

Memorandum

## Overview of test methods

### **United Nations Recommendations on the Transport of Dangerous Goods, Manual of Tests and Criteria, Part I, Test series 1 to 8 (explosives)**

- 1(a) UN gap test
- 1(b) Koenen test
- 1(c)(i) time/pressure test

- 2(a) UN gap test
- 2(b) Koenen test
- 2(c)(i) time/pressure test

- 3(a)(ii) BAM Fallhammer
- 3(b)(i) BAM friction apparatus
- 3(c)(i) thermal stability test at 75 °C
- 3(d) small-scale burning test

4 most tests are possible, contact us for details

5 most tests are possible, contact us for details

- 6(a) single package test on packaged explosive
- 6(b) stack test on packaged explosive
- 6(c) external fire (bonfire) test on packaged explosive
- 6(d) unconfined package test on packaged explosive

7 most tests are possible, contact us for details

- 8(a) thermal stability test for ammonium nitrate emulsions, suspensions or gels
- 8(b) ANE gap test
- 8(c) Koenen test

### **United Nations Recommendations on the Transport of Dangerous Goods, Manual of Tests and Criteria, Part II, Test Series A to H (explosives and self- reactives)**

- A.6 UN detonation test
- B.1 detonation test in package
- C.1 time/pressure test
- C.2 deflagration test
- D.1 deflagration test in package
- E.1 Koenen test
- E.2 Dutch pressure vessel test
- F.4 modified Trauzl test

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13 March 2017

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- G.1 thermal explosion test in package
- H.1 US SADT test
- H.3 isothermal storage test (heat flow calorimetry)
- H.4 heat accumulation storage test (HAST)

**United Nations Recommendations on the Transport of Dangerous Goods, Manual of Tests and Criteria, Part III, Test series L to S (other dangerous materials)**

- L.2 sustained combustion test
- N.1 test for readily combustible solids
- N.2 test for pyrophoric solids
- N.3 test for pyrophoric liquids
- N.4 test for self-heating substances (modified Bowes-Cameron cage test)
- N.5 test for substances which in contact with water emit flammable gases
- O.1 test for oxidizing solids
- S.1 test for determination of the self-sustaining exothermic decomposition of fertilizers containing nitrates (trough test)

**United Nations Recommendations on the Transport of Dangerous Goods, Manual of Tests and Criteria, Appendices**

- Appendix 5 Test methods for vent sizing (10-litre vessel)
- Appendix 6 Screening procedures

**Various thermal stability and reactivity tests**

- mini-autoclave (modified closed pressure vessel test)
- advanced reactive system screening tool (ARSST)
- differential scanning calorimetry (DSC)
- differential thermal analysis (DTA)
- thermogravimetry (TG)
- thermomechanical analysis (TMA)

Some of the above mentioned techniques can be performed under pressure or under various atmospheres. Direct coupling to FTIR or MS for analysis of the decomposition products is possible. Real time observation with a microscope is also possible.

**Tests on ammonium nitrate based fertilizers**

- 4 inch detonation test according to Regulation (EC) 2003/2003
- oil retention test according to Regulation (EC) 2003/2003
- indentation test (screening test for detonative properties)

### **Dust explosion properties**

Various tests are possible, please contact us for details.

### **Other test methods**

The above overview is not exhaustive, we have a range of teste methods and equipment for testing of hazardous materials available and we will be please to discuss the possibilities. Just contact us.

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