

Magnifying lenses and technical endoscopes			Layer and wall-thickness measurement		
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## 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

- No. 41120–41125: Nickel-plated brass cover plates

- No. 41130: Dust-proof plastic housing

**Advantage:**

- No. 41130: Precision magnifying glass for pin-sharp images free from chromatic aberration



No. 41100



No. 41120



No. 41125



No. 41130

		Magnification	Lens Ø (mm)	Lens design	Lens material	Ident. No.	
ORION	41100...	3,5-times	55	Biconvex	Glass	Ident. No.	011
						Unit price, €	O. R.
ORION	41120...	6x	23	Aplanatic	Glass	Ident. No.	011
						Unit price, €	O. R.
ORION	41120...	8x	23	Aplanatic	Glass	Ident. No.	021
						Unit price, €	O. R.
ORION	41120...	10x	23	Aplanatic	Glass	Ident. No.	031
						Unit price, €	O. R.
ORION	41120...	15x	18	Aplanatic	Glass	Ident. No.	051
						Unit price, €	O. R.
ORION	41120...	20x	18	Aplanatic	Glass	Ident. No.	061
						Unit price, €	O. R.
ATORN	41125...	3/6/9-times	30	Biconvex	Glass	Ident. No.	011
						Unit price, €	O. R.
ESCHENBACH	41130...	3/6/9-times	23	Achromatic	Glass	Ident. No.	010
						Unit price, €	O. R.

ESCHENBACH = Prod. Gr. 411

ORION = Prod. Gr. 454

ATORN = Prod. Gr. 490

**ATORN®** Reading magnifier**Application:**

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

**Execution:**

- Nickel-plated brass frame

- Round aluminium handle with recessed grips

**Technical Data:**

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



41140...	Ident. No.	025
	Unit price, €	O. R.

Prod. Gr. 490

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## ESCHENBACH Reading magnifier

### Application:

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

### Execution:

- Ergonomic, black plastic handle

### Technical Data:

- Lens design: Aplanatic
- Lens material: Plastic light lens

Magnification	2,9-times	3,8-times
Lens Ø (mm)	75	60
41141...	Ident. No. 011	Ident. No. 021
	Unit price, € O. R.	Unit price, € O. R.

Prod. Gr. 411



## ATORN® Handheld magnifier

### Application:

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

### Execution:

- Black anodised aluminium mount and handle

### Technical Data:

- Lens design: Aplanatic

Magnification	4x	5-times	8x	10x	15x
Lens Ø (mm)	50	40	30	23	23
41145...	Ident. No. 104	Ident. No. 105	Ident. No. 108	Ident. No. 110	Ident. No. 115
	Unit price, € O. R.	Unit price, € O. R.	Unit price, € O. R.	Unit price, € O. R.	Unit price, € O. R.

Prod. Gr. 490



## ESCHENBACH Pocket magnifier lamp EASY-POCKET

### 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

### scope of supply and services:

Batteries (2 x 1.5 V AA, type 2025)

### Technical Data:

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

41570...	Ident. No. 010
	Unit price, € O. R.

Prod. Gr. 411



## ESCHENBACH Pocket magnifier lamps mobilux LED

### Application:

For magnifying small parts with additional light source.

### Execution:

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

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)

### 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

### Technical Data:

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

Magnification	4x	4x	7-times	10x	12,5-times
Lens Ø (mm)	60	-	35	35	35
41541...	Ident. No. 011	Ident. No. 016	Ident. No. 021	Ident. No. 031	Ident. No. 041
	Unit price, € O. R.	Unit price, € O. R.	Unit price, € O. R.	Unit price, € O. R.	Unit price, € O. R.

Prod. Gr. 411



Ident. No. 011



Ident. No. 016

## 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)

**Technical Data:**

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



Magnification	Ident. No.	3,5-times	5-times	7-times
41541...	Unit price, €	<b>095</b> O. R.	<b>100</b> O. R.	<b>105</b> O. R.

Prod. Gr. 411

## 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



41541...	Ident. No.	<b>150</b>
	Unit price, €	O. R.

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



41330...	Ident. No.	<b>020</b>
	Unit price, €	O. R.

Prod. Gr. 454



## 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



41335...	Ident. No. Unit price, €	010 O. R.
----------	-----------------------------	--------------

Prod. Gr. 478

Accessories for		41335 010
41330...	Fluorescent tubes	Ident. No. Unit price, € 500 O. R.
41335...	Magnifier attachment	Ident. No. Unit price, € 020 O. R.
41335...	Table clamp	Ident. No. Unit price, € 040 O. R.
41335...	Table-top base For magnifier ring lamp	Ident. No. Unit price, € 050 O. R.

## ORION® Magnifier ring lamp

### 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



41330...	Ident. No. Unit price, €	010 O. R.
----------	-----------------------------	--------------

Prod. Gr. 454

Accessories for		41330 010
41330...	Fluorescent tubes	Ident. No. Unit price, € 500 O. R.

## ESCHENBACH Magnifying lamp 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



41336...	Ident. No. Unit price, €	100 O. R.
----------	-----------------------------	--------------

Prod. Gr. 411

Accessories for		41336 100
41336...	Table-top base For VARIO magnifying lamps	Ident. No. Unit price, € 110 O. R.

## ESCHENBACH 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

**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



41338...	Ident. No. Unit price, €	010 O. R.
----------	-----------------------------	--------------

Prod. Gr. 411

Accessories for		41338 010
41338...	Replaceable magnifier	Ident. No. Unit price, €
		400 O. R.

## Waldmann W 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

- 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

**scope of supply and services:**

**Ident. No. 100, 120:** Incl. bulbs

**Technical Data:**

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



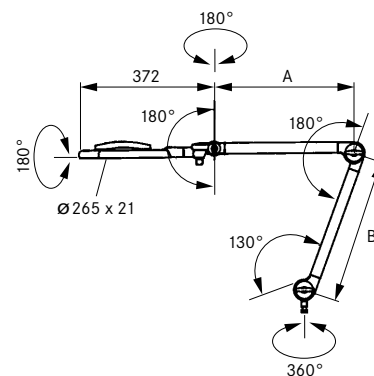
Ident. No. 100, 120

Model	RLLQ 48 R	RLLQ 48/2 R	RLLQ 48 R	RLLQ 48/2 R
A/B (mm)	484/500	484/500	384/400	384/400
41335...	Ident. No. Unit price, €	100 O. R.	110 O. R.	120 O. R.
		100 O. R.	120 O. R.	130 O. R.

Prod. Gr. 478

Accessories for			41335 100	41335 110	41335 120
41335...	Table clamp	Ident. No. Unit price, €	040 O. R.	040 O. R.	040 O. R.

Accessories for			41335 130
41335...	Table clamp	Ident. No. Unit price, €	040 O. R.



Ident. No. 100, 120

### ESCHENBACH Magnifying glasses

#### MaxDetail

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

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

**Advantage:**  
▪ Very light

▪ Large visual field (approx. 150 mm at distance of 400 mm)

**scope of supply and services:**  
In glasses case

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

41185...	Ident. No. Unit price, €	011 O. R.
----------	-----------------------------	--------------

Prod. Gr. 411

Accessories for		41185 011
41185... MaxDetail	Spectacle magnifier	Ident. No. Unit price, €
		020 O. R.



### ESCHENBACH 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



41185...	Ident. No. Unit price, €	100 O. R.
----------	-----------------------------	--------------

Prod. Gr. 411

### ESCHENBACH 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

Magnification		3-times	2-times
Working distance (mm)		130	250
41190...	Ident. No. Unit price, €	010 O. R.	020 O. R.

Prod. Gr. 411



### ATORN® 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

**Advantage:**  
▪ Half-open tube with white background for optimum, glare-free illumination of objects

▪ Brass dial, chrome-plated, high-precision laser graduated  
▪ Superb edge sharpness for near parallax-free viewing

**Technical Data:**  
▪ Scale value: 0.1 mm  
▪ Lens design: Achromatic  
▪ Lens material: Glass

Magnification		6x	8x	10x
Max. length measuring range (mm)		20	10	10
41540...	Ident. No. Unit price, €	055 O. R.	105 O. R.	205 O. R.

Prod. Gr. 490



Accessories for				41540 055	41540 105
41540...	Scale plate	Scale plate for 6x	Ident. No. Unit price, €	057 O. R.	-
		Scale plate for 8x	Ident. No. Unit price, €	-	107 O. R.
		Scale plate for 10x	Ident. No. Unit price, €	-	-

Accessories for			41540 205
41540...	Scale plate	Ident. No. Unit price, €	-
		Ident. No. Unit price, €	-
		Ident. No. Unit price, €	207 O. R.

## ORION® Measuring magnifying glass

Full metal design

### Application:

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

- INOX steel scale, black engraved divisions

### Technical Data:

- Lens design: Aplanatic
- Lens material: Glass

### Execution:

- Parallax-free, distortion-free reading

Magnification	6x	8x	10x	12-times
Max. length measuring range (mm)	20	10	10	6
Scale value (mm)	0.1	0.1	0.1	0.05
41535...	Ident. No. Unit price, €	060 O. R.	080 O. R.	100 O. R.

Prod. Gr. 454



## ESCHENBACH Measuring magnifying glass

Replaceable reticule plate

### Application:

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

### scope of supply and services:

Replaceable reticule plate, type 01, with case

### Execution:

- Focus using focussing ring
- Measuring range 10 mm
- Reticule plate 01

### Technical Data:

- Max. length measuring range: 20 mm
- Scale value: 0.1 mm
- Lens design: Achromatic
- Lens material: Glass

Magnification	7-times	10x
41560...	Ident. No. Unit price, €	110 O. R.

Prod. Gr. 411



## ESCHENBACH Measuring magnifying glass

LED light

### Application:

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

- Almost unlimited service life

### scope of supply and services:

Without batteries (2 x 1.5 V, type C)

### Execution:

- Replaceable reticule plate

### Advantage:

- Very bright, shadow-free light
- Power consumption approx. 10% compared to traditional lighting

41562...	Ident. No. Unit price, €	010 O. R.
----------	-----------------------------	--------------

Prod. Gr. 411



Calibration on request.

### ESCHENBACH Micromagnifiers

**Application:**  
For surface inspection of all materials

**scope of supply and services:**  
Batteries (2x 1.5 V AA)

**Execution:**

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

**Technical Data:**

- Magnification: 30-times
- Material: Plastic

41548...	Ident. No.	010
	Unit price, €	O. R.

Prod. Gr. 411



### ATORN® Measuring microscope

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

- Robust light metal housing
- Focussing using threaded channels in lens and eyepiece

**Execution:**

- Attached LED lighting (battery-powered)

**scope of supply and services:**

In transport case, with LED illumination, batteries (4x button cells 1.5 V type LR44)

Magnification	20x	40-times	60-fold
Max. length measuring range (mm)	7	4	2
Scale value (mm)	0.05	0.02	0.0125
Object field Ø (mm)	8	5	2.5
Working distance (mm)	57	36	26
Lens design	Achromatic	Achromatic	Achromatic
	41550...	41552...	41556...
	Ident. No.	Ident. No.	Ident. No.
	020	020	020
	O. R.	O. R.	O. R.
	Unit price, €		

Prod. Gr. 490



No. 41550

### RIDGID Digital inspection camera

#### micro CA-25™

**Application:**  
For detailed visual inspections at short range.

**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

**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

**Technical Data:**

- 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

41500...	Ident. No.	025
	Unit price, €	O. R.

Prod. Gr. 412





**RIDGID** 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 SD 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



41500...	Ident. No.	013
	Unit price, €	O. R.

Prod. Gr. 412

Accessories for		41500 013	
41500... Camera head For micro CA-100™, micro CA-300™, micro Explorer and SeeSnake micro	Camera head dia. 17 mm, cable length 0.9 m	Ident. No.	017
		Unit price, €	O. R.
	Camera head dia. 6 mm, cable length 1 m	Ident. No.	018
41500... Extension cables For micro CA-100™, micro CA-300™, micro Explorer and SeeSnake micro		Unit price, €	O. R.
	Camera head dia. 6 mm, cable length 4 m	Ident. No.	019
		Unit price, €	(O. R.)
	Cable length: 0.9 m	Ident. No.	021
		Unit price, €	O. R.
	Cable length: 1.8 m	Ident. No.	024
		Unit price, €	(O. R.)

**RIDGID** 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



41500...	Ident. No.	101
	Unit price, €	O. R.

Prod. Gr. 412

Accessories for		41500 101
Accessories for		41500 101



## 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 mm), CD with DinoCapture software

#### Technical Data:

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



Ident. No. 062-071



Ident. No. 072-074



Ident. No. 076

Model	AM4113ZT	AM4113TL	AM4515ZT	AM7013MZT	AD7013MTL
Camera resolution (Mpix)	1.3	1.3	1.3	5.0	5.0
Magnification	10 to 70-times	10 to 90-times	50 to 200-times	10 to 70-times	10 to 90-times
Max. magnification	200-times	-	-	200-times	-
Image resolution	1280 x 1024 pix	1280 x 1024 pix	1280 x 1024 pix	2592 x 1944 pix	2592 x 1944 pix
Min. working distance (mm)	0.5	45	0.5	0.5	45
Max. working distance (mm)	60	150	60	60	150
Polariser	Yes	Yes	Yes	Yes	No
Material of the housing	Plastic	Plastic	Plastic	Metal	Metal
41613...	Ident. No. 062 Unit price, €	Ident. No. 071 Unit price, €	Ident. No. 074 Unit price, €	Ident. No. 076 Unit price, €	Ident. No. 076 Unit price, €

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 articulated arm and focussing facility via turning knob. 200 mm height adjustment. Holder on column rotatable by 360° with focussing facility.

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.



Ident. No. 080  
MS-34B stand



Ident. No. 081  
MS-35B stand



Ident. No. 083  
MS-36B stand



Ident. No. 084  
MS-W1 stand



Ident. No. 085  
RK-10A

Model	MS-34B	MS-35B	MS-36B	MS-W1	RK-10A
Stand design	Column stand	Column stand	Column stand	Mobile stand	Column stand
Width x height x depth	75 x 130 x 115 mm	150 x 305 x 220 mm	150 x 305 x 220 mm	45 x 120 x 74 mm	150 x 230 x 220 mm
41613...	Ident. No. 080 Unit price, €	Ident. No. 081 Unit price, €	Ident. No. 083 Unit price, €	Ident. No. 084 Unit price, €	Ident. No. 085 Unit price, €

Prod. Gr. 412



## Glass calibration standard

For USB handheld microscope with DinoCapture software

### Application:

For calibrating the USB microscope in conjunction with DinoCapture software

41613...	Ident. No.	091
	Unit price, €	O. R.

Prod. Gr. 412

### 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

41612...	Ident. No.	020
	Unit price, €	O. R.

Prod. Gr. 412

### 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. dioptr adjustment
- Integrated reflected and transmitted light, continuously controllable
- High-quality lens for bright, sharp three-dimensional images

41612...	Ident. No.	150
	Unit price, €	O. R.

Prod. Gr. 307

- Zoom lens with continuous magnification
- Focussed using ergonomic manual wheels on both sides for left and right-handed users
- Column stand with footprint 260 mm x 200 mm

### 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



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**Mahr** 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. dioptr adjustment
- High-quality lens for bright, sharp three-dimensional images
- Zoom lens with continuous magnification

41612...	Ident. No. Unit price, €	160 (O. R.)
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Prod. Gr. 307

- Focused 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



**Motic** 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. dioptr 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

41613...	Ident. No. Unit price, €	180 O. R.
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Prod. Gr. 412

- 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:**

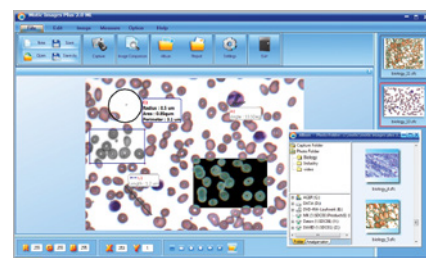
- Microscope with integrated camera and software for recording images and videos

**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



Software Images Plus 2.0 for image measurements

**ZEISS** 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

41611...	Ident. No. Unit price, €	025 O. R.
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Prod. Gr. 412

- 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





Accessories for			41611 025
41613...	K-LED double spot illuminator	Ident. No. Unit price, €	715 (O. R.)
41613...	K-LED ring light	Ident. No. Unit price, €	720 (O. R.)
41613...	K-LED controller For spot lights and ring lights	Ident. No. Unit price, €	730 (O. R.)



Integrated LED vertical lighting

## **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

41611...	Ident. No. Unit price, €	030 O. R.
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Prod. Gr. 412

Accessories for			41611 030
41613...	K-LED spot illuminator	Ident. No. Unit price, €	705 (O. R.)
41613...	K-LED double spot illuminator	Ident. No. Unit price, €	715 (O. R.)
41613...	K-LED controller For spot lights and ring lights	Ident. No. Unit price, €	730 (O. R.)

- 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 tube 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°

41611...	Ident. No. Unit price, €	130 O. R.
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Prod. Gr. 412

Accessories for			41611 130
41613...	K-LED spot illuminator	Ident. No. Unit price, €	705 (O. R.)
41613...	K-LED double spot illuminator	Ident. No. Unit price, €	715 (O. R.)
41613...	K-LED controller For spot lights and ring lights	Ident. No. Unit price, €	730 (O. R.)

- 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



III. with AxioCam ERc 5s digital camera



## 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

41611...	Ident. No. Unit price, €	200 (O. R.)
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Prod. Gr. 412

- 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

### Advantage:

- Excellent resolution even at low magnifications
- Bright, high-contrast and brilliant 3D images

### 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

41611...	Ident. No. Unit price, €	210 (O. R.)
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Prod. Gr. 412

- Stand with profile column, rough/fine drive and large support surface 450 x 346 mm

### 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



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## 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

41611...	Ident. No. Unit price, €	300 (O. R.)
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Prod. Gr. 412

- 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



Testing equipment



## 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 analyse 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/04; 50x/075
- Incident lighting with halogen reflector lamp 12 V 50 W

41611...	Ident. No. Unit price, €	310 (O. R.)
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Prod. Gr. 412

- 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

Accessories for		41611 310
41614... Digital camera AxioCam ERc 5s with image processing software Full package	Ident. No. Unit price, €	090 (O. R.)

## PHOTONIC OPTICS 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.

- 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



Ident. No. 676

Segment control system	No	Yes
<b>41613...</b>	Ident. No. <b>676</b> Unit price, € (O. R.)	Ident. No. <b>682</b> O. R.

Prod. Gr. 412

## PHOTONIC OPTICS 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

<b>41613...</b>	Ident. No. <b>761</b> Unit price, € (O. R.)
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Prod. Gr. 412

- 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



2-arm LED HI-Power spot fitted on a round column stand

## PHOTONIC OPTICS 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

<b>41613...</b>	Ident. No. <b>765</b> Unit price, € (O. R.)
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Prod. Gr. 412

### Execution:

- For column diameters of 25, 30, 32, 35 mm



**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		F1	F3000
Colour temperature (K)		5500	5800
Life time of illuminant (h)		50000	30000
<b>41613...</b>	Ident. No.	<b>635</b>	<b>637</b>
	Unit price, €	O. R.	(O. R.)

Prod. Gr. 412



Ident. No. 635



Ident. No. 637

**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

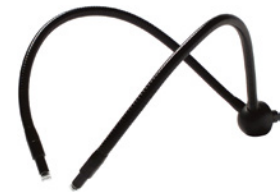
individual, space-saving applications.

**Technical Data:**

- Number of arms: 2 PCS
- Arm length: 550 mm

<b>41613...</b>	Ident. No.	<b>640</b>
	Unit price, €	O. R.

Prod. Gr. 412

**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

**Technical Data:**

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

**Execution:**

- Fibre optic cable length 750 mm

<b>41613...</b>	Ident. No.	<b>645</b>
	Unit price, €	(O. R.)

Prod. Gr. 412

**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

<b>41613...</b>	Ident. No.	<b>631</b>
	Unit price, €	(O. R.)

Prod. Gr. 412

## ORION® Mobile rebound hardness tester D200

Separate impact unit type D and wireless printer

DIN 50156

### 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/mm<sup>2</sup>. 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 ten 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 | 81-955 HV | 81-654 HB | 32.5-97.9 HS | 38.4-99.5 HRB | 20-68.4 HRC | 375-2639 N/mm<sup>2</sup>
- Hardness accuracy: ± 6 HL
- Hardness resolution: 1 HL | 1 HB | 1 HV | 1 N/mm<sup>2</sup> | 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



42160...	Ident. No. Unit price, €	095 O. R.
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Prod. Gr. 423

## ORION® Mobile rebound hardness tester D400

Separate impact unit type D

DIN 50156

### 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

### scope of supply and services:

Display unit, separate impact unit D, hardness reference block with workshop certificate (HLD value), software with connecting cable, batteries, coupling compound, cleaning brush 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 | 80-940 HV | 80-650 HB | 32-100 HS | 60-100 HRB | 20-68 HRC | 59-86 HRA
- Hardness accuracy: ± 4 HL (0.5% at 800 HL)
- Hardness resolution: 1 HL | 1 HB | 1 HV | 1 HS | 0.1 HRC | 0.1 HRB
- Rechargeable battery/battery designation: 1.2 V Mignon AA
- Length x width x height: 122 x 65 x 22 mm
- Memory (measurements): 1974 PCS



42160...	Ident. No. Unit price, €	115 O. R.
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Prod. Gr. 423



**KRAUTKRAMER mobile UCI hardness tester MIC 10****Separate manual probe**

DIN 50159

**Application:**

For determining and directly displaying hardness values in line with HB (Brinell), HV (Vickers), HRA (Rockwell A), HRB (Rockwell B), HRC (Rockwell C), 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\*

42170...	Ident. No. Unit price, €	010 O. R.
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Prod. Gr. 486

- 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. HRB measuring range: 41-105 HRB
- Min./max. HRC measuring range: 20.3-68 HRC
- Min./max. HB measuring range: 76-618 HB
- Min./max. tensile strength: 255-2180 N/mm<sup>2</sup>
- Hardness accuracy: ± 5
- Hardness resolution: 1 HB | 1 HV | 1 N/mm<sup>2</sup> | 0.1 HRC | 0.5 HRC | 1 HRC | 0.1 HRB | 0.5 HRB | 1 HRB



III. with optional manual measuring probe

**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



Example application

Test force (N)				10	50	98
Test body Ø (mm)				2.4	3.0	3.0
		Model				
42170...	Ideal for e.g. gear teeth and thin sheet metal	MIC 201-A	Ident. No. Unit price, €	100 (O. R.)	-	-
42170...	Ideal for measuring e.g. edge hardness and nitrided layers	MIC 205-A	Ident. No. Unit price, €	-	110 O. R.	-
42170...	Ideal for e.g. forged parts and inspecting welding seams	MIC 2010-A	Ident. No. Unit price, €	-	-	120 (O. R.)

Prod. Gr. 486

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## ORION® Mobile UCI hardness tester UCI-3000

Separate manual probe

DIN 50159

### 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 resolution: 1 HB | 1 HV | 0.1 HRC | 0.5 HRC | 1 HRC | 0.1 HRB | 0.5 HRB | 1 HRB
- Memory (measurements): 12900 PCS



42170...	Ident. No.	610
	Unit price, €	O. R.

Prod. Gr. 423

## ATORN® SHORE hardness testers

Shore A for soft materials and Shore D for hard materials

ISO 868

### 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



Ident. No. 100



Ident. No. 110

Model		HD-3000 Shore A	HD-3000 Shore D
Contact force (DIN 53505) (N)		12.5	50
42195...	Ident. No.	100	110
	Unit price, €	O. R.	O. R.

Prod. Gr. 426

## ATORN® Test sample set

for Shore hardness testers

### Application:

For checking Shore hardness testers

		ATORN test sample set Shore A	ATORN test sample set Shore D
Number of test samples (PCS)	Shore hardness range	42195... Ident. No.	42195... Ident. No.
7	30   40   50   60   70   80   90	140 O. R.	- -
3	60   75   85	- -	150 O. R.
		Unit price, €	

Prod. Gr. 426



Ident. No. 140



Ident. No. 150

**ATORN®** 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

42195...	ATORN test stands for Shore hardness tester	Ident. No. Unit price, €	120 O. R.
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Prod. Gr. 426



Test stand with SHORE A hardness tester

**ATORN®** Shore D loading weight  
For ATORN test stands**Technical Data:**

- Loading weight: 4000 g

- Load weight material: Stainless steel A2 1.4305

42195...	ATORN loading weight Shore D	Ident. No. Unit price, €	130 O. R.
----------	------------------------------	-----------------------------	--------------

Prod. Gr. 426

**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 other and to the edge.



Generating a hardness indentation

**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 Rrel 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).

Test procedure	Hardness values	
	Steel design (extract)	Aluminium design (extract)
Rockwell	HR 15-N, HR 30-TW*, etc.	HRF, HRE, HR 30-TW*
Vickers		HV 5-HV 60

Vickers-Micro	HV 0.010–HV 2	
Vickers-Makro	HV 1–HV 150	
Brinell	HBW 10/500, HBW 2.5/31.25, HBW 1/10	HBW 5/62.5, HBW 2.5/31.25
LEEB	380 HV 100, 620 HV 100**	
UCI	HRC, HV 1, HV 5, HV 10	

➔ 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

ISO DIN EN ISO 6506-3

#### 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

Testing method	HBW	HBW	HBW
Ball Ø (mm)	2.5	5.0	10.0
Test force (N)	187.5	750	3000
Hardness value	<b>42365...</b> Ident. No.	<b>42365...</b> Ident. No.	<b>42365...</b> Ident. No.
150	<b>002</b> O. R.	<b>020</b> (O. R.)	<b>040</b> (O. R.)
200	<b>004</b> O. R.	<b>022</b> O. R.	<b>042</b> O. R.
250	<b>006</b> O. R.	<b>024</b> O. R.	<b>044</b> O. R.
300	<b>008</b> O. R.	<b>026</b> (O. R.)	<b>046</b> O. R.
350	<b>010</b> O. R.	<b>028</b> (O. R.)	<b>048</b> (O. R.)
400	<b>012</b> O. R.	<b>030</b> (O. R.)	<b>050</b> O. R.
450	<b>014</b> (O. R.)	-	<b>052</b> (O. R.)
500	-	-	<b>054</b> O. R.
Unit price, €			

Prod. Gr. 424



Ident. No. 004



Ident. No. 024

## Hardness comparison plates

### HV test procedure

ISO DIN EN ISO 6507-3

#### 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

Testing method	HV 1	HV 3	HV 5	HV 10	HV 30
Hardness value	<b>42365...</b> Ident. No.	<b>42365...</b> Ident. No.	<b>42365...</b> Ident. No.	<b>42365...</b> Ident. No.	<b>42365...</b> Ident. No.
240	<b>138</b> (O. R.)	-	<b>168</b> (O. R.)	<b>184</b> O. R.	<b>198</b> O. R.
300	<b>140</b> O. R.	-	<b>170</b> (O. R.)	<b>186</b> O. R.	<b>200</b> O. R.
400	<b>142</b> (O. R.)	<b>158</b> (O. R.)	<b>172</b> O. R.	<b>188</b> O. R.	<b>202</b> O. R.
540	<b>144</b> O. R.	<b>160</b> (O. R.)	<b>174</b> O. R.	<b>190</b> O. R.	<b>204</b> O. R.
620	<b>146</b> O. R.	-	<b>176</b> (O. R.)	<b>192</b> O. R.	<b>206</b> (O. R.)
720	<b>148</b> O. R.	<b>164</b> O. R.	<b>178</b> O. R.	<b>194</b> O. R.	<b>208</b> O. R.
840	<b>150</b> O. R.	<b>166</b> (O. R.)	-	<b>196</b> O. R.	<b>210</b> (O. R.)
Unit price, €					

Prod. Gr. 424



Ident. No. 148



Ident. No. 204

## Hardness comparison plates

### HRA test method

ISO DIN EN ISO 6508-3

#### 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 value	Testing method		60	70	80
<b>42365...</b>	HRA	Ident. No.	<b>302</b> (O. R.)	<b>304</b> (O. R.)	<b>306</b> O. R.
Unit price, €					

Prod. Gr. 424





## Hardness comparison plates

## HRB test method

ISO DIN EN ISO 6508-3

**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

Hardness value			60	90	100
	Testing method	Ident. No.			
42365...	HRB-W	Unit price, €	312 O. R.	316 O. R.	318 (O. R.)

Prod. Gr. 424



## Hardness comparison plates

## Test method HRC

ISO DIN EN ISO 6508-3

**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

Hardness value			20	30	40	45	50	55	60	62/63	65
	Testing method	Ident. No.									
42365...	HRC	Unit price, €	320 O. R.	322 O. R.	324 O. R.	326 O. R.	328 O. R.	330 O. R.	332 O. R.	334 O. R.	336 O. R.

Prod. Gr. 424



Ident. No. 332

Testing equipment



## 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 clean 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 laboratories for special applications and/or simple cleaning work in workshops/production facilities. These tasks include cold-cleaning of temperature-sensitive parts, cleaning dusty and lint-covered materials, removing swarf, soot and scale and removing dirt that can be dissolved without using heated cleaning media.

#### 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



Ident. No. 031

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
43690... Ident. No.	011	031
Unit price, €	O. R.	O. R.

Prod. Gr. 432

Accessories for		43690 011	43690 031
43690... Insert basket for model series USR	Ident. No.	211	231
	Unit price, €	O. R.	O. R.
43690... Hostalen (polyethylene) immersion basket for model series USR	Ident. No.	311	311
	Unit price, €	O. R.	O. R.
43690... Stainless steel immersion basket for model series USR	Ident. No.	411	411
	Unit price, €	O. R.	O. R.
43690... Plastic standard cover for model series USR	Ident. No.	-	131
	Unit price, €		O. R.



## 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, flux, paint residue, 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

- 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

#### Advantage:

- Sweep function facilitates homogeneous sound distribution in cleaning bath and improves cleaning performance
- Autodegas/degas for rapid degassing
- Temperature-controlled ultrasound activation at pre-heated temperature
- Integrated fill level marking

#### 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



Ident. No. 071

Fig. with standard cover made of plastic



Ident. No. 093

Fig. with standard cover made of stainless steel

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)	2.75	4.25	5.75	9.5	12.75	18	28	45	90
Tray width (inner) (mm)	240	240	300	300	300	327	505	500	600
Tray depth (inner) (mm)	137	137	151	240	240	300	300	300	500
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
Outlet connection (in)	3/8	3/8	3/8	3/8	3/8	3/8	3/8	1/2	1/2
43690... Ident. No.	033	043	046	053	063	071	083	091	093
Unit price, €	O. R.	O. R.	O. R.	O. R.	O. R.	O. R.	O. R.	O. R.	(O. R.) <sup>+</sup>

Prod. Gr. 432

Accessories for			43690 033	43690 043	43690 046	43690 053	43690 063
43690...	Plastic standard cover for model series USR	Ident. No. Unit price, €	131 O. R.	131 O. R.	146 O. R.	151 O. R.	151 O. R.
43690...	Insert basket for model series USR	Ident. No. Unit price, €	231 O. R.	243 O. R.	246 O. R.	251 O. R.	263 O. R.
43690...	Hostalen (polyethylene) immersion basket for model series USR	Ident. No. Unit price, €	311 O. R.	311 O. R.	311 O. R.	311 O. R.	311 O. R.
43690...	Stainless steel immersion basket for model series USR	Ident. No. Unit price, €	411 O. R.	411 O. R.	411 O. R.	411 O. R.	411 O. R.
43690...	Stainless steel standard cover for model series USR	Ident. No. Unit price, €	-	-	-	-	-

Accessories for			43690 071	43690 083	43690 091	43690 093
43690...	Plastic standard cover for model series USR	Ident. No. Unit price, €	171 O. R.	183 O. R.	-	-
43690...	Insert basket for model series USR	Ident. No. Unit price, €	271 O. R.	283 O. R.	291 O. R.	293 (O. R.)
43690...	Hostalen (polyethylene) immersion basket for model series USR	Ident. No. Unit price, €	311 O. R.	311 O. R.	311 O. R.	311 O. R.
43690...	Stainless steel immersion basket for model series USR	Ident. No. Unit price, €	411 O. R.	411 O. R.	411 O. R.	411 O. R.
43690...	Stainless steel standard cover for model series USR	Ident. No. Unit price, €	-	-	191 O. R.	193 (O. R.)



### Insert basket for model series USR

Model series USR

#### Execution:

- Stainless steel insert basket



Basket width (inner) (mm)	Basket depth (inner) (mm)	Basket height (inner) (mm)	Wire Ø (mm)	Cage mesh size (mm)	Max. cage load (kg)	43690... Ident. No.
177	73	30	1	7	1	211 O. R.
198	106	50	1	7	1	231 O. R.
190	105	75	1	7	3	243 O. R.
255	115	75	1	9	5	246 O. R.
255	200	75	1	9	6	251 O. R.
250	190	115	1	9	7	263 O. R.
280	250	115	1	9	8	271 O. R.
455	250	115	1	9	10	283 O. R.
455	270	194	1	9	20	291 O. R.
545	450	250	1.2	16	30	293 (O. R.)
						Unit price, €

Prod. Gr. 432



### Submersible baskets for ultrasonic cleaning devices

#### Application:

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

**Ident. No. 411:** Ideal for small parts.

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

#### Execution:

- Ident. No. 311:**

Ø (mm)	74		59
Height (mm)	50		60
43690...	Hostalen immersion basket	Ident. No. Unit price, €	311 O. R.
43690...	Stainless steel immersion basket	Ident. No. Unit price, €	- 411 O. R.

Prod. Gr. 432



Ident. No. 311

Ident. No. 411



## 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.

### 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

### 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
- Outlet connection: 1/2 in



Model TI-H

Model	TI-H 15	TI-H 20
Max. tray contents (l)	14.4	19.8
Tray width (inner) (mm)	300	330
Tray depth (inner) (mm)	240	300
Effective ultrasonic capacity (W)	200	250
Max. ultrasound peak capacity (W)	800	1000
Heating power (W)	1000	1400
Max. power drain (W)	1200	1650
43690... Ident. No.	506	508
Unit price, €	(O. R.)	(O. R.)

Prod. Gr. 432

Accessories for		43690 506	43690 508
43690... Insert basket for ultrasonic cleaning device Model series TI-H	Ident. No.	516	518
	Unit price, €	(O. R.)	(O. R.)



## Insert basket for ultrasonic cleaning device

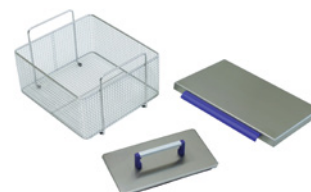
Model series TI-H

### Execution:

- Stainless steel insert basket

Basket width (inner) (mm)	Basket depth (inner) (mm)	Basket height (inner) (mm)	Wire Ø (mm)	Cage mesh size (mm)	Max. cage load (kg)	43690... Ident. No.
260	210	135	1	9	7	516 (O. R.)
290	270	135	1	9	8	518 (O. R.)
						Unit price, €

Prod. Gr. 432



Basket and cover (pull-out)

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## 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

- Ultrasonic bath made from special, highly cavitation-proof stainless steel
- Inclined bath floor for improved drainage
- Suspension device for cleaning and draining positions

### 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



Ident. No. 709

X-tra basic with optional standard cover



Insertion basket in dripping position

Model	X-tra basic 300	X-tra basic 550	X-tra basic 800	X-tra basic 1200	X-tra basic 1600	X-tra basic 2500
Max. tray contents (l)	30	58	83	126	162	255
Tray width (inner) (mm)	330	500	500	600	600	750
Tray depth (inner) (mm)	300	330	330	600	600	650
Tray height (inner) (mm)	300	350	500	350	450	520
Effective ultrasonic capacity (W)	600	1000	1000	1800	2000	2000
Max. ultrasound peak capacity (W)	2400	4000	4000	7200	8000	8000
Heating power (W)	1700	2900	5800	5800	7500	7500
Max. power drain (W)	2310	3910	6810	7620	9520	9520
Nominal voltage (V/AC)	220	400	400	400	400	400
Outlet connection (in)	3/4	3/4	3/4	1	1	1
43690...	Ident. No. 703 Unit price, € (O. R.) <sup>+</sup>	706 (O. R.) <sup>+</sup>	709 (O. R.) <sup>+</sup>	712 (O. R.) <sup>+</sup>	715 (O. R.) <sup>+</sup>	718 (O. R.) <sup>+</sup>

Prod. Gr. 432

Accessories for		43690 703	43690 706	43690 709	43690 712	43690 715	43690 718
43690... Standard cover for ultrasonic cleaning device Model series X-tra basic	Ident. No. Unit price, €	803 (O. R.)	809 (O. R.)	809 (O. R.)	812 (O. R.)	812 (O. R.)	818 (O. R.)
43690... Insert basket for ultrasonic cleaning device Model series X-tra basic	Ident. No. Unit price, €	903 (O. R.)	906 (O. R.)	909 (O. R.)	912 (O. R.)	915 (O. R.)	918 (O. R.)



## Insert basket for ultrasonic cleaning device

Model series X-tra basic

### Execution:

- Stainless steel insert basket



Insertion basket in dripping position

Basket width (inner) (mm)	Basket depth (inner) (mm)	Basket height (inner) (mm)	Wire Ø (mm)	Cage mesh size (mm)	Max. cage load (kg)	43690... Ident. No.
255	230	165	2	20	12	903 (O. R.)
415	255	210	2	20	25	906 (O. R.)
400	255	360	2	20	40	909 (O. R.)
490	525	200	2	20	50	912 (O. R.)
480	525	300	2	20	50	915 (O. R.)
630	575	365	2	20	50	918 (O. R.)
						Unit price, €

Prod. Gr. 432

## ATORN® 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



Ident. No. 041-131

Min./max. force of measuring range	3-30 cN	5-50 cN	10-100 cN	25-250 cN	50-500 cN	100-1000 cN	300-3000 cN	500-5000 cN	1000-10000 cN
Scale value, force (cN)	1	1	2	5	10	20	50	100	200
Meter Ø (mm)	36	36	36	36	72	72	72	72	72
Sensor length (mm)	29	29	29	29	48	48	48	48	8
Weight (g)	64	64	64	64	260	260	278	294	290
44100...	Ident. No. 041	051	061	081	091	101	121	131	151
	Unit price, € O. R.	O. R.	O. R.	O. R.	O. R.	O. R.	O. R.	O. R.	O. R.

Prod. Gr. 440

## 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 %



Min./max. force of measuring range	0-50 N	0-100 N	0-200 N	0-500 N
Scale value, force (N)	0.5	1	2	10
44165...	Ident. No. 020	030	040	050
	Unit price, € (O. R.)	O. R.	(O. R.)	O. R.

Prod. Gr. 443

## 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

- Display resolution +/- 20,000 digits

### Advantage:

- 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%



Min./max. force of measuring range	0-50 N	0-100 N	0-200 N	0-500 N	0-1000 N	0-2000 N	0-5000 N
Digit increment, force (N)	0.02	0.05	0.1	0.2	0.5	1	2
Connection thread for clamping device	M6	M6	M6	M6	M6	M12	M12
44166...	Ident. No. 006	011	021	051	101	201	501
	Unit price, € (O. R.)	O. R.	O. R.	O. R.	O. R.	(O. R.)	(O. R.)

Prod. Gr. 443



## ATORN® 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

- Display resolution +/- 50,000 digits

#### Advantage:

- 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



Min./max. force of measuring range		0-50 N	0-100 N	0-200 N	0-500 N	0-1000 N	0-2000 N	0-5000 N
Digit increment, force (N)		0.001	0.01	0.01	0.01	0.1	0.1	0.1
Connection thread for clamping device		M6	M6	M6	M6	M6	M12	M12
44181...	Ident. No. Unit price, €	005 O. R.	010 O. R.	020 (O. R.)	050 O. R.	100 O. R.	200 (O. R.)	500 O. R.

Prod. Gr. 490

## 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

- 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



Max. force measuring range (N)		2	5	10	25	50	100	200	300	600	1000
Scale value, force (N)		0.02	0.05	0.1	0.25	0.5	2	4	5	10	20
Length (mm)		250	250	250	250	250	255	255	290	342	368
Sleeve Ø (mm)		14.5	14.5	14.5	14.5	14.5	14.5	18	21	28	28
442 10...	Ident. No. Unit price, €	010 (O. R.)	020 O. R.	030 O. R.	040 O. R.	050 O. R.	060 O. R.	070 O. R.	080 O. R.	090 O. R.	100 O. R.

Prod. Gr. 443

## ATORN® 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:

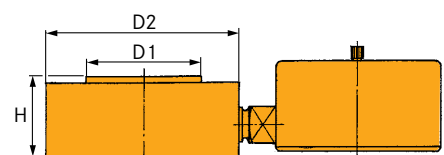
- Very slim design for in constricted spaces
- Integrated throttle damping for light, abrupt loading and unloading

#### 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



Min./max. force of measuring range	0-0.16 kN	0-0.25 kN	0-0.6 kN	0-1 kN	0-1.6 kN	0-2.5 kN	0-6 kN	0-10 kN	0-16 kN	0-25 kN	0-60 kN	0-100 kN
Scale value, force (kN)	0.005	0.005	0.01	0.02	0.05	0.05	0.1	0.2	0.5	0.5	1	2
Outer Ø (mm)	75	75	75	75	75	75	75	75	75	75	90	90
Overall height of force sensor (mm)	30	30	30	30	30	30	30	30	30	30	32	32
Piston Ø (mm)	45	45	45	45	45	45	45	45	45	45	56	56
Fastening thread clearance (mm)	55	55	55	55	55	55	55	55	55	55	75	75
Mean distance between manometer and force sensor (mm)	82	82	82	82	82	82	82	82	82	82	90	90
44420... Ident. No. Unit price, €	021 O. R.	031 O. R.	051 O. R.	061 O. R.	071 O. R.	081 O. R.	101 O. R.	111 O. R.	121 O. R.	131 O. R.	151 O. R.	161 O. R.

Prod. Gr. 490

## 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)

Ident. No. 010-040: Large LCD display with 11 mm digit size

Ident. No. 050-060: Large LCD display with 12 mm digit size

### scope of supply and services:

Ident. No. 010-040: 9 V battery, E-block

Ident. No. 050-060: 2x1.5 V AA batteries



Ident. No. 010-040



Ident. No. 050-060  
Type HDB

Type description	CH 15K20	CH 50K50	CH 50K100	HDB 5K5N	HDB 10K10
Max. weight measuring range (kg)	15	50	50	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
44228... Ident. No. Unit price, €	010 O. R.	030 O. R.	040 O. R.	050 O. R.	060 O. R.

Prod. Gr. 443

## KERN 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

### scope of supply and services:

Mains charger, radio remote control

### Technical Data:

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



Type description	HFB 150K50	HFB 300K100	HFB 600K200
Max. weight measuring range (kg)	150	300	600
Digit increment, weight (g)	50	100	200
44267... Ident. No. Unit price, €	310 (O. R.)	320 (O. R.)	330 (O. R.)

Prod. Gr. 447

## KERN Electronic crane scales, type HFM

### Remote control

**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

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

**Advantage:**

- When not in use, the weight display is automatically frozen until the HOLD key is pressed
- Adjust to unstable environmental conditions by changing the readability

**scope of supply and services:**

Mains charger, remote control with batteries (2x 1.5 V type AAA)



Type description	HFM 1T0.1	HFM 3T0.5	HFM 5T0.5	HFM 10T1
Max. weight measuring range (kg)	1000	3000	5000	10000
Digit increment, weight (g)	100	500	500	1000
Housing dimensions (LxWxH)	175 x 270 x 200 mm	175 x 270 x 200 mm	190 x 300 x 230 mm	190 x 300 x 230 mm
Weight (kg)	15	16.5	25	37
44267... Ident. No.	210	220	230	240
Unit price, €	(O. R.)	(O. R.)	(O. R.)	(O. R.) <sup>+</sup>

Prod. Gr. 447

## KERN KERN compact scales, type PCB and FCB

**Application:**

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

**Ident. No. 050–060:** Ideal for use in various locations.

**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)

- Option: Battery operation

- Ident. No. 050–060:** Second display on the rear side

**Advantage:**

- Ident. No. 011–045:** User-programmable weighing unit (thread length g/m, paper weight g/m<sup>2</sup>)
- 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



Ident. No. 011



Ident. No. 041

Type description	PCB 250-3	PCB 1000-1	PCB 3500-2	PCB 6000-1	PCB 10000-1	FCB 12K1 N	FCB 24K2 N
Max. weight measuring range	250 g	1000 g	3500 g	6000 g	10000 g	12 kg	24 kg
Digit increment, weight (g)	0.001	0.01	0.01	0.1	0.1	1	2
Plate length x plate width	-	130 x 130 mm	130 x 130 mm	150 x 170 mm	150 x 170 mm	252 x 228 mm	252 x 228 mm
Panel Ø (mm)	81	-	-	-	-	-	-
Min. item weight (g)	0.002	0.02	0.02	0.2	0.2	2	4
Reproducibility (g)	0.001	0.01	0.02	0.1	0.1	1	2
Linearity (g)	0.003	0.03	0.03	0.3	0.3	3	6
Housing dimensions (LxWxH)	245 x 163 x 79 mm	245 x 163 x 79 mm	245 x 163 x 79 mm	245 x 163 x 79 mm	245 x 163 x 79 mm	345 x 270 x 106 mm	345 x 270 x 106 mm
44605... Ident. No.	011	021	031	041	045	050	060
Unit price, €	O. R.	O. R.	O. R.	O. R.	O. R.	O. R.	O. R.

Prod. Gr. 447

## 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

- Input item, batch designation, operator etc.

- Ident. No. 041–051:** Circular wind guard only available for weighing tray size: Diameter 81 mm

### Advantage:

- User-programmable weighing unit (thread length g/m, paper weight g/m<sup>2</sup>)

### Technical Data:

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



Ident. No. 021



Ident. No. 051

Type description	PKS 360-3	PKS 2000-2	PKS 3600-2	PKS 10K0.1
Max. weight measuring range (g)	361	2010	3610	10100
Digit increment, weight (g)	0.001	0.01	0.01	0.1
Plate length x plate width	-	130 x 130 mm	130 x 130 mm	150 x 170 mm
Panel Ø (mm)	81	-	-	-
Min. item weight (g)	0.001	0.01	0.01	0.1
Reproducibility (g)	0.002	0.01	0.02	0.1
Linearity (g)	0.005	0.05	0.05	0.3
44615...	Ident. No. 021	031	041	051
Unit price, €	(O. R.)	(O. R.)	(O. R.)	(O. R.)

Prod. Gr. 447

## KERN 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/m<sup>2</sup>)

### scope of supply and services:

Mains adapter

### Technical Data:

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



Ident. No. 020–040

Type description	572-33	572-39	572-45	572-49	572-57
Max. weight measuring range (g)	1610	4210	12100	16100	24100
Digit increment, weight (g)	0.01	0.01	0.05	0.1	0.1
Plate length x plate width	-	-	160 x 200 mm	160 x 200 mm	160 x 200 mm
Panel Ø (mm)	150	150	-	-	-
Min. item weight (g)	0.03	0.03	0.15	0.3	0.3
Reproducibility (g)	0.01	0.02	0.05	0.1	0.1
Linearity (g)	0.03	0.03	0.15	0.3	0.3
44615...	Ident. No. 010	016	020	030	040
Unit price, €	(O. R.)	(O. R.)	O. R.	(O. R.)	(O. R.)

Prod. Gr. 447

## KERN 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.

- Battery operation possible (6x type AA, 1.5 V)

- Large LCD display with 25 mm digit size

### scope of supply and services:

Mains adapter

### Technical Data:

- With unit counting: No



Type description	EOB 35K10	EOB 60K20	EOB 60K20L	EOB 150K50	EOB 150K50L	EOB 300K100A	EOB 300K100L
Max. weight measuring range (kg)	35	60	60	150	150	300	300
Digit increment, weight (g)	10	20	20	50	50	100	100
Plate length x plate width	310 x 300 mm	310 x 300 mm	550 x 550 mm	310 x 300 mm	550 x 550 mm	310 x 300 mm	550 x 550 mm
Reproducibility (g)	10	20	20	50	50	100	100
Linearity (g)	20	40	40	100	100	200	200
44607...	Ident. No. 011	021	026	031	036	041	046
Unit price, €	(O. R.)	(O. R.)	(O. R.)	(O. R.)	(O. R.)	(O. R.)	(O. R.)

Prod. Gr. 447

## KERN 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/m<sup>2</sup>
- Formulation function for weighing different components

- Backlit LCD display with 25 mm digit size

**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



Ident. No. 200  
Example with display that can be freely positioned, weighing tray 315 x 305 mm

Type description	DE 6K1D	DE 15K0.2D	DE 15K2D	DE 35K5D	DE 60K1D	DE 60K10D	DE 60K10DL	DE 150K20D
Max. weight measuring range (kg)	3	6	6	15	30	30	30	60
Max. weight measuring range 2 (kg)	6	15	15	35	60	60	60	150
Digit increment, weight (g)	1	0.2	2	5	1	10	10	20
Digit increment 2, weight (g)	2	0.5	5	10	2	20	20	50
Plate length x plate width	315 x 305 mm	315 x 305 mm	315 x 305 mm	315 x 305 mm	315 x 305 mm	315 x 305 mm	522 x 403 mm	315 x 305 mm
Min. item weight (g)	2	0.4	4	10	2	20	20	40
Reproducibility (g)	1	0.2	2	5	1	10	10	20
Reproducibility 2 (g)	2	0.5	5	10	2	20	20	50
Linearity (g)	3	0.8	4	15	4	30	4	60
Linearity 2 (g)	6	2	10	30	8	40	40	100
44618... Ident. No.	200	210	220	230	240	250	260	270
Unit price, €	(O. R.)	(O. R.)	(O. R.)	(O. R.)	(O. R.)	(O. R.)	O. R.	(O. R.)

Type description	DE 150K20DL	DE 300K50D	DE 300K50DL
Max. weight measuring range (kg)	60	150	150
Max. weight measuring range 2 (kg)	150	300	300
Digit increment, weight (g)	20	50	50
Digit increment 2, weight (g)	50	100	100
Plate length x plate width	522 x 403 mm	522 x 403 mm	650 x 500 mm
Min. item weight (g)	40	100	200
Reproducibility (g)	20	50	50
Reproducibility 2 (g)	50	100	100
Linearity (g)	60	150	150
Linearity 2 (g)	100	300	300
44618... Ident. No.	280	290	300
Unit price, €	O. R.	(O. R.)	(O. R.)

Prod. Gr. 447

## KERN 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

- 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



Type description	CPB 6K0.1N	CPB 15K0.2N	CPB 30K0.5N
Max. weight measuring range (kg)	6	15	30
Digit increment, weight (g)	0.1	0.2	0.5
Min. item weight (g)	0.1	0.25	0.5
44616... Ident. No.	251	261	271
Unit price, €	O. R.	O. R.	O. R.

Prod. Gr. 447





## KERN test weights

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



➔ Further information, advice and quotations available on request.



## 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

	Model 415	456C Model B	456C Model S	456C Model T
Versions	FNF combined units	F-, NF1) and FNF combined units		
Integrated probe	X	X		
Separate probe		X (axial or rectangular)		
Measuring range	0–1000 µm	0–1500 <sup>2)</sup> µm		
Digit increment	1 µm	< 100 µm: 0,1 µm / ≥ 100: 1 µm		
Measuring rate	≥ 60 measurements/min	≥ 70 measurements/min		
Measuring arched surfaces		Convex from R = 2 mm Concave from R = 25 mm (external probe)		
Error limit	± 3% of the measured value (min. ± 3 µm)	a) ± 3% of the measured value (min. ± 1.5 µm) b) ± 1% of the measured value, for calibration around the layer thickness nominal value		
Measurement display	Digit height 19 mm	Max. digit height approx. 28 mm (display measured value and operating keys) rotating display: 0–90° – 180°–270°		
Calibration	a) Zero setting on non-coated surface b) Zero setting with fixed calibration value <sup>3)</sup>	a) Zero setting on non-coated surface b) Point calibration for smooth and rough surfaces c) Calibration lock d) 3 individually programmable calibration memories		
		Zero-offset for calibration according to ISO 19840		
		Individual batch calibration		
Number of batches	-		1	999
Device memory (number of measured values)	-	5 <sup>4)</sup>	1500 in one batch	150000 in up to 2500 batches
Tolerance limits	-		X	X <sup>5)</sup> (also lot-based)
Statistics function (pre-selectable)	-		X	
Interface	-		USB and Bluetooth	
Software for further processing the measured data in the PC	-	ElcoMaster 2.0 (download version)	ElcoMaster 2.0 in CD	

➔ On request:

- NF-coating thickness measuring instruments
- Measuring ranges up to 30 mm.
- If no uncoated substrate is present
- The last 5 measured values are saved
- Graphical representation of measured values and exceeded tolerance limits on display

# elcometer® 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-metallic 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. 600–615:** 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. 620:** Internal memory for 1500 measured values

▪ **Ident. No. 620–625:** Deviation from limit values triggers acoustic and visual signals

▪ **Ident. No. 625:**

- Internal memory for 150000 measured values
- User-defined batches viewed separately

## Advantage:

- Fast samplings 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

## scope of supply and services:

**Ident. No. 600–605:** Measuring instrument, calibration films (25, 50, 125, 250, 500, 1000 µm), hand strap, protective sleeve, plastic bag, 2x AA batteries, operating instructions

**Ident. No. 610–615:** Measuring instrument, hand strap, protective sleeve, plastic bag, 2x AA batteries, operating instructions

**Ident. No. 620–625:** Measuring instrument, hand strap, transport case, screen protector, USB cable, ElcoMaster 2.0™ software, protective sleeve, 2x AA batteries, operating instructions

## Notes:

**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



Ident. No. 600–605



Ident. No. 610–625



Test probe					Integrated	Separately	Separately	Separately
Min./max. layer thickness display range					-	0-31 mm	0-31 mm	0-31 mm
Min./max. layer thickness of measuring range					0-1500 µm	-	-	-
Accuracy (+/-) (µm)					2.5	50	50	50
Data transmission type					USB	USB	USB/Bluetooth	USB/Bluetooth
Internal memory					5 measured values	5 measured values	1500 measured values	150000 measured values
Adjustable limit values					No	No	Yes	Yes
	Model	Type	Probe design					
45800...	A456CFBLI	B	F	Ident. No. Unit price, €	600 O. R.	-	-	-
45800...	A456CFBS	B	F	Ident. No. Unit price, €	-	610 O. R.	-	-
45800...	A456CFNFB1	B	FNF	Ident. No. Unit price, €	605 O. R.	-	-	-
45800...	A456CFNFBS	B	FNF	Ident. No. Unit price, €	-	615 O. R.	-	-
45800...	A456CFNFSS	S	FNF	Ident. No. Unit price, €	-	-	620 O. R.	-
45800...	A456CFNFTS	T	FNF	Ident. No. Unit price, €	-	-	-	625 O. R.

Prod. Gr. 451

Accessories for		45800 600	45800 605	45800 610	45800 615	45800 620	45800 625
45800... USB Bluetooth adapter For coating thickness gauges in the 456C model series	Ident. No. Unit price, €	690 (O. R.)	690 (O. R.)	690 (O. R.)	692 (O. R.)	692 (O. R.)	692 (O. R.)

## Ultrasonic wall thickness gauge

### Integrated probe

#### 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 and 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

46 100...	Ident. No.	500
	Unit price, €	O. R.

Prod. Gr. 451

Accessories for		46 100 500
46 100...	Coupling liquids 500 ml for ultrasonic wall thickness gauges	Ident. No. Unit price, €
46 100...	Coupling liquids 5 x 250 g bottles for ultrasonic wall thickness gauges	Ident. No. Set price, €
		090 O. R.
		520 O. R.

- 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



## ORION® Temperature measuring instrument with universal sensor with universal probe

#### Application:

For simple temperature measurements in industrial applications

#### Execution:

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

46 105...	Ident. No.	200
	Unit price, €	O. R.

Prod. Gr. 456

- Error limit  $\pm 1\% \pm 1^\circ\text{C}$

#### 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



## ORION® 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°C..+199.9°C, otherwise 1.0°C
- Ident. No. 220:
  - 2 simultaneous measurements
  - Error limit  $\pm 0.1\% \pm 0.7^\circ\text{C}$
- Ident. No. 240:
  - 4 simultaneous measurements
  - Configuration via software or logger keyboard

- Data logger function for storing 16,000 measurements
- Backlight
- Error limit  $\pm 0.3\% \pm 1.0^\circ\text{C}$

#### 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

46 105...	2-channel	Ident. No.	220
		Unit price, €	O. R.
46 105...	4-channel	Ident. No.	240
		Unit price, €	O. R.

Prod. Gr. 456



Ident. No. 220



Ident. No. 240

## 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. 330:** Straight

▪ **Ident. No. 340:** Curved

▪ **Ident. No. 350:** Glass-fibre-insulated

## Technical Data:

▪ Cable length: 1 m



Ident. No. 310



Ident. No. 320



Ident. No. 330



Ident. No. 340



Ident. No. 350

Min./max. temperature measuring range		-40 to 400 °C	-100 to 1100 °C	-65 to 550 °C	-40 to 900 °C	-50 to 400 °C
Length (mm)		120	300	130	130	1000
Ø (mm)		3	3	10	8	1
46105...	Ident. No. Unit price, €	310 O. R.	320 O. R.	330 O. R.	340 O. R.	350 O. R.

Prod. Gr. 456

## ORION® 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:  $\pm 0.5^\circ\text{C} \pm 3\%$

▪ **Ident. No. 010:** IP 65 protection

▪ **Ident. No. 020:** Additional measurement of relative air humidity and dew point

## scope of supply and services:

USB data cable, Windows software on CD and battery (1x 3 V lithium type CR2032)

## Technical Data:

- Min./max. temperature measuring range:  $-30$  to  $70^\circ\text{C}$
- Digit increment (measuring instrument for temperature):  $0.1^\circ\text{C}$
- Temperature error limit (residual area):  $0.7^\circ\text{C}$

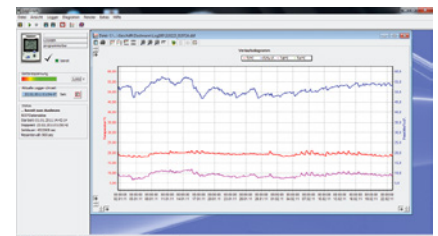


Data logger with temperature probes

Min./max. humidity (rF) of measuring range		-	0-99 %
IP protection class		IP 65	-
46200...	Ident. No. Unit price, €	010 O. R.	020 O. R.

Prod. Gr. 456

Accessories for			46200 010	46200 020
46200... Temperature sensor	40 x 3 mm, length 3 m	Ident. No. Unit price, €	103 O. R.	103 O. R.
	40 x 3 mm, length 8 m	Ident. No. Unit price, €	108 O. R.	108 O. R.



## ORION® Infrared temperature measuring instruments

### Application:

For measuring surface temperatures of rotating or live components

### Execution:

- Error limit  $\pm 2\%$  or  $\pm 2^\circ\text{C}$
- **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  $^\circ\text{C}/^\circ\text{F}$
  - Backlit display (switchable)

- 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

- 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

### scope of supply and services:

With battery in case.

### Technical Data:

- Digit increment (measuring instrument for temperature):  $0.1^\circ\text{C}$



Ident. No. 020



Ident. No. 041



Ident. No. 045

Min./max. temperature measuring range	-33 to 500 $^\circ\text{C}$	-50 to 1000 $^\circ\text{C}$	-60 to 550 $^\circ\text{C}$
Min./max. emission ratio	-	-	0.1-1.0
Optical focus	11:1	50:1	12:1
Rechargeable battery/battery designation	Mignon AA	9 V block	Micro AAA
46135...	Ident. No. Unit price, €	020 O. R.	041 O. R.
		045 O. R.	

Prod. Gr. 456

## ORION® 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  $^\circ\text{C}/^\circ\text{F}$
- USB port
- Error limit  $\pm 2\%$  or  $\pm 2^\circ\text{C}$

### 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

### scope of supply and services:

Sturdy transport case, USB cable, mains plug with USB connection, incl. temperature sensor TYP K, small camera tripod

### Technical Data:

- Min./max. temperature measuring range: -50 to 1000  $^\circ\text{C}$
- Optical focus: 50:1



46135...	Ident. No. Unit price, €	100 O. R.
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Prod. Gr. 456



**ATORN®** Infrared temperature measuring instruments**Application:**

For measuring surface temperatures of rotating or live components

**Execution:**

- Temperature display in °C and °F
- Backlit 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:**



Ident. No. 011

- Consistently small measuring spot of 13 mm at any distance of up to 140 mm
- Error limit  $\pm 1\%$  or  $\pm 1^\circ\text{C}$  from  $0^\circ\text{C}$  to  $530^\circ\text{C}$   $\pm 1^\circ\text{C} \pm 0.07^\circ\text{C}$  from  $0^\circ\text{C}$  to  $32^\circ\text{C}$
- **Ident. No. 021:**
  - Error limit  $\pm 1\%$  or  $\pm 1^\circ\text{C}$  from  $0^\circ\text{C}$  to  $760^\circ\text{C}$   $\pm 1^\circ\text{C} \pm 0.07^\circ\text{C}$  from  $0^\circ\text{C}$  to  $32^\circ\text{C}$
  - 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



Ident. No. 021

- at a distance of 62 mm) via a lever adjustment, ideal for inspecting small electronic components, for example
- Error limit  $\pm 0.75\%$  or  $\pm 0.75^\circ\text{C}^*$
- Measured value memory for up to 100 values

**scope of supply and services:**

**Ident. No. 011:** With batteries in case

**Ident. No. 021–030:** With batteries in case, incl. USB cable and Windows software

**Technical Data:**

- Digit increment (measuring instrument for temperature):  $0.1^\circ\text{C}$



Ident. No. 030

Min./max. temperature measuring range	-32 to $530^\circ\text{C}$	-32 to $760^\circ\text{C}$	-35 to $900^\circ\text{C}$
Min./max. emission ratio	0.1-1.0	0.1-1.5	0.1-1.1
Optical focus	20:1	40:1	75:1 + DFL
Rechargeable battery/battery designation	9 V block	9 V block	Mignon AA
46150...	Ident. No. 011 Unit price, €	Ident. No. 021 O. R.	Ident. No. 030 O. R.

Prod. Gr. 490

**ORION®** 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

- Large digits for clear view of measured values

**scope of supply and services:**

Battery (1x 9 V block battery, type 6 LR 61)

**Technical Data:**

- Min./max. temperature measuring range:  $-20$  to  $60^\circ\text{C}$
- Temperature error limit:  $0.5^\circ\text{C}$
- Min./max. humidity (rF) of measuring range: 0-99 %
- Humidity (rF) error limit/conditions: 5 % / from 20 to 70 %
- Humidity (rF) error limit | residual area: 7 %

46210...	Ident. No. 010 Unit price, €	010 O. R.
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Prod. Gr. 456

**ORION®** 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/min., MPH, knots
- Energy-saving Auto-OFF function

**Advantage:**

- Handy device size and easy one-hand operation

46210...	Ident. No. 020 Unit price, €	020 O. R.
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Prod. Gr. 456

- Automatic display illumination with brightness sensor
- Large digits for clear view of measured values

**scope of supply and services:**

Battery (1x 9 V block battery, type 6 LR 61)

**Technical Data:**

- Min./max. current of measuring range: 0.4-25 m/s
- Digit increment | current: 0.01 m/s
- Current error limit (+/-): 0.45 m/s
- Min./max. working temperature: 0 to  $40^\circ\text{C}$



## 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

46210...	Ident. No. Unit price, €	030 O. R.
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Prod. Gr. 456

- Automatic display illumination with brightness sensor
- Large digits for clear view of measured values

### 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

46210...	Ident. No. Unit price, €	040 O. R.
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Prod. Gr. 456

- Automatic display illumination with brightness sensor
- Large digits for clear view of measured values

### 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

- Can be charged via mini USB port

### Advantage:

- 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



	Model	Probe system	Ident. No. Unit price, €	050 O. R.
47100...	SURTRONIC DUO	Runner probe system		

Prod. Gr. 445

## Mahr

### 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



	Model	Ident. No.	
47100...	MarSurf PS 1	010	O. R.

Prod. Gr. 307

Testing equipment



## 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.

**scope of supply and services:**

**Ident. No. 100:** Display unit with feed unit type VH, standard probe SH, diamond probe tip 5 µm/90°, adapter and connecting cable between feed unit and display unit, battery, power pack/charger, CD with software DIASOFT Basic, USB PC connecting cable, metal calibration standard, case

**Ident. No. 110:** Display unit with feed unit type VH, standard probe SH, diamond probe tip 5 µm/90°, adapter and connecting cable between feed unit and display unit, battery, power pack/charger, CD with software DIASOFT Basic, USB PC connecting cable, metal calibration standard, case, feed unit

**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



Ident. No. 100



Ident. No. 110

	Model	Probe system	Ident. No.	
47000...	DIAVITE Compact II VH	Runner probe system	100	O. R.
47000...	DIAVITE Compact II VHF	Runner probe system, Free probe system	110	O. R.

Prod. Gr. 445



## 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



		Model	Probe system	Ident. No.	
47100...	Roughness measuring device MAHR M 300 C	MarSurf M 300 C	Runner probe system	Unit price, €	200 (O. R.)

Prod. Gr. 307



## 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

### Advantage:

- Bluetooth connection between feed unit and display 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
- 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



		Model	Probe system	Ident. No.	
47100...	Roughness measuring device MAHR M 300	MarSurf M 300	Runner probe system	Unit price, €	100 (O. R.)

Prod. Gr. 307



## Measuring and evaluation software EXPLORER

For MAHR roughness measuring devices MarSurf PS1 and MarSurf M300

### Application:

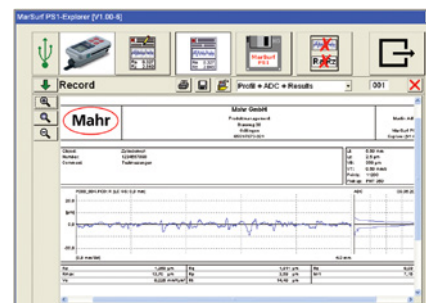
User-friendly software for evaluating, displaying, saving and recording logged measured values and profiles. Saved data can be printed out, e.g. on A4 paper or in other formats.

### 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

47100...	Ident. No.	680
	Unit price, €	(O. R.)

Prod. Gr. 307



**Mahr** 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

Ident. No. 500



Ident. No. 510



Ident. No. 520



Ident. No. 530



Ident. No. 540



Ident. No. 550



Ident. No. 630

Type	47100... Ident. No.	
Standard tracer PHT 3-350	500	O. R.
Bore probe PHT 3-350	510	(O. R.)
Tooth flank probe PHTF 0.5-100	520	(O. R.)
Dual-skid probe PT 50	530	(O. R.)

Prod. Gr. 307

Type	47100... Ident. No.	
Groove probe PHT 11-100	540	(O. R.)
Convex and concave probe PHTR-100	550	(O. R.)
Tracer extension PHT (80)	630	O. R.
		Unit price, €

**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.

- 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

**Execution:**

- Threaded spindle

Span (mm)	14	23
Clamping depth (mm)	8	15
Material	Brass	Aluminium
Surface	Chrome-plated	Anodised
Length x width x height	50 x 15 x 15 mm	75 x 25 x 25 mm
47000...	Ident. No. Unit price, €	500 O. R.
		505 O. R.

Prod. Gr. 445

**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

**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

**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

**Advantage:**

- Galvanoplastic manufacturing method for high accuracy and uniformity

44810...	Ident. No. Set price, €	010 O. R.
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Prod. Gr. 445



## 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.

- Evaluation parameters Ra and Rz

#### Advantage:

- Galvanoplastic manufacturing method for high accuracy and uniformity

#### Execution:

- Wear-resistant and non-rusting

#### scope of supply and services:

In a case



Ident. No. 070

Machining method	Hand-polishing	Longitudinal turning	Face turning	Front milling	Flat grinding	Cylindrical grinding	Electrical discharge machining
Model	336	320	319	321	315	316	331
Number of comparative patterns (PCS)	5	8	8	8	8	8	8
Min. Ra comparison range (µm)	0.0125	0.4	0.4	0.4	0.025	0.025	0.4
Max. Ra comparison range (µm)	0.2	50	50	50	3.2	3.2	50
Min. Rz comparison range (µm)	0.25	1.6	1.6	1.6	0.25	0.25	2.5
Max. Rz comparison range (µm)	1.6	160	160	160	16	16	160
Min./max. Rz comparison range	0.25-1.6 µm	1.6-160 µm	1.6-160 µm	1.6-160 µm	0.25-16 µm	0.25-1.6 µm	2.5-160 µm
ISO surface roughness categories	N0-N4	N5-N12	N5-N12	N5-N12	N1-N8	N1-N8	N5-N12
Board width (mm)	60	60	60	60	60	60	60
Board length (mm)	130	130	130	130	130	130	130
<b>448 10...</b>	Ident. No. Set price, €	<b>050</b> (O. R.)	<b>070</b> O. R.	<b>076</b> O. R.	<b>080</b> O. R.	<b>100</b> O. R.	<b>110</b> O. R.
							<b>120</b> (O. R.)

Prod. Gr. 445

## 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 DIN ISO 4287, DIN ISO 4288, BS 2634 and ANSI B 46.1.

facing and longitudinal turning, end and horizontal milling, reaming, boring and planing.

#### Advantage:

- Galvanoplastic manufacturing method for high accuracy and uniformity

#### Execution:

- Wear-resistant and non-rusting
- Evaluation parameters Ra and Rz
- Complete surface-roughness reference samples for machining methods flat and round grinding,

#### scope of supply and services:

In a case



Model		314
Number of comparative patterns (PCS)		64
ISO surface roughness categories		VDI12-45
<b>448 10...</b>	Ident. No. Unit price, €	<b>200</b> O. R.

Prod. Gr. 445

## 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.

#### Advantage:

- Galvanoplastic manufacturing method for high accuracy and uniformity

#### Execution:

- Wear-resistant and non-rusting
- Evaluation parameter Ra

#### scope of supply and services:

In a case



Machining method		Electrical discharge machining
Model		013
Number of comparative patterns (PCS)		12
VDI 3400 surface standard		12-45
<b>448 10...</b>	Ident. No. Unit price, €	<b>300</b> O. R.

Prod. Gr. 445

**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.

- Evaluation parameters Ra and Rz

**Advantage:**

- Galvanoplastic manufacturing method for high accuracy and uniformity

**Execution:**

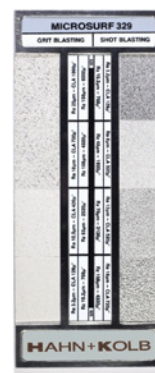
- Wear-resistant and non-rusting

**scope of supply and services:**

In a case

Machining method		Sandblasting   Shot-blasting
Model		329
Number of comparative patterns (flint) (PCS)		4
Number of comparative patterns (balls) (PCS)		4
Min./max. Ra comparison range (flint)		3.2-25 µm
Min./max. Rz comparison range (flint)		25-160 µm
Min./max. Ra comparison range (balls)		3.2-18 µm
Min./max. Rz comparison range (balls)		25-100 µm
Board width (mm)		60
Board length (mm)		130
44810...	Ident. No.	030
	Set price, €	(O. R.)

Prod. Gr. 445

**ORION® Electronic stopwatches****Application:**

For universal timing using different functions.

- 10 memory slots

**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:**

- Acoustic signal: Yes
- With timing: Yes
- With forward/reverse counting: Yes
- With time indicator: Yes
- With date and weekday indicator: Yes
- Width: 64 mm
- Height: 86 mm

Digit height (mm)		39070...	39082...
		Ident. No.	Ident. No.
6		010	O. R.
11		-	010 O. R.
		Unit price, €	

Prod. Gr. 301



No. 39070



No. 39082

Testing equipment

**Sanhart® Large stop watch****Application:**

For timing when a large display is required.

- Switchable time resolution in 1/10 s or 1/100 min.

**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

**scope of supply and services:**

With battery (1x 1.5 V, type AA)

**Technical Data:**

- Display area of dial gauge: 999 min. | 99/100 min. | 9 hr. | 59 min. | 59 sec. | 1/10 sec.
- Width: 130 mm
- Height: 175 mm
- Depth: 40/95 mm

39092...	Ident. No.	050
	Unit price, €	O. R.

Prod. Gr. 391

**Hand stroboscope  
RT Strobe Pocket LED****Application:**

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

- Adjustable flash duration
- Frequency range 30....300,000

**scope of supply and services:**

Stroboscope, batteries 3 x 1.5 V type AA, case

**Execution:**

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

**Technical Data:**

- Error limit (%): 0.02 %
- Width: 95 mm
- Height: 195 mm
- Depth: 50 mm
- IP protection class: IP 65

39355...	Ident. No.	025
	Unit price, €	O. R.

Prod. Gr. 392



## 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 ( $\pm 1$  digit increment)
- Update time: 1 s
- Measuring distance: optical max. 600 mm (non-contact measurement)

- Memory function: last value measured, maximum value, minimum value, mean
- Shutdown: automatically 30 s after last key press, measured value saved
- Housing: Plastic with holster

**scope of supply and services:**

Case with basic device, adapter, measuring tip, hollow measuring tip, measuring wheels 0.1 m and 6 inch (cylindrical running surface), extension shaft, 10 reflective markers, 2 x 1.5 V AA batteries, calibration certificate, operating instructions

**Technical Data:**

- Max. rotation speed of measuring range (contact): 19999 U/min(rpm)
- Max. speed measurement of measuring range: 1999 m/min
- Max. measurement distance: 600 mm
- Error limit (%): 0.02 %



39330...	Ident. No.	050
	Unit price, €	O. R.

Prod. Gr. 392

Accessories for		39330 050
39320...	Reflective tape for handheld rev meter	Ident. No. 502 Unit price, € O. R.
39330...	Reflective markers for handheld rev meter	Ident. No. 055 Price/pack, € O. R.

**ORION®** 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 ( $\pm 1$  digit increment)
- Update time: 1 s
- Measuring distance: optical max. 600 mm
- Memory function: last value measured, maximum value, minimum value, mean

- Shutdown: automatically 30 s after last key press, measured value saved
- Housing: Plastic with holster

**scope of supply and services:**

Case with basic device, reflection markers, 2 x 1.5 V AA batteries, calibration certificate, operating instructions

**Technical Data:**

- Max. measurement distance: 600 mm
- Error limit (%): 0.02 %



39350...	Ident. No.	025
	Unit price, €	O. R.

Prod. Gr. 301

Accessories for		39350 025
39320...	Reflective tape for handheld rev meter	Ident. No. 502 Unit price, € O. R.
39330...	Reflective markers for handheld rev meter	Ident. No. 055 Price/pack, € O. R.

## 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

- Zero setting/reset using knurled knob

- 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



39400...	Ident. No.	010
	Unit price, €	O. R.

Prod. Gr. 394

## 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



Meter counter with measuring wheel

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

Prod. Gr. 394

## Measuring wheel

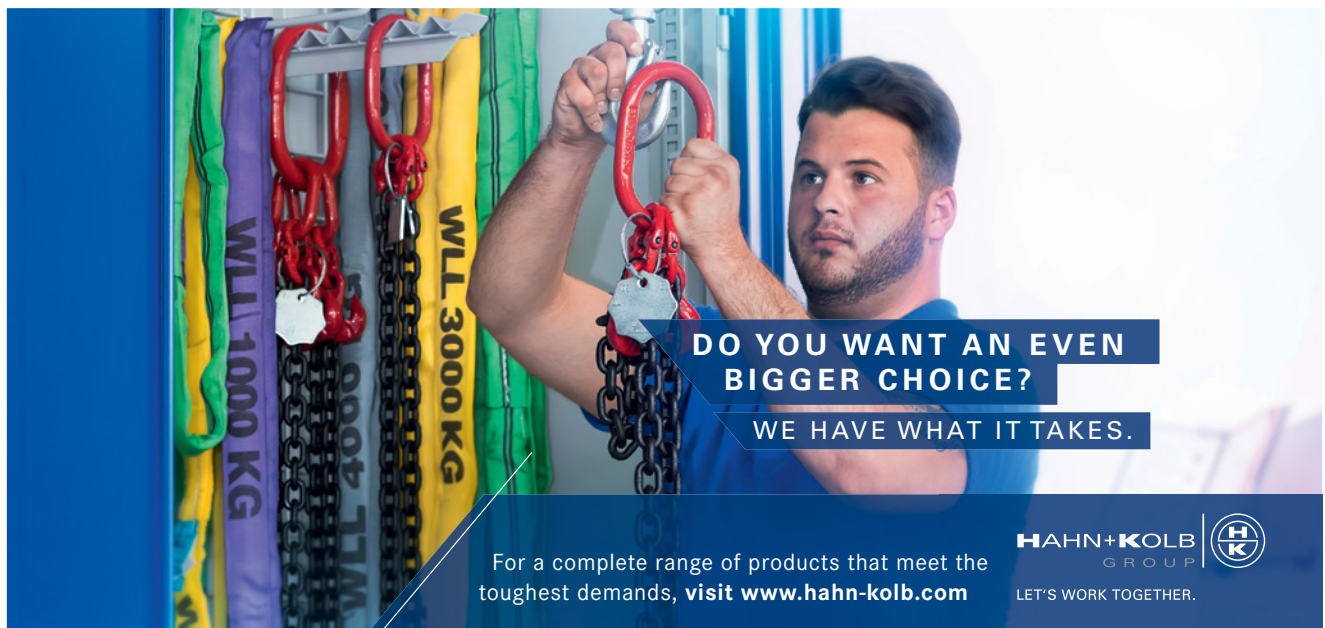
**Application:**

For use in metre counters length meters)

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

Prod. Gr. 394






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