

**K-No.:** 26364

**1000 A Current Sensor for ±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	$\Omega$
$I_{SN}$	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	%
$\epsilon_L$	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		$\mu s$
$\Delta t (I_{P,max})$	Delay time at $di/dt = 1200 A/\mu s$			1	$\mu s$
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	$\pm 13.50$	$\pm 15$	$\pm 15.75$	V
$I_{CO}$	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 - 3 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	82	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 → 6kV (page5). CN-984

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**Maximum peak currents at defined temperatures Values for supply voltage ±14.25 V (±15 V -5 %)**

T <sub>A</sub>	55 °C	55 °C	55 °C	55 °C
R <sub>M</sub>	1 Ω	5 Ω	20 Ω	50 Ω
I <sub>P,max</sub>	1780A	1620A	1200A	790 A

T <sub>A</sub>	85 °C	85 °C	85 °C	85 °C
R <sub>M</sub>	1 Ω	5 Ω	20 Ω	50 Ω
I <sub>P,max</sub>	1620A	1480A	1120A	750A

**Maximum continuous currents at defined temperatures**

T <sub>A</sub>	≤ 70 °C	70 °C < T <sub>a</sub> ≤ 85 °C
I <sub>P</sub> = I <sub>P,max</sub> up to	1800 A <sub>rms</sub>	1200 A <sub>rms</sub>

**Limit curve of measurable current  $I_P=f(R_M)$  Values for supply voltage ±14.25 V (±15 V -5 %)**

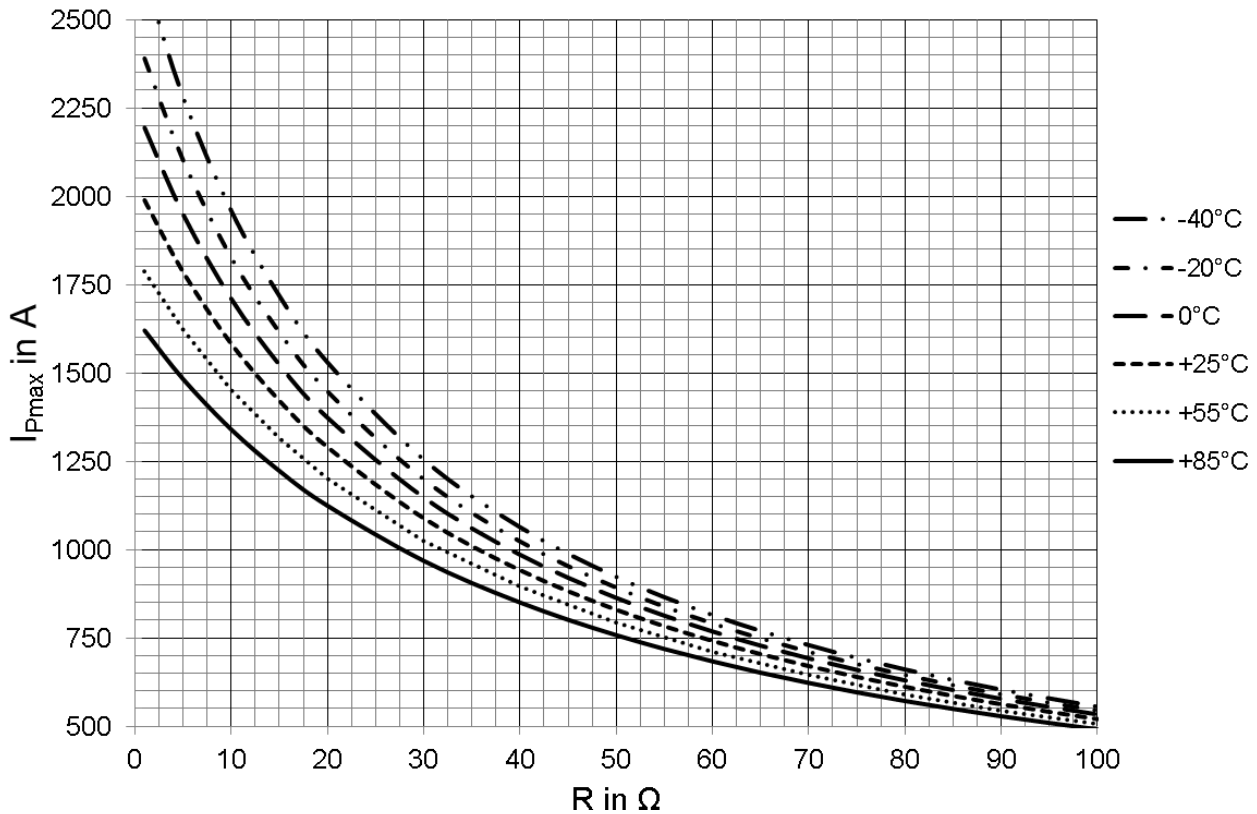


Fig. 1:  $I_{P,max} = f(R_m) @T_A$

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**Overload puls ( $\mu s$ -range)**

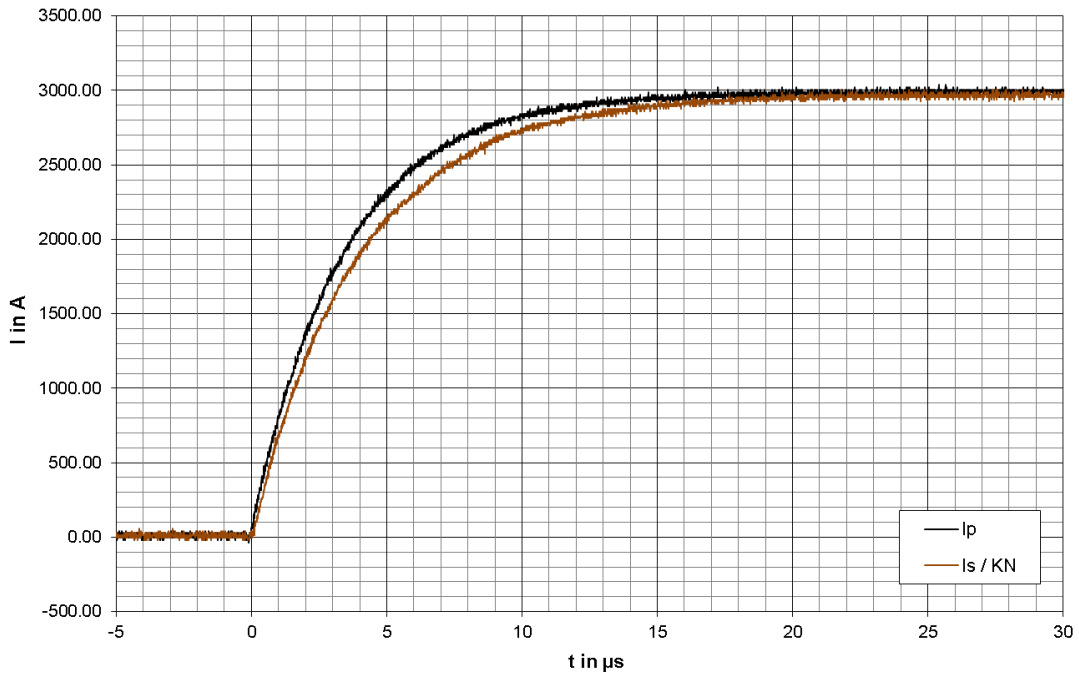
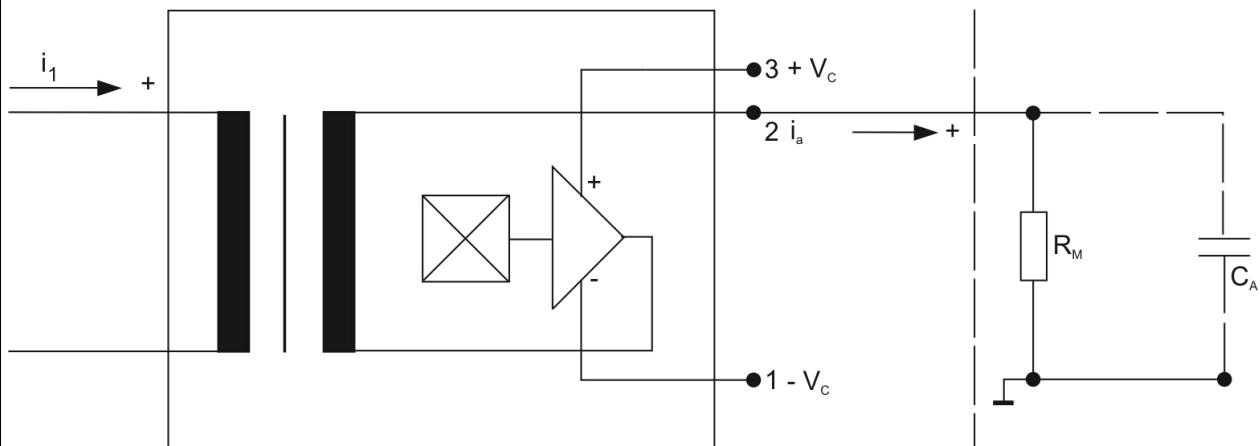


Fig. 2: Output current reaction of a 3kA current pulse with  $R_M = 10\Omega$

**Schematic diagram:**



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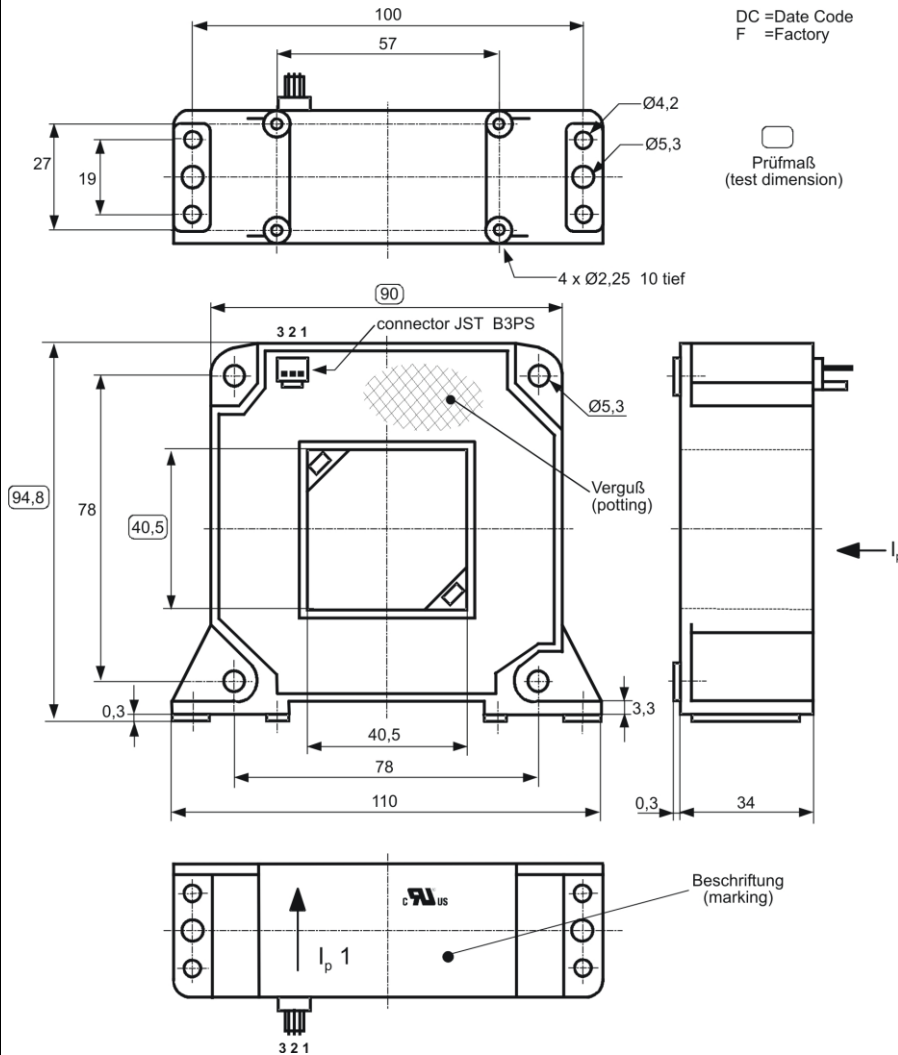
Maßbild (mm): Freimaßtoleranz DIN ISO 2768-c  
Mechanical outline General tolerance

Anschlüsse:  
Connections:  
**Connector:**  
JST B3PS

Pin 1: -V<sub>C</sub>  
Pin 2: I<sub>Out</sub>  
Pin 3: +V<sub>C</sub>

Beschriftung  
(marking):

↑ UL-sign  
4640-X101  
F DC



<sup>1</sup> I<sub>p</sub>: 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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**Inspection<sup>1)</sup>** (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 - 3 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 - 3 to primary)

Designed according standard EN 61800 with insulation material group 1

$V_W$		HV transient test according (to M3064) (1,2 $\mu s$ / 50 $\mu s$ -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

$X_{ges}(I_{PN})$ : 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:

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

$\varepsilon_L$ : 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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