Current and Voltage Sensors

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Content

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Electrohms is a leading designer and manufacturer of custom magnetics and sensors for measuring current and voltage. With a wide range of standard components and proven custom design capability, we deliver on innovation, quality and service to our customers worldwide. We have over 45 years of experience in serving our customers in critical applications for industrial, renewable energy, automation and IOT markets .

DESIGNERS CHOICE

We are a one stop shop for AC/DC measurement of current and voltage as well as custom magnetics.Our wide range of standard products makes it easy for designers to create high performance and cost effective solutions.

CUSTOMISATION

We are willing to go the extra mile to deliver a customized product where required to create outstanding end system performance.

Using smart design tools and rapid prototyping our engineers deliver your prototypes and final samples on time.

PRODUCT RELIABILTY

Reliability starts from a robust design and engineering processes. We follow DFMEA and APQP processes and ensure delivery of highly reliable products.

All product families undergo a full cycle of qualification testing which includes extreme temperature cycling, dry and damp heat tests, vibration and EMI. We offer our customers qualification data on demand.

We work with top quality supplier and buy electronic components only from reputed brands and proven traceability.

All sensors are 100% tested on automated testing setups.

CERTIFICATIONS AND STANDARDS

We are ISO 9001 certified and all our products are CE marked and meet ROHS 2 requirements.

We use UL approved materials. We will get specific products UL approved based on customer demand.

We design and test our products to comply to the following standards:

- EN50178 : Requirements for electronic equipment for use in power installation
- EN50155 : Railway Applications – Electronic equipment used on rolling stock
- CE certification : as per EMC directive of EU
- UL 508 : for UL certification
- IEC 61010-1:Safety requirements for electrical equipment for measurement, control, and laboratory use

Range Overview

Hall Effect Current Sensor - Closed Loop

HE

HED

HE2K

HEP

25A 3000A

Hall Effect Current Sensor - Open Loop

HS/HL

HSS

HB

HSM

50A 2500A

Hall Effect Current Sensor - Split Core

HJ/HK

HK

HJC/ HKC

HJA

50A 1500A

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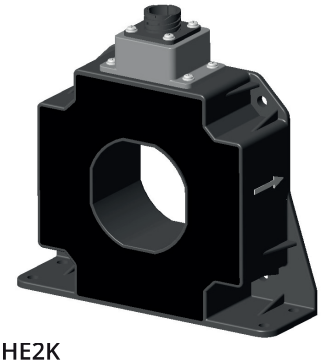
Range Overview

Railway Application

HE

HED

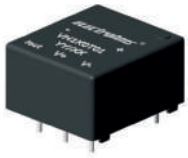
HER



HE2K

50A 2000A

Voltage Sensors



VH/VA

VHASM

VHASM

VJ

150V 2000V

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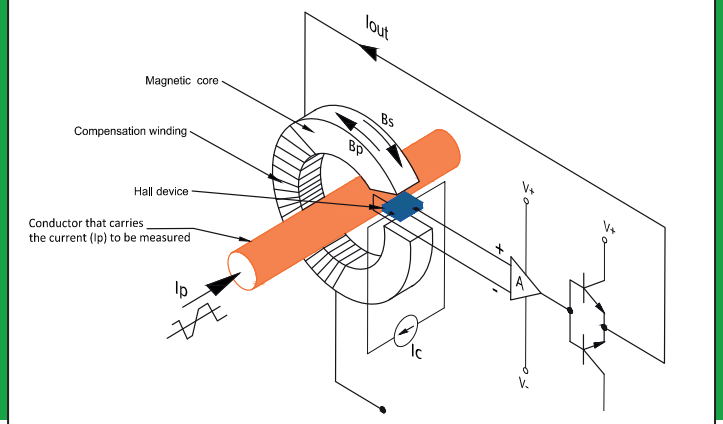
Closed Loop Hall Effect Technology



Bp	Magnetic flux by the input current
Bs	Magnetic flux by the output current
A	Amplifiers and signal conditioning to drive the output current
I_{out}	Output current which is proportional in the input current I_p
I_p	Conductor that carries the current (Ip) to be measured

Compared to the open loop sensors, closed loop current sensors have a compensation winding on the core that dramatically improves performance. The closed loop transducers use the Hall generator voltage to create a compensation current in a the secondary coil to create a magnetic flux which is equal to and in the opposite direction of flux generated by the input current as measured by the Hall generator. In other words, the secondary current, Iout, creates a flux equal in amplitude, but opposite in direction, to the flux created by the primary current and thus the total flux in the core gap is always being nulled to zero.

Operating the Hall generator in a zero flux condition eliminates the drift of gain with temperature. An additional advantage to this configuration is that the secondary winding will act as a current transformer at higher frequencies, significantly extending the bandwidth and reducing the response time of the transducer. When the magnetic flux is fully compensated (zero), the magnetic potential (ampere-turns) of the two coils are identical. Hence: NP • IP = NS • IS which can also be written as IS = IP • NP / NS. Consequently, the secondary current , Iout , is the exact image of the primary current, IP, being measured. Inserting a "burden resistor", Rb, in series with the secondary coil (see fig.) creates an output voltage Vout that is an exact image of the measured current Ip.

Electrical Features

- Wide frequency range
- Good overall accuracy
- Fast response time
- Low temperature drift
- Excellent linearity
- No insertion losses

Mechanical features

- A wide range of primary current apertures
- PCB mounted, or panel mounted
- Panel mounting with both horizontal and vertical Positions.
- Compact packages

Advantages

- Galvanic isolation between the primary and secondary circuits
- Measurement of all waveforms is possible: direct current, alternating current, impulse, etc.
- High accuracy over a large frequency range (from direct current to 100 kHz)
- Excellent dynamic performance
- High overload capability
- High reliability

Applications

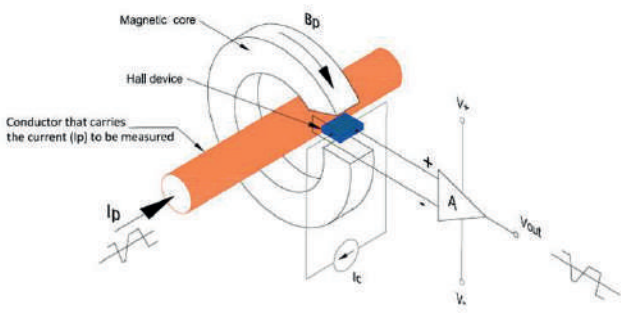
Industrial :

Variable speed drives, Uninterruptible Power Supplies (UPS), Active harmonic filters, Battery chargers, Wind generators, Solar inverters, etc.

Railway :

Main converters, Auxiliary converters (lighting, air conditioning), Battery chargers, Choppers

Open Loop Hall Effect Technology



Bp	Magnetic flux by the input current concentrated by the core
A	Amplifiers and signal conditioning to drive the output voltage
Vout	Output voltage which is proportional to the input current I_p

Principle

Open loop current sensors measure direct, alternating and impulse currents, with galvanic isolation between the primary and secondary circuits

The primary current flowing in the sensor creates a propotional primary magnetic flux. A Hall device placed in the air gap of the magnetic core produces a hall voltage Vh which is proportional to this flux as well as the current Ip being measured. An electronic circuit (A) amplifies this Hall voltage (Vh) allowing it to be directly utilised in the end application measurement circuit as a secondary output voltage Vs. The current sensor measures instantaneous values.

The secondary output voltage Vs is therefore directly proportional to the primary current. It is an exact replica of the primary current Ip, generally with a value of 4 V for a nominal current IPN.

Mechanical features

- A wide range of primary current apertures
- PCB mounted or panel mounted
- For retrofit applications – a range of split core sensor which can easily and securely be clamped onto the primary conductor
- Integrated primary conductor available on special order
- Panel mounting with both horizontal and vertical Positions.
- Compact packages

Application

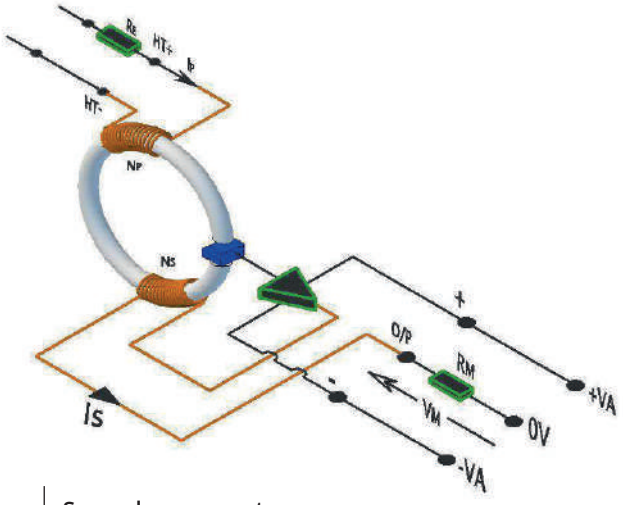
Variable speed drives, Uninterruptible Power Supplies (UPS), Active harmonic filters, Battery chargers Welding rectifiers

Advantages

The main advantages of this open loop Hall effect technology are as follows:

- Galvanic isolation between the primary and secondary circuits.
- Measurement of all waveforms is possible: direct current, alternating, current, impulse, etc.
- Good accuracy over a frequency band (from Direct current to 50 kHz)
- High reliability.
- Reduced weight and volume
- Low power consumption
- Excellent cost/performance ratio.

Closed Loop Voltage Transducer



Is	Secondary current
Np	Primary turns
Ns	Secondary turns
Vm	Voltage across burden Resistance
Rm	Burden Resistance

The input current proportional to the measured voltage is applied to the sensor through (current limiting) input resistors. This current is driven through the primary coil of a sensor generates an output voltage proportionate to the measured voltage in the same principle as closed loop current sensors. In this, two different options are available for voltage measurement which are as follows

- VH series (User specified input resistors) - In this the user connects the input resistor in series with the sensor to limit the input current. The value of the input resistor R1 is selected according to the voltage to be measured with due consideration to the maximum input current of the sensor. This approach allows for maximum flexibility.

- VHASM series (Integrated input resistor) - The value of integrated input resistor determines the nominal measuring voltage of the sensors. A wide selection of nominal voltage levels are offered to cover a variety of applications.

Features

- Measurement of DC & low frequency voltages
- Galvanic isolation between input and output
- High accuracy
- Low temperature drift
- Good linearity

Applications

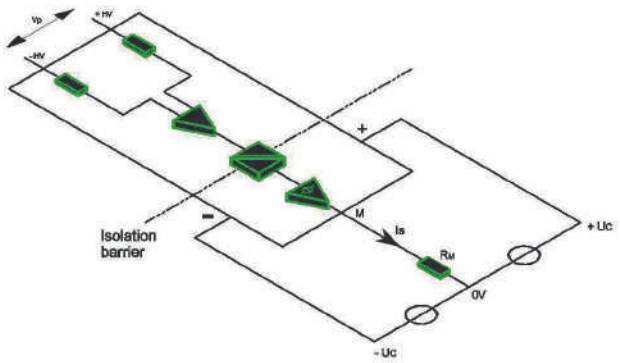
Industrial :

Variable speed drives, Uninterruptible Power Supplies (UPS), Battery chargers, Solar inverters, etc.

Railway :

Auxiliary converters (lighting, air conditioning), Battery chargers

High Isolation Voltage Sensors



Vp	Primary voltage
Vn	Voltage across burden Resistance
Rm	Burden Resistance

Voltage sensors are suitable for measurement of DC and AC voltages with high galvanic isolation. These sensors are accurate and provide proportionate output signal to the applied input voltage for control electronics with high fidelity.

Advantages

- Measurement of DC & AC voltages
- Good accuracy & linearity
- Low drift due to temperature
- Low power consumption
- High immunity to fast common mode voltage changes (several kV/µs)
- Low sensitivity to electromagnetic disturbances
- Low output noise

Applications

Industrial :

Variable speed drives, Uninterruptible Power Supplies (UPS), Battery chargers, Solar inverters, etc.

Railway :

Main converters, Auxiliary converters (lighting, air conditioning), Battery chargers

Applications of Sensors

Railways

- Traction Converter
- Auxiliary Converter
- Electronic Rectified Regulated Unit

Solar & Wind

- SSM/ PVEM
- Central/ Off Grid Inverter
- Converter for Wind Energy

Industrial

- UPS/ Inverter
- Lighting Control
- AC/DC Drive
- Welding
- Motor Protection
- Metering (Panel / Energy)
- Power Electronics

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Applications of Sensors

EV

- DC Fast Charging
- AC Wall Charging
- Ultrafast Charging and Battery Swapping

IOT & Smart Monitoring

- Battery Monitoring
- Smart Metering
- Automation
- Industry 4.0

Consumer

- Smart Appliances
- Protection & Control
- Lighting

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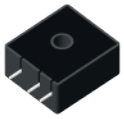
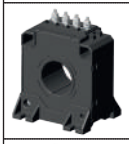
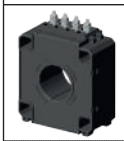
Open Loop Current Sensors

Series		Family	Main Specification					
			Nominal current (A)	Output	Supply Voltage (V)	Output Termination	Primary Conductor opening (mm)	Mounting
HL		HL050...600T05	50- 600	+2.5 ±0.625V	+5.0	Molex 5045 series, 4pin	20.4x10.4	Flange
HS		HS050...600T01	50- 600	4.0V	±15.0	Molex 5045 series, 4pin	20.5x10	Flange
HB		HB400T01	400	4-20mA	+24.0	Screw terminal block, 5.08mm pitch, 4Pin	Φ31.80	Flange
HSS		HSS200...1K5T01	200 - 1500	4.0V	±15.0	Molex 5045 series, 4pin	40.5x30.5	Flange
HSM		HSM500... 2K5T01	500 - 2500	4.0V	±15.0	Molex 5045 series, 4pin	64.0x21.0	Flange

Closed Loop Current Sensors

Series		Family	Main Specification						Mounting
			Nominal current (A)	Output	Supply Voltage (V)	Secondary turns	Output Termination	Primary Conductor opening (mm)	
HA		HA025T01	25	+2.5 ± 0.625V	+5.0	1080	Pins	13x7.15	PCB
HE		HE025T01	25	+2.5 ± 0.625V	+5.0	2000	Pins	Φ5.75	PCB
		HE025T02	25	+2.5 ± 0.625V	+5.0	2000	Pins	Built in	PCB
		HE055T01	50	50mA	±12 - ±15	1000	Pins	13x7.15	PCB
		HE100T01	100	50mA	±12 - ±15	2000	Pins	13x7.15	PCB
		HEF300T03	300	120 mA	±24	2500	JST B3P-VH series 3 pin header	Φ25	Flange
		HE050... 300T04	50 - 300	150mA for 300A nominal	±12 - ±15	2000	Faston Tab 6.3x0.8mm	Φ25	Flange
		HE500T02	500	100mA	±15 - ±24	5000	Molex 5045 series, 3pin	Φ31.80	Flange
		HE500T05	500	100mA	±15 - ±24	5000	JST B3P-VH series 3 pin header	Φ31.80	Flange
		HE500T07	500	100mA	±15 - ±24	5000	Molex Minifit jr 5566 series	Φ31.80	Flange
		HE1K0T03	1000	200mA	±15 - ±24	5000	JST B3P-VH series 3 pin header	Φ40.50	Flange

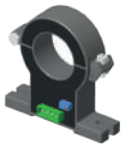
Closed Loop Current Sensors

Series		Family	Main Specification						Mounting
			Nominal current (A)	Output	Supply Voltage (V)	Secondary turns	Output Termination	Primary Conductor opening (mm)	
HE		HE2K0T01-CB10	2000	400mA	±15 - ±24	5000	M5 screw studs	Φ60.5	Flange
		HE2K0T02-CB10	2000	500mA	±15 - ±24	4000	Phoenix contact header, MCV series 3pin	Φ60.5	Flange
		HE2K0T03	2000	500mA	±15 - ±24	4000	M5 screw studs (side termination)	Φ60.5	Flange
		HE2K0T04	2000	400mA	±15 - ±24	5000	M5 screw studs (side termination)	Φ60.5	Flange
HED		HED500T01	500	100mA	±15 - ±24	5000	M5 screw studs	Φ42.0	Flange
		HED1K0T01	1000	200mA	±15 - ±24	5000	M5 screw studs	Φ42.0	Flange
		HED1K0T01-CB11	1000	250mA	15 - ±24	4000	M5 screw studs	Φ42.0	Flange
		HED1K3T01	1300	325mA	15 - ±24	4000	M5 screw studs	Φ42.0	Flange
		HED1K0T02	1000	200mA	15 - ±24	5000	M5 screw studs	Φ42.0	Flange
		HED1K0T02-CB11	1000	250mA	15 - ±24	4000	M5 screw studs	Φ42.0	Flange
		HED1K3T01-CB10	1300	325mA	15 - ±24	4000	CPC 11 series, AMP	Φ42.0	Flange

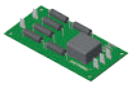
Closed Loop Current Sensors

Series		Family	Main Specification						Mounting
			Nominal current (A)	Output	Supply Voltage (V)	Secondary turns	Output Termination	Primary Conductor opening (mm)	
HER		HER1K0T03	1000	200mA	15 - ±24	Main -5000 / Test 1000	CPC 13 series, AMP	Φ42.0	Flange
		HER1K3T01-CB10	1300	325mA	15 - ±24	4000	CPC 11 series, AMP (side mounted)	Φ42.0	Flange
		HER1K3T02-CB10	1300	325mA	15 - ±24	4000	M5 screw studs	Φ42.0	Flange
HEP		HEP3K0T01	3000	600mA	±24	5000	M5 screw studs	Φ102.0	Flange

Split Core Current Sensors

Series		Family	Main Specification					Mounting
			Nominal current (A)	Output	Supply Voltage (V)	Output Termination	Primary Conductor opening (mm)	
HJ		HJ050...500T09	50 - 500	+2.5 ± 1V	+5.0	Phoenix contact header, BCH350V series 4pin	Φ20	Flange
		HJ050...500T02	50 – 500	+2.5 ± 1V	+5.0	Molex 5045 series, 4pin	Φ20	Flange
		HJ100...500T04	100 – 500	10V	+12.0	Molex 5045 series, 4pin	Φ21	Flange
		HJ050... 1K0T08-CS1	50 - 1000	4 -20 mA	+24 V	Phoenix contact header 1755752, 4 pin	Φ40.5	Flange
HK		HK050...500T03	50 – 500	4.0V	±12 - ±15	Molex 5045 series, 4pin	Φ20	Flange
		HK050...500T09	50 – 500	4.0V	±12 - ±15	Phoenix contact header, BCH350V series 4pin	Φ20	Flange
		HKC100...2K0T01	100 – 2000	4.0V	±15.0	Phoenix contact header, BCH350V series 4pin	Φ40.5	Flange
HJA		HJA1K5T01	1500A	+2.5 ± 1.5V	9.0 - 18.0	MSTBVA 2,5/ 4-G-5,08 series	Φ50	Mounting flange available on request

Voltage Sensors

Series		Family	Main Specification				
			Input	Output	Supply Voltage	Output termination	Mounting
VA		VA1K0T01	1000V	+2.5 ± 0.625V	5V	Pins	PCB
VH		VH1K0T01	1000V	25mA	±15V	Pins	PCB
VHASM		VHASM150T01	150V	25mA	±15V	88 x 48 x 18.8 mm	Flange
		VHASM400T01	400V	25mA	±15V	128 x 60 x 18.8 mm	Flange
		VHASM750T02	750V	20mA	±15V	128 x 60 x 18.8 mm, 167 x 80 x 86 mm	Flange
		VHASM750T02-CB13	750V	20mA	±15V	128 x 60 x 18.8 mm, 167 x 80 x 86 mm	Din rail mount
		VHASM1K0T01	1000V	25mA	±15V	128 x 60 x 18.8 mm	Flange
		VHASM1K0T01-CB11	1000V	25mA	±15V	167 x 80 x 55.5 mm	Din Rail
		VHASM1K2T02	1200V	20mA	±15V	128 x 60 x 18.8 mm	Flange
VJ		VJ500T03	500V	50mA	±15V - ±24V	137.8 x 63 x 65.5mm	Flange
		VJ1K0T03	1000V	50mA	±15V - ±24V	137.8 x 63 x 65.5mm	Flange
		VJ1K5T03	1500V	50mA	±15V - ±24V	137.8 x 63 x 65.5mm	Flange

General Notes :

- Ensure proper polarity of the power supply connection to avoid damage to the sensor.
- Ensure proper ESD practices when handling and installing the sensor. Static electricity or excessive voltage can damage the sensor.
- In general, it is recommended that twisted or shielded cables should be used for output signals to reduce noise pickup.
- The sensor is sensitive to magnetic fields generated by other devices. In the presence of such fields, depending on their strength and vicinity, the accuracy may be impaired
- Our specifications are guaranteed at specified Input characteristics, supply voltage, temperature, etc. Some characteristics might change, if these parameters are varied, Contact Electrohms for information on expected performance level on parameters not mentioned on the datasheet.
- It is recommended to centrally locate the current carrying conductor or completely fill the central opening for optimum performance.
- It is recommended that the end user, to use mating connector with equivalent terminal plating material to ensure proper long term reliability and to avoid any possibility of galvanic corrosion.
- Avoid storing in high-temperature and high-humidity environment.
- For PCB mountable sensors used after a very long storage duration in in a humid environment, please check the pins for solderability before mounting in assembly
- It is recommended to perform a zero-offset adjustment in application circuit by measuring the offset voltage during installation.
- Nominal value is that value of input which the sensor operates continuously. The maximum value is measurement is rms. Current applied more than maximum rated current can result in damage to circuitry. Please contact Electrohms to determine any overload specifications.
- Current drawn by sensor is equal to no-load current drawn plus the compensation current drawn. Please ensure the power supply feeding the sensor has required current capacity to supply total current drawn (inclusive of compensation current to the secondary winding)
- In the case of single supply voltage, the output signal varies around a nonzero value.
- We offer close-loop sensors. with standard output signals (e.g. 0-5 VDC, 0-10 VDC or 4-20 mA) for specific applications on demand.
- High frequency primary current may result in excessive heating in iron magnetic core and cause damage to internal circuitry; for high frequency applications select current sensor with ferrite core material
- If the measured current exceeds the rated current, magnetic core saturation will occur and the output voltage signal will not be linearly proportional to the measured current.
- Due to their principle of operation (measure of magnetic field by the Hall effect probe). closed loop hall effect current sensors can be sensitive to strong magnetic fields. It is recommended to avoid positioning them to close to high current power cables
- Open Loop hall sensor have the offset and gain potentiometer setting sealed after factory setting. Removal of the sealant affect the performance and warranty claim will not be accepted

Safety instructions :

- This Sensor must be used in electric/electronic equipment with respect to applicable standards and safety requirements in accordance with the manufacturer's operating instructions.

- Caution, risk of electrical shock
- When operating the Sensor, certain parts of the module can carry hazardous voltage (eg. primary busbar, power supply).
- Ignoring this warning can lead to injury and/or cause serious damage.
- A protective housing or additional shield could be used.
- Over currents (»IPN) can cause an additional voltage offset due to magnetic remanence.
- Temperature of the primary conductor shall not exceed 100 ˚C.
- This Sensors must be used in electrical or electronic systems as per the applicable standards.
- Protect non-isolated high-voltage current carrying parts against direct contact (e.g. with a protective housing)
- When installing the sensor, ensure that the safe separation (between primary circuit and secondary circuit) is maintained over the whole circuits and their connections.

ELECTROHMS

Electrical Sensing solution for a connected world

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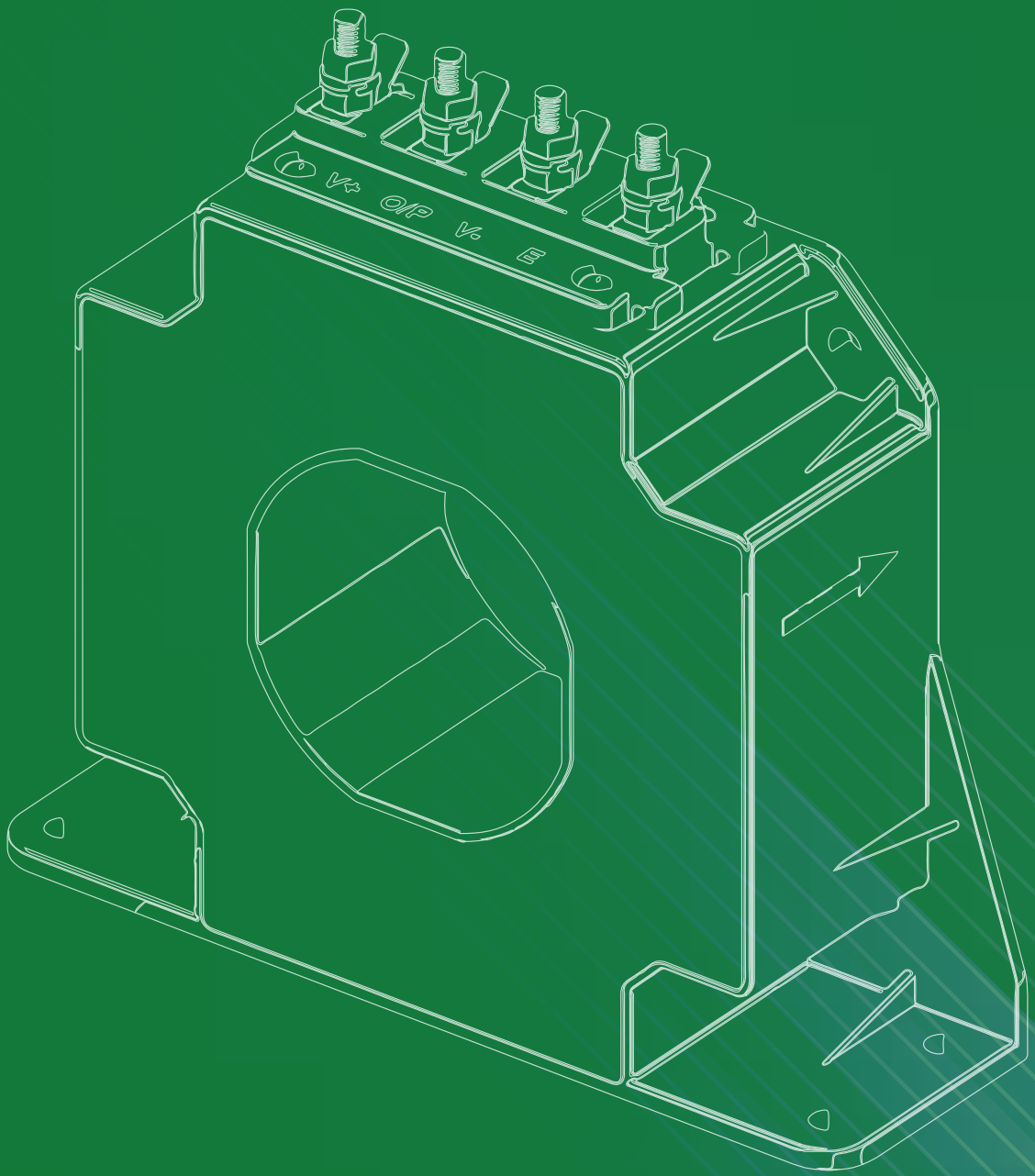

5 YEAR WARRANTY

CE

RoHS Compliant

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