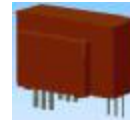


K-No.: 24618

**50/100 A Current Sensor**

 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: 28.01.2008

Customer: Standard type

Customers Part no.:

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**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
- Reduced offset ripple

**Applications**

Mainly used for stationary operation in industrial applications:

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

**Electrical data – Ratings<sup>1)</sup>**

$I_{PN}$	Primary nominal r.m.s. current		
	@ $V_C = \pm 15V, R_M \geq 0 \Omega$	50	A
	@ $V_C = \pm 12V, R_M \geq 0 \Omega$ or $V_C = \pm 15V, R_M \geq 16 \Omega$	100	A
$R_M$	Measuring resistance $V_C = \pm 12V$	0 ... 200	$\Omega$
	$V_C = \pm 15V$	16 ... 400	$\Omega$
$I_{SN}$	Secondary nominal r.m.s. current	25/50	mA
$K_N$	Turns ratio	1...3 : 2000	

**Accuracy – Dynamic performance data<sup>1)</sup>**

		min.	typ.	max.	Unit
$I_{P,max}$	Max. measuring range				
	@ $V_C = \pm 12V, R_M = 10 \Omega$ ( $t_{max} = 10sec$ )	$\pm 145$			A
	@ $V_C = \pm 15V, R_M = 16 \Omega$ ( $t_{max} = 10sec$ )	$\pm 175$			A
X	Accuracy @ $I_{PN}, T_A = 25^\circ C$		0.1	0.5	%
$\epsilon_L$	Linearity			0.1	%
$I_0$	Offset current @ $I_P = 0, T_A = 25^\circ C$		0.02	0.08	mA
$t_r$	Response time		500		ns
$\Delta t$ ( $I_{P,max}$ )	Delay time at $di/dt = 100 A/\mu s$		200		ns
f	Frequency bandwidth	DC...200			kHz

**General data<sup>1)</sup>**

		min.	typ.	max.	Unit
$T_A$	Ambient operating temperature	-40		+85	$^\circ C$
$T_S$	Ambient storage temperature	-40		+90	$^\circ C$
m	Mass		13,5		g
$V_C$	Supply voltage	$\pm 11.4$	$\pm 12$ or $\pm 15$	$\pm 15.75$	V
$I_C$	Current consumption		18.5		mA
	Constructed and manufactured and tested in accordance with EN 61800-5-1 (Pin 1 - 6 to Pin 7 – 9) Reinforced insulation, Insulation material group 1, Pollution degree 2				
$S_{clear}$	clearance (component without solder pad)	10.2			mm
$S_{creep}$	creepage (component without solder pad)	10.2			mm
$V_{sys}$	System voltage overvoltage category 3	RMS		600	V
$V_{work}$	Working voltage (table 7 acc. to EN61800-5-1)	RMS		1020	V
$U_{PD}$	Rated discharge voltage	peak value		1400	V

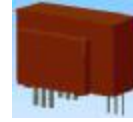
Date	Name	Issue	Amendment
28.01.08	Le	81	Date changed. Insignificant

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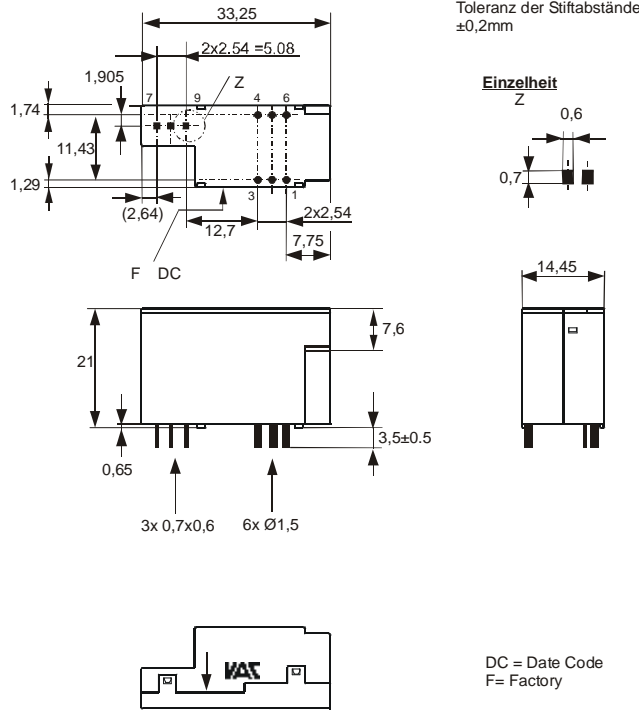
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**Mechanical outline (mm):**

General tolerances DIN ISO 2768-c

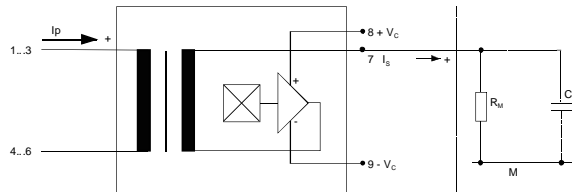


Connections:  
1...6: Ø 1,5 mm  
7...9: 0,6x0,7 mm

Marking:

**VAC**  
4646X412  
F DC

**Schematic diagram**



**Possibilities of wiring for  $V_C = \pm 15V$**  <sup>1)</sup> (@  $T_A = 85^\circ C$ ,  $R_M = 25 \Omega$ )

primary windings $N_P$	primary current RMS maximal $I_P [A]$	primary current RMS maximal $\hat{I}_{P,max} [A]$	output current RMS $I_S (I_P) [mA]$	turns ratio $K_N$	primary resistance $R_P [mW]$	wiring
1	100	175	50	1:2000	0.12	
2	35	82	35	2:2000	0.54	
3	25	58	37,5	3:2000	1.1	

<sup>1)</sup> preliminary data

Temperature of the primary conductor should not exceed 100°C.  
Additional information is obtainable on request.  
This specification is no declaration of warranty acc. BGB §443 dar.

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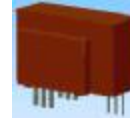
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**Electrical Data (investigate by a type checking) <sup>1)</sup>**

		min.	typ.	max.	Unit
$V_{Ctot}$	Maximum supply voltage (without function) $\pm 15.75$ bis $\pm 18$ V: for 1s per hour			$\pm 18$	V
$R_S$	Secondary coil resistance @ $T_A=85^\circ\text{C}$			145	$\Omega$
$R_p$	Primary coil resistance per turn @ $T_A=25^\circ\text{C}$			0.36	m $\Omega$
$X_{TI}$	Temperature drift of X @ $T_A = -40 \dots +85^\circ\text{C}$			0.1	%
$I_{0ges}$	Offset current (including $I_0, I_{0t}, I_{0T}$ )			0.1	mA
$I_{0t}$	Long term drift Offset current $I_0$		0.03		mA
$I_{0T}$	Offset current temperature drift $I_0$ @ $T_A = -40 \dots +85^\circ\text{C}$		0.03		mA
$I_{0H}$	Hysteresis current @ $I_p=0$ (caused by primary current $3 \times I_{PN}$ )		0.02	0.05	mA
$\Delta I_0/\Delta V_C$	Supply voltage rejection ratio			0.01	mA/V
$i_{loss}$	Offset ripple* (with 1 MHz- filter first order)			0.15	mA
$i_{loss}$	Offset ripple* (with 100 kHz- filter first order)		0.017	0.025	mA
$i_{loss}$	Offset ripple* (with 20 kHz- filter first order)		0.005	0.007	mA
$C_k$	Maximum possible coupling capacity (primary – secondary)		5		pF
	Mechanical Stress according to M3209/3 Settings: 10 – 2000 Hz, 1 min/Decade, 2 hours An exceptionally high rate of on/off – switching of the supply voltage accelerates the aging process of the sensor.			10g	

**Inspection <sup>1)</sup>** (Measurement after temperature balance of the samples at room temperature)

$K_N(N_1/N_2)$	(V)	M3011/6	Transformation ratio ( $I_p=3 \times 10A, 40-80$ Hz)	$1 \dots 3 : 2000 \pm 0.5$ %
$I_0$	(V)	M3226	Offset current	$< 0.05$ mA
$V_{P,eff}$	(V)	M3014	Test voltage, rms, 1s Pin 1 - 6 to Pin 7 - 9	2.5 kV
$V_e$	(AQL 1/S4)		Partial discharge voltage acc. M3024 (RMS) with $V_{vor}$ (RMS)	1500 V 1875 V

**Type Testing** (Pin 1 - 6 to Pin 7 – 9)

Designed according standard EN 61800 with insulation material group 1

$V_W$	HV transient test according (to M3064) (1,2 $\mu\text{s}$ / 50 $\mu\text{s}$ -wave form)			8	kV
$V_d$	Testing voltage acc. M3014 (RMS)		(5 s)	5	kV
$V_e$	Partial discharge voltage acc. M3024 (RMS) with $V_{vor}$ (RMS)			1500 V 1875 V	V

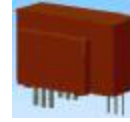
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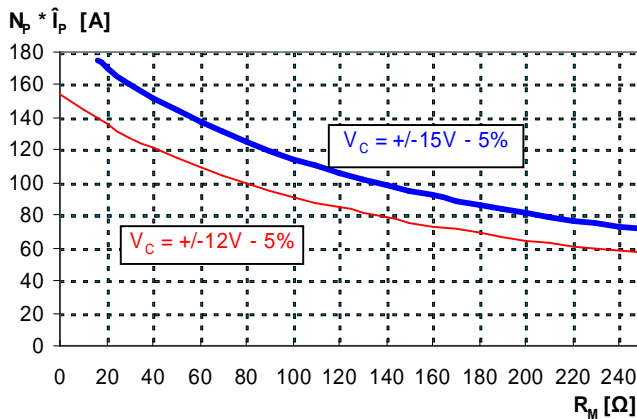
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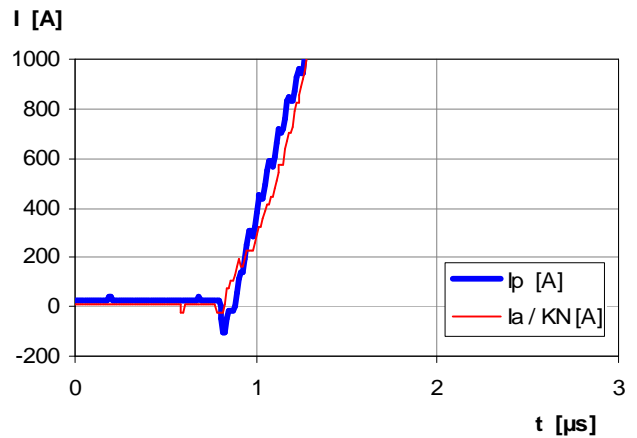
**Limit curve of measurable current  $\hat{I}_p(R_M)$  <sup>1)</sup>**

@ ambient temperature  $T_A \leq 85^\circ\text{C}$



**Maximum measuring range (μs-range) <sup>1)</sup>**

Output current behaviour of a 3kA current pulse  
@  $V_C = \pm 15\text{V}$  und  $R_M = 25\Omega$



Fast increasing currents (higher than the specified  $I_{p,max}$ ), e.g. in case of a short circuit, can be transmitted because the currents are transformed directly.

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

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

In this case the response time is enlarged.

It is calculated from:

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

**Applicable documents**

Current direction: A positive output current appears at point  $I_s$ , by primary current in direction of the arrow.

Constructed and manufactured and tested in accordance with EN 61800.

Housing and bobbin material UL-listed: Flammability class 94V-0.

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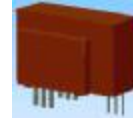
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$I_{0H}$ : Zero variation of  $I_o$  after overloading with a DC of tenfold the rated value ( $R_M = R_{MN}$ )

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

$t_r$ : Response time (describe the dynamic performance for the specified measurement range), measured as delay time at  $I_P = 0,9 \cdot I_{PN}$  between a rectangular current and the output current.

$\Delta t (I_{Pmax})$ : Delay time (describe the dynamic performance for the rapid current pulse rate e.g short circuit current) measured between  $I_{Pmax}$  and the output current  $i_a$  with a primary current rise of  $di_1/dt = 100 A/\mu s$ .

$X_{ges}(I_{PN})$ : 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<sub>i</sub>) in a specified temperature range, obtained by:

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

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

Where  $I_P$  is any input DC and  $I_{Sx}$  the corresponding output term.  $I_{SN}$ : see notes of F<sub>i</sub> ( $I_o = 0$ ).

This "Additional information" is no declaration of warranty according BGB §443.

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Телефон: 8 (812) 309-75-97 (многоканальный)

Факс: 8 (812) 320-03-32

Электронная почта: [ocean@oceanchips.ru](mailto:ocean@oceanchips.ru)

Web: <http://oceanchips.ru/>

Адрес: 198099, г. Санкт-Петербург, ул. Калинина, д. 2, корп. 4, лит. А