

woIf Newsletter

Results of practical tests

Reusable sealing elements with swelling material



- For sealing cables, ducts and expansion joints against gas diffusion and accumulating water
- Interaction with heat

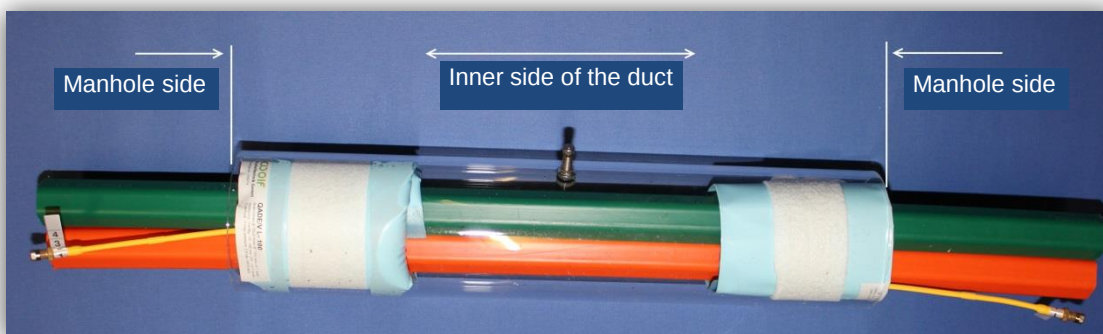
Results of testing the universal application of the swelling-material sealing system

Fibre Optics CT GmbH, Stuttgart tests the universal application of the improved sealing system. This is done using numerous testing methods that are not contained in the IEC or DIN EN standards, following criteria of “practicality, extreme ease of use and no need for special installation aids”.

If you are interested in carrying out your own practical tests or demonstrations, we would be glad to supply you with the necessary swelling material for testing.

■ Practical test 1: Interaction between air overpressure and increase in temperature

This object of this test is to investigate the influence of increased pressure inside the duct due to an increase in temperature.



Test result:

The sealing elements remain in place, despite an increase of pressure inside the duct. (They do not shift position and are not squeezed out of the duct, as with other products.)

The swelling-material sealing elements guarantee a reliable seal from the manhole side (duct ends)

- efficient against gas diffusion resulting from soil erosion
- tight directly on contact with water, 5 m to 10 m water column

Stability of the seal from the inner side of the duct

- against air overpressure following an increase in temperature
- temperature range -15 °C to +45 °C

Results of laboratory testing by Fibre Optics CT

Sealing efficiency of the swelling-material sealing system

Extract from Fibre Optics CT GmbH Test Report FO7 Part 45 BP 68/2014

**“The effect of heat and overpressure on the tightness of the sealing system (valve) against gas diffusion and 5 m water column.
Temperature cycling -15 °C to +45 °C with air circulation”**
.”

Test method No. 1:

Test specimen horizontal, water column ~ 1-2 cm

1. Effect of temperature cycling on the sealing efficiency and expansion behaviour of the sealing cushion (valve), at temperatures from -15 °C to 45 °C
2. Efficiency of the sealing combination petrolatum and swelling sealing tapes when subjected to heat and overpressure



Test method No 2:

Test specimen vertical, water column ~ 3-4 m

1. Efficiency of the sealing combination petrolatum and swelling sealing tapes
after temperature cycling against pressurised water

2. Long-term behaviour of the sealing combination on ageing

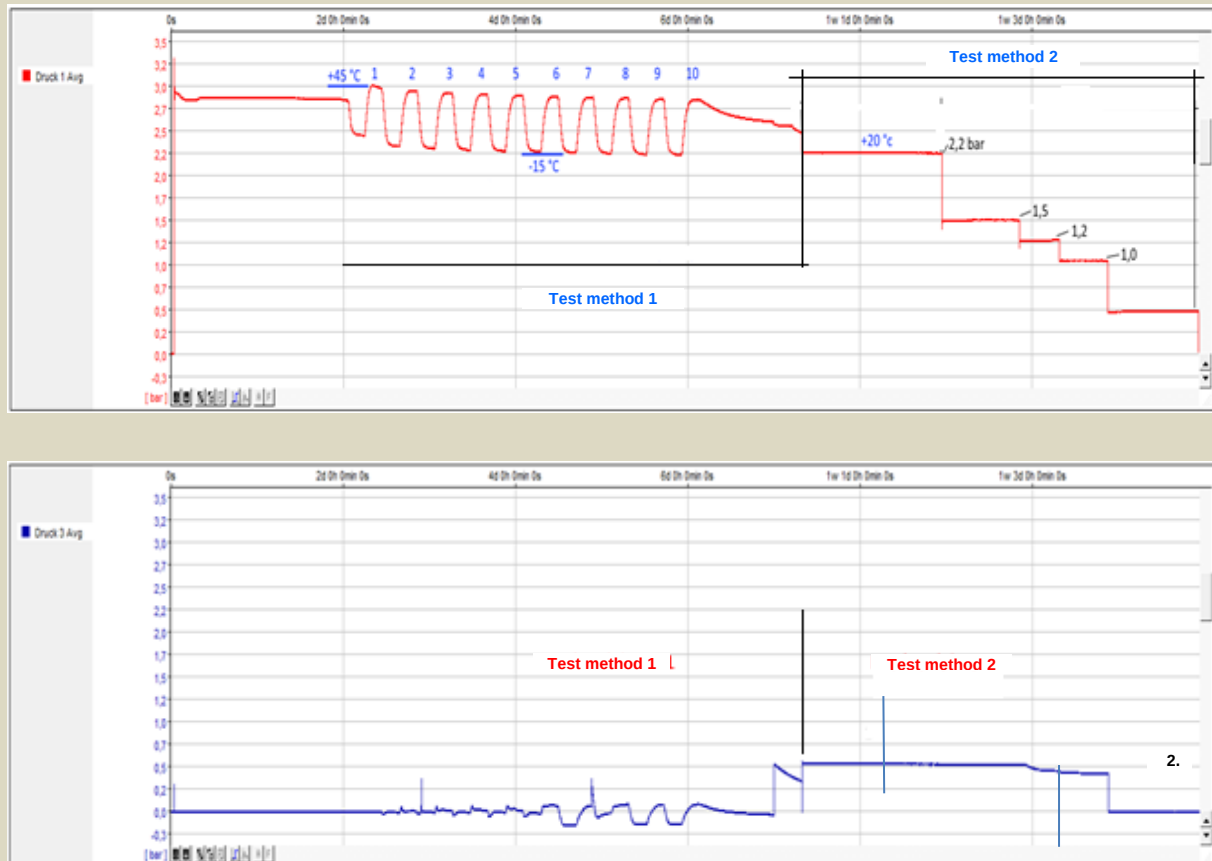
Loss of overpressure due to the leak rate of the sealing cushion, ≤ 2.7 mbarl/year, and expansion behaviour

(3) Water container (1 m water column)

(4) Receptacle for collecting the water



Test results



Test results:

Test method No. 1: Requirements V (1) fulfilled

0.35 bar air overpressure caused by temperature increase can dissipate through the swelling-material sealing system

Test method No. 2: Requirements V (2) fulfilled

- 5 m water column > 2 d - passed
- Longterm behaviour of the seal - passed
- Leak rate for cushion inflated to a pressure of 2.8 to 1.0 bar $\geq$ 4 m water column

Test method No. 3: Requirements fulfilled

- Non-destructive removal in less than 2 minutes for purposes of refurbishment and re-use

Results of laboratory testing by Fibre Optics CT Reusability of the swelling-material sealing system

Extract from Fibre Optics CT GmbH Test Report FO7 07.43-PB 127/2013

“Reusability of the swelling-material coated sealing cushion (valve)”

Reusability



First, non-destructive removal



Then remove old swelling sealing tapes from sealing cushion ...

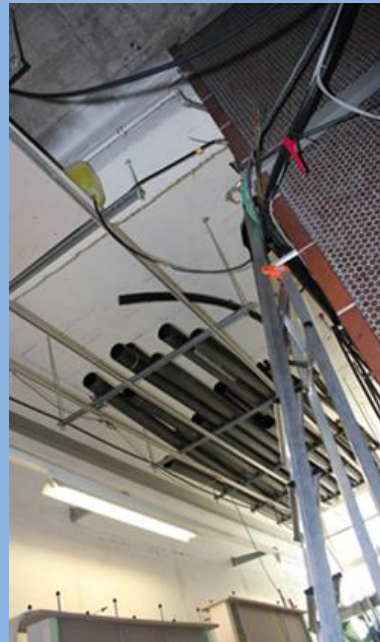


... and replace with new tapes



Reinstall the sealing cushion

Test setup



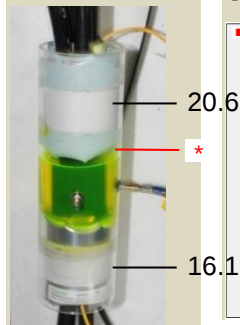
Pressurised container 3 m water column



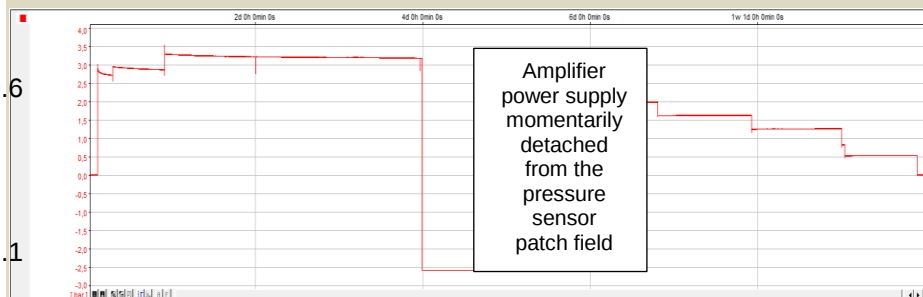
5 m water column on the test specimen

Test results

Protocol
127/2013
D 1.1



Sealing-cushion pressure filling and reduction by 0.5 bar/24 h to
0.5 bar/cushion overpressure
Sealing system 20.6 QADE/V L 100 with 22.1 QV-DB 4.2x110/10

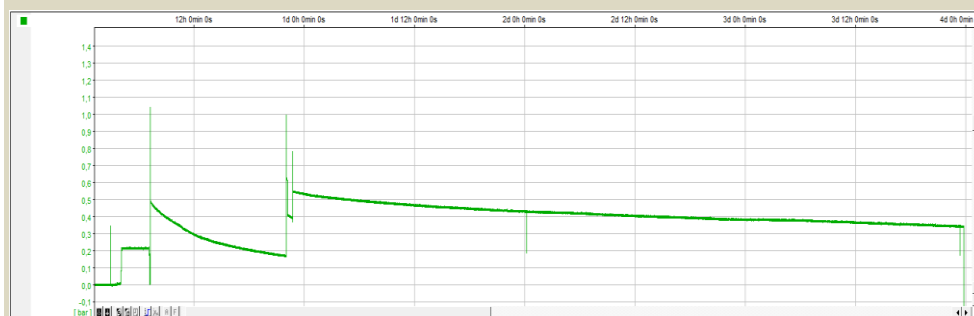
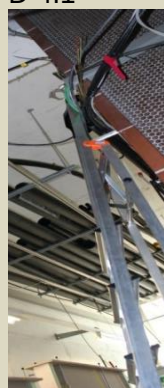


Result:

* The sealing system 20.6 QADE/VL 100 was turned through 180° and soaked in water for a short time (approx. 20 min). After this, there was no water pressure on the sealing system! **The requirement "Sealing tightness against gas and 5 m water column" is therefore also fulfilled for the refurbished sealing element.**

Requirement according to DVGW-VP601: gas diffusion < 0.1 bar.

Protocol
127/2013
D 4.1



Practical test 2: Efficiency of cable, duct and expansion joint sealing with swelling material tapes and/or swelling sealing clips

This object of this test is to investigate the sealing efficiency of the swelling material products used to coat the sealing element.

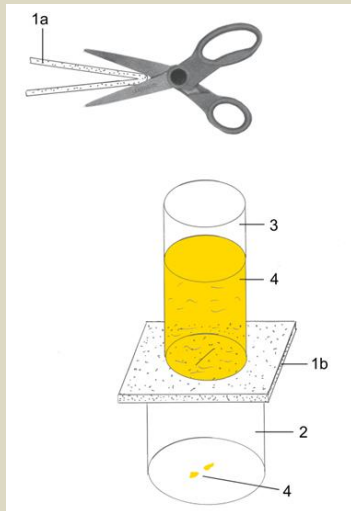


Test procedure:

A perspex tube containing cables is sealed using a swelling-material sealing element. A fluorescent liquid is then poured into the tube and the tightness checked.

Test result: The swelling material does not let any liquid through; the seal is tight. The swelling material is also self-healing, so that even if it is damaged, there are no negative consequences for the efficiency of the seal.

Test it for yourself!



Make an incision of about 1 cm in a folded piece of swelling material. Lay the swelling material on top of a receptacle, for example a perspex tube (2). Place a tube (3) on the piece of swelling material (1b) and fill it with fluorescent water (4).

The test is passed if less than 10 ml of water penetrate the swelling material.

Practical test 3: Mechanical impact resistance of Wolf sealing cushion types QADE/V, QAK/V and QADK/V L

The object of this test is to investigate the resistance of the sealing element components – aluminium laminate (5 layered, 400 μm), coated with swelling material – for cable, duct or expansion joint sealing, or for sealing floors and ceiling areas from pressure from gravel etc.



Test result, protocol 027/2014

The swelling-material coated sealing cushion is laid on basalt grit size 5/8 and subjected to a load of 3900 N for 15 min (pressure load 39 N/cm²).

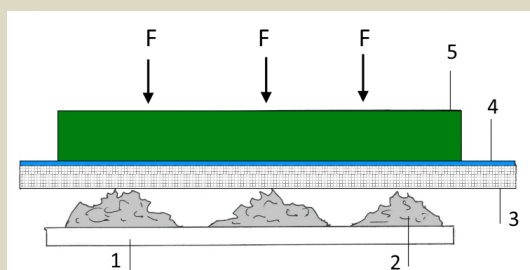
At the end of the test there is no sign of pressure marks on the laminated foil.



Test it for yourself!



Lay the special 5-layered aluminium laminate (4) coated with swelling material (3) on a base plate (1) covered with stones (2). (The swelling material should face downwards.) Subject it to a load (5) of 90 - 200 kg.



The test is passed if there are no holes to be seen in the laminate.

Practical test 4: Tightness against gas diffusion

At the present state of technology there are no defined criteria in the applicable DIN EN standards for overpressure caused by gas diffusion from gas-contaminated earth or manholes, so a defined testing specification is necessary in order to correct current misrepresentations regarding requirements.

We have sought expert opinion on this subject:

Question 1:

Can gas diffusion – consisting of volatile halogenated hydrocarbons – penetrate cable protection ducts (installation depth 1 to 4 m) that are sealed against non-accumulating water seepage as described in the Federal Soil Protection and Contaminated Sites Ordinance?

Question 2:

Can the penetration be measured in mbar?

If so, how high is the overpressure?

What testing facilities would you recommend?

Replies (translated from the original German):

Dear Mr. Wolf,

The LUBW (Baden-Württemberg Institute for the Environment, Measurements and Nature Conservation) does not have any direct data to answer your question regarding contaminated sites, but of course it is theoretically possible that volatile halogenated hydrocarbons present in the air in the soil could be carried over long distances in a cable protective duct. This would presuppose a pressure gradient to induce the flow. If this were the case, the volatile halogenated hydrocarbons would behave exactly like other gases e.g. petrol fumes. The problem could be avoided by not laying cables in contaminated earth.

Best regards,

W. Kohler

Dr. Wolfgang Kohler (Engineer)

LUBW (Baden-Württemberg Institute for the Environment, Measurements and Nature Conservation)

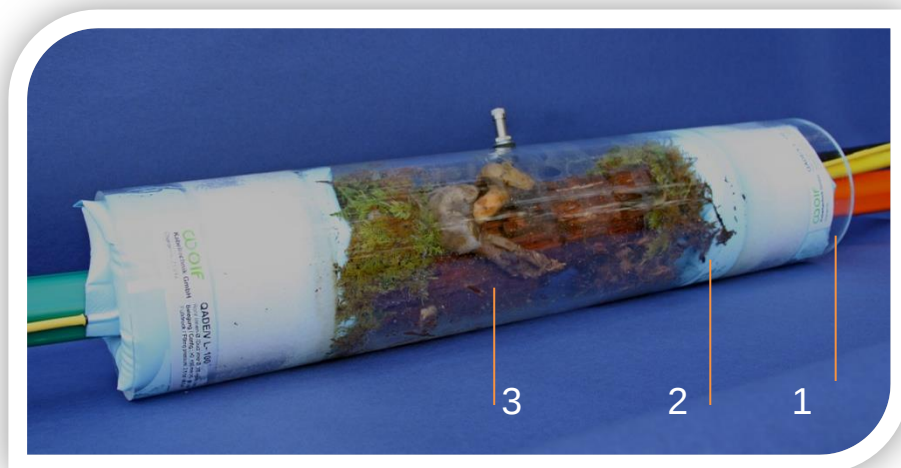
Griesbachstr. 1

76185 Karlsruhe

Test it for yourself!

Tight-sealing against gas diffusion

Test setup for visual assessment and odour sampling



- 1 Plexiglas tube 110x100 mm, length 500 mm, configured with cables and/or protected microducts
- 2 The cables/ducts are sealed against gas diffusion (from inside) and pressing water (from outside) by means of a sealing cushion QADE/V L 100 and the gaps between the cables are sealed using the QV-EADS/2-4 K swelling sealing clip.
- 3 Test material "odour sampling"
- 4 Forest waste products (decaying remains of trees, moss, fungi etc), impregnated with an intermediate product resulting from waste product fermentation. The intermediate product was provided by the University of Hohenheim (State Institute of Agricultural Engineering and Bioenergy).



Odour sampling:

Smell the closed ends of the tube sealed with cable/duct sealing cushion QADE/V L 100. The test is passed if there is no trace of a „rotting“ smell.

Manufacturer

National sales

International sales

WOLF GmbH,

Zazenhäuser Str. 52, 70437 Stuttgart, Germany

Tel. ++49 (0) 711 87 39 41

Fax ++49 (0) 711 87 12 30

Email: service@wolf-systems.com

Internet: www.wolf-systems.com

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