acids, hydrocarbons, lubricants and refrigerants.

KLINGER – The global leader in static sealing

KLINGERSIL® C-4400

The many, varied demands placed on gaskets

A common perception is that the suitability of a gasket for any given application depends upon the maximum temperature and pressure conditions. This is not the case.



Maximum temperature and pressure values alone can not define a material's suitability for an application. These limits are dependent upon a multiplicity of factors as shown in the diagram opposite. It is always advisable to consider these factors when selecting a material for a given application.

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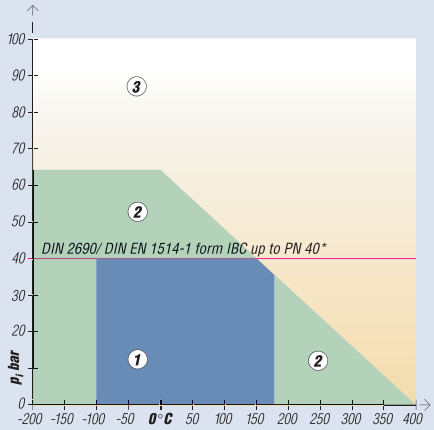

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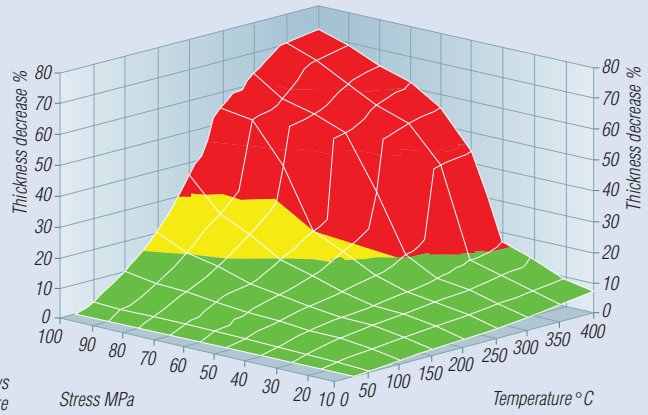
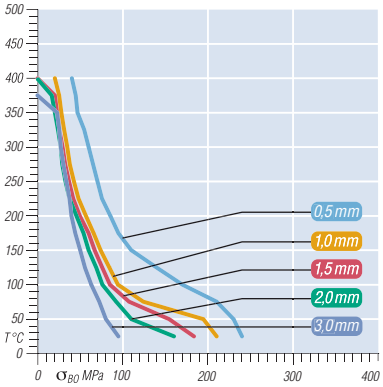


The diagram shows additional thickness decrease at temperature

KLINGERSIL® C-4400

Maximum permissible surface pressure σ_{B0} under operating conditions acc. DIN 28090 – 1

The maximum surface pressure under operating conditions is the maximum allowable surface pressure on the effective gasket area under service conditions that can be applied to the gasket before unacceptable relaxation of the flanged joint occurs and/or the gaskets are destroyed.



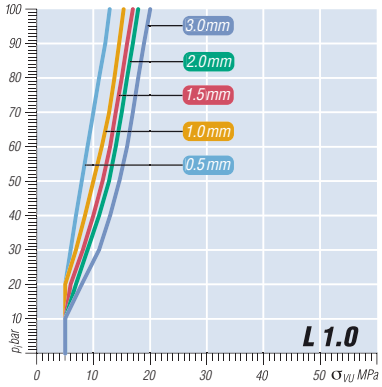
The diagram above shows this values for different gasket thicknesses.

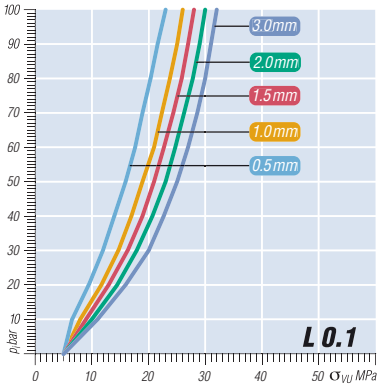
Min. surface pressure σ_{VU} for tightness classes L = 1.0, L = 0.1 and L = 0.01 in accordance to DIN 28090

The minimum surface pressure is the minimum surface pressure that should be applied to the gasket to achieve the necessary tightness requirements.

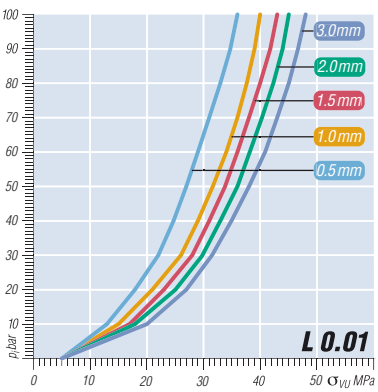
The value must be sufficient to compress the material into the flange imperfections, reduce the materials porosity and also counteract the release of load due to the internal pressure.

The diagrams below show the minimum gasket stress required to achieve the relevant tightness classes as a function of thickness.



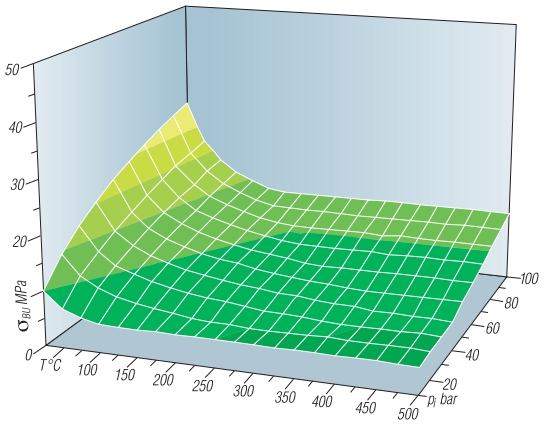


Tightness class L= 0.1 allows a maximum leakage of 0.1 mg nitrogen per second per meter of gasket length (mg/s x m)



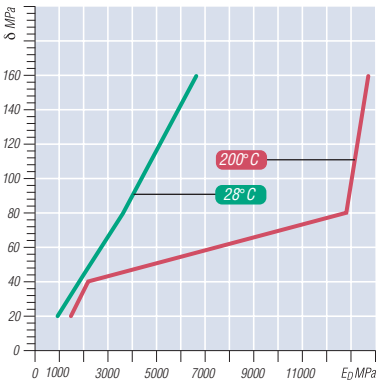
Minimum surface pressure σ_{BU} for tightness class L = 0.1

The three dimensional diagram below describes the behaviour of 2 mm gasket material with respect to the minimum surface pressure to achieve a tightness class of L = 0.1 under a wide range of temperatures and internal pressures. It clearly shows that the minimum surface pressure decreases at elevated temperatures – the gasket will seal at lower loads under these conditions.



Modulus of elasticity E_D in accordance to DIN 28090

This diagram outlines the modulus of elasticity compared to the surface load. The curves describe the behaviour at ambient temperature and at 200°C.



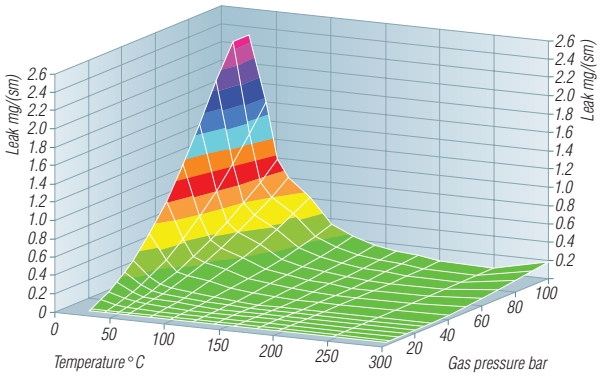
KLINGERSIL® C-4400
Flanged joint integrity

High temperature tightness

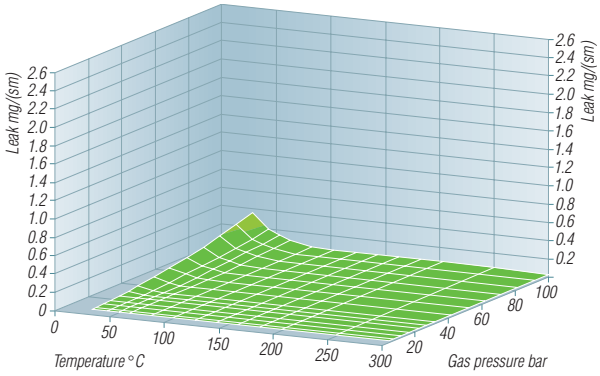
High temperature tightness is measured by means of the Klinger Hot Compression test under defined constant gasket load and temperature with increasing internal pressures using nitrogen as test fluid.

Stabilisation time for each reading is two hours and a new test specimen is used for every gasket load and temperature.

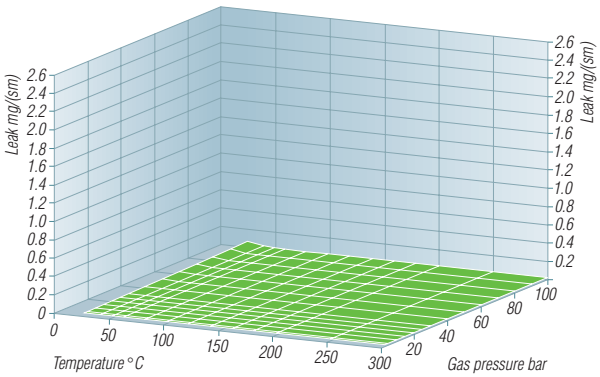
The tightness is analysed with a massflow meter. The pressure is controlled by pressure controller.



Gasket load 15 MPa



Gasket load 25 MPa



Gasket load 35 MPa

Important points to be observed

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For safety reasons never re-use gaskets.

KLINGERSIL® C-4400
Installation instructions

The following guidelines are designed to ensure the optimum performance of our gasket materials:

1. Choosing the gasket

There are many factors which must be taken into account when choosing a gasket material for a given application including temperature, pressure and chemical compatibility. Please refer to the information given in our brochure or, for advice to our software program KLINGER®expert. If you have any questions regarding the suitability of material for a given application please contact Klinger Technical Department.

2. Gasket thickness

The gasket should be as thin as technically practical. To ensure optimum performance a minimum thickness/width ratio of 1/5 is required (ideally 1/10).

3. Flange condition

Ensure all remains of old gasket materials are removed and the flanges are clean, in good condition and parallel.

4. Gasket compounds

Ensure all gaskets are installed in a dry state, the use of gasket compounds is not recommended as this has a detrimental effect on the stability and load bearing characteristics of the material. In its uncompressed form the gasket can absorb liquid, and this may lead to failure of the gasket in service. To aid gasket removal Klinger materials are furnished with a non sticking finish.

In difficult installation conditions, seperating agents such as dry sprays based on molybdenum sulphide or PTFE e.g. KLINGERflon spray, may be used, but only in minimal quantities. Make sure that the solvents and propellants are completely evaporated.

5. Gasket Dimensions

Ensure gasket dimensions are correct. The gasket should not intrude into the bore of the pipework and should be installed centrally.

6. Bolting

Wire brush stud/bolts and nuts (if necessary) to remove any dirt on the threads. Ensure that the nuts can run freely down the thread before use.

Apply lubricant to the bolt and to the nut threads as well as to the face of the nut to reduce friction when tightening. We recommend the use of a bolt lubricant which ensures a friction coefficient of between 0.10 to 0.14.

7. Joint Assembly

It is recommended that the bolts are tightened using a controlled method such as torque or tension, this will lead to greater accuracy and consistency than using conventional methods of tightening. If using a torque wrench, ensure that it is accurately calibrated.

For torque settings please refer to the KLINGER®expert or contact our Technical Department which will be happy to assist you.

Carefully fit the gasket into position taking care not to damage the gasket surface.

When torquing, tighten bolts in three stages to the required torque as follows:

Finger tighten nuts. Carry out tightening, making at least three complete diagonal tightening sequences i.e. 30%, 60% and 100% of final torque value. Continue with one final pass – torquing the bolts/studs in a clockwise sequence.

8. Retightening

Provided that the above guidelines are followed retightening of the gasket after joint assembly should not be necessary.

If retightening is considered necessary, then this should only be performed at ambient temperature before or during the first start-up phase of the pipeline or plant. Retightening of compressed fibre gaskets at higher operating temperatures and longer operating times may lead to a failure of the gasket connection and possible blow out.

9. Re-use

For safety reasons never re-use a gasket.

KLINGERSIL® C-4400
Technical data

Uses

High pressure gasket for universal applications. Suitable for use with oils, water, steam, gases, salt solutions, fuels, alcohols, moderate organic and inorganic acids, hydrocarbons, lubricants and refrigerants, food industry. Outstanding performance in many applications.

Dimensions of the standard sheets

Sizes:
1000 x 1500 mm, 2000 x 1500 mm.
Thicknesses:
0.5 mm, 1.0 mm, 1.5 mm, 2.0 mm, 3.0 mm;
other thicknesses and sizes on request.
Tolerances:
thickness ± 10%, length ± 50 mm, width ± 50 mm.

Surfaces

KLINGERSIL® gasket materials are generally furnished with surfaces of low adhesion. On request, graphite facings and other surface finishes on one or both sides are also available.

A non coloured version for food application with technically identical values is named KLINGERSIL® C-4400L.

Function and durability

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With this in mind, please also observe our installation instructions.

Tests and approvals

BAM approval in accordance with UVV 28, oxygen (VBG 62) tested up to 100 bar and 80 °C.
Approved for gas supply in accordance with DIN 3535/6.
DIN-DVGW-permit NG-5123AT0251, HTB tested. SVGW-permit, ÖVGW-permit, TÜV-Poland, KTW recommended, food toleration Austria. Germanischer Lloyd, BS 7531 Grade Y.
TA-Luft (Clean air) approval, tested in accordance with VDI 2440 at 200°C.

Typical values				
Compressibility ASTM F 36 J			%	11
Recovery ASTM F 36 J	min		%	55
Stress relaxation DIN 52913	50 MPa, 16h/ 175°C		MPa	32
	50 MPa, 16h/ 300°C		MPa	25
Stress relaxation BS 7531	40 MPa, 16h/ 300°C		MPa	23
Klinger cold/hot compression	thickness decrease at 23°C		%	10
50 MPa	thickness decrease at 300°C		%	20
Tightness according DIN 3535/6			mg/s x m	0.02
Tightness class L	DIN 28090-1			0.1
Specific leakrate λ	VDI 2440		mbar x l/s x m	1.64E-08
Cold compression	DIN 28091-2		%	8 -12
Cold recovery	DIN 28091-2		%	3 - 5
Hot compression	DIN 28091-2		%	< 15
Hot recovery	DIN 28091-2		%	1
Spring back R	DIN 28091-2		mm	0.019
Thickness increase after fluid	oil JRM 903: 5 h/150 °C		%	3
immersion ASTM F 146	fuel B: 5 h/23 °C		%	5
Density			g/cm³	1.6
Average surface resistance	R_{OA}		Ω	1.4x10E12
Average specific volume resistance	ρ_D		Ω cm	1.2x10E12
Average dielectric strength			kV/mm	21.6
Average power factor	1 kHz, ca.2 mm thickness		tan δ	0.075
Average dielectric coefficient	1 kHz, ca.2 mm thickness		εr	7.7
Thermal conductivity			W/mK	0.40-0.42
ASME-Code sealing factors				
for gasket thickness 2,0 mm	tightness class 0.1 mg/s x m		MPa	y 20
				m 3.5

KLINGER EXPERT®
Powerful sealing calculation with online help on CD-ROM

Certified according to DIN EN ISO 9001:2000

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Issue: July 2005

http://www.klinger.com.au

KLINGERSIL® C-4408
High strength due to steel reinforcement

Universal high-pressure gasket (C-super) for use in a wide range of industrial applications.

Basis

Aramid fibres, bound with NBR. Suitable for high stress due to wire reinforcement. Resistant to oils, water, steam, gases, fuels, alcohols, hydrocarbons, lubricants and refrigerants.

Klinger cold/hot compression

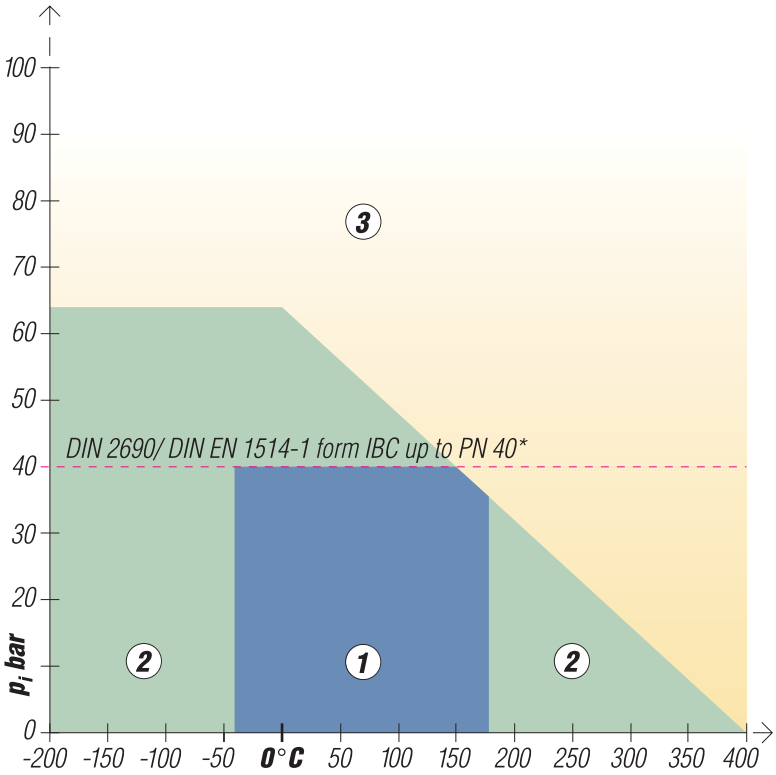
With this test method developed by Klinger you can evaluate the cold/hot compression of a gasket in cold and hot condition.

Unlike the method acc. to DIN 52913 and BS 7531, the surface load is kept constant during the complete test so that the gasket is exposed to much tougher conditions.

The thickness decrease at an ambient temperature of 23°C and at heating up to 300°C is measured.

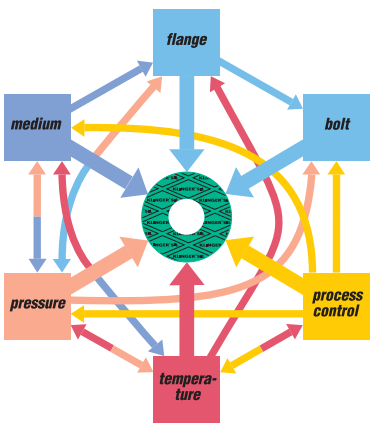
The indicated thickness decrease at 300°C refers to the thickness obtained after loading at 23°C.

** Gaskets according to DIN 2690 are only standardised up to PN 40*



The many and varied demands made on gaskets

The successful operation of a gasket depends upon a multiplicity of factors. Many who use static gaskets believe that the values quoted for maximum admissible temperature and maximum operating pressure are inherent properties or characteristics of gaskets and gasket materials.



Unfortunately, this is not the case.

The maximum temperatures and pressures at which gaskets may be used are influenced by a large number of factors.

Therefore a definite statement of these values for gasket material is not possible.

So why does Klinger provide pT diagrams?

For the reasons given the pT diagram is not infallible: it serves as a rough guide for the end user who often has only the operating temperatures and pressures to go on.

Additional stresses such as greatly fluctuating load may significantly affect whether a gasket is suitable for the application.

Resistance to media must be taken into account in every case.

The fields of decision

(1) If your operating temperatures and pressures fall within this field, a technical examination is normally unnecessary.

(2) If your operating temperatures and pressures are within this field, a technical examination is recommended.

(3) If your operating temperatures and pressures are within this "open" field, a technical examination is always necessary.

KLINGERSIL®
C-4408

Typical values for 2 mm thickness			
Compressibility ASTM F 36 J		%	8
Recovery ASTM F 36 J	min	%	50
Stress relaxation DIN 52913	50 MPa, 16 h/300 °C	MPa	28
Klinger cold/hot compression, 50 MPa	thickness decrease at 23°C	%	10
	thickness decrease at 300°C	%	22
Tightness acc. to DIN 3535/6		ml/min	2.5
Soluble chloride content	chlorides (sol.)	ppm	150
Thickness increase ASTM F 146	oil JRM 903: 5 h/150 °C	%	5
	fuel B: 5 h/23 °C	%	5
Density		g/cm³	1.9

Important points to be observed

The selection of gaskets requires expertise and know-how since ever greater reliability coupled with the lowest possible leakage rates are demanded of gasket materials.

The exacting demands made on the tightness of gasket materials (e.g. Tightness class $L_{0.01}$) mean that with increasing internal pressure higher surface pressures must be applied to the gasket.

It must be shown that the flange joint will tolerate the demands made on it without being mechanically overloaded. Furthermore, the surface pressure applied to create the seal should never fall below the required minimum value since this will reduce the life of the gasket. Highly stressed, but not overstressed gaskets have a longer life than understressed gaskets.

If the gasket fitted will be subjected to non-static loading, or will suffer stress fluctuations during discontinuous operation, it is advisable to choose a gasket which is not prone to embrittlement with increasing temperature (e.g. KLINGERgraphite laminate or KLINGERtop-chem), especially for steam and/or water applications.

For discontinuous operations in water and/or steam applications, we recommend as a general guide a surface pressure of about 30 MPa. In such cases the gasket should be as thin as is practicable.

For reasons of safety, we advise against the re-use of gaskets.

Dimensions of the standard sheets

Sizes:
1,000 x 1,500 mm, 1,500 x 2,000 mm
Thicknesses:
0.5 mm, 1.0 mm, 1.5 mm, 2.0 mm, 3.0 mm
other thicknesses on request.
Tolerances:
thickness ± 10%, length ± 50 mm, width ± 50 mm

Rings and other finished gaskets

These gaskets are available in any size and corresponding sheet thicknesses, also flanged and PTFE-enveloped .

Surfaces

The standard surface finish of the material is such that the surface has an extremely low adhesion.
On request, graphite facings and other surface finishes on one or both sides are also available.

Function and durability

The performance and life of KLINGER gaskets depend in large measure on proper storage and fitting, factors beyond the manufactor's control. We can, however, vouch for the excellent quality of our products.

With this in mind, please also observe our installation instructions.

KLINGER EXPERT®
points the way to the right gasket for the job

Subject to technical alterations.
Status: August 2003

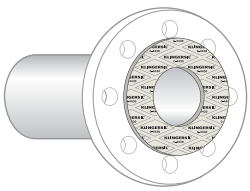
Certified according to DIN EN ISO 9001:2000

KLINGER®

KLINGERSIL® C-4430

A Universal Material with outstanding stress retention and resistance to hot water and steam

KLINGERSIL® C-4430
Optimum combination of synthetic fibres bonded with NBR.
Resistant to water and steam at higher temperatures as well as to oils, gases, salt solutions, fuels, alcohols, moderate organic and inorganic acids, hydrocarbons, lubricants and refrigerants.

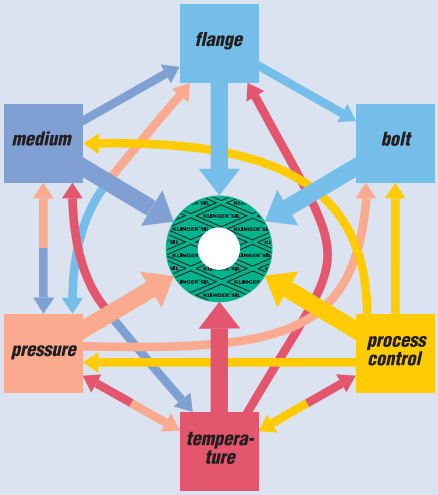


KLINGER – The global leader in static sealing

KLINGERSIL® C-4430

The many, varied demands placed on gaskets

A common perception is that the suitability of a gasket for any given application depends upon the maximum temperature and pressure conditions. This is not the case.

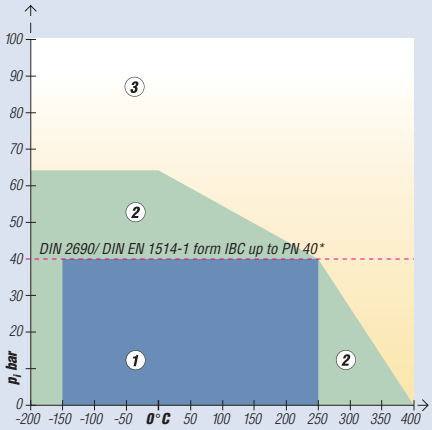


Maximum temperature and pressure values alone can not define a material's suitability for an application. These limits are dependent upon a multiplicity of factors as shown in the diagram opposite. It is always advisable to consider these factors when selecting a material for a given application.

Selecting gaskets with pT diagrams

The Klinger pT diagram provides guidelines for determining the suitability of a particular gasket material for a specific application based on the operating temperature and pressure only.

Additional stresses such as fluctuating load may significantly affect the suitability of a gasket in the application and must be considered separately. Always refer to the chemical resistance of the gasket to the fluid.



**Gaskets according to DIN 2690 are only standardised up to PN 40 and gasket thickness 2 mm.*

Areas of Application

① *In area one, the gasket material is normally suitable subject to chemical compatibility.*

② *In area two, the gasket materials may be suitable but a technical evaluation is recommended.*

③ *In area three, do not install the gasket without a technical evaluation.*

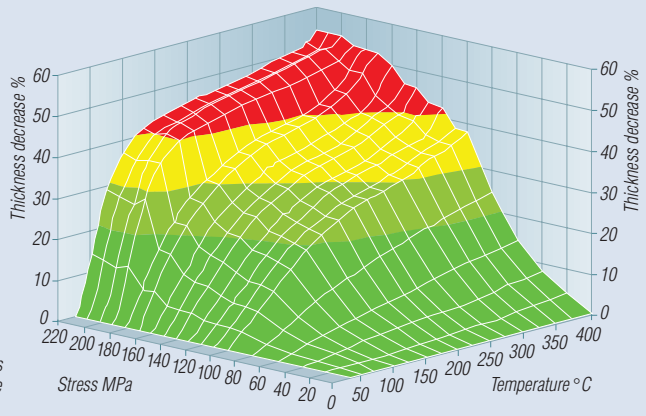
Klinger Hot and Cold Compression Test Method

The Klinger Hot Compression Test was developed by Klinger as a method to test the load bearing capabilities of gasket materials under hot and cold conditions.

In contrast to the BS 7531 and DIN 52913 tests, the Klinger Compression test maintains a constant gasket stress throughout the entire test. This subjects the gasket to more severe conditions.

The thickness decrease is measured at an ambient temperature of 23°C after applying the gasket load. This simulates assembly.

Temperatures up to 300°C are then applied and the additional thickness decrease is measured. This simulates the first start up phase.

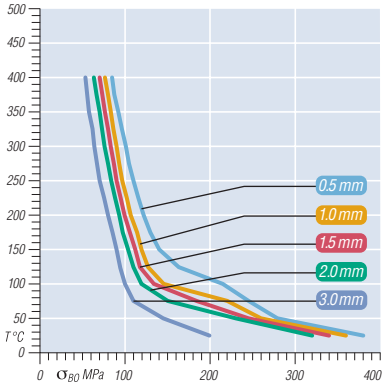


The diagram shows additional thickness decrease at temperature

KLINGERSIL® C-4430

Maximum permissible surface pressure σ_{BO} under operating conditions acc. DIN 28090 – 1

The maximum surface pressure under operating conditions is the maximum allowable surface pressure on the effective gasket area under service conditions that can be applied to the gasket before unacceptable relaxation of the flanged joint occurs and/or the gaskets are destroyed.



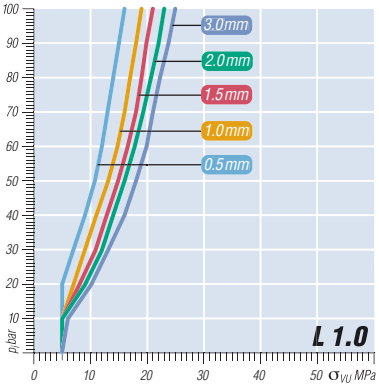
The diagram above shows this values for different gasket thicknesses.

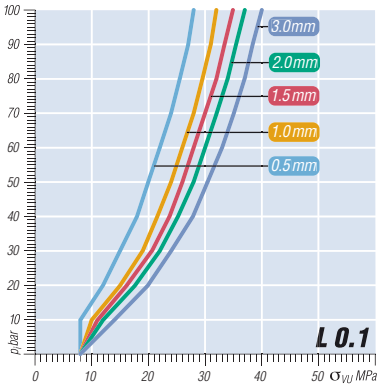
Min. surface pressure σ_{VU} for tightness classes L = 1.0, L = 0.1 and L = 0.01 in accordance to DIN 28090

The minimum surface pressure is the minimum surface pressure that should be applied to the gasket to achieve the necessary tightness requirements.

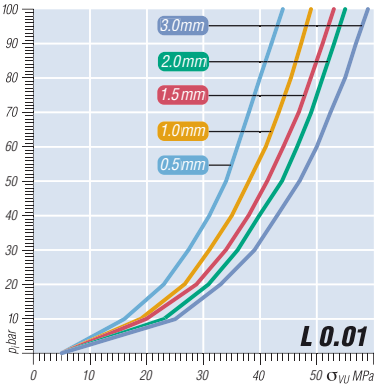
The value must be sufficient to compress the material into the flange imperfections, reduce the materials porosity and also counteract the release of load due to the internal pressure.

The diagrams below show the minimum gasket stress required to achieve the relevant tightness classes as a function of thickness.



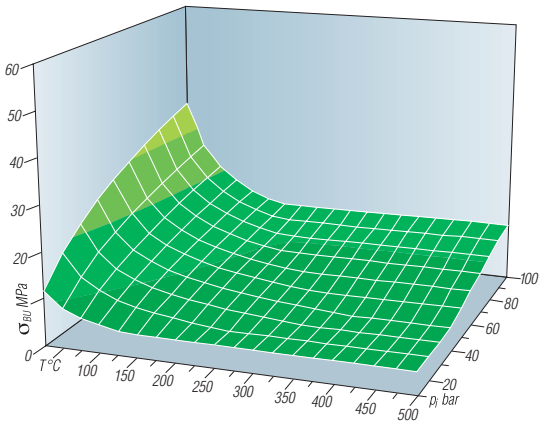


Tightness class L= 0.1 allows a maximum leakage of 0.1 mg nitrogen per second per meter of gasket length (mg/s x m)



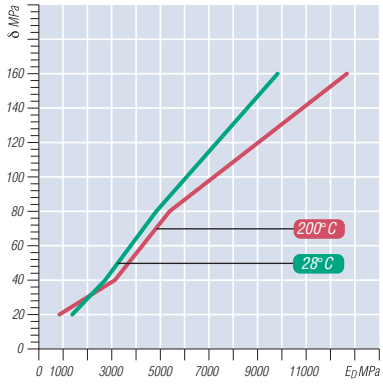
Minimum surface pressure σ_{BU} for tightness class L = 0.1

The three dimensional diagram below describes the behaviour of 2 mm gasket material with respect to the minimum surface pressure to achieve a tightness class of L = 0.1 under a wide range of temperatures and internal pressures. It clearly shows that the minimum surface pressure decreases at elevated temperatures – the gasket will seal at lower loads under these conditions.



Modulus of elasticity E_D in accordance to DIN 28090

This diagram outlines the modulus of elasticity compared to the surface load. The curves describe the behaviour at ambient temperature and at 200°C.



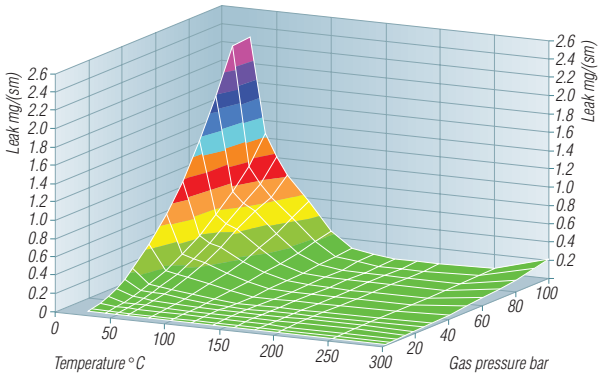
KLINGERSIL® C-4430
Flanged joint integrity

High temperature tightness

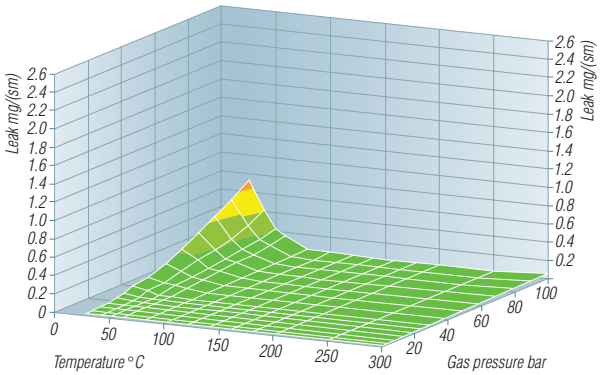
High temperature tightness is measured by means of the Klinger Hot Compression test under defined constant gasket load and temperature with increasing internal pressures using nitrogen as test fluid.

Stabilisation time for each reading is two hours and a new test specimen is used for every gasket load and temperature.

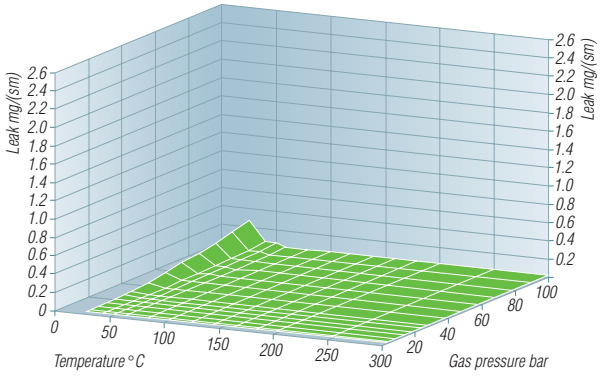
The tightness is analysed with a massflow meter. The pressure is controlled by pressure controller.



Gasket load 15 MPa



Gasket load 25 MPa



Gasket load 35 MPa

Important points to be observed

With heightened awareness of safety and environmental issues, reducing leaks from flanged assemblies has become a major priority for industry. It is therefore important for companies who use gaskets to choose the correct material for the job and install and maintain it correctly to ensure optimum performance.

A flanged joint will remain tight as long as the surface pressure in service is higher than the minimum surface pressure required to achieve the necessary levels of tightness but is lower than the maximum permissible surface pressure.But increasingly high demands on the tightness requirements for flanged joints (e.g. Tightness class L 0.1 in accordance with DIN 28090) necessitate the application of high loads on the gasket material in order to meet these stringent requirements.

If the gasket is to be subjected to non-static loading and stress fluctuations due to temperature and pressure cycling, it is advisable to select a gasket material which is less prone to embrittlement with increasing temperatures (e.g. KLINGERgraphite laminate, KLINGERtop-chem or KLINGERtop-sil). In cyclic loading conditions we recommend a minimum surface stress of 30 MPa and that the gasket should be as thin as is practicable.

For safety reasons never re-use gaskets.

KLINGERSIL® C-4430
Installation instructions

The following guidelines are designed to ensure the optimum performance of our gasket materials:

1. Choosing the gasket

There are many factors which must be taken into account when choosing a gasket material for a given application including temperature, pressure and chemical compatibility. Please refer to the information given in our brochure or, for advice to our software program KLINGER®expert. If you have any questions regarding the suitability of material for a given application please contact Klinger Technical Department.

2. Gasket thickness

The gasket should be as thin as technically practical. To ensure optimum performance a minimum thickness/width ratio of 1/5 is required (ideally 1/10).

3. Flange condition

Ensure all remains of old gasket materials are removed and the flanges are clean, in good condition and parallel.

4. Gasket compounds

Ensure all gaskets are installed in a dry state, the use of gasket compounds is not recommended as this has a detrimental effect on the stability and load bearing characteristics of the material. In its uncompressed form the gasket can absorb liquid, and this may lead to failure of the gasket in service. To aid gasket removal Klinger materials are furnished with a non sticking finish.

In difficult installation conditions, seperating agents such as dry sprays based on molybdenum sulphide or PTFE e.g. KLINGERflon spray, may be used, but only in minimal quantities. Make sure that the solvents and propellants are completely evaporated.

5. Gasket Dimensions

Ensure gasket dimensions are correct. The gasket should not intrude into the bore of the pipework and should be installed centrally.

6. Bolting

Wire brush stud/bolts and nuts (if necessary) to remove any dirt on the threads. Ensure that the nuts can run freely down the thread before use.

Apply lubricant to the bolt and to the nut threads as well as to the face of the nut to reduce friction when tightening. We recommend the use of a bolt lubricant which ensures a friction coefficient of between 0.10 to 0.14.

7. Joint Assembly

It is recommended that the bolts are tightened using a controlled method such as torque or tension, this will lead to greater accuracy and consistency than using conventional methods of tightening. If using a torque wrench, ensure that it is accurately calibrated.

For torque settings please refer to the KLINGER®expert or contact our Technical Department which will be happy to assist you

Carefully fit the gasket into position taking care not to damage the gasket surface.

When torquing, tighten bolts in three stages to the required torque as follows:

Finger tighten nuts. Carry out tightening, making at least three complete diagonal tightening sequences i.e. 30%, 60% and 100% of final torque value. Continue with one final pass – torquing the bolts/studs in a clockwise sequence.

8. Retightening

Provided that the above guidelines are followed retightening of the gasket after joint assembly should not be necessary.

If retightening is considered necessary, then this should only be performed at ambient temperature before or during the first start-up phase of the pipeline or plant. Retightening of compressed fibre gaskets at higher operating temperatures and longer operating times may lead to a failure of the gasket connection and possible blow out.

9. Re-use

For safety reasons never re-use a gasket.

KLINGERSIL® C-4430
Technical data

Uses
High pressure gasket for universal applications. Suitable for use with water and steam at higher temperatures as well as to oils, gases, salt solutions, fuels, alcohols, moderate organic and inorganic acids, hydrocarbons, lubricants and refrigerants. Premium material grade with outstanding stress retention.

Dimensions of the standard sheets
Sizes:
1000 x 1500 mm, 2000 x 1500 mm.
Thicknesses:
0.5 mm, 1.0 mm, 1.5 mm,
2.0 mm, 3.0 mm;
other thicknesses and sizes on request.
Tolerances:
thickness ± 10%, length ± 50 mm,
width ± 50 mm.

Surfaces
KLINGERSIL® gasket materials are generally furnished with surfaces of low adhesion. On request, graphite facings and other surface finishes on one or both sides are also available.

Function and durability
The performance and service life of KLINGER gaskets depend in large measure on proper storage and fitting, factors beyond the manufactor's control. We can, however, vouch for the excellent quality of our products.

With this in mind, please also observe our installation instructions.

Tests and approvals
Fire safe according to BS 5146.
BAM approval in accordance with UVV 28, oxygen(VGB 62)
tested up to 100 bar and 85° C.
Approved for gas supply in accordance with DIN 3535/6.
DIN - DVGW permit NG 5123AN0418.
SVGW permit, KTW recommended.
Lab. National d`Essais 9030144.
WRc approval. Germanischer Lloyd.
BS 7531 Grade X.
TA Luft (Clean air) approval,
tested in accordance with VDI 2440 at 250° C.

Typical values				
Compressibility ASTM F 36 J			%	9
Recovery ASTM F 36 J	min		%	50
Stress relaxation DIN 52913	50 MPa, 16h/ 175°C		MPa	39
	50 MPa, 16h/ 300°C		MPa	35
Stress relaxation BS 7531	40 MPa, 16h/ 300°C		MPa	31
Klinger cold/hot compression	thickness decrease at 23°C		%	8
50 MPa	thickness decrease at 300°C		%	11
Tightness according DIN 3535/6			mg/s x m	< 0.1
Tightness class L	DIN 28090-1			0.1
Specific leakrate λ	VDI 2440	mbar x l/s x m		2,13E-05
Cold compression	DIN 28091-2		%	6 - 10
Cold recovery	DIN 28091-2		%	2 - 4
Hot compression	DIN 28091-2		%	7
Hot recovery	DIN 28091-2		%	1
Spring back R	DIN 28091-2		mm	0.019
Thickness increase after fluid	oil JRM 903: 5 h/150 °C		%	3
immersion ASTM F 146	fuel B: 5 h/23 °C		%	5
Density			g/cm^3	1.75
Average surface resistance	R_{OA}		Ω	6.8x10E10
Average specific volume resistance	ρ_D		Ω cm	1.2x10E11
Average dielectric strength			kV/mm	15.2
Average power factor	1 kHz, ca.3 mm thickness		tan δ	0.05
Average dielectric coefficient	1 kHz, ca.3 mm thickness		εr	6.4
Thermal conductivity			W/mK	0.42
ASME-Code sealing factors				
for gasket thickness 2,0 mm	tightness class 0.1 mg/s x m		MPa y	25
			m	5

KLINGER EXPERT®
Powerful sealing calculation with online help on CD-ROM

Certified according to DIN EN ISO 9001:2000

Subject to technical alterations.
Issue: July 2004

KLINGERSIL® C-4438

Descripción: Material de *Aplicación Universal* con sobresaliente aceptación y retención de la carga compresiva. Excelente resistencia al vapor, al agua, a los aceites y a los hidrocarburos.

Composición: Fibra de vidrio / NBR con malla de acero al carbono

Compresibilidad: (ASTM F36J) 7-17 %

Recuperación: (ASTM F36J) 50% Mínimo

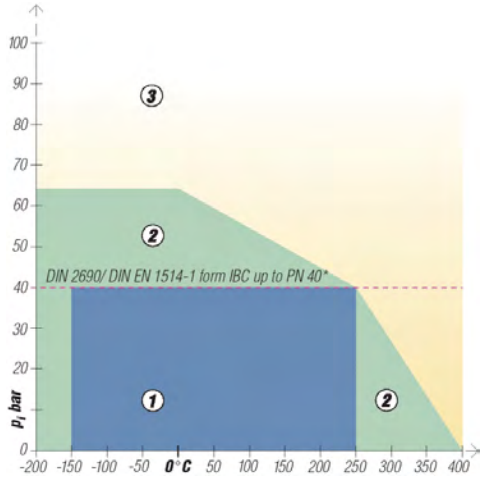
Sellabilidad: (ASTM F37A) N/D

Rigidez Dialéctrica: ASTM D 149-95a N/D

Densidad: 1.9 g/cm3

Nomenclatura ASTM: F712112 B3 E11 M6

Color: Blanco / Verde



Recomendaciones:

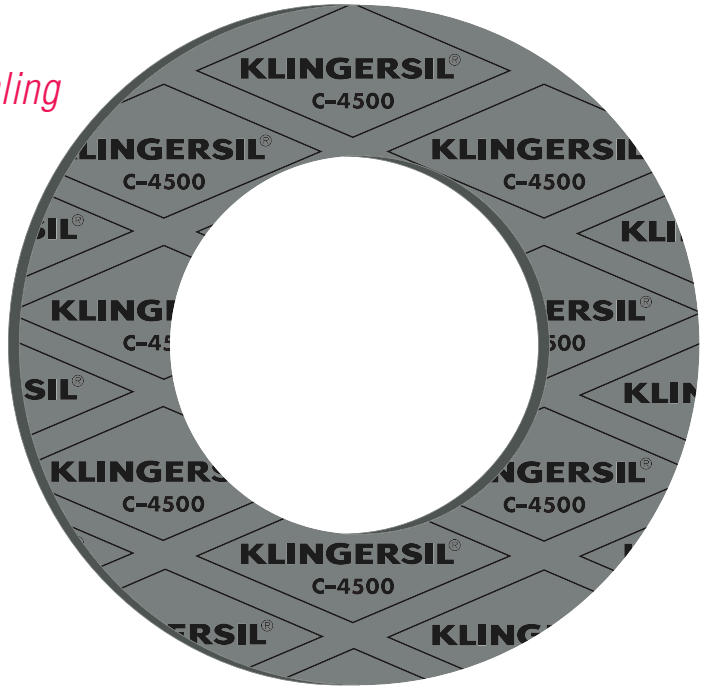
1-Deben consultarse las "Recomendaciones Generales" para el uso y selección de los materiales para juntas libres de amianto. Estas se publican en nuestro folleto "Hojas de Materiales para Juntas" y en nuestra página web www.rklinger.com.ar

2- La resistencia química de este material, al igual que de otros, puede consultarse en nuestra página web www.rklinger.com.ar

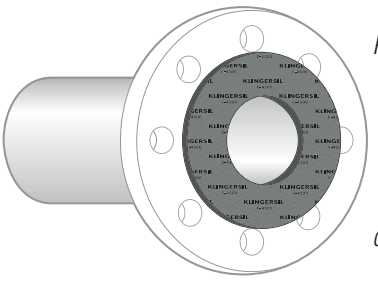
3- La incorporación de una malla metálica, especialmente en espesores finos, refuerza la resistencia a la carga compresiva del material de junta, y aunque en algo atenúa el riesgo de fisura y expulsión de un trozo de la junta, como consecuencia de variaciones de carga generadas en ciclos térmicos y de presión, no lo elimina.

KLINGER®

The global leader in static sealing



A Hightech Fibre Material – ideal for strong alkali media and steam



KLINGERSIL® C-4500
Carbon fibres and special heat resistant additives bonded with NBR. A superior performance product designed for use with strongly alkaline media and steam in the chemical industry.

KLINGERSIL® C-4500

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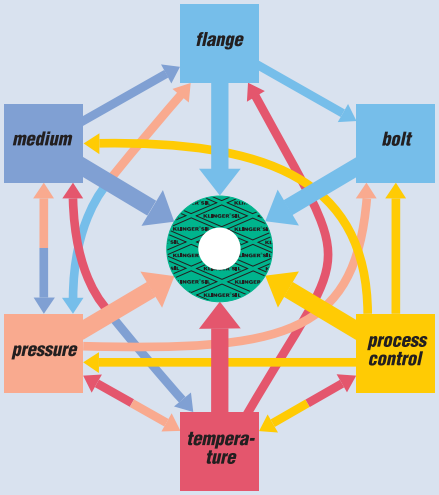

Maximum temperature and pressure values alone can not define a material's suitability for an application. These limits are dependent upon a multiplicity of factors as shown in the diagram opposite. It is always advisable to consider these factors when selecting a material for a given application.

Selecting gaskets with pT diagrams

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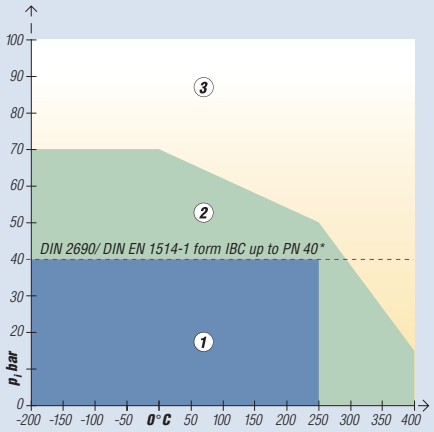

*Gaskets according to DIN 2690 are only standardised up to PN 40 and gasket thickness 2 mm.

Areas of Application

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This simulates assembly.

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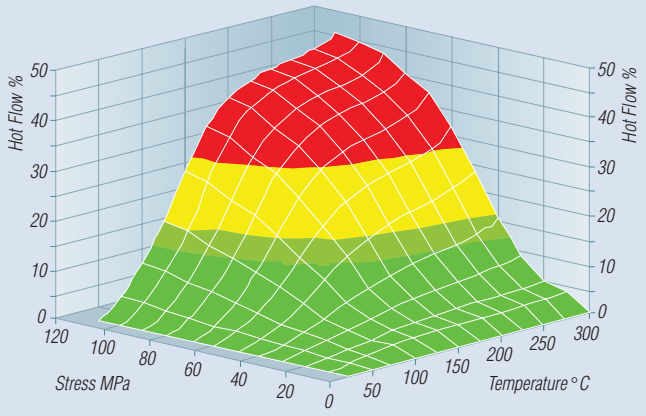
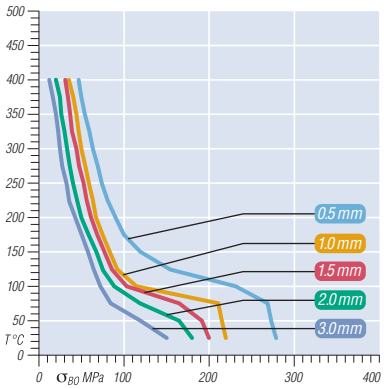


The diagram shows additional thickness decrease at temperature

KLINGERSIL® C-4500

Maximum permissible surface pressure σ_{B0} under operating conditions acc. DIN 28090 – 1

The maximum surface pressure under operating conditions is the maximum allowable surface pressure on the effective gasket area under service conditions that can be applied to the gasket before unacceptable relaxation of the flanged joint occurs and/or the gaskets are destroyed.



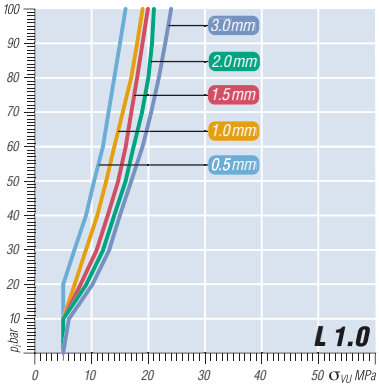
The diagram above shows this values for different gasket thicknesses.

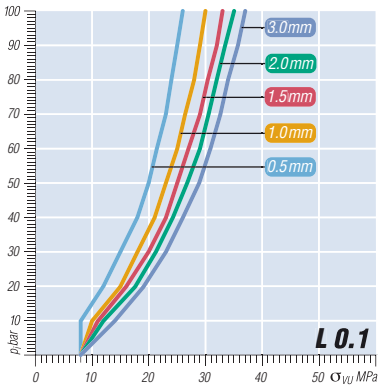
Min. surface pressure σ_{VU} for tightness classes L = 1.0, L = 0.1 and L = 0.01 in accordance to DIN 28090

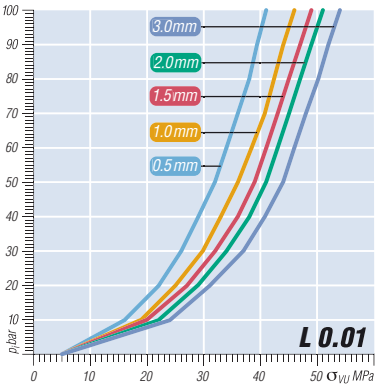
The minimum surface pressure is the minimum surface pressure that should be applied to the gasket to achieve the necessary tightness requirements.

The value must be sufficient to compress the material into the flange imperfections, reduce the materials porosity and also counteract the release of load due to the internal pressure.

The diagrams below show the minimum gasket stress required to achieve the relevant tightness classes as a function of thickness.



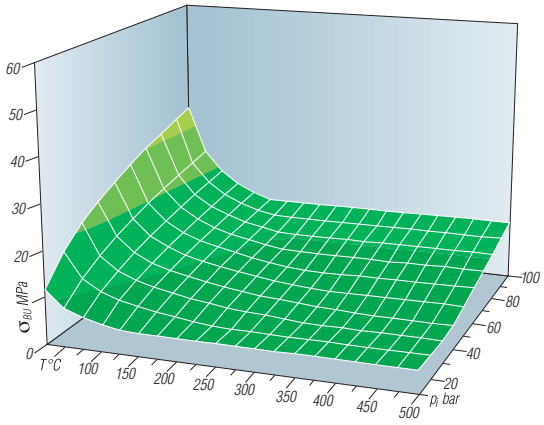




Tightness class L= 0.1 allows a maximum leakage of 0.1 mg nitrogen per second per meter of gasket length (mg/s x m)

Minimum surface pressure σ_{BU} for tightness class L = 0.1

The three dimensional diagram below describes the behaviour of 2 mm gasket material with respect to the minimum surface pressure to achieve a tightness class of L = 0.1 under a wide range of temperatures and internal pressures. It clearly shows that the minimum surface pressure decreases at elevated temperatures – the gasket will seal at lower loads under these conditions.



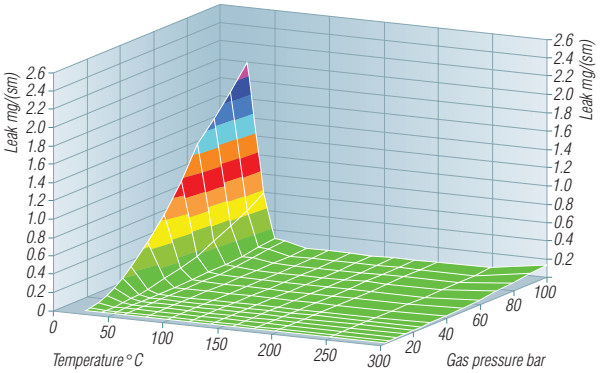
KLINGERSIL® C-4500
Flanged joint integrity

High temperature tightness

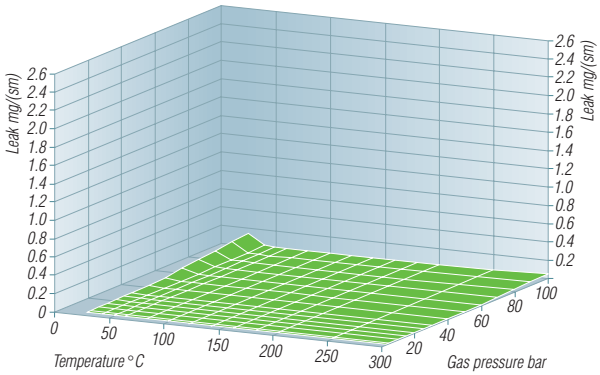
High temperature tightness is measured by means of the Klinger Hot Compression test under defined constant gasket load and temperature with increasing internal pressures using nitrogen as test fluid.

Stabilisation time for each reading is two hours and a new test specimen is used for every gasket load and temperature.

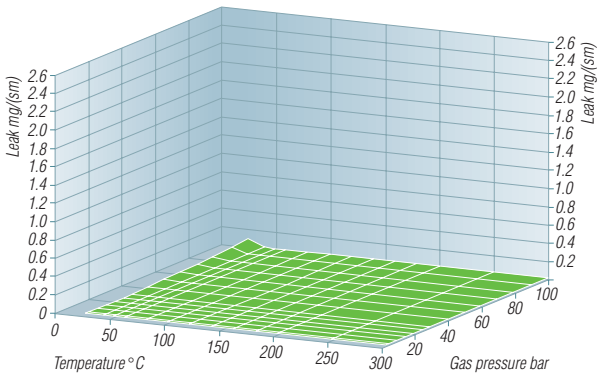
The tightness is analysed with a massflow meter. The pressure is controlled by pressure controller.



Gasket load 15 MPa



Gasket load 20 MPa



Gasket load 35 MPa

Important points to be observed

With heightened awareness of safety and environmental issues, reducing leaks from flanged assemblies has become a major priority for industry. It is therefore important for companies who use gaskets to choose the correct material for the job and install and maintain it correctly to ensure optimum performance.

A flanged joint will remain tight as long as the surface pressure in service is higher than the minimum surface pressure required to achieve the necessary levels of tightness but is lower than the maximum permissible surface pressure.But increasingly high demands on the tightness requirements for flanged joints (e.g. Tightness class L 0.1 in accordance with DIN 28090) necessitate the application of high loads on the gasket material in order to meet these stringent requirements.

If the gasket is to be subjected to non-static loading and stress fluctuations due to temperature and pressure cycling, it is advisable to select a gasket material which is less prone to embrittlement with increasing temperatures (e.g. KLINGERgraphite laminate, KLINGERtop-chem or KLINGERtop-sil). In cyclic loading conditions we recommend a minimum surface stress of 30 MPa and that the gasket should be as thin as is practicable.

For safety reasons never re-use gaskets.

KLINGERSIL® C-4500
Installation instructions

The following guidelines are designed to ensure the optimum performance of our gasket materials:

1. Choosing the gasket

There are many factors which must be taken into account when choosing a gasket material for a given application including temperature, pressure and chemical compatibility. Please refer to the information given in our brochure or, for advice to our software program KLINGER®expert. If you have any questions regarding the suitability of material for a given application please contact Klinger Technical Department.

2. Gasket thickness

The gasket should be as thin as technically practical. To ensure optimum performance a minimum thickness/width ratio of 1/5 is required (ideally 1/10).

3. Flange condition

Ensure all remains of old gasket materials are removed and the flanges are clean, in good condition and parallel.

4. Gasket compounds

Ensure all gaskets are installed in a dry state, the use of gasket compounds is not recommended as this has a detrimental effect on the stability and load bearing characteristics of the material. In its uncompressed form the gasket can absorb liquid, and this may lead to failure of the gasket in service. To aid gasket removal Klinger materials are furnished with a non sticking finish.

In difficult installation conditions, seperating agents such as dry sprays based on molybdenum sulphide or PTFE e.g. KLINGERflon spray, may be used, but only in minimal quantities. Make sure that the solvents and propellants are completely evaporated.

5. Gasket Dimensions

Ensure gasket dimensions are correct. The gasket should not intrude into the bore of the pipework and should be installed centrally.

6. Bolting

Wire brush stud/bolts and nuts (if necessary) to remove any dirt on the threads. Ensure that the nuts can run freely down the thread before use.

Apply lubricant to the bolt and to the nut threads as well as to the face of the nut to reduce friction when tightening. We recommend the use of a bolt lubricant which ensures a friction coefficient of between 0.10 to 0.14.

7. Joint Assembly

It is recommended that the bolts are tightened using a controlled method such as torque or tension, this will lead to greater accuracy and consistency than using conventional methods of tightening. If using a torque wrench, ensure that it is accurately calibrated.

For torque settings please refer to the KLINGER®expert or contact our Technical Department which will be happy to assist you

Carefully fit the gasket into position taking care not to damage the gasket surface.

When torquing, tighten bolts in three stages to the required torque as follows:

Finger tighten nuts. Carry out tightening, making at least three complete diagonal tightening sequences i.e. 30%, 60% and 100% of final torque value. Continue with one final pass – torquing the bolts/studs in a clockwise sequence.

8. Retightening.

Provided that the above guidelines are followed retightening of the gasket after joint assembly should not be necessary.

If retightening is considered necessary, then this should only be performed at ambient temperature before or during the first start-up phase of the pipeline or plant. Retightening of compressed fibre gaskets at higher operating temperatures and longer operating times may lead to a failure of the gasket connection and possible blow out.

9. Re-use

For safety reasons never re-use a gasket.

KLINGERSIL® C-4500
Technical data

Uses

High pressure gasket for special applications. Suitable for use with strong alkali medias and steam at higher temperatures as well as to oils, gases, salt solutions, fuels, alcohols, organic and inorganic acids, hydrocarbons, lubricants and refrigerants. Premium material grade with very high stress retention.

Dimensions of the standard sheets

Sizes:
1000 x 1500 mm, 2000 x 1500 mm.
Thicknesses:
0.5 mm, 1.0 mm, 1.5 mm,
2.0 mm, 3.0 mm;
other thicknesses and sizes on request.
Tolerances:
thickness ± 10%, length ± 50 mm,
width ± 50 mm

Surfaces

KLINGERSIL® gasket materials are generally furnished with surfaces of low adhesion. On request, graphite facings and other surface finishes on one or both sides are also available.

Function and durability

The performance and service life of KLINGER gaskets depend in large measure on proper storage and fitting, factors beyond the manufactor's control. We can, however, vouch for the excellent quality of our products.

With this in mind, please also observe our installation instructions.

Tests and approvals

Fire safe according API SPEC 6 FA.
BAM approval in accordance with UVV 28, oxygen(VGB 62)
tested up to 100 bar and 85°C.
Approved for gas supply in accordance with DIN 3535/6.
DIN - DVGW permit NG 5123AN0539.
ÖVGW permit, KTW recommended
Lab. National d`Essais 105.097
Germanischer Lloyd.
BS 7531 Grade X.
TA Luft (Clean air) approval, tested in accordance with VDI 2440 at 250°C.

Typical values				
Compressibility ASTM F 36 J			%	12
Recovery ASTM F 36 J	min		%	60
Stress relaxation DIN 52913	50 MPa, 16h/ 175°C		MPa	35
	50 MPa, 16h/ 300°C		MPa	32
Stress relaxation BS 7531	40 MPa, 16h/ 300°C		MPa	30
Klinger cold/hot compression	thickness decrease at 23°C		%	10
50 MPa	thickness decrease at 300°C		%	15
Tightness according DIN 3535/6			mg/s x m	< 0.1
Tightness class L	DIN 28090-1			0.1
Specific leakrate λ	VDI 2440	mbar x l/s x m		4.94E-06
Cold compression	DIN 28091-2		%	7 - 11
Cold recovery	DIN 28091-2		%	3 - 5
Hot compression	DIN 28091-2		%	9
Hot recovery	DIN 28091-2		%	1
Spring back R	DIN 28091-2		mm	0.019
Thickness increase after fluid	oil JRM 903: 5 h/150 °C		%	3
immersion ASTM F 146	fuel B: 5 h/23 °C		%	5
Density			g/cm^3	1.4
Average surface resistance	R_{OA}		Ω	5.7x10E4
Average specific volume resistance	ρ_D		Ω cm	7.5x10E4
Average dielectric strength			kV/mm	< 0.1
Average power factor	1 kHz, ca.3 mm thickness		tan δ	0.147
Average dielectric coefficient	1 kHz, ca.3 mm thickness		εr	9.7
Thermal conductivity			W/mK	0.2
ASME-Code sealing factors				
for gasket thickness 2,0 mm	tightness class 0.1 mg/s x m		MPa y	25
			m	4

KLINGER EXPERT®
Powerful sealing calculation with online help on CD-ROM

Certified according to DIN EN ISO 9001:2000

Subject to technical alterations.
Issue: January 2004

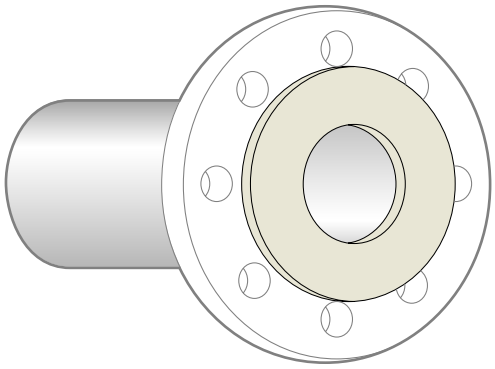
3.065e - 1/2004

KLINGER®

KLINGERSIL® C-8200

Premium high-pressure gasket
for use with acids.
Resistant to a wide variety of media.

Greater security for concentrated acids

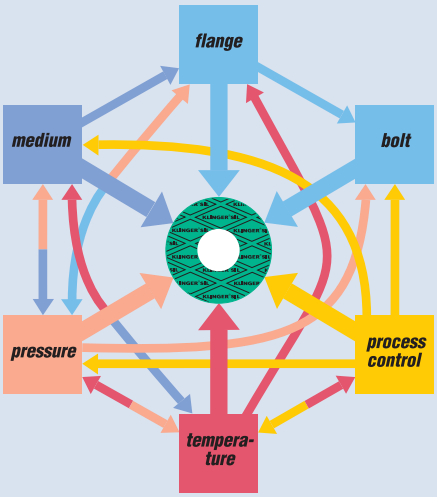


Glass fibres bonded with special acid-resistant elastomeres.

KLINGERSIL® C-8200
Information for your safety

The many and varied demands made on gaskets

The successful operation of a gasket depends upon a multiplicity of factors.
Many who use static gaskets believe that the values quoted for maximum admissible temperature and maximum operating pressure are inherent properties or characteristics of gaskets and gasket materials.



Unfortunately, this is not the case.
The maximum temperatures and pressures at which gaskets may be used are influenced by a large number of factors.

Therefore a definite statement of these values for gasket material is not possible.

Important points to be observed

The selection of gaskets requires expertise and know-how since ever greater reliability coupled with the lowest possible leakage rates are demanded of gasket materials.

The exacting demands made on the tightness of gasket materials (e.g. Tightness class $L_{0.01}$) mean that with increasing internal pressure higher surface pressures must be applied to the gasket.

It must be shown that the flange joint will tolerate the demands made on it without being mechanically overloaded. Furthermore, the surface pressure applied to create the seal should never fall below the required minimum value since this will reduce the life of the gasket. Highly stressed, but not overstressed gaskets have a longer life than understressed gaskets.

If the gasket fitted will be subjected to non-static loading, or will suffer stress fluctuations during discontinuous operation, it is advisable to choose a gasket which is not prone to embrittlement with increasing temperature (e.g. KLINGERgraphite laminate or KLINGERtop-chem), especially for steam and/or water applications.
For discontinuous operations in water and/or steam applications, we recommend as a general guide a surface pressure of about 30 MPa. In such cases the gasket should be as thin as is practicable.

For reasons of safety, we advise against the re-use of gaskets.

KLINGER EXPERT®
Powerful sealing calculation with online help on CD-ROM

Maximum gasket pressure in operating condition σ_{BO} in accordance with DIN 28090

This diagram shows the max. permissible gasket pressure in MPa to be applied as a function of the service temperature. The values apply to the stated gasket thicknesses.

Min. gasket pressure σ_{VU} for tightness classes L = 1.0, L = 0.1 and L = 0.01 in accordance with DIN 28090

This diagram shows the min. gasket pressure necessary to achieve the tightness for the above tightness classes at room temperature. Tightness class L= 0.1 allows a max. leakage of 1 mg nitrogen per second per meter of gasket length (mg/s·m).
The curves are shown for the standard thickness material.

Minimum gasket pressure σ_{BU} for tightness class L = 0.1

This three-dimensional diagram describes the behaviour of the gasket material with respect to the required minimum gasket pressure for a complete temperature range at 2 mm thickness. It clearly shows that the required minimum load decreases at medium and higher temperatures – the gasket will seal at lower surface loads under these conditions.

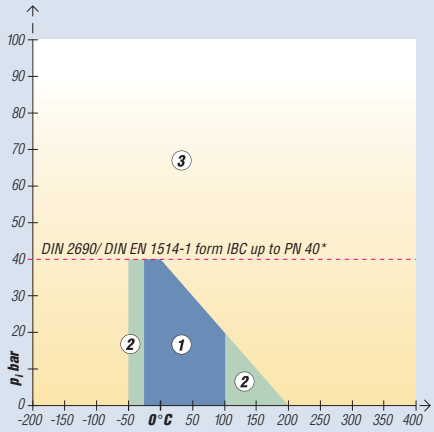
KLINGERSIL® C-8200
Information for your safety

So why does Klinger provide pT diagrams?

For the reasons given the pT diagram is not infallible: it serves as a rough guide for the end user who often has only the operating temperatures and pressures to go on.

Additional stresses such as greatly fluctuating load may significantly affect whether a gasket is suitable for the application.

Resistance to media must be taken into account in every case.



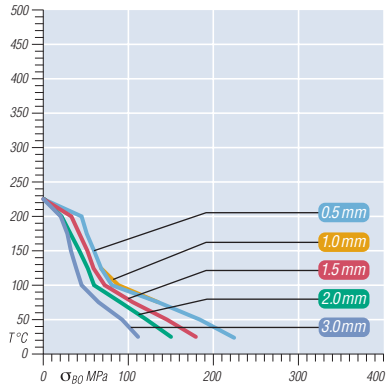
**Gaskets according to DIN 2690 are only standardised up to PN 40 and gasket thickness 2 mm.*

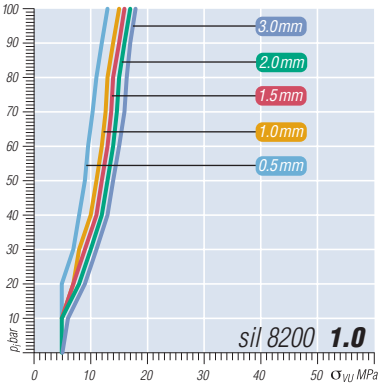
The fields of decision

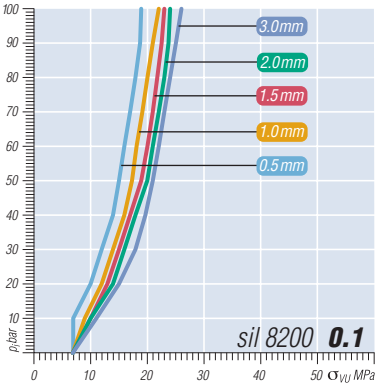
① If your operating temperatures and pressures fall within this field, a technical examination is normally unnecessary.

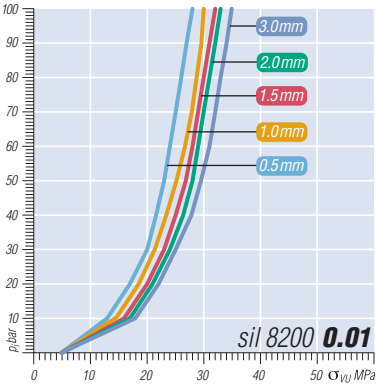
② If your operating temperatures and pressures are within this field, a technical examination is recommended.

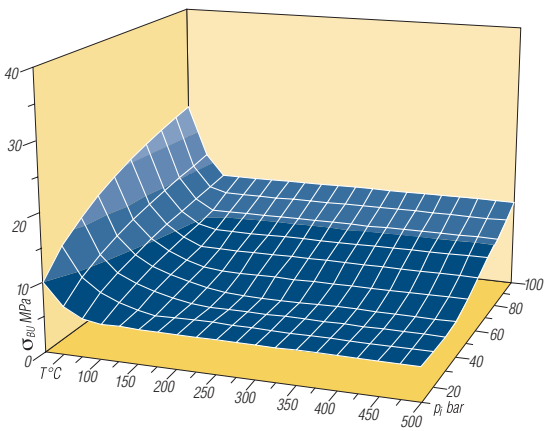
③ If your operating temperatures and pressures are within this "open" field, a technical examination is always necessary.



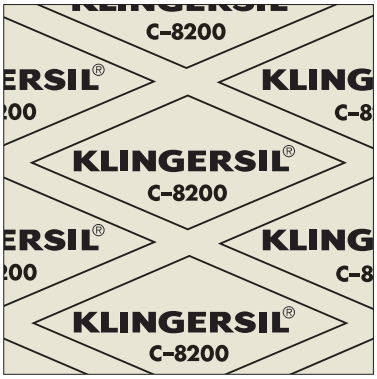








KLINGERSIL® C-8200
Technical data



Typical values for 2 mm thickness				
Compressibility ASTM F 36 J		*%*		*9*
Recovery ASTM F 36 J	*min*	*%*		*55*
Klinger cold/hot compression	*thickness decrease at 23°C*	*%*		*7*
25 MPa	*thickness decrease at 200°C*	*%*		*17*
Density		*g/cm³*		*1.7*
Acid tests				
Thickness increase	*HNO_3 , 96%, 18h/23 °C*	*%*		*unsuitable*
	H_2SO_4, 96%, 18h/23 °C	*%*		*10*
	H_2SO_4, 65%, 48h/23 °C	*%*		*8*
Average surface resistance	*R_{0A}*	*Ω*		*8.3x10E9*
Average specific volume resistance	*ρ_D*	*Ω cm*		*1.2x10E10*
Average dielectric strength		*kV/mm*		*17.5*
Average power factor	*1 kHz, ca.3 mm thickness*	*tan δ*		*0.27*
Average dielectric coefficient	*1 kHz, ca.3 mm thickness*	*εr*		*8.4*
ASME-Code sealing factors				
for gasket thickness 2,0 mm	*tightness class 1.0 mg/s x m*	*MPa*	*y*	*15*
and tightness classes		*MPa*	*m*	*3*
DIN 28090	*tightness class 0.1 mg/s x m*	*MPa*	*y*	*22.5*
		MPa	*m*	*4*
	tightness class 0.01 mg/s x m	*MPa*	*y*	*27.5*
		MPa	*m*	*4*

Klinger cold/hot compression
With this test method developed by Klinger you can evaluate the cold/hot compression of a gasket in cold and hot condition.

Unlike the method acc. to DIN 52913 and BS 7531, the surface load is kept constant during the complete test so that the gasket is exposed to much tougher conditions.

The thickness decrease at an ambient temperature of 23°C and at heating up to 200°C is measured.

The indicated thickness decrease at 200°C refers to the thickness obtained after loading at 23°C.

Dimensions of the standard sheets
Sizes:
1,000 x 1,500 mm, 1,500 x 2,000 mm.
Thicknesses:
0.5 mm, 1.0 mm, 1.5 mm,
2.0 mm, 3.0 mm;
other thicknesses on request.
Tolerances:
thickness ± 10%, length ± 50 mm,
width ± 50 mm

Rings and other finished gaskets
These gaskets are available in any size and corresponding sheet thicknesses, also edged and PTFE-covered.

Surfaces
The standard surface finish of the material is such that the surface has an extremely low adhesion. On request, graphite facings and other surface finishes on one or both sides are also available.

Function and durability
The performance and life of KLINGER gaskets depend in large measure on proper storage and fitting, factors beyond the manufactor's control. We can, however, vouch for the excellent quality of our products.

With this in mind, please also observe our installation instructions.

Tests and approvals
TÜV Poland.
BS 7531 Grade X.

Certified according to DIN EN ISO 9001:2000

Subject to technical alterations.
Status: December 2003