## Testing equipment

### Chapter Overview

<table>
<thead>
<tr>
<th>Magnifying lenses and technical endoscopes</th>
<th>Layer and wall-thickness measurement</th>
</tr>
</thead>
<tbody>
<tr>
<td>Magnifying lenses</td>
<td>Layer-thickness measuring instruments</td>
</tr>
<tr>
<td>Inspection camera and technical endoscope</td>
<td>Ultrasonic wall thickness measuring instruments</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Microscopes and observation systems</th>
<th>Temperature and ambient conditions monitoring</th>
</tr>
</thead>
<tbody>
<tr>
<td>USB hand-held microscopes</td>
<td>Temperature and air-humidity measuring instruments</td>
</tr>
<tr>
<td>Microscopes</td>
<td>Infrared temperature-measuring instruments</td>
</tr>
<tr>
<td>Accessories for stereo microscopes</td>
<td>Ambient monitoring measuring instruments</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Hardness testing and metallography</th>
<th>Form/contour and roughness measurement</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mobile hardness testers</td>
<td>Roughness measuring instruments</td>
</tr>
<tr>
<td>Shore hardness testers</td>
<td>Surface roughness reference samples</td>
</tr>
<tr>
<td>Hardness reference plates</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Ultrasonic cleaning</th>
<th>Time, speed and frequency measurements, lift, displacement and piece counters</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ultrasonic cleaning devices</td>
<td>Stopwatches</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Force measurement and weighing technology</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Spring balances</td>
<td>Rev meter</td>
</tr>
<tr>
<td>Tensile and compressive force measuring instruments</td>
<td>Lift, displacement and piece counters</td>
</tr>
<tr>
<td>Cylindrical spring balances and dynamometers</td>
<td></td>
</tr>
<tr>
<td>Force measuring cells</td>
<td></td>
</tr>
<tr>
<td>Scales</td>
<td></td>
</tr>
</tbody>
</table>
Folding pocket magnifiers

Application:
For magnifying small objects

Execution:
- No. 41100 011, 41125 011: Glass lens in plastic frame
- No. 41120: Glass lens in metal frame

Advantage:
- No. 41125: Nickel-plated brass cover plates
- No. 41130: Dust-proof plastic housing

<table>
<thead>
<tr>
<th>No. 41100</th>
<th>Magnification</th>
<th>Lens Ø (mm)</th>
<th>Lens design</th>
<th>Lens material</th>
<th>Ident. No.</th>
<th>Unit price, €</th>
</tr>
</thead>
<tbody>
<tr>
<td>41100...</td>
<td>3.5-times</td>
<td>55</td>
<td>Biconvex</td>
<td>Glass</td>
<td>011</td>
<td>O. R.</td>
</tr>
<tr>
<td>41120...</td>
<td>6x</td>
<td>23</td>
<td>Aplanatic</td>
<td>Glass</td>
<td>021</td>
<td>O. R.</td>
</tr>
<tr>
<td>41120...</td>
<td>8x</td>
<td>23</td>
<td>Aplanatic</td>
<td>Glass</td>
<td>031</td>
<td>O. R.</td>
</tr>
<tr>
<td>41120...</td>
<td>10x</td>
<td>23</td>
<td>Aplanatic</td>
<td>Glass</td>
<td>041</td>
<td>O. R.</td>
</tr>
<tr>
<td>41125...</td>
<td>3/6/9-times</td>
<td>30</td>
<td>Biconvex</td>
<td>Glass</td>
<td>051</td>
<td>O. R.</td>
</tr>
<tr>
<td>41130...</td>
<td>3/6/9-times</td>
<td>23</td>
<td>Achromatic</td>
<td>Glass</td>
<td>061</td>
<td>O. R.</td>
</tr>
</tbody>
</table>

Application:
For magnifying small objects, e.g. for quality control during production.

Execution:
- Nickel-plated brass frame

Technical Data:
- Magnification: 2.5x
- Lens diameter: 75 mm
- Lens design: Biconvex

Reading magnifier

Application:
For magnifying small objects

Technical Data:
- Round aluminium handle with recessed grips

<table>
<thead>
<tr>
<th>41140...</th>
<th>Ident. No.</th>
<th>Unit price, €</th>
</tr>
</thead>
<tbody>
<tr>
<td>41140...</td>
<td>025</td>
<td>O. R.</td>
</tr>
</tbody>
</table>

Prod. Gr. 490

ESCHENBACH = Prod. Gr. 411
ORION = Prod. Gr. 454
ATORN = Prod. Gr. 490

ARE YOU LOOKING FOR EVEN MORE BRANDS?
WE HAVE WHAT IT TAKES.
Magnifying lenses and technical endoscopes

ESCHENBACH Reading magnifier

**Application:**
For magnifying small objects, e.g. for quality control during production.

**Execution:**
- Ergonomic, black plastic handle

<table>
<thead>
<tr>
<th>Magnification</th>
<th>2.9-times</th>
<th>3.8-times</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lens Ø (mm)</td>
<td>75</td>
<td>60</td>
</tr>
<tr>
<td>Ident. No.</td>
<td>011</td>
<td>021</td>
</tr>
</tbody>
</table>

| Prod. Gr. 411

**Technical Data:**
- Lens design: Aplanatic
- Lens material: Plastic light lens

ATORN Handheld magnifier

**Application:**
For magnifying especially small objects, e.g. for quality control during production.

**Execution:**
- Black anodised aluminium mount and handle

<table>
<thead>
<tr>
<th>Magnification</th>
<th>4x</th>
<th>5-times</th>
<th>8x</th>
<th>10x</th>
<th>15x</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lens Ø (mm)</td>
<td>50</td>
<td>40</td>
<td>80</td>
<td>108</td>
<td>115</td>
</tr>
<tr>
<td>Ident. No.</td>
<td>014</td>
<td>015</td>
<td>018</td>
<td>110</td>
<td>115</td>
</tr>
</tbody>
</table>

| Prod. Gr. 490

**Technical Data:**
- Lens design: Aplanatic

ESCHENBACH Pocket magnifier lamp

**Application:**
For magnifying small parts with additional light source.

**Execution:**
- Illuminated by SMD LED
- Slim, lightweight design for safe storage in any pocket
- Bright LED lighting when lens is extended
- LED light switches on automatically only when the lens is fully extended

<table>
<thead>
<tr>
<th>Magnification</th>
<th>4x</th>
<th>5-times</th>
<th>8x</th>
<th>10x</th>
<th>15x</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lens Ø (mm)</td>
<td>75</td>
<td>60</td>
<td>80</td>
<td>108</td>
<td>115</td>
</tr>
<tr>
<td>Ident. No.</td>
<td>010</td>
<td>016</td>
<td>021</td>
<td>031</td>
<td>041</td>
</tr>
</tbody>
</table>

| Prod. Gr. 411

**Scope of supply and services:**
- Batteries (2 x 1.5 V AA, type 2025)

**Technical Data:**
- Lens design: 4x
- Lens material: Aspherical
- Lens material: Plastic light lens with scratchproof cera-tec® hard coating

ESCHENBACH Pocket magnifier lamps

**Application:**
For magnifying small parts with additional light source.

**Execution:**
- Illuminated by SMD LED
- Large, user-friendly switch
- Lanyard eyelet

**Advantage:**
- Long LED service life: approx. 50,000 hours
- Step-up converter for voltage control (for brighter, consistent lighting over a longer period than other pocket magnifiers)

**LED pocket magnifying lamps without step-up converters:**
- Collimating lens for bright, homogeneous illumination

**Scope of supply and services:**
- Including batteries (2 x 1.5 V AA batteries), case for optimum lens protection and filter for 3 different light colours (white, yellow and orange)

**Technical Data:**
- Lens design: Aspherical
- Lens material: Plastic light lens with scratchproof cera-tec® hard coating

<table>
<thead>
<tr>
<th>Magnification</th>
<th>4x</th>
<th>4x</th>
<th>7-times</th>
<th>10x</th>
<th>12.5-times</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lens Ø (mm)</td>
<td>60</td>
<td>60</td>
<td>35</td>
<td>35</td>
<td>35</td>
</tr>
<tr>
<td>Ident. No.</td>
<td>011</td>
<td>016</td>
<td>021</td>
<td>031</td>
<td>041</td>
</tr>
</tbody>
</table>

| Prod. Gr. 411

**Ident. No. 011**

**Ident. No. 016**
Magnifying lenses and technical endoscopes

ESCHENBACH

**LED magnifying lamp**

*Powerlux*

**Application:**
For magnifying small parts with additional light source.

**Execution:**
- Illuminated by 2 SMD LEDs
- Bright light, approx. 8000 K for true-colour images
- Automatic switch-off after 30 min.

**Advantage:**
- Compact design for simple, intuitive movement over the reading material
- Large field of vision
- Consistently bright and dazzle-free illumination

**scope of supply and services:**
Protective hard foam case and batteries (3 x 1.5 V AA)

<table>
<thead>
<tr>
<th>Magnification</th>
<th>3.5-times</th>
<th>5-times</th>
<th>7-times</th>
</tr>
</thead>
<tbody>
<tr>
<td>41541...</td>
<td>995</td>
<td>100</td>
<td>105</td>
</tr>
</tbody>
</table>

Prod. Gr. 411

**Technical Data:**
- Lens diameter: 58 mm
- Lens design: Aspherical
- Lens material: Plastic light lens with scratchproof cera-tec® hard coating

ESCHENBACH

**Large-area magnifier**

*VISOLUX®*

**Application:**
For checking surfaces and small parts

**Execution:**
- Two different colour temperatures for dazzle-free inspection of glossy parts
- Automatic switch-off after 30 minutes
- Illuminated by 2 SMD LEDs

**Advantage:**
- Unique, large visual field
- Ergonomic, view-friendly lens angle
- Integrated additional orange filter

**Technical Data:**
- Magnification: 3-times
- Lens diameter: 100 mm
- Lens material: Plastic light lens with scratchproof cera-tec® hard coating

<table>
<thead>
<tr>
<th>Ident. No.</th>
<th>Unit price, €</th>
</tr>
</thead>
<tbody>
<tr>
<td>41541...</td>
<td>150</td>
</tr>
</tbody>
</table>

Prod. Gr. 411

ORION

**LED magnifying lamp**

*Flex arm*

**Application:**
For magnifying small parts with additional light source.

**Execution:**
- Illuminated by 60 LEDs
- Mounted with table clamp
- Gooseneck stand

**Advantage:**
- Very large visual field
- Maintenance-free with long-lasting LEDs
- Ergonomic handle for easy adjustment of flexible arm

**scope of supply and services:**
Lamp, power pack and table clamp

**Technical Data:**
- Magnification: 1.75-times
- Lens diameter: 170 mm
- Lens design: Biconvex
- Lens material: Glass

<table>
<thead>
<tr>
<th>Ident. No.</th>
<th>Unit price, €</th>
</tr>
</thead>
<tbody>
<tr>
<td>41330...</td>
<td>020</td>
</tr>
</tbody>
</table>

Prod. Gr. 454
Magnifying lenses and technical endoscopes

Waldmann W  Magnifier ring lamp

Application:
For magnifying small parts with additional light source.

Execution:
- Fluorescent tube 22 W
- Joints can be firmly clamped in any position
- Mains supply 230 V, 50 Hz with 3 m mains cable

Technical Data:
- Magnification: 2-times
- Lens diameter: 120 mm
- Lens design: Biconvex
- Lens material: Glass

Prod. Gr. 478

<table>
<thead>
<tr>
<th>Accessories for</th>
<th>Unit price, €</th>
<th>O. R.</th>
</tr>
</thead>
<tbody>
<tr>
<td>41330... Fluorescent tubes</td>
<td>500</td>
<td>O. R.</td>
</tr>
<tr>
<td>41335... Magnifier attachment</td>
<td>020</td>
<td>O. R.</td>
</tr>
<tr>
<td>41335... Table clamp</td>
<td>040</td>
<td>O. R.</td>
</tr>
<tr>
<td>41335... Table-top base For magnifier ring lamp</td>
<td>050</td>
<td>O. R.</td>
</tr>
</tbody>
</table>

Magnifier ring lamp

ORION

Application:
For magnifying small parts with additional light source.

Execution:
- Fluorescent tube 22 W
- Reach 900 mm
- Spring balance allows it to be clamped in any position
- Mains connection 230 V, 50 Hz

Technical Data:
- Magnification: 1.75-times
- Lens diameter: 120 mm
- Lens design: Biconvex
- Lens material: Glass

Prod. Gr. 454

<table>
<thead>
<tr>
<th>Accessories for</th>
<th>Unit price, €</th>
<th>O. R.</th>
</tr>
</thead>
<tbody>
<tr>
<td>41330... Fluorescent tubes</td>
<td>500</td>
<td>O. R.</td>
</tr>
</tbody>
</table>

Magnifying lamp

ESCHENBACH VARIO

Application:
For magnifying small parts with additional light source.

Execution:
- Fluorescent tube 9 W
- Magnification: Basic lens only 1.9x, with folded additional lens 2.8x
- Joints can be firmly clamped in any position
- Mains supply 230 V, 50 Hz with mains cable

scope of supply and services:
Table clamp

Technical Data:
- Magnification: 2-times
- Lens diameter: 132 mm
- Lens design: Aspherical
- Lens material: Plastic light lens with scratchproof cera-tec® hard coating

Prod. Gr. 411

<table>
<thead>
<tr>
<th>Accessories for</th>
<th>Unit price, €</th>
<th>O. R.</th>
</tr>
</thead>
<tbody>
<tr>
<td>41336... Table-top base For VARIO magnifying lamps</td>
<td>110</td>
<td>O. R.</td>
</tr>
</tbody>
</table>
LED ring magnifier lamp

**VARIO-LED**

**Application:**
For magnifying small parts with additional light source.

**Execution:**
- Illuminated by 36 LEDs
- 6 joints can be firmly clamped in any position
- Mounted with table clamp
- Folding and detachable lens cover
- Mains supply 100 V-240 V, 50-60 Hz
- Dimmable LEDs - individual light intensity for any work area

**Advantage:**
- LEDs with primary lens for optimum light bundling
- Sharp-edged and distortion-free images
- Ergonomic design

**Technical Data:**
- Magnification: 2-times
- Lens diameter: 132 mm
- Lens design: Aspherical
- Lens material: Plastic light lens with scratchproof cera-tec® hard coating

**Accessories for 41338 010**

<table>
<thead>
<tr>
<th>Ident. No.</th>
<th>Unit price, €</th>
<th>O. R.</th>
</tr>
</thead>
<tbody>
<tr>
<td>41338...5</td>
<td>400</td>
<td></td>
</tr>
</tbody>
</table>

**Prod. Gr. 411**

---

LED magnifying lamp

**TEVISIO**

**Application:**
- Ident. No. 100, 120: For magnifying small parts with additional light source.

**Execution:**
- Ident. No. 100, 120:
  - Illuminated by 48 SMD LEDs
  - Power consumption: 14 W at 6000 lx
  - Degree of protection IP 20, protection class 2
  - Power supply unit, 100-240 V, 50/60 Hz, 3.5 m connection cable
  - Integrated membrane key for ON/OFF, dimming or visualiser function

**Advantage:**
- Ident. No. 100, 120:
  - Maintenance-free up to 50,000 hours
  - 40% energy saving with low-energy SMD LEDs, colour rendering index: 1 A
  - Large visual field for optimum view, mobile 3D head joint for large operating range
  - 6 pivots and balanced linkage for precise adjustment
  - Light adjustable to 10% intensity

**Technical Data:**
- Magnification: 2-times
- Lens design: Biconvex
- Lens material: Glass

<table>
<thead>
<tr>
<th>Model</th>
<th>RLLQ 48 R</th>
<th>RLLQ 48/2 R</th>
<th>RLLQ 48 R</th>
<th>RLLQ 48/2 R</th>
</tr>
</thead>
<tbody>
<tr>
<td>A/B (mm)</td>
<td>484/500</td>
<td>484/500</td>
<td>384/400</td>
<td>384/400</td>
</tr>
<tr>
<td>Ident. No.</td>
<td>100</td>
<td>110</td>
<td>120</td>
<td>130</td>
</tr>
</tbody>
</table>

**Accessories for 41335 100, 120**

<table>
<thead>
<tr>
<th>Ident. No.</th>
<th>Unit price, €</th>
<th>O. R.</th>
</tr>
</thead>
<tbody>
<tr>
<td>41335...5</td>
<td>040</td>
<td></td>
</tr>
</tbody>
</table>

**Prod. Gr. 478**

---

**Waldmann**

**LED magnifying lamp**

**TEVISIO**

**Application:**
- Ident. No. 100, 120: For magnifying small parts with additional light source.

**Execution:**
- Ident. No. 100, 120:
  - Illuminated by 36 LEDs
  - Power supply unit, 100-240 V, 50/60 Hz, 3.5 m connection cable
  - Integrated membrane key for ON/OFF, dimming or visualiser function

**Advantage:**
- Ident. No. 100, 120:
  - Maintenance-free up to 50,000 hours
  - 40% energy saving with low-energy SMD LEDs, colour rendering index: 1 A
  - Large visual field for optimum view, mobile 3D head joint for large operating range
  - 6 pivots and balanced linkage for precise adjustment
  - Light adjustable to 10% intensity

**Technical Data:**
- Magnification: 2-times
- Lens diameter: 153 mm
- Lens design: Biconvex
- Lens material: Glass

<table>
<thead>
<tr>
<th>Model</th>
<th>RLLQ 48 R</th>
<th>RLLQ 48/2 R</th>
<th>RLLQ 48 R</th>
<th>RLLQ 48/2 R</th>
</tr>
</thead>
<tbody>
<tr>
<td>A/B (mm)</td>
<td>484/500</td>
<td>484/500</td>
<td>384/400</td>
<td>384/400</td>
</tr>
<tr>
<td>Ident. No.</td>
<td>100</td>
<td>110</td>
<td>120</td>
<td>130</td>
</tr>
</tbody>
</table>

**Accessories for 41335 100, 120**

<table>
<thead>
<tr>
<th>Ident. No.</th>
<th>Unit price, €</th>
<th>O. R.</th>
</tr>
</thead>
<tbody>
<tr>
<td>41335...5</td>
<td>040</td>
<td></td>
</tr>
</tbody>
</table>

---

**Prod. Gr. 478**
## Magnifying glasses

**MaxDetail**

**Application:**
For magnifying small parts whilst working with both hands.

**Execution:**
- ± 3 dpt diopter adjustment

**Advantage:**
- Very light

**Technical Data:**
- Magnification: 2-times
- Working distance: 400 mm
- Lens material: Plastic light lens

### Accessories for Magnifying glasses

<table>
<thead>
<tr>
<th>Prod. Gr.</th>
<th>Identi. No.</th>
<th>Unit price, €</th>
<th>O. R.</th>
</tr>
</thead>
<tbody>
<tr>
<td>41185...</td>
<td>011</td>
<td>011</td>
<td>011</td>
</tr>
</tbody>
</table>

**Prod. Gr. 411**

---

## Headlight LED

**For attaching to spectacles**

**Application:**
For pinpoint illumination of components

**Execution:**
- Range: vertical illuminance: approx. 3200 lx at 250 mm, approx. 1200 lx at 400 mm
- Cable length: 1 m
- Bulb housing: 32 x 20 x 34 mm
- Illumination with 2 strong LEDs

**Advantage:**
- A clip easily attaches the headlight LED to spectacles. It can also be used on a support by non-spectacle wearers.
- For pinpoint illumination

### Prod. Gr. 411

---

## Headband magnifying glasses

**Application:**
For magnifying small parts whilst working with both hands.

**Execution:**
- High quality plastic design
- Binocular lightweight lens with cera-tec® hard coating
- Closed shade protects against scattered light
- Suitable for spectacle wearers
- Height adjustment with latching function

**Technical Data:**
- Lens design: Binoculars

### Technical Data:

<table>
<thead>
<tr>
<th>Magnification</th>
<th>3-times</th>
<th>2-times</th>
</tr>
</thead>
<tbody>
<tr>
<td>Working distance (mm)</td>
<td>130</td>
<td>250</td>
</tr>
</tbody>
</table>

### Prod. Gr. 411

---

## Measuring magnifying glass

**Full metal design with replaceable scale plates**

**Application:**
For measuring surfaces in workshops, laboratories, quality assurance, e.g. measuring indentations during Brinell hardness test

**Execution:**
- Parallax-free, distortion-free reading
- Brass dial, chrome-plated, high-precision laser graduated
- Superb edge sharpness for near parallax-free viewing

**Advantage:**
- Half-open tube with white background for optimum, glare-free illumination of objects
- Scale value: 0.1 mm
- Lens design: Achromatic
- Lens material: Glass

### Technical Data:

<table>
<thead>
<tr>
<th>Magnification</th>
<th>6x</th>
<th>8x</th>
<th>10x</th>
</tr>
</thead>
<tbody>
<tr>
<td>Max. length measuring range (mm)</td>
<td>20</td>
<td>10</td>
<td>10</td>
</tr>
</tbody>
</table>

### Prod. Gr. 490

---

---

---
Magnifying lenses and technical endoscopes

**Magnifying lenses**

<table>
<thead>
<tr>
<th>Accessories for</th>
<th>41540 055</th>
<th>41540 105</th>
</tr>
</thead>
<tbody>
<tr>
<td>Scale plate for 6x</td>
<td>O. R.</td>
<td>O. R.</td>
</tr>
<tr>
<td>Scale plate for 8x</td>
<td>-</td>
<td>107</td>
</tr>
<tr>
<td>Scale plate for 10x</td>
<td>-</td>
<td>-</td>
</tr>
</tbody>
</table>

**Scale plate**

- **Ident. No.**
- **Unit price, €**

| Scale plate for 6x | 057 | O. R. |
| Scale plate for 8x | - | 107 |
| Scale plate for 10x | - | - |

**Testing equipment**

**Accessories for 41540 055 41540 105**

- **Scale plate for 6x**
- **Ident. No.**
- **Unit price, €**

<table>
<thead>
<tr>
<th>Identity No.</th>
<th>Unit price, €</th>
</tr>
</thead>
<tbody>
<tr>
<td>057</td>
<td>O. R.</td>
</tr>
</tbody>
</table>

- **Scale plate for 8x**
- **Ident. No.**
- **Unit price, €**

<table>
<thead>
<tr>
<th>Identity No.</th>
<th>Unit price, €</th>
</tr>
</thead>
<tbody>
<tr>
<td>-</td>
<td>107</td>
</tr>
</tbody>
</table>

- **Scale plate for 10x**
- **Ident. No.**
- **Unit price, €**

<table>
<thead>
<tr>
<th>Identity No.</th>
<th>Unit price, €</th>
</tr>
</thead>
<tbody>
<tr>
<td>-</td>
<td>-</td>
</tr>
</tbody>
</table>

**Orion**

**Measuring magnifying glass**

*Full metal design*

**Application:**
For measuring surfaces in workshops, laboratories, quality assurance, e.g. measuring indentations during Brinell hardness test

**Technical Data:**
- Lens design: Aplanatic
- Lens material: Glass

**Execution:**
- Parallax-free, distortion-free reading
- INOX steel scale, black engraved divisions

### Magnification

<table>
<thead>
<tr>
<th>Magnification</th>
<th>6x</th>
<th>8x</th>
<th>10x</th>
<th>12x</th>
</tr>
</thead>
<tbody>
<tr>
<td>Max. length measuring range (mm)</td>
<td>20</td>
<td>10</td>
<td>10</td>
<td>6</td>
</tr>
<tr>
<td>Scale value (mm)</td>
<td>0.1</td>
<td>0.1</td>
<td>0.1</td>
<td>0.05</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Identity No.</th>
<th>Unit price, €</th>
</tr>
</thead>
<tbody>
<tr>
<td>060</td>
<td>O. R.</td>
</tr>
<tr>
<td>080</td>
<td>O. R.</td>
</tr>
<tr>
<td>100</td>
<td>O. R.</td>
</tr>
<tr>
<td>120</td>
<td>O. R.</td>
</tr>
</tbody>
</table>

**Prod. Gr. 454**

**Measuring magnifying glass**

*Replaceable reticle plate*

**Application:**
For measuring on flat surfaces, e.g. small hole diameters, paint damage etc.

**Technical Data:**
- Lens design: Achromatic
- Lens material: Glass

**Execution:**
- Focus using focussing ring
- Measuring range 10 mm
- Reticle plate 01

### Magnification

<table>
<thead>
<tr>
<th>Magnification</th>
<th>7-times</th>
<th>10x</th>
</tr>
</thead>
<tbody>
<tr>
<td>Identity No.</td>
<td>Unit price, €</td>
<td></td>
</tr>
<tr>
<td>41560...</td>
<td>110</td>
<td>O. R.</td>
</tr>
</tbody>
</table>

**Prod. Gr. 411**

**Measuring magnifying glass**

*LED light*

**Application:**
For measuring on flat surfaces, e.g. small hole diameters, paint damage etc.

**Technical Data:**
- Magnification: 10x
- Max. length measuring range: 20 mm
- Scale value: 0.1 mm
- Lens design: Achromatic
- Lens material: Glass

**Execution:**
- Replaceable reticle plate

**Advantage:**
- Almost unlimited service life

**Scope of supply and services:**
Without batteries (2 x 1.5 V, type C)

**Prod. Gr. 411**

**Measuring magnifying glass**

*LED light*

**Application:**
For measuring on flat surfaces, e.g. small hole diameters, paint damage etc.

**Execution:**
- Replaceable reticle plate

**Advantage:**
- Almost unlimited service life

**Scope of supply and services:**
Without batteries (2 x 1.5 V, type C)

**Prod. Gr. 411**
Magnifying lenses and technical endoscopes

Magnifying lenses

ESCHENBACH  Micromagnifiers

Application:
For surface inspection of all materials

Execution:
- Optional illumination
- Black plastic housing
- Focus using rotary ring

<table>
<thead>
<tr>
<th>Ident. No.</th>
<th>Unit price, €</th>
</tr>
</thead>
<tbody>
<tr>
<td>41548...</td>
<td>O. R.</td>
</tr>
</tbody>
</table>

Prod. Gr. 411

Technical Data:
- Magnification: 30-times
- Material: Plastic

Measuring microscope

Application:
For general measuring tasks in linear measurement technology, graphics industry or hardness test for Brinell and Vickers.

Execution:
- Attached LED lighting (battery-powered)
- Robust light metal housing
- Focussing using threaded channels in lens and eyepiece

<table>
<thead>
<tr>
<th>Magnification</th>
<th>20x</th>
<th>40-times</th>
<th>60-fold</th>
</tr>
</thead>
<tbody>
<tr>
<td>Max. length measuring range (mm)</td>
<td>7</td>
<td>4</td>
<td>2</td>
</tr>
<tr>
<td>Scale value (mm)</td>
<td>0.05</td>
<td>0.02</td>
<td>0.0125</td>
</tr>
<tr>
<td>Object field Ø (mm)</td>
<td>8</td>
<td>5</td>
<td>2.5</td>
</tr>
<tr>
<td>Working distance (mm)</td>
<td>57</td>
<td>36</td>
<td>25</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Lens design</th>
<th>Achromatic</th>
<th>Achromatic</th>
<th>Achromatic</th>
</tr>
</thead>
<tbody>
<tr>
<td>41550...</td>
<td>Ident. No.</td>
<td>41552...</td>
<td>Ident. No.</td>
</tr>
<tr>
<td>41556...</td>
<td>Ident. No.</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Prod. Gr. 490

Technical Data:
- Scope of supply and services: Batteries (2x 1.5 V AA)
- In transport case, with LED illumination, batteries (4x button cells 1.5 V type LR44)

Digital inspection camera

RIDGID  micro CA-25™

Application:
For detailed visual inspections at short range.

Execution:
- 2.4” colour LCD display with 480 x 234 pixel resolution
- Aluminium camera head with ultra-bright LED illumination
- Flexible camera cable waterproof to 3 m

Advantage:
- Live images transmitted to external device via video output
- Digital 180° screen rotation for upright image display

<table>
<thead>
<tr>
<th>Ident. No.</th>
<th>Unit price, €</th>
</tr>
</thead>
<tbody>
<tr>
<td>41500...</td>
<td>O. R.</td>
</tr>
</tbody>
</table>

Prod. Gr. 412

Technical Data:
- Scope of supply and services: micro CA-25™, camera head 17 mm with 0.9 m, RCA/cinch cable, attachable tools: mirror, hook and magnet, 4x 1.5 V AA batteries, transport case
- Image rotation: 360° (2 x 180°)
- Field of vision: 72 Degree
- Screen size: 2.4 in
- Internal memory: 235MB
- External memory on SD card: Up to 32 GB
- Camera head diameter: 17 mm
- Number of LEDs: 4 PCS
- Cable length: 0.9 m
- Camera cable | extending: No
- Speech recording: No
- Image | video and audio recording: No
- Video output: PAL
Digital inspection camera
micro CA-100™

Application:
For detailed visual inspections in hard-to-reach spots.

Execution:
- 3.5" colour LCD display with 320 x 240 pixel resolution
- Aluminium camera head with ultra-bright LED illumination
- Flexible camera cable (waterproof camera head and cable)

Advantage:
- Camera cable extendable up to 9 m using extensions
- Live images transmitted to external device via video output
- Digital 4x 90° screen rotation for upright image display

scope of supply and services:
- micro CA-100, camera head 17 mm with 0.9 m, RCA/cinch cable, AA, attachable tools: mirror, hook and magnet, 4x 1.5 V AA batteries, transport case

Technical Data:
- Image rotation: 360° (4 x 90°)
- Field of vision: 72 Degree
- Screen size: 3.5 in
- Internal memory: No
- External memory on MS card: No
- Camera head diameter: 17 mm
- Number of LEDs: 4 PCS
- Cable length: 0.9 m
- Camera cable | extending: Yes
- Speech recording: No
- Image | video and audio recording: No
- Video output: PAL | NTSC

Product Group: 412

<table>
<thead>
<tr>
<th>Product 41500..-013</th>
<th>Identification No.</th>
<th>Unit price, €</th>
</tr>
</thead>
<tbody>
<tr>
<td>Camera head dia. 17 mm, cable length 0.9 m</td>
<td>017</td>
<td>O. R.</td>
</tr>
<tr>
<td>Camera head dia. 6 mm, cable length 1 m</td>
<td>018</td>
<td>O. R.</td>
</tr>
<tr>
<td>Camera head dia. 6 mm, cable length 4 m</td>
<td>019</td>
<td>(O. R.)</td>
</tr>
<tr>
<td>Cable length: 0.9 m</td>
<td>021</td>
<td>O. R.</td>
</tr>
<tr>
<td>Cable length: 1.8 m</td>
<td>024</td>
<td>(O. R.)</td>
</tr>
</tbody>
</table>

Digital inspection camera
micro CA-300™

Application:
For detailed visual inspections in hard-to-reach spots.

Execution:
- 3.5" colour LCD display with 320 x 240 pixel resolution
- Aluminium camera head with ultra-bright LED illumination
- Flexible camera cable (waterproof camera head and cable)
- Audio recorder with integrated loudspeaker
- Headset

Advantage:
- Camera cable extendable up to 9 m using extensions
- Live images transmitted to external device via video output
- Digital 4x 90° screen rotation for upright image display

scope of supply and services:
- micro CA-300, camera head 17 mm with 0.9 m, RCA/cinch cable, attachable tools: mirror, hook and magnet, 3.7 V Li-Ion rechargeable battery with power pack 5 V 1.5A, headset, 4 GB SD card, mini USB cable, transport case

Technical Data:
- Image rotation: 360° (4 x 90°)
- Field of vision: 72 Degree
- Screen size: 3.5 in
- Internal memory: 235MB
- External memory on SD card: Up to 32 GB
- Camera head diameter: 17 mm
- Number of LEDs: 4 PCS
- Cable length: 0.9 m
- Camera cable | extending: Yes
- Speech recording: Yes
- Image | video and audio recording: Image jpeg/video AVI 640 x 480 pix
- Video output: PAL | NTSC

Product Group: 412

<table>
<thead>
<tr>
<th>Product 41500..-101</th>
<th>Identification No.</th>
<th>Unit price, €</th>
</tr>
</thead>
<tbody>
<tr>
<td>Camera head dia. 17 mm, cable length 0.9 m</td>
<td>017</td>
<td>O. R.</td>
</tr>
<tr>
<td>Camera head dia. 6 mm, cable length 1 m</td>
<td>018</td>
<td>O. R.</td>
</tr>
<tr>
<td>Camera head dia. 6 mm, cable length 4 m</td>
<td>019</td>
<td>(O. R.)</td>
</tr>
<tr>
<td>Cable length: 0.9 m</td>
<td>021</td>
<td>O. R.</td>
</tr>
<tr>
<td>Cable length: 1.8 m</td>
<td>024</td>
<td>(O. R.)</td>
</tr>
</tbody>
</table>
**USB handheld microscopes**

**DinoCapture measuring software**

**Application:**
For industrial inspections, quality control, training, mounting, repairs and material defect analyses

**Execution:**
- CMOS Color high-resolution sensor
- Adjustable LED lighting
- MicroTouch button for saving live images/videos on PC
- Record images and videos
- USB 2.0 interface

- Housing dimensions, diameter 32 x 105 mm
- DinoCapture software: 2D image measurement (line, radius, diameter, arc, polygon, angle), insertion of texts, direct output of measured data to Excel

**Advantage:**
- Rapid archiving and recording of components under the USB handheld microscope
- Low-cost entry-level equipment for image viewing and measuring
- High flexibility with exchangeable attachments
- Automatic magnification reading

**scope of supply and services:**
USB handheld microscope with USB cable (L = 1.8 m), CD with DinoCapture software

**Technical Data:**
- Cable length: 1.8 m
- Data transmission type: USB
- Software: DinoCapture

<table>
<thead>
<tr>
<th>Model</th>
<th>AM4113ZT</th>
<th>AM4131TL</th>
<th>AM4515ZT</th>
<th>AM7013M2T</th>
<th>AD7013M1TL</th>
</tr>
</thead>
<tbody>
<tr>
<td>Camera resolution (Mpix)</td>
<td>1.3</td>
<td>1.3</td>
<td>1.3</td>
<td>5.0</td>
<td>5.0</td>
</tr>
<tr>
<td>Magnification</td>
<td>10 to 70-times</td>
<td>10 to 90-times</td>
<td>50 to 200-times</td>
<td>10 to 70-times</td>
<td>10 to 90-times</td>
</tr>
<tr>
<td>Max. magnification</td>
<td>200-times</td>
<td>-</td>
<td>-</td>
<td>200-times</td>
<td>-</td>
</tr>
<tr>
<td>Image resolution</td>
<td>1280 x 1024 pix</td>
<td>1280 x 1024 pix</td>
<td>1280 x 1024 pix</td>
<td>2592 x 1944 pix</td>
<td>2592 x 1944 pix</td>
</tr>
<tr>
<td>Min. working distance (mm)</td>
<td>0.5</td>
<td>45</td>
<td>0.5</td>
<td>0.5</td>
<td>45</td>
</tr>
<tr>
<td>Max. working distance (mm)</td>
<td>60</td>
<td>150</td>
<td>60</td>
<td>60</td>
<td>150</td>
</tr>
<tr>
<td>Polariser</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>No</td>
</tr>
<tr>
<td>Material of the housing</td>
<td>Plastic</td>
<td>Plastic</td>
<td>Plastic</td>
<td>Metal</td>
<td>Metal</td>
</tr>
<tr>
<td>41613...</td>
<td>Ident. No.</td>
<td>062</td>
<td>071</td>
<td>076</td>
<td>072</td>
</tr>
<tr>
<td>Unit price, €</td>
<td>O. R.</td>
<td>O. R.</td>
<td>O. R.</td>
<td>O. R.</td>
<td>O. R.</td>
</tr>
</tbody>
</table>

**Prod. Gr. 412**

**Tripods for USB microscopes**

**Application:**

Ident. No. 080: Standard column stand with focussing facility via turning knob. 50 mm height adjustment. Holder on column rotatable by 360° with focussing facility.

Ident. No. 081: Column stand with articulatred arm and focussing facility via turning knob. 200 mm height adjustment. Holder on column rotatable by 360° with focussing facility.

Ident. No. 083: Column stand with extension arm and focussing facility via turning knob. 200 mm height adjustment, 250 mm horizontal extension arm. Holder on column rotatable by 360° with focussing facility.

Ident. No. 084: Roller stand for flat surfaces and curved surfaces with a diameter greater than 70 mm, height adjustable. Holder on column rotatable by 360° without focussing facility.

Ident. No. 085: Sturdy column stand with large boom arm, fast vertical adjustment and fine focus adjustment. 180 mm height adjustable, 150 mm horizontal extension arm incl. 150 mm extension, holder on column rotatable by 360°, focussing facility.

<table>
<thead>
<tr>
<th>Model</th>
<th>MS-34B stand</th>
<th>MS-35B stand</th>
<th>MS-36B stand</th>
<th>MS-W1 stand</th>
<th>RK-10A stand</th>
</tr>
</thead>
<tbody>
<tr>
<td>Stand design</td>
<td>Column stand</td>
<td>Column stand</td>
<td>Column stand</td>
<td>Mobile stand</td>
<td>Column stand</td>
</tr>
<tr>
<td>Width x height x depth</td>
<td>75 x 130 x 115 mm</td>
<td>150 x 305 x 220 mm</td>
<td>150 x 305 x 220 mm</td>
<td>45 x 120 x 74 mm</td>
<td>150 x 230 x 220 mm</td>
</tr>
<tr>
<td>41613...</td>
<td>Ident. No.</td>
<td>066</td>
<td>081</td>
<td>083</td>
<td>084</td>
</tr>
<tr>
<td>Unit price, €</td>
<td>O. R.</td>
<td>O. R.</td>
<td>O. R.</td>
<td>O. R.</td>
<td>O. R.</td>
</tr>
</tbody>
</table>

**Prod. Gr. 412**
**Glass calibration standard**

For USB handheld microscope with DinoCapture software

<table>
<thead>
<tr>
<th>Prod. Gr.</th>
<th>Id. No.</th>
<th>Unit price, €</th>
<th>O.R.</th>
</tr>
</thead>
<tbody>
<tr>
<td>41613...</td>
<td>091</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Application:
For calibrating the USB microscope in conjunction with DinoCapture software.

Execution:
- Scale lengths/graduations (in mm): 50/1 mm, 10/0.1 mm, 2/0.01 mm

---

**Stereo microscopes**

**Interchangeable lenses**

Application:
For simple viewing of mechanical components, electronic PCBs and for general surface inspections.

Execution:
- Interchangeable lenses with 20x and 40x magnification
- Binocular lens barrel with 45° viewing angle
- Eyepieces rotatable by 360°
- Working distance 95 mm
- Halogen incident and transmitted lighting

<table>
<thead>
<tr>
<th>Prod. Gr.</th>
<th>Id. No.</th>
<th>Unit price, €</th>
<th>O.R.</th>
</tr>
</thead>
<tbody>
<tr>
<td>41612...</td>
<td>020</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Advantage:
- 45° viewing angle for convenient and effortless work

Scope of supply and services:
- Stand, microscope head and holder, eyepieces and eye cups

Technical Data:
- Eyepiece type: WF 10x/20
- Field of view figure: 20
- Lens tube type: Binoculars
- Incident light: Halogen spotlight
- Transmitted light: Halogen

---

**Stereo zoom microscope SM 150**

**Binocular, with manual zoom**

Application:
For viewing mechanical components, electronic PCBs and for general surface inspections in quality assurance, in production environments and in education.

Execution:
- 7x to 45x magnification
- Manual zoom with zoom factor 6.4:1
- Binocular lens barrel with 45° prism head
- Eyepieces rotatable by 360°, adjustable pupil distance, incl. dioptre adjustment
- Integrated reflected and transmitted light, continuously controllable
- High-quality lens for bright, sharp three-dimensional images

<table>
<thead>
<tr>
<th>Prod. Gr.</th>
<th>Id. No.</th>
<th>Unit price, €</th>
<th>O.R.</th>
</tr>
</thead>
<tbody>
<tr>
<td>41612...</td>
<td>150</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Advantage:
- Convenient and effortless work thanks to 45° inclination

Scope of supply and services:
- Microscope, eyepiece 10x, cover, glass plate and white/black plate, operating instructions

Technical Data:
- Field of view figure: 28

---

**ARE YOU LOOKING FOR PRODUCTS OF THE HIGHEST QUALITY?**

**WE HAVE WHAT IT TAKES.**

For a complete range of products that meet the toughest demands, visit [www.hahn-kolb.com](http://www.hahn-kolb.com)
### Stereo zoom microscope SM 160
**Binocular, with manual zoom**

**Application:**
For viewing large mechanical components, electronic PCBs and for general surface inspections in quality assurance, in production environments and in education.

**Execution:**
- 7x to 45x magnification
- Manual zoom with zoom factor 6.4:1
- Binocular lens barrel with 45°prism head
- Eyepieces rotatable by 360°, adjustable pupil distance, incl. dioptre adjustment
- High-quality lens for bright, sharp three-dimensional images
- Zoom lens with continuous magnification
- Focussed using ergonomic manual wheels on both sides for left and right-handed users
- Boom stand with footprint 230 mm x 230 mm
- Working distance 105 mm

**Advantage:**
- Convenient and effortless work thanks to 45° inclination

**Scope of supply and services:**
Microscope, eyepiece 10x, cover, operating instructions

**Technical Data:**
- Field of view figure: 28

<table>
<thead>
<tr>
<th>Ident. No.</th>
<th>Unit price, €</th>
</tr>
</thead>
<tbody>
<tr>
<td>41612...</td>
<td>160 (O.R.)</td>
</tr>
</tbody>
</table>

Prod. Gr. 307

---

### Stereo zoom microscope
**Microscope with integrated camera and image-processing software**

**Application:**
For viewing mechanical components, electronic PCBs and for general surface inspections in quality assurance, in production environments and in education. The integrated camera with Images Plus 2.0 image processing software can record images and video, measure, record and add information to viewed parts.

**Execution:**
- 10x to 40x magnification
- Manual zoom with zoom factor 4:1
- Binocular with 45° fixed viewing angle
- Eyepieces rotatable by 360°, incl. dioptre adjustment
- Camera head with integrated 1/2" CMOS camera chip, 3 megapixels and 2048-1536 pixel image resolution
- Image processing software Images Plus 2.0 for Windows XP/Vista/7 and MAC
- Adjustable LED reflected and transmitted lighting
- Column stand (W x D x H) 330 mm x 280 mm x 300 mm
- Software Image Plus 2.0: Imaging in standard file formats, processing of real-time images and image stitching, video recording with time stamp, images with audio, 2D measurements, e.g., for lengths, radii, circles, angles, circumference etc., magnification function for improving measuring accuracy, data export and reporting incl. calibration

**Advantage:**
- Microscope with integrated camera and software for recording images and videos

**Scope of supply and services:**
Stand with LED illumination, microscope head and holder, eyepieces, software, calibration standard and dust cover

**Technical Data:**
- Model: DM 143
- Lens tube type: Binoculars with integrated 1/2" camera chip
- Eyepiece type: 10x wide field
- Pillar diameter: 32 mm
- Software: Image Plus 2.0

<table>
<thead>
<tr>
<th>Ident. No.</th>
<th>Unit price, €</th>
</tr>
</thead>
<tbody>
<tr>
<td>41613...</td>
<td>180 (O.R.)</td>
</tr>
</tbody>
</table>

Prod. Gr. 412

---

### Stereo zoom microscope STEMI 305 EDU
**Binocular, manual zoom, excellent optics**

**Application:**
For viewing mechanical components, electronic PCBs and for general surface inspections in quality assurance, in production environments and in education.

**Execution:**
- 8x to 40x magnification
- Manual zoom with 5:1 zoom factor
- Binocular lens barrel with 45° fixed viewing angle
- Adjustable viewing distance 55-75 mm
- Eyepieces 10x/23 Br. foc.
- Focus range of 145 mm, free working distance 110 mm
- Tilting LED incident spotlight for bright field and dark field illumination
- Integrated LED transmitted light, switches between bright field and dark field illumination
- M52 thread for front optics or polariser
- Column stand K EDU (W x D) 190 mm x 310 mm

**Advantage:**
- Durable LED light in daylight quality
- Fixed grid positions 0.8x, 1x, 2x, 3x, 4x

**Technical Data:**
- Lens tube type: Binoculars
- Field of view figure: 23

<table>
<thead>
<tr>
<th>Ident. No.</th>
<th>Unit price, €</th>
</tr>
</thead>
<tbody>
<tr>
<td>41611...</td>
<td>025 (O.R.)</td>
</tr>
</tbody>
</table>

Prod. Gr. 412
Microscopes and observation systems

**Stereo zoom microscope STEMI 305 MAT - ESD version**

**Binocular, manual zoom, excellent optics**

**Application:**
For viewing mechanical components, electronic PCBs and for general surface inspections in quality assurance, in production environments and in education. ESD properties make this microscope ideal for inspecting electronic components and printed circuit boards. LED ring lighting also allows numerous illumination scenarios in daylight quality.

**Execution:**
- ESD suppression function: Anti-static surface and earthing socket
- 8x to 40x magnification
- Manual zoom with 5:1 zoom factor
- Binocular lens barrel with 45° fixed viewing angle
- Adjustable viewing distance 55-75 mm
- Eyepieces 10x/23 Br. foc.
- Focus range of 145 mm, free working distance 110 mm
- Segment ring light: Full circle, half circle, quarter circle
- M52 thread for front optics or polariser
- Column stand K MAT (W x D) 190 mm x 310 mm

**Advantage:**
- Bright, high-contrast, 3D images
- Camera connection with fixed 50:50 light split for simultaneous viewing of live images through the eyepiece and on the monitor
- Durable LED light in daylight quality
- Trinocular microscopic body with fixed 50:50 light split for simultaneous viewing of live images through the eyepiece and on the monitor

**Technical Data:**
- Lens type: Binoculars
- Field of view figure: 23

---

**Stereo zoom microscope STEMI 508 MAT**

**Trinocular, manual zoom, excellent optics**

**Application:**
For viewing delicate components in precision engineering, electronic components and PCBs, for general surface inspections in education, quality assurance, (material) research and development and in production environments. The integrated camera adapter C-Mount 0.5x enables the connection of a digital camera and, via suitable software, offers the option of recording, measuring and saving images.

**Execution:**
- 4x to 32x magnification
- Manual zoom with 8:1 zoom factor
- Trinocular lens barrel (100/100) with fixed viewing angle of 35°
- Integrated camera adapter C-Mount 0.5x 60N-C 2/3”
- Eyepieces 10x/23 Br. foc.
- Front optics 5 Apo 0.63x FWD 127 mm
- Segment ring light: Full circle, half circle, quarter circle
- Column stand K MAT (W x D) 190 mm x 310 mm

**Advantage:**
- Bright, high-contrast, 3D images
- Durable LED light in daylight quality

**Technical Data:**
- Field of view figure: 23
**Microscopes and observation systems**

**Microscopes**

**Stereo zoom microscope SteREO Discovery.V8**

- **High-quality microscope with manual zoom**

**Application:**
- For viewing delicate components in precision engineering, electronic components and PCBs, for general surface inspections in quality assurance, material research and development and in production environments. For all users requiring high image brilliance and outstanding 3D images.

**Execution:**
- Manual zoom with zoom factor 8:1
- Binocular photo lens barrel with 35° fixed viewing angle
- Adjustable viewing distance 55-75 mm
- Eyepiece PL 10x/21
- Lens Achromat S 1.0 FWD 63 mm

**Ident. No.**

<table>
<thead>
<tr>
<th>Prod. Gr.</th>
<th>Unit price, €</th>
<th>(O. R.)</th>
</tr>
</thead>
<tbody>
<tr>
<td>41611...</td>
<td>200</td>
<td></td>
</tr>
</tbody>
</table>

**Advantage:**
- Click-stop function (user-activated)
- Photo intermediate lens barrel for 100/100 switch-over between direct viewing and camera
- Stand with T-column, rough/fine drive and large support surface 290 x 353 mm

**Technical Data:**
- Field of view figure: 21
- Tripod height: 490 mm
- Camera connection: C-Mount 60N

**Stereo zoom microscope SteREO Discovery.V12**

- **High-quality microscope with motorised zoom**

**Application:**
- For viewing delicate components in precision engineering, electronic components and PCBs, for general surface inspections in quality assurance, material research and development and in production environments. For all users requiring high image brilliance and outstanding 3D images.

**Execution:**
- Motorised zoom with 12.5:1 zoom factor
- Binocular, fixed photo lens barrel 40 mm and 20° tilting eyepieces
- Adjustable viewing distance 30-81 mm
- Eyepiece PL 10x/23
- Lens Achromat S 1.0 FWD 63 mm
- Electronic click-stop function
- Photo intermediate lens barrel for 100/100 switch-over between direct viewing and camera
- Digital HIP controls for excellent operating convenience
- Adjustable double iris diaphragm

**Ident. No.**

<table>
<thead>
<tr>
<th>Prod. Gr.</th>
<th>Unit price, €</th>
<th>(O. R.)</th>
</tr>
</thead>
<tbody>
<tr>
<td>41611...</td>
<td>210</td>
<td></td>
</tr>
</tbody>
</table>

**Advantage:**
- Excellent resolution even at low magnifications
- Bright, high-contrast and brilliant 3D images
- HIP: digital control with additional system information and storage functions
- Double iris diaphragm for increasing depth of field when viewing 3D objects

**Notes:**
HIP is a compact control that replaces the conventional turning knob for motorised zoom and focus functions. It provides additional storage functions and communicates the current status of the system.

**Technical Data:**
- Field of view figure: 23
- Tripod height: 520 mm
- Camera connection: C-Mount 60N

---

**ARE YOU LOOKING FOR PRODUCTS THAT MEET THE TOUGHEST DEMANDS?**

**WE HAVE WHAT IT TAKES.**

For a complete range of products that meet the toughest demands, visit www.hahn-kolb.com

---

846 ARTICLES ON STOCK PRINTED IN BOLD - WWW.HAHN-KOLB.COM
### Light microscope Primotech MAT

**5x revolving nosepiece and integrated camera**

**Application:**
For viewing specimens by incident light in metallography, machine construction and in the automotive industry. The integrated, network-compatible camera can be operated via iPad with either software version, Labscope or Matscope, and provides the option of recording, measuring and saving images and videos.

**Execution:**
- Microscope stand Primotech MAT LED with 5x revolving nosepiece, coded
- Incl. Epiplan lens 5x/0.13 W0.8", 20x/0.4 W0.8", 50x/0.65 W0.8"
- Eyepieces E-PL 10x/20 Br. Foc.
- Lens barrel 30°/20 with integrated IP camera, 3 megapixels
- LED incident lighting 3 W 5000 K
- LED transmitted lighting without capacitor
- 2x filter sliders with conversion filters (3200 K), diameter 25 mm
- Interface module NMA basic for network communication
- Stage A with plate and object holder
- Column stand Primotech MAT LED (W x D) 140 mm x 135 mm

**Advantage:**
- Network communication via Ethernet and Matscope app
- Large specimen area of up to 34 mm
- Durable LED light in daylight quality
- Calibration slide for app

**Notes:**
Supplied without iPad. Software ZEISS Labscope and ZEISS Matscope for iPad can be downloaded free from the iTunes Apple Store!

**Technical Data:**
- Field of view figure: 20

---

### Light microscope Axio Lab.A1 MAT

**For materials analysis using bright field microscopy**

**Application:**
Axio Lab.A1 MAT is suitable for a broad range of applications in metallography with a high specimen throughput. For example, it can be used to analysed grain sizes and micro-structures of metals. The results offer insight into the mechanisms leading to material defects, e.g., fatigue, corrosion, stress cracks and bridges. Results can then be documented using a digital camera and image processing software.

**Execution:**
- Magnification 5x-50x
- 5x nosepiece revolver and 4x reflector revolver
- Binocular photo lens barrel 30° (50/50), mirror image
- Eyepiece type PL 10x/22 Br. Foc.
- Lens EC Epiplan M27 5x/0.13; 10x/0.25; 20x/0.4; 50x/0.75
- Incident lighting with halogen reflector lamp 12 V 50 W
- Reflector module bright field ACR for incident light
- 2x filter sliders with white balance filter diameter 25 mm
- Mount for polariser slider A
- Cross table 75x30 R with hard anodised coating, specimen holder A with two stage springs

**Advantage:**
- High-quality microscope for fast specimen throughput
- Photo lens barrel for connecting a digital camera
- 30° viewing angle for ergonomic work
- Z-drive with fine drive knob on the left and fine drive disk on the right

**Technical Data:**
- Field of view figure: 22
- Switching of eyepiece/camera connection: 50/50
- Camera connection: C-Mount 60N

---

**III. incl. ZEISS ERc 5s digital camera**
**LED ring and LED transmitted light**

**LED lighting for microscopes**

**Application:**
For even, shadow-free and homogeneous illumination of objects.

**Execution:**
- LED ring light with 40 LEDs and continuous brightness control
- Control unit with two connectors for two lighting units (LED ring light and LED transmitted light)
- Ident. No. 676: Without segment control
- Ident. No. 682: With segment control

**Advantage:**
- Ident. No. 682:
  - Integrated segment control also allows different lighting scenarios to be created.

<table>
<thead>
<tr>
<th>Segment control system</th>
<th>Ident. No.</th>
<th>Unit price, €</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>676</td>
<td>676 (O. R.)</td>
</tr>
<tr>
<td></td>
<td>682</td>
<td>682 O. R.</td>
</tr>
</tbody>
</table>

**Advantages:**
- Selectable segments: Quarter circle, half circle, 2 opposite quarter circles, full circle
- Rotation of the selected segments in both rotational directions (clockwise/counter-clockwise)

**Scope of supply and services:**
Control unit and power supply unit

**Technical Data:**
- Outer diameter: 94 mm
- Internal diameter: 66 mm
- Number of LEDs: 40 PCS
- Colour temperature: 5000 K
- Lamp type: LED

---

**Gooseneck illuminator**

**For LED Hi-Power spot, 2 arms**

**Application:**
For flexible and pinpoint incident light tasks in microscopy. The LED Hi-Power Spot can be fixed directly to the stand via an adapter and is therefore suitable for individual, space-saving applications.

**Execution:**
- Flexible gooseneck arms
- Two high-quality LED Hi-Power Spots
- Spotlights can be switched separately
- Control unit with continuous brightness control

**Advantage:**
- Homogeneous, neutral white light, continuously dimmable, ripple and flicker-free

<table>
<thead>
<tr>
<th></th>
<th>Ident. No.</th>
<th>Unit price, €</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>761</td>
<td>761 O. R.</td>
</tr>
</tbody>
</table>

**Advantages:**
- Brightness comparable to one 150 W halogen light source

**Scope of supply and services:**
LED Hi-Power Spot, 2 arms, control unit and power supply unit

**Technical Data:**
- Number of arms: 2 PCS
- Arm length: 480 mm
- Colour temperature: 5000 K
- Lamp type: LED

---

**Adapters**

**For LED Hi-Power Spot with 2 arms**

**Application:**
For attaching LED Hi-Power Spot lamps to round column stands with diameters of 25, 30, 32, 35 mm

**Execution:**
- For column diameters of 25, 30, 32, 35 mm

<table>
<thead>
<tr>
<th></th>
<th>Ident. No.</th>
<th>Unit price, €</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>765</td>
<td>765 O. R.</td>
</tr>
</tbody>
</table>
**LED cold light source**

*Lighting unit without light source for microscopes*

**Application:**
For a broad range of lighting applications in microscopy. Allows the highest possible light intensities to be focussed on a surface. Sensitive objects are also protected against intense heat.

**Execution:**
- Robust metal housing
- Infinitely variable brightness regulation
- ESD connector
- Ident. No. 637:
  - Electronic shutter function
- Remote control via USB and foot switch (toggle standby, toggle presets, dimming)
- All settings (brightness/shutter/strobe parameters) can be easily configured

**Advantage:**
- High light density over a small surface
- Ideal for small object fields, e.g. 40x magnification

**Technical Data:**
- Lamp type: LED
- ESD bush: Yes

**Model** | **Colour temperature (K)** | **Life time of illuminant (h)** | **Unit price, €**
--- | --- | --- | ---
F1 | 5500 | 50000 | 635
F3000 | 5800 | 30000 | O. R.

**Gooseneck illuminator**

*Fibre optic light guide, 2-arm*

**Application:**
2-arm gooseneck illuminator. In combination with a PHOTONIC LED cold light source, ideal for flexible, pinpoint incident lighting tasks in microscopy. The LED HI-Power Spot can be fixed directly to the stand via an adapter and is therefore suitable for individual, space-saving applications.

**Technical Data:**
- Number of arms: 2 PCS
- Arm length: 550 mm

**Split ring light with focussing attachment**

*for LED cold light source*

**Application:**
Split ring light with focussing attachment for even, shadow-free and homogeneous illumination of objects. Incl. ring adapter diameter 66/58 mm

**Execution:**
- Fibre optic cable length 750 mm

**Technical Data:**
- Outer diameter: 94 mm
- Internal diameter: 66 mm
- Active optical fibre diameter: 9 mm

**Universal adapter**

*For ring lights*

**Application:**
Universal adapter for adapting ring lights with 66 mm internal diameter and lenses with 38 mm or 58 mm external diameter
Mobile rebound hardness tester D200
Separate impact unit type D and wireless printer

**Application:**
For determining and directly displaying hardness values in line with HL (Leeb), HB, HV, HRB (Rockwell B), HRC, HS (Shore) and tensile strength in N/mm². Suitable for large components made from steel, stainless steel, cast iron, aluminium alloys, brass, bronze and copper forged alloys from a mass of approx. 5 kg upwards.

**Execution:**
- Separate impact unit type D, HM ball diameter 3 mm
- Backlit, 3.9", colour, LCD touch screen display (240 x 320 pixels)
- Individual value and mean value display, absolute range, no. of measurements
- Dynamic rebound method in line with ASTM A956 and DIN 50156
- Probe test direction can be selected depending on the position of the surface being measured
- Internal memory for 500 measurements
- Wireless printer
- Material groups: 1.) Low-alloy/unalloyed steel, 2.) Tool steel, 3.) Corrosion-resistant steel, 4.) Grey cast iron GG, 5.) Spheroidal cast iron, 6.) Aluminium cast alloys, 7.) Brass, 8.) Bronze, 9.) Copper forged alloys, 10.) Forged steel

**Advantage:**
- Standard conversion tables integrated in the device are split into nine material groups
- Hardness values are immediately displayed according to a pre-defined hardness scale
- Wireless printer for documenting individual measurements or measurement series

**Scope of supply and services:**
Display unit, separate impact unit, hardness reference block, wireless printer, charger, cleaning brush, USB cable, stylus, software and transport case.

**Notes:**
Components with a reduced mass of < 5 kg must be suitably positioned vibration-free on a large metal subsurface.

**Technical Data:**
- Measuring range (low-alloy steel): 560–950 HL
- Measuring range (chrome-nickel steel): 81–995 HV
- Measuring range (aluminium alloys): 32.5–979 HS
- Measuring range (copper and bronze): 38.4–99.5 HRB
- Measuring range (gray cast iron GG): 20–68.4 HRC
- Measuring range (spheroidal cast iron): 375–2639 N/mm²
- Hardness accuracy: ± 6 HL
- Hardness revolution: 1 HL | 1 HB | 1 HV | 1 N/mm² | 1 HS | 0.1 HRC | 0.1 HRB
- Rechargeable battery/battery designation: 1.2 V NiMH AAA
- Length x width x height: 130 x 87 x 28 mm

**Mobile rebound hardness tester D400
Separate impact unit type D**

**Application:**
For determining and directly displaying hardness values in line with HL (Leeb), HB, HV, HRB (Rockwell B), HRC, HS (Shore) and HRA. Suitable for large components made from steel, stainless steel, cast iron, aluminium alloys, brass, bronze and copper forged alloys from a mass of approx. 5 kg upwards.

**Execution:**
- Separate impact unit type D, HM ball diameter 3 mm
- Backlit LCD display (128 x 64 pixels)
- Individual value and mean value display, absolute range, no. of measurements
- Dynamic rebound method in line with ASTM A956 and DIN 50156
- Probe test direction can be selected depending on the position of the surface being measured
- Internal memory for 1974 measurements
- Material groups: 1.) Low-alloy/unalloyed steel, 2.) Tool steel, 3.) Corrosion-resistant steel, 4.) Grey cast iron GG, 5.) Spheroidal cast iron, 6.) Aluminium cast alloys, 7.) Brass, 8.) Bronze, 9.) Copper forged alloys

**Advantage:**
- Standard conversion tables integrated in the device are split into nine material groups
- Hardness values are immediately displayed according to a pre-defined hardness scale
- Wireless printer for documenting individual measurements or measurement series

**Scope of supply and services:**
Display unit, separate impact unit, hardness reference block, wireless printer, charger, cleaning brush, USB cable, stylus, software and transport case.

**Notes:**
Components with a reduced mass of < 5 kg must be suitably positioned vibration-free on a large metal subsurface.

**Technical Data:**
- Measuring range (low-alloy steel): 200–900 HL
- Measuring range (chrome-nickel steel): 80–940 HV
- Measuring range (aluminium alloys): 32-100 HS
- Measuring range (copper and bronze): 375–2639 N/mm²
- Hardness accuracy: ± 4 HL
- Hardness revolution: 0.1 HRC | 1 HS
- Rechargeable battery/battery designation: 1.2 V Mignon AA
- Length x width x height: 122 x 65 x 22 mm
- Memory (measurements): 1974 PCS
KRAUTKRAMER mobile UCI hardness tester MIC 10

Separate manual probe

Application:
For determining and directly displaying hardness values in line with HB (Brinell), HV (Vickers), HRA (Rockwell A), HRB (Rockwell B), HRC (Rockwell), HS (Shore) on metallic materials. Ideal for fine-grain materials and alloys. For example, thin-walled materials > 4 mm, nitride-hardened, case-hardened and high-frequency-hardened parts, chrome-coated, galvanised or toothed components can be tested for the material characteristic hardness depending on the probe in use. Even hard-to-reach spots can be hardness tested in any position with the same accuracy. Suitable test attachments are optionally available for curved surfaces.

Execution:
- For separate manual probe, Vickers 136° indentation body (optionally available)
- Membrane keypad with six function keys
- Individual value and mean value displays
- Applied Vickers method in line with ASTM A 1038 or DIN 50159
- Conversion in line with DIN 50150 and ASTM E 140*
- Further manual measuring or motorised probes available upon request

 Advantage:
- Measures immediately, over the entire sample and in all directions with consistent accuracy
- Standard conversion tables integrated in the device
- Hardness values are immediately displayed according to a pre-defined hardness scale

Scope of supply and services:
(without probe) with batteries 2x 1.5 V AA batteries, transport case

Technical Data:
- Min./max. HV measuring range: 20-1740 HV
- Min./max. HRC measuring range: 20.3-68 HRC
- Min./max. HB measuring range: 76-618 HB
- Min./max. tensile strength: 255-2180 N/mm²
- Hardness accuracy: ± 0.1 HRC |
- 0.5 HRC |
- 1 HRC |
- 0.1 HRB |
- 0.5 HRB |
- 1 HRB

Hand sensors

Accessories for UCI hardness tester MIC 10

Application:
Ident. No. 100: Manual probe 10 N with connecting cable for mobile UCI hardness tester MIC 10. Ideal for e.g. gear teeth and thin components.
Ident. No. 110: Manual probe 50 N with connecting cable for mobile UCI hardness tester MIC 10. Universal standard probe for many areas of application, especially for recording edge hardness and nitrided layers on components.
Ident. No. 120: Manual probe 98 N with connecting cable for mobile UCI hardness tester MIC 10. Ideal for small forged parts and inspecting welding seams

Execution:
- Manual probe incl. connecting cable

Scope of supply and services:
Manual probe with connecting cable

Technical Data:
- Probe diameter: 19 mm
- Manual probe length: 143 mm

Test force (N) | 10 | 50 | 98
---|---|---|---
Test body Ø (mm) | 2.4 | 3.0 | 3.0

For a complete range of products that meet the toughest demands, visit www.hahn-kolb.com
Mobile UCI hardness tester UCI-3000

Separate manual probe

Application:
For determining and directly displaying hardness values in line with HB (Brinell), HV (Vickers), HRA (Rockwell A), HRB (Rockwell B), HRC (Rockwell), HS (Shore) on metallic materials. Ideal for fine-grain materials and alloys. Includes 50 N standard probe for performing e.g. hardness tests on nitride-hardened, case-hardened and high-frequency-hardened parts and coating tests (from 30 microns with 10 N probe). Suitable test attachments are optionally available for curved surfaces.

Execution:
- Includes separate 50 N manual probe, Vickers 136° indenter
- Manual probe 145 mm long
- Colour LCD display, backlit
- Individual, min./max and mean value display, with graphic diagrams
- Applied Vickers method in line with ASTM A 1038 or DIN 50159
- Memory for 12,900 measurements divisible into 100 blocks
- USB interface

Software UCI 3000
Further manual probes 10 N and 98 N are available upon request

Advantage:
- For all test devices without correction value input
- Standard conversion tables integrated in the device
- Hardness values are immediately displayed according to a pre-defined hardness scale

Scope of supply and services:
Display unit, standard probe 50 N, rechargeable battery, charger, USB connecting cable, CD with software for data transmission and evaluation in Excel, transport case

Technical Data:
- Min./max. HV measuring range: 240-940 HV
- Min./max. HRC measuring range: 20-70 HRC
- Min./max. HB measuring range: 90-460 HB
- Hardness accuracy: HB 4% | HV 3% | HRC 1.5%
- Hardness revolution: 1 HB | 1 HV | 0.1 HRC | 0.5 HRC | 1 HRC | 0.1 HRB | 0.5 HRB | 1 HRB
- Memory (measurements): 12900 PCS

SHORE hardness testers
Shore A for soft materials and Shore D for hard materials

Application:

Ident. No. 100: For determining Shore A hardness in line with DIN ISO 7619-1, ISO 7619-1, ISO 868 and ASTM D 2240. Suitable for e.g. soft rubber, elastomers, natural rubber, neoprene, polyester, cast resins etc.

Ident. No. 110: For determining Shore D hardness in line with DIN ISO 7619-1, ISO 7619-1, ISO 868 and ASTM D 2240. Suitable for e.g. hard rubber, acrylic glass, stiff thermoplastics, Formica, vinyl sheets, cellulose/acetate, hard rubber materials etc.

Execution:
- Trailing pointer

Large glare-free display rotates through 360°
Accurate to 0.5 hardness units

Advantage:
- Ergonomic handles for excellent handling

Technical Data:
- Min./max. display range of Shore: 0 - not applicable - 100
- Scale value | Shore: 1
- Shore error limit: ± 0.5
- Meter diameter: 57 mm
- Trailing pointer: Yes

Test sample set for Shore hardness testers

Application:
For checking Shore hardness testers

<table>
<thead>
<tr>
<th>Number of test samples (PCS)</th>
<th>Shore hardness range</th>
<th>ATORN test sample set Shore A</th>
<th>ATORN test sample set Shore D</th>
</tr>
</thead>
<tbody>
<tr>
<td>7</td>
<td>30</td>
<td>40</td>
<td>50</td>
</tr>
<tr>
<td>3</td>
<td>60</td>
<td>75</td>
<td>85</td>
</tr>
</tbody>
</table>

Unit price, €

Ident. No. 140
Ident. No. 150
Hardness testing and metallography

**Shore hardness testers**

**Test stand set for Shore hardness tester**

- **Application:** For mounting ATORN SHORE hardness testers. Ideal for accurate and reproducible individual and series measurements.
- **Execution:**
  - Robust aluminium test unit
  - Height adjustable
- **Advantage:** Tilt lever for shock-free and constant test force
- **Technical Data:**
  - Overhang: 115 mm
  - Test table diameter: 98 mm
  - Max. sample thickness: 180 mm
  - Test unit material: Alu construction

<table>
<thead>
<tr>
<th>Prod. Gr.</th>
<th>ATORN test stands for Shore hardness tester</th>
<th>Ident. No.</th>
<th>Unit price, €</th>
</tr>
</thead>
<tbody>
<tr>
<td>42195...</td>
<td>ATORN test stands for Shore hardness tester</td>
<td></td>
<td>120</td>
</tr>
</tbody>
</table>

Test stand with SHORE A hardness tester

**Shore D loading weight**

- **For ATORN test stands**
- **Technical Data:**
  - Load weight material: Stainless steel A2 1.4305

<table>
<thead>
<tr>
<th>Prod. Gr.</th>
<th>ATORN loading weight Shore D</th>
<th>Ident. No.</th>
<th>Unit price, €</th>
</tr>
</thead>
<tbody>
<tr>
<td>42195...</td>
<td>ATORN loading weight Shore D</td>
<td></td>
<td>130</td>
</tr>
</tbody>
</table>

Hardness reference plates

- **BRINELL in line with DIN EN ISO 6506-3**
- **ROCKWELL in line with DIN EN ISO 6508-3**
- **VICKERS in line with DIN EN ISO 6507-3**

**Application:** Hardness reference plates are indispensable tools for indirect and periodic checking the functioning and measuring the uncertainty of hardness testing devices.

**Requirements to hardness reference plates (HVPL) as calibration masters:**

HVPLs should embody the measured variables as accurately as possible and remain unchanged over their service life. This means during the production of these plates, a uniform hardness (homogeneity of the structure) must be aimed for over the complete tested surface. Nowadays this is achieved by selecting the correct material and thermal treatment. On the other hand:

- The number of test indentations
- The dimensions of the plate (above all of the plate thickness)
- The distances between the test indentations and up to the edge
- Hardness value drift is unavoidable. To minimise this drift, standards define the dimensions of the plates as well as the minimum distances of the test indentations from one another and to the edge.

- **Example of a Vickers plate according to EN ISO 6507:**
  - Dimensions:
  - HV1–HV10: Triangle with 35 mm edge length, 6 mm thick
  - HV30: Triangle with 70 mm edge length, 6 mm thick
  - **Minimum intervals between test indentations (centres):**
  - Steel/copper alloys: 3x average diagonal length of test indentation
  - Pb/Sn/Zn/Al: 6x average diagonal length of test indentation
  - **Minimum intervals between test indentations (centres) and edge of sample:**
  - Steel/copper alloys: 2.5x average diagonal length of test indentation
  - Pb/Sn/Zn/Al: 3x average diagonal length of test indentation
  - **Calibration of hardness reference plates:**
  - Calibration is performed on a hardness calibration device. The test area is divided into 5 equal segments and a hardness value determined in each segment. The calibration value is the average of these 5 hardness values.
  - The range R is determined from the difference between the largest and smallest measured value. The relative range $R_{rel}$ is calculated from the range $R$ divided by the average value.
  - A further parameter is measurement uncertainty $u$ (in line with GUM). This is calculated from the standard deviation from these 5 hardness values (standard deviation $2\lambda - \leq$ measurement uncertainty $u$).

<table>
<thead>
<tr>
<th>Test procedure</th>
<th>Hardness values</th>
</tr>
</thead>
<tbody>
<tr>
<td>Steel design (extract)</td>
<td>Alumium design (extract)</td>
</tr>
<tr>
<td>Rockwell</td>
<td>HR 15-N, HR 30-TW*, etc.</td>
</tr>
<tr>
<td>Vickers</td>
<td>HRF, HRE, HR 30-TW*</td>
</tr>
</tbody>
</table>

HV 5–HV 60

Generating a hardness indentation
Hardness testing and metallography

Hardness reference plates

<table>
<thead>
<tr>
<th>Testing method</th>
<th>HV 0.010–HV 2</th>
<th>HV 1–HV 150</th>
</tr>
</thead>
<tbody>
<tr>
<td>Vickers-Micro</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Vickers-Makro</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Brinell</td>
<td>HBW 10/500, HBW 2.5/31.25, HBW 1/10</td>
<td>HBW 5/62.5, HBW 2.5/31.25</td>
</tr>
<tr>
<td>LEEB</td>
<td>380 HV 100, 420 HV 100**</td>
<td></td>
</tr>
<tr>
<td>UCI</td>
<td>HRC, HV 1, HV 5, HV 10</td>
<td></td>
</tr>
</tbody>
</table>

All hardness reference plates are delivered with a DKD calibration certificate of the Material Testing Agency MPA North-Rhine Westphalia.

Hardness comparison plates

Test procedure HBW

<table>
<thead>
<tr>
<th>Ball Ø (mm)</th>
<th>2.5</th>
<th>5.0</th>
<th>10.0</th>
</tr>
</thead>
<tbody>
<tr>
<td>Test force (N)</td>
<td>187.5</td>
<td>750</td>
<td>3000</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Hardness value</th>
<th>HBW</th>
<th>HBW</th>
<th>HBW</th>
</tr>
</thead>
<tbody>
<tr>
<td>150</td>
<td>002 O. R. 020 O. R. 040 O. R.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>250</td>
<td>004 O. R. 022 O. R. 042 O. R.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>350</td>
<td>008 O. R. 026 O. R. 046 O. R.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>450</td>
<td>012 O. R. 030 O. R. 050 O. R.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>550</td>
<td>014 (O. R.) - - 054 O. R.</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Prod. Gr. 424

Application:
For indirect and periodic checking of functionality and measurement inaccuracy of hardness testers in line with the HBW test method.

Execution:
- Fine-grained, homogeneous steel
- MPA certificate

Hardness comparison plates

HV test procedure

<table>
<thead>
<tr>
<th>Testing method</th>
<th>HV 1</th>
<th>HV 3</th>
<th>HV 5</th>
<th>HV 10</th>
<th>HV 30</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hardness value</td>
<td>12365... Ident. No.</td>
<td>12365... Ident. No.</td>
<td>12365... Ident. No.</td>
<td>12365... Ident. No.</td>
<td>12365... Ident. No.</td>
</tr>
<tr>
<td>240</td>
<td>138 O. R. - - 168 O. R. 184 O. R. 198 O. R.</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>300</td>
<td>140 O. R. - - 170 O. R. 185 O. R. 200 O. R.</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>450</td>
<td>142 O. R. 158 O. R. 172 O. R. 188 O. R. 202 O. R.</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>540</td>
<td>144 O. R. 160 O. R. 174 O. R. 190 O. R. 204 O. R.</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>620</td>
<td>146 O. R. - - 176 O. R. 192 O. R. 206 O. R.</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>840</td>
<td>150 O. R. 166 O. R. - - 196 O. R. 210 O. R.</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Prod. Gr. 424

Application:
For indirect and periodic checking of functionality and measurement inaccuracy of hardness testers in line with the HV test method.

Execution:
- Fine-grained, homogeneous steel
- MPA certificate

Hardness comparison plates

HRA test method

<table>
<thead>
<tr>
<th>Hardness value</th>
<th>42365... Ident. No.</th>
<th>42365... Ident. No.</th>
<th>42365... Ident. No.</th>
</tr>
</thead>
<tbody>
<tr>
<td>60</td>
<td>302 (O. R.)</td>
<td>304 (O. R.)</td>
<td>306 (O. R.)</td>
</tr>
</tbody>
</table>

Prod. Gr. 424

Application:
For indirect and periodic checking of functionality and measurement inaccuracy of hardness testers in line with the HRA test method.

Execution:
- Fine-grained, homogeneous steel
- MPA certificate
Hardness testing and metallography

Hardness reference plates

TOOLING · MACHINERY EDITION 7

Hardness testing and metallography

Hardness reference plates

TOOLING · MACHINERY EDITION 7

Hardness comparison plates

HRB test method

Application:
For indirect and periodic checking of functionality and measurement inaccuracy of hardness testers in line with the HRB-W test method.

Execution:
- Fine-grained, homogeneous steel
- MPA certificate

<table>
<thead>
<tr>
<th>Hardness value</th>
<th>Testing method</th>
<th>60</th>
<th>90</th>
<th>100</th>
</tr>
</thead>
<tbody>
<tr>
<td>42365...</td>
<td>HRB-W</td>
<td>312</td>
<td>316</td>
<td>318</td>
</tr>
</tbody>
</table>

Unit price, €
- O. R.

Ident. No. 312

Prod. Gr. 424

Hardness comparison plates

Test method HRC

Application:
For indirect and periodic checking of functionality and measurement inaccuracy of hardness testers in line with the HRC test method.

Execution:
- Fine-grained, homogeneous steel
- MPA certificate

<table>
<thead>
<tr>
<th>Hardness value</th>
<th>Testing method</th>
<th>20</th>
<th>30</th>
<th>40</th>
<th>45</th>
<th>50</th>
<th>55</th>
<th>60</th>
<th>62/63</th>
<th>65</th>
</tr>
</thead>
<tbody>
<tr>
<td>42365...</td>
<td>HRC</td>
<td>320</td>
<td>322</td>
<td>324</td>
<td>326</td>
<td>328</td>
<td>330</td>
<td>332</td>
<td>334</td>
<td>336</td>
</tr>
</tbody>
</table>

Unit price, €
- O. R.

Ident. No. 332

Prod. Gr. 424

Ultrasonic cleaning devices

Fundamentals:
Ultrasonic cleaning is one of the most modern cleaning methods available. It achieves maximum cleanliness of the treated parts, even in hard-to-reach areas, yet is extremely gentle to the material being cleaned. Optimum ultrasonic cleaning depends essentially on four factors:

- Cleaning device
- Cleaning chemicals
- Temperature
- Time

Applications:
- Suitable for removing grease, oils, fluxes, grinding and polishing abrasives, paint residue, oxide layers, scales etc.
- Can be used for ferrous and non-ferrous materials, plastics, glass etc. (mechanical, electronic, optical and medical components)

Ultrasonic cleaning terms
- Ultrasonic oscillator systems: high frequency (HF) energy is produced by an ultrasonic generator, converted into mechanical energy by piezoelectric oscillator systems and applied to the bath fluid. This creates millions of microscopic vacuum bubbles that implode as a result of pressure fluctuations. Highly effective fluid flows (jets) are generated that remove dirt particles from the surfaces of immersed items.
- Sweep function: this function produces homogeneous sound field distribution by continuously shifting of the sound field maxima. The result is an optimal distribution of cleaning performance in the cleaning bath.
- Degas and auto-degas function: fresh cleaning fluid is saturated with air. The bath fluid is degassed to optimise the effect of ultrasound.
- Pulse function: can be switched on to increase electronic performance. Approx. 20% more vacuum bubbles than the sweep function (model series X-tra basic, XL and X-tra line).
- Selecting a suitable cleaning tub:
  - The useful dimensions of the cleaning tub, eventually also of the cleaning basket, depend on the dimensions of the parts to be cleaned and their positioning in the cleaning tub.
  - Can be used to lean individual parts, multiple parts at the same time or bulk materials. Either a cleaning basket or a handling device with an appropriate fixture for attaching the items to be cleaned can be used in the bath.
**Ultrasonic single-frequency cleaning device USR S**

**Single-frequency device without heating system**

**Application:**
USR S model ultrasonic cleaning devices without heating systems are designed as single-frequency devices. They are used primarily in the metalworking industry for gentle, intensive cleaning of parts made from steel, light metal, non-ferrous base metal, plastic and glass. The temperature-controlled heating system helps dissolve dirt thereby improving cleaning times and cleaning results. Ideal for removing greases, oils, swarf, flux, paint residue, soot, scale, dust etc.

**Execution:**
- Single-frequency devices 37 kHz
- Table-mounted device with controls on front
- Ultrasonic bath made from special, highly cavitation-proof stainless steel

**Advantage:**
- Sweep function facilitates homogeneous sound distribution in cleaning bath and improves cleaning performance
- Autodegas/degas functions for rapid degassing
- Integrated fill level marking

**scope of supply and services:**
Ultrasonic cleaning device basic unit USR S without cover and insert basket. (Exception: USR S/10 incl. plastic cover)

**Technical Data:**
- Single frequency: 37 kHz
- Min./max. nominal voltage: 220 / 240 V/AC

**Model | USR S 10 | USR S 30**
---|---|---
Max. tray contents (l) | 0.8 | 2.75
Tray width (inner) (mm) | 190 | 240
Tray depth (inner) (mm) | 85 | 137
Tray height (inner) (mm) | 60 | 100
Effective ultrasonic capacity (W) | 30 | 80
Max. ultrasound peak capacity (W) | 240 | 320
Max. power drain (W) | 30 | 80
Outlet connection (in) | 0 | 3/8

<table>
<thead>
<tr>
<th>43690...</th>
<th>Ident. No.</th>
<th>Unit price, €</th>
</tr>
</thead>
<tbody>
<tr>
<td>43690 011</td>
<td>O. R.</td>
<td>211</td>
</tr>
<tr>
<td>43690 031</td>
<td>O. R.</td>
<td>231</td>
</tr>
</tbody>
</table>

**Ultrasonic single-frequency cleaning device USR S/H**

**Single-frequency device with heating system**

**Application:**
USR S model ultrasonic cleaning devices with heating system H are designed as single-frequency devices. They are used primarily in the metalworking industry for gentle, intensive cleaning of parts made from steel, light metal, non-ferrous base metal, plastic and glass. The temperature-controlled heating system helps dissolve dirt thereby improving cleaning times and cleaning results. Ideal for removing greases, oils, swarf, soot, scale, dust etc.

**Execution:**
- Single-frequency devices 37 kHz
- Double half-wave sound adapted to bath geometry
- Table-mounted device with controls on front
- Ultrasonic bath made from special, highly cavitation-proof stainless steel
- Cleaning time and temperature pre-selection can be set via separate rotary dials

**Advantage:**
- Temperature dial for setting range from 30°C to 80°C in 5° increments
- Dry-run-proof ceramic heating
- Freely-positionable drain on rear of device

**scope of supply and services:**
Ultrasonic cleaning device basic unit USR S/H without insert basket and standard cover

**Technical Data:**
- Single frequency: 37 kHz
- Min./max. nominal voltage: 220 / 240 V/AC

**Model | USR S 30H | USR S 40H | USR S 60H | USR S 100H | USR S 120H | USR S 180H | USR S 300H | USR S 450H | USR S 900H**
---|---|---|---|---|---|---|---|---|---
Max. tray contents (l) | 0.8 | 2.75 | 5.75 | 9.5 | 12.75 | 18 | 28 | 45 | 90
Tray width (inner) (mm) | 240 | 240 | 300 | 300 | 377 | 500 | 600 | 800 | 1000
Tray depth (inner) (mm) | 137 | 137 | 151 | 240 | 240 | 300 | 300 | 300 | 300
Tray height (inner) (mm) | 100 | 150 | 150 | 150 | 200 | 200 | 200 | 300 | 300
Effective ultrasonic capacity (W) | 80 | 140 | 150 | 200 | 200 | 200 | 300 | 400 | 800
Max. ultrasound peak capacity (W) | 320 | 560 | 600 | 600 | 800 | 800 | 1200 | 1600 | 3200
Heating power (W) | 200 | 200 | 400 | 600 | 800 | 800 | 1200 | 1600 | 2000
Max. power drain (W) | 280 | 340 | 550 | 550 | 1000 | 1000 | 1500 | 2000 | 2800

<table>
<thead>
<tr>
<th>43690...</th>
<th>Ident. No.</th>
<th>Unit price, €</th>
</tr>
</thead>
<tbody>
<tr>
<td>43690 031</td>
<td>O. R.</td>
<td>043</td>
</tr>
<tr>
<td>43690 211</td>
<td>O. R.</td>
<td>046</td>
</tr>
<tr>
<td>43690 311</td>
<td>O. R.</td>
<td>031</td>
</tr>
<tr>
<td>43690 411</td>
<td>O. R.</td>
<td>031</td>
</tr>
<tr>
<td>43690 231</td>
<td>O. R.</td>
<td>031</td>
</tr>
<tr>
<td>43690 046</td>
<td>O. R.</td>
<td>031</td>
</tr>
<tr>
<td>43690 031</td>
<td>O. R.</td>
<td>031</td>
</tr>
<tr>
<td>43690 031</td>
<td>O. R.</td>
<td>031</td>
</tr>
<tr>
<td>43690 031</td>
<td>O. R.</td>
<td>031</td>
</tr>
</tbody>
</table>

**Fig. with standard cover made of stainless steel**

**Fig. with standard cover made of plastic**

**Fig. with standard cover made of Hostalen (polyethylene) immersion basket**

**Fig. with standard cover made of Hostalen (polyethylene) immersion basket**

**Fig. with standard cover made of Hostalen (polyethylene) immersion basket**

**Fig. with standard cover made of Hostalen (polyethylene) immersion basket**

**Fig. with standard cover made of Hostalen (polyethylene) immersion basket**

**Fig. with standard cover made of Hostalen (polyethylene) immersion basket**

**Fig. with standard cover made of Hostalen (polyethylene) immersion basket**
Insert basket for model series USR
Model series USR

Execution:
- Stainless steel insert basket

Submersible baskets for ultrasonic cleaning devices

Application:
- Ident. No. 311: Ideal for high-quality, sensitive small parts.
- Ident. No. 411: Ideal for small parts.

Execution:
- Ident. No. 311:
  - Hostalen (polyethylene) immersion basket
  - Closed immersion basket without cover
- Ident. No. 411:
  - Stainless steel immersion basket
  - Close-meshed immersion basket without cover

<table>
<thead>
<tr>
<th>Basket width (inner) (mm)</th>
<th>Basket depth (inner) (mm)</th>
<th>Basket height (inner) (mm)</th>
<th>Wire Ø (mm)</th>
<th>Cage mesh size (mm)</th>
<th>Max. cage load (kg)</th>
<th>Prod. Gr. 432</th>
</tr>
</thead>
<tbody>
<tr>
<td>177</td>
<td>73</td>
<td>30</td>
<td>1</td>
<td>7</td>
<td>1</td>
<td>211</td>
</tr>
<tr>
<td>198</td>
<td>106</td>
<td>50</td>
<td>1</td>
<td>7</td>
<td>1</td>
<td>231</td>
</tr>
<tr>
<td>190</td>
<td>105</td>
<td>75</td>
<td>1</td>
<td>7</td>
<td>3</td>
<td>243</td>
</tr>
<tr>
<td>255</td>
<td>115</td>
<td>75</td>
<td>1</td>
<td>9</td>
<td>5</td>
<td>246</td>
</tr>
<tr>
<td>255</td>
<td>200</td>
<td>75</td>
<td>1</td>
<td>9</td>
<td>5</td>
<td>251</td>
</tr>
<tr>
<td>250</td>
<td>190</td>
<td>115</td>
<td>1</td>
<td>9</td>
<td>7</td>
<td>263</td>
</tr>
<tr>
<td>280</td>
<td>250</td>
<td>115</td>
<td>1</td>
<td>9</td>
<td>8</td>
<td>271</td>
</tr>
<tr>
<td>455</td>
<td>250</td>
<td>115</td>
<td>1</td>
<td>9</td>
<td>10</td>
<td>283</td>
</tr>
<tr>
<td>455</td>
<td>270</td>
<td>194</td>
<td>1</td>
<td>9</td>
<td>20</td>
<td>291</td>
</tr>
<tr>
<td>545</td>
<td>450</td>
<td>250</td>
<td>1.2</td>
<td>16</td>
<td>30</td>
<td>293</td>
</tr>
</tbody>
</table>

Unit price, €
Prod. Gr. 432

<table>
<thead>
<tr>
<th>Ø (mm)</th>
<th>Height (mm)</th>
<th>Prod. Gr. 432</th>
</tr>
</thead>
<tbody>
<tr>
<td>74</td>
<td>50</td>
<td>59</td>
</tr>
<tr>
<td>59</td>
<td>60</td>
<td>43690...</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Prod. Gr. 432</th>
</tr>
</thead>
<tbody>
<tr>
<td>43690...</td>
</tr>
<tr>
<td>311</td>
</tr>
<tr>
<td>411</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Ø (mm)</th>
<th>Prod. Gr. 432</th>
</tr>
</thead>
<tbody>
<tr>
<td>74</td>
<td>311</td>
</tr>
<tr>
<td>59</td>
<td>411</td>
</tr>
</tbody>
</table>

Unit price, €
Prod. Gr. 432
Ultrasonic cleaning
Ultrasonic cleaning devices

Ultrasonic multi-frequency cleaning device TI-H
Multi-frequency device with heating system up to 20 litre tank capacity

Application:
Removes greases, oils, swarf, flux, paint residue, soot, scale, dust etc. X-tra basic ultrasonic cleaning devices are designed as multi-frequency devices with a bath capacity up to 20 litres. They are used primarily in the metalworking industry for gentle, intensive cleaning of parts made from steel, light metal, non-ferrous base metal, plastic and glass. These devices are also suitable for cleaning spindle-side tool fixtures and preliminary cleaning of parts for subsequent surface treatment. 25 kHz ultrasonic frequency for coarse and preliminary cleaning, 45 kHz for fine cleaning.

Advantage:
• Sweep function facilitates homogeneous sound distribution in cleaning bath
• All devices are equipped with multi-frequency (25/45 kHz), bottom-mounted transducers and heating
• Temperature-controlled ultrasound activation at pre-heated temperature

Scope of supply and services:
Ultrasonic cleaning device basic unit TI-H without insert basket and standard cover

Technical Data:
• Tray height (inner): 200 mm
• Multi-frequency: 25 kHz/45 kHz
• Oscillation: No
• Min./max. nominal voltage: 220 / 240 V/AC

Execution:
• Multi-frequency devices with 25 and 45 kHz for coarse, preliminary and fine cleaning
• Heating system with temperature regulation from 30°C to 80°C
• Table-mounted device with controls on front
• Ultrasonic bath made from special, highly cavitation-proof stainless steel

<table>
<thead>
<tr>
<th>Model</th>
<th>TH 15</th>
<th>TH 20</th>
</tr>
</thead>
<tbody>
<tr>
<td>Max. tray contents (l)</td>
<td>14.4</td>
<td>19.8</td>
</tr>
<tr>
<td>Tray width (inner) (mm)</td>
<td>300</td>
<td>330</td>
</tr>
<tr>
<td>Tray depth (inner) (mm)</td>
<td>240</td>
<td>300</td>
</tr>
<tr>
<td>Effective ultrasonic capacity (W)</td>
<td>200</td>
<td>250</td>
</tr>
<tr>
<td>Max. ultrasound peak capacity (W)</td>
<td>800</td>
<td>1000</td>
</tr>
<tr>
<td>Heating power (W)</td>
<td>1000</td>
<td>1400</td>
</tr>
<tr>
<td>Max. power drain (W)</td>
<td>1200</td>
<td>1650</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>43690...</th>
<th>Ident. No.</th>
<th>Unit price, €</th>
</tr>
</thead>
<tbody>
<tr>
<td>506</td>
<td>(O. R.)</td>
<td>508</td>
</tr>
<tr>
<td>508</td>
<td>(O. R.)</td>
<td>508</td>
</tr>
</tbody>
</table>

ARE YOU LOOKING FOR EVEN MORE BRANDS?
WE HAVE WHAT IT TAKES.

For a complete range of products that meet the toughest demands, visit www.hahn-kolb.com

Ident. No.

Insert basket for ultrasonic cleaning device
Model series TI-H

Execution:
• Stainless steel insert basket

<table>
<thead>
<tr>
<th>Basket width (inner) (mm)</th>
<th>Basket depth (inner) (mm)</th>
<th>Basket height (inner) (mm)</th>
<th>Wire Ø (mm)</th>
<th>Cage mesh size (mm)</th>
<th>Max. cage load (kg)</th>
<th>43690...</th>
</tr>
</thead>
<tbody>
<tr>
<td>260</td>
<td>210</td>
<td>135</td>
<td>1</td>
<td>9</td>
<td>7</td>
<td>516 (O. R.)</td>
</tr>
<tr>
<td>290</td>
<td>270</td>
<td>135</td>
<td>1</td>
<td>9</td>
<td>8</td>
<td>518 (O. R.)</td>
</tr>
</tbody>
</table>

Unit price, €
Ultrasonic cleaning device X-tra basic
Multi-frequency device with heating system from 30 litre bath capacity

Application:
Removes greases, oils, lapping and polishing compounds, swarf, flux, paint residue, soot, scale, dust etc. X-tra basic ultrasonic cleaning devices are designed as multi-frequency devices with a bath capacity from 30 litres upwards. They are used primarily in the metalworking industry for gentle, intensive cleaning of parts made from steel, light metal, non-ferrous base metal, plastic and glass. These devices are also suitable for cleaning spindle-side tool fixtures and preliminary cleaning of parts for subsequent surface treatment. The additional pulse function improves cleaning performance for removing particularly stubborn dirt. The result is maximum cleanliness even in hard-to-reach spots. 25 kHz ultrasonic frequency for coarse and preliminary cleaning, 45 kHz for fine cleaning.

Execution:

- Multi-frequency devices with 25 and 45 kHz for coarse, preliminary and fine cleaning
- Heating system with temperature regulation from 30°C to 80°C
- Automatic safety shutdown after 12 h operation or at 90°C bath temperature
- Free-standing device on rollers with controls on front

Advantage:
- Additional pulse function for improving ultrasonic cleaning performance
- Sweep function facilitates homogeneous sound distribution in cleaning bath
- All devices are equipped with multi-frequency (25/45 kHz), bottom-mounted transducers and heating
- Temperature-controlled ultrasound activation at pre-heated temperature
- 3 year warranty if used correctly in single-shift operation

Scope of supply and services:
Ultrasonic cleaning device basic unit X-tra basic without insert basket and standard cover

Technical Data:
- Multi-frequency: 25 kHz/45 kHz
- Oscillation: No

<table>
<thead>
<tr>
<th>Model</th>
<th>X-tra basic 300</th>
<th>X-tra basic 550</th>
<th>X-tra basic 800</th>
<th>X-tra basic 1200</th>
<th>X-tra basic 1600</th>
<th>X-tra basic 2500</th>
</tr>
</thead>
<tbody>
<tr>
<td>Max. tray contents (l)</td>
<td>30</td>
<td>58</td>
<td>83</td>
<td>126</td>
<td>162</td>
<td>255</td>
</tr>
<tr>
<td>Tray width (inner) (mm)</td>
<td>330</td>
<td>500</td>
<td>500</td>
<td>600</td>
<td>600</td>
<td>600</td>
</tr>
<tr>
<td>Tray depth (inner) (mm)</td>
<td>300</td>
<td>330</td>
<td>330</td>
<td>600</td>
<td>600</td>
<td>600</td>
</tr>
<tr>
<td>Tray height (inner) (mm)</td>
<td>300</td>
<td>350</td>
<td>500</td>
<td>350</td>
<td>450</td>
<td>500</td>
</tr>
<tr>
<td>Effective ultrasonic capacity (W)</td>
<td>600</td>
<td>1000</td>
<td>1000</td>
<td>1800</td>
<td>2000</td>
<td>2000</td>
</tr>
<tr>
<td>Max. ultrasound peak capacity (W)</td>
<td>2400</td>
<td>4000</td>
<td>4000</td>
<td>7200</td>
<td>8000</td>
<td>8000</td>
</tr>
<tr>
<td>Heating power (W)</td>
<td>1700</td>
<td>2900</td>
<td>5800</td>
<td>5800</td>
<td>7500</td>
<td>7500</td>
</tr>
<tr>
<td>Max. power drain (W)</td>
<td>2310</td>
<td>3910</td>
<td>6810</td>
<td>7620</td>
<td>9520</td>
<td>9520</td>
</tr>
<tr>
<td>Nominal voltage (V/AC)</td>
<td>220</td>
<td>400</td>
<td>400</td>
<td>400</td>
<td>400</td>
<td>400</td>
</tr>
<tr>
<td>Outlet connection (in)</td>
<td>3/4</td>
<td>3/4</td>
<td>3/4</td>
<td>1</td>
<td>1</td>
<td>1</td>
</tr>
</tbody>
</table>

Accessories for X-tra basic Model series X-tra basic

<table>
<thead>
<tr>
<th>43690...</th>
<th>Ident. No.</th>
<th>Unit price, €</th>
</tr>
</thead>
<tbody>
<tr>
<td>703</td>
<td>(O. R.)</td>
<td>706</td>
</tr>
<tr>
<td>706</td>
<td>(O. R.)</td>
<td>709</td>
</tr>
<tr>
<td>712</td>
<td>(O. R.)</td>
<td>715</td>
</tr>
<tr>
<td>718</td>
<td>(O. R.)</td>
<td></td>
</tr>
</tbody>
</table>

Insert basket for ultrasonic cleaning device Model series X-tra basic

<table>
<thead>
<tr>
<th>Basket width (inner) (mm)</th>
<th>Basket depth (inner) (mm)</th>
<th>Basket height (inner) (mm)</th>
<th>Wire Ø (mm)</th>
<th>Cage mesh size (mm)</th>
<th>Max. cage load (kg)</th>
<th>43690...</th>
</tr>
</thead>
<tbody>
<tr>
<td>255</td>
<td>230</td>
<td>165</td>
<td>2</td>
<td>20</td>
<td>12</td>
<td>903</td>
</tr>
<tr>
<td>415</td>
<td>255</td>
<td>210</td>
<td>2</td>
<td>20</td>
<td>25</td>
<td>905</td>
</tr>
<tr>
<td>400</td>
<td>255</td>
<td>360</td>
<td>2</td>
<td>20</td>
<td>40</td>
<td>909</td>
</tr>
<tr>
<td>490</td>
<td>525</td>
<td>200</td>
<td>2</td>
<td>20</td>
<td>50</td>
<td>912</td>
</tr>
<tr>
<td>480</td>
<td>575</td>
<td>300</td>
<td>2</td>
<td>20</td>
<td>50</td>
<td>915</td>
</tr>
<tr>
<td>630</td>
<td>575</td>
<td>365</td>
<td>2</td>
<td>20</td>
<td>50</td>
<td>918</td>
</tr>
</tbody>
</table>

Insert basket in dripping position

Prod. Gr. 432

Ultrasonic cleaning device X-tra basic
Multi-frequency device with heating system from 30 litre bath capacity

Application:
Removes greases, oils, lapping and polishing compounds, swarf, flux, paint residue, soot, scale, dust etc. X-tra basic ultrasonic cleaning devices are designed as multi-frequency devices with a bath capacity from 30 litres upwards. They are used primarily in the metalworking industry for gentle, intensive cleaning of parts made from steel, light metal, non-ferrous base metal, plastic and glass. These devices are also suitable for cleaning spindle-side tool fixtures and preliminary cleaning of parts for subsequent surface treatment. The additional pulse function improves cleaning performance for removing particularly stubborn dirt. The result is maximum cleanliness even in hard-to-reach spots. 25 kHz ultrasonic frequency for coarse and preliminary cleaning, 45 kHz for fine cleaning.

Execution:

- Multi-frequency devices with 25 and 45 kHz for coarse, preliminary and fine cleaning
- Heating system with temperature regulation from 30°C to 80°C
- Automatic safety shutdown after 12 h operation or at 90°C bath temperature
- Free-standing device on rollers with controls on front

Advantage:
- Additional pulse function for improving ultrasonic cleaning performance
- Sweep function facilitates homogeneous sound distribution in cleaning bath
- All devices are equipped with multi-frequency (25/45 kHz), bottom-mounted transducers and heating
- Temperature-controlled ultrasound activation at pre-heated temperature
- 3 year warranty if used correctly in single-shift operation

Scope of supply and services:
Ultrasonic cleaning device basic unit X-tra basic without insert basket and standard cover

Technical Data:
- Multi-frequency: 25 kHz/45 kHz
- Oscillation: No

<table>
<thead>
<tr>
<th>Model</th>
<th>X-tra basic 300</th>
<th>X-tra basic 550</th>
<th>X-tra basic 800</th>
<th>X-tra basic 1200</th>
<th>X-tra basic 1600</th>
<th>X-tra basic 2500</th>
</tr>
</thead>
<tbody>
<tr>
<td>Max. tray contents (l)</td>
<td>30</td>
<td>58</td>
<td>83</td>
<td>126</td>
<td>162</td>
<td>255</td>
</tr>
<tr>
<td>Tray width (inner) (mm)</td>
<td>330</td>
<td>500</td>
<td>500</td>
<td>600</td>
<td>600</td>
<td>600</td>
</tr>
<tr>
<td>Tray depth (inner) (mm)</td>
<td>300</td>
<td>330</td>
<td>330</td>
<td>600</td>
<td>600</td>
<td>600</td>
</tr>
<tr>
<td>Tray height (inner) (mm)</td>
<td>300</td>
<td>350</td>
<td>500</td>
<td>350</td>
<td>450</td>
<td>500</td>
</tr>
<tr>
<td>Effective ultrasonic capacity (W)</td>
<td>600</td>
<td>1000</td>
<td>1000</td>
<td>1800</td>
<td>2000</td>
<td>2000</td>
</tr>
<tr>
<td>Max. ultrasound peak capacity (W)</td>
<td>2400</td>
<td>4000</td>
<td>4000</td>
<td>7200</td>
<td>8000</td>
<td>8000</td>
</tr>
<tr>
<td>Heating power (W)</td>
<td>1700</td>
<td>2900</td>
<td>5800</td>
<td>5800</td>
<td>7500</td>
<td>7500</td>
</tr>
<tr>
<td>Max. power drain (W)</td>
<td>2310</td>
<td>3910</td>
<td>6810</td>
<td>7620</td>
<td>9520</td>
<td>9520</td>
</tr>
<tr>
<td>Nominal voltage (V/AC)</td>
<td>220</td>
<td>400</td>
<td>400</td>
<td>400</td>
<td>400</td>
<td>400</td>
</tr>
<tr>
<td>Outlet connection (in)</td>
<td>3/4</td>
<td>3/4</td>
<td>3/4</td>
<td>1</td>
<td>1</td>
<td>1</td>
</tr>
</tbody>
</table>

Accessories for X-tra basic Model series X-tra basic

<table>
<thead>
<tr>
<th>43690...</th>
<th>Ident. No.</th>
<th>Unit price, €</th>
</tr>
</thead>
<tbody>
<tr>
<td>703</td>
<td>(O. R.)</td>
<td>706</td>
</tr>
<tr>
<td>706</td>
<td>(O. R.)</td>
<td>709</td>
</tr>
<tr>
<td>712</td>
<td>(O. R.)</td>
<td>715</td>
</tr>
<tr>
<td>718</td>
<td>(O. R.)</td>
<td></td>
</tr>
</tbody>
</table>

Insert basket for ultrasonic cleaning device Model series X-tra basic

<table>
<thead>
<tr>
<th>Basket width (inner) (mm)</th>
<th>Basket depth (inner) (mm)</th>
<th>Basket height (inner) (mm)</th>
<th>Wire Ø (mm)</th>
<th>Cage mesh size (mm)</th>
<th>Max. cage load (kg)</th>
<th>43690...</th>
</tr>
</thead>
<tbody>
<tr>
<td>255</td>
<td>230</td>
<td>165</td>
<td>2</td>
<td>20</td>
<td>12</td>
<td>903</td>
</tr>
<tr>
<td>415</td>
<td>255</td>
<td>210</td>
<td>2</td>
<td>20</td>
<td>25</td>
<td>905</td>
</tr>
<tr>
<td>400</td>
<td>255</td>
<td>360</td>
<td>2</td>
<td>20</td>
<td>40</td>
<td>909</td>
</tr>
<tr>
<td>490</td>
<td>525</td>
<td>200</td>
<td>2</td>
<td>20</td>
<td>50</td>
<td>912</td>
</tr>
<tr>
<td>480</td>
<td>575</td>
<td>300</td>
<td>2</td>
<td>20</td>
<td>50</td>
<td>915</td>
</tr>
<tr>
<td>630</td>
<td>575</td>
<td>365</td>
<td>2</td>
<td>20</td>
<td>50</td>
<td>918</td>
</tr>
</tbody>
</table>

Insert basket in dripping position

Prod. Gr. 432
Spring balances with spherical probe

Application:
For testing and setting control elements with adjustable friction moments, contact forces in electrical switch gears and regulating and controlling elements in motor vehicles.

Execution:
- Measuring possible in both directions
- Dial face with scale in centinewtons (cN) or newtons (N)
- Error limit 0.01 x (final value + measured value)
- Trailing pointer
- Ident. No. 151: Shortened sensor lever

Scope of supply and services:
In case

<table>
<thead>
<tr>
<th>Min./max. force of measuring range</th>
<th>3-30 cN</th>
<th>5-50 cN</th>
<th>10-100 cN</th>
<th>25-250 cN</th>
<th>50-500 cN</th>
<th>100-1000 cN</th>
<th>300-3000 cN</th>
<th>500-5000 cN</th>
<th>1000-10000 cN</th>
</tr>
</thead>
<tbody>
<tr>
<td>Scale value, force (cN)</td>
<td>1</td>
<td>1</td>
<td>2</td>
<td>5</td>
<td>10</td>
<td>20</td>
<td>50</td>
<td>100</td>
<td>200</td>
</tr>
<tr>
<td>Meter Ø (mm)</td>
<td>36</td>
<td>36</td>
<td>36</td>
<td>36</td>
<td>72</td>
<td>72</td>
<td>72</td>
<td>72</td>
<td>72</td>
</tr>
<tr>
<td>Sensor length (mm)</td>
<td>29</td>
<td>29</td>
<td>29</td>
<td>29</td>
<td>48</td>
<td>48</td>
<td>48</td>
<td>48</td>
<td>8</td>
</tr>
<tr>
<td>Weight (g)</td>
<td>64</td>
<td>64</td>
<td>64</td>
<td>64</td>
<td>260</td>
<td>260</td>
<td>278</td>
<td>294</td>
<td>290</td>
</tr>
<tr>
<td>Ident. No. 4100</td>
<td>041</td>
<td>051</td>
<td>061</td>
<td>081</td>
<td>091</td>
<td>101</td>
<td>121</td>
<td>131</td>
<td>151</td>
</tr>
</tbody>
</table>

Tensile and compressive force measuring device

**Mechanical, model 1191**

Application:
Robust, mechanical handheld force measuring unit for mobile applications, for bi-directional force measurement in workshops and in quality assurance.

Execution:
- High-precision measuring springs arranged in opposing directions
- Force-proportional precision gauge for measuring travel
- Calibration is carried out using reference measuring devices or weights

Advantage:
- Robust, simple and safe to use
- Maintenance-free

Scope of supply and services:
Pressure plate diameter 23 mm, draw hook, 2 extensions M6 x 15 or 45 mm, factory calibration certificate and transport case.

Technical Data:
- Meter diameter: 50 mm
- Trailing pointer: Yes
- Error limit | based on end value: +/- 1 %

<table>
<thead>
<tr>
<th>Min./max. force of measuring range</th>
<th>0-50 N</th>
<th>0-100 N</th>
<th>0-200 N</th>
<th>0-500 N</th>
</tr>
</thead>
<tbody>
<tr>
<td>Scale value, force (N)</td>
<td>0.5</td>
<td>1</td>
<td>2</td>
<td>10</td>
</tr>
<tr>
<td>Ident. No. 4165</td>
<td>020</td>
<td>030</td>
<td>040</td>
<td>050</td>
</tr>
<tr>
<td>Unit price, €</td>
<td>O. R.</td>
<td>O. R.</td>
<td>O. R.</td>
<td>O. R.</td>
</tr>
</tbody>
</table>

Tensile and compressive force measuring device

**Electronic, model 326**

Application:
Robust, electronic handheld force measuring unit for mobile applications, for checking actuation forces and rigidity of assemblies and components such as springs, buttons, switches, levers, closures etc. This unit is used primarily in quality assurance, incoming goods inspections, production and research and development.

Execution:
- Fixed measuring frequency from 1000 Hz
- High-resolution force sensor
- Processor-controlled electronics with the latest software
- Calibration is carried out using reference measuring devices or weights
- Rechargeable batteries ensure smooth operation
- Peak value memory for tensile and compressive forces
- 5-digit LCD display + comma with optional backlight

Advantage:
- Display resolution +/- 20,000 digits
- Simple and safe to use
- Maintenance-free, electronic handheld force measuring device for mobile applications
- Once saved, basic settings remain stored even when the device is switched off
- Ergonomic design, therefore suitable for left and right-handed users
- Fixed installation possible in testing devices

Scope of supply and services:
Unit with battery pack set, 230 V AC power supply unit/charger, USB connection cable, factory calibration certificate, transport case, accessories (see above).

Technical Data:
- Error limit | based on end value: 0.1%

<table>
<thead>
<tr>
<th>Min./max. force of measuring range</th>
<th>0-50 N</th>
<th>0-100 N</th>
<th>0-200 N</th>
<th>0-500 N</th>
<th>0-1000 N</th>
<th>0-2000 N</th>
<th>0-5000 N</th>
</tr>
</thead>
<tbody>
<tr>
<td>Digit increment, force (N)</td>
<td>0.02</td>
<td>0.05</td>
<td>0.1</td>
<td>0.2</td>
<td>0.5</td>
<td>1</td>
<td>2</td>
</tr>
<tr>
<td>Connection thread for clamping device</td>
<td>M6</td>
<td>M6</td>
<td>M6</td>
<td>M6</td>
<td>M6</td>
<td>M12</td>
<td>M12</td>
</tr>
<tr>
<td>Ident. No. 4166</td>
<td>006</td>
<td>011</td>
<td>021</td>
<td>051</td>
<td>101</td>
<td>201</td>
<td>501</td>
</tr>
</tbody>
</table>
**Tensile and compressive force measuring device**

**Electronic, model ZD 2**

**Application:**
Robust, electronic handheld force measuring unit for mobile applications, for checking actuation forces and rigidity of assemblies and components such as springs, buttons, switches, levers, closures etc. This unit is used primarily in quality assurance, incoming goods inspections, production and research and development.

**Execution:**
- Adjustable measuring frequencies from 50 Hz to 2000 Hz
- Record measurement curves
- Processor-controlled electronics with the latest WINDOWS CE software
- Store peak values or curves in EXCEL files
- USB 2.0 interface for further processing and storing
- Calibration is carried out using reference measuring devices or weights
- Rechargeable batteries ensure smooth operation
- 7-digit LCD display + comma, with optional backlight

<table>
<thead>
<tr>
<th>Min./max. force of measuring range (N)</th>
<th>0-50 N</th>
<th>0-100 N</th>
<th>0-200 N</th>
<th>0-500 N</th>
<th>0-1000 N</th>
<th>0-2000 N</th>
<th>0-5000 N</th>
</tr>
</thead>
<tbody>
<tr>
<td>Digit increment, force (N)</td>
<td>0.001</td>
<td>0.01</td>
<td>0.01</td>
<td>0.01</td>
<td>0.1</td>
<td>0.1</td>
<td>0.1</td>
</tr>
<tr>
<td>Connection thread for clamping device</td>
<td>M6</td>
<td>M6</td>
<td>M6</td>
<td>M6</td>
<td>M6</td>
<td>M12</td>
<td>M12</td>
</tr>
</tbody>
</table>

**44181...**

<table>
<thead>
<tr>
<th>Ident. No.</th>
<th>Unit price, €</th>
</tr>
</thead>
<tbody>
<tr>
<td>O. R.</td>
<td>O. R.</td>
</tr>
<tr>
<td>005</td>
<td>010</td>
</tr>
<tr>
<td>020</td>
<td>050</td>
</tr>
<tr>
<td>100</td>
<td>200</td>
</tr>
<tr>
<td>500</td>
<td></td>
</tr>
</tbody>
</table>

**Advantage:**
- Display resolution +/- 50,000 digits
- Adjustable measuring frequency
- Real-time measured data display using optional SoftTesT software
- Once saved, basic settings remain stored even when the device is switched off
- Ergonomic design, therefore suitable for left and right-handed users
- Fixed installation possible in testing devices

**scope of supply and services:**
Device with battery pack set, 230 V AC power supply unit/charger, SD memory card, USB connection cable, CD with software and operating instructions, factory calibration certificate, transport case, accessories

**Technical Data:**
- Min. measurement frequency: 50 Hz
- Max. measuring frequency: 2000 Hz
- Error limit | based on end value: 0.5%
- Data transmission type: USB

---

**Cylindrical spring force meter**

**Application:**
For weighing in laboratories and on site

**Execution:**
- Suspension from retaining ring possible
- Load attached by hook
- made from chrome-nickel steel and brass, high-gloss nickel-plated
- Laser-engraved black scale

<table>
<thead>
<tr>
<th>Max. force measuring range (N)</th>
<th>2</th>
<th>5</th>
<th>10</th>
<th>25</th>
<th>50</th>
<th>100</th>
<th>200</th>
<th>300</th>
<th>600</th>
<th>1000</th>
</tr>
</thead>
<tbody>
<tr>
<td>Scale value, force (N)</td>
<td>0.02</td>
<td>0.05</td>
<td>0.1</td>
<td>0.25</td>
<td>0.5</td>
<td>2</td>
<td>4</td>
<td>5</td>
<td>10</td>
<td>20</td>
</tr>
<tr>
<td>Length (mm)</td>
<td>250</td>
<td>250</td>
<td>250</td>
<td>250</td>
<td>255</td>
<td>255</td>
<td>290</td>
<td>342</td>
<td>342</td>
<td>342</td>
</tr>
<tr>
<td>Sleeve Ø (mm)</td>
<td>14.5</td>
<td>14.5</td>
<td>14.5</td>
<td>14.5</td>
<td>14.5</td>
<td>14.5</td>
<td>14.5</td>
<td>18</td>
<td>21</td>
<td>28</td>
</tr>
</tbody>
</table>

**44210...**

<table>
<thead>
<tr>
<th>Ident. No.</th>
<th>Unit price, €</th>
</tr>
</thead>
<tbody>
<tr>
<td>O. R.</td>
<td>O. R.</td>
</tr>
<tr>
<td>010</td>
<td>020</td>
</tr>
<tr>
<td>030</td>
<td>040</td>
</tr>
<tr>
<td>050</td>
<td>060</td>
</tr>
<tr>
<td>070</td>
<td>080</td>
</tr>
<tr>
<td>090</td>
<td>100</td>
</tr>
</tbody>
</table>

**Advantage:**
- Overload protection up to approx. 20% above final value
- Not suitable for dynamic loads
- Error limit <= 1% of end value
- Integrated linear measuring springs

**Technical Data:**
- Min. force measuring range: 0 N

---

**Force measuring cell**

**Analogue measurement display**

**Application:**
For static and quasi-static force measurement on machines and equipment, e.g. hydraulic presses, rolling machines, calenders, bending machines, strength testing machines, torque meters etc.

**Execution:**
- Analogue manometer, diameter 63 mm with trailing pointer
- Force measuring cell made from VA steel in slim design
- Integrated throttle damping
- Two M6 fixing threads on housing floor
- Error limit 2% of final value

**Advantage:**
- Very slim design for in constricted spaces
- Integrated throttle damping for light, abrupt loading and unloading

**scope of supply and services:**
With calibration certificate, in plastic case

**Technical Data:**
- Protruding piston height: 2 mm
- Fastening thread: 2 x M6
- Error limit | based on end value: 2%
- Manometer diameter: 63 mm
KERN electronic hand balance, type CH/HDB
practical suspended scales within reach at all times

**Application:**
For rapid checking of weights with high mobility.

**Execution:**
- Display units: kg/lb/N
- Functions: AUTO-OFF after 5 min.
- Pull-out tape measure, length 1 m
- Data hold function (weight display can be frozen for 5 s)

<table>
<thead>
<tr>
<th>Type description</th>
<th>CH 15K20</th>
<th>CH 50K50</th>
<th>CH 50K100</th>
<th>HDB 5K5N</th>
<th>HDB 10K10</th>
</tr>
</thead>
<tbody>
<tr>
<td>Max. weight measuring range (kg)</td>
<td>15</td>
<td>50</td>
<td>100</td>
<td>5</td>
<td>10</td>
</tr>
<tr>
<td>Digit increment, weight (g)</td>
<td>20</td>
<td>50</td>
<td>100</td>
<td>5</td>
<td>10</td>
</tr>
<tr>
<td>Height (mm)</td>
<td>270</td>
<td>270</td>
<td>270</td>
<td>195</td>
<td>195</td>
</tr>
<tr>
<td>Housing dimensions (LxWxH)</td>
<td>30 x 90 x 176 mm</td>
<td>30 x 90 x 176 mm</td>
<td>30 x 90 x 176 mm</td>
<td>25 x 70 x 105 mm</td>
<td>25 x 70 x 105 mm</td>
</tr>
<tr>
<td>Weight (kg)</td>
<td>0.25</td>
<td>0.25</td>
<td>0.25</td>
<td>0.15</td>
<td>0.15</td>
</tr>
</tbody>
</table>

Prod. Gr. 443

Electronic crane scale, type HFB
Remote control

**Application:**
For mobile use in production, warehousing and shipping.

**Execution:**
- Internal battery operation (up to 40 h operation)
- Data hold function
- Rotating hook with safety lock
- Radio remote control with a range of approx. 20 m
- Large LCD display with 25 mm digit size
- Second display on the rear
- Robust plastic housing

**Advantage:**
- When not in use, the weight display is automatically frozen until the HOLD key is pressed
- Battery operation, compact design and low tare weight for high mobility

**Technical Data:**
- Housing dimensions (LxWxH): 126 x 163 x 159 mm
- Weight: 3.2 kg

<table>
<thead>
<tr>
<th>Type description</th>
<th>HPB 150K50</th>
<th>HPB 300K100</th>
<th>HPB 600K200</th>
</tr>
</thead>
<tbody>
<tr>
<td>Max. weight measuring range (kg)</td>
<td>150</td>
<td>300</td>
<td>600</td>
</tr>
<tr>
<td>Digit increment, weight (g)</td>
<td>50</td>
<td>100</td>
<td>200</td>
</tr>
</tbody>
</table>

Prod. Gr. 447

### KERN electronic hand balance, type CH/HDB
practical suspended scales within reach at all times

**Application:**
For rapid checking of weights with high mobility.

**Execution:**
- Display units: kg/lb/N
- Functions: AUTO-OFF after 5 min.
- Pull-out tape measure, length 1 m
- Data hold function (weight display can be frozen for 5 s)

**Type description**
- CH 15K20
- CH 50K50
- CH 50K100
- HDB 5K5N
- HDB 10K10

**Max. weight measuring range (kg)**
- 15
- 50
- 100
- 5
- 10

**Digit increment, weight (g)**
- 20
- 50
- 100
- 5
- 10

**Height (mm)**
- 270
- 270
- 270
- 195
- 195

**Housing dimensions (LxWxH)**
- 30 x 90 x 176 mm
- 30 x 90 x 176 mm
- 30 x 90 x 176 mm
- 25 x 70 x 105 mm
- 25 x 70 x 105 mm

**Weight (kg)**
- 0.25
- 0.25
- 0.25
- 0.15
- 0.15

**Prod. Gr. 44228...**

### Electronic crane scale, type HFB
Remote control

**Application:**
For mobile use in production, warehousing and shipping.

**Execution:**
- Internal battery operation (up to 40 h operation)
- Data hold function
- Rotating hook with safety lock
- Radio remote control with a range of approx. 20 m
- Large LCD display with 25 mm digit size
- Second display on the rear
- Robust plastic housing

**Advantage:**
- When not in use, the weight display is automatically frozen until the HOLD key is pressed
- Battery operation, compact design and low tare weight for high mobility

**Technical Data:**
- Housing dimensions (LxWxH): 126 x 163 x 159 mm
- Weight: 3.2 kg

<table>
<thead>
<tr>
<th>Type description</th>
<th>HPB 150K50</th>
<th>HPB 300K100</th>
<th>HPB 600K200</th>
</tr>
</thead>
<tbody>
<tr>
<td>Max. weight measuring range (kg)</td>
<td>150</td>
<td>300</td>
<td>600</td>
</tr>
<tr>
<td>Digit increment, weight (g)</td>
<td>50</td>
<td>100</td>
<td>200</td>
</tr>
</tbody>
</table>

**Prod. Gr. 44267...**

---

**Testing equipment**

**Prod. Gr. 490**

---

**Prod. Gr. 443**

---

**Prod. Gr. 447**
Electronic crane scales, type HFM

Application:
For production, quality control and logistics applications. Also suitable for continuous use in industrial environments thanks to the sturdy construction and robust design.

Execution:
- Internal battery operation (up to 60 h operation, battery charge level indicated by three-colour LED)
- Data hold function
- Rotating hook with safety lock

Advantage:
- Radio remote control with a range of approx. 20 m
- Large LCD display with 30 mm digit size

scope of supply and services:
Mains charger, remote control with batteries (2x 1.5 V type AAA)

<table>
<thead>
<tr>
<th>Type description</th>
<th>HFM 1T0.1</th>
<th>HFM 3T0.5</th>
<th>HFM 5T0.5</th>
<th>HFM 10T1</th>
</tr>
</thead>
<tbody>
<tr>
<td>Max. weight measuring range (kg)</td>
<td>1000</td>
<td>3000</td>
<td>5000</td>
<td>10000</td>
</tr>
<tr>
<td>Digit increment, weight (g)</td>
<td>100</td>
<td>500</td>
<td>500</td>
<td>1000</td>
</tr>
<tr>
<td>Housing dimensions (LxWxH)</td>
<td>175 x 270 x 200 mm</td>
<td>175 x 270 x 200 mm</td>
<td>190 x 300 x 230 mm</td>
<td>190 x 300 x 230 mm</td>
</tr>
<tr>
<td>Weight (kg)</td>
<td>15</td>
<td>16.5</td>
<td>25</td>
<td>37</td>
</tr>
</tbody>
</table>

KERN compact scales, type PCB and FCB

Application:
Ident. No. 011–045: For versatile applications in laboratories and production facilities.

Execution:
- Robust ABS housing with stainless steel weighing tray
- Backlit LCD display with 15 mm digit size
- AUTO-OFF function after 3 min. without load change
- PRE-TARE function for manual prior subtraction of known container weights
- Battery operation possible (1x type E-Block, 9 V, not included)

Advantage:
- Option: Battery operation
- Ident. No. 011–045: User-programmable weighing unit (thread length g/m, paper weight g/m²)
- Ident. No. 050–060: Low weight for excellent mobility

scope of supply and services:
Mains adapter

Technical Data:
- With unit counting: Yes
- Data transmission type: RS232

<table>
<thead>
<tr>
<th>Type description</th>
<th>PCB 250-3</th>
<th>PCB 1000-1</th>
<th>PCB 3500-2</th>
<th>PCB 6000-1</th>
<th>PCB 10000-1</th>
<th>FCB 12K1 N</th>
<th>FCB 24K2 N</th>
</tr>
</thead>
<tbody>
<tr>
<td>Max. weight measuring range</td>
<td>250 g</td>
<td>1000 g</td>
<td>3500 g</td>
<td>6000 g</td>
<td>10000 g</td>
<td>12 kg</td>
<td>24 kg</td>
</tr>
<tr>
<td>Digit increment, weight (g)</td>
<td>0.001</td>
<td>0.01</td>
<td>0.01</td>
<td>0.1</td>
<td>0.1</td>
<td>1</td>
<td>2</td>
</tr>
<tr>
<td>Plate length x plate width</td>
<td>130 x 130 mm</td>
<td>130 x 130 mm</td>
<td>150 x 170 mm</td>
<td>150 x 170 mm</td>
<td>252 x 228 mm</td>
<td>252 x 228 mm</td>
<td></td>
</tr>
<tr>
<td>Panel Ø (mm)</td>
<td>81</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Min. item weight (g)</td>
<td>0.002</td>
<td>0.02</td>
<td>0.02</td>
<td>0.2</td>
<td>0.2</td>
<td>2</td>
<td>4</td>
</tr>
<tr>
<td>Linearity (g)</td>
<td>0.003</td>
<td>0.03</td>
<td>0.03</td>
<td>0.3</td>
<td>0.3</td>
<td>3</td>
<td>6</td>
</tr>
<tr>
<td>Housing dimensions (LxWxH)</td>
<td>245 x 163 x 79 mm</td>
<td>245 x 163 x 79 mm</td>
<td>245 x 163 x 79 mm</td>
<td>245 x 136 x 79 mm</td>
<td>245 x 136 x 79 mm</td>
<td>345 x 270 x 106 mm</td>
<td>345 x 270 x 106 mm</td>
</tr>
</tbody>
</table>

|-----------|---------------|--------|--------|--------|--------|--------|--------|
**KERN precision scales, type PKS**

**Application:**
For demanding weighing applications such as in laboratories.

**Execution:**
- Robust ABS housing
- Backlit graphic LCD display
- Screen diagonal: approx. 81 mm
- Automatic reference optimisation
- 40 memory places per operating mode
- Capacity indicator
- Weigh within tolerance range (with signal display) for dosing and portioning

**Advantage:**
- User-programmable weighing unit (thread length g/m, paper weight g/m²)

**Technical Data:**
- With unit counting: Yes
- Data transmission type: RS232
- Housing dimensions (LxWxH): 250 x 167 x 85 mm

**Precision scales**

**Type 572**

**Application:**
Versatile applications; suitable for use e.g. as laboratory scales, counting scales or checkweigher scales.

**Execution:**
- Robust metal housing
- LCD display with 14 mm digit size
- Automatic reference optimisation
- Mechanical overload protection
- Options: Battery operation

**Advantage:**
- User-programmable weighing unit (thread length g/m, paper weight g/m²)

**Technical Data:**
- With unit counting: Yes
- Data transmission type: RS232
- Housing dimensions (LxWxH): 310 x 180 x 90 mm

**Platform scales**

**Type EOB**

**Application:**
For simple weighing tasks, ideal for shipping and logistics.

**Execution:**
- Stainless steel weighing tray
- Display unit with 1.8 m cable and wall bracket as standard (display unit stand 450 mm high)
- AUTO-OFF function after 3 min.

**Advantage:**
- Battery operation possible (6x type AA, 1.5 V)
- Large LCD display with 25 mm digit size

**Technical Data:**
- With unit counting: No
### Platform scales

**Type DE-D**

#### Application:
For versatile use in various locations such as production, warehousing and shipping.

#### Execution:
- Dual range scales with automatic switch-over
- Display unit (degree of protection IP65) with 1.5 m cable
- Options: Stand for display unit
- Freely-programmable weighing unit, e.g. displays in thread length g/m, paper weight g/m²
- Formulation function for weighing different components

#### Advantage:
- Dual measurement display for finer digit increment and higher accuracy in the initial weighing range
- Versatile positioning of display unit, free-standing or bolted to scales

#### scope of supply and services:
- Mains adapter

#### Technical Data:
- With unit counting: Yes
- Data transmission type: RS232

<table>
<thead>
<tr>
<th>Type description</th>
<th>DE 6K1D</th>
<th>DE 15K0.2D</th>
<th>DE 15K2D</th>
<th>DE 35K5D</th>
<th>DE 60K1D</th>
<th>DE 60K10D</th>
<th>DE 60K10DL</th>
<th>DE 150K20D</th>
</tr>
</thead>
<tbody>
<tr>
<td>Max. weight measuring range (kg)</td>
<td>3</td>
<td>6</td>
<td>6</td>
<td>15</td>
<td>30</td>
<td>30</td>
<td>30</td>
<td>60</td>
</tr>
<tr>
<td>Max. weight measuring range 2 (kg)</td>
<td>6</td>
<td>15</td>
<td>15</td>
<td>35</td>
<td>60</td>
<td>60</td>
<td>60</td>
<td>150</td>
</tr>
<tr>
<td>Digit increment, weight (g)</td>
<td>1</td>
<td>0.2</td>
<td>2</td>
<td>5</td>
<td>1</td>
<td>10</td>
<td>10</td>
<td>20</td>
</tr>
<tr>
<td>Digit increment 2, weight (g)</td>
<td>2</td>
<td>0.5</td>
<td>5</td>
<td>10</td>
<td>2</td>
<td>20</td>
<td>20</td>
<td>50</td>
</tr>
<tr>
<td>Plate length x plate width</td>
<td>315 x 305 mm</td>
<td>315 x 305 mm</td>
<td>315 x 305 mm</td>
<td>315 x 305 mm</td>
<td>315 x 305 mm</td>
<td>315 x 305 mm</td>
<td>522 x 403 mm</td>
<td>315 x 305 mm</td>
</tr>
<tr>
<td>Min. item weight (g)</td>
<td>2</td>
<td>0.4</td>
<td>4</td>
<td>10</td>
<td>2</td>
<td>20</td>
<td>20</td>
<td>40</td>
</tr>
<tr>
<td>Reproducibility (g)</td>
<td>1</td>
<td>0.2</td>
<td>2</td>
<td>5</td>
<td>1</td>
<td>10</td>
<td>10</td>
<td>20</td>
</tr>
<tr>
<td>Reproducibility 2 (g)</td>
<td>2</td>
<td>0.5</td>
<td>5</td>
<td>10</td>
<td>2</td>
<td>20</td>
<td>20</td>
<td>50</td>
</tr>
<tr>
<td>Linearity (g)</td>
<td>3</td>
<td>0.8</td>
<td>4</td>
<td>15</td>
<td>4</td>
<td>30</td>
<td>4</td>
<td>60</td>
</tr>
<tr>
<td>Linearity 2 (g)</td>
<td>6</td>
<td>2</td>
<td>10</td>
<td>30</td>
<td>8</td>
<td>40</td>
<td>40</td>
<td>100</td>
</tr>
</tbody>
</table>

| Ident. No. | 200 | 210 | 220 | 230 | 240 | 250 | 260 | 270 |

#### Counting scales

**Type CPB**

#### Application:
For counting and weighing components

#### Execution:
- Counting total memory for adding up measured values
- Display: Total weight, reference weight in g, total quantity
- Large LCD display with 20 mm digit size and backlight function
- AUTO-OFF function can be selected after 1/5/30 min.
- Automatic reference optimisation

#### Advantage:
- Programmable acoustic signal on reaching quantity
- Options: Battery operation approx. 70 h without backlight possible

#### scope of supply and services:
- Work protection hood and power pack

#### Technical Data:
- Plate length x plate width: 294 x 225 mm
- With unit counting: Yes
- Data transmission type: RS232
- Housing dimensions (LxWxH): 350 x 320 x 125 mm

<table>
<thead>
<tr>
<th>Type description</th>
<th>CPB 6K0.1N</th>
<th>CPB 15K0.2N</th>
<th>CPB 30K0.5N</th>
</tr>
</thead>
<tbody>
<tr>
<td>Max. weight measuring range (kg)</td>
<td>6</td>
<td>15</td>
<td>30</td>
</tr>
<tr>
<td>Digit increment, weight (g)</td>
<td>0.1</td>
<td>0.2</td>
<td>0.5</td>
</tr>
<tr>
<td>Min. item weight (g)</td>
<td>0.1</td>
<td>0.25</td>
<td>0.5</td>
</tr>
<tr>
<td>Ident. No.</td>
<td>251</td>
<td>261</td>
<td>271</td>
</tr>
<tr>
<td>Unit price, €</td>
<td>O. R.</td>
<td>O. R.</td>
<td>O. R.</td>
</tr>
</tbody>
</table>

Prod. Gr. 447
KERN test weights

We also provide test weights in standard and special shapes either individually or in sets. DKD calibration certificates can be provided for all test weights.

Layer thickness measuring devices

Application:
- For non-destructive measurement of:
  - Non-magnetic layer thicknesses on all magnetic metal layers
  - Non-conducting layer thicknesses on all non-magnetic metal layers
- Model series 415: suitable for smooth surfaces
- Model series 456: suitable for smooth and rough surfaces
- Design versions:
  - F (iron) devices = magnet-inductive measuring principle according to DIN EN ISO 2178 for measuring Cr, Cd, Cu, Zn and Sn layers as well as paint, plastic and enamel coats on magnetic iron/steel substrates
  - NF (non-ferrous) devices 1) = eddy current measuring principle according to DIN EN ISO 2360 for measuring anodised coats, paint, lacquer, plastic and rubber on non-ferrous metals (e.g. aluminium, copper, brass)
  - FNF devices combination of F and NF devices

<table>
<thead>
<tr>
<th></th>
<th>Model 415</th>
<th>456C Model B</th>
<th>456C Model S</th>
<th>456C Model T</th>
</tr>
</thead>
<tbody>
<tr>
<td>Versions</td>
<td>FNF combined units</td>
<td>F-, NF) and FNF combined units</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Integrated probe</td>
<td>X</td>
<td></td>
<td></td>
<td>X</td>
</tr>
<tr>
<td>Separate probe</td>
<td></td>
<td>X (axial or rectangular)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Measuring range</td>
<td>0–1000 µm</td>
<td>0–15000 µm</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Digit increment</td>
<td>1 µm</td>
<td>&lt; 100 µm: 0,1 µm / ≥ 100: 1 µm</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Measuring rate</td>
<td>≥ 60 measurements/min</td>
<td>≥ 70 measurements/min</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Measuring arched surfaces</td>
<td>Convex from R = 2 mm</td>
<td>Concave from R = 25 mm (external probe)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Error limit</td>
<td>± 3% of the measured value (min. ± 3 µm)</td>
<td>b) ± 1% of the measured value, for calibration around the layer thickness nominal value</td>
<td>a) ± 3% of the measured value (min. ± 3,5 µm)</td>
<td></td>
</tr>
<tr>
<td>Measurement display</td>
<td>Digit height 19 mm</td>
<td>Max. digit height approx. 28 mm (display measured value and operating keys) rotating display: 0–90° – 180°–270°</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Calibration</td>
<td>a) Zero setting on non-coated surface b) Zero setting with fixed calibration value³</td>
<td>a) Zero setting on non-coated surface b) Point calibration for smooth and rough surfaces c) Calibration lock d) 3 individually programmable calibration memories</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Number of batches</td>
<td>-</td>
<td>1</td>
<td>999</td>
<td></td>
</tr>
<tr>
<td>Device memory (number of measured values)</td>
<td>-</td>
<td>5⁴</td>
<td>1500 in one batch</td>
<td>150000 in up to 2500 batches</td>
</tr>
<tr>
<td>Tolerance limits</td>
<td>-</td>
<td>X</td>
<td>X³ (also lot-based)</td>
<td></td>
</tr>
<tr>
<td>Statistics function (pre-selectable)</td>
<td>-</td>
<td>X</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Interface</td>
<td>-</td>
<td>USB and Bluetooth</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Software for further processing the measured data in the PC</td>
<td>-</td>
<td>ElcoMaster 2.0 (download version)</td>
<td>ElcoMaster 2.0 in CD</td>
<td></td>
</tr>
</tbody>
</table>

On request:
1) NF-coating thickness measuring instruments
2) Measuring ranges up to 30 mm
3) If no uncoated substrate is present
4) The last 5 measured values are saved
5) Graphical representation of measured values and exceeded tolerance limits on display

Further information, advice and quotations available on request.
**Layer thickness measuring devices, model series 456C**

**Application:**
- **Ident. No. 600, 610:** For measuring non-magnetic coatings (paintwork, plastics, chrome, copper, zinc etc.) on magnetic substrates.
- **Ident. No. 605, 615–625:** For measuring non-magnetic coatings (paints, plastics, chrome, copper, zinc etc.) on magnetic substrates and for measuring non-conductive coatings (paints, plastics etc.) on non-conductive substrates (copper, aluminium, zinc, bronze, brass, etc.).

**Execution:**
- Robust ABS plastic housing
- Large, easy-to-read 2.4" colour display
- Dust and water-proof, degree of protection IP 64
- **Ident. No. 600:** Integrated Bigfoot™ probe for high measuring accuracy
- **Ident. No. 600–605:** Data logging, concave from R=2
- **Ident. No. 600–618:** Internal memory for displaying the last 5 measured values
- **Ident. No. 605:** Integrated Bigfoot™ combination probe for high measuring accuracy
- **Ident. No. 610–625:** Data logging, concave from R=2 and convex from R=25
- **Ident. No. 625:** Internal memory for 15000 measured values
- User-defined batches viewed separately

**Advantage:**
- Fast sampling rates of over 70 measurements per minute
- **Ident. No. 600–615:** Various calibration methods stored
- **Ident. No. 620:** View and delete measured values and delete batches
- **Ident. No. 620–625:** Various calibration methods stored incl. automatic fast calibration
- **Ident. No. 625:**
  - View and delete measured values and batches
  - Alphanumeric batch names entered into device by user
- Scanning and auto repeat mode with connected ultra/scan probe

**Test probe**

<table>
<thead>
<tr>
<th>Test probe</th>
<th>Integrated</th>
<th>Separately</th>
<th>Separately</th>
<th>Separately</th>
</tr>
</thead>
<tbody>
<tr>
<td>Min./max. layer thickness display range</td>
<td>0-31 mm</td>
<td>0-31 mm</td>
<td>0-31 mm</td>
<td></td>
</tr>
<tr>
<td>Min./max. layer thickness of measuring range</td>
<td>0-1500 µm</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Min./max. accuracy (+/-) (µm)</td>
<td>2.5</td>
<td>50</td>
<td>50</td>
<td>50</td>
</tr>
<tr>
<td>Data transmission type</td>
<td>USB</td>
<td>USB</td>
<td>USB/Bluetooth</td>
<td>USB/Bluetooth</td>
</tr>
<tr>
<td>Internal memory</td>
<td>5 measured values</td>
<td>5 measured values</td>
<td>1500 measured values</td>
<td>150000 measured values</td>
</tr>
<tr>
<td>Adjustable limit values</td>
<td>No</td>
<td>No</td>
<td>Yes</td>
<td>Yes</td>
</tr>
</tbody>
</table>

**Model**

- **45800... A456CFBLI** B F
- **45800... A456CFBS** B F
- **45800... A456CFNFB1** B FNF
- **45800... A456CFNFS** B FNF
- **45800... A456CFNFTS** T FNF

**Unit price, €**

<table>
<thead>
<tr>
<th>Model</th>
<th>Type</th>
<th>Probe design</th>
<th>Unit price, €</th>
</tr>
</thead>
<tbody>
<tr>
<td>45800...</td>
<td>A456CFBLI</td>
<td>B F</td>
<td>600 O. R.</td>
</tr>
<tr>
<td>45800...</td>
<td>A456CFBS</td>
<td>B F</td>
<td>-</td>
</tr>
<tr>
<td>45800...</td>
<td>A456CFNFB1</td>
<td>B FNF</td>
<td>605 O. R.</td>
</tr>
<tr>
<td>45800...</td>
<td>A456CFNFS</td>
<td>B FNF</td>
<td>-</td>
</tr>
<tr>
<td>45800...</td>
<td>A456CFNFTS</td>
<td>T FNF</td>
<td>-</td>
</tr>
</tbody>
</table>

**Ident. No. 600–615:**
- For measuring non-magnetic coatings (paintwork, plastics, chrome, copper, zinc etc.) on magnetic substrates.
- **Ident. No. 605:** Internal memory for 15000 measured values
- User-defined batches viewed separately

**Ident. No. 600–618:**
- Internal memory for displaying the last 5 measured values
- **Ident. No. 605:** Integrated Bigfoot™ combination probe for high measuring accuracy

**Ident. No. 605–615:**
- Data logging, concave from R=2 and convex from R=25
- **Ident. No. 625:**
  - View and delete measured values and batches
  - Alphanumeric batch names entered into device by user
  - Scanning and auto repeat mode with connected ultra/scan probe

**Accessories for 456C model series**

<table>
<thead>
<tr>
<th>Accessories for</th>
<th>45800 600</th>
<th>45800 605</th>
<th>45800 610</th>
<th>45800 615</th>
<th>45800 620</th>
<th>45800 625</th>
</tr>
</thead>
<tbody>
<tr>
<td>Prod. Gr. 651</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>USB/Bluetooth adapter</td>
<td>690 (D. R.)</td>
<td>690 (D. R.)</td>
<td>690 (D. R.)</td>
<td>692 (D. R.)</td>
<td>692 (D. R.)</td>
<td>692 (D. R.)</td>
</tr>
</tbody>
</table>

**Technical Data:**
- Layer thickness resolution: < 100 µm: 0.1 µm
- Min./max. accuracy (+/-) in %: 1-3 %
- Measuring rate: > 70 measurements/min

**Ident. No. 610–625:**
- Probes not included in scope of delivery. For suitable probes, see 45800 650–665.

**Technical Data:**
- Layer thickness resolution: < 100 µm: 0.1 µm
- Min./max. accuracy (+/-) in %: 1-3 %
- Measuring rate: > 70 measurements/min
Ultrasonic wall thickness gauge

Application:
For undisturbed recording of material thicknesses of highly-diverse acoustically conductive materials such as metals, NF metals, ceramic, plastics, glass etc. Ideal for monitoring corrosion and erosion on closed components or structures or those accessible only from one side, e.g. pipes, tanks, large metal sheets etc.

Execution:
- Robust stainless steel housing
- Dust and water-proof, degree of protection IP 67
- Swivelling, backlit LCD display
- Integrated, replaceable 5 MHz probe
- mm/inch switch-over

Advantage:
- Simple operation using four function keys
- Automatic zero point calibration
- Calibration to known wall thickness(es) and/or known material sound velocity

scope of supply and services:
Measuring instrument with replaceable probe (5 MHz), carrying strap, 100 ml coupling liquid, 1x 1.5 V AA battery, operating instructions, manufacturer’s certificate, transport case

Technical Data:
- Min./max. length measuring range: 1-250 mm
- Resolution of wall thickness: < 100 mm: 0.01 mm | > 100 mm: 0.1 mm
- Probe: Integrated
- Transceiver probe diameter: 12 mm
- Test frequency: 5 MHz

Temperature measuring instrument with universal sensor

Application:
For simple temperature measurements in industrial applications

Execution:
- Watertight
- HOLD function
- Auto-off
- Switch between °C/°F

Technical Data:
- Min./max. temperature measuring range: -64 to 1370 °C
- Digit increment (measuring instrument for temperature): 0.1 °C
- Length x width x height: 78 x 43 x 20 mm

Temperature measuring instruments

2-channel and 4-channel

Application:
For measuring temperature differences

Execution:
- Displays differential temperature
- USB interface
- Input for thermocouple, type K
- Digit increment 0.1°C from -199.9°..+199.9°C, otherwise 1.0°C
- Ident. No. 220:
  - 2 simultaneous measurements
  - Error limit ± 0.1% ±0.7°C
- Ident. No. 240:
  - 4 simultaneous measurements
  - Configuration via software or logger keyboard

scope of supply and services:
Ident. No. 220: Measuring instrument, battery, 2x thermal wire type K, operating instructions
Ident. No. 240: Measuring instrument, battery, software, data cable, 2x thermal wire type K, operating instructions

Technical Data:
- Min./max. temperature measuring range: -200 to 1370 °C
- Length x width x height: 184 x 64 x 30 mm
Temperature and ambient conditions monitoring
Temperature and air-humidity measuring instruments

Temperature sensor

Application:
Ident. No. 310–320: For measurements in liquid, gaseous and powdery materials
Ident. No. 330–340: For measuring surface temperatures
Ident. No. 350: For measuring temperatures, e.g. in furnaces

Execution:
- NiCr-Ni sensor
- Ident. No. 310: Stainless steel
- Ident. No. 320: Flexible

Ident. No. 310

Ident. No. 320

Ident. No. 330

Ident. No. 340

Ident. No. 350

<table>
<thead>
<tr>
<th>Min./max. temperature measuring range</th>
<th>-40 to 400 °C</th>
<th>-100 to 1100 °C</th>
<th>-65 to 550 °C</th>
<th>-40 to 900 °C</th>
<th>-50 to 400 °C</th>
</tr>
</thead>
<tbody>
<tr>
<td>Length (mm)</td>
<td>120</td>
<td>300</td>
<td>130</td>
<td>130</td>
<td>1000</td>
</tr>
<tr>
<td>Ø (mm)</td>
<td>3</td>
<td>3</td>
<td>10</td>
<td>8</td>
<td>1</td>
</tr>
<tr>
<td>Prod. Gr. 456</td>
<td>310</td>
<td>320</td>
<td>330</td>
<td>340</td>
<td>350</td>
</tr>
</tbody>
</table>

Ident. No. 310–320: For measurements in liquid, gaseous and powdery materials
Ident. No. 330–340: For measuring surface temperatures
Ident. No. 350: For measuring temperatures, e.g. in furnaces

Data logger for temperature and humidity

Application:
Ident. No. 010: For monitoring temperature, e.g. for transport and storage
Ident. No. 020: For monitoring temperature and humidity, e.g. for transport and storage

Execution:
- Large display for current value indication and
- External temperature sensor connection
- Battery status indication
- User-friendly Windows software
- Hi-Lo visual and acoustic alarm
- Memory for up to 60,000 measured values with 3 variables
- Measuring interval adjustable from 1 second up to 24 hours

High accuracy: ±0.5°C/± 3%
Ident. No. 010: IP 65 protection
Ident. No. 020: Additional measurement of relative air humidity and dew point

Data logger with temperature probes

<table>
<thead>
<tr>
<th>Min./max. humidity (rF) of measuring range</th>
<th>-</th>
<th>0-99 %</th>
</tr>
</thead>
<tbody>
<tr>
<td>Prod. Gr. 456</td>
<td>010</td>
<td>O. R.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>46200...</th>
<th>Ident. No.</th>
<th>Unit price, €</th>
</tr>
</thead>
<tbody>
<tr>
<td>46200 010</td>
<td>103</td>
<td>O. R.</td>
</tr>
<tr>
<td>46200 020</td>
<td>103</td>
<td>O. R.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>46200...</th>
<th>Product for</th>
<th>46200 010</th>
<th>46200 020</th>
</tr>
</thead>
<tbody>
<tr>
<td>46200 010</td>
<td>Temperature sensor</td>
<td>103</td>
<td>O. R.</td>
</tr>
<tr>
<td>46200 020</td>
<td>Temperature sensor</td>
<td>103</td>
<td>O. R.</td>
</tr>
</tbody>
</table>
Infrared temperature-measuring instruments

Application:
For measuring surface temperatures of rotating or live components

Execution:
- Error limit ±2% or ± 2°C
- Ident. No. 020:
  - HOLD/max./min./difference
  - Adjustable emission degree 0.10 to 1.00
  - Laser point (class II) for aiming (switchable)
- Ident. No. 020–041:
  - Limit value alarm HI/LO
  - Unit: Switch between °C/°F
  - Backlit display (switchable)

Ident. No. 020
- Input for thermocouple sensor NiCr-Ni (type K)
- Ident. No. 041:
  - HOLD/max./min./difference, additionally with AVG (average from measurement series) and lock (continuous measurement)
  - Adjustable emission degree 0.10 to 1.01
  - Laser point (class II) for aiming (switchable), 2 laser beams for indicating the measuring field size
- Ident. No. 045:
  - IP 54 splash-proof
  - Large backlit display for simultaneous visualization of measured values, max. and limit values

Ident. No. 041
- Two laser beams for indicating the measuring field size
- LOCK function (continuous measurement)
- Response time < 1 second
- HOLD /max. function
- Battery life 18 hours in continuous operation
- Adjustable acoustic alarm

Ident. No. 045
- Limit value alarm HI/LO
- Unit: Switch between °C/°F
- Backlit display (switchable)
- Two laser beams for indicating the measuring field size

Identification No.
- 020
- 041
- 045

Unit price, €
- 0. R.

Prod. Gr. 456

Video infrared temperature measuring device with integrated humidity sensor

Application:
For non-contact measuring of dew points and surface temperatures. Ideal for indoor climate specialists. Indoor climate measurements

Execution:
- Double target laser
- HOLD, MAX, MIN functions
- Switch display between °C/°F
- USB port
- Error limit ±2% or ± 2°C

Advantage:
- Large 2.2 inch TFT colour display
- Input for thermocouple sensor NiCrNi (type K)
- Large measured value memory (micro-SD card slot)
- IR temperature measuring device with integrated humidity sensor
- Applications are displayed as JPG images with measured values and date stamps

Identification No.
- 041
- 045

Unit price, €
- 020
- 041

Prod. Gr. 456
Infrared temperature measuring instruments

Application: For measuring surface temperatures of rotating or live components

Execution:
- Temperature display in °C and °F
- Backlight display, switchable
- Alarm functions: acoustic and visual HIGH/LOW alarm
- Target laser (class II a) for precise aiming on measured object, switchable
- Measuring functions: Min./max./scan/Hold/OFF
- USB interface

Ident. No. 011:
- Consistently small measuring spot of 13 mm at any distance of up to 140 mm
- Error limit ±1% or ±1°C from 0°C to 530°C ± 0.07°C from 0°C to 32°C
- Ident. No. 021:
- Error limit ±1% or ±1°C from 0°C to 760°C ± 0.07°C from 0°C to 32°C
- Connector for thermocouple, type K
- Measured value memory for up to 20 values
- Ident. No. 030:
- Equipped with X-shaped laser for easy detection of actual measuring field size
- DFL laser function (dual-focus laser): The 75:1 standard lens can be switched over to a close focus lens (focus 62:1, spot size diameter 1 mm at a distance of 62 mm) via a lever adjustment, ideal for inspecting small electronic components, for example
- Error limit ±0.75% or ±0.75°C*
- Measured value memory for up to 100 values

Ident. No. 011
- Product Group: 490
- Ident. No.: 011
- Unit price: €

Ident. No. 021
- Ident. No.: 021

Ident. No. 030
- Ident. No.: 030

Unit price: €

Temperature-humidity measuring device

Application: For measuring indoor climates

Execution:
- Running display
- Max-hold display
- Min-hold display
- Energy-saving Auto-OFF function

Advantage:
- Handy device size and easy one-hand operation
- Automatic display illumination with brightness sensor

Ident. No.: 020
- Unit price: €

Flow meter (anemometer)

Application: For simple measurements of air-conditioning ventilation systems.

Execution:
- Running display
- Max-hold display
- AVG display (average value)
- Switch between units of display: m/s, km/h, ft/minute, MPH, knots
- Energy-saving Auto-OFF function

Advantage:
- Handy device size and easy one-hand operation

Ident. No.: 020
- Unit price: €
Orion® Light intensity measuring instrument (luxmeter)

Application:
For monitoring lighting conditions in workplaces, warehouses, industrial buildings and residential
buildings.

Execution:
- Automatic zero point calibration
- Max-hold display
- Switch between units of display: LUX Fc
- Energy-saving Auto-OFF function

Advantage:
- Handy device size and easy one-hand operation

<table>
<thead>
<tr>
<th>Ident. No.</th>
<th>Unit price, €</th>
<th>O. R.</th>
</tr>
</thead>
<tbody>
<tr>
<td>46210...</td>
<td>030</td>
<td></td>
</tr>
</tbody>
</table>

Scope of supply and services:
Battery (1x 9 V block battery, type 6 LR 61)

Technical Data:
- Digit increment | illumination: 0.01 lx
- Illumination error limit (+/-): 5 lx
- Min./max. working temperature: 0 to 40 °C

Orion® Noise level measuring devices

Application:
For monitoring permissible noise pollution levels, e.g. in workplaces.

Execution:
- Running display
- Max-hold display
- Min-hold display
- Energy-saving Auto-OFF function

Advantage:
- Handy device size and easy one-hand operation

<table>
<thead>
<tr>
<th>Ident. No.</th>
<th>Unit price, €</th>
<th>O. R.</th>
</tr>
</thead>
<tbody>
<tr>
<td>46210...</td>
<td>040</td>
<td></td>
</tr>
</tbody>
</table>

Scope of supply and services:
Battery (1x 9 V block battery, type 6 LR 61)

Technical Data:
- Min./max. sound-pressure-level measuring range: 40-130 dB
- Digit increment | sound-pressure level: 0.1 dB
- Sound-pressure-level error limit (+/-): 3.5 dB
- Min./max. working temperature: 0 to 40 °C

Roughness measuring device SURTRONIC DUO
Mobile roughness measuring device with internal feed unit

Application:
User-friendly, mobile roughness measuring device for standard roughness measurement of parameters Ra, Rz, Rp, Rv, Rt, Rz1max, R3z (Daimler DB N 31007), Rsk, Rq and Rku.

Execution:
- 3.7" colour LCD display for displaying up to 4 measured values
- Split display and feed unit
- Bluetooth connection between the two units (max. distance 2 m)
- Roughness parameters in line with DIN ISO and ASME
- Displays primary profile/parameters Pa, Pz, Pp, Pv and Pt
- Integrated skid-type probe with diamond tip 5 µm

Advantage:
- Can be charged via mini USB port
- InstantOn, from standby mode to measuring mode in just 5 seconds
- Simple and intuitive operation, no training required
- Measured value is saved until the next measurement
- Battery life up to 3000 measurements per charge

Technical Data:
- Surface roughness measuring range: 199 µm | 40 µm
- Scanning path: 5 mm
- Surface roughness resolution: 0.01 µm
- Threshold wave length: 0.8 mm
- Data transmission type: USB

<table>
<thead>
<tr>
<th>Model</th>
<th>Probe system</th>
<th>Ident. No.</th>
<th>Unit price, €</th>
<th>O. R.</th>
</tr>
</thead>
<tbody>
<tr>
<td>47100...</td>
<td>SURTRONIC DUO</td>
<td>Runner probe system</td>
<td>050</td>
<td></td>
</tr>
</tbody>
</table>
Roughness measuring device MarSurf PS 1
Mobile roughness measuring device with integrated feed unit

Application:
Compact, mobile roughness measuring device for standard roughness measurements in production facilities and measuring rooms.

Execution:
- Stylus instrument with feed unit for skid-type probes
- Calibration standard integrated into feed unit
- Roughness parameters in line with DIN ISO, JIS, and ASME
- Standard tracer PHT 6-350 with diamond probe tip 2 µm

Advantage:
- Simple and intuitive operation, no training required
- Reliable measurement using automatic cut-off selection (patented)
- Measurements in all directions: horizontal, vertical and overhead
- Height adjustable mounts allows measurement of cones
- Over 500 measurements from just one battery charge

Technical Data:
- Surface roughness measuring range: 350 µm | 180 µm | 90 µm
- Surface roughness scanning path: 1.75 mm | 5.6 mm | 17.5 mm
- Surface roughness resolution: 0.032 µm | 0.016 µm | 0.008 µm
- Threshold wave length: 0.25 mm | 0.8 mm | 2.5 mm
- Measurement profile memory (number of single readings): 20000 PCS
- Measurement profile memory (number of profiles): 15 PCS
- Data transmission type: RS232C/USB

---

Roughness measuring device DIAVITE Compact II
mobile roughness measuring device with external feed unit

Application:
Compact, mobile roughness measuring device for standard roughness measurements in production facilities and measuring rooms.

Execution:
- External calibration standard Ra 3.0 µm
- Roughness parameters in line with DIN ISO, JIS, ASME
- Ident. No. 100: Stylus instrument with feed unit VH for skid-type probe
- Ident. No. 110: Stylus instrument with feed unit VHF for skid-type probes and free tracers
- Standard probe SH with diamond probe tip 5 µm

Advantage:
- Simple and intuitive operation, no training required
- Safe measurement using permanently connected cut-off filter with scanning path
- Feed unit can be integrated into device for wireless measuring
- Measurements in all directions, horizontal, vertical and overhead
- Evaluation software DIASOFT Basic with individual log generation. Version can be upgraded with feed unit VHF.

Technical Data:
- Surface roughness measuring range: 350 µm | 20 µm
- Min. scanning path: 0.5 mm
- Max. scanning length: 15 mm
- Surface roughness resolution: 0.001 µm | 0.01 µm
- Threshold wave length: 0.25 mm | 0.8 mm | 2.5 mm
- Measurement profile memory (number of profiles): 15 PCS
- Data transmission type: USB

---

<table>
<thead>
<tr>
<th>Model</th>
<th>Probe system</th>
<th>Ident. No.</th>
<th>Unit price, €</th>
<th>O. R.</th>
</tr>
</thead>
<tbody>
<tr>
<td>47000...</td>
<td>DIAVITE Compact II VH</td>
<td>Ident. No. 100</td>
<td>100</td>
<td>O. R.</td>
</tr>
<tr>
<td>47000...</td>
<td>DIAVITE Compact II VHF</td>
<td>Ident. No. 110</td>
<td>110</td>
<td>O. R.</td>
</tr>
</tbody>
</table>
Roughness measuring device MarSurf M 300C
Mobile roughness measuring device with external feed unit for skid-type probes

Application:
Mobile roughness measuring device for standard roughness measurements in production facilities and measuring rooms.

Execution:
- Stylus instrument with feed unit for skid-type probes
- Calibration standard integrated into feed unit
- Roughness parameters in line with DIN ISO, JIS, ASME and MOTIF
- Standard tracer PHT 6-350 with diamond probe tip 2 µm
- Thermal printer with high print quality

Advantage:
- Bluetooth connection for wireless data transfer between feed unit and evaluation unit
- Simple calibration using integrated calibration standard
- Measurements in all directions, horizontal, vertical and overhead
- Lock and/or password-protected device settings
- Up to 5 selectable individual measurement lengths

Technical Data:
- Surface roughness measuring range: 350 µm | 180 µm | 90 µm
- Surface roughness scanning path: 1.75 mm | 5.6 mm | 17.5 mm
- Surface roughness resolution: 0.032 µm | 0.016 µm | 0.008 µm
- Threshold wave length: 0.25 mm | 0.8 mm | 2.5 mm
- Measurement profile memory (number of single readings): 40000 PCS
- Measurement profile memory (number of profiles): 30 PCS
- Data transmission type: RS232C/USB

<table>
<thead>
<tr>
<th>Model</th>
<th>Probe system</th>
<th>Ident. No</th>
<th>Unit price, €</th>
</tr>
</thead>
<tbody>
<tr>
<td>Roughness measuring device MAHR M 300 C</td>
<td>MarSurf M 300 C Runner probe system</td>
<td>200</td>
<td>(O. R.)</td>
</tr>
</tbody>
</table>

Roughness measuring device MarSurf M 300
Mobile roughness measuring device with Bluetooth feed unit for skid-type probes

Application:
Mobile roughness measuring device for standard roughness measurements in production facilities and measuring rooms.

Execution:
- Stylus instrument with feed unit for skid-type probes
- Calibration standard integrated into feed unit
- Roughness parameters in line with DIN ISO, JIS, ASME and MOTIF
- Standard tracer PHT 6-350 with diamond probe tip 2 µm
- Thermal printer with high print quality
- Bluetooth connection between feed unit and display unit
- Simple calibration using integrated calibration standard

Advantage:
- Measurements in all directions: horizontal, vertical and overhead
- Lock and/or password-protected device settings
- Up to 5 selectable individual measurement lengths

Technical Data:
- Surface roughness measuring range: 350 µm | 180 µm | 90 µm
- Min. scanning path: 1.75 mm
- Max. scanning length: 17.5 mm
- Surface roughness resolution: 0.032 µm | 0.016 µm | 0.008 µm
- Threshold wave length: 0.25 mm | 0.8 mm | 2.5 mm
- Measurement profile memory (number of single readings): 40000 PCS
- Measurement profile memory (number of profiles): 30 PCS
- Data transmission type: RS232C/USB

<table>
<thead>
<tr>
<th>Model</th>
<th>Probe system</th>
<th>Ident. No</th>
<th>Unit price, €</th>
</tr>
</thead>
<tbody>
<tr>
<td>Roughness measuring device MAHR M 300</td>
<td>MarSurf M 300 Runner probe system</td>
<td>100</td>
<td>(O. R.)</td>
</tr>
</tbody>
</table>

Measuring and evaluation software EXPLORER
For MAHR roughness measuring devices MarSurf PS1 and MarSurf M300

Application:
User-friendly software for evaluating, displaying, saving and recording logged measured values and profiles. Saved data can be printed out, e.g. on A4 paper or in other formats.

Advantage:
- Simple recording and logging of results and profiles
- Automatic detection of MarSurf PS1 and M 300 via USB cable
- Easy, user-friendly software operation
- Your company logo can be inserted

<table>
<thead>
<tr>
<th>Ident. No</th>
<th>Unit price, €</th>
</tr>
</thead>
<tbody>
<tr>
<td>680</td>
<td>(O. R.)</td>
</tr>
</tbody>
</table>
Probes for MarSurf roughness measuring devices

Application:
- **Ident. No. 500**: Skid-type probe for recording surface roughness
- **Ident. No. 510**: Skid-type probe for logging surface roughness, e.g., in bores from 3 mm diameter
- **Ident. No. 520**: Skid-type probe for logging surface roughness on gear tooth flanks etc.
- **Ident. No. 530**: Skid-type probe for logging surface roughness on metal plates and roller surfaces in line with DIN EN 10049 (SEP)
- **Ident. No. 540**: Skid-type probe for logging surface roughness, e.g., in grooves, recesses etc.
- **Ident. No. 550**: Skid-type probe for logging surface roughness on convex and/or concave shapes.
- **Ident. No. 630**: Extension 80 mm for skid-type probes and free tracers

Miniature precision vice
For clamping small components

Application:
Clamping and aligning options for rotationally symmetrical components using vertical and horizontal prisms. Slots on long sides provide short clamping option.

Execution:
- Threaded spindle
- Prism plane parallelism 0.02 mm
- Replaceable clamping jaw pairs made from toughened steel or plastic

Technical Data:
- Plane parallelism of prisms: 0.02 mm

Surface-roughness reference samples
For the six most common machining methods

Application:
Surface-roughness reference samples for assessing surface roughness through simple visual and tactile comparison in line with DIN ISO 4287, DIN ISO 4288, BS 2634 and ANSI B 46.1. Machining method: Horizontal milling, face milling, longitudinal milling, reaming, flat grinding, lapping

Execution:
- Wear-resistant and non-rusting
- Evaluation parameters Ra and Rz
- Extract from machining methods such as horizontal and face milling, longitudinal turning, reaming, flat grinding and lapping
- Extract from machining methods such as horizontal and face milling, longitudinal turning, reaming, flat grinding and lapping
- Extract from machining methods such as horizontal and face milling, longitudinal turning, reaming, flat grinding and lapping

Advantage:
- Galvanoplastic manufacturing method for high accuracy and uniformity

Scope of supply and services:
Set of surface-roughness reference samples for all machining methods: Horizontal milling, face milling, longitudinal milling, reaming, flat grinding, lapping

Technical Data:
- Machining method: Horizontal milling | Front milling | Longitudinal turning | Flat grinding | Lapping | Grinding
- Model: 130
- Number of comparative patterns: 30 PCS
- ISO surface roughness categories: N2-N10
- Board width: 90 mm
- Board length: 120 mm

TOOLING · MACHINERY EDITION 7
Surface-roughness reference samples

For milling machining processes

Application:
Surface-roughness reference samples for assessing surface roughness through simple visual and tactile comparison in line with DIN ISO 4287, DIN ISO 4288, BS 2634 and ANSI B 46.1.

Execution:
• Wear-resistant and non-rusting
• Evaluation parameters Ra and Rz

Advantage:
• Galvanoplastic manufacturing method for high accuracy and uniformity

Scope of supply and services:
In a case

<table>
<thead>
<tr>
<th>Machining method</th>
<th>Hand-polishing</th>
<th>Longitudinal turning</th>
<th>Face turning</th>
<th>Front milling</th>
<th>Flat grinding</th>
<th>Cylindrical grinding</th>
<th>Electrical discharge machining</th>
</tr>
</thead>
<tbody>
<tr>
<td>Model</td>
<td>336</td>
<td>320</td>
<td>319</td>
<td>321</td>
<td>315</td>
<td>316</td>
<td>331</td>
</tr>
<tr>
<td>Number of comparative patterns (PCS)</td>
<td>5</td>
<td>8</td>
<td>8</td>
<td>8</td>
<td>8</td>
<td>8</td>
<td>8</td>
</tr>
<tr>
<td>Min. Ra comparison range (µm)</td>
<td>0.0125</td>
<td>0.4</td>
<td>0.4</td>
<td>0.4</td>
<td>0.025</td>
<td>0.025</td>
<td>0.4</td>
</tr>
<tr>
<td>Max. Ra comparison range (µm)</td>
<td>0.2</td>
<td>50</td>
<td>50</td>
<td>50</td>
<td>3.2</td>
<td>3.2</td>
<td>50</td>
</tr>
<tr>
<td>Min. Rz comparison range (µm)</td>
<td>0.25</td>
<td>1.6</td>
<td>1.6</td>
<td>1.6</td>
<td>0.25</td>
<td>0.25</td>
<td>2.5</td>
</tr>
<tr>
<td>Max. Rz comparison range (µm)</td>
<td>1.6</td>
<td>160</td>
<td>160</td>
<td>160</td>
<td>16</td>
<td>16</td>
<td>160</td>
</tr>
<tr>
<td>Min./Max. Rz comparison range</td>
<td>0.25-1.6 µm</td>
<td>1.6-100 µm</td>
<td>1.6-100 µm</td>
<td>1.6-100 µm</td>
<td>0.25-16 µm</td>
<td>0.25-16 µm</td>
<td>2.5-160 µm</td>
</tr>
<tr>
<td>ISO surface roughness categories</td>
<td>N0-N4</td>
<td>N5-N12</td>
<td>N5-N12</td>
<td>N5-N12</td>
<td>N1-N8</td>
<td>N1-N8</td>
<td>N5-N12</td>
</tr>
<tr>
<td>Board width (mm)</td>
<td>60</td>
<td>60</td>
<td>60</td>
<td>60</td>
<td>60</td>
<td>60</td>
<td>60</td>
</tr>
<tr>
<td>Board length (mm)</td>
<td>130</td>
<td>130</td>
<td>130</td>
<td>130</td>
<td>130</td>
<td>130</td>
<td>130</td>
</tr>
</tbody>
</table>

Reference table with surface-roughness reference samples

For milling machining processes

Application:
Surface-roughness reference samples for assessing surface roughness through simple visual and tactile comparison in line with VDI 3245 and VDI 3400.

Execution:
• Wear-resistant and non-rusting
• Evaluation parameter Ra

Advantage:
• Galvanoplastic manufacturing method for high accuracy and uniformity

Scope of supply and services:
In a case

<table>
<thead>
<tr>
<th>Machining method</th>
<th>Electrical discharge machining</th>
</tr>
</thead>
<tbody>
<tr>
<td>Model</td>
<td>013</td>
</tr>
<tr>
<td>Number of comparative patterns (PCS)</td>
<td>12</td>
</tr>
<tr>
<td>VDI 3400 surface standard</td>
<td>12.45</td>
</tr>
</tbody>
</table>

Surface-roughness reference samples

In line with VDI 3400 electrical discharge machining

Application:
Surface-roughness reference samples for assessing surface roughness through simple visual and tactile comparison in line with VDI 3345 and VDI 3400.

Execution:
• Wear-resistant and non-rusting
• Evaluation parameter Ra

Advantage:
• Galvanoplastic manufacturing method for high accuracy and uniformity

Scope of supply and services:
In a case

<table>
<thead>
<tr>
<th>Machining method</th>
<th>Electrical discharge machining</th>
</tr>
</thead>
<tbody>
<tr>
<td>Model</td>
<td>013</td>
</tr>
<tr>
<td>Number of comparative patterns (PCS)</td>
<td>12</td>
</tr>
<tr>
<td>VDI 3400 surface standard</td>
<td>12.45</td>
</tr>
</tbody>
</table>

Ident. No. 070
Surface-roughness reference samples

For milling machining processes

**Application:**
Surface-roughness reference samples for assessing surface roughness through simple visual and tactile comparison in line with DIN ISO 4287, DIN ISO 4288, BS 2634 and ANSI B 46.1.

**Execution:**
- Wear-resistant and non-rusting

<table>
<thead>
<tr>
<th>Machining method</th>
<th>Sandblasting</th>
<th>Shot-blasting</th>
</tr>
</thead>
<tbody>
<tr>
<td>Model</td>
<td>329</td>
<td></td>
</tr>
<tr>
<td>Number of comparative patterns (flint) (PCS)</td>
<td>4</td>
<td></td>
</tr>
<tr>
<td>Number of comparative patterns (balls) (PCS)</td>
<td>4</td>
<td></td>
</tr>
<tr>
<td>Min./max. Ra comparison range (flint)</td>
<td>3.2-25 µm</td>
<td>25-160 µm</td>
</tr>
<tr>
<td>Min./max. Rz comparison range (flint)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Min./max. Ra comparison range (balls)</td>
<td>3.2-18 µm</td>
<td>25-100 µm</td>
</tr>
<tr>
<td>Min./max. Rz comparison range (balls)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Board width (mm)</td>
<td>130</td>
<td></td>
</tr>
<tr>
<td>Board length (mm)</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Scope of supply and services:**
- In a case

**Evaluation parameters Ra and Rz**

**Advantage:**
- Galvanoplastic manufacturing method for high accuracy and uniformity

Electronic stopwatches

**Application:**
For universal timing using different functions.

**Execution:**
- Black plastic housing
- LCD display
- Digit increment 1/100
- No. 39070:
  - Functions: Time per lap, number of laps, split time, fastest/slowest time/average lap time

**Technical Data:**
- 10 memory slots

<table>
<thead>
<tr>
<th>Digit height (mm)</th>
<th>39070...</th>
<th>39082...</th>
</tr>
</thead>
<tbody>
<tr>
<td>6</td>
<td>010 O. R.</td>
<td>010 O. R.</td>
</tr>
<tr>
<td>11</td>
<td>-</td>
<td>-</td>
</tr>
</tbody>
</table>

**Scope of supply and services:**
- With battery (1x 1.5 V, type AA)

Large stop watch

**Application:**
For timing when a large display is required.

**Execution:**
- Electronic digital stop watch
- Large 2-row LCD display with 8/22 mm digit size
- Stopwatch function with 4 timers
- Loud alarm signal
- Standard time display
- Programmable sequence

**Technical Data:**
- Switchable time resolution in 1/10 s or 1/100 min.

<table>
<thead>
<tr>
<th>39092...</th>
<th>Id. No. 050 O. R.</th>
</tr>
</thead>
</table>

Hand stroboscope

**Application:**
For determining and monitoring speed or oscillation frequency of rotating or vibrating systems without interrupting the production process

**Execution:**
- Latest LED technology
- Continuously adjustable light frequency
- High illuminance across the entire frequency range
- High adjustment accuracy and stability

**Technical Data:**
- Adjustable flash duration
- Frequency range 30....300,000

**Scope of supply and services:**
- Stroboscope, batteries 3 x 1.5 V type AA, case

<table>
<thead>
<tr>
<th>39355...</th>
<th>Id. No. 025 O. R.</th>
</tr>
</thead>
</table>
Electronic handheld rev meters

Application:
For non-contact and contact (mechanical) rotational speed measurements, as well as contact (mechanical) speed and length measurements

Execution:
- Non-contact measurement using red, modulated light beam and reflective markers
- Mechanical measurement using adapter and attachable contact tips (male taper) or hollow measuring tip (female taper)
- For the speed measurement (peripheral speed or belt speed) as well as length measurement, a measuring wheel is placed on the adapter
- 5 digit LCD display
- Error limit: 0.02% of display value (± 1 digit increment)
- Update time: 1 s
- Measuring distance: optical max. 600 mm (non-contact measurement)

39330... Ident. No. 050

<table>
<thead>
<tr>
<th>Accessories for handheld rev meter</th>
<th>Ident. No.</th>
<th>Unit price, €</th>
<th>O. R.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Reflective tape for handheld rev meter</td>
<td>502</td>
<td>O. R.</td>
<td></td>
</tr>
<tr>
<td>Reflective markers for handheld rev meter</td>
<td>055</td>
<td>O. R.</td>
<td></td>
</tr>
</tbody>
</table>

Electronic handheld rev meters

Application:
For non-contact rotational speed measurement

Execution:
- Non-contact measurement using a red, modulated light beam and a reflection marker
- 5 digit LCD display
- Error limit: 0.02% of display value (± 1 digit increment)
- Update time: 1 s
- Measuring distance: optical max. 600 mm
- Memory function: last value measured, maximum value, minimum value, mean

39350... Ident. No. 025

<table>
<thead>
<tr>
<th>Accessories for handheld rev meter</th>
<th>Ident. No.</th>
<th>Unit price, €</th>
<th>O. R.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Reflective tape for handheld rev meter</td>
<td>502</td>
<td>O. R.</td>
<td></td>
</tr>
<tr>
<td>Reflective markers for handheld rev meter</td>
<td>055</td>
<td>O. R.</td>
<td></td>
</tr>
</tbody>
</table>

Stroke counter

Application:
For continuous stroke counting on duplication machines, presses, conveyors.

Execution:
- Count frequency max. 500 strokes/min.
- Stroke movement min. 38°, max. 60°
- Drive shaft right
- Stroke direction towards the observer
- Counting method: adding in stroke direction, 1 stroke = 1 digit

39400... Ident. No. 010

| Stroke lever: automatic return to home position, adjustable on drive shaft |

Technical Data:
- Max. display value: 99999
- Number of digits: 5 PCS
- Drive shaft diameter: 4 mm
- Digit height: 4.5 mm
- Width: 40 mm
- Height: 46 mm
Metre counter (length metre)

Application:
For continuous counting of distances covered on machines, e.g. production lines or conveyors.

Execution:
- Count frequency with measuring wheel max. 200 m/min., without measuring wheel, max. 300 m/min.
- Zero setting/reset using compression lever
- Stroke lever: automatic return to home position, adjustable to left or right on drive shaft
- Ident. No. 010: Counting method: adding towards observer, subtracting away from observer, 10 digits – 5 revolutions – 1 m with measuring wheel circumference 200 mm
- Ident. No. 020: Counting method: adding towards observer, subtracting away from observer, 10 digits – 2 revolutions – 1 m with measuring wheel circumference 500 mm

Scope of supply and services:
Without measuring wheel

Technical Data:
- Max. display value: 9999.9 m
- Number of digits: 5 PCS

| Drive shaft Ø (mm) | 4 | 7 |
| Digit height (mm)  | 4.5 | 7 |
| Width (mm)         | 80 | 120 |
| Height (mm)        | 48 | 64 |
| 39430... Ident. No. | 010 | 020 |
| Unit price, €       | O. R. | O. R. |

Measuring wheel

Application:
For use in metre counters length meters

<table>
<thead>
<tr>
<th>Wheel tread type</th>
<th>Smooth</th>
<th>Serrated</th>
<th>Smooth</th>
<th>Crossed</th>
<th>Serrated</th>
</tr>
</thead>
<tbody>
<tr>
<td>Wheel circumference (mm)</td>
<td>200</td>
<td>200</td>
<td>500</td>
<td>500</td>
<td>500</td>
</tr>
<tr>
<td>Material</td>
<td>Plastic</td>
<td>Plastic</td>
<td>Plastic</td>
<td>Nitrile</td>
<td>Plastic</td>
</tr>
<tr>
<td>Width (mm)</td>
<td>12</td>
<td>12</td>
<td>25</td>
<td>25</td>
<td>25</td>
</tr>
<tr>
<td>39431... Ident. No.</td>
<td>241</td>
<td>291</td>
<td>542</td>
<td>562</td>
<td>592</td>
</tr>
<tr>
<td>Unit price, €</td>
<td>O. R.</td>
<td>O. R.</td>
<td>O. R.</td>
<td>O. R.</td>
<td>O. R.</td>
</tr>
</tbody>
</table>