

## RM 12... 18S

Analog - Digital multimeters



© Ziegler Instruments Order No. RM 12... 18S Data sheet-EI-RO-921018-2-2013-EN

## Application

It is Analog Digital Multimeter which measures VAC, VDC, VAC+DC, Frequency, mA DC, mA (AC+DC), Resistance, continuity, Diode, Farad, AC current measurement.

## Product Features

### Automatic Terminal Blocking System (ABS)

The automatic Terminal blocking system prevents incorrect connection of the test leads and incorrect selection of the measured quantity. This reduces danger to the user, the meter and the system to a remarkable extent.

### Interface And Software com 100

The multimeters are fitted with a serial RS-232 C interface via which the measured values can be transmitted to a PC. These values, electrically isolated, are transmitted to the attachable interface adaptor with infrared light through the case\*

### MIN/MAX Value Storage

In addition to the display of the actual measured value, the minimum or maximum value can constantly be updated and stored.

### Indication Of Negative Values On The Analog Scale

When measuring DC quantities, also negative values are shown on the analog scale so that variations of the measured value can be observed at the zero point.

### Indication Of Negative Values On The Analog Scale

The measuring principle employed permits the measurement of the root-mean-square value (TRMS) of AC quantities and mixed quantities (AC and DC) regardless of the waveform.

### Automatic Data Hold\*

The DATA HOLD function makes it possible to hold the digitally displayed measured value. According to a patented method, it is ensured that no freak value but the actual measured value is held in the case of rapid changes in measured quantities. The held measured value appears on the digital display. The actual measured value continues to be shown on the analog scale.

### Autoranging / Manual Range Selection

The measured values are selected with rotary switch. The measuring range is automatically matched to the measured value. The measuring range can also be selected manually via the AUTO/MAN push button.

### Continuity Test

This permits testing for short circuit and open circuit. In addition to the display, a facility of sound signal is available.

### Temperature Measurement

It is possible to use all models of multi series, in direct connection of temperature sensor Pt 100 / Pt 1000. The meters automatically detects the type of sensors connected to it & displays directly measured temperature.

### Signalling in the case of a blown fuse

The display FUSE points to a blown fuse.

### Power economizing circuit

The meter disconnects automatically when the measured value remains unchanged for about 10 minutes and no operating control was operated during this time. The disconnection facility can be disabled.

### Overload Warning

A sound signal indication violation of the overload limits.

### Protective holster for rough duty

A holster of soft rubber with tilt stand protects the meter against damage in the case of shock and drop. The rubber material makes for the meter to stand firmly even on vibrating surface.

### Top model *multi* 18S

The top model multi 18S features a 4 3/4 digit display (31 000 digits) as well as the following additional functions : Event counter, measurement of the duration of the event, time counter (stop watch), data compare, dB measurement, wide-range capacitance measurement.

### Calibration

multi is automatically calibrated with respect to Fluke 5500 / Wavetek 9100. Automatic calibration is done through a developed calibration software with RS232 connection to the multimeter. Every multimeter is provided with the Test Certificate which is traceable to National / International standards.

\* Protected by patent rights

Specifications multi12... 16S

Meas. function	Measuring range						Resolution	Input impedance		Inherent deviation of the digital display ± (...% of meas. val. + ...digits) for reference condition					Overload capacity <sup>4)</sup>		Measuring function	
	Multi	12	13	14	15	16				12	13	14	15	16	Overload value	Overload duration		
<b>V<sub>DC</sub></b>	30.00 mV	●	●	●	●	●	10 μV	> 10G Ω // < 40 pF	0.5 + 3 <sup>5)</sup>					1000 V	DC	<b>V<sub>DC</sub></b>		
	300.0 mV	●	●	●	●	●	100 μV	> 10G Ω // < 40 pF	0.5 + 3									
	3.000 V	●	●	●	●	●	1 mV	11M Ω // < 40 pF	0.25 + 1									
	30.00 V	●	●	●	●	●	10 mV	10M Ω // < 40 pF	0.25 + 1									
	300.0 V	●	●	●	●	●	100 mV	10M Ω // < 40 pF	0.25 + 1									
1000 V	●	●	●	●	●	1 V	10M Ω // < 40 pF	0.35 + 1					0.1 + 1					
<b>V<sub>AC</sub></b>	3.000 V	●	●	●	●	● <sup>1)</sup>	1 mV	11M Ω // < 40 pF	0.75 + 2(10... 300 D) 0.75 + 1 (> 300 D)					0.75 + 3 (> 10 D)	AC effective sinusoidal	<b>V<sub>AC</sub></b>		
	30.0 V	●	●	●	●	● <sup>1)</sup>	10 mV	10M Ω // < 40 pF										
	300.0 V	●	●	●	●	● <sup>1)</sup>	100 mV	10M Ω // < 40 pF										
	1000 V	●	●	●	●	● <sup>1)</sup>	1 V	10M Ω // < 40 pF										
<b>V<sub>TRMS</sub></b>	3.000 V					● <sup>1)</sup>	1 mV	11M Ω // < 40 pF	---					0.75 + 3 (> 10 D)	<b>V<sub>TRMS</sub></b>			
	30.00 V					● <sup>1)</sup>	10 mV	10M Ω // < 40 pF	---									
	300.0 V					● <sup>1)</sup>	100 mV	10M Ω // < 40 pF	---									
	1000 V					● <sup>1)</sup>	1 V	10M Ω // < 40 pF	---									
Voltage drop. approx.								12	13	14 / 15/16								
<b>A<sub>DC</sub></b>	300.0 μA		●	●	●	●	100 nA	---	---	15 mV	1.0 + 5 (> 10D)			0.5 + 5 (> 10 D)	0.36 A	cont.	<b>A<sub>DC</sub></b>	
	3.000 mA	●	●	●	●	●	1 μA	15 mV	150 mV	150 mV	1.0 + 2			0.5 + 2				
	30.00 mA	●	●	●	●	●	10 μA	150 mV	150 mV	650 mV	1.0 + 5 (< 10 D)			0.5 + 5 (> 10 D)				
	300.0 mA	●	●	●	●	●	100 μA	1 V	1 V	1 V	1.0 + 2			0.5 + 2				
	3.000 A	●	●	●	●	●	1 mA	---	100 mV	100 mV	1.0 + 5 (> 10 D)			1.0 + 5 (> 10 D)				
	10.00 A		16A	●	●	●	10 mA	---	300/270mV	270 mV	1.0 + 2			1.0 + 2				
<b>A<sub>AC</sub></b>	3.000 mA			●	●		1 μA	---	---	150 mV	1.5 + 2 (> 10 D)			---	0.36 A	cont.	<b>A<sub>AC</sub></b>	
	30.00 mA	●	●				10 μA	150 mV	150 mV	---	1.5 + 2 (> 10 D)			---				
	300.0 mA	●	●	●	●		100 μA	1 V	1 V	1 V	1.5 + 2 (> 10 D)			---				
	10.00 A		16A	●	●		10 mA	---	300/270mV	270 mV	1.5 + 2 (> 10 D)			---				
<b>A<sub>TRMS</sub></b>	30.00 A <sup>2)</sup>	●					10 mA	150 mV	---	---	1.5 + 2 (> 10 D)			---	0.36 A	cont.	<b>A<sub>TRMS</sub></b>	
	300.0 A <sup>2)</sup>	●					100 mA	1 V	---	---	1.5 + 2 (> 10 D)			---				
<b>A<sub>TRMS</sub></b>	3.000 mA					● <sup>1)</sup>	1 μA	---	---	150 mV	---			1.5 + 4 (> 10 D)	12 A	10 min	<b>A<sub>TRMS</sub></b>	
	300.0 mA					● <sup>1)</sup>	100 μA	---	---	1 V	---			1.5 + 4 (> 10 D)				
	10.00 A					● <sup>1)</sup>	10 mA	---	---	270 mV	---			1.75 + 4 (> 10 D)				
No-load voltage																		
<b>Ω</b>	30.00 Ω	●	●	●	●	●	10 m Ω	max. 3.2 V	0.5 + 3 <sup>5)</sup>					0.4 + 3 <sup>5)</sup>	1000 V	DC	<b>Ω</b>	
	300.0 Ω	●	●	●	●	●	100 m Ω	max. 3.2 V	0.5 + 3					0.4 + 3				
	3.000 k Ω	●	●	●	●	●	1 Ω	max. 1.25 V	0.4 + 1					0.2 + 1				
	30.00 k Ω	●	●	●	●	●	10 Ω	max. 1.25 V	0.4 + 1					0.2 + 1				
	300.0 k Ω	●	●	●	●	●	100 Ω	max. 1.25 V	0.4 + 1					0.2 + 1				
	3.000 M Ω	●	●	●	●	●	1 k Ω	max. 1.25 V	0.6 + 1					0.4 + 1				
	30.00 M Ω	●	●	●	●	●	10 k Ω	max. 1.25 V	2.0 + 1					2.0 + 1				
→	2.000 V	●	●	●	●	●	1 mV	max. 3.2 V	0.25 + 1					0.1 + 1			→	
<b>F</b>	30.00 nF					●	10 pF	250 k Ω	2.5 V	---					1.0 + 3 <sup>6)</sup>	1000 V	DC / AC effective sinusoidal	<b>F</b>
	300.0 nF					●	100 pF	250 k Ω	2.5 V	---					1.0 + 3			
	3.000 μF					●	1 nF	25 k Ω	2.5 V	---					1.0 + 3			
	30.00 μF					●	10 nF	25 k Ω	2.5 V	---					3.0 + 3			
Sensor								F <sub>min</sub> V <sub>DC</sub>	F <sub>min</sub> V <sub>AC</sub>									
<b>Hz</b>	300.0 Hz					●	0.1 Hz	1 Hz	45 Hz	---					0.5 + 1 <sup>8)</sup>	cont.	<b>Hz</b>	
	3.000 kHz					●	1 Hz	1 Hz	45 Hz	---								
	30.00 kHz					●	10 Hz	10 Hz	45 Hz	---								
	100.0 kHz					●	100 Hz	100 Hz	100 Hz	---								
<b>%</b>	2.0...98.0 %					●	0.1 %	1 Hz	---	---					1 Hz.....1kHz: ±5 D <sup>9)</sup> 1Hz.....10kHz: ±5 D/kHz <sup>9)</sup>	≤ 3 kHz: 1000V ≤ 30 kHz: 300V ≤ 100 kHz: 30 V	<b>%</b>	
<b>°C</b>	- 200.0... + 200.0°C	●	●	●	●	●	0.1°C	Pt 100	---	---	2 Kelvin + 5 D <sup>10)</sup>					1000 V	DC	<b>°C</b>
	+ 200.0... + 850.0°C	●	●	●	●	●	0.1°C	Pt 100	---	---	1.0 + 5 <sup>10)</sup>							
	-100.0... + 200.0°C	●	●	●	●	●	0.1°C	Pt 1000	---	---	2 Kelvin + 2 D <sup>10)</sup>							
	+ 200.0 ... + 850.0°C	●	●	●	●	●	0.1°C	Pt 1000	---	---	1.0 + 2 <sup>10)</sup>							

1) TRMS measurement  
 2) Direct display with clip-on transformer 1000:1  
 4) At 0°C... + 40°C  
 5) With zero setting; w/o zero setting + 35 digits  
 6) With zero setting; w/o zero setting + 50 digits  
 7) multi 13S (w/o 16 A fuse) : 16A cont., 20A for 5 min;  
 multi 14S... 16S: 12A for 5 min, 16A for 30s

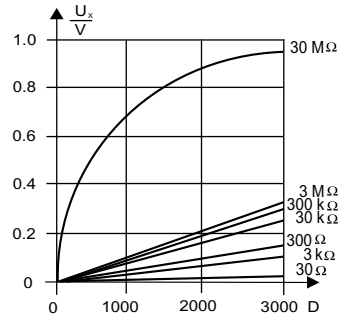
8) Range 3 V  $U_E = 1.5 V_{rms} \dots 100 V_{rms}$   
 30 V  $U_E = 15 V_{rms} \dots 300 V_{rms}$   
 300 V  $U_E = 150 V_{rms} \dots 1000 V_{rms}$   
 9) On the range 3V<sub>DC</sub> rectangular signal positive at one end 5 ... 15 V, f = const., not 163.84 Hz or integer multiple.  
 10) Without sensor



### Reference conditions Measuring current with diode test and / or continuity test 18S

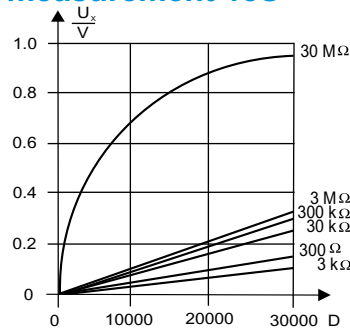
Ambient temperature	+23Co + 2K
Relative humidity	45%... 55%
Frequency of the measured quantity	45 Hz... 65 Hz
Waveform of the measured quantity	Sinusoidal
Battery voltage	8V + 0.1 V

### Measuring voltage with resistance measurement 12 ... 16



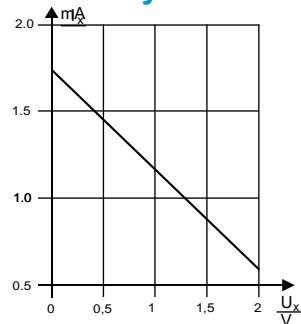
Voltage  $U_x$  across the resistance  $R_x$  to be measured as a function of measuring range and display.

### Measuring voltage with resistance measurement 18S



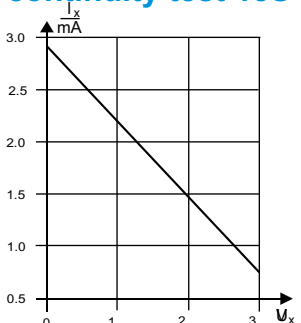
Voltage  $U_x$  across the resistance  $R_x$  to be measured as a function of measuring range and display.

### Measuring current with diode test and / or continuity test 12 ... 16



Measuring current  $I_x$  as a function of the displayed voltage  $U_x$  on the device under test.

### Measuring current with diode test and / or continuity test 18S



Measuring current  $I_x$  as a function of the displayed voltage  $U_x$  on the device under test.

### Influence quantities and variations for 12...16 16

Influence quantity	Influence range	Measured quantity / measuring range	Variation <sup>1)</sup>			
			± (...% of meas. val. + ... digits)			
			12...	14	15	16
Temperature	0 C... + 21 C and +25 C... + 40 C	30/300 mV $\overline{=}$	1.0 + 3			1.0 + 1
		3...300 V $\overline{=}$	0.15 + 1			0.1 + 1
		1000 V $\overline{=}$	0.2 + 1			0.1 + 1
		V $\sim$	0.4 + 2			0.3 + 2
		300 $\mu$ A <sup>2)</sup> ... 300 mA $\overline{=}$	0.5 + 1			0.15 + 1
		3A / 10 (16) A $\overline{=}$	0.5 + 1			
		A $\sim$	0.75 + 1			0.75 + 3
		30 $\Omega$ <sup>2)</sup>	0.15 + 2			
		300 $\Omega$	0.25 + 2			0.15 + 2
		3 k $\Omega$ ... 3 M $\Omega$	0.15 + 1			0.1 + 1
		30 M $\Omega$	1.0 + 1			0.6 + 1
		30 nF <sup>2)</sup> ... 3 $\mu$ F	---			0.5 + 2
		30 $\mu$ F	---			2.0 + 2
		Hz	---			0.5 + 1
		%	---			± 5 D
Frequency of the measured quantity	15 Hz... < 30 Hz 30 Hz... < 45 Hz > 65 Hz... 400Hz > 400 Hz... 1 kHz > 1kHz... 20 kHz	3 ... 300 V $\sim$	---	---		1.0 + 3
			---	---		0.5 + 3
Crest factor CF	1 ... 3 > 3 ... 5	V $\sim$ <sup>4)</sup> , A $\sim$ <sup>4)</sup>	---	---		0.5 + 3
			---	---		1.0 + 3
			---	---		0.5 + 3
			---	---		1.0 + 3
			---	---		0.5 + 3
			---	---		1.0 + 3
			---	---		0.5 + 3
			---	---		1.0 + 3
			---	---		0.5 + 3
			---	---		1.0 + 3
Waveform of the measured quantity <sup>3)</sup>	CF	Voltage measurement	The permissible crest factor CF of the AC quantity to be measured is a function of the displayed value :			
			CF			
		Current measurement				

Influence quantity	Influence range	Measured quantity / measuring range	Variation 12S... 16S
Battery voltage	5) ... < 7.9 V > 8.1 V... 10.0 V	V $\overline{=}$	± 2 D
		V $\sim$	± 4 D
		A $\overline{=}$	± 4 D
		A $\sim$	± 6 D
		30 $\Omega$ / 300 $\Omega$ / °C	± 4 D
		3 k $\Omega$ ... 30 M $\Omega$	± 3 D
		nF, $\mu$ F	± 1 D
		Hz	± 1 D
Relative humidity	75 % 3 days Meter off	V $\sim$	1x Intrinsic error
		A $\sim$	
		$\Omega$	
		F	
		Hz	
DATA		C	± 1 D
MIN / MAX		V $\sim$ , A $\sim$	± 2 D

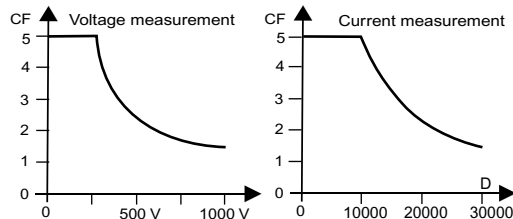
- 1 With temperature; Error data is per 10 K change in temperature. With frequency; Error data is valid from a display of 300 digits.
- 2 With zero setting
- 3 With unknown waveform (crest factor CF > 2), the measurement must be made with manual range selection.
- 4 Except for sinusoidal waveform
- 5 From the time the symbol "  $\sim$ " appears.

### Influence quantities and variations for 18S

Influence quantity	Influence range	Measured quantity / measuring range <sup>1)</sup>	Variation <sup>2)</sup> ± (...% of meas. val. + ... digits)	
Temperature	-10 C...+21 C and +25 C...+40 C	V $\overline{\overline{=}}$	0.05 + 3	
		V $\sim$ , V $\overline{\overline{=}}$	0.2 + 30	
		300 $\mu$ A / 3 mA	0.2 + 3	
		30 mA $\overline{\overline{=}}$	0.1 + 3	
		300 mA... 10 A $\overline{\overline{=}}$	0.2 + 3	
		300 $\mu$ A... 300 mA $\overline{\overline{=}}$	0.3 + 30	
		3A / 10 A $\overline{\overline{=}}$	0.5 + 30	
		300 $\Omega$	0.1 + 5	
		3 k $\Omega$ ... 3 M $\Omega$	0.1 + 3	
		30 M $\Omega$	0.6 + 3	
		30 nF... 3 $\mu$ F	0.5 + 3	
		30 $\mu$ F	2.0 + 3	
		Hz	0.1 + 3	
-200... + 100 C	0.5 Kelvin + 2 D			
+ 100... + 850 C	0.5 + 2			
Frequency of the measured quantity	15 Hz... < 45 Hz	300 mV $\sim$	1.0 + 20	
			65 Hz... < 200 Hz	1.4 + 20
			> 15 Hz... < 30 Hz	1.0 + 20
			> 30 Hz... < 45 Hz	0.5 + 20
			> 65 Hz... 400 Hz	0.5 + 20
			> 400 Hz... 1 kHz	1.0 + 20
	15 Hz... < 30 Hz	1000 V $\sim$	1.0 + 20	
			30 Hz... < 45 Hz	0.5 + 20
			> 65 Hz... 1 kHz	2.0 + 20
			15 Hz... < 30 Hz	1.0 + 20
			30 Hz... < 45 Hz	2.0 + 20
			> 65 Hz... 1 kHz	1.0 + 20
	15 Hz... < 45 Hz	A $\sim$	1.0 + 20	
> 65 Hz... 1 kHz	A $\sim$	1.0 + 20		
Crest factor CF	1...3 > 3...5	V $\sim$ <sup>4)</sup> , A $\sim$ <sup>4)</sup>	± 1% of rdg.	
			± 3% of rdg.	

The permissible crest factor CF of the AC quantity to be measured is a function of the displayed value :

Waveform of the measured quantity <sup>3)</sup>



Influence quantity	Influence range	Measured quantity / measuring range	Variation
Battery voltage	5) ... < 7.9 V > 8.1 V... 10.0 V	V $\overline{\overline{=}}$	± 6 D
		V $\sim$	± 30 D
		A $\overline{\overline{=}}$	± 30 D
		A $\sim$	± (1% of rdg. + 10D)
		$\Omega$	± 10 D
		3 nF... 30 $\mu$ F	± 10 D
		Hz	± 6 D
C	± 5 D		
Relative humidity	75 %	V, dB, A, $\Omega$ , F, Hz, C	1x inherent deviation
	3 days Meter off		
DATA		V, dB, A, $\Omega$ , Hz	± 20 D
		F	± 2 D
MIN / MAX		V, dB, A, $\Omega$ , Hz	± 10 D
		C, F	± 1 D

- 1 With zero setting
- 2 With temperature; Error data is per 10 K change in temperature. With frequency; Error data is valid from a display of 10% of the measuring range.
- 3 With unknown waveform (crest factor CF > 2), the measurement must be made with manual range selection.
- 4 Except for sinusoidal waveform
- 5 From the time the symbol " -| " appears.

### Display

LCD field (65 mm x 30 mm) with analog indication and digital display and with annunciators for unit of measurement, function and various special functions.

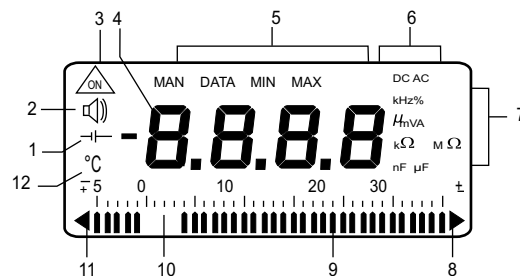
### Analog

Indication LCD scale with pointer  
 Scale length 55 mm on V  $\overline{\overline{=}}$  and A  $\overline{\overline{=}}$  ;  
 47 mm on all other ranges  
 + 5...0...± 30 with 35 scale divisions on  $\overline{\overline{=}}$ ,  
 0...30 with 30 scale divisions on all other ranges  
 Scaling With automatic reversal  
 Polarity indication By triangle  
 Overrange indication On  $\Omega$  10 readings/s,  
 Sampling rate 20 readings/s, On  $\Omega$  10 readings/s

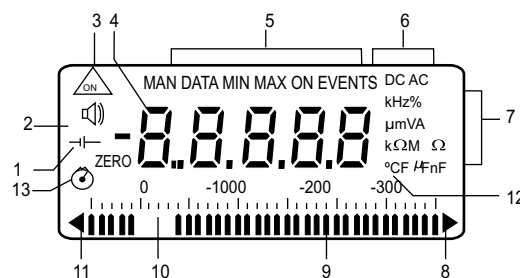
### Digital

Display/ height of numerals multi 12... 16,  
 7 segment numerals / 15mm  
 multi 18S:  
 7-segment numerals/12 mm  
 multi 12...16,  
 3 digit  $\Delta$  3100 counts  
 multi 18S:  
 4 digit  $\Delta$  31000 counts  
 "OL" is shown  
 "-" sign is shown,  
 When positive pole to " -| "  
 2 readings/s,  
 On  $\Omega$  and C: 1 reading/s

### Display multi 12... 16



### Display multi 18S

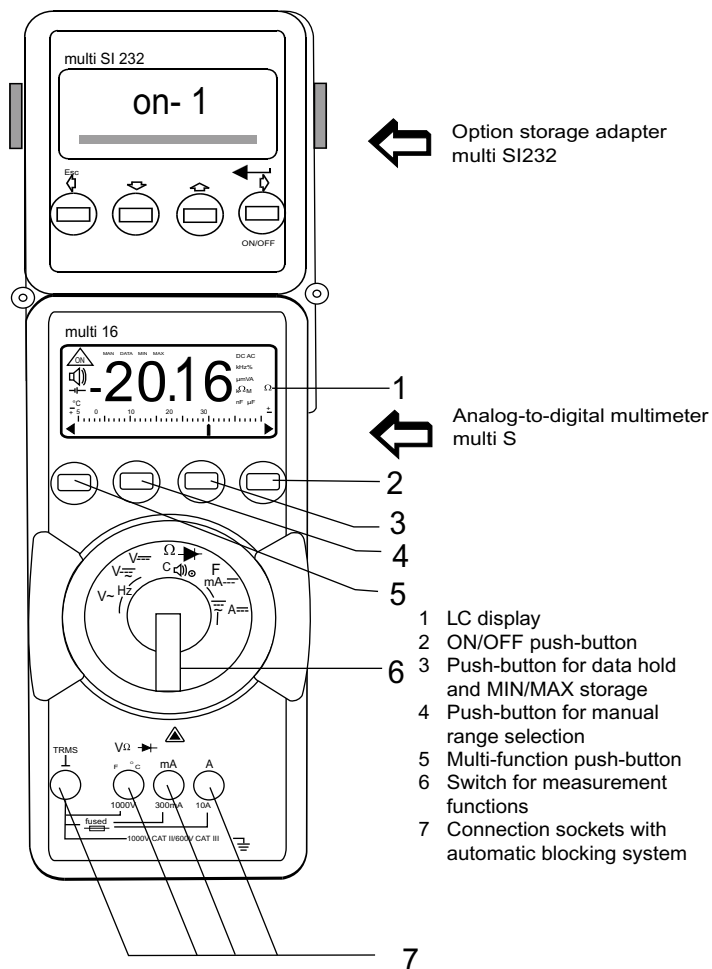


- 1 Display with low battery voltage
- 2 Display with sound signal on
- 3 Symbol for "CONTINUOUSLY ON"
- 4 Digital display with indication of decimal point and polarity
- 5 Display with manual range selection as well as with data and MIN/MAX hold
- 6 Display of the selected function
- 7 Display of the unit of measurement
- 8 Display with overrange
- 9 Pointer for analog indication
- 10 Scale for analog indication
- 11 Indication that negative analog range is exceeded
- 12 Display of the unit 0C when measuring temperature
- 13 Display with time counter switched on

## Applied rules and standards

IEC 61010-1:2001 DIN EN 61010 part 1 VDE 0411 -1	Safety requirements for electrical equipment for measurement, control and laboratory use.
DIN 43751 IS 13875	Digital measuring instruments
EN 61326:2002	Generic emission standard; Residential, commercial and light industry.
EN 61326:2002	Generic immunity standard; residential, commercial and light industry.
VDI/VDE 3540	Reliability of measuring and control equipment.
DIN EN 60529 DIN VDE 0470 part 1	Test equipment and test procedures -Degrees of protection provided by enclosures (IP Code).

## Operating controls 12... 18S



## Environmental conditions

Working temperature range	multi 12... 16 -10 °C... + 50 °C multi 18S -20 °C... + 50 °C
Storage temperature range	-25 °C... + 70 °C (excl. batteries)
Climatic class	multi 12... 16 2z/-10/50/70/75% with reference to VDI/VDE 3540 multi 18S, 2z/-20/50/70/75% with reference to VDI/VDE 3540 up to 2000m
Altitude above sea level	

## Warranty

3 year against defects in materials and workmanship & calibration from the date of purchase.

## Mechanical configuration

Protection type	For meters; IP 50, for connection sockets: IP 20
Dimensions	84 mm x 195 mm x 35 mm
Weight	0.35 kg, approx., incl. battery

## Scope of delivery

- 1 multimeter
- 1 Probe Set
- 1 copy of operating instructions
- 1 test certificate
- 1 rubber holster with tilt stand and carrying strap warranty card
- 1 set of extra fuses.

## ZIEGLER INSTRUMENTS

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## Ziegler

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