C. Binder: Components and nonmetallic materials for oxygen service
Safe usage is possible if basic requirements for components are met!

- Ignition Resistant
- Oxygen Compatible
- Proper Design

AIR LIQUIDE | BAM | BG RCI
Gases under pressure
Compatible Nonmetallic Materials
Testing of Nonmetallic Materials

- Autogenous Ignition Temperature (AIT) determination
- Aging resistance testing
- Oxygen pressure shock testing
Testing of Nonmetallic Materials

- Flange test
- Testing for reactivity with liquid oxygen on mechanical impact
Testing of Nonmetallic Materials

- Autogenous Ignition Temperature (AIT)
Testing of Nonmetallic Materials

- Aging resistance testing
Testing of Nonmetallic Materials

- Ignition sensitivity testing to oxygen pressure shocks
Testing of Nonmetallic Materials

- Flange Test
Testing of Nonmetallic Materials

- Testing for reactivity with liquid oxygen
List of Nonmetallic Materials tested by BAM

List M 034-1, supporting document to German code of practice M 034 "Oxygen"

- For guidance only
- No certification – unless otherwise stated
List of Nonmetallic Materials

Contents

Lubricants for valves

Gaskets

Seals for screwed pipe connections

Seals for valves

Materials for piston rings in compressors

Filling liquids

Annex 1: Manufacturers or sales offices

Annex 2: BAM’s test methods
# List of Nonmetallic Materials

## Contents

1. **Gleitmittel für Armaturen / Lubricants for valves**

<table>
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<tr>
<th>Bezeichnung des Gleitmittels</th>
<th>Obere Druckgrenze (bar) bei 60 °C</th>
<th>Bemerkungen</th>
<th>Hersteller bzw. Vertreiber</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lubricant</td>
<td>Maximum use pressure (bar) at 60 °C</td>
<td>Comments</td>
<td>Manufacturer or sales office</td>
</tr>
</tbody>
</table>

- Turmstemp IV100 CL VIT: Paste, 130 bar, 14
- Turmstemp IV1200 GX: Paste, 100 bar, 14
- Turmstemp IV1400 VP1: Paste, 130 bar, 14
- Turmstemp L182: Paste, 30 bar, 14
Importance of Batch Testing of Nonmetallic Materials

Maximum pressures of non-reaction at 60 °C of different batches of one paste-like lubricant of the same producer

- maximum 310 bar
- minimum 160 bar

T. Tillack, Chr. Binder, K. Arlt, T. Brock, P. Hartwig, and O. Hesse,
12 th International ASTM Symposium on Flammability and Sensitivity, Berlin, 2009
Testing of Oxygen Components

- According to ...
  - Standards
    - Certain components covered, only!
  - “BAM Test Method”
    - Testing at higher temperatures
    - Check of drawings
Testing of Oxygen Components

- Pressure Surge Tester
List of Oxygen Components tested by BAM

- List M 034-2, supporting document to German code of practice M 034 “Oxygen”
List of Oxygen Components

Contents

Cylinder valves/ bundle valves
Pressure reducers/ regulators
Hoses/ hose couplings
Various components
Annex 1: Manufacturers or sales offices
Annex 2: Applied test methods by BAM
## List of Oxygen Components tested by BAM

### Contents

#### 1. Gasflaschenventile/Bündelventile / Cylinder valves/bundle valves

1.1 Standard-Ventile / Standard valves

<table>
<thead>
<tr>
<th>Bezeichnung</th>
<th>Maximaler Betriebsdruk (bar) bei 60 °C</th>
<th>Bemerkungen</th>
<th>Hersteller bzw. Vertreiber</th>
</tr>
</thead>
<tbody>
<tr>
<td>Designation</td>
<td>Maximum use pressure (bar) at 60 °C</td>
<td>Comments</td>
<td>Manufacturer or sales office</td>
</tr>
</tbody>
</table>

- Gasflaschenventile KRV 10 und KVO 10
- Zulassung für Ventile und Behälter nach EN 1562:2011

AIR LIQUIDE  BAM  BG RCI  Gases under pressure
Requirement for Lifetime Burn-Out Safety of Oxygen Components

- Effective and living quality assurance system

E.g.,
Quality of workmanship of manufacturer

Position of bore ???
Oxygen Compatible Materials and Burn-Out Safe Oxygen Components

Guarantee Safe Usage