

K-No.: 24959
100 A Current Sensor Module for 5V-Supply Voltage

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


Date: 13.12.2007
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

		min.	typ.	max.	Einheit
I_{PN}	Primary nominal r.m.s. current		100		A
V_{out}	Output voltage @ I_P		$V_{Ref} \pm (0.625 \cdot I_P / I_{PN})$		V
V_{out}	Output voltage @ $I_P=0$, $T_A=25^\circ\text{C}$		$V_{Ref} \pm 0.0025$		V
V_{Ref}	Reference voltage external	0		4	V
V_{Ref}	Reference voltage internal		2.5 ± 0.005		V
K_N	Turns ratio		1 : 1000		

Accuracy – Dynamic performance data

		min.	typ.	max.	Unit
$I_{P,max}$	Max. measuring range	± 230			
X	Accuracy @ I_{PN} , $T_A=25^\circ\text{C}$			1	%
ϵ_L	Linearity			0.1	%
$V_{out} -2,5V$	Offset voltage @ $I_P=0$, $T_A=25^\circ\text{C}$			$\pm 2,5$	mV
$\Delta V_{out} / 2,5V / \Delta T$	Temperature drift of V_{out} @ $I_P=0$, $T_A=-40...85^\circ\text{C}$		3	10	ppm/K
t_r	Response time @ 80% von I_{PN}		1		μs
$\Delta t (I_{P,max})$	Delay time at $di/dt = 100 \text{ A}/\mu\text{s}$		1		μs
f	Frequency bandwidth	DC...100			kHz

General data

		min.	typ.	max.	Unit
T_A	Ambient operating temperature	-40		+85	$^\circ\text{C}$
T_S	Ambient storage temperature	-40		+85	$^\circ\text{C}$
m	Mass		18		g
V_C	Supply voltage	4.75	5	5.25	V
I_{C0}	Current consumption		16		mA
Constructed and manufactured and tested in accordance with EN 61800-5-1 (Primary to Secondary) Reinforced insulation, Insulation material group 1, Pollution degree 2					
S_{clear}	Clearance (component without solder pad)	12			mm
S_{creep}	Creepage (component without solder pad)	12			mm
V_{sys}	System voltage	overvoltage category 3	RMS	600	V
V_{work}	Working voltage	(tabel 7 acc. to EN61800-5-1) overvoltage category 2	RMS	1000	V
U_{PD}	Rated discharge voltage	peak value		1225	V

Maximal continuous and peak currents at defined temperatures

T_A	50 $^\circ\text{C}$	70 $^\circ\text{C}$	85 $^\circ\text{C}$	105 $^\circ\text{C}$
I_P	150 A	110 A	100 A	50 A
$I_{P,max}$	258 A	251 A	244 A	237 A

Date	Name	Issue	Amendment				
		81					
Hrsg.: KB-E editor	Bearb.: Le designer			KB-PM IA: KRe. check		freig.: Heu. released	

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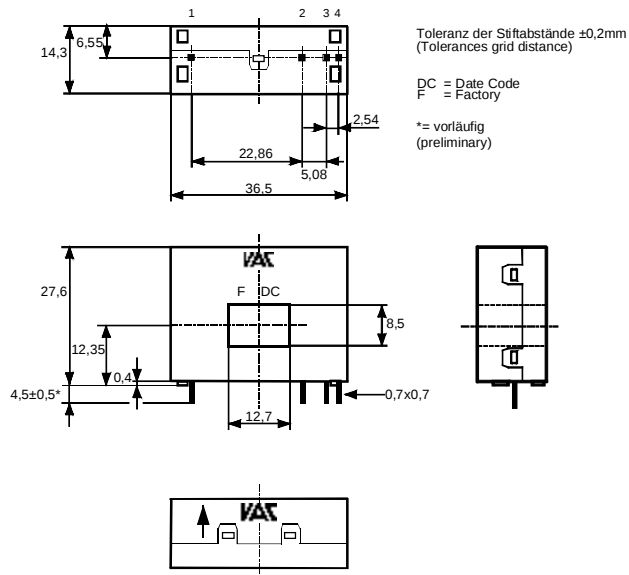
Page 2 of 2

Mechanical outline (mm):

General tolerances DIN ISO 2768-c

Connections:

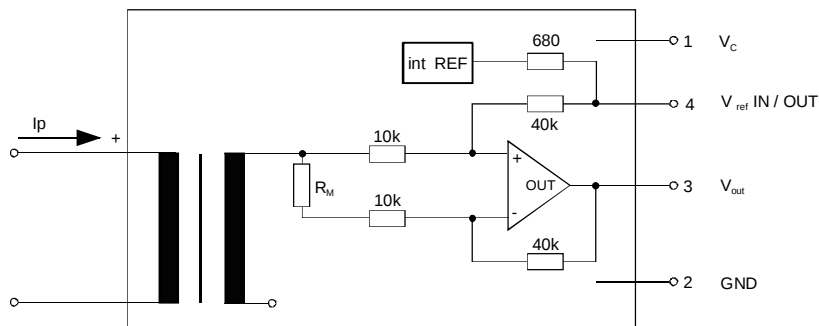
1..4 = 0.7 x 0.7mm



Marking:


4646X160
F DC

Schematic diagram



Additional information is obtainable on request.
Temperature of the primary conductor should not exceed 110°C.
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	16mA	$+I_P \cdot K_N + V_{out}/R_L$		mA
$I_{out,SC}$	Short circuit output current		± 20		mA
R_S	Secondary coil resistance @ $T_A = 85^\circ C$			14	Ω
$R_{i,Ref}$	Internal resistance of Reference input		670		Ω
$R_{i,V_{out}}$	Output resistance of V_{out}			1	Ω
R_L	External recommended resistance of V_{out}	1			k Ω
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
$\Delta V_0 = \Delta(V_{out} - V_{Ref})$	Sum of any offset drift including:		2	6	mV
V_{0t}	Long term drift 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 $10 \times I_{PN}$)			0.7	mV
$\Delta V_0/\Delta V_C$	Supply voltage rejection ratio			1	mV/V
V_{oss}	Offsetripple (with 1 MHz- filter first order)			20	mV
V_{oss}	Offsetripple (with 100 kHz- filter first order)		2,5	6	mV
V_{oss}	Offsetripple (with 20 kHz- filter first order)		0.7	1.5	mV
C_k	Maximum possible coupling capacity (primary – secondary)		6		pF
	Mechanical stress according to M3209/3				
	Settings: 10 Hz, 1 min/Decade, 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. internal reference ($I_P=100A$, 40-80Hz)	625 $\pm$ 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 1-4 to inner hole	1.8	kV
V_e	(AQL 1/S4)		Partial discharge voltage acc.M3024 (RMS) with V_{vor} (RMS)	1300 1625	V V

Type Testing (Pin 1-4 to inner hole)

Designed according standard EN 50178 with insulation material group 1

V_W	HV transient test according to M3064 (1,2 μs / 50 μs -wave form)	8	kV
V_d	Testing voltage to M3024	(5 s)	3.6
V_e	Partial discharge voltage acc.M3024 (RMS) with V_{vor} (RMS)	1300 1625	V V

Applicable documents

Classification of environmental conditions according to EN 60721 5K3

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 $I_P = 0.8 \cdot I_{PN}$ 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 $di_P/dt \geq 100 \text{ A}/\mu\text{s}$.

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_0 : Offset voltage between V_{out} and the rated reference voltage of $V_{ref} = 2.5V$.
 $V_0 = V_{out}(0) - 2.5V$

V_{0H} : Zero variation of V_0 after overloading with a DC of tenfold the rated value

V_{0t} : Long term drift of V_0 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}

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

ϵ_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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