



AX-C705

1. Introduction

1.1. Generalization

The Meter is a battery-operated process maintenance field device which combined both digital-parameter function with process-signal source together.

Functioning as follows:

- Measurement function of TC voltage, DC voltage , Ohms, DC, Continuity and Diode; Data reserving function;
- Max. Voltage applied to output terminals: about 32V; Max. current applied to output terminals: about 25mA.
- Output function of DC (Constant, Manual-Step and SIMULATE modes)
- Loop-circuit testing function; Powering the loop circuit with 24 Voltage and testing the current; Built-in 250Ω HART loop resistance
- Safety: complied with IEC 61010-1 safety requirements for measurement, control and electronic instruments for lab use.

1.2. Opening the Meter Case

Check the product to see whether it is damaged in the shipment or not. Check the materials to see whether they are the same as shown in the packing list. Keep the packing materials for late delivery.

Standard and chosen accessories supplied are listed as follows. Chosen ones are bought at purchaser's options.

Standard accessories:

- 1x testing wire(with alligator clips)
- 1x user's manual
- 2x 1.5V (LR6)Alkaline batteries
- 2x 63mA/250V Fast Fuses

1.3. Safety Information

The design, manufacture and test of the Meter reach the IEC 61010-1 Safety Requirements. This Manual contains all warnings and safety regulations that must be followed to ensure safe operation and retain the meter in safe condition. Read the following instructions before operation.

Mark △ in the Meter means the operator needs to make reference to related parts in the Manual to ensure safe operation.

Warning - identifies conditions and actions that pose hazard(s) to the user; Caution - identifies conditions and actions





that may damage your meter. Note - identifies symbols from which you can understand operation and features of your meter. For related international symbols used by the Meter and the Manual, please read table below for reference.

Warning

- Do not use the meter if it is damaged. Before using the meter, inspect the case. Look for cracks or missing plastic. Pay particular attention to the insulation surrounding the connectors.
- Make sure the battery door is closed and latched before operating the meter.
- Do not use the meter if it operates abnormally. Protection may be impaired. When in doubt, have the meter serviced.
- Do not operate the meter around explosive gas, vapour, or dust.
- Use only type AA batteries, properly installed in the meter case to power the meter.
- Use caution when working above 30V AC RMS, 42V AC PK, or 60V DC. Such voltages pose a shock hazard.
- When using the probes, keep fingers behind the finger guards on the probes.
- Connecting the common test lead before connecting the live test lead. When disconnecting test leads, disconnect the live test lead first.
- Read carefully and make sure well understanding of this Manual before use.
- Make sure the requirements in the Manual are strictly followed and keep the Manual for reference whenever needs.
- Mis-operation may cause accidents and damages to the Meter in testing.

Caution!

To avoid possible damage to the Meter or to equipment under test:

- Make sure the rotary switch is in the right position, disconnect the testing leads and the circuit under test before rotating, conversion in testing is prohibited in case of damaging the Meter.
- Cut all the power off and release electricity fully from all capacitor before testing online resistance, diode and continuity.
- Check fuse in the Meter before testing current. Cut off the power before connection. Remember: when testing current, connect the Meter with the Circuit in series. Do not connect testing leads to any circuit in parallel.
- Do not use the Meter if symbol "⚡" displays.
- Do not store or use the Meter in high temperature, high moisture, explosive, inflammable, strong electromagnetic environment and dew or direct sunlight place.
- Do not use abrasive or solvent to clean the Meter, use a damp cloth or neutral detergent instead.
- Make dry before store if the Meter is damp.

1.4. Symbols

AC Current ~

DC Current —

AC or DC ≈

Low Battery ⚡

Conforms to Standards of European Union CE

Earth ground ⊕

Double Insulated □



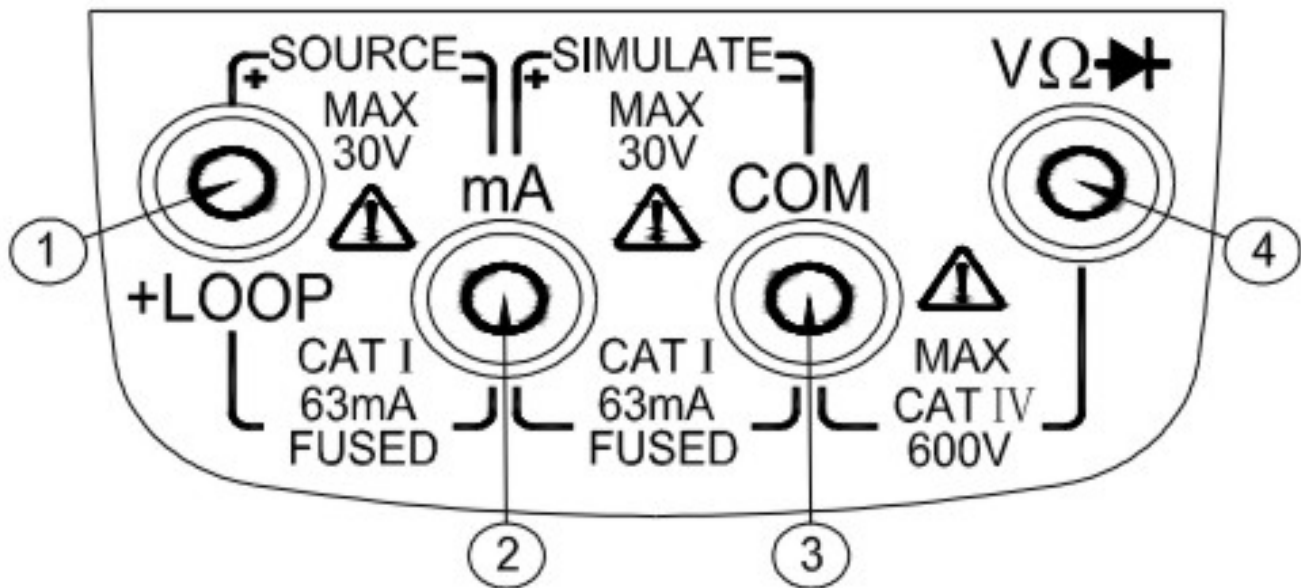
Fuse 

Safety rules 

CAT III - Overvoltage of class three, secondary pollution (according to IEC61010) refers to the level of protection for the pulse compression. Typical installation location includes: distribution of three-phase circuit (including a single commercial lighting circuit) position-fixed equipment; interior lighting equipments in large buildings, lines; industrial field devices.

CAT IV - Overvoltage of class four, secondary pollution (according to IEC61010) refers to the level of protection for the pulse compression. typical installation location includes: Three-phase utility power supply equipment for any outdoor power lines or equipment; Any outdoor transmission lines; Electricity meter front-end over-current protection device.

1.5. Input/Output terminals



1 - output point for loop circuit power

2 - current measurement input common point for DC output common point for loop circuit power Simulates the output of a transmitter group (with external power supply connected in series.) With protection by 63mA fuse.

3 - common point for all testing Common point for simulate transmitter output.

4 - voltage output of 600V Ω diode and continuity test.



1.6. Using display hold mode

Under output mode, the Meter freezes data displayed in the reading part when pressing <BACK> button to enter into display hold mode (screen displays symbol). Repress <BACK> button to exit from display hold mode.

2. Operation Instructions

2.1. General Service

This section introduces how to use this Meter. Most functions are available by turning rotary switch. White symbols besides rotary switch indicates main function, green symbols indicates replacing function. Press green button to use the replacing function.

2.2. AC Voltage Measurement

- Turn the rotary switch to “~”.
- Insert black probe into “COM” terminal ,and insert red probe into “Ω_V” terminal.
- Connect the probes to the circuit under test and then read the measured value when stable.

2.3. DC voltage measurement

- Turn the rotary switch to “-”.
- Insert black probe into “COM” terminal ,and insert red probe into “Ω_V” terminal.
- Connect the probes to the circuit under test and then read the measured value when stable.

Warning

- Do not input voltage higher than DC 600V or AC 600V rms. There is a risk of damaging the Meter though it is possible to display a higher voltage.
- Max. Voltage applied to output terminals: about 32V; Max. current applied to output terminals: about 25mA.
- When the input voltage is higher than 30V, symbol <LIGHTNING> displays for warning.

2.4. Resistance measurement

Warning

To avoid damage to the Meter or equipment under test, cut all power off and release electricity fully from all capacitor before testing continuity.

- Turn the rotary switch to “Ω”.
- Insert black probe into “COM” terminal ,and insert red probe into “Ω_V” terminal.
- Connect the probes to the circuit under test and then read the measured value when stable.

Note





- The screen displays "OL" if the open circuit or resistance of the device under measurement exceeds the maximum range of the Meter.
- Max. Voltage applied to output terminals: about 32V; Max. current applied to output terminals: about 25mA.
- Because the testing current output by the meter may go through all possible links between probes, the measured resistance value in the circuit could be different from the rated value.

2.5. Continuity test

Warning

To avoid damage to the Meter or equipment under test, cut all power off and release electricity fully from all capacitor before testing continuity.

- Turn the rotary switch to "I".
- Insert black probe into "COM" terminal ,and insert red probe into "Ω_V" terminal.
- Connect the probes to the circuit under test and the buzzer beeps when the circuit connected (resistance lower than 20Ω).

2.6. Diode test

Warning

To avoid damage to the Meter or equipment under test, cut all power off and release electricity fully from all capacitor before testing continuity.

- Turn the rotary switch to "D ", press green button and select test.
- Insert black probe into "COM" terminal ,and insert red probe into "Ω_V" terminal.
- Connect the probes to the diode under test and then read the measured value when stable.

Forward test: connect the red probe to the positive polar of the diode under test and black probe to the negative polar, the screen displays approximate value of diode forward voltage drop, about 0.5~0.8V generally. Adverse test: connect the red probe to the positive polar of the diode under test and black probe to the negative polar, the screen displays "OL" in normal case.

2.7. Current measurement

Warning

To avoid damage to the Meter or equipment under test, make sure both the rotary switch position and input terminal position conforms to the required measurement mode.

- Turn the rotary switch to "mA"
- Insert black probe into "COM" terminal ,and insert red probe into "mA" terminal.
- Connect the probes to the circuit under test and then read the measured value when stable.
- Press button "mA%" to display current value in percentage form.





current value //Displayed In percentage form

-22.000mA //162.50%

0.000mA // 25.00%

4.000mA // 0.00%

20.000mA // 100.00%

22.000mA // 112.50%

2.8. Measuring loop-circuit current

The function may measure current value powered with 24VDC constant voltage. 24V loop-circuit measurement function may test transmitter loop circuit. The meter may be connected to transmitter, but not to transmitter or signal adaptor.

Warning

Typical value of loop power supply is 24VDC. Voltage between terminals could be higher than 24V in different situations, such as current value in loop circuit or internal connection in series.

- Turn the rotary switch to “”, and the screen displays “ LOOP POWER”;
- Insert black probe into “mA” terminal ,and insert red probe into “+LOOP” terminal;
- Connect the probes to the circuit under test and then read the measured value when stable.
- Press “mA%” button to display current value in percentage form.

2.9. Measuring loop-circuit current with 250Ω

- Turn the rotary switch to “”, and the screen displays “ LOOP POWER” and “250Ω HART”.
- Insert black probe into “mA” terminal ,and insert red probe into “+LOOP” terminal;
- Connect the probes to the circuit under test and then read the measured value when stable.
- Press “mA%” button to display current value in percentage form.

2.10. Using current output function

The meter offers 0-20 mA and 4-20mA current output functions. Two output modes: SOURCE mode: supply current from internal source; SIMULATE mode (simulate): absorb current from external source Two Configuration modes: Constant current output: constant output of designated current. Manual-step output: output current increases or decreases in 25% or 100% step. If you need to apply current for non-source circuit (such as loop current without power), then select SOURCE mode. The meter consumes more battery power of being used as current source than that of being used in SIMULATE mode, so select SIMULATE mode if possible.

Warning

Do not apply output terminals with voltage higher than 30V; otherwise it may lead to electric shocks. Make sure that the voltage between circuit and ground wire is lower than 30V. Be sure to use the enclosed probes and wires (check them to see whether they in a suitable measurement mode).

Warning





Do not apply any voltage to output terminals except in SIMULATE mode. Any wrong application may damage internal circuit.

2.11. Constant current output (SOURCE mode)

- Turn the rotary switch to “”; the screen displays “OUTPUT” and “LOOP POWER”; output is set as 0mA.
- Insert black probe into “mA” terminal ,and insert red probe into “+LOOP” terminal;
- Press ”mA%” button to display current value in percentage form.
- Press <LEFT>, <RIGHT>, <UP>, <DOWN> buttons to set output value.
- Connect the leading wire to the circuit under test.

2.12. Constant current output (SIMULATE mode)

SIMULATE mode refers to simulate a group of loop-circuit current transmitter with the Meter. If there are cases of an external DC voltage (range from 5-28 V) and tested loop current in series, then select SIMULATE mode.

Warning

Before connecting the testing lead to loop circuit current, turn the rotary switch to any position of mA output. Otherwise, low impedance from other position of rotary switch will appear and cause current higher than 35mA to go through the loop circuit.

- Turn the rotary switch to “”; the screen displays “OUTPUT” and “SIMULATE”; output is set as 0mA.
- Insert black probe into “mA” terminal ,and insert red probe into “mA” terminal; Press ”mA%” button to display current value in percentage form.
- Press <LEFT>, <RIGHT>, <UP>, <DOWN> buttons to set output value.
- Connect the leading wire to the circuit under test.

2.13. Manual-step output

In constant current output mode, press green button to select manual-step output function: increases or decreases in 25% or 100% step. Press <UP>, <DOWN> button may increase or decrease current in 25% or 100% step.

2.14. Setup function

Setup function may:

- Start and close automatic power-off function.
- Open and close buzzer.

In power-off state, press button and turn the rotary switch from OFF to any other position simultaneously. Wait for 2 seconds and then loosen. Press button to select setup function; press button to change setup state; press green button to hold setup value.





3. General Maintenance

3.1.

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

- Take out the batteries if the meter won't be used for a long time.
- Max. Voltage applied to output terminals: about 32V; Max. current applied to output terminals: about 25mA.
- Dirt or moisture in the terminals can affect readings.

Clean the terminals as follows:

- Turn the Meter off and remove all test leads.
- Shake out any dirt that may be in terminals.
- Soak a new swab with alcohol. Clean each terminal with the swab.

3.2. Replacing the Battery

The Meter is powered by two AA batteries (IEC LR6).

Warning

To avoid electrical shock or personal injury:

- Remove test leads from the meter before opening the battery door.
- Max. Voltage applied to output terminals: about 32V; Max. current applied to output terminals: about 25mA.
- Close and latch the battery door before using the meter.

Note

- The new and old Batteries can not be mixed.
- Max. Voltage applied to output terminals: about 32V; Max. current applied to output terminals: about 25mA.
- Make sure the battery's poles are in accordance with the symbols illustrated in battery pool when replacing them.
- Max. Voltage applied to output terminals: about 32V; Max. current applied to output terminals: about 25mA.
- Take out the batteries if the meter won't be used for a long time.
- Max. Voltage applied to output terminals: about 32V; Max. current applied to output terminals: about 25mA.
- Dispose the old batteries in accordance with the local law

Replace the batteries as follows.

- Turn the rotary switch to OFF and remove the test leads from the terminals.
- Take off the protector of the meter, remove the battery door by using a standard-blade screwdriver to turn the battery door fasteners, and then take off the battery case.
- Replace with two new batteries.
- Reinstall the battery case and tighten screws.

3.3. Replacing the Fuses

Warning





To avoid personnel injury or damage to the meter, use only the specified fuse. The specification is 6 3mA 250V fast-melt. 3mA 250V-fuse protection is in the mA current output terminal. To check whether fuses are blown:

- Turn the rotary switch to $\approx$ mA
- Plug the black test into COM, and the red test lead into the mA input.

Use an ohmmeter to check the resistance between test leads .If the resistance is about 20Ω , the fuse is good. An open reading means that fuse is blown. Replace the fuse as follows.

- Remove the test leads from the meter and turn the meter OFF.
- Take off the protector of the meter, remove the four screws by using a standard-blade screwdriver, and then take off the cover.
- Replace the blown fuse(s).
- Reinstall the cover.

4. Specification

4.1. Safety and conformity

Overload protection - V~COM terminal:AC600V/10 seconds; mA terminal:63mA/250V fast-melt fuse

Legal conformity - IEC61010-1(CAT IV 600V CAT III 1000V Pollution ClassificationII)

Electromagnetic compatibility - Conforms to IEC61326-1,Group 1 Class B

Surge protection - 8kV(according to IEC61010.1-2001)

Identification Mark - CE

Quality Standard - Develops , designs and manufactures in conformity with ISO 9001

4.2. General feature

Display Screen - digit: display in four digits(5 in current measurement and output)

Refresh display - 2.5 displays/second

Operation temperature and moisture range - $0\sim 40^{\circ}\text{C}$, relative moisture $\leq 85\%$ (no condensation)

Storage temperature and moisture range - $-20^{\circ}\text{C}\sim 60^{\circ}\text{C}$ relative moisture $\leq 90\%$ (no condensation)

Accuracy required temperature and moisture range - $23\pm 5^{\circ}\text{C}$ relative moisture $\leq 75\%$ (no condensation) Temperature co-efficiency - $0.1 \times \text{basic accuracy} / ^{\circ}\text{C}$ (temperature range $< 18^{\circ}\text{C}$ or $> 28^{\circ}\text{C}$)

Ambient condition for operation - Indoor, outdoor operation(no waterproof),at an altitude of $0\sim 2,000$ meter

Indicator for over-range - OL

Continuity/open test - Beeper sounds for resistance readings below threshold, or to indicate a momentary open circuit

Battery type - two AA 1.5V Alkaline (LR6) batteries battery life when using alkaline battery: measures any parameter: about 100 hours; DC current output(SIMULATE):about 50 hours; DC current output (SOURCE 20mA(1000 Ω load):about 2.5 hours.

Low battery - displays battery symbol





Automatic power-off - The default value is 5 mins if no operation which is adjustable.

Preheating time - 10min

Closed – case calibration No internal adjustments needed

Battery access door - Battery or fuse replaceable without voiding calibration

Measurement - 180(L)×90(W)×47(D)mm

Weight - about 500g

Calibration period - one year

4.3. Detailed accuracy indicator

Accuracy is specified for a period of one year after calibration, at $23\pm5^{\circ}\text{C}$, with relative humidity to 75 %. Accuracy specifications are given as: $\pm$ ([% of reading] + [number of least significant digits]) (note: “number of least significant digits” means the digits increased or decreased in least significant digits).

Measuring part - Range - Frequency - Accuracy - Remark

DC voltage - 50V - 10mV - 0.5%+4 - • Measuring impedance 10 M Ω (standard value)

- Common mode restrain: 50Hz or 60Hz > 100Db
- String mode restrain: 50Hz or 60Hz > 45dB
- Overload protection: 600V (peak –peak value)

AC voltage - 500V - 100mV - 0.5%+20 (45Hz~100Hz)/2%+20 (100Hz~400Hz)

- • frequency beeps: 45Hz~400Hz
- Adaptive to range from 10% to 100%
- AC conversion: mean value
- Measuring impedance: 10 M Ω (standard value)<100pF
- Common mode restrain: 50Hz or 60Hz > 100Db
- Overload protection: 600V(peak –peak value)

Ohm - 5k Ω - 0.001k Ω - 0.5%+4 - • open-circuit voltage: <5V;

- short-circuit current: about 0.1mA.
- leads resistance excluded in the accuracy;
- overload protection: 600V

continuity - 500 Ω - 0.1 Ω - Short-circuit beep is about 20 Ω

- open-circuit voltage: <5V
- short-circuit current: about 0.1mA.
- overload protection: 600V(peak –peak value)

diode - 2V - 0.001V - 1%+20

DC current - 20mA - 0.001mA - 0.2%+4

- overload protection: 63mA/250V fast-melt protection;
- loaded voltage: about 18mV/mA





4.4. Outputting detailed accuracy indicator

Output function - Range - Output designated range - Frequency - Accuracy - Remark

DCI DC current - 20mA - 0.000~22.000mA - 0.001mA - 0.2%+4 • Max. load: 1k Ω at 20mA

SIMULATE Simulate transmitter - -20mA - 0.000~22.000mA - 0.001mA - 0.2%+4

- external power supply: 5~28V

- Max. load: 1k Ω at 20mA

LOOP Loop-circuit power - - - 24V $\pm$ 10% • Max. output current 25mA

- Max. Voltage applied to output terminals: about 32V; Max. current applied to output terminals: about 25mA.
- Max. Voltage applied to output terminals: about 32V; Max. current applied to output terminals: about 25mA.
- Protection in output terminal :63mA/250V Fast fuse.

