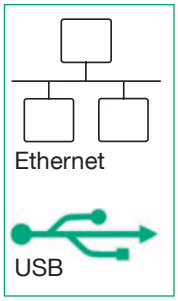
Milliohmmeter RESISTOMAT® for Production and Laboratory

Model 2316

Code:	2316 EN
Delivery:	ex stock/6 weeks
Warranty:	24 months

2316 EN



- **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_{rms}**
- **Ethernet-, USB-, RS232 - as well as PLC interface**

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

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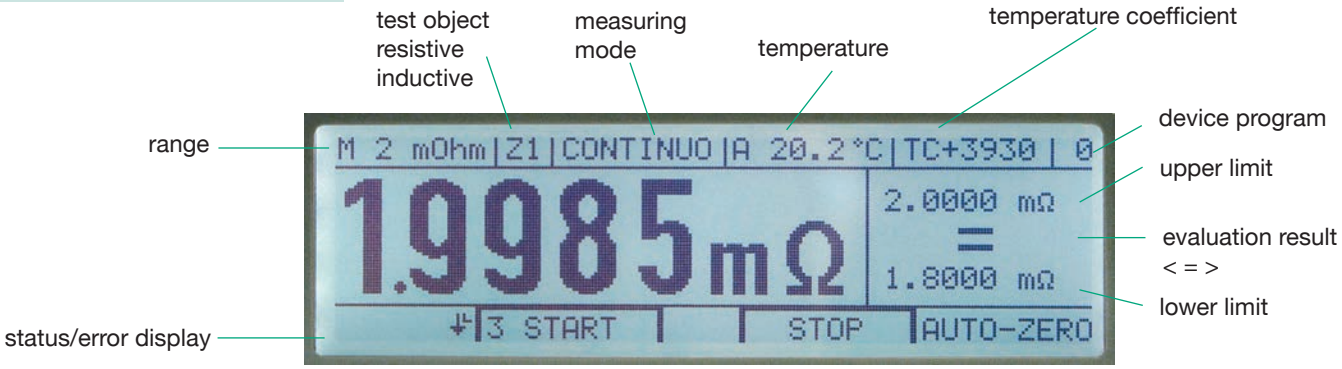
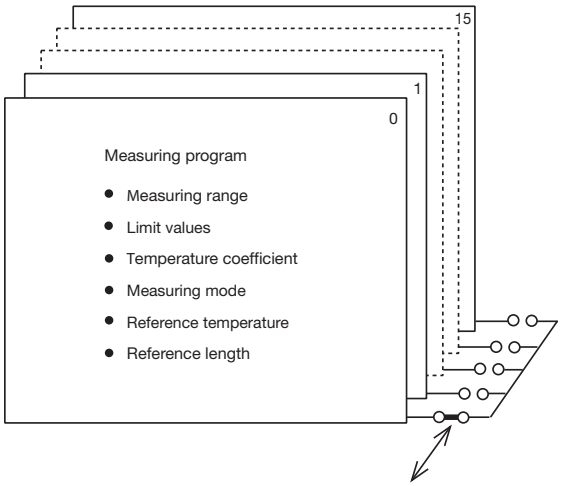
Measurement Display



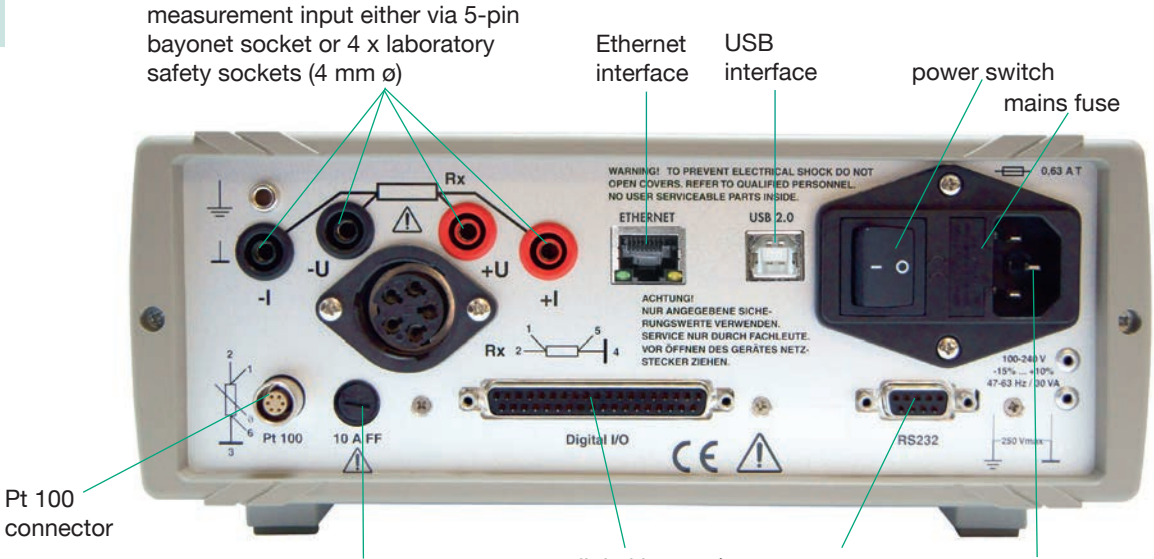
Menu

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, Ethernet)

Rear Side



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Device and Documentation Software

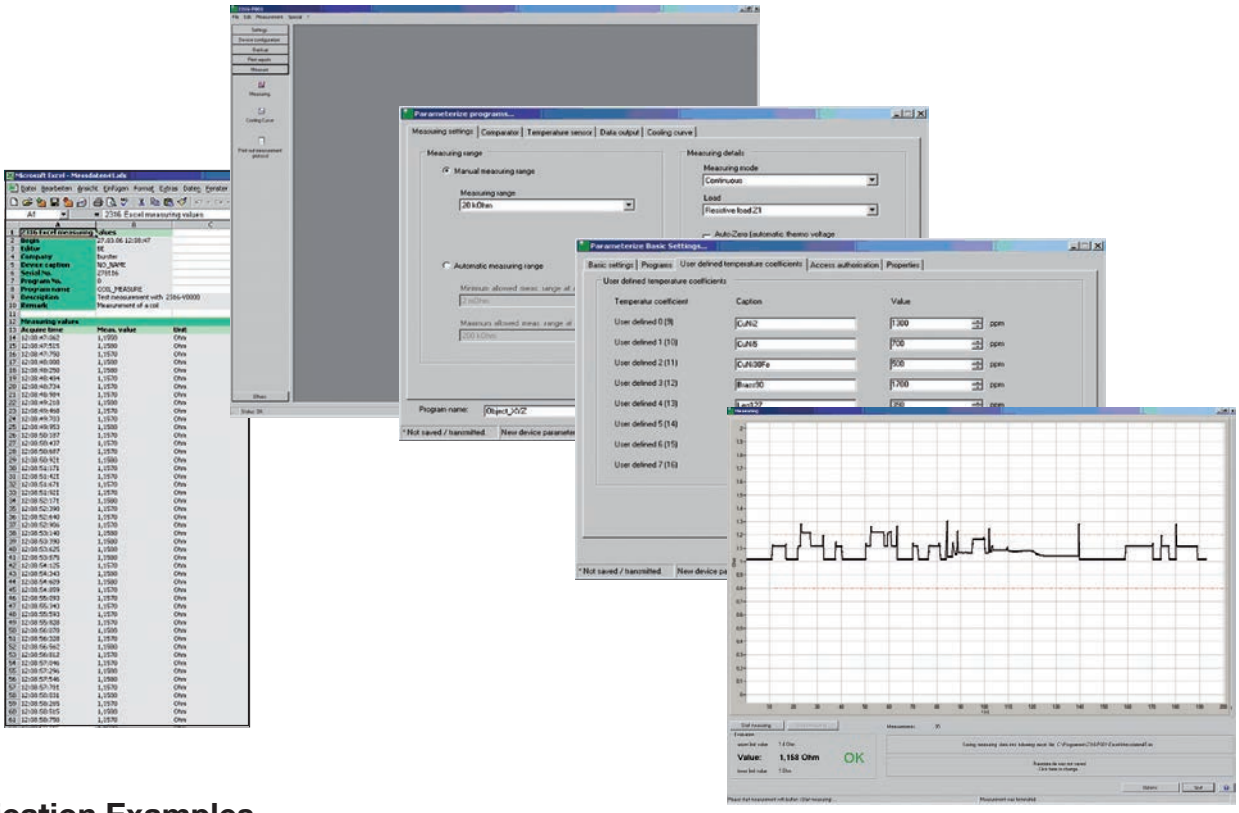
The software model 2316-P001 is especially developed for the device setting, measurement value evaluation as well as the printout of measurement reports.
A demo version is available at **www.burster.com** in the section Instruments & PC software.

Following features are available:

- Full control of RESISTOMAT® model 2316
- Online 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:	128 MB RAM (at least) (WIN7, WIN8, WIN10)
Hard Disk:	approx. 200 MB free memory
Interface:	RS232, USB or Ethernet



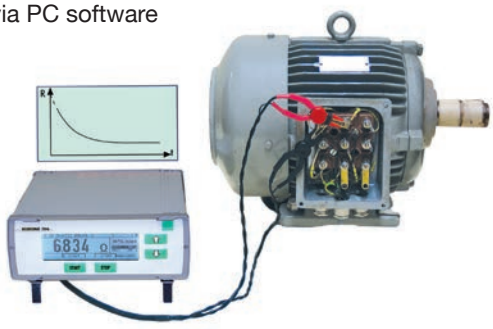
Application Examples

Electrical testing of stators for electric motors

During stator manufacture, the stator wire is crimped into the connecting pin after winding. Crimping can cause wire breakage or the crimping process may not be performed correctly, resulting in a higher resistance. The crimping process requires 100 % testing.

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



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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 interfaces as well as the Pt100-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 low**	Measuring current high**
*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):	≤ ± 0.03 % Rdg. ± 3 counts
Temperature drift:	< 50 ppm/K
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_{rms}
Measurement mode:	continuous and single measurement, cooling curve measurements on motor or transformer windings, alternated measurement 250 ms fast measurement
Measurement display:	Ω, Ω/m, Ω/km, Ω/ft, Ω/kft at variable measurement length 0.1 ... 100m
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
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
Protection class:	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 / 1A
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:	Slaveport type B Baud rate: 57600
Ethernet:	Western socket RJ45 10/100 MBit

Calibrations Sets:

1. 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 as well as adapter model 2394, including one DKD/DAkkS 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 EN
2. The **calibration set model 2316-Z011** consists of 3 calibration resistors 10 mΩ, 100 mΩ and 1 Ω as well as adapter model 2394. Otherwise as before mentioned.

Order Information

RESISTOMAT®

Range 20 mΩ ... 200 kΩ	**Model 2316-V0000**
Range 2 mΩ ... 200 kΩ	**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 connection cable	**Model 9900-K349**
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 (3U)	**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 incl. data transmission lead model 9900-K333	**Model 2316-P001**
Calibration set	**Model 2316-Z010**
Calibration set	**Model 2316-Z011**

DAkkS Calibration Certificate

Model 2316-V0000	**Model 23DKD-2316-V0000**
Model 2316-V0001	**Model 23DKD-2316-V0001**

WKS Calibration Certificate

Model 2316-V0000	**Model 23WKS-2316-V0000**
Model 2316-V0001	**Model 23WKS-2316-V0001**

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

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

Kelvin measuring tongs and probes	**see data sheet 2385 EN**
Wire holding devices for wires up to 2500 mm^2	**see data sheet 2381 EN**
Calibration resistors	**see data sheet 1240 EN**

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