KRASO GMBH & CO. KG
Baumannweg 1 | 46414 Rhede
T +49 (0) 28 72 - 95 35 - 0
+49 (0) 28 72 - 95 35 - 888
info@kraso.de | **KRASO**.de

TEST CERTIFICATE

University of Stuttgart
Materials Testing Institute
PO box 801140 • 70511 Stuttgart

MPA STUTTGART Materialprüfungsanstalt Universität Stuttgart

Documentation of results

Report no.:	903 4037 001
Client:	Krasemann GmbH & Co. KG Max-Planck-Str. 2 D-46414 Rhede
Order no. (client):	
Order no. (MPA):	**903 4037 000 /Hh/Ber/Ge**
Test object:	**KRASO KDS 150 cable penetration**
Test specification with issue date:	Pressure increase test
Date of receipt of the test object:	12 June 2017
Test date:	17 July 2017
Report date:	21 July 2017
Page 1 of	3 pages of text
Supplements:	1
Appendices:	-
Total number of pages:	4
Number of copies:	1 x Krasemann GmbH & Co. KG

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The test results relate exclusively to the test specimens.

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1 Task

The test object is a **KRASO KDS 150 cable penetration** pre-installed by the client (Figure 1. Enclosure 1) with a welded-on closing plate. This was to be examined with regard to leakage. Pressure is normally applied to this penetration from the outside. In order to reproduce this load, only a pressure increase test after prior evacuation of the test object was possible.

2 Examinations carried out

In order to carry out the test, a tube was inserted into the closing plate, with the tube being sealed against the plate with silicone. A DPI 515 pressure measuring system and a vacuum pump were connected to this tube to measure the pressure drop. The vacuum pump was able to be shut off using a high-quality valve.

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3 Test results

The valve was opened and the vacuum pump switched on. After pumping for approx. 15 minutes, there was an internal pressure of -0.959 bar. The internal pressure rose relatively quickly at first. The process slowed down, however, as the measuring time continued. This can be attributed to temperature effects and/or setting effects in the seal. The pressure increases over night, after a period of approx. 16 hrs, was only 2 mbar.

The interior of the test object, with a diameter of 150 mm and a height of 60 mm, comes to almost exactly 1 litre (1.06 l).

The correlation

$$L = p \cdot V/t$$

where L is the absolute leakage rate in the physical unit **[mbar l/s]**,
the pressure increase **p = 2 mbar**,
the volume **V = 1.06 l**
and the time **t = 58020 s**

results in an absolute leakage rate of **$L = 3.7 \cdot 10^{-5}$ mbar·l/s.** The specific leakage rate (i.e. regardless of the geometric size) results from dividing the absolute leakage rate by the effective seal circumference **0.47 m**, hence **$L_s = 7.8 \cdot 10^{-5}$ mbar·l/(s·m).**

University of Stuttgart
Materials Testing Institute
Pfaffenwaldring 32
70569 Stuttgart (Vaihingen)
VAT ID no. DE 147794196

Phone: (0711) 685 – 0
Fax: (0711) 685- 62635
Website: www.mpa.uni-stuttgart.de

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All results were calculated with maximum accuracy and then rounded to one decimal point.

4 Summary

A pre-installed **KRASO KDS 150 cable penetration** was examined for leakage rate according to the pressure increase method.

5 Interpretation of the result and recommendations

The measured leakage rate was only approx. 3 ml of air per day. This should be seen as extremely low and is an indication of the high quality of the cable penetration. All components that are installed together with this cable penetration, such as the concrete wall and the cables, which are sealed against the environment, are expected to have much higher leakage rates.

The tested **KRASO KDS 150 cable penetration** can therefore be assigned a very high leak-tightness, which would correspond to **high quality according to TA Luft** or the VDI guidelines 2200/2240 if it had been determined using helium as a medium and with the aid of a helium mass spectrometer. Unfortunately, this was not possible for various reasons due to the testing technology requirements. In any case, a technical leak-tightness against water and against non-toxic gases at a pressure difference of 1 bar can be confirmed.

The technical leak-tightness is presumably also valid for higher pressure differences, which were not the object of this examination, however.

[Stamp]

[Signature]

Dr.-Ing. K. Berreth
Influence of hydrogen and oxygen department

[Signature]

Dipl.-Ing. R. Hahn
Influence of hydrogen and oxygen department

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Enclosure 1

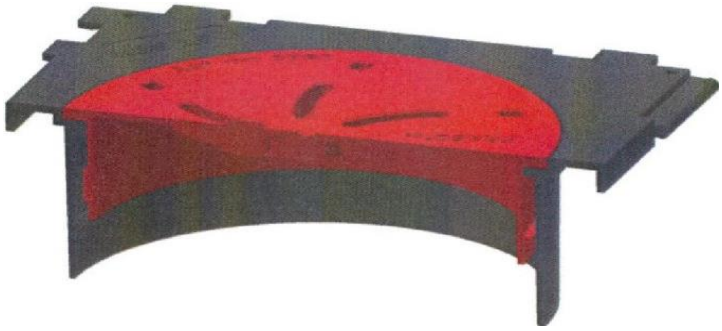

Fig. 1: Test object: **KRASO® KDS 150 cable penetration** shown as a sectional model

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