

TEST CERTIFICATE



Certificate Z-18070301-2 KDS 150 cable penetration with system cover

KRASO GmbH & Co. KG
Max-Planck-Str. 2
46414 Rhede

The above-mentioned seal was tested by GAIST based on the specifications of the VDI Guideline 2200 (issue 2007-05) with regard to high quality according to TA Luft. The examination took place under the following framework conditions:

Test setup: Cable penetration, type KDS 150 with system cover sealed using O-ring

Ageing temperature: 23 °C
Ageing time: 48 hrs
Test temperature: 23 °C

The subsequent leak measurement at room temperature, using a helium mass spectrometer, at a test differential pressure of 1 bar, showed a leakage of:

$$7.31 \cdot 10^{-5} \text{ l/(s}\cdot\text{m)}$$

The leakage criterion of the VDI Guideline 2440 (issue 2000-11) of $1.0 \cdot 10^{-4}$ mbar-l/(s·m) was not exceeded. The specified seal is therefore deemed high quality for the purpose of TA Luft.

The issue of this certificate is based on a test, for which the results and framework conditions are documented in test report no. 18070301-2.

[Signature]
M. Reppien (management)
Steinfurt, 14/08/2018

Certificate

GAIST GmbH | Am Campus 2 | 48565 Steinfurt | Germany | info@gaist.de

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Test report 18070301-2

about the

Leak-tightness test on KDS 150 cable penetration with: applied system cover

Client	KRASO GmbH & Co. KG Max-Planck-Str. 2 46414 Rhede
Order	Leak-tightness tests on KDS 150 system cover
Objects of the test	KRASO cable penetration, type KDS 150, system cover
Manufacturer	KRASO GmbH & Co. KG
Sampling process	By the manufacturer
Order date	03/07/2018
Test period	17/07/2018 - 27/07/2018
Test laboratory	Fachhochschule Münster, Laboratory for Sealing Technology, 48565 Steinfurt
Testers	Michael Reppien, Christian Mertens
Scope	10 pages

[Signature]

Steinfurt, 14/08/2018

Michael Reppien
(Managing Director)

The test results are only valid for the tested objects during the specified period. The full test report or extracts thereof may only be published with the written consent of GAIST GmbH.

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Contact GAIST GmbH, Am Campus 2, D-48565 Steinfurt
Phone: +49 2551 962 920, Fax: +49 2551 962 923, Website: <http://gaist.de>, E-Mail: info@gaist.de

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1 Objective of the examination

Leak-tightness test on a provided KDS 150 system cover, which enables a statement to be made about the leak-tightness according to the guidelines VDI 2440 (issue 2000-11) and VDI 2200 (issue 2007-06) and TA Luft. A statement about the radon tightness should also be submitted. The test is carried out with the help of a helium mass spectrometer over a period of 24 hours.

2 Object of the examination

The object of the examination was the KDS 150 cable penetration with applied system cover provided by the client:



Figure 1: Top view of the KDS 150

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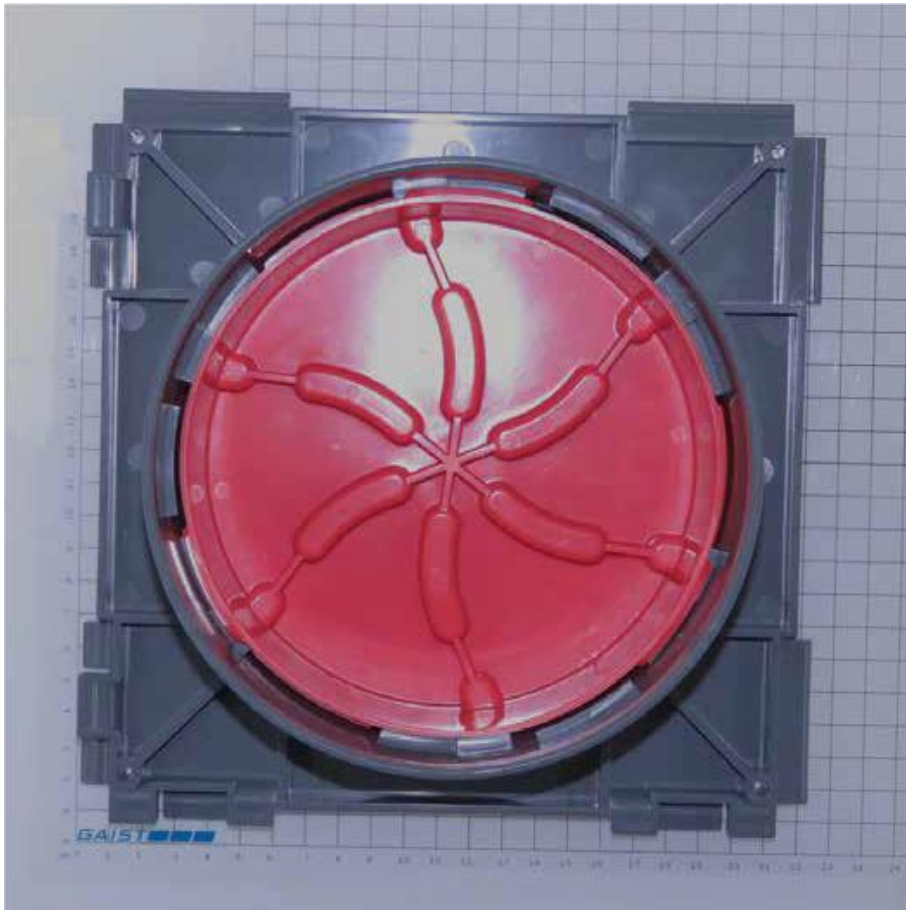


Figure 2: Bottom view of the KDS 150

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Figure 3: Dismantled system cover with O-ring

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3 Test setup for the leak-tightness check

The following test setup was used for the test:

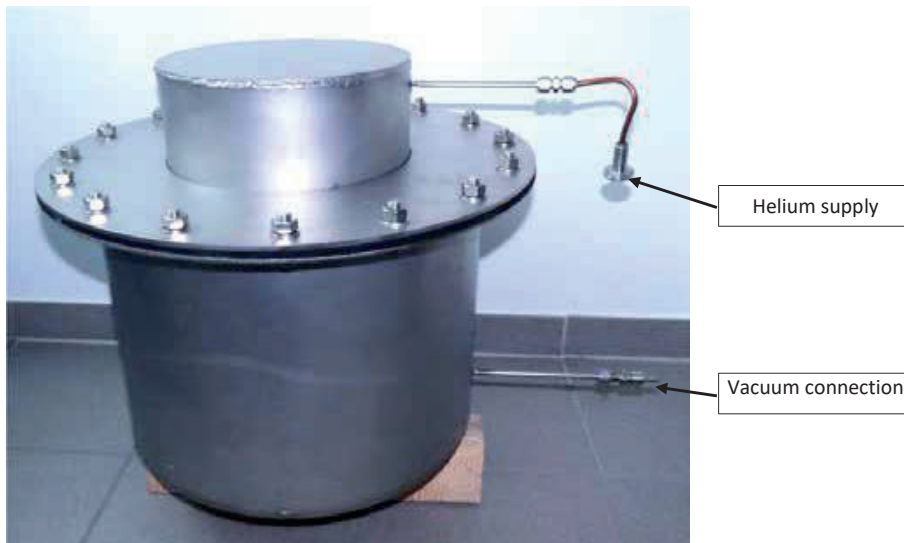


Figure 4: Test setup

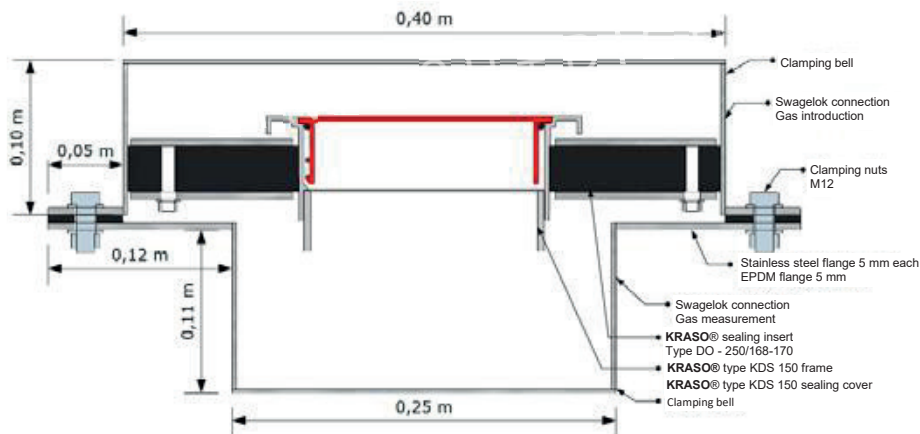


Figure 5: Technical sketch of the experimental setup

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Figure 6: Interior view of the opened test setup with KDS 150

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4 Test procedure

4.1 Framework conditions and parameters

The following framework conditions were used for the test:

(Warm) storage duration	48	Hours
Storage temperature	23 ± 2	°C
Test duration TA Luft	24	Hours
Test pressure TA Luft	1	bar (absolute)
Test medium TA Luft	Helium	

Table 1: Framework conditions of the test

Component	Average diameter [mm]	Effective circumference [mm]
O-ring KDS 150 system cover	155	487
Adapter flange internal Ø	166	522
Adapter flange external Ø	402	1263
Sealing length in total		2272

Table 2: List of the seals involved

4.2 Testing the sealing behaviour (VDI 2200 / VDI 2440 / TA Luft)

The test setup is connected to a helium mass spectrometer via vacuum metal hoses. The high vacuum is built up using an internal rotary vane pump of the leak detector with downstream turbo molecular pump to improve the suction capacity and the helium subsurface behaviour. To apply the medium to the sealing volume, this is connected with the helium source and a pressure transducer via a pipeline. For measurements with a mass spectrometer, the helium concentration in the test gas is directly proportional to the measured leakage rate. To minimise the percentage of ambient air in the test gas, the volume inside the clamping bell is evacuated several times and filled with helium at 1 bar (absolute).

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