

Operating Manual MU2000K - Archive document updated: 2015-04-09/Sc

- Universal Measuring Transducer for Voltage and Current (AC and DC)



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1 Application and short description

Measuring transducers MU2000K can measure DC- and AC-voltages up to 600 V and DC- and AC-currents 0-1/5 A.

Preset measuring ranges can be selected. More measuring ranges (zero and full-scale) can be easily scaled. The output signals DC 0/2-10 V and 0/4-20 mA are insulated from measuring input and supply voltage. With its universal supply voltage AC/DC 24-240 V the measuring transducer can be connected to all common supply voltages.

The MU2000K e.g. is suitable for measuring DC voltages and charging currents at batteries or for measuring AC voltages and currents in plants for own generation of energy.

2 Overview of functions

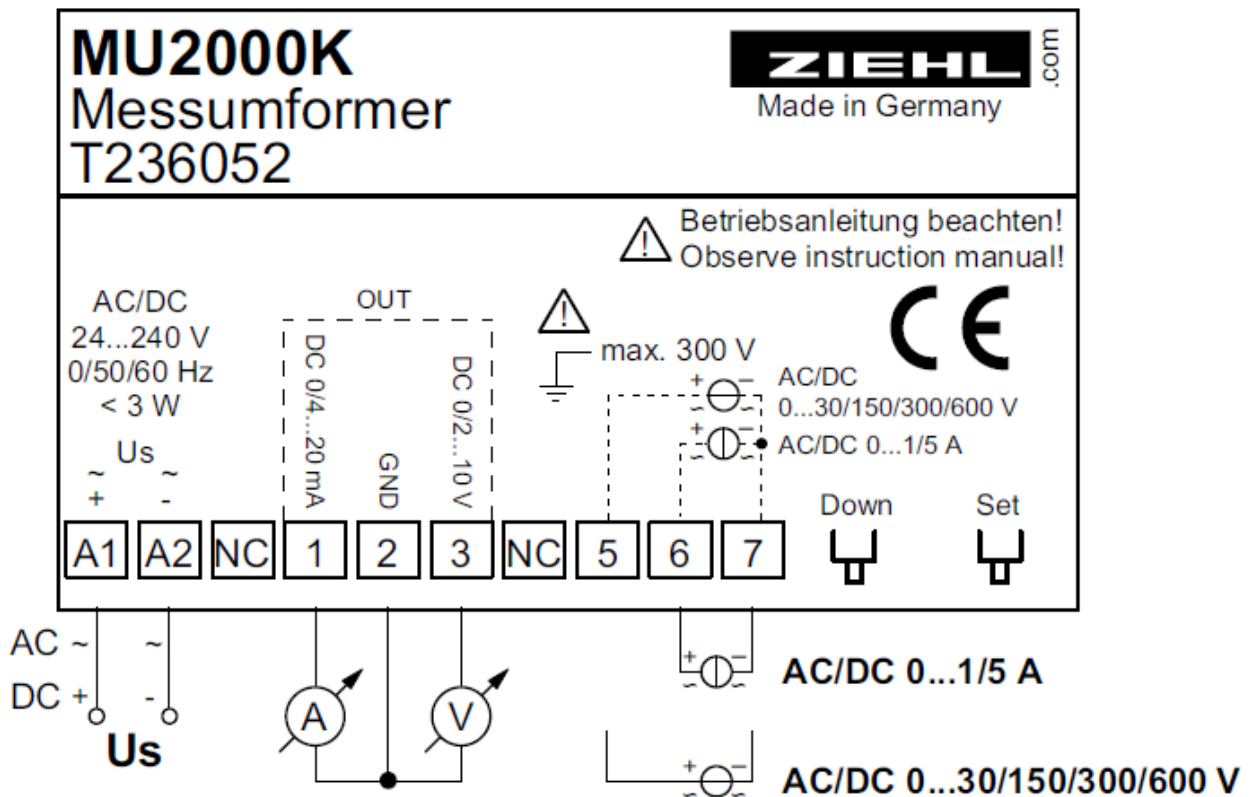
- Output signal 0-20mA and 0-10V or 4-20mA and 2-10V
- Rated Supply Voltage AC/DC 24-240V
- Insulation between inputs, outputs and supply voltage

Inputs:

- AC/DC 0 ... 600 V
(preset values: 0...30 V / 80...120 V / 0...150 V / 0...300 V / 0...600 V)
- AC/DC 0 ... 5 A
(preset values: 0...1 A / 0...5 A)

Zeros and Full Scales for more measuring-ranges can be freely selected by the user.

3 Connecting diagram



4 Important Information



The measuring input fulfils reinforced insulation according to DIN EN 61010-1 for overvoltage category II and pollution degree 2.
Connected voltages may not exceed 300 V AC/DC to earth.



DANGER!
Hazardous voltage!
Will cause death or serious injury. Turn off and lock out all power supplying this device before working on this device.

To use the equipment flawless and safe, transport and store properly, install and start professionally and operate as directed.

Only let persons work with the equipment who are familiar with installation, start and use and who have appropriate qualification corresponding to their function. They must observe the contents of the instructions manual, the information which are written on the equipment and the relevant security instructions for the setting up and the use of electrical units.

The equipment are built according to DIN / EN and checked and leave the plant according to security in perfect condition. If, in any case the information in the instructions manual is not sufficient, please contact our company or the responsible representative.

Instead of the industrial norms and regulations written in this instructions manual valid for Europe, you must observe out of their geographical scope the valid and relevant regulations of the corresponding country.

5 Installation

Observe the maximum temperature permissible when installing in switching cabinet. Make sure sufficient space to other equipment or heat sources. If the cooling becomes more difficult e.g. through close proximity of apparatus with elevated surface temperature or hindrance of the cooling air, the tolerable environmental temperature is diminishing.



Attention! Universal power supply
The device have a universal power supply, that is suitable for DC- and AC voltages. Before connecting the device to supply-voltage make sure that the connected voltage corresponds with the voltage on the lateral type on the device.

The unit can be installed as follows:

- Installation in switchgear cabinet on 35 mm mounting rail according to EN 60715
- With screws M4 for installation on walls or panel. (additional latch is not included in delivery)

Connection according to connection plan or type plate.

6 Commissioning

6.1 Overview of commissioning

The MU2000K can be commissioned to predefined standard ranges or scaled to an arbitrary range.

There are two different ways to do the settings:

- [Point 6.2 – 6.4](#): MU2000K setting a predefined range
- [Point 6.5 – 6.7](#): MU2000K scaling an arbitrary range

6.2 Overview of the predefined standard ranges

Following standard ranges can be set without adjustment to the unit:

Input voltage (AC / DC)	
Zero point	Full scale
0 V ...	30 V
80 V ...	120 V
0 V ...	150 V
0 V ...	300 V
0 V ...	600 V

Input current (AC / DC)	
Zero point	Full scale
0 A ...	1 A
0 A ...	5 A

Output
0 - 10 V / 0 - 20 mA or 2 - 10 V / 4 - 20 mA

6.3 Setting a predefined range

- Power off the device
- Press Button [Set] and keep pressed
- Power on the device, and keep pressed the button [Set]
 - ⇒ After 5s flashes the green LED, release button [Set]
 - ⇒ Parameterization „input type“ → LED ON flashes 1x
- Select with button [Set] the input type → displayed by LED U (DC voltage), LED AC + U (AC voltage), LED I (DC current), LED AC + I (AC current)
- Press button [Down]
 - ⇒ Parameterization „range“ >> LED ON flashes 2x

- Select with button [Set] the range of the input

Number of flashes	LED			
	U	AC + U	I	AC + I
1 x	DC 0...30 V	AC 0...30 V	DC 0...1 A	AC 0...1 A
2 x	DC 80...120 V	AC 80...120 V	DC 0...5 A	AC 0...5 A
3 x	DC 0...150 V	AC 0...150 V		
4 x	DC 0...300 V	AC 0...300 V		
5 x	DC 0...600 V	AC 0...600 V		

- Press button [Down]
 - ⇒ Parameterization „output“ → LED Power flashes 4x

- Select with button [Set] the output range

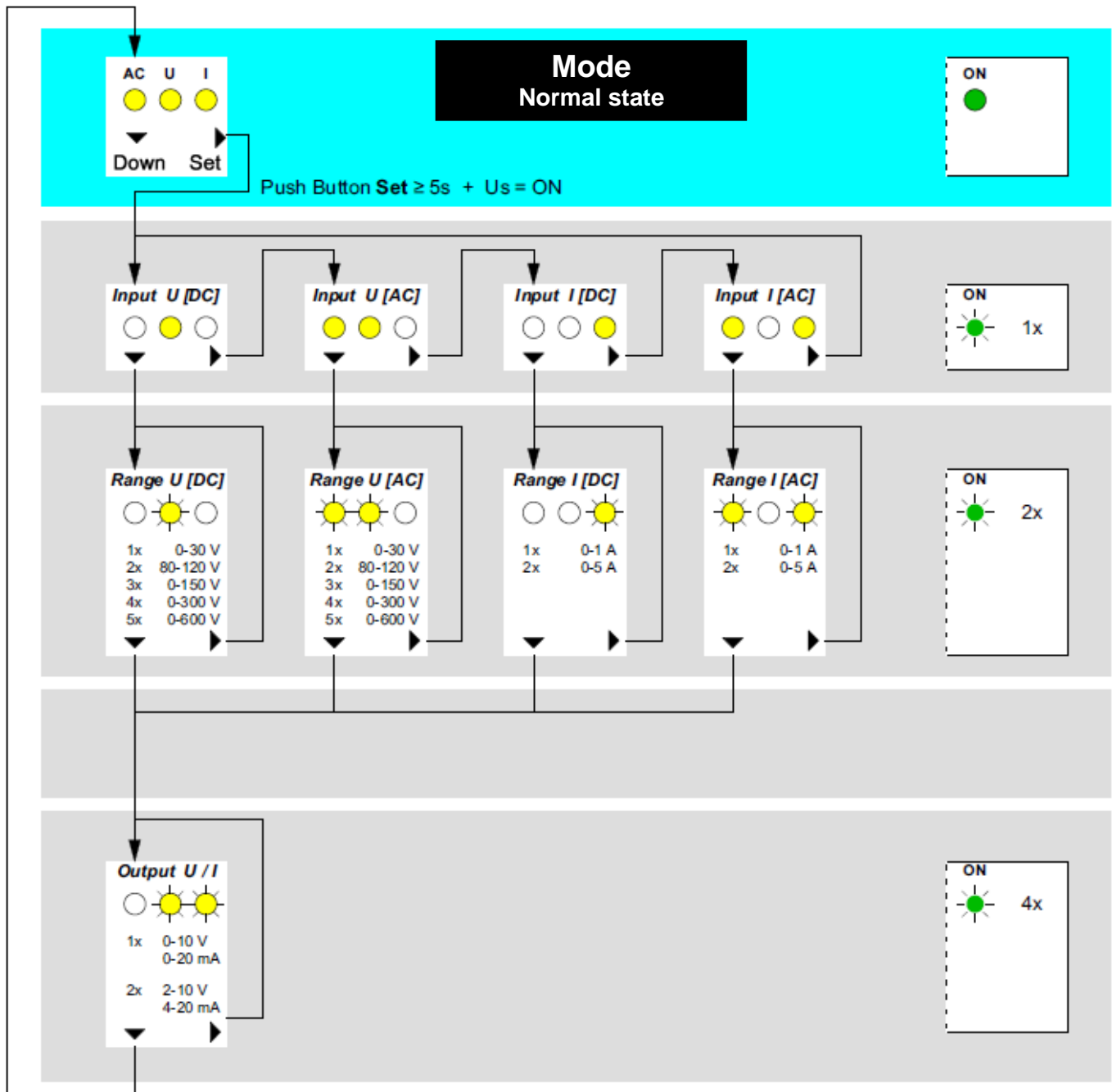
Number Of flashes	LED U + I
1 x	0 - 10 V / 0 - 20 mA
2 x	2 - 10 V / 4 - 20 mA

- Press button [Down]
 - ⇒ End of parameterization, LED ON lights permanently

Attention:

- When no button is pressed during scaling for 120 s, the process is cancelled automatically. Entered values will be discarded.
- When scaling is started, all parameters are reset to default.
- In normal operating mode the selected input is displayed with LED.

6.4 Diagram for setting a predefined range



6.5 Overview of scaling an arbitrary range

Other ranges may be set by scaling of the input signal:

Input	Range	
	Zero point	Full scale
U (AC / DC)	0 ... 600 V	0 ... 600 V
I (AC / DC)	0 ... 5 A	0 ... 5 A

Output
0 - 10 V / 0 - 20 mA or 2 - 10 V / 4 - 20 mA

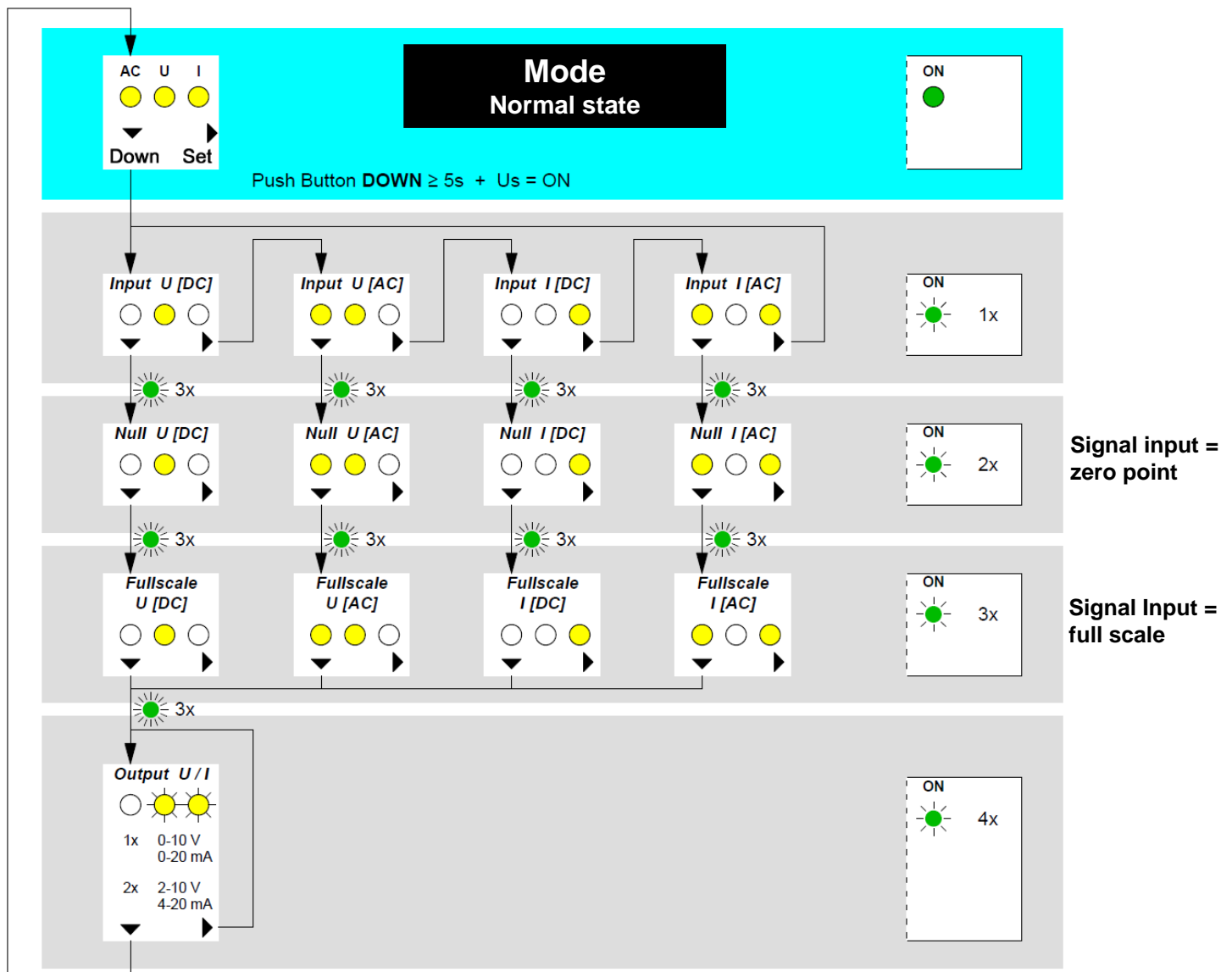
6.6 Scaling of range

- Power off the device
- Press Button [Down] and keep pressed
- Power on the device, and keep pressed the button [Down]
 - ⇒ After 5s flashes the green LED, release button [Down]
 - ⇒ Parameterization „input type“ → LED ON flashes 1x
- Select with button [Set] the input type → displayed by LED U (DC voltage), LED AC + U (AC voltage), LED I (DC current), LED AC + I (AC current)
- Press button [Down]
 - ⇒ Parameterization „input zero point“ → LED ON flashes 2x
 - ⇒ Connect a signal at the input corresponding to the zero point
- Press button [Down] (store of value, green LED flashes 3 times quickly)
 - ⇒ Parameterization „input full scale“ → LED ON flashes 3x
 - ⇒ Connect a signal at the input corresponding to the full scale
- Press button [Down] (store of value, green LED flashes 3 times quickly)
 - ⇒ Parameterization „output“ → LED ON flashes 4x
- Select with button [Set] the output range
 - LEDs (U + I) 1 x flash -> output 0 - 10 V / 0 - 20 mA
 - LEDs (U + I) 2 x flash -> output 2 - 10 V / 4 - 20 mA
- Press button [Down]
 - ⇒ End of parameterization, LED ON lights permanently

Attention:

- When no button is pressed during scaling for 120 s, the process is cancelled automatically. Entered values will be discarded.
- When scaling is started, all parameters are reset to default.
- In normal operating mode the selected input is displayed with LED.

6.7 Diagram for scaling of range

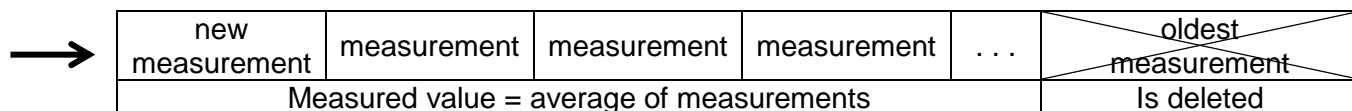


6.8 System measurement time

Measuring time for one measurement is 20 ms (at AC 60 Hz app. 17 ms).

System measuring time is calculated by measuring time multiplied with number of measurements.

Generation of measured value:



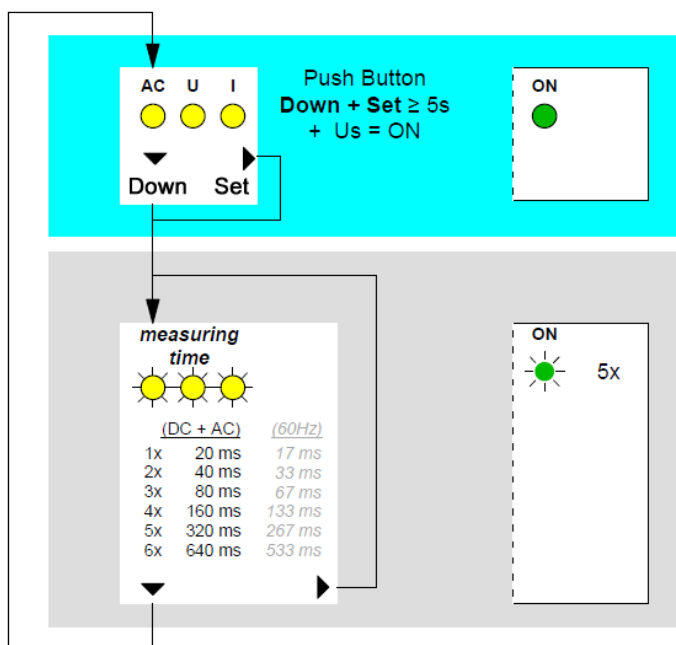
6.9 Setting the System measurement time

- Power off the device
- Keep pressed buttons [Set] and [Down] simultaneously
- Switch on power supply while buttons are pressed
 - ⇒ Release buttons after app. 5s when green LED starts blinking
 - ⇒ Parameterization „System measurement time“ → LED ON flashes 5x

- Select with button [Set] the System measurement time

Number of flashes	LEDs AC + U + I
1 x	20 ms (60Hz = 17 ms)
2 x	40 ms (60Hz = 33 ms)
3 x	80 ms (60Hz = 67 ms)
4 x	160 ms (60Hz = 133 ms)
5 x	320 ms (60Hz = 267 ms)
6 x	640 ms (60Hz = 533 ms)

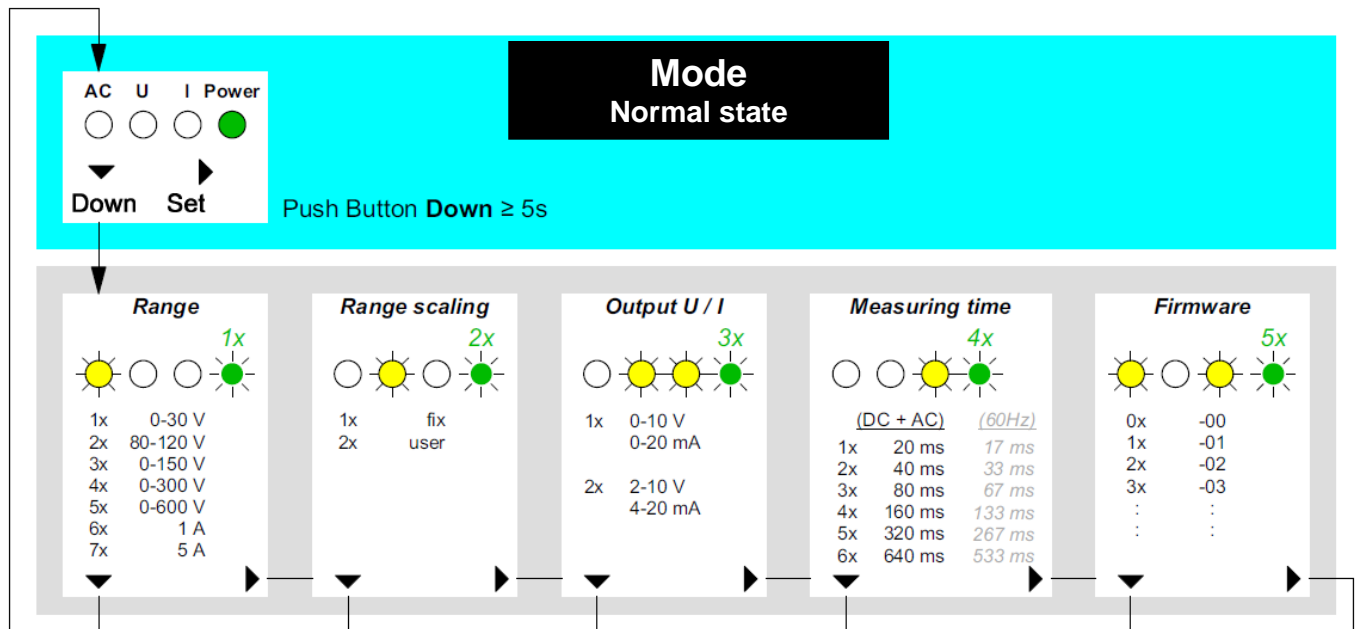
- Press button [Down]
 - ⇒ End of parameterization, LED ON lights permanently



6.10 Checking of parameters

During operation several parameters can be checked.

- Keep button [Down] pressed (5s) until green LED Power starts blinking (1x)
 - ⇒ Exit with pressing button [Down] again,
Automatic exit 30s after last actuation of a button
- Display of selected parameter with blinking yellow LEDs.
- Shift with button [Set] to next parameters (green LED Power blinks accordingly)



6.11 Factory setting

Default settings:

- Input: AC 5 A (AC 0 – 5 A)
- Output: DC 0 – 10 V, 0 – 20 mA
- Measuring time: 160 ms (8 measurements, x 20 ms measurement time)

7 Error search

Wrong output signal (current/voltage) OUT (terminal 1 – 2 – 3)

Cause The device is not configured correctly

Remedy Check commissioning

22mA at output 0/4...20 mA, 11V at output 0/2...10 V


Cause Internal error of device

Remedy Reset by interrupting supply voltage. If the error cannot be patched by a Reset send back to factory for repair.

8 Technical data

Rated supply voltage U_s	AC/DC 24 – 240 V	0/50...400 Hz	< 3 W < 8 VA
Tolerance	DC 20,4 - 297 V	AC 20 - 264 V	

Inputs / Ranges	Input-resistance	Maximum Input signal	Error of full scale
DC 30 V, 150 V, 300 V, 600 V	> 500 k Ω	600 V	0,1 %
AC 30 V, 150 V, 300 V, 600 V			0,5 %
DC 1 A, 5 A	30 m Ω	7,5 A / 4s, 25 A / 1s	0,1 %
AC 1 A, 5 A			0,5 %
Frequency at AC- measurements	50 ... 400 Hz		
measurement deviation at > 100 Hz	1% of full scale		
measurement deviation at > 300 Hz	2% of full scale		
Temperature factor	< 0,02 % / K		
Resolution	14 Bit		



max. 300 V

Output	2 outputs with common ground
Reaction time	< 45ms + System measurement time
Voltage output	DC 0/2 – 10 V
Tolerance	0,3 % of full scale (from 0,1 V)
Temperature factor	< 0,01 % / K
Resolution	11,6 Bit < 3,1 mV
Load	≥ 1 k Ω
Current output	DC 0/4 – 20 mA
Tolerance	0,3 % of full scale (from 0,1 mA)
Temperature factor	< 0,015 % / K
Resolution	11,6 Bit < 6,1 μ A
Load	≤ 500 Ω
Error from load	$(250 \Omega - \text{Load}) / 250 \Omega * 0,3$ % of current

Measuring principle	RMS (AC), mean (DC)
Measuring time	20 ms (17 ms at 60 Hz)
Averaging	adjustable 1, 2, 4, 8, 16, 32 measurements
System measurement time	Measuring time * Averaging

Test conditions	EN 61010-1
Rated supply voltage U_s (terminals A1,A2)	
Pollution degree	2
Overvoltage category	III reinforced insulation
Rated insulation voltage U_i	300V
Input (terminals 4,5,6,7)	
Pollution degree	2
Overvoltage category	II reinforced insulation
Rated insulation voltage U_i	300 V
Galvanic insulation / Test-voltage	
Input – output	DC 3820 V
U_s – output	DC 5250 V
U_s – input	DC 5250 V

EMC immunity	EN 61326-1 Industrial electromagnetic environment
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EMC emission	EN 61000-6-3
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Environmental conditions

rated ambient temperature range	-20 °C ... +50 °C
storage temperature	-20 °C ... +70 °C
Admissible temperature for wiring	-5 °C ... +70 °C
Altitude	< 2000 m above sea level (MSL)
Climatic conditions	5 - 85% rel. humidity, no condensation
Vibration resistance EN 60068-2-6	2...13,2 Hz ±1 mm 13,2 ... 100 Hz 1 g

Housing

Dimension (H x W x D)	Type K 75 x 22,5 x 110 mm
Line connection solid wire	each 1 x 0,5...2,5 mm ²
Stranded wire with insulated ferrules	each 1 x 0,14...1,5 mm ²
Torque	0.5 Nm (3,6 lb.in)
Protection class housing	IP 40
Protection class terminals	IP 20
Mounting	Snap mounting on 35 mm standard rail EN 60 715 or M4 screws
Weight	app. 100 g

Subject to technical changes

9 Housing Type K

Dimensions in mm

