

**K-no.:** 24508

**15 A Current Sensor Module for 5V- Supply Voltage**
**Date:** 08.04.2008

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

**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
- short 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
- Uninterruptible Power Supplies (UPS)

**Electrical data – Ratings**

$I_{PN}$	Primary nominal r.m.s. current	15	A
$V_{out}$	Output voltage @ $I_P$	$2.5 \pm (0.625 \cdot I_P / I_{PN})$	V
$V_{out}$	Output voltage @ $I_P=0, T_A=25^\circ\text{C}$	$2.5 \pm 0.020$	V
$V_{Ref}$	Reference voltage	$2.5 \pm 0.005$	V
$K_N$	Turns ratio	1...3 : 2000	

**Accuracy – Dynamic performance data**

		min.	typ.	max.	Unit
$I_{P,max}$	Max. measuring range	±51			
X	Accuracy @ $I_{PN}, T_A=25^\circ\text{C}$	0.7			%
$\epsilon_L$	Linearity	0.1			%
$V_{out} -2,5V$	Offset voltage @ $I_P=0, T_A=25^\circ\text{C}$	±20			mV
$\Delta V_{out} / 2,5V / \Delta T$	Temperatur drift of $V_{out}$ @ $I_P=0, T_A=-40...85^\circ\text{C}$	16		32	ppm/K
$t_r$	Response time @ 90% von $I_{PN}$	300			ns
$\Delta t (I_{P,max})$	Delay time at $di/dt = 100 \text{ A}/\mu\text{s}$	200			ns
f	Frequency bandwidth	DC...100			kHz

**General data**

		min.	typ.	max.	Unit
$T_A$	Ambient operating temperature	-40		+85	°C
$T_S$	Ambient storage temperature	-40		+85	°C
m	Mass	12			g
$V_C$	Supply voltage	4.75	5	5.25	V
$I_C$	Current consumption	15			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)	7			mm
$S_{creep}$	Creepage (component without solder pad)	7			mm
$V_{sys}$	System voltage	overvoltage category 3	RMS	300	V
$V_{work}$	Working voltage	(tabel 7 acc. to EN61800-5-1) overvoltage category 2	RMS	650	V
$U_{PD}$	Rated discharge voltage	peak value		1320	V

Date	Name	Issue	Amendment
08.04.08	Le	82	"preliminary" delete

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 editor

 Bearb.: Le  
 designer

 KB-PM: KRe  
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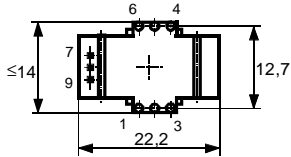
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**Mechanical outline (mm):**

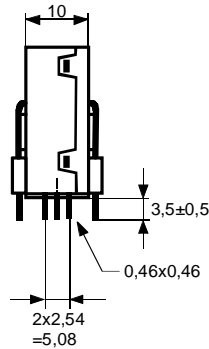
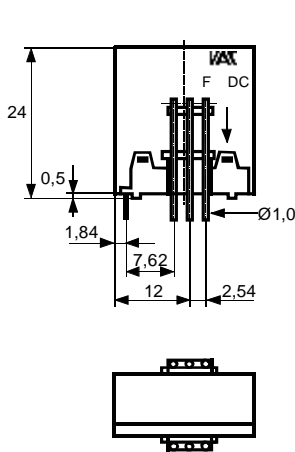
General tolerances DIN ISO 2768-c

Connections:

1...6:  $\varnothing$  1 mm  
7...9: 0,46\*0,46 mm



Toleranz der Stiftabstände  
 $\pm 0,2$  mm  
(Tolerances grid distance)

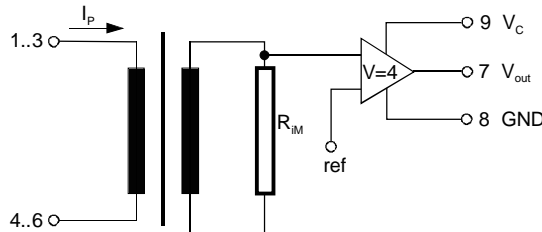


Marking:

**VAC**  
4646X652  
F DC

DC = Date Code  
F = Factory

**Schematic diagram**



**Possibilities of wiring** (@  $T_A = 85^\circ\text{C}$ )

primary windings	primary current RMS	primary current maximal	output voltage RMS	turns ratio	primary resistance	wiring
$N_P$	$I_P$ [A]	$\hat{I}_{P,max}$ [A]	$V_{out}(I_{PN})$ [V]	$K_N$	$R_P$ [mW]	
1	15	$\pm 51$	$2.5 \pm 0.625$	1:2000	0.33	
2	7,5	$\pm 25$	$2.5 \pm 0.625$	2:2000	1.5	
3	5	$\pm 17$	$2.5 \pm 0.625$	3:2000	3	

Temperature of the primary conductor should not exceed 110°C.  
Additional information is 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)			6	V
$I_C$	Supply Current with primary current		15mA + $I_p \cdot K_N + V_{out}/R_L$		mA
$I_{out,SC}$	Short circuit output current		$\pm 20$		mA
$R_P$	Resistance / primary winding @ $T_A=25^\circ C$		1		m $\Omega$
$R_S$	Secondary coil resistance @ $T_A=85^\circ C$			67	$\Omega$
$R_{i,(V_{out})}$	Output resistance of $V_{out}$			1	$\Omega$
$R_L$	External recommended resistance of $V_{out}$	1			k $\Omega$
$C_L$	External recommended capacitance of $V_{out}$			500	pF
$\Delta X_T/\Delta T$	Temperature drift of X @ $T_A = -40 \dots +85^\circ C$			40	ppm/K
$\Delta V_0 = \Delta(V_{out} - 2.5V)$	Sum of any offset drift including:		6	12	mV
$V_{0t}$	Long term drift of $V_0$		2		mV
$V_{0T}$	Temperature drift von $V_0$ @ $T_A = -40 \dots +85^\circ C$		5		mV
$V_{0H}$	Hysteresis of $V_{out}$ @ $I_P=0$ (after an overload of $10 \times I_{PN}$ )		3		mV
$\Delta V_0/\Delta V_C$	Supply voltage rejection ratio			1	mV/V
$V_{oss}$	Offsetripple (with 1 MHz- filter first order)			70	mV
$V_{oss}$	Offsetripple (with 100 kHz- filter first order)		5.5	11	mV
$V_{oss}$	Offsetripple (with 20 kHz- filter first order)		1.5	3	mV
$C_k$	Maximum possible coupling capacity (primary – secondary)		5	10	pF
	Mechanical stress according to M3209/3 Settings: 10 – 2000 Hz, 1 min/Decade, 2 hours			30g	

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

$V_{out} (I_P=I_{PN})$	(V)	M3011/6:	Output voltage vs. internal reference ( $I_P=15A$ , 40-80Hz)	625 $\pm$ 0.7%	mV
$V_{out}-2.5V (I_P=0)$	(V)	M3226:	Offset voltage	$\pm 0.020$	V
$V_d$	(V)	M3014:	Test voltage, rms, 1 s pin 1 – 6 vs. pin 7 – 9	1.5	kV
$V_e$	(AQL 1/S4)		Partial discharge voltage acc.M3024 (RMS) with $V_{vor}$ (RMS)	1400 1750	V V

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

Designed according standard EN 50178 with insulation material group 1

$V_W$			HV transient test according (to M3064) (1,2 $\mu s$ / 50 $\mu s$ -wave form)	8	kV	
$V_d$			Testing voltage to M3014	(5 s)	3	kV
$V_e$			Partial discharge voltage acc.M3024 (RMS) with $V_{vor}$ (RMS)	1400 1750	V V	

**Applicable documents**

 Current direction: A positive output current appears at point  $I_S$ , by primary current in direction of the arrow.  
 Housing and bobbin material UL-listed: Flammability class 94V-0.  
 Enclosures according to IEC529: IP50.

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

$t_r$ : 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 voltage  $V_{out}(I_P)$

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

$U_{PD}$  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 insulation

$V_o$ : Offset voltage between  $V_{out}$  and the rated reference voltage of  $V_{ref} = 2,5V$ .  
 $V_o = V_{out}(0) - 2,5V$

$V_{0H}$ : Zero variation of  $V_o$  after overloading with a DC of tenfold the rated value

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

$X$ : Permissible measurement error in the final inspection at RT, defined by

$$X = 100 \cdot \left| \frac{V_{out}(I_{PN}) - V_{out}(0)}{0,625V} - 1 \right| \%$$

$X_{ges}(I_{PN})$ : Permissible measurement error including any drifts over the temperature range by the current measurement  $I_{PN}$

$$X_{ges} = 100 \cdot \left| \frac{V_{out}(I_{PN}) - 2,5V}{0,625V} - 1 \right| \% \quad \text{or} \quad X_{ges} = 100 \cdot \left| \frac{V_{out}(I_{PN}) - V_{ref}}{0,625V} - 1 \right| \%$$

$\epsilon_L$ : Linearity fault defined by  $e_L = 100 \cdot \left| \frac{I_P}{I_{PN}} - \frac{V_{out}(I_P) - V_{out}(0)}{V_{out}(I_{PN}) - V_{out}(0)} \right| \%$

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