VACUUMSCHMELZE	SPECIFICATION	Item No.: T60404-P4640-X100

K-No.: 26021	1000 A Current Sensor for ±15V- 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: 17.02.2016
Customer: Standard Type	Customer part no..:	Page 1 of 6

RoHS compliant

c UL us

Electrical data

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

[1] connected to sensor output, R_M for $I_{P,max}$ see fig. 1 on page 2

Accuracy – Dynamic performance data

		min.	typ.	max.	Einheit
$I_{P,max}$ [2]	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
t_{ra}	Reaction time @ 10% of I_{PN} (di/dt = 1200 A/µs)	-	-	1	µs
f_{BW}	Frequency bandwidth	DC…100	-	-	kHz

[2] currents with high slew rates can be measured above $I_{P,max}$ (transformer behavior)

General data

		min.	typ.	max.	Einheit
ϑ_A	Ambient operating temperature	-40	-	+85	°C
ϑ_S	Ambient storage temperature	-40	-	+85	°C
m	Mass	-	550	-	g
U_C	Supply voltage	±13.50	±15	±15.75	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
* U_{sys}	System voltage (determines impulse voltage acc. table 7)	-	-	1000	V_{RMS}
* U_{AC}	Working voltage (acc. U_{ACL} as limit in table 3)			1000	V_{RMS}
		-	-	1500	V_{DC}
* U_{PD}	Rated discharge voltage (acc. table 24 with U_{PD}=U_{ACP})	-	-	1414	V_{peak}
	Max. potential difference acc. to UL 508	-	-	1000	V_{rms}

***** Constructed and manufactored and tested in accordance with EN 61800-5-1:2007 (Pin 1 - 3 to primary opening)
Reinforced insulation, Insulation material group 1, Pollution degree 2, Overvoltage category III

Datum	Name	Index	Änderung
17.02.16	Ku	83	Data sheet reworked. CN-15-519

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

Capability of the sensor for measuring max. peak currents at defined temperatures, values for supply voltage ±14.25 V (±15 V -5 %):

ϑ_A	55 °C	55 °C	55 °C	55 °C	85°C	85°C	85°C	85°C
R_M	1 Ω	5 Ω	20 Ω	50 Ω	1 Ω	5 Ω	20 Ω	50 Ω
$I_{P,max}$	1780A	1620A	1200A	790A	1620A	1480A	1120A	750A
Dwell time	*< 10min*	*< 10min*	*< 10min*	∞	*< 3min*	*< 3min*	*< 3min*	∞

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

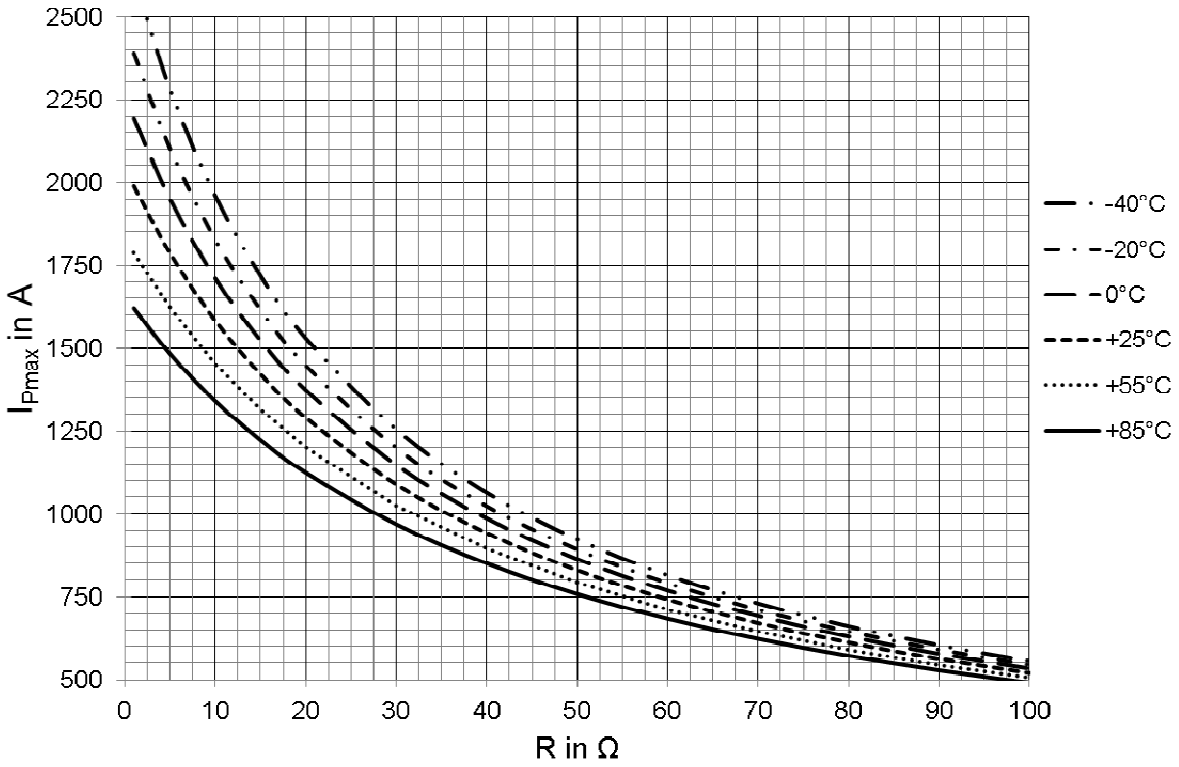


Fig. 1: $I_{Pmax} = f(R_m)$ @ ϑ_A

Absolute maximum conditions:

ϑ_A	≤ 70 °C	70 °C < ϑ_A ≤ 85 °C
$I_P = I_{P,max}$ up to	1800 A_{DC}	1200 A_{DC}

Stresses above these conditions may cause permanent damage. Exposure to absolute maximum rating conditions for extended periods will degrade device reliability and lifetime expectancy. Functional operation of the device at these or any other conditions beyond those specified in this specification is not permitted.

Overload pulse (µs-range)

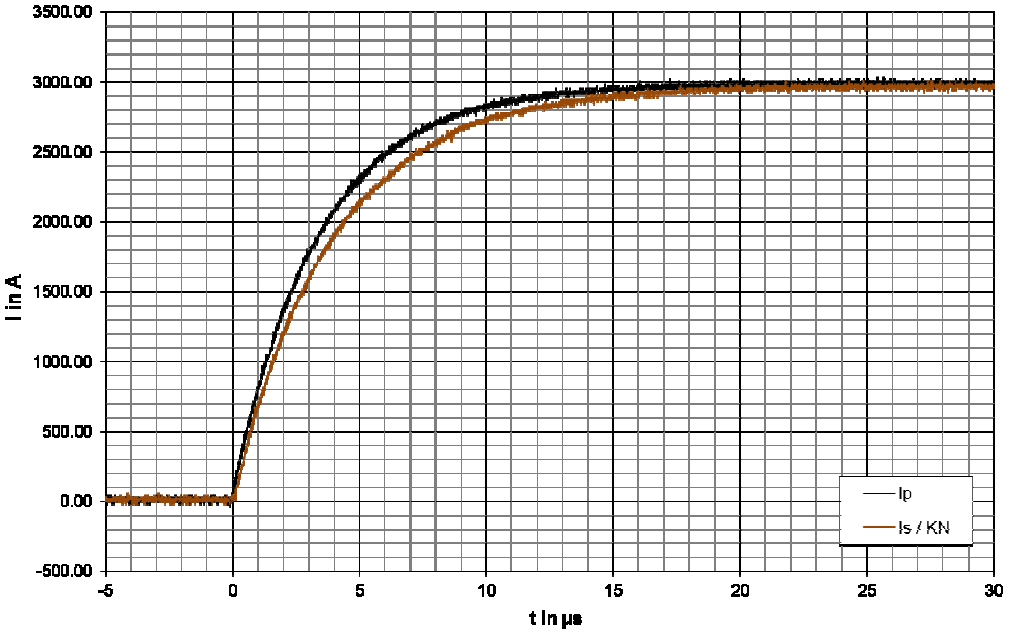
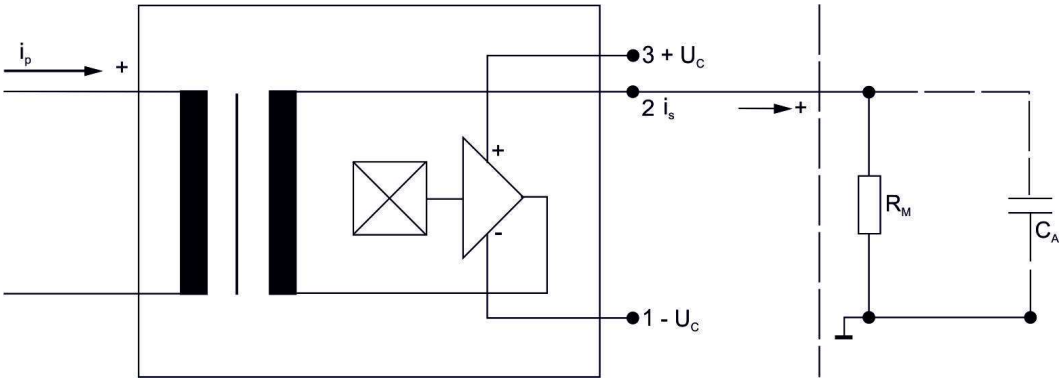


Fig. 2: Output current reaction of a 3kA current pulse with R_M= 10Ω

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!

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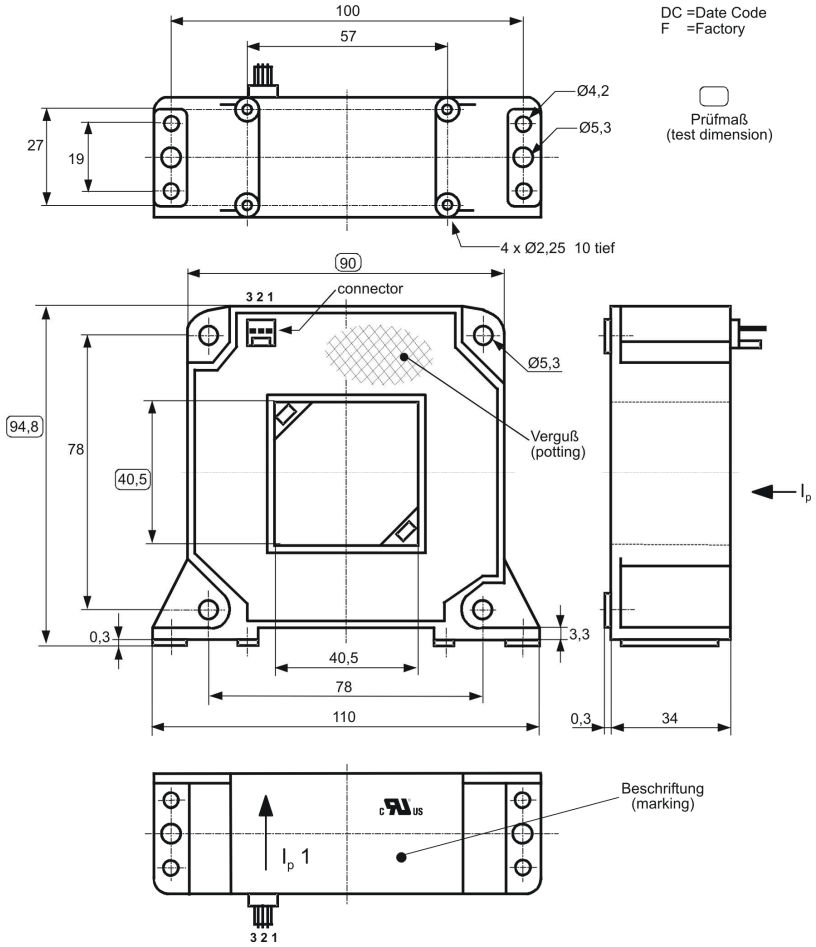
Mechanical outline (mm) General tolerances DIN ISO 2768-c



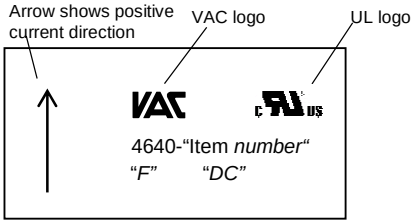
Connections:

Connector:
Molex 7395 (3 Pin)

Pin 1: $-U_C$
Pin 2: I_S (output current)
Pin 3: $+U_C$

Marking

Explanation: Item number: see Tab.2 (left column)
F = Factory code
DC = Date code



Example: Sensor with end number X152
Produced in Slovakia in April 2015
- *Part number: 4640-X152*
- *Factory code: SK*
- *Date code: F4*

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

Offset ripple reduction

The offset ripple can be reduced by an external low pass. The simplest solution is a passive low pass filter of 1st order by connecting a capacitor parallel to the burden resistor R_M as shown on page 3. The required capacitance can be calculated as follows:

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

In this case the response time is enlarged. It is calculated from:

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

Routine Test[1)] (Measurement after temperature balance of the samples at room temperature; SC = significant characteristic)

$K_N(N_1/N_2)$	(100%) M3011/6	Transformation ratio (I_{PN}= 1000A, 40-80 Hz)		1 : 5000 ± 0.4	%	(SC)
I_0	(100%) M3226	Offset current		< 0.1	mA	(SC)
U_P	(100%) M3014	Test voltage (1s) Pin 1 - 3 to primary opening	(RMS)	2.2	kV	(SC)
U_{PDE}	(AQL 1/S4)	Partial discharge voltage (extinction)	(RMS)	1500	V	
$U_{PD(rms)} \cdot 1.875$		*acc. table 24	(RMS)	1875	V	

Type Test (Pin 1 - 3 to primary opening)

$\hat{U}_W$	M3064	HV transient test, *acc. table 18, 19 (1.2 µs / 50 µs-wave form)		12	kV
U_P	M3014	Test voltage (5s)	(RMS)	6	kV
U_{PDE}		Partial discharge voltage (extinction)	(RMS)	1500	V
$U_{PD(rms)} \cdot 1.875$		*acc. table 24	(RMS)	1875	V
ESD	EN 61000-4-2	contact / surface		±8 / ±15	kV

*** IEC 61800-5-1:2007.**

Applicable documents

Constructed and manufactored and tested in accordance with EN 61800-5-1:2007
Further standards: UL 508 ; file E317483, category NMTR2 / NMTR8

Explanation to parameters used in this datasheet

Accuracy

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

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

X: Permissible measurement error in the final inspection at RT. I_{SB} is the DC output current for a DC primary current with the same value as the (positive) rated current I_{PN} (with $I_O = 0$)

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

X_{Ti}: Temperature drift of the rated value orientated output term. I_{SN} (cf. Notes on F_i) in a specified temperature range: I_{SB} is the secondary current at temperature ϑ_{A1} or ϑ_{A2}

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

ε_L: Linearity fault where I_P is any input DC and I_{Sx} the corresponding output term. ($I_O = 0$).

$$\varepsilon_L = 100 \cdot \left| \frac{I_P}{I_{PN}} - \frac{I_{Sx}}{I_{SN}} \right|$$

Offset and drift

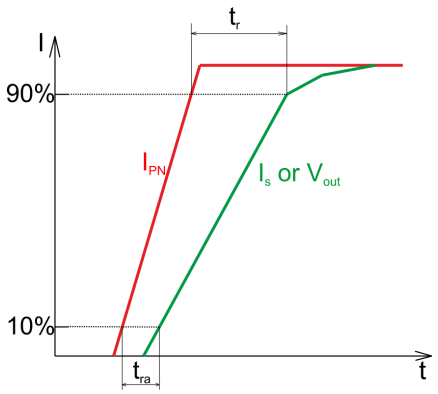
I_{OH}: Zero variation after overloading with a DC of tenfold the rated value ($R_M = R_{MN}$)

I_{Ot}: Long term drift of I_O after 100 temperature cycles in the range -40 to 85 °C.

Dynamic properties

t_{ra} Reaction time, measured as a delay time between a rectangular primary current (di/dt ≈ 1200A/µs) and the output current I_S at $I_P = 0.1 * I_{PN}$

t_r: Response time, measured as a delay time between a rectangular primary current and the output current I_S at $I_P = 0.9 * I_{PN}$



Voltage ratings (according to IEC 61800-5-1:2007)

U_{PD} Rated discharge voltage (recurring peak voltage separated by the insulation)

U_{sys} System voltage: RMS value of rated voltage

U_{AC} Working voltage: RMS voltage which occurs by design in a circuit or across an insulation

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