

# Handbuch Operating Manual

## HM8011-3

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# Digital Multimeter HM8011-3

- **4 ½-Digit Display (19.999 Indication)**
- **0.05% DC Accuracy**
- **28 Measurement Ranges**
- **True RMS Measurements**
- **Current Measurement up to 20Amps**

With over 20,000 units in the field, the highly versatile **HM8011-3 Digital Multimeter** has established a proven record of reliability. The DMM includes **28 measurement ranges** with a 4½ digit LED display of **19999** and a resolution of **10µV, 10nA or 10mΩ**, dependent on the measurement type and range. Fast and logical operation of the **HM8011-3** is accomplished with a central rotary range switch and pushbutton function switches.

All AC & DC voltage ranges have a high input resistance of **10MΩ** and maintain low drift and offset current. Waveforms with **crest factors up to 7** can be accurately measured with the True RMS measurement capability. Up to **20A** of AC or

DC current can be measured short term on the **10A** range.

Built in **protection circuits** on the input circuitry protect the instrument from damage caused from improper operation. Overloads of 1,000 Volts on the higher ranges and over 350 Volts peak in the lower ranges can be accommodated. The use of **shrouded banana plugs** on the inputs minimize accidental contact with live circuitry.

The **HM8011-3 Digital Multimeter** is the instrument of choice when selecting a DMM. It provides reliable and accurate performance along with excellent long-term stability and simple operation.

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## Specifications

(Values guaranteed for 6 months)  
Reference Temperature: 23°C ± 1°C

### DC Voltage:

#### Ranges:

200mV, 2V, 20V, 200V, 1000V

#### Resolution:

10µV, 100µV, 1mV, 10mV, 100mV

#### Accuracy:

2V to 1000V: ±(0.05% o.v.<sup>1)</sup> + 0.005% o.r.<sup>2)</sup>

200mV: ±(0.05% o.v. + 0.01% o.r.)

#### Maximum Input Voltage:

1000V<sub>p</sub> for 20V, 200V and 1000V range

380V<sub>p</sub> for 0.2V and 2V range

**Input Impedance:** 10MΩ || 70pF

**Input Current:** max. 10pA (23°C)

**CMRR:**<sup>3)</sup> ≥ 100dB (50/60Hz ± 0.5%)

**NMRR:**<sup>4)</sup> ≥ 60dB (50/60Hz ± 0.5%)

### DC Current:

#### Ranges:

200mA, 2mA, 20mA, 200mA, 2A, 10A (20A)

#### Resolution:

10nA, 100nA, 1µA, 10µA, 100µA, 1mA

#### Accuracy:

0.2 to 200mA: ±(0.2% o.v. + 0.01% o.r.)

2A to 10A: ±(0.3% o.v. + 0.01% o.r.)

### AC Voltage:

#### Ranges:

200mV, 2V, 20V, 200V, 750V

### Resolution:

10µV, 100µV, 1mV, 10mV, 100mV

### Accuracy:

#### 0.2 to 20V:

at 40Hz to 10kHz: ±(0.5% o.v. + 0.07% o.r.)

at 20Hz to 20kHz: ±(1% o.v. + 0.07% o.r.)

#### 200V and 750V:

at 40Hz to 100Hz: ±(0.5% o.v. + 0.07% o.r.)

at 20Hz to 100Hz: ±(1% o.v. + 0.07% o.r.)

#### Max. Input Voltage:

1000V<sub>p</sub> for 20V, 200V and 750V range

380V<sub>p</sub> for 0.2V and 2V range

**Input Impedance:** 10MΩ || 70pF

**CMRR:** ≥ 60dB (50/60Hz ± 0.5%)

**Crest Faktor:** up to 7

### AC Current:

#### Ranges:

200µA, 2mA, 20mA, 200mA, 2A, 10A (20A)

#### Resolution:

10nA, 100nA, 1µA, 10µA, 100µA, 1mA

#### Accuracy: (40Hz to 100Hz)

0.2 to 200mA: ±(0.7% o.v. + 0.07% o.r.)

2A to 10A: ±(1% o.v. + 0.07% o.r.)

#### Resistance:

##### Ranges:

200Ω, 2kΩ, 20kΩ, 200kΩ, 2MΩ, 20MΩ

##### Resolution:

10mΩ, 100mΩ, 1Ω, 10Ω, 100Ω, 1kΩ

**Accuracy:** ±(0.1% o.v. + 0.01% o.r. + 50mΩ)

for 20MΩ to range: ±(0.2% o.v. + 0.01% o.r.)

Input protection up to 220V<sub>AC</sub> (350V<sub>p</sub>)

<sup>1)</sup> o.v. = of value; <sup>2)</sup> o.r. = of range; <sup>3)</sup> Common Mode Rejection Ratio; <sup>4)</sup> Normal Mode Rejection Ratio  
Values without tolerances are meant to be guidelines and represent characteristics of the average instrument.

## General information

The operator should not neglect to carefully read the following instructions and those of the mainframe HM8001, to avoid any operating errors and to be fully acquainted with the module when later in use.

After unpacking the module, check for any mechanical damage or loose parts inside. Should there be any transportation damage, inform the supplier immediately and do not put the module into operation.

This plug-in module is primarily intended for use in conjunction with the Mainframe HM8001. When incorporating it into other systems, the module should only be operated with the specified supply voltages.

## Safety

This instrument has been designed and tested in accordance with **IEC Publication 1010-1, Safety requirements for electrical equipment for measurement, control, and laboratory use**. It corresponds as well to the the CENELEC regulations EN 61010-1. All case and chassis parts are connected to the safety earth conductor. Corresponding to Safety Class 1 regulations (three-conductor AC power cable). Without an isolating transformer, the instruments power cable must be plugged into an approved three-contact electrical outlet, which meets International Electrotechnical Commission (IEC) safety standards.

## Warning!

**Any interruption of the protective conductor inside or outside the instrument or disconnection of the protective earth terminal is likely to make the instrument dangerous. Intentional interruption is prohibited.**

The instrument must be disconnected and secured against unintentional operation if there is any suggestion that safe operation is not possible. This may occur:

- if the instrument has visible damage,
- if the instrument has loose parts.
- if the instrument does not function,
- after long storage under unfavourable circumstances (e.g. outdoors or in moist environments),
- after excessive transportation stress (e.g. in poor packaging).

When removing or replacing the metal case, the instrument must be completely disconnected from the mains supply. If any measurement or calibration procedures are unavoidable on the opened-up instrument, these must only be carried out by qualified personnel acquainted with the danger involved.

## Symbols as Marked on Equipment



ATTENTION refer to manual.



DANGER High voltage.



Protective ground (earth) terminal.

## Operating conditions

The ambient temperature range during operation should be between +10°C and +40°C and should not exceed -40°C or +70°C during transport or storage. The operational position is optional, however, the ventilation holes on the HM8001 and on the plug-in modules must not be obstructed.

## Warranty

Before being shipped, each plug-in module must pass a 24 hour quality control test.

Provided the instrument has not undergone any modifications Hameg warrants that all products of its own manufacture conform to Hameg specifications and are free from defects in material and workmanship when used under normal operating conditions and with the service conditions for which they were furnished.

The obligation of HAMEG hereunder shall expire two (2) years after delivery and is limited to repairing, or at its option, replacing without charge, any such product which in Hamegs sole opinion proves to be defective with the scope of this warranty.

This is Hamegs sole warranty with respect to the products delivered hereunder. No statement, representation, agreement or understanding, oral or written, made by an agent, distributor, representative or employee of, which is not contained in this warranty will be binding upon Hameg, unless made in writing and executed by an authorized Hameg employee. Hameg makes no other warranty of any kind whatsoever, expressed or implied, and all implied warranties of merchantability and fitness for a particular use which exceed the aforestated obligation are hereby disclaimed by Hameg be liable to buyer, in contract or in tort, for any special, indirect, incidental or consequential damages, espesses, losses or delays however caused.

In case of any complaint, attach a tag to the instrument with a description of the fault observed. Please supply name and department, address and telephone number to ensure rapid service.

The instrument should be returned in its original packaging for maximum protection. We regret that transportation damage due to poor packaging is not covered by this warranty.

## Maintenance

The most important characteristics of the instruments should be periodically checked according to the instructions provided in the sections "Operational check" and "Alignment procedure". To obtain the normal operating temperature, the mainframe with inserted module should be turned on at least 60 minutes before starting the test. The specified alignment procedure should be strictly observed.

When removing the case detach mains/line cord and any other connected cables from case of the mainframe HM8001. Remove both screws on rear panel and, holding case firmly in place, pull chassis forward out of case. When later replacing the case, care should be taken to ensure that it properly fits under the edges of the front and rear frames. After removal of the two screws at the rear of the module, both chassis covers can be lifted. When reclosing the module, care should be taken that the guides engage correctly with the front chassis.

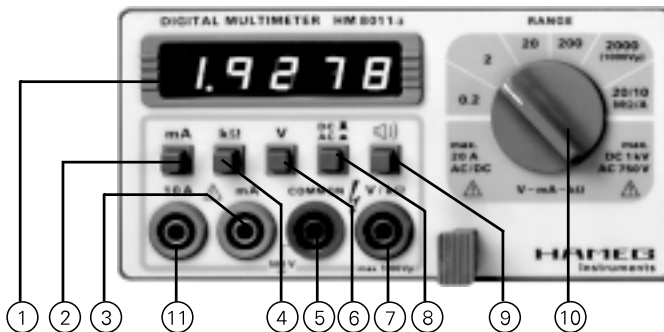
## Operation of the module

Provided that all hints given in the operating instructions of the HM8001 Mainframe were

followed especially for the selection of the correct mains voltage start of operation consists practically of inserting the module into the right or left opening of the mainframe. The following precautions should be observed:

Before exchanging the module, the mainframe must be switched off. A small circle (o) is now revealed on the red power button in the front centre of the mainframe. If the BNC sockets at the rear panel of the HM8001 unit were in use before, the BNC cables should be disconnected from the basic unit for safety reasons. Slide in the new module until the end position is reached. Before being locked in place, the cabinet of the instrument is not connected to the protective earth terminal (banana plug above the mainframe multipoint connector). In this case, no test signal must be applied to the input terminals of the module.

Generally, the HM8001 set must be turned on and in full operating condition, before applying any test signal. If a failure of the measuring equipment is detected, no further measurements should be performed. Before switching off the unit or exchanging a module, the instrument must be disconnected from the test circuit.



### (1) DIGITAL DISPLAY (7-segment LEDs)

The digital display indicates the measured value with a resolution of  $4\frac{1}{2}$  digits, the most significant digit being used up to "11". The measured value is displayed with correct point position and sign. When DC values are measured, the digits are preceded by a minus sign, if the positive pole of the measured quantity is connected to the COMMON input (5). If the measurement range is exceeded ( $>19999$ ), the display flashes and displays "0", and the buzzer beeps intermittently.

### (2) mA (pushbutton)

Function selection switch for current measurements (AC and DC current).

### (3) mA (shock-proof socket for connectors of 4mm diameter)

Connection (high potential) for AC and DC current measurements in combination with the COMMON input (low potential). The input is fuse-protected.

### (4) kΩ (pushbutton)

Function selection switch for resistance measurements.

### (5) COMMON (shock-proof socket for connectors of 4mm diameter)

The COMMON socket (low potential) serves as a common connection for all measurement functions, to which the earthy potential of the measured quantity is applied. This input is connected with the internal shielding of the set.

**The voltage across this terminal with respect to the cabinet (non-fused earthed conductor, ground) should not exceed 500V to ensure safety of operation.**

### (6) kΩ (pushbutton)

Function selection switch for voltage measurements (AC and DC voltage).


**(7) COMMON**(shock-proof socket for connectors of 4mm diameter)

Connection (high potential) for voltage and resistance measurements in combination with the COMMON input **(5)**.

**CAUTION!** The voltage across this terminal with respect to case (**non-fused earthed conductor, ground**) should not exceed **1000 V to ensure safety of operation.**

**(8) DC/AC** (pushbutton)

Function selection between DC and AC measurements.

**(9)**  (pushbutton)

Switch for disconnecting the acoustic signal. The buzzer beeps with every change of the measurement range, when overload occurs, and if the display is zero in the resistance range.

**(10) RANGE** (6-position rotary switch)

The range switch permits to adjust the measurement ranges within the selected functions. When voltages and currents of unknown magnitude are measured, **firstly select the highest measurement range!** Then set the switch to the next range in order, until optimum resolution is obtained.

**(11) 10A** (20A) (shock-proof socket for connectors of 4mm diameter)

Terminal (high potential) for AC and DC current measurements in the 10A range in combination with the common input **(5)**. **The input is not fuse protected. At currents which exceed 10A (max. 20A) the maximum admissible measuring time is 30 sec. Measuring times exceeding 30 sec. can cause thermal damage of the internal resistors.**

## Mode selection

A mode selection switch set serves to activate the desired measurement function. Resistance, current and voltage measurements are selected with mutually releasing switches. In the current and voltage ranges, an additional selection between AC and DC measurements is possible.

## Range selection

The measurement ranges are subdivided into decades. The full-scale values of the lowest ranges are 0.2V, 0.2mA or 0.2k $\Omega$ , e.g. maximum full-scale values of 199.99mV, 199.99 $\mu$ A or 199.99 $\Omega$  are indicated. In the 20 M $\Omega$  and 10A ranges, a maximum full-scale value of 19.999M $\Omega$  and 19.999A respectively is displayed. In all other ranges, the measured values are indicated directly in V, mA or  $\Omega$ . When voltages or currents of unknown magnitude are to be measured, firstly select the highest measurement range, then switch over to the range with the optimum display.

## Indication of the measured value

The measured values are displayed by five 7 segment LED displays. The maximum value of the first digit is " 1 ", which corresponds to a 4½ digit display with a capacity of 19999 digits. The measured value is indicated with correct point position and sign. The digits are preceded by a minus sign, if the positive pole of the device under test is connected to the COMMON socket **(5)** in case of DC measurement. If the input terminals are short-circuited, a value of max.  $\pm 2$  digits (according to the measurement range) is displayed. If the full-scale value of the measurement range is exceeded (or open input is used during resistance measurements), the display will flash and indicate "0" value. The buzzer beeps intermittently when the resistance is near zero in the resistance ranges.

## Test value application

The HM 8011-3 module is provided with four shockproof connecting sockets, preventing accidental contact with the measured quantity, if adequate test cables (such as HZ 15) are used. To ensure safety of operation, the test cables should be checked for isolation damage periodically and replaced, if necessary.

The COMMON socket **(5)** (black) is used for all measurement ranges and accepts the earthy potential for all measured quantities. Zero potential and internal shielding of the HM8011-3 module are connected to this terminal. The inputs **(3)** / **(11)** (blue) are exclusively reserved for current measurements, whereas the V/k $\Omega$  input **(7)** serves for all other types of measurement.

## Voltage measurements

**The maximum input voltage to the HM8011-3 with the COMMON socket connected to ground potential is 1000 V. E.g.: If the HM8011-3 is connected to the device under test, the sum resulting from the test voltage and the voltage across the COMMON terminal to ground should not exceed 1000 V. The maximum admissible COMMON socket-ground potential difference is 500 V<sub>p</sub>.**

The mean value of the input voltage and AC voltages are determined by the true rms value. When measuring AC voltages, a DC component is suppressed. If possible, the COMMON terminal **(5)** should be connected directly to ground or to the test circuit point carrying the lowest potential to ground.

During measurements of circuits containing inductive components, inadmissibly high voltages may occur, when the test circuit is opened. In this case, appropriate precautions should be taken to prevent destruction of the HIM 8011-3 module by induced voltages.

## Current measurements

For current measurements, the device to be tested is connected to the mA socket (3) or the 10A socket (11). **The HMS011-3 module should be inserted into the line which carries the lowest potential to ground. To ensure safety of operation, the voltage to ground across the COMMON terminal should not exceed 500 V<sub>p</sub>.**

AC currents are determined by their true rms value (see "Crest factor"). When measuring AC currents, a DC component is suppressed.

The current measurement ranges are microfuse-protected from overload condition (2000mA range: up to 2A; lower ranges: up to 200mA). The 10A input is not fuse protected. If a fuse has blown, firstly eliminate the overload cause. Then re-establish the operating condition of the H M 8011-3 multimeter.

**At currents which exceed 10A (max. 20A) the max. admissible measuring time is 30sec.**

## Resistance measurements

For resistance measurements, the device to be tested is inserted between the COMMON terminal (5) and the V/kΩ socket (11). A DC voltage is applied across the connecting terminals. Therefore only devices which are not under voltage should be measured, because any voltage present in the test circuit will give an erroneous result. If very small resistances are measured, the line resistance of the connecting leads must be taken into consideration. When the resistance measurement inputs are shortened (approx. 0Ω) the buzzer beeps continuously.

## Overload protection

All measurement ranges of the HM8011-3 multimeter are protected against different types of overload conditions. General procedure: **When measuring unknown magnitudes, firstly select the highest measurement range, before switching over to the optimum readout range. If a failure of the HMS011-3 module is detected, firstly eliminate the failure cause, before performing any further measurement.**

Fuse replacement: If overload occurred in a current measurement range, one of the two microfuses must be replaced before re-starting operation of the HM8011-3 module. For this purpose, the set must be opened, the fuses being only a cessible from the inside. In any case, only fuses of the specified type shall be used to avoid damaging of the HM8011-3 multimeter and to ensure continuity of specification in the current measurement ranges.

## Crestfactor

The evaluation of complex or distorted signals requires detection of the true rms value. The HM

8011-3 multimeter permits to measure AC values and indicate their **true rms value**. The **crest factor** is an important magnitude for test value interpretation and accuracy evaluation. It is defined by the signal peak voltage to signal rms value:

$$\text{Crest factor} = CF = \frac{V_p}{\sqrt{I_{rms}}}$$

This factor is a measure of the dynamic input voltage range of an AC/DC converter and expresses its capability of handling test signals having a high crest factor without reaching the converters saturation limit.

The crest factor of the HM8011-3 multimeter ranges from 1 to 7 (for errors of < 1%) and depends on the rms value of the signal to be measured. The crest factor has a maximum value of 3.5 at full-scale reading, e.g. of 7 at the mid-scale point of the selected measurement range. The reading accuracy is reduced for signals having a higher crest factor.

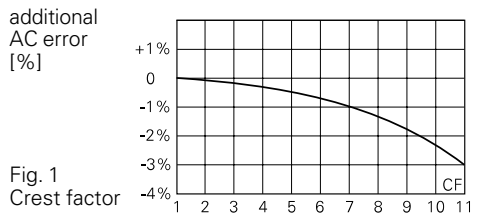


Fig. 1  
Crest factor

Among others, the reading accuracy depends on the band width of the rms converter. Measurements of complex signals are hardly affected, unless important harmonics of the measured signal are beyond the converter bandwidth of 150 kHz (-3 dB).

Another magnitude acting upon the reading accuracy is the duty factor of the test signal. It is related to the crest factor as follows:

$T$  = period duration  
 $t$  = pulse duration  
 $u$  = pulse voltage

$$CF = \sqrt{T/t}$$

The shown waveform with a 1% duty factor for example has a crest factor of 10. The accuracy specified in Fig. 1 is given for such a waveform and a constant pulse voltage of 1V.

## Operational check

To obtain the normal operating temperature, the mainframe with inserted module should be returned on at least 60 minutes before starting the test.

## Measuring equipment required

Fluke 51 01 B calibrator/Rotek 600 AC/DC calibrator  
 1 Resistor 180 kΩ ± 0.01 %

## Test procedure

If one of the calibrators specified above or a standard of adequate accuracy is available, all measurement ranges of the HM8011-3 multimeter can be checked by comparison with the limits indicated in the following tables. If any results deviate from the values specified in the tables, the concerned H M 8011-3 measurement ranges must be re-aligned. However, a re-alignment should only be performed, if a calibrator of adequate accuracy is available.

In all measurement ranges, the HM8011-3 test modes must be checked by comparison with the values specified in the following tables. However, before changing the measurement range, care should always be taken that the signal applied to the HM8011-3 module does not inadmissibly stress the device under test. At the beginning of a new series of measurements, the calibrator should always be reset to the minimum output value.

Before changing the measurement range, the calibrator output must be switched off and not be reactivated, unless the next higher HM8011-3 measurement range in order is selected. A shielded cable should be used to connect the calibrator and the HM8011-3 multimeter to avoid undesired external influences on the measured signal.

For better survey, the checks should be performed in the recommended sequence.

### a) DC voltage measurement range

(Tab.1)

Range	Reference(+23° C)	Limit of indication
200mV	100.00mV	99.93-100.07
2V	1.0000V	.9994-1.0006
20V	10.000V	9.994-10.006
200V	100.00V	99.94-100.06
1000V	1000.0V	999.4-1000.6

### b) AC voltage measurement range

(Tab.2)

Range	Reference(+23°C)	Limits of indication
200mV	100.00mV	<sup>(1)</sup> 99.36-100.64 <sup>(2)</sup> 98.86-101.14
2V	1.0000V	<sup>(1)</sup> .9936-1.0064 <sup>(2)</sup> .9886-1.0114
20V	10.000V	<sup>(1)</sup> 9.936-10.064 <sup>(2)</sup> 9.886-10.114
200V	100.00V	<sup>(3)</sup> 99.36-100.64 <sup>(4)</sup> 98.86-101.14
1000V	1000.0V	<sup>(3)</sup> 745.5-754.5 <sup>(4)</sup> 741.8-758.2

<sup>(1)</sup> =40Hz to 10kHz    <sup>(3)</sup> =40Hz to 100Hz  
<sup>(2)</sup> =20Hz to 20kHz    <sup>(4)</sup> =20Hz to 100Hz

### c) DC current measurement range

(Tab.3)

Range	Reference(+23°C)	Limits of indication
200µA	100.00µA	99.78-100.22
2mA	1.000mA	.9978-1.0022
20mA	10.000mA	9.978-10.022
200mA	100.00mA	99.78-100.22
2A	1000.0mA	996.8-1003.2
10A	1.000A	0.995-1.005

### d) AC current measurement range

(Tab.4)

Range	Reference(+23°C)	Limits of indication
200µA	100.00µA	99.16-100.84
2mA	1.000mA	.9916-1.0084
20mA	10.000mA	9.916-10.084
200mA	100.00mA	99.16-100.84
2A	1000.0mA	988.6-1011.4
10A	1.000A	0.988-1.011

### e) Resistance ranges

(Tab.5)

Range	Reference(+23° C)	Limit of indication
200Ω	100.00Ω	99.83-100.17
2kΩ	1.0000kΩ	.9987-1.0013
20kΩ	10.000kΩ	9.987-10.012
200kΩ	100.00kΩ	99.87-100.12
2000kΩ	1000.0kΩ	998.7-1001.2
20MΩ	10.000kΩ	9.960-10.040

## Alignment procedure

### A - Clock frequency

Connect counter to 100kHz<sup>1)</sup> point of testconnector CN101. Adjust clock with **[1]** VR107 to 100 kHz ± 50 Hz.

### B - Zero point DC

Select 0.2V DC range. Adjust display for zero reading with **[2]** VC103 at open input.

### C - Reference voltage

Select 2V DC range. Apply 1.8000V DC. Adjust for a reading of 1.800V with **[3]** VR106.

### D - DC voltage gain

Select 0.2V DC range. Apply 0.1 800V DC. Adjust for a reading of 180.00 mV with **[4]** VR105.

### E - Resistance reference

Select 200kΩ range. Connect 180kΩ ± 0.01 % or appropriate Calibrator to input terminals. Adjust with **[5]** VR101 for a reading of 180.00 kΩ.

## F - Zero point AC

Select 2V AC range. Short circuit at input terminals. Adjust for zero reading with [6] VR104.

## G - AC voltage gain of 1

Select 2V AC range. Apply 1.8000V AC/400 Hz. Adjust with [7] VR103 for a reading of 1.8000 V  $\pm$  5 digit.

## H - AC voltage gain of 10

Select 0.2V AC range. Apply 0.1800VAC/400 Hz. Adjust with [8] VR102 for a reading of 1.80.00V  $\pm$  5 digit.

## I - Frequency compensation

a) Select 200V AC range. Apply 180.00V/400Hz. Adjust with [9] VC101 for a reading of 178,60V  $\pm$  10 digit.

b) Select 20V AC range. Apply 18.000V/20 kHz. Adjust with [10] VC102 for a reading of 17.860V  $\pm$  10 digit.

c) Repeat steps a) and b).

## Specification HM8011-3

### Temperature coefficient per°C

(Reference temperature: 23°C)

VDC	200mV range	0.007% o.v.+ 0.001 % o.r.
	other ranges	0.005% o.v.+ 0.001 % o.r.
VAC	all ranges	0.02% o.v.+ 0.005% o.r.
mA <sub>DC</sub>	all ranges	0.02% o.v.+ 0.005% c. r.
mA <sub>AC</sub>	all ranges	0.05% o.v.+ 0.01% o.r.
$\Omega$	all ranges	0.015% o.v.+ 0.001 % o.r.

o.v. = of value    o. r. = of range

### Current at resistance measurements:

200 $\Omega$ -range:	1mA;
2k $\Omega$ -range:	100 $\mu$ A
20k $\Omega$ -range:	10 $\mu$ A
200 k $\Omega$ -range:	1 $\mu$ A
2/20M $\Omega$ -range:	10nA

### Voltage at resistance measurements:

0.3V typ. at open input; depending of the measured resistor value. Negative potential of measuring voltage is at common terminal.

### Voltage drop at current measurements:

0.2mA-20mA range: 0.5Vmax.

200 mA range: 1.5Vmax.

2000 mA range: 0.5Vmax.

### Overload protection

#### Voltage ranges:

0.2V and 2V range:  $U_i$  max. 380V<sub>pk</sub>  
all other ranges:  $U_i$  max. 1000V<sub>pk</sub>.

### Current measuring ranges:

0.2 mA to 200 mA: Microfuse 200mA

Type Wickmann 19193 200mA quick

2000mA-range: Microfuse 2A

Type Wickmann 19194 2A quick

Max. Input voltage for all ranges 250V<sub>pk</sub>.

### Resistance ranges:

Max. Input voltage for all ranges 350Vpk.

### Operating conditions:

10°C to +40°C max. relative humidity: 80%

### Display

4½digit 7 segment LED display, 8x5mm

**Measurement rate:** 2.5 measurements/s

**Supply:**(from HM 8001) 25V~/140mA( $\Sigma$ = 3.5VA)

**Dimensions** (without 22pol. multipoint connector):

**B** 135, **H** 68, **T** 228 mm Weight: approx. 1 kg