Flexible Clamp Power Meter



User Manual

QINGDAO TESSIO TECHNOLOGY CO., LTD.

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I. Safety Rules and Precautions

Thank you for purchasing our company's TCM-2050 series flexible clamp power meter. In order to use this product better, please be sure to:

Read this user manual in detail.

Strictly observe the safety rules and precautions listed in this manual.

◆In any case, special attention should be paid to safety when using this instrument.

◆Pay attention to the labels and symbols on the panel and back panel of the instrument.

◆Can not be used to test voltages higher than 600V, do not use in strong electromagnetic environment to avoid affecting the positive, it is forbidden to test in flammable and dangerous places.

♦ Make sure that the connecting plug of the wire has been inserted into the interface tightly. Please pay attention to the direction when testing the phase.

The test lead must be removed from the test lead before it can be pulled out from the instrument. Do not touch the input jack by hand to avoid electric shock.

•Do not operate the instrument with wet hands, or expose it

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to rainwater. Do not use the instrument when it is wet.

◆Do not place and store the meter for a long time in places with high temperature and humidity, condensation and direct sunlight.

• The battery voltage is low, please replace the battery in time.

◆Please remove the battery if the instrument will not be used for a long time.

• Replace the battery, pay attention to the battery polarity.

The use, disassembly and maintenance of this instrument must be operated by authorized personnel.

• Due to the reasons of this instrument, if it is dangerous to continue using it, you should stop using it immediately and seal it up immediately.

Processed by an authorized agency.

The " Δ " danger sign on the instrument and manual, the user must follow the instructions for safe operation.

◆The "☑" in the manual is extremely dangerous, and the user must strictly follow the instructions for safe operation.

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II. Introduction

TCM-2050 series flexible clamp power meter is a kind of power meter carefully developed by our company for onsite measurement of three-phase AC voltage, current, leakage current, phase between voltages, phase between voltage and current, frequency, phase sequence, electric energy, active power,

reactive power Multi-function, digital, smart meter for power, apparent power, power factor, total power, etc., using flexible coil sensor with diameter of φ 150mm or φ 300mm, easy to use and flexible, can replace traditional bulky clamp leakage current meter and power clamp meter It can also be used to identify the transformer wiring group, inductive and capacitive circuits, read out the phase relationship between the CTs of each group of differential protection, check whether the wiring of the watt-hour meter is correct or not, and repair line equipment, etc. Electric inspectors provide a new type of electric power meter that is safe, accurate and more convenient.

Using advanced Rockwell coil (or Rogowski coil) technology, it is a toroidal coil that is evenly wound on non-ferromagnetic materials, with no hysteresis effect, no magnetic saturation phenomenon, high linearity, and strong anti-interference ability. The output signal is the derivative of current against time. By integrating the output voltage signal,

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the current signal can be truly restored. There is no exposed metal conductor in the coil part of the flexible current clamp, non-contact measurement, safe and fast; its small size, light weight, beautiful appearance, soft and flexible, suitable for narrow environments and places with dense wiring; high measurement accuracy, strong reliability, response frequency bandwidth.

The instrument also has functions such as backlight, data retention, and data storage. It is easy to use and is an essential tool for electrical safety testing.

III. Model Specifications

Model	TCM-2050	TCM-2050E
Coil length	470mm	950mm
Coil inner diameter	Φ 150mm	ф 300mm

IV. Electrical Symbols

4	Extremely dangerous! The operator must strictly abide				
	by the safety rules, otherwise there is a danger of				
	electric shock, resulting in personal injury or casualty.				
A	Danger! The operator must strictly abide by the safety				
	rules, otherwise there is a danger of electric shock,				
	resulting in personal injury or casualty.				
À	Warning! Safety rules must be strictly followed,				

	otherwise personal injury or equipment damage may be		
	caused.		
	Double insulation		
2	Alternating current(AC)		
	Direct Current (DC)		

V. Technical Specifications

Features	Three-phase AC voltage, leakage		
	current, current, active power, reactive		
	power, apparent power, total power,		
	phase of current and voltage, phase		
	between phase voltages, frequency,		
	electrical energy, phase sequence, etc.		
Power Supply	DC4.5V AA alkaline battery (1.5V		
	AAA×3)		
Measurement Method	Flexible CT, three-phase voltage clamp		
Jaw size	φ 150mm/ φ 300mm		
Wire Position	The conductor to be measured is in the		
	center of the flexible coil		
	200 groups, displaying "FULL" symbol		
Data Storage	200 groups, displaying "FULL" symbol		
Data Storage	200 groups, displaying "FULL" symbol indicates that the storage is full		
Data Storage Frequency	200 groups, displaying "FULL" symbolindicates that the storage is full50Hz/60Hz automatic recognition		

Sample Rate	About 2 times/sec		
Line Voltage	Line measurement below AC 600V		
Display Mode	LCD: 128dots×64dots; Display field:		
	43mm×29mm		
Meter size	Host size: width, thickness and height		
	151*100*35mm (without coil)		
Backlight	Have		
Low battery prompt	Have. A symbol is displayed in the		
	upper right corner when the battery is		
	low.		
Data retention	Data hold function: "HD" symbol		
	display		
Overflow display	Overrange overflow function: "OL"		
	symbol display		
Automatic shut-down	After about 15 minutes of inactivity, the		
	meter automatically shuts down to		
	reduce battery consumption		
Battery Voltage	When the battery voltage drops to about		
	3.4V, a low battery voltage symbol will		
	be displayed to remind you to replace		
	the battery		
Instrument quality	Meter: about 350g (including battery)		

Working current	100mA	
Working temperature	-10°C~40°C; below 80%rh	
and humidity		
Storage temperature	-10°C~60°C; below 70%rh	
and humidity		
Dielectric strength	AC 3700V/rms (between core and	
	shell)	

VI. Range and Accuracy

1. AC voltage U:

Range	Precision	Resolution	Standard ambient conditions
0.00~10.00V	\pm (1.5%FS+5dgt)	0.01V	Ambient
$10.1^{10}0.00$		0.11	$23^{\circ}C\pm2^{\circ}C$; Relative
10.1 100.00	\pm (1.5%FS+5dgt)	0.10	humidity: 40% \sim
$101^{\sim}600V$	$\pm (1.5\%FS + 5dgt)$	1V	60%RH

2. AC current I:

Range	Precision	Resolution	Standard ambient
			conditions
$0.0^{\sim}100.0A$	\pm (2%FS+5dgt)	0. 1A	Ambienttemperature:23°C±2°C;relative
$101^{\sim}1000A$	\pm (2%FS+5dgt)	1A	humidity: 40% \sim
1001~3000A	\pm (3%FS+5dgt)	1A	60%RH; the measured current line is perpendicular to the center of the plane where the sensor coil is located

3. Frequency F:

Range	Precision	Resolution	Standard ambient conditions
			Ambient temperature: 23°C±2°C;
45~65Hz	± 0.6 Hz	0.1Hz	Relative humidity: $40\% \sim 60\%$ RH;
			Voltage≥13.0V; Current≥6.0A

4. Phase angle:

Range	Precision	Resolution	Standard ambient conditions
0.0 [~] 359.9°	$\pm 2.0^{\circ}$	0.1°	Ambienttemperature:23°C±2°C;Relative humidity:40%∼60%RH;Voltage≥13.0V;Current≥6.0A

5. Power factor: PF=W/VA

Range	Precision	Resolution	Standard ambient conditions
0.000~1.000	±0.030	0.001	Ambienttemperature: $23^{\circ}C\pm2^{\circ}C$;Relative humidity: $40\% \sim 60\%$ RH;The measuredcurrent line is perpendicular tothe center of the plane where thesensorcoilislocated;Voltage ≥ 13.0 V;Current ≥ 6.0 A

6. Apparent power S: VA=(V×A)

Range	Precision	Resolution	Standard ambient
			conditions
0.00 [~] 99.99VA	\pm (3.5%FS+5dgt)	0. 01VA	Ambient temperature:
100.0 [~] 999.9VA	\pm (3.5%FS+5dgt)	0.1VA	23°C \pm 2°C; Relative
1.000~9.999KVA	\pm (3.5%FS+5dgt)	0.001KVA	60%RH; The
10.00 [~] 99.99KVA	\pm (3.5%FS+5dgt)	0.01KVA	measured current line is perpendicular to
100.0 [~] 999.9KVA	\pm (3.5%FS+5dgt)	0. 1KVA	the center of the plane where the

			sensor coil is located;
$1000^{\sim}1800$ KVA	\pm (4.5%FS+5dgt)	1KVA	Voltage≥13.0V;
			Current>6.0A

7. Active power P: W=($V \times A \times COS \Phi$)

Range	Precision	Resolution	Standard ambient
			conditions
$0.00^{99.99}$	\pm (3.5%FS+5dgt)	0.01W	Ambient temperature: 23°C
100.0 [~] 999.9W	\pm (3.5%FS+5dgt)	0.1W	$\pm 2^{\circ}$ C; Relative
1.000 [~] 9.999KW	\pm (3.5%FS+5dgt)	0.001KW	humidity: $40\% \sim$ 60%RH; The measured current line is perpendicular to the center of the plane where the sensor coil is located; Voltage \geq 13.0V; Current \geq 6.0A
10.00 [~] 99.99KW	\pm (3.5%FS+5dgt)	0.01KW	
100.0 [~] 999.9KW	\pm (3.5%FS+5dgt)	0.1KW	
1000~1800KW	\pm (4.5%FS+5dgt)	1KW	

8. Reactive power Var=($V \times A \times \sin \Phi$)

Range	Precision	Resolution	Standard ambient
			conditions
0.00 [~] 99.99Var	\pm (3.5%FS+5dgt)	0.01Var	Ambient temperature:
100.0 [~] 999.9Var	\pm (3.5%FS+5dgt)	0.1Var	23°C±2°C; Relative humidity:
1.000 [~] 9.999KVar	\pm (3.5%FS+5dgt)	0.001KVar	$40\% \sim 60\%$ RH;
10.00 [~] 99.99KVar	\pm (3.5%FS+5dgt)	0.01KVar	The measured current line is
100.0 [~] 999.9KVar	\pm (3.5%FS+5dgt)	0.1KVar	perpendicular to the center of the
1000~1800KVar	±(4.5%FS+5dgt)	1KVar	plane where the sensor coil is located; Voltage≥13.0V; Current≥6.0A

9. Electric energy W:

Range	Precision	Resolution	Standard ambient
			conditions
0.00 [~] 9.9999KWh	\pm (3.5%FS+5dgt)	0.0001KWh	Ambient temperature:
0.00 [~] 99.999KWh	\pm (3.5%FS+5dgt)	0.001KWh	23°C±2°C; Relative
0.00 [~] 999.99KWh	\pm (3.5%FS+5dgt)	0.01KWh	60%RH; The
0.00 [~] 99999.9KWh	\pm (4.5%FS+5dgt)	0.1KWh	measured current line is perpendicular
$0.00^{\sim}180000$ KWh	± (4.5%FS+5dgt)	1KWh	to the center of the plane where the sensor coil is located; Voltage≥13.0V; Current>6.0A

VII. Instrument structure

- 1. Rogowski Sensing Coil
- 2. Open the coil knob
- 3. LCD monitor
- 4. Keypad
- 5. Voltage input jack
- 6. Battery cover



VIII. Operation Methods

1. Turn on and off

Short press the POWER button to turn on, the LCD will display, and then short press the POWER button to shut down. The meter will automatically shut down after 15 minutes of inactivity (except the power test page) to reduce battery consumption. Every time there is a key operation, the 15-minute shutdown countdown will restart. If the LCD display is dark after power on, the battery voltage may be too low, please replace the battery.

2. Data retention, cancellation, storage, viewing, clearing

1) Short press the HOLD key during the test, the "HD" symbol will be displayed, the current test data will be kept, and automatically numbered and stored, and then short press the HOLD key to cancel the hold. The meter continues to measure, if the stored data reaches 200 groups, press the HOLD key again, the meter will flash and display the "FULL" symbol, indicating that the stored data is full.

2) Press and hold the HOLD button (about 2 seconds) to enter the data review mode, and automatically display the first group of stored data, then short press the SET button (-) or MODE button (+) to view the previous or next group of data, no storage The data shows "NULL". In the data access mode, short press the HOLD key to turn pages to view other pages, and short press the POWER key to exit the data access mode.

3) Enter the data review mode, long press the HOLD button (about 2 seconds), select "Yes" (short press the SET button) to

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clear all stored data, and automatically return to the test state after clearing, select "No" (short press the MODE button) key) to cancel clearing the data and return to the test state.

3. Switch the test page

In the test state, short press the MODE button to switch the test, power on the default power page, short press the MODE button to switch the current and voltage power factor page, voltage and current phase angle page, voltage and voltage phase angle page, frequency page, phase sequence page and energy measurement in turn pages, and can be cycled through.

4. Alarm settings

In the test state, long press the POWER button to enter the alarm setting page, short press the HOLD button to select the parameter to be adjusted, and the selected parameter will be displayed in reverse white. Short press the SET button (-) or the MODE button (+) to adjust the parameter value. Add or subtract 1, long press the SET key (-) or MODE key (+) to add or subtract 20 each time (current 50).

After setting the parameters, set "Alarm Set:" to "ON" to turn on the alarm, and set it to "OFF" to turn off the alarm.

5. Switch the voltage channel

In the test state, short press the SET key to enter the

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channel selection state, and then short press the SET key to select the next channel, which can be selected cyclically, ϕ 1, ϕ 2, ϕ 3 correspond to voltage channels U1, U2, U3 respectively. In the switching channel state, there is no operation for about 3~4 seconds or short press the MODE key to exit the channel selection state.

IX.Test description

1. Single-phase AC voltage (U1/U2/U3) measurement



Power on, switch the page to the current voltage power factor page according to the third point of the above eight operation methods, and connect the test line, as shown in the figure above. If the measured voltage is displayed as "OL", it means that the measured voltage value has exceeded the upper limit of the voltage range of the instrument, and the power to be measured should be quickly turned off or the test lead should be removed. Over-range measurement may result in electric shock and damage to the instrument.

The following table shows the corresponding relationship between the set channel and the measurement terminal. Please refer to the fifth point of the above eight operation methods for switching between the off and voltage channels.

Voltage channel	COM side	COM port	Display
settings	flag	color	channel
φ1	U1	yellow	U1:
φ2	U2	green	U2:
ф3	U3	red	U3:

2. Single-phase AC current (I) measurement



Power on and switch the page to the current and voltage power factor page (see the eighth operation method for details). Then turn the coil lock head to open the clamp head, clamp the measured wire, and rotate to lock the coil (note that the clamp head must be fully closed), as shown in the figure above. If the measured current I is displayed as "OL", it means that the measured current value has exceeded the upper limit of the current range of the instrument, and the power to be measured should be turned off or the instrument should be removed immediately. Over-range measurement may damage the instrument.

3. Three-phase AC leakage current (I) measurement



Power on and switch the page to the current and voltage power factor page (see the eighth operation method for details). Then turn the coil lock head to open the clamp head, clamp the measured wire, and rotate to lock the coil (note that the clamp head must be fully closed), as shown in the figure above. If the measured current I is displayed as "OL", it means that the measured current value has exceeded the upper limit of the current range of the instrument, and the power to be measured should be turned off or the instrument should be removed immediately. Over-range measurement may damage the instrument.

4. Single-phase power factor (PF1/PF2/PF3) measurement



Power on and switch the page to the current and voltage power factor page (see the eighth operation method for details). Then turn the coil lock head to open the clamp head, clamp the wire to be measured, rotate to lock the coil (note that the clamp head must be fully closed), and connect the test leads, as shown in the figure above.

If you want to use other channels, you can switch the voltage channel (for details, please refer to the fifth point of the eighth operation method), and change the test lead to the corresponding wiring port.

Attention: When the measuring voltage is less than 13V or the measuring current is less than 6A, the power factor will not

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be measured.

5. Single-phase active power (P) / reactive power (Q) / apparent power (S) measurement



Power on and switch the page to the power page (see the eighth operation method for details). Then turn the coil lock head to open the clamp head, clamp the wire to be measured, rotate to lock the coil (note that the clamp head must be fully closed), and connect the test leads, as shown in the figure above. If you want to use other channels, you can switch the voltage channel (for details, please refer to the fifth point of the eighth operation method), and change the test lead to the corresponding wiring port.

Attention: When the measuring voltage is less than 13V or the measuring current is less than 6A, the power will not be measured. 6. Single-phase electric energy (W1/W2/W3) measurement



Power on, then turn the coil lock head to open the clamp head, clamp the measured wire, rotate to lock the coil (note that the clamp head must be fully closed), and connect the test wire, as shown in the figure above.

If you want to use other channels, you can switch the voltage channel (for details, please refer to the fifth point of the eighth operation method), and change the test lead to the corresponding wiring port.

Switch the page to the energy measurement page (see the eighth operation method for details), it will automatically start timing and accumulate the calculated energy.

Attention: When the measured voltage is less than 13V or the measured current is less than 6A, it will stop calculating the energy. 7. Voltage (U1/U2/U3) and current phase angle measurement



Power on and switch the page to the voltage and current phase angle page (see the eighth operation method for details). Then turn the coil lock head to open the clamp head, clamp the wire to be measured, rotate to lock the coil (note that the clamp head must be fully closed), and connect the test leads, as shown in the figure above. Other ports U2 and U3 that are not connected to the phase voltage display 0.0°. If other phase voltages are connected to the corresponding ports, the phase angle between the corresponding phase voltage and the clamped measured current will be measured at the same time.

If you want to use other channels, you can switch the voltage channel (for details, please refer to the fifth point of the eighth operation method), and change the test lead to the corresponding wiring port.

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Attention: When the measurement voltage is less than 13V or the measurement current is less than 6A, the phase angle will not be measured, and it will display 0.0° .

 Phase angle measurement between three-phase voltages (U1/U2/U3)



Power on and switch the page to the voltage and voltage phase angle page (see the eighth operation method for details), and connect the test leads, as shown in the figure above.

Attention: When the measurement voltage is less than 13V or the measurement current is less than 6A, the phase angle will not be measured, and it will display 0.0°.



9. Frequency measurement of three-phase voltage and current

Power on and switch the page to the frequency page (see the eighth operation method for details). Then turn the coil lock head to open the clamp head, clamp the wire to be measured, rotate to lock the coil (note that the clamp head must be fully closed), and connect the test leads, as shown in the figure above.

Attention: When the measuring voltage is less than 13V or the measuring current is less than 6A, the frequency will not be measured.

U1 U2 U3 MEM:009

10. Three-phase voltage phase sequence measurement

Power on and switch the page to the phase sequence page (see the eighth operation method for details), and connect the test line, as shown in the figure above.

When the square flashes from U1->U2->U3, it is a positive phase sequence, otherwise it is a reverse phase sequence.

Attention: When the measured voltage is less than 13V, the phase sequence will not be measured.

11. Three-phase four-wire total power summation



Three-phase four-wire summation record 1

Turn on the power and press and hold the SET key (about 2 seconds) in the measurement state to enter the three-phase summation measurement state, then turn the coil lock head to open the clamp head, clamp the measured wire 1, and rotate to lock the coil (note that the clamp head must be fully closed), and connect the test leads, as shown in the figure above.

After waiting for the displayed value to stabilize, press the HOLD key to record the 1-phase power information and enter the 2-phase recording state.

Three-phase four-wire summation record 2



Rotate the coil lock head to open the clamp head, clamp the measured wire 2, rotate to lock the coil (note that the clamp head must be fully closed), and keep the voltage test line unchanged, as shown in the figure above.

After waiting for the displayed value to stabilize, press the HOLD key to record the 2-phase power information and enter the 3-phase recording state.



Rotate the coil lock head to open the clamp head, clamp the measured wire 3, rotate to lock the coil (note that the clamp head must be fully closed), and keep the voltage test line unchanged, as shown in the figure above.

After waiting for the displayed value to stabilize, short press the HOLD key to record the 3-phase power information, calculate the three-phase total power and other information and display the three-phase summation page.

Attention: Press the HOLD button within 3 seconds after each short press is invalid.



Total Power S: 3.660 KVA PF: 0.999 MEM:009 ∑3

The figure above shows the three summation pages. Short press the MODE button to switch between these two pages in a loop, short press the HOLD button to keep and save the data, and then short press the HOLD button to return. Short press the POWER key to exit the three-phase summation page and return to the test state.

12. Three-phase three-wire total power summation

Three-phase three-wire summation record 1



Turn on the power and press and hold the SET key (about 2 seconds) in the measurement state to enter the three-phase summation measurement state, then turn the coil lock head to open the clamp head, clamp the measured wire 1, and rotate to lock the coil (note that the clamp head must be fully closed), and connect the test leads, as shown in the figure above.

After waiting for the displayed value to stabilize, press the HOLD key to record the 1-phase power information and enter the 2-phase recording state.



Rotate the coil lock head to open the clamp head, clamp the measured wire 3, rotate to lock the coil (note that the clamp head must be fully closed), and keep the voltage test line unchanged, as shown in the figure above.

After waiting for the displayed value to stabilize, press the HOLD key to record the 2-phase power information and enter the 3-phase recording state.



Three-phase three-wire summation record 3

Rotate the coil lock head to open the clamp head, the clamp head does not clamp any wire, rotate to lock the coil (note that the clamp head must be fully closed), and remove all voltage wires without clamping any wires, as shown in the figure above.

After waiting for the active power, reactive power and

apparent power to return to zero, short press the HOLD key to record the 3-phase power information, calculate the three-phase total power and other information and display the three-phase summation page.

Note: Press the HOLD button within 3 seconds after each short press is invalid.



The figure above shows the three summation pages. Short press the MODE button to switch between these two pages in a loop, short press the HOLD button to keep and save the data, and then short press the HOLD button to return. Short press the POWER key to exit the three-phase summation page and return to the test state.

X. Battery Replacement

Â	Warning! Do not test if the battery cover is not	
<u> </u>	properly covered, otherwise it will be dangerous.	
	Pay attention to the battery polarity, otherwise the	
	meter will be damaged.	

The battery is low, please replace it in time.

If the meter will not be used for a long time, please remove the battery.

1) When the battery power is low, the meter displays a low battery voltage symbol, please replace the battery.

2) Press the POWER button to shut down, confirm that the meter is in the off state, open the battery cover, pay attention to the battery model and the positive and negative poles of the battery, replace it with a new qualified battery, and cover the battery cover.

meter	1 set
test lead	1 set (1 each of gray, yellow, green and
	red, 4 in total)
test clip	1 set (4 pieces)
Instrument package	1pc
Detector battery	3 No. 7 dry batteries
Manual, Warranty	1 set

The contents of this user manual should not be used as a reason to use the product for a special purpose.

The company is not responsible for other losses caused by use.

The company reserves the right to modify the contents of the user manual. Subject to modification without further notice.