

## Current Transducer HOB-P series

$$I_{PN} = 30 \dots 130 \text{ A}$$

Ref: HOB 30-P, HOB 50-P, HOB 75-P, HOB 100-P, HOB 130-P

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
- Galvanic separation between primary and secondary circuit
- Low power consumption
- Compact design for THT PCB mounting
- Factory calibrated.

### Advantages

- Low offset temperature drift
- Creepage /clearance > 11 mm
- Very short delay time < 200 ns
- High cut-off frequency > 1 MHz
- Enhanced immunity.

### 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)
- Combiner box
- Solar inverter on DC side of the inverter (MPPT)
- Plasma cutter, welding
- Charging station.

### Standards

- IEC 61010-1: 2017
- IEC 61010-2-30: 2017
- IEC 61800-3: 2017
- IEC 61800-5-1: 2007
- IEC 62109-1: 2010
- UL 508: 2018.

### Application Domain

- Industrial.

## Safety



### Caution

If the device is used in a way that is not specified by the manufacturer, the protection provided by the device may be compromised. Always inspect the electronics unit and connecting cable before using this product and do not use it if damaged.

Mounting assembly shall guarantee the maximum primary conductor temperature, fulfill clearance and creepage distance, minimize electric and magnetic coupling, and unless otherwise specified can be mounted in any orientation.

This device is not intended for outdoor use.



### Caution, risk of electrical shock

This transducer must be used in limited-energy secondary circuits SELV according to IEC 61010-1, in electric/electronic equipment with respect to applicable standards and safety requirements in accordance with the manufacturer's operating specifications.

Use caution during installation and use of this product; certain parts of the module can carry hazardous voltages and high currents (e.g. power supply, primary conductor).

Ignoring this warning can lead to injury and/or cause serious damage.

De-energize all circuits and hazardous live parts before installing the product.

All installations, maintenance, servicing operations and use must be carried out by trained and qualified personnel practicing applicable safety precautions.

This transducer is a build-in device, whose hazardous live parts must be inaccessible after installation.

This transducer must be mounted in a suitable end-enclosure.

Besides make sure to have a distance of minimum 30 mm between the primary terminals of the transducer and other neighboring components.

Main supply must be able to be disconnected.

Never connect or disconnect the external power supply while the primary circuit is connected to live parts.

Never connect the output to any equipment with a common mode voltage to earth greater than 30 V.

Always wear protective clothing and gloves if hazardous live parts are present in the installation where the measurement is carried out.

This transducer is a built-in device, not intended to be cleaned with any product. Nevertheless if the user must implement cleaning or washing process, validation of the cleaning program has to be done by himself.

When defining soldering process, please use no cleaning process only.



### ESD susceptibility

The product is susceptible to be damaged from an ESD event and the personnel should be grounded when handling it.

Do not dispose of this product as unsorted municipal waste. Contact a qualified recycler for disposal.

Although LEM applies utmost care to facilitate compliance of end products with applicable regulations during LEM product design, use of this part may need additional measures on the application side for compliance with regulations regarding EMC and protection against electric shock. Therefore LEM cannot be held liable for any potential hazards, damages, injuries or loss of life resulting from the use of this product.



Direct current power supply.



Underwriters Laboratory Inc. recognized component

## Absolute maximum ratings

| Parameter                                                | Symbol         | Unit | Value |
|----------------------------------------------------------|----------------|------|-------|
| Maximum supply voltage (not destructive)                 | $U_{C\ max}$   | V    | 5.5   |
| Maximum primary conductor temperature                    | $T_{B\ max}$   | °C   | 120   |
| Electrostatic discharge voltage (HBM - Human Body Model) | $U_{ESD\ HBM}$ | 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: 19

### Standards

- CSA C22.2 NO. 14-18 INDUSTRIAL CONTROL EQUIPMENT - Edition 13
- UL 508 STANDARD FOR INDUSTRIAL CONTROL EQUIPMENT - Edition 18

### Ratings

| Parameter                       | Symbol    | Unit    | Value  |     |
|---------------------------------|-----------|---------|--------|-----|
| Primary involved potential      |           | V AC/DC | 600    |     |
| Max surrounding air temperature | $T_A$     | °C      | 100    | 105 |
| Primary current                 | $I_P$     | A       | 130    | 100 |
| Secondary supply voltage        | $U_C$     | V DC    | 5      |     |
| Output voltage                  | $U_{out}$ | V       | 0 to 5 |     |
| Current consumption (max)       | $I_C$     | mA      | 26     |     |

### Conditions of acceptability

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

- 1 - The secondary circuit pin terminals have not been evaluated for field wiring.
- 2 - Low voltage control circuit shall be supplied by an isolating 5 V DC source.
- 3 - This product is intended to be mounted on a printed wiring board.

### 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   | 4.4   |                                                                                  |
| Impulse withstand voltage 1.2/50 $\mu$ s          | $U_{Ni}$ | kV   | 9.6   |                                                                                  |
| Partial discharge test voltage ( $q_m < 10$ pC)   | $U_t$    | V    | 1500  | Primary / Secondary                                                              |
| Clearance (pri. - sec.)                           | $d_{Cl}$ | mm   | > 11  | Shortest distance through air                                                    |
| Creepage distance (pri. - sec.)                   | $d_{Cp}$ | mm   | > 11  | Shortest path along device body                                                  |
| Clearance (pri. - sec.)                           |          | mm   | > 11  | When mounted on PCB with recommended layout                                      |
| Case material                                     |          |      |       | V0 according to UL 94                                                            |
| Comparative tracking index                        | $CTI$    |      | 600   |                                                                                  |
| Application example                               |          | V    | 600   | Reinforced insulation, non uniform field according to IEC 61800-5-1, CAT III PD2 |
| Application example                               |          | V    | 1000  | Basic insulation non uniform field according to IEC 61800-5-1, CAT III PD2       |
| Application example                               |          | V    | 600   | Simple insulation, non uniform field according to UL 508, CAT III PD2            |

## Environmental and mechanical characteristics

| Parameter                     | Symbol      | Unit | Min | Typ | Max                | Comment |
|-------------------------------|-------------|------|-----|-----|--------------------|---------|
| Ambient operating temperature | $T_A$       | °C   | -40 |     | 105                |         |
| Ambient storage temperature   | $T_{A\ st}$ | °C   | -40 |     | 105                |         |
| Mass                          | $m$         | g    |     | 30  |                    |         |
| Relative Humidity             | $RH$        | %    |     |     | 95                 |         |
| Altitude                      |             | m    |     |     | 2000 <sup>1)</sup> |         |

Note:<sup>1)</sup> Insulation coordination at 2000 m.

**Electrical data HOB 30-P**

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

| Parameter                                                                          | Symbol                | Unit          | Min    | Typ               | Max     | Comment                          |
|------------------------------------------------------------------------------------|-----------------------|---------------|--------|-------------------|---------|----------------------------------|
| Primary nominal RMS current                                                        | $I_{PN}$              | A             |        | 30                |         |                                  |
| Primary current, measuring range                                                   | $I_{PM}$              | A             | -75    |                   | 75      | @ $U_C \geq 4.6\text{ V}$        |
| Number of primary turns                                                            | $N_P$                 |               |        | 1                 |         |                                  |
| Primary jumper resistance @ +25 °C                                                 | $R_P$                 | mΩ            |        | 0.06              |         |                                  |
| Primary jumper resistance @ +120 °C                                                | $R_P$                 | mΩ            |        | 0.076             |         |                                  |
| Supply voltage <sup>1)</sup>                                                       | $U_C$                 | V             | 4.6    | 5                 | 5.5     |                                  |
| Current consumption                                                                | $I_C$                 | mA            | 18     | 22                | 26      |                                  |
| Reference voltage (output)                                                         | $U_{ref}$             | V             | 2.48   | 2.5               | 2.52    | Internal reference               |
| Output voltage range @ $I_{PM}$                                                    | $U_{out} - U_{ref}$   | V             | -2     |                   | 2       | Over operating temperature range |
| $U_{ref}$ output resistance                                                        | $R_{ref}$             | Ω             | 130    | 200               | 300     | Series                           |
| $U_{out}$ output resistance                                                        | $R_{out}$             | Ω             |        | 30                |         | Series                           |
| Electrical offset voltage @ $I_P = 0\text{ A}$                                     | $U_{OE}$              | mV            | -5     |                   | 5       | $U_{out} - U_{ref}$              |
| Electrical offset current, referred to primary                                     | $I_{OE}$              | A             | -0.188 |                   | 0.188   |                                  |
| Temperature coefficient of $U_{ref}$                                               | $TCU_{ref}$           | ppm/K         | -170   |                   | 170     | -40 °C ... 105 °C                |
| Temperature coefficient of $U_{OE}$                                                | $TCU_{OE}$            | mV/K          | -0.075 |                   | 0.075   | -40 °C ... 105 °C                |
| Offset drift referred to primary @ $I_P = 0\text{ A}$                              | $TCI_{OE}$            | mA/K          | -2,813 |                   | 2.813   | -40 °C ... 105 °C                |
| Nominal sensitivity                                                                | $S_N$                 | mV/A          |        | 26.667            |         | 800 mV @ $I_{PN}$                |
| Sensitivity error @ $I_{PN}$                                                       | $\varepsilon_S$       | %             | -0.75  |                   | 0.75    | Factory adjustment               |
| Temperature coefficient of $S$                                                     | $TCS$                 | ppm/K         | -200   |                   | 200     | -40 °C ... 105 °C                |
| Linearity error 0 ... $I_{PN}$                                                     | $\varepsilon_L$       | % of $I_{PN}$ | -0.70  |                   | 0.70    |                                  |
| Linearity error 0 ... $I_{PM}$                                                     | $\varepsilon_L$       | % of $I_{PM}$ | -0.55  |                   | 0.55    |                                  |
| Magnetic offset current (@ $10 \times I_{PN}$ ) referred to primary                | $I_{OM}$              | A             | -0.8   |                   | 0.8     | One turn                         |
| Delay time to 10 % of the final output value for $I_{PN}$ step                     | $t_{D10}$             | ns            |        |                   | 200     | @ 100 A/μs                       |
| Delay time to 90 % of the final output value for $I_{PN}$ step                     | $t_{D90}$             | ns            |        |                   | 200     | @ 100 A/μs                       |
| Frequency bandwidth (-3 dB)                                                        | $BW$                  | kHz           |        | 1000              |         |                                  |
| RMS Noise voltage spectral density (Output) (100 Hz ... 10 kHz) (10 kHz ... 1 MHz) | $u_{no}$              | μV/√Hz        |        |                   | 20<br>1 |                                  |
| Peak-to-peak voltage (DC ... 10 kHz) (DC ... 100 kHz) (DC ... 1 MHz)               | $U_{no pp}$           | mV            |        | 2.6<br>2.7<br>2.6 |         |                                  |
| Sum of sensitivity and linearity error @ $I_{PN}$                                  | $\varepsilon_{SL}$    | % of $I_{PN}$ | -1.45  |                   | 1.45    |                                  |
| Sum of sensitivity and linearity error @ $I_{PN}$ , @ $T_A = +85\text{ °C}$        | $\varepsilon_{SL85}$  | % of $I_{PN}$ | -3.21  |                   | 3.21    | See formula note <sup>2)</sup>   |
| Sum of sensitivity and linearity error @ $I_{PN}$ , @ $T_A = +105\text{ °C}$       | $\varepsilon_{SL105}$ | % of $I_{PN}$ | -3.80  |                   | 3.80    | See formula note <sup>2)</sup>   |

**Notes:** <sup>1)</sup> 3.3 V SP version available

$$\varepsilon_{SL}(T_A) = \varepsilon_{SL25} + \left( TCS + \frac{TCI_{OE}}{I_{PN}} \right) \times |T_A - 25| \quad (\text{Apply SI units and Quantity Calculus})$$

**Electrical data HOB 50-P**

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

| Parameter                                                                          | Symbol                | Unit                           | Min    | Typ               | Max     | Comment                          |
|------------------------------------------------------------------------------------|-----------------------|--------------------------------|--------|-------------------|---------|----------------------------------|
| Primary nominal RMS current                                                        | $I_{PN}$              | A                              |        | 50                |         |                                  |
| Primary current, measuring range                                                   | $I_{PM}$              | A                              | -125   |                   | 125     | @ $U_C \geq 4.6\text{ V}$        |
| Number of primary turns                                                            | $N_P$                 |                                |        | 1                 |         |                                  |
| Primary jumper resistance @ +25 °C                                                 | $R_P$                 | m $\Omega$                     |        | 0.06              |         |                                  |
| Primary jumper resistance @ +120 °C                                                | $R_P$                 | m $\Omega$                     |        | 0.076             |         |                                  |
| Supply voltage <sup>1)</sup>                                                       | $U_C$                 | V                              | 4.6    | 5                 | 5.5     |                                  |
| Current consumption                                                                | $I_C$                 | mA                             | 18     | 22                | 26      |                                  |
| Reference voltage (output)                                                         | $U_{ref}$             | V                              | 2.48   | 2.5               | 2.52    | Internal reference               |
| Output voltage range @ $I_{PM}$                                                    | $U_{out} - U_{ref}$   | V                              | -2     |                   | 2       | Over operating temperature range |
| $U_{ref}$ output resistance                                                        | $R_{ref}$             | $\Omega$                       | 130    | 200               | 300     | Series                           |
| $U_{out}$ output resistance                                                        | $R_{out}$             | $\Omega$                       |        | 30                |         | Series                           |
| Electrical offset voltage @ $I_P = 0\text{ A}$                                     | $U_{OE}$              | mV                             | -5     |                   | 5       | $U_{out} - U_{ref}$              |
| Electrical offset current, referred to primary                                     | $I_{OE}$              | A                              | -0.313 |                   | 0.313   |                                  |
| Temperature coefficient of $U_{ref}$                                               | $TCU_{ref}$           | ppm/K                          | -170   |                   | 170     | -40 °C ... 105 °C                |
| Temperature coefficient of $U_{OE}$                                                | $TCU_{OE}$            | mV/K                           | -0.075 |                   | 0.075   | -40 °C ... 105 °C                |
| Offset drift referred to primary @ $I_P = 0\text{ A}$                              | $TCI_{OE}$            | mA/K                           | -4.688 |                   | 4.688   | -40 °C ... 105 °C                |
| Nominal sensitivity                                                                | $S_N$                 | mV/A                           |        | 16                |         | 800 mV @ $I_{PN}$                |
| Sensitivity error @ $I_{PN}$                                                       | $\varepsilon_S$       | %                              | -0.75  |                   | 0.75    | Factory adjustment               |
| Temperature coefficient of $S$                                                     | $TCS$                 | ppm/K                          | -200   |                   | 200     | -40 °C ... 105 °C                |
| Linearity error 0 ... $I_{PN}$                                                     | $\varepsilon_L$       | % of $I_{PN}$                  | -0.70  |                   | 0.70    |                                  |
| Linearity error 0 ... $I_{PM}$                                                     | $\varepsilon_L$       | % of $I_{PM}$                  | -0.55  |                   | 0.55    |                                  |
| Magnetic offset current (@ $10 \times I_{PN}$ ) referred to primary                | $I_{OM}$              | A                              | -0.8   |                   | 0.8     | One turn                         |
| Delay time to 10 % of the final output value for $I_{PN}$ step                     | $t_{D10}$             | ns                             |        |                   | 200     | @ 100 A/ $\mu$ s                 |
| Delay time to 90 % of the final output value for $I_{PN}$ step                     | $t_{D90}$             | ns                             |        |                   | 200     | @ 100 A/ $\mu$ s                 |
| Frequency bandwidth (-3 dB)                                                        | $BW$                  | kHz                            |        | 1000              |         |                                  |
| RMS Noise voltage spectral density (Output) (100 Hz ... 10 kHz) (10 kHz ... 1 MHz) | $u_{no}$              | $\mu\text{V}/\sqrt{\text{Hz}}$ |        |                   | 20<br>1 |                                  |
| Peak-to-peak noise voltage (DC ... 10 kHz) (DC ... 100 kHz) (DC ... 1 MHz)         | $U_{no pp}$           | mV                             |        | 1.6<br>1.6<br>1.7 |         |                                  |
| Sum of sensitivity and linearity error @ $I_{PN}$                                  | $\varepsilon_{SL}$    | % of $I_{PN}$                  | -1.45  |                   | 1.45    |                                  |
| Sum of sensitivity and linearity error @ $I_{PN}$ , @ $T_A = +85\text{ °C}$        | $\varepsilon_{SL85}$  | % of $I_{PN}$                  | -3.21  |                   | 3.21    | See formula note <sup>2)</sup>   |
| Sum of sensitivity and linearity error @ $I_{PN}$ , @ $T_A = +105\text{ °C}$       | $\varepsilon_{SL105}$ | % of $I_{PN}$                  | -3.80  |                   | 3.80    | See formula note <sup>2)</sup>   |

**Notes:** <sup>1)</sup> 3.3 V SP version available

$$\varepsilon_{SL}(T_A) = \varepsilon_{SL25} + \left( TCS + \frac{TCI_{OE}}{I_{PN}} \right) \times |T_A - 25| \text{ (Apply SI units and Quantity Calculus)}$$

**Electrical data HOB 75-P**

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

| Parameter                                                                          | Symbol                | Unit                           | Min    | Typ               | Max     | Comment                          |
|------------------------------------------------------------------------------------|-----------------------|--------------------------------|--------|-------------------|---------|----------------------------------|
| Primary nominal RMS current                                                        | $I_{PN}$              | A                              |        | 75                |         |                                  |
| Primary current, measuring range                                                   | $I_{PM}$              | A                              | -187.5 |                   | 187.5   | @ $U_C \geq 4.6\text{ V}$        |
| Number of primary turns                                                            | $N_P$                 |                                |        | 1                 |         |                                  |
| Primary jumper resistance @ +25 °C                                                 | $R_P$                 | m $\Omega$                     |        | 0.06              |         |                                  |
| Primary jumper resistance @ +120 °C                                                | $R_P$                 | m $\Omega$                     |        | 0.076             |         |                                  |
| Supply voltage <sup>1)</sup>                                                       | $U_C$                 | V                              | 4.6    | 5                 | 5.5     |                                  |
| Current consumption                                                                | $I_C$                 | mA                             | 18     | 22                | 26      |                                  |
| Reference voltage (output)                                                         | $U_{ref}$             | V                              | 2.48   | 2.5               | 2.52    | Internal reference               |
| Output voltage range @ $I_{PM}$                                                    | $U_{out} - U_{ref}$   | V                              | -2     |                   | 2       | Over operating temperature range |
| $U_{ref}$ output resistance                                                        | $R_{ref}$             | $\Omega$                       | 130    | 200               | 300     | Series                           |
| $U_{out}$ output resistance                                                        | $R_{out}$             | $\Omega$                       |        | 30                |         | Series                           |
| Electrical offset voltage @ $I_P = 0\text{ A}$                                     | $U_{OE}$              | mV                             | -5     |                   | 5       | $U_{out} - U_{ref}$              |
| Electrical offset current, referred to primary                                     | $I_{OE}$              | A                              | -0.469 |                   | 0.469   |                                  |
| Temperature coefficient of $U_{ref}$                                               | $TCU_{ref}$           | ppm/K                          | -170   |                   | 170     | -40 °C ... 105 °C                |
| Temperature coefficient of $U_{OE}$                                                | $TCU_{OE}$            | mV/K                           | -0.075 |                   | 0.075   | -40 °C ... 105 °C                |
| Offset drift referred to primary @ $I_P = 0\text{ A}$                              | $TCI_{OE}$            | mA/K                           | -7.031 |                   | 7.031   | -40 °C ... 105 °C                |
| Nominal sensitivity                                                                | $S_N$                 | mV/A                           |        | 10.667            |         | 800 mV @ $I_{PN}$                |
| Sensitivity error @ $I_{PN}$                                                       | $\varepsilon_S$       | %                              | -0.75  |                   | 0.75    | Factory adjustment               |
| Temperature coefficient of $S$                                                     | $TCS$                 | ppm/K                          | -200   |                   | 200     | -40 °C ... 105 °C                |
| Linearity error 0 ... $I_{PN}$                                                     | $\varepsilon_L$       | % of $I_{PN}$                  | -0.60  |                   | 0.60    |                                  |
| Linearity error 0 ... $I_{PM}$                                                     | $\varepsilon_L$       | % of $I_{PM}$                  | -0.50  |                   | 0.50    |                                  |
| Magnetic offset current (@ $10 \times I_{PN}$ ) referred to primary                | $I_{OM}$              | A                              | -0.8   |                   | 0.8     | One turn                         |
| Delay time to 10 % of the final output value for $I_{PN}$ step                     | $t_{D10}$             | ns                             |        |                   | 200     | @ 100 A/ $\mu$ s                 |
| Delay time to 90 % of the final output value for $I_{PN}$ step                     | $t_{D90}$             | ns                             |        |                   | 200     | @ 100 A/ $\mu$ s                 |
| Frequency bandwidth (-3 dB)                                                        | $BW$                  | kHz                            |        | 1000              |         |                                  |
| RMS Noise voltage spectral density (Output) (100 Hz ... 10 kHz) (10 kHz ... 1 MHz) | $u_{no}$              | $\mu\text{V}/\sqrt{\text{Hz}}$ |        |                   | 20<br>1 |                                  |
| Peak-to-peak noise voltage (DC ... 10 kHz) (DC ... 100 kHz) (DC ... 1 MHz)         | $U_{no pp}$           | mV                             |        | 1.1<br>1.1<br>1.2 |         |                                  |
| Sum of sensitivity and linearity error @ $I_{PN}$                                  | $\varepsilon_{SL}$    | % of $I_{PN}$                  | -1.35  |                   | 1.35    |                                  |
| Sum of sensitivity and linearity error @ $I_{PN}$ , @ $T_A = +85\text{ °C}$        | $\varepsilon_{SL85}$  | % of $I_{PN}$                  | -3.11  |                   | 3.11    | See formula note <sup>2)</sup>   |
| Sum of sensitivity and linearity error @ $I_{PN}$ , @ $T_A = +105\text{ °C}$       | $\varepsilon_{SL105}$ | % of $I_{PN}$                  | -3.70  |                   | 3.70    | See formula note <sup>2)</sup>   |

**Notes:** <sup>1)</sup> 3.3 V SP version available

<sup>2)</sup>  $\varepsilon_{SL}(T_A) = \varepsilon_{SL25} + \left( TCS + \frac{TCI_{OE}}{I_{PN}} \right) \times |T_A - 25|$  (Apply SI units and Quantity Calculus)

**Electrical data HOB 100-P**

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

| Parameter                                                                                | Symbol                | Unit                           | Min    | Typ               | Max     | Comment                          |
|------------------------------------------------------------------------------------------|-----------------------|--------------------------------|--------|-------------------|---------|----------------------------------|
| Primary nominal RMS current                                                              | $I_{PN}$              | A                              |        | 100               |         |                                  |
| Primary current, measuring range                                                         | $I_{PM}$              | A                              | -250   |                   | 250     | @ $U_C \geq 4.6\text{ V}$        |
| Number of primary turns                                                                  | $N_P$                 |                                |        | 1                 |         |                                  |
| Primary jumper resistance @ +25 °C                                                       | $R_P$                 | m $\Omega$                     |        | 0.06              |         |                                  |
| Primary jumper resistance @ +120 °C                                                      | $R_P$                 | m $\Omega$                     |        | 0.076             |         |                                  |
| Supply voltage <sup>1)</sup>                                                             | $U_C$                 | V                              | 4.6    | 5                 | 5.5     |                                  |
| Current consumption                                                                      | $I_C$                 | mA                             | 18     | 22                | 26      |                                  |
| Reference voltage (output)                                                               | $U_{ref}$             | V                              | 2.48   | 2.5               | 2.52    | Internal reference               |
| Output voltage range @ $I_{PM}$                                                          | $U_{out} - U_{ref}$   | V                              | -2     |                   | 2       | Over operating temperature range |
| $U_{ref}$ output resistance                                                              | $R_{ref}$             | $\Omega$                       | 130    | 200               | 300     | Series                           |
| $U_{out}$ output resistance                                                              | $R_{out}$             | $\Omega$                       |        | 30                |         | Series                           |
| Electrical offset voltage @ $I_P = 0\text{ A}$                                           | $U_{OE}$              | mV                             | -5     |                   | 5       | $U_{out} - U_{ref}$              |
| Electrical offset current, referred to primary                                           | $I_{OE}$              | A                              | -0.625 |                   | 0.625   |                                  |
| Temperature coefficient of $U_{ref}$                                                     | $TCU_{ref}$           | ppm/K                          | -170   |                   | 170     | -40 °C ... 105 °C                |
| Temperature coefficient of $U_{OE}$                                                      | $TCU_{OE}$            | mV/K                           | -0.075 |                   | 0.075   | -40 °C ... 105 °C                |
| Offset drift referred to primary @ $I_P = 0\text{ A}$                                    | $TCI_{OE}$            | mA/K                           | -9.375 |                   | 9.375   | -40 °C ... 105 °C                |
| Nominal sensitivity                                                                      | $S_N$                 | mV/A                           |        | 8                 |         | 800 mV @ $I_{PN}$                |
| Sensitivity error @ $I_{PN}$                                                             | $\varepsilon_S$       | %                              | -0.75  |                   | 0.75    | Factory adjustment               |
| Temperature coefficient of $S$                                                           | $TCS$                 | ppm/K                          | -200   |                   | 200     | -40 °C ... 105 °C                |
| Linearity error 0 ... $I_{PN}$                                                           | $\varepsilon_L$       | % of $I_{PN}$                  | -0.50  |                   | 0.50    |                                  |
| Linearity error 0 ... $I_{PM}$                                                           | $\varepsilon_L$       | % of $I_{PM}$                  | -0.40  |                   | 0.40    |                                  |
| Magnetic offset current (@ $10 \times I_{PN}$ ) referred to primary                      | $I_{OM}$              | A                              | -0.8   |                   | 0.8     | One turn                         |
| Delay time to 10 % of the final output value for $I_{PN}$ step                           | $t_{D10}$             | ns                             |        |                   | 200     | @ 100 A/ $\mu$ s                 |
| Delay time to 90 % of the final output value for $I_{PN}$ step                           | $t_{D90}$             | ns                             |        |                   | 200     | @ 100 A/ $\mu$ s                 |
| Frequency bandwidth (-3 dB)                                                              | $BW$                  | kHz                            |        | 1000              |         |                                  |
| RMS Noise voltage spectral density (Output)<br>(100 Hz ... 10 kHz)<br>(10 kHz ... 1 MHz) | $u_{no}$              | $\mu\text{V}/\sqrt{\text{Hz}}$ |        |                   | 20<br>1 |                                  |
| Peak-to-peak voltage<br>(DC ... 10 kHz)<br>(DC ... 100 kHz)<br>(DC ... 1 MHz)            | $U_{no pp}$           | mV                             |        | 0.8<br>0.8<br>1.0 |         |                                  |
| Sum of sensitivity and linearity error @ $I_{PN}$                                        | $\varepsilon_{SL}$    | % of $I_{PN}$                  | -1.25  |                   | 1.25    |                                  |
| Sum of sensitivity and linearity error @ $I_{PN}$ , @ $T_A = +85\text{ °C}$              | $\varepsilon_{SL85}$  | % of $I_{PN}$                  | -3.01  |                   | 3.01    | See formula note <sup>2)</sup>   |
| Sum of sensitivity and linearity error @ $I_{PN}$ , @ $T_A = +105\text{ °C}$             | $\varepsilon_{SL105}$ | % of $I_{PN}$                  | -3.60  |                   | 3.60    | See formula note <sup>2)</sup>   |

**Notes:** <sup>1)</sup> 3.3 V SP version available

$$\varepsilon_{SL}(T_A) = \varepsilon_{SL25} + \left( TCS + \frac{TCI_{OE}}{I_{PN}} \right) \times |T_A - 25| \quad (\text{Apply SI units and Quantity Calculus})$$

**Electrical data HOB 130-P**

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

| Parameter                                                                                | Symbol                | Unit                           | Min    | Typ             | Max     | Comment                          |
|------------------------------------------------------------------------------------------|-----------------------|--------------------------------|--------|-----------------|---------|----------------------------------|
| Primary nominal RMS current                                                              | $I_{PN}$              | A                              |        | 130             |         |                                  |
| Primary current, measuring range                                                         | $I_{PM}$              | A                              | -250   |                 | 250     | @ $U_C \geq 4.6\text{ V}$        |
| Number of primary turns                                                                  | $N_P$                 |                                |        | 1               |         |                                  |
| Primary jumper resistance @ +25 °C                                                       | $R_P$                 | m $\Omega$                     |        | 0.06            |         |                                  |
| Primary jumper resistance @ +120 °C                                                      | $R_P$                 | m $\Omega$                     |        | 0.076           |         |                                  |
| Supply voltage <sup>1)</sup>                                                             | $U_C$                 | V                              | 4.6    | 5               | 5.5     |                                  |
| Current consumption                                                                      | $I_C$                 | mA                             | 18     | 22              | 26      |                                  |
| Reference voltage (output)                                                               | $U_{ref}$             | V                              | 2.48   | 2.5             | 2.52    | Internal reference               |
| Output voltage range @ $I_{PM}$                                                          | $U_{out} - U_{ref}$   | V                              | -2     |                 | 2       | Over operating temperature range |
| $U_{ref}$ output resistance                                                              | $R_{ref}$             | $\Omega$                       | 130    | 200             | 300     | Series                           |
| $U_{out}$ output resistance                                                              | $R_{out}$             | $\Omega$                       |        | 30              |         | Series                           |
| Electrical offset voltage @ $I_P = 0\text{ A}$                                           | $U_{OE}$              | mV                             | -5     |                 | 5       | $U_{out} - U_{ref}$              |
| Electrical offset current, referred to primary                                           | $I_{OE}$              | A                              | -0.625 |                 | 0.625   |                                  |
| Temperature coefficient of $U_{ref}$                                                     | $TCU_{ref}$           | ppm/K                          | -170   |                 | 170     | -40 °C ... 105 °C                |
| Temperature coefficient of $U_{OE}$                                                      | $TCU_{OE}$            | mV/K                           | -0.075 |                 | 0.075   | -40 °C ... 105 °C                |
| Offset drift referred to primary @ $I_P = 0\text{ A}$                                    | $TCI_{OE}$            | mA/K                           | -9.375 |                 | 9.375   | -40 °C ... 105 °C                |
| Nominal sensitivity                                                                      | $S_N$                 | mV/A                           |        | 8               |         | 1040 mV @ $I_{PN}$               |
| Sensitivity error @ $I_{PN}$                                                             | $\varepsilon_S$       | %                              | -0.75  |                 | 0.75    | Factory adjustment               |
| Temperature coefficient of $S$                                                           | $TCS$                 | ppm/K                          | -200   |                 | 200     | -40 °C ... 105 °C                |
| Linearity error 0 ... $I_{PN}$                                                           | $\varepsilon_L$       | % of $I_{PN}$                  | -0.45  |                 | 0.45    |                                  |
| Linearity error 0 ... $I_{PM}$                                                           | $\varepsilon_L$       | % of $I_{PM}$                  | -0.35  |                 | 0.35    |                                  |
| Magnetic offset current (@ $10 \times I_{PN}$ ) referred to primary                      | $I_{OM}$              | A                              | -0.8   |                 | 0.8     | One turn                         |
| Delay time to 10 % of the final output value for $I_{PN}$ step                           | $t_{D10}$             | ns                             |        |                 | 200     | @ 100 A/ $\mu$ s                 |
| Delay time to 90 % of the final output value for $I_{PN}$ step                           | $t_{D90}$             | ns                             |        |                 | 200     | @ 100 A/ $\mu$ s                 |
| Frequency bandwidth (-3 dB)                                                              | $BW$                  | kHz                            |        | 1000            |         |                                  |
| RMS Noise voltage spectral density (Output)<br>(100 Hz ... 10 kHz)<br>(10 kHz ... 1 MHz) | $u_{no}$              | $\mu\text{V}/\sqrt{\text{Hz}}$ |        |                 | 20<br>1 |                                  |
| Peak-to-peak noise voltage<br>(DC ... 10 kHz)<br>(DC ... 100 kHz)<br>(DC ... 1 MHz)      | $U_{no pp}$           | mV                             |        | 0.8<br>0.8<br>1 |         |                                  |
| Sum of sensitivity and linearity error @ $I_{PN}$                                        | $\varepsilon_{SL}$    | % of $I_{PN}$                  | -1.20  |                 | 1.20    |                                  |
| Sum of sensitivity and linearity error @ $I_{PN}$ , @ $T_A = +85\text{ °C}$              | $\varepsilon_{SL85}$  | % of $I_{PN}$                  | -2.83  |                 | 2.83    | See formula note <sup>2)</sup>   |
| Sum of sensitivity and linearity error @ $I_{PN}$ , @ $T_A = +105\text{ °C}$             | $\varepsilon_{SL105}$ | % of $I_{PN}$                  | -3.38  |                 | 3.38    | See formula note <sup>2)</sup>   |

**Notes:** <sup>1)</sup> 3.3 V SP version available

$$\varepsilon_{SL}(T_A) = \varepsilon_{SL25} + \left( TCS + \frac{TCI_{OE}}{I_{PN}} \right) \times |T_A - 25| \quad (\text{Apply SI units and Quantity Calculus})$$

## 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.

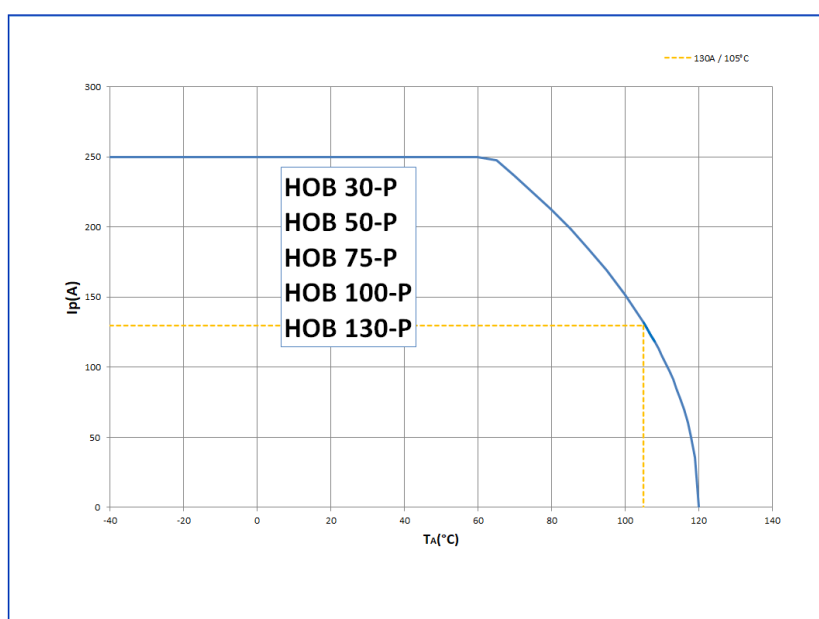
Unless otherwise stated (e.g. “100 % tested”), the LEM definition for such intervals designated with “min” and “max” is that the probability for values of samples to lie in this interval is 99.73 %.

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 the product.

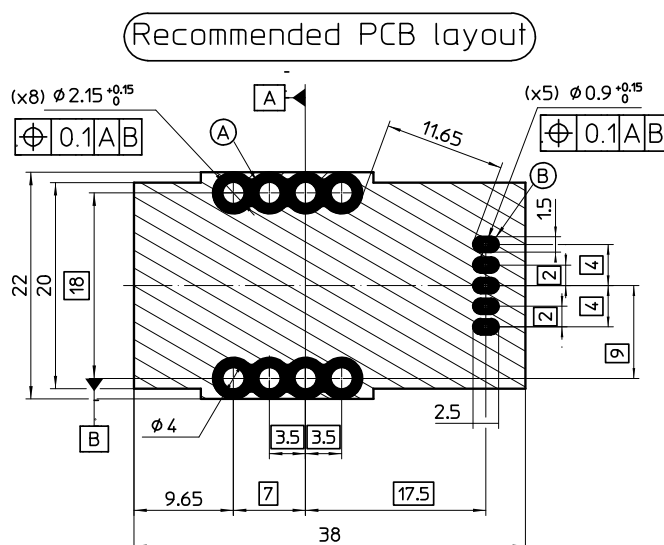
## Maximum continuous DC current

For all ranges



**Important notice:** whatever the usage and/or application, the transducer jumper temperature shall not go above the maximum rating of 120 °C as stated in page 3 of this datasheet.

# PCB Footprint (in mm, general tolerance $\pm 0.3$ mm)



Pad design according to IPC2222, IPC2221

## Assembly on PCB

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

## Insulation distance (nominal values):

|                                    | $d_{Cp}$ | $d_{Cl}$ |
|------------------------------------|----------|----------|
| On PCB: A - B                      | 11.65 mm | -        |
| Between jumper and secondary block | 13.75 mm | 11.49 mm |

## 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:

<https://www.lem.com/en/file/3137/download>.

**Dimensions** (in mm, general tolerance  $\pm 0.3$  mm)

