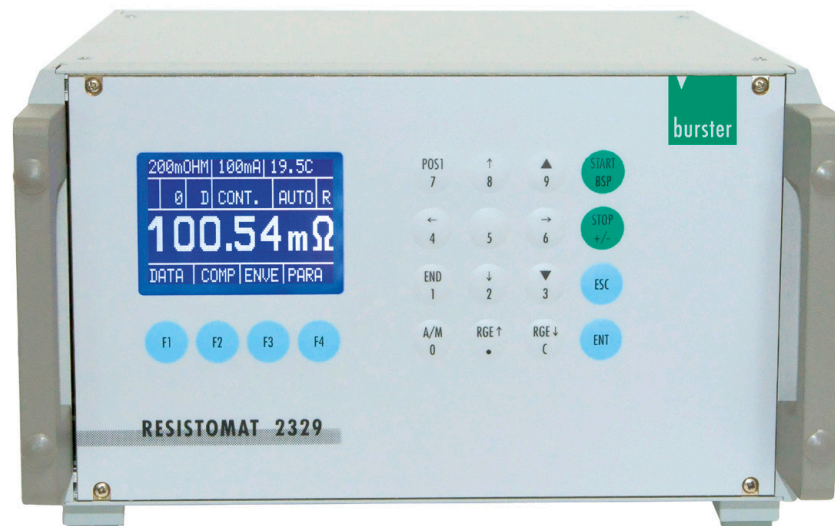


# RESISTOMAT® for Fast Resistance Measurement in Automated Processes

Model 2329

Code: 2329 EN  
 Delivery: ex stock/2 weeks  
 Warranty: 24 months

Option with 6 channel switch system



2329 EN

- Measurement range from 200 mΩ ... 200 kΩ
- Resolution up to 10 μΩ
- Measurement accuracy 0.03 % R<sub>dg</sub>.
- Automatic measurement range selection
- Up to 50 measurements and evaluations per second
- Temperature compensation for all materials

- Thermovoltage compensation
- Dry-circuit measurement in accordance with DIN IEC 512
- Data logger for 20 000 measurement values
- RS232 and PLC interface standard (IEEE488, USB and Ethernet option)

## Application

The RESISTOMAT® model 2329 is particularly suitable for fast measurements of low resistances in automated processes. Up to 50 measurements per second can easily be performed. The device complies with the latest CE guidelines and is designed for laboratory use as well as heavy-duty industrial applications.

A 2-fold and 4-fold comparator with switching outputs has been included for classification and selection; this feature is particularly useful for serial tests.

One special application involves the measurement of contact resistances (dry-circuit measurement); the load voltage in this case is limited to 20 mV in order to prevent fritting (DIN IEC 512). The RS232 (standard) and IEEE488, USB, Ethernet (option) computer interfaces allow the set-up of fully automatic testing stations. The PLC interface allows easy integration into your production process control.

Typical applications are resistance and conductivity measurements on:

- ▶ Fuses
- ▶ Airbag triggers
- ▶ Coils for the automobile industry and electrical engineering
- ▶ Plug-in contacts and switches
- ▶ Commutator welded joints
- ▶ Meter samples in cable manufacture
- ▶ Circuit-board conductors etc.

## Description

The device operates on the basis of proven 4-wire technology which corrects any incoming line or contact resistances. The measurement lines are checked by an integrated cable rupture monitor.

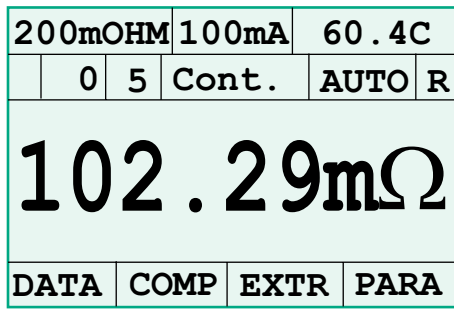
Needless to say, the functions include temperature compensation for various test substances such as copper, brass, tungsten etc. Temperatures are measured by a Pt100 sensor or infrared sensor (pyrometer) with analog outputs or any temperature transmitter e.g. thermocouple.

For measuring test objects with low inductances, a special measurement input protection was developed to prevent voltage peaks from damaging the device when test objects are disconnected.

If objects need to be tested for several different parameters by an automatic measurement system, you can store up to 32 device settings such as measurement ranges, limiting values, temperature coefficients etc. These settings are called up via a bit pattern (5 bits). Naturally, all device settings can also be made via the RS232 (standard) or IEEE488, USB, Ethernet interfaces (option).

The integrated data logger can be used during serial measurements to store up to 20 000 measurement values which can be divided into 32 individual blocks. A digital filter is available for preselecting the measurement values to be stored. The evaluation menu of the stochastic data logger displays the maximum, minimum and average values as well as the standard deviation.

## Display



**Status line I**  
 Measurement range, measurement current or 20 mV for dry-circuit measurements  
 Temperature with active temperature compensation or setpoint values with Δ % display

**Status line II**  
 Error status, the last device adjustment loaded, continuous or single measurement, manual or automatic range selection, measurement sequence R or Z

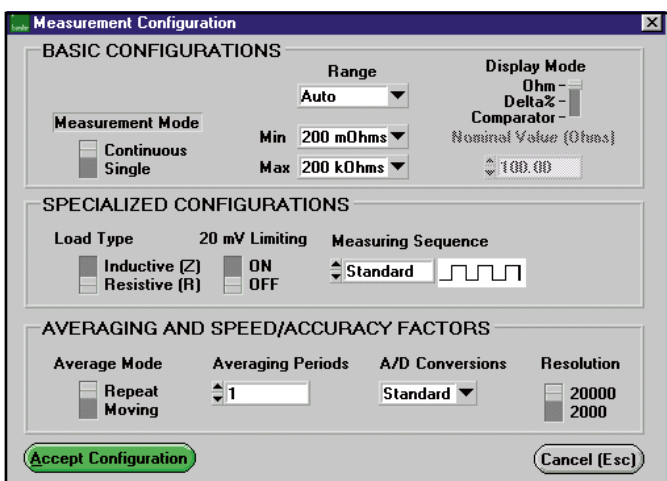
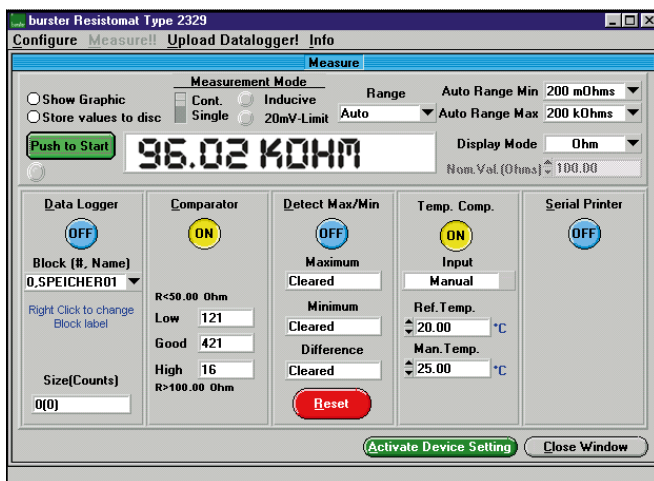
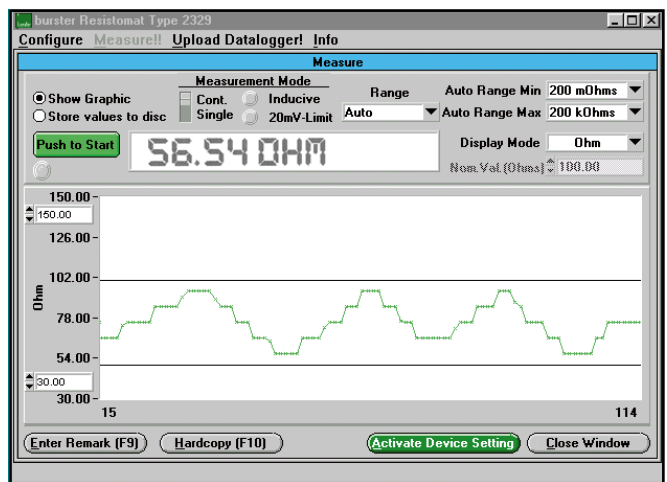
**Measurement value field**  
 The last value measured

Meaning of the function keys

## Device and Documentation Software

The software model 2329-P001 is especially developed for the device setting as well as for the measurement value evaluation and provides following features:

- ▶ Full control of RESISTOMAT® model 2329
- ▶ Online display of the measured values (graphic or tabular)
- ▶ Direct storage of the measured values in ASCII files
- ▶ Read-in and storage of data logger values in ASCII files
- ▶ Data export in ASCII format to e.g. MS Excel



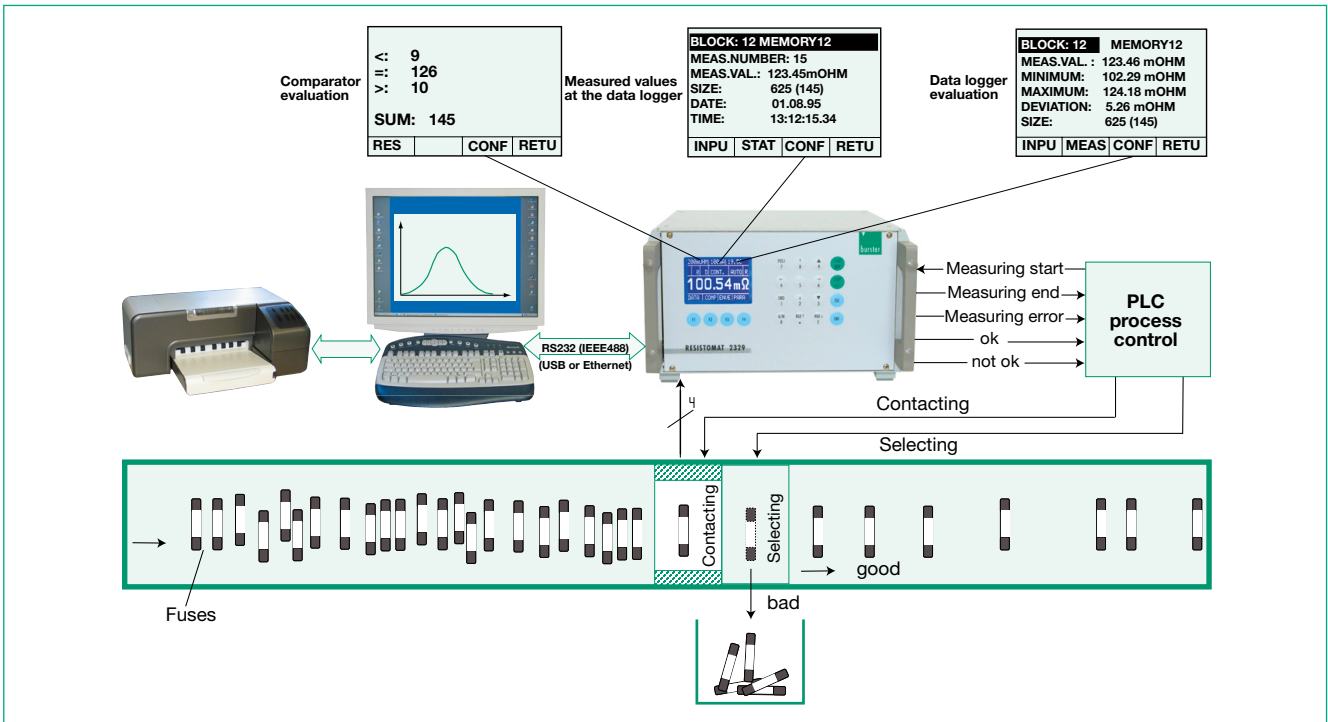
## System Requirements

- Processor: 80386 with co-processor or better  
 Graphic: Standard VGA 640\*480, 256 colours (also monochrome LCD display)  
 Memory: min. 8 MB RAM  
 Hard disk: approx. 10 MB free memory  
 Relocation file: min. 15 MB  
 Operating system: Win 95, Win 98, Win 2000, WinNT 4.0, ME, XP  
 Interfaces: RS232, IEEE488, USB or Ethernet

# Applications

## Fuses 100 % tested

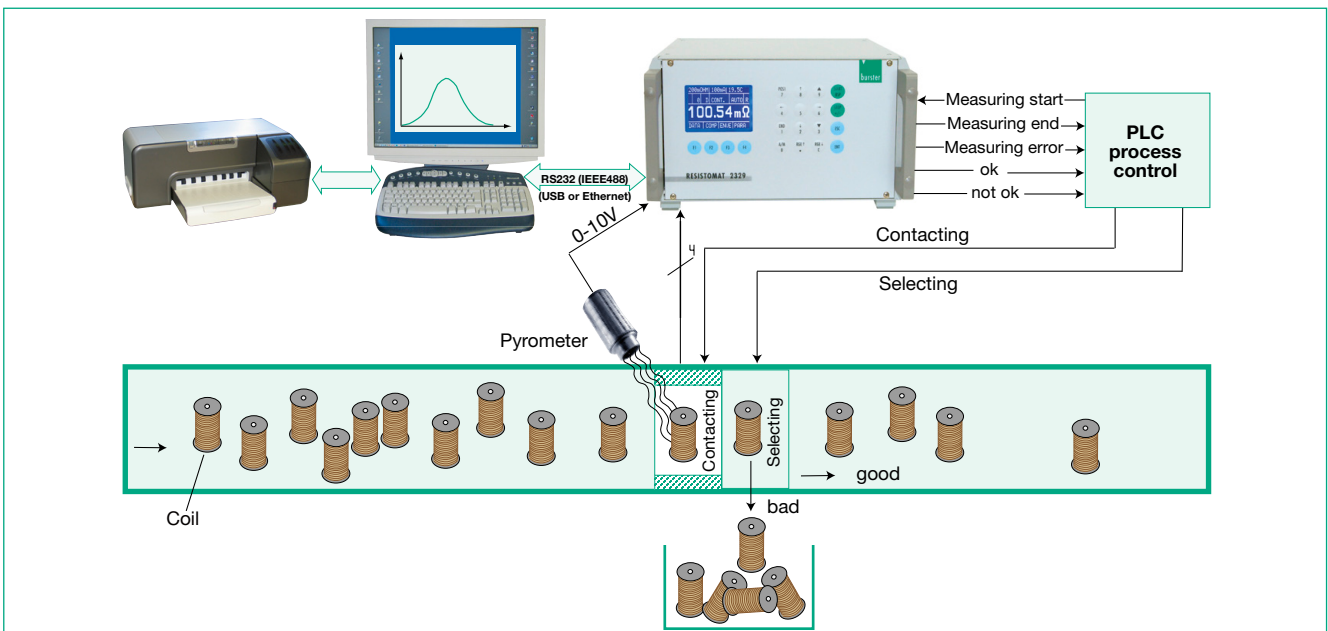
Evaluation of the fuse production with device internal statistic program or externally via PC



2329 EN

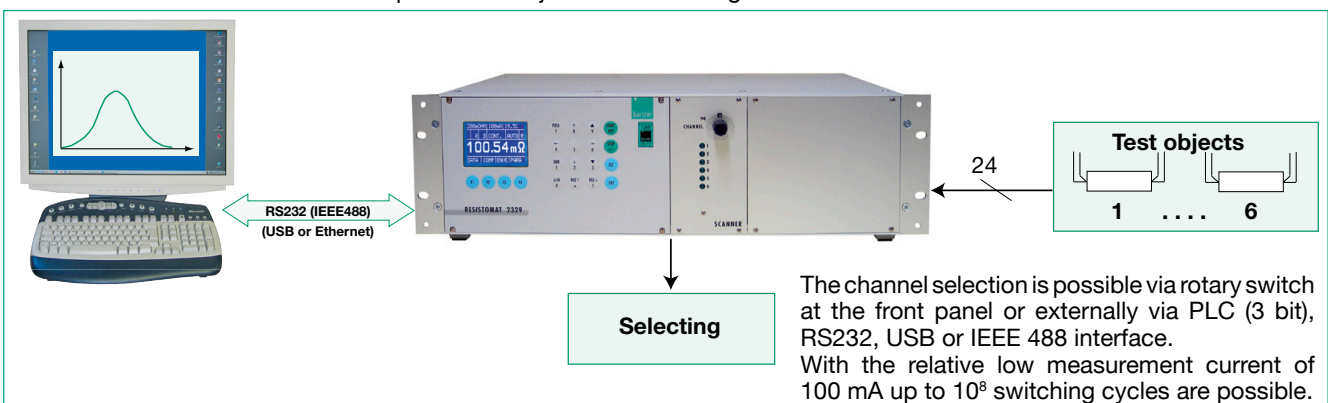
## Coils 100 % tested

The measurement happens in consideration of the temperature coefficient. For that purpose the surface temperature of the coil is measured with a pyrometer.



## PC-controlled tests with 6 channel switch

Automatic 4-wire measurement for up to 6 test objects with the integrated switch box.



## Technical Data

### Design

The device is easy to maintain and equipped with a robust metal housing. Easy accessibility of the individual modules and ideal servicing conditions are thus ensured.

All the control elements are arranged clearly and logically on the front panel. The connection socket for test objects and the inputs/outputs for the interface, comparators, Pt 100 sensor (for temperature compensation) and control unit are located on the rear panel of the device.

Measuring Range	Resolution	Measuring Current
200.00 mΩ	10 μΩ	100 mA
2.0000 Ω	100 μΩ	10 mA
20.000 Ω	1 mΩ	10 mA
200.00 Ω	10 mΩ	1 mA
2.0000 kΩ	100 mΩ	100 μA
20.000 kΩ	1 Ω	100 μA
200.00 kΩ	10 Ω	10 μA

Measurement error (with the temperature compensation inactive):  
up to 0.03 % of reading ± 2 counts

Warm-up time: < 10 min. to attain the error tolerance range

Max. voltage at the open terminals: ≤ 16 V

Max. load voltage: ≥ 5 V

Measurement connection:

4-wire technology for current and voltage measurement (Kelvin), ungrounded circuit, potential binding is possible either on the test object or the RESISTOMAT®.

Measurement time:

up to 50 measurements and evaluations per second, depending on the resolution and measurement mode in case of purely ohmic test objects.

Measurement mode: continuous or single measurement

Range selection: manual or automatic

Dry-circuit measurement: in accordance with DIN IEC 512  
20 mV load voltage limiting up to 4 Ω

Temperature compensation:

selection and adjustment of 10 different temperature coefficients

Temperature measurement:

via an external Pt 100 sensor or transmitter (pyrometer) with a voltage (0 ... 10 V) or current output (0 ... 20 mA), (4 ... 20 mA)

Comparator: 2 or 4 limiting values, as required

Data logger: the data logger has a memory capacity of 20 000 measurement values which can be divided into 32 blocks.

### General Data

Display:

128 x 64 pixel, transfective LCD graphic display with adjustable contrast and background illumination

Measurement value indication:

selective 3 1/2 or 4 1/2 digit, LCD 15 mm high, measurement value display as absolute, Δ%, or evaluation >>, >, =, <, <<

Voltage supply: 230 V ± 10 % or 115 V ± 10 %  
adjustable via supply voltage selector

Mains frequency: 47 - 63 Hz

Power consumption: max. 25 VA

Temperature drift: 20 ppm/K

Ambient conditions: operation: +5 ... 23 ... 50 °C,  
storage -10 ... 60 °C

Potential binding:

the measurement section is grounded internally; a switchover to external grounding is also possible

Clock, data logger, adjustment: internal battery back-up

Parameter entry: via keys or interfaces

Weight: approx. 5 kg

Housing dim. (H x W x D): 151 x 237 x 285 [mm]  
with handles D = 325 mm

Device protection: EN 61010

Protection class: IP 40

### Connections

Rx input (test object):

5-pin Tuchel socket series C 70 BT 3015000 with bayonet lock

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

Analog I/O: 9-pin, subminiature D-plug  
Temperature input 0 ... 10 V, 0 ... 20 mA, 4 ... 20 mA  
analog output 0 ... 10 V, scaling error ≤ 2,5 %

Digital I/O: 37 pin, subminiature D socket

PLC interface: ext. DC supply 20 V ... 24 V ... 30 V, pos. logic  
with current consuming PLC inputs

$U_{min} = 15 V$   $U_{max} = 30 V$   $I_{max} = 150 mA$

5 Bit for evaluation <<, <, =, >, >>

1 Bit measure end

1 Bit measure busy

1 Bit measure error

6 Bit for binary selection of the device setting

4 Bit for control input

3 Bit for control output

1 Bit START/STOP each for measurement,  
comparator, data logger, min./max., printer

Relay outputs: one switching contact each for the  
evaluation results <<, <, =, >, >>

switching power 30 W

voltage load max. 48 V

current load max. 1 A

Contact input: measurement START/STOP with footswitch

### Interface connections:

RS232C interface:

9-pole Subminiature D-socket

Baud rate 300 - 38 400

Protocol ANSI X 3.28-1976 subcategory 2.1, A3

SCPI command language, version 1995.0

data recording to a printer with RS232 interface  
is possible

IEEE488 interface (optional):

24 pole plug connection standardized for open collector output  
(E1) SH1, AH1, T6, TEØ, L4, LEØ, SR1, RL1, PPØ, DC1, DTØ, CØ,  
SCPI command language, version 1995.0

### Order Information

**RESISTOMAT®** **Model 2329**  
with RS232 interface

**RESISTOMAT®** **Model 2329-V001**  
with RS232 and IEEE488 interface

**RESISTOMAT®** **Model 2329-V002**  
with RS232 interface and 6 channel switch system

**RESISTOMAT®** **Model 2329-V801**  
for the check of airbag igniters,  
measuring current < 10 mA, voltage load < 2 V

### Accessories

**Measurement lead** **Model 2329-K001**  
4-pole, 1.5 m long shielded cable with banana plugs

**RS232 data transmission lead** **Model 9900-K333**  
for PC connection

**USB Converter** **Model 9900-K351**

**Ethernet Converter** **Model 9900-K453**

**Pt 100 temperature sensor** **Model 2392-V001**  
with 2.5 m shielded connection line and connection plug

**Pyrometer** **Model 2328-Z001**  
for temperature range 0 ... 100 °C

**Device and documentation software** **Model 2329-P001**  
incl. data transmission cable model 9900-K333

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

**9 pin socket** **Model 9900-V609**  
for analog I/O interface

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

**Assembly set for 19" 3U rack mounting** **Model 2329-Z004**

**IEEE488 interface module** **Model 2329-Z006**

**DKD/DAKs Calibration Certificate** **Model 23DKD-2329**

**WKS Calibration Certificate** **Model 23WKS-2329**

Kelvin measuring tongs and probes **see data sheet 2385 EN**

Wire holding device for wires up to 2500 mm<sup>2</sup> **see data sheet 2381 EN**

Calibration resistors **see data sheet 1240 EN**