

KRAFTWERK®

FAVORITE TOOLS SINCE 1979

Instruction Manual Digital multimeter

Art. 31130

EN



1. General instructions

This instrument complies with CAT. III 600 V overvoltage standards.

To get the best service from this instrument, read carefully this user's manual and respect the detailed safety precautions. International symbols used on the multimeter and in this manual are explained in chapter 1.1.3.

1.1 Precautions safety measures

1.1.1 Preliminary

- Measurement category III is for measurements performed in the building installation.

NOTE: Examples are measurements on distribution boards, circuit-breakers, wiring, including cables, bus-bars, junction boxes, switches, socket-outlets in the fixed installation, and equipment for industrial use and some other equipment, for example, stationary motors with permanent connection to the fixed installation.

- Measurement category II is for measurements performed on circuits directly connected to the low voltage installation.

NOTE: Examples are measurements on household appliances, portable tools and similar equipment.

- Measurement category I is for measurements performed on circuits not directly connected to MAINS.

NOTE: Examples are measurements on circuits not derived from MAINS, and specially protected (internal) MAINS derived circuits. In the latter case, transient stresses are variable; for that reason, requires that the transient withstand capability of the equipment is made known to the user.

- When using this multimeter, the user must observe all normal safety rules concerning:

- Protection against the dangers of electric current.
- Protection of the multimeter against misuse.

- For your own safety, only use the test probes supplied with the instrument. Before use, check that they are in good condition.

1.1.2 During use

- If the multimeter is used near noise generating equipment, be aware that display may become unstable or indicate large errors.

- Do not use the multimeter or test leads if they look damaged.

- Use the multimeter only as specified in this manual; otherwise, the protection provided by the multimeter may be impaired.


- Use extreme caution when working around bare conductors or bus bars.

- Do not operate the multimeter around explosive gas, vapor, or dust.

- Verify a multimeter's operation by measuring a known voltage. Do not use the multimeter if it operates abnormally. Protection may be impaired. When in doubt, have the multimeter serviced.

- Uses the proper terminals, function, and range for your measurements.

- When the range of the value to be measured is unknown, check that the range initially set on the multimeter is the highest possible or, wherever possible, choose the autoranging mode.

- To avoid damages to the instrument, do not exceed the maximum limits of the input values shown in the technical specification tables.
- When the multimeter is linked to measurement circuits, do not touch unused terminals.
- Caution when working with voltages above 60 V DC or 30 V AC rms. Such voltages pose a shock hazard.
- When using the probes, keep your fingers behind the finger guards.
- When making connections, connect the common test lead before connecting the live test lead; when disconnecting, disconnect the live test lead before disconnecting the common test lead.
- Before changing functions, disconnect the test leads from the circuit under test.
- For all DC functions, including manual or auto-ranging, to avoid the risk of shock due to possible improper reading, verify the presence of any AC voltages by first using the AC function. Then select a DC voltage range equal to or greater than the AC range.
- Disconnect circuits power and discharge all high-voltage capacitors before testing resistance, continuity, diodes, or capacitance.
- Never perform resistance or continuity measurements on live circuits.
- Before measuring current, check the multimeter's fuse and turn off power to the circuit before connecting the multimeter to the circuit.
- In TV repair work, or when carrying out measurements on power switching circuits, remember that high amplitude voltage pulses at the test points can damage the multimeter. Use of a TV filter will attenuate any such pulses.
- Use just one 6F22 battery, properly installed in the multimeter's battery case, to power the multimeter.
- Replace the battery as soon as the battery indicator () appears. With a low battery, the multimeter might produce false readings that can lead to electric shock and personal injury.
- Do not measure voltages above 600 V in Category III installations.
- When the Relative measurement mode is activated, the "REL" symbol is displayed. Caution must be used because hazardous voltage may be present.
- Do not operate the multimeter with the case (or part of the case) removed.

1.1.3 Symbols used in this manual and on instrument



Caution: refer to the instruction manual. Incorrect use may result in damage to the device or its components.

~ AC (Alternating Current)

== DC (Direct Current)

 AC or DC

 Earth ground

 Double insulated

 Fuse

 Conforms to European Union directives

1.1.4 Instructions

- Remove test leads from the multimeter before opening the multimeter case or battery cover.
- When servicing the multimeter, use only specified replacement parts.
- Before opening up the instrument, always disconnect from all sources of electric current and make sure you are not charged with static electricity, which may destroy internal components.
- Any adjustment, maintenance or repair work carried out on the multimeter while it is live should be carried out only by appropriately qualified personnel, after having taken into account the instructions in this present manual.
- A "qualified person" is someone who is familiar with the installation, construction and operation of the equipment and the hazards involved. He is trained and authorized to energize and de-energize circuits and equipment in accordance with established practices.
- When the instrument is opened up, remember that some internal capacitors can retain a dangerous potential even after the instrument is switched off.
- If any faults or abnormalities are observed, take the instrument out of service and ensure that it cannot be used until it has been checked out.
- If the multimeter is not going to be used for a long time, take out the battery and do not store the multimeter in high temperature or high humidity environment.

1.2 Protection mechanisms

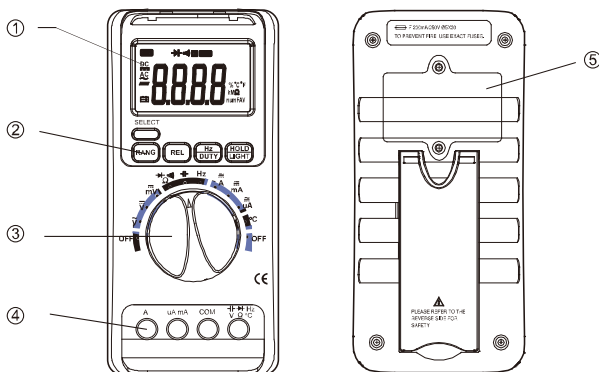
This instrument is fitted with various protection mechanisms:

- Varistor protection for limiting transients of over 600 V at the V Ω terminal.
- A PTC (Positive Temperature Coefficient) resistor protects against permanent overvoltages of up to 600 V during resistance, capacitance, temperature, continuity and diode measurements.

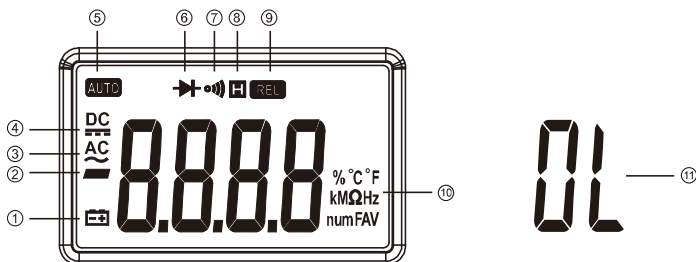
2. Description

2.1 Product overview

1. LCD display
2. Keypad
3. Rotary switch
4. Terminals
5. Battery cover




2.2 LCD Display



1. Low battery indication (Note: When this symbol appears, it means that the battery needs to be replaced.)
2. Indicates negative readings
3. Indicator for AC voltage or current
4. Indicator for DC voltage or current
5. The multimeter is in the Autorange mode in which the multimeter automatically selects the range with the best resolution.
6. The multimeter is in Diode Test mode.
7. The multimeter is in Continuity Check mode.
8. The multimeter is in Data Hold mode.
9. The multimeter is in Relative Measurement mode.
10. Measurement units
11. This symbol means that the input is too large for the selected range.

2.3 Keypad

| Key | Function | Operation performed |
|----------------|---|--|
| SELECT |  A mA μ A Power-up Option | Switches between Resistance measurement, Diode Test and Continuity check. Switches between DC and AC current. Disables automatic power-off feature. |
| HOLD/ LIGHT | Any switch position | Press it to enter and exit the Data Hold mode. Press it and hold 2 seconds, backlight on; if press it and hold for seconds again, backlight off. |
| RANGE | V~, V $\overline{\text{---}}$, Ω , A, mA and μ A. | 1. Press it to enter the manual ranging mode. 2. Press it to step through the ranges available for the selected function. 3. Press it and hold RANGE for 2 seconds to return to autoranging. |
| REL | Any switch position | Press REL to enter and exit the Relative measurement mode. |
| Hz/ DUTY | V~, A, mA and μ A. | Press it to start the frequency counter; press it again to enter duty cycle mode, and press it again to exit the frequency counter mode. |

3. Functions

3.1 General functions

3.1.1 DATA HOLD mode

Data Hold mode makes the multimeter stop updating the display. Enabling Data Hold function in autorange mode makes the multimeter switch to manual ranging mode, but the full-scale range remains the same. Data Hold function can be cancelled by changing the measurement mode, pressing **RANGE** key, or push **HOLD/LIGHT** key again.

To enter and exit the Data Hold mode:

1. Press **HOLD/LIGHT** key (shortly). Fixes the display on the current value, **H** is displayed.
2. A second short press returns the multimeter to normal mode.

3.1.2 Manual ranging and Autorange mode

The multimeter has both manual ranging and autorange options.

- In the autorange mode, the multimeter selects the best range for the input detected. This allows you to switch test points without having to reset the range.
- In the manual ranging mode, you select the range. This allows you to override autorange and lock the multimeter in a specific range.
- The multimeter defaults to the autorange mode in measurement functions that have more than one range. When the multimeter is in the autorange mode, **AUTO** is displayed.

To enter and exit the manual range mode:

1. Press **RANGE** key. The multimeter enters the manual ranging mode. **AUTO** turns off. Each presses of **RANGE** key increments the range. When the highest range is reached, the multimeter wraps to the lowest range.

NOTE: If you manually change the measurement range after entering the Data Hold modes, the multimeter exits this mode.

2. To exit the manual ranging mode, press and hold down **RANGE** key for two seconds. The multimeter returns to the autorange mode and **AUTO** is displayed.

3.1.3 Battery Saver

The multimeter enters the "sleep mode" and blanks the display if the multimeter is on but not used for 30 minutes.

Press the **HOLD /LIGHT** key or rotate the rotary switch to wake the multimeter up.

To disable the Sleep mode, hold down the **SELECT** key while turning the multimeter on.

3.1.4 Relative measurement mode

The multimeter will display relative measurement in all functions except frequency.

To enter and exit the relative measurement mode:

1. With the multimeter in the desired function, touch the test leads to the circuit on which you want future measurement to be based.
2. Press **REL** key to store the measured value and activate the relative measurement mode. The difference between the reference value and subsequent reading is displayed.
3. Press **REL** key for more than 2 seconds to return the multimeter to normal operation.

3.2 Measurement functions

3.2.1 AC and DC Voltage measurement



To avoid electrical shock and/or damage to the instrument, do not attempt to take any voltage measurement that might exceeds 600 V DC or 600 V AC rms.

To avoid electrical shock and/or damage to the instrument, do not apply more than 600 V DC or 600 V AC rms between the common terminal and the earth ground.

The multimeter's voltage ranges are 400.0 mV, 4.000 V, 40.00 V, 400.0 V and 600 V (AC).

To measure AC or DC voltage (set up and connect the multimeter as shown in Figure 2):

1. Set rotary switch to the DCV, ACV or DCmV range.
2. Connect the black and red test leads to the COM and V terminals respectively.
3. Connect the test leads to the circuit being measured
4. Read the displayed value. The polarity of red test lead connection will be indicated when making a DCV measurement.

NOTE:

Unstable display may occur especially at 400 mV range, even though you do not put test leads into input terminals, in this case, if an erroneous reading is suspected, short the V terminal and the COM terminal, and make sure the zero display.

For better accuracy when measuring the DC offset of an AC voltage, measure the AC voltage first. Note the AC voltage range, then manually select a DC voltage range equal to or higher than the AC range. This improves the accuracy of the DC measurement by ensuring that the input protection circuits are not activated.

3.2.2 Resistance measurement



To avoid electrical shock and/or damage to the instrument, disconnect circuit power and discharge all high-voltage capacitors before measuring resistance.

The multimeter's resistance ranges are 400.0 Ω , 4.000 k Ω , 40.00 k Ω , 400.0 k Ω , 4.000 M Ω and 40.00 M Ω .

To measure resistance (set up the multimeter as shown in figure 3):

1. Set the rotary switch to Ω range.
2. Connect the black and red test leads to the COM and V Ω terminals respectively.
3. Connect the test leads to the circuit being measured and read the displayed value.

Some tips for measuring resistance:

The measured value of a resistor in a circuit is often different from the resistor's rated value. This is because the multimeter's test current flows through all possible paths between the probe tips.

In order to ensure the best accuracy in measurement of low resistance, short the test leads before measurement and memory the test probe resistance in mind. This necessary to subtract for the resistance of the test leads.

The resistance function can produce enough voltage to forward-bias silicon diode or transistor junctions, causing them to conduct. To avoid this, do not use the 40 M Ω range for in-circuit resistance measurements. On 40 M Ω range, the multimeter may take a few seconds to stabilize reading. This is normal for high resistance measuring.

When the input is not connected, i.e. at open circuit, the figure "OL" will be displayed for the overrange condition.

3.2.3 Diode Test



To avoid electrical shock and/or damage to the instrument, disconnect circuit power and discharge all high-voltage capacitors before testing diodes.

To test a diode out of a circuit (set up the multimeter as shown in Figure 4):

1. Set the rotary switch to Ω range.
2. Press the SELECT key once to activate Diode Test.
3. Connect the black and red test leads to the COM and V Ω terminals respectively.
4. For forward-bias readings on any semiconductor component, place the red test lead on the component's anode and place the black test lead on the component's cathode.
5. The multimeter will show the approx. forward voltage of the diode.

In a circuit, a good diode should still produce a forward bias reading of 0.5 V to 0.8 V; however, the reverse-bias reading can vary depending on the resistance of other pathways between the probe tips.

3.2.4 Continuity Check



To avoid electrical shock and/or damage to the instrument, disconnect circuit power and discharge all high-voltage capacitors before testing for Continuity.

To test for continuity:

1. Set the rotary switch to Ω range.
2. Press the SELECT key twice to activate Continuity Check.
3. Connect the black and red test leads to the COM and Ω terminals respectively.
4. Connect the test leads to the resistance in the circuit being measured.
5. When the test lead to the circuit is below 75 Ω , a continuous beeping will indicate it.

Note:

Continuity test is available to check open/short of the circuit.

3.2.5 Capacitance measurement

To avoid electrical shock and/or damage to the instrument, disconnect circuit power and discharge all high-voltage capacitors before measuring capacitance. Use the DC voltage function to confirm that the capacitor is discharged.

The multimeter's capacitance ranges are 50.00 nF, 500.0 nF, 5.000 μ F, 50.00 μ F and 100.0 μ F.

To measure capacitance:

1. Set the rotary switch to **⎓** range.
2. Connect the black and red test leads to the COM and **⎓** terminals respectively (or you can use capacitor test lead).
3. Connect the test leads to the capacitor being measured and read the displayed value.

Some tips for measuring capacitance:

- The multimeter may take a few seconds to stabilize reading. This is normal for high capacitance measuring.
- To improve the accuracy of measurements less than 50 nF, subtract the residual capacitance of the multimeter and leads.
- Below 500 pF, the accuracy of measurements is unspecified.

3.2.6 Frequency and Duty Cycle measurement

Do not measure Frequency on high voltage (>600 V) to avoid electrical shock hazard and/or damage to the instrument.

The multimeter can measure Frequency or Duty Cycle while making either an AC Voltage or AC Current measurement.

To measure frequency or Duty Cycle:

1. With the multimeter in the desired function (AC Voltage or AC Current), press the Hz% key.
2. Read the frequency of the AC signal on the display.
3. To make a duty cycle measurement, press the Hz% key again.
4. Read the percent of duty cycle on the display.
5. Set the rotary switch to the Hz range.
6. Insert the black and red test leads into the COM and Hz input terminals.
7. Connect the test leads tip in parallel with the circuit to be measured. And don't touch any electrical conductors.
8. At frequency measuring status, press Hz% one time then multimeter enters duty cycle measuring status, press it again then return to frequency measuring status.
9. Read the result directly from the display.

Note:

In noisy environment, it is preferable to use shield cable for measuring small signal.

3.2.7 Temperature measurement

To avoid electrical shock and/or damage to the instrument, do not apply more than 250 V DC or 250 V AC rms between the $^{\circ}$ C terminal and the COM terminal.

To avoid electrical shock, do not use this instrument when voltages at the measurement surface exceed 60 V DC or 24 V AC rms.

To avoid damage or burns. Do not make temperature measurement in microwave ovens.

To measure temperature:

1. Set the rotary switch to $^{\circ}$ C range and the LCD will show the current environment temperature.

2. Insert 'K' type thermocouples into the COM terminal and °C terminal (or you can insert it by using Multi Function Socket), taking care to observe the correct polarity.
3. Touch the object with the thermocouple probe for measurement.
4. Read the stable reading from LCD

3.2.8 Current measurement



To avoid damage to the multimeter or injury if the fuse blows, never attempt an in-circuit current measurement where the open-circuit potential to earth is greater than 250 V.

To avoid damage to the multimeter, check the multimeter's fuse before proceeding. Use the proper terminals, function, and range for your measurement. Never place the probes in parallel with a circuit or component when the leads are plugged into the current terminals.


The multimeter's current ranges are 400.0 μ A, 4000 μ A, 40.00 mA, 400.0 mA, 4.000 A and 10.00 A.

To measure current (set up the multimeter as shown in Figure 7):

1. Turn off power to the circuit. Discharge all high voltage capacitors.
2. Set the rotary switch to the μ A, mA or A range.
3. Press the SELECT key to select DCA or ACA measuring mode.
4. Connect the black test lead to the COM terminal and the red test leads to the mA terminal for a maximum of 400 mA. For a maximum of 10 A, move the red test lead to the A terminal.
5. Break the circuit path to be tested.
Touch the black probe to the more negative side of the break; touch the red probe to the more positive side of the break. (Reversing the leads will give a negative reading, but will not damage the multimeter.)
6. Turn on power to the circuit; then read the display. Be sure to note the measurement units at the right side of the display (μ A, mA or A). When only the figure "OL" displayed, it indicates over range situation and the higher range has to be selected.
7. Turn off power to the circuit and discharge all high voltage capacitors. Remove the multimeter and restore the circuit to normal operation.

4. Technical specifications

4.1 General specifications

- Environment conditions: 600 V CAT. III
- Pollution degree: 2
- Altitude < 2000 m
- Operating temperature: 0~40°C, 32°F~122°F (<80% RH, <10°C non-condensing)
- Storage temperature: -10~60°C, 14°F~140°F (<70% RH, battery removed)
- Temperature Coefficient: 0.1x (specified accuracy) / °C (<18°C or >28°C)
- MAX. Voltage between terminals and earth ground: 600 V AC rms or 600 V DC
- Fuse Protection: μ A and mA: F 500 mA / 600 V \varnothing 5 x 20; A: F 10 A / 600 V \varnothing 6 x 30
- Sample Rate: 3 times/sec for digital data
- Display: 3 3/4 digits LCD display. Automatic indication of functions and symbols
- Range selection: automatic and manual
- Over Range indication: LCD will display "OL"
- Low battery indication: The " " is displayed when the battery is under the proper operation range
- Polarity indication: "- " displayed automatically
- Power source: 9 V ===
- Battery type: 6F22
- Dimensions: 180 x 85 x 45 mm
- Weight: approx. 360 g with battery

4.2 Measurement specifications

Accuracy is specified for one year after calibration, at operating temperatures of 18°C to 28°C, with relative humidity at 0% to 75%.

Accuracy specifications take the form of: \pm (% of Reading + Number of Least Significant Digits)

4.2.1 Voltage

| Function | Range | Resolution | Accuracy |
|---|------------------------|------------|------------------------------------|
| DC Millivolt. mV $\overline{=}$ | 400 mV | 0.1 mV | \pm (1.0% of rdg + 10 digits) |
| DC Voltage V $\overline{=}$ | 4 V | 1 mV | \pm (0.5% of rdg + 3 digits) |
| | 40 V | 10 mV | |
| | 400 V | 100 mV | |
| | 600 V | 1 V | |
| AC Voltage ^(1.& 2.) V \sim | 400m V ^(3.) | 0.1 mV | \pm (3.0% of rdg + 3 digits) |
| | 4 V | 1 mV | \pm (1.0% of rdg + 3 digits) |
| | 40 V | 10 mV | |
| | 400 V | 100 mV | |
| | 600 V | 1 V | \pm (1.2% of rdg + 3 digits) |
| 1. Frequency Range for ACV: 40 Hz~400 Hz. 2. Response for ACV: Average, calibrated in rms of sine wave. 3. Manual Range only. | | | |

Overload Protection: 600 V DC or 600 V AC rms.

Input Impedance (Nominal): DC voltage: >10 M Ω <100 pF; AC voltage: >5 M Ω <100 pF

Common Mode Rejection Ratio: DC voltage: >100 dB at DC, 50 or 60 Hz;

AC voltage: >60 dB at DC, 50 or 60 Hz

Normal Mode Rejection Ratio: DC voltage: >45 dB at 50 or 60 Hz

4.2.2 Frequency

| Function | Range | Resolution | Accuracy |
|---------------------------------|-----------|------------|-------------------------------|
| Frequency Hz (10 Hz-100 kHz) | 50.00 Hz | 0.01 Hz | \pm (0.1% of rdg + 3digits) |
| | 500.0 Hz | 0.1 Hz | |
| | 5.000 kHz | 0.001 kHz | |
| | 50 kHz | 0.01 kHz | |
| | 100 kHz | 0.1 kHz | |


Overload protection: 250 V DC or 250 V AC rms

4.2.3 Resistance

| Function | Range | Resolution | Accuracy |
|---------------------|------------------|---------------|------------------------------|
| Resistance Ω | 400.0 Ω | 0.1 Ω | $\pm(0.5\%$ of rdg+3 digits) |
| | 4.000 k Ω | 1 Ω | $\pm(0.5\%$ of rdg+2 digits) |
| | 40.00 k Ω | 10 Ω | |
| | 400.0 k Ω | 100 Ω | |
| | 4.000 M Ω | 1 k Ω | |
| | 40.00 M Ω | 10 k Ω | $\pm(1.5\%$ of rdg+3 digits) |


Overload protection: 250 V DC or 250 V AC rms

4.2.4 Diode Test

| Function | Range | Resolution | Accuracy |
|---|-------|------------|------------------|
| Diode Test  | 1 V | 0.001 V | 1.0% uncertainty |

Test Condition: Forward DC current approximately 1mA. Reversed DC voltage approximately 1.5 V.
Overload protection: 250 V DC or 250 V AC rms

4.2.5 Continuity Check

| Function | Range | Resolution | Accuracy |
|---|--------------|--------------|--|
|  | 400 Ω | 0.1 Ω | Open circuit voltage: approx. 0.5 V |

Description: Continuity beeper $\leq 75 \Omega$

Overload protection: 250 V DC or 250 V AC rms


4.2.6 Temperature

| Function | Range | Resolution | Accuracy |
|----------------------------------|---|------------------------|---|
| Celsius scale $^{\circ}\text{C}$ | -55 $^{\circ}\text{C}$ ~0 $^{\circ}\text{C}$ | 0.1 $^{\circ}\text{C}$ | $\pm(9.0\%$ of rdg + 2 $^{\circ}\text{C}$) |
| | 1 $^{\circ}\text{C}$ ~400 $^{\circ}\text{C}$ | | $\pm(2.0\%$ of rdg + 3 $^{\circ}\text{C}$) |
| | 401 $^{\circ}\text{C}$ ~1000 $^{\circ}\text{C}$ | 1 $^{\circ}\text{C}$ | $\pm 2.0\%$ of rdg |

Temperature specifications do not include thermocouple errors.

Overload protection: 250 V DC or 250 V AC rms

4.2.7 Capacitance

| Function | Range | Resolution | Accuracy |
|--|-------------|------------|---|
| Capacitance  | 50 nF | 10 pF | <10nF: $\pm[5.0\%$ of (rdg + 50 digits) $\pm(3.0\%$ of rdg +10 digits) |
| | 500 nF | 100 pF | |
| | 5 μ F | 1 nF | $\pm (3.0\%$ of rdg + 5 digits) |
| | 50 μ F | 10 nF | |
| | 100 μ F | 100 nF | |

Overload protection: 250 V DC or 250 V AC rms

4.2.8 Current

| Function | Range | Resolution | Accuracy |
|--|--------------|-------------|---------------------------------|
| DC μ A | 400 μ A | 0.1 μ A | $\pm(1.5\%$ of rdg + 3 digits) |
| | 4000 μ A | 1 μ A | |
| DC mA | 40 mA | 0.01 mA | |
| | 400 mA | 0.1 mA | |
| DC A | 4 A | 1 mA | $\pm(2.0\%$ of rdg + 8 digits) |
| | 10 A | 10 mA | |
| AC ^(1. & 2.) μ A | 400 μ A | 0.1 μ A | $\pm(1.8\%$ of rdg + 5 digits) |
| | 4000 μ A | 1 μ A | |
| AC mA | 40 mA | 0.01 mA | |
| | 400 mA | 0.1 mA | |
| AC A | 4 A | 1 mA | $\pm(3.0\%$ of rdg + 10 digits) |
| | 10 A | 10 mA | |
| 1. Frequency Range: 40 Hz-200 Hz 2. Response: Average, calibrated in rms of sine wave | | | |

Overload protection: F 10 A / 600 V fuse for A range. F 500 mA / 600 V fuse for μ A and mA ranges.

Maximum input current: 400 mA DC or 400 mA AC rms for μ A and mA ranges, 10 A DC or 10 A AC rms for A ranges.

For measurements >5 A, 4 minutes maximum ON to measure 10 minutes OFF; Above 10 A unspecified.

5. Maintenance

This section provides basic maintenance information, including fuse and battery replacement instructions. Do not attempt to repair or service your multimeter unless you are qualified to do so and have the relevant calibration, performance test, and service information.

5.1 General Maintenance



To avoid electrical shock or damage to the multimeter, do not get water inside the case. Remove the test leads and any input signals before opening the case.

Periodically wipe the case with a damp cloth and mild detergent. Do not use abrasives or solvents.

Dirt or moisture in the terminals can affect readings.

To clean the terminals:

- Turn the multimeter off and remove all test leads.
- Shake out any dirt that may be in the terminals.
- Work the swab around in each terminal. The oiling agent insulates the terminals from moisture-related contamination.

5.2 Fuse replacement




Before replacing the fuse, disconnect test leads and/or any connectors from any circuit under test. To prevent damage or injury, replace the fuse only with specified ratings.

To replace the multimeter's fuse:

1. Set rotary switch to the OFF position.
2. Disconnect test leads and/or any connectors from the terminals.
3. Use a screwdriver to unlock the four screws on the rear cover.
4. Take out the rear cover from the multimeter.
5. Remove the fuse by gently prying one end loose, then sliding the fuse out of its bracket.
6. Install the replacement fuses only with specified ratings: F 10 A / 600 V Ø6 x 30 and F 500 mA / 600 V Ø5 x 20.
7. Rejoin the rear cover and tighten the screws.

5.3 Battery replacement



To avoid false readings, which could lead to possible electric shock or personal injury, replace the battery as soon as the battery indicator () appears.

Before replacing the battery, disconnect test leads and / or any connectors from any circuit under test, turn the multimeter off and remove test leads from the input terminals.

To replace the battery:

1. Set rotary switch to the OFF position.
2. Disconnect test leads and/or any connectors from the terminals.
3. Use a screwdriver to unlock the two screws on the battery cover.
4. Take out the battery cover from the multimeter.
5. Remove the used battery.
6. Replace with one new 9 V battery (6F22).
7. Rejoin the battery cover and tighten the screws.



Waste electrical products should not be disposed of together with household waste. Please recycle where designated facilities exist. Check with your local authority or retailer for recycling advice.

- The battery must be removed from the appliance before it is scrapped.
- The appliance must be disconnected from the main power supply when removing the battery.
- The battery must be disposed of safely.

DECLARATION OF CONFORMITY

Model: **31130**
Digital multimeter

KRAFTWERK Sàrl, 25 rue due Stade, F-67870 Bischofsheim

Declares under sole responsibility that the product to which this declaration relates is in conformity with the following standard(s) or other normative document(s):

EN 61010-1: 2010
EN 61010-031: 2015
EN 61326-1: 2013
EN 61326-2-2: 2013

Following the provisions of Directive(s)
Machinery Directive:

2014/30/EU
2014/35/EU

Bischofsheim, 28/04/2018

Alexander Pieper
CEO

WARRANTY

We do not take responsibility for any damage caused by misuse or any use that is not in compliance with the safety standards described herein.

CUSTOMER SERVICES

Contact your local importer or your specialized dealer to obtain address of our service department.

FROM DATE OF PURCHASE RECEIPT
2 YEAR GUARANTEE
ON MATERIAL OR PRODUCTION DEFECTS

KRAFTWERK®

FAVORITE TOOLS SINCE 1979

KRAFTWERK Europe AG
Mettlenbachstrasse 23
CH-8617 Mönchaltorf
Switzerland
Tel. +41-44 949 40 50

KRAFTWERK Sàrl.
25, rue du Stade
F - 67870 Bischoffsheim
France
Tel. +33-388 48 64 50

www.kraftwerktools.com