

Report

on Testing an Adhesive for Reactivity with Oxygen

Reference Number II-3917/2005 E
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1 Application

Customer TECNADE s.a.s.
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ITALIEN

Order Date September 15, 2005

Reference BAM-Binder 6-10-05

Receipt of Order October 17, 2005

Test Samples Adhesive SELON 336 as a thread sealant for use in gaseous oxygen piping, valves and sittings, and components at temperatures up to 60 °C.
BAM-Order No. II.1/48 263

Receipt of Samples October 11, 2005

Test Date November 23, 2005

Test Location BAM - Working Group "Safe Handling of Oxygen";
building no. 41, room no. 120

Test Procedure According to DIN EN 1797: 2002-02 „CRYOGENIC VESSELS - GAS/MATERIAL COMPATIBILITY“ and annex of „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 2005) according to rule BGR 500 „Betreiben von Arbeitsmitteln“ part 2, chapter 2.32 „Betreiben von Sauerstoffanlagen“, Edition: February 2005 and pamphlet M 034 „Umgang mit Sauerstoff“ (BGI 617).

All pressures of the report are excess pressures.
This test report consists of page 1 to 4 and annex 1.

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

TESTREPORT

2 Documents and Test Samples

The following documents and samples were submitted to BAM:

- 1 test application
- 1 Safety Data Sheet
- 1 Material Data Sheet
- 1 Adhesive SELON 336
Volume : 200 ml
Colour: green - transparent

3 Test Methods and Results

The test methods have been carried out according to DIN EN 1797: 2002-02 „CRYOGENIC VESSELS - GAS/MATERIAL COMPATIBILITY“ and annex of „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 2005) according to rule BGR 500 „Betreiben von Arbeitsmitteln“ part 2, chapter 2.32 „Betreiben von Sauerstoffanlagen“, Edition: February 2005 and pamphlet M 034 „Umgang mit Sauerstoff“ (BGI 617).

The adhesive SELON 336 has been tested in liquid and in cured condition.

A determination of the autogenous ignition temperature (AIT) and a test for aging resistance in high pressure oxygen were not necessary as SELON 336 is not for use at temperatures greater than 60 °C.

3.1 Ignition Sensitivity to Gaseous Oxygen Impacts

The test method is described in annex 1.

3.1.1 Liquid Adhesive

Results:

Sample temperature t_a [°C]	Oxygen pressure p_a [bar]	Oxygen pressure p_e [bar]	Reaction on Impact
60	1	30	ignition on 2. impact
60	1	25	no reaction*)
60	1	25	no reaction*)

*) within a series of five consecutive impacts

In two separate tests, each consisting of a series of five consecutive impacts, no reactions with oxygen could be observed at an oxygen pressure p_e of 25 bar.

3.1.2 Cured Adhesive

Results:

Sample temperature t_a [°C]	Oxygen pressure p_a [bar]	Oxygen pressure p_e [bar]	Reaction on Impact
60	1	20	ignition on 2. impact
60	1	15	no reaction*)
60	1	15	no reaction*)

*) within a series of five consecutive impacts

In two separate tests each consisting of a series of five consecutive impacts, no reactions with oxygen could be observed at an oxygen pressure p_e of 15 bar.

4 Evaluation

On basis of those test results, there are no objections with regard to technical safety to use the adhesive SELON 336 in piping, valves and fittings, or other components for gaseous oxygen service at following operating conditions:

Maximum oxygen pressure up to 15 bar	Maximum Temperature up to 60 °C
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This report does not cover the use of SELON 336 for liquid oxygen service. For this application, a particular test for reactivity with liquid oxygen needs to be carried out.

5 Comments

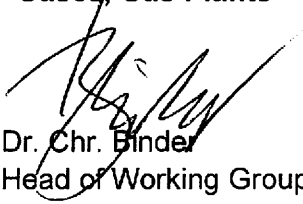
This report expires at once, if the composition of the tested material is changed. This report expires on December 31, 2015, at the latest. A prolongation beyond this date is possible, if the manufacturer confirms in writing that the material has not changed since this evaluation.

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 only for gaseous 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, December 8, 2005

Division II.1
"Gases, Gas Plants"



Dr. Chr. Binder
Head of Working Group

Working Group
"Safe Handling of Oxygen"



Dipl.-Ing. P. Hartwig
Engineer in Charge

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Annex 1

Testing for Ignition Sensitivity to Gaseous Oxygen Impacts

Approximately 0.2 g to 0.5 g of the pasty or divided solid sample is placed into a heatable steel tube, 15 cm³ in volume. In case of liquids to be tested, ceramic fibre, soaked with the sample, is used. The sample tube is connected by a 750 mm long pipe (internal diameter 14 mm) and a pneumatically operated quick opening valve to a high-pressure oxygen accumulator.

A heater allows to set the sample tube to the test temperature t_a . After the tube and pipe are at test pressure p_a , the quick opening valve is opened and preheated oxygen of 60 °C and of pressure p_e flows abruptly into the pipe and tube. In this way, the oxygen in the tube and in the pipe is almost adiabatically compressed from pressure p_a to p_e and heated. If there is a reaction of the sample with oxygen, indicated by a steep temperature rise in the tube, further tests with a new sample are performed at a lower pressure ratio p_e/p_a . If, however, no reaction of the sample with oxygen can be detected after a waiting period of 30 seconds, the tube is de-pressurized and the test is repeated (up to four times) until a reaction takes place. This means, each test series consists of a maximum of five single tests with the same material under the same conditions. If no reaction can be observed, even after the fifth single test of a test series, testing is continued with new samples at greater pressure ratios p_e/p_a , until finally that pressure ratio is determined, at which no reaction can be observed within a test series of five single tests. If the repetition of that test series with a new sample shows the same result, the test can be finished or continued at a different test temperature t_a .