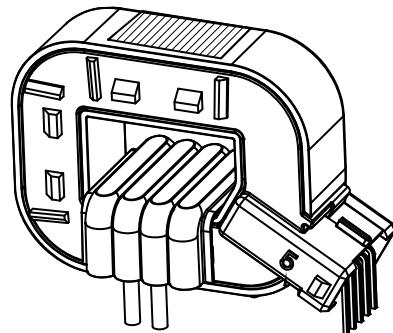


For the electronic measurement of current: DC, AC, pulsed..., with galvanic separation between the primary and the secondary circuit.



Features

- Open loop multi-range current transducer
- Voltage output
- Single power supply +5 V
- Overcurrent detect $2.92 \times I_{PN}$ (peak value)
- EEPROM Control
- Galvanic separation between primary and secondary circuit
- Low power consumption
- Compact design for THT PCB mounting
- Aperture: $15 \times 8 \text{ mm}$
- Factory calibrated
- **Dedicated parameter settings available on request (see page 6).**

Special features

- Internal reference $V_{ref} = 1.65 \text{ V}$
- $V_{out} - V_{ref} = 460 \text{ mV} @ I_{PN}$

Advantages

- Low offset drift
- Over-drivable V_{ref}
- 8 mm creepage/clearance
- Fast response.

Applications

- AC variable speed and servo motor drives
- Static converters for DC motor drives
- Battery supplied applications
- Uninterruptible Power Supplies (UPS)
- Switched Mode Power Supplies (SMPS)
- Power supplies for welding applications
- Combiner box
- MPPT.

Standards

- IEC 61800-2: 2015
- IEC 61800-3: 2004
- IEC 61800-5-1: 2007
- IEC 62109-1: 2010
- UL 508: 2013.

Application Domain

- Industrial.

Absolute maximum ratings

Parameter	Symbol	Unit	Value
Supply voltage (not destructive)	U_c	V	8
Supply voltage (not entering non standard modes)	U_c	V	6.5
Primary conductor temperature	T_B	°C	120
Electrostatic discharge voltage	U_{ESD}	kV	2

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: 5

Standards

- CSA C22.2 NO. 14-10 INDUSTRIAL CONTROL EQUIPMENT - Edition 12
- UL 508 STANDARD FOR INDUSTRIAL CONTROL EQUIPMENT - Edition 17

Ratings

Parameter	Symbol	Unit	Value
Primary involved potential		V AC/DC	600
Max surrounding air temperature	T_A	°C	105
Primary current	I_P	A	According to series primary current
Secondary supply voltage	U_c	V DC	5
Output voltage	V_{out}	V	0 to 5

Conditions of acceptability

- 1 - These devices have been evaluated for overvoltage category III and for use in pollution degree 2 environment.
- 2 - A suitable enclosure shall be provided in the end-use application.
- 3 - The terminals have not been evaluated for field wiring.
- 4 - These devices are intended to be mounted on a printed wiring board of end use equipment. The suitability of the connections (including spacings) shall be determined in the end-use application.
- 5 - Primary terminals shall not be straightened since assembly of housing case depends upon bending of the terminals.
- 6 - Any surface of polymeric housing have not been evaluated as insulating barrier.
- 7 - Low voltage control circuit shall be supplied by an isolating source (such as a transformer, optical isolator, limiting impedance or electro-mechanical relay).
- 10 - The jumper installed within the primary hole is only intended for fixing the sensor and not for carrying the primary current

Marking

Only those products bearing the 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.

Insulation coordination

Parameter	Symbol	Unit	Value	Comment
RMS voltage for AC insulation test 50/60 Hz/1 min	U_d	kV	4.3	
Impulse withstand voltage 1.2/50 μ s	\bar{U}_w	kV	8	
Partial discharge test voltage ($q_m < 10$ pC)	U_t	V	1500	Busbar/secondary, jumpers/secondary
Clearance (pri. - sec.)	d_{Cl}	mm	> 8	Shortest distance through air
Creepage distance (pri. - sec.)	d_{Cp}	mm	> 8	Shortest path along device body
Clearance (pri. - sec.)	-	mm	> 8	When mounted on PCB with recommended layout
Case material	-	-	V0	According to UL 94
Comparative tracking index	CTI		600	
Application example	-	-	600 V CAT III PD2	Reinforced insulation according to IEC 61800-5-1
Application example	-	-	1000 V CAT III PD2	Basic insulation according to IEC 61800-5-1

Environmental and mechanical characteristics

Parameter	Symbol	Unit	Min	Typ	Max	Comment
Ambient operating temperature	T_A	°C	-40		105	
Ambient storage temperature	T_s	°C	-40		105	
Mass	m	g		34		

Electrical data

At $T_A = 25^\circ\text{C}$, $U_C = +5\text{ V}$, $R_L = 10\text{ k}\Omega$ unless otherwise noted (see Min, Max, typ. definition paragraph in page 7).

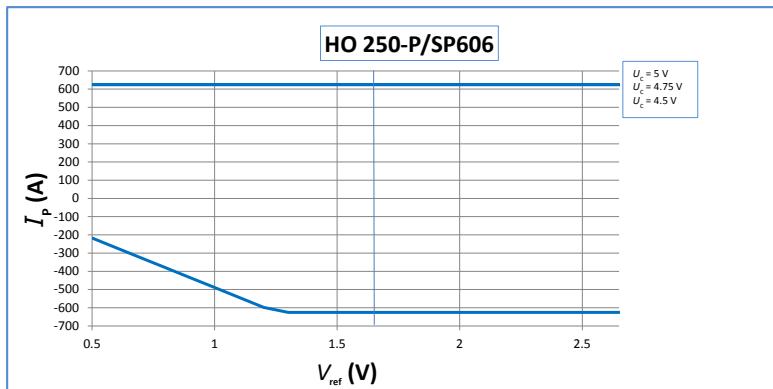
Parameter	Symbol	Unit	Min	Typ	Max	Comment
Primary nominal RMS current	I_{PN}	A		250		
Primary current, measuring range	I_{PM}	A	-625		625	
Number of primary turns	N_p	-		1		See application information
Supply voltage ¹⁾	U_C	V	4.5	5	5.5	
Current consumption	I_C	mA		19	25	
Reference voltage (output)	V_{ref}	V	1.63	1.65	1.67	Internal reference
Reference voltage (input)	V_{ref}	V	0.5		2.65	External reference
Output voltage range @ I_{PM}	$V_{out} - V_{ref}$	V	-1.15		1.15	Over operating temperature range
V_{ref} output resistance	R_{ref}	Ω	130	200	300	Series
V_{out} output resistance	R_{out}	Ω		2	5	Series
Allowed capacitive load	C_L	nF	0		6	
Overcurrent detection output on resistance	R_{on}	Ω	70	95	150	Open drain, active low Over operating temperature range
Overcurrent detection hold	t_{hold}	ms	0.7	1	1.4	Additional time after threshold has released
EEPROM control	V_{out}	mV	0		50	V_{out} forced to GND when EEPROM in an error state ²⁾
Electrical offset voltage @ $I_p = 0\text{ A}$	V_{OE}	mV	-5		5	$V_{out} - V_{ref}$ @ $V_{ref} = 1.65\text{ V}$
Electrical offset current Referred to primary	I_{OE}	A	-2.72		2.72	
Temperature coefficient of V_{ref}	TCV_{ref}	ppm/K	-170		170	-40 $^\circ\text{C}$... 105 $^\circ\text{C}$
Temperature coefficient of V_{OE}	TCV_{OE}	mV/K	-0.075		0.075	-40 $^\circ\text{C}$... 105 $^\circ\text{C}$
Offset drift referred to primary @ $I_p = 0\text{ A}$	TCI_{OE}	mA/K	-40.8		40.8	-40 $^\circ\text{C}$... 105 $^\circ\text{C}$
Theoretical sensitivity	G_{th}	mV/A		1.84		460 mV @ I_{PN}
Sensitivity error @ I_{PN}	ε_G	%	-0.5		0.5	Factory adjustment (straight bus-bar)
Temperature coefficient of G	TCG	ppm/K	-350		350	-40 $^\circ\text{C}$... 105 $^\circ\text{C}$
Linearity error 0 ... I_{PN}	ε_L	% of I_{PN}	-0.5		0.5	
Linearity error 0 ... I_{PM}	ε_L	% of I_{PM}	-0.5		0.5	
Magnetic offset current (@ $10 \times I_{PN}$) referred to primary	I_{OM}	A	-0.92		0.92	One turn
Reaction time @ 10 % of I_{PN}	t_{ra}	μs			2.5	@ 50 A/ μs
Response time @ 90 % of I_{PN}	t_r	μs			3.5	@ 50 A/ μs
Frequency bandwidth (-3 dB)	BW	kHz		100		Small signals
Output RMS noise voltage spectral density (100 Hz ... 100 kHz)	e_{no}	$\mu\text{V}/\sqrt{\text{Hz}}$			2.9	
Output noise voltage (DC ... 10 kHz) (DC ... 100 kHz) (DC ... 1 MHz)	V_{no}	mVpp		2.6 4.7 8.2		
Primary current, detection threshold	I_{pTh}	A	$2.63 \times I_{PN}$	$2.92 \times I_{PN}$	$3.21 \times I_{PN}$	Peak value $\pm 10\%$, overcurrent detection OCD
Accuracy @ I_{PN}	X	% of I_{PN}	-1		1	
Accuracy @ I_{PN} @ $T_A = +105^\circ\text{C}$	X	% of I_{PN}	-5.10		5.10	See formula note ³⁾
Accuracy @ I_{PN} @ $T_A = +85^\circ\text{C}$	X	% of I_{PN}	-4.08		4.08	See formula note ³⁾

Notes: ¹⁾ 3.3 V SP version available

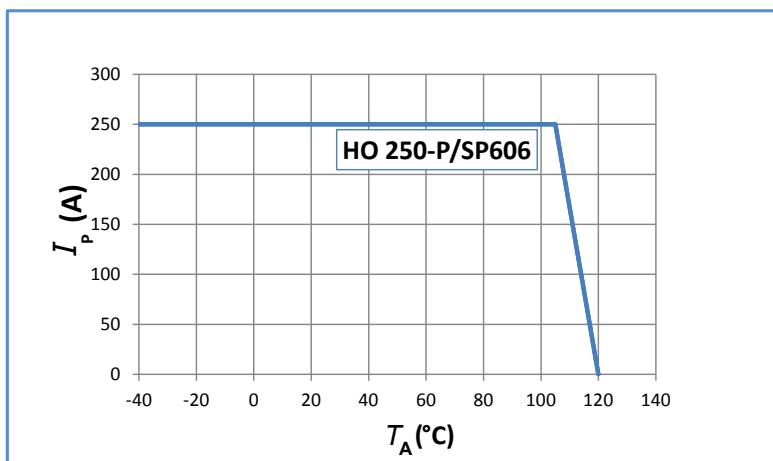
²⁾ EEPROM in an error state makes the transducer behave like a reverse current saturation. Use of the OCD may help to differentiate the two cases

³⁾ Accuracy @ T_A (% of I_{PN}) = $X + \left(\frac{TCG}{10000} \times (T_A - 25) \right) + \left(\frac{TCI_{OE}}{1000 \times I_{PN}} \times 100 \times (T_A - 25) \right)$.

Measuring range versus internal/external reference voltage



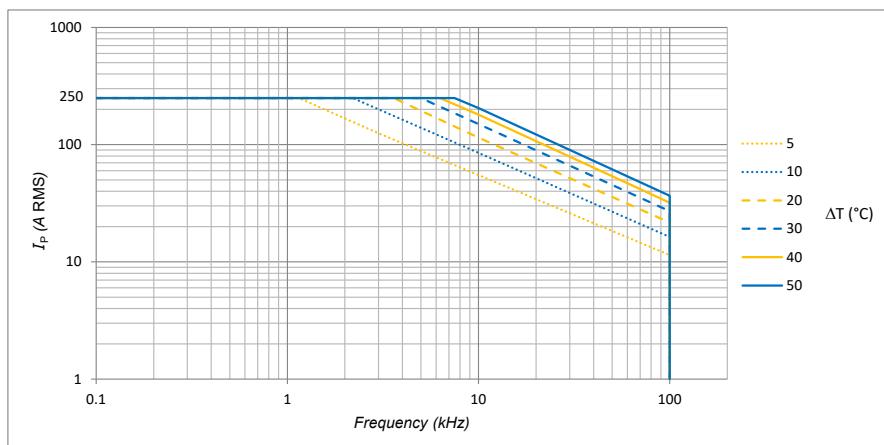
Maximum continuous DC current



Important notice: whatever the usage and/or application, the transducer primary bar / jumper temperature shall not go above the maximum rating of 120 °C as stated in page 2 of this datasheet.

Frequency derating versus primary current and core temperature increase ΔT (°C)

Primary current in A RMS is sine wave.



Example:

Primary current ripple (sine wave): 50 A RMS

Ripple frequency: 20 kHz

- the core temperature increase is 10 °C

HO-P/SP606 series: name and codification

HO family products may be ordered **on request**¹⁾ with a dedicated setting of the parameters as described below (standard products are delivered with the setting 1106 according to the table).

HO-P/SP606-XXXX			
Internal reference	Response time	EEPROM Control	Overcurrent detection ($\times I_{PN}$) ²⁾
0 Not used	0 4 μ s	0 YES	0 5.10 A 1.18
1 1.65 V	1 3.5 μ s	1 NO	1 6.24 B 1.62
2 Not used	2 6 μ s		2 6.94 C 2.04
3 Not used			3 8.30 D 2.51
4 Not used			4 9.03 E 2.78
			5 10.02 F 3.32
			6 2.92 G 3.62
			7 4.09 H 4.01

Notes: ¹⁾ For dedicated settings, minimum quantities apply, please contact your local LEM support

²⁾ OCD ($\times I_{PN}$) correction table versus range and temperature
All other values or empty cells: no change.

HO-P/SP606-110x	
OCD Parameter	I_{PN} (A) all temperatures
	250
0	6.9
1	-
2	-
3	-
4	-
5	-

Tolerance on OCD value	
$\pm 20\%$	
$\pm 10\%$	No change
-	Do not use

Application information

HOxx-P series is designed to use a bus-bar or a cable ¹⁾ to carry the current through out the aperture with a maximum capacity of 15 × 8 mm. The 2 jumpers should be used as mechanical fixation on the PCBA and must be kept in open circuit.

Note: ¹⁾ The maximum magnetic offset referred to primary is inversely proportional to the number of turns, thus is divided by 2 with 2 turns.

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, minimum and maximum values are determined during the initial characterization of the product.

Remark

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: [Products/Product Documentation](#)

Safety

This transducer must be used in limited-energy secondary circuits.



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.

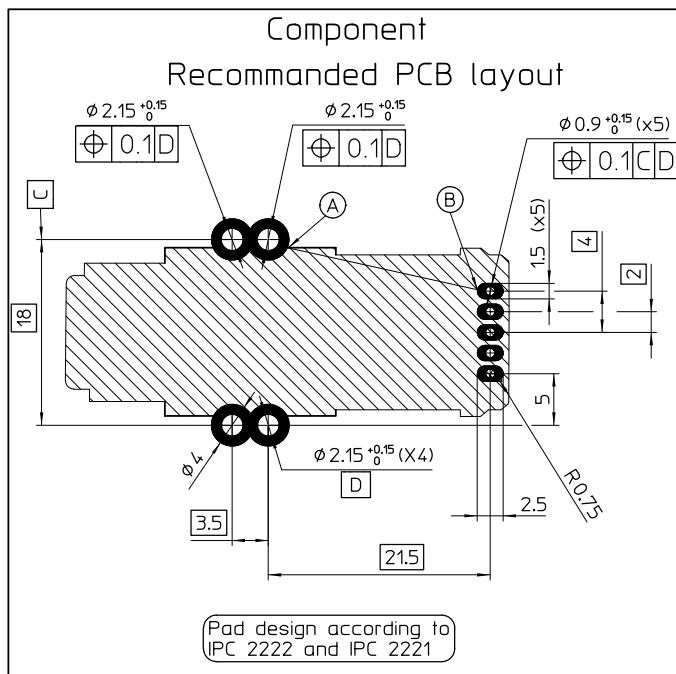
When operating the transducer, certain parts of the module can carry hazardous voltage (e.g. primary bus bar, power supply). Ignoring this warning can lead to injury and/or cause serious damage.

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.

PCB Footprint in mm.

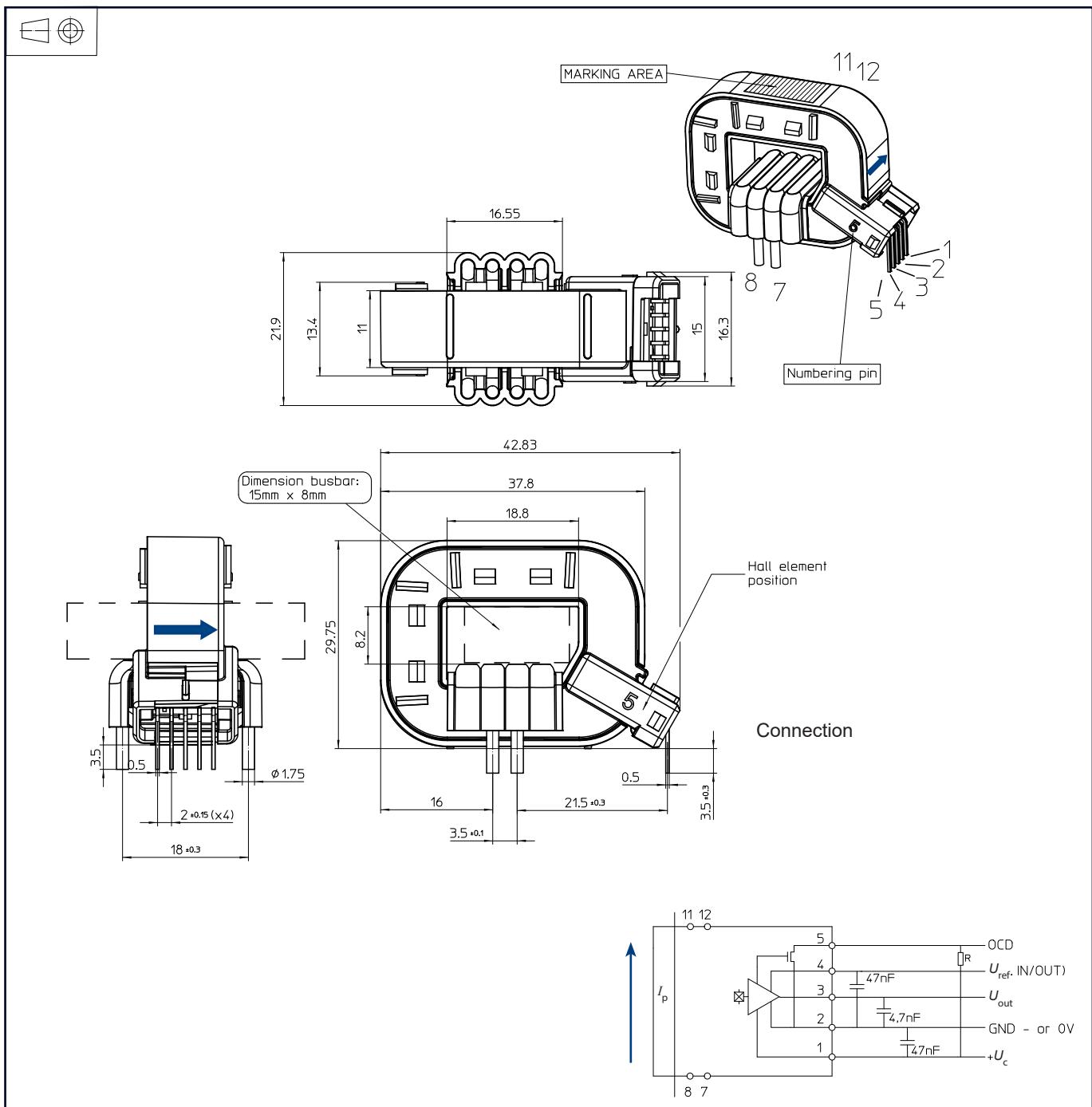


Assembly on PCB

Recommended PCB hole diameter	2.15 mm for primary pin
Maximum PCB thickness	0.9 mm for secondary pin
Wave soldering profile	2.4 mm
No clean process only	maximum 260 °C, 10 s

Insulation distance (nominal values):

	d_{Cp}	d_{Cl}
On PCB: A - B	18.85 mm	-
Between jumper and secondary pin	21.1 mm	20.9 mm
Between primary busbar and secondary pin	14.6 mm	-
Between primary busbar and jumper	-	8 mm
Between primary busbar and core	-	11.34 mm
Between core and secondary terminal	-	1.18 mm

Dimensions (mm, general linear tolerance ± 0.3 mm)

Remark:

- V_{OUT} is positive with respect to V_{ref} when positive I_p flows in direction of the arrow shown on the drawing above.

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