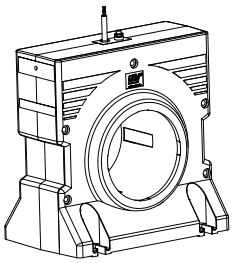
Current Transducer RA 2000-S/SP1

For the measurement of alternating components in a determined bandwidth, contained in a continuous primary current.



Electrical data

M	Mutual inductance		$4.4018 \cdot 10^{-6}$	H
U_{out}	Output voltage (analog)	$U_{out} = M \cdot \frac{di_P}{dt}$		V
	When I_P has a sinusoidal shape	$U_{out\ RMS} =$	$2 \cdot \pi \cdot M \cdot f \cdot I_{P\ RMS}$	V
			$2 \cdot \pi \cdot M = 27.657 \cdot 10^{-6}$	H

Examples: $U_{out\ RMS} = 4.4018 \cdot 10^{-6} \cdot 2 \cdot \pi \cdot 50 \cdot 50 = 0.069$ V @ 50 Hz, 50 A

$U_{out\ RMS} = 4.4018 \cdot 10^{-6} \cdot 2 \cdot \pi \cdot 3000 \cdot 50 = 4.140$ V @ 3000 Hz, 50 A

L_S	Inductance of secondary circuit (±6 %)	8.65	mH
N_S	Number of secondary turns	1920	

Accuracy - Dynamic performance data

BW	Frequency bandwidth	20 ... 3000	Hz

Test circuit

L_T	Inductance of test circuit (±6 %)	8.75	mH
N_T	Number of turns (test winding)	1920	
R_T	Resistance of test winding @ T_A = 70 °C (±3 %)	134	Ω
I_T	Test current	< 50	mA

General data

T_A	Ambient operating temperature	−25 ... 70	°C
$T_{A\ st}$	Ambient storage temperature	−40 ... 85	°C
T_B	Primary conductor temperature	≤ 100	°C
R_S	Secondary coil resistance @ T_A = 70 °C (±3 %)	131	Ω
m	Mass	6	kg
	Standards	EN 50155: 2017 [1)]	
		EN 50121-3-2: 2016	

Note: [1)] Additional information available on request.

Features

- Insulating plastic case recognized according to UL 94-V0.

Special features

- Shielded cable: 2 m
- Connection to screen: M5 threaded stud.

Advantages

- No insertion losses
- Current overload capability.

Applications

- Single or three phase inverters
- Propulsion and braking choppers
- Propulsion converters.

Application Domain

- Railway (fixed installations and onboard).

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Accuracy

Accuracy for the measurement of a single frequency signal:
Amplitude error: in % of the measured signal.·Table 1.1 - Maximum amplitude and phase errors for single frequency signals.

Frequency / Amplitude	20 Hz ... 100 Hz		10 Hz ... 3000 Hz	
	Amplitude error	Phase error in °	Amplitude error	Phase error in °
0.1 A ... 1 A	±2.8	−90 ±5	±2.7	−90 ±2.5
1 ... 10 A	±2.5	−90 ±5	±2.6	−90 ±2.5
10 ... 20 A	±2.9	−90 ±5	±3.0	−90 ±2.5

Accuracy for the measurement of signal added to a DC current of > 10 A

Amplitude error: in % of the measured signal.

Frequency / Amplitude	20 Hz ... 100 Hz		10 Hz ... 3000 Hz	
	Amplitude error	Phase error in °	Amplitude error	Phase error in °
0.1 A ... 1 A	±2.8	−90 ±5	±2.7	−90 ±2.5
1 ... 10 A	±2.5	−90 ±5	±2.6	−90 ±2.5
10 ... 20 A	±2.9	−90 ±5	±3.0	−90 ±2.5

Table 1.2 - Maximum amplitude and phase errors for signals added to a minimum DC fundamental.
The values are the same as without DC (see 1.1)

Accuracy for the measurement of signal added to a AC (fundamental) current in the range between 15 Hz and 100 Hz of > 10 A RMS

Amplitude error: in % of the measured signal.

Frequency / Amplitude	20 Hz ... 100 Hz		10 Hz ... 3000 Hz	
	Amplitude error	Phase error in °	Amplitude error	Phase error in °
0.1 A ... 1 A	±2.8	−90 ±5	±2.7	−90 ±2.5
1 ... 10 A	±2.5	−90 ±5	±2.6	−90 ±2.5
10 ... 20 A	±2.9	−90 ±5	±3.0	−90 ±2.5

Table 1.3 - Maximum amplitude and phase errors for signal added to a minimum AC fundamental.

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Insulation coordination

U_d	RMS voltage for AC insulation test, 50 Hz, 1 min	12 [1)] 500 [2)] Min	kV V
d_{Cp}	Creepage distance	113.5	mm
d_{Cl}	Clearance	107.8	mm
CTI	Comparative Tracking Index (group I)	600	

Notes: [1)] Between primary and secondary + test winding
[2)] Between secondary and test winding.

Safety

This transducer must be used in limited-energy secondary circuits according to IEC 61010-1.

This transducer 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 transducer, certain parts of the module can carry hazardous voltage (e.g. primary busbar, power supply). Ignoring this warning can lead to injury and/or cause serious damage.
This transducer is a build-in device, whose conducting parts must be inaccessible after installation. A protective housing or additional shield could be used.
Main supply must be able to be disconnected.

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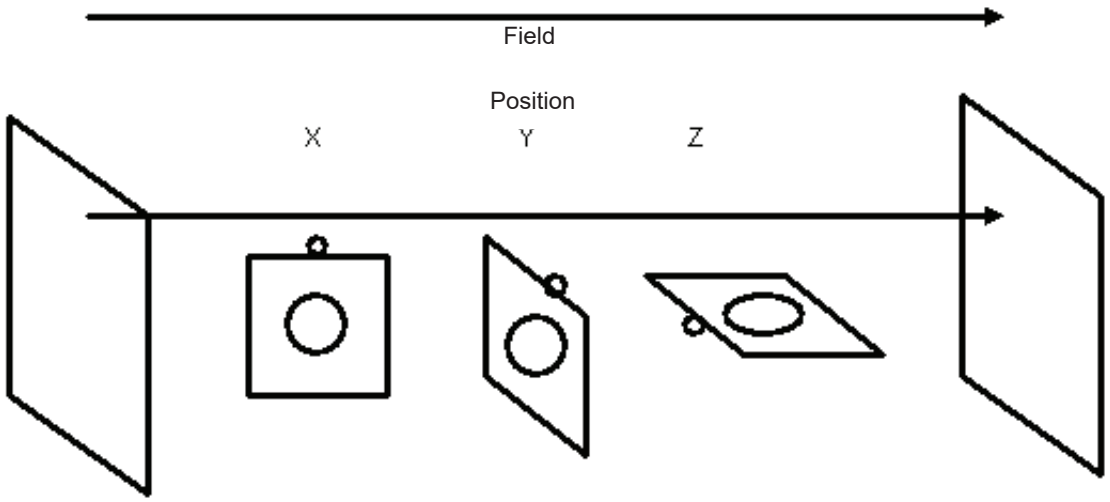
Influence of external magnetic fields

Table 2-1 shows the error in the measurement of the primary current (mA RMS) due to external magnetic fields at the frequency of the external field. The errors are measured with respect to the theorically expected signal.
The influence is different for the 3 axes of the transducer. See Figure 2-1 for the orientation of the axes.
At 50 Hz:

Position / Frequency	X	Y	Z
	mAT/A/m	mAT/A/m	mAT/A/m
H_{AC} @ 50 Hz	5	18.2	1.54
H_{AC} @ 300 Hz	17.6	49.2	1.96

Table 2.1 - Influence of external magnetic fields in each axes of the transducer.



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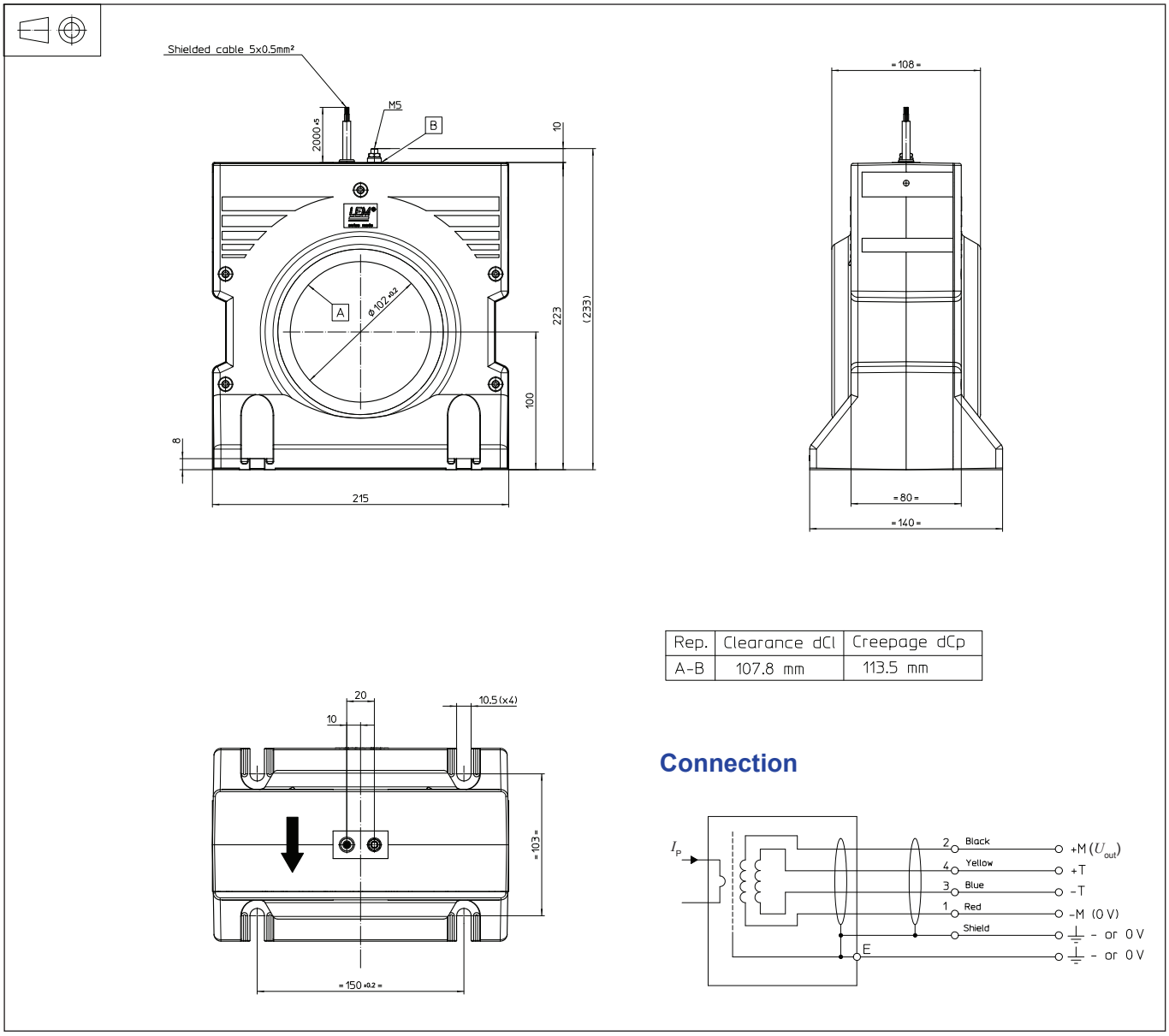
Dimensions RA 2000-S/SP1 (in mm)



Rep.	Clearance dCl	Creepage dCp
A-B	107.8 mm	113.5 mm

Connection

Mechanical characteristics

- General tolerance ±1 mm
- Transducer fastening 4 slots ⌀ 10.5 mm
  4 steel screws M10
  Recommended fastening torque 11.5 N·m
- Primary through-hole ⌀ 102 mm
- Connection of secondary shielded cable 5 x 0.5 mm²
- Connection of screen M5 threaded stud
  Recommended fastening torque 2.2 N·m

Remarks

- U_S is positive when di/dt flows in the direction of the arrow.
- Temperature of the primary conductor should not exceed 100 °C.
- Installation of the transducer must be done unless otherwise specified on the datasheet, according to LEM Transducer Generic Mounting Rules. Please refer to LEM document N°ANE120504 available on our Web site: https://www.lem.com/en/file/3137/download/.

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