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PeakTech®

PeakTech 1665 Digital Multimeter

Specifications

- Max Input: 1000 A DC/AC, 1000 V DC/AC
- Crest Factor: > 1ms
- Display: 6/7-digit LCD with max. 6000 display, backlight
- Auto Range: Yes
- True RMS: V AC and A AC
- Frequency Range: 50 to 400Hz (A AC; V AC)
- Resistance Measurement: 0.5 to 99.0%
- Temperature Measurement: N/A
- Battery: 9V Block Battery (NEDA 1604 or equivalent)

Safety precautions

This product complies with the requirements of the following European Community Directives: 2014/30/EU (Electromagnetic Compatibility) and 2006/95/EC (Low Voltage) as amended by 2004/22/EC (CE-Marking).
Overvoltage category III 600V; pollution degree 2.

CAT I: For signal level, telecommunication, electronic with small transient over voltage
CAT II: For local level, appliances, main wall outlets, portable equipment

CAT III: Distribution level, fixed installation, with smaller transient overvoltages than CAT IV.
CAT IV: Units and installations, which are supplied overhead lines, which are stand in a risk of persuade of a lightning, i.e. main-switches on current input, overvoltage-diverter, current use counter.

WARNING! Do not use this instrument for high-energy industrial installation measurement.
To ensure safe operation of the equipment and eliminate the danger of serious injury due to short-circuits (arcing), the following safety precautions must be observed. Damages resulting from failure to observe these safety precautions are exempt from any legal claims whatever.

- Do not exceed the maximum permissible input ratings (danger of serious injury and/or destruction of the equipment).
- The meter is designed to withstand the stated max voltages. If it is not possible to exclude without that impulses, transients, disturbance or for other reasons, these voltages are exceeded a suitable prescale (10:1) must be used.
- Do not operate the meter before the cabinet has been closed and screwed safely as terminal can carry voltage.
- Disconnect test leads or probe from the measuring circuit before switching modes or functions.
- To avoid electric shock, disconnect power to the unit under test and discharge all capacitors before taking any resistance measurements.
- Check test leads and probes for faulty insulation or bare wires before connection to the equipment.
- To avoid electric shock, do not operate this product in wet or damp conditions. Conduct measuring works only in dry clothing and rubber shoes, i. e. on isolating mats.
- Never touch the tips of the test leads or probe.
- Comply with the warning labels and other info on the equipment.
- Always start with the highest measuring range when measuring unknown values.
- Do not subject the equipment to direct sunlight or extreme temperatures, humidity or dampness.

- Do not subject the equipment to shocks or strong vibrations.
- Do not operate the equipment near strong magnetic fields (motors, transformers etc.).
- Keep hot soldering irons or guns away from the equipment.
- Allow the equipment to stabilize at room temperature before taking up measurement (important for exact measurements).
- Do not input values over the maximum range of each measurement to avoid damages of the meter.
- Do not turn the rotary function switch during voltage measurement, otherwise the meter could be damaged.
- Use caution when working with voltages above 35V DC or 25V AC. These Voltages pose shock hazard.
- Replace the battery as soon as the battery indicator “BAT” appears. With a low battery, the meter might produce false reading that can lead to electric shock and personal injury.
- Fetch out the battery when the meter will not be used for long period.
- Do not modify the equipment in any way
- Periodically wipe the cabinet with a damp cloth and mid detergent. Do not use abrasives or solvents.
- The meter is suitable for indoor use only
- Do not store the meter in a place of explosive, inflammable substances.
- Opening the equipment and service – and repair work must only be performed by qualified service personnel
- Measuring instruments don’t belong to children hands.

Cleaning the cabinet

Clean only with a damp, soft cloth and a commercially available mild household cleanser. Ensure that no water gets inside the equipment to prevent possible shorts and damage to the equipment.

Safety information

	Caution! Refer to accompanying documents.
	Caution! Risk of electric shock.
	Equipment protected throughout by double insulation (class II)
	TÜV/GS approved; TÜV-Rheinland
	Alternating current
	Direct current
	Ground

However, electrical noise or intense electromagnetic fields in the vicinity of the equipment, may disturb the measurement circuit. Measuring instruments will also respond to unwanted signals that may be present within the measurement circuit. Users should exercise care and take appropriate precautions to avoid misleading results when making measurement in the presence of electromagnetic interference.

Max. Input Limits

Function	**Maximum Input**
A AC	1000 A DC/AC
A DC	1000 A DC/AC
V DC; V AC	1000 V DC/AC
Resistance, Capacitance, Frequency, Diode Test	600 V DC/AC
Type K Temperature	600 V DC/AC

Introduction

This clamp meter is a handheld instrument that is designed for use in the laboratory, field servicing, at home, and any circumstance where high current measurement is required.
The clamp meter is built with a design of finger guard which ensures users operating the instrument under a safety situation; a rugged case that is shock resistant and fire-retardant; and electronic overload protection for all functions and ranges.

Unpacking and inspection
Upon removing your new digital clamp meter from its packing, you should have the following items:

- 1 Digital clamp meter
- 1 Test lead set (one black, one red)
- 1 Thermocouple type-K
- 1 9V – Battery
- 1 Carrying case
- 1 Instruction manual

If any of the above items are missing or are received in a damaged condition, please contact the distributor from whom you purchased the unit.

Instrument Layout

1	**Current clamp** For measuring DC/AC current. The plus mark identifies the direction of flow of d irect current through the conductor placed in the clamp. The displayed value is positive.
2	**Clamp opening:** Operate the clamp opener (6) to open the jaws and attach them to the testing l eads. Always place the clamp only to the current-carrying wire. When you put t he clamp meter to complete line including phase, neutral and PE, the incoming and outgoing field neutralizes and it appears no measurement result. Attach cla mps only the phase and the neutral conductor, but not the PE, so only the curre nt is measured which is not discharged through the neutral conductor, but via th e ground connection.

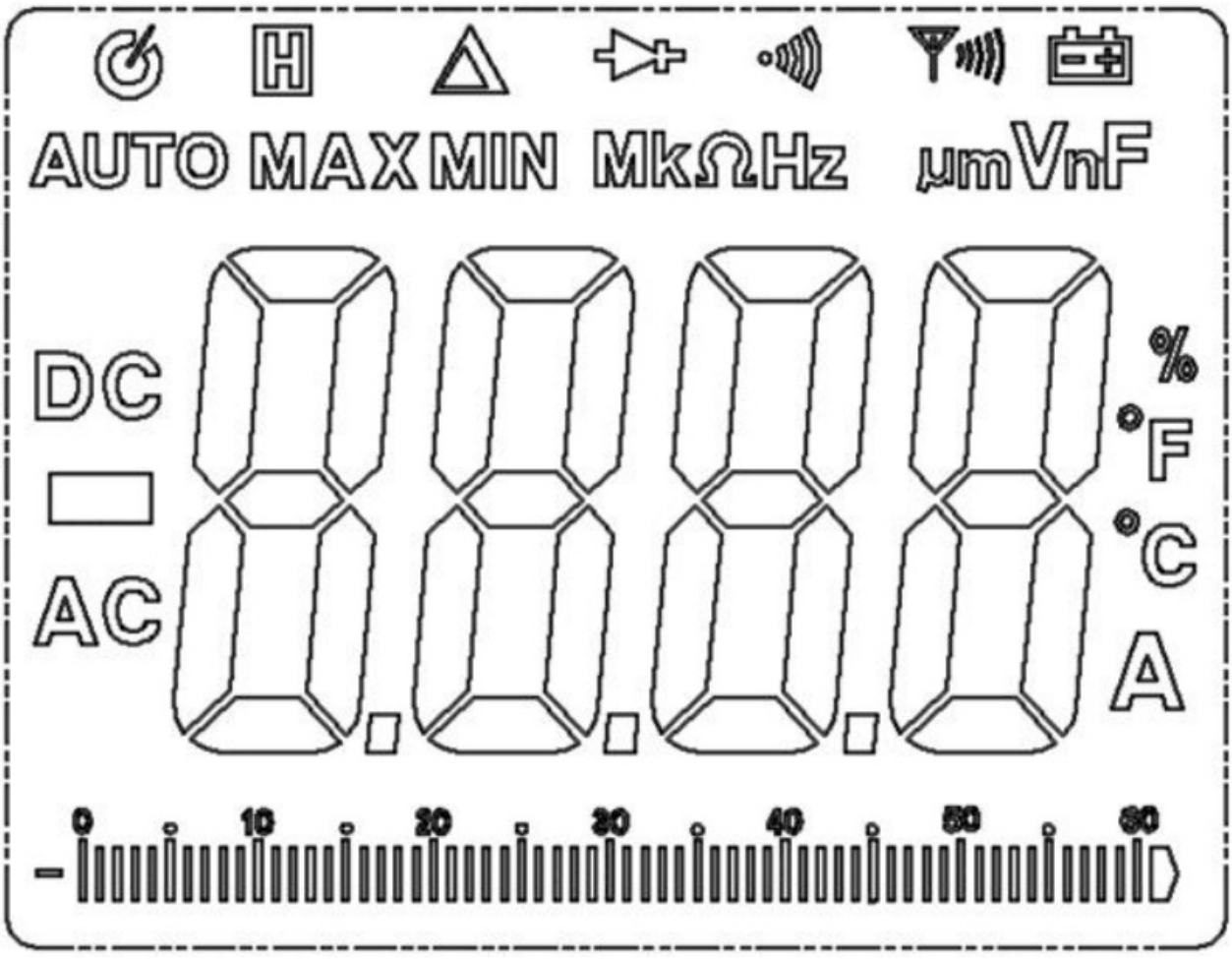
3	**LED of the measurement spotlight**
4	**Measurement spotlight** Press and hold ZERO button for 2 seconds to activate the measuring point illu mination for a better view of the point to be measured in low light conditions ZE RO button for 2 seconds.
5	**Clamp opener** Press the lever to open the clamp. When the lever is released, the clamp will cl ose again.
6	**Function switch** To select the desired measurement function.
7	**HOLD/  – button** Press HOLD button to toggle in and out of the Data-Hold mode. In the Data-Hol d mode, the “HOLD” annunciator is displayed and the last reading is frozen on t he display. Press the HOLD button again to exit and resume readings.  **– button** Press the HOLD/  – button for 2 seconds to activate the backlight. After tur ning on the backlight –  button, it automatically switches off after about 30 seconds again.

8	**MODE-button** To activate more measurement functions (Diode, Continuity, CAP) and to switch between AC and DC.

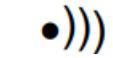
9	**MAX/MIN-button** Press the MAX/MIN button to activate the MAX/MIN recording mode. The displ ay icon “MAX” will appear. The meter will begins recording and displaying the m aximum value measured. Press the MAX/MIN button and “MIN” will appear. The meter will display the minimum value measured during the recording session. Press the MAX/MIN button and “MAX MIN” will appear. The meter will display th e present reading, but will continue to update and store the max and min readin gs. To exit MAX/MIN mode press and hold the MAX/MIN button for 2 seconds.
10	**REL-button (Relative measurement)** In the relative mode the value shown on the LCD is always The difference betw een the stored reference value and the present reading. For example, if the refe rence value is 24.000 V and the present reading is 12,50 V the display will indic ate –11,50 V. If the new reading is the same as the reference value, the display will be zero. This feature also is made as DCA ZERO adjustment.
11	**Hz/%-button:** This keys acts with trigger. Press “Hz/Duty” key when frequency mode is in ope ration, the meter will switch to duty cycle measurement mode. Press this key ag ain to switch to frequency measurement mode also.

12	**LCD display** 4 ¾ – LCD – display with bargraph
13	**COM** – input socket
14	**V/W/CAP**-input socket
15	**Battery compartment** (rear side)

Display icons Description



HOLD	Data Hold
APO	Auto Power Off
AUTO	Autoranging

DC	Direct Current
AC	Alternating Current
MAX	Max reading
MIN	Min reading
	Low battery
ZERO	DCA zero
mV oder V	Milli-volts or Volts (Voltage)
W	Ohms (Resistance)
A	Amperes (Current)
F	Farad (Capacitance)
Hz	Hertz (Frequency)
%	Duty Ratio
oF und oC	Degrees Fahrenheit and Celsius units (Temperature)
n,m,m,M,k	Unit of measure prefixes: nano, milli, micro, mega, and kilo
	Continuity test
	Diode test

Technical data

Display	3 6/7-digit LCD-display with max. 6000 counts, function symbols and backlight
Jaw opening	48 mm (1,9”) max.

Polarity	automatic switchover: in case of negative readings (-) prior to the measurement dis play
Over-Range indication	„OL“ is displayed
Low battery indication	 is displayed
Measurement rate	3x per second
PEAK detector	>1ms
Input resistance	10MW (V DC/AC)
AC-bandwidth	50 to 400Hz (A AC; V AC)
AC-response	True RMS (V AC and A AC)
Crest factor	3.0: 60A range 1,4: 1000A range (at 50/60Hz and 5% to 100% of range)
Thermocouple	Type-K
Auto power off	ca. 15 minutes
Operating temperature	5°C ~ 40°C (41°F ~ 104°F) / <80% RH
Operation Altitude	2000m (7000ft.)
Storage temperature	-20°C ~ +60°C (-4°F ~ 140°F) / <90% RH
Battery	9V-battery (NEDA 2604)
Dimensions (WxHxD)	76 x 230 x 40mm
Weight	315g

Measurement functions and ranges

Specifications

Function	Range	Resolution	Accuracy (% of reading)
DC – Current	60.00 A	10 mA	± (2,5% + 10 digits)
	600.0 A	100 mA	± (2,5% + 8 digits)
	1000 A	1 A	± (3,0% + 8 digits)
AC – Current True RMS (50 Hz to 60 Hz)	60.00 A	10 mA	± (2,5% + 10 digits)
	600.0 A	100 mA	± (2,5% + 8 digits)
	1000 A	1 A	± (3,0% + 8 digits)
	All AC voltage ranges are specified from 5% of range to 100% of range		
DC – Voltag	600.0 mV DC	0,1 mV	± (1,0% + 3 digits)
	6.000 V DC	1mV	± (1,2% + 3 digits)
	60.00 V DC	10 mV	

e	600.0 V DC	100 mV	
	1000 V DC	1 V	± (1,5% + 3 digits)
AC – Voltage True RMS (50 Hz to 1000 Hz)	6.000 V AC	1 mV	± (1,5% + 5 digits)
	60.00 V AC	10 mV	
	600.0 V AC	100 mV	
	1000 V AC	1 V	± (3,0% + 8 digits)
	All AC voltage ranges are specified from 5% of range to 100% of range		
Resistance	600.0 Ω	0,1 Ω	± (1,0% + 4 digits)
	6.000 kΩ	1 Ω	± (1,5% + 2 digits)
	60.00 kΩ	10 Ω	
	600.0 kΩ	100 Ω	
	6.000 MΩ	1 kΩ	± (2,0% + 5 digits)

	60.00 MΩ	10 kΩ	± (2,5% + 8 digits)
Capacitance	40.00 nF	10 pF	±(5,0% + 20 digits)
	400.0 nF	0,1 nF	±(3,0% + 5 digits)
	4.000 nF	1 nF	±(3,0% + 5 digits) ±(4,0% + 10 digits)
	40.00 µF	10 nF	
	400.0 µF	0,1 µF	
	4000 µF	10 µF	±(4,5% + 10 digits)

Frequency	9.999 Hz	0,001 Hz	±(1,0% + 5 digits)
	99.99 Hz	0,01 Hz	
	999.9 kHz	0,1 Hz	
	9.999 kHz	1 Hz	
	99.99 kHz	10 Hz	
	999.9 MHz	100 Hz	
	10.000 MHz	1 kHz	

	Sensitivity: > **1,0 V rms (duty cycle: 20 – 80 %; < 100 kHz)** / > **5 V rms (duty cycle : 20 – 80 %; > 100 kHz)**		
Duty cycle	0.5 to 99.9%	0,1	± (1.2% of rdg + 10 digits)
	Pulsewidth: 100 µs – 100 ms Frequency: 10 Hz – 100 kHz Sensitivity: > 5 Vrms		
Temperature (type-K)	-20.0 to 760.0°C	0,1 °C	±(3.0% of reading + 5°C)
	-4.0 to 1400.0°F	0,1 °F	±(3.0% of reading + 5°F)
	Accuracy of the temperature sensor not included		

Diode and audible Continuity Test

Range	Description	Test conditions
	Display read approx. forwa rd voltage of diode	Forward DC current approx. 1, 0mA Reversed DC voltage app rox 3,0 V
	Built-in buzzer sounds if c onductance is less than ap prox 50 Ω	Open circuit voltage approx. 2,8 V Forward DC current appr ox < 1,5mA

How to make measurements

CAUTION!

Note on using the supplied safety test leads according the IEC / EN 61010-031:2008:

- Measurements in the field of overvoltage category CAT I or CAT II can be performed with test leads without sleeves with a maximum of up to 18mm long, touchable

metallic probe, whereas for measurements in the field of overvoltage category CAT III or CAT IV test leads with put on sleeves, printed with CAT III and CAT IV must be used, and therefore the touchable and conductive part of the probes have only max. 4mm of length.

- Before making any measurements read safety precautions. Always examine the instrument and accessories used with the instrument for damage, contamination (excessive dirt, grease, etc) and defects.
- Examine the test leads for cracked or frayed insulation and make sure the lead plugs fit snugly into the instrument terminals. If any abnormal conditions exist, do not attempt to make any measurements.
- Never exceed the maximum allowable input voltage of 1000 V AC / DC. Exceeding the risk of damage to the device.
- A maximum voltage difference of 1000 V AC / DC between the COM input and ground must not be exceeded.

Voltage measurements

WARNING! To avoid possible electric shock, instrument damage and/or equipment damage, do not attempt to take any voltage measurements if the voltage is above 1000 V AC/DC are the maximum voltages that this instrument is designed to measure. The “COM” terminal potential should not exceed 1000 V measured to ground.

1. Select mV or V-function with the rotary function-switch.
2. Select the desired AC voltage range or DC voltage range, by pressing MODE-button.
3. Slide socket lock upwards and connect the black test lead to the COM input of the device.
4. Plug the red test lead into the V/Ω/CAP/  /Hz – input of the device and connect the circuit where a voltage measurement is required. Voltage is always measured in parallel across a test point. Turn on power the circuit/device to be measured and make the voltage measurement reduce the range setting if set too high until a satisfactory reading is obtained.
5. After completing the measurement, turn off power to the circuit/device under test, discharge all capacitors and disconnect the meter test leads.

Understanding Phantom readings

In some DC and AC voltage ranges, when the test leads are not connected to any circuit, the display might show a phantom reading. This is normal. The meter´s high input sensitivity produces a wandering effect. When you connect the test leads to a circuit, accurate reading appears.

Warning!

If the test leads are applied to an electrical outlet do not set under all circumstances the Function / Range switch to a different range. This could damage the internal circuitry of the device and serious injury.

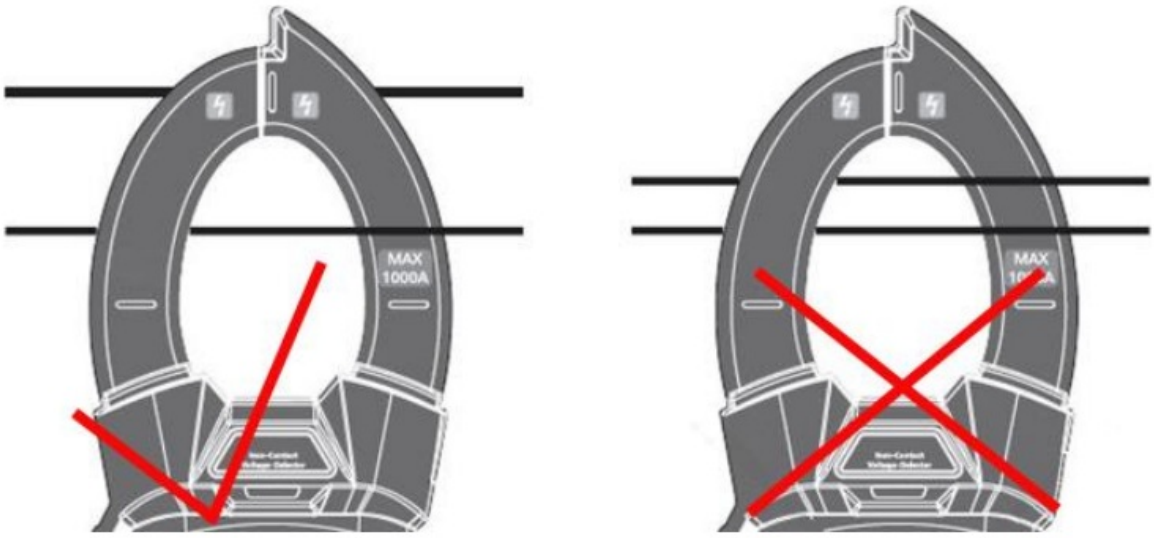
Current Measurements

WARNING! This clamp is designed to take current measurements on circuits with a maximum voltage difference of 600 V AC/DC between any conductor and ground potential. Using the clamp for current measurements on circuits above this voltage may

cause electric shock, instrument damage and/or damage to the equipment under test. Before measuring current make certain that the test leads are removed from the instrument.

The clamp is overload protected up to 1000 V AC/DC for up to 1 Min. Do not take current readings on circuits where the maximum current potential is not known. Do not exceed the maximum current that this instrument is designed to measure.

Measurements with the Clamp

1. Set Function Switch to 50 A / 1000 A position.
2. Press the trigger to open the transformer jaws and clamp them around a conductor. Jaws should be completely closed before taking a reading.
   Note: Take the clamp only around the live conductor (L1 or N)
3. 

   Select the desired AC or DC range by pressing MODE-button.
4. The most accurate reading will be obtained by keeping the conductor across centre of the transformer jaws. The reading will be indicated on the display.
5. REL (Zero): The REL-function removes offset values and improves the accuracy for DC current measurements.
   - Perform a zero adjustment by selecting 60A/600A/1000A DC range with the function selector switch and without a conductor in the clamp, press the REL button.
   - The display shows zero. The offset value is now stored and removed from all measurements

- Now perform your current measurement, as described in points 1 – 4.

Resistance measurements

WARNING! Attempting resistance or continuity measurements on live circuits can cause electric shock, damage to the instrument and damage to the equipment under test. Resistance measurements must be made on de-energized (DEAD) circuits only for maximum personal safety. The electronic overload protection installed in this instrument will reduce the possibility of damage to the instrument bus not necessarily avoid all damage or shock hazard.

1. Turn off any power to the resistor to be measured. Discharge capacitors. Any voltage present during a resistance measurement will cause inaccurate readings and could damage the meter.
2. Insert the black test lead into the COM and the red test lead into the V/Ω/CAP/  /Hz – input terminals respectively.
3. Turn the Function selector switch to the Ω position.
4. Connect the probe tips to the circuit or device under test, making sure it is de-energized first.
5. Read the resistance value in the LCD-display. Open circuits will be displayed as an overload OL condition.
6. After completing measurement, disconnect the test leads.

Note:

Test lead resistance can interfere when measuring low resistance readings and should be subtracted from resistance measurements for accuracy. Select lowest resistance range and make the test leads short together.

The display value is the test lead resistance to be subtracted.

Continuity testing

CAUTION! Measurements must only be made with the circuit power OFF.

1. Set the rotary switch to the Ω position.
2. Plug the black test lead to COM-input and the red test lead to the V/Ω/CAP/ /Hz – input.
3. Select the .))) function by pressing the MODE-button.
4. Connect the probe tips to the circuit or device under test, making sure it is de-energized first.

5. An audible tone will sound for resistance less than approx. 50 Ω.
6. After all measurements are completed, disconnect the test leads from the circuit and from the input terminals.

Diode testing

CAUTION! Measurements must only be made with the circuit power OFF.

1. Set the rotary switch to the Ω position.
2. Plug the black test lead to COM-input and the red test lead to the V/Ω/CAP/  /Hz – input.
3. Select the  function by pressing MODE-button.
4. The red test lead should be connected to the anode and the lack lead to the cathode.
5. For a silicon diode, the typical forward voltage should be about 0,7 V or 0.4 V for a germanium diode.
6. If the diode is reverse biased or there is an open circuit the display shows “OL”.
7. After all measurements are completed, disconnect the test leads from the circuit and from the input terminals.

Capacitance measurement

ATTENTION! Capacitors can store very high voltages. Before any measurement discharge the Capacitor to be measured. For this purpose, put a resistance of 100 kΩ over the capacitor terminals. Avoid the contact or bare wiring (injury by electric shock!). Measuring of charged capacitors may result in damage to the instrument.

1. Turn off power to the device under test and discharge all capacitors.
2. Discharge all voltage from the capacitor before measuring is capacitance value.
   Note:
   A safe way to discharge a capacitor is to connect a 100 kΩ resistor across the two capacitor leads.
3. Set the rotary switch to the Ω/  /.)))/CAP range.
4. Select the CAP-function by pressing MODE-button.
5. Plug the black and red test leads into the COM and V/Ω/CAP/  /Hz – input

terminals respectively. Touch the probes to the capacitor. Always observe polarity makings when measuring capacitors.

6. Read capacitance value directly from the display.
7. After completing the measurement, disconnect the test leads.

Note:

With residual voltage afflicted capacitors and capacitors with poor insulation resistance may affect the test result is negative.

Frequency measurements

1. Set the rotary switch to the Hz/% position
2. Plug the black and red test leads into the COM and V/Ω/CAP/  /Hz input terminals respectively.
3. Attach the probe tips to the points across which the frequency is to be measured, and read the result directly from the display.

4. Read the Duty Ratio on the cover small display.
5. After completing the measurement, disconnect the test leads.

Temperature measurements

Warning!

To avoid electric shock, disconnect test leads from any source of voltage before making a temperature measurement.

1. Set the rotary switch to TEMP position.
2. Insert the temperature adaptor into the V/Ω-input terminal and the COM-terminal. Ensure that the minus marking at the adaptor is inserted into the COM-terminal and the plus-marking is inserted into the V/Ω-input terminal.
3. Select the desired measuring unit °C or °F by pressing MODE-button.

4. Insert the K-type thermocouple into the temperature socket (T1) and / or into the input socket (T2) making sure to observe the correct polarity.
5. Touch the temperature probe head to the part whose temperature you wish to measure. Read the temperature in the display.

Note

In the case of an open measuring input or exceeded the measuring range “OL” is displayed in the display.

Maintenance

The removal of the rear case as well as maintenance and repair work must be performed by qualified personnel.

Use only a soft, dry cloth to clean the housing. Never clean the housing with solvents or abrasive-containing cleaning agents.

Replacing the battery

This meter is powered by a NEDA type 1604 or equivalent 9 V-battery. When the meter displays the battery symbol  the battery must be replaced to maintain proper operation. Use the following procedure to replacing the battery.

1. Disconnect test leads from any live source, turn the rotary switch to OFF and remove the test leads from the input terminals.
2. The battery cover is secured to the bottom case by a screw. Using a screwdriver, remove the screw from the battery cover and remove the battery cover.
3. Remove the battery and replace with a new equivalent 9 V-battery.
4. Replace the battery cover and reinstall the screw.

Note:

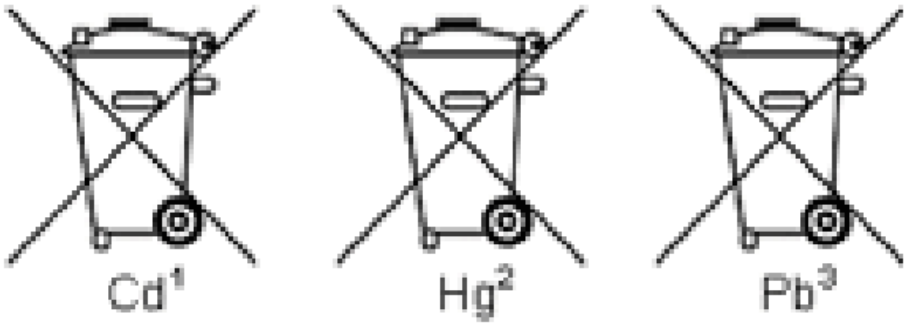
Batteries which are used up, dispose duly. Used up batteries are hazardous and must be given in the for this being supposed collective container.

Notification about the Battery Regulation

The delivery of many devices includes batteries, which for example serve to operate the remote control. There also could be batteries or accumulators built into the device itself.

In connection with the sale of these batteries or accumulators, we are obliged under the Battery Regulations to notify our customers of the following:
Please dispose of old batteries at a council collection point or return them to a local shop at no cost. The disposal in domestic refuse is strictly forbidden according to the Battery Regulations. You can return used batteries obtained from us at no charge at the address on the last side in this manual or by posting with sufficient stamps.
Contaminated batteries shall be marked with a symbol consisting of a crossed-out refuse bin and the chemical symbol (Cd, Hg or Pb) of the heavy metal which is responsible for the classification as pollutant:

1. “Cd” means cadmium.
2. “Hg” means mercury.
3. “Pb” stands for lead.



- This manual considers the latest technical knowing. Technical changings which are in the interest of progress reserved.
- Missprints and errors are reserved!
- We herewith confirm, that the units are calibrated by the factory according to the specifications as per the technical specifications.
- We recommend to calibrate the unit again, after 1 year.

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FAQ

- **Q: Can I use this instrument for high-energy industrial installation measurements?**
  A: No, it is not recommended to use this instrument for high-energy industrial installations to ensure safe operation and prevent short-circuits.
- **Q: What should I do if the display shows an error message?**
  A: If the display shows an error message or unusual readings, refer to the user manual for troubleshooting steps or contact customer support for assistance.

Documents / Resources

	PeakTech 1665 Digital Multimeter [pdf] Instruction Manual 1665 Digital Multimeter, 1665, Digital Multimeter, Multimeter

References

- User Manual

PeakTech

1665, 1665 Digital Multimeter, Digital Multimeter, Multimeter, PeakTech

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