

## H024. 1 AHBC-LTA Series Close loop Hall Current Sensor V1.1

### 1. Product Introduction

AHBC-LTA high-precision Hall current sensor is insulated between the primary and secondary, without position error, can truly measure and resolve 1000:1, used for precise measurement of DC, AC and pulse current.

The product conforms to the industry standard: JB/T7490-2007 "Hall Current Sensor".

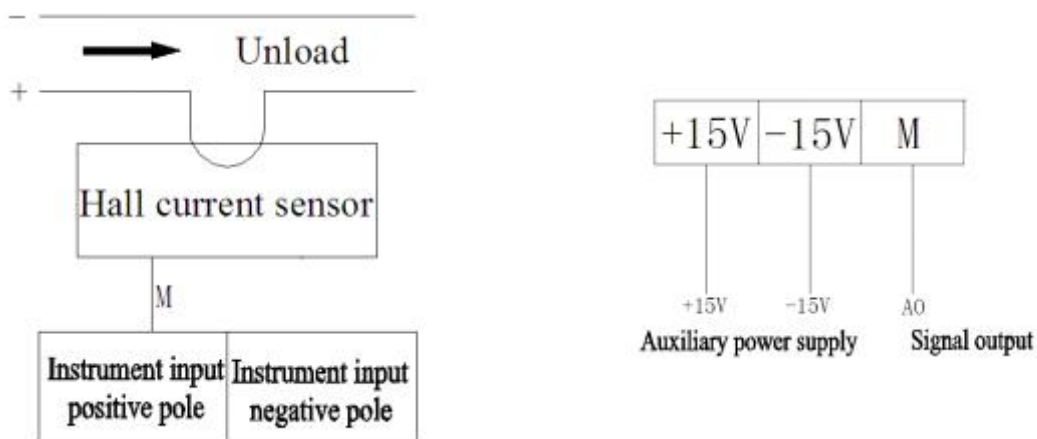
### 2. Technical Parameters and Overall Dimensions

| Parameters                | Index                           |                 |
|---------------------------|---------------------------------|-----------------|
| Rated Input Current       | 0~300A                          |                 |
| Measuring resistance      | $\pm 15V$ @ $\pm 300A_{max}$    | 0(min) 100(max) |
|                           | @ $\pm 600A_{max}$              | 0(min) 36(max)  |
| Rated Output Current      | 50mA,100mA                      |                 |
| Turns Ratio               | 1:3000                          |                 |
| Accuracy Class            | 0.5                             |                 |
| Power Voltage             | DC $\pm 12V \sim 24V$           |                 |
| Zero Offset Current       | $\pm 0.2mA$                     |                 |
| Linearity                 | $\leq 0.05\%FS$                 |                 |
| Response Time             | $\leq 1\mu s$                   |                 |
| Insulation voltage        | 3.5kv/50Hz/1min                 |                 |
| Bandwidth                 | 0~100kHz                        |                 |
| Secondary coil resistance | 56 $\Omega$                     |                 |
| Isolation Voltage         | 3.5kV/50Hz/1min                 |                 |
| Operating Temperature     | $-40^{\circ}C \sim 85^{\circ}C$ |                 |
| Storage Temperature       | $-40^{\circ}C \sim 85^{\circ}C$ |                 |
| Power consumption current | 20mA+1s                         |                 |



### 3.Mode of Connection

-1-



+15V—— power supply+15V

-15V ——power supply-15V (Note that power positive and negative poles cannot be inversely connected.)

M —— signal output

**Note: The output signal "-" is connected to the power ground G, and the specific wiring is based on the terminal number on the physical shell.**

### 4. Precautions

1. When the Hall sensor is used, attention must be paid to the coupling between the primary side coil and assistant side coil in order to get better dynamic characteristics and sensitivity, single conductor that should cram the thread hole of Hall sensor module completely is proposed to use.

2. When the Hall sensor is used, the best measuring accuracy can be got under rated input current value. When the measured current is much less than the rated value, the primary side can use multi-turns if want to obtain the best accuracy, that is  $I_p N_p = \text{rated ampere-turns}$ . In addition, the temperature of the primary side feeder line cannot be more than 80°C.

3. When the Hall current sensor is working normally, the auxiliary power supply cannot be more than  $\pm 20\%$  of calibration value.

4. The Hall Current sensor is strictly prohibited to be fallen from high place ( $\geq 1\text{m}$ ) during installation and use.

5. Zero and full scale regulator potentiometer can not be adjusted.

6. Auxiliary power supply is required to be deployed voluntarily.

7. Power positive and negative poles cannot be inversely connected.

### 5. Order Sample

Sample 1 AHBC-LTA Hall current sensor

Auxiliary power supply: DC $\pm$ 15V

Input: 100A

Output: 50mA

Accuracy: Grade 0.5

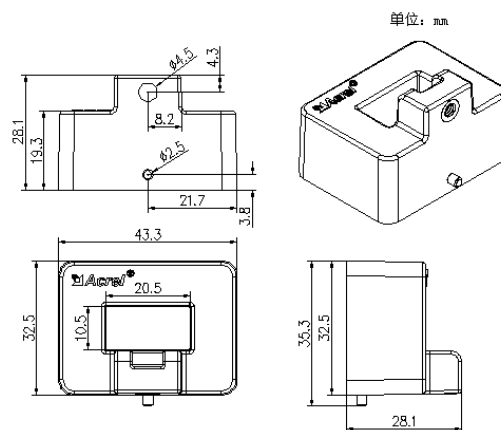
## HE001.1 AHKC-BSA Series Open Hall Current Sensor V1.0

### 1. Product Introduction

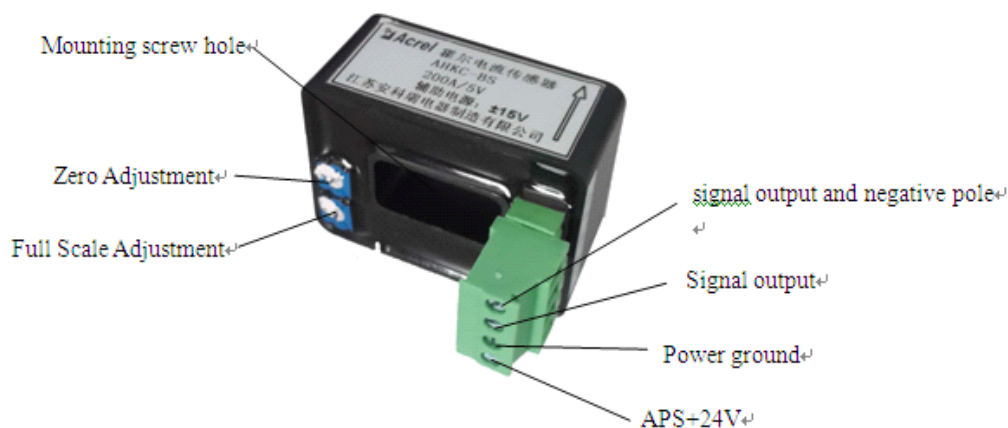
It is insulative between the primary and secondary grade of AHKC-BSA series current sensor which can be used for measuring pulse current .

### 2. Technical Parameters and Overall Dimensions

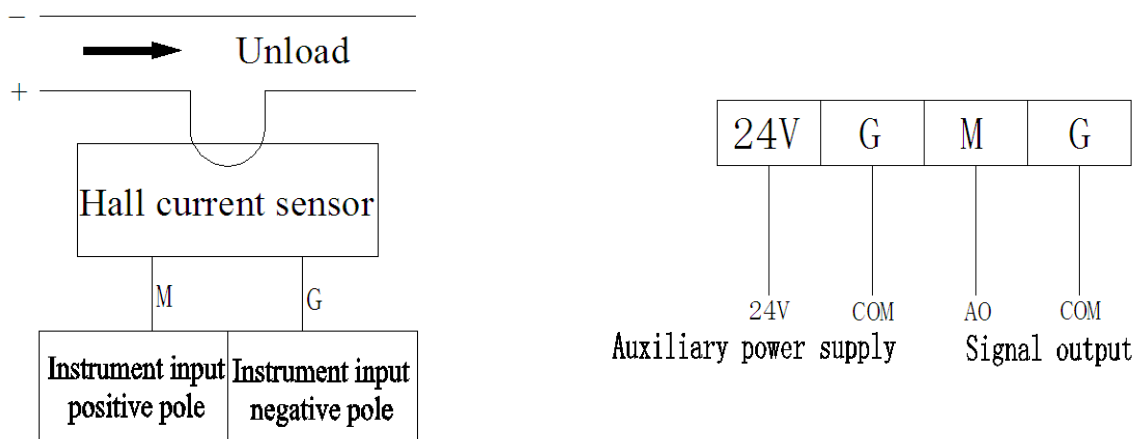
| Parameters               | Index                                |
|--------------------------|--------------------------------------|
| Rated Input Current(DC)  | 0~(50-500)A                          |
| Rated Output Voltage(DC) | 4-20mA                               |
| Accuracy Class           | 1.0                                  |
| Power Voltage            | DC24V<br>(allowable fluctuation±20%) |
| Zero Offset Current      | ±0.05mA                              |
| Offset Current Drift     | ≤±0.01mA/°C                          |
| Linearity                | ≤0.2%FS                              |
| Response Time            | ≤20us                                |
| Isolation Voltage        | 2.5kV/50Hz/1min                      |
| Operating Temperature    | -40℃~85℃                             |
| Storage Temperature      | -40℃~85℃                             |
| Consumption              | ≤1.2W                                |
| Over loading             | Continuance 1.2                      |



### 3. Installation Method



#### 4. Mode of Connection



24V — power supply 24V

G — power ground

M — signal output end positive pole

G — signal output end negative pole

**Note: The specific wiring is subject to the terminal no. of object shell.**

#### 5. Precautions

1. When the Hall sensor is used, attention must be paid to the coupling between the primary side coil and assistant side coil in order to get better dynamic characteristics and sensitivity, single conductor that should cram the thread hole of Hall sensor module completely is proposed to use.

2. When the Hall sensor is used, the best measuring accuracy can be got under rated input current value. When the measured current is much less than the rated value, the primary side can use multi-turns if want to obtain the best accuracy, that is  $I_p N_p = \text{rated ampere-turns}$ . In addition, the temperature of the primary side feeder line cannot be more than 80°C.

3. When the Hall current sensor is working normally, the auxiliary power supply cannot be more than  $\pm 20\%$  of calibration value.

4. The Hall Current sensor is strictly prohibited to be fallen from high place ( $\geq 1\text{m}$ ) during installation and use.

5. Zero and full scale regulator potentiometer can not be adjusted.

6. Auxiliary power supply is required to be deployed voluntarily.

7. Power positive and negative poles cannot be inversely connected.

#### 6. Order Sample

Sample 1 AHKC-BSA Hall current sensor

Auxiliary power supply: DC24V

Input: DC(0~200)A

Output: DC4-20mA

Accuracy: Grade 1

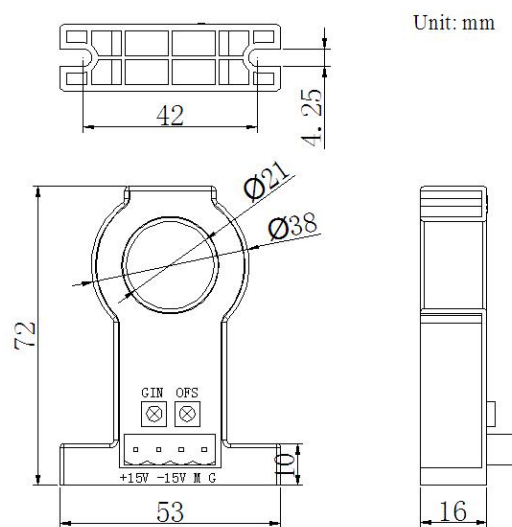
## HE002.1 AHKC-E Series Closed Hall Current Sensor V1.0

### 1. Product Introduction

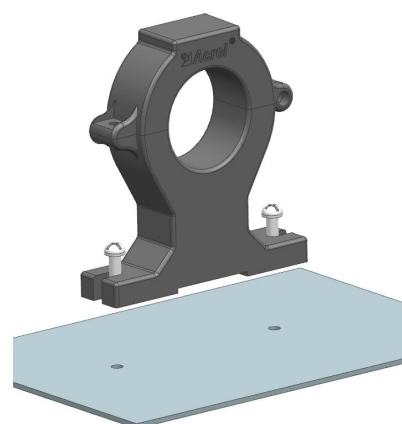
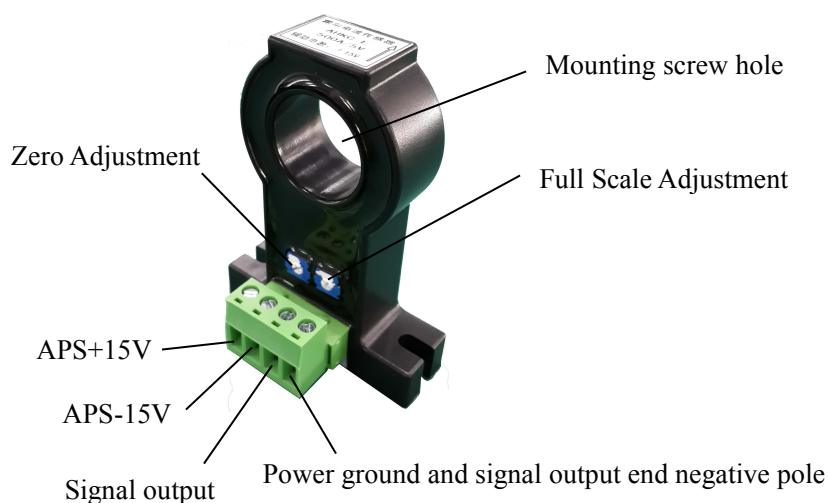
It is insulative between the primary and secondary grade of AHKC-E series current sensor which can be used for measuring direct current, alternating current and pulse current.

### 2. Technical Parameters and Overall Dimensions

| Parameters            | Index                              |
|-----------------------|------------------------------------|
| Rated Input Current   | 0~(50-500)A                        |
| Rated Output Voltage  | ±5V/±4V                            |
| Accuracy Class        | 1.0                                |
| Power Voltage         | DC±15V (allowable fluctuation±20%) |
| Zero Offset Voltage   | ±20mV                              |
| Offset Voltage Drift  | ≤±1.0mV/°C                         |
| Linearity             | ≤0.2%FS                            |
| Response Time         | ≤5us                               |
| Bandwidth             | 0~20kHz                            |
| Isolation Voltage     | 3.5kV/50Hz/1min                    |
| Operating Temperature | -40°C~85°C                         |
| Storage Temperature   | -40°C~85°C                         |
| Consumption           | ≤0.5W                              |

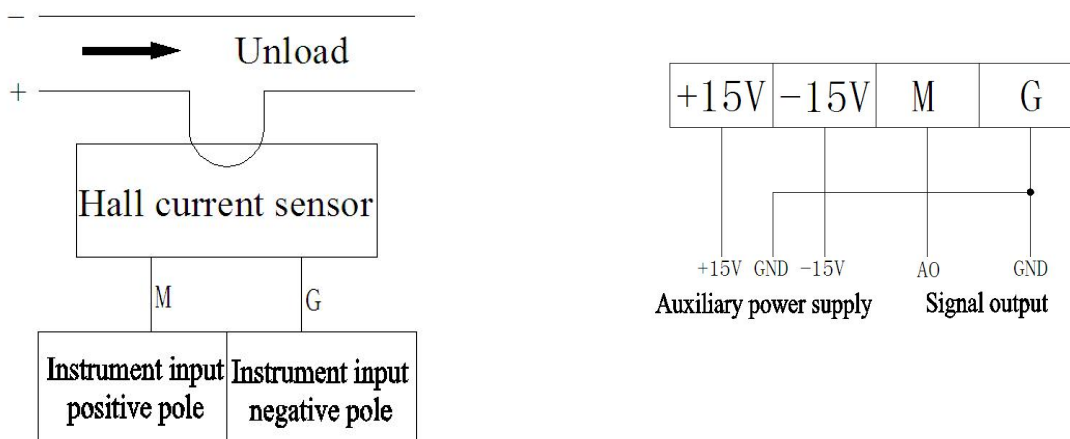


### 3. Installation Method



Base Plate Screw M4 (gasket)  
Installation

#### 4. Mode of Connection



+15V—— power supply+15V

-15V ——power supply-15V (Note that power positive and negative poles cannot be inversely connected.)

M —— signal output end positive pole

G —— power ground and signal output end negative pole

**Note: The specific wiring is subject to the terminal no. of object shell.**

#### 5. Precautions

1. When the Hall sensor is used, attention must be paid to the coupling between the primary side coil and assistant side coil in order to get better dynamic characteristics and sensitivity, single conductor that should cram the thread hole of Hall sensor module completely is proposed to use.

2. When the Hall sensor is used, the best measuring accuracy can be got under rated input current value. When the measured current is much less than the rated value, the primary side can use multi-turns if want to obtain the best accuracy, that is  $I_p N_p = \text{rated ampere-turns}$ . In addition, the temperature of the primary side feeder line cannot be more than 80℃.

3. When the Hall current sensor is working normally, the auxiliary power supply cannot be more than  $\pm 20\%$  of calibration value.

4. The Hall Current sensor is strictly prohibited to be fallen from high place ( $\geq 1\text{m}$ ) during installation and use.

5. Zero and full scale regulator potentiometer can not be adjusted.

6. Auxiliary power supply is required to be deployed voluntarily.

7. Power positive and negative poles cannot be inversely connected.

#### 6. Order Sample

Sample 1 AHKC-E Hall current sensor

Auxiliary power supply: DC $\pm 15\text{V}$

Input: 200A

Output: 5V

Accuracy: Grade 1

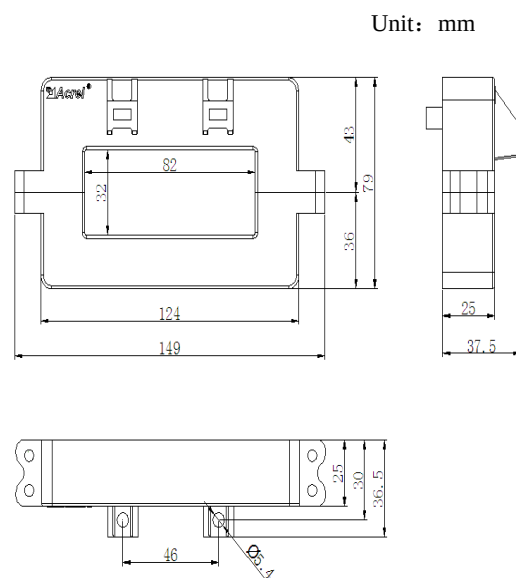
## HE001.1 AHKC-H Series Open Hall Current Sensor V1.0

### 1. Product Introduction

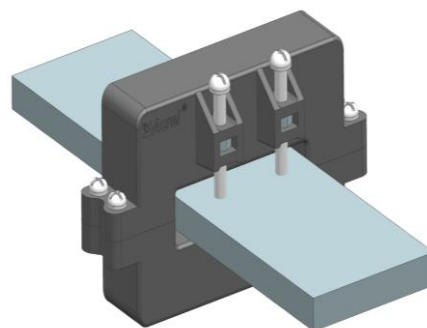
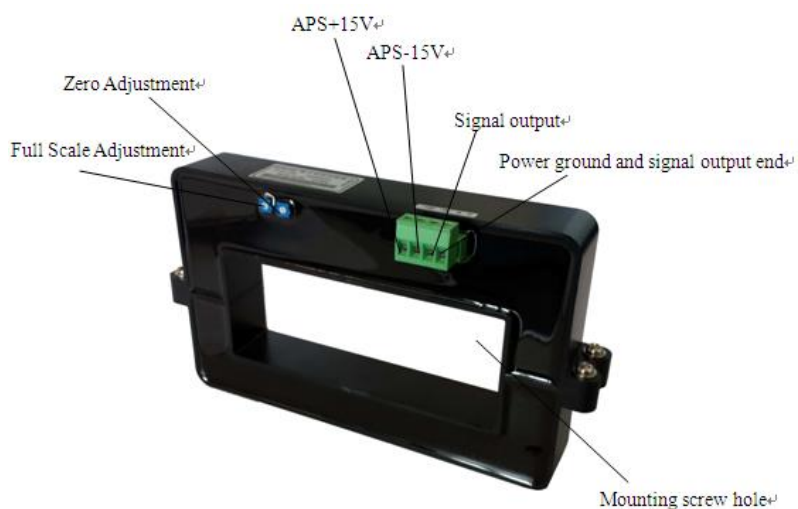
It is insulative between the primary and secondary grade of AHKC-H series current sensor which can be used for measuring direct current, alternating current and pulse current.

### 2. Technical Parameters and Overall Dimensions

| Parameters            | Index                            |
|-----------------------|----------------------------------|
| Rated Input Current   | 0 ~ (500-3000)A                  |
| Rated Output Voltage  | $\pm 5V/\pm 4V$                  |
| Accuracy Class        | 1.0                              |
| Power Voltage         | DC $\pm 15V$ ( allowable         |
| Zero Offset Voltage   | $\pm 20mV$                       |
| Offset Voltage Drift  | $\leq \pm 2.0mV/^{\circ}C$       |
| Linearity             | $\leq 0.2\%FS$                   |
| Response Time         | $\leq 5\mu s$                    |
| Bandwidth             | 0 ~ 20kHz                        |
| Isolation Voltage     | 2.5kV/50Hz/1min                  |
| Operating Temperature | -40 $^{\circ}C$ ~ 85 $^{\circ}C$ |
| Storage Temperature   | -40 $^{\circ}C$ ~ 85 $^{\circ}C$ |
| Consumption           | $\leq 0.5W$                      |

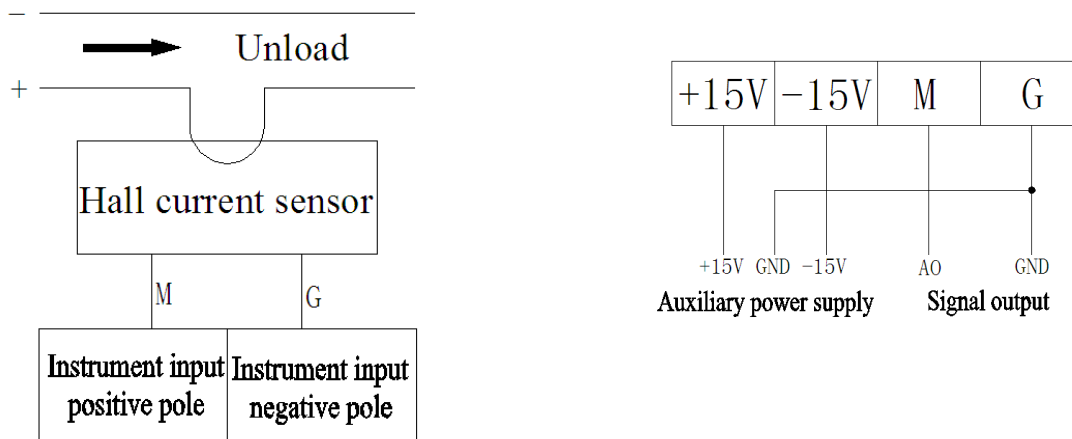


### 3. Installation Method



Base Plate Screw M3 (gasket)  
Installation

#### 4. Mode of Connection



+15V—— power supply+15V

-15V ——power supply-15V (Note that power positive and negative poles cannot be inversely connected.)

M —— signal output end positive pole

G —— power ground and signal output end negative pole

**Note: The specific wiring is subject to the terminal no. of object shell.**

#### 5. Precautions

1. When the Hall sensor is used, attention must be paid to the coupling between the primary side coil and assistant side coil in order to get better dynamic characteristics and sensitivity, single conductor that should cram the thread hole of Hall sensor module completely is proposed to use.

2. When the Hall sensor is used, the best measuring accuracy can be got under rated input current value. When the measured current is much less than the rated value, the primary side can use multi-turns if want to obtain the best accuracy, that is  $I_p N_p = \text{rated ampere-turns}$ . In addition, the temperature of the primary side feeder line cannot be more than 80°C.

3. When the Hall current sensor is working normally, the auxiliary power supply cannot be more than  $\pm 20\%$  of calibration value.

4. The Hall Current sensor is strictly prohibited to be fallen from high place ( $\geq 1\text{m}$ ) during installation and use.

5. Zero and full scale regulator potentiometer can not be adjusted.

6. Auxiliary power supply is required to be deployed voluntarily.

7. Power positive and negative poles cannot be inversely connected.

#### 6. Order Sample

Sample 1 AHKC-H Hall current sensor

Auxiliary power supply : DC $\pm$ 15V

Input: 1500A

Output : 5V

Accuracy : Grade 1

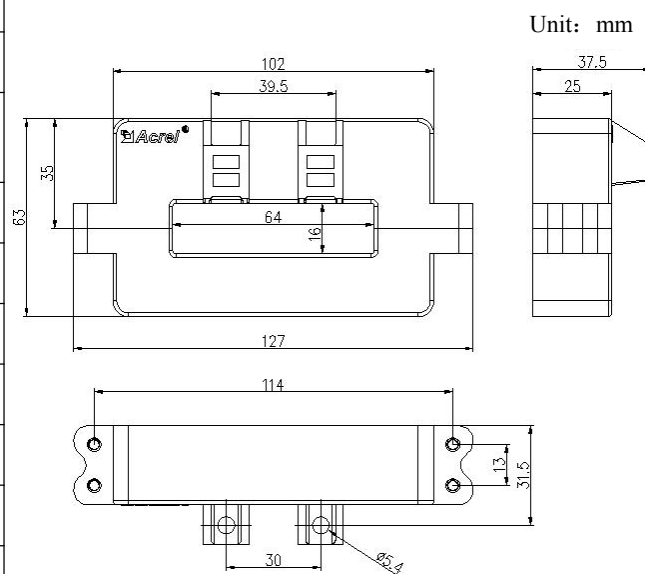
## HE004.1 AHKC-K Series Open Hall Current Sensor V1.0

### 1. Product Introduction

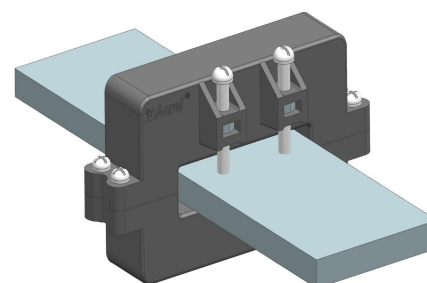
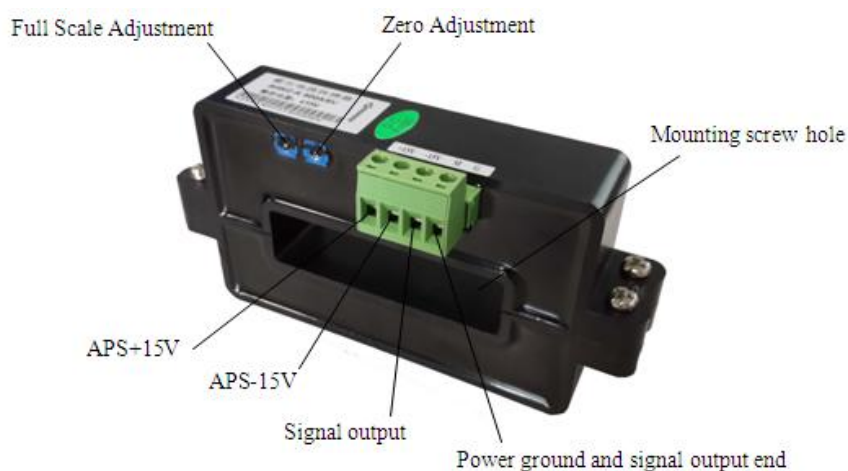
It is insulative between the primary and secondary grade of AHKC-K series current sensor which can be used for measuring direct current, alternating current and pulse current.

### 2. Technical Parameters and Overall Dimensions

| Parameters            | Index                                 |
|-----------------------|---------------------------------------|
| Rated Input Current   | 0~±(50-2000)A                         |
| Rated Output Voltage  | ±5V/±4V                               |
| Accuracy Class        | 1.0                                   |
| Power Voltage         | DC±15V<br>(allowable fluctuation±20%) |
| Zero Offset Voltage   | ±20mV                                 |
| Offset Voltage Drift  | ≤±1.0mV/°C                            |
| Linearity             | ≤0.2%FS                               |
| Response Time         | ≤5us                                  |
| Bandwidth             | 0~20kHz                               |
| Isolation Voltage     | 3.5kV/50Hz/1min                       |
| Operating Temperature | -40°C~85°C                            |
| Storage Temperature   | -40°C~85°C                            |
| Consumption           | ≤0.5W                                 |

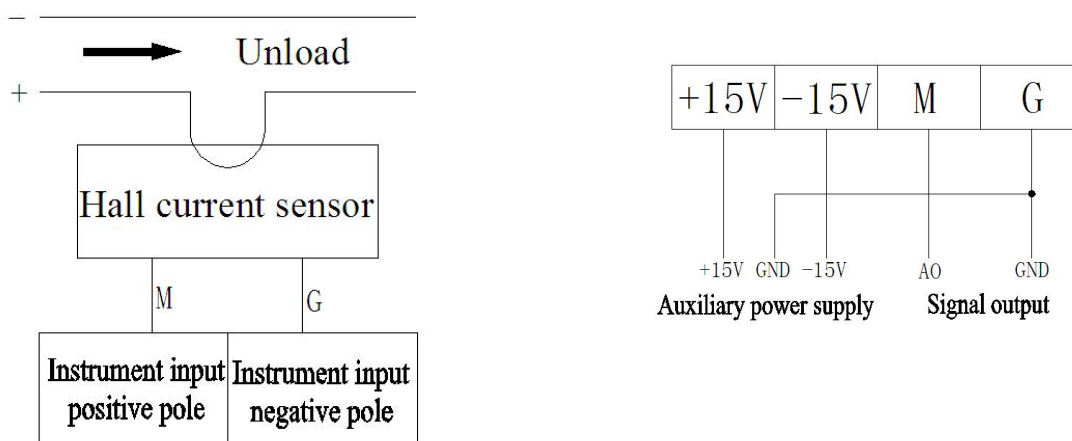


### 3. Installation Method



Base Plate Screw M4 (gasket)  
Installation

#### 4. Mode of Connection



+15V—— power supply+15V

-15V ——power supply-15V (Note that power positive and negative poles cannot be inversely connected.)

M —— signal output end positive pole

G —— power ground and signal output end negative pole

**Note: The specific wiring is subject to the terminal no. of object shell.**

#### 5. Precautions

1. When the Hall sensor is used, attention must be paid to the coupling between the primary side coil and assistant side coil in order to get better dynamic characteristics and sensitivity, single conductor that should cram the thread hole of Hall sensor module completely is proposed to use.

2. When the Hall sensor is used, the best measuring accuracy can be got under rated input current value. When the measured current is much less than the rated value, the primary side can use multi-turns if want to obtain the best accuracy, that is  $I_p N_p = \text{rated ampere-turns}$ . In addition, the temperature of the primary side feeder line cannot be more than 80℃.

3. When the Hall current sensor is working normally, the auxiliary power supply cannot be more than  $\pm 20\%$  of calibration value.

4. The Hall Current sensor is strictly prohibited to be fallen from high place ( $\geq 1\text{m}$ ) during installation and use.

5. Zero and full scale regulator potentiometer can not be adjusted.

6. Auxiliary power supply is required to be deployed voluntarily.

7. Power positive and negative poles cannot be inversely connected.

#### 6. Order Sample

Sample 1 AHKC-KA Hall current sensor

Auxiliary power supply: DC $\pm 15\text{V}$

Input: 800A

Output: 5V

Accuracy: Grade 1

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## AHBC-CAN500/24V Hall Effect Transducer

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### Features

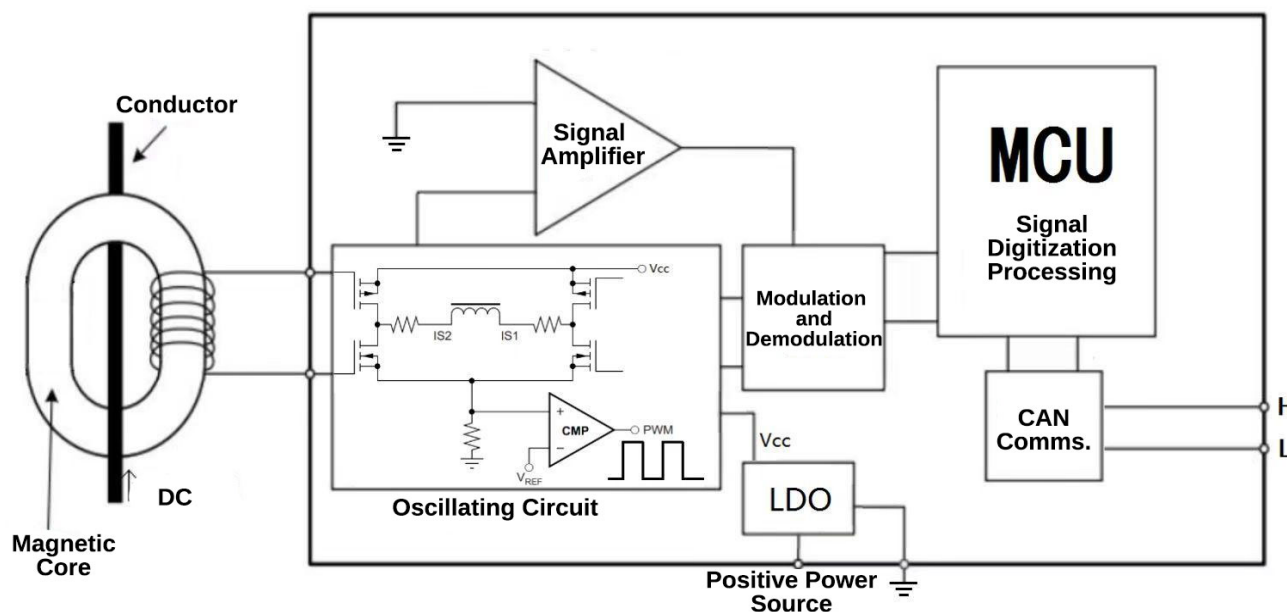
- Good Linearity
  - Linearity Error <0.1%
- Wide Voltage Supply
  - Supply Voltage: +18V to +28V
- Power Protection Function
  - Automatic Overvoltage Protection
- High Accuracy
  - Accuracy: 0.2%
  - Temperature Drift <50ppm
- Digital Communication
  - High-Speed CAN 2.0 Interface
- Operating Temperature: -40°C to +105°C

### Application

- EV Battery Management System (BMS)
- EV Battery Distribution Unit (BDU)
- EV High-Voltage Distribution Unit (PDU)
- Industrial Lithium Battery Energy Management
- Land-Based Tank Backup Power

### Overview

The AHBC-CAN500/24V power sensor is a high-precision DC current sensor primarily installed on battery busbars to monitor charging and discharging currents. Utilizing fluxgate technology, it offers high precision and low hysteresis. With a zero-offset current less than 10mA, it maintains low zero offset and high accuracy even after exposure to large currents up to 1000A. This sensor is ideal for power battery monitoring, high-precision current measurement, and battery management systems, meeting the SOC estimation accuracy requirement of less than 10% as per national standard QCT897-2011. All functionalities comply with automotive-grade standards.



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## Technical Parameter (Power Supply Voltage $U_c=24V$ )

### Max Parameters

| Parameter                  | Symbol   | Specs | Unit      | Condition                |
|----------------------------|----------|-------|-----------|--------------------------|
| Overvoltage                | $U_c$    | 35    | V         | 400ms                    |
| Overvoltage                | $U_c$    | 32    | V         | 1min                     |
| Min. Operating Voltage     | $U_c$    | 18    | V         | Can work but not measure |
| Max. Operating Voltage     | $U_c$    | 28    | V         | Can work but not measure |
| Clearance                  | $D_{Cl}$ | 7     | mm        |                          |
| Creepage Distance          | $D_{cp}$ | 7.2   | mm        |                          |
| Insulation Resistance      | $R_{IS}$ | 500   | $M\Omega$ | 500V, 1min               |
| IP Rating                  |          | IP56  |           |                          |
| AC Insulation Test Voltage |          | 5     | kV        | 50Hz, 1min               |
| DC Insulation Test Voltage |          | 5     | kV        | 1min                     |

### Standard Parameters

| Parameter                     | Symbol     | Specs |               |      | Unit        | Condition                      |
|-------------------------------|------------|-------|---------------|------|-------------|--------------------------------|
|                               |            | Min.  | Typical Value | Max. |             |                                |
| Rated Measuring Current       | $I_{PN}$   | -500  |               | 500  | A           |                                |
| Max Measuring Current         | $I_{PM}$   | -600  |               | 600  | A           |                                |
| Supply Voltage                | $U_c$      | 18    | 24            | 28   | V           |                                |
| Operating Current @ $I_p=0A$  | $I_c$      |       | 30            |      | mA          | $U_c=12V, T=25^{\circ}C$       |
| Operating Current @ $I_{PM}$  | $I_c$      |       | 160           |      | mA          | $U_c=12V, T=25^{\circ}C$       |
| Linearity Error               | $L$        | -0.1  |               | 0.1  | %           | $\pm 3\sigma$ Full Temp. Range |
| Zero Offset@ $I_p=0A$         | $I_o$      | -10   |               | 10   | mA          | $\pm 3\sigma$ Full Temp. Range |
| Accuracy@ $I_p=\pm 40A$       | $X_G$      | -60   |               | 60   | mA          | $\pm 3\sigma$ Full Temp. Range |
| Operating Temperature         | $T_A$      | -40   |               | 105  | $^{\circ}C$ |                                |
| Zero Offset Temperature Drift | $T_{off}$  |       | 0             |      | mA/K        |                                |
| Gain Temperature Drift        | $T_{gain}$ | -50   |               | 50   | ppm/K       | $\pm 3\sigma$ Full Temp. Range |
| Output Noise                  | Noise      | -10   |               | 10   | dB          |                                |

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## CAN Bus Electrical Parameters

CAN2.0

CAN Oscillator Tolerance: 0.27%

Baud Rate: 250 kbps

External Resistor: 120Ω

Data Mode: Big-endian Mode

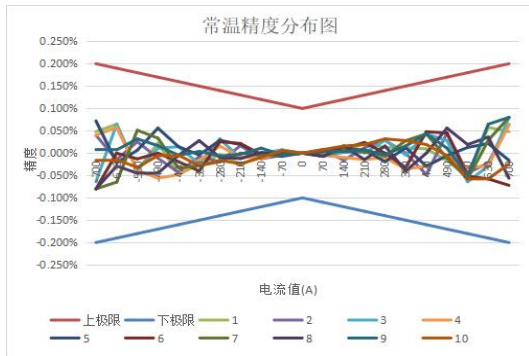
### Data Format

| Message Description    | CAN ID | Data length | Message launch type                   | Signal description                                            | Signal name      | Start bit | Length |
|------------------------|--------|-------------|---------------------------------------|---------------------------------------------------------------|------------------|-----------|--------|
| Return Current IP (mA) | 0X3C2  | 8 bytes     | Cyclic transmitted message 10ms cycle | IP Value:<br>80000000H=0mA<br>7FFFFFFFH=-1mA<br>80000001H=1mA | IP-VALUE         | 24        | 32     |
|                        |        |             |                                       | Error indication<br>0 = Normal 1 = Failure                    | ERROR INDICATION | 32        | 1      |
|                        |        |             |                                       | Error Information                                             | CSM_FAIL         | 33        | 7      |
|                        |        |             |                                       | NAME                                                          | PRODUCT_NAME     | 48        | 16     |
|                        |        |             |                                       | CRC-8<br>POLY: 8+X2+X+1                                       | CRC_8            | 56        | 8      |

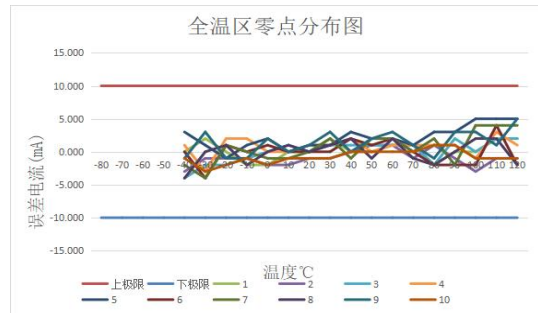
### Error Info.

| Error Description                                       | IP VALUE   | ERROR INDICATION | ERROR INFORMATION |
|---------------------------------------------------------|------------|------------------|-------------------|
| Failure Error                                           | FFFF FFFFH | 1                | 40H               |
| Current Exceeds 600A                                    | FFFF FFFFH | 1                | 41H               |
| Over-frequency Oscillation for more than 10ms (>2.5kHz) | FFFF FFFFH | 1                | 44H               |
| Magnetic Core Not Oscillating for More Than 20ms        | FFFF FFFFH | 1                | 46H               |
| Entering Fault Mode                                     | FFFF FFFFH | 1                | 47H               |
| No Signal for More Than 100ms                           | FFFF FFFFH | 1                | 49H               |
| Overvoltage (>32V)                                      | FFFF FFFFH | 1                | 4AH               |
|                                                         |            |                  |                   |
|                                                         |            |                  |                   |

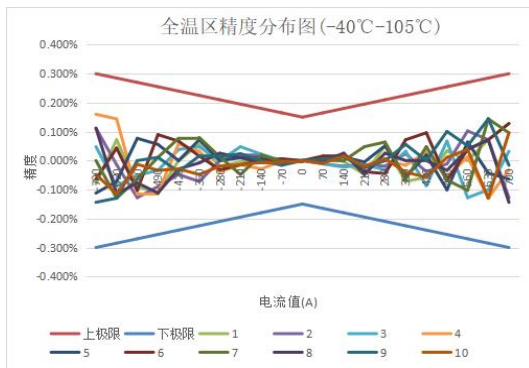
Normal Temperature Accuracy Distribution Chart



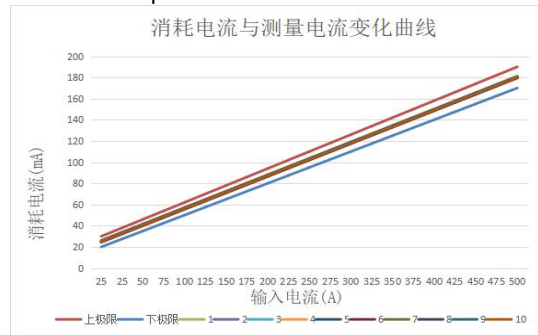
Zero Point Distribution Chart Across Full Temperature Range



Accuracy Distribution Chart Across Full Temperature Range



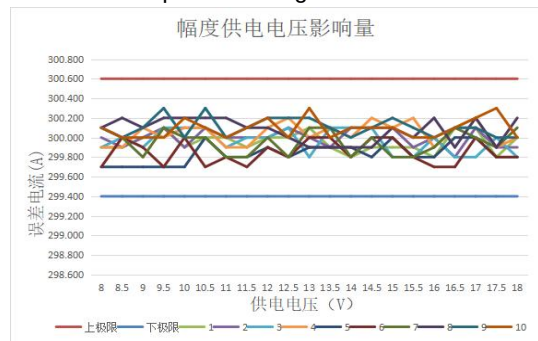
Current Consumption vs. Measured Current Variation Curve



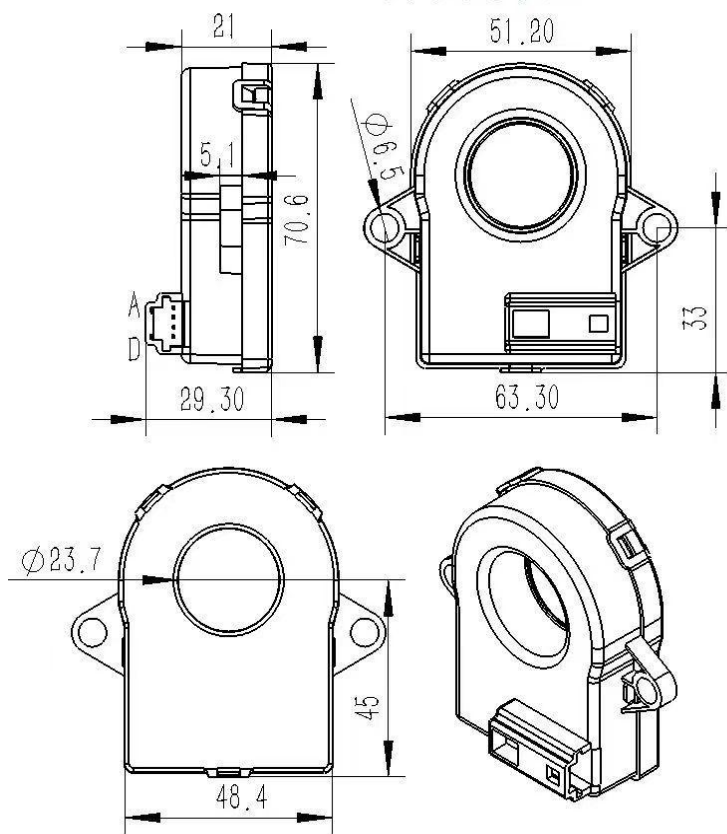
Zero Point Power Supply Voltage Influence



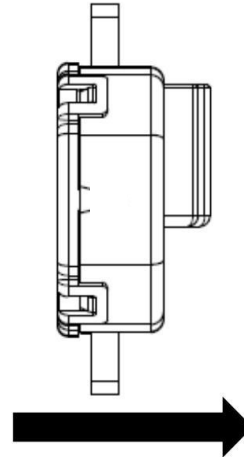
Amplitude Voltage Influence



## Mechanical Size



I<sub>p</sub> [Forward Current Direction]



| PIN NO | Function |
|--------|----------|
| D      | VCC      |
| C      | GND      |
| B      | CAN_H    |
| A      | CAN_L    |

## Mechanical Features

| Characteristic                | Rating            | Unit |
|-------------------------------|-------------------|------|
| General Tolerance             | $\pm 0.5$         | mm   |
| Other Tolerances Apply        | GB/T 1804-2000-M  |      |
| Fixed Hole Size               | $\phi 6.5$        | mm   |
| Fastening Screws              | M6                |      |
| Recommended Tightening Torque | 1.8( $\pm 10\%$ ) | N.m  |
| Connector                     | Tyco AMP 1473672  |      |
| Housing Material              | PBT GF30          |      |
| Weight                        | 80                | g    |
| PIN Material                  | Tin-Plated Brass  |      |
| IP Rating                     | IP56              |      |
|                               |                   |      |
|                               |                   |      |
|                               |                   |      |

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#### Performance Parameter Definition:

**Static Output Voltage (V<sub>ovo</sub>):** The sensor's output voltage V<sub>ovo</sub> in the absence of a significant magnetic field B=0G. -BR: The static output voltage V<sub>ovo</sub> has a constant ratio with the supply voltage V<sub>cc</sub>; VQvo=V<sub>cc</sub>/2.

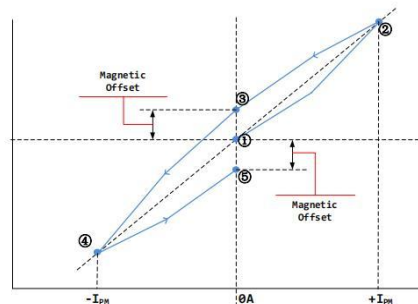
**Sensitivity (Sens):** Sens is the slope of the reference output line  $V_{our} = V_{cc}/2 + 2 \times I_p / I_{p\_Max}$ , indicating how the output changes with the current. The relationship with current is:  $Sens = 2 / I_{p\_Max}$ .

**Offset with Temperature:** Due to tolerances in internal components, stress, and thermal factors, the zero point may shift under operating temperature conditions.

**Sensitivity with Temperature:** Due to the influence of internal temperature compensation coefficients, sensitivity may deviate from the expected value at room temperature across the entire operating temperature range.

**Electrical Offset Voltage:** This is the error caused by the noise generated by the HALL element and the internal operational amplifier's gain, referred to as the offset voltage.

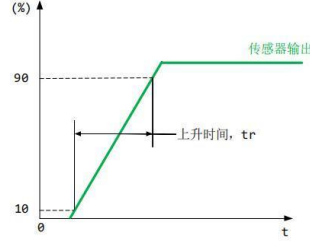
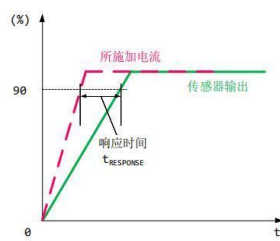
**Magnetic Offset:** When the primary current transitions from its maximum value to zero, due to the magnetic hysteresis phenomenon in the sensor's magnetic core material, an error is produced at the output, referred to as magnetic offset voltage.



**Offset Voltage:** Offset voltage is the output voltage when the primary current is zero, ideally VQvo=2.50. Therefore, the difference between V<sub>ovo</sub> and the ideal value is called the total offset voltage error. This offset error can be attributed to electrical offset voltage (due to the resolution of the internal QVO adjustment in the ASIC), magnetic offset, temperature drift, and temperature-induced hysteresis.

**Response Time:** The sensor's response time refers to the interval between when the applied current reaches 90% of its final value and when the sensor output reaches the corresponding value of the applied current.

**Rise Time:** The sensor's rise time is the interval between the sensor output reaching 10% and 90% of its final value.



Zero Point Ratiometricity Error (QVO Ratiometricity Error): This refers to the deviation of the sensor's zero output from the theoretical value when the supply voltage  $V_{cc}$  varies from 5V to 4.75V <  $V_{cc}$  < 5.25V. The formula is defined as follows:

$$E_r = \left(1 - \frac{V_{QVO(V_{CC1})}}{V_{QVO(5V)}} \times \frac{V_{CC1}}{5}\right) \times 100\%$$

Linearity Error: Non-linearity is an indicator of the linearity of the sensor IC across the full current measurement range. Here, the endpoint straight line is used as the reference working line:

$$Lin_{ERR} = \frac{\Delta L_{max}}{Y_{FS}} \times 100\%$$

where:

LinERR: Sensor 's endpoint linearity error.

$\Delta L_{max}$ : The absolute maximum deviation between the arithmetic mean of multiple measurements at the same calibration point and the corresponding point on the reference straight line during forward and reverse measurements.

#### Notes:

1. **Incorrect wiring may cause sensor damage.** After connecting the sensor to a 5V power supply, the measured current passes through the sensor in the direction of the arrow, and the corresponding voltage value can be measured at the output terminal.
2. **-BR Mode:** The zero output voltage  $V_{ovo} = \frac{V_{cc}}{2}$ , with a fixed gain of 2V, and the output curve is:

$$V_{our} = \frac{V_{cc}}{2} + 2 \times \frac{I_p}{I_{pMax}}$$

Changes in the supply voltage within a certain range will cause  $V_{our}$  to change. For example, if  $V_{cc}$  ranges from 4.75V to 5.25V, the static output voltage  $V_{ovo}$  at 0A will range from 2.375V to 2.625V. The gain does not change with  $V_{cc}$ , and is fixed at 2V, so the full-scale output range of  $V_{our}(I_{pMax})$  will be 4.375V to 4.625V.

3. **-BF Mode:** When  $V_{cc} = 4.75 - 5.25V$ , the zero output voltage is fixed at 2.5V, with a fixed gain of 2V. The output curve is:

$$V_{our} = 2.5 + 2 \times \frac{I_p}{I_{pMax}}$$