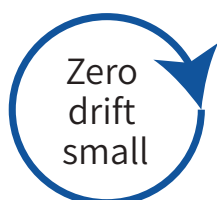
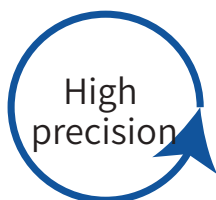
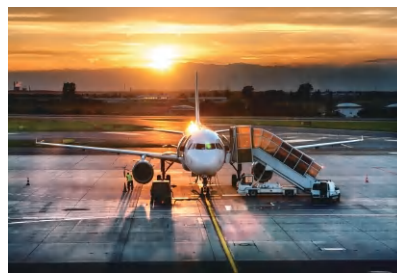
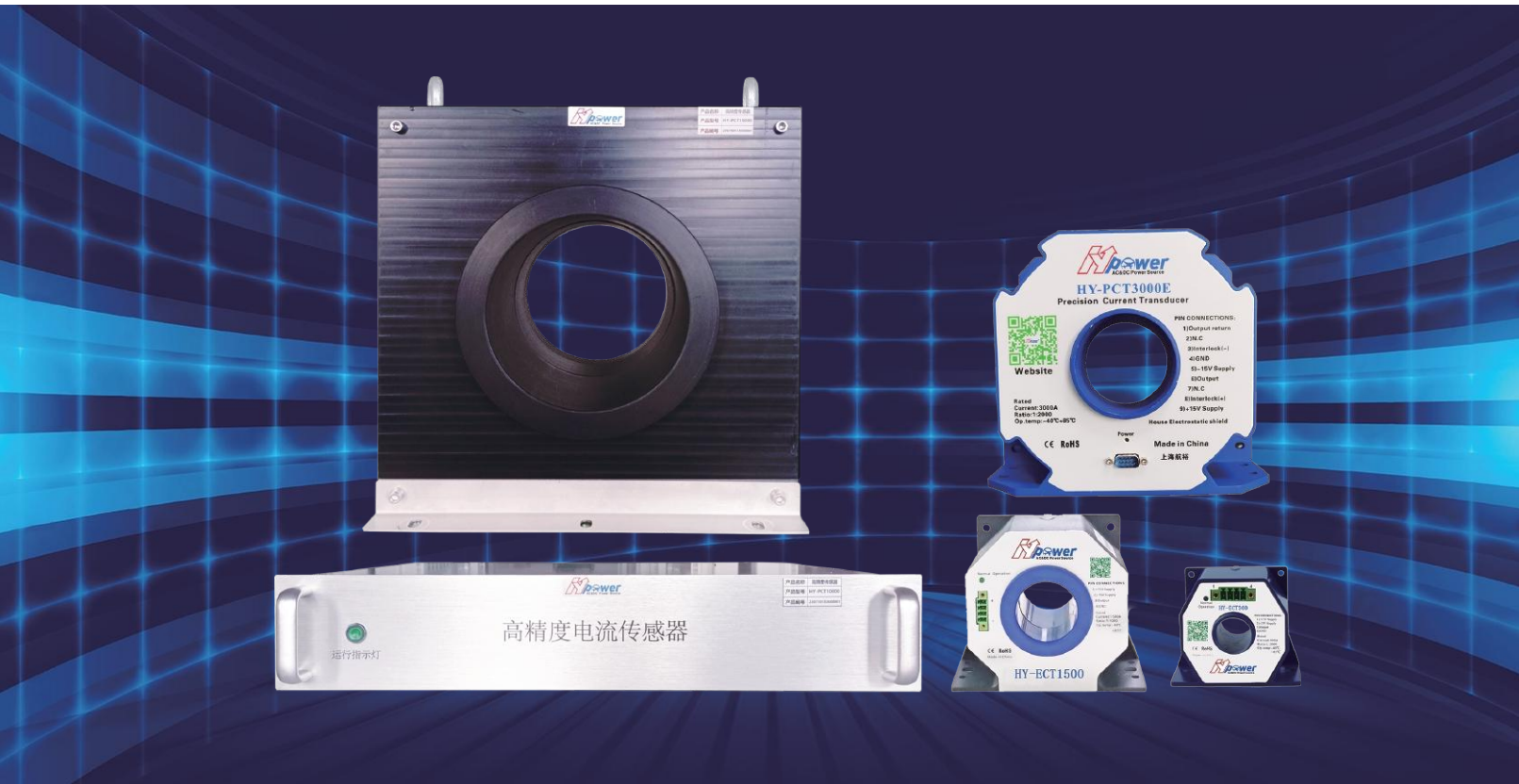


# HY-PCTSU Series High Precision Current Sensor



## Application Field

- Medical equipment: scanner, MRI
- Rail transportation: high-speed train, subway, tram, trolley bus
- Aerospace: Satellites, rockets
- Instrumentation: Power analyzer, high precision power supply
- Smart grid: power generation, battery monitoring, medium and low voltage substation
- Industrial control: industrial motor drive, UPS, welding, robot, crane, elevator, ski lift
- Ships: Electric powered ships
- Power: converter, inverter
- Measurement: verification and calibration
- Cars: Electric cars
- New energy: photovoltaic, wind energy



## Industrial Medical And Electrical Measuring Equipment Field

- Measurement of instantaneous current and voltage value in isolation state, current can be measured in contactless mode, measuring range from 0.1A to 5000A.

## Electric Vehicle Field

- It can be used for power management and motor drive of cars, buses and trucks.
- Contributes to energy saving and environmental protection, and reduces energy consumption through current control in high energy consumption applications.



## High-Speed EMU Field

- Measure the instantaneous current and voltage value in isolation state.
- Select contactless mode to measure current, ranging from 0.1A to 5000A.
- The installation of a highly flexible modular design to meet the different market requirements of railway systems.
- Achieve high performance indicators, accuracy from 5-20ppm, short-circuit response to real-time response.
- Wide temperature range, high insulation voltage resistance and electromagnetic compatibility design, meet different national railway standards.

## Field Of Energy Equipment

- Advanced AC and DC induction technology and signal adjustment circuit (RMS value, real value, threshold detection, etc.) are integrated.
- Output switch signals, relay formation signals, electrical isolation standard models (such as DC 0-5V, DC 0-10V, or 4-20mA) can be directly connected to programmable controllers or monitoring devices.
- The use of advanced technology and process, many times in the production process adjustment, calibration, so that the product to meet the performance and quality standards required by the market.



# HY-PCTSU Series High Precision Current Sensor

For a long time, domestic sensors in high precision, high stability, low temperature drift and special applications and imported sensors there is a gap, high-precision sensors have been monopolized by foreign countries. Hangyu Power after years of technology precipitation, has always been committed to high-end high-precision sensor import substitution, continuously improve the quality of sensors in measurement accuracy, temperature characteristics, response time, stability, reliability and other aspects, launched HY-PCTSU series high-precision sensor, not only AC and DC universal, but also with high precision, low zero drift, low temperature drift, intelligent and other advantages, while comprehensively replacing imported sensors, it reduces acquisition costs and meets the needs of bulk purchase to expand production.

## Core technology

- Excitation flux closed-loop control technology
- Self-excitation demagnetization technology
- Multi-point zero flux technology
- Multi-range automatic switching technology
- Temperature control compensation technology

## Performance Characteristics

- Isolation measurement of primary and secondary edges
- Excellent linearity and accuracy
- Strong resistance to electromagnetic interference
- Wide band and low response time

## Product Features



### Full Scale Range

Many kinds  
Many models



### High Precision

Accuracy: 5ppm, 10ppm,  
50ppm optional  
2ppm can be  
customized



### Ac-Dc universal

Can measure AC, DC,  
pulse current



### Zero Drift Small

Zero drift: 2PPM



### Temperature drift is small Good consistency

Temperature impact:  
1ppm/10 degrees



### Intelligitize

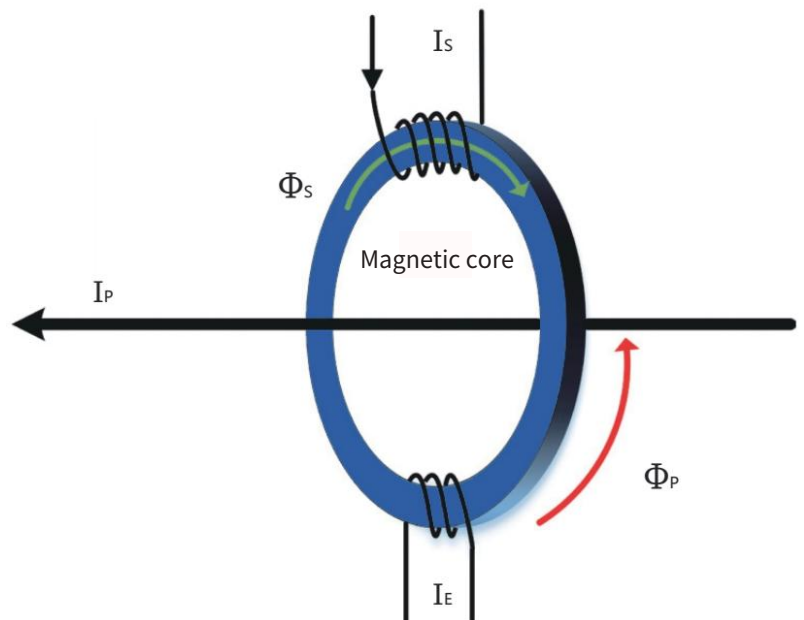
Start with load  
Overload protection,  
self-recovery

## Technical principle

The magnetic core is stimulated by  $I_E$  to reach the magnetic balance state, the introduction of the input current  $I_P$  breaks the magnetic balance and generates the magnetic link  $\Phi_P$ . Based on this, one or more currents in the opposite direction,  $I_S$ , are applied to the magnetic core to produce a flux  $\Phi_S$  in the opposite direction, eventually resulted in the total magnetic flux in the core of 0. The known number of turns of the coil applying  $I_S$  current is  $N$ , then:

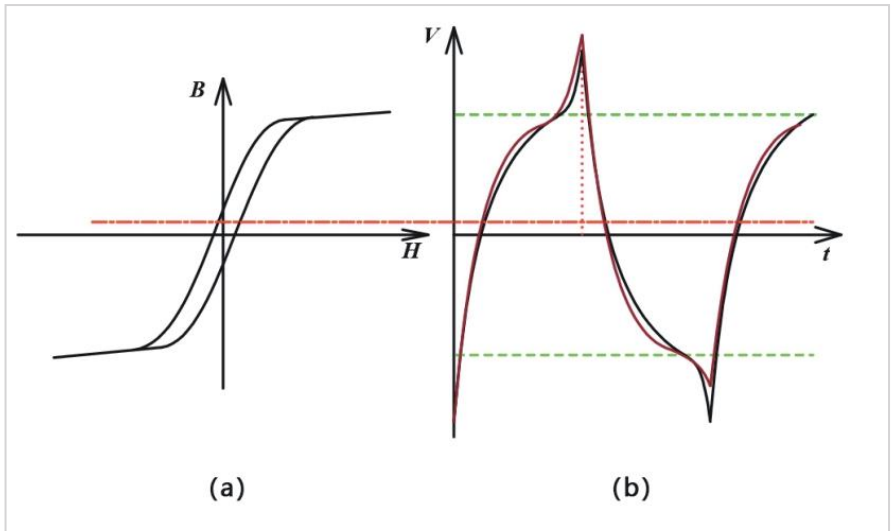
$$I_P = N \cdot I_S$$

The theory is based on the need for a sophisticated zero-flux detector, in order to ensure the linearity, stability, noise factor, frequency response and other technical parameters of the whole system, the zero flux detector must be sufficiently sensitive and not easily disturbed by flux chains outside of itself.

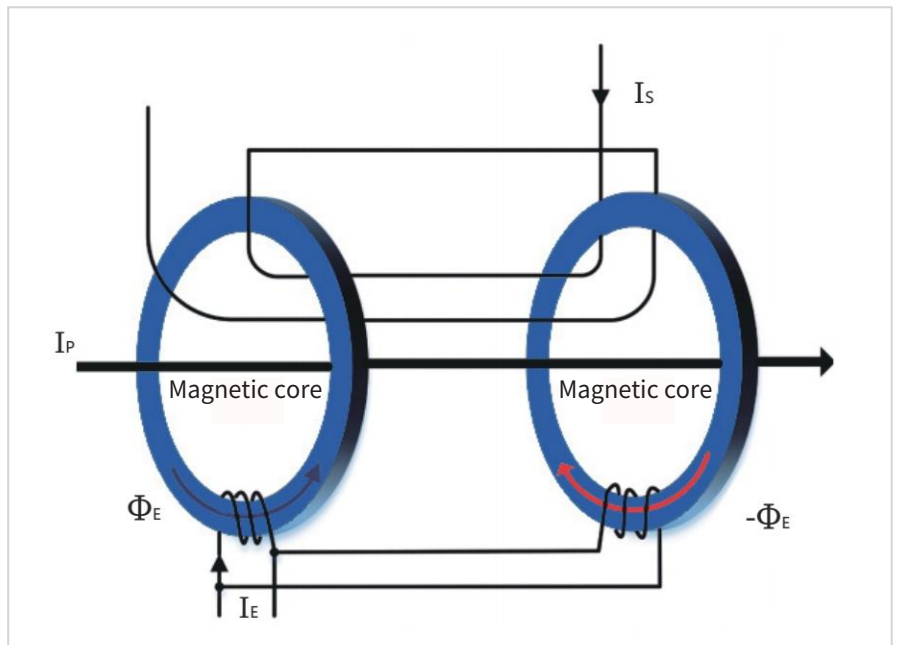


The zero-flux detector relies on the nonlinear relationship between the magnetic field strength  $H$  and the magnetic flux density  $B$  near the saturation of the magnetic field of the ferromagnetic material, as shown in Figure (a) on the right.

The current waveform in the magnetic core is shown in Figure (b). The region shown by the peak is that the coil is in a near saturation state, the AC impedance is reduced, and the current in the coil increases or decreases exponentially. When the primary current  $I_P \neq 0$ , the magnetic flux  $\Phi_S$  generated by  $I_P$  will break the balance, so that the magnetic induction intensity in the direction of the coil  $I_P$  flux will increase, the current will increase, and the current on the other hand will decrease, the current  $I_P$  size can be obtained by detecting the changing current.



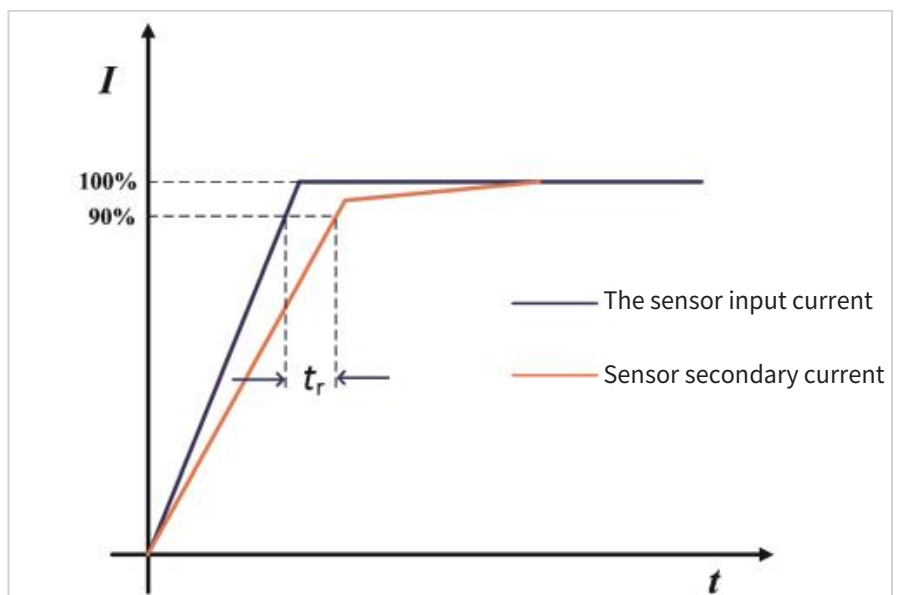
At the same time, due to the transformer effect,  $I_E$  will induce current on the  $I_P$ , affecting the measurement results. To reduce this error source, add an additional core that is the same as the excitation signal, and apply excitation signals of equal magnitude and opposite direction, so the magnetic field generated by induction is greatly reduced, which eliminates the disturbance on the primary conductor, as shown in the figure on the right, adding an AC response winding dedicated to improving the entire detection system can extend the frequency response of the entire sensor to hundreds of kHz.



## Response time

The response time of the sensor refers to the speed of the secondary current establishment time of the sensor, as shown in the figure on the right, the measurement of the secondary current of the sensor will definitely lag behind the establishment time of the input current. When the measured current of the sensor reaches 90% of the nominal value of the current, the time difference obtained by comparing the curve with the input current is the response time of the sensor.

The faster the sensor's response time, the better its performance.



## Product Selection

Product model	Effective value of the rated current at the input end	Overload capacity	Output terminal rated signal	Precision	Supply voltage ( $\pm 5\%$ )	Band width (-3dB)	Aperture (mm)
HY-PCTSU6000	$\pm 6000A$	$\pm 6600A$	1000mA	50ppm	$\pm 220V$	50kHz	$\varnothing 90$
HY-PCTSU5000	$\pm 5000A$	$\pm 5500A$	1000mA	50ppm	$\pm 220V$	50kHz	$\varnothing 90$
HY-PCTSU4000	$\pm 4000A$	$\pm 4400A$	1000mA	50ppm	$\pm 220V$	50kHz	$\varnothing 70$
HY-PCTSU3000	$\pm 3000A$	$\pm 3300A$	1000mA	50ppm	$\pm 220V$	100kHz	$\varnothing 70$
HY-PCTSU2000	$\pm 2000A$	$\pm 2200A$	1000mA	50ppm	$\pm 220V$	100kHz	$\varnothing 50$
HY-PCTSU1500	$\pm 1500A$	$\pm 1600A$	1500mA	10ppm	$\pm 15V$	500kHz	$\varnothing 38$
HY-PCTSU1000	$\pm 1000A$	$\pm 1200A$	667mA	10ppm	$\pm 15V$	500kHz	$\varnothing 38$
HY-PCTSU600	$\pm 600A$	$\pm 720A$	400mA	10ppm	$\pm 15V$	500kHz	$\varnothing 38$
HY-PCTSU500	$\pm 500A$	$\pm 600A$	333mA	10ppm	$\pm 15V$	500kHz	$\varnothing 38$
HY-PCTSU400	$\pm 400A$	$\pm 480A$	200mA	10ppm	$\pm 15V$	500kHz	$\varnothing 26$
HY-PCTSU300	$\pm 300A$	$\pm 360A$	150mA	10ppm	$\pm 15V$	500kHz	$\varnothing 26$
HY-PCTSU200	$\pm 200A$	$\pm 240A$	200mA	10ppm	$\pm 15V$	500kHz	$\varnothing 26$
HY-PCTSU100	$\pm 100A$	$\pm 120A$	100mA	10ppm	$\pm 15V$	500kHz	$\varnothing 26$
HY-PCTSU60	$\pm 60A$	$\pm 72A$	100mA	10ppm	$\pm 15V$	500kHz	$\varnothing 26$

## Electrical Performance

Item	Symbol	Test condition	Minimum value	Nominal	Maximum value	Unit
Input terminal rated DC current	$I_{PN\_DC}$	—	—	$\pm 500$	—	Adc
Input terminal rated AC current*	$I_{PN}$	—	—	353	—	Aac
Overload current at the input	$I_{PM}$	1 minute	—	—	$\pm 600$	Adc
Operating voltage	$V_C$	—	$\pm 14.2$	$\pm 15$	$\pm 15.8$	V
Power consumption current	$I_{PWR}$	Input current rating	$\pm 30$	$\pm 363$	$\pm 430$	mA
Current variable ratio	$K_N$	Input: Output	1500:1	1500:1	1500:1	—
Rated output current	$I_{SN}$	Input current rating	—	$\pm 0.333$	—	A
Measuring resistance	$R_M$	See Figure 1	0	3	10	$\Omega$

\* refers to AC valid value

## Measurement Of Accuracy

Item	Symbol	Test condition	Minimum value	Nominal	Maximum value	Unit
Accuracy	X <sub>G</sub>	Input DC, 25±10°C	—	—	10	ppm
Linearity	ε <sub>L</sub>	—	—	—	2	ppm
Temperature stability	T <sub>C</sub>	—	—	—	0.1	ppm/K
Time stability	T <sub>T</sub>	—	—	—	0.2	ppm/month
Power supply anti-interference	T <sub>V</sub>	—	—	—	1	ppm/V
Zero offset current	I <sub>0</sub>	@25°C	—	—	1 (User adjustable zero)	μA
Ripple current	I <sub>N</sub>	DC-10Hz	—	—	0.5	ppm
Dynamic response time	t <sub>r</sub>	di/dt=100A/μs, rising to 90%I <sub>PN</sub>	—	—	1	μ
Rate of current change	di/dt	—	100	—	—	A/μs
Band width (-3dB)	F	—	0	—	500	kHz
Zero offset current	I <sub>0T</sub>	Full temperature range	—	—	±5	μA

## Safety Feature

Item	Symbol	Test condition	Numerical value	Unit
Isolation voltage / Between input and output	V <sub>d</sub>	50Hz, 1min	5	KV
Transient isolation withstand voltage/ Between input and output	V <sub>w</sub>	50μs	10	KV
Creepage distance / Between the input and the shell	d <sub>Cp</sub>	—	11	mm
Electrical clearance distance / Between the input and the shell	d <sub>ci</sub>	—	11	mm
Comparative tracking index (CTI)	CTI	IEC-60112	600	V

## General Characteristic

Item	Symbol	Test condition	Minimum value	Nominal	Maximum value	Unit
Operating temperature range	T <sub>A</sub>	—	-40	—	+85	°C
Storage temperature range	T <sub>s</sub>	—	-40	—	+85	°C
Relative humidity	RH	—	20	—	80	%
Quality	M	—		1150±80		g

## Instructions For Load Resistors

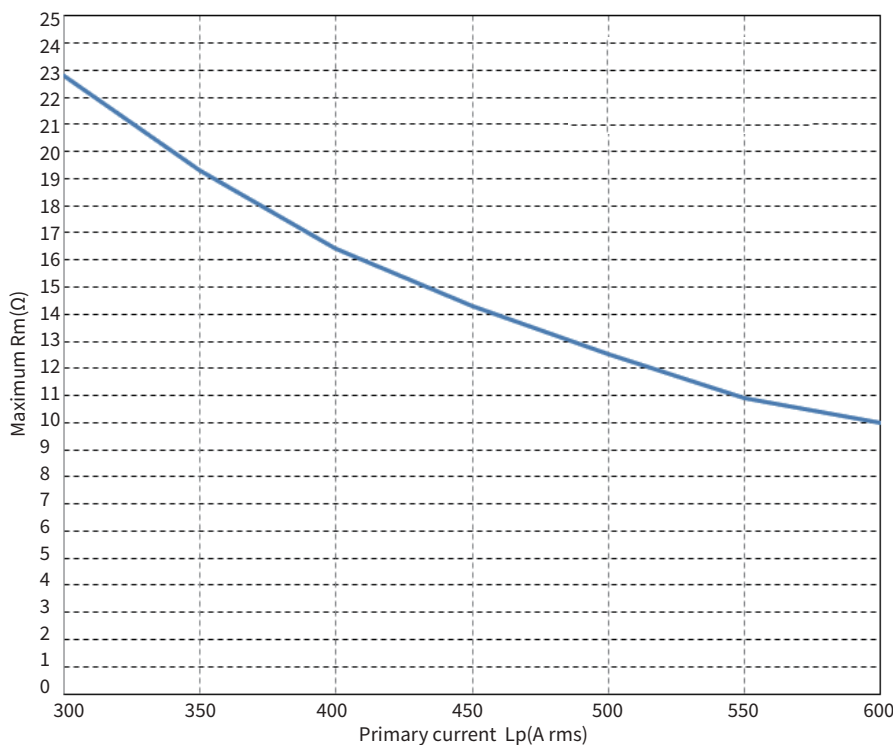


Figure 1: Load resistance and measured current relationship.

## Running Status Description

◇ During normal operation, the green light is always on:

After the device is powered on, when the device is working normally, the green indicator light is always on, the third and eighth pins of the D-Sub9 interface are conducted.

◇ When the current is overloaded or the power supply is abnormal, the green light is off:

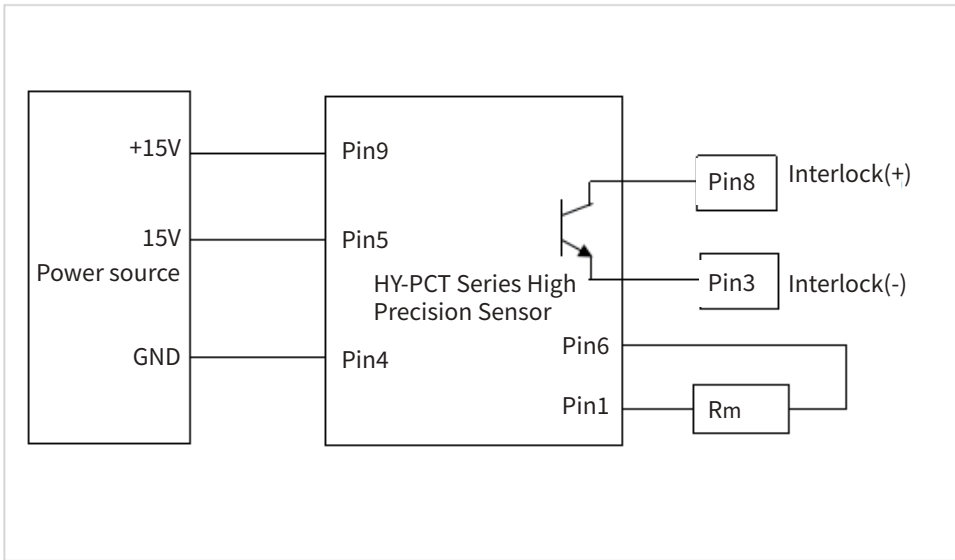
When the green light is not on, it should first check whether the power supply of the sensor is normal. When the power supply is normal, if the green indicator is off, the current sensor is in the non-zero flux state. At this time, if the bus input current amplitude exceeds the specified range of the sensor, the sensor enters the overload working mode, and the output current is no longer proportional to the input current signal. In overload mode, the sensor output current is always maintained at the maximum output state, and the green indicator is off. When the input current returns to the specified measured current range, the sensor output current returns to normal, and the green indicator light is always on.

◇ In overload mode, pin 3 and pin 8 of the D-Sub9 interface are disconnected.

# Application Connection And Description

## 1 D-Sub9 Connection terminal pin function definition

Pin Number	1	2,7	3	4	5	6	8	9
Definition	I_ Output return	N.C	Interlock(-)	GND	-15V Supply	I_ Output	Interlock(+)	+15V Supply



Test instructions:

The input current can be obtained by measuring the test current  $I_s$  flowing through the  $R_M$ , or the voltage  $U_R$  at both ends of the  $R_M$

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

## 2. Interlock Port connection description:

Interlock Port connection mode, According to the user's actual application, there are two design methods as follows, As shown in Figure A and Figure B respectively:

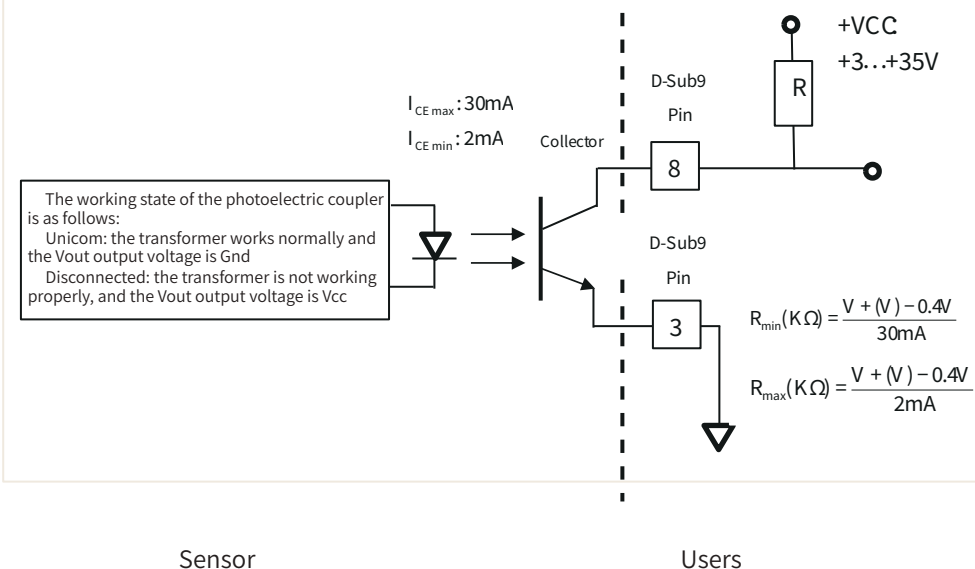


Figure A: Low level output during normal operation of the sensor



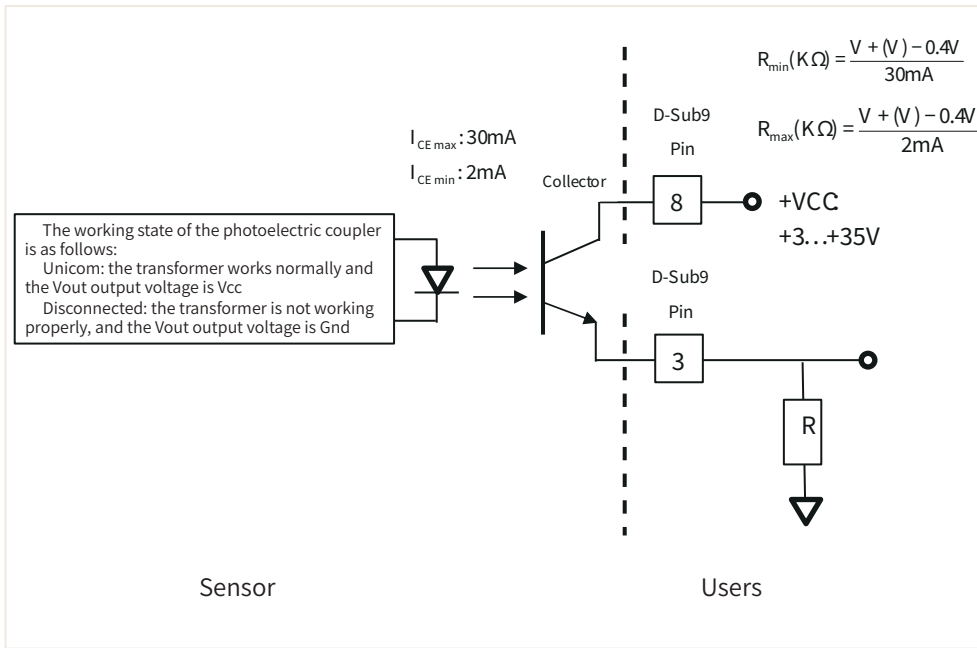
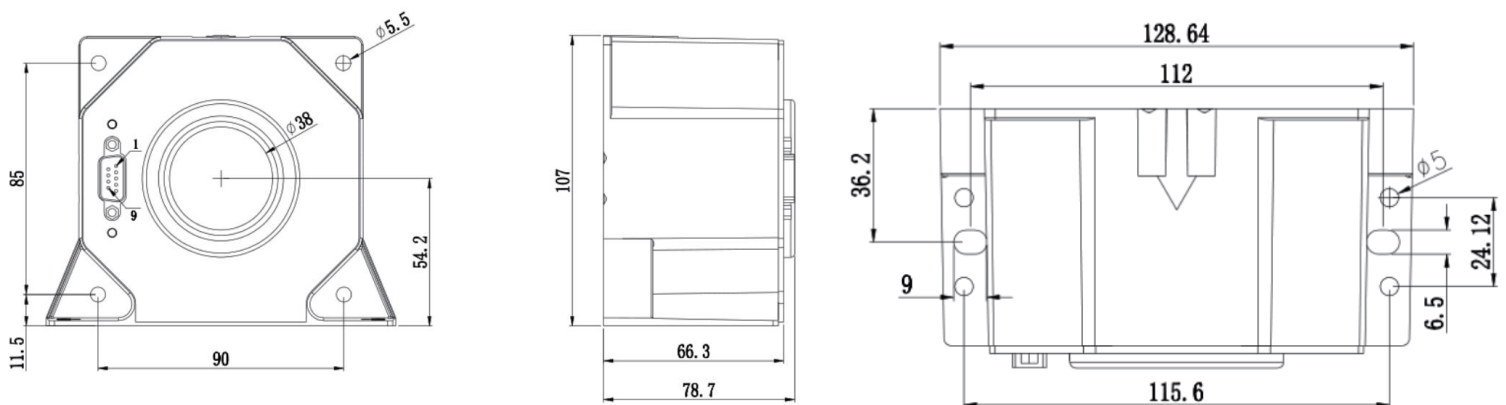


Figure B: High level output when the sensor is operating normally

3. The output of pin Vout in the photoelectric coupler is related to the client design circuit, as shown in the following table:

Project	Vout	Description
Figure A	<0.2V	Sensor operating status is normal
	Vcc	Sensor operating status is abnormal, in the overload mode or abnormal power supply
Picture B	<0.2V	Sensor operating status is abnormal, in the overload mode or abnormal power supply
	Vcc	Sensor operating status is normal

## Overall dimension specification



Unit: mm

This product is aluminum die casting, the material is ADC10, the shape and size tolerance according to GB/T15114-2009 and GB6414-2017-DCTG7 standards



Official wechat: hypower-cn



## Contact us

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Hangyu Power System (Shanghai) Co., Ltd

Mobile/Whatsapp: +8613801800699

Fax: +86-21-67285228-8009

Email:sales@hangyupower.com

neo@hangyupower.com

Address: Building B, 11th Floor, No. 1698 Minyi Road, Songjiang District,  
Shanghai.PRChina

website:www.hangyupower.com

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Current Sensor Sample, version 01.00, March 2024

All technical data and instructions are based on the actual product

If there is any change, Hangyu Power has the final interpretation right

Authorized distributor:

