

K-No.: 26333

1000 A Current Sensor for $\pm 15V$ - Supply Voltage
Date: 10.04.2014

 for electric current measurement:
 DC, AC, pulsed, mixed ..., with a galvanic isolation between
 primary circuit (high power) and secondary circuit (electronic circuit)

Customer: Standard Type

Customer part no.:
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Electrical Data – Ratings

| | | | |
|----------|----------------------------------|-----------|----------|
| I_{PN} | Primary nominal r.m.s. current | 1000 | A |
| R_M^* | Measuring resistance | 0 ... 100 | Ω |
| I_{SN} | Secondary nominal r.m.s. current | 200 | mA |
| K_N | Turns ratio | (1): 5000 | |

 * for $I_{P,max}$ see fig. 1 on page 2

Accuracy – Dynamic performance data

| | | min. | typ. | max. | Einheit |
|------------------------|---|----------|------|------|---------|
| $I_{P,max}^*$ | Max. measuring range @ $R_M = 10 \Omega$; $T_A = 25^\circ C$ | 1580 | | | A |
| | @ $R_M = 10 \Omega$; $T_A = 85^\circ C$ | 1340 | | | A |
| X | Accuracy @ I_{PN} , $T_A = -40 \dots +85^\circ C$ | | | 0.4 | % |
| ϵ_L | Linearity | | | 0.1 | % |
| I_0 | Offset current @ $I_P = 0$, $T_A = 25^\circ C$ | | | 0.1 | mA |
| I_{0H} | Hysteresis current | | | 0.1 | mA |
| t_r | Response time @ 80% of I_{PN} | | < 1 | | μs |
| $\Delta t (I_{P,max})$ | Delay time at $di/dt = 1200 A/\mu s$ | | | 1 | μs |
| f | Frequency bandwidth | DC...100 | | | kHz |

 *currents with high slew rates can be measured above $I_{P,max}$
General data

| | | min. | typ. | max. | Einheit |
|---------------|--|-------------|----------|-------------|------------|
| T_A | Ambient operating temperature | -40 | | +85 | $^\circ C$ |
| T_S | Ambient storage temperature | -40 | | +85 | $^\circ C$ |
| m | Mass | | 550 | | g |
| V_C | Supply voltage | ± 13.50 | ± 15 | ± 15.75 | V |
| I_{C0} | Current consumption for $I_P = 0A$ | | 25 | | mA |
| I_{CN} | Current consumption for $I_{PN} = 1000A$ | | 190 | | mA |
| * S_{clear} | Clearance | 20 | | | mm |
| * S_{creep} | Creepage | 20 | | | mm |

 * Constructed and manufactured and tested in accordance with EN 61800-5-1 (Pin 1 - 4 to primary opening)
 Reinforced insulation, Insulation material group 1, Pollution degree 2

| | | | | | |
|--------------|-------------------------|-------------------------------|------------|------|---|
| * V_{sys} | System voltage | overvoltage category 3 | RMS | 1000 | V |
| * V_{work} | Working voltage | (tabel 7 acc. to EN61800-5-1) | RMS | 1500 | V |
| * U_{PD} | Rated discharge voltage | | peak value | 1500 | V |

 Max. potential difference acc. to UL 508 RMS 1000 V_{AC}

| Datum | Name | Index | Änderung |
|----------|------|-------|---|
| 10.04.14 | KRe. | 83 | Completion of data sheet: X, V_C , „max. Potential...“ (page1), Values for supply voltage (page2), maximum continuous currents at defined Temperatures (page2), Applicable documents added and V_d from 4.4 \rightarrow 6kV (page 5) CN-985 |

| | | | |
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Maximum peak currents at defined temperatures Values for supply voltage $\pm 14.25 V (\pm 15 V -5 \%)$

| | | | | |
|-------------|------------|------------|-------------|-------------|
| T_A | 55 °C | 55 °C | 55 °C | 55 °C |
| R_M | 1 Ω | 5 Ω | 20 Ω | 50 Ω |
| $I_{P,max}$ | 1780A | 1620A | 1200A | 790A |

| | | | | |
|-------------|------------|------------|-------------|-------------|
| T_A | 85 °C | 85 °C | 85 °C | 85 °C |
| R_M | 1 Ω | 5 Ω | 20 Ω | 50 Ω |
| $I_{P,max}$ | 1620A | 1480A | 1120A | 750A |

Maximum continuous currents at defined temperatures

| | | |
|-------------------------|-----------------------|--|
| T_A | $\leq 70\text{ °C}$ | $70\text{ °C} < T_a \leq 85\text{ °C}$ |
| $I_P = I_{P,max}$ up to | 1800 A _{rms} | 1200 A _{rms} |

Limit curve of measurable current $\hat{I}_P=f(R_M)$ Values for supply voltage $\pm 14.25 V (\pm 15 V -5 \%)$

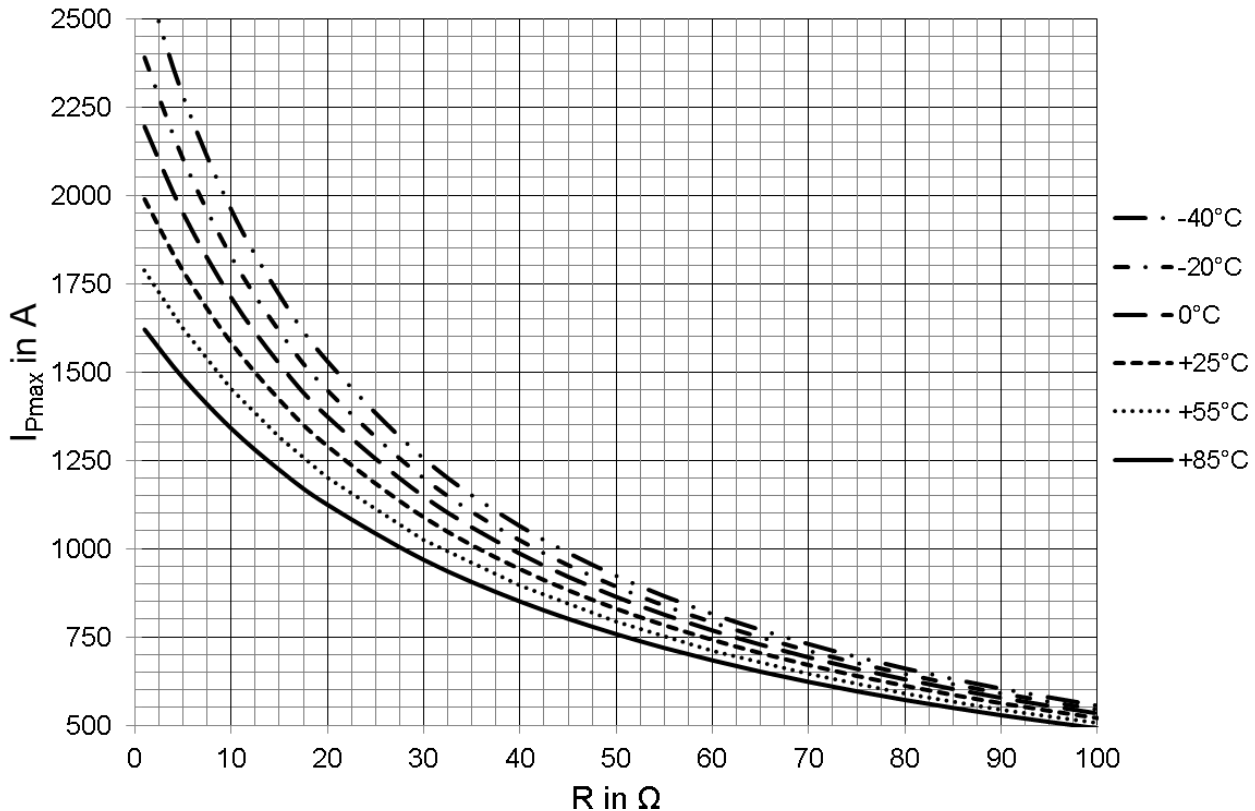


Fig. 1: $I_{P,max} = f(R_m) @T_A$

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Overload puls (μs -range)

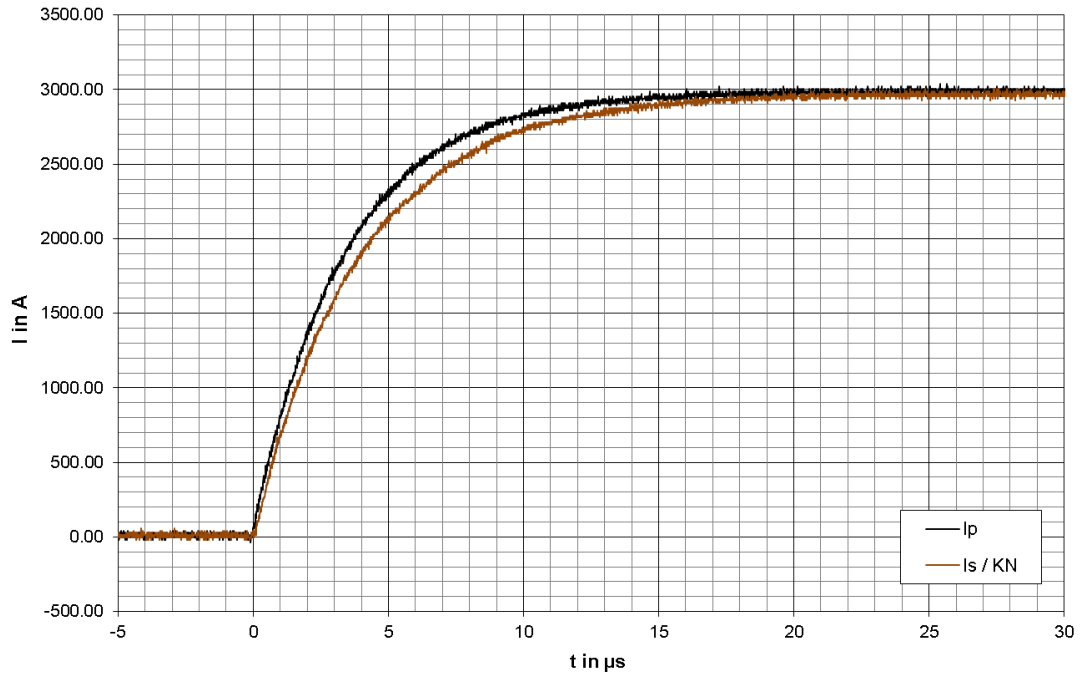
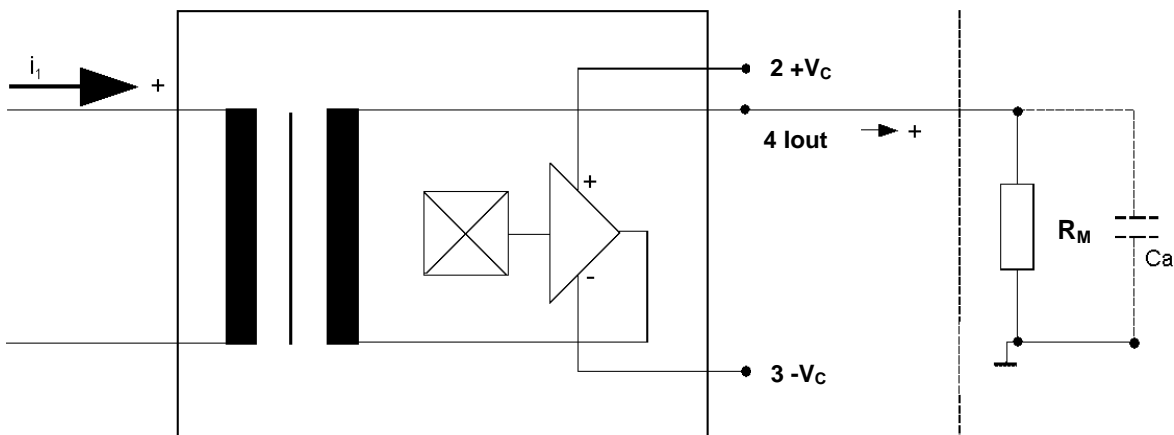


Fig. 2: Output current reaction of a 3kA current pulse with $R_M = 10\Omega$

Schematic diagram:



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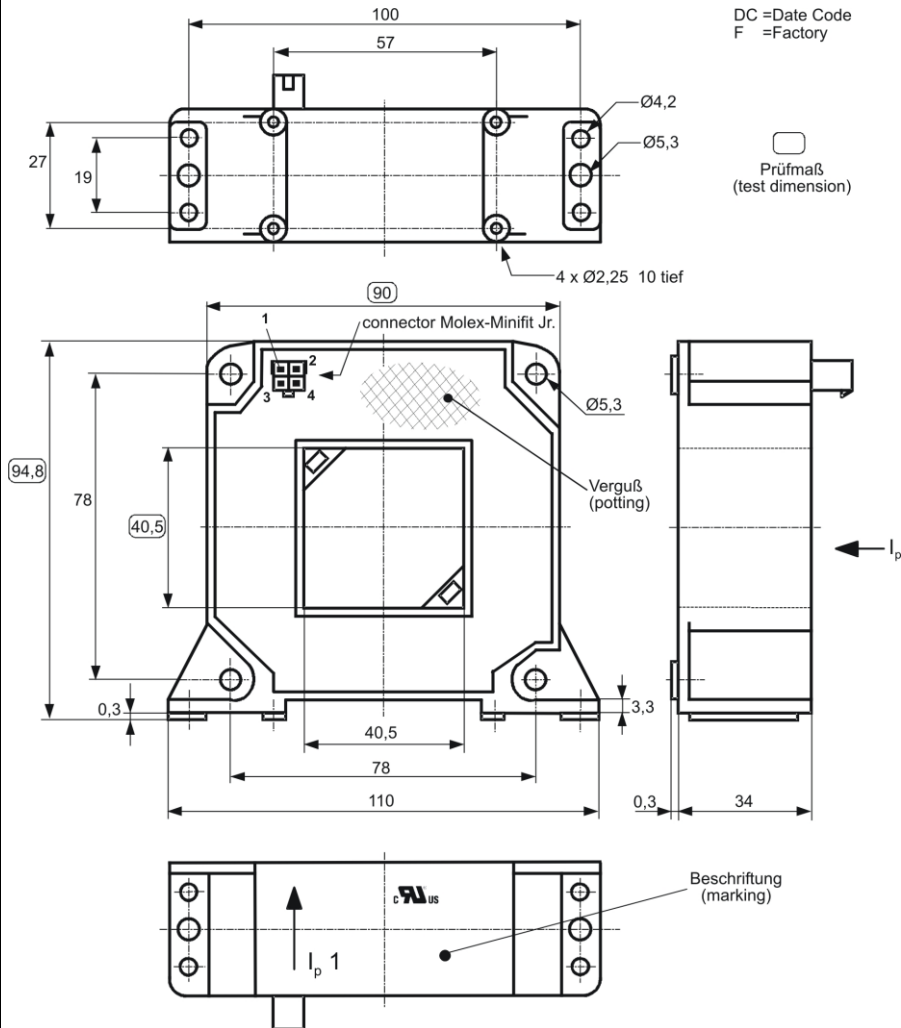
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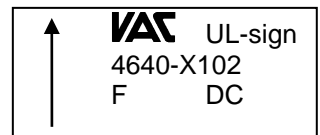
Maßbild (mm): Freimaßtoleranz DIN ISO 2768-c
Mechanical outline General tolerance

Anschlüsse:
Connections:
Connector:
Molex Minifit(4Pin)

Pin 1: n.c.
Pin 2: +V_C
Pin 3: -V_C
Pin 4: I_{out}



Beschriftung (marking):



¹ I_p: positive current direction

Offset ripple reduction

The offset ripple can be reduced by an external low pass. Simplest solution is a passive low pass filter of 1st order with

$$f_g = \frac{1}{2\pi \cdot R_M \cdot C_a}$$

In this case the response time is enlarged.

It is calculated from:

$$t'_r \leq t_r + 2,5R_M C_a$$

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Inspection¹⁾ (Measurement after temperature balance of the samples at room temperature; SC = significant characteristic)

| | | | | | |
|----------------|------------|---------|--|--------------------|---------|
| $K_N(N_1/N_2)$ | (V) | M3011/6 | Transformation ratio ($I_P=3*1000A$, 40-80 Hz) | 1 : 5000 \pm 0.4 | % |
| I_0 | (V) | M3226 | Offset current | < 0.1 | mA |
| $V_{P,eff}$ | (V) | M3014 | Test voltage, rms, 1s Pin 1 - 4 to Primary | 2.2 | kV (SC) |
| V_e | (AQL 1/S4) | | Partial discharge voltage acc. M3024 (RMS) with V_{vor} (RMS) | 1500 1875 | V V |

Type Testing (Pin 1 - 4 to primary)

Designed according standard EN 61800 with insulation material group 1

| | | | | | |
|-------|--|---|-------|--------------|--------|
| V_W | | HV transient test according (to M3064) (1,2 μs / 50 μs -wave form) | | 12 | kV |
| V_d | | Testing voltage acc. M3014 (RMS) | (5 s) | 6 | kV |
| V_e | | Partial discharge voltage acc. M3024 (RMS) with V_{vor} (RMS) | | 1500 1875 | V V |

Applicable documents

Constructed and manufactured and tested in accordance with EN 61800.

Further standards: UL 508 ; file E317483, category NMTR2 / NMTR8

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Explanation of several of the terms used in the tablets (in alphabetical order)

I_{0H} : Zero variation after overloading with a DC of tenfold the rated value ($R_M = R_{MN}$)

I_{0t} : Long term drift of I_o after 100 temperature cycles in the range -40 bis 85 °C.

t_r : Response time, measured as delay time at $I_P = 0,8 \cdot I_{Pmax}$ between a rectangular current and the output current.

$\Delta t (I_{Pmax})$: Delay time between I_{Pmax} and the output current i_a with a primary current rise of $di_1/dt = 1200 A/\mu s$.

U_{PD} Rated discharge voltage (recurring peak voltage separated by the insulation) proved with a sinusoidal voltage V_e
 $U_{PD} = \sqrt{2} \cdot V_e / 1,5$

V_{vor} Defined voltage is the RMS value of a sinusoidal voltage with peak value of $1,875 \cdot U_{PD}$ required for partial discharge test in IEC 61800-5-1

$$V_{vor} = 1,875 \cdot U_{PD} / \sqrt{2}$$

V_{sys} System voltage RMS value of rated voltage according to IEC 61800-5-1

V_{work} Working voltage voltage according to IEC 61800-5-1 which occurs by design in a circuit or across insulation

$X_{ges}(I_{PN})$: The sum of all possible errors over the temperature range by measuring a current I_{PN} :

$$X_{ges} = 100 \cdot \left| \frac{I_S(I_{PN})}{K_N \cdot I_{PN}} - 1 \right|$$

X: Permissible measurement error in the final inspection at RT, defined by

$$X = 100 \cdot \left| \frac{I_{SB}}{I_{SN}} - 1 \right|$$

where I_{SB} is the output DC value of an input DC current of the same magnitude as the (positive) rated current ($I_o = 0$)

X_{Ti} : Temperature drift of the rated value orientated output term. I_{SN} (cf. Notes on F_i) in a specified temperature range, obtained by:

$$X_{Ti} = 100 \cdot \left| \frac{I_{SB}(T_{A2}) - I_{SB}(T_{A1})}{I_{SN}} \right|$$

ε_L : Linearity fault defined by $\varepsilon_L = 100 \cdot \left| \frac{I_P}{I_{PN}} - \frac{I_{Sx}}{I_{SN}} \right|$

Where I_P is any input DC and I_{Sx} the corresponding output term. I_{SN} : see notes of F_i ($I_o = 0$).

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