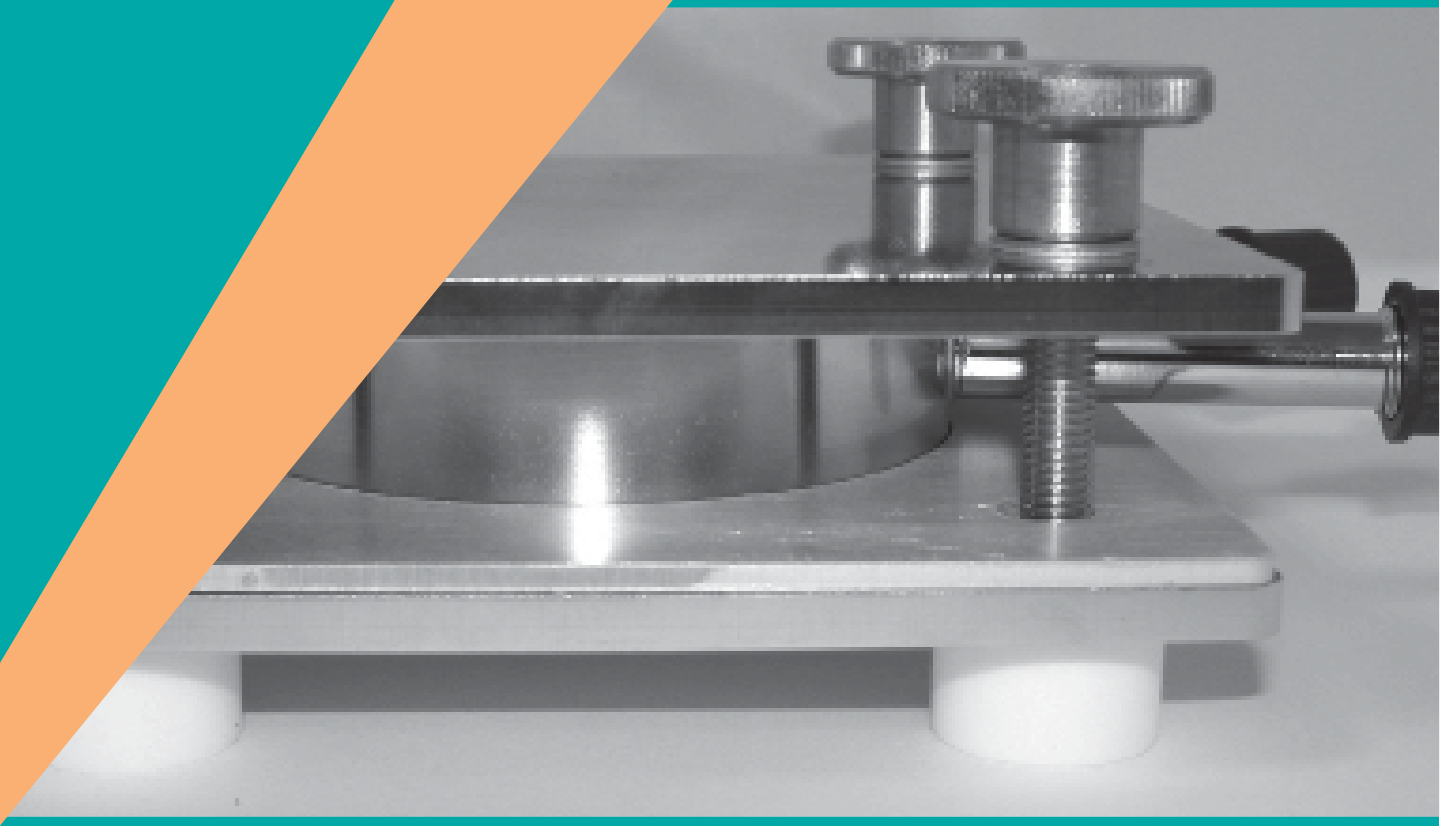
Permeation
Migration
Sensor
Technology

LABC
LABORTECHNIK



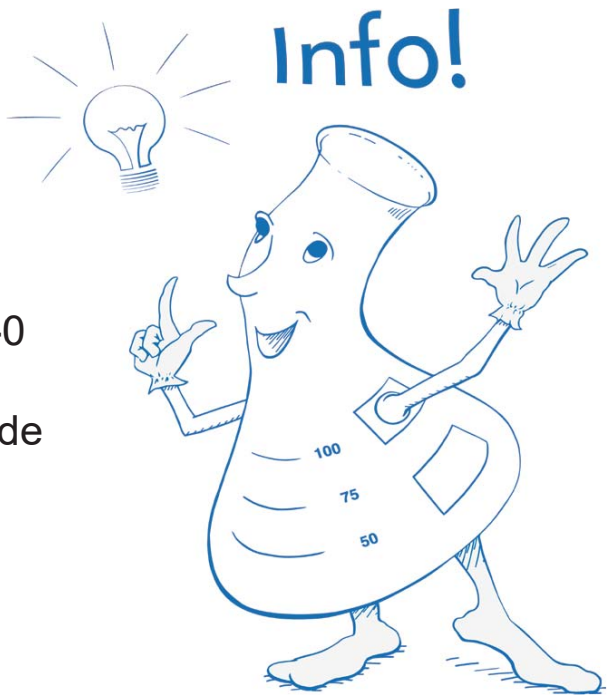
Catalogue No.: 101_V04

Permeation
Migration
Sensor Technology

This catalog provides an overview of our permeation, migration and sensor technology assortment.

If you can not find the product you need, we gladly assist you.

Your team of
LABC-Labortechnik



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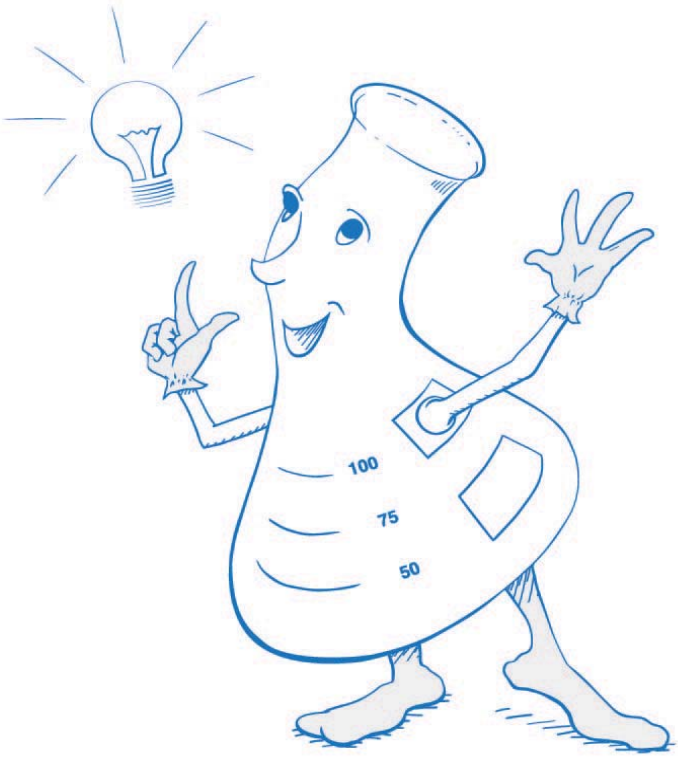
Our service:

- We are at your disposal for any kind of **inquiry via phone**, fax or email
- We gladly take the **time** to **advise** you in detail
- Further **information** material is always available upon request
- Many more products and information available under:

www.LABC.de

Concisely



Permeation

The transport of a substance through personal protective equipment (PPE) to human skin (permeation) should be prevented by wearing a PPE. The maximum time for wearing the equipment depends to a large extent on the resistance of the personal protective equipment (PPE) to the respective pollutant and the type of activity performed. As such, chemical safety gloves and clothing must exhibit a minimum resistance to invisible penetration (permeation) of chemicals for a period of time based on use in practice. This resistance is simulated experimentally according to the test methods of norms EN 16523-1:2015-04 and EN 16523-1:2015-04 (previously DIN EN 374-3) through determination of breakthrough times.
The wide variety of chemical substances encountered, the prescribed recommendations for a PPE material in a chemical safety data sheet and minor changes in the PPE material composition during its manufacture require that numerous permeation tests be carried out.

LABC-Labortechnik develops permeation workstations for standardised measurements.

Qumat®-Q401-HR with detector: FID or FIP/FPD

PERMOBIL, mobile permeation test stand

Permeation measuring cell NW50

Permeation measuring cell NW50liqui

Fluid-PermCell NW50-liquid

Migration

Food contact materials such as food packaging protect the contents, they contain information, both for the consumer and the entire supply chain down to the retail business. Many foods cannot be stored and thus marketed without suitable packaging. Consumers first see the packaging on the supermarket shelf. The incentive to buy the product increases with packaging quality. Packaging materials include plastic, cardboard/paper/carton, aluminium, tin plate, glass and composite film.

For packing materials to conform with food laws, it is logical for materials and articles to be manufactured in such a way that, under normal or foreseeable conditions of use, they only transfer their material constituents to food in quantities which could not endanger human health and that do not cause any discernible odour or bad taste.

Migration tests are carried out as simulation experiments here. They are most successfully carried out using so-called “migration cells”. It has been found that using a wide variety of migration cell sizes appropriate for the problem is better than using cells of a specific unit size. The advantage of a migration cell is that contact from one side can be re-established effectively without any sharp edges or other effects. To obtain comparable results, the tests are performed under standardised test conditions, such as test duration, test temperature and testing medium (food simulant) corresponding to the least favourable usage conditions possible of the material or article from plastic.
To measure migration of packing material substances, good analytical and laboratory know-how is needed, for example in order to obtain reliable analysis data based on high-resolution GC or LC and coupled mass spectrometry.
LABC-Labortechnik has made it its job to provide a broad spectrum of laboratory equipment and accessories related to all aspects of migration testing to analytical laboratories.

Migration Cell System „Sieg-Mi-Flex“

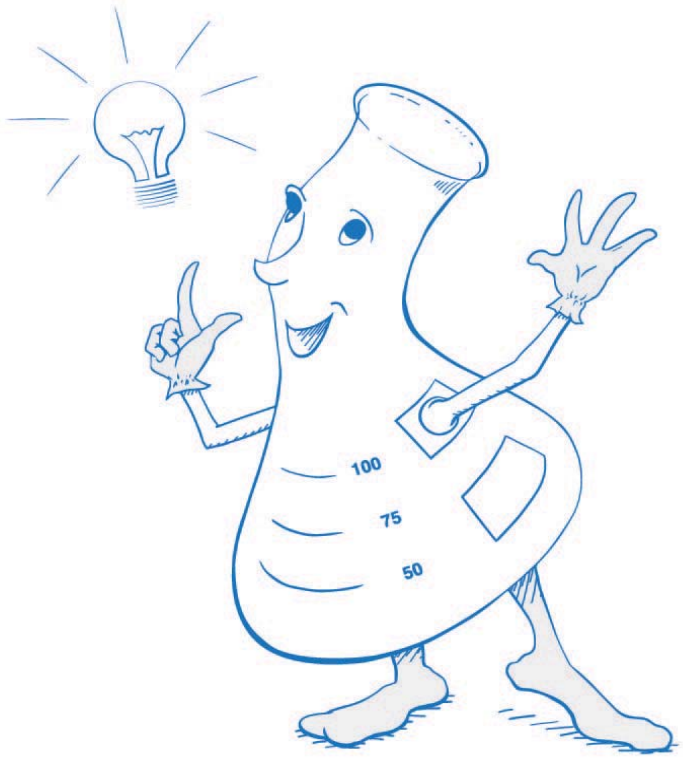
„MigraCubicle“ Migration Cell System

Migra-Zell Type A Migration Cell

Sensor Technology

Equipment for taste testing of food contact materials with the Siegwerk combination migration cell system (Sieg-Mi-Flex), consisting of a stainless steel fixing plate set and a glass centre ring with water as the food simulant at 130 °C, a taste test set for testing the change in taste of packing substances and packing media through the air space using the test substance water according to DIN 55534:2006-08, wide-neck flasks with ground stoppers for odour testing of food packages and the Scharfenberger odour tester for olfactory determination of upper and lower side of food contact materials.

Permeation



Qumat®-Q401-HR with detector

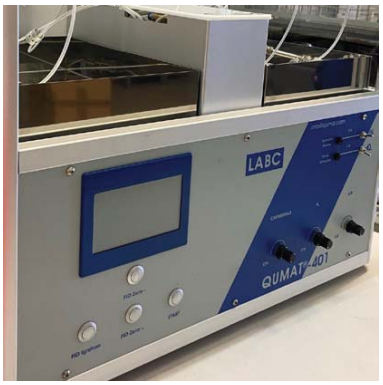
The analyser measures the permeation rate in chemical safety gloves and clothing.
The chemicals are detected using a built-in FID or FPD.
The analyser measures the breakthrough of the test chemicals in three permeation measurement cells according to DIN EN 374-3 and EN 16523-1 (or alternatively in 1“ ASTM cells).

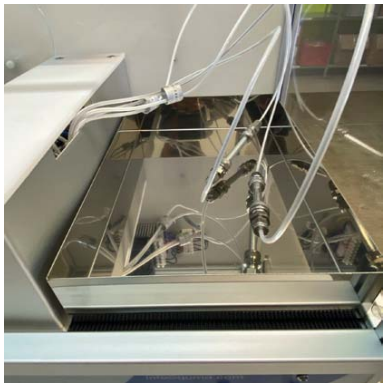
Test cells are held in the permeation measurement cells, filled on one side with the fluid to be tested, and continuously permeated on the other side by a gaseous collecting medium. These three defined gas streams are analysed one after the other for volatile test substances detectable by an FID. The results are documented in a table. If a test substances traverses the test sample at a permeation rate of > 1 µg min^{-1} cm^{-2} , a breakthrough has occurred according to DIN EN 374-3 and EN 16523-1.

Note:
Only trained and qualified personnel may operate the equipment. A two-day-training-course is recommended. It is offered in German and English.

The Qumat®-Q401-HR-FID
Item No.: 170-0328968

- a PC-controlled multiposition valve for analysing six gas streams one after the other. In addition to the three glass permeation measurement cells (not in the scope of delivery!), the zero gas, a reference gas (such as isobutane/air) and a test gas at the test chemical breakthrough concentration can be measured with the test specimens.
- a plexiglass housing with an exhaust gas nozzle for temperature control of the permeation cells, reference gas cell, test gas cell and the zero gas
- a temperature controller with a fan, a heater (300 W) and a Peltier cooler (>100 W) to pre-establish the temperatures of 23 °C ± 1 °C or 33 °C ± 1 °C
- **a FID for the detection of hydrocarbon-containing test substances**
- an evaluation program that generates Excel-compatible data (prerequisite: the PC must have a USB and Windows 7 or higher)
- Permanent control and documentation of the gas flow with a gas flowmeter





Qumat®-Q401-HR-FID/FPD
Item No.: 170-0360517

- a PC-controlled multiposition valve for analysing six gas streams one after the other. In addition to the three glass permeation measurement cells (not in the scope of delivery!), the zero gas, a reference gas (such as isobutane/air) and a test gas at the test chemical breakthrough concentration can be measured with the test specimens.
- a Plexiglass housing with an exhaust gas nozzle for temperature control of the permeation cells, reference gas cell, test gas cell and the zero gas
- a temperature regulator with a fan, a heater (300 W) and a Peltier cooler (>100 W) for pre-establishing the temperatures of 23 °C ± 1 °C or 33 °C ± 1 °C
- **a FID for the detection of hydrocarbon-containing test substances and (switchable) an FPD for the detection of P- and S-containing test substances**
- an evaluation program that generates Excel-compatible data (prerequisite: the PC must have a USB and Windows 7 or higher)
- Permanent control and documentation of the gas flow with a gas flowmeter

The necessary permeation measuring cells can be ordered individually, Item No. 250-0088978, Catalogue p. 15

Scope of delivery:
- Qumat®-Q401-HR FID or FID/FPD analyser (width × depth × height: 100 cm × 70 cm × 60 cm)
- 2 PTFE blind flanges for reagent gas and test gas with glass lower part of the permeation measurement cells
- evaluation program

Mobile IFA* permeation test stand according to EN 16523-1 (replaces EN374-3)

The measurement is done in a temperature-controlled permeation measurement cell according to EN 16523-1 (replaces EN374-3). The sample is held in the measurement cell and the test substances acts on the front side. Purified ambient air passes through the measurement space on the back side, with some of the air being routed to a suitable detector (such as a PID**) for concentration measurement. The record of the detector signal provides the permeation curve of the material-chemical pair under investigation, and facilitates the determination of the permeation rate.
The equipment was developed specifically for testing chemical safety glove and chemical safety clothing materials for chemical permeability.

*** IFA = Institute for Workplace Safety of the DGUV**
[German Social Accident Insurance];
**** PID = Photoionisation detector**

The PERMOBIL:

- portable housing made of aluminium profiles and plexiglass
- integrated, ventilation-supported temperature controller to ensure that the required EN test temperature of 23 °C ±1 °C is maintained at normal ambient temperature using a heater (300 W) and a Peltier cooler (>100 W)
- integrated pump with a volumetric flow meter and controller for drawing in ambient air through a commercially-available combination filter (gas- and particulate filter)
- Permeation cell according to EN 16523-1 (replaces EN374-3)
- Compensation vessel for removing the tested air stream
- Technical specifications: 230 V, weight: approx.13 kg,
- Dimensions: Height = 365 mm (460 mm with filter!), width = 450 mm, depth = 300 - 375 mm

PERMOBIL work station with PID-Detektor
Item No.: 280-0407564

PERMOBIL without PID-Detektor
Item No.: 250-0289047

Permeation measuring cell NW50

With different film holders for liquid test chemicals and gaseous or liquid collection media.

Permeation measuring cell NW50 in accordance with EN 16523-1 (replaces EN 374-3) for testing PPE films (safety gloves, safety clothing) in relation to the permeability of liquid test substances and gaseous collection media.

Die Permeation measuring cell NW50:
Item No.: 250-0088978

made out of glass, complete in support with three support feet and PTFE holder (for films < 0.2 mm) NW50 incl. silicone FEP-coated O-ring seals (2 × 56 mm + 1 × 62 mm)

Individual parts for the Permeation measuring cell NW50:

Upper part for the Permeation measuring cells NW50
Item No.: 120-0088893

with ground sleeve NS14.5 EN 16523-1 (replacement for EN 374-3)

Base part for the Permeation measuring cells NW50
Item No.: 120-0088909

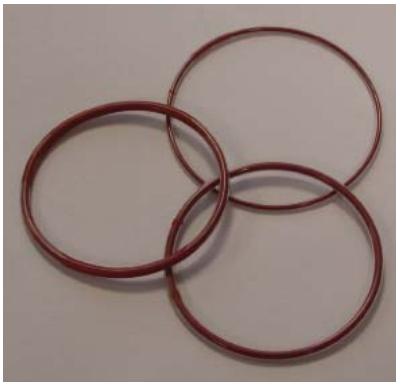
with gas inlet and outlet pipes for gaseous collecting media (Aø = 8 mm), EN 16523-1 (replacement for EN 374-3)

H

made out of Pertinax® Item No.: 120-0088961 (synthetic resin bonded paper) for the Permeation measuring cell NW50 according to EN 16523-1, EN 16523-2 (replacement for EN 374-3), with screws and stand-feet made of aluminum metal

made out of aluminium Item No.: 120-0387842 (instead of Pertinax® (synthetic resin bonded paper)) for the Permeation measuring cell NW50 according to EN 16523-1, EN 16523-2 (replacement for EN 374-3), with screws and stand-feet made of aluminum metal

O-Ring seal set:



according to EN 16523-1 Item No.: 120-0088879 (replacement for EN 374-3), silicone/FEP sheathed, suitable for the PTFE clamping device No. 711982-EN

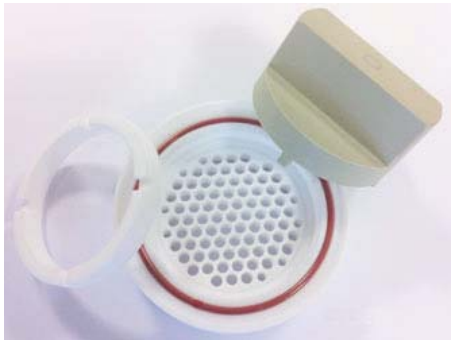
according to ASTM 1“ Item No.: 120-0329026
(2.54 cm) silicone/FEP sheathed, suitable for the PTFE clamping device No. 711982-ASTM

PTFE clamping device:

according to EN 16523-1
Item No.: 120-0649087
(replacement for EN 374-3 and ISO 6529) for the Permeation measuring cell NW50, for clamping foils up to approx. 0.2 mm incl. 3 pcs. O-rings (VQM with FEP sheathed)

according to ASTM 1“
Item No.: 120-0302722
(2.54 cm) for the Permeation measuring cell NW50 according to EN 16523-1 (replacement for EN 374-3), for clamping foils up to approx. 0.3 mm incl. 3 pcs. O-rings (VQM with FEP sheathed)

PTFE Permeation sample holder
Item No.: 250-0342773



for foils with a thickness of 0.2 mm to max. 5 mm as well as foils with textured, strongly embossed surface and/or with seams (of protective gloves/protective clothing) in accordance with EN 16523-1 (replacement for EN 374-3), ID: Ø 50 mm with a perforated plate as a film prop for the LABC-Permeation measuring cell NW50 with 2 pcs. of O-Rings (VQM with FEP sheathed), with a PTFE-Screw ring for sample fixation and a screwing tool made out of PPH.

Permeationsmesszelle NW50liqui

Permeation measuring cell NW50liqui:
Item No.: 250-0807364

in accordance to EN 16523-1 (replacement for EN 374-3 and ISO 6529) for testing PSA foils (protective gloves, protective suits) on the permeability of liquid and gaseous test substances of liquid collecting media. The Permeation measuring cell NW50liqui is not double-walled (= without tempering jacket!) and is used with pH and conductivity meters and their sensors.

Permeation measuring cell NW50liqui without tempering jacket made out of DURAN®-laboratory glass und fluorine plastic materials:

- 1 x Base part for the Permeation measuring cell NW50liqui with two laterally positioned glass taps for venting the water filling and 1 x lateral glass thread GL 25, as well as
- 1 x Screw cap made out of PBT, GL 25, red, with a central inner diameter of 15 mm
- 1 x Silicone sealing ring (VMQ)/PTFE for GL25, AØ = 22 mm/IØ = 12 mm,
- 1 x Ground-in stopper with a conical ground NS14,5/23 made out of Borosilicate laboratory glass,
- 1 x Upper part for the Permeation measuring cell NW50 with ground socket NS14,5 made out of DURAN® glass,
- 1 x PTFE clamping device (sample holder) for the Permeation measuring cell NW50 for clamping PTFE foils, including 3 O-Rings (silicone/FEP-coated) and
- 1 x Quick Release NW50 made out of Pertinax® (without standing feet!) with knurled screws made out of V2A.

Individual parts for the Permeation measuring cell NW50liqui:

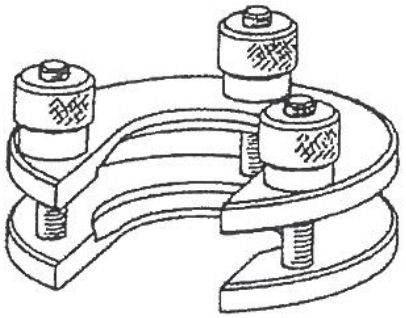
Upper part for the Permeation measuring cells NW50
Item No.: 120-0088893

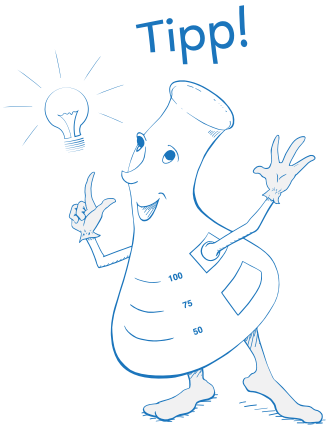
with ground sleeve NS14.5 EN 16523-1 (replacement for EN 374-3)

Base part for the Permeation measuring cell NW50liqui
Item No.: 120-0214599

without tempering jacket (according to EN16523-1/EN16523-2 (EN 374-3)) made out of glass, for testing foils (protective gloves, protective suits) on the permeability of liquid or gaseous test media with a liquid collecting medium (e. g. water) and the detection with a pH or conductivity sensor, including two laterally positioned glass taps for venting and one lateral glass thread GL 25.

Quick Release for the Permeation measuring cell NW50liqui
Item No.: 120-0186452
made of Pertinax® (without standing feet!), with knurled screws made out of V2A for the Permeation measuring cell NW50 without tempering jacket.





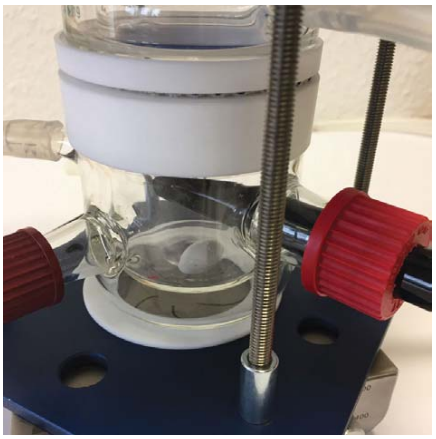
We also manufacture additional Permeation Cells:

e. g. with a sampliing port NS14 for sample extractions from a liquid collecting medium or e. g. with a laterally positioned sampling port with a GL thread and screw cap including a septum for sampling from a gaseous collection media.

Fluid-PermCell NW50-liquid

Item No.: 280-0354356

Determination of chemical permeation of liquid test chemicals under continuous contact relative to safety clothing or safety glove material samples and a liquid collection medium.



The test of resistance of safety clothing materials against permeation is described in norms EN 16523-1 (replaces EN 374-3), ASTM F-739 and draft norm DIN EN ISO 6529, for example. The temperature-controlled Fluid-PermCell NW50 liquid permeation cell has a closed collection chamber (corresponding to: a closed system (circuit)) in which the liquid collection medium is thoroughly mixed with a magnetic stirring rod and the concentration of the permeated test chemical is measured as a function of time through a built-in conductivity or pH sensor “in situ”. The measurements are stored in the Multi3410 datalogger (manual conductivity and pH meter). The evaluation of the measured data can be done via tabular calculation on a PC.
In addition to the test chemicals recommended in draft norm DIN EN ISO 6529 (30 % sodium hydroxide solution, 96 % and 18 % sulphuric acid), inorganic and organic acids and bases can be measured using an aqueous collection medium as an alternative.
The Fluid-PermCell NW50-liquid with a temperature control jacket made of DURAN® laboratory glass is thermostatically maintained using the digital Peltier thermostat PT31 (heating/cooling liquid: water) to a test temperature of 23 °C (+1 °C). Other test temperatures can be selected as well, such as 33 °C (up to max. 35 °C and min. 13 °C)!
The material sample to be tested is placed in a PTFE sample holder (PTFE clamp).

To determine the resistance of materials against the permeation of chemicals in sustained contact:

a) for the list of test chemicals in normative Appendix A of EN 374-1:2003
b) for the list of suitable technologies for detecting chemicals in informative Appendix C of EN 16523-1:2015-04
c) for the list of suitable technologies for determining gaseous chemicals in informative Appendix A of EN16523-2:2015-04

concerning a)

	Test Chemicals	CAS	LABC-Analysers		
A	Methanol	67-56-1	Qumat® Q401-HR with FID detector		
B	Aceton	67-64-1	Qumat® Q401-HR with FID detector	PERMOBIL with PID detector	
C	Acetonitrile	75-05-8	Qumat® Q401-HR with FID detector	PERMOBIL with PID detector	
D	Dichloromethane	75-09-2	Qumat® Q401-HR with FID detector		
E	Carbon disulphide	75-15-0	Qumat® Q401-HR with FPD/FID detector		
F	Toluene	109-88-3	Qumat® Q401-HR with FID detector	PERMOBIL with PID detector	
G	Diethylamine	109-89-7	Qumat® Q401-HR with FID detector	PERMOBIL with PID detector	
H	Tetrahydrofuran	109-99-9	Qumat® Q401-HR with FID detector	PERMOBIL with PID detector	
I	Ethyl acetate	141-78-6	Qumat® Q401-HR with FID detector	PERMOBIL with PID detector	
J	n-Heptane	142-85-5	Qumat® Q401-HR with FID detector	PERMOBIL with PID detector	
K	Sodium hydroxide 40 %	1310-73-2			Fluid-PermCell NW50-liquid with pH electrode*
L	Sulphuric acid 96 %	7664-93-9			Fluid-PermCell NW50-liquid with pH electrode*

* 1 Conductivity electrode is included!

concerning b)

Test Chemicals	CAS	LABC-Analysers		
Methanol	67-56-1	Qumat® Q401-HR with FID detector		
Acetone	67-64-1	Qumat® Q401-HR with FID detector	PERMOBIL with PID detector	
Acetonitrile	75-05-8	Qumat® Q401-HR with FID detector	PERMOBIL with PID detector	
Dichloromethane	75-09-2	Qumat® Q401-HR with FID detector		
Carbon disulphide	75-15-0	Qumat® Q401-HR with FPD/FID detector		
Toluene	109-88-3	Qumat® Q401-HR with FID detector	PERMOBIL with PID detector	
Diethylamine	109-89-7	Qumat® Q401-HR with FID detector	PERMOBIL with PID detector	
Tetrahydrofurnan	109-99-9	Qumat® Q401-HR with FID detector	PERMOBIL with PID detector	
Ethyl acetate	141-78-6	Qumat® Q401-HR with FID detector	PERMOBIL with PID detector	
n-Heptane	142-78-6	Qumat® Q401-HR with FID detector	PERMOBIL with PID detector	
Sodium hydroxide 40 %	1310-73-2			Fluid-PermCell NW50-liquid with pH electrode*
Sulphuric acid 96 %	7664-93-9			Fluid-PermCell NW50-liquid with pH electrode*
Acetic acid (99 + 1 %)	64-19-7	Qumat® Q401-HR with FID detector	PERMOBIL with PID detector	Fluid-PermCell NW50-liquid with pH electrode*
Ammonia solution (25 + 1 %)	1336-21-6			Fluid-PermCell NW50-liquid with pH electrode*
Hydrogen peroxide (30 + 1 Vol. %)	124-43-6			Fluid-PermCell NW50-liquid with Redox electrode
Isopropanol	67-63-0	Qumat® Q401-HR with FID detector	PERMOBIL with PID detector	
Sodium hypochlorite (13 + 1 % active chlorite)	7681-52-9			Fluid-PermCell NW50-liquid with pH electrode *

* 1 Conductivity electrode is included!

concerning c)

Test Chemicals	CAS	LABC-Analysers		
Ammonia NH3	7664-41-7		Fluid-PermCell NW50-liquid with pH electrode*	
Hydrochloric acid HCl	7647-01-0		Fluid-PermCell NW50-liquid with pH electrode*	
Chlorine gas Cl_2	7782-50-5		Fluid-PermCell NW50-liquid with pH electrode*	
Ethylene oxide (Oxirane) C_2H_4O	75-21-8	Qumat® Q401-HR with FID detector		PERMOBIL with PID detector
Methyl chloride CH_3Cl	74-97-3	Qumat® Q401-HR with FID detector		
Hydrofluoric acid HF	7664-39-3	in planning!		
Phosphine PH_3	7803-51-2	Qumat® Q401-HR with FPD/FID detector		
Phosgene $COCl_2$	75-44-5			
Methyl bromide CH_3Br	74-83-9	Qumat® Q401-HR with FID detector		
Carbon monoxide CO	630-08-0			
Nitrogen dioxide NO_2	10102-44-0		Fluid-PermCell NW50-liquid with pH electrode*	
Sulphur dioxide SO_2	7446-09-5	Qumat® Q401-HR with FPD/FID detector	Fluid-PermCell NW50-liquid with pH electrode*	
Sulphuryl fluoride SO_2F_2		Qumat® Q401-HR with FPD/FID detector		
1-3 butadiene	106-99-0	Qumat® Q401-HR with FID detector		PERMOBIL with PID detector
Ozone O_3	10028-15-6			
Cyanogen chloride ClCn	506-77-4			

* 1 Conductivity electrode is included!

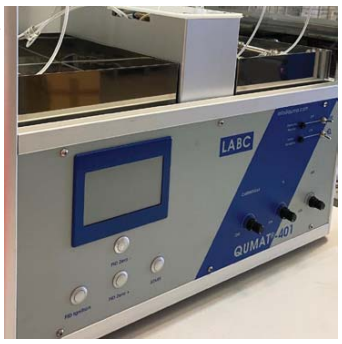
Further information regarding LABC-Analysers:

Qumat® Q401-HR with FID detector:

- 3 measurement points, temperature-controlled, open cycle, gas collection medium
- used as permanent installations in research and testing laboratories
- Energy used is electricity, hydrogen (for FID) and nitrogen or compressed air (collection medium)

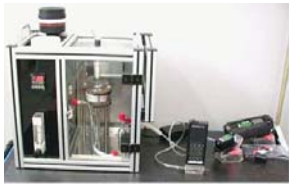
Qumat® Q401-HR with FID/FPD detector (switchable):

- 3 measurement points, temperature-controlled, open cycle, gas collection medium
- used as permanent installations in research and testing laboratories
- Energy used is electricity, hydrogen (for FID) and nitrogen or compressed air (collection medium)



PERMOBIL mit PID-Detektor:

- 1 measurement point, temperature-controlled, open cycle, gas collection medium
- used in testing laboratories or in process controls
- can be used as a mobile unit
- as energy, only electricity is used



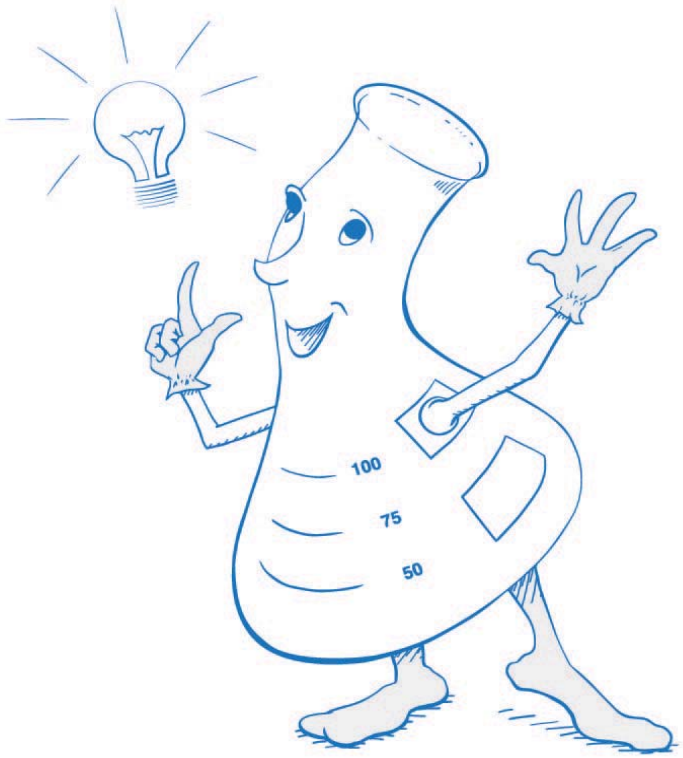
Fluid-PermCell NW50-liquid mit pH-Elektrode*:

- 1 measurement point, temperature-controlled, closed circuit, water as collection medium
- used as permanent installation in research, testing laboratories or in process controls
- as energy, only electricity is used

* 1 Conductivity electrode is included!

All LABC-Analysers should be operated by trained specialists with solid knowledge in analytical chemistry. LABC-Labortechnik offers bookable training stages or product instructions.

Migration



Sample preparation with the modular and flexible „Sieg-Mi-Flex“ migration cell system for analytical measurement and organoleptic testing of the migration of packaging contents “Extractables and Leachables” (E&L) and MOSH/MOAH in food simulants, the headspace or pharmaceutical formulations for the purpose of compliance with legal regulations.

In the EU, packaging that comes into direct contact with food is subject to Regulation (EC) No 1935/2004. Article 3 lists the general requirements. Logically, the most important of these states that materials and articles must be manufactured in such a way that, under normal or foreseeable conditions of use, they only transfer their constituents to food in quantities which could not endanger human health. Supplemental individual requirements include: VO (EG) 450/2009 (active and intelligent packages), RL 2007/42/EG (cellulose film), VO (EG) 2023/2006 (good manufacturing practices), RL 2005/31/EG (ceramics).
For materials made of plastic, 2002/72/EG (“Plastic Guidelines”), EU ordinances 975/2009, 282/2008 (recyclable plastics) and 10/2011 (PIM), and 2016/1416 (for amending and correcting 10/2011) apply where specific requirements for the migration of substances is described.
Providing the food has not yet been placed in the packaging, testing occurs under unfavourable “worst case” contact conditions with food simulants that describe the properties of the food to be packaged. The total of all released constituents (global migration) must not exceed the limit of 10 mg per dm^2 of packaging area. Certain substances are also subject to specific migration limits (SMLs), which stipulate the maximum permitted amount in the food.
Migration cells or chambers for preparing the samples for the migration analyses with defined surface/volume ratios should have a high level of impermeability and be chemically resistant against the food simulants established in Regulation No 10/2011 (PIM) as well as the substitute food simulants ethanol 95 %, isooctane and water for organoleptic tests.

The „Sieg-Mi-Flex“ migration cell system complies with Norm EN 1186-1,
EU Regulation No. 1935/2004 and No. 10/2011 and 2016/1416 and makes it easier to prepare samples when using migration analytics or an organoleptic assessment.

Food categories and simulants in Regulation to (EU) No 10/2011 (PIM)

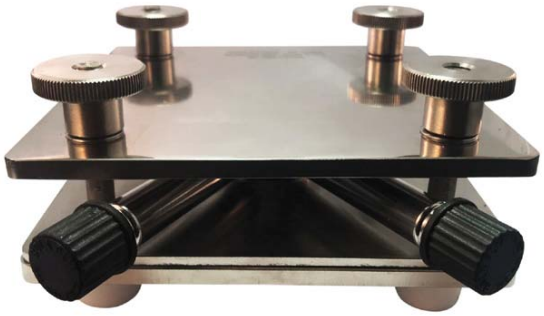
Food Properties:	Food simulant:
Hydrophilic	(A) Ethanol 10 % (v/v)
Hydrophilic; < pH 4,5	(B) Acetic acid 3% (w/v)
Hydrophilic/Lipophilic; alcohol content up to 20 %	(C) Ethanol 20 % (v/v)
Lipophilic; alcohol content >20 %; oil in water emulsion	(D1) Ethanol 50 % (v/v)
Lipophilic; free fats	(D2) Vegetable oil with specific fatty acid distribution
Dry foods	(E) Poly-2,6-diphenyl-p-phenylene oxide (MPPO)

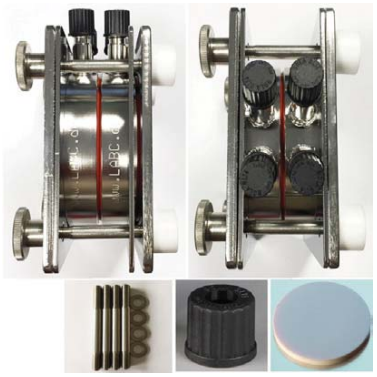
Thanks to the flexibility and modular structure of the „Sieg-Mi-Flex“ migration cell system, many packaging sizes and thicknesses with a wide range of material properties can be used for migration tests with all liquid and solid food simulants, food simulants for substitute tests (iso-octane, ethanol 95 (v/v)) or solvents from pharmaceutical formulations, even above their boiling point, on a defined sample area plus subsequent storage depending on the time and temperature.
The „Sieg-Mi-Flex“ migration cell system, in conformity with European Norm EN 1186-1:2002 (D), Appendix C (informative), Figure C.4 Cell type B and Figure C.5 Cell type C has been developed and tested in cooperation with the analytical department at Siegwerk Druckfarben AG & Co. KGaA.

Eva Holster and Dr Dieter Franke from Siegwerk Druckfarben AG & Co. KGaA: “The „Sieg-Mi-Flex“ migration cell system not only facilitates sample preparation but is also the system with the greatest impermeability.”

Migration Cell System Sieg-Mi-Flex

- The „Sieg-Mi-Flex“ migration cell system is available in the following materials: stainless steel (VA 1.4571), borosilicate glass and PFA-coated stainless steel (on request!).
- The materials can be combined.
- The „Sieg-Mi-Flex“ migration cell system fixing plate set with a size of 140 × 140 mm (European Norm EN 1186-1:2002, Figure C.5 Cell type C) is suitable for use with all centre rings and all size reduction plates from the Sieg-Mi-Flex system for testing sample areas of different sizes with defined surface/volume ratios.
- The system can also be rapidly adapted to special sample sizes using the stainless steel (VA 1.4571) “reduction plates” in conjunction with the centre rings.
- It is furthermore possible to add two packaging samples (top/bottom) to the migration cell System „Sieg-Mi-Flex“.
- The migration cell System „Sieg-Mi-Flex“ is then stored standing upright rather than lying down horizontally.
- The barrier effect of packaging materials can also be tested, e. g. with the “sandwich format” test setup.





By using the migration cell System „Sieg-Mi-Flex“, a migration estimate of the packaging contents from food packaging can already be conducted using the finished rolls of material.
Tests have shown that the diffusion-induced temperature compensation is sufficient if a „Sieg-Mi-Flex“ migration cell system filled with a simulant stays upright for 24 hours.
No rotation is required. The „Sieg-Mi-Flex“ migration cell system can be easily opened and closed using stainless steel knurled screws. During temperature conditioning in drying cabinets or bath/circulating thermal regulators, its compact design enables it to be stored both horizontally and vertically.

The Sieg-Mi-Flex migration cell system can be used to test many packaging sizes and strengths with the broadest range of material properties with all liquid and solid food simulants.
For tests with solid food simulants (E) poly(2,6-diphenyl-p-phenylene oxide) (MPPO), the Tenax kit is used. Some customers also use the Tenax kit for migration tests with oil as the fixing plate with the GL45 connecting pieces is easier to clean in a dishwasher than the central rings with GL14 cast-in and cast-out connecting pieces.
In this case, the „Sieg-Mi-Flex“ migration cell system is subjected to the test conditions while positioned horizontally one test specimen at a time. Thanks to the high temperature resistance (-20 °C to 180 °C) and the high pressure seal up to 9 bar, stainless steel „Sieg-Mi-Flex“ migration cell systems can also be used for liquid food simulants under testing conditions above their boiling point.

Pressure test for a stainless steel „Sieg-Mi-Flex“ migration cell system

HERSTELLERBESCHEINIGUNG

Hersteller	LABC-Labortechnik Josef-Dietzgen-Str. 1 D-53773 Hennef
Komm.-Nr.	247665/11135
Behälter-Nr.	M001
Beschreibung	Migrationszelle DN 120 „Sieg-Mi-Flex“ (Edelstahl)

Technische Angaben

zulässiger Betriebsüberdruck des Innenraumes	9 bar
zulässige Betriebtemperatur	max.180°C
Inhalt	0,22 ltr.
Werkstoff	Edelstahl 1.4571

Hiermit wird bescheinigt, daß diese Mikrationszelle ordnungsgemäß hergestellt wurde.
Es wurden keine Beanstandungen festgestellt.

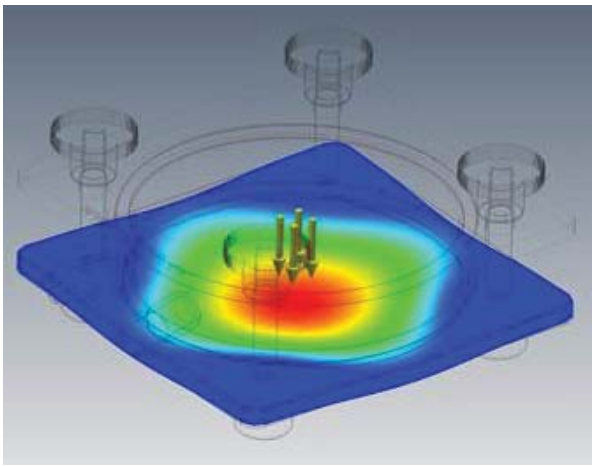
Der Prüfdruck beträgt bei der Flüssigkeitsdruckprüfung nach unseren Werksdruckprüfrichtlinien mindestens das 1,33 fache des zulässigen Betriebsüberdruckes. Der Innenraum (Reaktionsraum) des Gefässes wurde für 30 Minuten bei Raumtemperatur dem Prüfdruck von 13 bar ausgesetzt.

Die Druckprüfung ergab keine Beanstandung.

Das vorliegende Gerät ist ein Druckgerät nach den technischen Anforderungen der Druckgeräterichtlinien nach §3 Absatz 3 und im angegebenen Druckbereich für den Einsatz bei Flüssigkeiten und Gasen geeignet. Vor jedem Einsatz ist eine Sichtkontrolle auf einwandfreien Zustand vorzunehmen. Beschädigte Gefäße dürfen nicht eingesetzt werden.
Wir weisen darauf hin, dass der Anwender für die beim Betrieb notwendigen Sicherheitsmassnahmen verantwortlich zeichnet.

Hennef,12.02.2014
LABC-Labortechnik

(Hersteller)



A fixing plate made from V4A stainless steel has been subjected to 10 bar pressure using the finite element method (FEM). Result: the maximum deflection in the centre of the fixing plate was < 0.2 mm. A liquid pressure test was also carried out under at least 1.33 times the test pressure of 9 bar at room temperature, and at the test pressure of 13 bar. The pressure test did not result in any objections.

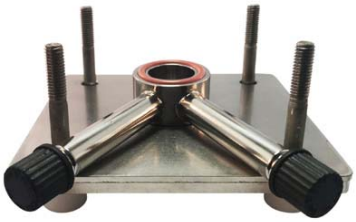
Stainless steel Migration Cell

- Temperature resistant -15 °C to 180 °C, pressure-tight up to 9 bar
- The Sieg-Mi-Flex cells are placed standing upright when used with two test specimens and lying horizontally when used with one test specimenist
- The highest selling migration chamber

Central Rings:

Item No.:	Nominal diameter:	Surface*:	Filling volume**:
250-0235693	DN120	1,0 / 2,0 dm²	200 ml
250-0342940	DN110	0,95 / 1,9 dm²	190 ml
250-0218665	DN100	0,75 / 1,5 dm²	150 ml
250-0342926	DN90	0,60 / 1,2 dm²	120 ml
250-0218672	DN80	0,50 / 1,0 dm²	100 ml
250-0218689	DN70	0,35 / 0,7 dm²	70 ml
250-0218696	DN60	0,25 / 0,5 dm²	50 ml
250-0218702	DN30	0,05 / 0,1 dm²	10 ml

* Approx. surface with 1 test specimen/with 2 test specimens
** Approx. filling volume of the central ring



Stainless steel Central Ring for the „Sieg-Mi-Flex“ Migration Cell System consisting of:

- 1 x stainless steel central ring (V4A 1.4571) with cast-in and cast-out connecting pieces with GL14 threads
- 2 x FEP/silicone O-rings that fit in the central ring’s groove (top and bottom)
- 2 x GL14 seal caps (PPS housing incl. PTFE/sil. gasket)
- 1 x positioning aid made from 2 mm stainless steel (V2A 1.4301) (except DN120!)

Stainless steel Fixing Plate Set for the „Sieg-Mi-Flex“ Migration Cell System Item No. 250-0239899 consisting of:

- 2 x VA 1.4571 plates with drill holes, polished inside
- 4 x stainless steel knurled screws
- 4 x pin thread M8, stainless steel (VA 1.4571), Length: 66,5mm
- 4 x PTFE feet, natural
- 4 x stainless steel “Sieg-Mi-Flex” washers

Note:
All Sieg-Mi-Flex Central Rings fit in the Fixing Plate Set!

Usage:

The following simulants can be used in the stainless steel „Sieg-Mi-Flex“ Migration Cell System:

(A) Ethanol 10 % (v/v),
(B) Acetic acid 3 % (w/v),
(C) Ethanol 20 % (v/v),
(D1) Ethanol 50 % (v/v),
(D2) Vegetable oil with specific fatty acid distribution from Regulation (EU) No 10/2011 (PIM).

Furthermore, pursuant to European Norm EN1186 and Commission Directive 97/48/EC it is possible to use substitute simulants such as the solvents isooctane and ethanol 95 % (v/v) plus other alternative simulants that do not chemically attack the materials stainless steel (V4A 1.4571), PTFE and FEP (tetrafluoroethylene-hexafluoropropylene copolymer).

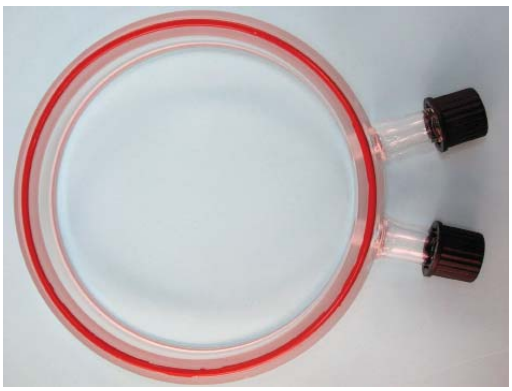
Glass Migration Cell

- Temperature resistant from -15 °C to 130 °C, pressure seal up to 1 bar, transparent and highly chemical resistant thanks to the use of borosilicate 3.3 laboratory glass
- The Sieg-Mi-Flex cells are placed standing upright when used with two test specimens and lying horizontally when used with one test specimen

Central Rings:

Item No.:	Nominal diameter:	Surface*:	Filling volume**:
250-0277600	DN120	1,0 / 2,0 dm²	200 ml
250-0738668	DN80	0,5 / 1,0 dm²	100 ml
250-0738675	DN50	0,19 / 0,38 dm²	50 ml

* Approx. surface with 1 test specimen/with 2 test specimens
** Approx. filling volume of the central ring



Glass Central Ring for the „Sieg-Mi-Flex“ Migration Cell System consisting of:

- 1 x Borosilicate glass central ring with cast-in and cast-out fittings with GL14 threads
- 2 x FEP/silicone O-rings that fit in the central ring’s groove (top and bottom)
- 2 x GL14 seal caps (PPS housing incl. PTFE/sil. gasket)

Glass Fixing Plate Set for the „Sieg-Mi-Flex“ Migration Cell System Item No. 250-0277594 consisting of:

- 2 x Borosilicate glass plates with drill holes, protective inserts for screws
- 4 x stainless steel screws (M8), with stainless steel knurled screws
- 4 x PTFE threaded feet, white (M8)

Usage:

Detecting discolouration during the migration test. Sensor determination in packaging materials of abnormal aromas in water (such as styrene, p-methylbenzaldehyde). Migration investigations of cardboard with a barrier coating as a function of time and temperature through headspace analysis, with the two GL-14 screwed connections at the glass centre ring being very helpful. By olfactory means or via TENAX® adsorption tubes, PowerSorb or SPME Fiber Holder (>Thermodesorption > GC /MS).

Combination Migration Cell with Glass Fixing Plate and Stainless Steel Central Ring

- Temperature resistant from -15 °C to 130 °C, pressure seal up to 1 bar
- A transparent glass fixing plate set
- The chemical resistance corresponds to the stainless steel migration cell
- The Sieg-Mi-Flex cells are placed standing upright when used with 2 test specimens and lying horizontally when used with one test specimen!

Central Rings:

Item No.:	Nominal diameter:	Surface*:	Filling volume**:
250-0235693	DN120	1,0 / 2,0 dm²	200 ml
250-0342940	DN110	0,95 / 1,9 dm²	190 ml
250-0218665	DN100	0,75 / 1,5 dm²	150 ml
250-0342926	DN90	0,60 / 1,2 dm²	120 ml
250-0218672	DN80	0,50 / 1,0 dm²	100 ml
250-0218689	DN70	0,35 / 0,7 dm²	70 ml
250-0218696	DN60	0,25 / 0,5 dm²	50 ml
250-0218702	DN30	0,05 / 0,1 dm²	10 ml

* Approx. surface with 1 test specimen/with 2 test specimens
** Approx. filling volume of the central ring

Stainless steel Central Ring for the „Sieg-Mi-Flex“ Migration Cell System, consisting of:

- 1 x stainless steel central ring (V4A 1.4571) with cast-in and cast-out connecting pieces with GL14 threads
- 2 x FEP/silicone O-rings that fit in the central ring’s groove (top and bottom)
- 2 x GL14 seal caps (PPS housing incl. PTFE/sil. gasket)
- 1 x positioning aid made from 2 mm stainless steel (V2A 1.4301) (except DN120!)

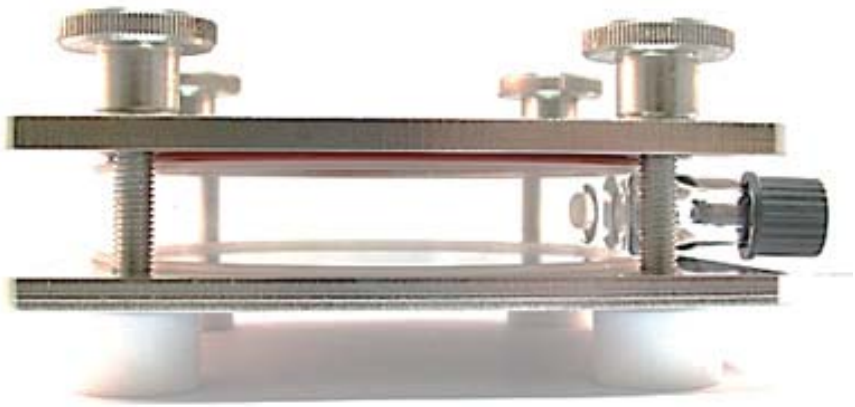
Glass Fixing Plate Set for the „Sieg-Mi-Flex“ Migration Cell System Item No. 250-0277594 consisting of:

- 2 x Borosilicate glass plates with drill holes, protective inserts for
- screws
- 4 x stainless steel screws (M8), with stainless steel knurled screws
- 4 x PTFE threaded feet, white (M8)

Usage:

Monitoring the wetting capacity with liquid food simulants of test sample films that tend towards static charging or hydrophobic behaviour. Monitoring and documenting migration tests through the use of photographs. Detecting discolouration and air bubbles during the migration test.

Combination Migration Cell with Stainless Steel Fixing Plate and Glass Central Ring

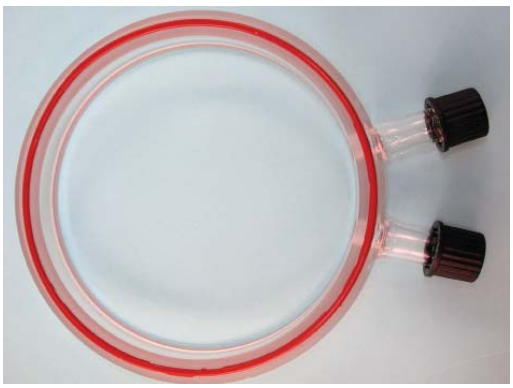


- Temperature resistant from -15 °C to 130 °C, pressure seal up to 4 bar
- A transparent glass central ring
- The chemical resistance corresponds to the stainless steel migration cell
- The Sieg-Mi-Flex cells are placed standing upright when used with 2 test specimens and lying horizontally when used with one test specimen!

Central Rings:

Item No.:	Nominal diameter:	Surface*:	Filling volume**:
250-0277600	DN120	1,0 / 2,0 dm²	200 ml
250-0738668	DN80	0,5 / 1,0 dm²	100 ml
250-0738675	DN50	0,19 / 0,38 dm²	50 ml

* Approx. surface with 1 test specimen/with 2 test specimens
** Approx. filling volume of the central ring



Glass Central Ring for the „Sieg-Mi-Flex“ Migration Cell System consisting of:

- 1 x Borosilicate glass central ring with cast-in and cast-out fittings with GL14 threads
- 2 x FEP/silicone O-rings that fit in the central ring’s groove (top and bottom)
- 2 x GL14 seal caps (PPS housing incl. PTFE/sil. gasket)

Stainless steel Fixing Plate Set for the „Sieg-Mi-Flex“ Migration Cell System Item No. 250-0239899 consisting of:

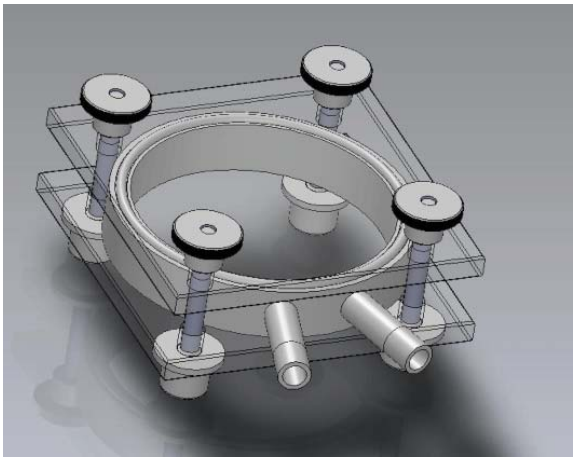
- 2 x VA 1.4571 plates with drill holes, polished inside
- 4 x stainless steel knurled screws
- 4 x pin thread M8, stainless steel (VA 1.4571), Length: 66,5mm
- 4 x PTFE feet, natural
- 4 x stainless steel “Sieg-Mi-Flex” washers

Note:
All Sieg-Mi-Flex Central Rings fit in the Fixing Plate Set!

Usage:

For organoleptic and analytic migration investigations above the boiling point with water as the food simulant, such as in the testing of packaging materials for taste changes of water as a food simulant at 130 °C.

Combination Migration Cell with Stainless Steel or Glass Fixing Plate and PVDF Central Ring



- PVDF Central Ring for migration simulations with subsequent metal analysis
- pressure-tight up to 9 bar with stainless steel fixing plates
- pressure-tight up to 1 bar with glass fixing plates
- Temperature resistance of the PVDF Central Ring -15 °C to 180 °C,
- For subsequent metal analysis, the Sieg-Mi-Flex cell with PVDF Central Ring must be covered with 2 test pieces and the cells must stand upright!

Central Ring:

Item No.:	Nominal diameter:	Surface*:	Filling volume**:
250-0786201	DN120	1,0 / 2,0 dm²	200 ml

* Approx. surface with 1 test specimen/with 2 test specimens
** Approx. filling volume of the central ring

PVDF Central Ring for the Migration Cell „Sieg-Mi-Flex“ „Sieg-Mi-Flex“ consisting of:

- 1 x PVDF middle ring DN120 (ring height: 20 mm without seal!) with inlet and outlet nozzles all made of PVDF with GL14 thread
- 2 x sealing cap GL14 (PPS, black + PTFE/silicone seal)
- 2 x O-ring FEP/silicone DN120 fits in groove of middle ring (top/bottom)

Stainless steel Fixing Plate Set for the „Sieg-Mi-Flex“ Migration Cell System Item No. 250-0239899 consisting of:

- 2 x VA 1.4571 plates with drill holes, polished inside
- 4 x stainless steel knurled screws
- 4 x pin thread M8, stainless steel (VA 1.4571), Length: 66,5mm
- 4 x PTFE feet, natural
- 4 x stainless steel “Sieg-Mi-Flex” washers

Note:
All Sieg-Mi-Flex Central Rings fit in the Fixing Plate Set!

Glass Fixing Plate Set for the „Sieg-Mi-Flex“ Migration Cell System Item No. 250-0277594 consisting of:

- 2 x Borosilicate glass plates with drill holes, protective inserts for screws
- 4 x stainless steel screws (M8), with stainless steel knurled screws
- 4 x PTFE threaded feet, white (M8)

How to clean Migration Cells

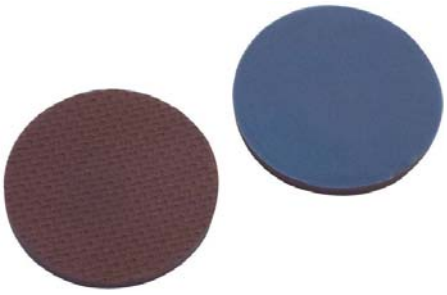
The Sieg-Mi-Flex cells are disassembled for cleaning and sonicated with isopropanol at room temperature in an ultrasonic bath for about 15 min., then dried. Then rinsed with ethanol pure LC-MS quality and dried again.

How to clean Septa

The silicone / PTFE septum seal in the GL14 screw caps on the filler neck or spout is not always resistant to isooctane.

Some users have also had this experience with Isooctan. PTFE is resistant to isooctane. However, if the thin PTFE layer is mechanically injured, it may look as if the septum seal is not resistant to isooctane. If the septum seal of silicone/PTFE is swollen, according to our observations, this is due to over-tightening the caps.
Because when the gasket swells, the PTFE layer of the gasket is punctured or broken.
We recommend tightening the fitting only „hand-tight“ and changing the gasket pro forma after each analysis.
The table shows available septum seals for GL14 screw caps (with or without hole cap)

Item No.:	Details:
120-0857123	Septum seal made of aluminum foil for GL14 screw caps (with or without hole) Ø = 13 mm aluminum septum, 0,1 mm Packaging Unit = 100 pcs.
120-0857154	Butyl red/PTFE gray septum seal for GL14 screw caps (with or without hole) Ø = 12,5 mm disc, butyl rubber red/PTFE gray, 55 ° shore A, 1,6 mm Packaging Unit = 100 pcs.
120-0085892	Silicone septum seal/Alu-laminated for GL14 screw caps (with or without hole) Ø = 12,5 mm, silicone white/aluminum, 50 ° shore A, 1,0 mm Packaging Unit = 100 pcs.
120-0857130	Silicone/PTFE septum seal for GL14 screw caps (with or without hole) Ø = 12,5 mm disc, silicone natural/PTFE beige, 45 ° shore A, 3,2 mm Packaging Units = 100 pcs.



Septum seal made of Butyl red rot/PTFE grey

Septum seal made of aluminum foil

Silicone/PTFE septum seal

Silicone septum seal/alu-laminated

Tenax® / Oil-Kit

- Temperature resistant -15 °C to 180 °C, pressuretight up to 1 bar
- This Sieg-Mi-Flex cell design takes one test specimen (on bottom!) and it is laid horizontally

Stainless steel Central Ring:

Item No.:	Nominal diameter:	Surface*:	Filling volume**:
250-0591775	DN120	1,0 dm²	220 ml

Stainless steel Central Ring for the Tenax® /Oil-Kit for the Siegwerk Migration Cell System, consisting of:

- 1 x stainless steel central ring (V4A 1.4571) without GL14 cast-in and cast-out connecting pieces
- 2 x FEP/silicone O-rings that fit in the central ring's groove (top and bottom)

Glass Central Ring:

Item No.:	Nominal diameter:	Surface*:	Filling volume**:
250-0649100	DN120	1,0 dm²	220 ml

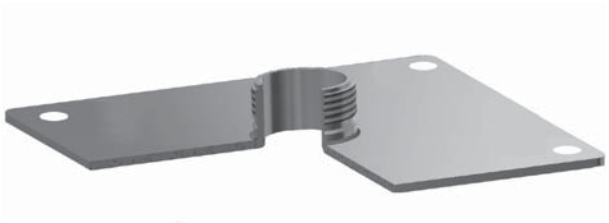
Glass Central Ring for the Tenax®/Oil-Kit for the Siegwerk Migration Cell System, consisting of:

- 1 x Glass Central Ring (Borosilicate glass 3.3) without GL14 cast-in and cast-out fittings
- 2 x FEP/silicone O-rings that fit in the central ring's groove (top and bottom)

* Approx. surface with 1 test specimen/with 2 test specimens
** Approx. filling volume of the central ring

Fixing Plate Upper Parts:

Item No.:	Details:
250-0649049	**Borosilicate glass upper fixing plate for the Tenax®/Oil-Kit for the Siegwerk Migration Cell System, consisting of:** • 1 x borosilicate glass upper fixing plate and centric GL45 fitting with 4 x drill holes, without M8 inner thread, 140 × 140 mm • 4 x PTFE hole inserts
250-0788274	**Stainless steel upper fixing plate for the Tenax®/Oil-Kit for the Siegwerk Migration Cell System, consisting of:** • 1 x Stainless steel (VA 1.4571) upper fixing plate and centric GL45 fitting, without screw cap, with 4 x drill holes, without M8 inner thread, 140 x 140 mm • 4 x PTFE hole inserts



Screw Cap
Item No.: 120-0649056

- easy-to-gripedging made out of PPS
- black
- GL45 closed
- with PTFE-coated silicone seal for the GL45 fitting on the Fixing Plate Upper Part with centric GL45 fitting
- Packaging unit = 1 pcs.

In addition you can order our **Stainless steel Fixing Plate Set (Item No.: 250-0239899)** Catalogue p. 30 and the **Glass Fixing Plate Set (Item No.: 250-0277594)** Catalogue p. 32.

Usage:

In addition to tests using the Tenax®, the Tenax®/Oil-Kit is also used for migration tests with vegetable oil since for many customers the fixing plate with the GL45 fitting is easier to clean in a dishwasher than the centre ring with GL14 cast-in and cast-out fittings.

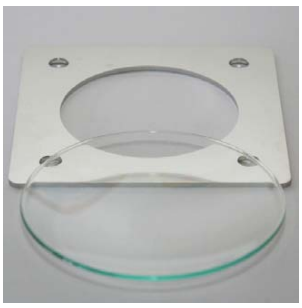
Tenax®-EcoKit

Tenax®-EcoKit for the „Sieg-Mi-Flex“ migration cell system for determining mass transfer through paper and cardboard, using modified Tenax® (polyphenylene oxides(MPPO)) as the simulant according to EN 14338:2004-03.

- Temperature resistant from -15 °C to 180 °C, **not pressure sealed!**
- This Sieg-Mi-Flex cell design takes one test specimen (on bottom!) and it is laid horizontally

Tenax®-EcoKit:

Item No.:	Nominal diameter:	Surface*:	Filling volume**:
250-0643030	DN120	1,0 dm²	200 ml



* Approx. surface with 1 test specimen/with 2 test specimens
** Approx. filling volume of the central ring

Tenax®-EcoKit for the „Sieg-Mi-Flex“ Migration Cell System consisting of:

- 1 x DN100 positioning aid (ID = 111.5 mm) made of V2A(1.4301)
- 1 x Watch glass made of soda-lime laboratory glass, Ø = 125 mm

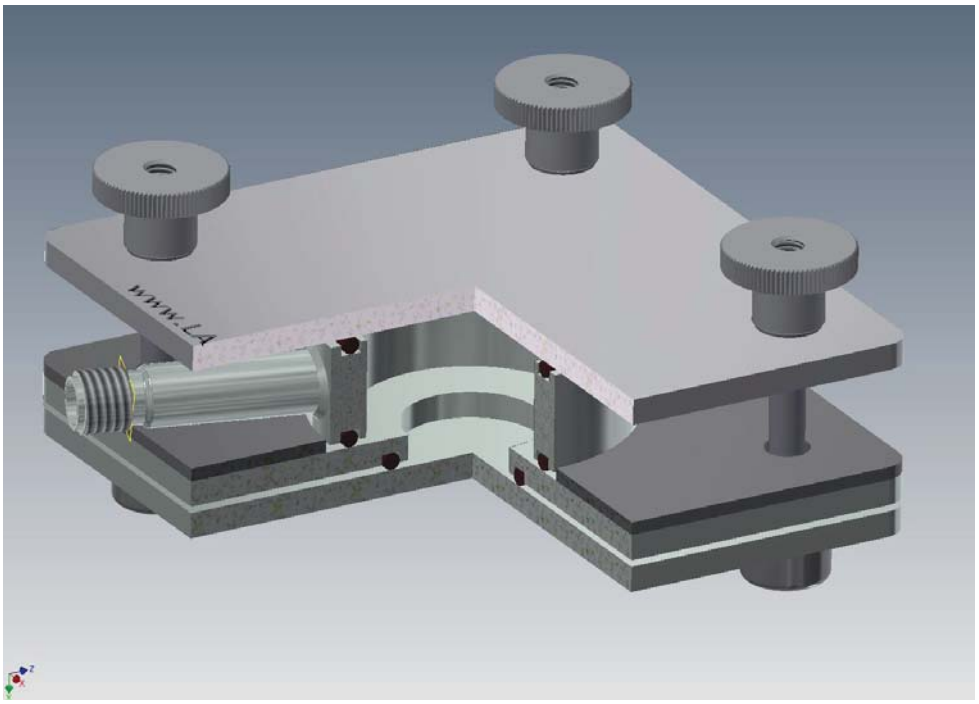
For an existing DN120 stainless steel centre ring for the Siegwerk Migration Cell System consisting of:

- 1 x Stainless steel Central Ring DN120 (V4A 1.4571) with GL14 cast-in and cast-out fittings
- 2 x FEP/silicone O-rings that fit in the DN120 centre ring’s groove (top and bottom)

In the test using Tenax® as the food simulant, the test specimen and a DN120 centre ring are fixed using a DN100 positioning aid. Then, the Tenax® is poured in and distributes evenly onto the specimen. Then, the wide opening is closed with a watch glass and sealed shut with aluminium foil (un-coated, flame-treated)

Reduction Plate (VA 1.4571)

In the „Sieg-Mi-Flex“ Migration Cell System there are eight standard Central Rings of various sizes included in the assortment. In practice, test specimens are of a size that requires the cell surface to be precisely matched. Fast and cost-effective solutions include the stainless steel reduction plates (VA 1.4571).



The image shows a „Sieg-Mi-Flex“ Migration Cell System using a Sieg-Mi-Flex reduction plate (DN40) in conjunction with a stainless steel Central Ring (DN60).

Stainless steel reduction plates for the „Sieg-Mi-Flex“ Migration Cell System can only be used with a larger Central Ring!

It is also possible to use two stainless steel reduction plates together with one larger Central Ring. In such cases, the Migration Cells „Sieg-Mi-Flex“ are positioned standing upright rather than lying down horizontally.

Reduction plate:

Item No.:	Nominal diameter:	Surface*:	Filling volume**:
250-0584210	DN50[1]	0,19 / 0,38 dm²	55 ml
250-0584104	DN40[1]	0,12 / 0,24 dm²	52 ml
250-0584203	DN20[2]	0,075 / 0,15 dm²	10 ml

* Approx. surface with 1 test specimen/with 2 test specimens
** Approx. filling volume of the central ring
[1] Use of Stainless Steal Reduction Plate DN40 & DN50 with DN60 central ring only
[2] Use of Stainless Steal Reduction Plate DN20 with DN30 central ring only

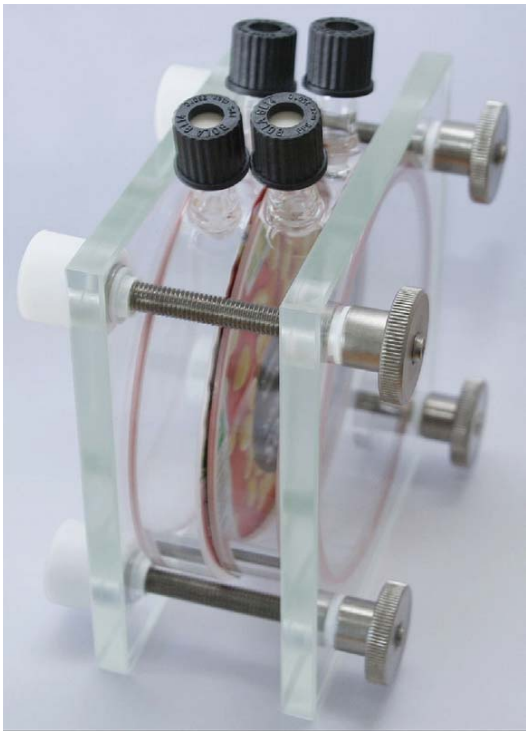
The reduction plates are temperature resistant up to 180°C

„Sandwich Set-Up“ without centring ring

For the “Sandwich Set-Up” without centring ring, in addition to a second Central Ring another set of extension connectors is needed to double the size of the reaction chamber in order to achieve two tightly sealed reaction chambers with the characteristically-defined surfaces and volumes.

Two laterally attached GL14 screw fittings on the Central Ring (sealed, e.g. with GL14 perforated caps and inserted septa), create two fittings (inlet and outlet) to each of the two steam areas formed by the connection of the fixing plate set and the fitting of a test sample film between the two Central Rings.

The “Sandwich Set-Up” of the „Sieg-Mi-Flex“ Migration Cell System can be used in a temperature range of -15 °C to 180 °C. The test specimen does not need to be precisely cut out for this test setup, and can protrude slightly past the Central Ring.

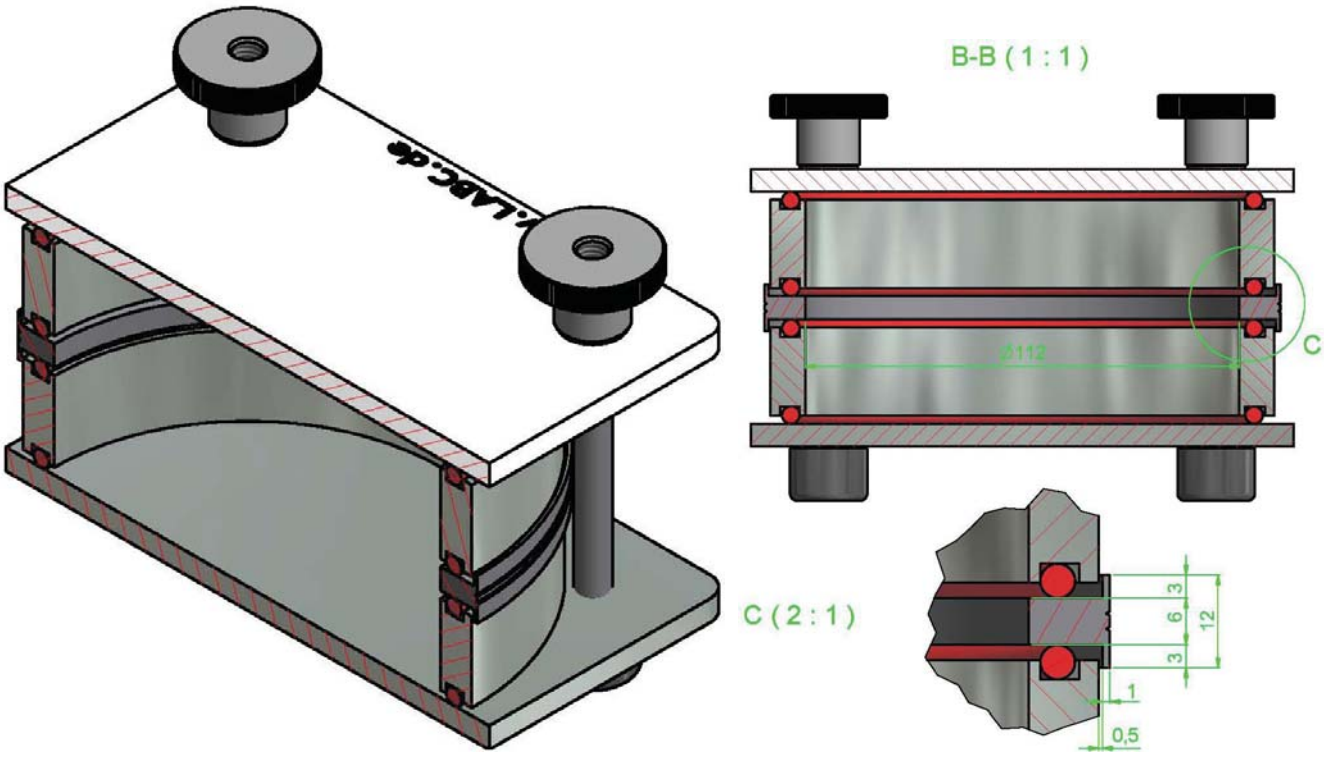


„Sandwich Set-Up“ with centring ring

For the “Sandwich Set-Up” with a stainless steel centring ring, in addition to a second Central Ring and a centring ring, another set of extension connectors is also needed to double the size of the reaction chamber in order to achieve two tightly sealed reaction chambers with the characteristicallydefined surfaces and volumes.

2 x laterally attached GL14 screw fittings on the Central Ring, sealed with GL14 perforated caps and inserted septa, for example, create two fittings (inlet and outlet) to each of the two steam areas formed by the connection of the fixing plate set and the fitting of a test sample film between the centring ring and a Central Ring.

In the “Sandwich Set-Up”, in order to also reduce the dead volume the centre ring can be employed without the 2 x lateral GL14 screw fittings. The “Sandwich Set-Up” with stainless steel centring ring of the „Sieg-Mi-Flex“ Migration Cell System can be used in a temperature range of -15 °C to 180 °C. The test specimen must be precisely cut out for this test setup.



Combination „Sandwich Set-Up“ with centring ring for a migration test with TENAX® without direct contact with the package

The test setup depicted in the figure tests the mass transfer through an open space from a packaging test specimen (fixed centrally in the centring ring!) to the TENAX® distributed on the bottom of the cells.
The “Sandwich Set-Up” also allows one to combine components of the Sieg-Mi-Flex system consisting of borosilicate glass and stainless steel and thereby to be able to flexibly adapt to a particular situation (temperature-resistant from -15 °C to 130 °C, pressure seal up to 1 bar).

Additional components needed for a “Sandwich Set-Up” of the „Sieg-Mi-Flex“ Migration Cell System

Stud bolt set VA 1.4571
Item No. 250-0584258
(the “extension connectors”! length: 109 mm) consisting of:

4 x M8 stud bolts and 4 x M8 stainless steel spring collars for use in the „Sieg-Mi-Flex“ Migration Cell System with the fixing plate set,

a) with 2 Reduction Plates and a Central Ring for modular adaptation to pre-existing sample film sizes
b) for doubling the “Sandwich Set-Up” reaction chamber with and without centring ring by arranging 2 stainless steel or borosilicate glass Central Rings one atop the other

Necessity: mandatory

Packaging unit = 4 each

DN120 centring ring and film holder
Item No.: 250-0591782

(for the inner bag barrier test and sandwich arrangement, for example), made of stainless steel VA 1.4571 and inner diameter of 112 mm +/-0.1 mm as an intermediate ring for 2 DN120 centre rings. Fit all DN120 Central Rings (including or not including the filling/pouring fittings!)

Necessity: optional

Packaging unit = 1 each

Migra spring clamp for fastening a positioning aid for the Central Ring
Item No. 130-0668255

made of V2A (1.4301, 3 mm thickness) to a fixing plate, „Sieg-Mi-Flex“ system

Necessity: optional

Packaging unit = 1 each

Migra screw perforated cap closure
Item No.: 120-0592109

with easy-to-grip PPS
edging, black, GL 14 with hole (Ø 9.2 mm) and silicone/PTFE gasket (approx. 3 mm thickness)

Necessity: optional

Packaging unit = 1 each

Further testing of mass transfers with the “Sandwich Set-Up” test setup in the headspace:

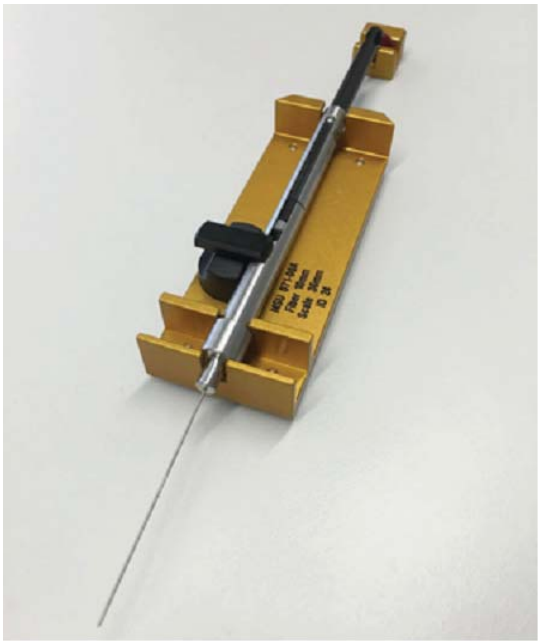
- The headspace of the food contact side of packaging versus the outside can be tested simultaneously (the film to be tested (test sample) is positioned between the two Central Rings and clamped into place).
- The barrier effect (permeation) of inner bags in folding cardboard boxes can be tested in the headspace. The box’s cardboard (donator) is placed between a fixing plate and a centre ring and the inner bag film (test sample) to be tested is positioned between the two centre rings and clamped into place.
- The barrier effect of “cardboard boxes” (coated cardboard) can be tested with the option of analysing the food contact side versus the outside. The test sample is positioned between the two centre rings and clamped into place.
- The barrier properties (permeation) (H_20, CO_2, N_2, O_2) of composite packaging can be tested.

When using the “Sandwich Set-Up” test setup, sample preparation generally occurs without a food simulant matrix although liquid or solid simulants can also be used here as well. The sampling and accumulation from the test space/spaces optionally occurs using an inert carrier gas that rinses the steam space(s) and concentrates the volatile substances on a TENAX® adsorption tube. The analysis then occurs using thermal desorption and GC/MS or GC/TOF.

A further method uses the adsorbent SPME (solid phase microextraction), for example 24 h at RT SPME fibre holder with Stableflex/SS and Carboxen/PDMS.

SPME Fiber Holder - solid phase not visible

SPME Fiber Holder - solid phase visible



SPME Fiber Holder for CTC auto-sampler

PowerSorb - Disposable Universal Adsorber

The Alternative to SPME

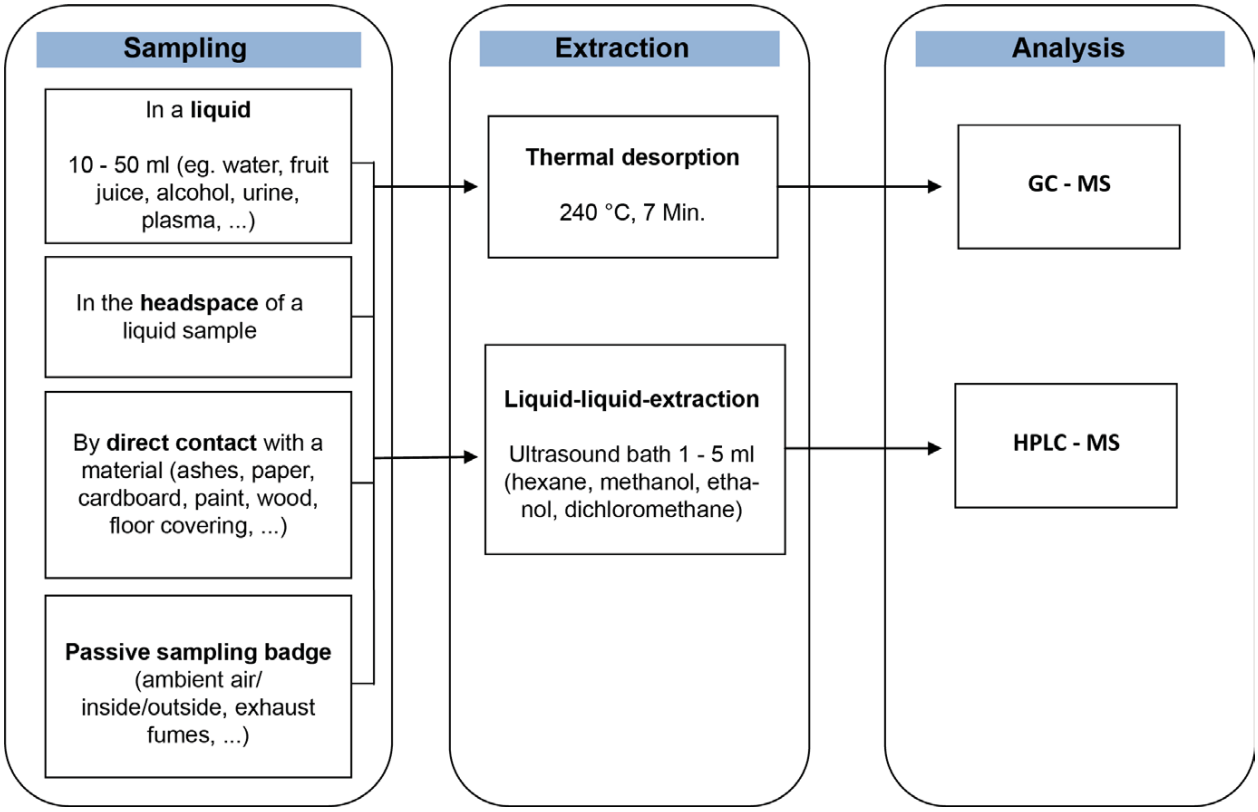
A new method is trace analysis using the disposable universal adsorbent PowerSorb. The disposable polymer PowerSorb has outstanding analytical abilities. It was specially developed for applications using thermal desorption or for fluid extraction by means of solvents. Sample preparation is simplified by the new innovative solution for trace analyses.

Area of application for the PowerSorb:

- Food industry
- Packaging industry
- Cosmetics industry
- Environmental analysis
- Water analysis (mineral, surface, spring, waste water...)
- Taste and fragrance analysis

Benefits of the PowerSorb:

- Ultra-pure, non-polar polymer
- Large adsorption surface
- Ready to use
- Alternative to SPME and SBSE techniques
- Excellent price-to-performance ratio
- Packaged under inert gas
- Clear reduction in sample preparation time
- Much more sensitive than SPME



The ultrapure PowerSorb polymer offers many options for use to accumulate traces in sold, liquid or gaseous matrices. The polymer is placed into contact with the sample for a fixed duration of 1 to 4 hours. Stirring takes place during the transfer time in order to achieve the best transfer and adsorption of molecules possible. The material can also be used as a passive adsorbent under the effect of ambient air in public spaces, in particular for benzene measurements and other VOCs. There are also specific passive sampling systems available as well.

Item No.:	Packaging Unit:	Details:
110-0649001	50 x 2 ml brown glass screwed vials with an ND9 threaded perforated cap and Sil/ PTFE gasket	PowerSorb Universal Disposable Polymer: L: 20 mm*, Ø 2 mm for trace analysis in solid, liquid and gaseous matrices, packaged individually in inert gas.

* further lengths, VPE sizes, vial sizes and vial seals on request!

Cutting test piece blanks

Positioning aids for **Central Ring** (made of V2A (1.4301), 3 mm thick) are also useful as templates for cutting out test samples. The test samples from which the test specimens are cut, with a film knife and a glass cutting plate, as a cut-resistant base, must be clean and free of surface contaminants. Dust may be removed through wiping the sample with a lint-free cloth or a soft brush. We recommend wearing cotton gloves.

Item No.:	Description and scope of delivery:
250-0643092	Positioning aid made of V2A (1.4301) for **DN30** Central Ring (Sieg-Mi-Flex), 3 mm and also useful as a template for cutting out sample specimens, ID (mm): 41.5
250-0643085	Positioning aid made of V2A (1.4301) for **DN60** Central Ring (Sieg-Mi-Flex), 3 mm and also useful as a template for cutting out sample specimens, ID (mm): 72.5
250-0643078	Positioning aid made of V2A (1.4301) for **DN70** Central Ring (Sieg-Mi-Flex), 3 mm and also useful as a template for cutting out sample specimens, ID (mm): 82.5
250-0643061	Positioning aid made of V2A (1.4301) for **DN80** Central Ring (Sieg-Mi-Flex), 3 mm and also useful as a template for cutting out sample specimens, ID (mm): 94.5
250-0643054	Positioning aid made of V2A (1.4301) for **DN90** Central Ring (Sieg-Mi-Flex), 3 mm and also useful as a template for cutting out sample specimens, ID (mm): 101.5
250-0643016	Positioning aid made of V2A (1.4301) for **DN100** Central Ring (Sieg-Mi-Flex), 3 mm and also useful as a template for cutting out sample specimens, ID (mm): 111.5
250-0643047	Positioning aid made of V2A (1.4301) for **DN110** Central Ring (Sieg-Mi-Flex), 3 mm and also useful as a template for cutting out sample specimens, ID (mm): 116.5
250-0643023	Positioning aid made of V2A (1.4301) for **DN120** Central Ring (Sieg-Mi-Flex), 3 mm and also useful as a template for cutting out sample specimens, ID (mm): 131.0

Migra cutting tool
Item No.: 130-0643115

for cutting out test samples for migration measurements, consisting of:
1 x film knife with aluminium handle (130 mm long) and 10 each spare blades

Migra stainless steel cutting board
Item No: 130-0668248

250 x 250 mm
Unbreakable cutting stand for cutting test pieces from 3 mm electropolished stainless steel (1.4301) with 4 feet and rounded corners.

Item No.:	Size:	international glove size*:	Description:
140-0668187	7	S	Migra cotton gloves, white, dry, free of dust and grease. Protective gloves for cutting test piece blanks to migration tests. Pairwise in the foil bag.
140-0668224	8	M	
140-0668217	9	L	
140-0668200	10	XL	
140-0668194	11	XXL	

* corresponds to the international glove size (men)

GL14 laboratory screw connectors

Pressure-resistant - for connecting GL male threads to hard-walled hoses or glass, plastic or metal tubes.

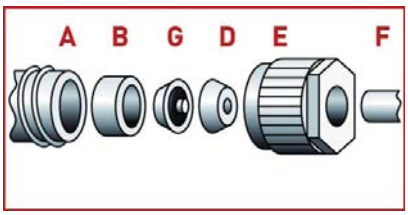
Technical specifications:

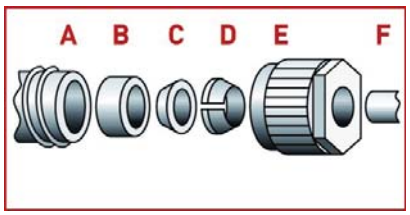
Temperatureresistance: -50 °C to 250 °C,
Chem. resistance: +++ universal
Pressure: 10 bar, vacuum compatible, FDA compliant

Product description:

Black PPS screw cap, inner parts consisting of clamping ring (PPS), sealing wedge and sealing plate (both made of PTFE), as well as an additional O-ring (FKM) for screwed connectors for hose outside diameters of less than 3 mm (no contact with the flow medium). Good chemical resistance, the medium only comes into contact with PTFE.

A GL threaded fitting
B sealing plate
C sealing wedge
D clamping wedge
E conical screw cap
F hose or tube
G sealing wedge with O-ring behind the PTFE lip (only for screwed connectors with hose outside diameters of less than 3 mm)



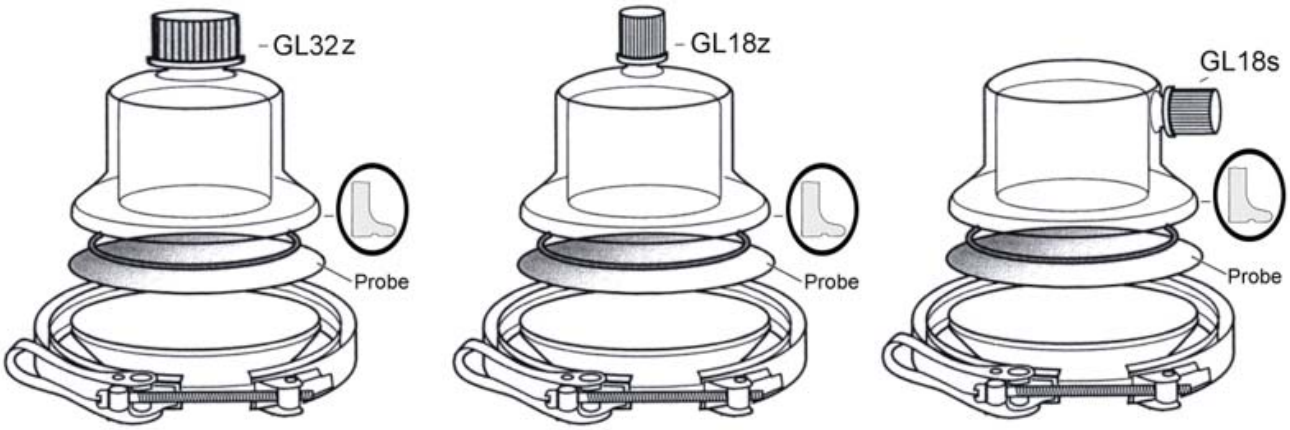


The Installation:

1. Place the conical screw cap onto the hose
2. Place the clamping wedge, followed by the sealing wedge and the sealing late, onto the hose
3. Screw the screw cap onto the GL threaded fitting – finished

Item No.:	Hose outside diameters:	GL threads:
120-0671330	(1/32") - 0,8 mm	14
120-0671408	1 mm	14
120-0671392	(1/16") - 1,6 mm	14
120-0671385	2 mm	14
120-0671378	3 mm	14
120-0671361	(1/8") - 3,2 mm	14
120-0671354	4 mm	14
120-0671347	5 mm	14
120-0671439	6 mm	14
120-0671422	(1/4") - 6,35 mm	14
120-0671415	8 mm	14

„MigraCubicle“ Migration Cell System



Item No.:	Type:	Surface:	Filling Volume:
250-0586511	MC150	2 dm²	200 ml

„MigraCubicle“ Migration Cell System
based on cell type D(Figure C.6, EN1186-1:2002), consisting of:

- Quick-locking closure made of CrNi steel,
- massive glass base made of DURAN® glass,
- Glass cover with GL threads (central (z) or lateral (s) made of DURAN® glass,
- O-ring made of seamless silicone rubber coated with FEP (FEP/Sil, (FEP=
- Fluorinated Ethylene Propylene)) and
- a GL screw cap made of PPS, black, with no holes and PTFE-coated silicone rubber gasket inlay.

Due to 6 different cell sizes and three different cover designs, the „MigraCubicle“ Migration Cell System can be adapted to the size of the sample specimen and food simulant.

The „MigraCubicle“ Migration Cell System makes reproducible sample preparation of migration measurements possible. The migration cells made of DURAN® glass have proven themselves effective in the experimental mass transfer measurement of the ingredients of packaging contact materials onto solid food testing simulants, such as Tenax®, and liquid food testing simulants (3 % solution of acetic acid, water and oil such as olive oil or sunflower oil). The Siegwerk Migration Cell System

(Sieg-Mi-Flex) is better suited for liquid food simulants, even above their boiling point.

In the „MigraCubicle“ Migration Cell System, very smooth and thin foils, such as 2 - 4 mm thick polystyrene foam (e. g.: from meal boxes), with a one-sided contact can be processed.

Also see the application instructions below. In addition, the „MigraCubicle“ Migration Cell System demonstrates high stability due to the massive base plate made of DURAN® borosilicate glass 3.3 and requires less space in the drying cabinet due to its low design.

The „MigraCubicle“ Migration Cell System is very well suitable for use with the solid food simulant MPPO (modified polyphenylene oxide. e. g., poly (2.6-diphenylphenylene oxide), particle size 60 - 80 mesh, pore size 200 nm MPPO (Tenax®, Regulation (EU) No. 10/2011(PIM))) and for the testing of sample specimens of polystyrene foam meal boxes (here, no O-ring is used, whereby the surfaces also change!). If the „MigraCubicle“ Migration Cell System is filled with liquid food simulants, losses of the liquid food simulants may occur depending on the cell size, testing temperature, surface tension or viscosity, as well as the thickness and composition of the sample specimens to be tested. Tip for practice: In the case of very thin and smooth foils, underlaying the sample specimen with laboratory aluminium foil or pure filter paper provides better seal tightness. For liquid food simulants, even above their boiling point, the Siegwerk LABC Migration Cell System (Sieg-Mi-Flex) is better suited.

In case of liquid food simulants, the steam pressure in the migration cell increases along with the temperature. As a result, the cell can become leaky or destroyed. The operation of the „MigraCubicle“ Migration Cell System is absolutely not suitable for tests above the boiling point of a food simulant. Here, the Siegwerk LABC Migration Cell System (Sieg-Mi-Flex) is suitable for this purpose.

Legal Bases:

Food contact materials such as food packaging must be tested by the manufacturer for conformity with the European Framework Regulation 1935/2004 EC and/or specific directives or regulations (e. g.: plastic regulation 10/2011 EC (PIM)) or the U.S. Code of Federal Regulations (CFR), Volume 21, Sections 175 through 178, to which they are also legally obliged.

In addition, standards EN 14338-2004-03 (paper and cardboard) and EN 1186-1 through 13:2002 “Materials and articles in contact with foodstuffs. Plastics”, a guideline for selecting testing conditions and test methods for migration measurements, must be observed.

Application:

MOSH/MOAH, Extractables and Leachables, Migration Tests and Sensor technology.

Empirical values for the suitability of the „MigraCubicle“ Migration Cell System depending on the medium and tests at 20°C.

Food Simulant:	Abbreviation*:	MC 35	MC 60	MC 100	MC 120	MC 150	MC 200
Ethanol 10 Vol.-%	A	yes	yes	no	no	no	no
Acetic acid 3 Gew.-%	C	yes	yes	yes	yes	yes	yes
Ethanol 20 Vol.-%	D	yes	yes	no	no	no	no
Ethanol 50 Vol.-%	D1	yes	yes	no	no	no	no
Vegetable Oil	D2	yes	yes	yes	no	no	no
MPPO	E	yes	yes	yes	yes	yes	yes
Water	H2O/H2O dist.	yes	yes	yes	yes	yes	yes
Ethanol 95 Vol.-%,	substitute tests	no	no	no	no	no	no
Isooctane	substitute tests	no	no	no	no	no	no

* e. g.: Food simulant A
Information provided without guarantee. An independent leak test is absolutely necessary!

Cell type MC:	Surface:	FEP/Sil-O-Ring:	Real surface with seal ring:	Glass Cell cover:	Real Surface without seal ring:
MC 35	approx. 0,15 dm²	Ø 0,46 dm	0,165 dm²	Ø 0,35 dm	0,096 dm²
MC 60	approx. 0,5 dm²	Ø 0,75 dm	0,442 dm²	Ø 0,60 dm	0,283 dm²
MC 100	approx. 1 dm²	Ø 1,10 dm	0,950 dm²	Ø 1,00 dm	0,785 dm²
MC 120	approx. 1,5 dm²	Ø 1,33 dm	1,39 dm²	Ø 1,20 dm	1,131 dm²
MC 150	approx. 2 dm²	Ø 1,57 dm	1,94 dm²	Ø 1,50 dm	1,767 dm²
MC 200	approx. 3,5 dm²	Ø 2,15 dm	3,63 dm²	Ø 2,00 dm	3,142 dm²

The real migration surfaces of the respective „MigraCubicle“ cell size depends on the inner diameters of the FEP/Sil O-rings.
In case of measurement without seal rings (e. g.: when testing meal boxes made of polystyrene foam), the surfaces depend on the inner diameter of the glass cell cover (inner edge to inner edge!).

GL32z:	GL18z:	GL18s:	Cell size:	Surface:
250-0635141	250-0586481	250-0586283	MC 35	0,15 dm²
250-0635172	250-0085885	250-0586252	MC 60	0,5 dm²
250-0635189	250-0586498	250-0586290	MC 100	1 dm²
250-0635196	250-0586504	250-0586542	MC 120	1,5 dm²
250-0635202	250-0586511	250-0586306	MC 150	2 dm²
250-0635219	250-0586528	250-0586313	MC 200	3,5 dm²

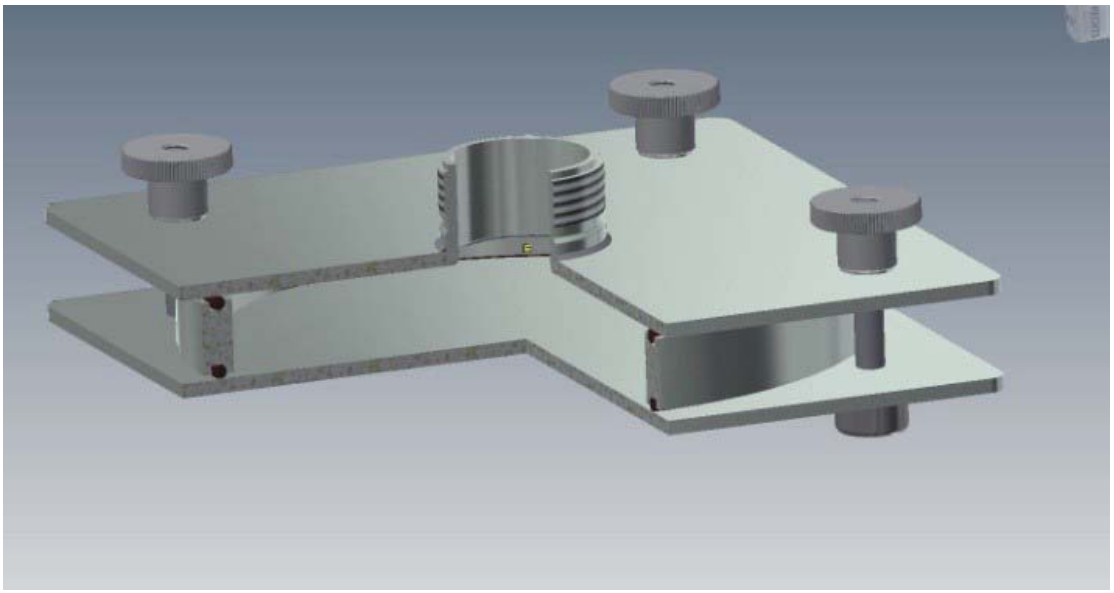
Migra-ZellType A migration cell analogous to EN1186-1-2002

In the Migra-Zell Type A, a surface/volume ratio of 2.5 dm^2 of food contact surface to 125 ml of test food substance (simulant) can be used, which is what is normally used.

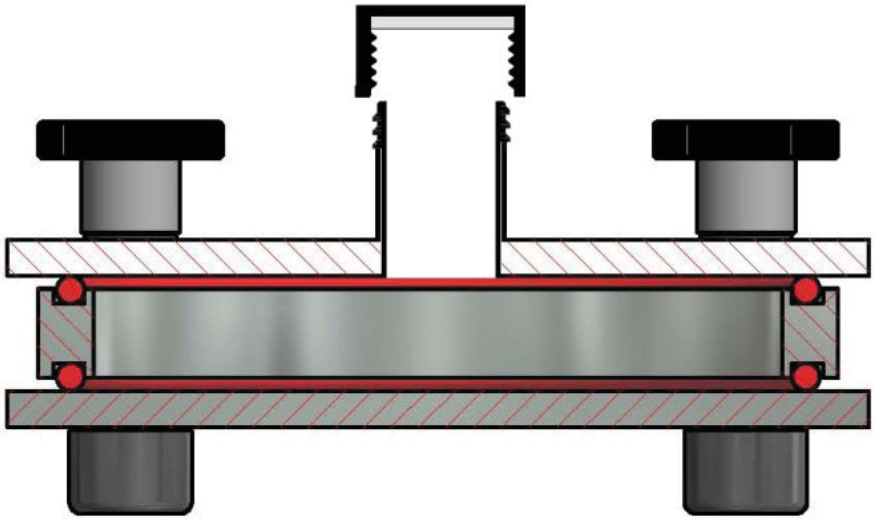
The Migra-Zell Type A is ultra seal tight and chemically resistant to the simulant foods described in regulation 10/2011 (PIM) and 2016/1416 (which amends and corrects 10/2011), and to the alternative food simulants ethanol 95 %, isooctane or water for organoleptic tests.
The advantage of a migration cell is that contact from one side can be re-established without any sharp edges or other effects.

For tests of mass transfer from packing surfaces to food simulants, the Type A migration cell was described in EN 1186-1 as a standard migration cell.
Comparative studies on the performance of cells of types A, B, C, D, E and F have shown that these cells have achieved similar results and should be considered to be equivalent (1186-1-2002, 9.4).

In the practise of migration testing, it has been found that using a wide variety of migration cell sizes appropriate for the problem is better than using cells of a specific unit size. In addition to so-called Migra-Zell Type A standard migration cells, LABC-Labortechnik offers a large assortment for simulation experiments in its „Sieg-Mi-Flex“ system and MigraCubicle migration cell series.



Migra-Zell Type A Migration Cell



Migra-Zell Type A migration cell
Item No.: 250-0668514
analogous to EN1186-1-2002 complete with inner cylinder and holding plate set:

Stainless steel holding plate set consisting of:

- 1 x stainless steel (VA 1.4571) plates with 4 x holes, each plate 200 mm × 200 mm × 4 mm, polished inside
- 1 x stainless steel (VA 1.4571) plates with 4 x holes, each 200 mm × 200 mm × 4 mm, polished inside and with a central GL45 fill and pour fitting incl. screw cap closure with easy-to-grip PPS edging, black and with PTFE-coated silicone gasket inlay
- 4 x stainless steel knurled screws and DIN 125B A2 screws
- 4 x PTFE feet, white
- 4 x washers

Inner cylinder:

- Inner cylinder made of stainless steel (VA 1.4571), h = 20 mm, each with an upper and lower groove, with 1 each FEP-coated O-ring seal and silicone core, Ø = 178 mm (measured from centre to centre).

Technical data:

- Temperature-resistance: -15 °C to approx. 180 °C,
- Pressure seal up to max. 1 bar,
- Surface area: approx. 2.5 dm²

Application examples for migration simulations with migration cells under exposure to light - and interesting variants of taste test

„Materials and articles must be manufactured in such a way that, under normal and foreseeable conditions of use, their constituents only migrate to a food or pharmaceutical formulation in such small quantities that they do not endanger the health and the food or the pharmaceutical in terms of smell and taste do not interfere“ is the meaning of the definition of food and pharmaceutical conformance of packaging materials.

To simulate the mass transfer of constituents from food contact materials, LABC-Labortechnik has developed a comprehensive range of migration cells (migration chambers).
These allow practical sample preparation, subsequent analytical measurement and organoleptic testing of the migration of packaging materials, „Extrcables and Leachables“ (E&L) and MOSH/MOAH as well as POSH/POA in food simulants, in headspace or in pharmaceutical formulations.

The migration simulations are carried out depending on the temperature and the time with legally prescribed simulants or in the headspace phase.

The influence of light (visible light/UV light) on the migration result can be done with migration simulations in a special migration cell (migration chamber) which is presented below.

Furthermore, taste test variants on organoleptically relevant migrants with water as test food after a migration simulation with food packaging materials are specified. Migration cells (migration chambers) allow migration simulation of the surface of sample specimen without cut edges.

Migration simulation under exposure to light

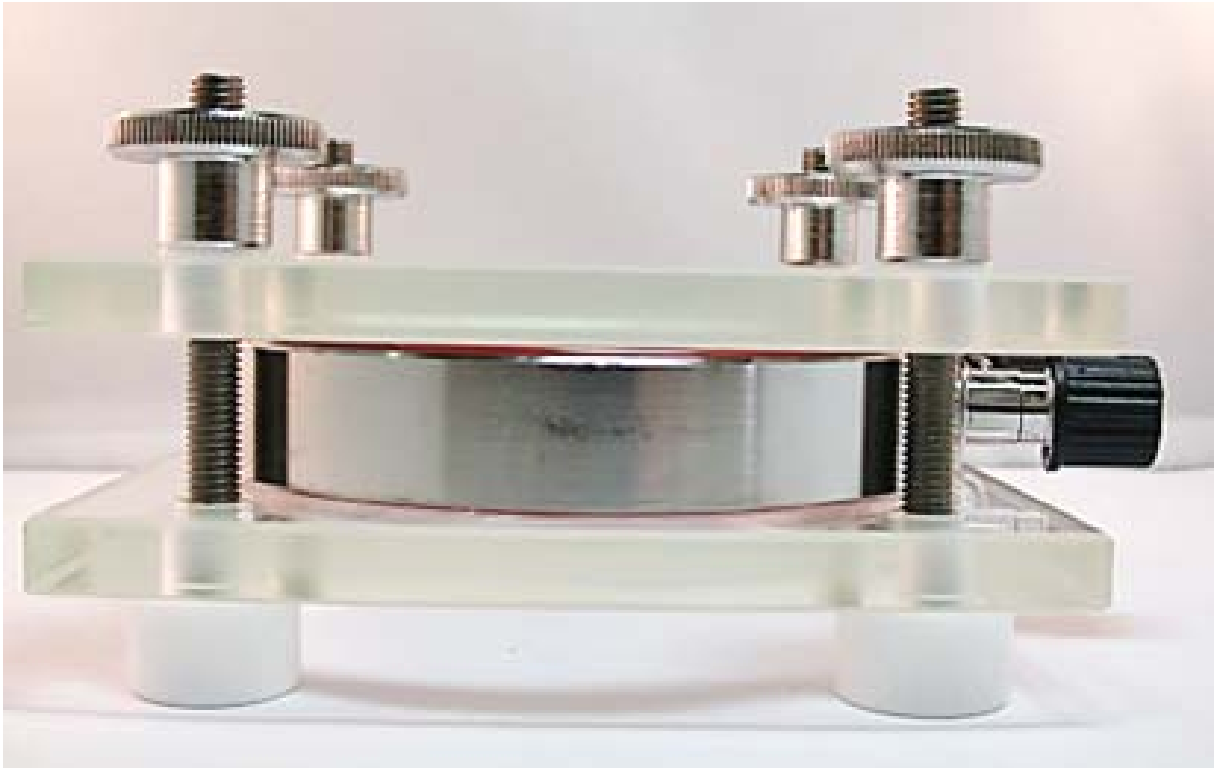
Migration simulations of packaging under the influence of light with the Combination Migration Cell System „Sieg-Mi-Flex“ consisting of a Fixing Plate Set made of Borofloat® glass plates and stainless steel center rings.

Borofloat® glass made by Schott; in addition to its good mechanical and glass-blowing machinability, also has special optical properties:

- unhindered translucent, especially in the visible wavelength range
- high transparency in the near IR and UV wave range
- low auto-fluorescence and solarization tendency

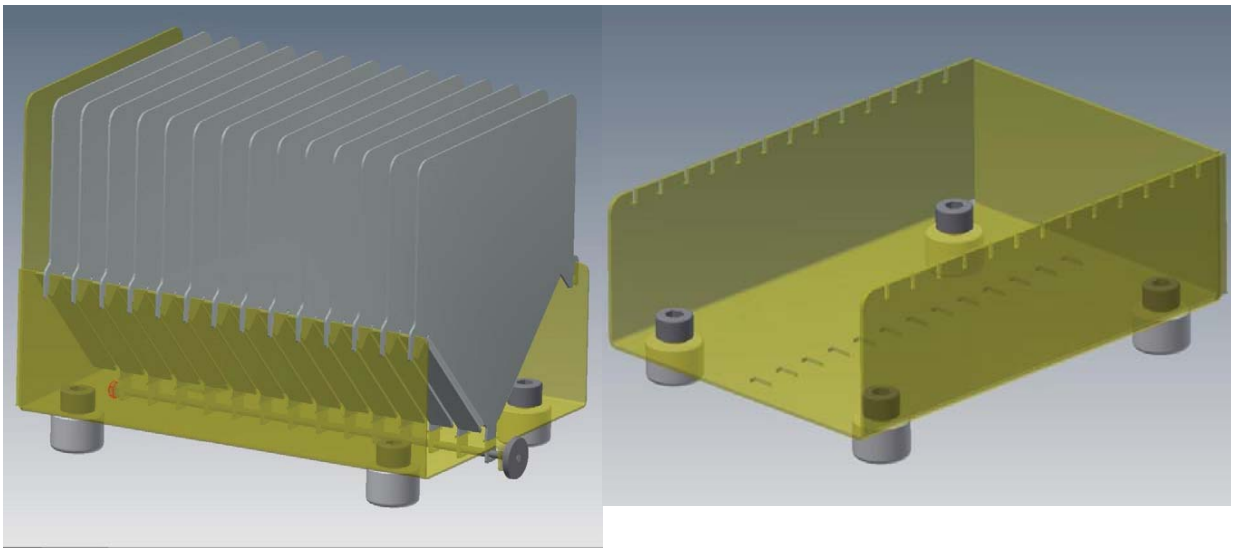
Into the Combination Migration Cell System „Sieg-Mi-Flex“ a test sample foil will be clamped and food simulants will be filled in. The horizontally positioned migration chamber is irradiated with light at room temperature. For the migration simulations under the influence of light and in dependence of the temperature light thermostats are also suitable. The combi-migration cell is temperature-resistant from -15 °C to 130 °C and pressure-tight up to 1 bar.

All stainless steel Central Rings of the „Sieg-Mi-Flex“ system for the migration simulation of differently sized sample pattern surfaces fit into the Borofloat® glass fixation plate set of the Migration Cell System „Sieg-Mi-Flex“.



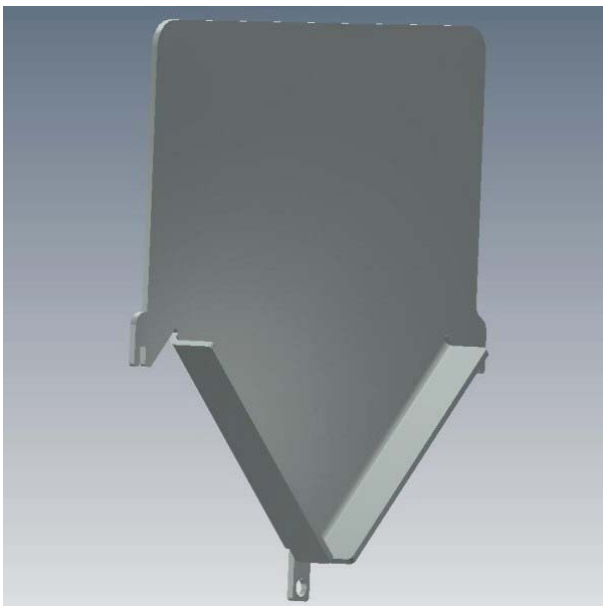
Migration testing using a bag (EN 1186-6:2002)

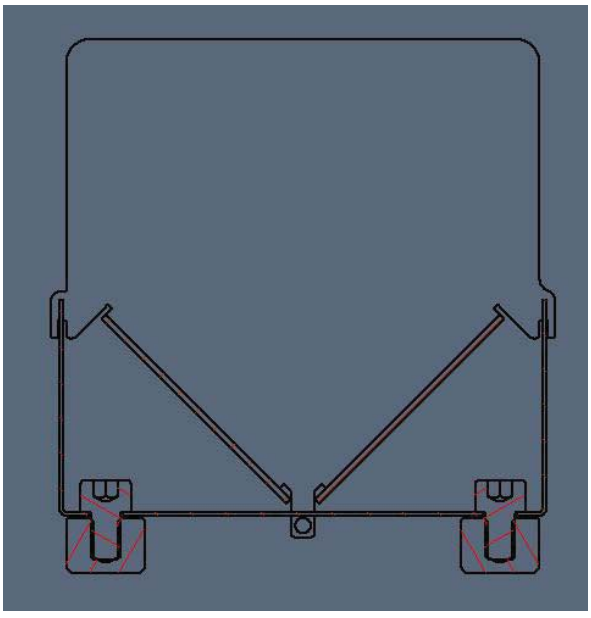
Item No.: 250-0649407



LABC stainless steel bag holder with PTFE feet for 14 bags as test specimens manufactured by sealing two 120 x 120 mm packing film sample specimens for a migration test according to EN1186-6:2002.

Description: In a box with 4 x PTFE feet, individual separations are placed in prescribed openings. The box and the separations are made of 1 mm stainless steel sheet. With an inserted pin, the lower brackets are kept from falling out. The bag holder can be easily removed for cleaning.





Thermostatically controlled equipment for migration tests

To achieve reproducible results, the test conditions depend substantially on time and temperature. Therefore, when selecting the temperature control equipment, be careful that the temperature control for the entire medium surrounding the sample vessel, the cells or bags corresponds to that established in Table B.2 of EN 1186-1:2002.

In the practice of migration tests, the following equipment are used:

Cabinets:

- **Safety dryer (Item No.: 230-0331586)** for limited amounts of solvent (Model FDL115), meeting the safety requirements of EN 1539:2010-08
- **Hot/cold test cabinet (Item No.: 230-0672955)** with explosion-proof test spaces for Zone 1 of the RUMED® Safety T-Line

Laboratory autoclaves:
They are usually used for migration tests in the temperature range of 90 °C to 130 °C and are present in many laboratories as standard equipment. (Please ask us about them!)

Bath thermostats:
With temperature-control liquids water or BASF heating bath liquid, which is miscible with water

Safety Dryer

Hot/cold test cabinet

Safety dryer for limited amounts of solvent, Model FDL115, manufacturer: Binder

Item No.: 230-0331586

- Meets the safety requirements of EN 1539:2010-08
- Brief drying times through high temperature precision and defined air exchange (air circulation approx. 20 x/min)
- Exhaust air flow according to EN 1539 at 50 °C approx. 400 L/min
- Silicone- and dust-free inner space
- Easily exchangeable fresh air cartridges provide a uniform fresh air quality
- Temperature range: Room temperature plus 5 °C to 300 °C
- APT.line™ pre-heating chamber technology
- Controller with time interval and real-time programming
- 2 chrome-plated grid shelves
- Fresh air monitoring with acoustic and optical alarms and
- Automatic heater shut-off
- Replaceable fresh air filter cartridges Class M6 according to DIN EN 79:2012
- Over-temperature limit controller, Class 2 (DIN 12880) with optical alarm
- Computer interface: RS 422

TECHNICAL DATA:

- Temperature range 10 °C above room temperature to [°C] 300,
- Space temperature deviation at 150 °C [± K] 2.5,
- Temporal temperature deviation [± K] 0.8,
- Heat-up time to 150 °C [min] 20,
- Recovery time after 30 s of door opening at 150 °C [min] 12,
- Air circulation (approx.) [x/min] 20,
- Exhaust air flow according to EN 1539 at 50 °C [approx. L/min] 400,
- Rated voltage [V] 230,
- Mains frequency [Hz] 50/60,
- Rated output [kW] 2.9,
- Phase (rated voltage) 1~,
- Net outside width [mm] 830,
- Net outside height [mm] 805,
- Net outside depth [mm] 685,
- Back wall distance [mm] 160,
- Side wall distance [mm] 100,
- Width inside [mm] 600,
- Height inside [mm] 435,
- Depth inside [mm] 435,
- Internal spatial volume [L] 115,
- Net equipment weight (empty) [kg] 90,
- Maximum total load [kg] 60,
- Maximum load per shelf [kg] 30,
- Energy consumption at 150 °C 1200 Wh/h,
- Sound level [dB(A)] 57,
- Number of shelves (Std./max.) 2/5

Hot/cold test cabinet with explosion-proof test spaces for Zone 1 of the RUMED® Safety T-Line

Item.-No.: 230-0672955

For the thermostatically-controlled testing of migration of packing ingredients using the „Sieg-Mi-Flex“ Migration Cell System as a function of time and temperature.

Typ: T500MIGRA

- Test space Ex II 2G EEx IIC T3
- Test space and external cladding of solvent-resistant stainless steel
- Circulating air fan for good spatial temperature distribution
- Intuitive handling through the CONTROL2015 touch controls
- Temperature range: from 0 °C to 80 °C
- Robust and extremely long life

Optional and not part of the scope of delivery, and only on request!

- Can be calibrated and validated!
- Moistening and drying possible!

In the hot/cold test cabinet Type: T500MIGRA, you can safely carry out migration tests („Sieg-Mi-Flex“ migration cell system) on packing media with explosive food simulants or alternative food simulants - even when an explosive atmosphere could temporarily occur due to leakage. The hot/cold test cabinet Type: T500MIGRA is suitable for storing or testing substances of temperature classes T1, T2 and T3 in explosion groups IIA, IIB and IIC and has an ATEX permit for Zone 1.

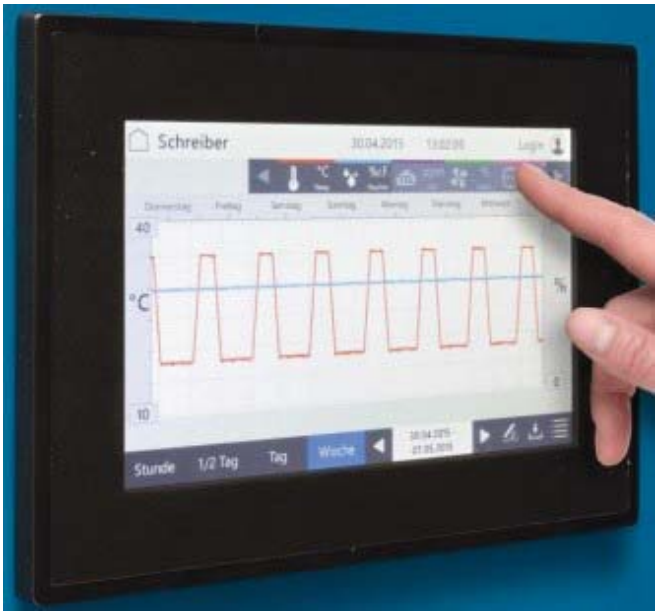
Heating – continuous and non-wear

Temporal and spatial high temperature constancy is ensured through a continuouslyrunning fan. The electrical resistance heater, which has very little residual heating due to is small mass, is located directly in front of the recirculating fan. It is controlled through non-contact means through a solid-state relay and therefore enables very direct and precise control. The advantage: high temperature precision and minimal wear.

The cooling - energy-saving and high performance

An air-cooled cooling machine is used as standard equipment. The compressor runs quietly and nearly vibration-free. The effectiveness of the heat exchanger is optimal. The overall cooling circuit works with energy-saving solenoid valve bypass technology which only turns off the compressor when no cooling output is required for an extended time. The result: Reliable, high operational safety and long life.

Control2015 touch – a controller for everything



Simple:
The clear 7“ colour touchscreen display can be operated intuitively.

Good:
Highly precise sensors and adjustment enable highly precise work, and can be qualified and validated every time.

Safe:
The documentation, with the help of the integrated plotter and log book provides transparency, is easy to operate and can be comfortably archived. (see also: http://www.rumed.de/control2015-touch/)

Hot/cold test cabinet RUMED® , Safety T-Line, Type T500MIGRA
Test space explosion-proof Ex II 2G EEx IIC T3

Room contents (l)	500
Minimal temperature	0 °C
Maximum temperature	+ 80 °C
Temporal temperature deviation (°C)	± 0,5 °C
Height (mm)	1500
Width (mm)	610
Depth (mm)	585
Number of shelves, reinforced	4
Maximum load per shelf (kg)	50
Equipment:	
Height (mm)	2105
Width (mm)	760
Depth (mm)	1125
Electrical connection (V/Hz)	400/230/50 (three-phase alternating current)

Pipe penetration
Item No.: 230-0672962

A 45 mm penetration in the side wall makes it possible to introduce measurement lines and hoses to the test space. Supply including sealing cover.

Necessity: optional

Castor wheel
Item No.: 230-0672962

Mobile version of test cabinet with 4 guide rolls, 2 of which can be locked with brakes.

Necessity: optional

Migra-Sample Bottles for raw materials with DIN thread

Compliant with EC 1935/2004 / EU 10/2011. Universally suitable for: pigment, solvent-based printing ink pastes or liquids (paints, resins, etc.). The wide opening makes it possible for mushy or viscous substances to be easily removed, e. g. with a spoon. The bottle and the screw cap can be easily cleaned - even in the dishwasher. The temperature resistance of the PP screw closure with inserted PTFE-coated PE foam seal is due to -20 ° C and 70 ° C.

Clear Glass:

Item No.:	Volume:	packaging unit:	Ø:	Height:	Thread DIN 168:	Cover:	Seal:
120-0669979	30 ml	120 pcs.	36 mm	72 mm	DIN 32	PP / orange	PE/ PTFE
120-0669986	50 ml	85 pcs.	44 mm	79 mm	DIN 32	PP / orange	PE/ PTFE
120-0669993	100 ml	63 pcs.	50 mm	97 mm	DIN 40	PP / orange	PE/ PTFE
120-0670005	250 ml	48 pcs.	70 mm	118 mm	DIN 55	PP / orange	PE/ PTFE
120-0670012	500 ml	20 pcs.	83 mm	158 mm	DIN 55	PP / orange	PE/ PTFE
120-0670029	1000 ml	18 pcs.	103 mm	185 mm	DIN 68	PP / orange	PE/ PTFE

Brown Glass:

Item No.:	Volume:	packaging unit:	Ø:	Height:	Thread DIN 168:	Cover:	Seal:
120-0670036	50 ml	85 pcs.	44 mm	79 mm	DIN 32	PP / orange	PE/ PTFE
120-0670043	100 ml	56 pcs.	50 mm	97 mm	DIN 40	PP / orange	PE/ PTFE
120-0670050	250 ml	30 pcs.	70 mm	118 mm	DIN 55	PP / orange	PE/ PTFE
120-0670067	500 ml	20 pcs.	83 mm	158 mm	DIN 55	PP / orange	PE/ PTFE

Clear Glass Narrow-necked Bottles:

Item No.:	Volume:	packaging unit:	Ø:	Height:	Thread DIN 168:	Cover:	Seal:
120-0738811	100 ml	72 Stk.	45 mm	118 mm	DIN 22	PP / orange	PE/ PTFE
120-0738835	250 ml	42 Stk.	61 mm	151 mm	DIN 22	PP / orange	PE/ PTFE
120-0738842	500 ml	35 Stk.	76 mm	189 mm	DIN 25	PP / orange	PE/ PTFE

Brown Glass Narrow-necked Bottles:

Item No.:	Volume:	packaging unit:	Ø:	Height:	Thread DIN 168:	Cover:	Seal:
120-0738859	100 ml	56 Stk.	45 mm	118 mm	DIN 22	PP / orange	PE/ PTFE
120-0738866	250 ml	42 Stk.	61 mm	151 mm	DIN 22	PP / orange	PE/ PTFE
120-0738873	500 ml	35 Stk.	76 mm	189 mm	DIN 25	PP / orange	PE/ PTFE

Delivery:

Only complete packaging units (pack) are delivered (no break possible!). The screw caps with inserted seal are not screwed onto the bottles. The bottles are welded in PE foil and the closures are packed in PE bags. Both articles should be flushed before the first use.

The core of the Migra sample bottle is the seal made of PTFE-coated, closed-cell polyethylene foam.
Due to the high elasticity of the PE foam and the pronounced resilience, the PE foam seal coated with a PTFE (Teflon®), which is compatible with migration, is perfectly suited for compensating tolerances in the interplay between seal and container mouth. With the PTFE coating this seal is very resistant to chemicals and is ideally suited for the sampling, storage and transport of raw material samples for migration and MOSH/MOAH tests.

An experience report from the application with the solvent butyl acetate:
Three 50 ml wide-neck bottles with DIN threads made of clear glass were filled with butyl acetate and sealed with the orange screw caps with the PE / PTFE seal. All three sealed bottles were stored at 50 °C for 5 days after weighing on the analytical balance. After cooling, the covers were checked for fit and tightness, with the result that all three were tight and firm. The balance returned a difference of > 0.005 g (about 0.01 %).

Screw Cap:

Item No.:	Thread DIN 168:	Cover:	Seal:
120-0310369	DIN 22	PP / orange	PE/PTFE
120-0239707	DIN 25	PP / orange	PE/PTFE
120-0070898	DIN 32	PP / orange	PE/PTFE
120-0172387	DIN 40	PP / orange	PE/PTFE
120-0070911	DIN 55	PP / orange	PE/PTFE
120-0172059	DIN 68	PP / orange	PE/PTFE

Fasteners with orange screw cap and inserted seal made of PE/PTFE are delivered as loose goods packed in PE bags.

For screw caps with DIN or GL threads, we also supply alternative density inserts, e. g. Aluminum discs, Viton® washers, PTFE washers, butyl rubber/PTFE for DIN a.m.!

Migra Glass Cylinder Bottles with screw thread and a closed plastic screw cap with inserted PTFE-laminated seal for migration simulations of completely immersed food contact materials.

Due to the cylindrical shape of the screw-top bottles, the largest possible opening is obtained. Especially suitable for migration simulation of completely immersed molded objects for the food contact. Compliant to EG 1935/2004 / EU 10/2011.
Temperature-resistant: -20 °C bis 80 °C.
The Migra Glass Cylinder Bottle and the screw cap can be easily cleaned - even in the dishwasher.

Delivery:

Only complete packaging units (pack) are delivered (no break possible!). The screw caps with inserted seal are not screwed onto the bottles. The bottles are welded in PE-foil and the closures are packed in PE-bags. Both articles should be flushed before the first use for migration simulations.

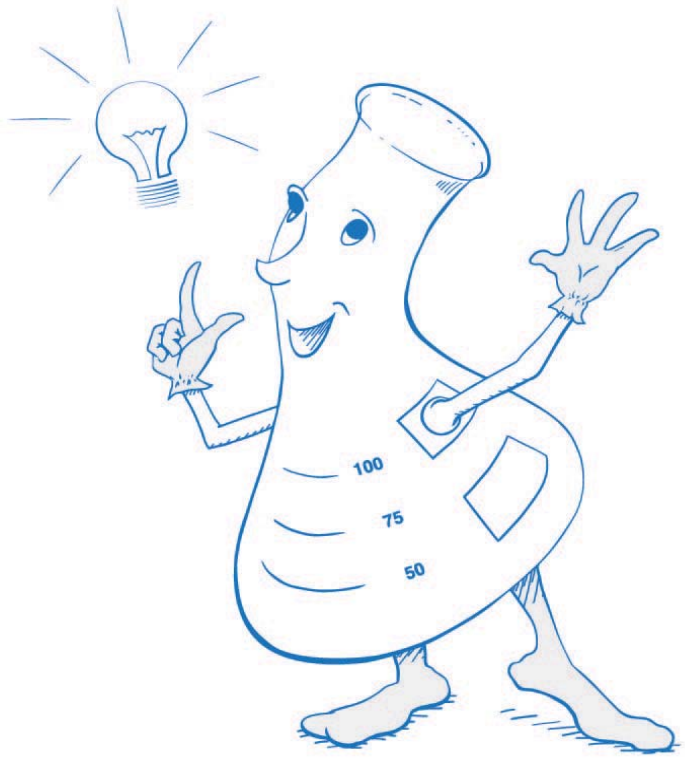
Clear Glass:

Item No.:	Volume:	Dimension:	Opening Ø:	Packaging Units:
120-0457101	30 ml	43 x 43 mm	31,5 mm	48 pcs.
120-0457125	60 ml	55 x 49 mm	42 mm	24 pcs.
120-0457071	120 ml	60 x 69 mm	45,5 mm	24 pcs.
120-0645300	180 ml	65 x 79 mm	53,5 mm	24 pcs.
120-0457095	240 ml	73 x 89 mm	59 mm	24 pcs.
120-0457118	480 ml	91x 96 mm	74,5 mm	12 pcs.
120-0457132	960 ml	95 x 170mm	75,5 mm	12 pcs.

Brown Glass:

Item No.:	Volume:	Dimension:	Opening Ø:	Packaging Units:
120-0645331	60 ml	55 x 49 mm	42 mm	24 pcs.
120-0645287	120 ml	60 x 69 mm	45,5 mm	24 pcs.
120-0645294	180 ml	65 x 79 mm	53,5 mm	24 pcs.
120-0645317	240 ml	73 x 89 mm	59 mm	24 pcs.
120-0645324	480 ml	91 x 96 mm	74,5 mm	12 pcs.
120-0645348	960 ml	95 x 170 mm	75,5 mm	12 pcs.

Sensor Technology



Taste-testing variants on organoleptic, relevant migrants with water as test food after a migration simulation with food packaging materials:

1) without cutting edge* and direct contact with water

a. Test temperature **below** the boiling point of water
b. Test temperature **above** the boiling point of water

2) without cutting edges* and contact through the air-space with water

a. Test temperature up to max. 100 °C

To achieve comparable results, the migration simulations are performed under standardized test conditions (duration and temperature).

The taste assessment is carried out according to the following intensity scale (according to DIN 10955):

0 = no discernible taste deviation
1 = just perceivable deviance of taste (still difficult to define)
2 = weak taste deviation
3 = distinct taste deviation
4 = strong taste deviation**

The results of the individual examinations should not differ by more than one level, otherwise the examination must be repeated. In the evaluation, the result is rounded to 0.5 intensity units by averaging the individual values. From Intensity 2 on the description of the odor deviation is given in key words.

* Edges can significantly contribute to the migration.
** The intensity does not necessarily signify the perceptible maximum.

Normative references:
DIN 10950-1, Sensory testing - Part 1: Terms,
DIN 10955, Sensory testing - Testing of packaging materials and packaging for foodstuffs,
DIN 10959, Sensory test methods - Determination of taste sensitivity

In addition to a sensor test, the matrix water also enables any further analytical investigations.

to 1) without cutting edges and direct contact with water

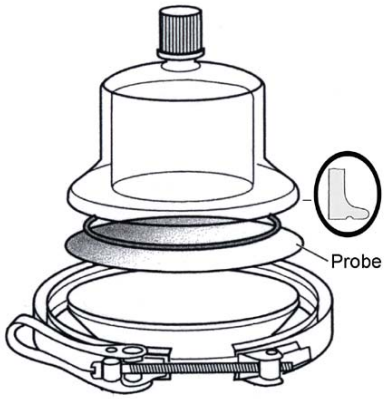
a. Test temperature **below** the boiling point of water

Exemplary performance of the taste test of film composites

The massive base plate of the Migration Cell System MigraCubicle made of DURAN® borosilicate glass is covered with the to be tested foil sample with the inside up. (Test area for Type MC 150: approx. 2 dm²). Then the cell is closed and filled with water (about 50 to 2000 ml depending on the desired area volume ratio!).
The test medium water only comes into contact with the sample foils, glass and FEP (Fluorinates Ethylene Propylene). Subsequently, the sealed cell is annealed at 40 °C for 10 days. After cooling, the water is tasted sensory for taste change and evaluated.
(Practical tip: Since there is a risk of microbial contamination at this temperature and is unpleasant for the sensory examination, it may be necessary to test at 46 °C (= shorten the test or test duration according to calculation formula from the Regulation (EU) 2016/1416 Section 2.1.4 Letter f))




Migra-Cubicle:



Item No.:	Type:	Surface:	Filling Volume:
250-0586511	MC150	2 dm²	200 ml

Migration Cell System:
„MigraCubicle GL18z MC150“ with stainless steel quick-release fastener, solid glass base, glass flange cover with centric GL18 thread, O-ring of seamless FEP encapsulated Slicon rubber (FEP / Sil, (FEP = Fluorinated Ethylene Propylene)) and a GL18 screw caps made of PPS closed, black with inlaid PTFE-coated silicone rubber seal analog cell type D (figure C.6, EN1186-1: 2002)

to 1) without cutting edges and direct contact with water

b. Test temperature **above** the boiling point of water at 130 °C

Exemplary performance of the taste test of lacquered foils:

Both stainless steel fixation plates of the migration cell are covered with foils to be tested (test surface: 2 x approx. 1 dm² = approx. 2 dm²). The cell is set upright and filled with water (about 200 ml). The test medium water only comes into contact with the sample foils, glass and FEP. (The sample foil conceals the stainless steel fixation plates!) Subsequently, the sealed cell is annealed in a counter pressure sterilization autoclave for 30 min at 129 - 130 °C. After cooling, the water is tasted sensory for taste change and evaluated.

In the test with this cell structure and with the occupancy of 2 test pieces, the food simulant water comes only with the food contact materials (such as packaging materials) and the materials glass and FEP! During the migration simulation, the migration cell is standing vertically! (see pictures!)



Glass Central Ring:

Item No.:	Nominal diameter:	Surface*:	Filling volume**:
250-0277600	DN120	1,00 / 2,00 dm²	200 ml

* Approx. surface with 1 test specimen/with 2 test specimens
** Approx. filling volume of the central ring

Glass Central Ring for the Migration Cell System „Sieg-Mi-Flex“ consisting of:

- 1 x Borosilicate Glass Central Ring with cast-in and cast-out fittings with GL14 threads
- 2 x FEP/silicone O-rings that fit in the central ring’s groove (top and bottom)
- 2 x GL14 seal caps (PPS housing incl. PTFE/sil. gasket)

Stainless steel Fixing Plate Set for the „Sieg-Mi-Flex“ Migration Cell System, Item No.: 250-0239899, consisting of:

- 2 x VA 1.4571 Plates with drill holes, polished inside
- 4 x stainless steel knurled screws (M8)
- 4 x stainless steel pin thread M8, Lenght: 66,5 mm
- 4 x PTFE feet, white (M8)
- 4 x stainless steel “Sieg-Mi-Flex” washers

The „Sieg-Mi-Flex“ combi-migration cell (Sieg-Mi-Flex) consisting of a glass central ring and a stainless steel fixing plate set, catalogue p. 36 is temperature-resistant up to 130 °C and pressure-tight up to 4 bar.

to 2) without cutting edges* and contact through the airspace with water

a. Test temperature up to max. 100 °C

Exemplary Performance of the Taste Test of Cardboard Foil Composites:

The Glass Central Ring is placed on the lower glass fixing plate. Subsequently, the to be tested films are placed on top of the glass center ring (test area: 1 x approx. 1 dm²). The cell is closed, positioned horizontally and carefully filled with 80 ml of water through the side ports, without wetting the films to be tested. Subsequently, the sealed cell is annealed in a heating cabinet for 30 min at 100 °C. After cooling, the water is tasted sensory for taste change and evaluated.





Glass Central Ring:

Item No.:	Nominal diameter:	Surface*:	Filling volume**:
250-0277600	DN120	1,00 / 2,00 dm²	ca. 200 ml

* Approx. surface with 1 test specimen/with 2 test specimens
** Approx. filling volume with 2 test specimens

Glass Central Ring for the Migration Cell System „Sieg-Mi-Flex“ consisting of:

- 1 x Borosilicate Glass Central Ring with cast-in and cast-out fittings with GL14 threads
- 2 x FEP/silicone O-rings that fit in the central ring’s groove (top and bottom)
- 2 x GL14 seal caps (PPS housing incl. PTFE/sil. gasket)

Glass Fixing Plate Set for the „Sieg-Mi-Flex“ Migration Cell System Item No. 250-0277594 consisting of:

- 2 x Borosilicate glass plates with drill holes, protective inserts for screws
- 4 x stainless steel screws (M8), with stainless steel knurled screws
- 4 x PTFE threaded feet, white (M8)

The glass migration cell System „Sieg-Mi-Flex“ consisting of a glass central ring and a glass fixing plate set, catalogue p. 32 is temperature-resistant from -15 °C to 130 °C and pressure-tight up to 1 bar.

Test of the taste transfer from the packing materials and packing media through room air using the test substance water according to DIN 55534:2006-08 and the taste test set

This is a quick test, which can be incorporated into an analytical method. This is an additional test method to DIN 10955. This test is therefore a quality control measure during the production of the packing media or the packing process (for example a packing material inlet and outlet check). This sensory quick test allows the quick investigation of packing aids such as pressure media, adhesives, dyes, paints, auxiliary materials and end products.

Short description:

The sample is located in a glass vessel with a fused glass tube with one side open on the inside, the tube being filled with water. Volatile substances from the packing material are absorbed by the water. Water is a neutral food that has no taste of its own and can be savoured well. In special cases, the tasting can be done with a closed nose.* The matrix water is well suited for any further analytical investigations.

* Differentiation between the flavour substances and the retronasal sense impression

Test substance:

boiled, low-salt, commercially available water (boiled for approx. 20 min in the water boiler!). This measure destroys organic matter and gasifies carbon dioxide.

Procedure:

50 cm² (12.5 × 4 cm) of packing material** are exactly cut out and rolled lengthwise and placed in the glass container aroundthe inner tube so that the broad side stands upright. Deviations must be agreed upon and indicated in the test report. (see image). Then, 40 ml of water are filled into the fused inner tube using the Fortuna pipette. Then, the vessel is sealed. At least two test batches are prepared for each test and evaluated separately. As a reference sample another taste test is run - the glass container with 40 ml of water without a packing material sample.

** The sample surface is adjusted depending on the inherent taste of the packing substance.

Test specifications:

Quick determination during production:
The test batches must be stored for 1 hour at a temperature of 40 °C (+/-2 °C).
Final determination for quality assurance:
the test batches should be stored for 24 hours at room temperature (23 °C +/-2 °C).

Tasting:

The tasting should also be carried out at room temperature (23 °C +/-2 °C) in an odorless test room. Approx. 10 ml of test substance (water) are extracted with a 10 ml PE pipette, placed in a taste-neutral drinking cup for tasting and assessed in comparison with the reference sample.

Taste Test Set
Item No.: 280-0086707

Item No.:	Content:
150-0086721	2 x Taste Test – clear glass container made of DURAN® laboratory glass with inner tube and NS60 stopper
160-0086745	50 x 10 ml PE pipettes
160-0086738	1 x 20 ml Suction piston full pipette
120-0673013	100 x PS disposable drinking cups (clear as glass, neutral taste)

Wide neck bottle with ground stopper

Sensory test of packing materials by means of odour testing and recognition of abnormal aromas can be carried out in glass wide-neck bottles with ground glass stoppers (both sodium glass).

Sample preparation:

X dm^2 of a representative sample of test material is stored in a 500 or 1000 wide-neck glass (clear or brown glass) at room temperature for 20 to 24 hours.

Odour test:

Shake the glass vessel, smell immediately after opening, and evaluate the intensity of the perceived odour using the following scale. Use whole or half numbers:

0 No perceivable odour
1 Odour is perceptible (but still difficult to determine)
2 Moderate odour (describe)
3 Somewhat strong odour
4 Strong odour

Before the glass is re-opened, wait for 2-3 minutes to pass.

Practical Tip:

To seal the standard ground glass plug and to more easily open the glass-onglass connection, PTFE sleeves with a grip collar and seal rings on the outside are very suitable. In the process, the PTFE sleeve is first placed on the core of the ground plug.

Brown Glass:

Item No.:	Volume:	max. outside-Ø:	Height without stopper:	NS:	Neck opening-Ø approx.:
120-0452526	500 ml	86 mm	163 mm	45	41 mm
120-0452540	1000 ml	107 mm	201 mm	60	54 mm

Clear Glass:

Item No.:	Volume:	max. outside-Ø:	Height without stopper:	NS:	Neck opening-Ø approx.:
120-0452519	500 ml	86 mm	163 mm	45	41 mm
120-0452533	1000 ml	107 mm	201 mm	60	54 mm

PTFE sleeve:

Item No.:	Description:	for NS:	Packaging Unit:
120-0045537	PTFE sleeve with grip edge and seal rings	45	1 pcs.
120-0673037	PTFE sleeve with grip edge and seal rings	60	1 pcs.

The known lime-soda glass vessels (lime-sodium glass), which are known as conical shoulder bottles or reagent bottles with ground plugs (also made of glass) are available in brown glass, clear glass and in various volumes. The robust, thick-walled and dishwasher-safe bottles are ideal inert packages, transport and storage containers.

For volumes not listed above, please check with us!

Test of the odour transfer from the food contact materials* to the air space for olfactory determination of the inherent odour of the upper and lower side using the human nose as a function of storage temperature and storage time.

The odour perception and quality are evaluated by a test panel based on their hedonic effect. Total contents: 120 ml, contents per chamber: 60 ml,
Chamber materials: DURAN® laboratory glass

Since the sample specimens (plates, films) of contact materials should only come into contact with an inert material, the odour tester is made of DURAN® laboratory glass according to Scharfenberger. It has 2 chambers, each of which is provided on the inlet side with a flat HV50 glass flange and on the outlet side with an NS45 ground sleeve. These are each sealed with an NS45 ground stopper and secured with an HWS stainless steel bracket. The test specimen is placed between the two HV50 glass flanges as a round blank and secured from the outside with a quick closure made of moulding material with knurled screws made of VA. The NS45 ground stopper has a flattened base in order to guarantee that the chamber volume is 60 ml. For the testing period, the odour tester is stored in an aluminium suspension device for a defined period of time at a defined temperature. After removing the NS45 ground stopper, the odour test is carried out by nose in the NS45 ground sleeve.

*** Contact materials are:**

1. materials and objects in the sense of Article 1, Paragraph 2 of Regulation (EC) No. 1935/2004 of the European Parliament and the Council of 27 October 2004 concerning materials and objects intended to come into contact with foods and for cancellation of Directives 80/590/EEC and 89/109/EEC (ABl. L 338 dated 13 Nov. 2004, pg. 4), which was amended through regulation (EC) No. 596/2009 (ABl. L 188 dated 18 July, 2009, pg. 14),
2. packaging, containers or other encasements intended for coming into contact with cosmetic media,
3. objects intended for coming into contact with mucous membranes of the mouth,
4. objects intended for body care,
5. toys and gag gifts,
6. objects intended for coming into contact with the human body, and not just briefly, such as clothing items, bed linens, masks, wigs, hair pieces, artificial eyelashes, bracelets,
7. cleaning and care media intended for household use or for contact materials

in the sense of number 1,

8. impregnation media and other finishing agents for contact materials in the sense of number 6 intended for household use,
9. media and objects for odour improvement in rooms intended for human occupation.

From “Food and Feed Code as amended in the publication” of 3 June, 2013 (Federal Register I pg.1426), amended through Article 1 of the regulation of 24 November, 2016 (FR I pg. 2656).

Scharfenberger odour tester, complete
Item No.: 280-0085915

with aluminium suspension device for olfactory determination of the inherent odour of the upper and lower side using the human nose as a function of storage temperature and storage time.

Technical specifications:

1 x glass set made of DURAN® laboratory glass, consisting of 2 x NS45 stoppers with sealed flat base and grip collar, 2 x HWS stainless steel clamps for conical standard ground connections, 1 x quick closure made of moulding material with knurled screws made of stainless steel for the two flat ground flanges HV50 and 1 x aluminium suspension device.
Total contents: 120 ml, contents per chamber: 60 ml

Glass set for odour tester according to Scharfenberger
Item No.: 120-0085946

made of DURAN® laboratory glass, consisting of:

2 x NS45 stoppers with sealed flat bottom and shaped grip
2 x HWS stainless steel clamps for conical standard ground connections and
2 x HV50 flat flanges with fused NS45 ground sleeve, free volume of the lower ground stopper edge (contents per chamber): approx. 60 ml each, total contents: 120 ml

Quick closure made of moulding material
Item-No.: 120-0186452

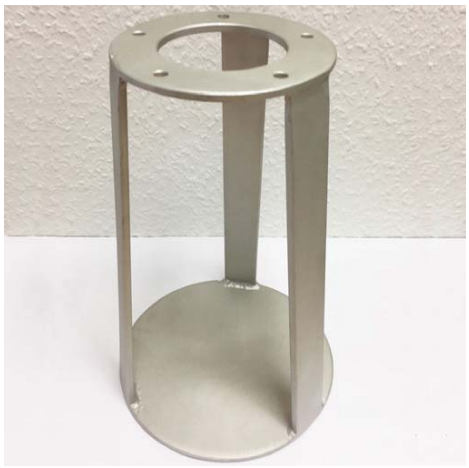
(no feet!) for glass bottle NW 50 /HV 50 with knurled screws made of stainless steel:

- for permeation measurement cell “BIGA cell/IFA cell” EN 16523-1 (EN 374-3)
- for permeation measurement cell “Fluid cell without temperature-control jacket” EN 16523-1 (EN 374-3)
- for odour tester according to Scharfenberger

Aluminium suspension device silver
Item No.: 120-0174169

with 3 bars, h= approx. 250 mm, OD bottom: approx. 170 mm, OD top: approx. 115 mm, ID top: approx. 66 mm can be used:

- for odour tester according to Scharfenberger
- for separatory funnels



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