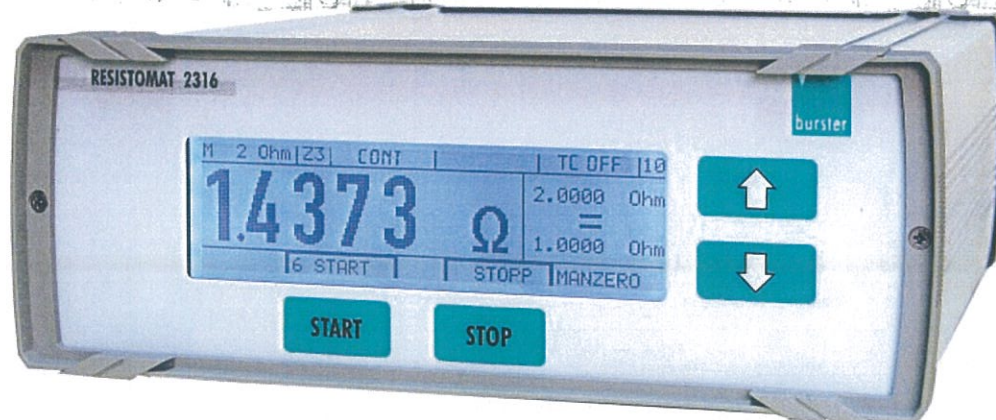


Milliohmmeter RESISTOMAT® for Production and Laboratory

Model 2316

Code: 2316 E
 Manufacturer: burster
 Delivery: ex stock/6 weeks
 Warranty: 24 months

2316-E



- Measuring ranges from 2 mΩ to 200 kΩ
- Resolution up to 0.1 μΩ
- Accuracy 0.03 % Rdg.
- Autorange
- Temperature compensation for all materials
- Thermal e.m.f. compensation
- Input voltage protection up to 400 V_{eff}
- RS232 and PLC interface standard (USB option)

Application

Fast and accurate measurements of the smallest resistance values are possible with the milliohmmeter RESISTOMAT® model 2316. Due to the rugged aluminium injection moulding desktop housing with membrane keypad it is suitable for use in laboratory and industrial environment likewise.

Wires and coils can be measured with temperature compensation. The temperature of the sample is measured with a Pt 100 or pyrometer and the resistance is then corrected to the equivalent at e.g. 20 °C (adjustable) in the instrument.

The application range is very wide such as the measurement of:

- ▶ transformer motor coil windings
- ▶ coils of all kind
- ▶ cables and wires on the drum or as meter samples
- ▶ switch and relay contacts
- ▶ heating elements
- ▶ fuses
- ▶ connections and transitions at power rails and many more

For a cooling curve recording with freely selectable time interval a data logger for up to 1000 values is available.

The complete control via RS232 interface enables the setup of fully automatic test stations. The instrument features a PLC interface for integration into production process control classification and makes selection of the samples an easy task.

Description

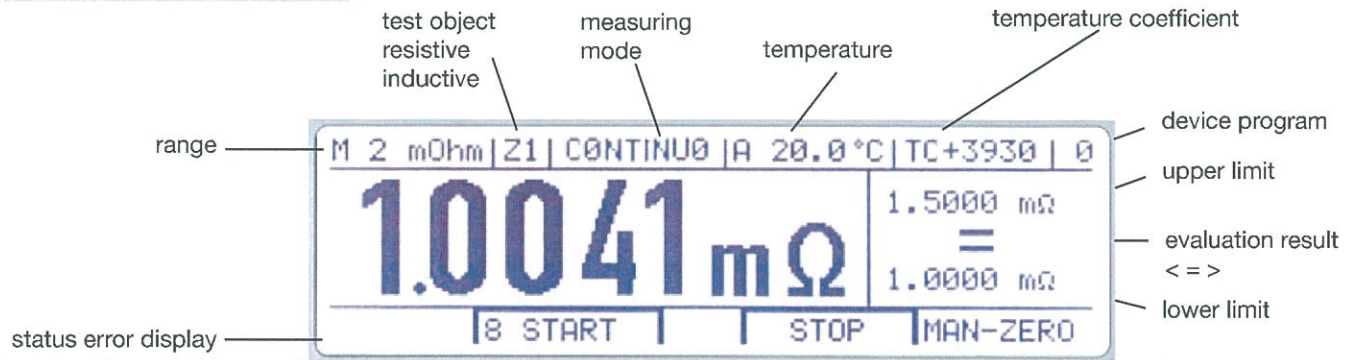
The device works according to the proven 4-wire measurement method which eliminates errors caused by test lead and contact resistances. Thermo voltages that might be in the measurement circle would be compensated automatically by this measurement method. The control of the measurement leads is done with an integrated cable fraction detection.

A temperature compensation for any given sample material such as copper, aluminium, tungsten, etc. is self-evident. The temperature measurement is done by an external Pt 100 sensor or by an external infrared measurement device (ref. to accessories). A special measurement voltage input protection was developed for testing large inductive samples so that voltage peaks do not cause permanent damage while pinching off the sample.

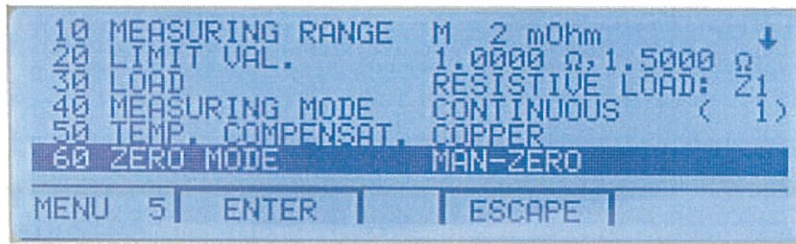
16 device settings such as the measurement range, limit values, temperature coefficient, etc. can be saved in order to test samples with different parameters in an automatic measurement system. All device specific settings are shown to the user via display. Calling up the settings is done via keypad or via PLC interface with a bit pattern (4-bits). It goes without saying that all device settings may also be effected via the RS232 interface.

The high-contrast LCD display with backlight assures very good reading of the measurement value in dark as well as bright spaces.

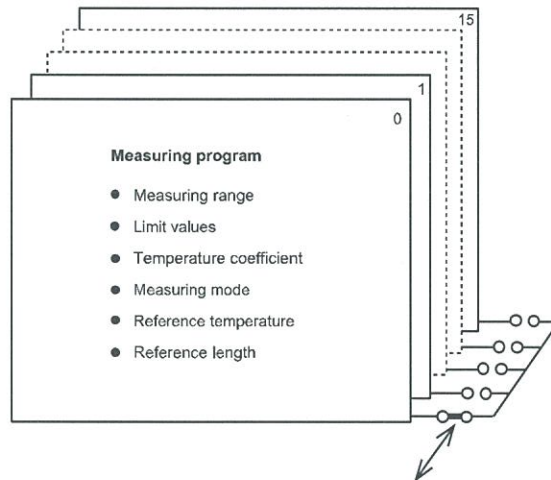
Measurement Display



Menu

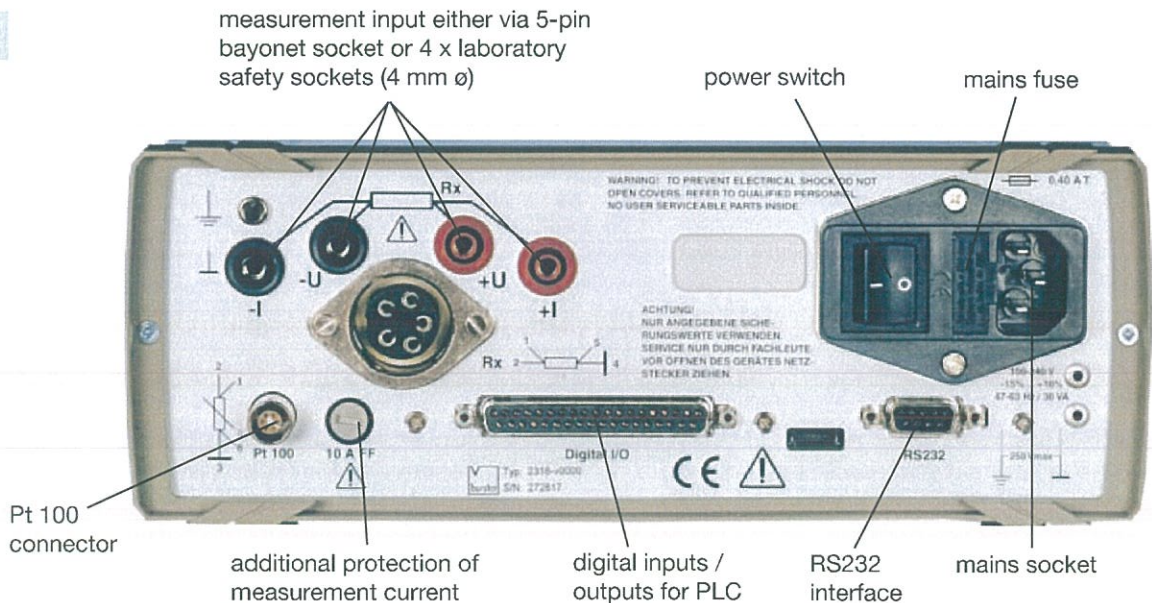


Measurement Program



For fast object changes, RESISTOMAT® 2316 can store up to 16 measurement programs, which can be executed either by PLC, by hand or RS232 (USB)

Rear Side



Device and Documentation Software

The software model 2316-P001 is especially developed for the device setting, measurement value evaluation as well as measurement report printout.

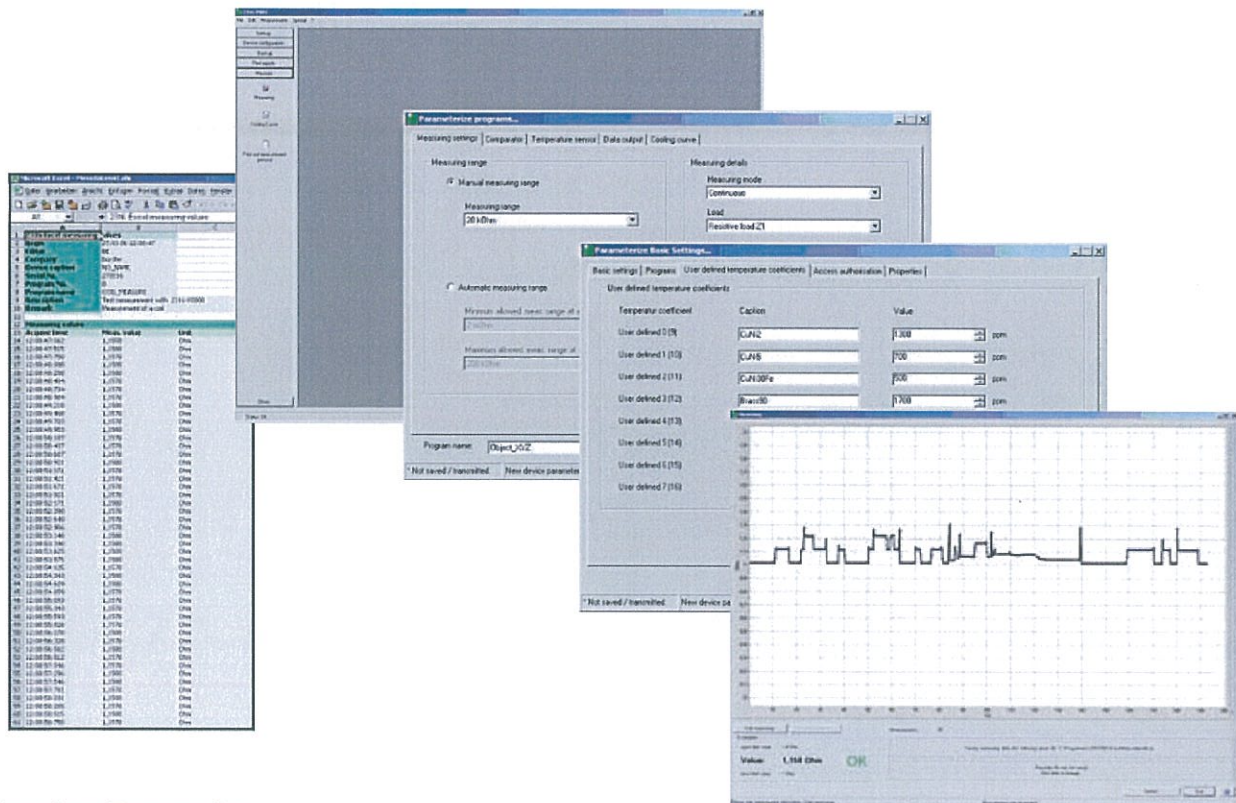
A demo version is available at www.burster.com/software.html.

Following features are available:

- ▶ Full control of RESISTOMAT® model 2316
- ▶ On-line display of the measuring values including limits in graphic or tabular mode
- ▶ Direct storage of the measuring values with time stamp in ASCII files
- ▶ Export of all data in ASCII format to MS-EXCEL
- ▶ Printout of a test certificate with your own logo
- ▶ Complete cooling curve record and printout of motor and transformer windings with extrapolation in Excel
- ▶ Backup of device settings

System requirements:

- Processor: Pentium 500 MHz (at least)
- Graphic: VAG 800 x 600 (at least)
256 colours (at least)
- Memory: 64 MB RAM (at least)
WIN 98SE and WIN NT 4.0)
128 MB RAM (at least)
(WIN ME, WIN2000, WIN XP)
- Hard Disk: approx. 200 MB free memory
- Interface: RS232 or USB (with option USB adapter)



Application Examples

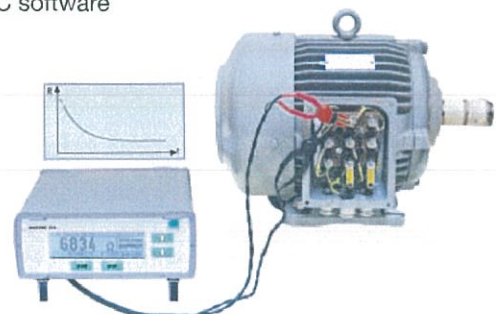
Quality control on wires and cable

- ▶ Testing of variable wire lengths from 100 mm ... 1000 mm measurement length
- ▶ The integrated temperature compensation allows a standardized resistance value in correspondence to the reference temperature (Germany e.g. 20 °C)
- ▶ Individual selection of material specific temperature coefficient



Cooling curve measurement on electric motors

- ▶ Selectable sample rate
- ▶ Data logger for up to 1000 measurement values
- ▶ External control of load stop
- ▶ Transfer of measurement data to EXCEL via PC software



Technical Data

Construction

The device has a service-friendly construction in a sturdy aluminium die casting housing which enables good access to the various components. The operation is done via the membrane keypad. The connections for the sample, the in- and outputs of the RS232/PLC interface as well as the Pt 100-sensors are located at the backside of the device.

The device features a diagnosis function for current source, amplifier, display, internal operation voltage and PLC I/O.

Measuring range	Resolution	Measuring current small**	Measuring current big**
* 2 mΩ	0.0001 mΩ	3 A	3 A
20 mΩ	0.001 mΩ	1 A	1 A
200 mΩ	0.01 mΩ	100 mA	1 A
2 Ω	0.0001 Ω	10 mA	1 A
20 Ω	0.001 Ω	10 mA	100 mA
200 Ω	0.01 Ω	1 mA	10 mA
2 kΩ	0.1 Ω	1 mA	1 mA
20 kΩ	1 Ω	100 μA	100 μA
200 kΩ	10 Ω	10 μA	10 μA

*RESISTOMAT model 2316-V0001 only **adjustable at the device

Accuracy (with temp. comp. off): $\leq \pm 0.03 \% \text{ Rdg.} \pm 3 \text{ Digit}$

Burden voltage: approx. 5 V max.

Measuring time (for ohmic probes): approx. 500 ms

Warm-up time to attain the error tolerance range: < 15 min

Measurement connection: 4-wire technology for current and voltage measurement (KELVIN), ground-free circuit design
FE-PE max. 250 V

Input protected: against induction voltages and external voltages up to 400 V_{eff}

Measurement mode: continuous and single measurement, cooling curve measurements on motor or transformer windings alternated measurement 250 ms fast measurement

Data logger: up to 1000 values (only in "cooling curve" mode)

Limit values: Hi/Lo limits programmable via keypad or interface

Range selection: manually or automatically

Automatic temperature compensation: 7 different temperature coefficients can be chosen and additional 8 TCs are adjustable

Temperature measurement: 0 ... 100 °C, resolution 0.1 °C, accuracy 0.1 °C
with ext. Pt100 sensor or temperature transmitter (pyrometer) with a voltage output of 0 ... 10 V

Display: high-contrast graphic LCD with adjustable contrast and LED background illumination
264*64 Dots, 127 x 34 mm

Measurement display: max. 21 000 counts

Device setting memory: for 16 different device settings

Operator language: German, English, French, Italian, Spanish

Mains supply: 85 ... 264 V AC 50/60 Hz

Power consumption: approx. 30 VA

Temperature drift: 50 ppm/K

Operation temperature: 0 ... +23 ... +50 °C

Humidity non-condensing: 80 % rel. hum. (up to 31 °C), thereover linearity decreasing to 50 % at 50 °C

Storage temperature: 0 ... +70 °C

Weight: 3.5 kg

Dimensions (W x H x D): 247 x 106 x 275 [mm]
19"-3HU rack mount set optionally

Device protection: EN 61010-1 protection class1

Type of protection: IP 40

Connections

Measuring input: alternatively via 4 terminals (ø 4 mm) or 5-pin socket with bayonet lock

Pt 100 sensor: 6-pin, LEMO socket EGG.1B.306

Digital I/O: 37-pin subminiature D-socket
PLC interface with positive logic (negative logic optionally)
additional comparator output with relay (disconnectible) 24 V / 1 A

RS232 interface: 9-pin subminiature D-socket
Baud rate: 300 ... 57 600
Protocol: ANSI X3.28 1976 Subc.2.1,A3
SCPI commands: Vers. 1995.0
direct data recording to a printer with RS232 interface is possible

USB interface: possible with an RS232/USB adapter cable model 9900-K351

Calibrations Sets:

- The **calibration set model 2316-Z010** consists of 4 calibration resistors series 1240 with the values 1 mΩ, 10 mΩ, 100 mΩ and 1 Ω, including one DKD certificate for each resistor. The added adapter model 2394 allows a direct contacting with the RESISTOMAT®. This calibration certificate documents the traceability to national standards. Full description see data sheet 1240-E
- The **calibration set model 2316-Z011** consists of 3 calibration resistors 10 mΩ, 100 mΩ and 1 Ω as well as adapter 2394. Otherwise as before mentioned.

Order Information

RESISTOMAT®

Range 20 mΩ ... 200 kΩ

Range 2 mΩ ... 200 kΩ

Model 2316-V0000

Model 2316-V0001

Accessories

Measurement leads, 4-pin, 1.5 m long shielded cable with banana plugs and bayonet socket **Model 2329-K001**

Temperature sensor with 2.5 m shielded connection line and 6-pin connection plug **Model 2392-V001**

Infrared temperature sensor (pyrometer) temperature range 0 ... 100 °C **Model 2328-Z001**

RS232 data transmission lead **Model 9900-K333**

USB data transmission lead **Model 9900-K351**

37-pin plug for digital I/O interface **Model 9900-V165**

5-pin bayonet plug for measuring input **Model 9900-V172**

19"rack mount kit (3 HU) **Model 2316-Z001**

External device program selecting switch with cable 2 m length and power supply **Model 2316-Z002**

External foot switch for measuring start/stop with cable 2 m length **Model 2316-Z003**

Device and documentation software **Model 2316-P001**

Calibration set **Model 2316-Z010**

Calibration set **Model 2316-Z011**

DKD Calibration

Model 2316-V0000 **Model 23DKD-2316-V0000**

Model 2316-V0001 **Model 23DKD-2316-V0001**

WKS Calibration

Model 2316-V0000 **Model 23WKS-2316-V0000**

Model 2316-V0001 **Model 23WKS-2316-V0001**

For DKD (Deutscher Kalibrierdienst) calibrations we use PTB-calibrated standards (national institute).

For WKS (manufacturer calibration) calibrations we use DKD-calibrated resistors.

Kelvin measuring pliers and probes **see data sheet 2385-E**

Wire holding devices for wires up to 2500 mm² **see data sheet 2381-E**

Calibration resistors **see data sheet 1240-E**

KELVIN Test Tongs and KELVIN Test Probes

Model 2385-V001

Model 2385-V020

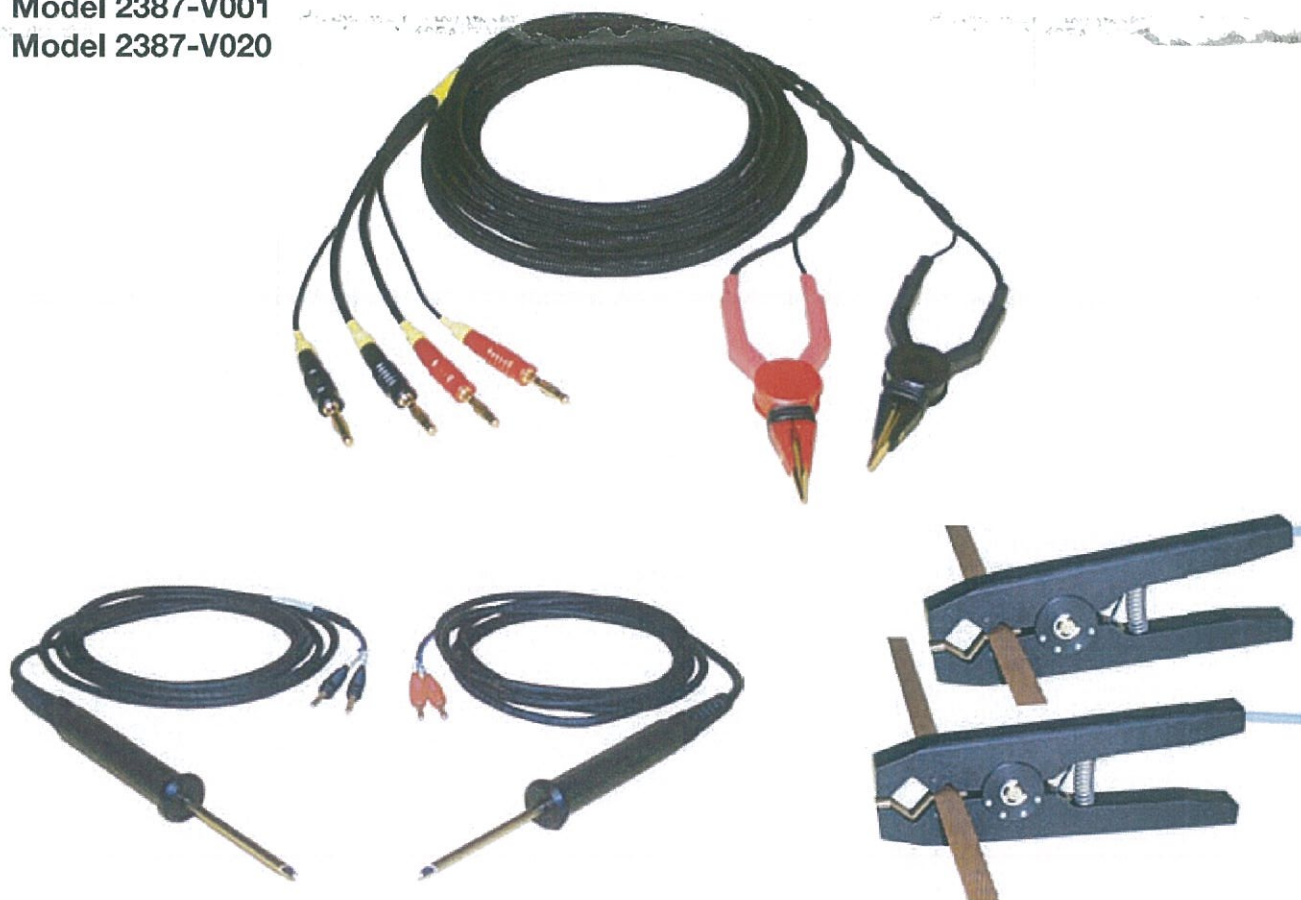
Model 2386-V001

Model 2387-V001

Model 2387-V020

Code: 2385 E
 Manufacturer: burster
 Delivery: ex stock
 Warranty: 24 months

2385-E



- Four-wire system
- Contact profiles for a multitude of applications
- For many different test sample cross sections

Applications

Particular attention is to be paid to the contact when measuring low value resistors of any kind. Poor contacts are generally synonymous with a considerable measurement error. The here presented Kelvin test tongs and Kelvin test probes offer a multitude of measurement possibilities for a wide range of applications. They guarantee a fault-free and simple 4 pole connection to the device being tested. In connection with the RESISTOMAT® digital ohmmeter as well as other generally available milli- and microohmmeters, these test tongs prove to be a rational and measurement quality improving accessory.

Description

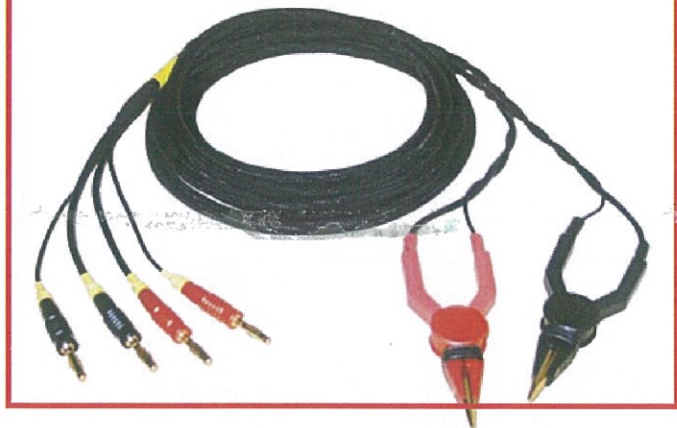
All of the Kelvin test tongs and Kelvin test probes described operate on a four-wire system. The contact on each of the two clip faces is insulated against the opposing contact. One contact is for current supply, the other one is the potential tap. The system used means that any conduction resistivity in either the branch circuit or the voltage tap has no influence on the measured result.

Model 2386 test tongs are constructed of solid nylon plates. This unbreakable material is suitable for heavy duty applications such as for test bays in the cable industry. Kelvin test probes are constructed with a turned part made of stainless steel and handles. The outer contacting and inner potential tap points are insulated against each other. The inner potential tap points are spring mounted.

Designs

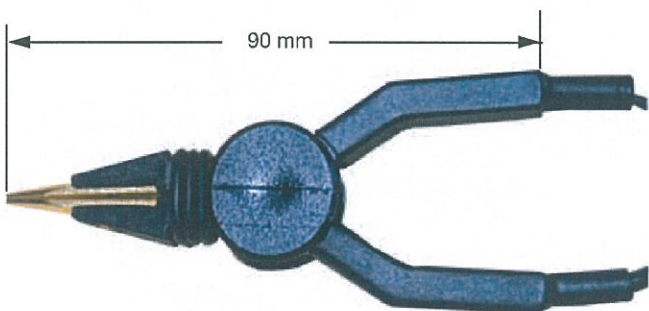
Kelvin Test Tongs Model 2385-V001

These test tongs are ideal for resistance tests on small components and are gold-plated which helps to retain lower contact resistance. The supply leads are 3 m long and fitted with banana plugs at the end.



Kelvin Test Tongs Model 2385-V020

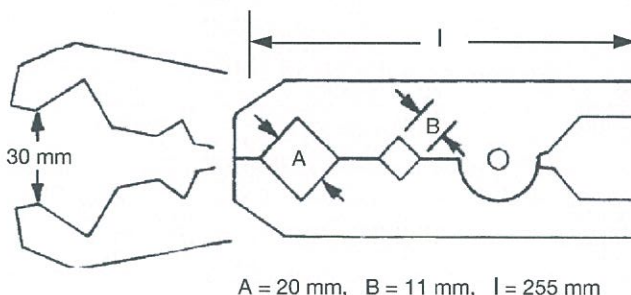
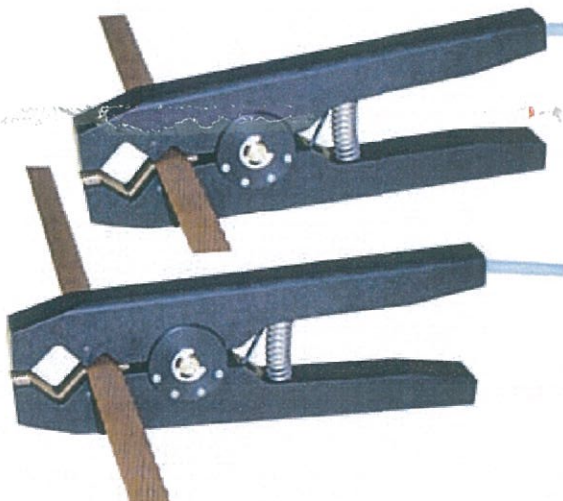
As model 2385-V001, however fitted with a 3 m lead and a 5 pin bayonet connector suitable for RESISTOMAT® models 2329 and 2316-V000X).



Kelvin Test Tongs Model 2386-V001

These test tongs are used for the measurement of ohmic resistances in test bays on dispatch-ready cable drums as well as various test samples in production plants or test laboratories.

When using different profiles in the contacting unit it is possible to make contact on test sample cross-sections from 1 to 1000 mm². The opening angle of the tongs and the form of the contacting profiles also permit special applications such as measurement on heavy duty transformers. The fitted supply leads are 10 m long with banana plugs.

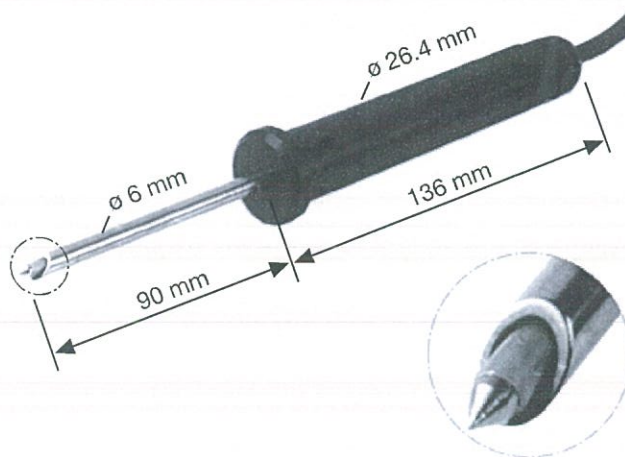


Kelvin Test Probe Model 2387-V001

These were specially designed for contacting low-impedance test samples where contacting with test tongs is not possible (counter-sunk terminal lugs on electro motors, conductivity measurements on printed conductors, for example). The points are made of hardened steel, guaranteeing a long life span. The supply leads are 3 m long and fitted with banana plugs at the end.

Kelvin Test Probe Model 2387-V020

As model 2387-V001, however fitted with a 5 pin connector suitable for RESISTOMAT® models 2316 and 2329.



Which KELVIN connecting cable fits which RESISTOMAT®?
Check the following table:

Model	2304 / 2316 / 2320 / 2323	2316 / 2329
Tongs	2385-V001 2386-V001	2385-V020
Probe	2387-V001	2387-V020

Order Information

Kelvin test tongs
Kelvin test tongs
Kelvin test tongs
Kelvin test probe
Kelvin test probe

Model 2385-V001
Model 2385-V020
Model 2386-V001
Model 2387-V001
Model 2387-V020