

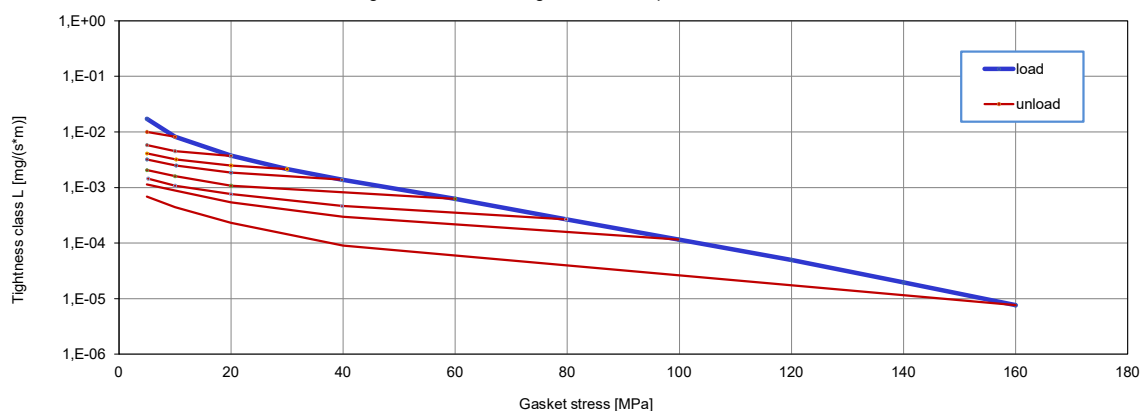
|                                                                                   |                    |                                                                                                                                                                   |  |           |                                                                                                                                                     |     |
|-----------------------------------------------------------------------------------|--------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------|--|-----------|-----------------------------------------------------------------------------------------------------------------------------------------------------|-----|
|  |                    | <b>LABORATORY OF SEALING MATERIALS</b><br>43-382 Bielsko-Biała, ul. Szyprów 17<br>tel. +48 33 8184133    e-mail: lbmu@spetech.com.pl    www.laboratory.spetech.eu |  |           | <br>TUV Rheinland<br>CERTIFIED<br>DIN EN ISO 9001<br>210/AL/5952 |     |
| Company                                                                           |                    | SPETECH sp. z o.o.                                                                                                                                                |  |           |                                                                                                                                                     |     |
| Gasket Type                                                                       |                    | SPETFOGRAF® GUS® 20                                                                                                                                               |  |           | <br>LB - 12402                                                   |     |
| Dimensions [mm]                                                                   |                    | 92 x 49 x 0,75 (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                 |  |  |
| $10^{-2}$               | 9                 | 5                                              | 5                | 5                | 5                | 5                | 5                | 5                 | 5                 |  |  |
| $10^{-3}$               | 48                |                                                |                  |                  |                  | 26               | 13               | 8                 | 5                 |  |  |
| $10^{-4}$               | 104               |                                                |                  |                  |                  |                  |                  |                   | 37                |  |  |
| $10^{-5}$               | 154               |                                                |                  |                  |                  |                  |                  |                   | 146               |  |  |
| $10^{-6}$               |                   |                                                |                  |                  |                  |                  |                  |                   |                   |  |  |
| $10^{-7}$               |                   |                                                |                  |                  |                  |                  |                  |                   |                   |  |  |

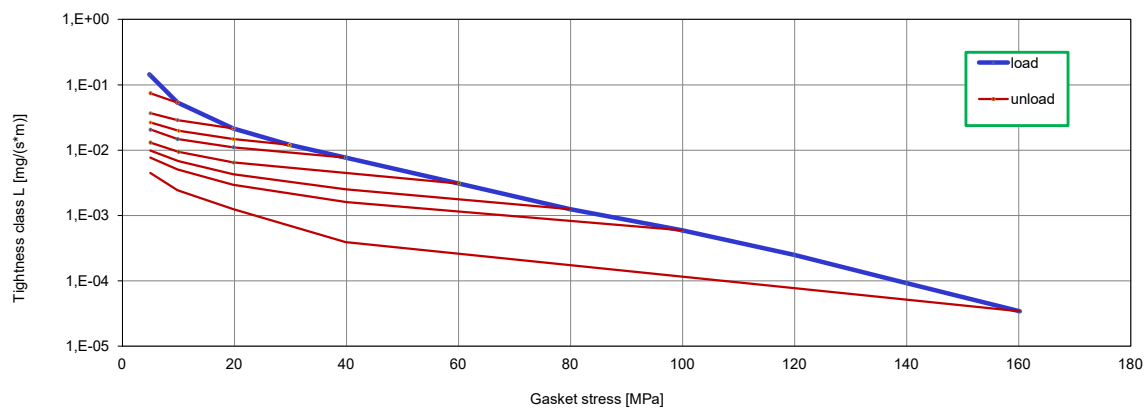
Leakage rate in function of gasket stress - pressure 10 bar / RT



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                 |  |  |
| $10^{-1}$               | 7                 | 5                                              | 5                | 5                | 5                | 5                | 5                | 5                 | 5                 |  |  |
| $10^{-2}$               | 34                |                                                |                  |                  | 25               | 9                | 5                | 5                 | 5                 |  |  |
| $10^{-3}$               | 86                |                                                |                  |                  |                  |                  |                  | 69                | 24                |  |  |
| $10^{-4}$               | 138               |                                                |                  |                  |                  |                  |                  |                   | 108               |  |  |
| $10^{-5}$               |                   |                                                |                  |                  |                  |                  |                  |                   |                   |  |  |
| $10^{-6}$               |                   |                                                |                  |                  |                  |                  |                  |                   |                   |  |  |
| $10^{-7}$               |                   |                                                |                  |                  |                  |                  |                  |                   |                   |  |  |
| $10^{-8}$               |                   |                                                |                  |                  |                  |                  |                  |                   |                   |  |  |

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

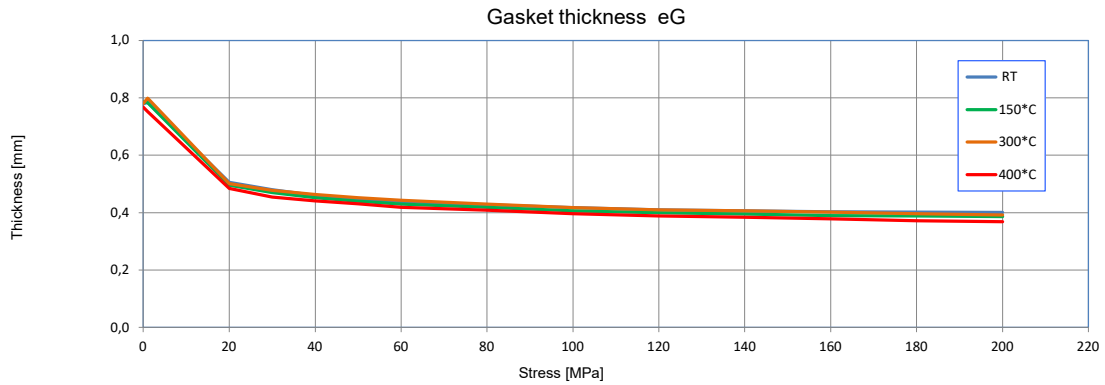


| Temperature   | RT             |                |                 |                  |                 |                  |                   |                |
|---------------|----------------|----------------|-----------------|------------------|-----------------|------------------|-------------------|----------------|
| Gasket stress | E <sub>G</sub> | e <sub>G</sub> | C=500 kN/mm     |                  | C=1500 kN/mm    |                  | Q <sub>smax</sub> | μ <sub>G</sub> |
|               |                |                | P <sub>QR</sub> | Δe <sub>Gc</sub> | P <sub>QR</sub> | Δe <sub>Gc</sub> |                   |                |
| [MPa]         | [MPa]          | [mm]           | [ - ]           | [mm]             | [ - ]           | [mm]             | [MPa]             | [ - ]          |
| 0             |                | 0,779          |                 |                  |                 |                  | 200               | 0,10           |
| 1             |                | 0,784          |                 |                  |                 |                  |                   |                |
| 20            | 504            | 0,505          |                 |                  |                 |                  |                   |                |
| 30            | 794            | 0,480          | 1,00            | 0,000            |                 |                  |                   |                |
| 40            | 760            | 0,460          |                 |                  |                 |                  |                   |                |
| 50            | 1185           | 0,447          | 1,00            | 0,000            |                 |                  |                   |                |
| 60            | 1598           | 0,438          |                 |                  |                 |                  |                   |                |
| 80            | 3678           | 0,427          |                 |                  |                 |                  |                   |                |
| 100           | 4043           | 0,417          |                 |                  |                 |                  |                   |                |
| 120           | 4130           | 0,409          |                 |                  |                 |                  |                   |                |
| 140           | 7332           | 0,406          |                 |                  |                 |                  |                   |                |
| 160           | 13373          | 0,403          |                 |                  |                 |                  |                   |                |
| 180           | 26277          | 0,401          |                 |                  |                 |                  |                   |                |
| 200           | 30055          | 0,400          | 1,00            | 0,000            |                 |                  |                   |                |

| Temperature   | 150°C          |                |                 |                  |                 |                  |                   |                |
|---------------|----------------|----------------|-----------------|------------------|-----------------|------------------|-------------------|----------------|
| Gasket stress | E <sub>G</sub> | e <sub>G</sub> | C=500 kN/mm     |                  | C=1500 kN/mm    |                  | Q <sub>smax</sub> | μ <sub>G</sub> |
|               |                |                | P <sub>QR</sub> | Δe <sub>Gc</sub> | P <sub>QR</sub> | Δe <sub>Gc</sub> |                   |                |
| [MPa]         | [MPa]          | [mm]           | [ - ]           | [mm]             | [ - ]           | [mm]             | [MPa]             | [ - ]          |
| 0             |                | 0,785          |                 |                  |                 |                  | 200               | 0,10           |
| 1             |                | 0,783          |                 |                  |                 |                  |                   |                |
| 20            | 554            | 0,495          |                 |                  |                 |                  |                   |                |
| 30            | 718            | 0,470          | 0,96            | 0,011            |                 |                  |                   |                |
| 40            | 878            | 0,452          |                 |                  |                 |                  |                   |                |
| 50            | 1228           | 0,440          | 0,97            | 0,013            |                 |                  |                   |                |
| 60            | 1580           | 0,430          |                 |                  |                 |                  |                   |                |
| 80            | 2952           | 0,418          |                 |                  |                 |                  |                   |                |
| 100           | 2631           | 0,406          |                 |                  |                 |                  |                   |                |
| 120           | 3119           | 0,399          |                 |                  |                 |                  |                   |                |
| 140           | 7950           | 0,395          |                 |                  |                 |                  |                   |                |
| 160           | 9844           | 0,390          |                 |                  |                 |                  |                   |                |
| 180           | 22151          | 0,388          |                 |                  |                 |                  |                   |                |
| 200           | 22066          | 0,386          | 0,99            | 0,017            |                 |                  |                   |                |

| Temperature   | 300°C          |                |                 |                  |                 |                  |                   |                |
|---------------|----------------|----------------|-----------------|------------------|-----------------|------------------|-------------------|----------------|
| Gasket stress | E <sub>G</sub> | e <sub>G</sub> | C=500 kN/mm     |                  | C=1500 kN/mm    |                  | Q <sub>smax</sub> | μ <sub>G</sub> |
|               |                |                | P <sub>QR</sub> | Δe <sub>Gc</sub> | P <sub>QR</sub> | Δe <sub>Gc</sub> |                   |                |
| [MPa]         | [MPa]          | [mm]           | [ - ]           | [mm]             | [ - ]           | [mm]             | [MPa]             | [ - ]          |
| 0             |                | 0,780          |                 |                  |                 |                  | 200               | 0,10           |
| 1             |                | 0,799          |                 |                  |                 |                  |                   |                |
| 20            | 623            | 0,501          |                 |                  |                 |                  |                   |                |
| 30            | 875            | 0,478          | 0,95            | 0,014            |                 |                  |                   |                |
| 40            | 1353           | 0,463          |                 |                  |                 |                  |                   |                |
| 50            | 1868           | 0,452          | 0,95            | 0,021            |                 |                  |                   |                |
| 60            | 2004           | 0,443          |                 |                  |                 |                  |                   |                |
| 80            | 2794           | 0,429          |                 |                  |                 |                  |                   |                |
| 100           | 4298           | 0,417          |                 |                  |                 |                  |                   |                |
| 120           | 4350           | 0,410          |                 |                  |                 |                  |                   |                |
| 140           | 7213           | 0,406          |                 |                  |                 |                  |                   |                |
| 160           | 10396          | 0,401          |                 |                  |                 |                  |                   |                |
| 180           | 6625           | 0,396          |                 |                  |                 |                  |                   |                |
| 200           | 7195           | 0,392          | 0,99            | 0,017            |                 |                  |                   |                |

| Temperature   | 400°C          |                |                 |                  |                 |                  |                   |                |
|---------------|----------------|----------------|-----------------|------------------|-----------------|------------------|-------------------|----------------|
| Gasket stress | E <sub>G</sub> | e <sub>G</sub> | C=500 kN/mm     |                  | C=1500 kN/mm    |                  | Q <sub>smax</sub> | μ <sub>G</sub> |
|               |                |                | P <sub>QR</sub> | Δe <sub>Gc</sub> | P <sub>QR</sub> | Δe <sub>Gc</sub> |                   |                |
| [MPa]         | [MPa]          | [mm]           | [ - ]           | [mm]             | [ - ]           | [mm]             | [MPa]             | [ - ]          |
| 0             |                | 0,768          |                 |                  |                 |                  | 200               | 0,10           |
| 1             |                | 0,752          |                 |                  |                 |                  |                   |                |
| 20            | 585            | 0,484          |                 |                  |                 |                  |                   |                |
| 30            | 749            | 0,454          | 0,94            | 0,016            |                 |                  |                   |                |
| 40            | 2795           | 0,441          |                 |                  |                 |                  |                   |                |
| 50            | 2626           | 0,431          | 0,94            | 0,013            |                 |                  |                   |                |
| 60            | 1862           | 0,418          |                 |                  |                 |                  |                   |                |
| 80            | 12734          | 0,408          |                 |                  |                 |                  |                   |                |
| 100           | 3377           | 0,396          |                 |                  |                 |                  |                   |                |
| 120           | 5138           | 0,388          |                 |                  |                 |                  |                   |                |
| 140           | 10711          | 0,384          |                 |                  |                 |                  |                   |                |
| 160           | 52974          | 0,378          |                 |                  |                 |                  |                   |                |
| 180           | 40749          | 0,372          |                 |                  |                 |                  |                   |                |
| 200           | 250453         | 0,368          | 0,99            | 0,025            |                 |                  |                   |                |



|              |                 |                                      |            |                                                         |
|--------------|-----------------|--------------------------------------|------------|---------------------------------------------------------|
| Description: | $E_G$           | Modulus of elasticity                | $Q_{smax}$ | Maximum surface pressure                                |
|              | $e_G$           | Gasket or sealing element thickness  | $\mu_G$    | Static friction factor (based on EN1591-1:2014 Annex E) |
|              | $P_{QR}$        | Creep relaxation factor              | $C$        | Stiffness                                               |
|              | $\Delta e_{Gc}$ | 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] | $K_1$ | $Q_0/P$ | $g_c$ | $c_1$ |
|--------|-----------------|----------------------|-------------|-------|---------|-------|-------|
| 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] | 0,8 |
|-----------------|------|-----------------|-----|

#### 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    | $\gamma$ [psi] | $\gamma$ [MPa] |
|------|----------------|----------------|
| 2,52 | 2500           | 17,2           |

$\sigma_{max}$  - 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]      | $k_0 k_3$ [N/mm] |
|------------------|-----------------|------------------|
| $7,0 \cdot b_D$  | $2,0 \cdot b_D$ | $\cdot b_D$      |

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

#### Factors acc. to:

WUDT-UC-WO-O/19

| $\sigma_m$ [MPa] | $\sigma_r$ [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   |

$\sigma_{max}$  - 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 [%] |
|---------------------|--------------|
| NDA                 | NDA          |

#### Factors acc. to:

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

| Temperature [°C] | Creep Relaxation [%] |
|------------------|----------------------|
| 20               | NDA                  |
| 100              | NDA                  |
| 200              | NDA                  |

#### 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     | [ $\Omega$ ]   |  | NDA |
| Volume resistance $R_v$ at U=10V      | [ $\Omega$ ]   |  | NDA |
| Surface resistivity $\rho_s$ at U=10V | [ $\Omega$ ]   |  | NDA |
| Volume resistivity $\rho_v$ at U=10V  | [ $\Omega m$ ] |  | NDA |