

Test Report

Customer: Pipeline Seal & Insulator Co. Ltd.
St. Neots, Cambridgeshire PE19 8YT

Project number (amtec): 302 257
Report number: 302 257 1/-

Test procedure: EN13555 – Leakage Test

Material: LineBacker G10/Teflon

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Pages: 4
Appendices: 4



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1. Subject of Investigation

The subject of investigation was a gasket material with sealing and electrical isolation characteristics which is named

- LineBacker G10/Teflon.

LineBacker G10/Teflon consists of a retainer with a Teflon ring sealing element.

2. Goal of Investigation

The goal of the investigation was the determination of the following gasket characteristics according to the European Standard EN 13555 which are necessary for the calculation according EN 1591-1:

- Minimum required gasket stress in assembly $Q_{\min(L)}$ (40 bar) and
- Minimum required gasket stress in service $Q_{s\min(L)}$ (40 bar).

3. Test Specimens

The dimension of the test specimens was 89 x 40 x 3.2 mm for DN40/PN40.

4. Testing Equipment

The gasket test was carried out on the following testing equipment:

Test rig: TEMES_{fl.ai1}
Serial number: 010 181

A photo and the schematic view of the testing equipment are shown in **appendix 1**.

5. Test Procedure

Leakage test (EN 13555)

The leakage test procedure consists of loading and unloading the gasket in a cyclic manner with measurement of the leak rate at several effective gasket stress levels with an internal gas pressure of 40 bar.

The procedure therefore consists of loading to 10 MPa, holding the load and measuring the leak rate and then raising the gasket stress to 20 MPa. The load is then held whilst the leak rate is measured. In the next step the load is reduced to 10 MPa and the leak rate is measured. Then measurements are done for the next loading - unloading cycle at 40 MPa, 20 MPa and 10 MPa and so on until either the 160 MPa loading - unloading cycle is completed or the value of Q_{smax} would have been exceeded.

Deviant from the standard test procedure the lowest gasket stress level is set to 5 MPa instead of 10 MPa. The test gas used for this test is helium.

From the generated leakage curve the minimum required gasket stress in assembly $Q_{min(L)}$ (40 bar) and the minimum required gasket stress in service $Q_{smin(L)}$ (40 bar) in dependence on the gasket surface pressure prior to the unloading Q_A can be evaluated for different tightness classes L.

6. Results

Leakage test (EN 13555)

The tightness behaviour of the gasket material LineBacker G10/Teflon was examined in a leakage test at 40 bar helium. In **appendix 2** the determined gasket characteristics

- minimum required gasket stress in assembly $Q_{min(L)}$ and
- minimum required gasket stress in service $Q_{smin(L)}$ in dependence on the gasket surface pressure prior to the unloading Q_A

are listed for both tests in dependence on the tightness class L.

For the determination of the leak rate two different measurement devices were used in parallel. The pressure drop method with a differential pressure was used for the leak tightness evaluation for leak rates higher $1.0 \cdot 10^{-3}$ mg/m/s, for lower leak rates the signal of the helium leak detector was taken for the calculation of the leak rate.

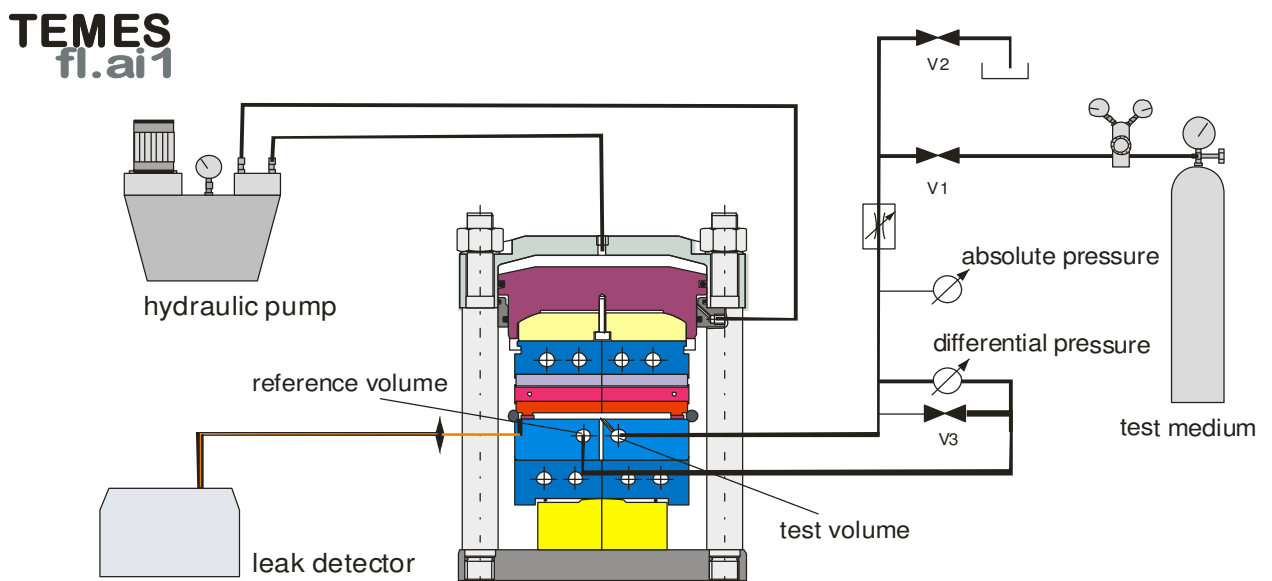
The graphical presentation of the leakage curve is shown in **appendix 3**. The tightness class $L_{0.01}$ was reached at the first loading step when the gasket stress raised 5 MPa. The minimum gasket stress in assembly for the tightness class $L_{0.01}$ is $Q_{\min(0.01)} = 5$ MPa. The highest tightness class which could be reached was $L_{0.0001}$, therefore a gasket stress of 72 MPa is necessary.

During the unloading cycles the leak rate is increasing marginal. In the unloading curves no drastic increase of the leak rate (or sudden blow-out) is observed until the lowest gasket stress level of 5 MPa is reached. The minimum gasket stress in service for the tightness class $L_{0.01}$ for an initial gasket surface pressure Q_A of 40 MPa is $Q_{\min(0.01)} < 5$ MPa.

The leak rate is nearly constant for all gasket stress levels of the different loading and unloading steps.

7. Photo documentation

In **appendix 4** a photo of the tested gasket specimen LineBacker G10/Teflon is presented.



Testing Equipment TEMES_{fl.ai1}

Table 1: Data Sheet for Gasket Characteristics (EN 13555)

Manufacturer: **PSI**
Product: **LineBacker G10/Teflon**

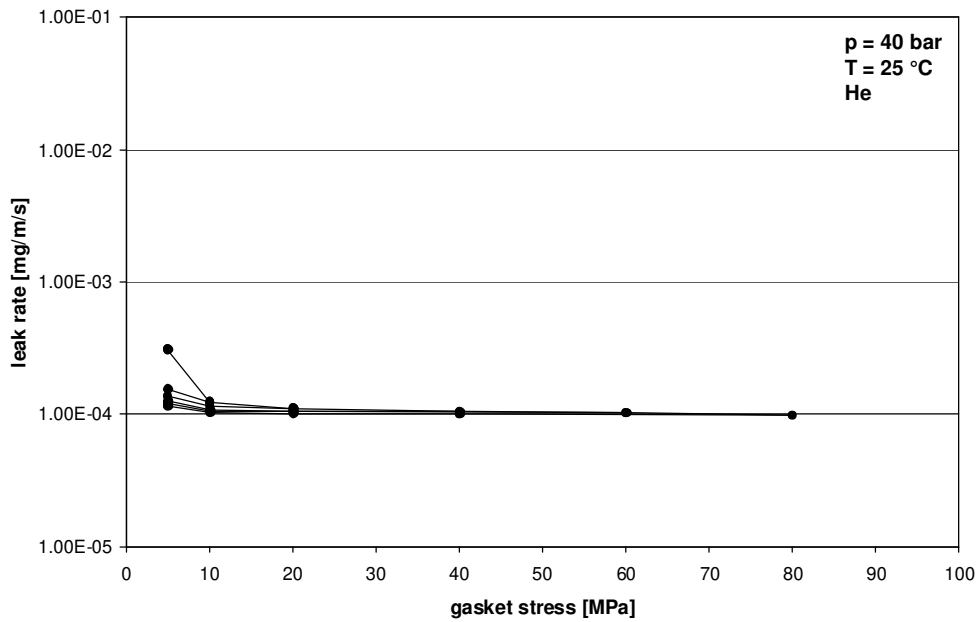
Minimum required Gasket Stress in Assembly $Q_{min(L)}$ [MPa]

p [bar] \ L	10	1	0.1	0.01	0.001	0.0001	0.00001
10							
test no.							
40	< 5	< 5	< 5	< 5	< 5	72	x
test no.	11-204						
80							
test no.							

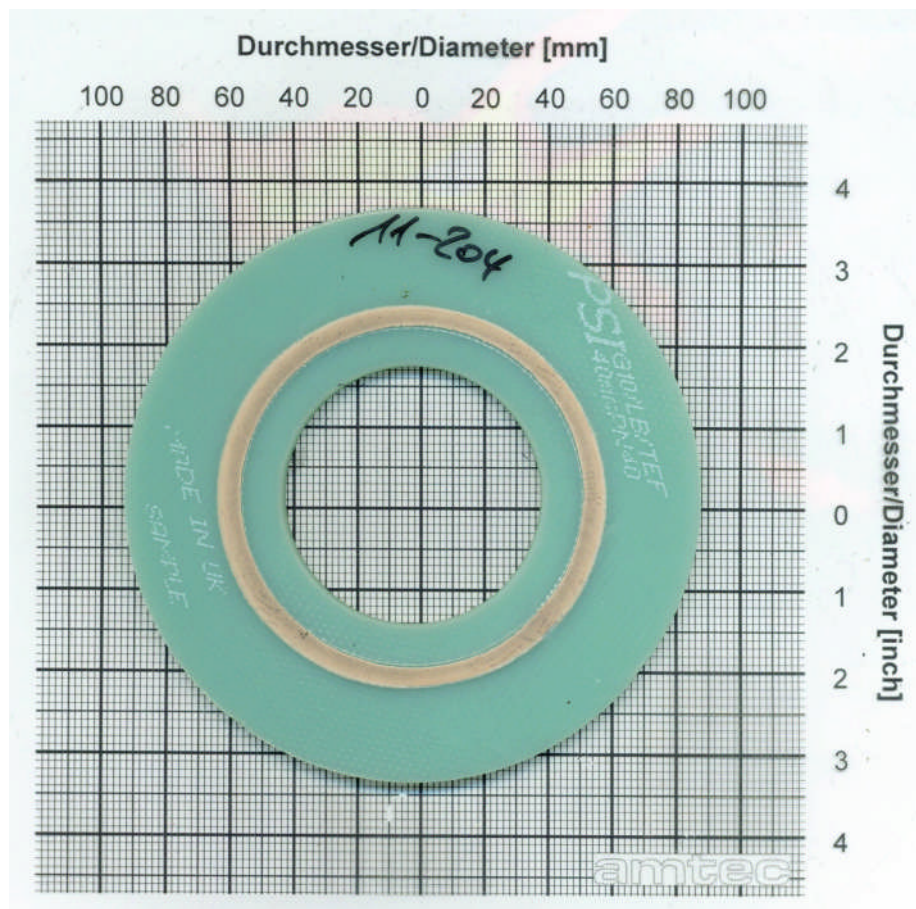
Minimum required Gasket Stress in Operation $Q_{smin(L)}$ [MPa]

Q_A [MPa] \ L	10	1	0.1	0.01	0.001	0.0001	0.00001
20	< 5	< 5	< 5	< 5	< 5	x	x
40	< 5	< 5	< 5	< 5	< 5	x	x
60	< 5	< 5	< 5	< 5	< 5	x	x
80	< 5	< 5	< 5	< 5	< 5	47	x
test no.	11-204						

Leakage curve
PSI - Linebacker G10/Teflon 89.1x39.94x3.617 mm
Test number: 11-204



Leakage test according EN 13555



Leakage test at RT (EN 13555)