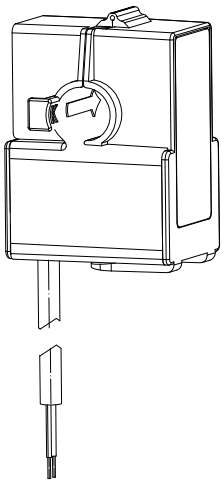
Current Transducer TOP 90-S10/SP4

I_{PN} = 90 A

For the electronic measurement of AC current, with galvanic separation between the primary and the secondary circuit.



Features

- Class I compliance
- Split core type
- ⌀ 10 mm sensing aperture non-contact measurement
- Insulating plastic case recognized according to UL 94-V0.

Special features

- Cable output 5 m
- With covers protected.

Advantages

- High accuracy and low phase shift
- Compact case
- Cost-effective solution
- Easy mounting.

Applications

- Power meters
  Current measurement for active power calculation
- Energy sub-meters
  For energy efficiency monitoring, consumption analysis and costs allocation
- Power quality monitoring
- Condition monitoring
  (e.g. motor loads such as conveyers, pumps or HVAC)
- Distributed measurement systems
- Uninterruptible Power Supplies (UPS)
- Power suppliers for welding applications
- Renewable Energy (Solar and Wind).

Standards

- EN 50178: 1997
- IEC 61010-1: 2010
- UL 508: 2010.

Application Domain

- Industrial.

LEM International SA
Chemin des Aulx 8
1228 PLAN-LES-OUATES Switzerland
www.lem.com

Absolute maximum ratings

Parameter	Symbol	Unit	Value
Maximum primary conductor temperature	$T_{B\ max}$	°C	100

Stresses above these ratings may cause permanent damage. Exposure to absolute maximum ratings for extended periods may degrade reliability.

UL 508:Ratings and assumptions of certification

File # E189713 Volume: 2 Section: 8

Standards

- CSA C22.2 NO. 14 - 10 INDUSTRIAL CONTROL EQUIPMENT - Edition 11 - Revision Date 2011/08/01
- UL 508 STANDARD FOR INDUSTRIAL CONTROL EQUIPMENT - Edition 17 - Revision Date 2010/04/15.

Parameter	Symbol	Unit	Value
Primary involved potential		V AC/DC	1000
Ambient operating temperature	T_A	°C	70
Primary current	I_P	A	0 to 90
Output current	I_{out}	mA	0 to 90

Conditions of acceptability

When installed in the end-use equiment, consideration shall be given to the following:

1 - These devices must be mounted in a suitable end-use enclosure.

2 - The terminals have not been evaluated for field wiring.

3 - The products shall be used in a pollution degree 2.

4 - Base on results of temperature tests, int he end use application, a maximum of 100 °C cannot be exceeded on the primary conductor.

Marking

Only those products bearing the UL or UR Mark should be considered to be Listed or Recognized and covered under UL's Follow-Up Service.Always look for the Mark on the product.

LEM International SA
Chemin des Aulx 8
1228 PLAN-LES-OUATES Switzerland
www.lem.com

Insulation coordination

Parameter	Symbol	Unit	Value	Comment
RMS voltage for AC insulation test, 50 Hz/1 min	U_d	kV	4.3	Between primary (completely filling the hole) and secondary
Impulse withstand voltage 1.2/50 µs	U_{Ni}	kV	7.8	
Partial discharge extinction RMS voltage @ 10 pC	U_e	V	1800	
Clearance (pri. - sec.)	d_{Cl}	mm	8	Shortest distance through air
Creepage distance (pri. - sec.)	d_{Cp}	mm	8	Shortest path along device body
Case material	-	-	V0 according to UL 94	
Comparative tracking index	CTI		600	
Application example		V	600	Reinforced insulation, non uniform field according to EN 50178 CAT III PD2
Application example		V	1000	Basic insulation, non uniform field according to EN 61010 CAT III PD2
Application example		V	600	According to UL 508 CAT III PD2

Environmental and mechanical characteristics

Parameter	Symbol	Unit	Min	Typ	Max	Comment
Ambient operating temperature	T_A	°C	−25		+70	
Ambient storage temperature	T_S	°C	−30		+90	
Mass	m	g		80		

LEM International SA
Chemin des Aulx 8
1228 PLAN-LES-OUATES Switzerland
www.lem.com

Electrical data TOP 90-S10/SP4

At T_A = 25 °C, R_L = 4 Ω, unless otherwise noted.

Parameter	Symbol	Unit	Min	Typ	Max	Comment
Primary nominal RMS current	I_{PN}	At		90		
Output current @ I_{PN}	I_{out}	mA		90		
Phase shift	$\Delta\varphi$	°	0.5	1.5	2.5	
Sensitivity error @ I_{PN}	ε_S	%	−1		+1	
Temperature coefficient of I_{out}	TCI_{out}	ppm/K			60	
Linearity error	ε_L	% of I_{PN}			0.1	
Frequency bandwidth (±1 dB)	BW	Hz		50/60		

Definition of typical, minimum and maximum values

Minimum and maximum values for specified limiting and safety conditions have to be understood as such as well as values shown in “typical” graphs.
On the other hand, measured values are part of a statistical distribution that can be specified by an interval with upper and lower limits and a probability for measured values to lie within this interval.

Unless otherwise stated (e.g. “100 % tested”), the LEM definition for such intervals designated with “min” and “max” is that the probability for values of samples to lie in this interval is 99.73 %.
For a normal (Gaussian) distribution, this corresponds to an interval between -3 sigma and +3 sigma. If “typical” values are not obviously mean or average values, those values are defined to delimit intervals with a probability of 68.27 %, corresponding to an interval between -sigma and +sigma for a normal distribution.
Typical, maximal and minimal values are determined during the initial characterization of a product.

Phase shift compensation capacitance with different load resistance and frequency

Load resistance (Ω)	50 Hz	60 Hz	Class I compliance
	Compensation capacitance (µF)	Compensation capacitance (µF)	
4.1	10 µF + 10 µF	10 µF + 4.7 µF	OK
5.6	10 µF + 4.7 µF	10 µF + 1 µF	OK
6.8	10 µF + 2.2 µF	6.8 µF + 2.2 µF	OK
7.5	10 µF + 2.2 µF	6.8 µF + 0.47 µF	OK
8.2	10 µF + 1 µF	6.8 µF + 1 µF	OK
9.1	10 µF	6.8 µF + 0.47 µF	OK
10	4.7 µF + 4.7 µF	6.8 µF	OK
12	6.8 µF + 1 µF	4.7 µF + 1 µF	OK
15	6.8 µF + 0.47 µF	4.7 µF + 0.22 µF	OK
20	4.7 µF + 1 µF	2.2 µF + 2.2 µF	OK

LEM International SA
Chemin des Aulx 8
1228 PLAN-LES-OUATES Switzerland
www.lem.com

Typical performance characteristics TOP 90-S10/SP4 versus load resistance R_L @ 25 °C

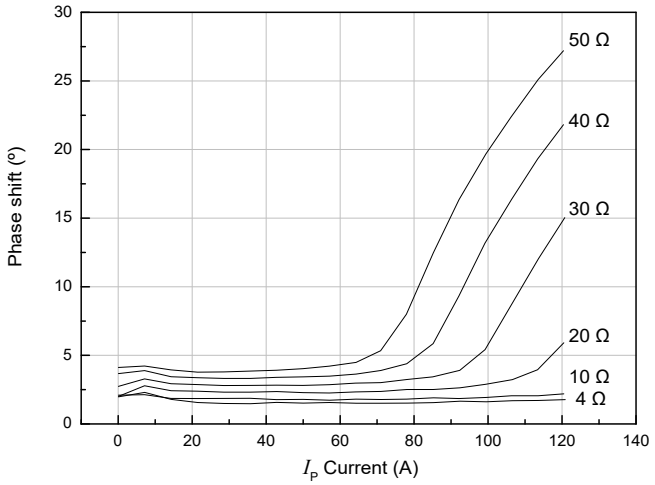


Figure 1: Phase shift @ 50 Hz

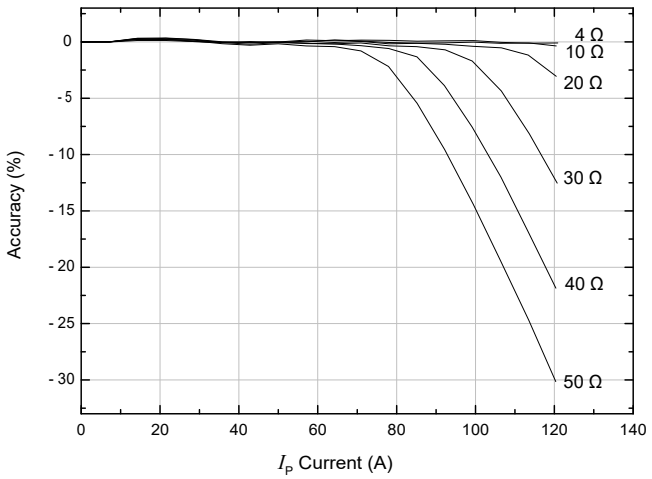


Figure 2: Accuracy @ 50 Hz

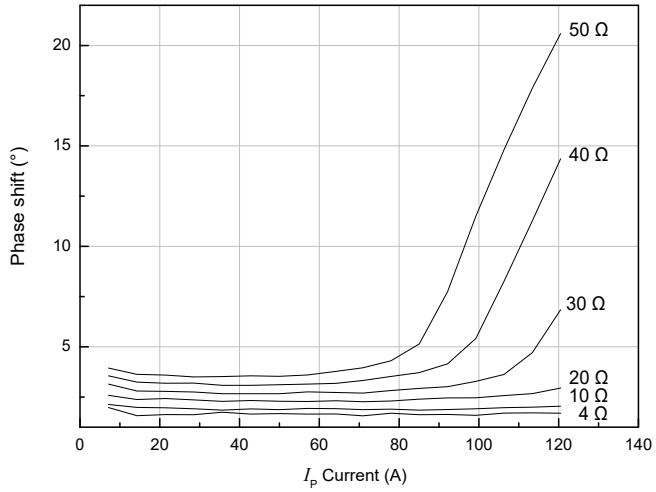


Figure 3: Phase shift @ 60 Hz

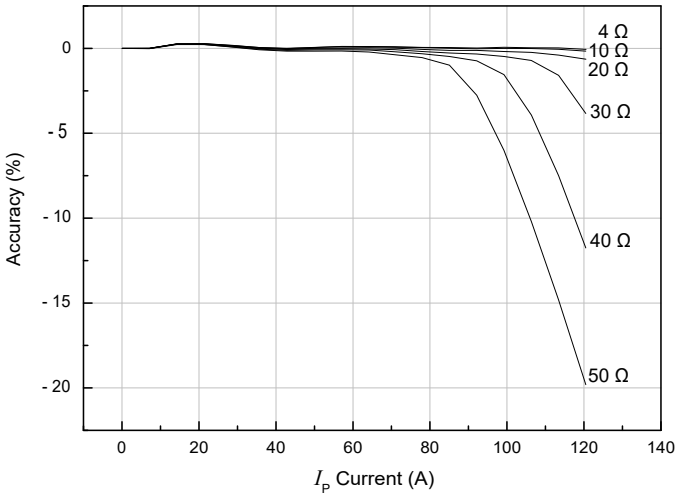


Figure 4: Accuracy @ 60 Hz

Typical phase shift characteristics TOP 90-S10/SP4 versus load resistance and compensation capacitance

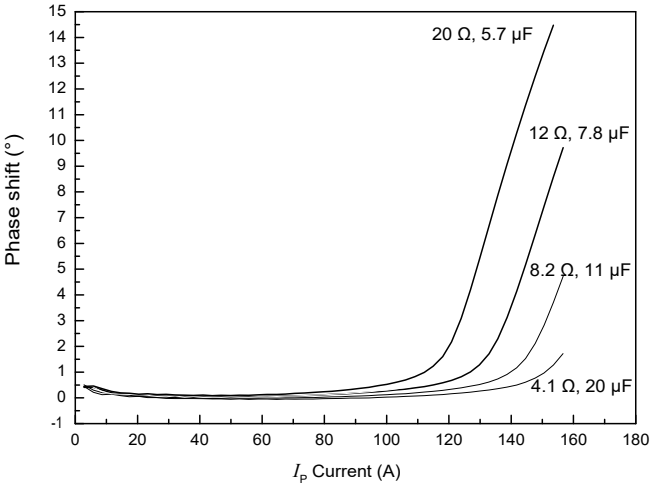


Figure 5: Phase shift @ 50 Hz

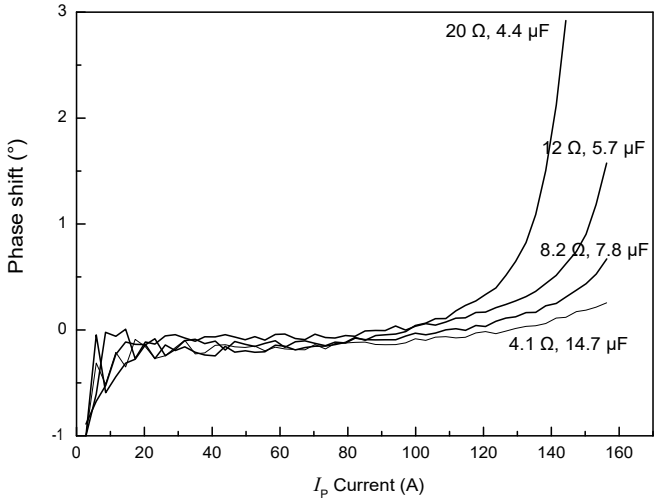


Figure 6: Phase shift @ 60 Hz

LEM International SA
Chemin des Aulx 8
1228 PLAN-LES-OUATES Switzerland
www.lem.com

Typical performance characteristics TOP 90-S10/SP4 accuracy versus load resistance R_L

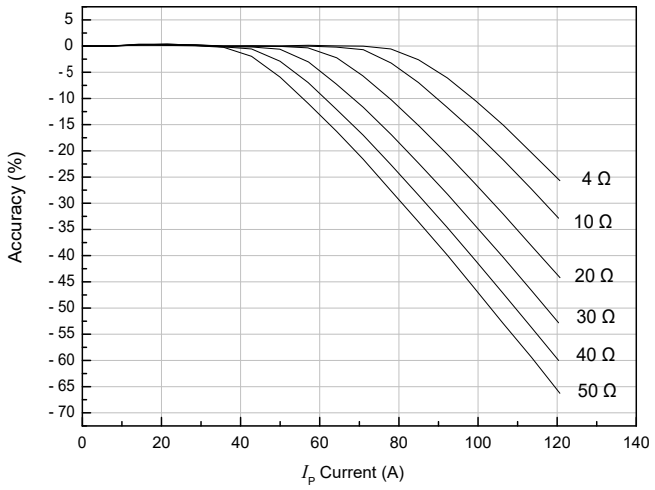


Figure 7: Accuracy with different R_L @ 105 °C

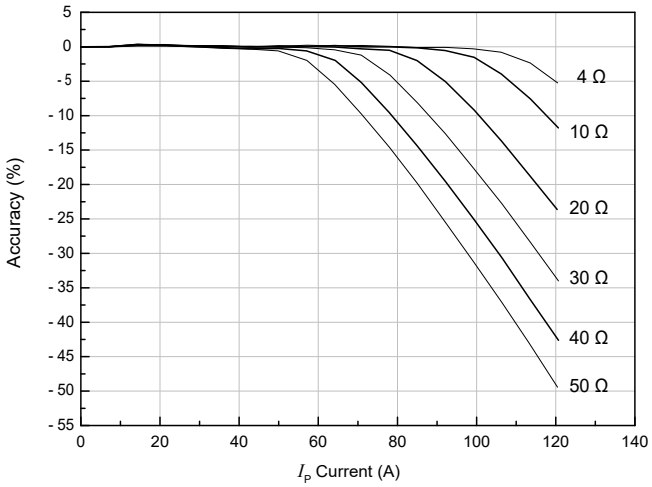


Figure 8: Accuracy with different R_L @ 70 °C

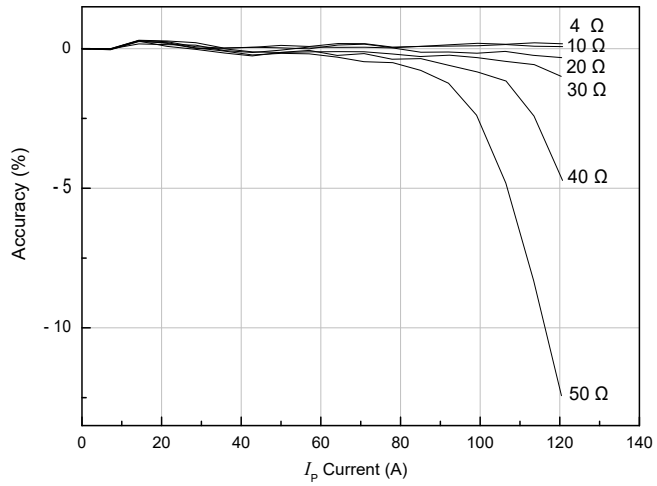


Figure 9: Accuracy with different R_L @ −20 °C

LEM International SA
Chemin des Aulx 8
1228 PLAN-LES-OUATES Switzerland
www.lem.com

Performance parameters definition

Ampere-turns and amperes

The transducer is sensitive to the primary current linkage Θ_P (also called ampere-turns).

$\Theta_P = N_P \cdot I_P$ (At)
Where N_P is the number of primary turn (depending on the connection of the primary jumpers)

Caution: As most applications will use the transducer with only one single primary turn (N_P = 1), much of this datasheet is written in terms of primary current instead of current linkages. However, the ampere-turns (At) unit is used to emphasis that current linkages are intended and applicable.

Sensitivity and linearity

To measure sensitivity and linearity, the primary current (AC) is cycled from 0 to I_{PN}. The sensitivity S is defined as the slope of the linear regression line for a cycle between 0 ... I_{PN}.
The linearity error ε_L is the maximum positive or negative difference between the measured points and the linear regression line, expressed in % of I_{PN}.

Overall accuracy

The overall accuracy at 25 °C ε_S is the error in the 0 ... I_{PN} range, relative to the rated value I_{PN}.

LEM International SA
Chemin des Aulx 8
1228 PLAN-LES-OUATES Switzerland
www.lem.com

Safety

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

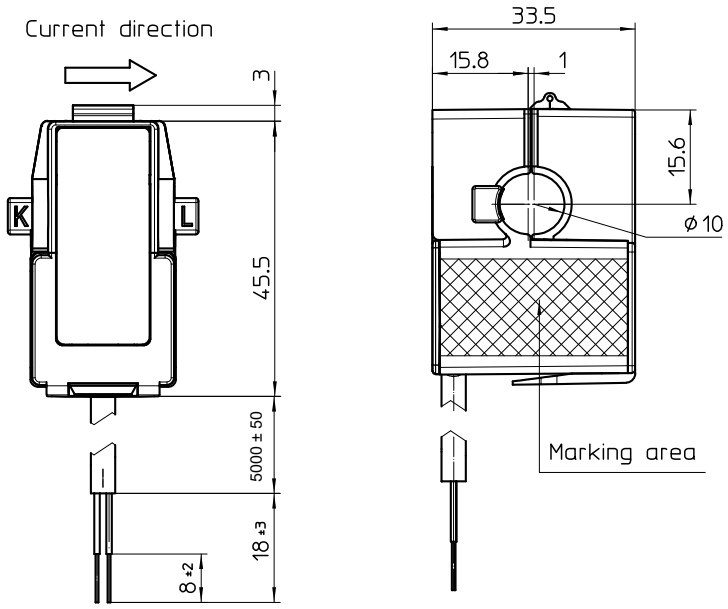
This transducer must be used in electric/electronic equipment with respect to applicable standards and safety requirements in accordance with the manufacturer's operating instructions.

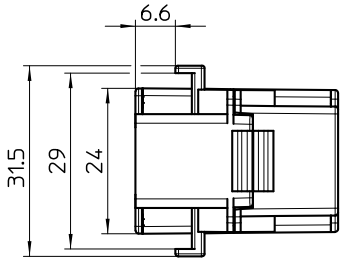
Caution, risk of electrical shock

When operating the transducer, certain parts of the module can carry hazardous voltage (eg. 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.

LEM International SA
Chemin des Aulx 8
1228 PLAN-LES-OUATES Switzerland
www.lem.com

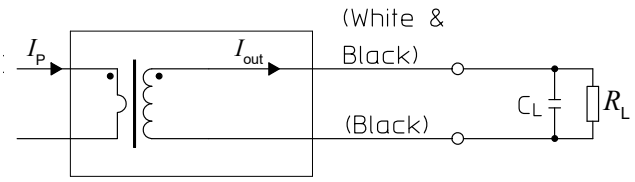
Dimensions (in mm)





d_{Cl}	d_{Cp}
8mm	8mm

Connection



Mechanical characteristics

- General tolerance ±0.5 mm
- Primary aperture ⌀ 10 mm
- Fastening Cable tie
- Output cable length 5 m

Remarks

- Attention: contact areas (air gap) must be kept clean (particle free) to ensure proper performance.
- 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/.**

LEM International SA
Chemin des Aulx 8
1228 PLAN-LES-OUATES Switzerland
www.lem.com