DATA SHEET

CTN1000ID

1000 A RMS / 1000 A DC Current Transducer

SPECIAL FEATURES

- 1000 A RMS nominal current
- 1000 A DC nominal current
- 400 MHz bandwidth (±3 dB)
- 41.2 mm aperture for cables and bus bars
- -40 °C to +85 °C operating range
- Best in class for accuracy and stability
- Isolated AC and DC current measurements
- 1 ppm maximum linearity error
- Industry standard D-SUB 9 connector
- Full aluminum body for superior EMI shielding
- Advanced sensor protection circuits

CTT50ID Functions and Benefits

The HBM series of current transducers feature industry standard, fluxgate, closed-loop technology. The second harmonic zero flux detection ensures the highest accuracy and lowest drift while maintaining a high bandwidth.
HBM current transducers are perfect for measuring currents between 10 and 1000 A RMS. With the high bandwidth support, they can be used with fast rise time signals, such as those found in electric drives or other inverter applications, such as those in renewable industries.
The CT series is available for 50 A RMS to 1000 A RMS, all sharing the same high-end technology. All connectors are compatible for fast exchange.

The optional 1 HE 19” rack mountable power supply can power any mix of up to six CTs.
Current output cables to connect directly to the GN31XB power card, as well as to the GN61XB card, are available.
Optional burden resistors are available for the GEN series Data Acquisition Systems or power analyzers without an integrated burden resistor.
The advanced sensor protection circuit ASPC prevents sensor damage for incorrect use cases, such as currents applied to unpowered CTs or powered CTs without a burden resistor to close the current output loop.

Specification Highlights			
	Symbol	**Value**	**Comment**
Nominal primary AC current	I_{PN} AC	1000 A RMS	
Nominal primary DC current	I_{PN} DC	± 1000 A	
Measuring range	$\hat{I}_{PM}$	± 1500 A	
Primary / secondary ratio	n1 : n2	1 : 1500	
Bandwidth	f(±3 dB)	400 kHz	Small signal, refer to Figure 3

Electrical Specifications				
At Ta = 23 °C, supply voltage = ± 15 V unless otherwise stated				
Parameter		**Symbol**	**Value**	**Comment**
Overload capacity		$\hat{I}_{OL}$	± 5000	Non-measured, 100 ms
Linearity error		ƐL	± 1 ppm	Refers to nominal DC current
Offset current (including earth field)		I_{OE}	± 5 ppm	Refers to nominal DC current
Offset temperature coefficient		TC_{IOE}	± 0.1 ppm/K	Refers to nominal DC current
Response time to a step current IPN		tr @ 90%	1 µs	To 90% of step current
			% of reading + % of Full Scale	Without offset Full scale refers to nominal DC current.
Total accuracy	<10 Hz	$Ɛ_{tot}$	0.0001 + 0.0001	
	<100 Hz		0.0002 + 0.0002	
	<1 kHz		0.01 + 0.0003	
	<10 kHz		0.15 + 0.0004	
	<100 kHz		5 + 0.0015	
	<400 kHz		30 + 0.003	
Phase shift	<10 Hz		± 0.01°	
	<100 Hz		± 0.01°	
	<1 kHz		± 0.02°	
	<10 kHz		± 0.2°	
	<100 kHz		± 3°	
	<400 kHz		± 45°	
RMS Noise	<10 Hz	ppm RMS	0.4 ppm RMS	ppm RMS refers to nominal current
	<100 Hz		0.4 ppm RMS	
	<1 kHz		0.4 ppm RMS	
	<10 kHz		0.4 ppm RMS	
	<100 kHz		4 ppm RMS	
Peak-to-peak noise	<10 Hz	ppm p-p	0.6 ppm p-p	ppm peak-to-peak refers to nominal current
	<100 Hz		1 ppm p-p	
	<1 kHz		1 ppm p-p	
	<10 kHz		4 ppm p-p	
	<100 kHz		10 ppm p-p	
Fluxgate excitation frequency		f_{Exc}	31.25 kHz	
Stability				
Offset change with external magnetic field		ppm/mT	± 4 ppm/mT	Refers to nominal DC current
Offset change with power supply voltage changes		ppm/V	± 0.2 mV	Refers to nominal DC current
Power supply				
Power supply voltages		Uc	± 15.75 V	
Idle current consumption		mA	± 81(typical)	Primary current = 0 A
Current consumption at max current		A	± 1.1	At $\hat{I}_{PM}$
Power consumption		W	18.5	At $\hat{I}_{PM}$

Burden Resistor RM and Ambient Temperature Derating

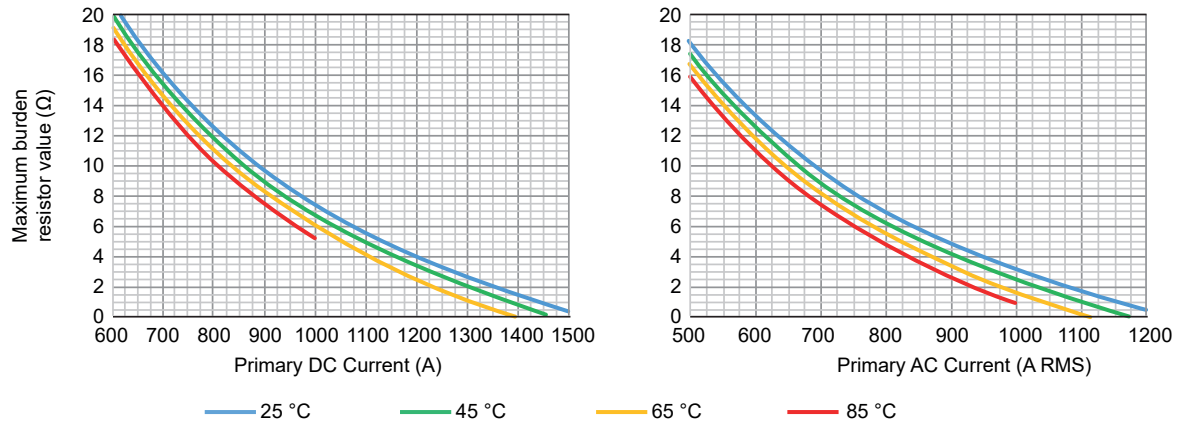

Figure 1: Burden resistor RM and ambient temperature derating

Frequency and Ambient Temperature Derating

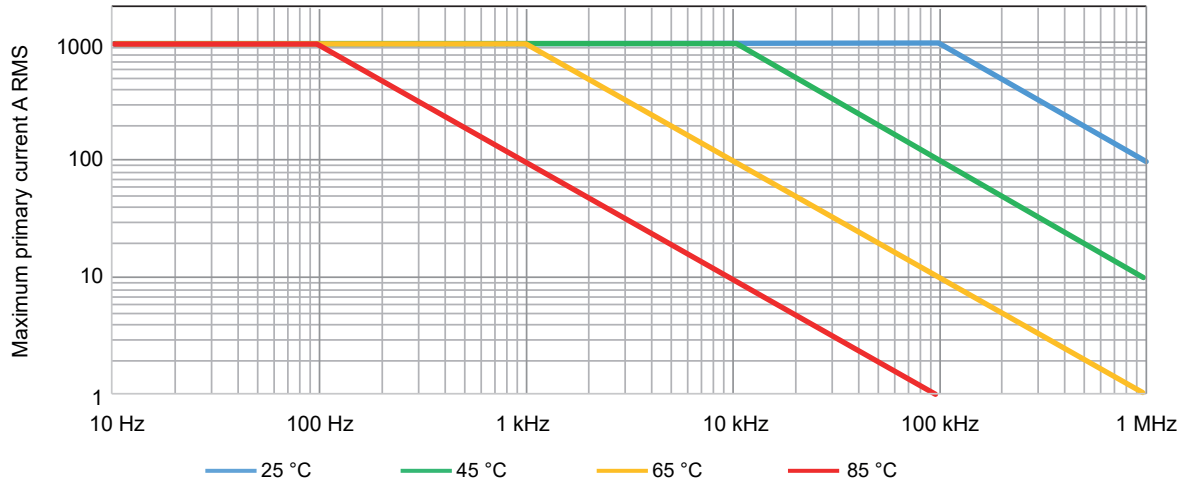

Figure 2: Frequency and ambient temperature derating

Amplitude and Phase Frequency Characteristics

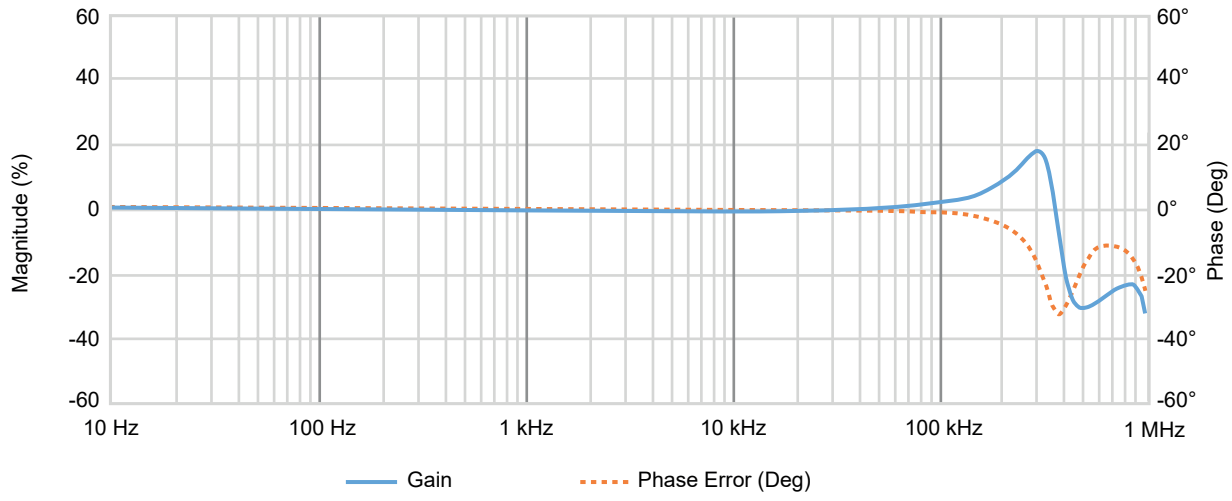

Figure 3: Frequency characteristics

Isolation Specifications[1]		
Clearance	11.0 mm	
Creepage distance	11.0 mm	
Comparative tracking index (CTI)	> 600 V	
Continuous working voltage (according to IEC 61010-1) [2] [3]	**Using uninsulated wire**	**Using BASIC insulated wire:**
Non mains signals	1000 V	2000 V
CAT II signals	1000 V RMS / 1000 V DC	1000 V RMS / 1000 V DC
CAT III signals	600 V RMS / 600 V DC	1000 V RMS / 1000 V DC
Transient voltage (according to IEC 61010-1) [2] [3]	**Using uninsulated wire**	**Using BASIC insulated wire:**
Non mains signals	5000 V	7500V
CAT II signals	9500 V	6000 V
CAT III signals	9500 V	8000 V

(1) **Note:** Higher isolation voltages can be achieved using isolated bus bars. Contact custom systems at: customsystems@hbkworld.com.

(2) ⚠ When using REINFORCED insulated wire, all wiring must be insulated for the highest voltage used. When using BASIC insulated or uninsulated wire, follow the specified voltages in the table above.

(3) ⚠ Do not connect the transducer to signals or use for measurements within Measurement Category IV, or for measurements on MAINs circuits or on circuits derived from Overvoltage Category IV which may have transient overvoltages above what the product can withstand. The product must not be connected to circuits that have a maximum voltage above the continuous working voltage, relative to earth or to other channels, or this could damage and defeat the insulation.

Environmental and Safety Specifications	
Ambient operating temperature range	-40 °C to +85 °C
Storage temperature range	-40 °C to +85 °C
Relative humidity	20% to 80%, Non-condensing
Maximum altitude	2000 m (6562 ft)
Usage	Designed for indoor use
Polution Degree	2
External devices	External devices connected to current transducers must comply with the standards IEC61010-1 and IEC62368-1 and be energy-limited circuitry.
Cleaning	The transducer should only be cleaned with a damp cloth. No detergent or chemicals should be used.
Ambient Temperature	**Note:** When multiple primary turns are used or high primary currents are applied the temperature around the transducer will increase, please monitor to ensure that the maximum ratings are not exceeded. It is recommended to have minimum 1mm^2 per ampere in the primary bus-bar.

Advanced Sensor Protection Circuits (ASPC)
Developed to protect the current transducer from typical fault conditions
• Unit is unpowered and secondary circuit is open or closed • Unit is powered and secondary circuit is open or interrupted
Both DC and AC primary current up to 100% of nominal value can be applied to the current transducers in the situations above without damage to the electronics

Note: The sensor core can be magnetized in all the cases above, resulting in a small change in output offset current (less than 10 ppm).

Harmonized Standards for CE and UKCA Compliance, According to the Following Directives[1]	
Low Voltage Directive (LVD): 2014/35/EU Electromagnetic Compatibility Directive (EMC): 2014/30/EU	
Electrical Safety	
EN 61010-1 (2017)	Safety requirements for electrical equipment for measurement, control, and laboratory use - General requirements
EN 61010-2-030 (2017)	Particular requirements for testing and measuring circuits
Electromagnetic Compatibility	
EN 61326-1 (2013)	Electrical equipment for measurement, control and laboratory use - EMC requirements - Part 1: General requirements

(1) UKCA The manufacturer declares on its sole responsibility that the product is in conformity with the essential requirements of the applicable UK legislation and that the relevant conformity assessment procedures have been fulfilled.

Manufacturer:

Hottinger Brüel & Kjaer GmbH
Im Tiefen See 45
64293 Darmstadt
Germany

Importer:

Hottinger Bruel & Kjaer UK Ltd.
Technology Centre Advanced Manufacturing Park
Brunel Way Catcliffe
Rotherham
South Yorkshire
S60 5WG
United Kingdom

D-SUB 9 Pins Male Pin Layout

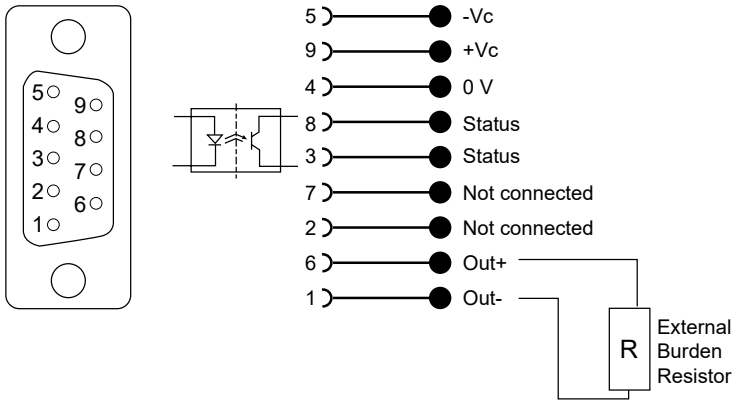

Figure 4: Standard D-SUB 9 current output

Positive primary current direction	Identified by an arrow on the transducer body
Status pin properties	
Forwarded direction	Pin 8 to 3 (shorted, when the sensor is operating in normal conditions)
Maximum forward current	10 mA
Maximum forward voltage	60 V
Maximum reverse voltage	5 V

Physical, Weight and Dimensions(1)

Weight	0.75 kg
Mounting instructions	
Base plate mounting	2 slotted holes Ø6 mm (Fastening torque: 5.5 Nm)
Back plate mounting	4 slotted holes Ø6 mm (Fastening torque: 5.5 Nm)

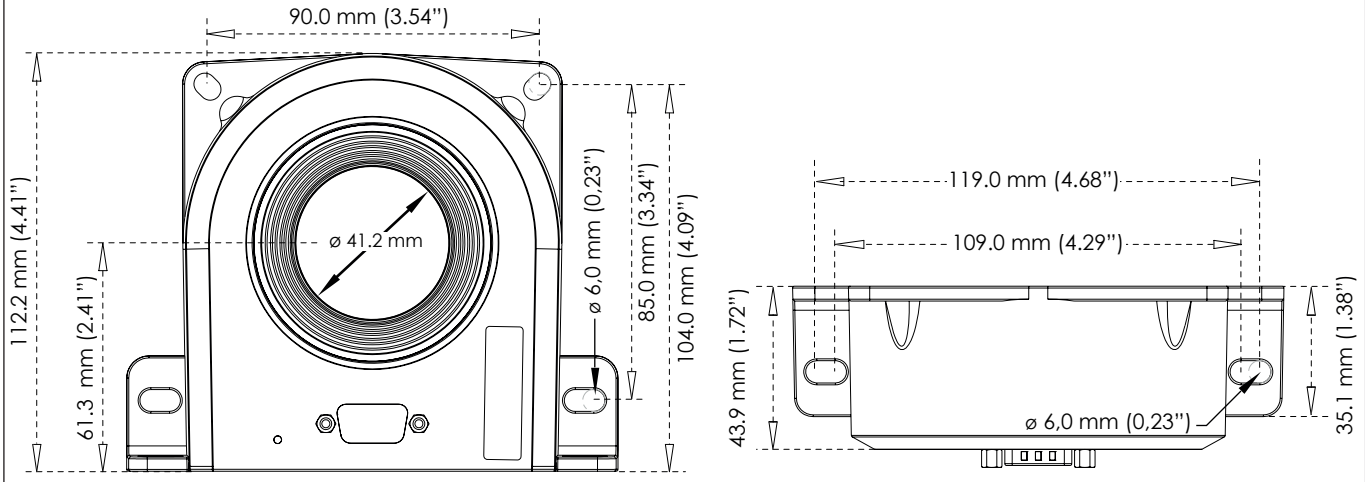

Figure 5: CTN1000ID dimension

(1) General tolerance of 0.3 mm unless otherwise stated

1-CTPSIU-6-1U Interface Unit for CT (Option, to be ordered separately)	
Modular 19” rack with 1 to maximum 6 channel CT support.	

Figure 6: Front side (left) and rear side (right)

Maximum number of CTs	6
Input connectors	9 pin SUBD
Output connectors	XLR
Signal LEDS	CT Power ON, CT Status
Power supply	100 to 240 V AC, 47 to 63 Hz 120 - 370 V DC
Weight	Typical 6.5 kg (14.33 lb)
Operating temperature range	0 °C to +50 °C (32 °F to 122 °F)
Dimensions	
Height	87.2 mm (3,43”)
Width / Width including mounting ears	442 mm (17,40”) / 466 mm (18,34”)
Depth	415 mm (16,33”)

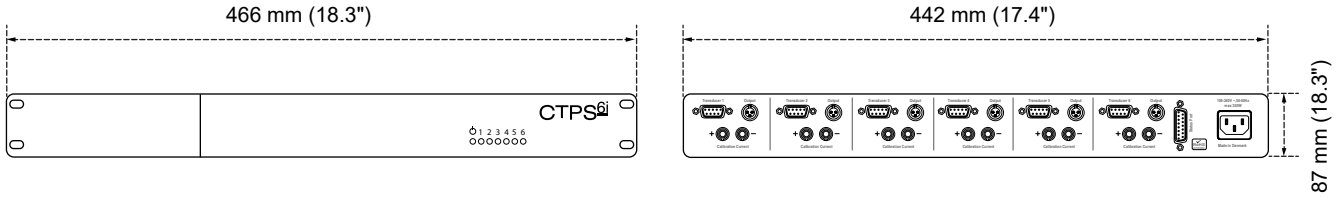

Figure 7: Dimensions

Current Transducer Family Overview				
Type	**Nominal current**	**Bandwidth (-3 dB)**	**Ratio Primary : Secundary**	**Aperture size**
CTT50ID	50 A RMS / 70 A DC	2000 kHz	1 : 500	20.7 mm
CTT100ID	100 A RMS 100 A DC	2000 kHz	1 : 1000	20.7 mm
CTT200ID	200 A RMS 200 A DC	2000 kHz	1 : 1000	20.7 mm
CTN1000ID	1000 A RMS 1000 A DC	400 kHz	1 : 1500	41.2 mm
Other values available on request(1)				

(1) Contact custom systems at: customsystems@hbkworld.com.
Request quote/information for special products for GEN series.

GN310B/GN311B HBM Current Transducer (CT) Wire Diagram

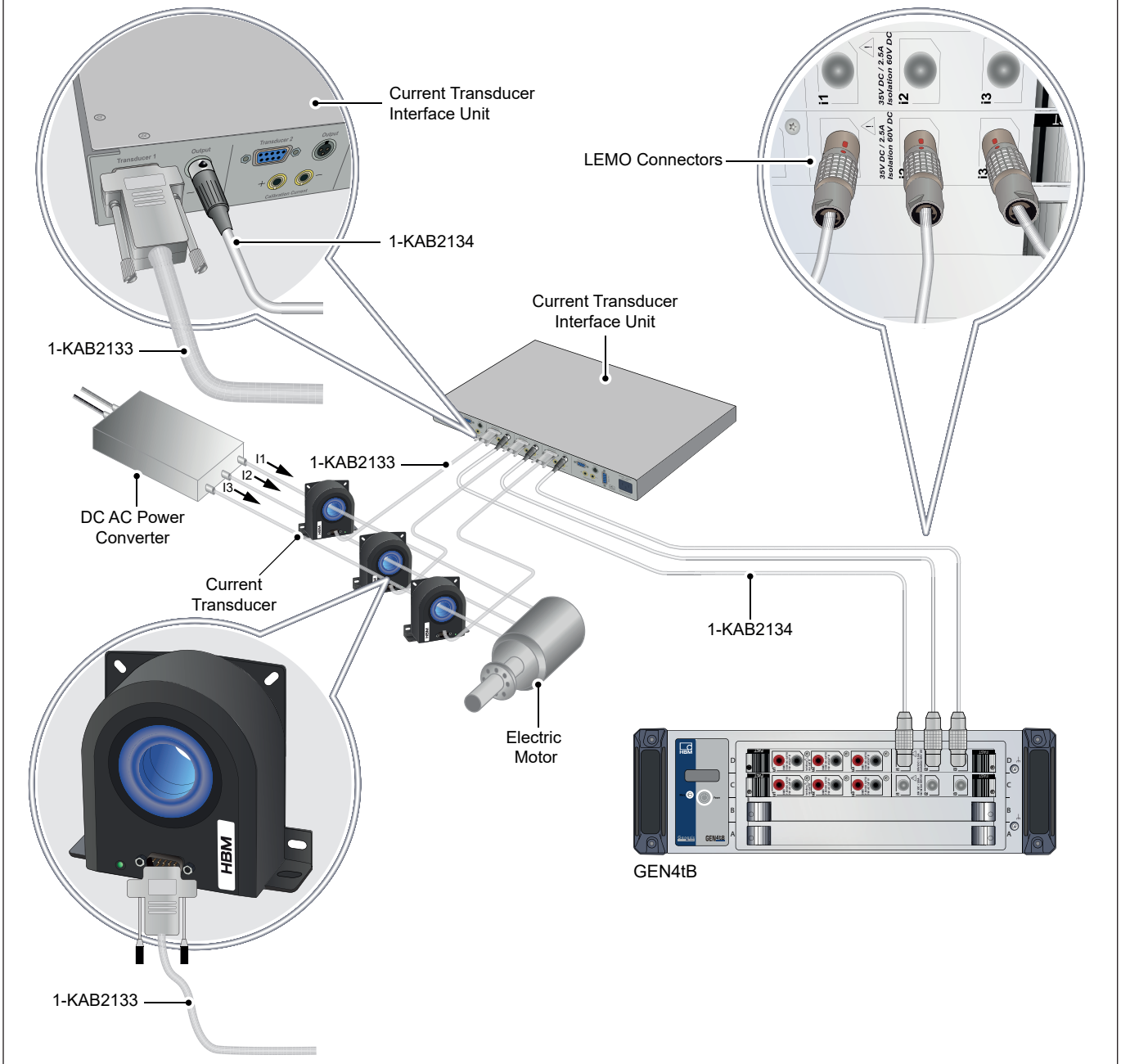

Figure 8: Current transducer connection diagram

GN610B/GN611B Current Transducer (CT) Wire Diagram

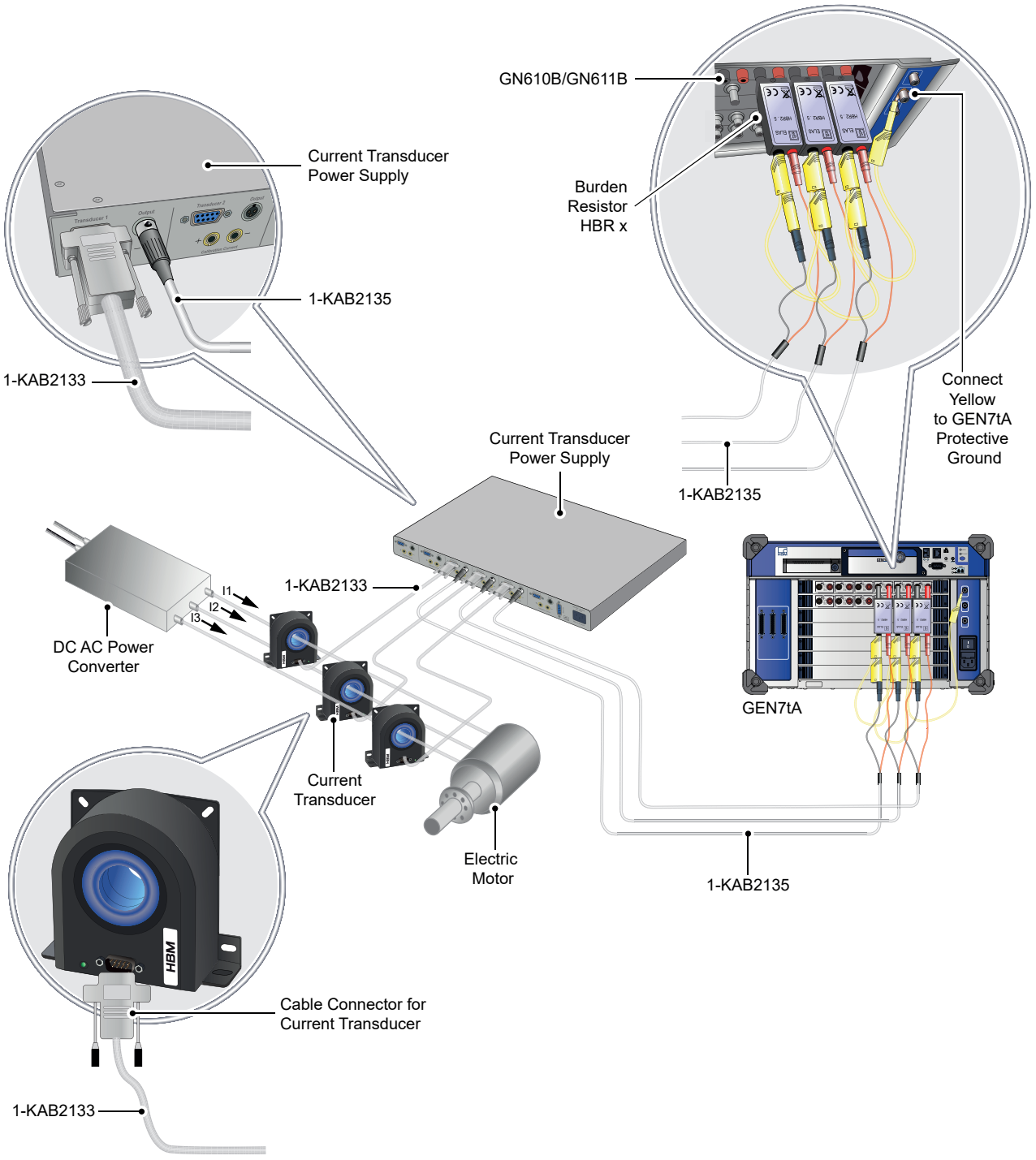

Figure 9: Current transducer connection diagram

Ordering Information

Article		Description	Order No.
1000 A DC or 1000 A RMS current transducer		Ultra-stable, high-precision fluxgate technology current transducer. Non-intrusive isolated DC and AC current measurement up to 1000 A RMS / 1000 A DC. Full aluminum body for superior EMI shielding. Extended operating temperature range. Large aperture ø 41.2 mm for cables and bus bars. Industry standard D-Sub 9 pin connection.	1-CTN1000ID

Current Transducers Interface and Cables, to be ordered separately

Article		Description	Order No.
CT Interface unit		Interface unit for up to six current transducers. Industry standard D-SUB 9 pin input connectors. Multi-pin XLR output connectors. Supports transducer calibration winding access through 4 mm banana plugs. Front LEDs to indicate normal operation of each transducer. 100 - 240 V AC 50/60 Hz AC input voltage. 120 - 370 V DC input voltage. 1U height 19” rack mountable.	1-CTPSIU-6-1U
CT cables		Industry standard current transducer connection cable. Shielded, low ohmic 9 wire cable with D-SUB 9 connectors on both ends. Supports power, status, current output and calibration current input. Lengths: 2, 5, 10 and 20 meters (6, 16, 32 and 65 ft)	1-KAB2133-2 1-KAB2133-5 1-KAB2133-10 1-KAB2133-15 1-KAB2133-20
XLR to LEMO cable for GN31XB		CT interface unit to GN31xB DAQ power card connection cable. Uses XLR and LEMO connectors for a direct current output connection to the GEN DAQ card. Length 2 m (6 ft)	1-KAB2134-2
XLR to Banana cable for GN61XB		CT interface unit to GN61xB DAQ 1kV card connection cable. Uses XLR and banana connectors for a current output connection to the GEN DAQ card. Requires an additional burden resistor in front of the GN61xB card to convert current to voltage. Length 2 m (6 ft)	1-KAB2135-2

GN610B/GN611B Burden Resistors, to be ordered separately

Burden selection for GN610B/GN611B
Note: When using the CTS/CTM series together with GN610B/GN611B cards a burden resistor is required to convert the CT output current to a voltage. When selecting the burden several specifications need to be taken into account: maximum power of the burden, maximum voltage the CT can drive with constant current, the wire impedance of the cables used etc. See the CT operating manual for more details.

Model	Recommended burden	mV/A sensitivity	A/V scaling
CTT50ID	HBR 2.5 Ω	5.0	200
CTT100ID	HBR 1.0 Ω	2.0	500
CTT200ID	HBR 1.0 Ω	0.5	2000
CTN1000ID	HBR 1.0 Ω	0.6667	1500

Article		Description	Order No
HBR 0.25 Ω, 1 W precision burden resistor		0.25 Ω1 W, 0.02% high precision, low thermal drift burden resistor. Internally uses 4 wire connection to reduce inaccuracy caused by the currents running to the burden resistor. Using banana input connectors and banana output pins. Directly compatible with GN610B/GN611B acquisition cards.	Ordered from custom systems(1)
HBR 0.5 Ω, 1 W precision burden resistor		0.5 Ω1 W, 0.02% high precision, low thermal drift burden resistor. Internally uses 4 wire connection to reduce inaccuracy caused by the currents running to the burden resistor. Using banana input connectors and banana output pins. Directly compatible with GN610B/GN611B acquisition cards.	Ordered from custom systems(1)
HBR 1 Ω, 1 W precision burden resistor		1 Ω, 1 W, 0.02% high precision, low thermal drift burden resistor. Internally uses 4 wire connection to reduce inaccuracy caused by the currents running to the burden resistor. Using banana input connectors and banana output pins. Directly compatible with GN610B/GN611B acquisition cards.	Ordered from custom systems(1)
HBR 2.5 Ω, 1 W precision burden resistor		2.5 Ω, 1 W, 0.02% high precision, low thermal drift burden resistor. Internally uses 4 wire connection to reduce inaccuracy caused by the currents running to the burden resistor. Using banana input connectors and banana output pins. Directly compatible with GN610B/GN611B acquisition cards.	Ordered from custom systems(1)
HBR 10 Ω, 1 W precision burden resistor		10 Ω, 1 W, 0.02% high precision, low thermal drift burden resistor. Internally uses 4 wire connection to reduce inaccuracy caused by the currents running to the burden resistor. Using banana input connectors and banana output pins. Directly compatible with GN610B/GN611B acquisition cards.	Ordered from custom systems(1)

(1) Contact custom systems at: customsystems@hbkworld.com.
Request quote/information for special products for GEN series.

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B06052_01_E00_00 01/02/2024