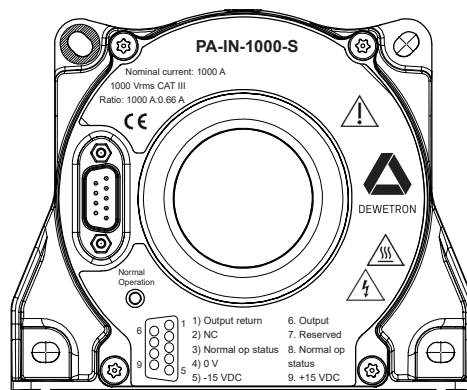


PA-IN-1000-S

CURRENT TRANSDUCER

FOR THE ELECTRONIC MEASUREMENT OF CURRENT:
 DC, AC, PULSED | WITH GALVANIC SEPARATION BE-
 TWEEN THE PRIMARY AND THE SECONDARY CIRCUIT.

$$I_{PN} = 1000 \text{ A}$$



FEATURES

- ▶ Closed loop (compensated) current transducer using an extremely accurate zero flux detector
- ▶ 9-pin D-SUB male secondary connector
- ▶ Status signal to indicate the transducer state
- ▶ LED indicator confirms normal operation
- ▶ Metal housing to improve immunity to EMC and power dissipation
- ▶ Operating temperature $-40\text{ }^{\circ}\text{C}$ to $85\text{ }^{\circ}\text{C}$

APPLICATIONS

- ▶ Feedback element in high performance gradient amplifiers for MRI
- ▶ Feedback element in high-precision, high-stability power supplies
- ▶ Calibration unit
- ▶ Energy measurement
- ▶ Medical equipment

ADVANTAGES

- ▶ Very high accuracy
- ▶ Excellent linearity
- ▶ Extremely low temperature drift
- ▶ Wide frequency bandwidth
- ▶ High immunity to external fields
- ▶ No insertion losses
- ▶ Very low noise on output signal
- ▶ Low noise feedback to primary conductor

STANDARDS

- ▶ EN 61000-6-2: 2005
- ▶ EN 61000-6-3: 2007
- ▶ EN 61010-1: 2010

APPLICATION DOMAIN

- ▶ Industrial
- ▶ Laboratory
- ▶ Medical

INSULATION COORDINATION

| Parameter | Symbol | Unit | Value | Comment |
|--|----------|------|-------|--|
| RMS voltage for AC insulation test, 50 Hz, 1 min | U_d | kV | 4.2 | Between primary and secondary + shield |
| Impulse withstand voltage 1.2/50 μ s | U_{Ni} | kV | 8 | - |
| Clearance (pri.–sec.) | d_{Cl} | mm | 11.5 | Shortest distance through air |
| Creepage distance (pri.–sec.) | d_{cp} | mm | 11.9 | Shortest path along device body |
| Comparative tracking index | CTI | - | 600 | - |
| Rated insulation RMS voltage | U_{Nm} | V | 1000 | Basic insulation according to IEC 61010-1 CAT III, PD2 |
| | | | | Reinforced insulation according to IEC 61010-1 CAT II, PD2 |

ENVIRONMENTAL AND MECHANICAL CHARACTERISTICS

| Parameter | Symbol | Unit | Min. | Typ | Max. |
|-------------------------------|-----------------------|------|------|-----|------|
| Ambient operating temperature | T_A | °C | -40 | - | +85 |
| Ambient storage temperature | T_S | °C | -40 | - | +85 |
| Relative humidity | RH | % | 20 | - | 80 |
| Dimensions | See drawing on page 7 | | | | |
| Mass | m | kg | - | 1.3 | |

ELECTRIC DATA

At $T_A = 25$ °C, $\pm U_C = \pm 15$ VDC, unless otherwise noted.

| Parameter | Symbol | Unit | Min. | Typ | Max. | Comment |
|---------------------------------------|----------------|----------|--------|------|--------|-------------------------------------|
| Primary continuous direct current DC | I_{PN} | A | -1000 | - | 1000 | * - |
| Primary nominal RMS current AC | I_{PN} | A | -1000 | - | 1000 | * - |
| Peak primary current, measuring range | \hat{I}_{PM} | A | -1500 | - | 1500 | * - |
| Measuring resistance | R_M | Ω | 0 | - | 1 | See graph on page 5 for other value |
| Secondary current nominal | I_{SN} | A | -0.666 | - | 0.666 | * - |
| Number of secondary turns | N_S | - | - | 1500 | - | - |
| Resistance of secondary winding | R_S | Ω | - | 8 | - | - |
| Overload capability ¹⁾ | \hat{I}_p | kA | -5 | - | 5 | @ pulse of 100 ms |
| Supply voltage DC | $+U_C$ | V | 14.25 | 15 | 15.75 | - |
| | $-U_C$ | | -14.25 | -15 | -15.75 | - |
| Current consumption positive DC | $+I_C$ | A | - | 0.12 | - | @ $I_P = 0$ |
| | | | | - | 1.12 | @ $I_{PM} = 1500$ |
| Current consumption negative DC | $-I_C$ | A | - | 0.07 | - | @ $I_P = 0$ |
| | | | | - | 1.07 | @ $I_{PM} = -1500$ |

| Parameter | Symbol | Unit | Min. | Typ | Max. | | Comment | |
|---|--------------|-------|--------------------------|--------------------|------|----|---|--|
| Output RMS noise current | I_{no} | ppm | - | 0.05 | 0.1 | | - | |
| | | | 0...10 Hz ²⁾ | - | 1.5 | 4 | | |
| | | | 0...10 kHz ²⁾ | - | 3.5 | 10 | | |
| Output peak-to-peak noise current ²⁾ | $I_{no,pp}$ | ppm | - | 18 | 34 | | - | |
| Electrical offset current + self magnetization + effect of earth magnetic field ²⁾ | I_{OE} | ppm | -10 | - | 10 | * | - | |
| Error (of full scale) | - | % | - | <0.0012 | - | | - | |
| Temperature coefficient of I_{OE} @ $I_p = 0$ A | TCI_{OE} | ppm/K | -0.3 | - | 0.3 | | - | |
| Frequency influence ³⁾ (of measured value) | - | %/kHz | - | <0.1 | - | | - | |
| Angular accuracy ³⁾ | - | ° | - | <0.01 + 0.05 °/kHz | - | | - | |
| Linearity error ²⁾ | ϵ_L | ppm | -2 | 1 | 2 | | - | |
| | | | -3 | 1 | 3 | * | | |
| Step response time to 90 % of $I_{PN,DC}$ | t_r | µs | - | - | 1 | | di/dt of 100 A/µs | |
| Frequency bandwidth (±1 dB) | BW | kHz | - | 230 | - | | Small-signal bandwidth, 1.5 % of I_{PN} | |
| Frequency bandwidth (±3 dB) | BW | kHz | - | 440 | - | | | |
| Start-up time | t_{start} | s | - | - | 15 | | - | |

Notes

1) Single pulse only, not AC. The transducer may require a few seconds to return to normal operation when autoreset system is running.

2) All ppm figures refer to full-scale which corresponds to a secondary nominal RMS current.

3) Verified with 50 Arms, DC...10 kHz

*) Lines with an * in the comment column apply over the -40...85 °C ambient temperature range.

OVERLOAD PROTECTION – ELECTRICAL SPECIFICATION – STATUS

The overload occurs when the primary current I_p exceeds a trip level such that the fluxgate detector becomes completely saturated and, consequently, the transducer will switch from normal operation to overload mode.

This trip level is guaranteed to be greater than I_{PM} and its actual value depends on operating conditions such as temperature and measuring resistance.

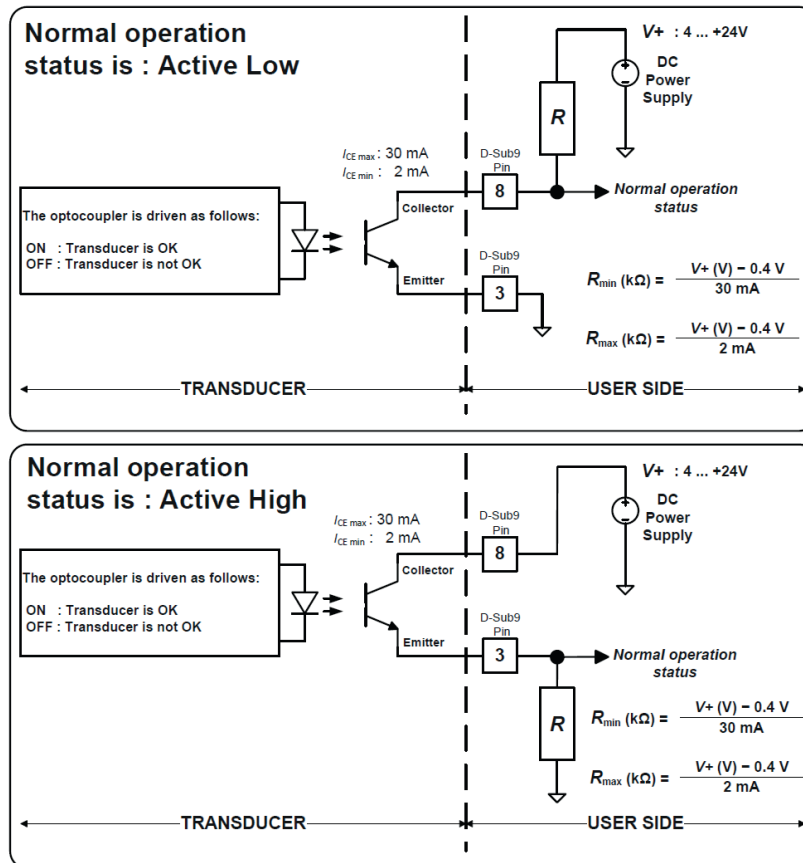
When this happens, the transducer will automatically begin to sweep in order to lock on the primary current again.

The overload conditions are:

- ▶ The secondary current I_s generated is a low frequency signal.
- ▶ The signal normal operation status (between pin 3 and 8 of the D-sub connector) switches to V+ or ≈ 0.7 V. See the status port wiring below.
- ▶ The green LED indicator (normal operation status) turns off.

The measuring can resume when the primary current returns in the measuring range between $-I_{PN}$ and $+I_{PN}$. Then the signal normal operation status switches to GND and the green LED indicator (normal operation status) switches on.

STATUS/INTERLOCK PORT WIRING



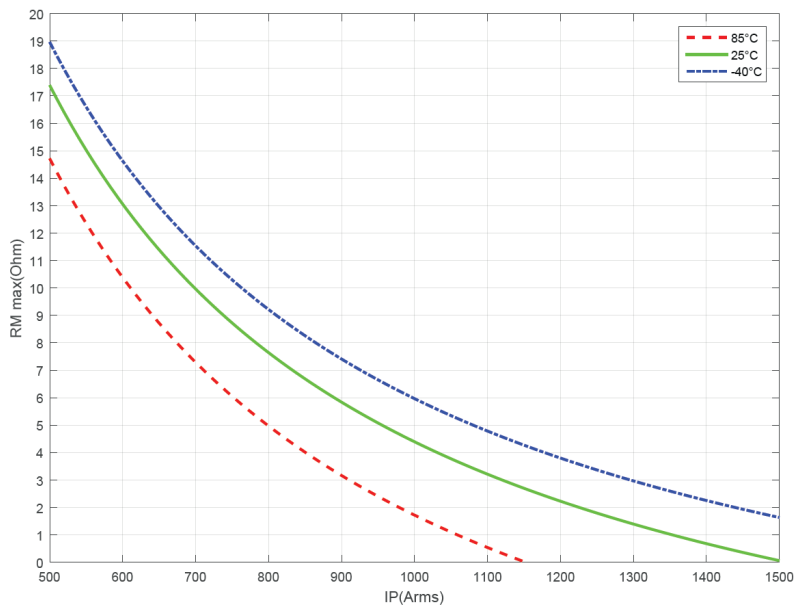
The following table shows how the normal operation status acts as below:

| Status | Value | Description |
|-------------|---------|--|
| Active low | ≈ 0.7 V | The transducer is OK (normal operation) |
| | V+ | The transducer is not OK (overload mode or supply fault) |
| Active high | V+ | The transducer is OK (normal operation) |
| | ≈ 0.7 V | The transducer is not OK (overload mode or supply fault) |

PA-IN-1000-S

MAXIMUM MEASURING RESISTANCE VERSUS PRIMARY CURRENT AND TEMPERATURE

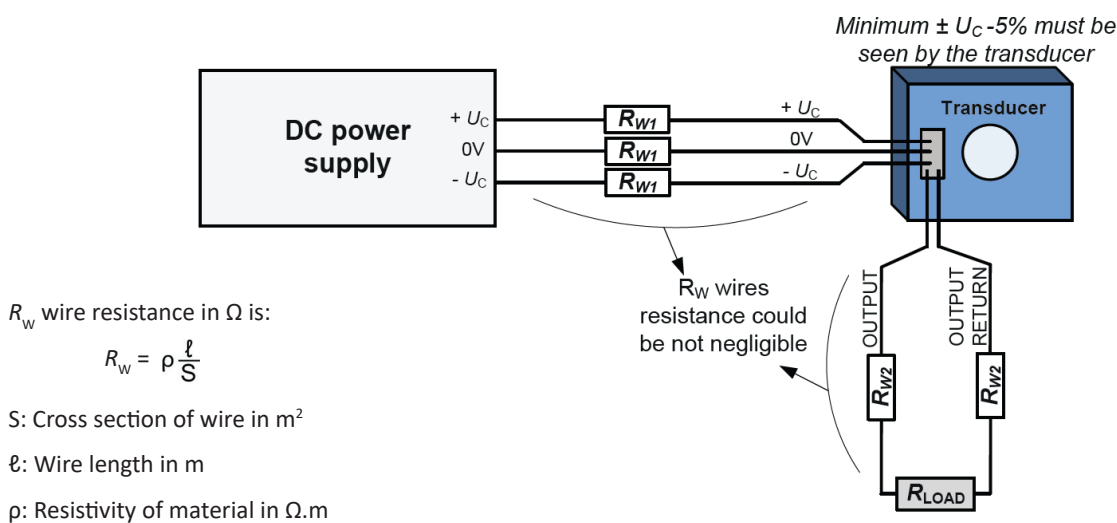
$\pm U_C = \pm 14.25 \text{ V}$



POWER SUPPLY AND LOAD

In order to reach the measuring range according to the maximum measuring resistor, be careful with the setup measurement when wires length are high. It means that:

- ▶ the wires resistance could be not negligible
- ▶ the voltage at the output of the DC power supply and the voltage at the transducer could be significantly different



Total measuring resistance is:

$$R_M = R_L + 2 \times R_{W1} + 2 \times R_{W2}$$

If $R_{W1} = R_{W2} = R_{\text{WIRE}}$ then $R_M = R_L + 4 \times R_{\text{WIRE}}$

PA-IN-1000-S

SAFETY

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

WARNING



Risk of injury

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 injury due to electrical shock

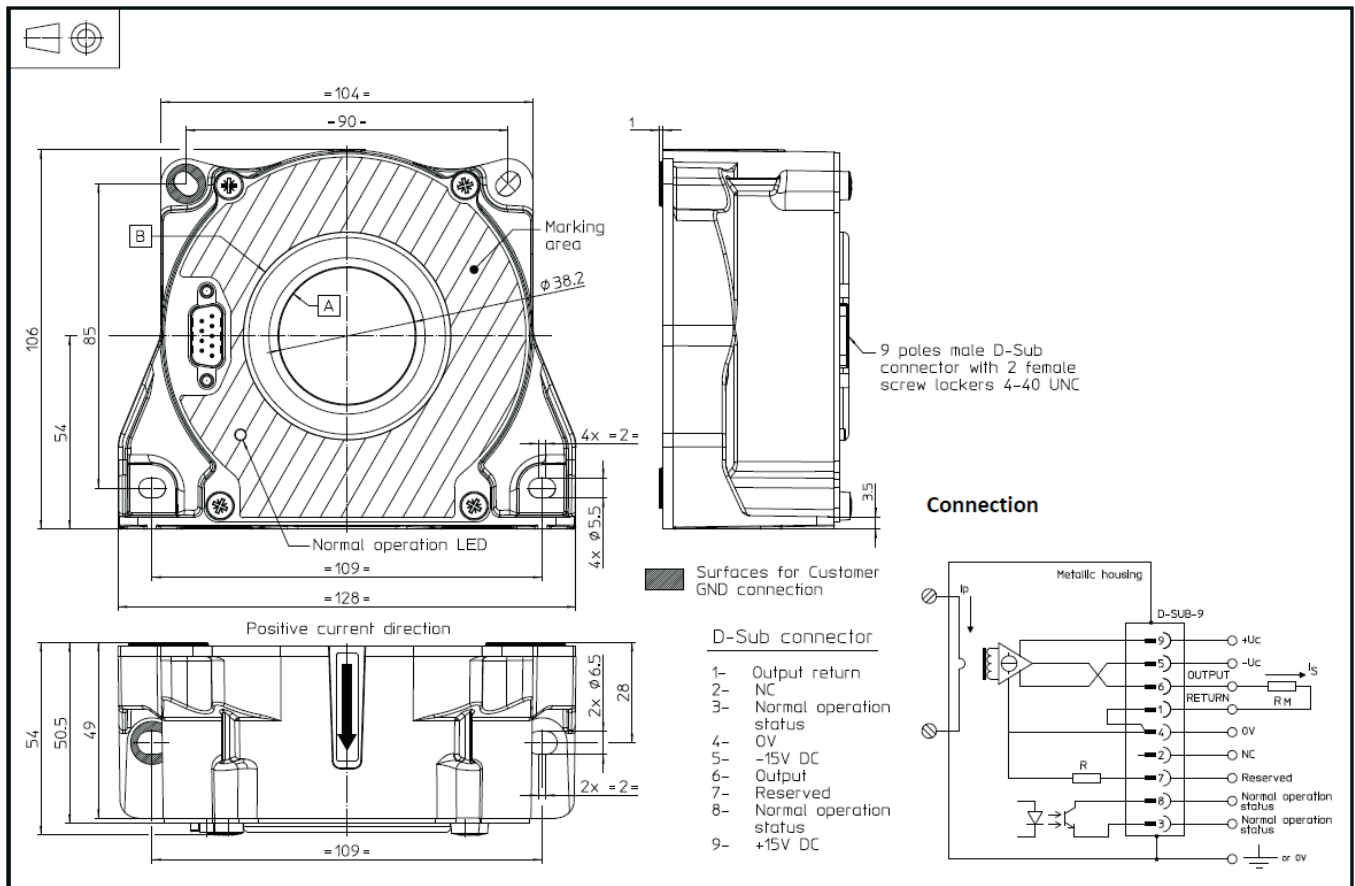
When operating the transducer, certain parts of the module can carry hazardous voltage (e.g. primary busbar, power supply). Ignoring this warning can lead to injury and/or cause serious damage.



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.

DIMENSIONS



PA-IN-1000-S



MECHANICAL CHARACTERISTICS

- ▶ General tolerance ± 0.5 mm
- ▶ Transducer fastening
 - Horizontal mounting 4 slotted holes $\varnothing 5.5$ mm
4 M5 steel screws
 - Vertical mounting 2 slotted holes $\varnothing 6.5$ mm
2 M6 steel screws
 - Recommended fastening torque 4.4 Nm
- ▶ Connection of secondary on DSUB-9,
UNC 4-40
- ▶ Installation of the transducer must be done unless otherwise specified on the datasheet, according to the manufacturer's [Transducer Generic Mounting Rules](#).
- ▶ All mounting recommendations are given for a standard mounting. Screws with flat and spring washers.

CONNECTION

- ▶ Normal operation status (pins 3 and 8)
- ▶ Normal operation means:
 - ± 15 V ($\pm U_c$) present
 - 0 V on DSUB has to be tied
 - zero detector is working
 - compensation current $\leq I_{PM}$ DC
 - green LED indicator switches on

REMARKS

- ▶ I_s is positive when I_p flows in the direction of the arrow.
- ▶ We recommend that a shielded output cable and plug are used to ensure the maximum immunity against electrostatic fields.
- ▶ Temperature of the primary conductor should not exceed 100 °C.
- ▶ We recommend to fix the potential of the housing to the ground or 0 V (on indicated surfaces).