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Federal Department of Defence,
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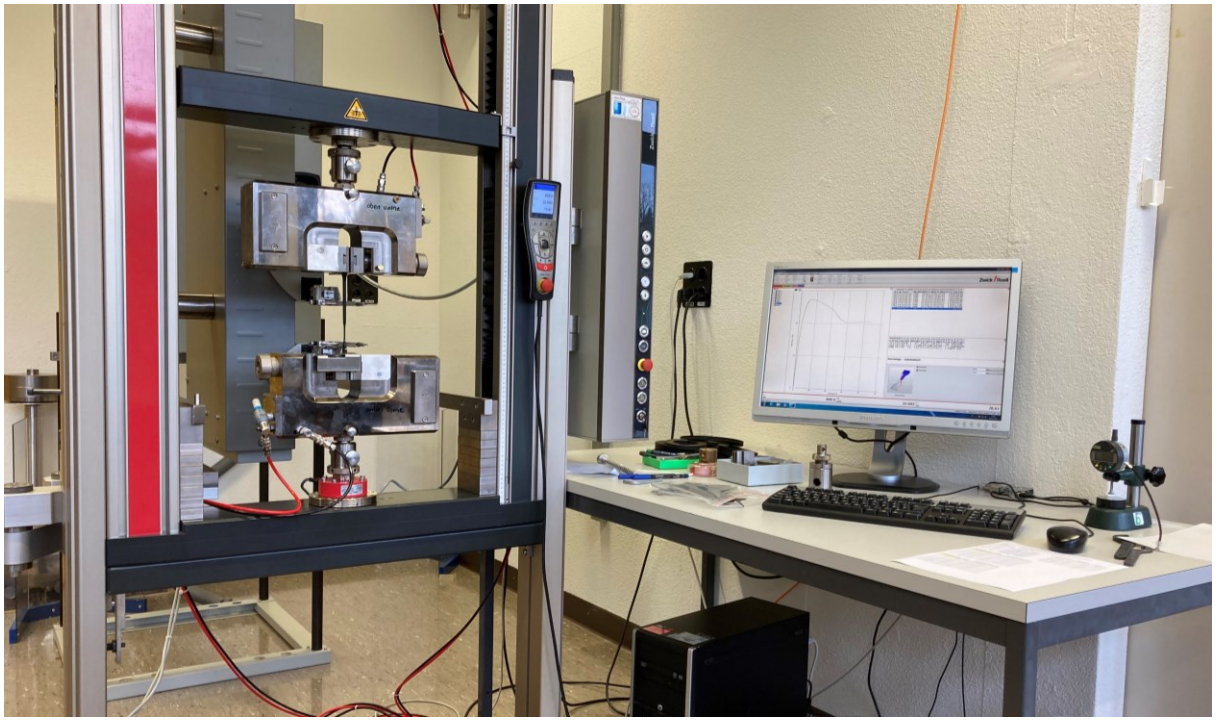
SPIEZ LABORATORY

September 2025

SPIEZ LABORATORY

Testing Laboratory for Polymers and Rubber

Overview of Services



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1. Fields of Activity

The Materials Testing Group of SPIEZ LABORATORY operates an Accredited Testing Laboratory (STS 0036) according to ISO 17025. It is a dedicated laboratory for testing of polymer materials such as thermoplastics, thermoplastic elastomers, thermosets, rubbers and textiles. As a special field the laboratory offers testing of plastics, elastomers and textiles for resistance to chemical warfare agents.

The activities of the laboratory include the following services:

- Materials testing regarding application, quality assurance and damage investigation of polymer materials
- Consultation services regarding properties and application of polymer materials

Our most important goal is to provide conclusive and practice-oriented answers in due time to the customers questions concerning polymer materials. This is achieved by the qualified and experienced staff on one hand and by the available wide-ranging test equipment on the other hand. Our work is regularly observed by the Swiss Accreditation Service SAS including experts of the relevant industry. This provides a high degree of confidence in our test results.

The scope of testing services can be subdivided into the following areas:

- Production of test specimens
- Testing for optimal processing quality
- Mechanical-physical testing
- Chemical-analytical testing
- Determination of the ageing behaviour/simulation of environmental influences
- Investigation of the resistance to various substances and chemicals
- Tests for flammability
- Colour measurements
- Testing for resistance to chemical warfare agents

We are contracted by external customers of various industries such as general mechanical engineering, medical, electrical, solar, appliances as well as producers and processors of the plastics industry within Switzerland and in foreign countries.

Contracts from internal customers comprise testing during evaluation and procurement of defense equipment by the armasuisse, type testing of equipment for protection shelters for the Federal Department for Civil Protection (FOCP) or testing for other Federal Departments.

2. Test Methods on Offer

2.1. Preparation of Test Specimens

The materials to be tested are usually delivered by our customers in various shapes such as complete form parts, semi-finished products and raw materials. Using suitable machines, equipment and tools, we produce standard test specimens or other suitable test specimens.

Moulded parts and semi-finished products made of rubber and thermoplastic elastomers can be cut into sheets or strips of any thickness down to approx. 0.5 mm using a splitting machine.

A comprehensive set of die-cutting tools allows simple and quick preparation of various standard test specimens such as dumb bells, stripes, rings and discs.

Standard test specimens can be produced from plastic sheets by copy milling.

Fig. 1: Die-cutting Tools for Preparation of Standard Test Specimens

Fig. 2: Copy Milling Machine

Fig 3: Splitting Machine

2.2. Mechanical-Physical Testing

Test Equipment	Test Parameter
Universal Testing Machines	Tensile, compression and bending tests up to 20 kN Test speeds up to 1000 mm/min Temperature range from - 80 to 150 °C Elongation/strain up to 1500 mm
Impact Testing Machine	Notched and un-notched impact bending tests Charpy-Pendulums: 0.5, 1, 2, 4, 7.5, 15, 25 and 50 J Izod-Pendulums: 1, 2.75 and 5.5 J
Hardness Testing	Shore A, Micro Shore A, Shore D, IRHD M
Tear Resistance	Forces up to 64’000 mN (Elmendorf)
Abrasion Resistance	Rotating drum, with or without rotating test specimen
Rebound Resilience	Basic dynamic testing of elastomers (elasticity, damping)

Fig. 4: Tensile Testing Machine

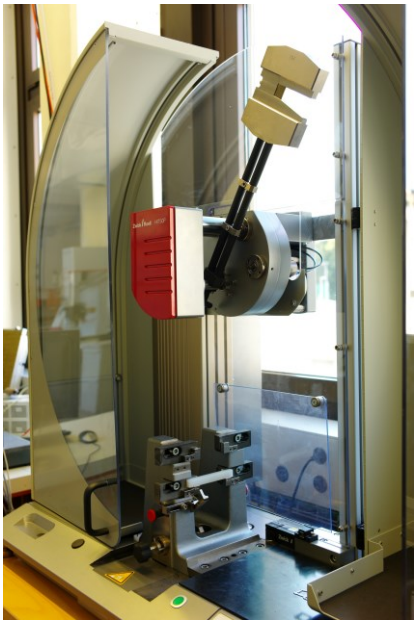


Fig. 5: Impact Pendulum

Fig. 6: Abrasion Resistance (Rotating Drum)

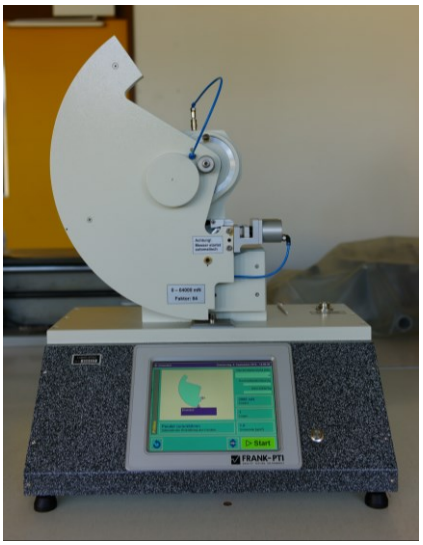
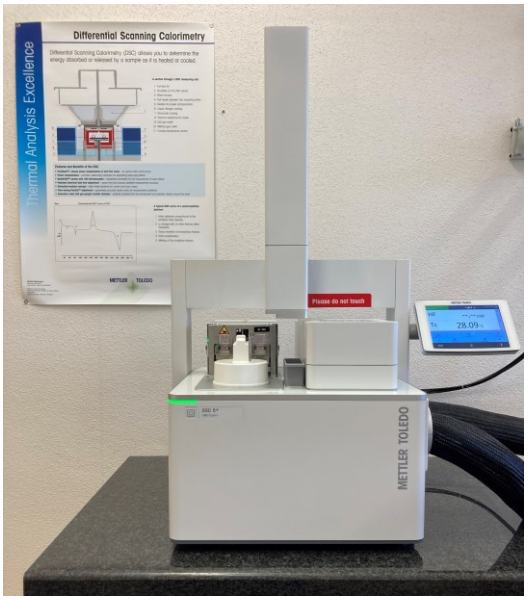


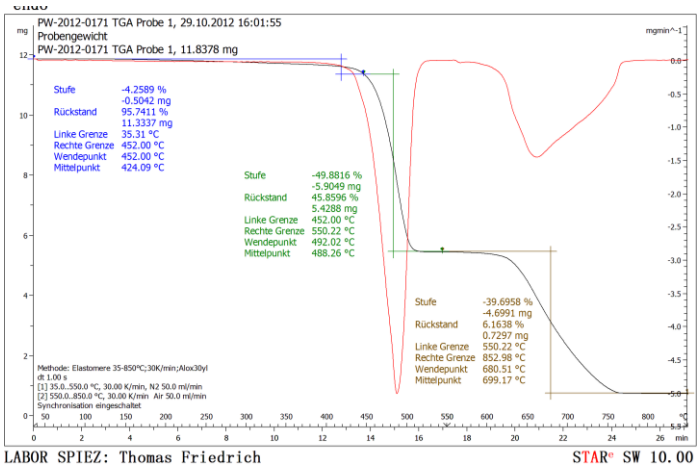
Fig. 7: Tear Resistance Pendulum

2.3. Chemical-Analytical Testing



Thermal analyses are powerful test methods providing significant information for the characterization of polymer materials. Differential Scanning Calorimetry DSC reveals glass transition temperatures as well as peak temperatures and enthalpy of melting and crystallization processes. The effectiveness of stabilizers against thermal induced oxidation can be investigated by measurement of the Oxidation Induction Time and Temperature OIT. Furthermore, investigations into the kinetics of chemical reactions, such as the curing of thermosets, are possible.

Fig. 8: Thermal Analysis Equipment DSC 5+



The composition of rubber compounds and identification of the rubber polymers they contain can be determined using Thermogravimetric Analysis (TGA). This allows us to conclude that the example shown is EPDM with the following composition:

4 % plasticizers, 50 % rubber, 40 % carbon black and 6 % inorganic residuals.

Fig. 9: Compositional Analysis of Rubber by TGA

Fourier-Transformation-Infrared-Spectroscopy FTIR allows the identification of unknown materials within short time by comparison of the response spectra with those from a comprehensive library of known materials.

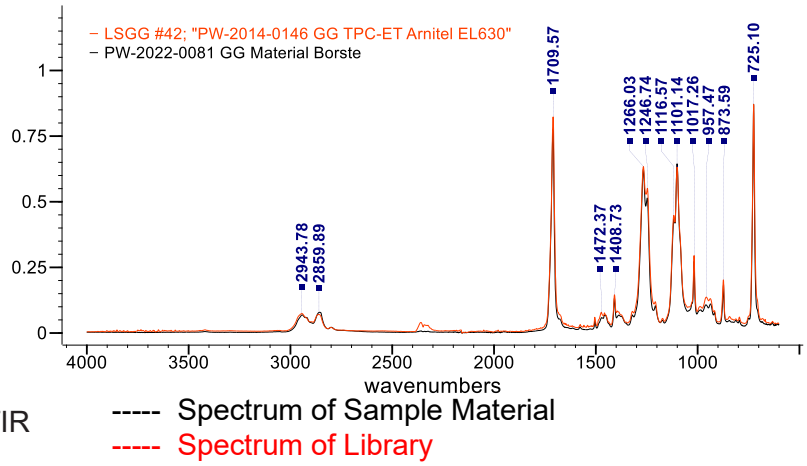


Fig. 10: Infrared Spectrometer FTIR

2.4. Investigation of Ageing Behaviour/Resistance to Environmental Conditions

To simulate and accelerate the effects of long term thermo-oxidative and physical degradation material samples are stored at elevated temperatures.

In the weathering test chamber material samples are exposed to UV radiation for simulation/acceleration of the photo-oxidative degradation. For outdoor applications the samples are additionally exposed to cyclic rain.

Rubber materials are stretches and exposed to an atmosphere with increased ozone concentration in a test chamber and afterwards visually inspected for cracks.

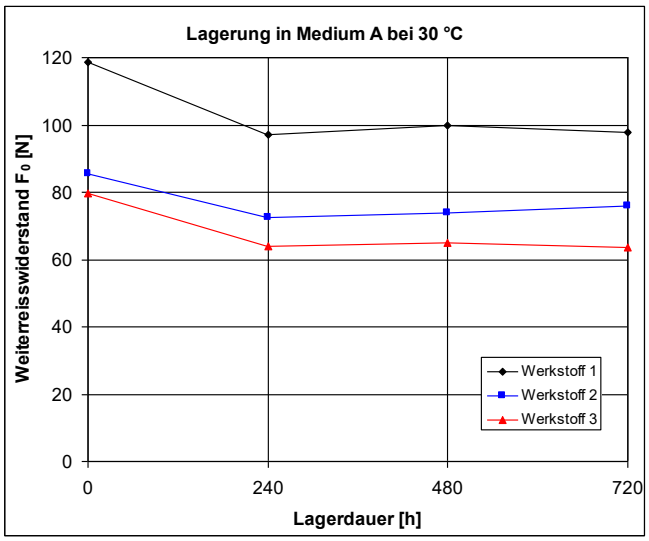
A controlled climate chamber enables alternating climate tests i.e., for testing the adhesion of coatings and lacquers.

Fig. 11: Weathering UV Test Chamber

Fig. 12: Ozone Test Chamber

By measuring material properties of interest before and after ageing or weathering, statements can be made about the ageing behaviour or resistance to environmental influences.

2.5. Resistance to Chemicals



To test the resistance of plastics and elastomers to oils, fats, chemicals, etc., test specimens are stored in the relevant medium for a specific period of time, at elevated temperatures if necessary. By measuring the relevant material properties before and after storage, conclusions can be drawn about their resistance to such media.

Fig. 13: Property Change due to Exposure to Chemicals

2.6. Verification of Processing Quality

Thermoplastics should not be damaged or degraded too severely during processing into moulded parts and semi-finished products. To test this, the difference in molecular weight between granulate and moulded part is preferably determined indirectly using a flow tester (MVR and MFR).

Fig. 14: Melt Flow Measurement MFR and MVR

Rubbers must be optimally vulcanised so that they can fulfil their function in service over a long period of time. The degree of vulcanisation is verified using the standardised measurement of the compression set.

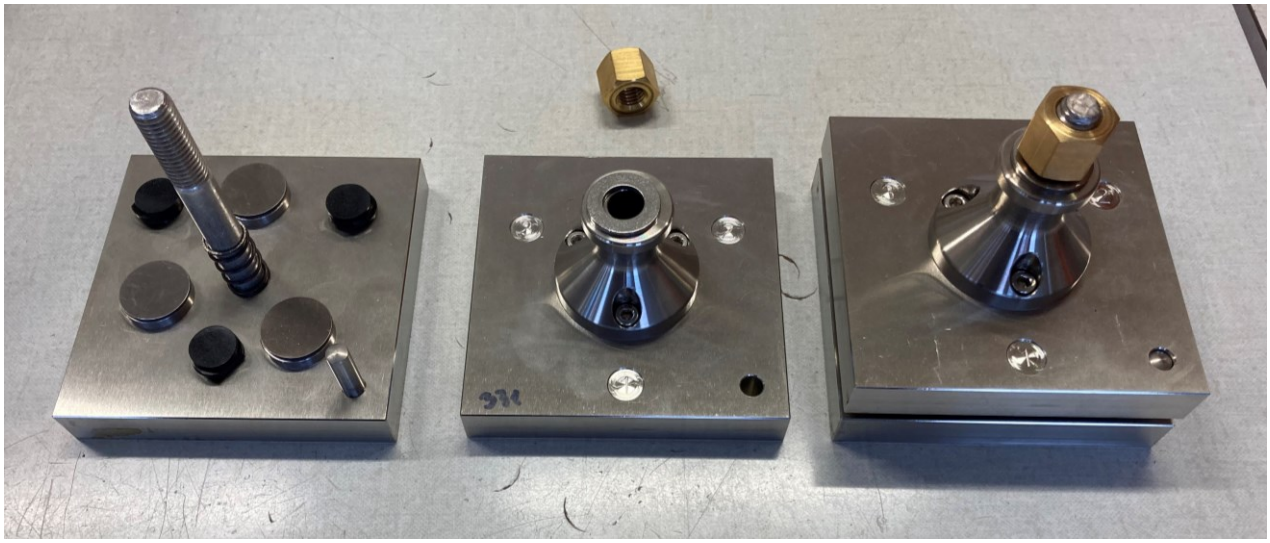


Fig. 15: Compression Set Measurement Devices

2.7. Flammability Tests

Plastics that are used in electrical apparatus and devices or in vehicles must, among other things, meet various requirements regarding flammability behavior. If an official UL 94 classification is sought, it is worthwhile to carry out the corresponding tests in advance.

Classification UL 94	Application
HB, HB-40, HB-75	Determination of linear horizontal burning rate
V-0, V-1, V-2	self-extinguishing materials, vertical burning test

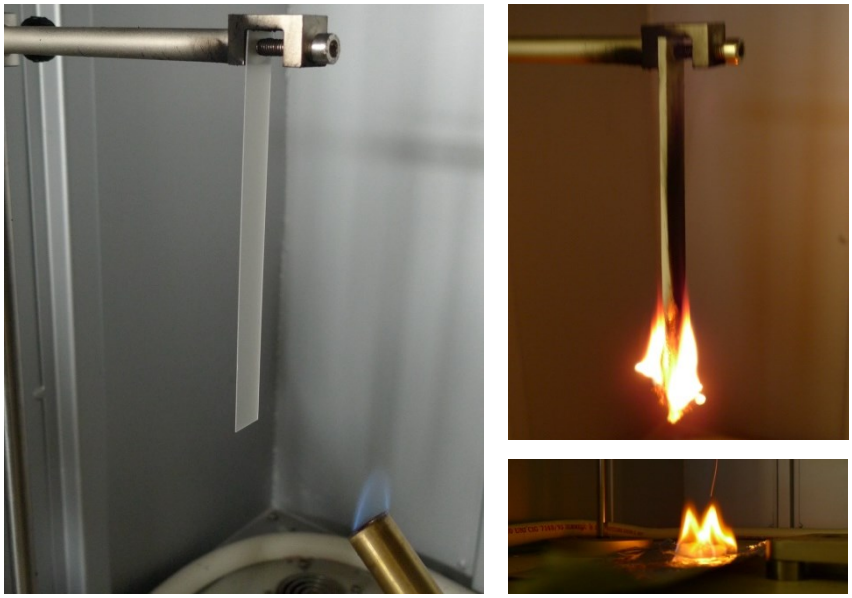


Fig. 16: Vertical Flammability Test UL 94 V-2

Tests according to **DIN 75200** are performed to determine horizontal burning rates of interior materials in motor vehicles.

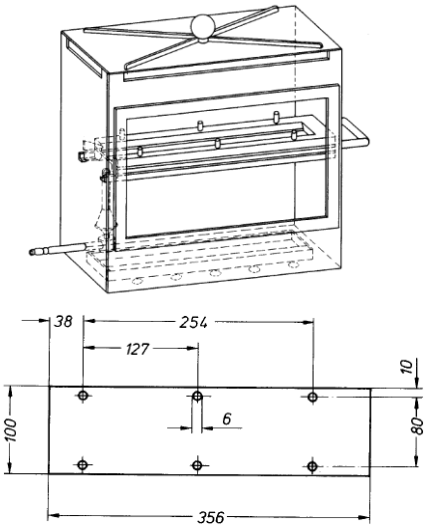


Fig. 17: Sample Dimensions and Test Chamber for Flammability Tests DIN 75200

2.8. Colorimetry

Our laboratory offers measurements of CIE color coordinates L*, a* und b* using the 45/0 measurement geometry. Of major interest are color differences, i.e. fading of colors due to artificial weathering under UV radiation. Colour differences are characterized by the parameters ΔE*, ΔL*, Δa* und Δb*.

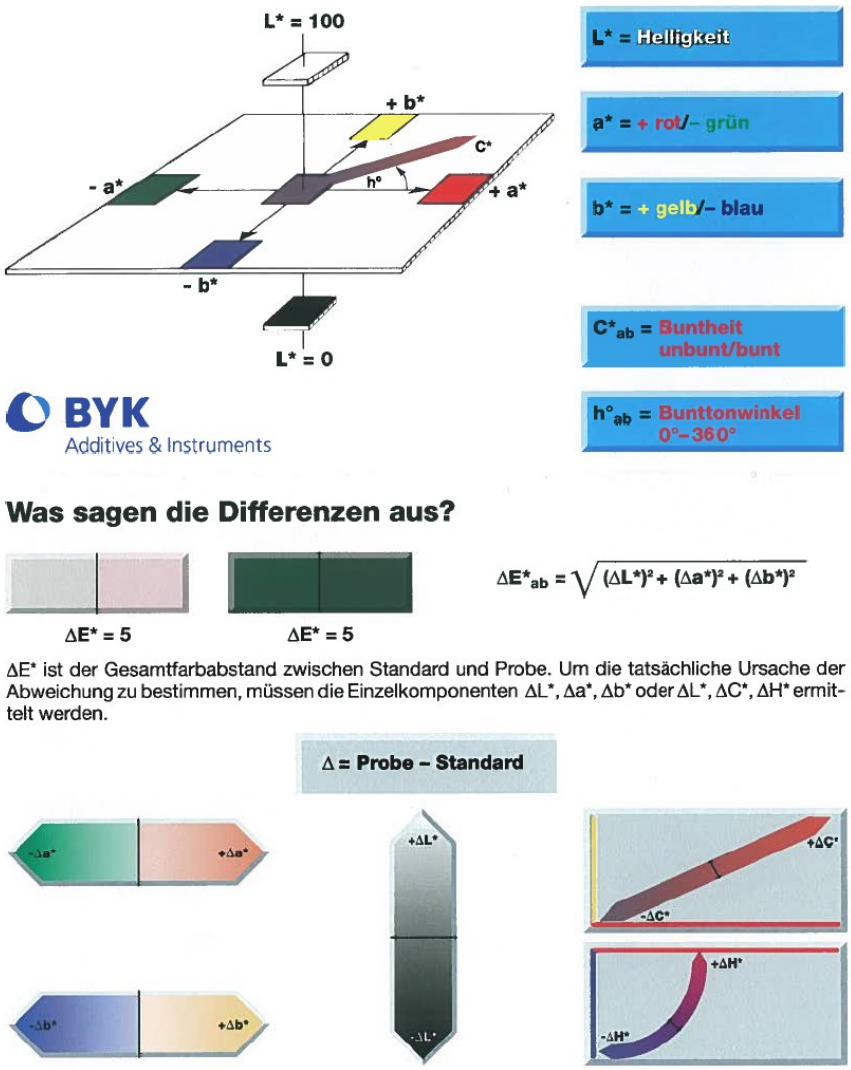


Fig. 18: CIE L*a*b*-System

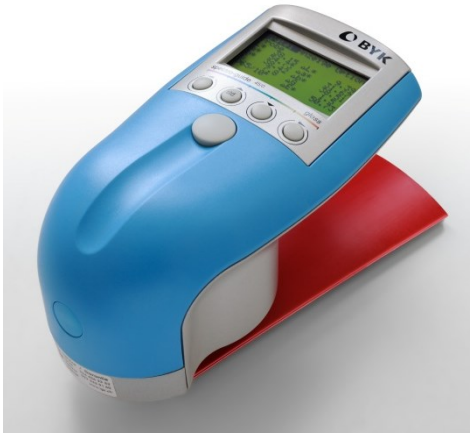
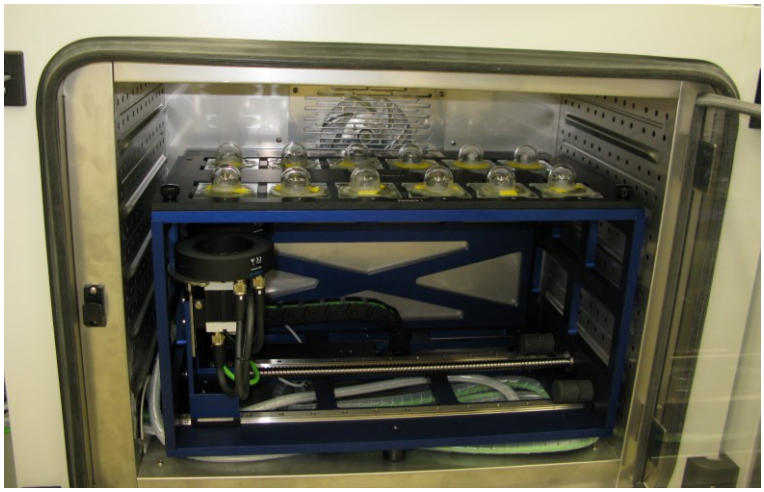


Fig. 19: Color Measurement Device

2.9. Resistance to Chemical Warfare Agents

Materials used for CBRN protection equipment such as suits, masks, gloves, boots, seals for ventilation components etc. are tested for their resistance to permeation by chemical warfare agents by means of various test apparatuses/test methods. Breakthrough of the warfare agents is detected either by means of change in the electrical conductivity of water, by color change of an indicator paper or by discoloration of a sampling solvent (photometric).



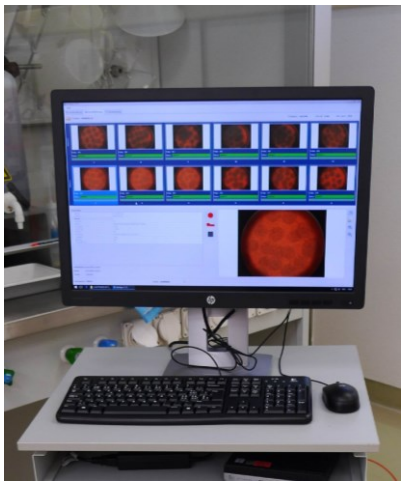


Fig. 20: Indicator Paper Method with Yperite HD, SD-Method (Camera System)

Fig. 21: Conductivity Method with Yperite HD

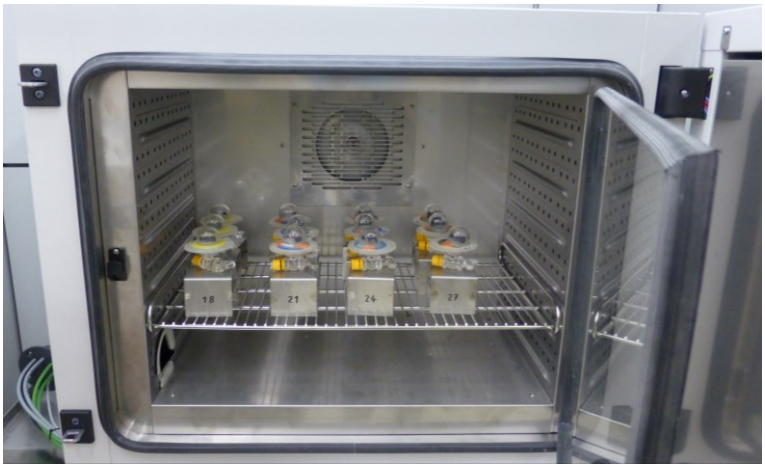
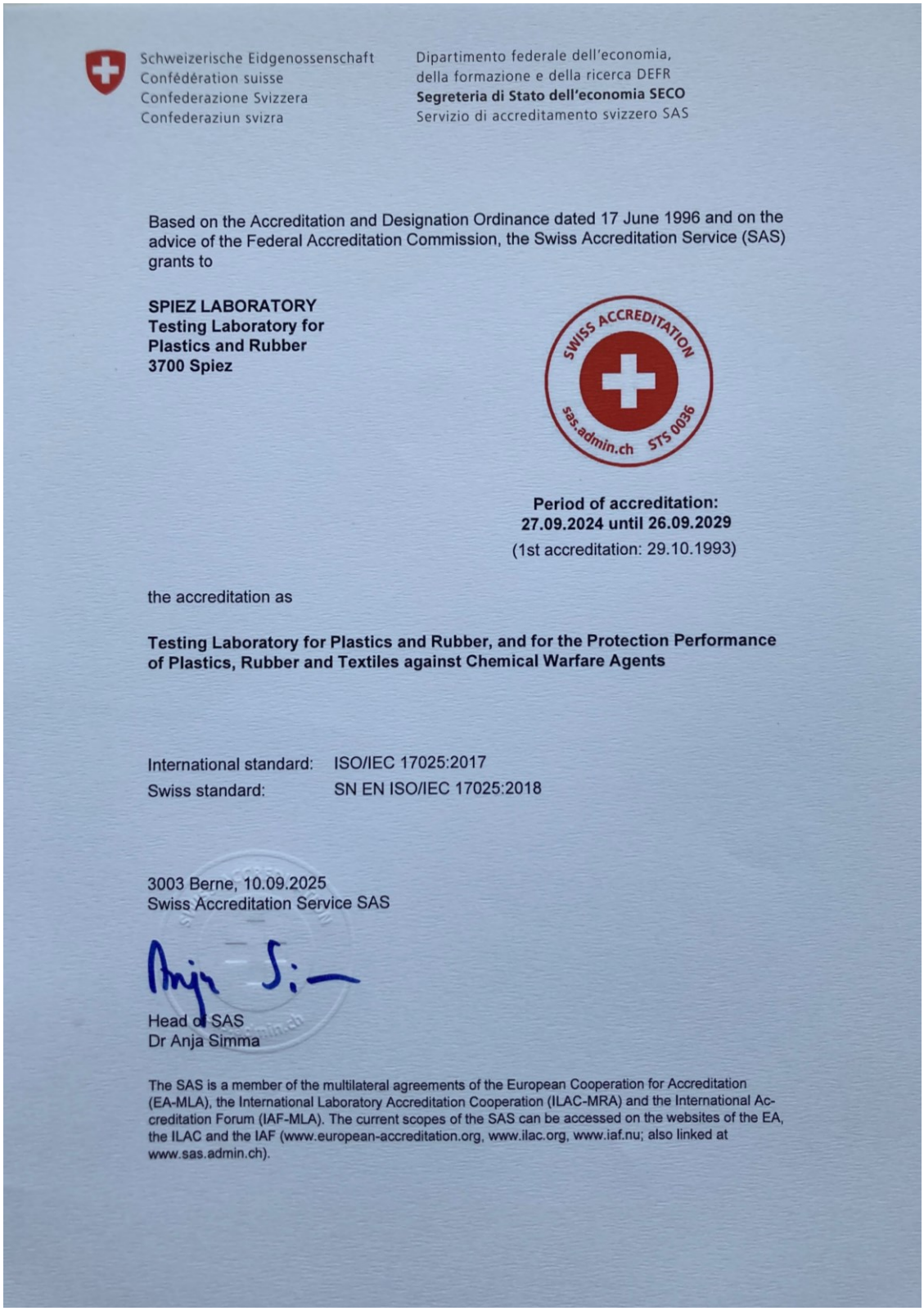


Fig. 22: Photometric Method with Sarin GB

3. Scope of Accreditation

The list of the accredited test methods can be found by entering the search term STS 0036 in the search mask of the Swiss Accreditation Service under the following link:

https://www.sas.admin.ch/sas/en/home/akkreditiertestellen/akkrstellensuchesas.html



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Dipartimento federale dell'economia, della formazione e della ricerca DEFR
Segreteria di Stato dell'economia SECO
Servizio di accreditamento svizzero SAS

Based on the Accreditation and Designation Ordinance dated 17 June 1996 and on the advice of the Federal Accreditation Commission, the Swiss Accreditation Service (SAS) grants to

SPIEZ LABORATORY
Testing Laboratory for Plastics and Rubber
3700 Spiez

SWISS ACCREDITATION
sas.admin.ch STS 0036

Period of accreditation:
27.09.2024 until 26.09.2029
(1st accreditation: 29.10.1993)

the accreditation as

Testing Laboratory for Plastics and Rubber, and for the Protection Performance of Plastics, Rubber and Textiles against Chemical Warfare Agents

International standard: ISO/IEC 17025:2017
Swiss standard: SN EN ISO/IEC 17025:2018

3003 Berne, 10.09.2025
Swiss Accreditation Service SAS

Head of SAS
Dr Anja Simma

The SAS is a member of the multilateral agreements of the European Cooperation for Accreditation (EA-MLA), the International Laboratory Accreditation Cooperation (ILAC-MRA) and the International Accreditation Forum (IAF-MLA). The current scopes of the SAS can be accessed on the websites of the EA, the ILAC and the IAF (www.european-accreditation.org, www.ilac.org, www.iaf.nu; also linked at www.sas.admin.ch).

Fig. 23: Accreditation Certificate