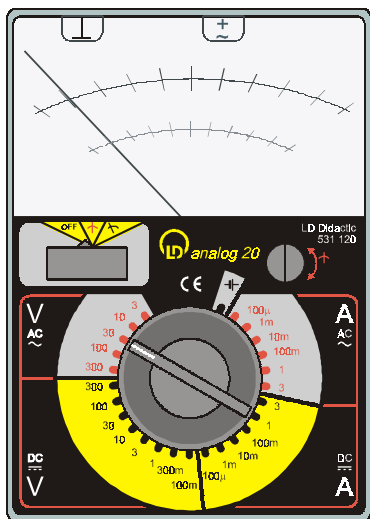


 **analog 20**
Analog multimeter



Instruction sheet

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1 Safety notes

The analog multimeter LD *analog 20* 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.

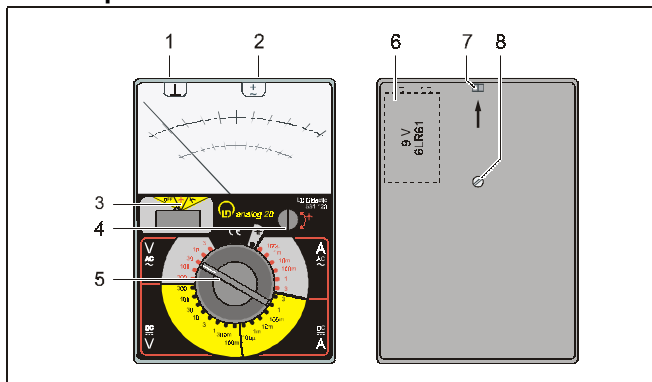
- The multimeter may only be operated by persons who are able to identify shock hazard and to take corresponding safety precautions.
- If measurements which imply shock hazard are carried out, a second person has to be informed.
- Unexpected voltages at measuring objects (e.g. defective devices or capacitors) 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 in measurements according to CAT II or III (i.e. on circuits with direct electrical connection to the power supply system or in building installation) the nominal voltage between the phase and the neutral conductor never exceeds 300 V.
- The measuring ranges must not be overloaded by more than the permissible amount (see section 7).

2 Description

The analog multimeter LD *analog 20* is suitable for measuring voltages and currents. 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 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 Safety connecting socket (ground)
- 2 Safety connecting socket
- 3 Slide switch (OFF, \uparrow , \times)
- 4 Rotary button (for setting the zero in the middle of the scale)
- 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 Exchanging the battery or the fuse:



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

The multimeter is delivered with the battery put into the compartment. The battery has to be connected to the battery clip:

- Press the lug at the front of the multimeter inward, e.g. using a small screwdriver, and remove the bottom part of the housing.
- Connect the battery 9 V (IEC 6F22) to the battery clip according to the polarity indicated. Make sure that the contacts are clean and reliable.

or

- Clamp a new fuse F 3.15 A 300 V (IEC127, \varnothing 5 mm \times 20 mm) in the fuse holder.
- Put the bottom part of the housing back onto the top part of the housing and press both parts together until they catch.

4.2 Checking the battery

- Disconnect all instrument leads from the measuring circuit.
- Set the slide switch to \curvearrowright .
- Set the range selection switch to --- and check whether the pointer is deflected into the battery test field marked by --- .

4.3 Measurements with the zero on the left:

- Set the slide switch to \curvearrowright .
- Select the range.
- Read the measured values from the black scale.

Remark: after approx. 45 minutes, the supply from the battery is switched off automatically. The power supply is activated again by switching the device off and on again with the slide switch.

4.4 Measurements with the zero in the middle:

- Set the slide switch to \uparrow .
- Select the range.
- Read the measured values from the red scale.

Remark: after approx. 45 minutes, the supply from the battery is switched off automatically. The power supply is activated again by switching the device off and on again with the slide switch.

4.5 Range selection:

- 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.

4.6 Mechanical zero control:

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

4.7 Electrical zero control

- Disconnect all instrument leads from the measuring circuit and set the slide switch to \uparrow .
- Select the range.
- Hold the multimeter horizontally and correct the zero of the pointer on the red scale by means of the rotary button.

4.8 Switching the device off

- Always set the slide switch to OFF when the measurement is over, in order to avoid unnecessary battery consumption.

5 Voltage measurements



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

5.1 DC voltage:



Range: 300 V, ..., 100 mV DC

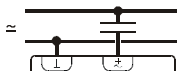
5.2 AC voltage:



Range: 300, ..., 3 V AC

5.3 AC voltage with a superimposed DC voltage:

- First measure the DC part (see above).
- Separate the DC part by means of a capacitor (e.g. 4.7 μF / 630 V), and measure the AC part.



Range: 300, ..., 3 V AC

The range has to be greater than the DC part.

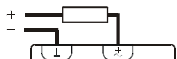
6 Current measurements



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

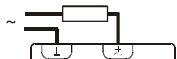
The multimeter has to be series-connected with the load at the position where the voltage to ground is minimal !

6.1 DC current



Range: 3 A, ..., 100 μA DC

6.2 AC current



Range: 3 A, ..., 100 μA DC

7 Measuring ranges and permissible overload

7.1 Voltage measurement

DC and AC voltage		
Range	Internal resistance	Permissible overload
100 mV	10 M Ω	360 V
300 mV	10 M Ω	360 V
1 V	10 M Ω	360 V
3 V	10 M Ω	360 V
10 V	10 M Ω	360 V
30 V	10 M Ω	360 V
100 V	10 M Ω	360 V
300 V	10 M Ω	360 V

7.2 Current measurement

DC and AC current		
Range	Voltage drop	Permissible overload
100 μ A	55 mV	30 mA
1 mA	55 mV	110 mA
10 mA	55 mV	400 mA
100 mA	55 mV	1.4 A
1 A	55 mV	2.1 A
3 A	55 mV	4.0 A

8 Technical data

8.1 General data:

Ranges:	25
Scale length:	87 mm
Pointer stop:	0 ... 100°
Dimensions:	100 mm × 140 mm × 35 mm
Weight:	260 g

8.2 Reference conditions:

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

8.3 Accuracy: (at reference conditions)

DC current:	±2 % of scale length
AC current:	±3 % of scale length

8.4 Influence quantities and nominal ranges of use:

Temperature (0 ... 40 °C):	±2 % of scale length / 10 K
Frequency (30 Hz ... 1.5 kHz):	±2.5 % of scale length
Frequency (1.5 kHz to 3 kHz):	±5 % of scale length

8.5 Electrical safety:

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

8.6 Electromagnetic compatibility:

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

8.7 Overload protection:

F 3.15 A 300 V (IEC127, Ø5 mm × 20 mm)

9 Maintenance

9.1 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.

9.2 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.

10 Meaning of the symbols

	EU mark of conformity
CAT	Measurement category according to IEC EN 61010-1
	Battery symbol
	Dangerous spot (observe the instruction sheet)
	Moving-coil element (core magnet)
	Electronics in the measuring circuit
	Horizontal position of use
	 Ground symbol / reference potential symbol
	 DC current, voltage / AC current, voltage
2	3 Accuracy class 2 / 3
	 Scale zero on the left / scale zero in the middle