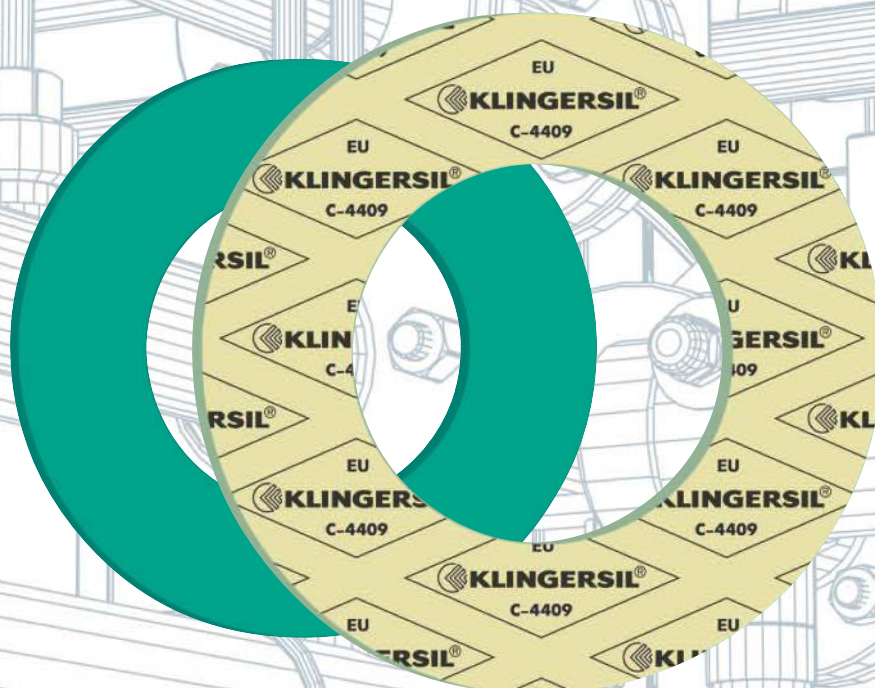


KLINGERSIL® C-4409

Greater security at
high thermal and mechanical
stress



KLINGERSIL® C-4409
Synthetic fibres bonded
with NBR.
High-pressure gasket.
High mechanical resistance
by expanded metal.
Chemical resistance against
oils, water, steam, hydro-
carbons as well as liquid and
gaseous chemicals.

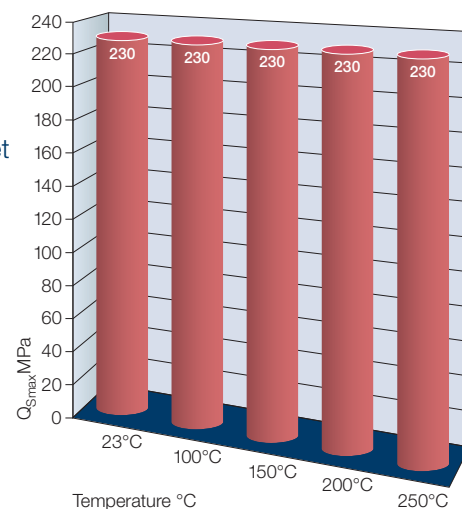
KLINGERSIL® C-4409

Gasket factors acc. to EN 13555

Maximum permissible surface pressure under operating condition Q_{Smax} acc. to EN 13555

The maximum surface pressure in operating condition is the maximum permissible surface pressure the gasket can be loaded at the specified temperatures.

To validate the test result of Q_{Smax} , P_{QR} values are provided. An evaluation of the tested gasket regarding unacceptable extrusion in the bore or damage of the gasket is also required.



The diagram shows these values for the various temperature ratings.

Creep relaxation factor P_{QR} acc. to EN 13555

This factor considers the relaxation influence on the gasket load between the tightening of the bolts and the long-term effect of the service temperature.

P _{QR} values for stiffness 500 kN/mm, gasket thickness 2 mm				
Temperature	Gasket stress		P _{QR} at Q _{Smax}	Q _{Smax} (MPa)
	30 MPa	50 MPa		
23°C	0.94	0.96	0.99	230
100°C	0.87	0.91	0.92	230
150°C	0.85	0.89	0.86	230
200°C	0.81	0.87	0.84	230
250°C	0.72	0.82	0.80	230

Secant unloading modulus of the gasket E_G and gasket thickness e_G acc. to EN 13555

Secant unloading modulus of the gasket E _G (MPa) and gasket thickness e _G (mm)										
Gasket stress	Ambient temperature		Temperature 100°C		Temperature 150°C		Temperature 200°C		Temperature 250°C	
MPa	E _G MPa	e _G mm	E _G MPa	e _G mm	E _G MPa	e _G mm	E _G MPa	e _G mm	E _G MPa	e _G mm
1		1.963		1.957		1.960		1.962		1.960
20	1014	1.823	1259	1.793	1692	1.788	1821	1.782	2353	1.769
30	1512	1.784	1723	1.769	1979	1.771	2094	1.766	2511	1.752
40	2054	1.755	2128	1.740	2160	1.748	2266	1.746	2591	1.733
50	2560	1.731	2471	1.716	2360	1.723	2421	1.724	2826	1.715
60	3141	1.711	2799	1.694	2580	1.700	2656	1.703	3361	1.700
80	4016	1.680	3509	1.653	3255	1.655	3245	1.662	4040	1.675
100	4951	1.655	4053	1.617	3908	1.617	3860	1.623	4267	1.649
120	5639	1.635	4611	1.585	4349	1.579	4301	1.583	4616	1.623
140	6296	1.619	5126	1.555	4816	1.543	4536	1.543	4908	1.594
160	6826	1.605	5558	1.526	4966	1.509	4796	1.508	5097	1.564
180	7265	1.592	5760	1.498	5185	1.480	4979	1.477	5270	1.537
200	7662	1.581	6036	1.472	5538	1.454	5181	1.450	5557	1.513
220	8105	1.570	6243	1.448	5747	1.431	5444	1.427	5806	1.493
230	8104	1.562	6321	1.433	5824	1.417	5449	1.414	5885	1.480

KLINGERSIL® C-4409

Gasket factors acc. to EN 13555

Minimum surface pressure $Q_{\min(L)}$ acc. to EN13555 (Installation)

The minimum surface pressure during installation is the minimum required surface pressure, which has to be applied on the gasket surface during assembly at room temperature.

This is to assure that the gasket can adjust to the roughness of the flange surfaces, that internal leakage paths can be tightened and that the required tightness class L for the specified internal pressure will be achieved.

Minimum surface pressure $Q_{S\min(L)}$ acc. to EN13555 (Operating condition)

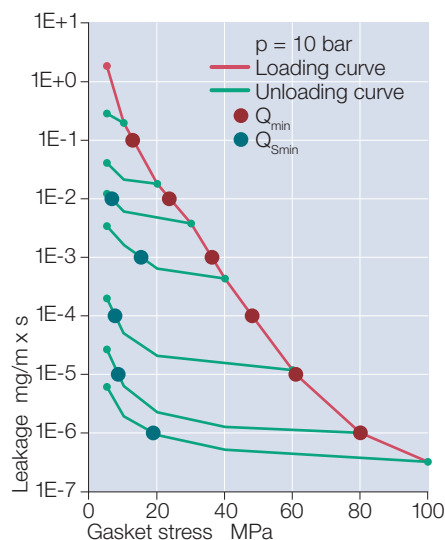
The minimum surface pressure in service is the minimum required surface pressure, which has to be applied on the gasket surface under operating conditions, i.e. after unloading during service, in order to keep the required tightness class L for the specified internal pressure.

Minimum stress to seal for tightness class L

$Q_{\min(L)}$ at assembly/ $Q_{S\min(L)}$ after off-loading 10 bar

L	$Q_{\min(L)}$	$Q_{S\min(L)}$ MPa						
mg/s x m	MPa	$Q_A = 10$ MPa	$Q_A = 20$ MPa	$Q_A = 30$ MPa	$Q_A = 40$ MPa	$Q_A = 60$ MPa	$Q_A = 80$ MPa	$Q_A = 100$ MPa
10^{-0}	6	5	5	5	5	5	5	5
10^{-1}	13		5	5	5	5	5	5
10^{-2}	23			6	5	5	5	5
10^{-3}	36				15	5	5	5
10^{-4}	48					8	5	5
10^{-5}	61						9	5
10^{-6}	80							19

Q_A = Stress on the gasket during installation before unloading

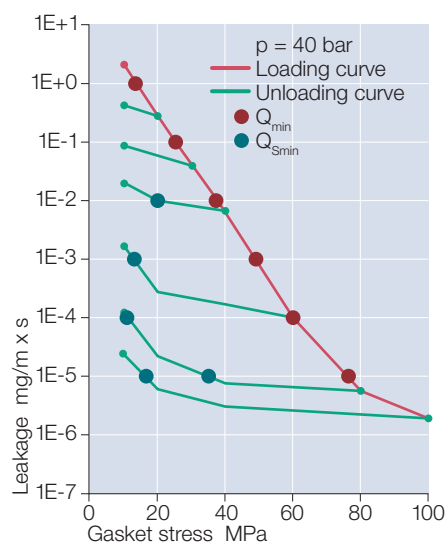


Minimum stress to seal for tightness class L

$Q_{\min(L)}$ at assembly/ $Q_{S\min(L)}$ after off-loading 40 bar

L	$Q_{\min(L)}$	$Q_{S\min(L)}$ MPa					
mg/s x m	MPa	$Q_A = 20$ MPa	$Q_A = 30$ MPa	$Q_A = 40$ MPa	$Q_A = 60$ MPa	$Q_A = 80$ MPa	$Q_A = 100$ MPa
10^{-0}	13	10	10	10	10	10	10
10^{-1}	25		10	10	10	10	10
10^{-2}	37			20	10	10	10
10^{-3}	49				13	10	10
10^{-4}	60					11	10
10^{-5}	76						35
10^{-6}							16

Q_A = Stress on the gasket during installation before unloading



KLINGERSIL® C-4409

Technical values

High-pressure gasket.
Chemical resistance against oils, water, steam, hydrocarbons as well as liquid and gaseous chemicals.

■ Basis

Synthetic fibres bonded with NBR.
High mechanical resistance by expanded metal.

■ Dimensions

of the standard sheets

Sizes KLINGERSIL®C-4409:
1,000 x 1,500 mm,
1,500 x 2,000 mm

Sizes KLINGERSIL®C-4409 L:
1,000 x 1,230 mm,
2,000 x 1,230 mm

Thicknesses:

1.0 mm, 1.5 mm

Tolerances:

Thickness acc. DIN 28091-1,
length ± 50 mm, width ± 50 mm.

Other thicknesses, sizes and tolerances on request.

■ Reinforcement with stainless steel

KLINGERSIL®C-4409 is reinforced with expanded metal made from carbon steel 1.1203.

Also available is a version reinforced with stainless steel 1.4301 named KLINGERSIL®C-4409 L.
The specification is the same as for KLINGERSIL®C-4409.

Typical values for thickness 1.5 mm

Compressibility ASTM F 36 J		%	7
Recovery ASTM F 36 J		%	50
Stress relaxation DIN 52913	50 MPa, 16 h/300°C	MPa	35
Stress relaxation BS 7531	40 MPa, 16 h/300°C	MPa	32
KLINGER cold/hot compression	thickness decrease at 23°C	%	10
50 MPa	thickness decrease at 300°C	%	10
Specific leakrate λ	VDI 2440	mbar x l/s x m	5.2E-05
Thickness increase after fluid immersion ASTM F 146	oil IRM 903: 5 h/150°C	%	5
	fuel B: 5 h/23°C	%	10
Density		g/cm³	2.0

ASME-Code sealing factors

for gasket thickness 1.0 mm	tightness class 0.1 mg/s x m	MPa	y 30
			m 3
for gasket thickness 2.0 mm	tightness class 0.1 mg/s x m	MPa	y 30
			m 3.2
for gasket thickness 3.0 mm	tightness class 0.1 mg/s x m	MPa	y 30
			m 3.8

Classification acc. to BS 7531:2006 Grade Y

■ Optimal thickness

The specifically technical advantages of this gasket material are optimal used in thickness of 1.5 mm.

■ Surfaces

KLINGERSIL® gasket materials are generally furnished with surfaces of low adhesion.

■ Function and durability

The performance and service life of KLINGER gaskets depend in large measure on proper storage and fitting, factors beyond the manufacturer'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

German Lloyd
TA-Luft (Clean air)