RESISTOMAT® 2316

The new generation of milliohmmeter

burster

...ready for any job

SHORT OPERATION MANUAL

RESISTOMAT®
Model 2316

Valid from: 27.11.2019

Manufacturer:
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2956-BA2361KEN-5999-111530

Note:

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The measurement solution.

EU-Konformitätserklärung (nach EN ISO/IEC 17050-1:2010)

EU-Declaration of conformity (in accordance with EN ISO/IEC 17050-1:2010)

Name des Ausstellers: burster präzisionsmesstechnik gmbh & co kg
Issuer's name:

Anschrift des Ausstellers: Talstr. 1-5
Issuer's address: 76593 Gernsbach, Germany

Gegenstand der Erklärung: Milliohmmeter RESISTOMAT® für Fertigung und Labor
Object of the declaration: *Milliohmmeter RESISTOMAT® for Production and Laboratory*

Modellnummer(n) (Typ): 2316
Model number / type:

Diese Erklärung beinhaltet obengenannte Produkte mit allen Optionen
This declaration covers all options of the above product(s)

Das oben beschriebene Produkt ist konform mit den Anforderungen der folgenden Dokumente:
The object of the declaration described above is in conformity with the requirements of the following documents:

Dokument-Nr. *Documents No.*	**Titel** *Title*	**Ausgabe** *Edition*
2011/65/EU	Richtlinie zur Beschränkung der Verwendung bestimmter gefährlicher Stoffe in Elektro- und Elektronikgeräten *Directive on the restriction of the use of certain hazardous substances in electrical and electronic equipment*	2011
2014/35/EU	Richtlinie zur Harmonisierung der Rechtsvorschriften der Mitgliedsstaaten über die Bereitstellung elektrischer Betriebsmittel zur Verwendung innerhalb bestimmter Spannungsgrenzen auf dem Markt *Directive on the harmonization of the laws of the Member States relating to the making available on the market of electrical equipment designed for use within certain voltage limits*	2014
2014/30/EU	Richtlinie zur Harmonisierung der Rechtsvorschriften der Mitgliedsstaaten über die Elektromagnetische Verträglichkeit *Directive on the harmonization of the laws of the Member States relating to electromagnetic compatibility*	2014
EN 61010-1	Sicherheitsbestimmungen für elektrische Mess-, Steuer-, Regel- und Laborgeräte – Teil 1: Allgemeine Anforderungen *Safety requirements for electrical equipment for measurement, control and laboratory use – Part 1: General requirements*	2010 + Cor.:2011
EN 61326-1	Elektrische Mess-, Steuer-, Regel- und Laborgeräte – EMV-Anforderungen – Teil 1: Allgemeine Anforderungen *Electrical equipment for measurement, control and laboratory use – EMC requirements – Part 1: General requirements*	2013
EN 55011	Industrielle, wissenschaftliche und medizinische Geräte – Funkstörungen – Grenzwerte und Messverfahren *Industrial, scientific and medical equipment – Radio-frequency disturbance characteristics – Limits and methods of measurement*	2009

Gernsbach — Ort / *place*
20.04.2016 — Datum / *date*
i.V. Christian Karius — *Quality Manager*

Dieses Dokument ist entsprechend EN ISO/IEC 17050-1:2010 Abs. 6.1g **ohne Unterschrift** gültig
According EN ISO/IEC 17050 this document ***is valid without a signature***.

Safety instructions

Whilst the hardware and software has been developed and tested in accordance with the state of the art, they cannot be guaranteed totally free of errors. Thus this instrument or part of this instrument must not be used to influence a control system from which risk to life or property can arise directly or indirectly without additional protection. Maintenance and repair work must only be performed by trained, competent technical personnel familiar with the associated risks.

- The instrument has two measurement inputs connected in parallel; only one of these inputs must be used at any one time. No leads must be plugged into the unused connector for safety reasons. The unused circular socket must be covered with the cap supplied.
- Before starting any measurement, make sure that the device under test does not carry an external voltage (e.g. mains voltage, voltage generated by a rotating motor etc.).
- Take care when handling inductive devices under test. By the physical nature of these devices, life-threatening induction voltages can be generated when the test current is disconnected. Read the instructions in the “Load selection”section.
- To avoid electric shock, never open the case. The instrument contains no components that can be maintained, adjusted or calibrated by the customer. The instrument can operate with all standard mains voltages in the world without needing to be switched over.
- Always replace fuses with fuses of the same type. Never use fuses with different characteristics or other rated currents. Before changing the fuse, pull out the mains plug and short-circuit the device under test.
- Should foreign bodies or liquids get inside the unit, disconnect the main lead. Get the instrument checked over by qualified technical personnel before using it again.
- Always leave repair work to qualified technical personnel.
- If you do not intend using the instrument for a prolonged period, take the mains plug out of the socket. Always pull on the connector itself, never the cable.
- Should liquid from a broken display escape from the unit and get on your hands, wash your hands thoroughly using soap and water. Remove any residues of the liquid with acetone or ethanol.
- Always keep the instrument out of rain or away from moisture to prevent a fire hazard or the risk of electric shock.
- Check the mains lead before use.

Preparations for use

Unpacking the unit

The instrument weighs 3.5 kg and is packaged accordingly to protect against shock.
Unpack the instrument carefully and verify that all items are present.

This normally includes: 1 RESISTOMAT® model 2316 milliohmmeter
1 power lead
1 operation manual

Inspect the instrument carefully for damage.

If you suspect that the instrument has been damaged during shipping, notify the delivery company immediately.
The packaging should be retained for examination by a representative of the manufacturer and/or the delivery company.
The RESISTOMAT® model 2316 should be shipped only in its original packaging or in packaging capable of providing an equivalent degree of protection.

Using the instrument for the first time

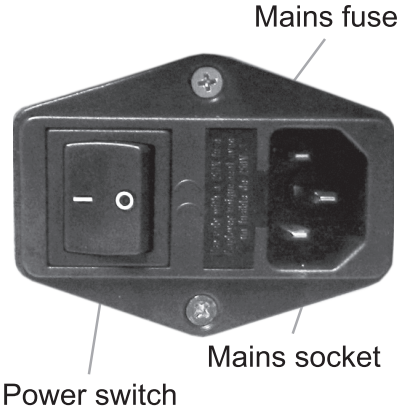
If condensation has formed on the instrument, make sure that the instrument is completely dry (including inside) before switching it on.
Connect the instrument to a standard grounding outlet using the power lead supplied.

WARNING! The instrument must never be switched on if it shows signs of damage during shipping.
The case or measurement input can carry life-threatening voltages if the mains voltage is transferred as a result of damage.

Supply voltage, power switch and mains fuse

The instrument can be operated with supply voltages of 85 to 264 V AC without presetting the mains voltage.
The power consumption is about 30 VA.

The fuse rating for a supply voltage of 230 V or 115 V is 3.15 AT.



The mains fuse is located between the mains socket and power switch on the rear of the unit.
Make sure that the unit is fully disconnected from the electrical mains before changing the fuse. This should be done by removing the power lead from the mains socket; always pull on the connector itself, never the cable.

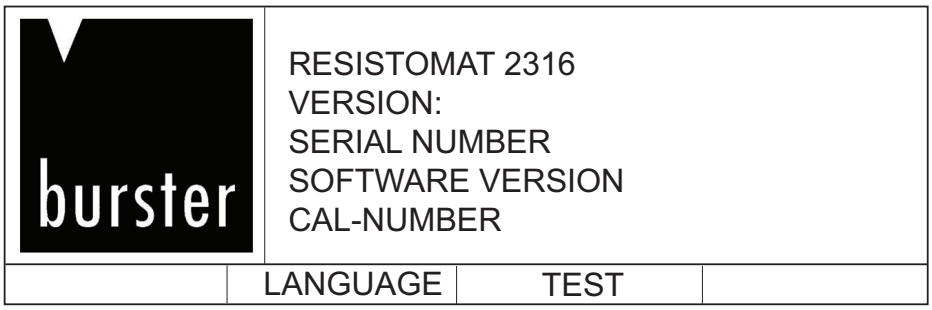
Only use original fuses 5 x 20 mm 3.15 AT.

Setup and installation

- Ensure that there is an adequate supply of air to prevent heat building up in the instrument.
- Do not place the instrument on surfaces such as carpets or cloths, or near materials such as curtains or wall hangings that could prevent the air circulating.
- Do not place the instrument at an inclined angle. It should always be used in a horizontal position.
- Keep the instrument away from apparatus, equipment, machines and installations that generate strong magnetic fields.
- Do not place heavy objects on the instrument.
- Condensation can form inside the instrument if it is taken directly from a warm room into a cold room. Wait a few hours before switching on the instrument.
- Make sure that the display panel is not mechanically stressed.
- The instrument must have reached thermal equilibrium.
- Select the installation location so that the instrument is not exposed to extreme temperatures (operating temperature range 0 to 50° C) or temperature variations, nor to humidity, direct sunlight, incandescent lamps, dust, oils, organic solvents, other aerosols or severe vibrations or mechanical shocks. In very dirty industrial environments, it is recommended to use a suitable protective enclosure.

Functional test

After switching on the instrument, the following text appears on the display for about 3 s:



Then the instrument switches directly to the measurement menu.

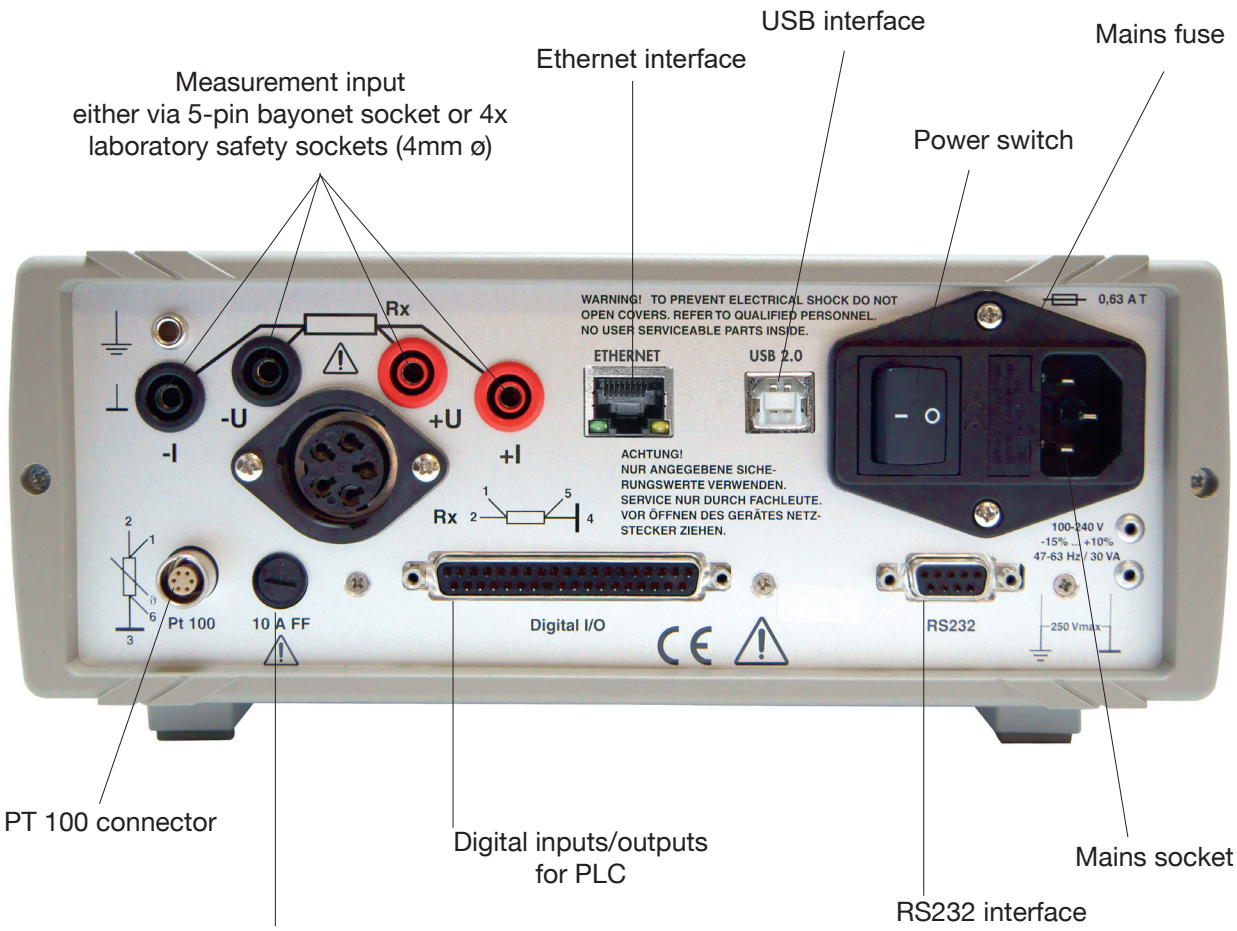
Calibration

The meter was calibrated before shipping. The calibration history of the instruments used for the calibration can be traced to the government measurement standard in accordance with DIN ISO 9000ff. The meter should be recalibrated after a period of about one year. Calibration is performed using the RS232 interface, and should only be performed at the manufacturer's premises. The customer can perform the calibration in-house by purchasing the PC software 2316-P001.

Storage

For long-term storage, pack the unit, along with a desiccant, into an airtight, sealed polyethylene bag. Do not store the unit where it will be exposed to sunlight or other light sources. Take care to ensure that nothing comes in contact with the display panel. The storage temperature range is 0 to 70°C. However, to maximize the lifespan of the display, the temperature should not exceed 50°C.

Power supply and signal-lead connectors



IMPORTANT: additional protection of the measurement current using a super quick-acting 10 A fuse 6.3 x 32 mm, 600 V_{AC}, 50 kA breaking capacity (or greater) RS-Components #209-9406 (in Germany)
Only use this fuse

NOTICE

- Use a suitable connecting cable with a dual-shield construction (aluminum foil cladding plus braided shield) for the communications port connection and the PLC I/O signal control lines.
- Observe the minimum line length required.
- Use metallic or metal-plated connecting plugs. Connect the braided shield of shielded cables to the connector casing.
- When using detachable extension leads, make sure the shielding is continuous.
- Always use a Pt100 sensor with shielded cable to connect to the Pt100 connector. The cable shield must not be in contact with the connector shell if grounding of the sensor is unclear. Otherwise currents circulating in a ground loop can cause measuring errors.
- **Only one device under test must be connected across the two parallel measurement inputs. No leads must be plugged into the unused connector for safety reasons.**

Front panel

Front panel with backlit LCD display and integral membrane keypad with tactile feedback

Button functions

[START] : In the measurement menu this button starts a measurement

In the Configuration menu this button is assigned different functions depending on the text shown on the display above the button (soft key).

[STOP] : In the measurement menu this button stops a measurement.

In the Configuration menu this button is assigned different functions depending on the text shown on the display above the button (soft key).

[⇧] : In the measurement menu and for manual range-selection can be used to increase the measuring range.

In the Configuration menu the button has a cursor (up) function.

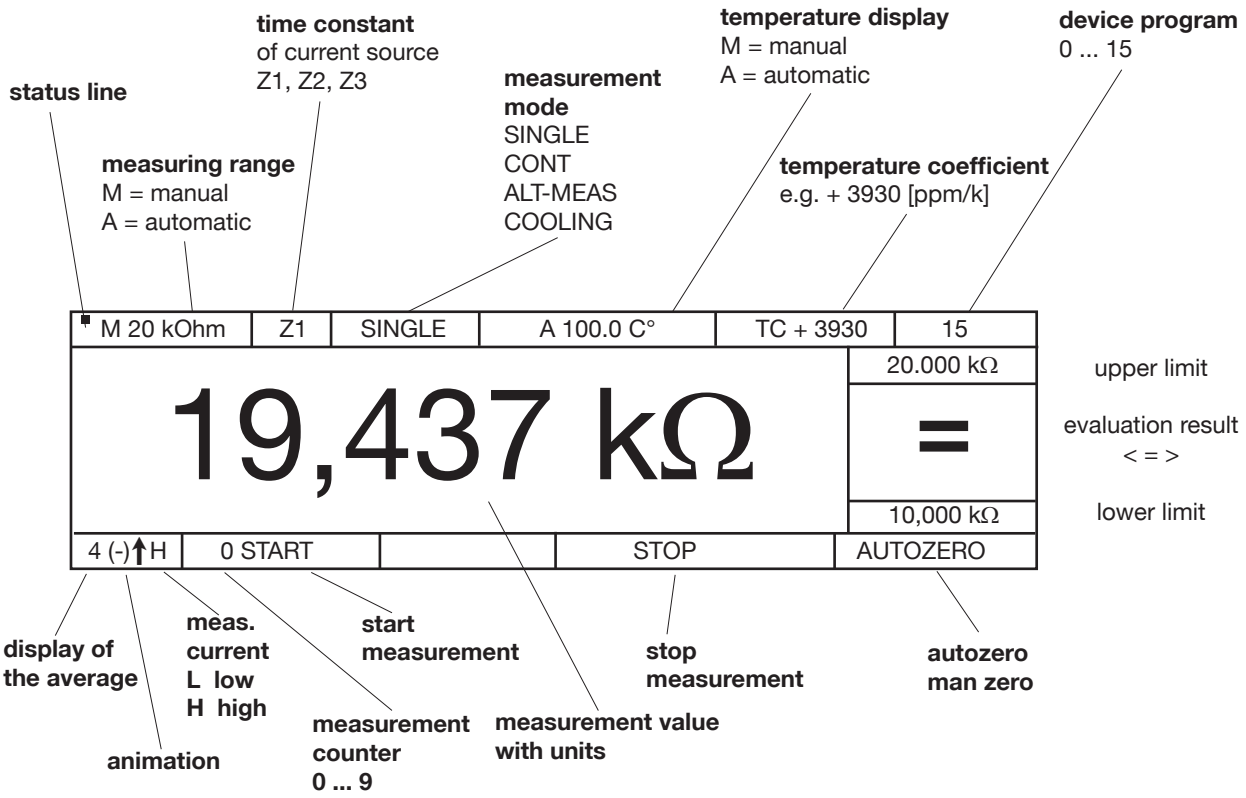
[⇩] : In the measurement menu and for manual range-selection can be used to decrease the measuring range.

In the Configuration menu the button has a cursor (down) function.

[⇧] : Pressing both buttons simultaneously
[⇩] Opens the Configuration menu.

Operation

Meaning of the individual display segments



Limits and the evaluation result are only displayed when the comparator is enabled. When a measurement is in progress, the measurement counter increments from 0 to 9, changing whenever a new measurement result is available.

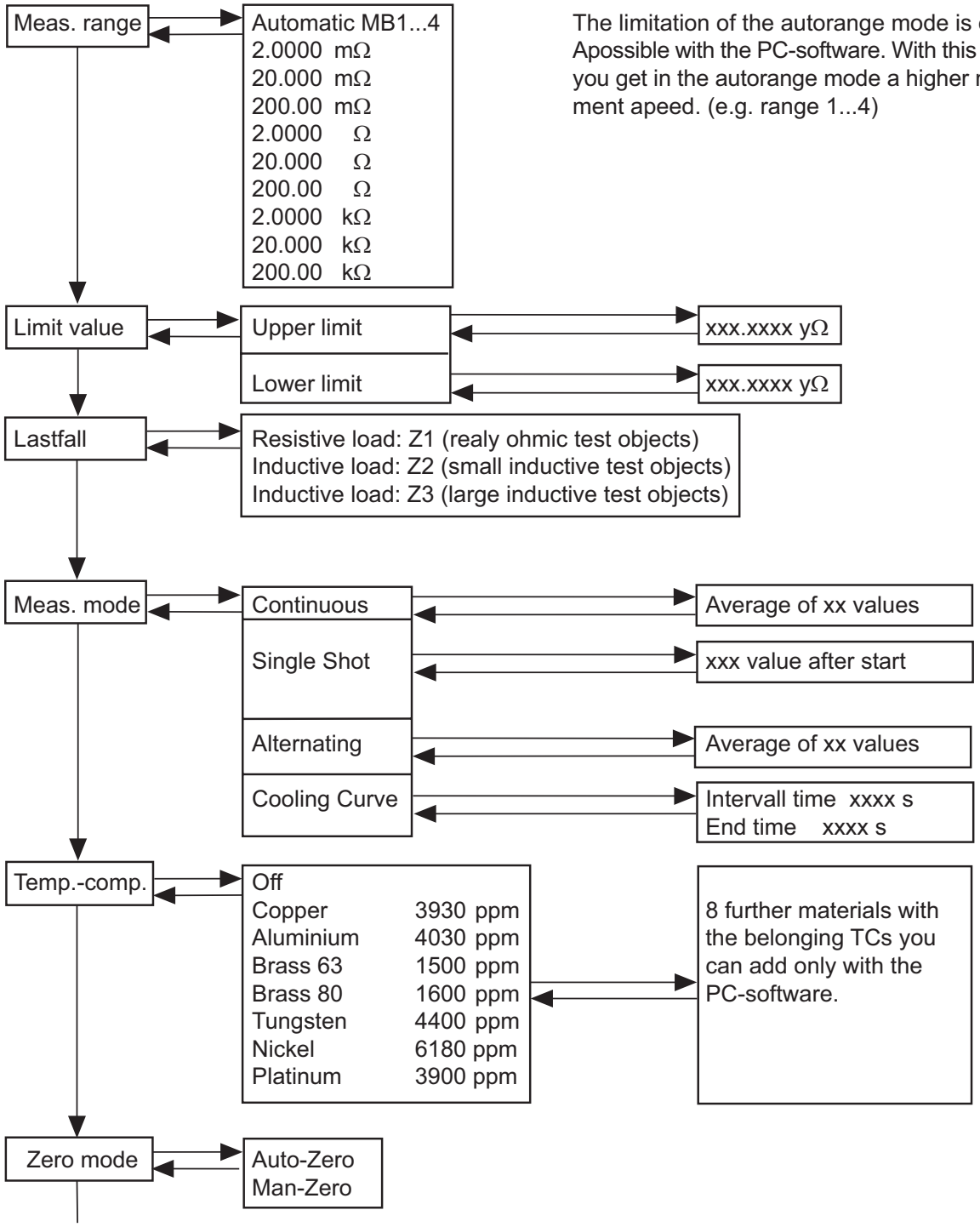
Danger warnings and error messages flash.

The animation indicator (-) flashes at second intervals to show that the meter is running and performing a measurement.

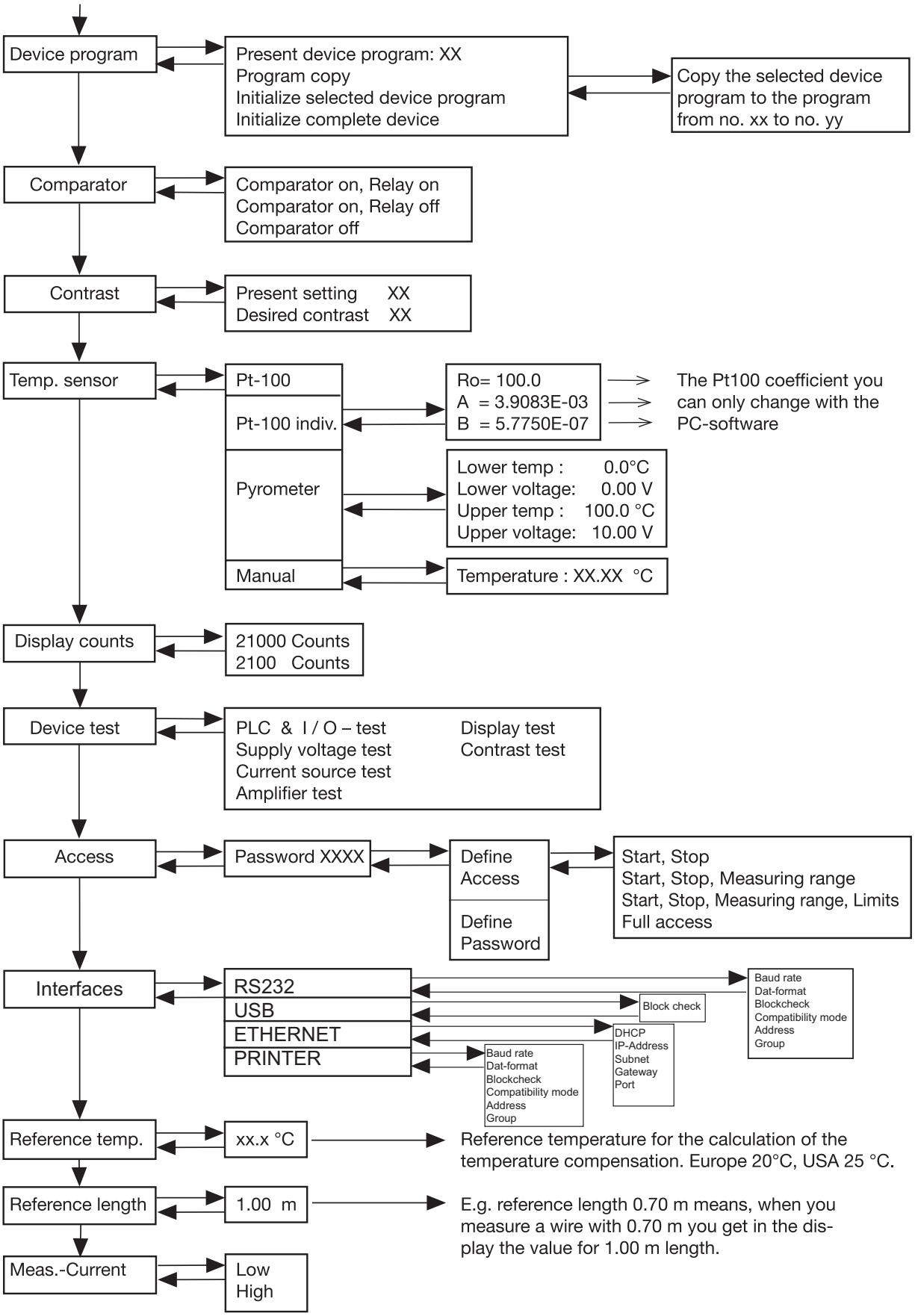
Configuration Program

After switch on the instrument, the operating language can be selected in the instrument identification menu.

Pressing both arrow buttons simultaneously opens the configuration program. ENTER confirms the selected menu option. ESC can be used to return from any option in the configuration menu back to the next menu option down. If a value needs to be changed e.g. limit, arrows appear above the START/STOP buttons to move the cursor to the left/right. The numerical value is changed using the up/down arrow buttons (on the right-hand side) on the front panel.

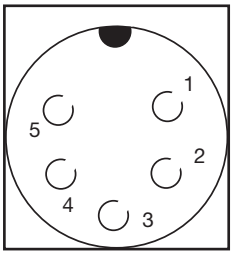


The limitation of the autorange mode is only Apossible with the PC-software. With this limitation you get in the autorange mode a higher measure-ment apeed. (e.g. range 1...4)


Device program
Present device program: XX
Program copy
Initialize selected device program
Initialize complete device
Copy the selected device program to the program from no. xx to no. yy
Comparator
Comparator on, Relay on
Comparator on, Relay off
Comparator off
Contrast
Present setting XX
Desired contrast XX
Temp. sensor
Pt-100
Pt-100 indiv.
Ro= 100.0
A = 3.9083E-03
B = 5.7750E-07
The Pt100 coefficient you can only change with the PC-software
Pyrometer
Lower temp : 0.0°C
Lower voltage: 0.00 V
Upper temp : 100.0 °C
Upper voltage: 10.00 V
Manual
Temperature : XX.XX °C
Display counts
21000 Counts
2100 Counts
Device test
PLC & I / O – test
Supply voltage test
Current source test
Amplifier test
Display test
Contrast test
Access
Password XXXX
Define Access
Define Password
Start, Stop
Start, Stop, Measuring range
Start, Stop, Measuring range, Limits
Full access
Interfaces
RS232
USB
ETHERNET
PRINTER
Block check
Baud rate
Dat-format
Blockcheck
Compatibility mode
Address
Group
DHCP
IP-Address
Subnet
Gateway
Port
Baud rate
Dat-format
Blockcheck
Compatibility mode
Address
Group
Reference temp.
xx.x °C
Reference temperature for the calculation of the temperature compensation. Europe 20°C, USA 25 °C.
Reference length
1.00 m
E.g. reference length 0.70 m means, when you measure a wire with 0.70 m you get in the display the value for 1.00 m length.
Meas.-Current
Low
High

Rear panel
Description of connector sockets

Measurement input

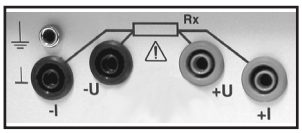


View towards socket

1	+ U
2	+ I
3	Analog GND
4	- I
5	- U

Connector shell : PE (protective ground) potential
Mating connector: burster model 9900-V172

Note: The current branch is protected by a fuse 6.3 x 32 [mm] 10AFF. (rear side of unit)

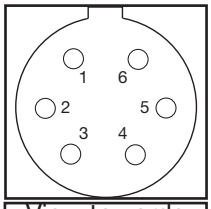


- I is at FE potential

CAUTION

Only one measurement input must be used at any one time.
No leads must be plugged into the unused input for safety reasons.

Pt100 input



View towards socket

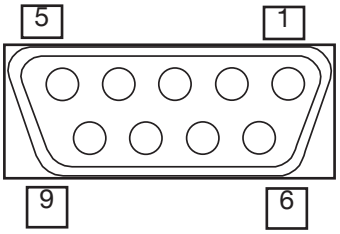
1	+ U
2	+ I
3	- I
4	Functional ground
5	Functional ground
6	- U

Connector shell : PE (protective ground) potential

Mating connector : burster model 4291-0
Two-wire technology is possible if the relevant conductors are joined together at the sensor.

Note: NEVER connect the cable shield to the connector shell if the grounding at the sensor end is unclear. Otherwise, if there is a ground connection at the temperature sensor, measuring errors may result from circulating ground-loop currents.(Connector shell is protective ground)

RS232 interface



9-pin min sub-D female connector
View towards socket

connected in instrument

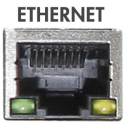
1	NC
2	TXD
3	RXD
4	
5	Digital GND (grounded internally)
6	
7	NC
8	
9	NC

Connector shell : PE potential
Mating connector : Model 9900-V209
Matching data cable : Model 9900-K333

USB interface

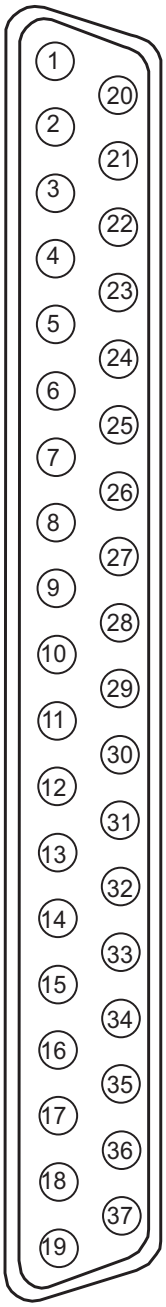
Use a USB A male to USB B male cable (burster part number 9900-K349, length 2m) to connect to a PC USB port.

Ethernet interface



Use a standard patch cable of category "Cat5e" or above for connecting to an Ethernet network.

Digital I/O



37-pin min sub-D
View towards socket

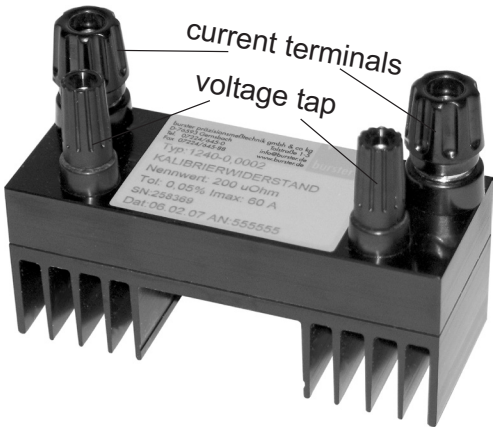
Pin	Function	Function
1	Relay	<, NO contact
2	Not used	
3	Relay	=, NO contact
4	PLC output	Device program saved ok
5	Relay	>, NO contact
6	Relay	Relay common contact
7	PLC output	Busy
8	PLC output	End of measurement
9	PLC output	Measuring error
10	PLC output	<
11	PLC output	Device program 0 mirrored
12	PLC output	=
13	PLC output	Device program 1 mirrored
14	PLC output	>
15	PLC output	DANGER
16	PLC output	Device program 2 mirrored
17	PLC output	Device program 3 mirrored
18	PLC	+ 24 V External
19	PLC	+ 24 V External
20	PLC	Ground 24 V External
21	PLC input	START / STOP measurement
22	PLC input	Comparator ON / OFF
23	PLC input	Remove load (cooling curve)
24	PLC input	Spare 1
25	PLC input	START printer
26	PLC input	Save device program
27	PLC input	Spare 2
28	PLC input	Device program 0
29	PLC input	Device program 1
30	PLC input	Device program 2
31	PLC input	Device program 3
32	PLC input	Spare 3
33	Not used	
34	Pyrometer	+ 10 V Analog input
35	Pyrometer	Ground, FE
36	Foot switch	NO contact
37	Foot switch	NO contact, DGND
Shell	Shield	Protective groun

Connector shell: PE potential
Mating connector: Model 9900-V165

Accessories

Wire holding device model 2381 for wire cross section 0,1 mm²...100 mm².
Wire holding devices for wire cross section up to 2500 mm² are also available.

Kevin Test Tongs model 2385 (small) and model 2386 (large),
Kevin Test Probes model 2387 for the rigth connection of the test object.



Calibration Resistors series 1240 range 100 µΩ up to 200 kΩ for the check and calibration of the RESISTOMAT® 2316.

This resistance measurement instrument leaves nothing to be desired

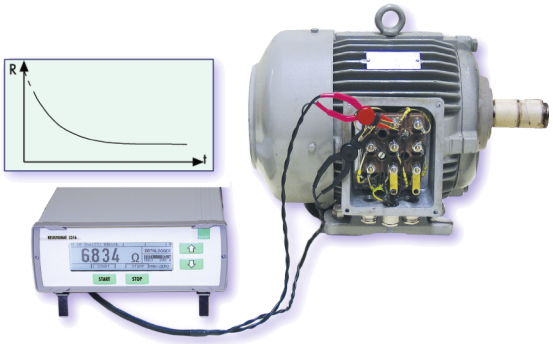
- ✗ Fits for rough industry environs as well as all kind of labs
- ✗ Measuring ranges from 0.1 µΩ up to 200 kΩ
- ✗ Highest precision at maximum price performance ratio
- ✗ Simple handling by intuition
- ✗ Easy-to-know, delivers spontaneous operation success
- ✗ Large backlit LCD display defies dim and bright lighting
- ✗ Sturdy, tough and nearly indestructible keys and housing
- ✗ Menu speaks five languages for international staff

Application examples

Quality control on wire & cable

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

... in combination RESISTOMAT® 2316
and clamping device 2381



Cooling curve measurement on electric motors

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

Further applications

Measurement on windings, switches, relays, heating elements, fuses and many more. With our wide product program consisting of measurement devices and accessories we offer you the optimal complete solution from one competent source.