

**K-no.: 24619**
**50 A Current Sensor for 5V- Supply Voltage**

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

**Date: 15.05.2014**
**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
- 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	50	A
$V_{out}$	Output voltage @ $I_P$	$V_{Ref} \pm (0.625 \cdot I_P / I_{PN})$	V
$V_{out}$	Output voltage @ $I_P=0, T_A=25^\circ C$	$V_{Ref} \pm 0.0025$	V
$V_{Ref}$	External Reference voltage range	0...4	V
	Internal Reference voltage	2.5 $\pm$ 0.005	V
$K_N$	Turns ratio	1...3 : 1400	

**Accuracy – Dynamic performance data**

		min.	typ.	max.	Unit
$I_{P,max}$	Max. measuring range	$\pm 150$			
X	Accuracy @ $I_{PN}, T_A=25^\circ C$			0.7	%
$\epsilon_L$	Linearity			0.1	%
$V_{out} - V_{Ref}$	Offset voltage @ $I_P=0, T_A=25^\circ C$			$\pm 2.5$	mV
$\Delta V_o / V_{Ref} / \Delta V$	Temperature drift of $V_{out}$ @ $I_P=0, T_A= -40...85^\circ C$		3	10	ppm/ $^\circ C$
$t_r$	Response time @ 90% von $I_{PN}$		500		ns
$\Delta t (I_{P,max})$	Delay time at $di/dt = 100 A/\mu s$		500		ns
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		15		g
$V_C$	Supply voltage	4.75	5	5.25	V
$I_C$	Current consumption		16		mA
	Constructed and manufactured and tested in accordance with EN 61800-5-1 (Pin 1 - 6 to Pin 7 – 10) 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
$V_{work}$	Working voltage	(table 7 acc. to EN61800-5-1) overvoltage category 2		RMS	1020
$U_{PD}$	Rated discharge voltage	peak value			1400
	Max. potential difference acc. to UL 508	RMS			600
					$V_{AC}$

Date	Name	Issue	Amendment
15.05.14	DJ	83	Marking changed from 4646X460 → 4646-X460. CN-14-009

Hrsg.: KB-E editor	Bearb.: DJ designer	KB-PM: KRe. check	freig.: HS released
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Date: 15.05.2014

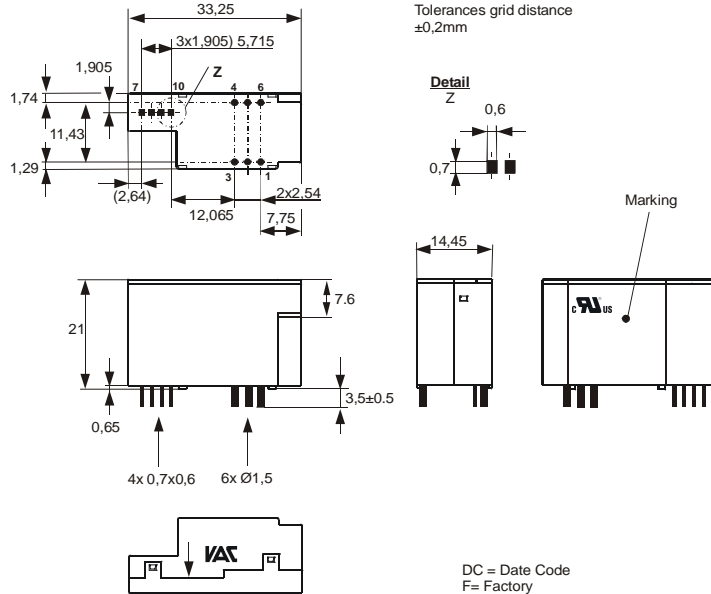
Customer: Standard type

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**Mechanical outline (mm):**

General tolerances DIN ISO 2768-c



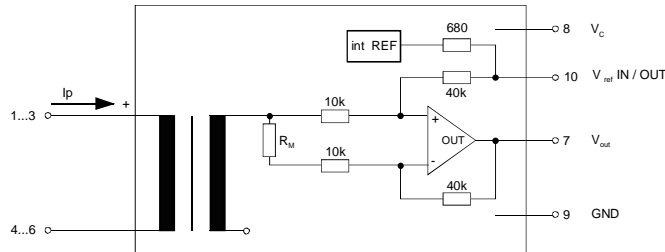
Connections:

1...6:  $\varnothing 1.5\text{ mm}$   
7..10:  $0.7 \times 0.6\text{ mm}$

Marking:

UL-sign  
4646-X460  
F DC

**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]	$V_{out}(I_P)$ [V]	$K_N$	$R_P$ [m $\Omega$ ]	
1	50	$\pm 150$	$2.5 \pm 0.625$	1:1400	0.1	
2	25	$\pm 75$	$2.5 \pm 0.625$	2:1400	0.45	
3	16,7	$\pm 50$	$2.5 \pm 0.625$	3:1400	1	

Temperature of the primary conductor should not exceed  $100^\circ\text{C}$   
Additional information is obtainable on request.  
This specification is no declaration of warranty acc. BGB §443 dar.

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editor

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**50 A Current Sensor for 5V- Supply Voltage**

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

**Date:** 15.05.2014

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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		16mA + $I_p \cdot K_N + V_{out}/R_L$		mA
$I_{out,SC}$	Short circuit output current		±20		mA
$R_P$	Resistance / primary winding @ $T_A=25^\circ C$			0.3	mΩ
$R_S$	Secondary coil resistance @ $T_A=85^\circ C$			30	Ω
$R_{i,Ref}$	Internal resistance of Reference input		670		Ω
$R_{is}(V_{out})$	Output resistance of $V_{out}$			1	Ω
$R_L$	External recommended resistance of $V_{out}$	1			kΩ
$C_L$	External recommended capacitance of $V_{out}$			500	pF
$\Delta X_{Ti} / \Delta V$	Temperature drift of X @ $T_A = -40 \dots +85^\circ C$			40	ppm/K
$\Delta V_0 = \Delta(V_{out} - V_{Ref})$	Sum of any offset drift including:		2	6	mV
$V_{0t}$	Longtermdrift of $V_0$		1		mV
$V_{0T}$	Temperature drift von $V_0$ @ $T_A = -40 \dots +85^\circ C$		1		mV
$V_{0H}$	Hystereses of $V_{out}$ @ $I_p=0$ (after an overload of $10 \times I_{PN}$ )			1	mV
$\Delta V_0 / \Delta V_C$	Supply voltage rejection ratio			1	mV/V
$V_{oss}$	Offsetripple (with 1 MHz- filter first order)			22	mV
$V_{oss}$	Offsetripple (with 100 kHz- filter first order)		3	8	mV
$V_{oss}$	Offsetripple (with 20 kHz- filter first order)		0.6	1.5	mV
$C_k$	Maximum possible coupling capacity (primary – secondary)		5		pF
	Mechanical stress according to M3209/3			30g	
	Settings: 10 – 2000 Hz, 1 min/Octave, 2 hours				

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

$V_{out}(I_p=I_{PN})$	(V)	M3011/6:	Output voltage vs. reference ( $I_p=3 \times 10As$ , 40-80Hz)	625±0,7%	mV
$V_{out}-V_{Ref}(I_p=0)$	(V)	M3226:	Offset voltage	± 0.0025	V
$V_d$	(V)	M3014:	Test voltage, rms, 1 s pin 1 – 6 vs. pin 7 – 10	2.5	kV
$V_e$	(AQL 1/S4)		Partial discharge voltage acc.M3024 (RMS) with $V_{vor}$ (RMS)	1500 1875	V V

**Type Testing** (Pin 1 - 6 to Pin 7 – 10)

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

**Applicable documents**

 Current direction: A positive output current appears at point  $V_{out}$ , by primary current in direction of the arrow.

Further standards UL 508 ; file E317483, category NMTR2 / NMTR8

Enclosures according to IEC529: IP50.

Datum	Name	Index	Ämendment
15.05.14	DJ	83	Inspection: M3011/6, $I_p=50A$ , 40-80Hz → $I_p=3 \times 10As$ , 40-80Hz. Typo changed, lapidary.
23.04.13	KRe.	83	Applicable documents: further standards added. AA-665

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

**t:** 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 valve 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  $\epsilon_L = 100 \cdot \left| \frac{I_P}{I_{PN}} - \frac{V_{out}(I_P) - V_{out}(0)}{V_{out}(I_{PN}) - V_{out}(0)} \right| \%$

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

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**freig.: HS**  
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