

# PeakTech®

## Prüf- und Messtechnik

 Spitzentechnologie, die überzeugt



**PeakTech® 2510**

**Bedienungsanleitung /  
Operation manual**

**Leistungs - Analysator /  
Power Analyzer**

# 1. Introduction

This product complies with the requirements of the following European Community Directives: 2004/108/EC (Electromagnetic Compatibility) and 2006/95/EC (Low Voltage) as amended by 2004/22/EC (CE-Marking). Overvoltage category II, Pollution degree 2.

# 2. Safety Precautions

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 of the equipment).
- \* Check test leads and probes for faulty insulations or bare wires before connection to the equipment.
- \* Replace a defective fuse only with a fuse of the original rating. **Never** short-circuit fuse or fuse housing.
- \* Never touch the tips of test leads or probes.
- \* Comply with the warning labels and other info on the equipment.
- \* Conduct measuring works only in dry clothing and in rubber shoes, i. e. on isolating mats.
- \* Do not connect voltage sources across the OHM/COM terminals of the equipment.
- \* Always start with the highest measuring range when measuring unknown values.
- \* Disconnect test leads or probe from the measuring circuit before switching modes or functions.
- \* Do not subject the equipment to direct sunlight or extreme temperatures.
- \* Do not subject the equipment to extreme 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 make current measurements at the Volt/Ohm-Input with connected test-leads
- \* Only for indoor-use.
- \* ***Measuring instruments don't belong to children hands***

## **2.1 Safety Symbols**



### **Caution !**

Do not open the case while measuring !



### **Caution !**

- \* Do not input overload to the input sockets !
- \* disconnect measuring probes before opening the battery case !
- \* only use dry cloths to clean the plastic case !

## **3. Features**

- \* Multi-Functions: Watt, VA, Whr, COS  $\theta$  (Power factor), ACV, ACA, DCV, DCA, Hz, Ohm.
- \* True AC power (Watt) & apparent power (VA) measurement.
- \* True RMS display for ACV, ACA.
- \* 0,1 W resolution (<1000 W)
- \* Super large LCD, easy to read-out, display in Watt, Power Factor, Voltage & Current value at the same time.
- \* Accept different kinds current input signals as direct input, inductive clamp probe or CT (current transformer).
- \* Auto range
- \* Built-in peak hold & data hold function.
- \* Watt & VA measurement with Hi, low alarm setting capability
- \* RS-232 output interface
- \* Built-in over input indication
- \* Power supply by batteries or AC to DC adaptor
- \* Low battery indicator
- \* Durable bench type housing plastic case with carrying handle.

## **4. Specifications**

### **4.1. General Specifications**

- Display
- \* 93 x 52 mm large LCD (liquid crystal display)
  - \* Multi-display unit, shows Volt, Ampere, Watt Power factor or Hz at same time.

Measurement	Watt, VA, Whr, Power factor, ACV, ACA, DCV, DCA, Hz, Ohm
Zero Adjustment	Whr: External adjustment by push button DCV, ACV, DCA, ACA: autom. adjustment
Polarity	Automatic switching "-" indicates reverse polarity
Current input mode	Direct input, inductive clamp probe or CT
Over input indication	Indication of " - - - - "
Data output	RS232 serial interface
Sampling time	W, VA, ACA, ACV, COS $\theta$ , Hz: Approx. 1,5 sec. DCV, DCA, Ohm: Approx. 1 sec.
Operating Temp.	0 to 50°C (32 to 122°F)
Operating Humidity	Less than 80% R. H.
Power Supply	Battery power: 6 x 1,5 V AA (UM-3); AC power: AC to DC 9 V / 500mA adapter (optional)
Power Consumption	Approx. DC 55 mA
Dimensions (WxHxD)	280 x 210 x 90 mm
Weight	approx. 1,6 kg
Standard Accessories	Test lead (red/black), Instruction manual Interface cable Software for Windows 9x, 2000, NT, XP, VISTA, 7

## **4.2. Electrical Specifications (23 ± 5°C)**

### **4.2.1. Watt (AC, true power), current mode from direct input**

<b>Range</b>	<b>Resolution</b>	<b>Accuracy</b>
6,000 Watt	0,1 Watt (<1000 W)	± 1,5% + 5 dgt.
	1 Watt (≥1000 W)	

- \* Accuracy is specified under the following conditions:
  - a) AC input current is  $\geq 0,05$  A AC &  $\leq 10$  A AC
  - b) AC input voltage is within  $110\text{ V} \pm 15\%$  and  $220\text{ V} \pm 15\%$  (50/60 Hz)
  - c) Power factor  $\geq 0,5$
- \* ACA, ACV frequency response is from 40 to 400 Hz
- \* Max. volt & current input signal value:  
Volt input: Max. AC 600 V, Current input: Max. AC 10 A

### **4.2.2. Watt (AC, true power), current input cooperate with inductive probe or CT**

<b>Range</b>	<b>Resolution</b>
0,1 to 999,9 Watt	0,1 Watt
9,999 Watt	1 Watt
99,99 kWatt	0,01 kWatt
999,9 kWatt	0,1 kWatt

- \* Accuracy will be same as the above "Direct current input mode" but plus the accuracy value of Current Transformer (CT) or the accuracy of Inductive Current Probe.
- \* Input current should obey:  
Input Probe -  $\geq 20$  A AC  
CT 100/5 A -  $\geq 8$  A A AC  
CT 1000/5 A -  $\geq 80$  A AC

### **4.2.3. VA (AC, Apparent Power), current mode from direct input**

<b>Range</b>	<b>Resolution</b>	<b>Accuracy</b>
99,99 VA	0,01 VA	± 2% + 2 dgt.
999,9 VA	0,1 VA	
9,999 VA	1 VA	

- \* Accuracy is specified under the following conditions:
  - a) AC input current is  $\geq 0,05$  A AC &  $\leq 10$  A AC
  - b) AC input voltage is within  $110\text{ V} \pm 15\%$  and  $220\text{ V} \pm 15\%$  (50/60 Hz)
- \* ACA, ACV frequency response is from 40 to 400 Hz

#### **4.2.4. Power Factor, current mode from direct input only**

Range	Resolution	Accuracy
0,01 to 1,00	0,01	$\pm 1,5\% + 2$ dgt.

- \* Accuracy is specified under the following conditions:
  - a) AC input current is  $\geq 0,05$  A AC &  $\leq 10$  A AC
  - b) AC input voltage is within  $110\text{ V} \pm 15\%$  and  $220\text{ V} \pm 15\%$  (50/60 Hz)
- \* Max. volt & current input signal value:  
 Volt input: Max. AC 600 V, Current input: Max. AC 10 A

#### **4.2.5. AC Voltage (true rms), DC Voltage**

Range	Resolution	Accuracy
0,1 V to 299,9 V	0,1 V	DCV : $\pm 1\% + 1$ dgt.
300 V to 600 V	1 V	ACV ( $\leq 10$ V) : $\pm 1\% + 7$ dgt. (11 V to 100 V): $\pm 1\% + 5$ dgt. (>100 V) : $\pm 1\% + 1$ dgt.

- \* Auto range
- \* Max. input voltage: 600 V AC/DC
- \* ACV accuracy is test under input signal is sine wave, 50/60 Hz
- \* ACV frequency response is from 40 to 400 Hz
- \* ACV is true rms.

#### **4.2.6. AC Current (true rms), DC Current; current mode from direct input**

	Range	Resolution	Accuracy
ACA	0,05 A to 1,999 A	1 mA	$\pm 1\% + 3$ dgt.
	2,00 A to 10,00 A	10 mA	
DCA	0,01 A to 10,00 A	10 mA	$\pm 1\% + 1$ dgt.

- \* Max. input current: AC 10 A, DC 10 A
- \* ACA accuracy is test under input signal is sine wave, 50/60 Hz
- \* ACA frequency response is from 40 to 400 Hz
- \* ACA is true rms

#### **4.2.7. AC Current (true rms), DC current; current mode from inductive probe**

Range		Resolution
ACA	<20 A	0,01 A
	20 A to 199,9 A	0,1 A
	200 A to 1000 A	1 A
DCA	1000 A	1 A

- \* Accuracy: Meter voltage range accuracy plus inductive probe's accuracy
- \* ACA is true rms

#### **4.2.8. AC Current, current mode from CT (Current Transformer)**

Range	Resolution
CT 100/5 A, 0,1 – 200,0 A	0,01 A (< 20 A); 0,1 A (> 20 A)
CT 1000/5 A, 1 – 2000 A	0,1 A (<200 A); 1 A (>200 A)

- \* Accuracy: Meter current range accuracy plus CT (Current Transformer) accuracy
- \* ACA is true rms

#### **4.2.9. Watt Hour, current from direct input**

Range	Resolution
0,001 Whr to 9.999 Whr	0,001 Whr
10,00 Whr to 99,99 Whr	0,01 Whr
100,0 Whr to 999,9 Whr	0,1 Whr
1000 Whr to 9999 Whr	1 Whr
10 kWhr to 99,99 kWhr	10 Whr
100 kWhr to 999,9 kWhr	100 Whr
1000 kWhr to 9999 kWhr	1 kWhr

- \* Accuracy & other specification requirement same as "Watt" range exactly
- \* When Watt hour value over 9999 kWhr, the display value will reset to 0000 Whr, then count up again.

#### **4.2.10. Resistance**

<b>Range</b>	<b>Resolution</b>	<b>Accuracy</b>
9,999 Ohm	1 Ohm	± 1% + 1 dgt.
19,99 kOhm	10 Ohm	

- \* Auto range
- \* Overload protection "Max. AC/DC 300 V"

#### **4.2.11. Frequency**

<b>Range</b>	<b>Resolution</b>	<b>Accuracy</b>
10,0 Hz to 99,9 Hz	0,1 Hz	± 1% + 1 dgt.
100 Hz to 999 Hz	1 Hz	

- \* Auto range
- \* Frequency signal input voltage level should be  $> 6\text{ V}$  &  $\leq 600\text{ V}$

#### **Remark:**

The above specification are tested under the environment RF Field Strength less than 3 V/M and frequency less than 30 MHz only.

## 5. Front Panel Description

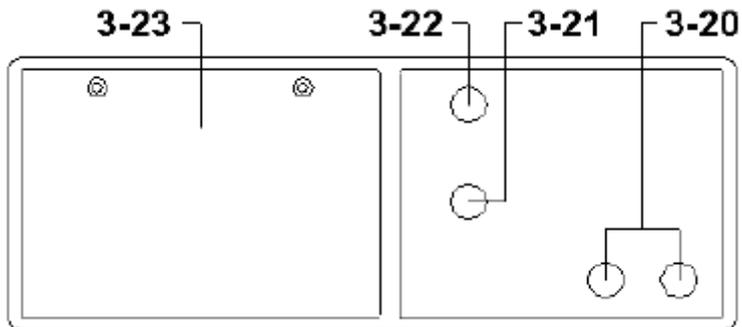
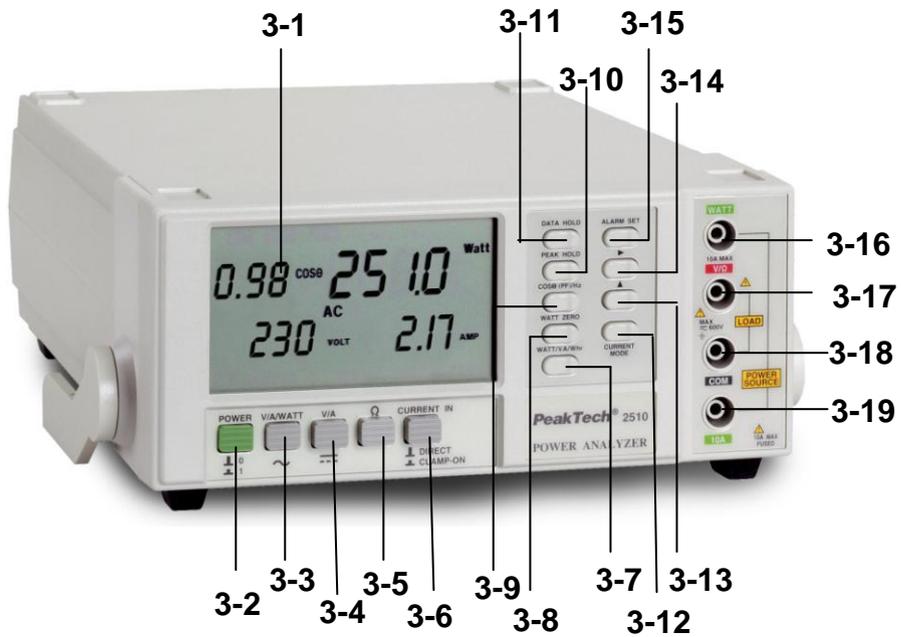


Fig.1

Marks:

ON = 1

OFF = 0

AC = ~

DC = ---

- 3-1 LCD-Display
- 3-2 Power Switch
- 3-3 AC V/A Watt Switch
- 3-4 DC V/A Switch
- 3-5 Ohm Switch
- 3-6 Current In Switch
- 3-7 Watt/VA/Whr Button
- 3-8 Whr Zero Button
- 3-9 COS  $\theta$  (Power Factor) / Hz Button
- 3-10 Peak Hold Button
- 3-11 Data Hold Button
- 3-12 Current Mode Button
- 3-13 " $\wedge$ " Button (Alarm Set)
- 3-14 ">" Button (Alarm Set)
- 3-15 Alarm Set Button
- 3-16 Watt Terminal
- 3-17 V/Ohm Terminal
- 3-18 COM Terminal
- 3-19 Current Terminal
- 3-20 Clamp-On Current Input Terminal
- 3-21 DC 9V Power Adaptor Input Socket
- 3-22 RS-232 Output Terminal
- 3-23 Battery Cover / Battery Compartment

## 6. Precautions & Preparations for Measurement

1. Ensure, that the batteries are connected correctly to its snap terminal and placed in the battery compartment.
2. Select and push the correct switch and button before making measurements.
3. Place the test leads into the proper input terminal before making measurements.
4. Remove either of the test leads from the circuit under test while changing the measurement function.
5. Operate the instrument only in the ambient temperature range of 32°F – 122°F (0°C – 50°C) and less than 80% Relative Humidity.

6. Do not exceed the maximum rated voltage of each range and input terminal.
7. Always switch the power to its "OFF"-position when the instrument is not in use.  
Remove the batteries if not intend to use the instrument for a long period of time.

## 7. Measuring Procedure



**Caution !**  
**Do not apply the overload voltage,**  
**current in the input terminal !**

### 7.1. AC Watt/V/A/PF/Hz – Measurement

1. Push the "Power Switch" (3-2, Fig. 1) to "ON" position

<b>ON = 1</b>	<b>OFF = 0</b>
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2. Select the "AC/V/A/Watt-Switch" (3-3, Fig. 1)
3. Select the "Current In"-Switch (3-6, Fig. 1) to the "DIRECT"-position
4. Do not make any wire connection to the input terminals. If the watt display is not zero, push the "Whr-Zero Button" (3-8, Fig. 1) once, then watt display will show "0".

**Remark:**

**The "Whr-Zero Button" can be executed only under ACV & ACA are under zero condition (no signal input).**

5. Power off the "Power Source" of the measured installation.  
Make the wire connection and connect the test leads into terminals (3-16, 3-17, 3-18, 3-19 – Fig. 2)

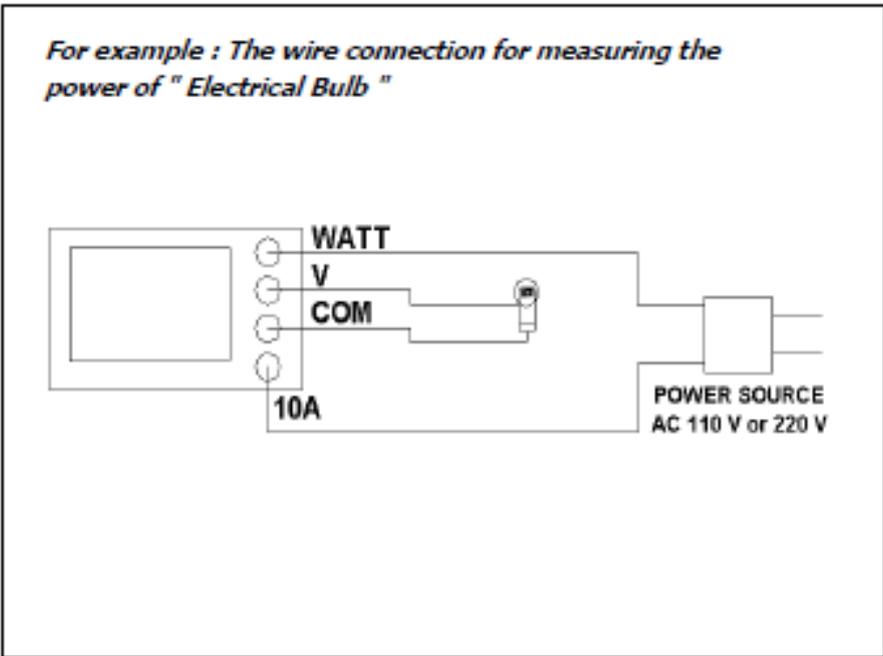
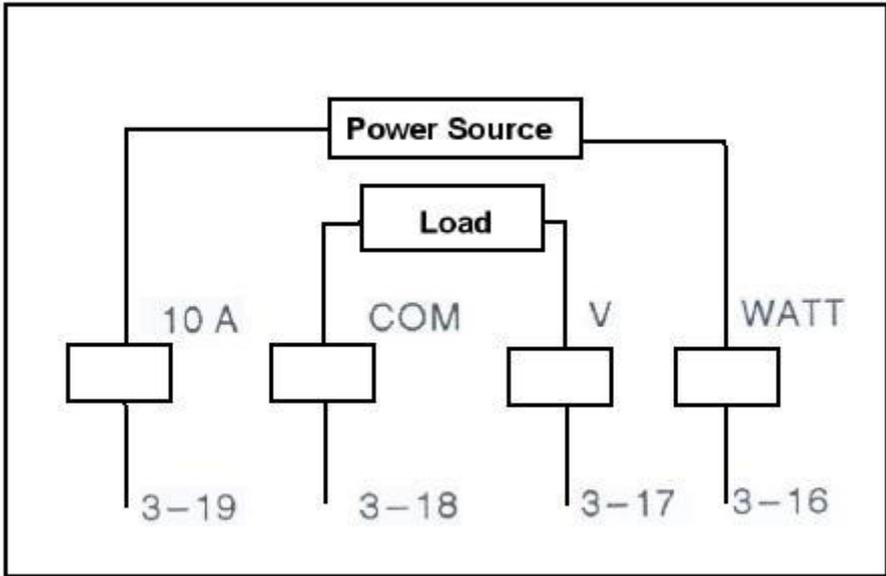


Fig. 2

6. \* Connect the "LOAD" to the terminals of 3-17, 3-18, (Fig. 2)  
\* Connect the "Power Source" to the terminals of 3-16, 3-19 (Fig. 2)
7. Power on the "Power Source" of the measured installation.  
The "LCD Display" (3-1, Fig. 1) will show the Watt, Voltage, Current, PF (Power Factor) at the same time.
  - \* Watt function is the true power ( $V \times A \times PF$ ) measurement
  - \* Voltage and Current function is the true rms measurement
  - \* For the Watt measurement, the max. input current should be less than AC 10 A.

Line frequency (Hz) measurement:

8. During the Watt measurement, push the " $\cos\phi$ /PF/Hz Button" (3-9, Fig. 1) once, will show Line Frequency value instead of the PF value.
  - \* Push the " $\cos\phi$ /PF/Hz Button" again, the Hz value will disappear and the PF value will display again.

### **7.2. AC VA/V/A/PF/Hz Measurement**

All the measuring procedures are same as the above "7.1-AC Watt/V/A/PF/Hz" measurement, except you should push the "Watt/VA/Whr Button" (3-7, Fig. 1) once, then the display will show the VA, voltage, current, Hz at the same time.

- \* The VA function is the apparent power ( $V \times A$ ) measurement
- \* During the VA measurement, the LCD will show VA, Voltage, Current and Hz, it can not show the value of PF (Power Factor).

### **7.3. AC Watt Hour (Whr) Measurement**

All the measuring procedures are same as the above "7.1-AC Watt/V/A/PF/Hz" measurement, except you should push the "Watt/VA/Whr Button" (3-7, Fig. 1) twice, then the display will show the Whr value along with the elapsed time.

- \* The Whr (Watt Hour) is the value of Watt x hour
- \* The Whr measurement will start at the moment after the Whr unit is displayed on the LCD-Display
- \* The display of Whr measurement will stop (hold) when pushing the "Data Hold Button" (3-11, Fig. 1) once. Push the "Data Hold Button" once again for continuing the Whr function.
- \* Press "Whr Zero" button (3 – 8, Fig.1) once will "reset (zero)" the Whr measuring value and make the new measurement again.

## **7.4. AC Voltage, AC Current Measurement**

1. Push the "Power Switch" (3-2, Fig. 1) to "ON"-position.

<b>ON = 1</b>	<b>OFF = 0</b>
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2. Select the "AC V/A/Watt Switch" (3-3, Fig. 1).
3. Select the "Current In Select Switch" (3-6, Fig. 1) to the "DIRECT"-position.
4. AC Voltage measurement
  - a) Connect red test lead to "V/Ohm Terminal" (3-17, Fig. 1) and black test lead to "COM Terminal" (3-18, Fig. 1)
  - b) Connect test lead probes into circuit under test.
  - c) The display will show the AC voltage directly
5. AC Current measurement
  - a) Connect red test lead to "Current (10 A) Terminal" (3-19, Fig 1) and black test lead to "COM Terminal" (3-18, Fig. 1)
  - b) Open the circuit in which current is to be measured. Now securely connect test leads in series with the load, which the current is measured.
  - c) The display will show the AC current directly.  
\* The max. AC current input value should be less than 10 A.

## **7.5. DC Voltage, DC Current Measurement**

1. Push the "Power Switch" (3-2, Fig. 1) to "ON" position

<b>ON = 1</b>	<b>OFF = 0</b>
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2. Select the "DC V/A Switch" (3-4, Fig. 1)
3. Select the "Current In Select Switch" (3-6, Fig. 1) to the "DIRECT" position.
4. DC Voltage Measurement
  - a) Connect red test lead to "V/OHM Terminal" (3-17, Fig. 1) and black test lead to "COM Terminal" (3-18, Fig. 1)
  - b) Connect test lead probes into circuit under test.
  - c) The display will show the DC voltage directly.

**Remark:**

**When the "DC" mark on the LCD is flashed, it means the measured display is negative DC voltage.**

## 5. DC Current Measurement

- a) Connect red test lead to "Current (10 A) Terminal" (3-19, Fig. 1) and black test lead to "COM Terminal" (3-18, Fig. 1).
- b) Open the circuit in which current is to be measured. Now securely connect test leads in series with the load, which the current is measured.
- c) The display will show the DC current directly.
  - \* The max. DC current input value should be less than 10 A.

## 7.6. Ohm Measurement

1. Push the "Power Switch" (3-2, Fig. 1) to "On" position.

<b>ON = 1</b>	<b>OFF = 0</b>
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2. Select the "Ohm Switch" (3-5, Fig. 1)
3. Connect red test lead to "V/Ohm Terminal" (3-17, Fig. 1) and black test lead to "COM Terminal" (3-18, Fig. 1)
4. If the resistance being measured is connected to a circuit, turn off power to circuit being tested and discharge all capacitors.
5. Connect test lead probes into circuit (resistance) under test.
6. Read resistance value on digital display.

## 7.7. AC Watt, VA, Whr measurement, current input cooperate with CT (Current Transformer)

Other measurement procedures are same as the 7.1, 7-2, except:

1. Wire connection as follows, refer (Fig. 3)

### **Voltage:**

"V-Terminal" (3-17, Fig. 3) and "COM Terminal" (3-18, Fig. 3)

### **Current:**

Current transformer output connect to the "10 A Terminal" (3-19, Fig. 3) and "COM terminal" (3-18, Fig. 3)

2. Select the CT type, 100/5 or 1000/5 by pushing the "Current Mode Button" (3-12, Fig. 1). The LCD will show the marker "CT 100/5 A", "CT 1000/5 A" when the CT type is selected.

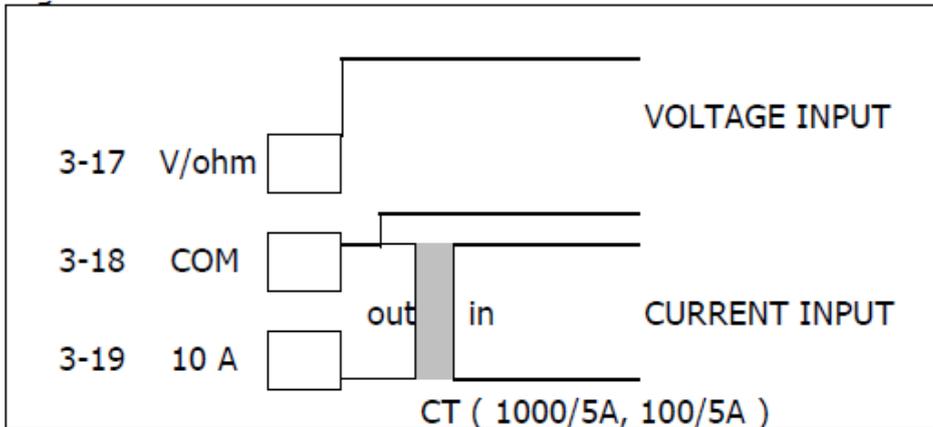


Fig. 3

### 7.8. AC Watt, VA, Whr measurement, current input cooperate with Clamp-On probe

Other measurement procedures are same as the 7.1, 7-2, except:

1. Wire connection as follows, refer (Fig. 4)

**Voltage:**

"V-Terminal" (3-17, Fig. 4) and "COM Terminal" (3-18, Fig. 4)

**Current:**

The output plug of the inductive current probe (1 AC mV per 1 ACA) connect to the "Clamp-On Current Input Terminals" (3-20, Fig. 4)

2. It should be selected the "Current In Switch" (3-6, Fig. 1) to the "Clamp-On" position, the display will show the marker "clamp1000A".

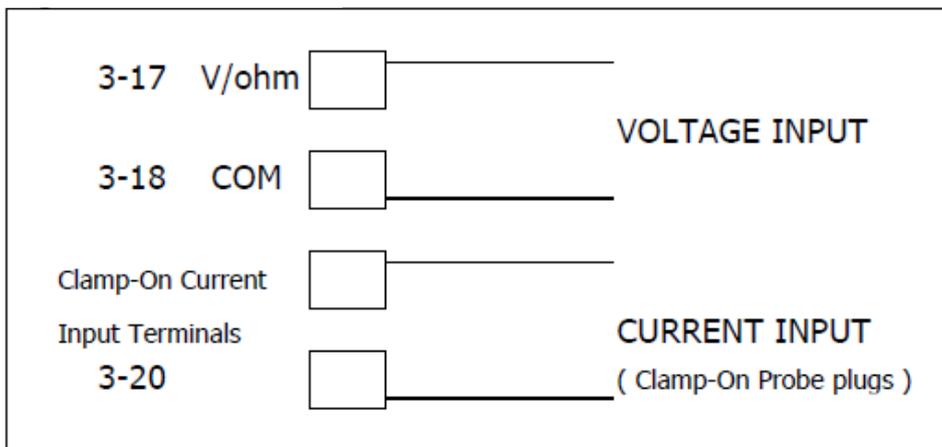


Fig. 4

### **7.9. Data Hold**

During the measurement, push the "Data Hold Button" (3-11, Fig. 1). It will hold the display values and LCD will show the "HOLD" symbol.

- \* Push the "Data Hold Button" again, it will release the DATA HOLD function.
- \* Data Hold function is not available for ohm range.

### **7.10. Peak Hold**

During the measurement, push the "Peak Hold Button" (3-10, Fig. 1). It will hold the peak measurement values and LCD will show the "PK.H" symbol.

Peak Hold function is only available for the "Watt value".

- \* Push the "Peak Hold Button" again, it will release the Peak Hold function.

### **7.11. Alarm Setting**

1. Alarm setting function is only for the "Watt" & "VA" display.
2. "Alarm Set Button" (3-15, Fig. 1) is used to set the max./min. alarm value or set the alarm off (display does not show Max., Min. symbol when adjusting the Alarm Set Button).

3. " > Button " (3-14, Fig. 1) is used to select the digit.
4. " ^ Button " (3-13, Fig. 1) is used to select the value (0, 1, 2, ...9) of each digit.
5. The buzzer will alarm when the Watt alarm setting value is larger than the max.-value or smaller than the min.-value.

## 8. Maintenance



**Caution !**  
**Risk of electric shock !**  
**Remove all test leads before opening the battery cover !**

### 8.1. Battery Replacement

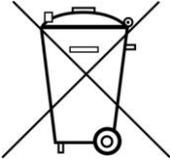
1. When the LCD display shows the "BAT" symbol, it is necessary to replace the batteries.
2. Loose the screw, slide the battery cover (3-23, Fig. 1) away from the instrument and remove the batteries.
3. Replace the 1,5 V AA (UM-3) battery (6 pcs.) and reinstate the cover.

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

### Statutory Notification about the Battery Regulations

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.



Batteries, which contain harmful substances, are marked with the symbol of a crossed-out waste bin, similar to the illustration shown left. Under the waste bin symbol is the chemical symbol for the harmful substance, e.g. „Cd“ for cadmium, „Pb“ stands for lead and „Hg“ for mercury.

You can obtain further information about the Battery Regulations from the Bundesministerium für Umwelt, Naturschutz und Reaktorsicherheit (*Federal Ministry of Environment, Nature Conservation and Reactor Safety*).

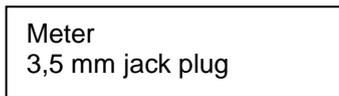
## **8.2. Cleaning**

**Only use dry cloths to clean the plastic case !**

## **9. RS232 PC Serial Interface**

The instrument features an RS-232 output via 3,5 mm terminal (3-22, Fig. 1). The connector output is a 16 digit data stream, which can be utilized to the user's specific application.

An RS-232 lead with the following connection will be required to link the instrument with the PC serial input.



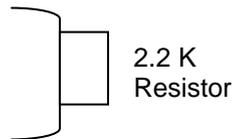
Center Pin.....

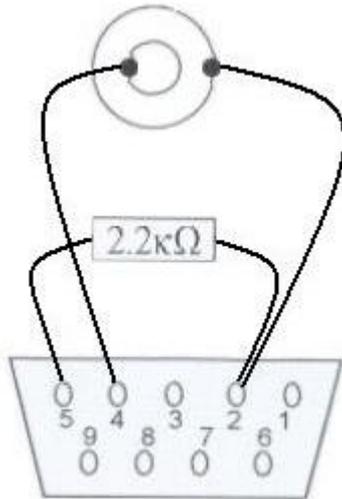
Ground/Shield.....

Pin 4

Pin 2

Pin 5





RS232 Format: 9600,N,8,1

Band Rate	9600
Parity	no Parity
Data bit	8
Stop bit	1

The 16 digit Data stream will be displayed in the following format:

D15	D14	D13	D12	D11	D10	D9	D8	D7	D6	D5	D4	D3	D2	D1	D0
-----	-----	-----	-----	-----	-----	----	----	----	----	----	----	----	----	----	----

D0                    End Word

D1 - D8             Display reading, D1 = LSD, D8 = MSD  
 For example: If the reading is 1234, then D8 to D1 is: 00001234

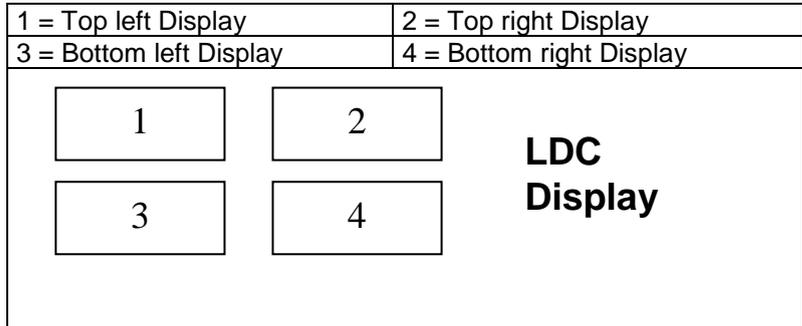
D9                    Decimal Point (DP), position from right to left:  
 0 = No DP, 1 = 1 DP, 2 = 2 DP, 3 = 3 DP

D10                  Polarity  
 0 = Positive      1 = Negative

D11 & D12

Annunciator for Display		
Hz = 31	DCV = 34	DCA = 36
k Watt = 48	ACV = 50	ACA = 52
Ohm = 38	kOhm = 39	Watt = 47
Hour = 61	Minute = 62	VA = 63
KVA = 64	kW/hr = 65	W/hr = F2
Power factor = 54		

D13



D14 4

D15 **Start Word**

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*This manual is according the latest technical knowing. Technical changings which are in the interest of progress, 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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