

Report

on Testing a Flange Gasket for Reactivity with Oxygen

Reference number II-3112/2004 E
Copy 1. Copy of 2 Copies

1 Application

Customer Rich. Klinger
Dichtungstechnik GmbH & Co KG
Am Kanal 8-10
2352 GUMPOLDSKIRCHEN
AUSTRIA

Order Date September 1, 2004

Reference Hein

Receipt of order September 6, 2004

Test samples Gasket KLINGER®top-chem-2003 for use in flanged connections in piping and components for oxygen; BAM-Order-No. II.1/47 601

Receipt of samples September 6, 2004

Test date September 23 to October 12, 2004

Test location BAM-Laboratory II.13; building no. 41, room no. 073

Test Procedure According to Annex of the pamphlet „Liste der nichtmetallischen Materialien die von der Bundesanstalt für Materialforschung und –prüfung (BAM) zum Einsatz in Anlageteilen für Sauerstoff als geeignet befunden worden sind.“(Edition: 31. August 2004) of regulation BGV B 7 „Oxygen“ of the „Berufsgenossenschaft der chemischen Industrie“.

TESTREPORT

This test report consists of page 1 to 3 and annex 1.

This test report may only be published in full and without any additions. A revocable permission in writing has to be obtained from BAM for any amended reproduction of this certificate or the publication of any excerpts. The test results refer exclusively to the tested materials.

In case a German version of the test report is available, exclusively the German version is binding.



2 Documents and Test Samples

The following documents and samples were submitted to BAM:

- 1 Application for testing,
- 1 data sheet, and
- 10 disks of KLINGER®top-chem-2003: Ø 140 mm x 2 mm; color: light beige; one side with imprint „KLINGER®top-chem-2003“

3 Test Methods and Results

The material KLINGER®top-chem-2003 for use in flanged connections in piping for gaseous and liquid oxygen has already been tested and evaluated under the reference number II-3797/2002 II in 2002. The flange test was repeated under different test conditions.

3.1 Flange Test

The test method is described in annex 1.

Results:

The test at 50 bar oxygen pressure and 50 °C showed that the material burned 2 mm to 10 mm into the sealing area between the flanges. At 30 bar oxygen pressure and 50 °C KLINGER®top-chem-2003 reacted up to 2 mm into the sealing area between the flanges.

At 20 bar oxygen pressure and 60 °C, only those parts of the gasket KLINGER®top-chem-2003 burn that projected into the pipe; the fire is neither transmitted to the steel nor does the gasket burn between the flanges. The flange remained gas-tight. Thereupon, the test was repeated four times at 20 bar and 60 °C. The same result was obtained as before.

4 Evaluation

The gasket KLINGER®top-chem-2003 for use in flanged connections in piping for gaseous and liquid oxygen has already been tested and evaluated under the BAM-reference number II-3797/2002 II in 2002.

On basis of those test results and the results of the flange testing there are no objections with regard to technical safety to use the gasket KLINGER®top-chem-2003 in flange connections made of copper, copper alloys or steel at oxygen pressures up to 20 bar and at temperatures up to 60 °C. This applies to flat faced flanges, male/female flanges, and flanges with tongue and groove.

There are also no objections to use the flat gasket material KLINGER®top-chem-2003 in plants or installations for liquid oxygen. In this case, a limitation to a particular pressure range is not necessary as compression of liquid oxygen causes no significant changes in concentration and therefore has no considerable influence on the reactivity of the material.

5 Comments

This report expires at once, if the composition of the tested material is changed. This report expires on November, 30, 2014, at the latest. A prolongation beyond this date is possible, if the manufacturer confirms in writing that the material has not changed since this evaluation.

Products that have been tested by us, and which are on the market, shall be marked according to our evaluation in the BAM test report. A label on a product saying that a BAM test has been performed and (or) citing our reference number, only, is not tolerable. The use of the product and its safe operating conditions must also be given.

It shall be clear that the product may be used for gaseous and/or liquid oxygen service. The maximum safe oxygen pressure of the product and its maximum use temperature as well as other restrictions in use shall be given.

**Federal Institute for Materials Research and Testing (BAM)
12200 Berlin, November 5, 2004**

**Division II.1
"Gases, Gas Plants"**



Dr. Chr. Binder
Head of Laboratory

**Laboratory II.13
"Equipment for Gases, Oxygen"**



Dipl.-Ing. K. Arlt
Engineer in Charge

Copies:

1. Copy: Rich. Klinger Dichtungstechnik GmbH & Co KG
2. Copy: BAM – Laboratorium II.13, Dr. Binder

Annex 1

Testing of Gaskets for Flanges in Oxygen Steel Pipings

The test apparatus mainly consists of two DN 65 PN 160 steel pipes, each approximately 2 m in length, with corresponding standard flanges welded to each pipe.

Both pipes are sealed using the gasket to be tested. In case of a gasket disk its inner diameter is chosen in such a way that it projects into the pipe. If a gasket tape is under test, both ends of the tape are allowed to project into the pipe. The test apparatus is then pressurized with oxygen up to the desired test pressure. The flange is heated by heating sleeves to the test temperature, at least 50 K lower than the ignition temperature of the gasket. An electrical filament ignites that part of the gasket projecting into the pipe. If the gasket is electrically conductive, such as spiral seals or graphite foils, a nonconductive primer capsule of organic material (PTFE, rubber) is used which acts on the seal.

The gasket's behavior after ignition is important for its evaluation. If the seal burns with such a hot flame that the fire is transmitted to the steel of the flange (in most case the test apparatus is destroyed), the seal is considered unsuitable from the beginning. If only those parts of the seal burn that project into the pipe and the fire is not transmitted to the flanges and if the seal does not burn between the flanges there are no objections with regard to technical safety to use the seal under the conditions tested. Such a positive result is to confirm in four additional tests. If, however, the flanged connection becomes un-tight during a test, e. g., because of softening or burning of the seal, the test has to be continued at a lower temperature and oxygen pressure until a positive test result is reached in five tests, as mentioned above.