**OPERATION MANUAL**

# Megohmmeter
# Model 24508

Valid from: 2010-09-17

**Note:**

Exclusion of warranty liability for operating manuals

All information in the present documentation was prepared and compiled with great care and reproduced subject to effective control measures. No warranty is provided for freedom from errors. We reserve the right to make technical changes. The present information as well as the corresponding technical data can change without notice. Reproduction of any part of this documentation or its processing or revision using electronic systems is prohibited without the manufacturer's prior written approval.

Components, devices and measured value sensors made by burster praezisionsmesstechnik (hereinafter referred to as „product") are the results of targeted development and meticulous research. As of the date of delivery, burster provides a warranty for the proper condition and functioning of these products covering material and production defects for the period specified in the warranty document accompanying the product. However, burster excludes guarantee or warranty obligations as well as any liability beyond that for consequential damages caused by improper use of the product, in particular the implied warranty of success in the market as well as the suitability of the product for a particular purpose. Furthermore, burster assumes no liability for direct, indirect or incidental damages as well as consequential or other damages arising from the provision and use of the present documentation.

Präzisionsmessgeräte, Sensoren und Messsysteme
für elektrische, thermische und mechanische Größen

**burster**

ISO 9001

# EG-Konformitätserklärung
*EC- Declaration of Conformity according to EN ISO/IEC 17050-1:2004*

**Name des Herstellers:**          burster präzisionsmesstechnik gmbh & co kg
*Manufacturer's Name:*

**Adresse des Herstellers:**        Talstr. 1-5
*Manufacturer's Address:*          76593 Gernsbach, Germany

**erklärt unter alleiniger Verantwortung, dass das gelieferte Produkt**
*declares under sole responsibility that the product as originally delivered*

**Produktname:**          Megohmmeter   Isolations-Prüfer
*Product Name:*           *Megohmmetre    Insulation Tester*

**Modellnummer(n) (Typ):**      24508
*Models Number / Type:*

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

**mit den folgenden europäischen Richtlinien übereinstimmt und entsprechend das CE-Zeichen trägt:**
*complies with the requirements of the following applicable European Directives, and carries the CE marking accordingly:*

2006/95/EC          Elektrische Betriebsmittel zur Verwendung innerhalb bestimmter Spannungsgrenzen
*Low Voltage*        *Electrical Equipment designed for use within certain voltage limits*

2004/108/EC         Elektromagnetische Verträglichkeit
*EMC*                *Electromagnetic Compatibility*

**Obengenannte Produkte entsprechen folgenden harmonisierten Normen:**
*Above named products conform with the following product standards:*

**Sicherheit:**          IEC 61010-1:2001 / EN 61010-1:2001    Messkategorie 1 *        Schutzklasse 1
*Safety requirements:*                                        CAT 1 *(Safety class 1)*   (110)/ 230 V~ Kat. II

**EMV Störaussendung:**   IEC/CISPR 11:2003 + A1:2004 + A2:2006 / EN 55011:2007 + A2:2007
*EMC Generic emission:*

**EMV Störfestigkeit:**   IEC 61326-1:2005 / EN 61326-1:2006                Industrie Bereich
*EMC Generic immunity:*                                                   *Industrial environment*

**Ergänzende Informationen:** * EN 61010-1:2001  Abs. 6.3.1 c 1):  Ladung $\leq 45\mu C$
                                               Abs. 6.3.1 c 2):  Entladungsenergie $\leq 350$ mJ;
                                               Abs. 6.3.2 b 1):  Kurzschlußstrom $\leq 15$ mA$_{DC}$
*Additional Information: EN 61010-1:2001 Abs. 6.3.1 c: Discharge energy <350 mJ; 6.3.2 b1): short circuit current $\leq 15$ mA$_{DC}$*

Das Produkt wurde in einer typischen Konfiguration getestet.
*The product was tested in a typical configuration.*

**Diese Konformitätserklärung betrifft alle nach Ausstellungsdatum ausgelieferten Produkte:**
*This DoC applies to above-listed products placed on the EU market after:*

Gernsbach              09.07.2008              i.V. Alfred Großmann
                       Datum */ date*          *Quality Manager*

General information

Preparations for use

Controls and connections

Manual operation of the unit

Controlling the unit remotely

Maintenance and customer service

Technical data

![burster logo] **Megohmmeter** **Model 24508**

# Contents

General information

Preparations for use

Controls and connections

Manual operation of the unit

Controlling the unit remotely

Maintenance and customer service

Technical data

General information

Preparations for use

Controls and connections

Manual operation of the unit

Controlling the unit remotely

Maintenance and customer service

Technical data

$C \epsilon$ **This equipment complies with the following product specifications**

**Safety:** **CEI 1010-1 / EN 61010-1 Class I protection**

**Operating voltage: 230 V cat. II**

**EMC:** **Electromagnetic compatibility**

**Interference emission: EN 55011 Group 1 Class B**

**Interference immunity: EN 50082-1**

**CEI 1000-4-2 Level 3; CEI 1000-4-3 Level 2**

**CEI 1000-4-4 Level 2**

# Safety requirements and operating instructions

■ **For reasons of safety, this equipment must only be used by suitably qualified and trained personnel who are aware of the potential hazards.**

⚠ **Read this manual through thoroughly before using the equipment.**

■ With regard to the potential hazards associated with using any electric circuit, it is important that the user is completely familiar with the information concerning the possible capabilities and applications of this equipment and how it works.

■ Under normal conditions of use, there is absolutely no risk to the user of electric shock from this equipment. Nevertheless, high voltages can occur during insulation tests, so all safety-related instructions must be followed to the letter. The various operations must be performed with care and attention by the user. A mistake can have catastrophic results for safety or result in severe damage to the equipment.

■ The protection provided by this equipment may be reduced if it is not used in accordance with the instructions in this manual, or if the user has made technical changes without authorization.

■ This equipment has class I protection (protected by equipment grounding conductor). The equipment is connected to the potential equalization system of the test room via the equipment grounding conductor, which must be tested to VDE 0100 part 410 (IEC 364-4-41).
Before using the equipment, always check that the power lead is undamaged. If the mains fuse has blown, it must be replaced by a fuse with an identical rating; disconnect the equipment from the mains and remove all cables from the front panel before replacing the fuse.

■ This equipment must be installed in a properly ventilated room, and its ventilation systems must not be blocked up or covered. If heat cannot dissipate properly then there is a risk of impaired operation of the equipment and a reduced service life.

■ Never use or operate electrical equipment if either the equipment or you are wet, not even if just your hands or feet are wet.

■ In the event of faults, switch off the voltage immediately and pull out the plug.

■ Notify any damage or anything unusual on electrical equipment to a skilled person immediately.

■ Find out about the relevant maintenance information for this equipment; please refer to the „Maintenance and Customer Service" chapter.

■ Use the test leads provided to connect the object under test to the megohmmeter.

■ During insulation-resistance testing, never touch the test probes or the object under test (high voltage).

■ Measuring the insulation resistance on a capacitive object can be dangerous for the user. A built-in relay ensures that the capacitive discharge of the element under test has a time constant of less than 0.1 s for 1 µF. It is forbidden to touch the object before making sure that it has been completely discharged.

■ Before measuring the insulation resistance it is essential to check that there is no voltage across the terminals of the object under test.

■ Confirming the "MEASURE: ..." function (using button [2]) switches on the voltage source. Certain safety precautions must therefore be followed depending on the programmed test voltage.

■ Key to symbols used:

     Warning – see operating manual

     Warning - Dangerous voltage - risk of electric shock

     Ground terminal

# 1. General information

## 1.1 Use

This equipment, given its specification, can be used for all common applications. It is particularly suitable for resistance measurements across insulators such as cable insulation, films, textiles, floor coverings, insulating oils etc.
With test voltages of 45 V, 100 V, 250 V and 500 V, the unit complies with most test regulations such asDIN 51953, DIN 53482, DIN 54345.
The guard circuit can be used to measure individual resistances in a delta connection e.g. a twin-core cable with common screening, or measuring insulators in a guard ring measuring cell.

The measuring range can be selected manually or automatically. Fast serial measurements can be performed using the integral threshold switch. If the reading lies below an adjustable limit, the threshold monitor trips and enables an isolated relay output. The megohmmeter is suitable for both laboratory and industrial use.

## 1.2 Description

The digital megohmmeter type 24508 is a microprocessor-controlled instrument for measuring insulation resistances. The unit has a clear layout and is housed in a rugged metal case. The individual components are easily accessible, providing ideal servicing conditions.

The measuring range extends from 50 kΩ to 10 TΩ or 5 pA to 10 mA for test voltages of 45 V, 100 V, 250 V and 500 V.

The two-line LCD display and compact menu-driven operation helps the user to set up the unit easily. Of course all settings can also be made via the RS232 interface. The connector for the isolated threshold output and the external test-start/stop is located on the rear panel.

General information

Preparations for use

Controls and connections

Manual operation of the unit

Controlling the unit remotely

Maintenance and customer service

Technical data

## 1.3   Block diagram

General informa-
tion

Preparations for
use

Controls and con-
nections

Manual operation
of the unit

Controlling the
unit remotely

Maintenance and
customer service

Technical data



**Principle of operation**

This unit contains a voltage generator, which outputs a regulated voltage, a measuring unit covering 8 measuring ranges, and one alphanumeric display. A microprocessor controls the various functions such as setup menus, voltage ranges, measuring ranges, computations, RS232 interface. It compares the measured value with a target value set by the user, and signals if the measurement lies above or below this value (via an indicator lamp on the front panel and using a changeover contact accessible on a rear-panel connector).

## 2. Preparations for use

### 2.1 Unpacking the unit

The unit weighs 2.1 kg and is packaged accordingly to protect against shock.
Carefully unpack the unit and verify that all items are present.
This normally includes:    1 digital megohmmeter type 24508
1 power lead
1 pair of instrument leads
1 copy of this manual.

Inspect the unit carefully for damage.

If you suspect that the unit has been damaged during shipping, notify the delivery company within 72 hours.
The packaging should be retained for examination by a representative of the manufacturer and/or the delivery company.
The megohmmeter type 24508 should be shipped only in its original packaging or in packaging capable of providing an equivalent degree of protection.

### 2.2 Using the equipment for the first time

Check that the correct supply voltage 230 V/50 Hz is available. Connect the unit to a standard grounding outlet using the power lead supplied.

**Warning:**   The unit must not be switched on under any circumstances 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.

### 2.3 Supply voltage

The supply voltage is factory set to 230 V~.

Supply voltage:              230 V~ ± 10 %

Frequency range:             50 Hz / 60 Hz

Power consumption:           10 VA

Fuse rating:                 0.16 AF

General information

Preparations for use

Controls and connections

Manual operation of the unit

Controlling the unit remotely

Maintenance and customer service

Technical data

**Preparations for use**

Controls and con- nections

Manual operation of the unit

Controlling the unit remotely

Maintenance and customer service

Technical data

## 2.4 Mains fuse

The mains fuse is located blow the mains socket on the rear of the unit.
**Make sure that the unit is fully disconnected from the electrical mains before changing the fuse.** (Remove the power lead from the grounding outlet).
Only use original fuses 5 x 20 mm 0.16 AF for 230 V~.

## 2.5 Power supply and signal-cable connectors

### DIGITAL I/0



| | | |
|---|---|---|
| 1 | - | Relay common contact |
| 2 | - | Relay NC contact |
| 3 | - | Relay NO contact |
| 4 | - | OV |
| 5 | - | External Start/Stop |

Connector shell : PE (protective ground) potential
Mating connector : Type 9942

### RS232 interface



9-pin min sub-D fe- male connector

View towards socket
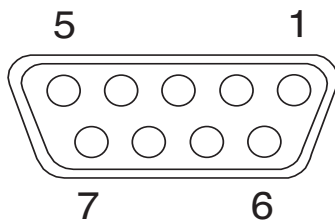
| | | |
|---|---|---|
| 1 | - | NC |
| 2 | - | RXD |
| 3 | - | TXD |
| 4 | - | DTR |
| 5 | - | Digital GND (grounded inter- nally) |
| 6 | - | NC |
| 7 | - | NC |
| 8 | - | CTS |
| 9 | - | NC |

Connector shell : PE (protective ground) potential
Mating connector : Type 9900- V209

## Rear panel of unit

General information

Preparations for use

Controls and connections

Manual operation of the unit

Controlling the unit remotely

Maintenance and customer service

Technical data

Fuse

Mains

0,16 A F

⚠ 230 V +/- 10 %
50 - 60 Hz   < 10 VA

**WARNING**
BEFORE OPENING
DISCONNECT POWER PLUG
SERVICE ONLY BY
QUALIFIED PERSONNEL

RS232

**ACHTUNG**
VOR ÖFFNEN DES GERÄTES
NETZSTECKER ZIEHEN
SERVICE NUR DURCH
FACHPERSONAL

CE

Comparator
Relay output
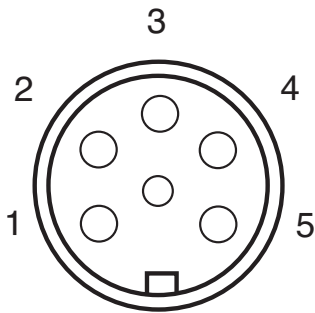and external
Start/Stop

Digital
I/O

General information

Preparations for use

Controls and connections

Manual operation of the unit

Controlling the unit remotely

Maintenance and customer service

Technical data

## 2.6   Functional test

After switching on the unit, the following text appears successively on the display:

> **burster 24508**
>
> **µA / Megohmmeter**

⇩

> **burster 24508**
>
> **Version B xxxxxxx**

⇩

> **RESISTANCE**
>
> **CURRENT**
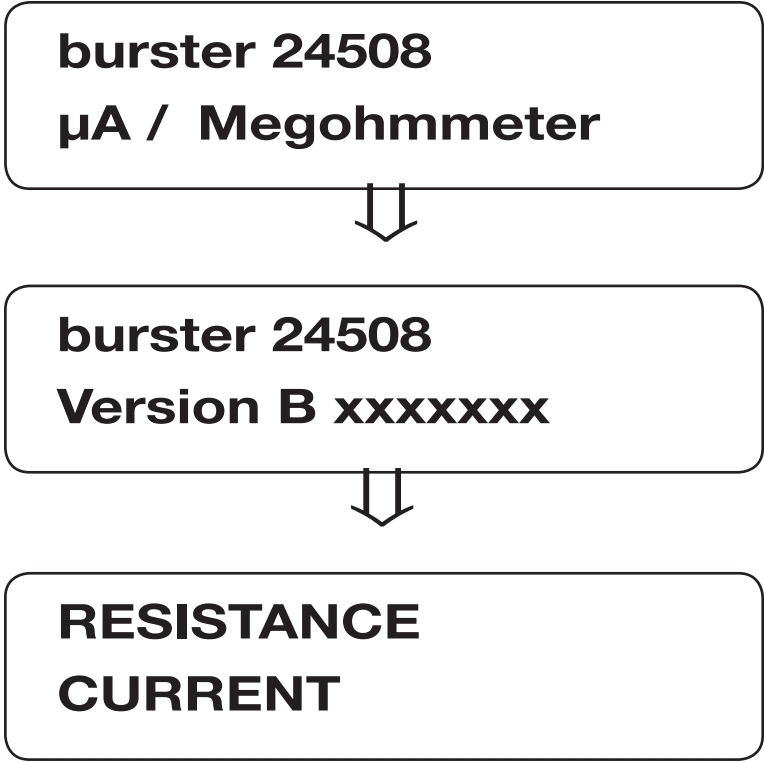
## 2.7   Calibration

The equipment 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 9000pp.

The equipment should be recalibrated after a period of about one year.

Calibration must only be performed at the manufacturer's premises.

## 2.8   Storage

The unit can be stored at temperatures between - 20°C and +70 °C.

If condensation has formed on the unit, make sure that the unit is completely dry (including inside) before switching it on.

No further measures are required before use after storage.

## 3. Controls and connections

### 3.1 Button functions
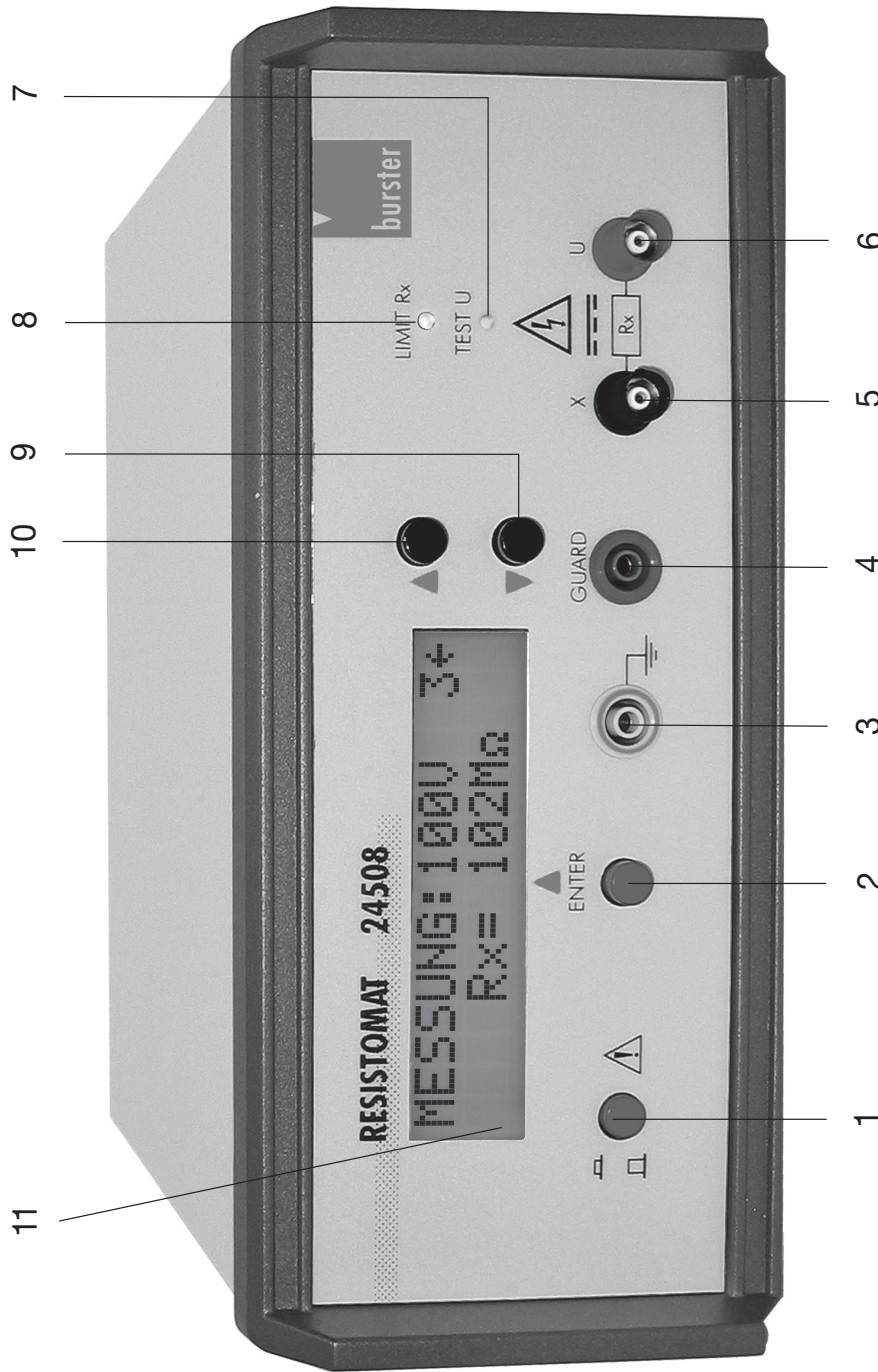


1 - Power switch

2 - Red button with dual function:   1. Confirming the menu selection
                                      2. START/STOP measurement in test menu

3 - Ground PE (protective earth / equipment grounding conductor)

4 - Guard connection for tests on screened cables

5 - Measurement input (X)

6 - Test voltage (U)

7 - Test-voltage indicator lights up when the test voltage is applied across the connectors

8 - Threshold indicator lights up when the measured value lies above the set limit

9+10 Cursor function UP/DOWN for selecting the test parameters

11 - Display for showing the measured value and displaying the different test menus

| General information | Preparations for use | Controls and connections | Manual operation of the unit | Controlling the unit remotely | Maintenance and customer service | Technical data |
|---|---|---|---|---|---|---|

General informa-
tion

Preparations for
use

Controls and con-
nections

Manual operation
of the unit

Controlling the
unit remotely

Maintenance and
customer service

Technical data

## 3.2 Description of connectors

### Test voltage
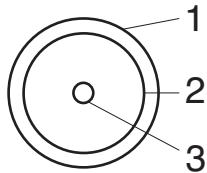


**Red BNC socket**

1 - Plastic insulation

2 - Ground (protective ground)

3 - Voltage output

### Measurement input
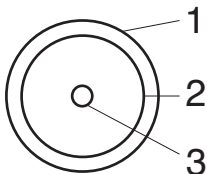


**Black BNC socket**

1 - Plastic insulation

2 - Guard (functional ground)

3 - Measurement input

### Guard connector
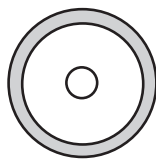


**Blue ø 4 mm safety socket**

for ø 4 mm safety bunch plug

### Ground socket
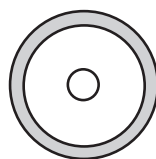


**Green/Yellow ø 4 mm safety socket**

for ø 4 mm safety bunch plug

# 4. Manual operation

## 4.1 General instructions

Before operating the 24508 and connecting any electrical leads, first study the „Safety requirements and operating instructions" chapter.
**Procedure**

- Place the unit on a stable work surface, and observe the directions on proper ventilation.

- Connect the unit to a mains outlet fitted with an equipment grounding contact, and power up the unit by pressing the mains switch [1]. The illuminated display indicates that the unit is running. If the display does not come on, check the electrical connection to the mains and the fuse if necessary (See „Maintenance and warranty" chapter)

- Connect the megohmmeter to the object under test according to the type of measurement to be made (the chapter „General information on the megohmmeter" in the appendix contains more details on this).

- Move the cursor in the menu „Resistance/Current" into the required position and then confirm your selection with button [2].
  Proceed to select the required settings in the subsequent menus.

  Confirming the "MEASURE: ..." function switches on the voltage source. Certain safety precautions must therefore be followed depending on the programmed test voltage.
  Pressing any control button during a test will abort the test and switch off the voltage source. Pressing one of the two selection keys [9] or [10] takes you back through the various functions.

- We recommend that after each test, you leave the object under test connected to the megohmmeter for a short time to allow the residual voltage across the terminals of the object under test to decay away (discharge time about 0.1 s for 1 µF).

General information

Preparations for use

Controls and connections

Manual operation of the unit

Controlling the unit remotely

Maintenance and customer service

Technical data

General informa-
tion

Preparations for
use

Controls and con-
nections

Manual operation
of the unit

Controlling the
unit remotely

Maintenance and
customer service

Technical data

## 4.2   Setting the measurement time

A time of up to 999 s (> 16 min.) can be preset in the „Time of Measure" menu. Once the measurement time has elapsed, the unit goes automatically into the stop state, and the value last measured is saved in the display.
The last measured value is transferred via the RS232 interface at the end of the measurement time.

## 4.3   Threshold switch

If the measured value exceeds the threshold, i.e. the test object is OK, the relay closes and the „R LIMIT" LED on the front panel comes on. An isolated changeover contact is provided for external processing (max. 48 V, 1 A). The measured-value display and the test assessment are saved until a new measurement is initiated.
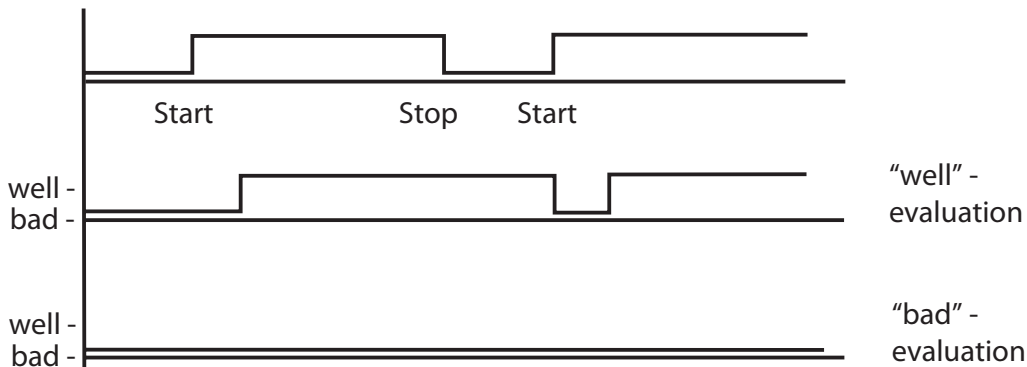


## 4.4   Starting a measurement

After switching on the unit, it opens in test mode with the parameters last entered and saved, such as measuring range, test voltage and threshold. The measurement can be launched manually using button [2] on the front panel or via an isolated contact on the rear of the unit.

General information

Preparations for use

Controls and connections

Manual operation of the unit

Controlling the unit remotely

Maintenance and customer service

Technical data

## 4.5 Error messages

In the event of measurements falling outside the measuring range, various error messages appear on the display as follows:

**LOWER-RANGE,**
if the reading from the object under test is less than the set measuring range (for manual range selection).

**UPPER-RANGE,**
if the reading from the object under test is greater than the set measuring range (for manual range selection).

**$R_x > R_{maxi}$,**
if the reading from the object under test is greater than the maximum measuring range (for automatic range selection only).

**Error $U_{test}$,**
if there is a short circuit or the test current is too large.

## 4.6 Example of performing a measurement in Auto range mode with preset threshold

1.  - First select the "RESISTANCE" operating mode and then "THRESHOLD" using the selection buttons [9] and [10], and confirm with [2].

    - The threshold can be changed in the „PARAMETERS" menu.

    - Use the two selection buttons to set the flashing digit to the value required and then confirm.

    - Repeat this step for all subsequent digits and then close this function.

2. - To change the test voltage, select the U TEST menu, select the test voltage required and confirm with button [2].
   Then select the MEASURE menu and confirm.

3. - The test parameters such as test voltage and measuring range are now displayed in the top line.
   MEASURE: xxxV Bx

4. - Press button [2] to start the measurement. The "TEST V" indicator lamp shows that the voltage is applied to the test object. A few seconds later its resistance value is displayed. If this value is greater than the preset threshold, the "R LIMIT" indicator lamp signals that the relay has switched.

   - Pressing any button during the test aborts this test.

- The principle for manual measurements is the same. In this case the range is selected in the "MANUAL MODE" menu.

Note:
Not all test voltages are available in the lowest (B1) and the highest (B8) range.

| | | | | | 45 V | 100 V | 250 V | 500 V |
|---|---|---|---|---|---|---|---|---|
| B1 | 50 | kΩ | ./. | 1 MΩ | x | x | (2) | (2) |
| B2 | 500 | kΩ | ./. | 10 MΩ | x | x | x | x |
| B3 | 5 | MΩ | ./. | 100 MΩ | x | x | x | x |
| B4 | 50 | MΩ | ./. | 1 GΩ | x | x | x | x |
| B5 | 500 | MΩ | ./. | 10 GΩ | x | x | x | x |
| B6 | 5 | GΩ | ./. | 100 GΩ | x | x | x | x |
| B7 | 50 | GΩ | ./. | 1 TΩ | x | x | x | x |
| B8 | 500 | GΩ | ./. | 10 TΩ | (1) | x | x | x |

(1) - reduced accuracy

(2) - The error message „Error U$_{test}$" is displayed.

## 4.7 Overview of operation

After switching on the unit, it jumps directly to the test mode last selected. If the RS232 data transfer lead is connected, the unit jumps directly into **SLAVE MODE**.

ON

```
┌─────────────────────────┐
│   burster 24508         │
│   µ A/MEGOHMMETER       │
└─────────────────────────┘
            │
            ▼
┌─────────────────────────┐
│   burster 24508         │
│   Version B 0000412     │
└─────────────────────────┘
```

| | |
|---|---|
| FRANCAIS | RESISTANCE → R |
| ENGLISH | CURRENT → I |
| GERMAN | RS232 INTERFACE → RS232 |
| | RETURN |

Select the menu and confirm with "Enter [2]

## CURRENT MEASUREMENT

$U_m$ = MEAS. VOLTAGE

| | | |
|---|---|---|
| B8 | I(mA) | $< 0,02 * U_m$ |
| B7 | I(µA) | $< 2 * U_m$ |
| B6 | I(µA) | $< 0,2 * U_m$ |
| B5 | I(µA) | $< 0,02 * U_m$ |
| B4 | I(nA) | $< 2 * U_m$ |
| B3 | I(nA) | $< 0,2 * U_m$ |
| B2 | I(nA) | $< 0,02 * U_m$ |
| B1 | I(pA) | $< 2 * U_m$ |
| Zurück | | |

| | |
|---|---|
| Umess | = 45V |
| Umess | = 100V |
| Umess | = 250V |
| Umess | = 500V |
| RETURN | |

MEASUREMENT

MEASUREMENT: xxx V
RETURN

U MEASUREMENT
MEAS. RANGE
MEASUREMENT
RETURN

AUTOMATIC
MANUAL
MEAS. TIMER
RETURN

MEAS. TIME
XXmin XXs

R
R

**RS232 INTERFACE**



SLAVE MODE

With a connection from pin 4 to pin 9 inside the 9-pin socket the device goes direct in the salve mode.

PARAMETER

RETURN

RS232

RS232

b = Baudrate
n = Data bits
s = Stop bits

| b = 9600 | n = 8 | s = 1 |
| b = 4800 | n = 8 | s = 1 |
| b = 2400 | n = 8 | s = 1 |
| b = 1200 | n = 8 | s = 1 |

RETURN

General information

Preparations for use

Controls and connections

**Manual operation of the unit**

Controlling the unit remotely

Maintenance and customer service

Technical data

Side tabs: General information · Preparations for use · Controls and connections · **Manual operation of the unit** · Controlling the unit remotely · Maintenance and customer service · Technical data

## RESISTANCE MEASUREMENT

Measuring

Measuring : xxx V

| Measuring : xxx V |
|---|
| Return |

| Utest | = | 45V |
|---|---|---|
| Utest | = | 100V |
| Utest | = | 250V |
| Utest | = | 500V |
| Return | | |

| Utest | = | 45V |
|---|---|---|
| Utest | = | 100V |
| Utest | = | 250V |
| Utest | = | 500V |
| Return | | |

| U Meas. |
|---|
| Meas. Range |
| Measuring |
| Return |

Measuring

| Measuring : xxx V B x |
|---|
| Return |

| B1 | 50 kΩ | < R < | 1 MΩ |
|---|---|---|---|
| B2 | 500 kΩ | < R < | 10 MΩ |
| B3 | 5 MΩ | < R < | 100 MΩ |
| B4 | 50 MΩ | < R < | 1 GΩ |
| B5 | 500 MΩ | < R < | 10 GΩ |
| B6 | 5 GΩ | < R < | 100 GΩ |
| B7 | 50 GΩ | < R < | 1 TΩ |
| B8 | 500 GΩ | < R < | 10 TΩ |
| Return | | | |

| B1 | 50 kΩ | < R < | 1 MΩ |
|---|---|---|---|
| B2 | 500 kΩ | < R < | 10 MΩ |
| B3 | 5 MΩ | < R < | 100 MΩ |
| B4 | 50 MΩ | < R < | 1 GΩ |
| B5 | 500 MΩ | < R < | 10 GΩ |
| B6 | 5 GΩ | < R < | 100 GΩ |
| B7 | 50 GΩ | < R < | 1 TΩ |
| B8 | 500 GΩ | < R < | 10 TΩ |
| Return | | | |

| AUTOMATIK |
|---|
| Manual |
| Limit Value |
| Meas. Time |
| Return |

| Gr = xxx E x Ω |
|---|
| PARAMETER |

| Meas. Time |
|---|
| XXmin XXs |

Choose with key [9] or [10] the value per digit and confirm with Enter [2]

| Limit Value |
|---|
| $R_x$= x,xx MΩ |

R

R

General informa-tion

Preparations for use

Controls and con-nections

Manual operation of the unit

Controlling the unit remotely

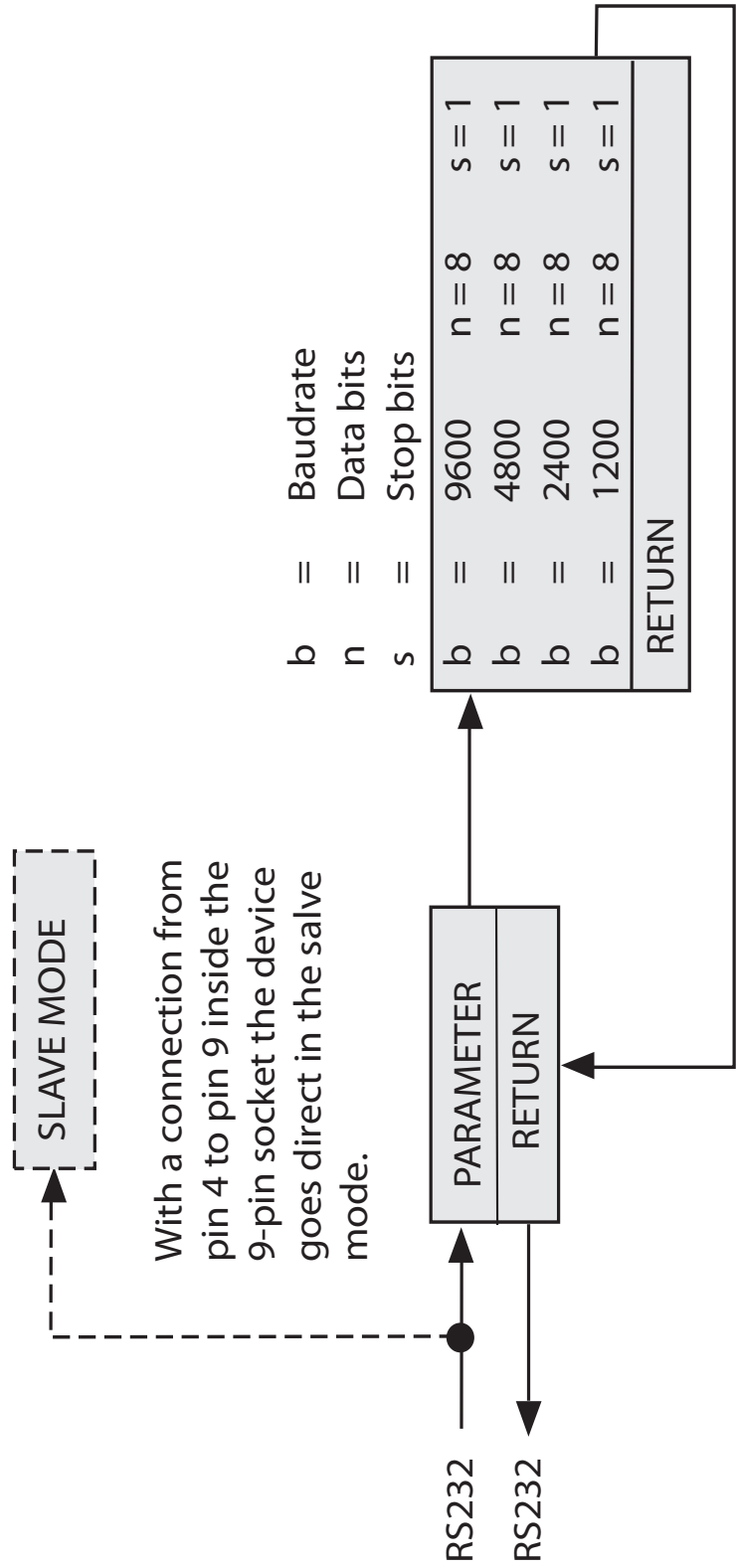Maintenance and customer service

Technical data

# 5. REMOTE CONTROL

## 5.1 Controlling the unit remotely

The megohmmeter type 24508 is fitted as standard with an RS232-C inter-face.

The interface is configured via the "INTERFACE MENU". When being controlled via the RS232, the unit must be in the RS232 menu "SLAVE MODE" and the special RS232 cable must be connected.

After power on you must first choose menu "RS232 INTERFACE" and confirm with the ENTER key below the display. The device is now in the "SLAVE MODE". As long as the connection pin 4 / 9 exists the device knows- also after power off- that the SLAVE MODE was chosen. After the disconnection of the RS232 cable the device goes back in the standard mode. After the "SLAVE MODE" must choose as described above.

## 5.2 Pin connections for the RS232 interface

The 9-pin min sub-D female connector is wired as follows:
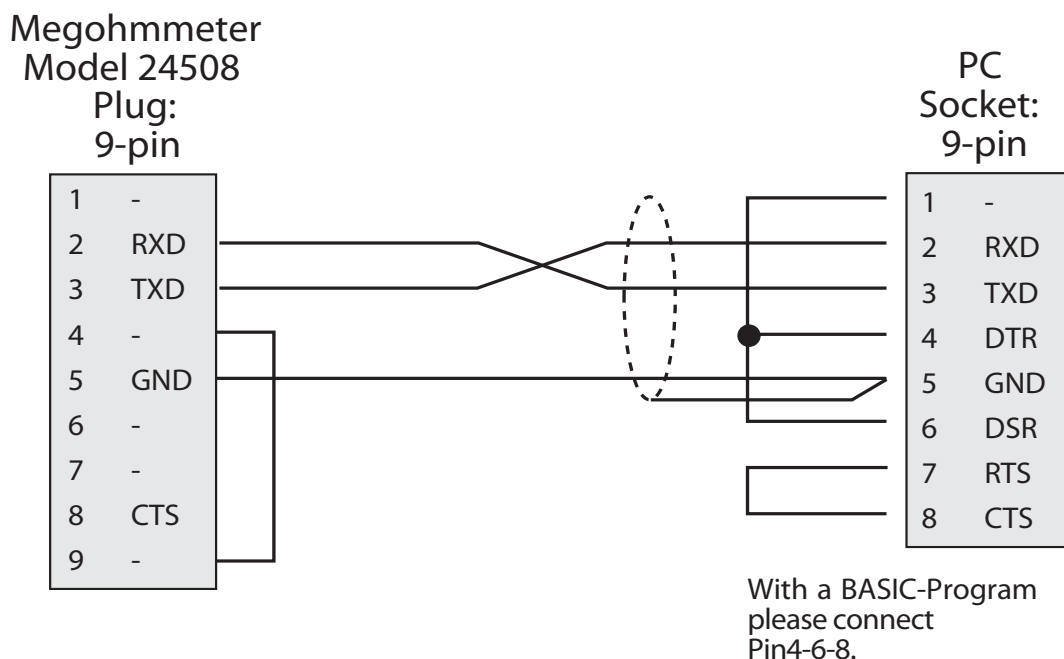
Megohmmeter
Model 24508
Plug:
9-pin

PC
Socket:
9-pin

| Megohmmeter Model 24508 | | PC Socket |
|---|---|---|
| 1 | - | 1 - |
| 2 | RXD | 2 RXD |
| 3 | TXD | 3 TXD |
| 4 | - | 4 DTR |
| 5 | GND | 5 GND |
| 6 | - | 6 DSR |
| 7 | - | 7 RTS |
| 8 | CTS | 8 CTS |
| 9 | - | |

With a BASIC-Program please connect Pin4-6-8.

General informa-
tion

Preparations for
use

Controls and con-
nections

Manual operation
of the unit

Controlling the
unit remotely

Maintenance and
customer service

Technical data

## 5.3   Command code for the RS232 interface

### 5.3.1   Transmit commands to the megohmmeter type 24508 via RS232

Threshold setting:     Sxxxx,yy;

| | |
|---|---|
| xxxx | 16-bit instruction (0-65000) |
| , | Delimiter between value and exponent |
| yy | 8-bit exponent (±127) |
| ; | Delimiter between parameters (or CR if last parameter) |

Test voltage: Ue     Uxx;

| | |
|---|---|
| xx | 8-bit instruction |
| 1 | Ue =  45V |
| 2 | Ue =  100V |
| 3 | Ue =  250V |
| 4 | Ue =  500V |
| ; | Delimiter between parameters (or CR if last parameter) |

Ohmmeter function:  Mxx,yy

| | |
|---|---|
| xx | Number of measurements prior to data transfer 3-255 |
| , | Data delimiter |
| yy | Measuring range : |
| 0 | =    Automatic selection of measuring range |
| 1 to 8 | =  Manual selection of measuring range G1-G8 |
| 16 | =  Automatic selection of measuring range with external activation of test |
| 17 to 24 | =  Manual selection of measuring range with external activation of test |
| CR | End of message; send after the last parameter |

In external mode, the complete group must be transmitted after each receive.

Current range:     Ixx,yy;     The same parameters apply as for the resistance range

| | |
|---|---|
| CR | End of message; send after the last parameter |

| Example 1 : | Test voltage | = | 100 V |
|---|---|---|---|
| | Threshold | = | 100 MOhm |
| | Number of measurements | = | 10 |
| | Measuring range | = | Automatic |

**Command: U2;S100,6;M10,0 CR**

| Example 2 : | Test voltage | = | 500 V |
|---|---|---|---|
| | Threshold | = | 1 GOhm |
| | Number of measurements | = | 5 |
| | Measuring range | = | B5 |

**Command: U4;S001,9;M05,5 CR**

## 5.3.2 Response from type 24508

First transmission    xx CR    Response after receiving command

| xx | Error flag (8-bit Hex code) |
|---|---|
| 00 | = Commands understood |
| 40 | Receive error (new instruction during the measurement) |
| 80 | = Receive error or incorrect command code sent |
| CR | End-of-message symbol - Start measurement<br>- if the code contains errors, wait for new command string |

Type 24508, transfer of measured value at end of measurement time:
Second transmission      xx,yyyyyEzzzCR

| xx | 8-bit flag (Hex code) | |
|---|---|---|
| 00 | = | Measured value < Threshold (insulation resistance error) |
| 01 | = | Measured value > Threshold (insulation resistance ok) |
| 10 | = | Measured value < measuring range |
| 20 | = | Measured value > measuring range |
| 21 | = | Arithmetic combination (or logical combination) of 20 and 01 |
| 30 | = | Problem with Utest (test voltage short-circuited) |
| 40 | = | Receive error |
| , | | Data delimiter |
| yyyyy | | 16-bit measured value (0-65000) |
| E | | Exponent |
| zzz | | 8-bit exponent ($\pm$ 127), if >128 exponent is negative*) |
| CR | | End-of-message symbol (Carriage Return) |

* when current reading is negative

General information

Preparations for use

Controls and connections

Manual operation of the unit

**Controlling the unit remotely**

Maintenance and customer service

Technical data

**General information**

**Preparations for use**

**Controls and connections**

**Manual operation of the unit**

**Controlling the unit remotely**

**Maintenance and customer service**

**Technical data**

## 5.4   Programming example

```
 REM — Basic-Beispiel zum Programmieren der seriellen Schnittstelle
 REM — REM und ' Zeichen sind Kommentarzeichen
 ' — — MEGOHMETER Typ 24508 mit nachfolgend belegtem Kabel
 ' — — 9 - 9 polige Verbindung  Typ 24508 Stecker    PC:Buchse
 '                   RXD (2)    nach    TXD (3)
 ' — —              TXD (3)    nach    RXD (2)
 ' — — Hardware-Handshake: am PC: DTR(4) mit DSR(6) und CTS(8)
 verbinden
 ' — — Bruecke Pin 4 mit Pin 9 am Typ 24508 zur Fernsteuer-Kennung
 ' — — Die beim PRINT # Befehl Q-Basic-spezifischen automatisch
 ' — — mitgesendeten Ende-Zeichen CR = CHR$(13),
 ' — — werden durch das Zeichen „;", am Ende des Befehls, unterdrueckt.
 ' — — Durch den Befehl „+ CHR$(13);" wird jedoch wieder das als
 ' — — letztes Zeichen notwendige „CR" (Ende)-Zeichen mitgesendet.
 '
 ' — — Geraeteinstellung =   Slave Mode   <
 '                   Previous menue
 '
 ' — — Stand 27.08.1999 AG (QSI)
 ' *****************************************************************


DIM Lesen$(20):                    'Laenge des Antwort$ festlegen
DIM Grenzwert$(10), Voltage$(4), Messfunktion$(8), Endezeichen$(2):

CLS :                              'Bildschirm loeschen

'*********** Kommentar auf Bildschirm
PRINT „ burster praezisionsmesstechnik gmbh& co kg"
PRINT „ Talstrasse 1-7,             76593 Gernsbach"
PRINT „ Tel : 07224/645-0     Fax:    07224/645-88"
PRINT „ http: //www.burster.de  e-mail: info@burster.de „
PRINT „ „
PRINT „ Demoprogramm fuer den MEGOHMETER Typ 24508 „
PRINT „ RS232 an COM 1, mit 9600 baud"

'*************** Schnittstelle an COM 1 ** RS 232 initialisieren
OPEN „COM1:9600,N,8,1" FOR RANDOM AS #1

Programmschleife:   'Einsprung nach Ende

PRINT : PRINT : PRINT : PRINT :

'*************** Sendeparameter zusammenstellen *****************

'*********** Grenzwerteingabe Tastatur oder Vorgabewert = 10E09
```

```
'Threshold = Sxxxx,yy;    (Grenzwert)
'              xxxx = Instruction Grenzwert
'              ,    = Separator zwischen Wert und Exponent
'              yy   = Exponent
'              ;    = Parameter separator oder CHR$(13) = CR

Grenzwert$ = „S10,09;": 'Default Grenzwert 10E09 = 10 Gigaohm + ;sepa-
rator
'Achtung: Grenzwertfunktionen sind nur in den Widerstandsbereichen ak-
tivierbar
INPUT ; „ Grenzwert$  z.B. 10E09 oder <Enter>, X=Ende"; Komparator$:
'Tastatureingabe?
IF Komparator$ = „x" OR Komparator$ = „X" THEN GOTO Ende2:   ' Pro-
grammende
IF Komparator$ = „" THEN
   GOTO defaultGW                       'Kein Zeichen
   ELSE
   Grenzwert$ = „S" + LEFT$(Komparator$, 2) + „," + RIGHT$(Komparator$,
   2) + „;"
END IF

IF VAL(Komparator$) < 100 THEN Grenzwert$ = „S10,09;":   ' Test kleiner
100 Ohm
IF VAL(Komparator$) > 1E+16 THEN Grenzwert$ = „S10,09;": ' Test groess-
er 10 Teraohm
defaultGW:  ' keine Eingabe erfolgt
PRINT

'*********** Messspannungs-Eingabe oder Vorgabewert = 100V
   'Voltage   = Uxx; or Ux; or Ux(x) + CHR$(13)(wenn letztes Parameter)
   '             xx   = 1 = Um=45V
   '             xx   = 2 = Um=100V
   '             xx   = 3 = Um=250V
   '             xx   = 4 = Um=500V
Voltage$ = „U02;":  'Default = 100V und Parameter separator;  oder
CHR$(13)
INPUT ; „ Messspannung 1=45V, 2=100V, 3=250V, 4=500V oder <Enter> „;
messspannung$:
SELECT CASE messspannung$
CASE „1"
   Voltage$ = „U01;":
   CASE „2"
   Voltage$ = „U02;":
   CASE „3"
   Voltage$ = „U03;":
CASE „4"
   Voltage$ = „U04;":
END SELECT
PRINT
```

*********** Funktionen (festgelegte Parameter)
　'Megohmmeter Function = Mxx,yy (ohne; weil letztes Zeichen =　Termi-nator CR)

| ' | xx | = Anzahl der Messzyklen vor Datenuebertragung |
|---|---|---|
| ' | , | = Separator |
| ' | YY | = Messmodus (Measurement mode) |
| ' | wenn = 0 | = Automatische Messbereichswahl |
| ' | = 1-8 | = Manuelle Messbereichswahl 1-8 |
| ' | = 16 | = Automatische Messbereichswahl mit externem Trigger |
| ' | = 17-24 | = Manuelle Messbereichswahl 1-8 mit externem Trigger |

　'Strommesser Function = Ixx,yy　(Code wie unter Mxx,yy)

Messfunktion$ = „M08,00": ' 8 Messzyklen, Automatische
　　　　　　　　Messbereichswahl;"
'Messfunktion$ = „M10,16": '10 Messzyklen, Automatische MB(00) mit
　　　　　　　　externem Trigger(16);
'Messfunktion$ = „I12,19": '12 Messzyklen, Manuelle Messbereichswahl(3)
　　　　　　　　und externem Trigger(16);

Endezeichen$ = CHR$(13)　　'Befehlsende-Zeichen

'************* Parameter ueber die Schnittstelle senden ********
PRINT #1, Grenzwert$ + Voltage$ + Messfunktion$ + Endezeichen$; :
'Schnittstelle
PRINT : PRINT „ Ausgabestring　　= „; 'naechste Zeile
PRINT Grenzwert$ + Voltage$ + Messfunktion$ + Endezeichen$; : 'Bild-schirm

'************* Typ 24508 Antwort (Fehlerflag) einholen und anzeigen
GOSUB einlesen:　　　　'CHR$(00) or CHR$(128) und CHR$(13) einlesen
　　　　　　　　' 00H=(CHR$(00)) und 0DH=(CHR$(13))

' PRINT „ Typ 24508 Befehls-Antwort$ =" + Lesen$ + CHR$(10):
　　　　　　　　　　'CHR$(13)+CHR$(10)
　　　　　　　　　　'　CR　　　LF

Flag1$ = „00": ' Flag loeschen

Flag1$ = MID$(Lesen$, 1, 1):
PRINT : PRINT „ Flag_1 = Fehlerflag　= „; CHR$(ASC(Flag1$)); :
　　　　　　　　　　'Hex Ziffer in ASCII umsetzen
IF Flag1$ = CHR$(128) THEN　　　'Hex 80　Binaer 0100 0000B = Fehler
　　PRINT „ Typ 24508 Steuer-Code-Fehler = 80"

```
GOTO Ende1:
END IF:
IF Flag1$ <> CHR$(0) THEN          'ungleich   Binaer 0000 0000B = Fehler
    PRINT „ Typ 24508 Steuer-Code-Fehler „'optioneller Code zu If
           CHR$(128)
  GOTO  Ende1:                              'deckt alle Fehler ab
END IF:

PRINT : PRINT : PRINT „ Messzeit Start und Warten auf Messergebnis":

 '************* Messwert einholen und auf Bildschirm *********************

GOSUB einlesen:              'Warten auf Messwert und Einlesen des
                                Messwertes

PRINT 'Neue Zeile
PRINT „ Typ 24508 Daten$   = „ + Lesen$; 'Wenn Timeout programmiert
                             dann minimale Messzeit warten

  'Antwort$ = Lesen$ = xx,yyyyy,Ezzz + CHR$(13)
              'xx = 8 Bit Flag in Hex
              '   =  00  = Messwert  <  Grenzwert (Isolation-Fehler)
              '   =  01  = Messwert  >  Grenzwert (ok)
              '   =  10  = Messwert  <  Messbereich
              '   =  20  = Messwert  >  Messbereich
              '   =  30  = Problem mit Umess (Kurzschluss)
              '   =  21  = Kombination 20 + 01
              ',        = Datenseparator
              'yyyyy  = Messwert 16 bits (0-65000)
              'E        = Exponent
              'zzz                = Exponent ueber 8 bit mit Vorzeichen
                  '        wenn >128 exponent = negativ

  '*********** Antwort zerlegen, zuerst Flag *************
Flag2$ = MID$(Lesen$, 1, 1):
PRINT „ Flag_2          = „; CHR$(ASC(Flag2$)); : ' Fehlercode in ASCII um-
setzen

SELECT CASE Flag2$
    CASE CHR$(0)              'Hex 00    Binaer 0000 0000B
    PRINT „ Messwert < Grenzwert —> Isolations-Fehler":

    CASE CHR$(1)              'Hex 01    Binaer 0000 0001B
    PRINT „ Messwert > Grenzwert —> Isolation ok":

    CASE CHR$(16)             'Hex 10    Binaer 0001 0000B
    PRINT „ Messwert < Messbereich „:
```

Sidebar tabs: General information / Preparations for use / Controls and connections / Manual operation of the unit / Controlling the unit remotely / Maintenance and customer service / Technical data

General informa-tion

Preparations for use

Controls and con-nections

Manual operation of the unit

Controlling the unit remotely

Maintenance and customer service

Technical data

```
CASE CHR$(32)              'Hex 20    Binaer 0010 0000B
    PRINT „ Messwert > Messbereich (oder offene Messleitungen) „:

    CASE CHR$(33)              'Hex 21    Binaer 0010 0001B
    PRINT „ Messwert > Messbereich und Messwert > Grenzwert":

    CASE CHR$(48)              'Hex 30    Binaer 0011 0000B
    PRINT „*****************************************************************"
END SELECT:

PRINT „ Message Typ 24508  = „; Lesen$:

    '*************** ;Messwert aufbereiten ********************
messwert$ = MID$(Lesen$, 3, 5):
exponent$ = MID$(Lesen$, 9, 3):
exponent = VAL(exponent$)
IF exponent > 128 THEN
    exponent = (exponent - 128) * (-1): 'negativer Exponent
END IF
IF exponent > 20 THEN
    PRINT „*** Fehlermessung (offener Messkreis?) ***": ' > Messbereiche
    GOTO Ende1
END IF


messwert = VAL(messwert$) * 10 ^ exponent:
PRINT „ Messwert Zahl      = „; messwert:


'******************** Programm-Abschluss ****************
Ende1:                  'Einsprung bei Fehler
GOTO Programmschleife:
Ende2:
CLOSE #1                 'Schnittstelle COM 1 schliessen
END:                    'Programmende


'******************** Unterprogramm einlesen *************
einlesen:               REM Unterprogramm aktuellen Input von Typ 24508
einlesen
I$ = „":                REM Variable loeschen
Lesen$ = „":            REM String loeschen
WHILE I$ <> CHR$(13):   REM einlesen bis CR
 I$ = INPUT$(1, #1):    REM 1 Zeichen abholen
  Lesen$ = Lesen$ + I$:  REM Zeichen zusammensetzen
WEND:                   REM alle Zeichen abholen bis Ende = LF
RETURN:
```

## 5.5 Execute of the test program 24508_06.exe

The Visual Basic Programm 24508_06.exe is a simple and easy to handle test program. It is gives no additional help function. All functions of the Megohmmeter model 24508 can check with this program. The down load is free of charge at www.burster.de Service&Kalibrieren->Geräte-Software->Widerstandsmessung->24508.

**Attention:** For the continue measurement the Microsoft EXCEL must be available. The single shot measurement is possible without EXCEL.

## 5.6 The answer to interface problems

| | Program sequence | Code ASCII or Hex | Hint / possible Error |
|---|---|---|---|
| 1 | Send instruction code | U2; S100.6; M10.0 | Separate the code with; and/or |
| 2 | Device gives the first answer (Hex) | 00 0D | Ok answer to the instruction code |
| 3 | Code at Error and Abort | 40 0D | e.g. during a measurement the device get an abort via the RS232 Interface |
| 4 | Code at Error and Abort | 80 0D | e.g. the instruction code has an Error or is unknown |
| 5 | 2 answer comes only when the answer 1 = 00 0D (line 2) | ´‚00200E008ı | Code demonstration in ASCII |
| 6 | | 01* 2C 30 30 32 30 30 45 30 30 38 0D* | Code demonstration in Hex |
| 7 | End | | |

\* Character not defined

Line 2:
In some program languages the Hex-Code 00 = String end. (the interface will be switch off). Please be careful that the end character "CR" (Hex 0D) comes in the error free flow two times. The interface must be read out 2 times until the end character "CR" (Hex 0D)!

Line 5:
Between the character "E" and the following characters is a little break in the ms range. During this time it is possible that the interface goes in timeout. If the string is cut at "E" the timeout must be longer.

**Hint:** Timer routines in PC programmes are defined according the application of the timers in ms or in s. Is the timeout defined to 10, and this are 10 ms and not 10 s, so the string can be cut at "E". The reason is the longer break of the 24508 after "E".

General informa-tion

Preparations for use

Controls and connections

Manual operation of the unit

Controlling the unit remotely

Maintenance and customer service

Technical data

**Additional information at the limit evaluation via the RS232 Interface**

Megohmmeters have very sensitive measurement inputs which can be disturb during a measurement. Depending the measurement range and the internal filter you get an engage of the display. This is the reason of the different analysis result.

1. When the measurement value engage the first displayed value is used for the analysis of the limit flag.

2. The second and further values are transferred via the RS232 Interface.

3. This is the reason why you can get different analysis result between the limit relays and the transferred value via RS232 Interface.

We recommend in the auto range mode to wait 5 measurement cycles before you evaluate the result.

**6. Maintenance and Customer service**

## 6.1 Maintenance

The megohmmeter type 24508 requires no maintenance by the user.

It merely needs protecting from dust and moisture.

Any repairs that may be needed must be performed only at the manufacturer's premises.

## 6.2 Customer Service

Please supply the serial number and software version when contacting the manufacturer with technical queries.
Only then can the manufacturer find out the technical status of the equipment and hence provide help quickly. The serial number is shown on the rating plate.

**Shipping instructions:**

If the megohmmeter needs to be returned for repairs, please note the following requirements for packing and shipping:

If you have a problem with the unit, please attach a note to the case summarizing the fault.

If you also include a name, department, fax number and your phone number for possible queries, this will help to speed up the process.

Use suitable packaging for the test equipment.

burster präzisionsmeßtechnik gmbh & co kg
Talstraße 1 - 5          PO Box 1432
76593 Gernsbach          76587 Gernsbach

General information

Preparations for use

Controls and connections

Manual operation of the unit

Controlling the unit remotely

Maintenance and customer service

Technical data

**General information** | **Preparations for use** | **Controls and connections** | **Manual operation of the unit** | **Controlling the unit remotely** | **Maintenance and customer service** | **Technical data**

## 6.3　Manuafacturer's guarantee

burster garantees reliable operation of the device for a period of 24 months followings its delivery.

Repairs required within this period will be performed free-of-charge.

This guarantee does not cover damage arising from improper handling of the device.

Furthermore, the manufacturer cannot be held liable for any type of consequential damage.

Technical data are subject to change without notice.

## 6.4　Cleaning the device

**To clean the front panel and housing of the device, only use water-soluble detergent, not benzene.**

# 7. Technical data

Only values with tolerances or limits can be taken as guaranteed. Values without tolerances serve purly as orientation and are not binding.

This device is easy to maintain and has a robust metal housing. The individual modules can be accessed and serviced with the greatest of ease.

| | |
|---|---|
| Resistance measuring range: | 50 kΩ ... 10 TΩ<br>with 8 ranges |
| Accuracy: | 50 kΩ ...   1 TΩ: 2.5 % rdg. ± 1 digit<br> 1 TΩ ... 10 TΩ: 10 % rdg. ± 1 digit |
| Current measuring range: | 5 pA ... 10 mA<br>with 8 ranges |
| Accuracy: | 500 pA ...   10 mA: 2.5 % rdg. ± 1 digit<br> 10 pA ... 500  pA:  10 % rdg. ± 1 digit |
| Test voltage: | 45 V, 100 V, 250 V, 500 V |
| Meas. time: | up to 999 s |
| Max. current in the measurement circuit: | < 5 mA |
| Range selection: | manuel or auto range<br>or via RS232 interface |
| Meas. connections: | BNC (red) Test voltage<br>BNC (black) Meas. input<br>4 mm ø savety socket (blue) Guard<br>4 mm ø savety socket (green/yellow) Ground |
| Display: | Two lines LCD<br>3 Digit value and unit |
| Threshold: | Relay potential free<br>(max. 48 V, 1 A) |
| Ext. Trigger: | with contact potential free |
| Interface: | RS232, 9-pin socket |

General information

Preparations for use

Controls and connections

Manual operation of the unit

Controlling the unit remotely

Maintenance and customer service

Technical data

# Model 24508         **Megohmmeter**   **burster**

| | |
|---|---|
| Operation temperature: | 0 °C ...   45 °C |
| Storage temperature: | - 20 °C ... + 70 °C |
| Operation voltage: | 230 V   ± 10 %   50 Hz |
| Device safety: | According EN 61010-1 |
| Power consumption: | < 10 VA |
| Housing ( W x H x D): | 255 x 125 x 270 [mm] |
| Weight: | 3 kg |

General information

Preparations for use

Controls and connections

Manual operation of the unit

Controlling the unit remotely

Maintenance and customer service

Technical data

# APPENDIX

## General information on the megohmmeter

Basically a megohmmeter consists of a precision voltage source connected in series with a measuring circuit that enables measurement of the current flowing through an object under test. The value of this current can be very small (less than a few nA); this means that errors in the reading can easily occur as a result of various forms of interference or even unwanted leakage currents flowing in parts other than the object under test (cable insulation, holders etc.). Using screened cables and a reference potential - a potential very close in value to the test voltage - it is possible to reduce these interference effects and to perform cable screening tests when required.

**The most common test situation:**

The test voltage connected to ground is applied to the „Rx" point of the object under test. The „X" input (protected by the guard potential) of the megohmmeter is connected to the „hot" point of „Rx".



$U_{test}$    Guard    X

$R_x$
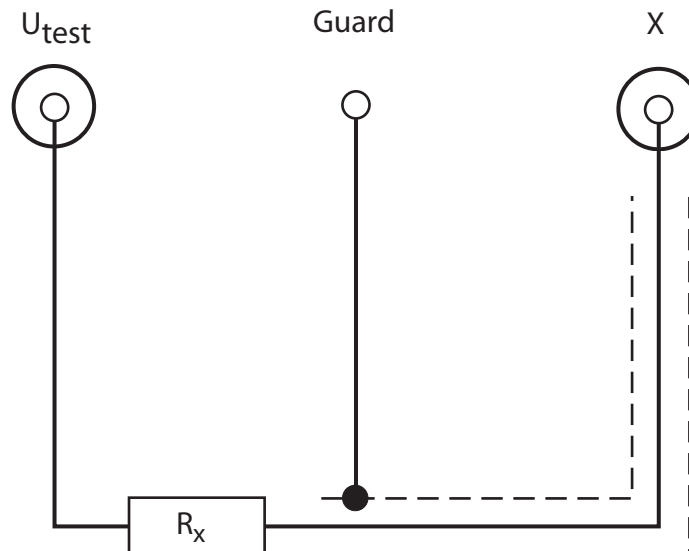
**Cable-screening measurement case**

The leakage currents are diverted away via the guard potential, and have no effect on the current flowing through the object under text „Rx". This principle lets you perform numerous of applications (see examples).

General informa-tion

Preparations for use

Controls and con-nections

Manual operation of the unit

Controlling the unit remotely

Maintenance and customer service

Technical data

## EXAMPLE 1

Measuring an insulation resistance $R_x$ between wire and shield on a 2-wire cable with common screening without the result being distorted by the two insulation resistances $R_1$ and $R_2$ lying in parallel.

The guard circuit is used for this measurement.

Test voltage     Guard     Meas. input

$R_2$   $R_1$

$R_x$

The guard connector lies at the same potential as the measurement input. Thus the resistances $R_1$ and $R_2$ are not included in the measurement.
Only the resistance $R_x$ (wire 1 to screening) is measured.
Since $U_{test} - U_G = 0$, the current through $R_1$ is also zero. The current through $R_2$ comes solely from the voltage source $U_G$. So only the value of $R_x$ is measured.

Ground     Screen

$R_x$     $R_2$

$R_1$

Wire 1     Wire 2

$R_x$ is measured

## EXAMPLE 2

Depending upon the connection wiring the RESIS-TOMAT® 24508 makes it possible to determinate the surface or the volume resistance.
For the determination of the surface resistance following connection is necessary:

Measure electrode ① with "x" input

Guardring ② with "U" input

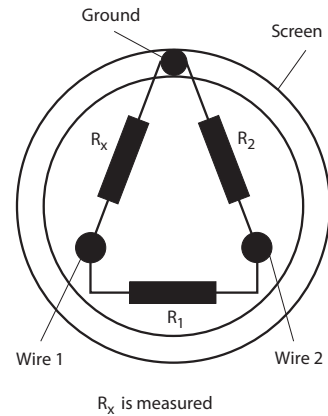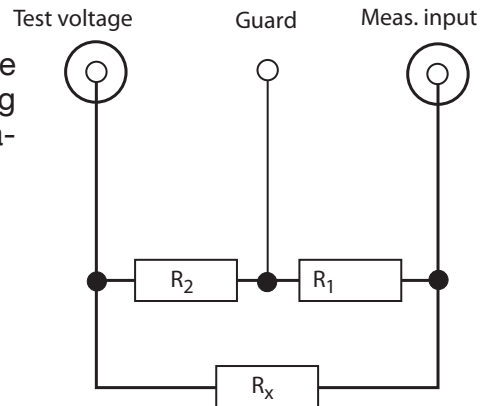Basic electrode ③ with "guard" input

For the determination of the volume resistance following connection is necessary:

Measure electrode ① with "X" input

Guardring ② with "guard" input

Basic electrode ③ with "U" input

Air gap ④

Guard Ring Electrode

② ④     ①     ④ ②

③

Sample
Rx