

# Dräger HIMEX<sup>®</sup> material for gas-tight chemical protective clothing



Hazardous material teams are confronted by all kinds of situations on a daily basis. Chemical protective clothing must protect the wearer from aggressive chemicals under extremely difficult conditions. The multi-layered Elastomer HIMEX<sup>®</sup> developed by Dräger Safety guarantees the wearer greater protection – even against mechanical stresses that can impair the effectiveness of the chemical protective suit while working.



ST-5700-2004

Dräger TeamMaster  
pro-ET: blue

Any chemical protective clothing is limited in its protective capacity by the material used. The minimum requirements in respect of chemical resistance and mechanical strength are defined in the European Standard (EN), DIN EN 943-1 issued in December 2002. The minimum requirements of DIN EN 943-2 issued in April 2002 are defined specifically for emergency teams. Nevertheless, a study of members of emergency teams shows that around 80% of protective clothing is damaged by mechanical stresses.<sup>1)</sup>

The multi-layered Elastomer HIMEX<sup>®</sup>, developed by Dräger Safety, opens up new prospects for chemical protective clothing. HIMEX<sup>®</sup> performs well in both the mechanical tests and chemical tests of the standards quoted (see table 1 'HIMEX<sup>®</sup> exceeds the standard' on page 2).

<sup>1)</sup> Study of the practical requirements on respiratory and body protection equipment to fight chemicals, BZS, 1995

HIMEX<sup>®</sup> is a registered trademark of Drägerwerk AG, Lübeck.



ST-5883-2004

Dräger WorkMaster  
pro-ET: orange

**TABLE 1: HIMEX® EXCEEDS THE REQUIREMENTS OF THE STANDARDS**

Property	EN 943, part 1+2 / EN-Class		HIMEX® <sup>1)</sup>
Abrasion resistance: (MARTINDALE abrasion test)	> 2.000 cycles	Class 6	> 2.000 cycles: no abrasion detected
Flex-cracking resistance at room temperature:	> 15.000 cycles	Class 4	> 40.000 cycles: no apparent cracks in the surface
Flex-cracking resistance at low temperature:	bei -30 °C	Class 2	bei -30 °C: > 200 cycles: no apparent cracks in the surface
Tear strength (trapezoidal method):	> 40 N	Class 3	> 210 N
Tensile strength:	1.000 N	Class 6	> 2.000 N
Penetration resistance:	> 50 N	Class 3	164 N
Seam strength:	> 300 N	Class 5	> 600 N
Resistance to flame exposure:	5 s flame contact	Class 3	self-extinguishing, no holes, no afterglow, gas-tight
Burst strength:	> 320 (kPa)	Class 4	> 1.030 kPa

<sup>1)</sup> acc. to DMT test report of 21 Feb 2003 and 22 April 2003

**TABLE 2: CHEMICAL TESTS**

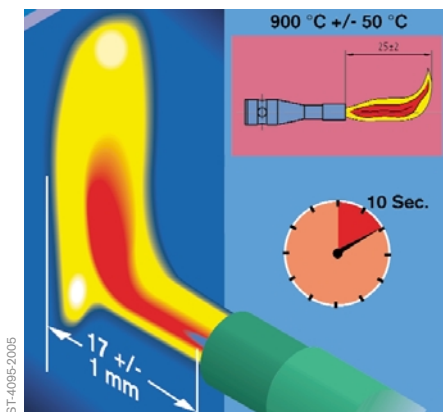
Chemical	Breakdown time (minutes) <sup>(4)</sup>	Chemical	Breakdown time (minutes) <sup>(4)</sup>
Acetone <sup>2) 3)</sup>	> 120	Hydrogen chloride <sup>2) 3)</sup>	> 480
Acetonitrile <sup>2) 3)</sup>	> 480	Methanol <sup>2) 3)</sup>	> 480
Ammonia <sup>2) 3)</sup>	> 480	Methyl chloride <sup>3)</sup>	> 480
1,3-Butadiene <sup>3)</sup>	> 480	n-Heptane <sup>2)</sup>	> 480
Carbon disulphide <sup>2) 3)</sup>	> 480	n-Hexane <sup>3)</sup>	> 480
Chlorine <sup>2) 3)</sup>	> 480	Nitrobenzene <sup>3)</sup>	> 480
Dichloromethane <sup>2) 3)</sup>	> 60	Sodium hydroxide (40%) <sup>2)</sup>	> 480
Diethylamine <sup>2) 3)</sup>	> 480	Sulphuric acid (96%) <sup>2)</sup>	> 480
N,N-Dimethylformamide <sup>3)</sup>	> 480	Tetrachlorethylene <sup>3)</sup>	> 480
Ethyl acetate <sup>2) 3)</sup>	> 480	Tetrahydrofurane <sup>2) 3)</sup>	> 480
Ethylene oxide <sup>3)</sup>	> 480	Toluene <sup>2) 3)</sup>	> 480

Further resistance data are available at '<http://www.draeger.com/voice>'.

<sup>2)</sup> Test chemicals of EN 943-2:2002 and vdfb guideline 08/02:2002-11(03) (German Fire Protection Association)

<sup>3)</sup> Test chemicals of NFPA 1991:2000 (National Fire Protection Association)

<sup>4)</sup> Time acc. to DIN EN ISO 6529:2003-01 until the permeation rate reaches 1,0 µg/cm<sup>2</sup>/min



HIMEX® even provides protection against darting flames. HIMEX® has yet another remarkable property: chemicals can often ignite and cause darting flames.

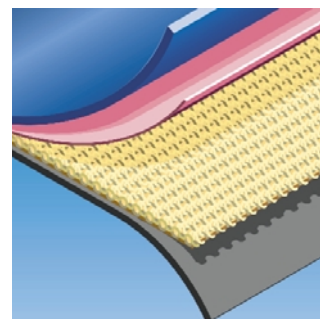
HIMEX® passes the flame test of DIN EN ISO 15 025, issued February 2003, otherwise used for heat protection materials with no adverse effect on its gas tightness.

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**What is HIMEX®?** HIMEX® has – simply put – a 4-layer sandwich construction. The outer layer based on elastomer material was specifically chosen for its abrasion resistance. In the middle are a highly chemical-resistant barrier layer and the high-strength substrate fabric. Its high tear strength is what gives HIMEX® its exceptional robustness. The inner layer with

elastomer base lends HIMEX® its smooth, easy to clean surface and additional chemical retaining power.

With many other materials for chemical protection, the barrier layer is arranged at the outside and is thus exposed to the wide range of effects of mechanical and thermal stress.



HIMEX® material layers

ST-4086-2005

**Comparison of different materials used for chemical protective clothing for hazardous materials response teams.**

Material A is a polypropylene film material. Material B is a fabric that incorporates various elastomer layers. These materials are frequently used for chemical protective clothing for hazardous materials emergency response teams.

HIMEX® is suitable for use wherever the work process means that protective clothing is subjected to high mechanical stress in conjunction with aggressive chemicals.

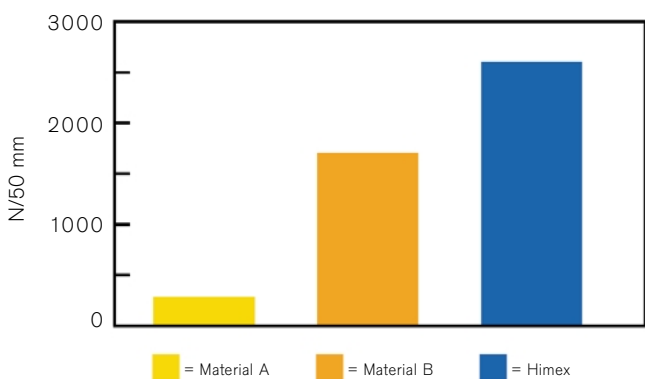
The tensile strength is shown in diagram 1 and tear strength in diagram 2.

When choosing chemical protective clothing, make sure you check out the material itself.

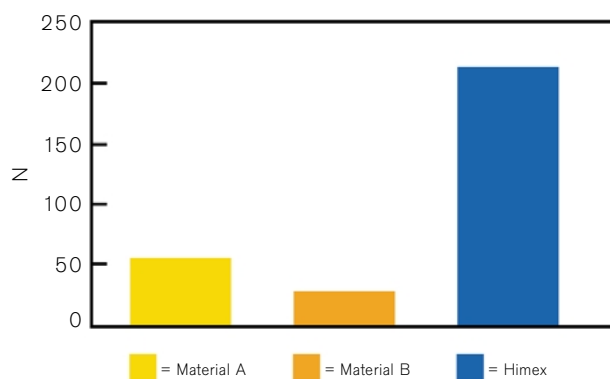
As a robust and highly chemical-resistant material for chemical protective clothing,

Dräger HIMEX® – another quality product from Dräger Safety.

**DIAGRAM 1: TENSILE STRENGTH**



**DIAGRAM 2: TEAR STRENGTH**



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