CSA103-P045T01S Current Sensor

User Manual

V1.1

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Thank you for choosing the YINHE ELECTRIC current sensor

This manual is the user manual for the CSA103-P045T01S Current Sensor produced by HUNAN YINHE ELECTRIC Co., Ltd. It provides users with relevant precautions for installation, commissioning, operation, and daily maintenance. Please read it carefully before installation and use. This manual is provided with the product and should be kept properly for reference and maintenance purposes.

Statement

We have carefully compiled this manual, but we do not guarantee that the content is entirely correct. Since our products are continuously being improved and updated, we reserve the right to modify the content of this manual at any time without prior notice. We are not responsible for any direct, indirect, intentional, or unintentional damage or potential hazards caused by the improper use of the content included in this manual.

Safety Operation Knowledge

- Before using the product, please read the user manual carefully.
- When moving the product, please disconnect the power supply and remove all connected cables first.
- If you find any damage to the housing, fasteners, power cord, connecting cables, or connected equipment, please immediately disconnect the device from the power source.
- If you find any damage to the housing, fasteners, power cord, connecting cables, or connected equipment, please immediately disconnect the device from the power source.

!Safety Warning

The current sensor must not be used in an open-circuit condition. That is, when there is current on the bus or the sensor is powered, the output terminal must not be disconnected. The current output terminal of the sensor can only be disconnected when there is no current on the bus and the sensor is not powered. Otherwise, there is a risk of induced high voltage and electric shock!

1. Product Overview

The CSA103-P045T01S is a current sensor that can measure direct current (DC), alternating current (AC), pulse, and various irregular waveform currents under the condition of complete isolation between the primary and secondary sides. It is mainly used in fields that require high accuracy, such as metrology verification and calibration, as well as in fields that demand high sensitivity, stability, and reliability, including power quality analysis, power analyzers, medical equipment, aerospace, and naval vessels.

2. Technical Features

- Extremely high accuracy
- Excellent linearity
- High stability
- High stability
- High resolution
- Low temperature drift
- Low offset current
- Low insertion loss
- Strong anti-interference capability
- Fast response speed
- Low noise
- Small phase difference
- Wide bandwidth
- Analog output

3. Applications

- Metrology verification and calibration
- Laboratory current measurement
- Instrumentation (e.g., power analyzers)
- Medical equipment (e.g., MRI)
- Battery pack testing
- Power control
- Power supply
- Ships
- New energy
- Rail transit
- Aerospace
- Industrial measurement

4. Electrical Performance

The following performance indicators are specified at a default ambient temperature (T_A) of 25°C (±5°C), supply voltage (U_C) of 220V, and a load resistance (R_M) of 1Ω. Special conditions are noted separately.

Item	Symbol	Test Conditions	Value			Unit
			Minimum	Nominal	Maximum	
Primary rated current(DC)	$I_{PN\ DC}$	--	-10000	--	10000	A
Primary Rated Current (AC rms)	$I_{PN\ AC}$	--	--	7072	--	A
Primary Overload Current	$I_{P\ OL}$	1 minute/hour	-12000	--	12000	A
Supply Voltage(AC)	U_c	Full range	90	220	260	V
Power Consumption	**P**	Within $I_{P\ OL}$ range	--	300	--	W
Current Ratio	K_N	Input: Output	5000:1			--
Rated Output Current	I_{SN}	Primary rated current	--	±2	--	A
Measurement Resistance	R_M	--	0	--	1	Ω

5. Precision - Dynamic Parameters

Item	Symbol	Test Conditions	Value			Unit
			Minimum	Nominal	Maximum	
Accuracy	X_e	Input DC	--	--	10	μA/A
Ratio Error	X_{Ge}	Input AC 50Hz/60Hz	--	--	100	μA/A
Phase Angle Error	Δφ		--	--	0.3438	′

Linearity	ε_L	--	--	--	2	μA/A
Temperature Drift Coefficient	T_{COUT}	--	--	--	0.1	(μA/A) /K
Time Drift Coefficient	TT	--	--	--	0.2	(μA/A) /month
Power Supply Interference	TV	--	--	--	1	(μA/A) /V
Zero Offset Current	I_o	25±10℃	--	--	2	μA/A
Zero Offset Current	I_{oT}	Full operating temperature range	--	--	±10	μA/A
Ripple Current	I_n	DC ~ 10Hz	--	--	0.5	μA/A
Dynamic Response Time	t_r	di/dt=100A/μs up to 90% $I_{PN\ DC}$	--	--	1	μs
Current Following Speed	di/dt	--	200	--	--	A/μs
Bandwidth (-3 dB)	BW	--	0	--	10	kHz

Note: All "%" and "μA/A" refer to the full-scale secondary current.

6. General Characteristics

Item	Symbol	Test Conditions	Value			Unit
			Minimum	Nominal	Maximum	
Working Temperature Range	T_A	--	-10	--	+70	℃
Storage Temperature Range	T_S	--	-25	--	+85	℃
Current Probe Detection Signal	--	When operating normally, the red probe detection light is constantly on, and pins 4 and 9 of the DB9 socket are in an open-circuit state without signal output. When the current probe is not connected or is poorly connected, the red probe detection light remains off, and a drive signal is provided to the optocoupler built into pins 4 and 9 of the DB9 socket, allowing current signal output under suitable operating voltage①。				--
Zero Current Threshold and Zero Current Indicator Signal	I_{P0D}	DC current input	--	±1.5	±2.0	A
	I_{P0A}	50Hz AC current input	--	±3.8	±5	A
	--	When the current input from the busbar exceeds the aforementioned threshold, the green zero current indicator light will not illuminate, and pins 3 and 8 of the DB9 socket will be in an open-circuit state without signal output. Conversely, when the current input from the busbar is below the threshold, the green zero current indicator light will illuminate, and a drive signal will be provided to the optocoupler built into pins 3 and 8 of the DB9 socket, enabling current signal output under the appropriate operating voltage②。				
Output Status Indicator Signal	--	When the current input from the busbar exceeds the normal measurement range, the yellow LED will not light up, and pins 1 and 6 of the DB9 socket will be in an open-circuit state without signal output. When the current input from the busbar is within its measurement range, the yellow LED will light up, indicating that the product's output signal is valid. At this time, a drive signal will be provided to the optocoupler built into pins 1 and 6 of the DB9 socket, enabling current signal output under the appropriate operating voltage③。				
Host Weight	--	--	5±0.5			kg

Probe Weight	--	--	30.5±0.5	kg

Notes:

①: Pins 4 and 9 of the DB9 socket are connected to the C and E terminals of the built-in optocoupler, respectively, in an Open Collector output form. The voltage tolerance between C and E is 60V, with a maximum output current of 2mA.

②: Pins 3 and 8 of the DB9 socket are connected to the C and E terminals of the built-in optocoupler, respectively, in an Open Collector output form. The voltage tolerance between C and E is 60V, with a maximum output current of 2mA.

③: Pins 1 and 6 of the DB9 socket are connected to the C and E terminals of the built-in optocoupler, respectively, in an Open Collector output form. The voltage tolerance between C and E is 60V, with a maximum output current of 2mA.

7. Appearance and Terminal Definitions

7.1. Host and Probe Appearance and Dimensions (See Figures 1 and 2, unit: mm)

Tolerance: The tolerance for the overall dimensions and installation positioning dimensions is in accordance with the Grade C standard of GB/T1804-2000.

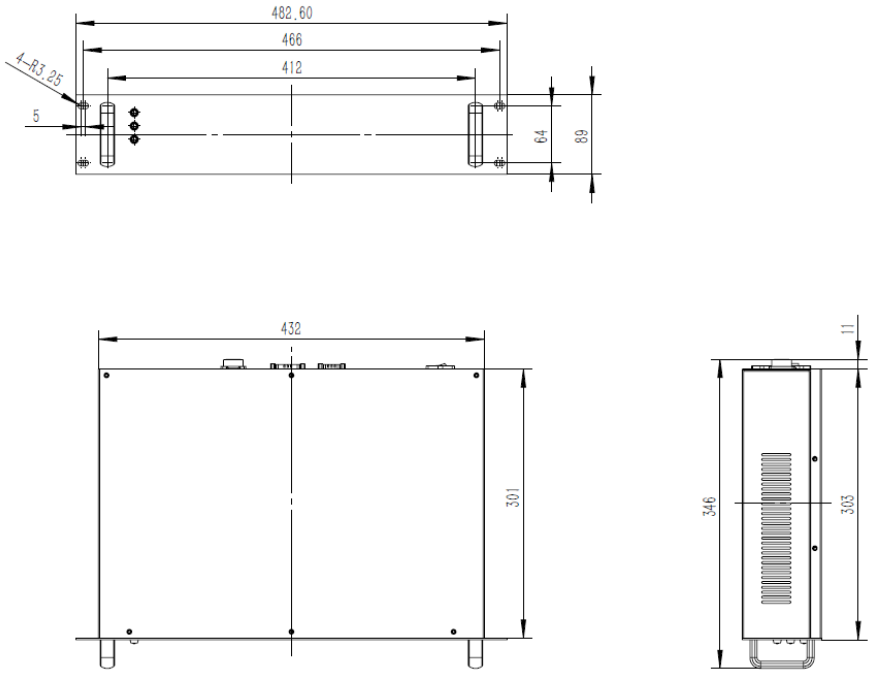


Figure 1: Host Appearance Dimensions

This split-type sensor consists of a host and a measurement probe, connected by a shielded cable. The host uses a standard 2U chassis, powered by 220V AC mains. The power supply indicator light is integrated into the power switch. On the front panel, from top to bottom on the left side, there are three indicator lights for probe detection, valid indication, and zero input, colored red, yellow, and green, respectively. If the probe detection (Probe) red indicator light is off, it indicates that the probe is not connected or the connection is poor. Please disconnect the host from power before reconnecting the probe. The current sensor can operate normally when both the valid indication light (Valid, yellow) and the zero input indication light (Zero, green) are on. The zero input indication light (Zero, green) being on indicates that there is no busbar current input or the input current is below the lower limit specified in the datasheet.

On the rear panel of the host, the left side features a three-in-one power supply socket with an internal fuse rated at 220V, 5A. The socket's right side is the grounding terminal. On the right side of the rear panel, there are three interfaces: a DB9 socket for connection status indication signals (optocoupler isolated), a DB15 socket for output signals, and a circular aviation plug for connecting the measurement probe.

Do not block the fan vents, and clean them regularly.

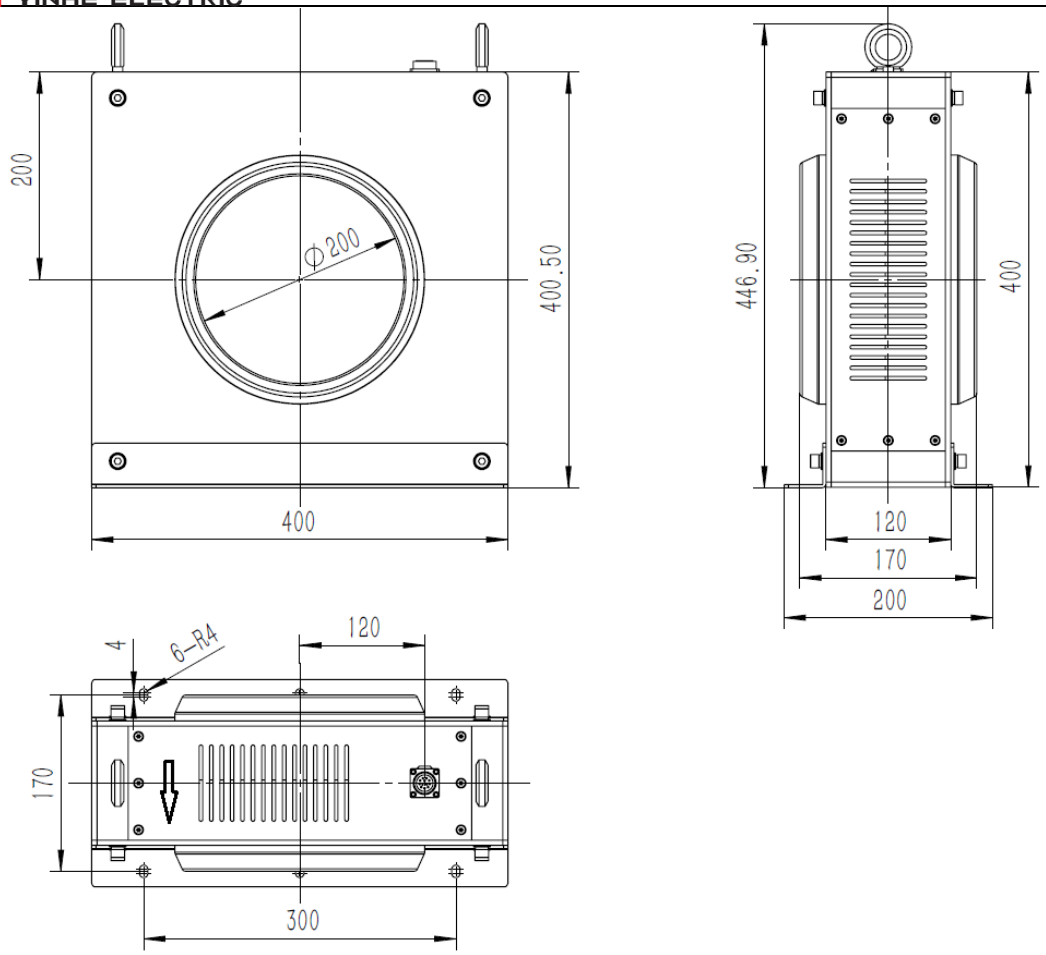


Figure 2: Probe Dimensions

The measurement probe dimensions are 400 × 400.5 × 200 mm (excluding protruding parts), with a center hole diameter of 200 mm.

Note: The direction of the arrow on the probe indicates the positive direction of the through-hole current.

7.2. Terminal Definitions

DB9 (Male) Interface Pin Definitions:

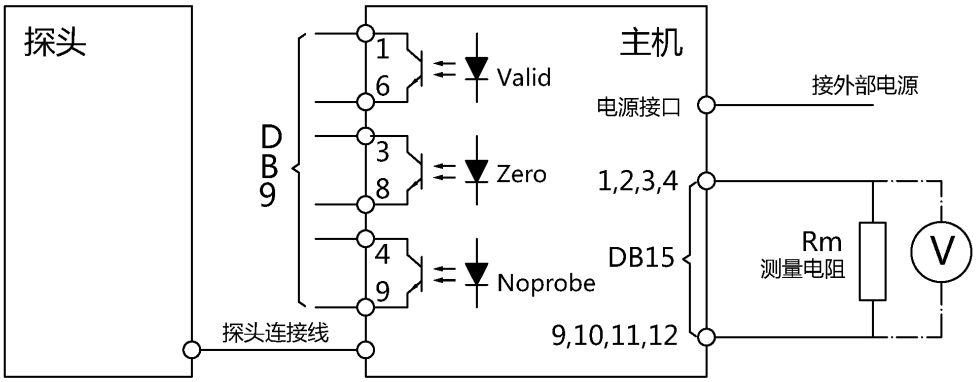
Pin Number	Definition	Pin Number	Definition
1	Valid Optocoupler C	4	NoProbe Optocoupler C
6	Valid Optocoupler E	9	NoProbe Optocoupler E
3	Zero Optocoupler C	2,5,7	Not Connected
8	Zero Optocoupler E	--	--

Among them, the optocoupler provides isolated output signals, with the C and E terminals in an Open Collector configuration, and the voltage tolerance between them is 60V.

DB15 (female) Interface Pin Definitions:

Pin Number	Definition	Pin Number	Definition
1,2,3,4	Current Output Positive	5,6,7,8,13,14,15	Not Connected
9,10,11,12	Current Output Ground	--	--

8. Application Connection and Description



Electrical connection

Testing Instructions:

The primary current I_P can be obtained by measuring the current I_s flowing through R_M or the voltage drop U_R across R_M, according to the following formula:

$$I_P = K_N * I_s = K_N * (U_R / R_M)$$

9. Packing List

Item No.	Name	Model and Specification	Quantity	Note
1	Current Sensor Control Host	CSA103-P045T01S	1 piece	--
2	Current Sensor Measurement Probe	CSA103-P045T01S	1 piece	--
3	Measurement Probe Cable	--	1 piece	Length: 3 meters (customizable)
4	Connector	DB9（female）	1 piece	--
5	Connector	DB15（male）	1 piece	--
6	Product User Manual	CSA103-P045T01S	1 copy	--
7	Host Power Cable	--	1 copy	--

10. Precautions

- When the direction of the input current I_P is consistent with the direction indicated by the arrow in the appearance diagram, the output current I_S is positive.
- When the sensor is powered or connected to the measurement circuit current, the secondary side must not be open-circuited.
- The primary conductor should be positioned as close to the center of the probe's hole as possible.
- The temperature of the primary conductor must not exceed 100℃.
- This module is a standard sensor. For special applications, please contact us.
- We reserve the right to modify this sensor manual without prior notice.

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