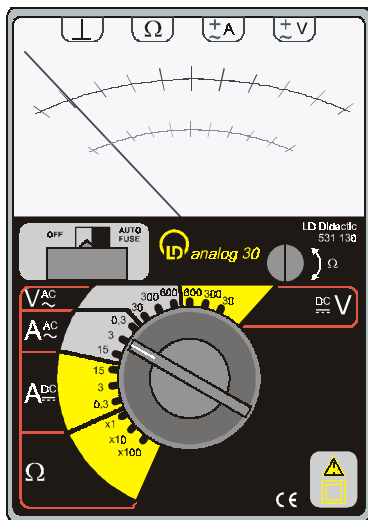


# *analog 30*

Analog multimeter



---

## Contents

<b>1</b>	<b>Safety notes</b> .....	<b>3</b>
<b>2</b>	<b>Description</b> .....	<b>4</b>
<b>3</b>	<b>Components</b> .....	<b>4</b>
<b>4</b>	<b>Operation</b> .....	<b>5</b>
4.1	Range selection .....	5
4.2	Mechanical zero control .....	5
4.3	Exchanging the battery .....	5
4.4	Setting the full deflection to 0 $\Omega$ , battery check .....	5
<b>5</b>	<b>Voltage measurements</b> .....	<b>6</b>
5.1	DC voltage up to 600 V .....	6
5.2	AC voltage up to 600 V .....	6
<b>6</b>	<b>Current measurements</b> .....	<b>6</b>
6.1	DC current up to 15 A .....	6
6.2	AC current up to 15 A .....	6
<b>7</b>	<b>Resistance measurements</b> .....	<b>7</b>
<b>8</b>	<b>Measuring ranges and permissible overload</b> .....	<b>8</b>
8.1	Voltage measurement .....	8
8.2	Current measurement .....	8
8.3	Resistance measurement .....	8
<b>9</b>	<b>Technical data</b> .....	<b>8</b>
9.1	General data .....	8
9.2	Reference conditions .....	9
9.3	Accuracy .....	9
9.4	Influence quantities and nominal ranges of use .....	9
9.5	Electrical safety .....	9
9.6	Electromagnetic compatibility .....	9
9.7	Overload protection .....	9
<b>10</b>	<b>Maintenance</b> .....	<b>10</b>
10.1	Cleaning .....	10
10.2	Battery .....	10
<b>11</b>	<b>Meaning of the symbols</b> .....	<b>10</b>

---

## 1 Safety notes

The analog multimeter LD *analog 30* has been designed and tested in accordance with the safety regulations IEC EN 61010-1. If the device is used appropriately, the safety of the multimeter and the security of the person using it are guaranteed. However, safety is not guaranteed if the multimeter is used improperly or handled carelessly. Therefore it is indispensable to read this instruction sheet carefully before using the multimeter and to observe the instructions.

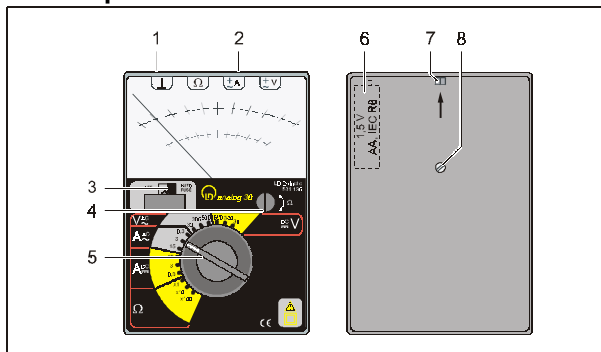
- The multimeter may only be operated by persons who are able to identify shock hazard and to take corresponding safety precautions.
- If measurements which imply shock hazard are carried out, a second person has to be informed.
- Unexpected voltages at measuring objects (e.g. defective devices or capacitors) have to be reckoned with.
- The instrument leads and housing of the multimeter must not be damaged e.g. by cracks or ruptures.
- Never open the housing before having removed all instrument leads from the multimeter.
- The multimeter must not be used for measurements in circuits with corona discharge (high voltage!).
- Particular care has to be taken in HF circuits, where dangerous mixed voltages may occur.
- In humid environments, no measurements must be carried out. Hands, shoes, the floor and the workplace have to be dry.
- Make sure that the nominal voltage between the phase and the neutral conductor never exceeds 600 V in measurements according to CAT II (i.e. on circuits with direct electrical connection to the power supply system) and 300 V in measurements according to CAT III (i.e. in building installation).
- The measuring ranges must not be overloaded by more than the permissible amount (see section 8).

## 2 Description

The analog multimeter LD *analog 30* is suitable for measuring voltages, currents and resistances. All measuring ranges can be selected by means of just one rotary switch. A mirror behind the scale enables virtually parallax-free reading of the pointer deflection.

The multimeter is equipped with an automatic circuit breaker (AUTO FUSE), which protects the current measuring ranges against overload. The moving-coil element of the multimeter is largely insensitive to external fields and it is protected against overload by means of two anti-parallel diodes. The robust plastic housing and the spring-loaded bearing jewels of the moving-coil element protect the device against damage in case of mechanical stress.

## 3 Components



- 1 Common terminal (ground, for all measuring ranges)
- 2 Terminals for resistance, current and voltage measurements
- 3 Slide switch
- 4 Potentiometer rotary button (to set the full-scale deflection to  $0 \Omega$ )
- 5 Range selection switch
- 6 Battery compartment (accessible after removing the bottom part of the housing)
- 7 Catch (for locking the bottom part of the housing)
- 8 Setscrew (for setting the zero position of the pointer mechanically)

---

## 4 Operation

### 4.1 Range selection:

- When carrying out current and voltage measurements, always set the range selection switch to the highest range; then switch down to lower ranges until the optimum pointer deflection is reached.
- When the measurement is finished, set the range selection switch back to the highest range.

### 4.2 Mechanical zero control:

- Disconnect all instrument leads from the measuring circuit.
- Hold the multimeter horizontally and correct the zero of the pointer by means of the setscrew.

### 4.3 Exchanging the battery:



Before opening the housing, remove all instrument leads from the multimeter !

- Press the lug at the front of the multimeter inward, e.g. using a small screwdriver, and remove the bottom part of the housing.
- Put a 1.5 V battery (IEC R6) into the battery compartment according to the polarity indicated. Make sure that the contacts are clean and reliable. (A battery is only required for resistance measurements).
- Put the bottom part of the housing back onto the top part of the housing and press both parts together until they catch.

### 4.4 Setting the full deflection to $0 \Omega$ , battery check

- Set the slide switch to the position AUTO FUSE.
- Set the range selection switch to the position  $\times 1 \Omega$ .
- Short the sockets  $\perp$  and  $\Omega$ .
- Using the potentiometer rotary button, set the full deflection to  $0 \Omega$ .

If the full deflection can no longer be set or if the display is no longer constant, the battery has to be exchanged.

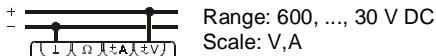
## 5 Voltage measurements



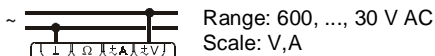
The nominal voltage between the phase and the neutral conductor must not exceed 600 V in voltage measurements according to CAT II and 300 V in measurements according to CAT III !

- Set the slide switch to the position AUTO FUSE.

### 5.1 DC voltage up to 600 V:



### 5.2 AC voltage up to 600 V:



## 6 Current measurements



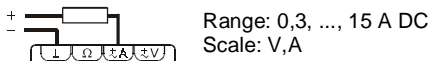
The nominal voltage between the phase and the neutral conductor must not exceed 600 V in current measurements according to CAT II and 300 V in measurements according to CAT III !

The multimeter has to be series-connected with the load at the position where the voltage to ground is minimal !

The measuring time must not exceed 5 min for currents over 10 A !

- Set the slide switch to the position AUTO FUSE.

### 6.1 DC current up to 15 A



### 6.2 AC current up to 15 A



---

## 7 Resistance measurements

Resistances are measured with the DC voltage from the battery (1.5 V, IEC R6). In the range  $\Omega \times 1$ , the battery is loaded heavily. Therefore the measurement should be carried out in a short time.

Only idle elements may be measured. External voltages would distort the measuring result.

- Set the slide switch to the position AUTO FUSE.
- When carrying out measurements on semiconductors, connect the positive pole to the  $\perp$  socket and the negative pole to  $\Omega$ .
- When measuring resistances over a long period and after changing to other resistance measuring ranges, check the full deflection of  $0 \Omega$  and, if necessary, readjust it.



Range:  $\Omega \times 100, \dots, \Omega \times 1$

Scale:  $\Omega$

## 8 Measuring ranges and permissible overload

### 8.1 Voltage measurement

DC voltage			AC voltage		
Range	Internal resistance	Permissible overload (AC/DC)	Range	Internal resistance	Permissible overload (AC/DC)
30 V	30 k $\Omega$	600	30 V	32 k $\Omega$	600
300 V	300 k $\Omega$	600	300 V	380 k $\Omega$	600
600 V	600 k $\Omega$	600	600 V	780 k $\Omega$	600

### 8.2 Current measurement

DC current			AC current		
Range	Voltage drop	Permissible overload (AC/DC)	Range	Voltage drop	Permissible overload (AC/DC)
0.3 A	200 mV	1.5 A	0.3 A	140 mV	1.5 A
3 A	340 mV	5 A	3 A	320 mV	5 A
15 A	900 mV	20 A *	15 A	915 mV	20 A *

\* max. measuring time 5 min for currents over 10 A

### 8.3 Resistance measurement

Switch	Range and centre of scale	Max. meas. current
$\Omega \times 1$	1 $\Omega$ ... 35 k $\Omega$ ... 5 k $\Omega$	approx. 50 mA
$\Omega \times 10$	10 $\Omega$ ... 350 k $\Omega$ ... 50 k $\Omega$	approx. 6 mA
$\Omega \times 100$	100 $\Omega$ ... 3.5 k $\Omega$ ... 500 k $\Omega$	approx. 0.6 mA

## 9 Technical data

### 9.1 General data:

Ranges:	15
Scale length:	87 mm
Pointer stop:	0 ... 100°
Dimensions:	100 mm $\times$ 140 mm $\times$ 35 mm
Weight:	300 g



---

## 9.2 Reference conditions:

Ambient temperature:	23 °C
Position of use:	horizontal
Frequency:	50 ... 60 Hz
Signal shape:	sine (max. deviation 1 %) for AC

## 9.3 Accuracy: (at reference conditions)

Voltage:	±2.5 % of scale length
Current:	±2.5 % of scale length
Resistance:	±2.5 % of scale length

## 9.4 Influence quantities and nominal ranges of use:

Temperature (0 ... 40 °C):	±2.5 % of scale length / 10 K
Frequency (30 Hz ... 1 kHz):	±2.5 % of scale length

## 9.5 Electrical safety:

Safety regulations:	EN 61010-1
Overvoltage category:	CAT III: 300 V, CAT II: 600 V
Degree of pollution:	2

## 9.6 Electromagnetic compatibility:

Emitted interference:	EN 500081-2
Immunity to interference:	EN 500082-2

## 9.7 Overload protection:

The voltage ranges are protected against overload up to 600 V AC and DC by PTC resistors and electric components of sufficient dimensions.

The current ranges are protected against overload up to 240 V AC and 50 V DC by the automatic circuit breaker AUTO FUSE.

The resistance ranges are protected against overload up to 250 V AC for 30 s by PTC resistors and electric components of sufficient dimensions.

In addition, a fuse T 16 A 500 V (Ø6.3 mm × 32 mm) protects the current and resistance ranges against overload up to 500 V AC and DC. However, internal electric components may be destroyed.

---

## 10 Maintenance

### 10.1 Cleaning:


The housing does not require particular maintenance. It can be cleaned by means of a piece of soft cloth slightly wetted with alcohol and a brush.

Potential electrostatic charges on the display window may have an influence on the measurements. The charges can be removed by means of a piece of soft cloth slightly wetted with alcohol.

### 10.2 Battery:


The condition of the battery should be checked from time to time. A discharged or decomposing battery must not remain in the battery compartment. If the multimeter is not used for a long period, the battery should be removed.


## 11 Meaning of the symbols


 EU mark of conformity


CAT Overvoltage category

 Ground symbol

 Reference potential symbol


 Dangerous spot (observe the instruction sheet)

 Moving-coil element (core magnet) with rectification

 DC current/voltage

 AC current/voltage

2.5 Accuracy class 2.5

 Horizontal position of use

 Continuous double or reinforced insulation