



**Date**  
February 2, 2005

**Our reference**  
05DV4 100/16695/brap

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## CERTIFICATE

### *Summary*

At the request of Dräger Safety AG & Co KGaA, Luebeck, TNO-PML assessed the protective properties of the material HIMEX M, olive-green (Part-No. R 55558). The following liquid chemical warfare agents were applied to the fabric:

- Mustard agent (HD), CAS-No.: 505-60-2
- Soman (GD), CAS-No.: 58868-94-3
- Sarin (GB), CAS-No.: 107-44-8
- VX, CAS-No.: 20820-80-8
- Tabun (GA), CAS-No.: 77-81-6
- Lewisite (L), CAS-No.: 541-25-3

The following gaseous toxic industrial chemicals were applied:

- Phosgene ( $\text{COCl}_2$ ), (CG) CAS-No.: 75-44-5
- Arsine ( $\text{AsH}_3$ ), (SA) CAS-No.: 7784-42-1
- Cyanogen Chloride ( $\text{ClCN}$ ), (CK) CAS-No.: 506-77-4
- Hydrogen Cyanide ( $\text{HCN}$ ), (AC) CAS-No.: 74-90-8

The assessment was based on the following documents:

### Standard:

- For the liquid chemicals: FINABEL O.7.C, Methodes de mesures de la resistance des materiaux impermeables et permeables au passage des agents toxique, partie A, 15-03-2000
- For the gaseous chemicals: ISO 6529, Protective Clothing – Protection against chemicals – Determination of resistance of protective clothing materials to permeation by liquids and gases, 15-10-2001

### Additional documents:

- TNO letter report no. 04D1/1262/16695/brap, dated November 25, 2004.
- TNO letter report no. 05DV4 094/16695/brap, dated February 1, 2005



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**Conclusion**

TNO PML has assessed the protective properties of the HIMEX M, olive-green material (Part-No. R 55558) and concludes that this material is suitable for use in chemical protective suits that should protect against the chemical warfare agents: Mustard Agent, Soman, Sarin, VX, Tabun and Lewisite. Evaluation of the material with Phosgene, Arsine, Cyanogen Chloride and Hydrogen Cyanide showed that the material also meets the ISO 6529 criterion of 1.0 µg/cm<sup>2</sup>/min.

The experiments gave the following breakthrough time results:

- Mustard agent : > 48 hours
- Soman : > 48 hours
- Sarin : > 48 hours
- VX : > 48 hours
- Tabun : > 48 hours
- Lewisite : > 48 hours
- Phosgene : > 480 minutes
- Arsine : > 480 minutes
- Cyanogen Chloride : > 480 minutes
- Hydrogen Cyanide : > 480 minutes

**SIGNATURES:**

A handwritten signature in black ink, consisting of a large, stylized 'R' followed by a horizontal line.

R.J. van Eenennaam  
Project Manager

A handwritten signature in black ink, consisting of a large, stylized 'S' followed by 'VdGijp'.

Dr. S. Van der Gijp  
Interim Manager Research Group  
Physical Protection