

# MA 4 S

## User manual

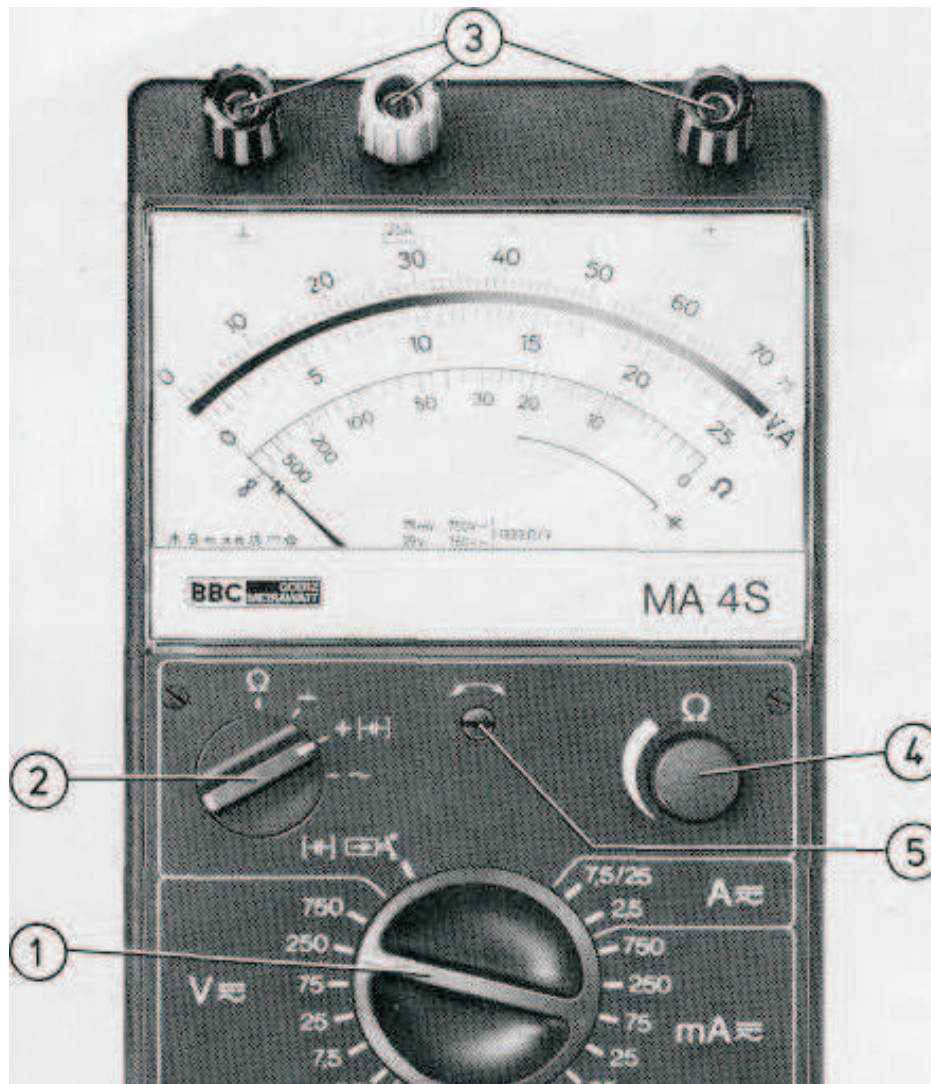
Nr. 3.348.330.01

M 1-7.1

**BBC**

GOERZ  
METRAWATT





- 1) Range switch
- 2) AC / DC / Ohm/ (+) relay reset switch
- 3) Inputs
- 4) Potentiometer for 0  $\Omega$  set
- 5) Screw for mechanical Zero

**Note:** The multimeter MA 4 S is built according to safety regulations VDE 041 O / DIN 57410 It guaranteed if used as the safety of the device and the operator.  
 Their safety is not guaranteed if the device is used improperly or carelessly handled.  
 It is therefore essential to read before you use the MA4S this manual carefully and completely and to comply in all respects.

## 1. Description

The MA 4 S is a multimeter, which is especially adapted to the needs of power engineering. It can be used throughout at the field of electrical engineering.

This device is very complete range studied - processing and unrivaled protection against misuse and overload.

Several well-coordinated protection devices protect the device against damage from misuse or overload within the specified limits for overload:

- Relay with threshold amplifiers and automatic battery monitoring
- Fuse protection with power diodes
- surge arresters and
- Movement-protection diodes

Its rugged construction ensures, in particular in connection with the protective rubber cover, a lot of protection in rough, mechanical stress.

The linear split V-A-scale applies to all current and voltage ranges for AC and size measurements. For resistance measurements, an additional scale exists.

## 2. Technische Kennwerte

### Meßbereiche

voltage	internal resistance	
	—	~
75 mV —	100 $\Omega$	—
750 mV —	1 k $\Omega$	—
2,5 V ~	3,4 k $\Omega$	340 $\Omega$
7,5 V ~	10 k $\Omega$	2,94 k $\Omega$
25 V ~	34 k $\Omega$	34 k $\Omega$
75 V ~	100 k $\Omega$	100 k $\Omega$
250 V ~	340 k $\Omega$	340 k $\Omega$
750 V ~	1 M $\Omega$	1 M $\Omega$

Strom	Spannungsabfall ca.	
	—	~
750 $\mu$ A —	75 mV	—
2,5 mA ~	100 mV	200 mV
7,5 mA ~	110 mV	140 mV
25 mA ~	110 mV	100 mV
75 mA ~	110 mV	80 mV
250 mA ~	130 mV	130 mV
750 mA ~	160 mV	160 mV
2,5 A ~	300 mV	300 mV
7,5 A ~	300 mV	300 mV
25 A ~	250 mV	250 mV

Widerstand	Meßumfang	Wert in Skalenmitte (R <sub>i</sub> )	I <sub>max</sub> bei Batteriespannung 1,5 V
Bereich			
$\Omega \times 1$	1 $\Omega$ ... 1 k $\Omega$	30 $\Omega$	50 mA
$\Omega \times 100$	100 $\Omega$ ... 100 k $\Omega$	3 k $\Omega$	0,5 mA



## Accuracy

at reference conditions

DIN 43 780 Class 1.5 for DC (relative errors on the scale length, 77 mm)  
and 1.5% for class sizes,

changing resistance reference conditions Ambient temperature +20 ° C

Mounting position horizontal frequency 40 ... 500 Hz

## Other

Effect sizes according to DIN 43 780 MA 4 The S has a branch rectification and  
is calibrated in rms values for sinusoidal AC 50 Hz

Nominal parameters and operating ranges

Temperature Temperature Error

Working temperature range frequency

0. . . +20. . . +40 ° C.

typical

$\pm 0.7\%$  /  $0/10$  K in the range 0 ... +40 ° C

-25. . . +40 ° C

15 .. 40 .. 500.. 10 000 Hz

Range 750 V:

15. . . 40 ... 500. .3 000 Hz

The frequency is influenced by grounding the

Terminal "J\_"

In the given reference ranges

corresponds to the basic error of class 1.5, in the spheres of influence,

the typical additional error  $\pm 1.5\%$

<, 0.7% of full scale at an interference field strength of 0.5 mT <0.5% full scale

for open input terminals and ground terminal J\_

(interference field strength 40 kV / m, frequency 50 Hz)

**DC current and voltage ranges:** error  $\leq \pm 1.5\%$  of full scale when the AC  
component is not greater than the selected upper range limit AC current ranges is:  
Error  $\leq \pm 2.5\%$  of full scale when the DC component is not greater than the selected  
upper range limit

**AC voltage ranges:** error  $\leq \pm 2.5\%$  of full scale when the DC component is not  
greater than 50% of the selected measuring range value  
Maximum allowable stresses and Thresholds of the guards must not be exceeded!

When the measured variable rectangular display is 11% too large,  
triangular-shaped in measured quantity by 4% too small.

Power supply for:

**Breaker control:**

9 V flat cell battery per IEC 6 F221) number of possible triggers for new battery is about 10,000

or ready about 1 year, with frequent tripping correspondingly less,

**For resistance** to 1.5 V baby cell IECR141)

The battery is charged only with terminal short-circuit or during the measurement. Instead of brown stone cells may also alkali-manganese cells or NiCd rechargeable batteries.

NiCd batteries are recommended especially at ambient temperatures below 0 ° C.

**Housing**

Insulation group B to VDE 0110 Protection Enclosure **IP 50**, terminals **IP 20** to DIN 40 050

Test voltage 3 kV rms to VDE 0410 V scale length, A-scale: 0 .. 75: 96mm  
 $\Omega$ -scale 0. .. 00: 77 mm

Dimensions 110 mm 181 mm  $\chi \chi$  62 mm Weight 0.75 kg including batteries

**3. Overload protection**

The MA4S is protected by several well-matched protection against damage from mishandling and overloading.

**1.3 Relays**

The bipolar relay is on a threshold amplifier controlled and protects the voltage ranges 750 mV ... 75 V and the resistance measuring range 100  $\Omega \chi$

**Pickup:**

6 - to 10-times the upper range limit for each area.

**Resilience:**

max. 5 minutes to about 10 times the upper range limit if the Overload threshold lies just below the relay.

**Breaking capacity:**

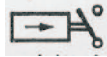
> 250 V with ^

max. 250 V -

The relay has raised, then the measuring circuit for the region 75 mV/750  $\mu$ A, 2,5 mA ... 250 mA and  $\Omega \chi 1$  separated, the guards of these areas (security and protection Diode) are still in operation.

### 3.1.1 Relay Reset

In order to reset the relay, set the main range selector (1) in the position



The needle moves to the last third of the scale when the relay is on.

By setting the current type selector (2) to the "+", it shows on the MA 4S, the voltage of the 9 V battery, or resets the relay immediately and gets armed again.

If the 9V battery voltage are low , the relay will not activated .

There is some time delay between its relay – reset attempt of five seconds . (loading time of the reset capacitor)

And so the main selector it must be turned in any other position, than the relay-reset for approximately five seconds .

The relay can be disarmed too , from an accidental mechanical shock. In any case the relay – reset function it will activate it again.

Never let the meter with the main selector at the relay – reset position , because it will stress the battery.

### 3.1.2 Automatic Battery Monitoring

The electronic battery monitoring causes the tripping of the relay in case of low battery.

The relay reset is then also blocked electronically.

In any case of replacing the battery, a new relay – reset needed, so to become active.

The internal reference (low – battery) voltage are set to (6.5 V)