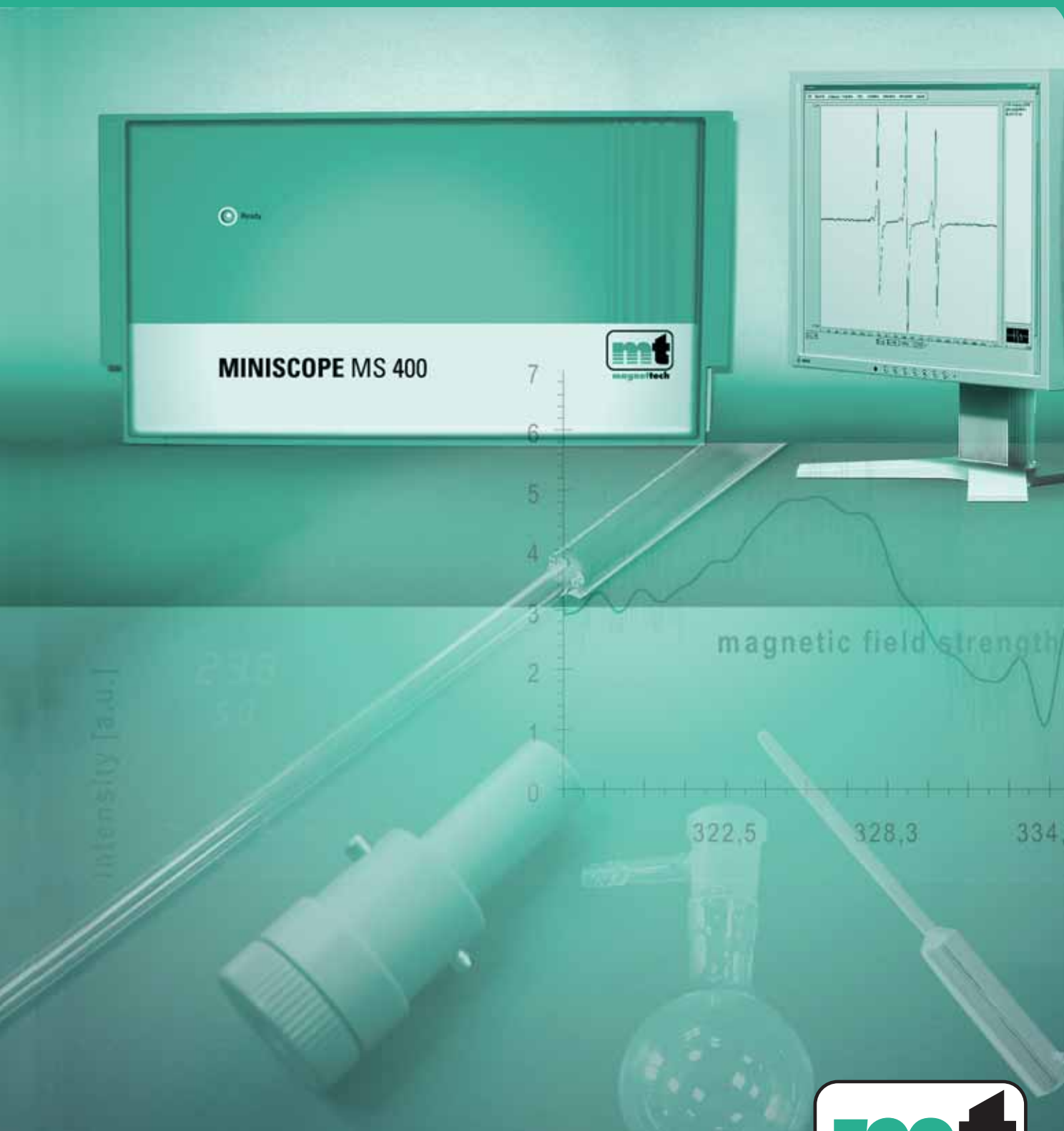
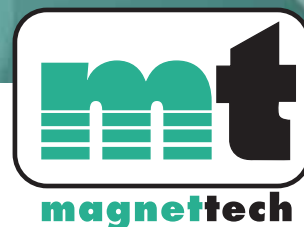


# EPR-Spectrometer

Catalogue for EPR-Spectrometer, Accessories & Glassware



Pricelist 2011



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## What is new ?

### Update - Informations

- **MiniScope MS400** with higher performance, page 4
- **Microwave frequency counter FC 400**, page 5
- **Temperature Controller TC H03**, PC controlled, page 11



# X-Band Spectrometer of the Line MiniScope

## MiniScope MS400

Order No:



### Consisting of:

- Spectrometer with high measurement sensitivity  $8 \cdot 10^9$  Spins/0,1mT
- Magnetic field stability  $1,5 \mu\text{T}/\text{min}$ ,  $15 \mu\text{T}/\text{h}$
- Control software
- Analysis software (data calculation)
- Multiplot software (data presentation)
- Guidance tube F 120/1.5 for capillaries
- 250 Pieces 50  $\mu\text{l}$  capillaries
- Sealing kit for capillaries
- Connector for vessels flushing the resonator with dry nitrogen
- Microwave power range standard  $100 \mu\text{W} - 50\text{mW}$ .  
Optional  $10 \mu\text{W} - 100\text{mW}$ , see page 5

### Ultra fast automatic frequency control (AFC)

The boiling of liquid nitrogen in the fixed temperature dewar can lead to spikes on the spectrum. The ultra fast AFC prevents this by keeping the measurement conditions constant.

### Irradiation window

Allows irradiation of samples in the resonator during the measurement using a parallel beam.

Option to insert a standard sample into the resonator.




### Jack for coaxial connection of a high frequency counter

The adjusted frequency during the scan can be used to calculate the  $g$  value of a signal. The  $g$  value gives the absolute position of a signal.

A suitable microwave frequency counter is the model FC400, see page 5.

A 10 10 009


## X-Band Spectrometer of the Line MiniScope

Extensions for the MiniScope MS400	Order No:
<b>Computer and 19" TFT monitor</b>	A 10 10 010
<b>Increase of microwave power range 10 <math>\mu</math>W - 100 mW</b> Recommended for samples saturating at microwave power higher than 50 mW and for measurements with microwave power less than 100 $\mu$ W	A 10 10 012
 <p><b>Holder and positioning system for a standard sample</b>            A simultaneous measurement of sample and standard is possible.            Inclusive is one secondary standard Chromium or Manganese of your choice (Order no. A 30 10 014 or A 30 10 015)</p>	A 10 10 016
 <p><b>Extended magnetic field range 50 – 600 mT through water cooling</b>            The increase of the magnetic field range is recommended in the case you like to measure transition metal complexes of Fe(III) low spin. The extension includes a compact refrigerated circulator with 240W cooling capacity.</p>	A 10 10 017
 <p><b>Frequency Counter FC400</b>            Frequency range: 0,5 to 10,0 GHz            Input level: -5 to +10 dBm, 50 Ohms            Display: 7 digits, 1kHz resolution            Connector: SMA female, back panel</p>	A 10 10 024

## X–Band Spectrometer of the Line MiniScope

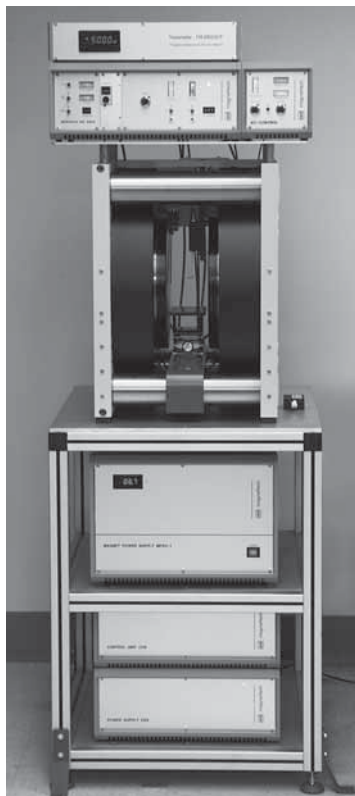
Packages for Special Applications using the MiniScope MS400	Order No:
<p><b>Alanine Dosimetry</b>            Consisting of:</p> <ul style="list-style-type: none"> <li>• Special holder SH-P</li> <li>• Special cuvette FFZK 130-4,5x0.8 for dosimetry thin film test strips</li> <li>• Holder for precise sample positioning with adjustable altitude</li> <li>• 2 Tubes for dosimetry tablets wit inner diameter 4,0 mm or 4,8 mm</li> <li>• <b>Optional: Software for dose calculation against a reference (Aerial Company). Price upon request.</b></li> </ul>	A 10 10 019
<p><b>NO-Fe(II)DETC</b>            Consisting of:</p> <ul style="list-style-type: none"> <li>• Fixed temperature dewar for spectrometer of the line MiniScope</li> <li>• Holder fit to the device with adjustable altitude for fixed temperature dewar suitable for MiniScopes</li> </ul>	A 10 10 020
<p><b>Reactive Oxygen Species (ROS)</b>            Consisting of:</p> <ul style="list-style-type: none"> <li>• Flat cell cuvette FZK 160-7x0.3</li> <li>• Special holder SH-P for flat cell cuvettes, guidance tubes, tissue cells and special cuvettes</li> <li>• Fixed holder with fitting for flat cell cuvettes FZK 160-7x0.3</li> <li>• Fixed holder with fitting for guidance tube F 120/1.5</li> <li>• <b>Optional: Software for automatic data acquisition and evaluation of kinetic measurements using disposable glass capillaries.</b>            See A 40 10 001, page 14</li> </ul>	A 10 10 021

# X-Band Spectrometer of the Line MiniScope

Continuous Flow Systems	Order No:
 <p><b>Continuous flow system, multi-channel</b>            Consisting of:</p> <ul style="list-style-type: none"> <li>• Sampler 1-8 channels</li> <li>• Peristaltic pump</li> <li>• Thermostat block</li> <li>• Special holder SH-P</li> <li>• Measurement cell with fixed holder with fitting suitable with special holder SH-P</li> <li>• Rack</li> <li>• Control software for pump and sampler</li> <li>• Control software for kinetics measurements</li> </ul>	A 10 10 022
<p><b>Continuous flow system, one-channel</b>            Consisting of:</p> <ul style="list-style-type: none"> <li>• Peristaltic pump</li> <li>• Thermostat block</li> <li>• Special holder SH-P</li> <li>• Measurement cell with fixed holder with fitting suitable with special holder SH-P</li> <li>• Rack</li> </ul>	A 10 10 023

# L-Band Spectrometer of the Line RadicalScope mt 500-L

RadicalScope mt 500-L Order No:




**Consisting of:**

- Magnet especially designed for L-band
- Magnet power supply
- Microwave bridge
- Power supply for control and microwave bridge
- Control unit
- Surface coil resonator
- Control software
- Analysis software (data calculation)
- Multiplot software (data presentation)
- Computer and 19" TFT monitor
- Scan mode: Spectral (without spatial resolution)


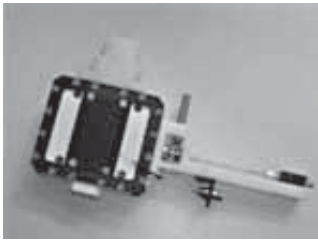
A 10 20 002



## Components for EPR Spectrometer

Extensions for the RadicalScope mt 500-L	Order No:
 <p><b>Hall control unit for magnetic field (Teslameter)</b></p>	A 10 20 003
<p><b>1D Imaging system</b> Consisting of:</p> <ul style="list-style-type: none"> <li>• Adapted calculation software</li> <li>• Gradient coils for gradient in x- or z-direction</li> <li>• Power supply for magnetic field gradient coils</li> <li>• Scan mode: Spectral Spatial (spatial resolution in x- or z-direction)</li> </ul>	A 10 20 004
<p><b>2D Imaging system</b> Consisting of:</p> <ul style="list-style-type: none"> <li>• Adapted calculation software</li> <li>• Gradient coils for gradient in x- and z-direction</li> <li>• Power supplies for magnetic field gradient coils in x- and z-direction</li> <li>• Scan mode: - 2D-Imaging (spatial resolution in x,z-direction) - Spectral Spatial (spatial resolution in x- or z-direction)</li> </ul>	A 10 20 005
Magnet System	Order No:
<p><b>Magnet power supply</b> Power up to 1 kVA</p>	A 20 20 001
<p><b>Magnet MT04</b> Electromagnet, 65 mT, air gap between the poles 150 mm (L-Band)</p>	A 20 20 002
Microwave Components	Order No:
<p><b>Microwave bridge</b> Homodyne, L-Band</p>	A 20 20 003

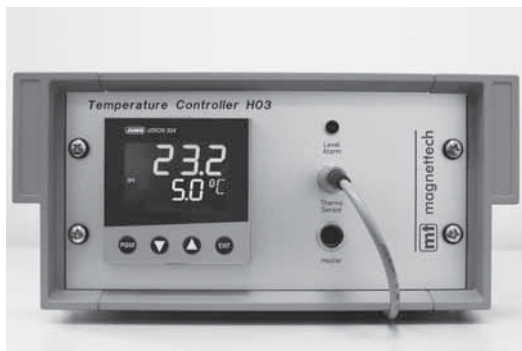
## Accessories for Spectrometer of the Line RadicalScope

Resonators	Order No:
 <p><b>L-Band surface coil resonator</b> Suitable for spectral measurements and spectral spatial surface investigations</p>	A 10 20 007
<p><b>Control unit for automatic matching using the L-Band surface coil resonator</b> Movements of the sample, e.g. breathing of a mouse, are controlled and compensated by this system</p>	A 10 20 008
 <p><b>L-Band re-entrant resonator</b> Diameter of accessible sample space 18 mm</p>	A 10 20 009

# Accessories for Spectrometer of the Line MiniScope

## Accessories

## Order No:



### Temperature Controller TC H03

Temperature range: 103K - 473K

PC controlled (control / registration software included)

Optional: Software for automatic data acquisition for temperature measurements. See A 40 10 004, page 14

A 30 10 001

### Vessel for flushing resonator (see the small vessel at the right side on the right photo)

Liquid nitrogen evaporates, flushing the resonator and preventing the condensation of humidity, optional accessory in connection with fixed temperature dewar.

Included in the delivery extent of Temperature Controller TC H03.

A 30 10 002



### Bio Temperature Controller BTC 01





Temperature range: 283K - 323K

A 30 10 012



### Bio Temperature Gas Controller BGC 01

A 30 10 013

## Accessories for Spectrometer of the Line MiniScope

Accessories	Order No:
<b>Rack</b> for continuous flow measurement arrangement	A 30 10 004
 <b>Metal block thermostat</b> <ul style="list-style-type: none"> <li>• Max. temperature 130° C</li> <li>• Adapted sample tubes for optimum heat transition</li> <li>• Interchangeable metal block for different sample vessels</li> </ul>	A 30 10 005
<b>Sample tube for thermostat block</b> (outer diameter 26 mm, length 100 mm)	A 30 10 006
 <b>1- Channel peristaltic pump</b> Very uniform pump behaviour, suitable for kinetics measurements	A 30 10 007
 <b>Pump tube for continuous flow system (1 piece)</b> (material tygon, inner diameter 1.02 mm)	A 30 10 008
 <b>Clamp sheath (cone) for tube fitting (1 piece)</b>	A 30 10 009

## Accessories for Spectrometer of the Line MiniScope

Accessories	Order No:
 <p><b>Basic screwing for tube fitting (1 piece)</b></p>	A 30 10 010
 <p><b>Coupling for tube fitting (1 piece)</b></p>	A 30 10 011
 <p><b>Two way connector incl. clamp sheath and sealing rings (1 piece)</b></p>	A 30 10 024
<p><b>PTFE tube 0,5 x 1,6 mm (5m)</b></p>	A 30 10 025
<p><b>FEP tube 0,8 x 1,6 mm (5m)</b></p>	A 30 10 026
 <p><b>Irradiation unit</b> Wavelength range: 240 - 700 nm, depend of the lamp inclusive light guide adapter at the MiniScope</p>	A 30 10 021
 <p><b>Holder for precise sample positioning with adjustable altitude</b></p>	A 30 10 022

## Secondary Standards and Optional Software

Secondary Standards	Order No:
Secondary standard Chromium Cr <sup>3+</sup> in MgO	A 30 10 014
Secondary standard Manganese Mn <sup>2+</sup> in ZnS	A 30 10 015

Optional Software for Spectrometer of the Line MiniScope	Order No:
Automatic data acquisition and evaluation for kinetic measurements using disposable glass capillaries	A 40 10 001
Automatic data acquisition and evaluation for continuous-flow kinetic measurements	A 40 10 002
Software for the determination of concentrations of nitroxides and free radicals in solution Inclusive holder for precise sample positioning with adjustable altitude and <b>one set of sample tubes, selected for identical volume</b>	A 40 10 003
Software for automatic data acquisition for temperature measurements	A 40 10 004
<b>Update</b> Control software for spectrometer of the line MiniScope	A 40 10 008
<b>Update</b> Automatic data acquisition and evaluation for kinetic measurements using disposable glass capillaries	A 40 10 009
<b>Update</b> Automatic data acquisition and evaluation for continuous-flow kinetic measurements	A 40 10 010

## Glassware

### How to choose the appropriate sample vessel for your sample

For measurement of samples in the EPR spectrometer you have the choice between the following sample vessels:

- Capillary
- Sample tube
- Flat cell
- Tissue cell
- Special cuvette
- Fixed temperature dewar

### Some general remarks

The active volume in the vertical direction of the MiniScope rectangular resonator is 23 mm. Over this 23 mm you have a Gauss distribution of the intensity. This means in the centre you measure 100 % intensity. 1.65 mm top and bottom of the centre the intensity is 95 %. 2.5 mm top and bottom of the centre the intensity is 90 %. This means you have two possibilities to get reproducible and comparable measurements:

1. You fill the sample vessel over the whole active volume of the resonator.
2. You fill 5 mm of your sample vessel. In this case you have to make sure that the sample is positioned absolutely in the centre of the resonator. A further requirement is that in the case you are using different sample vessels of the same kind, that they are selected for the same intensity or that you have compared them using a standard solution introducing correction factors.

In the case you are using sample vessels with a flat section you can orientate the flat section parallel or perpendicular to the front panel of your spectrometer. Please try, which orientation gives the higher intensity.

**Capillaries** are standardized calibrated sample vessels. They are cheap one way items and allow an easy sample exchange. Usually capillaries are used together with a matching guidance tube. For aqueous solutions the maximum volume of capillaries is 50  $\mu$ l. In the case you use organic solvents with a lower dielectric constant, you can use capillaries with a higher volume or sample tubes.

**Sample tubes** are used for liquid and solid samples. We offer sample tubes of different diameters and length. The dielectric constant of the solvent of your liquid sample lays down the diameter of the sample tube. For example radicals in hydrocarbons can be measured using a 4 mm or 5 mm sample tube. Concerning the solid samples the humidity of the sample restricts the diameter of the sample tube. The length 135 mm is used in general. The length 240 mm is adapted to the finger dewars, we offer. In the case a sample is not tuneable you can either choose a sample tube with a smaller diameter or you reduce the amount of sample inserted into the resonator.

**Flat cells** are used for liquid samples in solvents with a high dielectric constant. The ideal sample distribution in the resonator leads to a 2 – 2.5 fold higher intensity compared to 50  $\mu$ l capillaries. The crucial point, when using a flat cell is the orientation of the flat section, the vertical position and the filled volume of the flat cell.

Therefore we recommend using the special holder SH-P as the system to achieve always the same sample positioning.



## Glassware

**Tissue cells** can be used to measure skin sections, paste and emulsions. The same requirements have to be fulfilled that are valid for flat cells.

**A special cuvette** we offer for alanine dosimetry of thin film test strips. This cuvette has a flat section too. Furthermore we offer special tubes for alanine tablet dosimeters.

**Fixed temperature dewars** are used to measure samples at liquid nitrogen temperature of 77K. You can either drop the sample into the liquid nitrogen and the frozen drops are collected in the finger for measurement. A further possibility is to freeze a cylinder of 4 mm diameter matching to the size of the inner finger of the dewar. In the case you like to measure solid samples you can use sample tubes of 3 or 4 mm outer diameter and 240 mm length.

## Glassware

Protection Tubes and Guidance Tubes	Order No:
<b>Resonator protection tube</b>	A 30 10 019
<b>Guidance Tube F - 120/1.5</b>	A 50 00 002
<b>Guidance Tube F - 120/1.5T</b> Using for temperator	A 50 00 018

Sample Tubes for Dosimetry Tablets	Order No:
<b>Typ 1:</b> Inner diameter 4,0 mm	A 50 00 020
<b>Typ 2:</b> Inner diameter 4,8 mm	A 50 00 021

**In the case of using a special holder SH-P please order a fixed holder with fitting especially adapted to the sample vessel with these items.**

Capillaries for all Kinds of Spectrometer	Order No:
<b>Disposable glass capillaries 50µl, 250 pieces</b> Volume 50 µl with ring, accuracy $\pm 0.25\%$ , precision $< 0.5\%$ (capillaries with smaller volumes are available upon request)	A 50 00 001
<b>Sealing kit for disposable glass capillaries</b> None drying out vinyl kit on one plastic plate for secure sealing of more than 75 capillaries	A 70 00 001



## Glassware

Sample Tubes for all Kinds of Spectrometer / Typ 1	Order No:
<b>Sample tube P-135/3</b> Length 135 mm, outer diameter 3 mm, wall thickness 0.4 - 0.5 mm	A 50 00 004
<b>Sample tube P-135/4</b> Length 135 mm, outer diameter 4 mm, wall thickness 0.4 – 0.6 mm	A 50 00 005
<b>1 Set closing caps 4 mm</b> (50 pieces)	A 70 00 002
<b>Sample tube P-135/5</b> Length 135 mm, outer diameter 5 mm, wall thickness 0.5 – 0.6 mm	A 50 00 006
<b>1 Set closing caps 5 mm</b> (50 pieces)	A 70 00 003
<b>Sample tube P-135/6</b> Length 135 mm, outer diameter 6 mm, wall thickness 0.5 – 0.6 mm	A 50 00 007

Sample Tubes for all Kinds of Spectrometer / Typ 2	Order No:
<b>Sample tube P-240/3</b> Length 240 mm, outer diameter 3 mm, wall thickness 0.4 - 0.5 mm	A 50 00 008
<b>Sample tube P-240/4</b> Length 240 mm, outer diameter 4 mm, wall thickness 0.4 – 0.6 mm	A 50 00 009
<b>1 Set closing caps 4 mm</b> (50 pieces)	A 70 00 002

Sample Tubes, selected for identical Volume	Order No:
<b>Sample tubes P-135/4-S5</b> • 5 Sample tubes P-135/4 Length 135 mm, outer diameter 4 mm, selected for identical volume • 10 Closing caps 4 mm	A 50 00 010
<b>Sample tubes P-135/5-S5</b> • 5 Sample tubes P-135/5 Length 135 mm, outer diameter 5 mm, selected for identical volume • 10 Closing caps 5 mm	A 50 00 011

## Glassware

### Flat Cell Cuvette FZK 160

Order No:



#### Flat cell cuvette FZK 160:

- Total length: 160 mm
- Width of the flat section 7.0 mm, length of the flat section: 40 mm
- Outer diameter of the tube at the bottom 4 mm, length of the tube at the bottom 25 mm
- Outer diameter of the tube at the top 5 mm, length of the tube at the top 95 mm
- Both sides with smooth cut, open for continuous flow measurements, can be closed using common caps (are included in delivery, but can also be ordered separately (see sample tube P135/4)

#### Flat cell cuvette FZK 160-7x0.3

Width of flat section 7.0 mm, width of gap 0.3 mm including 5 closing caps 4 mm

A 50 10 002

### Flat Cell Cuvette FZK 200

Order No:



#### Flat cell cuvette FZK 200:

- Total length 200 mm
- Length of flat section 40 mm
- Capillary tubes on both sides, outer diameter 5 mm, inner diameter 0.8 +/- 0.1 mm
- Tube length bottom 40 mm, top 120 mm
- Both sides with smooth cut, open for continuous flow measurements, can be closed using common caps (are included in delivery, but can also be ordered separately (see sample tube P135/5)

#### Flat cell cuvette FZK 200-5x0.3

Width of flat section 5.0 mm, width of gap 0.3 mm including 5 closing caps 5 mm

A 50 10 003

**In the case of using a special holder SH-P please order a fixed holder with fitting especially adapted to the sample vessel with these items.**



## Glassware

### Flat Cell Cuvette FZKV 200

Order No:


**Flat cell cuvette FZKV 200:**

- Total length 200 mm
- Width of flat section 7.0 mm
- Length of flat section 40 mm
- Outer diameter of tube 5 mm
- Length of tube bottom 40 mm, top 120 mm
- Both sides ground neck NSK 5/13, can be closed by ground neck collets. NSH 5/13. ground neck collets will be included in delivery but can be ordered in pairs too.

**Flat cell cuvette FZKV 200-7x0.3**

Width of flat section 7.0 mm, width of gap 0.3 mm

A 50 10 006

**1 Pair ground neck collets NSH 5/13**

A 70 00 004

### Special Cuvette FFZK130

Order No:



**Special cuvette FFZK 130-4,5x0.8 for dosimetry test strips**

The special cuvette consists of a tube of 95 mm length, whose bottom end has a flat part of a length of 35 mm with one open side and a gap of 0.8 mm. The width of the flat section and the inner diameter of the tube can be chosen in dependency on the width of the test strip. For exact positioning of the cuvette we recommend our special holder SH-P.

A 50 10 012

**In the case of using a special holder SH-P please order a fixed holder with fitting especially adapted to the sample vessel with these items.**

## Glassware

Tissue Cells	Order No:
	
<p>The tissue cell consists of a flat part (sample holder) with the dimensions 65 x 7 x 2 mm having two holders in axial direction (bottom length of holder 20 mm, upper length 85 mm). The flat part has a milled deepening (length 30 mm, width 5 mm, depth in general 0.3 mm) which serves to hold the sample. The delivery includes one cover slide and two clamps for fixing the cover slide. Additional cover slides and clamps can be ordered separately.</p>	
<p><b>Tissue cell GZ 170-5.0x0.3</b> Width of deepening 5.0 mm, depth 0.3 mm</p>	A 50 00 012
<p><b>Tissue cell GZ 170-5.0x0.4</b> Width of deepening 5.0 mm, depth 0.4 mm</p>	A 50 00 013
<p><b>Tissue cell GZ 170-5.0x0.5</b> Width of deepening 5.0 mm, depth 0.5 mm</p>	A 50 00 017
<p><b>1 Cover slide for tissue cell GZ 170</b></p>	A 50 00 015
<p><b>1 set (2 pcs.) clamps for cover slide of tissue cell</b></p>	A 70 00 005

**In the case of using a special holder SH-P please order a fixed holder with fitting especially adapted to the sample vessel with these items.**

**On customer's request special manufactures or listed articles with deviating dimensions can be provided. Prices upon request.**

**All sample tubes and parts of the glassware which are positioned in the cavity have been made from synthetic quartz SQ2 (Suprasil).**

## Glassware

### Tissue Cells

**Order No:**

**Tissue Cell GZ 170P**

Material: plastic POM / PTFE. For fast and simple sample exchange for series measurements. The tissue cell consists of a flat part (sample holder) with the dimensions 50 x 5 x 2 mm having two holders in axial direction. The flat part has a milled deepening with dimensions 13 x 5,8 mm, depth 0,2 mm and a additional deepening with diameter 5,8 mm, depth 1 mm.

A 50 00 016

**In the case of using a special holder SH-P please order a fixed holder with fitting especially adapted to the sample vessel with these items.**

## Glassware

Dewars	Order No:
 <p><b>Dewars for spectrometer of the line MiniScope</b></p> <ul style="list-style-type: none"> <li>• Volume 50 ml</li> <li>• Outer finger: outer diameter 10.5 mm, length 178 mm</li> <li>• Inner finger: inner diameter 5.4 mm, length 105 mm</li> <li>• Storage time 2h</li> </ul> <p><b>Models with larger volume and different sizes of the finger upon request.</b></p>	A 50 10 007
 <p><b>Holder fit to the device with adjustable altitude for fixed temperature dewar suitable for MiniScopes</b></p>	A 50 10 008
 <p><b>Resonator Dewar for Temperature Controller TC H02 and TC H03</b></p>	A 50 10 009
<p><b>Resonator Dewar for Temperature Controller TC M01</b></p>	A 50 10 010
<p><b>Resonator Dewar for Bio Temperature Controller BTC 01 and Bio Temperature Gas Controller BGC 01</b></p>	A 50 10 011

## Glassware

### Sample Holder

**Order No:**

**Special holder SH-P for flat cell cuvettes, guidance tubes, tissue cells and special cuvettes**

One fixed holder with fitting (separately available too, see below), especially adapted as one chooses one of the following sample vessels:

- Flat cell cuvette FZK 160
- Flat cell cuvette FZK 200
- Guidance tube F-120/1,5
- Tissue cell GZ 170
- Special cuvette F-130/0,8
- Holder mounted at the device with fixation and protection tube for spectrometer of the line MiniScope allows a definite sample exchange

A 60 10 001


**Fixed holder with fitting for flat cell cuvettes, guidance tubes, tissue cells and special cuvettes**

Especially adapted to the following sample vessels:

- Flat cell cuvette FZK 160
  - Flat cell cuvette FZK 200
  - Guidance tube F-120/1,5
  - Tissue cell GZ 170
  - Special cuvette F-130/0,8
- Adapted to special holder SH-P.

A 60 10 002

# Glassware

Sample Holder	Order No:
 <p><b>Standard sample holder</b> Teflon, white</p>	
<p><b>PH-3 for sample tubes 3 mm</b></p>	A 60 10 003
<p><b>PH-4 for sample tubes 4 mm</b></p>	A 60 10 004
<p><b>PH-5 for sample tubes 5 mm</b></p>	A 60 10 005
<p><b>PH-6 for sample tubes 6 mm</b></p>	A 60 10 006
 <p><b>Sample Holder for TC H02 and TC H03 (Top)</b></p>	A 60 10 007
 <p><b>Sample Holder for TC H02 and TC H03 (Bottom)</b></p>	A 60 10 008

## Glassware

### Special Articles

**Air spray**

For blowing out and drying of flat cell cuvettes, 400 ml

A 70 00 006


**Two-component mixer for evacuation**

The mixer consists of two ball-shaped independent vessels having volumes of 50 ml and 20 ml, which can be combined by ground neck connectors avoiding the immediate mixing of the components. The ground neck connectors also serves as closing valve after establishing the vacuum. The connector for evacuation is located next to the neck of the larger vessel.

A 70 00 011

**On customer's request special manufactures or listed articles with deviating dimensions can be provided. Prices upon request.**

**All sample tubes and parts of the glassware which are positioned in the cavity have been made from synthetic quartz SQ2 (Suprasil).**

## Services / Terms of Delivery

Repair Work, Maintenance and Training	Order No:	Price/Euro
<b>Price per hour for service work</b> Travel expenses, spare parts and possible costs for accommodation will be added.		<b>120.-</b>
<b>Training courses</b>		<b>upon request</b>

Terms of Delivery	Order No:	Price/Euro															
<ul style="list-style-type: none"> <li>• If not mentioned otherwise all prices are related to one piece.</li> <li>• For orders less than a total price of <b>100.- EUR</b> an additional charge of <b>10.- EUR</b> will be calculated.</li> <li>• All prices are net prices, which do not include value-added tax enforced by law. On delivery outside the EU custom's charges will be added.</li> <li>• In the case of payment by cheque we charge 1.5 ‰ of the total however minimum <b>20 EUR</b> or <b>25 USD</b> as a processing fee.</li> <li>• Ordered items have to be controlled and shortcomings have to be announced within 5 days after delivery. Later complaints can not be taken into consideration.</li> <li>• Shipping costs using ground mail :               <table border="1"> <tbody> <tr> <td>Germany</td> <td></td> <td><b>12.-</b></td> </tr> <tr> <td>European Union</td> <td></td> <td><b>29.-</b></td> </tr> <tr> <td>World wide</td> <td></td> <td><b>49.-</b></td> </tr> <tr> <td>Additional costs for special package for glassware</td> <td></td> <td><b>9.-</b></td> </tr> <tr> <td>By courier service</td> <td></td> <td><b>upon request</b></td> </tr> </tbody> </table> </li> </ul>	Germany		<b>12.-</b>	European Union		<b>29.-</b>	World wide		<b>49.-</b>	Additional costs for special package for glassware		<b>9.-</b>	By courier service		<b>upon request</b>		
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# General Business Conditions

## 51 Validity of the conditions

- (1) The deliveries, achievements and offers of the salesman result exclusively based on these business conditions. These apply to all future business relations too, even if they are not specified once again. At the latest with the receipt of the ware or achievement these conditions count as accepted. Counter confirmations of the buyer under reference to its business conditions and/or purchase conditions is contradicted herewith.
- (2) Deviations of these business conditions are only legal if the salesman confirms it in writing.

## 52 Offer and contract expiry

- (1) The offers of the salesman are subject to change and non-binding. For legality acceptance explanations and all orders need a written or distance written confirmation of the salesman. The same applies to supplements, alterations or collateral covenants.
- (2) Drawings, images, measures, weights or other achievement data are only binding if this is specifically arranged written.
- (3) The sale employees of the salesman are not to be encountered authorised, to come to an oral collateral covenant or to give an oral assurance that exceeds the contents of the written contract.

## 53 Prices

- (1) As far as not indicated elsewhere, the salesman does comply bound with the prices contained in its offers 30 days from its date. The prices named in the order confirmation of the salesman are decisive plus the respective legal sales tax. Additional deliveries and achievements are charged separately.
- (2) The prices understand themselves if not differently arranged, ex works including normal packaging.

## 54 Delivery time and achievement time

- (1) Delivery appointments or delivery time periods that can be arranged binding need the writing.
- (2) Delays in delivery and achievement delays based on higher force and on the basis of events, that make the delivery substantially more difficult or even impossible to the salesman - to this belong especially strike, lock-out, official arrangements etc., also if it is with suppliers of the salesman or its subcontractor -, the salesman has also in binding arranged time periods and appointments not to be represented. They entitle the salesman to postpone the delivery and/or achievement around the duration of the handicap plus an appropriate start time or because of the not yet fulfilled part to resign entirely or partially of the contract.
- (3) If the handicap lasts longer than three months, after an appropriate deadline the buyer is entitled, to resign of the contract with respect to the not yet fulfilled part. If the delivery time extends itself or the salesman becomes free of its obligation, hence the buyer can derive no compensation claims. The salesman can only quote to the named circumstances, if he informs the buyer immediately.
- (4) As far as the salesman has to represent the non-observance of accepted binding time periods and appointments or is in delay, the buyer has claim to a delay compensation in the amount of ½ % for each completed week of the delay, altogether however maximum 5% of the charged value of the deliveries and achievements concerned by the delay. Claims exceeding this are excluded, unless the delay is based upon at least coarse carelessness of the salesman.
- (5) The salesman is entitled to part deliveries and part achievements always.

## 55 Danger transition

The danger through downfall, loss or damage of the ordered ware passes over on the buyer with delivery to the person or firm performing the transport.

## 56 Guarantee

- (1) The salesman guarantees that the products are free of fabrication and material defects; the guarantee time period for mechanical and electronic parts of the products is 2 years.
- (2) The guarantee time period starts with the delivery date. If instruction manuals or maintenance instructions of the salesman are not followed, changes are undertaken at the products, parts exchanged or consumption materials used, that do not correspond to the original specifications, each guarantee is cancelled. The guarantee is also cancelled if the product is mixed or forms a unit with other products and at the same time the necessary caution or installation instruction for this product was not noted.
- (3) The buyer must announce defects immediately, at the latest however within a week after entrance of the delivery object in writing to the salesman. Defects that cannot be discovered even in careful tests within this time period are to be announced to the salesman immediately after discovery in writing.
- (4) In the case of the communication of the buyer that the products do not correspond to the guarantee, the salesman demands with respect to its choice, that:
  - a) the defect part and/or device are sent to the salesman for repair and subsequent return;
  - b) The buyer has the defective part and/or device ready and the salesman sent a service engineer to the buyer in order to execute repair.
 If the buyer demands that guarantee work has to be done at a place of his choice, the salesman can comply with this whereby parts included in the guarantee are not calculated, while working hours and trip costs are to be paid according to the standard rates of the salesman.
- (5) If the improvement fails after an appropriate time period, the buyer can demand reduction of the compensation or cancelling of the contract with respect to its choice.
- (6) A guarantee for normal attrition is excluded.
- (7) Guarantee claims against the salesman accrue only the direct buyer and are not transferable.
- (8) The above paragraphs contain the complete guarantee for the products and exclude other guarantee claims of each type.

## 57 Spare parts

The salesman will deliver spare parts for the duration of five years from delivery of a device for it to the respectively valid spare part prices.

## 58 Ownership reservation

- (1) To the fulfilment of all demands (including all balance demands out of current account), that accrue to the salesman because of each legal reason against the buyer now or in the future, the salesman are lasted the following securities, that he will release on desire of its choice, as far as its value exceeds the demands persistently by more than 20%.
- (2) The ware remains ownership of the salesman. Processing or reshaping result always for the salesman as a manufacturer, however without obligation for it. Expires the (joint ownership) property of the salesman through connection, it is already now arranged that the (joint ownership) property of the buyer at the uniform thing proportional to its value (invoice value) passes over to the salesman. The buyer guards the (joint ownership) property of the salesman gratuitous. Ware, at which the salesman accrues (joint ownership) property, is designated in the following as reservation ware.

# General Business Conditions

- (3) The buyer is entitled to process and to sell the reservation ware in the regular business as long as he is not in the delay. Mortgaging or security transfers are inadmissible. Emerging demands (including all balance demands out of current account) because of the resale or another legal reason (insurance, prohibited action) regarding the reservation ware the buyer transfers to the salesman already now because of security reasons. The salesman authorizes it revocable to take in the demands transferred to the salesman for its invoice in behalf of his own name. This draft authorization can be revoked only if the buyer does not meet its obligations to pay regular.
- (4) In accesses of third on the reservation ware the buyer will refer to the property of the salesman and immediately will notify this.
- (5) In behaviour contrary to contract of the buyer - especially default in payment -, the salesman is entitled to turn back the reservation ware or to demand if necessary assignment of the return claims of the buyer against third. In the withdrawal as well as in the seizure of the reservation ware through the salesman there is no resignation of the contract – as far as the payment law is not applied.

## S9 Payment

- (1) As far as not differently arranged, invoices of the salesman have to be paid 10 days after billing without deduction.  
In spite of differently sounding determinations of the buyer the salesman is entitled to count payments first of all to its older guilt. If costs and interests are already emerged, the salesman is entitled, to count the payment first of all to the costs, then to the interests and finally to the head achievement.
- (2) A payment counts as resulted first when the salesman can control the sum. In the case of cheques, the payment counts first as resulted if the cheque is cashed.
- (3) If the buyer is in arrears, the salesman is entitled to calculate interests from the relevant moment in height of the interest rate calculated by the commercial banks for open current account credits plus the legal sales tax. They are to be proved if the buyer proves a slighter load.
- (4) If the buyer does not meet its payment obligations, especially a check does not redeem or suspend its payments, or if the salesman gets knowledge about other circumstances that question the credit worthiness of the buyer, the salesman is entitled to fix a due date for the total remainder guilt, also if he accepted cheques. Moreover in this case the salesman is entitled to demand advance payment or security achievement.
- (5) The buyer is only entitled to the compensation setoff, retention or reduction, also if rebukes of shortcomings or counter claims are made validly, if the counter claims become assessed legal or are indisputable.

## S10 Construction Changes

The salesman reserves himself the right to decide on construction changes always; he is not obligated however to undertake such changes also at already delivered products.

## S11 Software

At the software delivered by us with our devices in addition to accompanying documentation, following designated as „software“, exist patent rights of third or also of us. In the first mentioned case we are entitled to the right to grant the party of contract a exploitation right in the following circumference. Herewith we grant the customer the not exclusive and not transferable license to use the software remaining it under notice of the following determinations and only in the frame of its business.  
The use of the software is restricted to the operation of devices and installations delivered by us for whom the software has been delivered as part of the order. The party of contract is not entitled to transfer this license altogether or partially to third, to terminate lower license contracts, to transmit the software to third, to publish and to allow at third to use it. In addition the contractual partner will protect the software against the access third and will instruct all persons, who have access in the frame of its activity on the software about the arranged secrecy conditions.  
The party of contract has to vouch also for offences against these license conditions and is responsible for the persons, whom he clears access to the software. The guarantee for this software depends basically on the paragraph „guarantee“ of these business conditions.  
The party of contract is not entitled to change the delivered software independent without our prior approval, to decompile, to disassemble, or manipulate the program code in any form.  
As far as the extradition of the software results under separately arranged license conditions resulted, these have precedence.

## S12 Patents

- (1) The salesman will leave up to the buyer and its purchaser because of claims out of infringement of copyright, trademark or patents, unless, the design of a delivery object derives from the buyer. The release obligation of the salesman is limited through the height of the purchase price of the concerned ware. Additional prerequisite for the release is that the leadership of lawsuit is left to the salesman and that the maintained right infringement is to be assigned exclusively to the method of building of the delivery objects of the salesman without connection or use with other products.
- (2) The salesman has selectively the right to free himself of that in sec.1 received obligations, in that it either  
a) procures the required licenses regarding the nominally injured patents or  
b) places a correspondingly changed delivery object and/or parts to the buyer's disposal, which in the case of exchange against the object blamed for the infringement or parts of it removes the infringement reproach regarding the delivery object.

## S13 Secrecy

If nothing specific is arranged, information submitted to the salesman in connection with orders do not count as confidential.

## S14 Liability restriction

Compensation claims resulting from impossibility of the achievement, from positive demand infringement, from get into debt in contract expiry and from prohibited action are excluded against both the salesman and against its fulfilment assistant and/or performance assistant as far as intentional or coarsely careless acting does not exist.

## S15 Applicable right, jurisdiction, part futility

- (1) For these business conditions and the total right relations between salesman and buyer, the right of the Federal Republic of Germany counts.
- (2) As far as the buyer is a full businessman in the sense of the commercial law, a juristic person of the public rights or a publicly-legal special fortune, Berlin itself is the exclusive jurisdiction for all disputes resulting direct or indirect from the contract relation.
- (3) If a determination in these business conditions or a determination in the frame of other agreements should be or become invalid, the effectiveness of all other determinations or agreements is not touched from this.

