

# BENNING



**Testing, Measuring and  
Safety Instruments**

# Quality for industry, trade and service

## *innovative developments and consistent manufacturing quality*

Innovative developments and consistent manufacturing quality are the basis for the excellent international reputation of BENNING products. Their design and implementation are based on the requirements of professional users.

### **The appliance testers**

**BENNING ST 760+ / ST 755+ / ST 725 / ST 710** allow safe and time-saving safety and periodic testing of electrical appliances in compliance with the standards EN 50678, EN 50699, IEC 62353 and IEC 60974-4. **Measuring adapters**, such as the **BENNING MA 4** support standard-compliant testing.

### **Installation testers and insulation instruments**

The installation testers **BENNING IT 130 / IT 115 / IT 105** and the insulation instruments **BENNING IT 101 / IT 100** are intended for safety testing of low-voltage electrical installations according to the standard IEC/EN 60364. The **BENNING CM E1 earth measuring clamp** is intended for quick and safe measurements without using rods.

### **Digital multimeters and digital current clamps**

The product range offers the ideal solution for all requirements and applications. We manufacture both devices using the conventional averaging measuring method (RMS) and the TRUE RMS measuring method up to the highest measuring category CAT IV. For precise and safe measurements on PV systems with 1500 V technology and for all demanding measuring tasks, measuring instruments with data logger, Bluetooth®, PC software and app are also available.

### **Measuring devices for photovoltaics**

BENNING offers a range of measuring devices and accessories for commissioning tests, periodic testing and performance assessment of grid-connected PV systems in compliance with the standards IEC 62446 and IEC 61829. (**BENNING PV 1-1 / PV 2 / PV 3 / SUN 2 / SOLAR Manager**). The measuring instruments **BENNING CM 10-PV** and **BENNING MM 10-PV** allow making precise and safe measurements on PV systems with 1500 V technology.

### **Voltage, continuity and phase sequence testers**

The **DUSPOL®** and **DUTEST®** product range is intended for voltage, phase, polarity, phase sequence, continuity and semiconductor testing. **Socket testers** and **non-contact phase, phase sequence and magnetic field testers** complete the range of testers on offer.



Factory II, Robert-Bosch-Straße 20, D-46397 Bocholt, Germany

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## Any further questions?

### choose your contact person

#### Product Advice (Sales Department)

Tel. +49 / (0) 2871 / 93 111 · E-Mail: [duspol@benning.de](mailto:duspol@benning.de)

Do you need support for selecting the right testing, measuring and safety equipment as well as the right accessories? Don't hesitate to call us! We would be pleased to advise you.

Would you like to be up-to-date regarding our latest news, promotions etc.? Simply subscribe to our newsletter "Testing, Measuring and Safety Equipment" at [www.duspol.de](http://www.duspol.de). You can unsubscribe from the newsletter at any time.

#### Technical Support (After Sales Service)

Tel. +49 / (0) 2871 / 93 555 · E-Mail: [hotline@benning.de](mailto:hotline@benning.de)

You have problems regarding application, questions on software, etc.? Don't hesitate to contact our After Sales Service. Many years of experience, in-depth product knowledge and access to data sheets as well as internal documents help to ensure expert assistance.

#### Returns Management (Warranty, Repairs)

Tel. +49 / (0) 2871 / 93 554 · E-Mail: [returns@benning.de](mailto:returns@benning.de)

If you have any questions regarding warranty/repairs, please don't hesitate our returns management team.

Please send faulty or damaged testing, measuring and safety instruments to the address stated below via your specialized trade.

#### Calibration

Benning guarantees compliance with the technical and accuracy specifications stated in the operating manual for the first 12 months after the delivery date. Für die Einhaltung einer angemessenen The user is responsible for ensuring that the devices are recalibrated in due time.

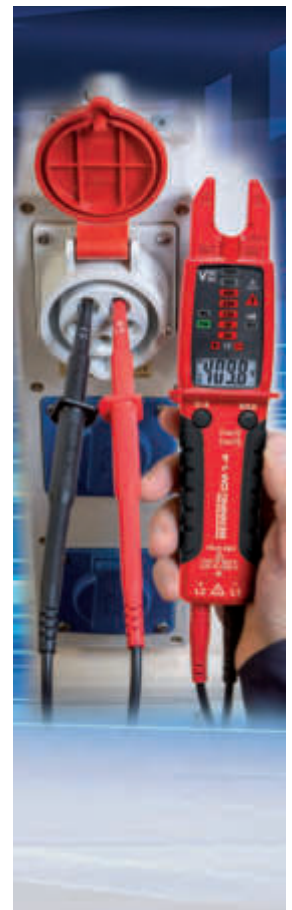
The manufacturer's calibration can be provided by us in the Bocholt factory. It includes installing the latest updates for the appliance testers BENNING ST 760(+) / ST 755(+) / ST 750 A.

#### Address for general returns/calibrations:

BENNING Elektrotechnik und Elektronik GmbH & Co. KG  
Quality Service / Returns Management · Robert-Bosch-Str. 20  
46397 Bocholt · Germany

Testing, measuring and safety instruments that have not been calibrated by BENNING or require a "DKD/DakKS" calibration, will be sent to our partner for calibration services ELMTEC. You can also send the devices directly to ELMTEC yourself.

ELMTEC Ingenieurgesellschaft mbH · Kattreppeln 28 · D-38154 Königslutter  
Tel. +49 / (0) 5353/ 9545-0 · E-Mail: [info@elmtec.de](mailto:info@elmtec.de)



discover the following innovations in this catalogue

## BENNING ST 760+ / ST 755+

item no.: 050334 / 050332

page 7 - 8

Appliance tester for testing electrical devices according to EN 50678, EN 50699, medical electrical devices acc. to IEC 62353 and welding equipment acc. to IEC 60974-4

Proven series of appliance testers with new features

- brilliant and high-definition 7" colour touchscreen
- innovative additional functions
- Smart menu with individual device templates (QuickTest) and favourites keys
- auto-ID, automatic incrementation of the identification number
- calibration certificate included in delivery

as well as the well-known features such as testing of various PRCD/ RCD types, visual inspections (standard, enhanced, customer-specific), creation of individual test procedures, free updates, etc.



## BENNING IT 100

item no.: 044107

page 19



Compact and convenient insulation measuring instrument with automatic locking in case of external voltage

## BENNING TA 7-16 / -32 / -63

item no.: 044040, 044041, 044042

page 22

- the ideal complement for installation testers to perform the required testing of 5-pin CEE sockets
- easy and safe contacting without having to open the CEE sockets
- for testing of 5-pin, 16 A, 32 A resp. 63 A CEE sockets
- available in three versions



## BENNING MM 7-2

item no.: 044690

page 40 - 43

The new benchmark in measuring technology - the new TRUE RMS digital multimeter is suited for the most challenging measuring tasks

- Electrical trade:
  - LoZ voltage measurement with low input impedance (> 2 kΩ)
  - measurement of the CP control signal (duty cycle/amplitude) of EV charging stations (wall boxes) for electric vehicles (via optional accessories)
- Industry:
  - TRUE RMS voltage and frequency measurement for frequency converter drives and loads with superimposed harmonics
  - measurement of the 4 mA to 20 mA current loop signal in process technology
- Service:
  - AutoV function with automatic switching (AC/ DC) and measuring range selection for quick troubleshooting
  - visual and acoustic continuity test with fast response time
- HVAC technology:
  - measurements on flame sensors (ionisation current)
  - measurement of the sacrificial anode current of hot water storage tanks
  - measurement of temperature and exhaust gas temperature in HVAC systems



## BENNING CM 2-1

item no.: 044689

page 57

TRUE RMS current clamp multimeter, universally applicable for various applications







# Appliance Tester - testing of electrical and medical electrical device

*PRCDs and arc welding equipment*

**NEW** Smart-menu  
**QuickTest**  
Press & test 



Modern, powerful testing devices organize entire test procedures.

Intuitive software creates test reports, overviews and statistics.



WLAN, LAN, Bluetooth®, USB interfaces enable updates and the integration of I/O devices.



Measuring adapters and cases for active and passive testing of three-phase equipment



Workshops with expert speakers and application specialists help with professional testing and refresh expert knowledge.



# Appliance Tester

testing of electrical appliances, medical electrical devices and welding equipment

**NEW!**

## Testing according to

- EN 50678 for electrical appliances after repair
- EN 50699 for recurrent test of electrical appliances
- IEC 62353 for medical electrical devices
- IEC 60974-4 for welding equipment (only ST 760+)

## BENNING ST 760+ – standard-compliant testing of arc welding equipment

- measuring the crest value and TRUE RMS value of open-circuit voltage and contact current of the welding circuit
- testing the functionality of three-phase welding equipment via optional BENNING MA 4 or BENNING MA 2-16 measuring adapter (see page 9)
- scope of services of the BENNING ST 755+

## Features

- testing of PRCDs of types S, S+, K, 2-pin/3-pin and of RCDs type AC, A, F, B, B+ in mobile power distributions
- testing of arc welding equipment (only ST 760+)
- standard, enhanced and customer-specific visual inspections
- management of customers and equipment in databases
- creation of individual test procedures and intervals (time-dynamically optimized)
- Smart menu for quick creation of new devices (QuickTest), up to 24 templates per standard, auto-ID, favourites menu for frequently used levels
- low operating costs, free updates via WLAN, LAN, USB
- multiple measurements (e. g. Rpe test repetitions) and other functions can be enabled by “On/Off sliders”
- touchscreen can be mirrored on PC or tablet
- external test data access to network-connected appliance testers
- powerful switching relays (80 A) are designed for a long service life



BENNING ST 755+ (050332)  
BENNING ST 760+ (050334)

BENNING ST 760+ (version CH):  
10228221  
BENNING ST 755+ (version CH):  
10228220



Only in German  
English language available 2023

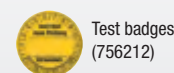
Optional accessories



Only in German  
English language available 2023



PC Software PC-WIN ST 750-760  
(047002)



## Appliance Tester

	BENNING ST 760+	BENNING ST 755+
display	7" capacitive color touchscreen	
protective conductor resistance (R <sub>PE</sub> )	0.5 Ω - 10 Ω (> 600 mA + 10 A test current)	
insulation resistance (R <sub>INSU</sub> )	0.1 MΩ - 100 MΩ (100 V - 1000 V test voltage)	
protective conductor current (I <sub>PE</sub> )	0.03 mA - 25 mA (differential, direct, alternative)	
contact current (I <sub>CONT</sub> )	0.03 mA - 25 mA (differential, direct, alternative)	
testing of electrical appliances	•	•
testing of PRCD types	•	•
testing of medical electrical devices	•	•
testing of welding equipment	•	–
voltage/current	1 V - 360 V/0.1 A - 16 A	
effective power/apparent power	20 W - 2300 W	
interfaces	W-LAN, LAN, Bluetooth®, 4 x USB, Mini-USB	
dimensions/weight	405 x 330 x 165 mm/ca. 6.0 kg	
scope of delivery	tester in case (IP 67), set of measuring leads/alligator clips, 2-pin test cable, appliance cable, SD card, calibration certificate	
item no.	050334	050332

See page 14 for further accessories

Measuring range indications refer to ranges from highest resolution to the final measuring range value

## Optional accessories

	item no.
PC software BENNING PC-Win ST 750-760	047002
1D USB barcode scanner for 1D barcodes	009369
barcode labels with consecutive numeric representation (1000 pieces), further number ranges available	756301
test badges „next test“ (300 pieces)	756212



### BENNING PC-Win ST 750-760

#### Database software for documentation and management of equipment and customers

- management, documentation and evaluation of test results
- explicit database structure with customer, department and test sample ID
- database merging for tests with several appliance testers
- creation of individual test procedures and visual inspections
- integrated "ReportDesigner" enables report layout adjustments
- import of test sample databases from external systems via MS Excel®
- direct conversion of SDF databases of the BENNING ST 750 A
- database export function including all attributes and results
- free software updates per download
- search function for appliance testers integrated in the network with memory access
- remote control of appliance testers via MS Cerhost®

### BENNING MA 4

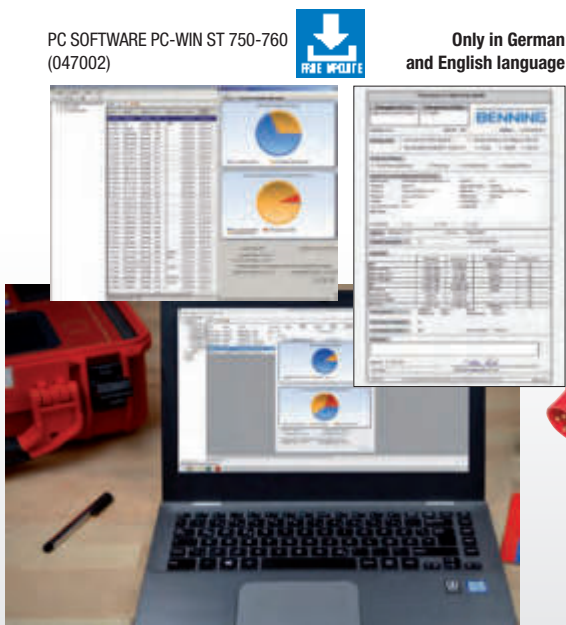
#### Active Measuring Adapter case up to 32 A

- suitable for equipment with CEE connection
- rotary switch positions "Cable" and "Function" with self-test
- complies with IEC/EN 61010-1 and EN 61557-16
- supports the following tests/measurements:
  - protective conductor and insulation resistance
  - alternative leakage current, differential current and direct protective conductor current
  - cable test, functional test and phase sequence test
  - testing of PRCDs and arc welding equipment

### BENNING MA 2-16

#### Active Measuring Adapter up to 16 A

measurements: R<sub>PE</sub>, R<sub>INSU</sub>, I<sub>PE/CONT</sub> (differential, direct, alternative)



Mains connection cable to the MA 4 (044163)



Measuring adapter case MA 4 (active/passive) (044162)

- for tests in combination with appliance testers
- current carrying capacity up to 32



Measuring adapter MA 2-16 (active/passive) (044160)

- current carrying capacity up to 16 A

### Optional accessories

	item no.
PC software BENNING PC-Win ST 750-760	047002

See page 14 for further accessories

	item no.
<b>measuring adapter BENNING MA 4</b> (16 A + 32 A CEE 5-pin, 16 A CEE 3-pin) suitable for all appliance testers (except BENNING ST 710) and third-party devices which actively connect a mains voltage of 230 V, leakage current measurement active/ passive, 32 A CEE mains connection cable	044162
<b>16 A mains connection cable to the BENNING MA 4</b> 16 A/ 400 V CEE plug - 32 A/ 400 V CEE coupling, length: 1 m	044163
<b>measuring adapter BENNING MA 2-16</b> (16 A CEE 5-pin) suitable only for BENNING ST 760(+)/ ST 755(+)	044160

# Passive measuring adapters for single-phase and three-phase equipment up to 32 A

*leakage current, fault current and load current measurements by means of leakage current clamp*

## BENNING MA 3 measuring adapter

- easy to use for efficient and quick testing
- connection for equipment with CEE connector
- suitable for all appliance testers (except BENNING ST 710)
- test functions in combination with appliance testers:
- protective conductor resistance and insulating resistance
- functional test and phase sequence test of CEE cables
- alternative leakage current measurements

## BENNING triple CEE measuring adapter

- connection for equipment with CEE connector
- suitable for all common appliance testers
- test functions in combination with appliance testers:
  - protective conductor resistance and insulating resistance
  - alternative leakage current measurements

## BENNING CM 9-1

### TRUE RMS Leakage Current Clamp

When using passive test adapters for testing in compliance with DGUV Regulation 3, an additional active leakage/fault current measurement may be required. For this, current clamps with a suitable filter and low resolution can be used.

- leakage/fault current measurement from 0.001 mA AC (1  $\mu$ A AC)
- preset filter (1 kHz) for appliance testing
- connectable low-pass filter LPF (40 Hz to 70 Hz)
- load current measurement up to 60.00 A AC
- voltage measurement: 0.01 V - 600.0 V AC/DC
- resistance measurement up to 600 k $\Omega$
- continuity test

Intermediate adapters are required for current measurement and for correct contacting for differential current measurement, direct protective conductor current measurement or load current measurement (see table below).



## Optional accessories

	item no.
<b>measuring adapter BENNING MA 3</b> (16 A CEE 3-pin, 16 A/32 A CEE 5-pin) for testing CEE extension cables (R <sub>PE</sub> , R <sub>INSU</sub> , I <sub>PE</sub> /I <sub>CONT</sub> , functional test and phase sequence test) and single-/ three-phase loads (passive). Suitable for BENNING appliance testers and third-party devices which actively connect a mains voltage of 230 V, only passive leakage current measurement.	044159
<b>triple CEE measuring adapter</b> 16 A 3-pin, 16 A/32 A 5-pin for passive testing of three-phase loads (R <sub>PE</sub> , R <sub>INSU</sub> , I <sub>PE</sub> /I <sub>CONT</sub> (alternative leakage current measurement method)	044147

See page 14 for further accessories

## Leakage Current Clamp and suitable Measuring Adapter

	item no.
<b>TRUE RMS leakage current clamp BENNING CM 9-1</b> Ideal for supporting active leakage and fault current measurements during appliance testing. With multimeter functions. See page 54.	044682
<b>TRUE RMS leakage current clamp BENNING CM 9-2</b> Ideal for supporting active leakage and fault current measurements during appliance testing. With Bluetooth® function and app. See page 54.	044685
<b>measuring adapters with individual lines led through for current measurements on CEE equipment</b>	
<b>single-phase</b> , shock-proof plug/coupling	044131
<b>three-phase</b> , 16 A/ 400 V CEE plug/ coupling	044127
<b>three-phase</b> , 32 A/ 400 V CEE plug/ coupling	044128

### Barcode, QR code

Test sample identification via barcodes with corresponding scanners has proven useful in daily use.

- 1D-USB barcode scanner for reading barcodes such as Code 39, Code 128, ...
- 1D/2D barcode scanner for barcodes and QR codes, Data Matrix codes, ...
  - corded with USB interface
  - cordless for connection to the Bluetooth® and radio interfaces of the BENNING ST 755+ / ST 760+
- barcode labels with consecutive numbering on reels (reels of 1000 pieces), further number ranges available

### RFID technology

ideal in dirty and rough environments

- RFID reader (125 kHz/13.56 MHz) for reading the UID no.
- RFID tag, self-adhesive for attachment onto the housing
- RFID tag, tag-type for attachment by means of cable ties

- 1D USB scanner (009369)
- 1D/2D USB scanner (009373)
- 1D/2D cordless scanner (009374)



(figure similar)

- RFID reader with USB interface (009372)



- RFID tag self-adhesive (044156)



- RFID tag tag-type (044158)



### Input keyboards support operation

Two keyboards are available for coupling to the BENNING ST 755+ / ST 760+ appliance testers.

- industrial keyboard with trackball and mouse buttons, compact design, dustproof and splash-proof (USB)
- wireless keyboard with touchpad and mouse buttons (2.4 GHz radio transmission via USB dongle)

### BENNING PT 2 - direct printing at the test object

**NEW!**

The perfect solution for printing labels and test certificates rapidly on site, e. g. for order or repair reports.

- portable direct thermal printer
- ideal for printing label and test records rapidly on site
- high printing speed
- data transmission via Bluetooth®
- compact dimensions (62 x 92 x 125 mm), with storage-battery mode
- delivery incl. one roll of labels and thermographic paper

- Industrial keyboard (044154)
- Wireless keyboard (044161)



(figure similar)

- Bluetooth® printer PT 2 (10225404)



- Brush probe (10217861)



- Rolls of labels for PT 2 (10225408)



- Rolls of thermographic paper for PT 2 (10225407)



### Optional accessories

	item no.
<b>1D USB scanner</b> for barcodes	009369
<b>1D/2D USB scanner</b> for barcodes and QR-/Data Matrix codes	009373
<b>1D/2D cordless scanner</b> for barcodes and QR-/Data Matrix codes	009374
<b>multifrequency RFID reader</b> with USB interface (125 kHz+13.56 MHz)	009372
<b>RFID tag self-adhesive</b> (125 kHz) 100 tags, Ø 18 mm	044156
<b>RFID tag tag-type</b> (125 kHz) 100 tags, l x w: 43 x 34 mm	044158

See page 14 for further accessories

	item no.
<b>industrial keyboard</b> with USB interface	044154
<b>wireless keyboard</b> with USB receiver (2.4 GHz)	044161
<b>printer BENNING PT 2 with Bluetooth®</b> incl. 6 V NiMH battery pack, power supply unit, belt clip, wall mounting kit, 1 roll of labels and 1 roll of thermographic paper	10225404
<b>rolls of labels for PT 2</b> 8 rolls, 300 self-adhesive labels per roll, label size l x w: 37 x 52 mm, material: polypropylene	10225408
<b>rolls of thermographic paper for PT 2</b> 20 rolls, roll length/width: 33 m/58 mm	10225407
<b>rolls of thermographic paper for PT 1</b> 20 rolls, roll length/width: 13 m/58 mm	044151
<b>4 mm brush probe</b> for gentle contacting of accessible conductive parts, such as sensitive metal surfaces and rotating/vibrating parts, e. g. drill chucks, orbital sanders, etc.	10217861



# Appliance Tester in compliance with EN 50678, EN 50699

## testing of electrical appliances under operating conditions

### BENNING ST 725

#### Mains-operated and battery-operated Appliance Tester for mobile testing of electrical devices

- testing in compliance with EN 50678 and EN 50699
- quick – testing within a few seconds
- all-in-one – appliance tester and RCD tester in one single device
- unique – testing of single-phase and three-phase devices under operating conditions

#### Application

Testing of devices with mains voltage-dependent switching elements/ mains-supply units/relays such as controlled devices/tools, devices of information and communication technology as well as of devices which can be tested completely with mains voltage only. In mains operating mode, the protective conductor current/contact current is measured by means of the required **differential current/direct measurement method**.

#### Features

- automatic testing procedure with “pass/fail” information
- limiting values preset in compliance with VDE standard
- storage locations for 999 test samples
- data transmission to the PC
- measured values support the creation of test certificates in MS Excel®
- keys for storing, calling and printing the measured values

#### Measuring functions

- protective conductor resistance (200 mA pulsed testing current, max. 2 x 90 sec.)
- testing of RCDs with 30 mA with indication of tripping time
- reduction of the ISO testing voltage to 250 V / 500 V
- mains operating mode: protective conductor current/contact current by means of differential current/direct measurement method (max. 2 x 5 min.)
- battery operating mode: protective conductor current/contact current by means of alternative leakage current measurement method
- optional measuring adapters for passive/active testing of three-phase appliances with CEE connector (page 14)



ST 725  
050317: with socket of type CH

Scope of delivery



NEW!

PT 2  
(10225404)

Measuring adapter MA 1-16 (044140),  
MA 1-32 (044141) (active) only for ST 725

Measuring adapter MA 4  
(active/passive)  
(044162)

Forms for test certificates for “Testing of electrical devices” are available for download free of charge at [www.benning.de](http://www.benning.de)!

### Appliance Tester

	BENNING ST 725
display	graphic display
protective conductor resistance (R <sub>PE</sub> )	0.05 Ω - 20 Ω
insulation resistance (R <sub>INSU</sub> )	0.1 MΩ - 20 MΩ (250 V/500 V DC)
protective conductor current/contact current by means of	
- differential current	0.25 mA - 20 mA
- alternative leakage current	0.25 mA - 20 mA
- direct measurement method	0.1 mA - 2 mA
line test	R <sub>PE</sub> , R <sub>ISO</sub> , short-circuit test and continuity test of phase conductor (L) and neutral conductor (N)
testing current of RCD	30 mA + 150 mA
tripping time	10 ms - 500 ms
protective conductor current of three-phase test objects under operating conditions (optional)	0.25 mA - 10 mA
voltage	50 V - 270 V
measured value memory	999 storage locations
interfaces	micro USB for PC, PS/2 for printer BENNING PT 2

Measuring range indications refer to ranges from highest resolution to the final measuring range value

	BENNING ST 725
scope of delivery	carrying case, test cable with alligator clip, mains connection cable, appliance cable, batteries, micro USB data cable, download software
item no.	050316

### Optional accessories

	item no.
measuring adapter BENNING MA 4 for active and passive testing of single-/three-phase loads (page 9)	044162
measuring adapter for appliances with 3-pin/5-pin CEE connector	
measuring adapter BENNING MA 1-16, 5-pin, active	044140
measuring adapter BENNING MA 1-32, 5-pin, active	044141
portable log printer BENNING PT 2 incl. serial PS/2 data cable	10225404
roll of thermographic paper for PT 2 (20 pieces)	10225407

See page 14 for further accessories

### BENNING ST 710

#### Battery-operated Appliance Tester for mobile testing of electrical devices

- testing in compliance with EN 50678 and EN 50699
- easy - operation by means of three keys
- quick - complete testing within 10 seconds
- mobile - testing can be made network-independently

#### Application

Safety-related testing of electrical devices/work equipment such as e.g. electrical devices/tools with ON/OFF switch, motorized equipment, lamps, cable reels, multiple distributors and household appliances. The protective conductor current/contact current is measured by means of the **alternative leakage current measurement method**.

#### Features

- automatic testing procedure for devices of class I, class II/III and line test
- testing of cable reels, multiple distributors and device connecting cables with rubber connector
- measuring result with "pass/fail" information
- limiting values preset in compliance with VDE standard
- indication in case of incorrect operation and if the test sample is not switched on
- sufficient battery capacity for > 2500 test samples
- three-phase test objects can be tested by means of optional measuring adapter

#### Measuring functions

- protective conductor resistance with a testing current of 200 mA DC and automatic polarity reversal
- insulating resistance with a testing voltage of 500 V DC
- protective conductor current and contact current by means of alternative leakage current measurement method
- voltage measurement on external shock-proof socket (L-N, L-PE, N-PE)



ST 710  
050315: with socket of type CH



Scope of delivery



CM 9-1  
(044682)

### Appliance Tester

	BENNING ST 710
display	graphic display
protective conductor resistance (R <sub>PE</sub> )	0.05 Ω - 20 Ω
insulation resistance (R <sub>iso</sub> )	0.1 MΩ - 20 MΩ (500 V DC)
protective conductor current/contact current by means of alternative leakage current measurement method (I <sub>EA</sub> )	0.1 mA - 20 mA
line test	R <sub>PE</sub> , R <sub>iso</sub> , short-circuit test and continuity test of phase conductor (L) and neutral conductor (N)
voltage	50 V - 270 V
scope of delivery	carrying case, test cable with alligator clip, appliance cable, batteries
item no.	050308

Measuring range indications refer to ranges from highest resolution to the final measuring range value

### Optional accessories





	item no.
<b>TRUE RMS leakage current clamp BENNING CM 9-1</b> for the measurement of differential current, protective conductor current and load current of single-phase and three-phase loads. With multimeter functions (see page 10, 56)	044682
<b>TRUE RMS leakage current clamp BENNING CM 9-2</b> for the measurement of differential current, protective conductor current and load current of single-phase and three-phase loads. With Bluetooth® function and App (see page 56).	044685
<b>measuring adapters for TRUE RMS leakage current clamps</b>	
<b>single-phase</b> , shock-proof plug/coupling	044131
<b>three-phase</b> , 16 A CEE-CEE, 5-pin	044127
<b>three-phase</b> , 32 A CEE-CEE, 5-pin	044128

See page 14 for further accessories

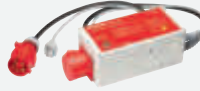




# Accessories for Appliance Tester

safe – functional – indispensable

14

	Description	Product data	Item no.	ST 760+	ST 725	ST 710
				ST 755+		
<b>Measuring adapter for single-phase and three-phase loads</b>						
	<b>BENNING MA 4 measuring adapter</b> , 16 A + 32 A CEE 5-pin, 16 A CEE 3-pin (active and passive testing of single-phase/three-phase loads and CEE extension cables), testing of three-phase welding equipment, also suitable for third-party devices that actively connect a mains voltage of 230 V	RPE, RINSU, IPE/ICONT with alternative leakage, differential and direct current measuring method	044162	•	•	
	<b>16 A mains connection cable to the BENNING MA 4</b> 16 A/ 400 V CEE plug - 32 A/ 400 V CEE coupling, length: 1 m	accessoires for BENNING MA 4	044163	•	•	
	<b>Measuring adapter BENNING MA 3</b> , 16 A/32 A CEE 5-pin, 16 A CEE (testing of CEE extensions cables and passive testing 1-/3-phase loads, 16 A CEE 3-pin (active testing)	RPE, RINSU, IPE/ICONT (for three-phase loads only with alternative leakage current measurement method) extension cables with functional test/phase sequence test	044159	•	•	
	<b>Measuring adapter triple</b> 16 A/32 A CEE 5-pin, 16 A CEE 3-pin (passive testing with L1-L2-L3 bridged)	RPE, RINSU, IPE/ICONT by means of alternative leakage current measurement method for three-phase loads	044147	•	•	•




## Measuring adapter for three-phase loads

	<b>Measuring adapter BENNING MA 2-16</b> , 16 A CEE 5-pin (active testing under operating conditions or passive testing with L1-L2-L3 bridged), testing of 3-phase welding equipment	RPE, RINSU, IPE/ICONT. by means of alternative leakage current/differential current/direct measurement method	044160	•		
	<b>Measuring adapter BENNING MA 1-16</b> , 16 A CEE 5-pin (active testing under operating conditions)	RPE, IPE by means of direct measurement method	044140		•	
	<b>Measuring adapter BENNING MA 1-32</b> , 32 A CEE 5-pin (active testing under operating conditions)	RPE, IPE by means of direct measurement method	044141		•	
	<b>Measuring adapter 16 A CEE 5-pin</b> (passive testing with L1-L2-L3 bridged)	RPE, RINSU, IPE/ICONT. by means of alternative leakage current measurement method	044122	•	•	•
	<b>Measuring adapter 32 A CEE 5-pin</b> (passive testing with L1-L2-L3 bridged)	RPE, RINSU, IPE/ICONT. by means of alternative leakage current measurement method	044123	•	•	•

## Measuring adapter for single-phase loads

	<b>Measuring adapter 16 A CEE 3-pin</b> (passive testing)	RPE, RINSU, IPE, ICONT.	044143	•	•	•
	<b>Measuring adapter 32 A CEE 3-pin</b> (passive testing)	RPE, RINSU, IPE, ICONT.	044144	•	•	•
	<b>Measuring adapter 4 mm stackable safety plug</b> on shock-proof plug	RPE, RINSU, IPE, ICONT.	044142		•	•


## Test cable / brush probe

	<b>5 m test cable</b> (2-pin) with 4 mm test probe	RPE, RINSU, ICONT.	10154024	•		
	<b>2 m test cable</b> (2-pin) with 4 mm test probe	RPE, RINSU, ICONT.	10150829	•		
	<b>4 mm brush probe</b> for gentle contacting of accessible conductive parts, such as sensitive metal surfaces and rotating/vibrating parts, e. g. drill chucks, orbital sanders, etc.	4 mm safety jack for connecting the test probe of the appliance tester, length: 185 mm, brush length/diameter: 60 mm/20 mm	10217861	•	•	•

## Hard case

	<b>Robust hard case</b> with foam insert, separate shelf and lid compartment for accessories and small parts. Safe transport protection for high-quality testing and measuring instruments.	Made of ABS material, dust and waterproof, dimensions 375 x 190 x 250 mm	10198412		•	•
---	---	--	----------	--	---	---

## Ceramic fuse

	<b>16 A fuses</b> packaging unit 10 pieces	fast-acting, rated current 16 A, breaking capacity 500 A, rated voltage 250 V, dimensions 5 x 20 mm	10019440		•	
---	---	---	----------	--	---	--

\* figure similar



## Installation Tester - testing of stationary electrical installations

*safety testing in compliance with the standard IEC 60364*

BENNING installation testers allow easy operation and excel due to clear functional and menu structures.

The BENNING IT 130/ IT 115 supports electricians in evaluating the measured values.

Accessories for the BENNING IT 130 include a PC software which is intended for logging and the creation of reports. Up to 1800 measurements can be managed in a structure comprising four levels.



The BENNING IT 105 meets all requirements for standard installation tests and is popular with providers of facility management and building service providers.

The low-impedance and insulating resistance instruments BENNING IT 101 / IT 100 are used for troubleshooting and fault analysis in electrical systems of any kind. It is often used to equip service specialists in industrial and modern automotive engineering.



Measuring the earth loop resistance by means of the BENNING CM E1 without using rods is the ideal solution for measuring earthing resistances in multiply earthed earthing systems.

# TRUE RMS Installation Testers

testing of electrical systems in compliance with the standards

## BENNING IT 130, IT 115

### TRUE RMS Installation Testers

Complete testing and efficient troubleshooting of electrical systems according to IEC 60364 with unambiguous "PASS"/"FAIL" indication by means of green/red LEDs

- measurement of the protective conductor line and of the equipotential bonding line with a testing current of 200 mA, with null balance of the measuring leads
- measurement of the insulation resistance with testing voltages of 50 V, 100 V, 250 V, 500 V and 1000 V
- line impedance and loop impedance measurement (optional without tripping of the RCD) with calculation of the shortcircuit current (PFC/PSC), sub-function: voltage drop
- testing of RCDs with nominal fault currents of 10/30/100/300/500/1000 mA by means of measurement of contact voltage (without tripping), tripping time and tripping current (ramp test)
- voltage measurement with frequency and phase sequence test
- earthing measurement by means of three-wire measuring method (optional earthing kit)
- delivery includes calibration certificate

### Additional functions BENNING IT 130

- testing of universal current-sensitive RCDs of type B/B+ and type EV (charging equipment for electric vehicles), MI (mobile installations)
- measured value memory covering four levels (object/block/fuse/measuring point) for up to 1800 measurements
- bidirectional USB/ RS 232 interfaces
- BENNING PC-Win IT 130-200 software included
- including "Commander" probe tip with "TEST" and "MEM" keys as well as bright LED measuring point illumination
- connection for barcode scanner for identifying the measuring point and renaming the storage location
- current measurement (TRUE RMS) by means of current clamp adapter (optional)
- illumination measurement by means of lux sensor (optional)



## TRUE RMS Installation Testers

	BENNING IT 130	BENNING IT 115
display	graphic display (illuminated)	
low-impedance resistance ( $\pm 200$ mA) / continuity (7 mA)	0.01 $\Omega$ - 2000 $\Omega$	
insulation resistance (50/100/250/500/1000V)	10 k $\Omega$ - 1000 M $\Omega$	
line impedance (L-N/L-L) / voltage drop ( $\Delta U$ )	0.01 $\Omega$ - 10 k $\Omega$	
loop impedance (L-PE)	0.01 $\Omega$ - 10 k $\Omega$	
short-circuit current ( $I_{sc}$ )	0.01 A - 200 kA	
RCD testing	AC/A/F/B/B+/EV/MI	AC/A/F
earth resistance (3-wire-method)	yes, via 044113	
phase sequence	•	
voltage (TRUE RMS), frequency	1 V - 550 V, 14 Hz - 500 Hz	
current (TRUE RMS)	0.1 mA - 300 A AC/DC via 044038	
luminous intensity	0.01 lux - 20 klux via 044111	
measured value memory	up to 1800	
interfaces	USB, RS 232	
logging software	•	
item no.	044103	044104

Measuring range indications refer to ranges from highest resolution to the final measuring range value.

## optional accessories

### Logging software BENNING PC-Win IT 130-200

- creation and transmission of installation structures to the BENNING IT 130 for efficient periodic testing
- download of measured values and logging by means of test reports and test certificates
- fully fledged, executable without any time limit and comprehensive

### Features IT 130, IT 115

- all measuring functions can be selected directly by means of a rotary switch
- graphic display and help function with connecting diagram
- complete measuring result with measuring parameters, limiting value and symbols for "PASS"/"FAIL"
- current supply by means of 6 NiMH storage batteries (AA) with charger

### BENNING CC 3

- AC/DC current clamp adapter is intended for measuring a load current up to 300 A (only BENNING IT 130).

### Earthing set

- to determine the earth resistance at main earthing systems, lightning arresters and local earth connections.

### "Commander" test plug

- for shock-proof socket, with "PASS"/"FAIL" indication by means of green/red LED, "TEST"/"MEM" key and bright LED measuring point illumination.

### BENNING TA 5

- 40 m cable reel, ideal for low-impedance measurements.

### BENNING Luxmeter type B

- allows measurements of the luminous intensity for planning and testing interior and exterior lighting systems (only BENNING IT 130).

"Commander" probe tip\*  
(044155)



Test report



„Commander“ test plug  
(044149)

Earthing set  
(044113)



Luxmeter type B  
(044111)



AC/DC current clamp adapter CC 3  
(044038)



40 m measuring cable TA 5  
(044039)



## Scope of delivery

	BENNING IT 130	BENNING IT 115
Scope of delivery	padded carrying case, test cable with shock-proof plug, universal three-wire test cable, set of test probes/ alligator clips, carrying strap, rechargeable storage batteries (6x NiMH AA), charger, calibration certificate	
	„Commander“ probe tip (switchable with TEST key), RS 232 PS/2, USB interface cable, batteries (2x AAA), PC software (via download link)	

## Optional accessories for IT 130 / IT 115

	item no.
<b>earthing set</b> for earthing measurement, 2 earth rods, 3 test cables (2 x 20 m, 1 x 4.5 m)	044113
<b>"Commander" test plug</b> for shock-proof socket, with "PASS"/"FAIL" indication via of green/red LED, "TEST"/"MEM" key, bright LED measuring point illumination	044149
<b>"Commander" probe tip</b> for shock-proof socket, with "PASS"/"FAIL" indication via green/red LED, "TEST"/"MEM" key, bright LED measuring point illumination (included in the scope of delivery of the BENNING IT 130)	044155
<b>BENNING Luxmeter type B</b> adapter, measuring range 0.01 lx - 20 klx, accuracy 5 % (only BENNING IT 130)	044111
<b>barcode scanner</b> with PS/2 connector. For identifying the measuring point and renaming the storage location (only BENNING IT 130)	009371
<b>measuring adapter for testing 5-pin CEE sockets</b> (see page 22)	
• BENNING TA 7-16, 16 A 6h 3P+N+PE	044040
• BENNING TA 7-32, 32 A 6h 3P+N+PE	044041
• BENNING TA 7-63, 63 A 6h 3P+N+PE+Pilot	044042

See page 22 for further accessories



# Installation Tester

*unbeatable price/performance ratio*

## BENNING IT 105

### Multifunction Installation Tester

Easy and efficiently tests of electrical installations after construction, modification or as periodic inspection according to IEC 60364

- low-impedance resistance of the protective conductor and equipotential bonding conductor connections (testing current: 200 mA)
- insulating resistance with testing voltages of 250 V, 500 V and 1000 V
- loop impedance (L-PE) without RCD tripping (NO-TRIP) with simultaneous display of the fault current (PFC)
- line impedance (L-N/L) with high testing current (HIGH CURRENT) with simultaneous display of the short-circuit current (PSC)
- testing of RCDs, standard and delayed (S) with sinusoidal (AC) and pulsating testing current (A) (tripping current, tripping time)
- voltage, frequency measurement (up to 440 V) and phase sequence testing
- delivery incl. calibration certificate

### Features

- unbeatable price/performance ratio
- easy operation, all measuring functions can be selected directly by means of a rotary switch
- large LC display with illumination
- test probe with TEST key for starting the measuring process
- AUTO start function for low-impedance, loop and line impedance measurements
- LOCK function (permanent measurement) of the insulating resistance
- compensation (null balance) of the measuring leads up to 10 Ω

IT 105



Scope of delivery



TA 5  
(044039)

## Installation Tester

	BENNING IT 105
display	graphic display (illuminated)
low-impedance resistance	0.15 Ω - 199 Ω
insulation resistance	200 kΩ - 199 MΩ
line impedance	0.2 Ω - 1999 Ω
loop impedance	0.2 Ω - 1999 Ω
short-circuit current	up to 26 kA
RCD testing	tripping time ( 1/2x, 1x, 5x IΔN, AUTO) tripping current (ramp)
testing current	sinusoidal (AC), pulsating (A) 10/30/100/300/500 mA
phase sequence	•
voltage, frequency	1 V - 440 V, 45 Hz - 65 Hz
item no.	044105

See page 22 for further accessories

Measuring range indications refer to ranges from highest resolution to the final measuring range value

## Scope of delivery

	BENNING IT 105
Scope of delivery	hard-top case, test probe with „TEST“ key, set of measuring leads/ alligator clips, test cable with shock-proof plug, carrying strap, batteries (6 x 1.5 V LR6/ type AA), calibration certificate

## Optional accessories

	Art.-Nr.
<b>BENNING TA 5</b> 40 m measuring lead with retractor and wrist strap, for the measurement of protective and bonding conductors, connection Ø 4 mm test socket/plug	044039

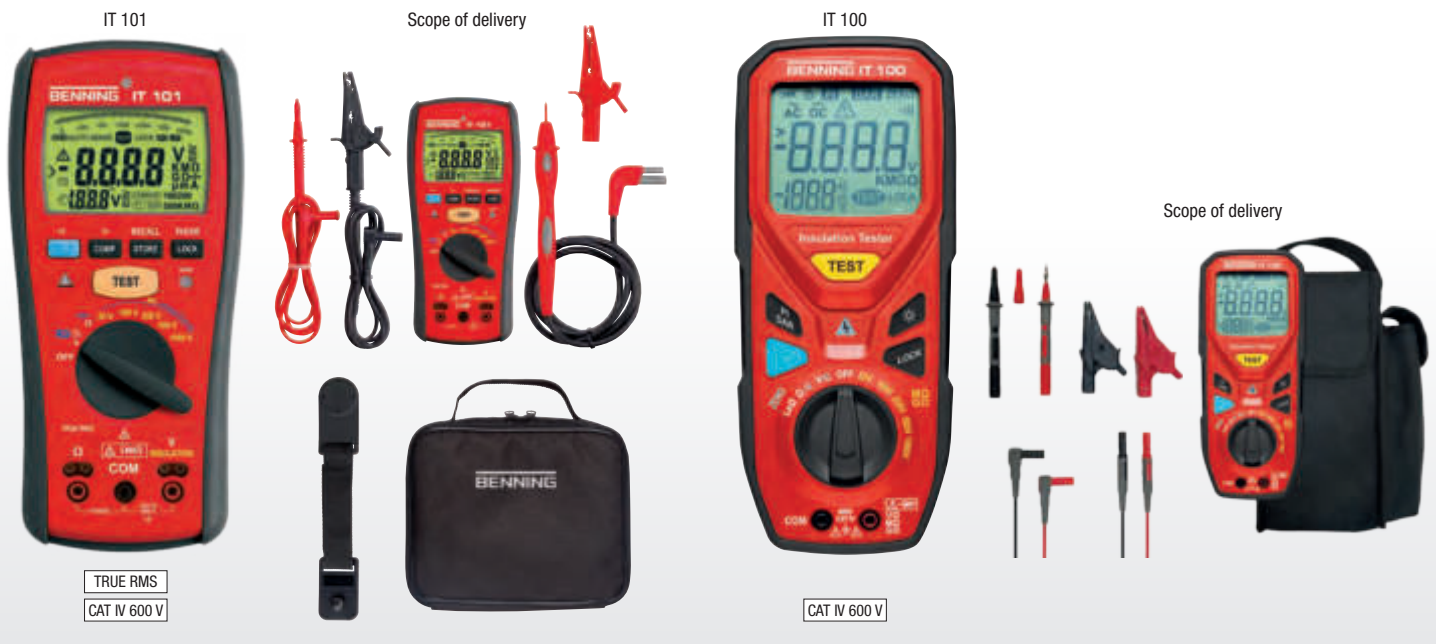
**NEW!**

### BENNING IT 101 Insulation and Resistance Measuring Device

- measurement of the insulating resistance with testing voltages of 50 V, 100 V, 250 V, 500 V and 1,000 V
- measurement of polarization index (PI) and dielectric absorption rate (DAR)
- selectable limiting values for ISO measurement, green LED for "PASS", red LED for  $\Delta$  testing voltage/external voltage
- resistance measurement with a testing current of 200 mA for testing protective conductor connections with null balance of the measuring leads
- switchable probe tip for triggering the measuring process
- internal memory for 100 measuring values per measuring function
- TRUE RMS voltage measurement with low-pass filter
- including case, switchable probe tip, silicone measuring leads, magnetic hook, alligator clips, rubber protective frame and batteries

### BENNING IT 100 Insulation and Resistance Measuring Device

- measurement of the insulating resistance with testing voltages of 50 V, 100 V, 250 V, 500 V and 1000 V
- automatic prevention of the test in case of external voltage
- measurement of polarization index (PI) and dielectric absorption rate (DAR)
- resistance measurement with a testing current of 200 mA for testing protective conductor connections with null balance of the measuring leads
- test function for checking the internal fuse
- compact and convenient housing design
- including case, set of measuring leads and measuring probes, alligator clips, rubber protective frame and batteries



## Insulation and Resistance Measuring Devices

	BENNING IT 101	BENNING IT 100
indicating range	4000 digit (illuminated) with bar graph	9999 (illuminated)
low-impedance resistance	0.01 $\Omega$ - 40 $\Omega$	0.01 $\Omega$ - 60 $\Omega$
insulation resistance	50 k $\Omega$ - 20 G $\Omega$	300 k $\Omega$ - 20 G $\Omega$
resistance	0.01 $\Omega$ - 40 k $\Omega$	0.1 $\Omega$ - 600 k $\Omega$
voltage (AC/DC)	0.1 V - 600 V AC TRUE RMS/DC	0.1 V - 600 V
supplementary function	leakage current, polarization index (PI), dielectric absorption rate (DAR), automatic discharge function, null balance of the measuring leads	polarization index (PI), dielectric absorption rate (DAR), automatic discharge function, null balance of the measuring leads, integrated fuse test, test locking in case of external voltage
measured value memory	500 measuring results	-
measuring method	TRUE RMS	RMS
measuring category	CAT IV 600 V	CAT IV 600 V
item no.	044033	044107

See page 22 for further accessories

Measuring range indications refer to ranges from highest resolution to the final measuring range value

# Earth Measuring Clamp

for earth loop resistance and leakage current measurement

## BENNING CM E1

### Earth Measuring Clamp for earth loop resistance and leakage current measurement

An adequate and effective earth connection is an important prerequisite for the correct functioning and safety of electrical installations.

The correct condition of an earth connection must be determined by inspection and measurement after each installation, modification and within the framework of periodic inspection of electrical installations and must be compared with the specified values.

Measuring the earth loop resistance by means of the BENNING CM E1 without using rods is the ideal solution for measuring earthing resistances in multiply earthed earthing systems.

- earth loop resistance measurement in multiply earthed earthing systems (IEC 61557-5)
- measurement of leakage and load currents using the TRUE RMS measuring method

### Benefits

- significant time saving and reduced effort compared to conventional measuring methods
- no need to disconnect the earth connection to be tested (often difficult due to corrosion), no need to set probes and auxiliary earth electrodes (difficult in built-up areas)
- safe both for the testing personnel and the electrical installation (earthing is maintained during measurement)
- no malfunctions of the installation due to disconnection of the earth connection

### A wide range of applications

Such as e. g. equipment/system earthing connections of buildings, industrial plants, transformer stations as well as earth connections in the field of lightning protection, street lighting, mobile communications, wind power and overhead line networks of electric utility companies



Measuring the earth loop resistance of an installation's earth connection



Measuring the system earthing connection of an industrial power distribution system

## Earth Measuring Clamp

	BENNING CM E1
indicating range	9999 with main and secondary display
basic accuracy	1.5 %
earth loop resistance	0.025 Ω - 1500 Ω
leakage current AC	300 μA - 1000 mA
load current AC	200 mA - 35 A
supplementary function	adjustable upper and lower alarm limit, automatic calibration during start-up, reference resistance loop for self-test
memory function	HOLD
Data Log function	116 measured values (interval 1s - 255 s)
measuring method	TRUE RMS
clamp opening	38 mm
measuring category	CAT III 300 V
item no.	044684

Measuring range indications refer to ranges from highest resolution to the final measuring range value

## Scope of delivery

	BENNING CM E1
Scope of delivery	hard-top case, reference resistance loop (0.474 Ω, 0.5 Ω, 10 Ω, 100 Ω) for self-test and battery (LR 61)



## the ideal solution

### Features

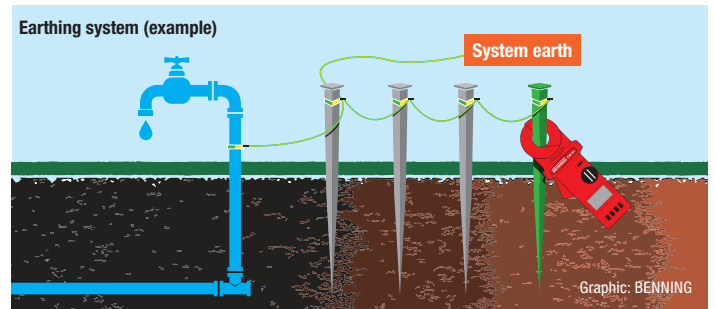
- optical and acoustic alarm function in case of earthing resistances being out of range
- large measuring clamp diameter of 38 mm
- measured value memory and data logger with adjustable measuring interval
- automatic calibration during start-up
- APO function (Auto-Power-Off) for battery saving (can be disabled))

### Tip

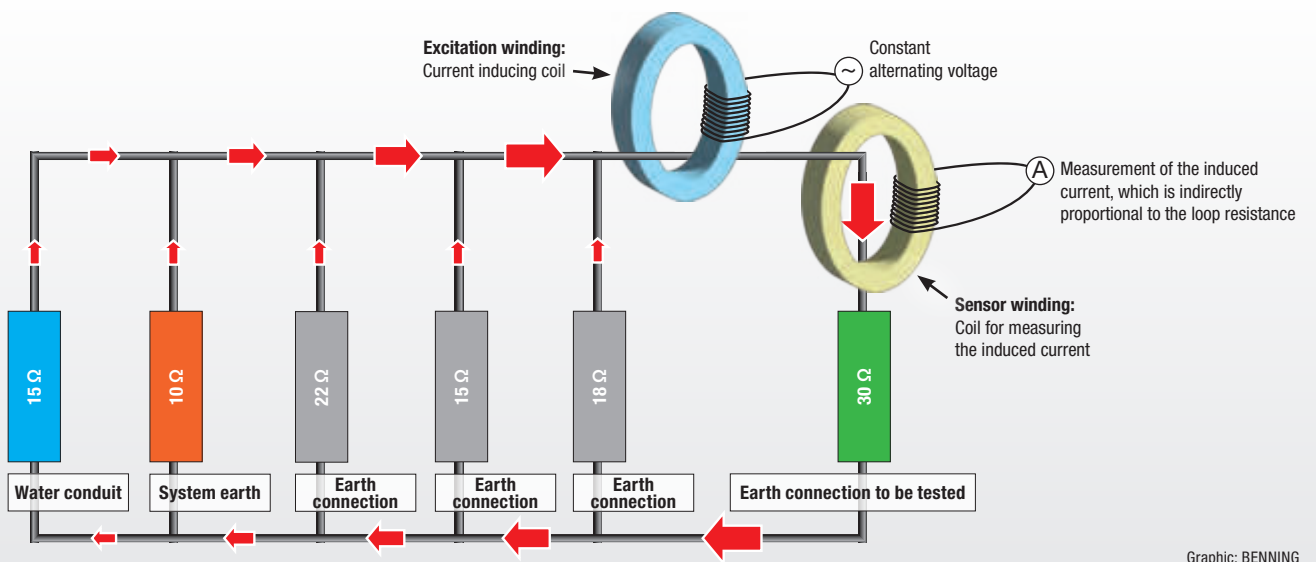
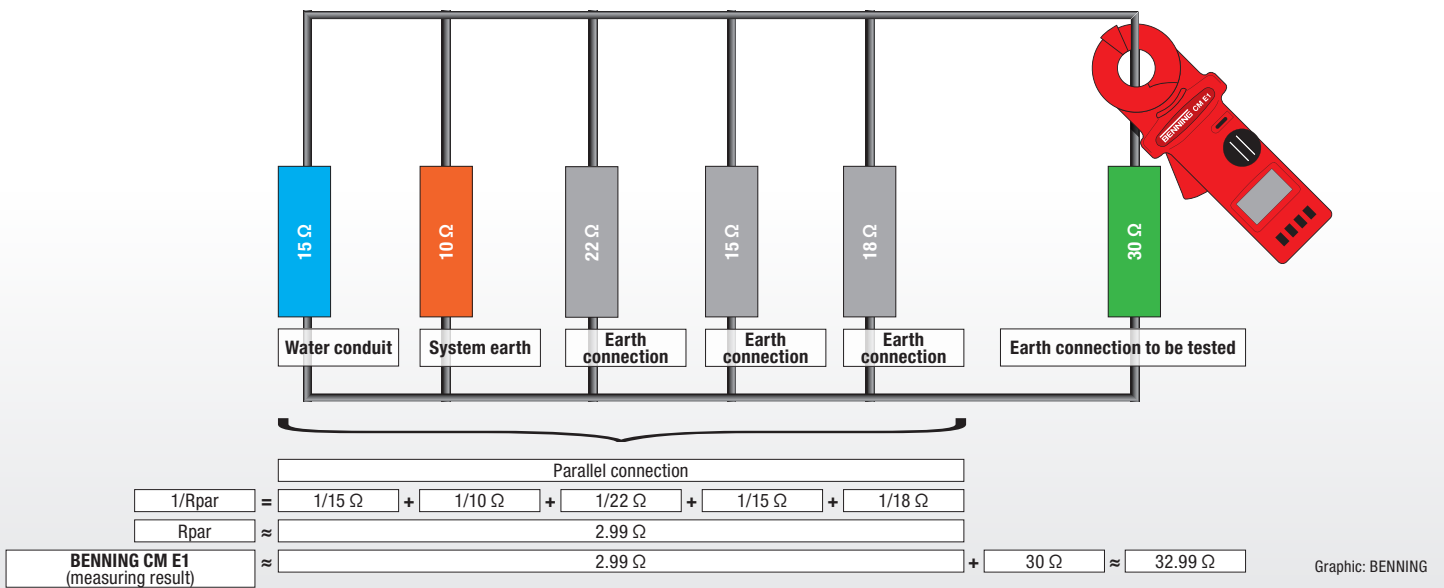
To measure a single earth electrode without a parallel earth connection, a temporary connection can be made to an existing earth connection, or a single earth rod can be set to create the required measuring loop.

### Functional principle

- The measuring clamp has an excitation winding and a sensor winding
- The excitation winding induces a current flow in the clamped earthing conductor via a constant AC voltage  $U$  ( $f = 3.333 \text{ kHz}$ )
- The sensor winding measures the induced current flow
- The BENNING CM E1 measures (calculates) the resistance of the entire earth loop ( $R_s = U/I$ )





### Equivalent circuit












# Accessories for Insulation and Resistance Measuring Device/ Installation Testers

## professional accessories


22

	Description	Product data	Item no.	IT 130	IT 115	IT 105	IT 101	IT 100
	<b>Robust hard case</b> dimensions 375 x 190 x 250 mm	With foam insert, separate shelf and lid compartment for accessories and small parts. Safe transport protection for high-quality testing and measuring instruments. Made of ABS material, dust and waterproof.	10198412	•	•	•	•	•
	<b>Stand-by case size M</b> dimensions: 240 x 180 x 70 mm	made of hard-wearing nylon fabric	010913				•	•



## Measuring accessories

	<b>BENNING TA 3</b> set of measuring leads, eight pieces	Ø 4 mm plug-in technology, red/black, professional equipment, CAT III 1000 V, consisting of: measuring leads (silicone), test probes (slender measuring tip), claw clamps, alligator clips	044126				•	•
	<b>BENNING TA 4</b> magnetic holder, three pieces	For attachment of multimeters to switching cabinets, machine and system parts. Consisting of: magnetic holder, adapter and belt	044120				•	
	<b>BENNING TA 5</b> 40 m measuring cable	with practical winder and strap, for the measurement of protective and bonding conductors, connection Ø 4 mm test socket/plug	044039	•	•	•	•	•
	<b>Ø 4 mm safety measuring leads with 2 mm measuring tip</b> , two pieces	red/black, L = 1.40 m, with Ø 2 mm measuring tip (L = 18 mm), CAT IV 600 V/ CAT III 1000 V (with protective caps), CAT II 1000 V (without protective caps)	044146				•	•
	<b>Ø 4 mm safety measuring leads with 4 mm measuring tip</b> , two pieces	red/black, L = 1.40 m, with Ø 4 mm measuring tip (L = 18 mm), CAT IV 600 V/ CAT III 1000 V (with protective caps), CAT II 1000 V (without protective caps)	044145				•	•
	<b>earthing set</b> for earthing measurement	three-wire measuring method. Consisting of: 2 earth rods, 3 test cables (2 x 20 m, 1 x 4.5 m)	044113	•	•			
	<b>CEE measuring adapter 16 A CEE 5-pin</b>	for measurement of voltage/phase-sequence (rotary field), frequency	044148	•	•			
	<b>“Commander” test plug</b> for shock-proof socket	with “TEST”/“MEM” key, LED measuring point illumination, “PASS”/“FAIL” indication by means of green/red LED, PE contact electrode for protective conductor connection	044149	•	•			
	<b>“Commander” probe tip</b> switchable	with “TEST”/“MEM” key, LED measuring point illumination, “PASS”/“FAIL” indication by means of green/red LED, PE contact electrode for protective conductor connection (BENNING IT 130 delivery including “Commander” probe tip!)	044155	•	•			




## CEE Measuring Adapter

	<b>BENNING TA 7-16</b> ~ 16 A 6h 3P+N+PE	for testing of 5-pin CEE sockets, easy and safe contacting without having to open the CEE sockets, coloured measuring jacks with unambiguous conductor assignment, universally applicable due to 4 mm safety measuring jacks, supported measurements/tests: Rlow, Riso, Zloop, Zline, RCD test, voltage and phase sequence testing	044040	•	•	•	•	•
	<b>BENNING TA 7-32</b> ~ 32 A 6h 3P+N+PE		044041	•	•	•	•	•
	<b>BENNING TA 7-63</b> ~ 63 A 6h 3P+N+PE, additional 2 mm safety measuring jack for the pilot contact on 63 A CEE sockets		044042	•	•	•	•	•

## Current Clamp Adapters

	<b>BENNING CC 3</b> AC/DC current clamp adapter	basic accuracy: 1 % - 2 % current: 0.2 A - 300 A AC/DC output: 1 mV/10 mV AC/DC per 1 A AC/DC	044038	•				
	<b>BENNING CFlex 1</b> AC current transformer	basic accuracy: 3 % current: 0.3 A - 3000 A AC output: 100 mV/10 mV/1 mV AC per 1 A AC	044068	•				

## Ceramic fuse

	<b>315 mA fuses</b> packaging unit 10 pieces	superfast-acting (FF), breaking capacity 10 kA, rated voltage 1000 V, dimensions 6.3 x 32 mm	757213				•	•
	<b>315 mA fuses</b> packaging unit 10 pieces	F1, medium slow-acting (M), rated voltage 250 V, dimensions 5 x 20 mm	757211	•	•			
	<b>1,6 A fuses</b> packaging unit 10 pieces	superfast-acting (FF), breaking capacity 30 kA, rated voltage 1000 V, dimensions 6.3 x 32 mm	10194027			•		

\* figure similar

## Installation Tester for photovoltaic systems and curve tracer

*testing in compliance with EN 62446 and EN 61829*



Voc: 1000 V DC  
I<sub>sc</sub>: 15 A DC

The photovoltaic installation testers by BENNING are the ideal solution for quick and professional testing of PV systems. The BENNING PV 2 SET for installation testing in compliance with

EN 62446 also offers curve measurement in compliance with EN 61829 and corresponding documentation by means of the software BENNING Solar Manager.



Voc: 1500 V DC  
I<sub>sc</sub>: 40 A DC

The PV tester BENNING PV 3 can be used in photovoltaic systems with system/string voltages up to 1500 V. Voltages up to 1500 V and short-circuit currents up to 40 A DC can be

documented depending on the current solar radiation and temperature.





# Installation Tester for photovoltaic systems

*commissioning tests, periodic inspection and curve measurement of PV systems*

## BENNING PV 1-1, PV 2

### Installation Tester for photovoltaic systems for testing grid-connected PV systems

- tests in compliance with EN 62446 standard
- easy – operation by means of keys with AUTO test procedure
- quick – testing within a few seconds only
- safe – contacting by means of PV connectors

#### Features

- automatic test procedure for Uo/c, Is/c and Riso
- insulating resistance with a testing voltage of 250 V, 500 V and 1000 V
- memory of measured values with real-time clock (date/time stamp)
- wireless connection BENNING SUN 2 (insolation/ temperature)
- USB interface and download software BENNING SOLAR Datalogger

## BENNING PV 2

### Installation Tester for photovoltaic systems and curve tracer

- testing in compliance with EN 62446 and EN 61829 for documenting the performance data
- measurement of the current-voltage characteristic (I-V) and the power characteristic (P-V)
- indication of Umpp, Impp and filling factor (FF)

#### Features

- automatic test procedures for curve measurement and Riso testing
- separate Riso measurement via 4 mm measuring leads
- optional PC software BENNING SOLAR Manager for the creation of test reports and documentation of characteristics
- free app BENNING PV Link (requires Android device with NFC)



## Installation Tester for PV systems

	BENNING PV 1-1	BENNING PV 2
display	graphic display (illuminated)	
protective conductor resistance (RPE)	0.05 Ω – 199 Ω	
open-circuit voltage with polarity (Uo/c)	5 V – 1000 V DC	
short-circuit current (Is/c)	0.5 A – 15 A DC	
insulating resistance (Riso)	0.05 MΩ – 199 MΩ (250/500/1000 V)	
insulating resistance (2-pin)	-	0.05 MΩ – 300 MΩ
AUTO measurement 1	+/-, Uo/s, Is/c, Riso	+/-, Uo/s, Is/c, Riso
AUTO measurement 2	-	characteristic (I-V, P-V)
AUTO measurement 3	-	measurement 1 + 2
DC string current/AC current	0.2 A – 40 A DC/AC (via BENNING CC 3)	
insolation	100 W/m² – 1250 W/m² (via BENNING SUN 2)	
PV module/ambient temperature	-30 °C – +125 °C (via BENNING SUN 2)	
voltage (2-pin)	30 V – 440 V AC/DC	
measured value memory	200	999
interfaces	USB/radio	USB/radio/NFC
dimensions/weight	270 x 115 x 55 mm/ca. 2.6 kg	
item no.	050421	050422

## Scope of delivery

	BENNING PV 1-1	BENNING PV 2
scope of delivery	carrying case, measuring/MC4/Sunclix leads, batteries, alligator clips, download software, micro USB cable	
	-	demo version of PC software BENNING SOLAR Manager

## SET offer

BENNING PV 2 SET		
BENNING PV 2		item no. 050427
BENNING SUN 2		
PC software BENNING SOLAR Manager		
Bag with neck strap PV		

## Optional accessories

	item No.
PC software BENNING SOLAR Manager license key for a single-user license	050423
Bag with neck strap for PV suitable for BENNING PV 1-1/PV 2	050426

See page 28 for further accessories

Measuring range indications refer to ranges from highest resolution to the final measuring range value

## BENNING SUN 2 Insolation and Temperature Measuring Instrument

- insolation measurement ( $W/m^2$ ) via PV reference cell
- PV module temperature and ambient temperature ( $^{\circ}C$ )
- digital compass and inclinometer
- with wireless transmission (433 MHz) to the BENNING PV 1-1/ PV 2, the current insolation and temperature values of the measuring result are stored
- data logger (5000 data records), including insolation and module/ ambient temperature
- integrated real-time clock with date/time stamp
- USB interface and download software for the preparation of test certificates in MS Excel<sup>®</sup>

## BENNING SOLAR Manager PC-Software (Windows<sup>®</sup>)

- documentation of the I-V and P-V characteristics measured by the BENNING PV 2
- STC conversion/ comparison with characteristic via integrated PV module database
- demo version available for download can be used free of charge for 14 days

## App BENNING PV Link

- displaying of curves via Android device with NFC interface
- STC comparison with characteristic via integrated PV module database
- available free of charge for the BENNING PV 2 in the Android Playstore

## BENNING SOLAR Datalogger download software

- download of measured values from the BENNING PV 1-1/PV 2 in CSV format
- further processing of measured values possible in MS Excel<sup>®</sup>

## Insolation and temperature measuring instrument

	BENNING SUN 2
insolation	100 $W/m^2$ – 1250 $W/m^2$
PV module/ambient temperature	-30 $^{\circ}C$ – +125 $^{\circ}C$
compass bearing	0 $^{\circ}$ – 360 $^{\circ}$
inclinometer (module/roof pitch)	0 $^{\circ}$ – 80 $^{\circ}$
real-time clock	date/time stamp
measured value memory for $W/m^2$ and $^{\circ}C$	5000 data records
interface/radio range	1 x USB/approx. 30 m for unobstructed view conditions
dimensions/weight	150 x 80 x 33 mm/350 g
scope of delivery	case, protective rubber holster, module/ambient temperature sensor, batteries, USB cable, download software via download link
item no.	050420

See page 28 for further accessories

Measuring range indications refer to ranges from highest resolution to the final measuring range value

## Recommended accessories

	Item No.	BENNING PV 1-1	BENNING PV 2
BENNING SUN 2	050420	recommended	necessary for curve measurement
PC software BENNING SOLAR Manager	050423	-	necessary for documentation
Temperature sensor (suction cup) (SUN 2) (see page 28)	050424	recommended	recommended
PV module holder (SUN 2) (see page 28)	050425	recommended	recommended
AC/DC current clamp adapter BENNING CC 3 (see page 28)	044038	recommended	recommended
40 m measuring lead BENNING TA 5 (see page 28)	044039	recommended	recommended
Download software BENNING SOLAR Datalogger	free	download of measured values in CSV format	download of measured values in CSV format
App BENNING PV Link for presentation of characteristic	free	-	requires Android devices with NFC interface

# Tester for photovoltaic systems

testing of solar parks, power plants and large installations with 1500 V technology

## BENNING PV 3

### PV Tester for PV systems with 1500 V technology

Rational testing of solar parks, power plants and large installations

- efficient - open-circuit voltage measurement for modern 1500 V DC systems
- powerful - short-circuit current measurement at PV strings up to 40 A DC
- safe – contacting by means of PV connectors

### Measuring functions

- polarity test of the PV generator/ PV cabling
- open-circuit voltage measurement for modern 1500 V DC systems
- short-circuit current measurement at PV strings up to 40 A DC
- insolation measurement ( $W/m^2$ ) and PV module temperature and ambient temperature ( $^{\circ}C$ ) by means of BENNING SUN 2 (optional)

### Features

- automatic test procedure (+/-, Vo/c, Is/c) with reverse polarity protection (incl.  $W/m^2$ ,  $^{\circ}C$  with integrated SUN 2)
- powerful short-circuit current measurement, reserve is up to 4 x larger than for conventional PV testers with 10 A limitation
- reduced testing times and effort for disassembly, as the individual PV strings no longer have to be separated and tested one after the other
- reduces the risk of failure due to overload during testing of PV strings of unknown power
- memory of measured values with real-time clock (date/time stamp)
- wireless connection BENNING SUN 2 (insolation/temperature)
- USB interface and download software BENNING SOLAR Datalogger
- large LC display with illumination
- optimum transport and storage protection (IP 64)

PV 3



Scope of delivery



## Tester for PV systems

	BENNING PV 3
display	graphic display (illuminated)
polarity test	automatic
open-circuit voltage (Uo/c)	5 V - 1500 V DC
resolution/accuracy	max. 0.1 V/ $\pm$ (0.5 % + 2 digit)
short-circuit current (Is/c)	0.5 A - 40 A DC (max. 45 kW)
resolution/accuracy	max. 0.01 A/ $\pm$ (1 % + 2 digit)
insolation	100 $W/m^2$ – 1250 $W/m^2$ (via BENNING SUN 2)
PV module/ambient temperature	-30 $^{\circ}C$ - +125 $^{\circ}C$ (via BENNING SUN 2)
measured value memory	999
interfaces	USB type B
batteries	3 x 3.7 V 18650 lithium-ion batteries
dimensions/weight	340 x 300 x 152 mm/approx. 5 kg
protection class	IP 40 (open), IP 64 (closed)
item no.	050428

Measuring range indications refer to ranges from highest resolution to the final measuring range value

## Scope of delivery

	BENNING PV 3
scope of delivery	PV tester in robust protective case (IP 64), set of PV measuring leads (MC4), set of measuring leads with probe tip and alligator clips, charger with 3 pieces 3.7 V lithium-ion batteries

## Optional accessories

	Art.-Nr.
<b>BENNING SUN 2</b> insolation and temperature measuring instrument (see page 25)	050420
<b>Temperature sensor (suction cup)</b> suitable for BENNING SUN 2 (see page 28)	050424
<b>PV module holder</b> suitable for BENNING SUN 2 (see page 28)	050425



safe voltage measurement up to 1500 V AC/ 2000 V DC via BENNING TA PV

## BENNING CM 10-PV

### Digital Current Clamp Meter for photovoltaic systems and applications with high voltages

- current measurement up to 600 A AC/DC with max. 10 mA resolution
- microampere and temperature measuring range for HVAC technology
- INRUSH function for measuring inrush currents
- measuring input for flexible current transformer BENNING CFlex 1 (044068) up to 3000 A AC (optional)
- non-slip and break-proof SoftGrip housing

## BENNING MM 10-PV

### Digital Multimeter for photovoltaic systems and applications with high voltages

- universally applicable with 10 A current measuring range
- LC display with bargraph indication for the detection of measuring trends
- rubber holster with magnetic hanger
- compact design for one-hand operation

### Common features of BENNING CM 10-PV, MM 10-PV

- safe voltage measurement up to 1500 V AC/ 2000 V DC via TA PV
- data logger, memory function and Bluetooth® Low Energy 4.0 interface
- app “BENNING MM-CM Link” for download, storage and sharing measured values via smartphone/ tablet
- low-pass filter (HFR) for measurements at pulsed motor drives
- Volt sensor for non-contact signalling of phase voltages and cable breaks in lines (red LED)
- continuity test and single-pole phase test via buzzer and red LED
- delivery including case, batteries, measuring leads, measuring adapter TA PV, alligator clips and wire temperature sensor



## TRUE RMS Digital Current Clamp/ Multimeter

	BENNING CM 10-PV	BENNING MM 10-PV
indicating range	6000 (illuminated)	6000 (illuminated) with bar graph
basic accuracy	1.0 %	0.5 %
AC voltage	0.1 V - 1000 V (1500 V via TA PV)	0.1 mV - 1000 V (1500 V via TA PV)
DC voltage	0.1 mV - 1000 V (2000 V via TA PV)	0.1 mV - 1000 V (2000 V via TA PV)
AC current	0.1 µA - 4000 µA, 10 mA - 600 A	1 mA - 10 A
DC current	0.1 µA - 4000 µA, 10 mA - 600 A	1 mA - 10 A
resistance	0.1 Ω - 600 kΩ	0.01 Ω - 40 MΩ
continuity/diode	• / •	• / •
frequency	0.01 Hz - 10 kHz	0.01 Hz - 100 kHz
capacity	0.1 µF - 1 mF	1 nF - 10 mF
temperature	-40 °C up to 400 °C	-40 °C up to 400 °C
volt sensor	•	•
interface	Bluetooth®	Bluetooth®
software	app (IOS, Android)	app (IOS, Android)
filter function	HFR filter (800 Hz)	HFR filter (800 Hz)
memory	HOLD, MIN/MAX, INRUSH, ZERO	HOLD, MAX/MIN, REL, SAVE
data log function	4000 measuring values (interval: 1 s - 60 s)	4000 measuring values (interval: 1 s - 60 s)
measuring method	TRUE RMS	TRUE RMS
clamp opening	37 mm	-
measuring category	CAT IV 600 V	CAT IV 600 V
item no.	044683	044089

See page 28, 48, 60 for further accessories

Measuring range indications refer to ranges from highest resolution to the final measuring range value

# Accessories for Testers for PV- Systems

## professional accessories

28

	Description	Product data	Item no.	PV 1-1	PV 2	SUN 2	PV 2 SET	CM 10-PV	MM 10-PV
<b>PC software</b>									
	<b>BENNING SOLAR Manager</b>	License key for a single-user license. Documentation of the PV system as well as of I-V and P-V characteristic curves STC calculation and comparison of characteristic curves via integrated PV module database.	050423		•				
<b>Current Clamp Adapter</b>									
	<b>BENNING CC 3</b> AC/DC current clamp adapter	For DC operating currents and AC currents up to 40 A. Basic accuracy : 1 % - 2 %	044038	•	•		•		•
<b>Stand-by cases</b>									
	<b>Stand-by case size S</b> dimensions: 220 x 110 x 50 mm	with belt loop on the back, made of hard-wearing nylon fabric	010912			•			•
	<b>Bag with neck strap for PV</b> dimensions: 280 x 135 x 50 mm (without device)	Allows hands-free working on measuring points that are dangerous or difficult to access. With shoulder strap and large viewing window for easy operation of the keys and viewing the display. Made of hard-wearing nylon fabric.	050426	•	•				
<b>Hard case</b>									
	<b>Robust hard case</b> dimensions 375 x 190 x 250 mm	With foam insert, separate shelf and lid compartment for accessories and small parts. Safe transport protection for high-quality testing and measuring instruments. Made of ABS material, dust and waterproof.	10198412	•	•	•	•	•	•
<b>Measuring accessories</b>									
	<b>BENNING TA 1</b> alligator clips, two pieces	Ø 4 mm plug-in technology, red/black, professional equipment, CAT III 1000 V	044124	•	•		•	•	•
	<b>BENNING TA 2</b> set of measuring leads, six pieces	Ø 4 mm plug-in technology, red/black, professional equipment, consisting of: measuring leads (silicone) CAT III 1000 V, test probes (Ø 4 mm measuring tip) CAT II 1000 V, alligator clips CAT III 1000 V	044125	•	•		•	•	•
	<b>BENNING TA 3</b> set of measuring leads, eight pieces	Ø 4 mm plug-in technology, red/black, professional equipment, CAT III 1000 V, consisting of: measuring leads (silicone), test probes (slender measuring tip), claw clamps, alligator clips	044126	•	•		•	•	•
	<b>BENNING TA 5</b> 40 m measuring cable	with practical winder and strap, for the measurement of protective and bonding conductors, connection Ø 4 mm test socket/plug	044039	•	•		•		
	<b>BENNING TA PV (4 mm)</b> measuring adapter	For safe DC and AC voltage measurement up to 1500 V AC/ 2000 V DC. Measuring category: 1000 V CAT III, 600 V CAT IV (with protective cap), 1000 V AC CAT II/ 1500 V DC CAT II (without protective cap). Length 1.4 m. Incl. protective caps CAT III/ IV	10217846					•	•
<b>Temperature sensor</b>									
	<b>Temperature sensor</b> with suction cup	For attachment of the module temperature sensor to the module back Contact sensor version. Cable length 2 m	050424			•			
<b>PV module holder</b>									
	<b>PV module holder</b>	For safe attachment of the SUN 2 to the PV module	050425			•			
<b>Ceramic fuse</b>									
	<b>500 mA fuses</b> packaging unit 10 pieces	fast-acting, breaking capacity 1 kA, rated voltage 1000 V, dimensions 6.3 x 32 mm	749771	•	•		•		

\* figure similar

## Voltage Tester and Continuity Tester

### *Socket Tester and Phase Sequence Indicator*

- DUSPOL® Voltage Tester – the original since 1948
- PROFIPOL®+ Voltage Tester – a plus in functionality
- BENNING CM 1-4 Multifunctional Tester with digital and LED display
- DUTEST® pro Continuity and Line Tester with LED torch
- BENNING SDT 1 Socket Tester
- TRITEST® pro Phase Sequence Indicator with LED torch
- TRITEST® easy non-contact Phase Sequence and Phase Tester
- BENNING VT 2 non-contact phase indicator and magnetic field tester





# DUSPOL® Voltage Testers

safe voltage testing up to 1000 V



tested and approved



IEC/EN 61243-3  
(VDE 0682-01):  
2015 standard


## The international standard for voltage testers IEC EN 61243-3 (VDE 0682-401) increases safety for work under voltage

Your work as an expert requires safe testing. Therefore, you should not make any compromises concerning safety! Voltage testers which are used on electrical systems of up to 1000 V have to comply with the standard IEC/EN 61243-3 (VDE 0682-401):2015. The standard creates uniform testing and safety criteria on an international level and remarkably which concentrates on user safety.

The generation of DUSPOL® voltage testers exceeds the demands of the standards concerning both the protection category for housings (IP 65) and overvoltage protection (CAT IV 600 V). The nominal voltage range has been increased to a minimum of 1000 V AC/DC in order to ensure safe testing of increased system voltages of industrial applications, photovoltaic systems and wind power plants as well as of hybrid automotive engineering.


- 1**  
phase-sequence test  
(counter-clockwise/clockwise)



- 2**  
sensor of non-contact  
cable break detector


- 3**  
single-pole  
phase test


- 4**  
measuring point  
illumination


- 5**  
acoustic and optical  
continuity test


- 6**  
frequency indication


- 7**  
LC display with  
background lighting



DUSPOL® digital  
1000 V AC  
1200 V DC  
CAT IV 600 V

**7**  
voltage indication  
1 – 1000 V AC TRUE RMS  
1 – 1200 V DC



resistance measurement and  
diode test with conducting state  
voltage indication



**8**  
load connection via  
push buttons



**9**  
vibrating alert in  
the test handle



**10**  
housing with protection  
against dust and water jets



DUSPOL® expert  
1000 V  
AC/DC  
CAT IV 600 V

DUSPOL® analog  
1000 V  
AC/DC  
CAT IV 600 V



All DUSPOL® voltage testers are equipped with a direct display system without loading the test point. In case of need, a load circuit can be connected via a push-button which suppresses inductive and capacitive reactive voltages. Thus, it is possible to clearly distinguish between high-energy and low-energy electric circuits.

A vibrating motor can be activated additionally. The vibrating power of this motor increases proportionally to the applied voltage. This is an additional indication of voltage being applied.

The DUSPOL® voltage testers underline once again the BENNING expertise in the field of testing, measuring and safety technology. With a DUSPOL® voltage tester you acquire an innovative product which has been tested and approved by the independent VDE Test and Certification Institute.

*DUSPOL® the original by BENNING*

## DUSPOL® Voltage Testers

- safe voltage testing up to 1000 V AC/DC
- load connection with vibration alert
- intentional tripping of a 30 mA RCD
- phase sequence test in a three-phase mains
- single-pole external conductor test and polarity test

## Additionally for DUSPOL® expert, DUSPOL® digital:

- LED step indicator from 50 V even in case of empty batteries
- acoustic continuity test with loud test buzzer and visual indication by means of yellow LED (continuity tests even of live components, such as e. g. fuses in “intermeshed” systems).
- measuring point illumination by means of white high-power LED
- phase sequence test by means of green LED (left/right)
- detector for non-contact localization of cable breaks on exposed and live lines
- delivery including batteries

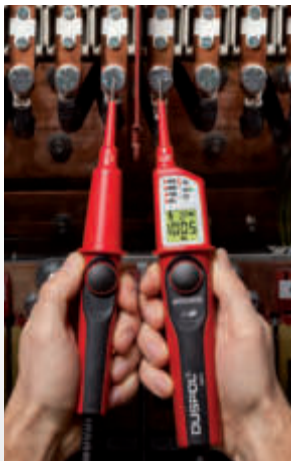
## Additionally for DUSPOL® digital:

- voltage testing up to 1000 V AC TRUE RMS/1200 V DC
- TRUE RMS measuring method
- low-volt range: 1.0 V to 11.9 V
- frequency indication up to 1000 Hz
- resistance measurement up to 300 kΩ
- conducting-state voltage measurement of diodes
- automatic LC display illumination by means of a light sensor

## A wide range of applications

Ideal for voltage tests

- in photovoltaic systems and wind power plants
- in hybrid vehicles
- of high system voltages in industrial applications
- in service and crafts



Testing an AC voltage of 1000 V in an industrial power distribution system



Testing the high DC voltage of a HV electric vehicle

### Set offer:

Set DUSPOL® digital with premium case



DUSPOL® digital SET  
item no. 050264

## Voltage and Continuity Tester

	DUSPOL® digital	DUSPOL® expert	DUSPOL® analog
indication	LED/LCD (illuminated)	LED	plunger system (illuminated)/LED
voltage range	1.0 V - 1000 V AC/1200 V DC	12 V - 1000 V AC/DC	12 V - 1000 V AC/DC
frequency range	1 - 1000 Hz	–	–
acoustic and visual continuity test	buzzer + yellow LED 0 - 100 kΩ	buzzer + yellow LED 0 - 100 kΩ	–
diode test	0.3 - 2.0 V	conducting-state/ non-conducting direction	–
resistance measuring range	0.1 kΩ - 300 kΩ	–	–
phase-sequence test	green LEDs (right/left)	green LEDs (right/left)	LCD (“R” symbol)
single-pole external conductor test	red “lightning” LED	red “lightning” LED	LCD (“R” symbol)
polarity test	LCD (+/-)	LED (+/-)	LED (+/-)
cable break detector	yellow LED (flashing)	yellow LED (flashing)	–
load connection via push button	I <sub>s</sub> = 550 mA (1000 V) 30 mA RCD trip	I <sub>s</sub> = 550 mA (1000 V) 30 mA RCD trip	I <sub>s</sub> = 550 mA (1000 V) 30 mA RCD trip
vibrating alarm	•	•	•
measuring point illumination	white LED	white LED	–
protection class	IP 65	IP 65	IP 65
item no.	050263	050262	050261

See page 36 for further accessories

# Multifunctional measuring instrument

for numerous applications

## BENNING CM 1-4

### Multifunctional Current Clamp with numerous functions and features of typical voltage testers

For precise and safe measurements using the TRUE RMS measuring method such as measuring current, voltage and much more in electrical installations and the electrical industry. With the open current measuring clamp, currents can be measured even in inaccessible places.

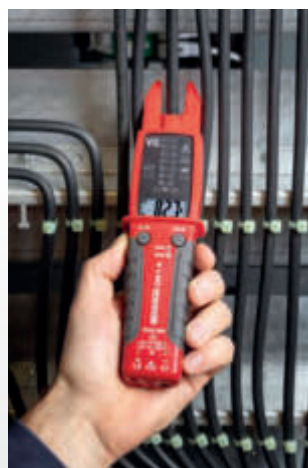
- current measurement up to 200 A AC (TRUE RMS) using the open current measuring clamp, even at inaccessible measuring points
- voltage measurement up to 1000 V AC/DC with LED step indicator
- LED step indicator: 12, 50, 120, 230, 400, 690, 1000 V
- phase sequence test by means of green LEDs (clockwise/counter-clockwise)
- single-pole external conductor test (phase) via red LED
- continuity test via buzzer and red LED
- polarity test via +/- LED

### Features

- robust and ergonomic ABS housing with rubberised grip area and measuring probe holder as well as open current measuring clamp
- LC display and LED step indicator
- voltage measurement with/without acoustic signal
- memory function HOLD
- highest measuring category CAT IV 600

### Benefits

- combination of numerous measuring functions in one device
- voltage tester functions such as phase sequence test, single-pole phase test, continuity test, polarity test
- LED step indicator from 12 V up to 1000 V AC/DC
- voltage display from 50 V - no batteries required
- one-hand operation for voltage measurement at sockets (19 mm)
- LED measuring point illumination
- incl. a wide range of accessories



AC current measurement



Voltage measurement and phase sequence test



One-hand operation for voltage measurement

## Multifunctional Current Clamp

	BENNING CM 1-4
indicating range	9999 (illuminated)/ LED
basic accuracy	1%
AC voltage	6 V - 1000 V
DC voltage	6 V - 1000 V
AC current	0.1 A - 200 A
resistance	1 Ω - 50 kΩ
continuity test	acoustic / LED
phase sequence test	green LED (right/left)
single-pole external conductor test	LED (red)
polarity test	LED (+/-)
memory function	HOLD
measuring method	TRUE RMS
clamp opening	16 mm
measuring point illumination	LED
measuring category	CAT IV 600 V
protection class	IP 54
item no.	044686

## Scope of delivery

	BENNING CM 1-4
scope of delivery	belt holster, measuring leads, protective caps, contact tip extensions, batteries (2 x 1.5 type AAA)

See page 60 for further accessories

Measuring range indications refer to ranges from highest resolution to the final measuring range value



## Socket Tester with contact sensor

### PROFIPOL®+ Voltage and Continuity Tester in convenient design

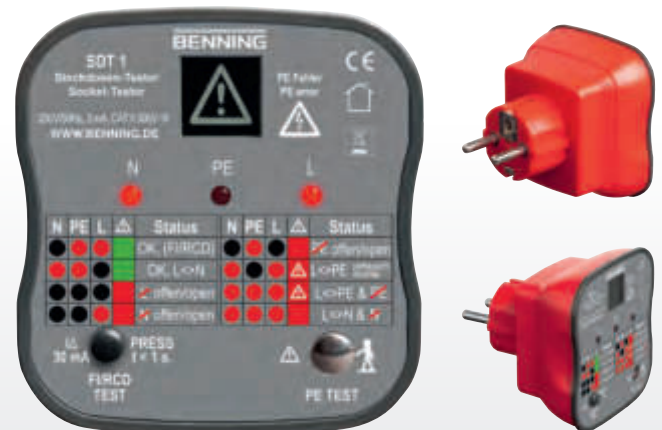
- slim and compact design
- test handle lock for one-hand operation on sockets and for safe storage
- indicating steps from 12 V to 690 V AC/DC, fully operational even with batteries being exhausted or removed
- acoustic continuity test with loud buzzer and visual indication by means of yellow LED (continuity tests even of live components, such as e. g. fuses in “intermeshed” systems).
- single-pole external conductor test (phase) and polarity test
- non-contact cable break detector (yellow LED)
- delivery including batteries

### BENNING SDT 1 Socket Tester with contact sensor for active PE error detection

- quick and easy testing of shock-proof sockets for correct connection
- wiring errors such as missing PE, N and L conductors as well as an inversion of the L and PE conductors are clearly indicated via three LEDs
- contact sensor warns of a dangerous contact voltage at the PE contact via the LC display
- unambiguous indication via LEDs and LC display
- FI/RCD TEST key for testing the tripping function of 30 mA RCDs
- an easily understandable status table provides information about the correct connection (OK, green) and the type of existing errors (red) at the shock-proof socket
- compact dimensions: 80 x 72 x 78 mm with lower weight (70 g)



SDT 1



### Voltage and Continuity Tester

	PROFIPOL® +
indication	LED
voltage range	12 V - 690 V AC/DC
acoustic and visual continuity test	buzzer + yellow LED 0 - 100 kΩ
single-pole external conductor test	red “lightning” LED
polarity test	LED (+/-)
cable break detector	yellow LED
protection class	IP 54
item no.	020023

See page 36 for further accessories

### Socket Tester

	BENNING SDT 1
indication	3 red LEDs for N, PE, L conductor and LC display “⚠”
voltage range	230 V AC, ± 10 %
frequency range	50 Hz - 60 Hz
PE test response threshold	U <sub>b</sub> < 50 V AC to earth
RCD testing current	I <sub>ΔN</sub> approx. 30 mA
power supply	via test object (no batteries required)
safety	IEC/EN 61010-1, IEC/EN 61010-2-033
measuring category	CAT II 300 V
item no.	020053

# Professional Continuity Tester

## Phase Sequence Indicator for three-phase mains

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### DUTEST® pro

#### Continuity and Line Tester for testing high-impedance and low-impedance resistances

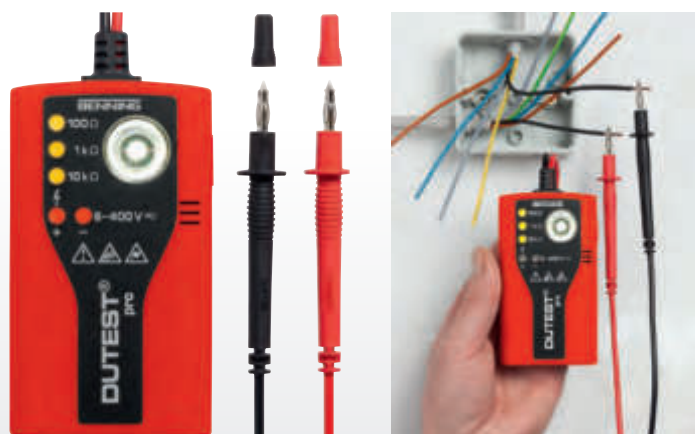
- continuity and semiconductor test by means of LEDs and loud buzzer
- visual indication by means of three LED steps: 0 - 100 Ω/1 kΩ/10 kΩ
- acoustic indication via buzzer up to approx. 100 Ω
- external-voltage indication: 6 V to 400 V AC/DC (LEDs/ buzzer)
- polarity test, single-pole external conductor test (phase)
- non-contact cable break detector (volt sensor)
- buzzer volume and brightness of the torch are adjustable
- precise and powerful LED torch
- integrated magnetic holder and belt clip at the rear of the housing

### TRITEST® pro

#### Phase Sequence Indicator with high-power LED torch and magnetic suspension

- indication of “clockwise” and “counter-clockwise” phase sequence by means of green/red LED
- indication of phase voltages L1, L2 and L3 by means of red LED
- voltage range: 400 V to 500 V AC (50 Hz to 60 Hz)
- luminous high-power LED torch
- integrated magnetic holder and belt clip at the rear of the housing
- including three attachable 4 mm probe tips and alligator clip

DUTEST® pro



TRITEST® pro



## Continuity and Line Tester

	DUTEST® pro
LED indication	3 x yellow, 2 x red
acoustic continuity test	loud test buzzer up to 100 Ω
visual continuity test	0 - 100 Ω/1 kΩ/10 kΩ (yellow LEDs)
voltage range	6 V - 400 V AC/DC (50 Hz/60 Hz)
single-pole external conductor test	•
polarity test	•
cable break detector	•
luminous LED torch	yes, adjustable to four levels
safety	IEC/EN 61010-1
measuring category	CAT III 300 V
batteries	3 x 1.5 V batteries of type AA (LR6)
scope of delivery	incl. set of measuring leads
item no.	050156

See page 36 for further accessories

## Phase Sequence Indicator

	TRITEST® pro
indication	4 x red, 1 x green LEDs
phase sequence indication	green/red LED for clockwise/counter-clockwise phase sequence
voltage range	400 V - 500 V AC
frequency range	50 Hz - 60 Hz
luminous LED torch	yes, single-level
safety	IEC/EN 61010-1, IEC/EN 61557-1, IEC/EN 61557-7
measuring category	CAT III 300 V
batteries	3 x 1.5 V batteries of type AA (LR6)
scope of delivery	incl. set of measuring leads/test probes, alligator clip
item no.	020052

*quick & easy testing*

## TRITEST® easy Phase and Phase Sequence Tester

- easy phase sequence testing in three-phase mains by means of green/red LED probe tip (clockwise/counter-clockwise)

## BENNING VT 2 Phase and Magnetic Field Tester **NEW!**

- very reliable phase testing on various shock-proof and CEE sockets
- testing of solenoid valves in pneumatic and hydraulic systems, heating systems, pumps as well as relays in vehicles, machines, devices and control systems (green LED probe tip)
- testing of permanent, AC-induced and DC-induced magnetic fields
- high sensitivity for 12 V voltage range can be activated via the push-button

## BENNING VT 1 Phase Tester

- quick and non-contact phase testing

### Common features of the non-contact phase tester

- non-contact testing, no contact to the electrical conductor required
- phase testing of sockets, distribution boxes, switches and lamps (by means of LED probe tip and buzzer)
- testing insulated lines (cable reel, chains of lights) of cable breaks
- the flashing frequency of the LED probe tip as well as the frequency of the acoustic signal increase with the voltage applied increasing as well
- capacitive measuring method requires no current flow
- battery compartment can be opened easily via robust screw cap
- impact and break-proof ABS housing with pen clip

TRITEST® easy



CAT IV 600 V

Phase sequence testing  
green = clockwise

VT 2



CAT IV 600 V

Testing a solenoid valve

VT 1



CAT IV 600 V

Phase test in junction boxes

## Non-contact Phase, Phase Sequence and Magnetic Field Tester

	TRITEST® easy	BENNING VT 2	BENNING VT 1
indication	green/red LED probe tip/buzzer		red LED probe tip/buzzer
voltage range	200 V - 1000 V AC	12 V - 1000 V AC	200 V - 1000 V AC
single-pole external conductor test	red LED probe tip flashing/buzzer		
phase sequence indication	• (right/left)	–	–
magnetic field test	–	•	–
cable break detector	•	•	•
measuring category	CAT IV 600 V, CAT III 1000 V		
batteries	2 x 1.5 V batteries of type AAA (LR03)		
scope of delivery	incl. batteries, pen clip		
dimensions	153 x 25 x 20 mm	153 x 25 x 20 mm	153 x 22 x 18 mm
weight	40 g	40 g	40 g
item no.	020051	044055	020054

See page 36 for further accessories



# Accessories for Testers

functional and indispensable

	Description	Product data	Item no.	DUSPOL®	PROFIPOL®+	SDT 1	DUTEST® pro	TRITEST® pro	TRITEST® easy	VT 2	VT 1
<b>Hard case / stand-by cases</b>											
	<b>Robust hard case</b> with foam insert, separate shelf and lid compartment for accessories and small parts. Safe transport protection for high-quality testing and measuring instruments.	Made of ABS material, dust and waterproof, dimensions 375 x 190 x 250 mm	10198412	•	•	•	•	•	•	•	•
	<b>Premium case DUSPOL®</b> Hard Case, dimensions: 330 x 105 x 65 mm High protection despite low weight	With handle, counter-rotating zipper (outside), padded mesh pocket with zipper, flexible fastening loops with Velcro.	010914	•	•						
	<b>Stand-by case DUSPOL®</b> dimensions: 330 x 100 x 60 mm	With belt loop on the back, made of hard-wearing nylon fabric	010911	•	•						
	<b>Stand-by case size S</b> dimensions: 220 x 110 x 50 mm	With belt loop on the back, made of hard-wearing nylon fabric	010912				•	•	•	•	•
<b>Test probe cap</b>											
 figure 1:1	<b>4 mm test probe cap (GS 38)</b> packaging unit = 10 test probe caps (sufficient for 5 voltage testers)	Rubberized test probe cap (GS 38) for reducing the test probe contact to a length of 4 mm	10184809	•	•						

## Digital Multimeter with safety and function without any compromises

*TRUE RMS measuring method to satisfy highest demands on accuracy*

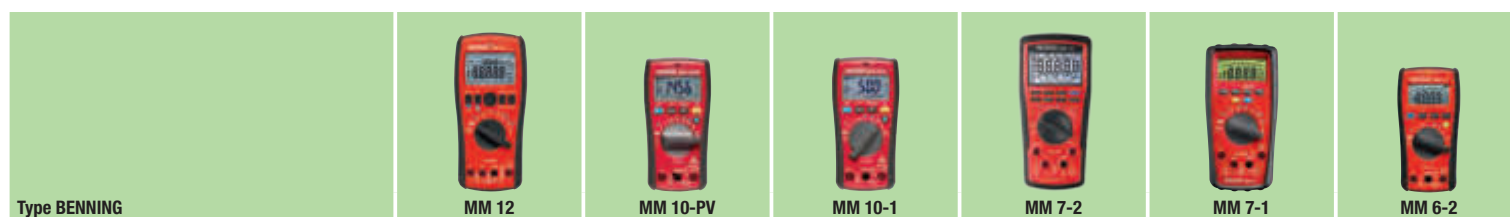
### For precise measurements in trade, service and industry:

- BENNING MM 12 with data logger, Bluetooth®, PC software and app
- BENNING MM 10-PV for photovoltaic systems and applications with 1500 V AC/2000 V DC
- BENNING MM 10-1 with microampere measuring range for HVAC
- BENNING MM 7-2, MM 6-2 maximum safety thanks to highest measuring category

### Digital Multimeter with proven quality and technology:

- BENNING MM 2/MM 3 precise current measuring ranges of 200  $\mu$ A up to 20 A
- BENNING MM P3 a variety of function in pocket size





Type BENNING

MM 12

MM 10-PV

MM 10-1

MM 7-2

MM 7-1

MM 6-2

### Display

indicating range	4 000 / 40 000	6 000	6 000	60 000	6 000	6 000
bar graph	•	•	•	•	•	•
backlight	•	•	•	•	•	•

### Measuring functions

basic accuracy	0.5 %	0.5 %	0.5 %	0.03 %	0.08 %	0.5 %
measuring method	TRUE RMS	TRUE RMS	TRUE RMS	TRUE RMS	TRUE RMS	TRUE RMS
AC voltage	10 $\mu$ V - 1000 V	100 $\mu$ V - 1000 V (1500 V via TA PV)	100 $\mu$ V - 1000 V	10 $\mu$ V - 1000 V	10 $\mu$ V - 1000 V	100 $\mu$ V - 1000 V
DC voltage	10 $\mu$ V - 1000 V	100 $\mu$ V - 1000 V (2000 V via TA PV)	100 $\mu$ V - 1000 V	10 $\mu$ V - 1000 V	10 $\mu$ V - 1000 V	100 $\mu$ V - 1000 V
AC current	10 $\mu$ A - 10 A	1 mA - 10 A	0.1 $\mu$ A - 400 mA	0.01 $\mu$ A - 10 A	10 $\mu$ A - 10 A	20 mA - 10 A
DC current	10 $\mu$ A - 10 A	1 mA - 10 A	0.1 $\mu$ A - 400 mA	0.01 $\mu$ A - 10 A	10 $\mu$ A - 10 A	1 mA - 10 A
resistance	0.1 $\Omega$ - 40 M $\Omega$	0.1 $\Omega$ - 40 M $\Omega$	0.1 $\Omega$ - 40 M $\Omega$	0.01 $\Omega$ - 60 M $\Omega$	0.1 $\Omega$ - 40 M $\Omega$	0.1 $\Omega$ - 40 M $\Omega$
frequency	0.1 Hz - 100 kHz	0.01 Hz - 100 kHz	0.01 Hz - 100 kHz	0.001 Hz - 1 MHz	0.01 Hz - 100 kHz	0.01 Hz - 100 kHz
capacity	0.01 nF - 40 mF	1 nF - 10 mF	1 nF - 10 mF	0.01 nF - 10 mF	1 nF - 10 mF	1 nF - 10 mF
temperature	-200 °C up to +1200 °C	-40 °C up to +400 °C	-40 °C up to +400 °C	-200 °C bis +1090 °C	-40 °C up to +400 °C	-
continuity/diode	• / •	• / •	• / •	• / •	• / •	• / •
indication (continuity)	buzzer	buzzer / red LED	buzzer / red LED	buzzer / LCD	buzzer / LCD	buzzer / red LED
volt sensor (single-pole external conductor test / cable break detector)	•	•	•	•	•	•

### Features

interface	Bluetooth®, USB	Bluetooth®	Bluetooth®	-	-	-
software	PC-SW, App (IOS, Android)	App (IOS, Android)	App (IOS, Android)	-	-	-
filter function	HFR filter (800 Hz)	HFR filter (800 Hz)	HFR filter (800 Hz)	HFR filter (1000 Hz)	-	-
measuring range switching	automatic / manual	automatic	automatic	automatic / manual	automatic	automatic/ manual
Auto Power Off	•	•	•	•	•	•
low battery indication	•	•	•	•	•	•
Data HOLD	•	•	•	•	•	•
MAX / MIN / AVG	• / • / •	• / • / -	• / • / -	• / • / •	• / • / -	- / - / -
PEAK	•	-	-	•	-	•
AutoV / LoZ	• / •	-	• / •	• / •	• / •	•
relative value function (REL)	•	•	•	•	-	•
level measurement (dB/dBm)	•	-	-	-	-	-
memory MEM	1 000 measuring values (A-SAVE, SAVE)	-	-	-	-	-
Data Log function	40 000 measuring values (interval: 1s - 600 s)	4 000 measuring values (interval: 1s - 600 s)	4 000 measuring values (interval: 1s - 600 s)	-	-	-
measuring category	CAT IV 600 V CAT III 1000 V	CAT IV 600 V CAT III 1000 V	CAT IV 600 V CAT III 1000 V	CAT IV 600 V CAT III 1000 V	CAT IV 600 V CAT III 1000 V	CAT IV 600 V CAT III 1000 V

### Scope of delivery

carrying case / batteries	• / •	• / •	• / •	• / •	• / •	• / •
fuse	•	•	•	•	•	•
measuring leads / TA PV	• / -	• / •	• / -	• / -	• / -	• / -
alligator clips	-	•	-	-	-	-
rubber holster with magnetic hanger	• / -	• / -	• / -	• / -	• / -	• / •
magnetic hanger	•	-	-	-	-	-
wire temperature sensor (K)	•	•	•	•	•	-
PC software / USB data cable	•	-	-	-	-	-
operating manual	•	•	•	•	•	•
calibration certificate	•	-	-	-	-	-

### Generally

dimensions	206 x 94 x 54	163 x 82 x 50	163 x 82 x 50	193 x 89 x 51	190 x 94 x 48	163 x 82 x 50
weight	640 g	425 g	425 g	420 g	460 g	410 g
item no.	044088	044089	044687	044690	044085	044087
catalogue page	44	27, 44	44	40 - 43	45	45





6 000	6 000	4 200	2 000	2 000	3 200	2 000	2 000	5 000
-	-	-	-	-	•	-	-	-
•	•	-	-	-	-	-	-	-

0.5 %	0.5 %	0.5 %	0.5 %	0.5 %	0.5 %	0.5 %	0.5 %	0.6 %
TRUE RMS	TRUE RMS	RMS	RMS	RMS	RMS	RMS	RMS	RMS
100 µV - 600 V	100 µV - 600 V	1 mV - 600 V	100 µV - 600 V	100 µV - 750 V	1 mV - 600 V	100 µV - 750 V	100 µV - 750 V	100 µV - 600 V
100 µV - 600 V	100 µV - 600 V	1 mV - 600 V	100 µV - 600 V	100 µV - 1000 V	100 µV - 600 V	100 µV - 1000 V	100 µV - 1000 V	100 µV - 600 V
20 mA - 10 A	-	0,1 A - 300 A	0.1 µA - 20 A	0.1 µA - 20 A	-	1 mA - 10 A	1 mA - 10 A	-
0.1 µA - 10 A	-	-	0.1 µA - 20 A	0.1 µA - 20 A	0.1 µA - 3.2 mA	1 mA - 10 A	1 mA - 10 A	-
0.1 Ω - 40 MΩ	0.1 Ω - 40 MΩ	0.1 Ω - 42 MΩ	0.1 Ω - 20 MΩ	0.1 Ω - 20 MΩ	0.1 Ω - 32 MΩ	0.1 Ω - 20 MΩ	0.1 Ω - 20 MΩ	0.1 Ω - 40 MΩ
0.01 Hz - 50 kHz	0.01 Hz - 50 kHz	-	1 Hz - 200 kHz	-	-	1 Hz - 20 MHz	1 Hz - 20 MHz	1 mHz - 5 MHz
0.01 nF - 1 mF	0.01 nF - 1 mF	-	1 pF - 200 µF	-	-	1 pF - 2 mF	1 pF - 2 mF	10 pF - 100 µF
-40 °C up to +400 °C	-	-	-	-	-	-20 °C up to +800 °C	-	-
•/•	•/•	•/•	•/•	•/•	•/•	•/•	•/•	•/•
buzzer / red LED	buzzer / red LED	-	-	-	-	buzzer / red LED	buzzer / red LED	-
•	•	-	-	-	-	•	•	-

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-	-	-	-	-	-	-	-	-
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automatic	automatic	automatic/ manual	manual	manual	automatic/ manual	automatic/ manual	automatic/ manual	automatic/ manual
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CAT IV 300 V CAT III 600 V	CAT IV 300 V CAT III 600 V	CAT III 300 V CAT II 600 V	CAT III 300 V CAT II 600 V	CAT III 600 V CAT II 1000 V	CAT III 600 V	CAT III 600 V CAT II 1000 V	CAT III 600 V CAT II 1000 V	CAT III 300 V CAT II 600 V

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150 x 77 x 44	150 x 77 x 44	225 x 77 x 35	192 x 95 x 50	192 x 95 x 50	165 x 80 x 36	156 x 74 x 44	156 x 74 x 44	132 x 86 x 19
310 g	310 g	230 g	550 g	550 g	310 g	320 g	320 g	130 g
044071	044070	044073	044029	044028	044027	044083	044082	044084
45	45	48	48	48	48	49	49	49

# BENNING

## MM 7-2

TRUE RMS Digital Multimeter

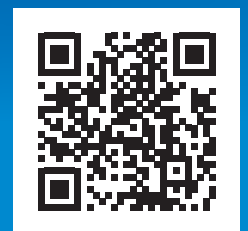
NEW!

### Top performance quality and safety

#### BENNING MM 7-2

#### TRUE RMS Digital Multimeter with AutoV, LoZ function and low-pass filter (HFR)

- ergonomic 2-component housing for increased grip and impact resistance
- TRUE RMS measuring method (AC and AC+DC) for measuring non-linear signals
- „AutoV“ function for automatic AC/DC switch-over and measuring range selection
- LoZ voltage measurement with low input impedance ( $> 2 \text{ k}\Omega$ ) to suppress reactive voltages
- quick continuity test with optical and acoustic indication ( $< 100 \mu\text{s}$ )
- jack control with warning (visual/acoustic) to protect against operating errors
- delivery including silicone measuring leads with 2 mm and 4 mm measuring probe (gold-plated) and carrying case



INFO

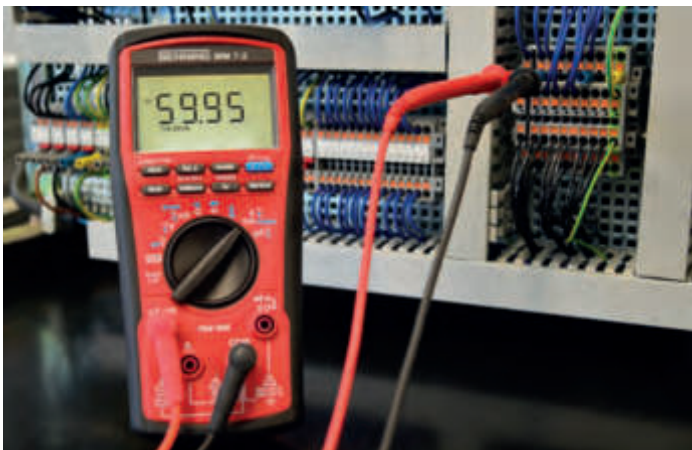
*integrated protective rubber holster for increased grip and impact resistance*



mains voltage measurement with AutoV and LoZ function



duty cycle measurement of the CP control signal of a wall box



measurement of the 4 mA to 20 mA current loop signal in process technology



scope of delivery

## BENNING MM 7-2

### TRUE RMS Digital Multimeter with AutoV, LoZ function and low-pass filter (HFR)

#### Application:

The new TRUE RMS digital multimeter in an ergonomic and rubber-coated 2K housing is suited for the most challenging measuring tasks in electrical trade, industry, service and HVAC technology.

#### • Electrical trade:

- LoZ voltage measurement with low input impedance ( $> 2 \text{ k}\Omega$ ) to suppress reactive voltages
- measurement of the CP control signal (duty cycle/amplitude) of EV charging stations (wall boxes) for electric vehicles (requires the BENNING EV 3-2 test adapter, item no. 044169 and adapter BNC - 4 mm jack, item no. 10231627)

#### • Industry:

- TRUE RMS voltage and frequency measurement for frequency converter drives and loads with superimposed harmonics
- measurement of the 4 mA to 20 mA current loop signal in process technology

#### • Service:

- AutoV function with automatic switching (AC/ DC) and measuring range selection for quick troubleshooting
- visual and acoustic continuity test with fast response time ( $< 100 \mu\text{s}$ ) for localising defective components, cable breaks and loose terminals

#### • HVAC technology:

- $\mu\text{A}$  measuring range for measurements on flame sensors (ionisation current) and measurement of the sacrificial anode current (mA) of hot water storage tanks
- measurement of temperature and exhaust gas temperature in heating, ventilation and air conditioning systems (HVAC)

#### Measuring functions:

- TRUE RMS voltage (1000 V) and current measurement (10 A, 20 A for 30 s)
- resistance ( $60 \text{ M}\Omega$ ), capacity (10 mF), frequency (1 MHz), duty cycle (%), 4 mA - 20 mA current loop (%), temperature measurement ( $^{\circ}\text{C}$ ,  $^{\circ}\text{F}$ )
- continuity, diode test and "Volsensor" function (non-contact and single-pole phase testing)

#### Features:

- backlit digital display with a resolution of 60,000 digits
- TRUE RMS measurement (AC and AC+DC)
- MIN/MAX/average and quick PEAK recording (250  $\mu\text{s}$ )
- quick continuity test ( $< 100 \mu\text{s}$ ) with optical and acoustic indication
- jack control (visual/acoustic) in the  $\mu\text{A}/\text{mA}$  and A ranges with warning in case of operating errors (fuse protection)
- display HOLD and Auto-HOLD when the measured value is stable
- scope of delivery:  
digital multimeter with integrated protective rubber holster, carrying case, high-quality silicone measuring leads with gold-plated 2 mm and 4 mm measuring probe (screw-on type), wire temperature sensor and batteries



# The new benchmark in measuring technology

outstanding quality, safety and price/performance ratio

**REL  $\Delta$**   
relative measurement for offset compensation

**VoltSense (Voltsensor)**  
non-contact and single-pole phase testing with 2 sensitivity levels

**AUTO-RANGE**  
automatic measuring range selection for increased ease of use

**HOLD/ A-HOLD**  
manual and automatic storage of the display value for convenient reading

**PEAK**  
quick memory of MAX/ MIN peak value (250  $\mu$ s) for current and voltage (APO disabled)

**Resistance/ continuity ( $\Omega$ ) /  $\infty$**   
max. resolution 0.01  $\Omega$  up to 60 M $\Omega$   
visual and acoustic signal with fast response time (< 100  $\mu$ s)

**Logic level Hz/ %**  
frequency and duty cycle measurement of logic signals

**mV DC, AC, AC+DC**  
0.01 V resolution (600 mV measuring range)

**V DC, AC+DC**  
0.03 % basic accuracy VDC (max.)

**V AC/ HFR**  
connectable low-pass filter for measurements on frequency converters and for measuring noisy signals

**AutoV**  
automatic AC+DC switch-over and measuring range selection

**LoZ function**  
low input impedance (> 2 k $\Omega$ ) to suppress reactive voltages

**Jack control (optical/ acoustic)**  
warning in case of incorrect measuring range selection to protect the fuses

**Silicone measuring leads with 2 mm and 4 mm measuring probe**  
highly flexible measuring lead with gold-plated measuring probe (reducing oxidation) for reliable contacting



original size

**Robust and ergonomic housing**  
with integrated protective rubber holster, rear stand and measuring lead holder

**APO (Auto Power OFF)**  
automatic switch-off ("APO") after 30 min. for extended battery lifetime (can be disabled)

**Large LC display with 60 000 digit**  
resolution and illumination, rate: 5/ s

**RANGE**  
Automatic and manual measuring range selection

**Analogue bar graph**  
for the detection of measuring trends, rate: 50 /s

**Function /  $\odot$**   
Funktionswahl und Displaybeleuchtung (APO 16 Min.)

**Hz**  
measurement of noisy mains frequencies

**MIN / MAX**  
memory of MIN/ MAX/ AVG measurement value (APO disabled)

**4 mA - 20 mA DC current loop measurement (%)**  
for process signals

**mA/ A DC, AC, AC+DC**  
for precise current measurement (TRUE RMS)

**$\mu$ A DC, AC, AC+DC**  
measurement of low currents, e.g. ionisation current of a gas heating system (HVAC technology)

**Temperature**  
via K type sensor in  $^{\circ}$ C and  $^{\circ}$ F

**Capacity/ diode**  
measurement of capacitors up to 10 mF, visual and acoustic diode testing

**Safety**  
EN 61010-1, EN 61010-2-033

**CAT IV 600 V/ CAT III 1000 V**  
transient protection up to 8 kV (1.2/50  $\mu$ s)

**TRUE RMS AC, AC+DC**  
TRUE RMS measuring method for non-sinusoidal signals

**1 kV HBC fuses with high breaking capacity**  
20 kA@1000 V, F 11 A  
30 kA@1000 V, F 0.4 A



## technical data

BENNING MM 7-2		
DC voltage	range	600.00 mV, 6.0000 V, 60.000 V, 600.00 V, 1000.0 V
	max. accuracy	± (0.03 % + 2 digit)
	max. resolution	0.01 mV
AC, AC+DC voltage	range	600.00 mV, 6.0000 V, 60.000 V, 600.00 V, 1000.0 V
	max. accuracy	± (0.5 % + 30 digit) @ 50 Hz ~ 60 Hz
	max. resolution	0.01 mV
DC current	range	600.00 µA, 6000.0 µA, 60.000 mA, 600.00 mA, 6.000 A, 10.000 A
	max. accuracy	± (0.075 % + 20 digit)
	max. resolution	0.01 µA
AC, AC+DC current	range	600.00 µA, 6000.0 µA, 60.000 mA, 600.00 mA, 6.000 A, 10.000 A
	max. accuracy	± (0.9 % + 20 digit) @ 40 Hz ~ 3 kHz
	max. resolution	0.01 µA
resistance	range	600.00 Ω, 6.000 kΩ, 60.000 kΩ, 600.00 kΩ, 6.0000 MΩ, 60.000 MΩ
	max. accuracy	± (0.085 % + 4 digit)
	max. resolution	0.01 Ω
capacity	range	10.00 nF, 100.0 nF, 1000 nF, 10.00 µF, 1.000 mF, 10.00 mF
	max. accuracy	± (1 % + 2 digit)
	max. resolution	0.01 nF
frequency (mains level)	range	10.000 Hz ~ max. 50.00 kHz (U/V), 10.000 Hz ~ max. 5.0000 kHz (I/A)
	max. accuracy	± (0.05 % + 5 digit)
	max. resolution	0.001 Hz
frequency (logic level)	range	5.000 Hz ~ 1.0000 MHz (U/V)
	max. accuracy	± (0.002 % + 4 digit)
	max. resolution	0.001 Hz
duty cycle	range	0.10 % - 99.99 %
	max. accuracy	± (3 digit per kHz + 2 digit)
	max. resolution	0.01 %
temperature	range	- 200 °C ~ 1090 °C, - 328,0 °F ~ 1994 °F
	max. accuracy	± (1.0 % + 1.0 °C), ± (1.0 % + 1.8 °F)
	max. resolution	0.1 °C, 0.1 °F
4 mA - 20 mA DC current loop	range	0 % (4 mA) ~ 100 % (20 mA)
continuity test	range	< 100 Ω ~ 400 Ω (optical and acoustic indication), response time < 100 µs
diode test	range	3.0000 V (optical and acoustic indication)
VoltSensor (voltage indicator)	non-contact	approx. 230 V, electric field measurement, 2 sensitivity levels
	via measuring lead	approx. 230 V, single-pole measurement via measuring lead, 2 sensitivity levels
indication	digital	5 digit, 60,000 digits, max. measuring rate 5/ s
	analogue bar graph	30 segments, measuring rate 50/ s
diagnosis and data HOLD functions	MIN/ MAX/ AVG	minimum, maximum and average value memory
	PEAK/ REL Δ	peak value memory (MIN/MAX), (250 µs)/ relative value measurement ~
	HOLD/ A-HOLD	measuring value memory, manual/automatic memory
measuring method	TRUE RMS	TRUE RMS measuring method AC, AC +DC
low-pass filter	HFR	high-frequency suppression of interfering signals
jack control	µA/ mA, A input	visual and acoustic alert in case of incorrect measuring range selection
safety		EN 61010-1, EN 61010-2-033, EN 61010-031
measuring category		CAT IV 600 V, CAT III 1000 V
power supply		3 x 1.5 V micro batteries (AAA/ IEC LR03), 150 h without illumination
dimensions/weight		193 x 89 x 51 mm/ 420 g
Item no.		044690

Measuring range indications refer to ranges from highest resolution to the final measuring range value.

# TRUE RMS Digital Multimeter

with data logger, Bluetooth® and free app

## BENNING MM 12

### TRUE RMS Logging Multimeter for professional use

- large digital display with secondary display and bargraph indication
- AUTO SAVE function, storage without key operation
- TRUE RMS measuring method (AC, AC+DC)
- optical PC interface with USB cable
- including PC software, alligator clips and calibration certificate

## BENNING MM 10-PV

### For photovoltaic systems and for applications with high voltages

- safe voltage measurement up to 1500 V AC/ 2000 V DC via measuring adapter TA PV
- universally applicable with 10 A current measuring range
- continuity test and single-pole phase test via buzzer and red LED

## BENNING MM 10-1

### For HVAC and for service use in harsh environments

- microampere measuring range for testing flame sensors and sacrificial anodes of heating systems/water storage tanks
- continuity test and single-pole phase test via buzzer and red LED

### Common features BENNING MM 12, MM 10-PV, MM 10-1

- data logger, memory function and Bluetooth® Low Energy 4.0 interface
- app "BENNING MM-CM Link" for download, storage and sharing measured values via smartphone/ tablet
- low-pass filter (HFR) for measurements at pulsed motor drives
- "AutoV" and "LoZ" function for automatic AC/DC voltage and to suppress reactive voltages (MM 12/MM 10-1)
- Volt sensor for non-contact signalling of phase voltages and cable breaks in lines via red LED (MM 10-PV/MM 10-1)
- delivery including case, rubber holster, wire temperature sensor, batteries, measuring leads. MM 10-PV additional with measuring adapter TA PV and alligator clips



## TRUE RMS Digital Multimeter

	BENNING MM 12	BENNING MM 10-PV	BENNING MM 10-1
indicating range	40000 (illuminated) with bar graph	6000 (illuminated) with bar graph	6000 (illuminated) with bar graph
basic accuracy	0.5 %	0,5 %	0.5 %
AC voltage	10 µV - 1000 V	0.1 mV - 1000 V (1500 V via TA PV)	0.1 mV - 1000 V
DC voltage	10 µV - 1000 V	0.1 mV - 1000 V (2000 V via TA PV)	0.1 mV - 1000 V
AC current	10 µA - 10 A	1 mA - 10 A	0.1 µA - 400 mA
DC current	10 µA - 10 A	1 mA - 10 A	0.1 µA - 400 mA
resistance	0.1 Ω - 40 MΩ	0.01 Ω - 40 MΩ	0.01 Ω - 40 MΩ
continuity/diode	• / •	• / •	• / •
frequency	0.1 Hz - 100 kHz	0.01 Hz - 100 kHz	0.01 Hz - 100 kHz
capacity	0.01 nF - 40 mF	1 nF - 10 mF	1 nF - 10 mF
temperature	-200 °C up to 1200 °C	-40 °C up to 400 °C	-40 °C up to 400 °C
volt sensor	-	•	•
interface	Bluetooth®, USB	Bluetooth®	Bluetooth®
software	PC software, app (IOS, Android)	app (IOS, Android)	app (IOS, Android)
filter function	HFR filter (800 Hz)	HFR filter (800 Hz)	HFR filter (800 Hz)
memory	1000 measuring values, HOLD, PEAK, MAX/MIN	HOLD, MAX/MIN, REL, SAVE	HOLD, MAX/MIN, REL, SAVE
data log function	40000 measuring values (interval: 1 s - 600 s)	4000 measuring values (interval: 1 s - 60 s)	4000 measuring values (interval: 1 s - 60 s)
measuring method	TRUE RMS	TRUE RMS	TRUE RMS
measuring category	CAT IV 600 V	CAT IV 600 V	CAT IV 600 V
item no.	044088	044089	044687

### BENNING MM 7-1 For industrial applications

- highest measuring category CAT IV 600 V for highest safety
- “AutoV” function for automatic AC/DC voltage detection and low input impedance (LoZ) to suppress reactive voltages
- the integrated Volt sensor signals non-contact phase voltages and cable breaks in cables (buzzer/LCD)
- LC display with bar graph indication and illumination
- delivery including rubber holster, case, battery, measuring leads and wire temperature sensor

### BENNING MM 6-2 With highest safety

- highest measuring category CAT IV 600 V for highest safety
- “AutoV” function with low input impedance (LoZ) to suppress reactive voltages
- rubber holster with integrated magnetic hanger
- Volt sensor for non-contact signaling of phase voltages and cable breaks in lines (buzzer/red LED)
- continuity test by means of red LED and buzzer
- LC display with bar graph indication and illumination
- delivery including rubber holster with magnetic hanger, case, batteries and measuring leads

### BENNING MM 5-2, MM 5-1 Compact, precise and innovative

- compact dimensions: 140 x 70 x 33 mm (without holster)
- rubber holster with integrated magnetic hanger
- Volt sensor for non-contact cable break detection (LCD/red LED)
- continuity test by means of red LED and buzzer
- measuring input for AC/DC current, microampere DC and temperature (MM 5-2)
- LC display with illumination (MM 5-2)
- delivery including rubber holster with magnetic hanger, case, batteries, measuring leads as well as wire temperature sensor (MM 5-2)



## TRUE RMS Digital Multimeter

	BENNING MM 7-1	BENNING MM 6-2	BENNING MM 5-2	BENNING MM 5-1
indicating range	6000 (illuminated) with bar graph	6000 (illuminated) with bar graph	6000 (illuminated)	6000 (illuminated)
basic accuracy	0.08 %	0.5 %	0.5 %	0.5 %
AC voltage	10 µV - 1000 V	100 µV - 1000 V	100 µV - 600 V	100 µV - 600 V
DC voltage	10 µV - 1000 V	100 µV - 1000 V	100 µV - 600 V	100 µV - 600 V
AC current	10 µA - 10 A	20 mA - 10 A	20 mA - 10 A	–
DC current	10 µA - 10 A	1 mA - 10 A	0.1 µA - 10 A	–
resistance	0.1 Ω - 40 MΩ	0.1 Ω - 40 MΩ	0.1 Ω - 40 MΩ	0.1 Ω - 40 MΩ
continuity/diode	• / •	• / •	• / •	• / •
frequency	0.01 Hz - 100 kHz	0.01 Hz - 100 kHz	0.01 Hz - 50 kHz	0.01 Hz - 50 kHz
capacity	1 nF - 10 mF	1 nF - 10 mF	0.01 nF - 1 mF	0.01 nF - 1 mF
temperature	-40 °C up to +400 °C	–	-40 °C up to +400 °C	–
volt sensor	•	•	•	•
interface	–	–	–	–
software	–	–	–	–
filter function	–	–	–	–
memory	HOLD, MAX/MIN, PEAK	HOLD, PEAK, REL	HOLD, PEAK	HOLD, PEAK
Data Log function	–	–	–	–
measuring method	TRUE RMS	TRUE RMS	TRUE RMS	TRUE RMS
measuring category	CAT IV 600 V	CAT IV 600 V	CAT III 600 V	CAT III 600 V
item no.	044085	044087	044071	044070

See page 50 for further accessories

Measuring range indications refer to ranges from highest resolution to the final measuring range value



**BENNING**

# MM 2-1, MM 2-2, MM 2-3

TRUE RMS Digital Multimeter Series

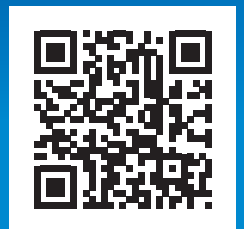
**NEW!**



## The **new entry-level class** of professional measuring equipment

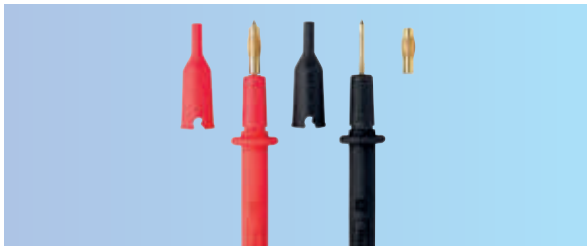
### TRUE RMS digital multimeter series with an excellent price/performance ratio

- TRUE RMS measuring method for measuring non-linear signals
- robust protective rubber holster for increased grip and impact resistance
- ergonomic housing with large display and illumination
- MIN/MAX/AVG recording, HOLD storage
- jack control with warning (visual/acoustic) to protect against operating errors (fuseprotection)
- delivery including silicone high-quality measuring leads with 2 mm and 4 mm measuring probe (gold-plated) and carrying case



INFO

*robust integrated protective rubber holster for increased grip and impact resistance*



silicone measuring leads with gold-plated measuring probe (2 mm fixed and 4 mm screw-on type)



scope of delivery BENNING MM 2-3

## BENNING MM 2-1, MM 2-2, MM 2-3

### Measuring functions:

- TRUE RMS voltage measurement (1000 V AC/DC) with max accuracy of 0.2 %
- resistance (60 M $\Omega$ ) and frequency measurement (50 kHz)
- continuity and diode test (visual/ acoustic)
- “Vultsensor” function for non-contact and single-pole phase testing

### Additionally for MM 2-2, MM 2-3:

- TRUE RMS current measurement (10 A AC/ DC) protected by a 1 kV HBC fuse
- capacity measurement (10 mF)

### Additionally for MM 2-3:

- temperature measurement (-40 °C up to +400 °C) incl. temperature sensor

### Features:

- backlit digital display with a resolution of 6,000 digits
- precise TRUE RMS measurement
- MIN/MAX/average and relative value measurement (REL)
- quick continuity test (< 15 ms) with visual and acoustic indication
- jack control (visual/acoustic) in the A ranges with warning in case of operating errors (fuse protection)
- display HOLD (storage of the current measured value)
- automatic and manual measuring range selection (RANGE)
- all ranges with overload protection up to 1000 V
- compact and ergonomic housing for one-hand operation
- scope of delivery:
  - digital multimeter with robust protective rubber holster,
  - high-quality silicone measuring leads with gold-plated 2 mm and 4 mm measuring probe
  - wire temperature sensor (MM 2-3), carrying case and batteries

ranges / functions	MM 2-1	MM 2-2	MM 2-3
voltage AC/DC	60.00 mV, 600.0 mV, 6.000 V, 60.00 V, 600.0 V, 1000 V		
current AC/DC	–	6.000 A, 10.00 A (by means of a 1 kV high breaking capacity fuse)	
resistance	600.0 $\Omega$ , 6.000 k $\Omega$ , 60.00 k $\Omega$ , 600.0 k $\Omega$ , 6.000 M $\Omega$ , 60.00 M $\Omega$		
frequency	10.00 Hz - max. 50.00 kHz (voltage), 50.00 Hz – 1.00 kHz (current)		
capacity	–	20.00 nF, 200.0 nF, 2000 nF, 20.00 $\mu$ F, 200.0 $\mu$ F, 2000 $\mu$ F, 10.00 mF	
temperature	–	–	-40 °C ~ +400 °C
continuity test	< 30 $\Omega$ - 480 $\Omega$ (visual and acoustic indication), response time < 15 ms		
diode test	3,000 V (visual and acoustic indication)		
VoltSensor	non-contact phase testing (electric field measurement), 2 sensitivity levels single-pole phase testing via measuring lead, 2 sensitivity levels		
indication	3 5/6 digit, 60,000 digits, max. measuring rate 5/s, illuminated		
diagnosis and data HOLD functions	MIN/MAX/AVG: minimum, maximum and average value memory REL $\Delta$ : relative value measurement HOLD: manual memory		
measuring method	TRUE RMS measuring method		
jack control (A input)	visual and acoustic alert in case of incorrect measuring range selection (fuse protection)		
safety	EN 61010-1, EN 61010-2-033, EN 61010-031		
measuring category	CAT IV 300 V, CAT III 600 V, CAT II 1000 V		
power supply	2 x 1.5 V micro batteries (AAA/ IEC LR03), battery life approx. 190 h without background lighting		
dimensions/weight	161 x 80 x 50 mm/ 334 g		
item no.	044691	044692	044693

Measuring range indications refer to ranges from highest resolution to the final measuring range value.

## BENNING MM 4

### With current clamp adapter

- basic measuring for AC current, voltage, resistance, continuity and diode test
- automatic and manual measuring range selection
- safe current measurement up to 300 A AC via attachable current clamp adapter (max. clamp opening 30 mm)
- delivery including case, batteries, measuring accessories (consisting of measuring lead, measuring probes, alligator clips (item no. 044119))

## BENNING MM 3, MM 2 and MM 1

### Quality that convinces

- basic measuring for current, voltage, resistance, capacity, frequency, continuity and diode test
- precise current measuring ranges (200  $\mu$ A and 2/20/200 mA) for ionization current measurement at the gas burner and for testing the sacrificial anode in the hot water tank (HVAC technicians) (MM 2/MM 3)
- automatic and/or manual measuring range selection
- delivery including rubber holster, case, battery/batteries and measuring leads



## Digital Multimeter

	BENNING MM 4	BENNING MM 3	BENNING MM 2	BENNING MM 1
indicating range	4200	2000	2000	3200 with bar graph
basic accuracy	0.5 %	0.5 %	0.5 %	0.5 %
AC voltage	1 mV - 600 V	100 $\mu$ V - 600 V	100 $\mu$ V - 750 V	1 mV - 600 V
DC voltage	1 mV - 600 V	100 $\mu$ V - 600 V	100 $\mu$ V - 1000 V	100 $\mu$ V - 600 V
AC current	0.1 A - 300 A	0.1 $\mu$ A - 20 A	0.1 $\mu$ A - 20 A	-
DC current	-	0.1 $\mu$ A - 20 A	0.1 $\mu$ A - 20 A	0.1 $\mu$ A - 3.2 mA
resistance	0.1 $\Omega$ - 42 M $\Omega$	0.1 $\Omega$ - 20 M $\Omega$	0.1 $\Omega$ - 20 M $\Omega$	0.1 $\Omega$ - 32 M $\Omega$
continuity/diode	• / •	• / •	• / •	• / •
frequency	-	1 Hz - 200 kHz	-	-
capacity	-	1 pF - 200 $\mu$ F	-	-
temperature	-	-	-	-
volt sensor	-	-	-	-
interface	-	-	-	-
software	-	-	-	-
filter function	-	-	-	-
memory	HOLD	-	-	HOLD
Data Log function	-	-	-	-
measuring method	RMS	RMS	RMS	RMS
measuring category	CAT III 300 V	CAT III 300 V	CAT III 600 V	CAT III 600 V
item no.	044073	044029	044028	044027

See page 50 for further accessories

Measuring range indications refer to ranges from highest resolution to the final measuring range value

*reliable and precise in each and every situation*

## BENNING MM 1-3, MM 1-2 and MM 1-1

### With volt sensor function

- extremely compact housing type
- the integrated Volt sensor signals phase voltages by means of an acoustic signal and a red LED signal
- localizes cable breaks and defective lamps in exposed cables (cable reel, light chains) via the feeding side of the phase
- delivery including case, batteries, measuring leads and wire temperature sensor (MM 1-3)

## BENNING MM P3

### Pocket-size

- even smaller and narrower with lower weight (130 g)
- minimum dimensions: 132 x 86 x 19 mm
- for all-purpose use with leather case, firmly connected attached measuring leads and batteries



## Digital Multimeter

	BENNING MM 1-3	BENNING MM 1-2	BENNING MM 1-1	BENNING MM P3
indicating range	2000	2000	2000	5000
basic accuracy	0.5 %	0.5 %	0.5 %	0.6 %
AC voltage	100 $\mu$ V - 750 V	100 $\mu$ V - 750 V	100 $\mu$ V - 750 V	100 $\mu$ V - 600 V
DC voltage	100 $\mu$ V - 1000 V	100 $\mu$ V - 1000 V	100 $\mu$ V - 1000 V	100 $\mu$ V - 600 V
AC current	1 mA - 10 A	1 mA - 10 A	–	–
DC current	1 mA - 10 A	1 mA - 10 A	–	–
resistance	0.1 $\Omega$ - 20 M $\Omega$	0.1 $\Omega$ - 20 M $\Omega$	0.1 $\Omega$ - 20 M $\Omega$	0.1 $\Omega$ - 40 M $\Omega$
continuity/diode	• / •	• / •	• / •	• / •
frequency	1 Hz - 20 MHz	1 Hz - 20 MHz	–	1 mHz - 5 MHz
capacity	1 pF - 2 mF	1 pF - 2 mF	–	10 pF - 100 $\mu$ F
temperature	-20 °C up to +800 °C	–	–	–
volt sensor	•	•	•	–
interface	–	–	–	–
software	–	–	–	–
filter function	–	–	–	–
memory	HOLD, MAX/MIN	HOLD, MAX/MIN	HOLD	HOLD
Data Log function	–	–	–	–
measuring method	RMS	RMS	RMS	RMS
measuring category	CAT III 600 V	CAT III 600 V	CAT III 600 V	CAT III 300 V
item no.	044083	044082	044081	044084

See page 50 for further accessories

Measuring range indications refer to ranges from highest resolution to the final measuring range value






# Accessories for Digital Multimeter

safe – functional – indispensable

Description	Product data	Item no.	MM 12	MM 10-PV	MM 10-1	MM 7-2	MM 7-1	MM 6-2	MM 5-2	MM 5-1	MM 4	MM 3	MM 2	MM 1	MM 1-3	MM 1-2	MM 1-1	MM P3








## Current Clamp Adapters

 <b>BENNING CFlex 1</b> AC current transformer	basic accuracy: 3 % current: 0.3 A - 3000 A AC output: 100 mV/10 mV/1 mV AC per 1 A AC	044068	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•
 <b>BENNING CC 3</b> AC/DC current clamp adapter	basic accuracy: 1 % - 2 % current: 0.2 A - 300 A AC/DC output: 1 mV/10 mV AC/DC per 1 A AC/DC	044038	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•
 <b>BENNING CC 1</b> AC current clamp adapter	basic accuracy: 1.9 % current: 1 A - 400 A AC output: 1 mV AC per 1 A AC	044037	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•







## Hard case / stand-by cases

 <b>Robust hard case</b> with foam insert, separate shelf and lid compartment for accessories and small parts. Safe transport protection for high-quality testing and measuring instruments.	Made of ABS material, dust and waterproof, dimensions 375 x 190 x 250 mm	10198412	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•
 <b>Stand-by case size S</b> dimensions: 220 x 110 x 50 mm	with belt loop on the back, made of hard-wearing nylon fabric	010912	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•
 <b>Stand-by case size M</b> dimensions: 240 x 180 x 70 mm	made of hard-wearing nylon fabric	010913	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•

## Measuring accessories

 <b>BENNING TA 1</b> alligator clips, two pieces	Ø 4 mm plug-in technology, red/black, professional equipment, CAT III 1000 V	044124	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•
 <b>BENNING TA 2</b> set of measuring leads, six pieces	Ø 4 mm plug-in technology, red/black, professional equipment, consisting of: measuring leads (silicone) CAT III 1000 V, test probes (Ø 4 mm measuring tip) CAT II 1000 V, alligator clips CAT III 1000 V	044125	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•
 <b>BENNING TA 3</b> set of measuring leads, eight pieces	Ø 4 mm plug-in technology, red/black, professional equipment, CAT III 1000 V, consisting of: measuring leads (silicone), test probes (slender measuring tip), claw clamps, alligator clips	044126	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•
 <b>BENNING TA 4</b> magnetic holder, three pieces	For attachment of multimeters to switching cabinets, machine and system parts. Consisting of: magnetic holder, adapter and belt	044120	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•
 <b>Ø 4 mm safety measuring leads with 2 mm measuring tip</b> , two pieces	Red/black, L = 1.40 m, with Ø 2 mm measuring tip (L = 18 mm), CAT IV 600 V/CAT III 1000 V (with protective caps), CAT II 1000 V (without protective caps)	044146	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•
 <b>Ø 4 mm safety measuring leads with 4 mm measuring tip</b> , two pieces	Red/black, L = 1.40 m, with Ø 4 mm measuring tip (L = 18 mm), CAT IV 600 V/CAT III 1000 V (with protective caps), CAT II 1000 V (without protective caps)	044145	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•
 <b>Temperature probe, type K, insertion probe</b> (V4A steel tube)	For flexible substances, liquids, gases and air. Measuring range: - 196 °C up to + 800 °C	044121	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•

## Ceramic fuse

 <b>440 mA fuses</b> packaging unit 10 pieces	fast-acting, breaking capacity 10 kA, rated voltage 1000 V, dimensions 10 x 35 mm	10016655	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•
 <b>1 A fuses</b> packaging unit 10 pieces	fast-acting, rated current 1 A, rated voltage 500 V, dimensions 6.3 x 32 mm	749669	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•
 <b>10 A fuses</b> packaging unit 10 pieces	fast-acting, rated current 10 A, breaking capacity 50 kA, rated voltage 600 V, dimensions 10 x 38 mm	748263	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•
 <b>11 A fuses</b> packaging unit 10 pieces	fast-acting, rated current 11 A, breaking capacity 20 kA, rated voltage 1000 V, dimensions 10 x 38 mm	10218772	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•
 <b>15 A fuses</b> packaging unit 10 pieces	fast-acting, rated current 15 A, breaking capacity 50 kA, rated voltage 600 V, dimensions 10.3 x 38.1 mm	10149447	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•
 <b>16 A fuses</b> packaging unit 10 pieces	fast-acting, rated current 16 A, rated voltage 500 V, dimensions 6.3 x 32 mm	749770	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•

## Digital Current Clamp Multimeter for AC/DC current

*TRUE RMS measuring method to satisfy highest demands on accuracy*

### For precise measurements in trade, service and industry:

- BENNING CM 12 power current clamp multimeter with data logger, Bluetooth® and app
- BENNING CM 10-PV for photovoltaic systems and applications with 1500 V AC/ 2000 V DC
- BENNING CM E1 earth measuring clamp for earth loop resistance and leakage current measurement
- BENNING CM 1-4 multifunctional current clamp with digital and LED display
- BENNING CM 2-1 universally applicable for various applications

### Particularly for troubleshooting in electrical installations and devices:

- BENNING CM 11 for process signals, automotive engineering and intrusion alarm systems
- BENNING CM 9 series for measurement of leakage currents and differential currents



# Digital Current Clamp Meters

## technical data



Type BENNING

CM 12

CM 10-PV

CM 10-1

CM E1

CM 7

CM 5-1

CM 11

CM 9-1

### Display

indicating range	9 999	6 000	6 000	9 999	4 000	9 999	6 000	6 000
LCD / LED / bar graph	• / - / •	• / - / -	• / - / -	• / - / -	• / - / •	• / - / -	• / - / -	• / - / -
backlight / measuring point illumination	• / -	• / •	• / •	- / -	• / -	• / -	• / -	• / -

### Measuring functions

basic accuracy	1 %	1 %	1 %	1.5 %	0.7 %	0.9 %	1 %	1 %
measuring method	TRUE RMS	TRUE RMS	TRUE RMS	TRUE RMS	TRUE RMS	TRUE RMS	TRUE RMS	TRUE RMS
AC voltage	10 mV - 1000 V	100 mV - 1000 V (1500 V via TA PV)	100 mV - 1000 V	-	100 mV - 750 V	1.3 V - 750 V	10 mV - 600 V	10 mV - 600 V
DC voltage	10 mV - 1000 V	100 µV - 1000 V (2000 V via TA PV)	100 mV - 1000 V	-	100 mV - 1000 V	0.7 V - 1000 V	10 mV - 600 V	10 mV - 600 V
AC current	10 mA - 600 A	0.1 µA - 4000 µA 10 mA - 600 A	10 mA - 1500 A	0.3 mA - 35 A	100 mA - 1000 A	0.9 A - 600 A	100 µA - 20 A	1 µA - 60 A
DC current	10 mA - 600 A	0.1 µA - 4000 µA 10 mA - 600 A	10 mA - 1500 A	-	100 mA - 1000 A	0.9 A - 600 A	100 µA - 10 A	-
current AC + DC	•	•	•	-	•	•	•	-
fault current (leakage)	-	• (0.1 µA)	-	• (0.3 mA)	-	-	• (0.1 mA)	• (1 µA)
resistance	0.1 Ω - 100 kΩ	0.1 Ω - 600 kΩ	0.1 Ω - 600 kΩ	RE lus: 0.025 Ω - 1500 Ω	0.1 Ω - 400 Ω	1 Ω - 10 kΩ	0.1 Ω - 600 kΩ	0.1 Ω - 600 kΩ
frequency / capacity	• / •	• / •	• / •	- / -	• / -	- / -	- / -	- / -
effective power / (cos Φ)	1 W - 600 kW / •	- / -	- / -	- / -	- / -	- / -	- / -	- / -
inrush current / THD	• / •	• / -	• / -	- / -	- / -	- / -	- / -	- / -
stand-by current / process signals	- / -	- / -	- / -	- / -	- / -	- / -	• / •	- / -
temperature	-	-40 °C up to 400 °C	-	-	-	-	-	-
continuity (buzzer) / diode	• / •	• / •	• / •	- / -	• / -	• / •	• / -	• / -
phase-sequence test	•	-	-	-	-	-	-	-
external conductor / polarity test	- / -	- / -	- / -	- / -	- / -	- / -	- / -	- / -
volt sensor	•	•	•	-	-	-	-	-











### Features

interface / software	Bluetooth® / App	Bluetooth® / App	Bluetooth® / App	- / -	- / -	- / -	- / -	- / -
filter function	HFR (1000 Hz)	HFR (800 Hz)	HFR (800 Hz)	-	-	-	-	HFR (1 kHz), LPF (40 Hz - 70 Hz)
measuring range switching	automatic/ manual	automatic	automatic	automatic	automatic	automatic	automatic/ manual	automatic
Auto Power Off	•	•	•	•	•	•	•	•
low battery indication	•	•	•	•	•	•	•	•
Data HOLD / MAX / MIN / AVG	• / • / • / •	• / • / • / -	• / • / • / -	• / - / - / -	• / • / • / -	• / - / - / -	• / • / • / -	- / - / - / -
PEAK / REL	• / -	- / -	- / -	- / -	• / -	- / -	- / -	• / -
null balance ZERO (A DC)	-	•	•	-	•	•	•	•
measuring input for CFlex 1	•	•	•	-	-	-	-	-
AutoV / LoZ	- / -	- / -	• / •	- / -	- / -	- / •	- / -	- / -
memory MEM	1 000 measuring values (A-SAVE)	-	-	-	-	-	-	-
Data Log function	9 999 measuring values (interval: 1s - 600 s)	4 000 measuring values (interval: 1s - 60 s)	4 000 measuring values (interval: 1s - 60 s)	116 measuring values (interval: 1s - 255s)	-	-	-	-
clamp opening	33 mm	37 mm	42 mm	38 mm	53 mm	35 mm	23 mm	23 mm
measuring category	CAT IV 600 V CAT III 1000 V	CAT IV 600 V CAT III 1000 V	CAT IV 600 V CAT III 1000 V	CAT III 300 V	CAT IV 600 V CAT III 1000 V	CAT IV 600 V CAT III 1000 V	CAT IV 300 V CAT III 600 V	CAT IV 300 V CAT III 600 V

### Generally

dimensions	243 x 103 x 55	240 x 86 x 48	254 x 86 x 48	276 x 100 x 47	275 x 105 x 51	215 x 85 x 51	206 x 76 x 34	210 x 76 x 34
weight	540 g	445 g	490 g	750 g	534 g	360 g	262 g	296 g
special features	power current clamp for power analysis in single-phase, three-phase and DC mains	microampere/ temperature measuring range for HVAC, non-slip/ break-proof SoftGrip housing	large current measurement range up to 1500 A AC/DC, non-slip/ break-proof SoftGrip housing	earth measuring clamp for earth loop resistance/ leakage, load current measurement	large clamp opening for clamping large conductor cross-sections/busbars	autotest, non-slip/ break-proof SoftGrip housing	ideal for troubleshooting, fire and intrusion alarm systems	leakage current clamp with multimeter functions
item no.	044680	044683	044688	044684	044059	044066	044067	044682
catalogue page	54	27, 54	54	55	55	55	56	56

Measuring range indications refer to ranges from highest resolution to the final measuring range value

		<b>NEW!</b> 							
6 000	9 999	4 000	4 000	4 200	4 200	2 000	2 000	2 000	6 000
• / - / -	• / • / -	• / - / -	• / - / -	• / - / -	• / - / -	• / - / -	• / - / -	• / - / -	• / - / -
• / •	• / •	• / -	- / -	• / -	• / -	- / -	- / -	- / -	• / -
1 % TRUE RMS	1 % TRUE RMS	0.5 % TRUE RMS	0.5 % TRUE RMS	2 % TRUE RMS	2 % TRUE RMS	1 % RMS	1 % RMS	2 % RMS	3 % TRUE RMS
-	6 V - 1000 V	100 µV - 600 V	1 mV - 600 V	-	-	100 mV - 750 V	100 mV - 600 V	-	-
-	6 V - 1000 V	100 µV - 600 V	100 µV - 600 V	-	-	100 mV - 1000 V	100 mV - 600 V	-	-
1 µA - 60 A	100 mA - 200 A	10 mA - 400 A	100 mA - 300 A	10 mA - 400 A	10 mA - 400 A	100 mA - 200 A	100 mA - 400 A	10 mA - 400 A	100 mA - 3000 A
-	-	10 mA - 400 A	10 mA - 300 A	10 mA - 400 A	-	-	-	-	-
-	-	•	•	•	-	-	-	-	-
• (1 µA)	-	-	-	-	-	-	-	-	-
-	1 Ω - 50 kΩ	0.1 Ω - 40 MΩ	0.1 Ω - 40 MΩ	-	-	0.1 Ω - 20 MΩ	0.1 Ω - 20 MΩ	-	-
- / -	- / -	• / •	- / -	- / -	- / -	- / -	- / -	- / -	- / -
- / -	- / -	- / -	- / -	- / -	- / -	- / -	- / -	- / -	- / -
- / -	- / -	- / -	- / -	• / -	• / -	- / -	- / -	- / -	- / -
- / -	- / -	- / -	- / -	- / -	- / -	- / -	- / -	- / -	- / -
-	-	-	-	-	-	-	-	-	-
- / -	• / -	• / •	• / -	- / -	- / -	• / •	• / -	- / -	- / -
-	•	-	-	-	-	-	-	-	-
- / -	• / •	- / -	- / -	- / -	- / -	- / -	- / -	- / -	- / -
-	-	•	-	•	•	•	-	-	-
Bluetooth® / App	- / -	- / -	- / -	- / -	- / -	- / -	- / -	- / -	- / -
HFR (1 kHz), LPF (50 Hz - 60 Hz)	-	HFR (800 Hz)	-	LPF (160 Hz)	LPF (160 Hz)	-	-	-	-
automatic	automatic	automatic	manuell	automatic	automatic	manuell	manuell	manuell	manuell
•	•	•	•	•	•	•	•	•	•
•	•	•	•	•	•	•	•	•	•
• / • / • / -	• / - / - / -	• / • / • / -	• / • / - / -	• / - / - / -	• / - / - / -	• / - / - / -	• / - / - / -	• / • / - / -	• / • / • / -
- / -	- / -	- / -	- / •	- / -	- / -	- / -	- / -	- / -	- / -
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-	-	-	-	-	-	-	-	-	-
- / -	- / -	• / •	- / -	- / -	- / -	- / -	- / -	- / -	- / -
-	-	-	-	-	-	-	-	-	-
40 mm	16 mm	27 mm	25 mm	23 mm	23 mm	16 mm	30 mm	30 mm	160 mm
CAT IV 300 V CAT III 600 V	CAT IV 600 V CAT III 1000 V	CAT IV 300 V CAT III 600 V	CAT III 300 V CAT II 600 V	CAT III 600 V	CAT III 600 V	CAT IV 600 V CAT III 1000 V	CAT III 600 V	CAT III 600 V	CAT IV 600 V
230 x 100 x 46	220 x 57 x 35	188 x 56 x 28	192 x 66 x 27	149 x 59 x 28	149 x 59 x 28	190 x 60 x 40	190 x 70 x 38	180 x 70 x 42	120 x 70 x 26
450 g	200 g	225 g	205 g	140 g	140 g	265 g	225 g	200 g	286 g
leakage current clamp with Bluetooth® and app	multifunctional current clamp with various measuring and voltage tester functions, one-hand operation	for various applications	for various applications	mini AC/DC current clamp in pocket size for precise measurements of load currents	mini AC current clamp in pocket size for precise measurements of load currents	open current clamp head, slim design	compact design	compact design	flexible AC current transformers for narrow measuring points, large cable cross-sections
044685	044686	044689	044035	044679	044678	044063	044062	044061	044069
56	32, 57	57	57	57	57	58	58	58	59



# TRUE RMS Digital Current Clamp Meters

with data logger, Bluetooth® and free app

## BENNING CM 12

### Power measurement in single-phase and three-phase loads

- AC/DC effective power (W), power factor (cos φ) and harmonic measurement (THD) for evaluation of the mains quality
- bipolar phase sequence test (L1-L2-L3)

## BENNING CM 10-PV

### For photovoltaic systems and HVAC

- safe voltage measurement up to 1500 V AC/ 2000 V DC via measuring adapter TA PV
- microampere and temperature measuring range for HVAC

## BENNING CM 10-1

### For professional service use

- precise current measurement up to 1500 A AC/DC
- “AutoV” function with low input impedance (LoZ) to suppress reactive voltages

## Common features BENNING CM 12, CM 10-PV, CM 10-1

- data logger, memory function and Bluetooth® Low Energy 4.0 interface
- app “BENNING MM-CM Link” for download, storage and sharing measured values via smartphone/ tablet
- INRUSH function for measuring inrush currents (motors etc.)
- low-pass filter (HFR high-frequency suppression) for measurements at pulsed motor drives
- measuring input for flexible current transformer BENNING CFlex 1 (044068) up to 3000 A AC (optional)
- Volt sensor for non-contact signalling of phase voltages and cable breaks in lines via red LED
- non-slip and break-proof SoftGrip housing
- delivery including case, batteries, measuring leads, CM 10-PV additional with measuring adapter TA PV, alligator clips and wire temperature sensor



## TRUE RMS Digital Current Clamp Meters

	BENNING CM 12	BENNING CM 10-PV	BENNING CM 10-1
indicating range	9999 (illuminated) with bar graph	6000 (illuminated)	6000 (illuminated)
basic accuracy	1 %	1 %	1 %
AC voltage	10 mV - 1000 V	0.1 V - 1000 V (1500 V via TA PV)	0.1 V - 1000 V (AutoV+LoZ)
DC voltage	10 mV - 1000 V	0.1 mV - 1000 V (2000 V via TA PV)	0.1 mV - 1000 V (AutoV+LoZ)
AC current	10 mA - 600 A	0.1 μA - 4000 μA, 10 mA - 600 A	10 mA - 1500 A
DC current	10 mA - 600 A	0.1 μA - 4000 μA, 10 mA - 600 A	10 mA - 1500 A
resistance	0.1 Ω - 100 kΩ	0.01 Ω - 600 kΩ	0.01 Ω - 600 kΩ
continuity/diode	• / •	• / •	• / •
frequency	0.01 Hz - 10 kHz	0.01 Hz - 10 kHz	0.01 Hz - 10 kHz
capacity	1 nF - 4 mF	1 μF - 1 mF	1 μF - 1 mF
effective power / (cos φ)	1 W - 600 kW / •	- / -	- / -
temperature	-	-40 °C up to 400 °C	-
volt sensor	•	•	•
interface	Bluetooth®	Bluetooth®	Bluetooth®
software	app (iOS, Android)	app (iOS, Android)	app (iOS, Android)
filter function	HFR filter (1000 Hz)	HFR filter (800 Hz)	HFR filter (800 Hz)
memory	1000 measuring values, HOLD, PEAK, MAX/MIN, AVG	HOLD, MIN/MAX, INRUSH, ZERO	HOLD, MIN/MAX, INRUSH, ZERO
data log function	9999 measuring values (interval: 1 s - 600 s)	4000 measuring values (interval: 1 s - 60 s)	4000 measuring values (interval: 1 s - 60 s)
measuring method	TRUE RMS	TRUE RMS	TRUE RMS
clamp opening	33 mm	37 mm	42 mm
measuring category	CAT IV 600 V	CAT IV 600 V	CAT IV 600 V
item no.	044680	044683	044688

See page 60 for further accessories

Measuring range indications refer to ranges from highest resolution to the final measuring range value

*innovative, proven and powerful*

## BENNING CM E1 TRUE RMS Earth Measuring Clamp for earth loop resistance and leakage current measurement

- earth loop resistance measurement  $R_e$  in multiply earthed earthing systems
- no need to disconnect the earthing conductor or to set earth rods and probes
- optical and acoustic alarm function in case of excessive earthing resistances
- measurement of leakage and load currents using the TRUE RMS measuring method
- large measuring clamp diameter of 38 mm
- measured value memory for 116 measured values
- supplied in a hard-top case with reference resistance loop

## BENNING CM 7 Up to 1000 A AC/DC TRUE RMS

- safe current measurement up to 1000 A AC/DC with TRUE RMS measuring method
- highest measuring category CAT IV 600 V for highest safety
- clamp opening up to 53 mm for clamping large conductor cross-sections/busbars
- illuminated LC display with bargraph indication for the detection of measuring trends
- delivery including case, battery and measuring leads

## BENNING CM 5-1 With automatic function and single-button operation

- safe current measurement max. up to 600 A AC/DC
- highest measuring category CAT IV 600 V
- automatic function (V AC/DC, A AC/DC,  $\Omega$ ) and measuring range selection
- safe and easy operation – measuring errors due to incorrect measuring range selection are excluded
- low input impedance (LoZ) to suppress reactive voltages
- non-slip and break-proof SoftGrip housing
- LC display with light sensor and background lighting
- delivery including case, battery and measuring leads



TRUE RMS

Further information see page 20, 21



TRUE RMS CAT IV 600 V



TRUE RMS CAT IV 600 V

## TRUE RMS Earth Measuring Clamp, Digital Current Clamp Meters

	BENNING CM E1	BENNING CM 7	BENNING CM 5-1
indicating range	9999	4000 (illuminated) with bar graph	9999 (illuminated)
basic accuracy	1.5 %	0.7 %	0.9 %
AC voltage	–	0.1 V - 750 V	1.3 V - 750 V
DC voltage	–	0.1 V - 1000 V	0.7 V - 1000 V
AC current	0.3 mA - 35 A	0.1 A - 1000 A	0.9 A - 600 A
DC current	–	0.1 A - 1000 A	0.9 A - 600 A
resistance	$R_{e-lus}$ 0.025 $\Omega$ - 1500 $\Omega$	0.1 $\Omega$ - 400 $\Omega$	1 $\Omega$ - 10 k $\Omega$
continuity/diode	- / -	• / -	• / •
frequency	–	1 Hz - 400 kHz	–
capacity	–	–	–
effective power / (cos $\varphi$ )	- / -	- / -	- / -
temperature	–	–	–
volt sensor	–	–	–
interface	–	–	–
software	–	–	–
filter function	–	–	–
memory	HOLD, REC (116 measuring values)	HOLD, MAX/MIN, PEAK, ZERO	HOLD, ZERO
data log function	116 measuring values	–	–
measuring method	TRUE RMS	TRUE RMS	TRUE RMS
clamp opening	38 mm	53 mm	35 mm
measuring category	CAT III 300 V	CAT IV 600 V	CAT IV 600 V
item no.	044684	044059	044066

See page 60 for further accessories

Measuring range indications refer to ranges from highest resolution to the final measuring range value

# TRUE RMS high-precision and leakage current clamps

to satisfy highest demands on accuracy

## BENNING CM 11

### AC/DC Current Clamp with a resolution of 0.1 mA and multimeter functions

- precise AC/DC current measurement
- ideal for troubleshooting in electrical installations, devices, automotive engineering, control systems (4 to 20 mA process signals) as well as in fire and intrusion alarm systems
- multifunctional use for voltage (600 V), resistance measurements (600 kΩ) and continuity test
- compact dimensions with a clamp opening of 23 mm
- delivery including case, batteries and measuring leads

## BENNING CM 9-1

### Leakage Current Clamp with a resolution of 1 μA AC and multimeter functions

- universally applicable for current (60 A AC), voltage (600 V), resistance measurement (600 kΩ) and continuity test
- LPF low-pass filter (40 Hz to 70 Hz) to suppress high-frequency interfering signals

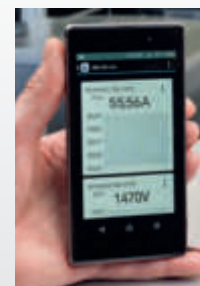
## BENNING CM 9-2

### Leakage Current Clamp with a resolution of 1 μA AC, Bluetooth® function and app

- Bluetooth® Low Energy 4.0 interface and app for indication, storage and sharing measured values via smartphone/ tablet
- LPF low-pass filter (50 Hz to 60 Hz) to suppress high-frequency interfering signals

### Common features BENNING CM 9-1, CM 9-2

- measurements of leakage, differential and protective conductor currents in electrical systems (IEC 60364), devices and machines (EN 60204-1)
- defined protection against magnetic fields in compliance with EN 61557-13, class 2
- device filter (1 kHz) in compliance to EN 61557-16 for testing electrical appliances
- delivery including case, batteries and measuring leads (except CM 9-2)



## TRUE RMS high-precision and leakage current clamps

	BENNING CM 11	BENNING CM 9-1	BENNING CM 9-2
indicating range	6000 (illuminated)	6000 (illuminated)	6000 (illuminated)
basic accuracy	1 %	1 %	1 %
AC voltage	10 mV - 600 V	10 mV - 600 V	–
DC voltage	10 mV - 600 V	10 mV - 600 V	–
AC current	0.1 mA - 20 A	1 μA - 60 A	1 μA - 60 A
DC current	0.1 mA - 10 A	–	–
resistance	0.1 Ω - 600 kΩ	0.1 Ω - 600 kΩ	–
continuity/diode	• / –	• / –	– / –
frequency	–	–	–
capacity	–	–	–
effective power / (cos φ)	– / –	– / –	– / –
temperature	–	–	–
volt sensor	–	–	–
interface	–	–	Bluetooth®
software	–	–	app (iOS, Android)
filter function	–	device- (1 kHz), low pass filter (40 Hz - 70 Hz)	device- (1 kHz), low pass filter (50 Hz - 60 Hz), without filter
memory	HOLD, MIN/MAX, ZERO	HOLD, PEAK, ZERO	HOLD, MAX/MIN
data log function	–	–	–
measuring method	TRUE RMS	TRUE RMS	TRUE RMS
clamp opening	23 mm	23 mm	40 mm
measuring category	CAT IV 600 V	CAT IV 600 V	CAT IV 600 V
item no.	044067	044682	044685

# TRUE RMS Digital Current Clamp Meter

*to satisfy highest demands on accuracy*

## BENNING CM 1-4 Multifunctional Current Clamp with digital and LED display

- current measurement up to 200 A AC via open current clamp
- voltage measurement up to 1000 V AC/DC (with/without acoustic signal), no batteries required from 50 V
- LED step indicator: 12, 50, 120, 230, 400, 690, 1000 V
- phase sequence test by means of green LEDs (right/left)
- single-pole external conductor test (phase) via red LED
- continuity test via buzzer and red LED
- polarity test via +/- LED
- one-hand operation for voltage measurement at sockets (19 mm)
- LED measuring point illumination
- incl. belt holster, measuring accessories, batteries
- further informations on page 32

## BENNING CM 2-1 and CM 2 For various applications

- safe and non-contact measuring of high currents
- AC/DC current measurement up to 400 A (CM 2-1), 300 A (CM 2)
- measurement of low currents (automotive, photovoltaics, industry)
- measuring inputs for voltage, resistance, continuity test as well as frequency, capacity (CM 2-1)
- "AutoV" function with low input impedance (LoZ)
- Volt sensor (NCV) for non-contact signaling of phase voltages (LCD) (CM 2-1)
- delivery including case, batteries, measuring leads

## BENNING CM P2 and CM P1 Minimum dimensions, maximum safety

- precise measurements of load currents up to 400 A
- maximum resolution of 10 mA in the 40.00 A measuring range
- inrush current measurement (INRUSH) in the 40 A measuring range of motors and lighting systems
- low-pass filter (LPF) to suppress high-frequency pulses at pulsed motor drives
- Volt sensor (NCV) for non-contact signaling of phase voltages (buzzer/LCD)
- delivery including case and batteries



## TRUE RMS Digital Current Clamp Meters

	BENNING CM 1-4	BENNING CM 2-1	BENNING CM 2	BENNING CM P2	BENNING CM P1
indicating range	9999 (illuminated)/LED	4000 (illuminated)	4000	4200 (illuminated)	4200 (illuminated)
basic accuracy	1 %	0.5 %	0.5 %	2 %	2 %
AC voltage	6 V - 1000 V	100 $\mu$ V - 600 V	1 mV - 600 V	-	-
DC voltage	6 V - 1000 V	100 $\mu$ V - 600 V	0.1 mV - 600 V	-	-
AC current	0.1 A - 200 A	10 mA - 400 A	100 mA - 300 A	0.01 A - 400 A	0.01 A - 400 A
DC current	-	10 mA - 400 A	10 mA - 300 A	0.01 A - 400 A	-
resistance	1 $\Omega$ - 50 k $\Omega$	0.1 $\Omega$ - 40 M $\Omega$	0.1 $\Omega$ - 40 M $\Omega$	-	-
continuity/diode	• / -	• / •	• / -	- / -	- / -
frequency	-	0.01 Hz - 50 kHz	-	-	-
capacity	-	1 nF - 10 mF	-	-	-
effective power / (cos $\phi$ )	- / -	- / -	- / -	- / -	- / -
temperature	-	-	-	-	-
volt sensor	-	•	-	•	•
interface	-	-	-	-	-
software	-	-	-	-	-
filter function	-	HFR (800 Hz)	-	LPF (160 Hz)	LPF (160 Hz)
memory	HOLD	HOLD, MAX/MIN	HOLD, MAX, ZERO	HOLD, INRUSH, ZERO	HOLD, INRUSH
data log function	-	-	-	-	-
measuring method	TRUE RMS	TRUE RMS	TRUE RMS	TRUE RMS	TRUE RMS
clamp opening	16 mm	27 mm	25 mm	23 mm	23 mm
measuring category	CAT IV 600 V	CAT IV 300 V	CAT III 300 V	CAT III 600 V	CAT III 600 V
item no.	044686	044689	044035	044679	044678

See page 60 for further accessories

Measuring range indications refer to ranges from highest resolution to the final measuring range value



# Digital Current Clamps

## for AC current

### BENNING CM 1-3 With Volt sensor function

- safe AC current measurement with open current clamp head up to max. 200 A AC
- measuring inputs for voltage, resistance, continuity and diode test
- integrated volt sensor signalises phase voltages by means of an acoustic signal and a red LED signal
- localizes cable breaks and defective lamps in exposed cables (cable reel, light chains) via the feeding side of the phase
- delivery including case, batteries and measuring leads

### BENNING CM 1-2 and CM 1-1 In compact design

- safe current measurement up to 400 A AC
- maximum resolution of 10 mA in the 20 A measuring range (CM 1-1)
- measuring inputs for voltage, resistance and continuity test (CM 1-2)
- compact dimensions with a clamp opening of 30 mm
- delivery including case, battery/ batteries as well as measuring leads (CM 1-2)



## Digital Current Clamp Meters

	BENNING CM 1-3	BENNING CM 1-2	BENNING CM 1-1
indicating range	2000	2000	2000
basic accuracy	1 %	1 %	2 %
AC voltage	0.1 V - 750 V	0.1 V - 600 V	-
DC voltage	0.1 V - 1000 V	0.1 V - 600 V	-
AC current	100 mA - 200 A	100 mA - 400 A	10 mA - 400 A
DC current	-	-	-
resistance	0.1 Ω - 20 MΩ	0.1 Ω - 20 MΩ	-
continuity/diode	• / •	• / -	- / -
frequency	-	1 Hz - 400 kHz	-
capacity	-	-	-
effective power / (cos φ)	- / -	- / -	- / -
temperature	-	-	-
volt sensor	•	-	-
interface	-	-	-
software	-	-	-
filter function	-	-	-
memory	HOLD	HOLD	HOLD, MAX
data log function	-	-	-
measuring method	RMS	RMS	RMS
clamp opening	16 mm	30 mm	30 mm
measuring category	CAT V 600 V	CAT III 600 V	CAT III 600 V
item no.	044063	044062	044061

See page 60 for further accessories

Measuring range indications refer to ranges from highest resolution to the final measuring range value

### BENNING CFlex 2, CFlex 1 Flexible AC Current Transformers up to 3000 A AC

- TRUE RMS measuring method (CFlex 2)
- measuring loop (46 cm) with high flexibility for narrow measuring points and large cable cross-sections
- length of connecting cable: 1.8 m
- simple closing mechanism which can be operated with gloves
- analog output is universally applicable for all multimeters and oscilloscopes via 4 mm safety plugs (CFlex 1)
- output 100/10/1 mV per A (CFlex 1)
- large 4 digit LC display with illumination (CFlex 2)
- delivery including case and batteries

### BENNING CC 3 and CC 1 AC/DC and AC Current Clamp Adapters

- safe AC current measurement max. up to 400 A
- connection via 4 mm safety measuring leads
- delivery including case and measuring leads as well as battery (CC 3)



## Current Transformers and Current Clamp Adapters














	BENNING CFlex 2	BENNING CFlex 1	BENNING CC 3	BENNING CC 1
indicating range	6000 (illuminated)	–	–	–
basic accuracy	3 %	3 %	1 % - 3 %	1.9 %
AC voltage	–	–	–	–
DC voltage	–	–	–	–
AC current	0.1 A - 3000 A	0.3 A - 3000 A	0.2 A - 300 A	1 A - 400 A
DC current	–	–	0.2 A - 300 A	–
resistance	–	–	–	–
continuity/diode	-/-	-/-	-/-	-/-
frequency	–	–	–	–
capacity	–	–	–	–
effective power / (cos φ)	-/-	-/-	-/-	-/-
temperature	–	–	–	–
volt sensor	–	–	–	–
interface	–	–	–	–
software	–	–	–	–
filter function	–	–	–	–
memory	HOLD, MIN/MAX	–	–	–
data log function	–	–	–	–
measuring method	TRUE RMS	–	–	–
clamp opening	160 mm	160 mm	21 mm	30 mm
measuring category	CAT IV 600 V	CAT III 600 V	CAT III 600 V	CAT III 300 V
item no.	044069	044068	044038	044037

See page 60 for further accessories

Measuring range indications refer to ranges from highest resolution to the final measuring range value

# Accessories for Digital Current Clamp Meter

safe – functional – indispensable

	Description	Product data	Item no.	CM 12	CM 10-PV	CM 10-1	CM E1	CM 7	CM 5-1	CM 11	CM 9-1	CM 9-2	CM 1-4	CM 2-1	CM 2	CM P2	CM P1	CM 1-3	CM 1-2	CM 1-1	CFlex 2	
<b>AC current transformer</b>																						
	<b>BENNING CFlex 1</b> AC current transformer	basic accuracy: 3 % current: 0.3 A - 3000 A AC output: 100 mV/10 mV/1 mV AC per 1 A AC	044068	•	•	•		•	•	•	•			•	•				•	•		
<b>Hard case / stand-by cases</b>																						
	<b>Robust hard case</b> dimensions 375 x 190 x 250 mm	With foam insert, separate shelf and lid compartment for accessories and small parts. Safe transport protection for high-quality testing and measuring instruments. Made of ABS material, dust and waterproof	10198412	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•
	<b>Stand-by case size S</b> dimensions: 220 x 110 x 50 mm	with belt loop on the back, made of hard-wearing nylon fabric	010912						•	•	•			•	•	•	•	•	•	•	•	•
	<b>Stand-by case size M</b> dimensions: 240 x 180 x 70 mm	made of hard-wearing nylon fabric	010913						•	•	•	•	•	•	•	•	•	•	•	•	•	•
	<b>Belt holster</b> dimensions: 190 x 80 x 40 mm	Practical belt holster with Velcro fasteners for attaching the measuring instrument, for attachment to the belt. Made of hard-wearing nylon fabric	10217845										•									
<b>Measuring accessories</b>																						
	<b>BENNING TA 1</b> alligator clips, two pieces	Ø 4 mm plug-in technology, red/black, professional equipment, CAT III 1000 V	044124	•	•	•		•	•	•	•		•	•	•				•	•		
	<b>BENNING TA 2</b> set of measuring leads, six pieces	Ø 4 mm plug-in technology, red/black, professional equipment, consisting of: measuring leads (silicone) CAT III 1000 V, test probes (Ø 4 mm measuring tip) CAT II 1000 V, alligator clips CAT III 1000 V	044125	•	•	•		•	•	•	•		•	•	•				•	•		
	<b>BENNING TA 3</b> set of measuring leads, eight pieces	Ø 4 mm plug-in technology, red/black, professional equipment, CAT III 1000 V, consisting of: measuring leads (silicone), test probes (slender measuring tip), claw clamps, alligator clips	044126	•	•	•		•	•	•	•		•	•	•				•	•		
	<b>Ø 4 mm safety measuring leads with 2 mm measuring tip</b> , two pieces	Red/black, L = 1.40 m, with Ø 2 mm measuring tip (L = 18 mm), CAT IV 600 V/CAT III 1000 V (with protective caps), CAT II 1000 V (without protective caps)	044146	•	•	•		•	•	•	•		•	•	•				•	•		
	<b>Ø 4 mm safety measuring leads with 4 mm measuring tip</b> , two pieces	Red/black, L = 1.40 m, with Ø 4 mm measuring tip (L = 18 mm), CAT IV 600 V/CAT III 1000 V (with protective caps), CAT II 1000 V (without protective caps)	044145	•	•	•		•	•	•	•		•	•	•				•	•		
	<b>BENNING TA PV</b> measuring adapter	For safe DC and AC voltage measurement up to 1500 V AC/ 2000 V DC. Measuring category: 1000 V CAT III, 600 V CAT IV (with protective cap), 1000 V AC CAT II/ 1500 V DC CAT II (without protective cap). Length 1.4 m. Incl. protective caps CAT III/ IV	10217846		•																	
	<b>Set of measuring leads</b> seven pieces	Ø 4 mm measuring leads, red/ black, length = 1.40 m, with 2 mm measuring probe. CAT IV 600 V / CAT III 1000 V (with protective caps), CAT II 1000 V (without protective caps), CAT II 1000 V (with 4 mm Ø contact tip extension). Contact tip protection to protect against injuries, attached to the black measuring lead. Set of protective caps (CAT III/ IV) red/black, to reduce the length of the uninsulated part of the contact tips. Set of 4 mm Ø contact tip extensions (CAT II)	10217842										•									
	<b>Temperature probe, type K, insertion probe</b> (V4A steel tube)	For flexible substances, liquids, gases and air. Measuring range: - 196 °C up to + 800 °C	044121		•																	

\* figure similar

**BENNING**

# LD 40 + LD 60

Laser Distance Meter

**NEW!**



## compact and multifunctional



Length measurement up to 40 m / 60 m



Area calculation



Volume calculation



Indirect height measurement



Continuous measurement



Selection of reference plane



Selection of measuring units



Additionally for BENNING LD 60:



Stake-out function



Digital level



Digital circular level



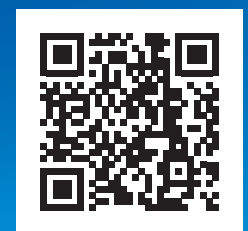
Automatically rotating display



Measured value memory for 50 measured values



Colour display



INFO



# Laser Distance Meter

*compact and multifunctional*

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## BENNING LD 60 and LD 40 Laser Distance Meter

### Application:

- Quick and easy measurement of rooms
- Determination of material requirements (e. g. cables, floor coverings, paint, etc.)
- Determination of volumes (e. g. tank volume, planning of air conditioning systems, room to be ventilated, etc.)
- Continuous measurement to determine a specific distance to a plane
- Calculation of heights that cannot be measured directly
- Adjustable reference plane for measurement between two surfaces or from an edge

### Additionally with LD 600:

- Staking out distances into equal sections for wallpapers and the like
- Level and protractor for aligning beams, profiles and pipes.
- Circular level for checking surfaces for horizontality
- Automatically rotating display for measurements on walls
- Determination of heights from a distance (e. g. of windows on upper floors)



scope of delivery LD 60

### Technical data

	BENNING LD 40	BENNING LD 60
measuring range	0.05 ... 40 m	0.05 ... 60 m
measuring accuracy	± 3 mm	± 1.5 mm
protection class	IP 54	
laser type	650 nm, Class II, <1 mW	
measuring speed	0.5 seconds	
dimensions (l x w x h)	98 x 36 x 23 mm	105 x 48 x 21mm
weight	76 g	84 g
item no.	050500	050501

## recommendation of the workshop equipment

### BENNING DB 1

#### Demonstration Case for testing and measuring of primary quantities of electrical engineering

- suited for teaching and education purposes, training courses and product presentations

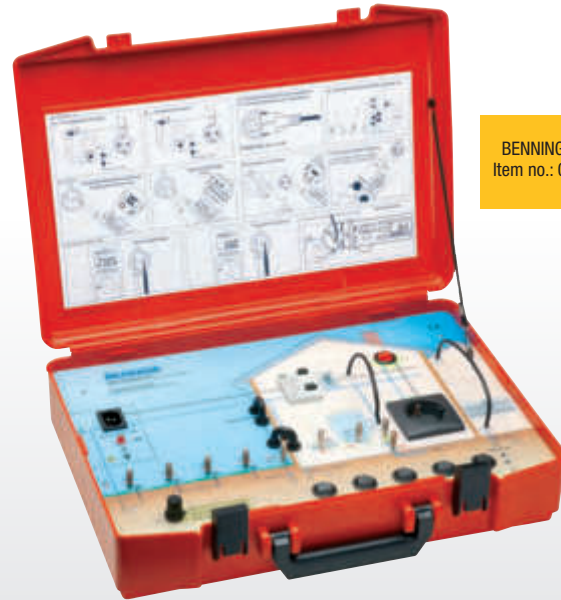


BENNING DB 1  
Item no.: 044132

### BENNING DB 2

#### Demonstration Case for practice-oriented training concerning installation testers

- portable case for simulation of electrical systems confirming to standards according to IEC 60364



BENNING DB 2  
Item no.: 044133

Required test and measurement	Tester/meter complying with standard	Single unit version I	Single unit/device combination version II	Single unit/device combination version III
<b>For enterprises of electrical engineer-craft according to Electricity Association</b>				
two-pole voltage tester	IEC/EN 61243-2	DUSPOL® analog item no. 050261	DUSPOL® expert item no. 050262	DUSPOL® digital item no. 050263
voltage (min. 600 V) and current meter (min. 15 A)	IEC/EN 61010-1 IEC/EN 61010-2-033	MM 2 item no. 044028	MM 6-2 + CC 1 item no. 044087 + 044037	MM 12 + CC 1 item no. 044088 + 044037
current clamp meter	IEC/EN 61010-1 IEC/EN 61010-2-032	CM P2 item no. 044679	CM 2-1 item no. 044689	CM 12 item no. 044680
insulation tester	IEC/EN 61557-2	IT 101 item no. 044033	IT 105 item no. 044105	IT 130 item no. 044103
loop ohmmeter	IEC/EN 61557-3	IT 105 item no. 044105	or IT 115 item no. 044104	
resistance measuring device	IEC/EN 61557-4	IT 101 item no. 044033		
earthing measuring device	IEC/EN 61557-5	CM E1 item no. 044684	earthing set for IT 115 item no. 044113	earthing set for IT 130 item no. 044113
RCD meter	IEC/EN 61557-6	IT 105 item no. 044105	IT 115 item no. 044104	IT 130 item no. 044103
phase sequence indicator	IEC/EN 61557-7	TRITEST® pro item no. 020052		
instrument for testing electrical equipment (EN 50678, EN 50699)	IEC/EN 61557-16	ST 725 item no. 050316	ST 755+ item no. 050332	ST 760+ item no. 050334
instrument for testing medical electrical equipment (IEC 62353)	IEC/EN 61557-16			
measuring device for testing arc welding equipment (IEC 60974-4)	IEC/EN 61557-16			

### Additional recommendation of BENNING

differential current clamp for error current determination in electric equipment and systems	IEC/EN 61557-13 IEC/EN 61010-1 IEC/EN 61010-2-032	CM 9-1 item no. 044682	CM 9-2 item no. 044685	CM 9-1 item no. 044682 or CM 9-2 item no. 044685
mA current clamp for measuring signal currents (4 to 20 mA DC), troubleshooting in electrical installations	IEC/EN 61010-1 IEC/EN 61010-2-032	CM 11 item no. 044067	CM 11 item no. 044067	CM 11 item no. 044067
continuity tester	IEC/EN 61010-1	DUTEST® pro item no. 050156	DUTEST® pro item no. 050156	DUTEST® pro item no. 050156
illumination sensor				Luxmeter type B for IT 130 item no. 044111

# BENNING

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