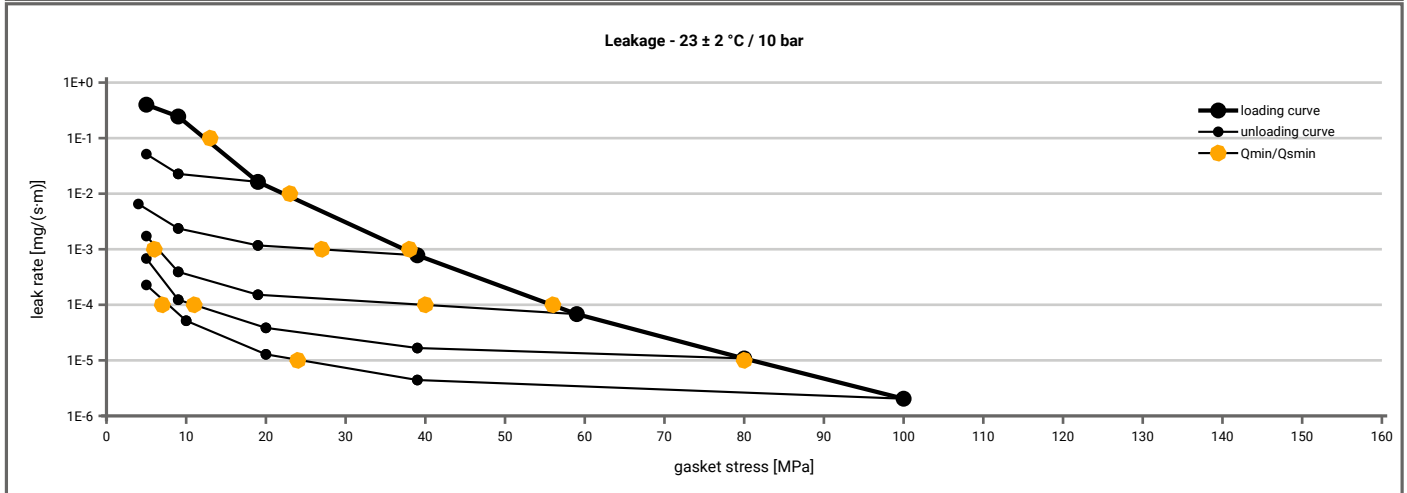


|                      |  |   |
|----------------------|--|---|
| Manufacturer address | KLINGER GmbH, Richard Klinger Str. 37, 65510 Idstein, DE | According to<br><b>DIN EN 13555</b><br>2005-2 |
| Product name         | KLINGER® top-graph-2000                                  |   |
| Product dimensions   | 92 x 49 x 2 mm (DIN EN 1514-1 1997-8)                    |   |

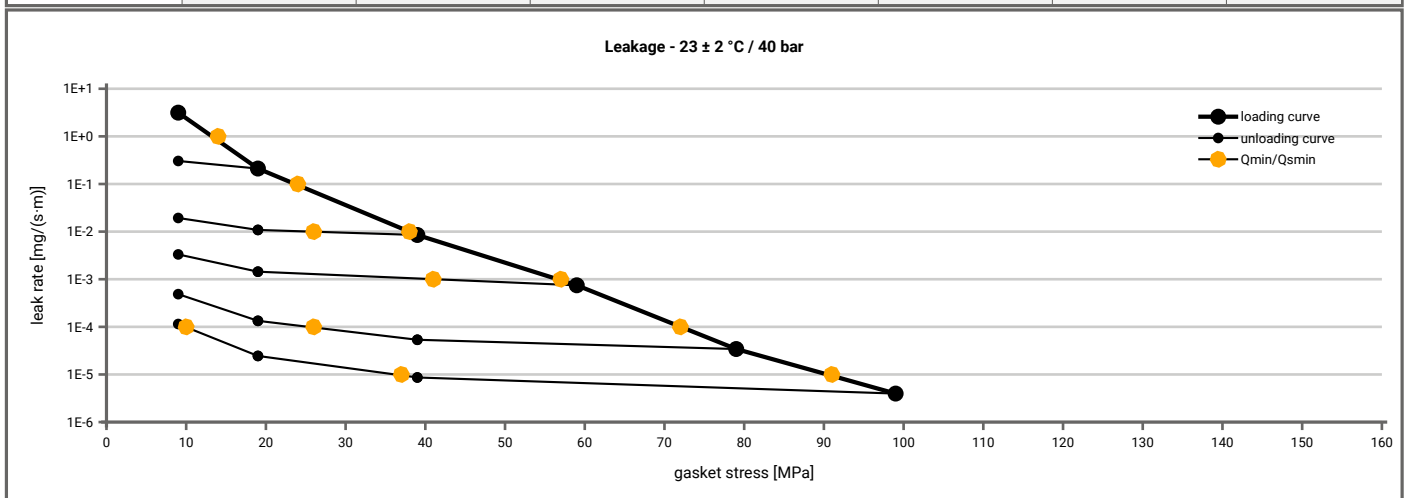
Minimum stress to seal  $Q_{min(L)}$  (at assembly),  $Q_{smin(L)}$  (after off-loading) for  $p = 10$  bar ( $T = 23 \pm 2$  °C)

| L [mg/(s·m)] | $Q_{min(L)}$ [MPa] | $Q_{smin(L)}$ [MPa] |                  |                  |                  |                  |                  |                   |
|--------------|--------------------|---------------------|------------------|------------------|------------------|------------------|------------------|-------------------|
|              |                    | $Q_A = 5$ [MPa]     | $Q_A = 10$ [MPa] | $Q_A = 20$ [MPa] | $Q_A = 40$ [MPa] | $Q_A = 60$ [MPa] | $Q_A = 80$ [MPa] | $Q_A = 100$ [MPa] |
| 1E-0         | 5                  |                     |                  | 5                | 5                | 5                | 5                | 5                 |
| 1E-1         | 13                 |                     |                  | 5                | 5                | 5                | 5                | 5                 |
| 1E-2         | 23                 |                     |                  |                  | 5                | 5                | 5                | 5                 |
| 1E-3         | 38                 |                     |                  |                  | 28               | 7                | 5                | 5                 |
| 1E-4         | 57                 |                     |                  |                  |                  | 41               | 12               | 8                 |
| 1E-5         | 81                 |                     |                  |                  |                  |                  |                  | 25                |
| 1E-6         |                    |                     |                  |                  |                  |                  |                  |                   |
| 1E-7         |                    |                     |                  |                  |                  |                  |                  |                   |
| 1E-8         |                    |                     |                  |                  |                  |                  |                  |                   |



Minimum stress to seal  $Q_{min(L)}$  (at assembly),  $Q_{smin(L)}$  (after off-loading) for  $p = 40$  bar ( $T = 23 \pm 2$  °C)

| L [mg/(s·m)] | $Q_{min(L)}$ [MPa] | $Q_{smin(L)}$ [MPa] |                  |                  |                  |                  |                   |
|--------------|--------------------|---------------------|------------------|------------------|------------------|------------------|-------------------|
|              |                    | $Q_A = 10$ [MPa]    | $Q_A = 20$ [MPa] | $Q_A = 40$ [MPa] | $Q_A = 60$ [MPa] | $Q_A = 80$ [MPa] | $Q_A = 100$ [MPa] |
| 1E+1         | 10                 |                     | 10               | 10               | 10               | 10               | 10                |
| 1E-0         | 14                 |                     | 10               | 10               | 10               | 10               | 10                |
| 1E-1         | 24                 |                     |                  | 10               | 10               | 10               | 10                |
| 1E-2         | 39                 |                     |                  | 26               | 10               | 10               | 10                |
| 1E-3         | 57                 |                     |                  |                  | 42               | 10               | 10                |
| 1E-4         | 73                 |                     |                  |                  |                  | 26               | 11                |
| 1E-5         | 91                 |                     |                  |                  |                  |                  | 37                |
| 1E-6         |                    |                     |                  |                  |                  |                  |                   |
| 1E-7         |                    |                     |                  |                  |                  |                  |                   |
| 1E-8         |                    |                     |                  |                  |                  |                  |                   |



Note: the content of darkened cells was not determined respectively is unnecessary

Rev.-No.: 1

Creation date of this sheet: 2012-07-03

|                             |  |  |
|-----------------------------|--|--|
| <b>Manufacturer address</b> | KLINGER GmbH, Richard Klinger Str. 37, 65510 Idstein, DE | According to<br><b>DIN EN 13555</b><br><b>2005-2</b> |
| <b>Product name</b>         | KLINGER® top-graph-2000                                  |  |
| <b>Product dimensions</b>   | 92 x 49 x 2 mm (DIN EN 1514-1 1997-8)                    |  |

| Relaxation ratio $P_{QR}$ for stiffness $C = 500$ [kN/mm]                      |           |                      |                        |                      |                        |                      |                        |                      |                        |                      |                        |                      |
|--|-----------|----------------------|------------------------|----------------------|------------------------|----------------------|------------------------|----------------------|------------------------|----------------------|------------------------|----------------------|
| Gasket stress  | 23 ± 2 °C |                      | Temperature 1 [100 °C] |                      | Temperature 2 [175 °C] |                      | Temperature 3 [200 °C] |                      | Temperature 4 [250 °C] |                      | Temperature 5 [300 °C] |                      |
|  | $P_{QR}$  | $\Delta e_{Gc}$ [µm] | $P_{QR}$               | $\Delta e_{Gc}$ [µm] | $P_{QR}$               | $\Delta e_{Gc}$ [µm] | $P_{QR}$               | $\Delta e_{Gc}$ [µm] | $P_{QR}$               | $\Delta e_{Gc}$ [µm] | $P_{QR}$               | $\Delta e_{Gc}$ [µm] |
| Stress level 1 [30 MPa]  | 0.96      | 10                   | 0.83                   | 43                   | 0.79                   | 54                   | 0.77                   | 58                   | 0.71                   | 74                   | 0.61                   | 98                   |
| Stress level 2 [50 MPa]  | 0.97      | 13                   | 0.89                   | 46                   | 0.87                   | 57                   | 0.87                   | 57                   | 0.79                   | 88                   | 0.71                   | 124                  |
|  |           |                      |                        |                      |                        |                      |                        |                      |                        |                      |                        |                      |
|  |           |                      |                        |                      |                        |                      |                        |                      |                        |                      |                        |                      |
|  |           |                      |                        |                      |                        |                      |                        |                      |                        |                      |                        |                      |
|  |           |                      |                        |                      |                        |                      |                        |                      |                        |                      |                        |                      |
|  |           |                      |                        |                      |                        |                      |                        |                      |                        |                      |                        |                      |
| $P_{QR}$ and $\Delta e_{Gc}$ at maximum gasket stress to be applied $Q_{smax}$ |           |                      |                        |                      |                        |                      |                        |                      |                        |                      |                        |                      |
| $P_{QR}$ at $Q_{smax}$   | 0.99      | 25                   | 0.91                   | 159                  | 0.85                   | 260                  | 0.80                   | 275                  | 0.75                   | 294                  | 0.36                   | 859                  |
| $Q_{smax}$   | 200 MPa   |                      | 200 MPa                |                      | 200 MPa                |                      | 160 MPa                |                      | 140 MPa                |                      | 160 MPa                |                      |

| Sekant unloading modulus of the gasket $E_G$ [MPa] and gasket thickness $e_G$ [mm] |             |            |                        |            |                        |            |                        |            |                        |            |                        |            |
|--|-------------|------------|------------------------|------------|------------------------|------------|------------------------|------------|------------------------|------------|------------------------|------------|
| Gasket stress [MPa]  | 23 ± 2 °C   |            | Temperature 1 [100 °C] |            | Temperature 2 [175 °C] |            | Temperature 3 [200 °C] |            | Temperature 4 [250 °C] |            | Temperature 5 [300 °C] |            |
|  | $E_G$ [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] | $E_G$ [MPa]            | $e_G$ [mm] |
| 0  | 0           | 2.015      | 0                      | 2.013      | 0                      | 2.032      | 0                      | 1.999      | 0                      | 1.998      | 0                      | 1.982      |
| 1  | 0           | 2.015      | 0                      | 2.013      | 0                      | 2.032      | 0                      | 1.999      | 0                      | 1.998      | 0                      | 1.982      |
| 20   | 2632        | 1.908      | 1313                   | 1.874      | 1618                   | 1.887      | 1621                   | 1.834      | 8351                   | 1.846      | 2366                   | 1.792      |
| 30   | 3923        | 1.886      | 2405                   | 1.857      | 2243                   | 1.872      | 2769                   | 1.821      | 7234                   | 1.836      | 4361                   | 1.781      |
| 40   | 3337        | 1.864      | 4077                   | 1.839      | 2887                   | 1.860      | 4167                   | 1.810      | 9698                   | 1.828      | 10640                  | 1.769      |
| 50   | 5771        | 1.850      | 3972                   | 1.823      | 4132                   | 1.850      | 3988                   | 1.797      | 15989                  | 1.820      | 8447                   | 1.758      |
| 60   | 7377        | 1.837      | 4517                   | 1.809      | 4802                   | 1.840      | 5172                   | 1.787      | 9627                   | 1.808      | 5955                   | 1.746      |
| 80   | 12917       | 1.817      | 5717                   | 1.785      | 5698                   | 1.817      | 4426                   | 1.759      | 9640                   | 1.781      | 5977                   | 1.731      |
| 100  | 12728       | 1.798      | 8376                   | 1.764      | 8259                   | 1.782      | 5293                   | 1.729      | 9954                   | 1.743      | 8048                   | 1.718      |
| 120  | 13711       | 1.783      | 8056                   | 1.737      | 7576                   | 1.732      | 6045                   | 1.690      | 9743                   | 1.694      | 8915                   | 1.705      |
| 140  | 16267       | 1.770      | 8859                   | 1.711      | 8784                   | 1.678      | 7023                   | 1.639      | 8311                   | 1.628      | 8370                   | 1.691      |
| 160  | 13677       | 1.757      | 7920                   | 1.680      | 8230                   | 1.619      | 6166                   | 1.574      |                        |            | 9562                   | 1.682      |
| 180  | 14161       | 1.747      | 9672                   | 1.652      | 8432                   | 1.563      |                        |            |                        |            |                        |            |
| 200  | 14210       | 1.737      | 9940                   | 1.623      | 8230                   | 1.491      |                        |            |                        |            |                        |            |

