

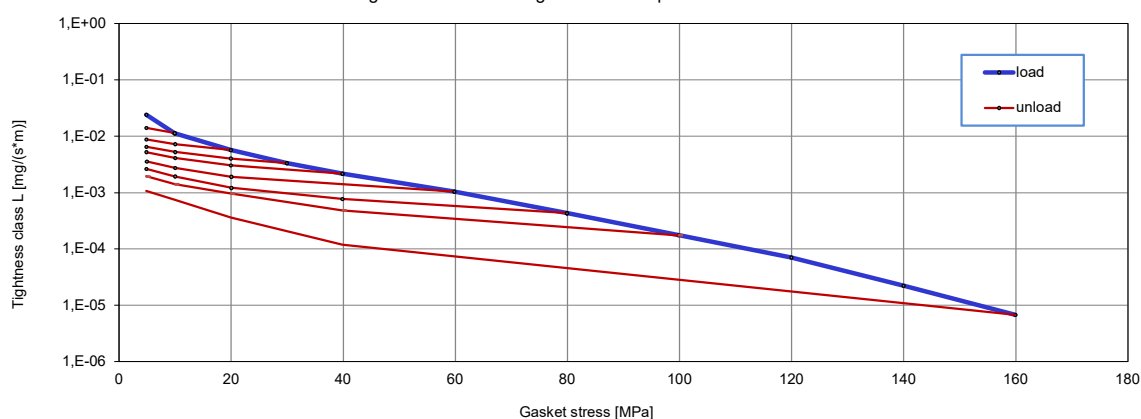
		LABORATORY OF SEALING MATERIALS 43-382 Bielsko-Biała, ul. Szyprów 17 tel. +48 33 8184133 e-mail: lbmu@spetech.com.pl www.laboratory.spetech.eu			 DAK 100-001 210/A13/9952
Company		SPETECH sp. z o.o.			
Gasket Type		SPETOGRAF® GUS® 20			 LB - 12402
Dimensions [mm]		92 x 49 x 1,5 (DN40 PN40)			
Calculation type EN 1591-1		a) flat gasket;		EN 1514-1	IBC
Notes:	Rev.0 (04-03-2021)				

Factors acc. to EN 13555 to use in calculation standard EN 1591-1:2009/ :2013

Minimum level of surface pressure required for leakage rate class L on assembly $Q_{min/L}$ and after off-loading $Q_{Smin/L}$ at room temperature (RT)

Internal pressure [bar]		10									
L [mg/(s·m)]	$Q_{min/L}$ [MPa]	$Q_{Smin/L}$ [MPa] for effective gasket stress									
		$Q_A = 10$ [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]	$Q_A = 160$ [MPa]		
10^{-0}	5	5	5	5	5	5	5	5	5		
10^{-1}	5	5	5	5	5	5	5	5	5		
10^{-2}	12		5	5	5	5	5	5	5		
10^{-3}	61						28	19	6		
10^{-4}	112								46		
10^{-5}	153								143		
10^{-6}											
10^{-7}											

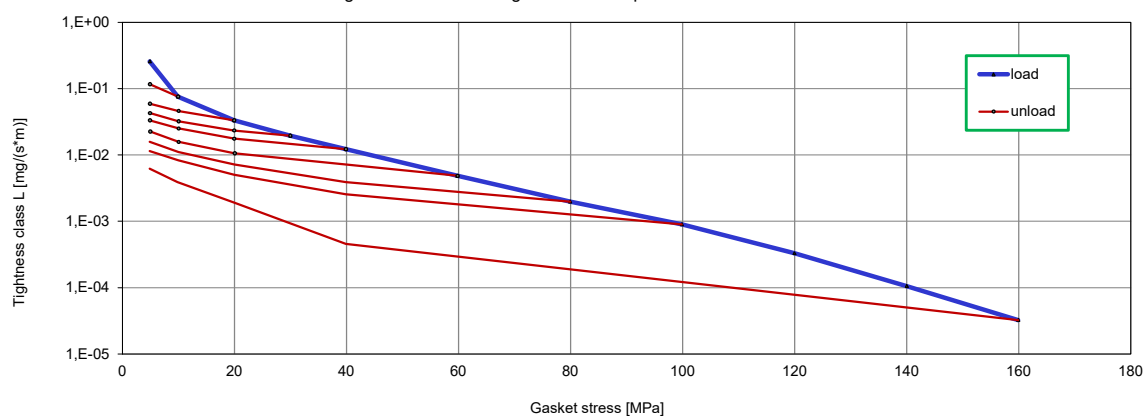
Leakage rate in function of gasket stress - pressure 10 bar / RT



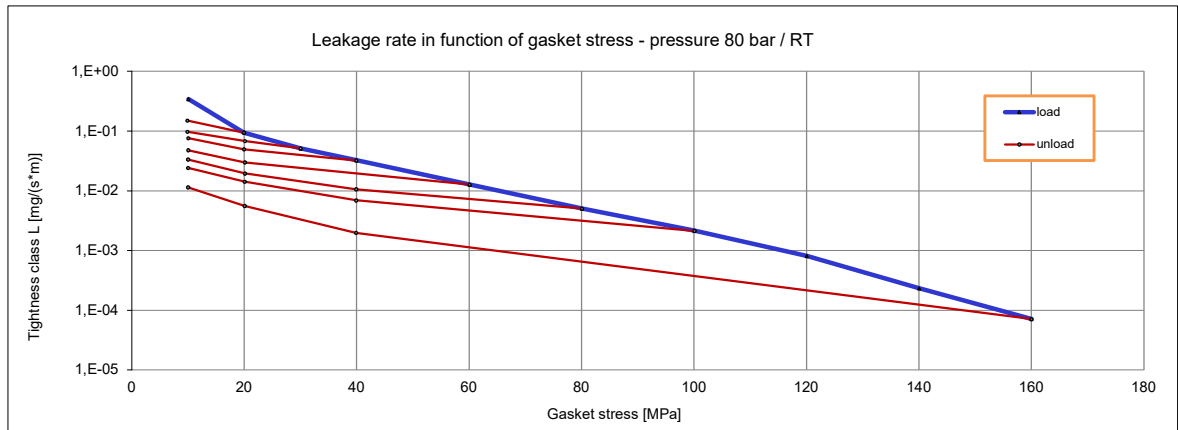
Minimum level of surface pressure required for leakage rate class L on assembly $Q_{min/L}$ and after off-loading $Q_{Smin/L}$ at room temperature (RT)

Internal pressure [bar]		40									
L [mg/(s·m)]	$Q_{min/L}$ [MPa]	$Q_{Smin/L}$ [MPa] for effective gasket stress									
		$Q_A = 10$ [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]	$Q_A = 160$ [MPa]		
10^{-0}	5	5	5	5	5	5	5	5	5		
10^{-1}	9	7	5	5	5	5	5	5	5		
10^{-2}	44					23	13	7	5		
10^{-3}	98							96	29		
10^{-4}									109		
10^{-5}											
10^{-6}											
10^{-7}											
10^{-8}											

Leakage rate in function of gasket stress - pressure 40 bar / RT



Minimum level of surface pressure required for leakage rate class L on assembly Q _{min/L} and after off-loading Q _{Smin/L} at room temperature (RT)											
Internal pressure [bar]		80									
L [mg/(s·m)]	Q _{min/L} [MPa]	Q _{Smin/L} [MPa] for effective gasket stress									
		Q _A = 20 [MPa]	Q _A = 30 [MPa]	Q _A = 40 [MPa]	Q _A = 60 [MPa]	Q _A = 80 [MPa]	Q _A = 100 [MPa]	Q _A = 160 [MPa]			
10 ⁻⁰	10	10	10	10	10	10	10	10			
10 ⁻¹	19	18	10	10	10	10	10	10			
10 ⁻²	66					44	30	12			
10 ⁻³	115							64			
10 ⁻⁴	154							146			
10 ⁻⁵											
10 ⁻⁶											
10 ⁻⁷											
10 ⁻⁸											

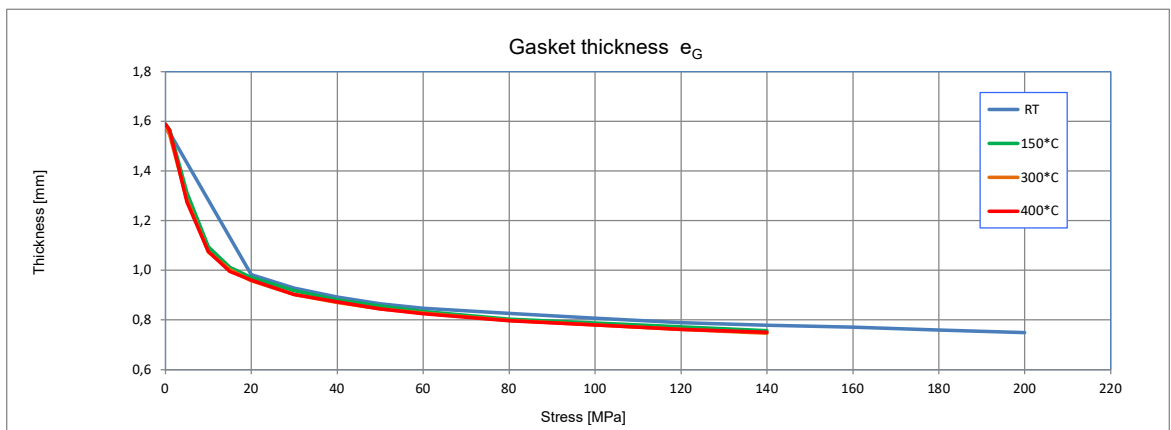


RT								
Temperature								
Gasket stress	E _G	e _G	C=500 kN/mm		C=1500 kN/mm		Q _{Smax}	μ _G
			P _{QR}	Δe _{Gc}	P _{QR}	Δe _{Gc}		
[MPa]	[MPa]	[mm]	[-]	[mm]	[-]	[mm]	[MPa]	[-]
0		1,570					200	0,10
1		1,553						
20	378	0,982						
30	647	0,928	0,99	0,003				
40	798	0,892						
50	1053	0,865	1,00	0,000				
60	1429	0,847						
80	3005	0,826						
100	3168	0,807						
120	2926	0,789						
140	4660	0,779						
160	6138	0,771						
180	6979	0,760						
200	5462	0,749	1,00	0,000				

150°C								
Temperature								
Gasket stress	E _G	e _G	C=500 kN/mm		C=1500 kN/mm		Q _{Smax}	μ _G
			P _{QR}	Δe _{Gc}	P _{QR}	Δe _{Gc}		
[MPa]	[MPa]	[mm]	[-]	[mm]	[-]	[mm]	[MPa]	[-]
0		1,589					140	0,10
1		1,566						
5	84	1,312						
10	209	1,095						
15	276	1,012						
20	466	0,971						
30	745	0,918	0,95	0,013				
40	870	0,880						
50	1344	0,856	0,97	0,013				
60	1565	0,835						
80	2170	0,804						
100	4350	0,788						
120	6620	0,773						
140	4681	0,757	0,99	0,012				

300°C								
Temperature								
Gasket stress	E_G	e_G	C=500 kN/mm		C=1500 kN/mm		Q_{smax}	μ_G
			P_{QR}	Δe_{Gc}	P_{QR}	Δe_{Gc}		
[MPa]	[MPa]	[mm]	[-]	[mm]	[-]	[mm]	[MPa]	[-]
0		1,580					140	0,10
1		1,545						
5	86	1,284						
10	200	1,074						
15	341	1,003						
20	464	0,958						
30	699	0,903	0,94	0,015				
40	1091	0,871						
50	1204	0,844	0,97	0,013				
60	1679	0,828						
80	2665	0,799						
100	3126	0,781						
120	4390	0,763						
140	3999	0,746	0,98	0,023				

400°C								
Temperature								
Gasket stress	E_G	e_G	C=500 kN/mm		C=1500 kN/mm		Q_{smax}	μ_G
			P_{QR}	Δe_{Gc}	P_{QR}	Δe_{Gc}		
[MPa]	[MPa]	[mm]	[-]	[mm]	[-]	[mm]	[MPa]	[-]
0		1,588					140	0,10
1		1,563						
5	98	1,275						
10	210	1,075						
15	293	0,996						
20	568	0,961						
30	687	0,903	0,93	0,018				
40	1061	0,873						
50	1145	0,845	0,97	0,013				
60	1517	0,825						
80	2841	0,797						
100	3752	0,780						
120	3956	0,763						
140	4146	0,751	0,98	0,023				



Description:	E_G	Modulus of elasticity	Q_{smax}	Maximum surface pressure
	e_G	Gasket or sealing element thickness	μ_G	Static friction factor (based on EN1591-1:2014 Annex E)
	P_{QR}	Creep relaxation factor	C	Stiffness
	Δe_{Gc}	Gasket thickness change due to creep		

Factors acc. to EN 13555 to use in calculation standard EN 1591-1:2001

T [°C]	Q_{min} [MPa]	$Q_{max, ref}$ [MPa]	E_0 [MPa]	K_1	Q_i/P	g_c	c_1
20	10	100	1	28	1,3	1,0	
100		90	1	28	1,3	1,0	
200		80	1	28	1,3	1,0	
300		70	1	28	1,3	1,0	
400							

b_{Gref} [mm]	19,5	e_{Gref} [mm]	1,5
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Factors acc. to:

EN 13445-3 : Unfired pressure vessels - Part 3: Design
 EN 13480-3:2002 Metallic industrial piping - Part 3: Design and calculation
 ASME Code s. VIII Boiler & Pressure Vessel Code

m	y [psi]	y [MPa]
2,52	2500	17,2

σ_{max} - see maximal applicable gasket stress Q_{smax} acc. EN 1591-1:2009/2013

Factors acc. to:

AD 2000-Merkblatt B7 August 2007

$k_0 k_D$ [N/mm]	k_1 [mm]	$k_0 k_D$ [N/mm]
$7,0 \cdot b_D$	$2,0 \cdot b_D$	$\cdot b_D$

 σ_{max} - see maximal applicable gasket stress Q_{smax} acc. EN 1591-1:2009/2013**Factors acc. to:**

WUDT-UC-WO-O/19

σ_m [MPa]	σ_r [MPa]	b [1]				
		20°C	100°C	200°C	300°C	400°C
17,5	$5,0 \cdot p_0$	1,0	1,1	1,1	1,1	1,2

 σ_{max} - see maximal applicable gasket stress Q_{smax} acc. EN 1591-1:2009/2013**Factors acc. to:**ASTM F36-2003 Standard Test Method for Compressibility and Recovery of Gasket Materials
Procedure J

Compressibility [%]	Recovery [%]
42,4	15,9

Factors acc. to:

ASTM F38-00 Standard Test Methods for Creep Relaxation of a Gasket Material (Method B)

Temperature [°C]	Creep Relaxation [%]
20	11,9
100	17,2
200	19,3

Factors acc. to:

EN 61340-2-3 Electrostatics - Part 2-3: Methods of test for determining the resistance and resistivity of solid planar materials used to avoid electrostatic charge accumulation

Surface resistance R_s at U=10V	[Ω]		NDA
Volume resistance R_v at U=10V	[Ω]		NDA
Surface resistivity ρ_s at U=10V	[Ω]		NDA
Volume resistivity ρ_v at U=10V	[Ωm]		NDA