VAC VACUUMSCHMELZE	**SPECIFICATION**	**Item No.:**	**T60404-P4640-X151**

K-No.: 26358	1000 A Current Sensor for ±24V- Supply Voltage for electric current measurement: DC, AC, pulsed, mixed ..., with a galvanic isolation between primary circuit (high power) and secondary circuit (electronic circuit)	Date: 10.04.2014
Customer: Standard Type	Customer part no..:	Page 1 of 6

Electrical data

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 Ω; T_A= 25°C	2500			A
	@ R_M = 10 Ω; T_A= 85°C	2150			A
X	Accuracy @ I_{PN}, T_A= -40 ... +85°C			0.4	%
ε_L	Linearity			0.1	%
I_0	Offset current @ I_P=0, T_A= 25°C			0.1	mA
I_{0H}	Hysteresis current			0.1	mA
t_r	Response time @ 80% of I_{PN}		< 1		µs
Δt ($I_{P,max}$)	Delay time at di/dt = 1200 A/µs			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	°C
T_S	Ambient storage temperature	-40		+85	°C
m	Mass		550		g
V_C	Supply voltage	±21.60	±24	±25.2	V
I_{C0}	Current consumption for Ip = 0A		27		mA
I_{CN}	Current consumption for I_{PN} = 1000A		190		mA
* s_{clear}	Clearance	20			mm
* s_{creep}	Creepage	20			mm

***** Constructed and manufactored 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 , Vc, „max. Potential...” (page1), Values for supply voltage (page2), maximum continuous currents at defined Temperatures (page2), UL-sign (page4). Applicable documents added, Vd 6kV (page5). CN-987

Hrsg.: KB-E editor	Bearb: Ku. designer		KB-PM: KRe. check		freig.: HS released

Maximum peak currents at defined temperatures **Values for supply voltage ±22.80 V (±24 V -5 %)**

T_A	55 °C	55 °C	55 °C	55 °C
R_M	1 Ω	5 Ω	20 Ω	50 Ω
$I_{P,max}$	2880A	2610A	1930A	1270A

T_A	85 °C	85 °C	85 °C	85 °C
R_M	1 Ω	5 Ω	20 Ω	50 Ω
$I_{P,max}$	2610A	2390A	1810A	1220A

Maximum continuous currents at defined temperatures

T_A	≤ 70 °C	70 °C < Ta ≤ 85 °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 ±22.80 V (±24 V -5 %)**

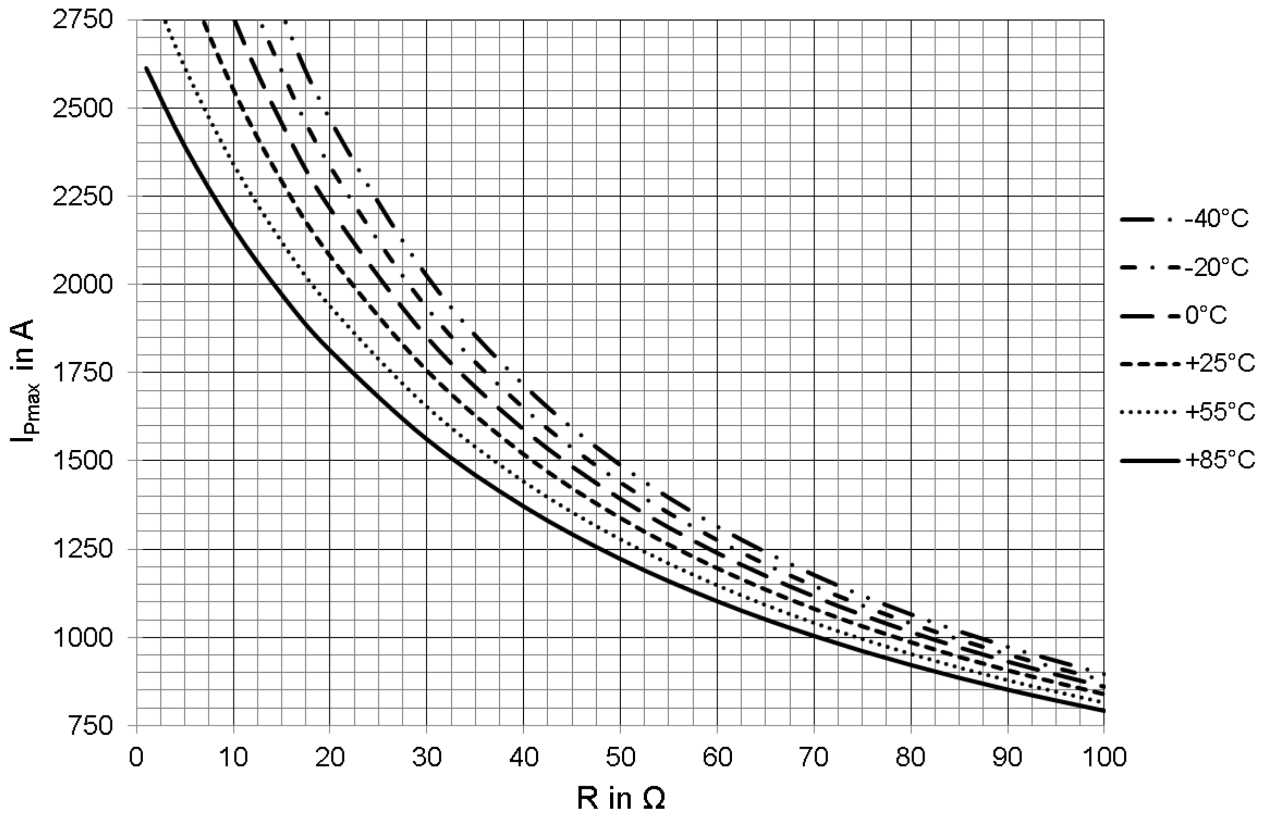


Fig. 1: $I_{Pmax} = f(R_m)$ @T_A

Overload puls (µs-range)

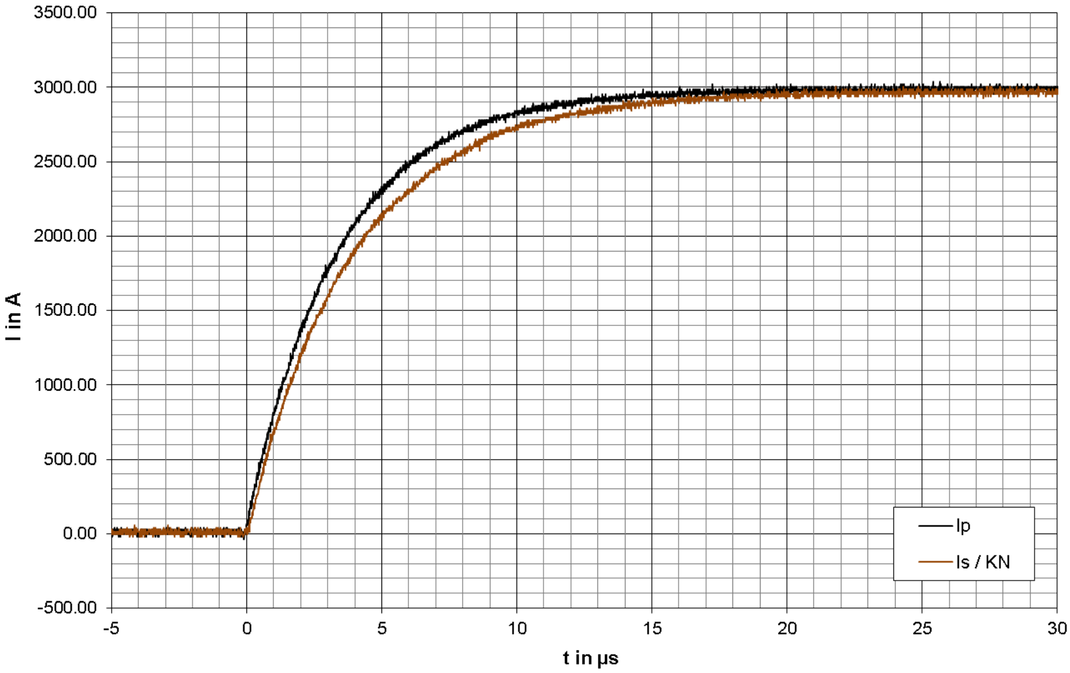
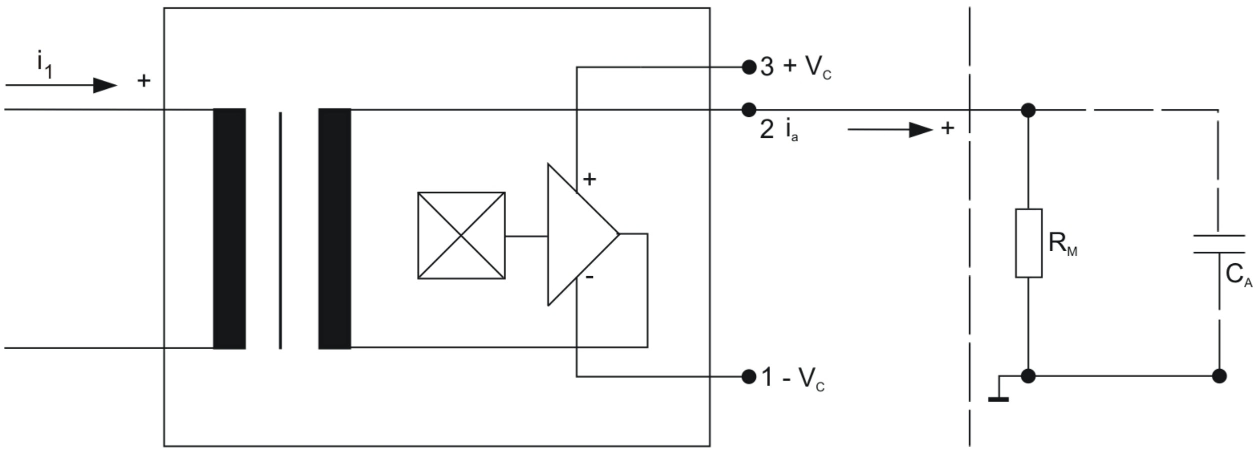


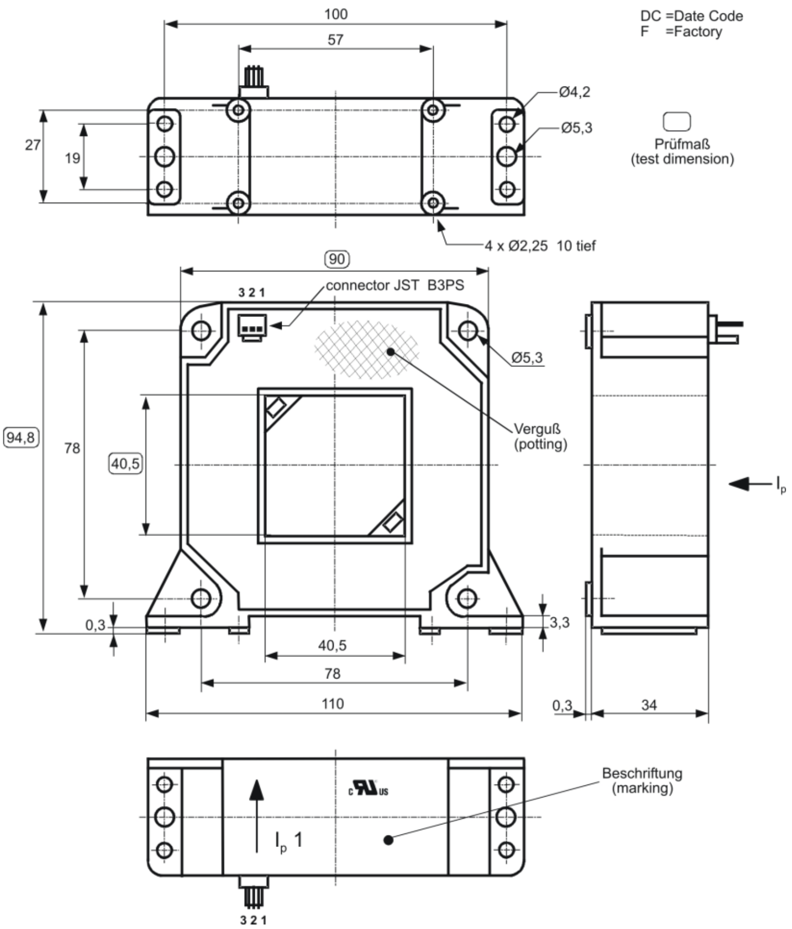
Fig. 2: Output current reaction of a 3kA current pulse with R_M= 10Ω

Schematic diagram:



The polarity of the supply voltage is very important!
With the wrong polarity, the current sensor will be damaged after a few seconds!

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



Anschlüsse:
Connections:
Connector:
JST B3PS

Pin 1: $-V_C$
Pin 2: I_{Out}
Pin 3: $+V_C$

Beschriftung
(marking):

VAC UL-sign
4640-X151
F DC

[1] Ip: 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:

$$t_r' \le t_r + 2{,}5 R_M C_a$$

Inspection[1)] (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 ± 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 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 manufactored and tested in accordance with EN 61800.
Further standards: UL 508 ; file E317483, category NMTR2 / NMTR8

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.

Δt (I_{Pmax}): Delay time between I_{Pmax} and the output current i_a with a primary current rise of di_1/dt = 1200 A/µs.

U_{PD} Rated discharge voltage (recurring peak voltage separated by the insulation) proved with a sinusoidal voltage V_e

$U_{PD} = \sqrt{2} * V_e / 1{,}5$

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

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

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 ($I_o = 0$).