

K-no.:
50 A Current Sensor-Module

 For the electronic measurement of currents:
 DC, AC, pulsed, mixed ..., with a galvanic
 isolation between the primary circuit
 (high power) and the secondary circuit
 (electronic circuit)

Date: 24.02.2014

Customer: Standard type

Customers Part no.:
Page 1 **of** 2

Description

- Closed loop (compensation)
Current Sensor with magnetic field probe
- Printed circuit board mounting
- Casing and materials UL-listed

Characteristics

- Excellent accuracy
- Very low offset current
- Very low temperature dependency and offset current drift
- Very low hysteresis of offset current
- Low response time
- Wide frequency bandwidth
- Compact design

Applications

Mainly used for stationary operation in industrial applications:

- AC variabel speed drives and servo motor drives
- Static converters for for DC motor drives
- Battery supplied applications
- Switched Mode Power Supplies (SMPS)
- Power Supplies for welding applications
- Uninterruptable Power Supplies (UPS)

Electrical data - Ratings

I_{PN}	Primary nominal r.m.s. current	50	A
R_M	Measuring resistance	15 ... 200	Ω
I_{SN}	Secondary nominal r.m.s. current	25	mA
K_N	Turns ratio	1 : 2000	

Accuracy – Dynamic performance data

		min.	typ.	max.	Unit
$I_{P,max}$	Max. measuring range @ $R_M=15 \Omega$	-165		+165	A
X^*	Accuracy @ $I_{PN}, T_A=25^\circ C$		0,1	0,5	%
ϵ_L	Linearity			0,1	%
I_0^*	Offset current @ $I_P=0, T_A=25^\circ C$		0,02	0,05	mA
t_r	Response time			3	μs
$\Delta t (I_{P,max})$	Delay time at $di/dt = 100 A/\mu s$			1	μs
f	Frequency bandwidth	DC...100			kHz

General data

		min.	typ.	max.	Unit
T_A	Ambient operating temperature	-40		+85	$^\circ C$
T_S	Ambient storage temperature	-40		+85	$^\circ C$
m	Mass			30	g
V_C	Supply voltage	$\pm 14,25$	± 15	$\pm 15,75$	V
I_C	Current consumption			18	mA
V_b	Rated voltage acc. to EN50178				
	Reinforced insulation				
	Insulation material group 1, Pollution degree 2,				
	Rated voltage: Mains supply (effective)		600	V	
	Non Mains supply (DC)		800	V	
	Creepage and clearance distance		8	mm	

Max.duration of peak currents at defined temperatures

T_A	50	70	85	$^\circ C$
I_P	120	100	50	A
$I_{P,max}$	165	165	160	A
R_M	15	15	20	Ω

All data marked with * is verified by final inspection, other values are typetested.

Date	Name	Issue	Amendment
24.02.14	KRe.	84	Marking changed acc to UL. 4644X101 → 4644-X101. CN-848
07.08.13	KRe.	84	Mechanical outline: marking with UL-sign. CN-635

Hrsg.: KB-E editor	Bearb.: Le. designer	KB-PM: KRe. check	freig.: HS released
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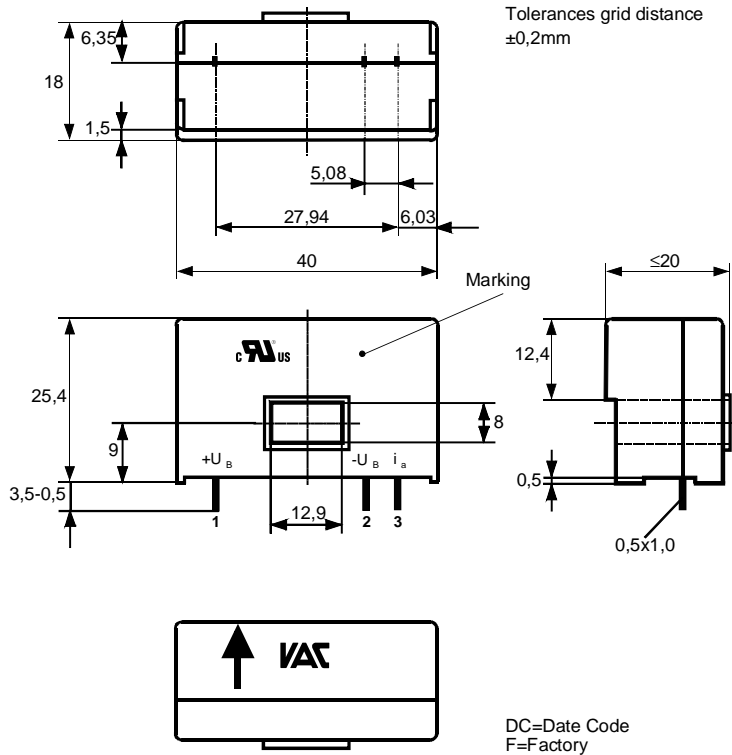
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Mechanical outline (mm):

General tolerances DIN ISO 2768-c

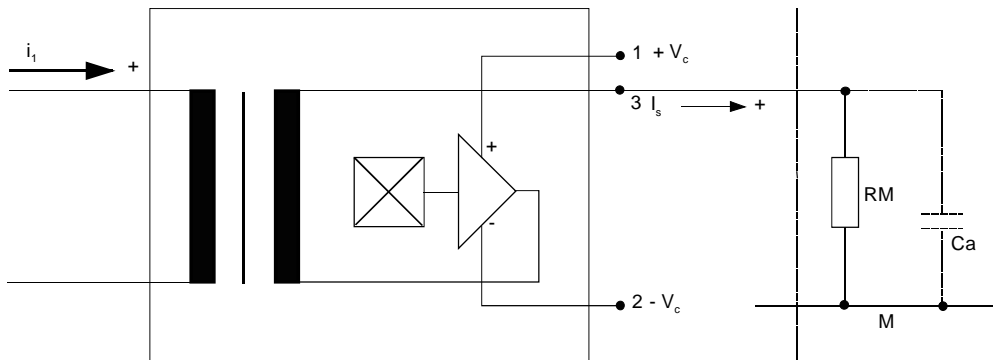


Connections:

Marking:

UL-sign
4644-X101
F DC

Schematic diagram



Additional indications are obtainable on request.
 This specification is no declaration of warranty acc. BGB §443 dar.

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Electrical Data

		min.	typ.	max.	Unit
V_{Ctot}	Maximum supply voltage (without function)			±18	V
R_S	Secondary coil resistance @ $T_A=85^\circ\text{C}$			120	Ω
X_{Ti}	Temperature drift of X @ $T_A = -40 \dots +85^\circ\text{C}$			0,1	%
I_{0ges}	Offset current (including I_0 , I_{0T} , I_{0H})			0,05	mA
I_{0t}	Offset current drift I_0			0,05	mA
I_{0T}	Offset current temperature drift I_0 @ $T_A = -40 \dots +85^\circ\text{C}$			0,05	mA
I_{0H}	Hysteresis current @ $I_P=0$, caused by primary current $3 \times I_{PN}$			0,075	mA
i_{oss}	Offset ripple			1	mA
$\Delta I_0/\Delta V_C$	Supply voltage rejection ratio			0,01	mA/V
C_k	Maximum possible coupling capacity primary – secondary			9	pF
	Mechanical Stress according to M3209/3 Settings: 10 – 2000 Hz, 1 min/Oktave, 2 hours			2g	

Inspection (Measurement after temperature balance of the samples at room temperature)

$K_N (N1/N2)^*$	(V)	M3011/6:	Transformation ratio ($I_1=5A$, 40-80 Hz)	= 1 : 2000 ± 0,5 %	
I_0^*	(V)	M3226:	Offset current	< 0,05	mA
V_d^*	(V)	M3014:	Test voltage, rms, 1s Pin 1 - 3 to Primary conductor	3	kV

Type Testing

HV transient test according to M3064	Settings :	$V_{d,max}$	=	8 kV	
Pin 1 - 3 to Primary conductor		R_i	=	60 Ω	
				1,2 μs / 50 μs -waveform	
				3 in a cycle of t = 10 seconds with changing polarity	
Test voltage and partial discharge voltage according to M3024	V_d	=	4,4	kV	60s
Pin 1 - 3 to Primary conductor	V_e	≥	1,0	kV	

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Datum	Name	Index	Änderung
24.02.14	KRe	84	Date updated. CN-848
07.08.13	KRe.	84	Applicable documents: UL-File E169271 added. VDE-registration cancelled. ÄA-635

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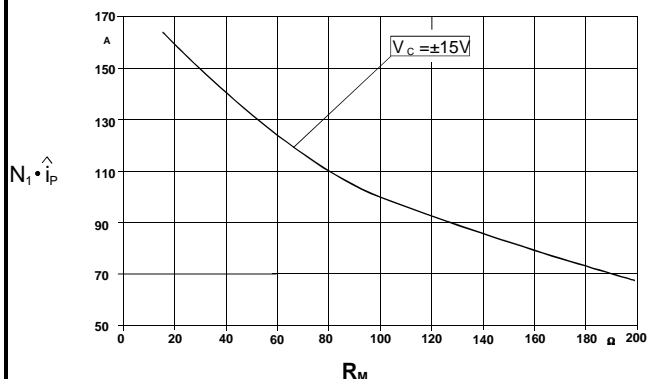
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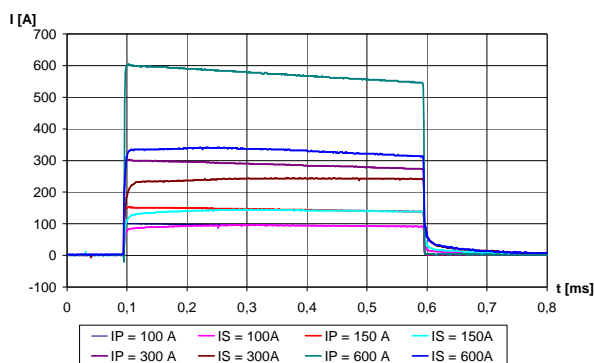
Limit curve of measurable current $\hat{I}_p(R_M)$

@ temperature of the component $\leq 85^\circ\text{C}$ turns ratio 1 : 2000



Maximum measuring range (us-range)

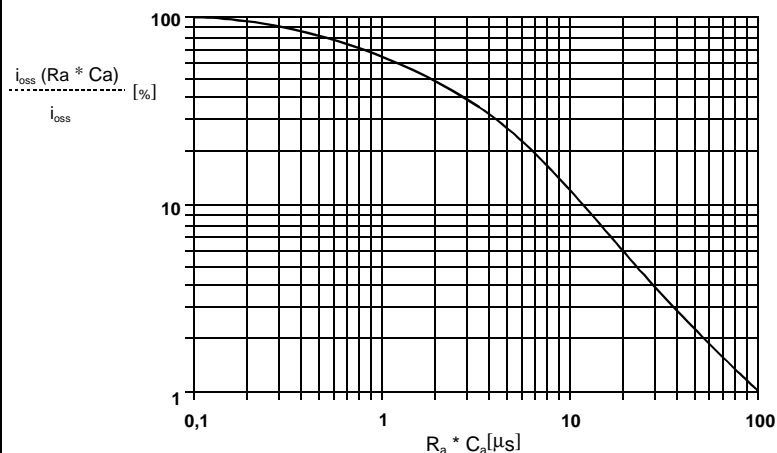
Pulse behaviour at pulse duration= 500µs



The value for $I_{p,max}$ indicated in the Specification is valid for currents from a few ms on. For shorter duration (e.g. short circuit current) the currents are transformed directly and can therefore be higher than $I_{p,max}$. This will curtail the accuracy but can be used for kick-offs.

Example : Avariabel Offset ripple reduction means a low pass

The offset ripple can be reduced by an external low pass. Therefore a capacitance C_a must be switched parallel to R_M . The diagram shows the remaining value of the offset ripple ($i_{oss}(R_M \cdot C_a)$) relative to the value without external capacitance (i_{oss}). In this case the response time is lengthened. It is calculated for :



$$t_r' \leq t_r + 2,5 \cdot R_M \cdot C_a \text{ bzw. } f_g = \frac{1}{2\pi \cdot R_M \cdot C_a}$$

Applicable documents

Current direction: A positive output current appears at point I_s , by primary current in direction of the arrow.
Constructed, manufactured and tested in accordance with EN 50178 (VDE 0160) and agrees with the standards.
Enclosures according to IEC529: IP50.
UL - file E169271, category XORU2 (transformers, construction only - component), UL 508

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

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

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

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} ist he output DC value of an input DC current of the same magnitude as the (positive) rated current ($I_o = 0$)

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

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

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:

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

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

I_{oT} : 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 $I_P = 0,9 \cdot I_{Pmax}$ 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 $di_1/dt = 100 \text{ A}/\mu\text{s}$.

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