VAC VACUUMSCHMELZE	**SPECIFICATION**	Item no.:	**T60404-N4646-X663**

K-no.: 24513	**6 A Current Sensor 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: 11.08.2014

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	6	A
V_{out}	Output voltage @ I_P	$V_{Ref} \pm (0.625 * I_P/I_{PN})$	V
V_{out}	Output voltage @ $I_P=0$, $T_A=25°C$	$V_{Ref} \pm 0.0053$	V
V_{Ref}	External Reference voltage range	0…4	V
	Internal Reference voltage	2.5 ±0.005	V
K_N	Turns ratio	1…3 : 2000	

Accuracy – Dynamic performance data

		min.	typ.	max.	Unit
$I_{P,max}$	Max. measuring range	±20			
X	Accuracy @ I_{PN}, T_A= 25°C			0.7	%
ε_L	Linearity			0.1	%
$V_{out} - V_{Ref}$	Offset voltage @ $I_P=0$, $T_A=25°C$			±5.3	mV
$\Delta V_o / V_{Ref} / \Delta T$	Temperature drift of V_{out} @ $I_P=0$, $V_{Ref}=2,5V$, $T_A=-40…85°C$	**6**		30	ppm/°C
t_r	Response time @ 90% von I_{PN}		300		ns
$\Delta t\ (I_{P,max})$	Delay time at di/dt = 100 A/µs		200		ns
f	Frequency bandwidth	DC…**200**			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 manufactored 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)	7.4			mm
S_{creep}	Creepage (component without solder pad)	8.0			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

Note: "According UL 508: Max. potential difference = 600 V_{AC}

Date	Name	Issue	Amendment
11.08.14	KRe.	83	Marking changed from 4646X663-83 ➔ 4646-X663-83. Electrical data: Vout changed. Accuracy-Dynamic: Vout changed. CN-14-076

Hrsg.: **KB-E** editor	Bearb: **DJ** designer	KB-PM: Sn. check		freig.: HS released

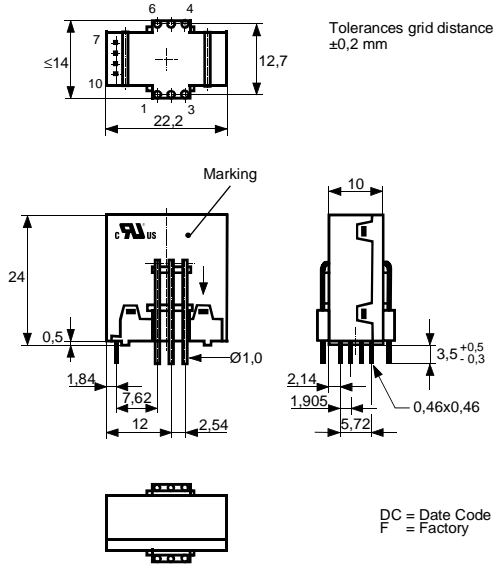|		
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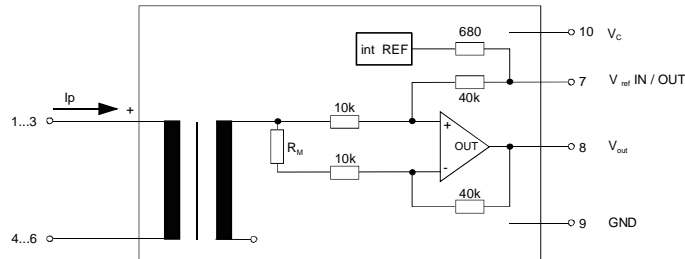## Mechanical outline (mm):

General tolerances DIN ISO 2768-c

Tolerances grid distance ±0,2 mm

6 4
7
≤14   12,7
10
1 3
22,2

Marking

cURus

24
0,5
Ø1,0
1,84
7,62
12   2,54

10
3,5 +0,5 −0,3
2,14
1,905
0,46x0,46
5,72

DC = Date Code
F = Factory

Connections:

1...6: ∅ 1 mm
7..10: 0,46*0,46 mm

Marking:

VAC   UL-sign
4646-X663-83
F   DC

Schematic diagram

int REF   680   10 V_c
40k   7 V_{ref} IN / OUT
Ip   1...3 +
R_M 10k
OUT   8 V_{out}
10k   −
40k
4...6   9 GND

Possibilities of wiring   (@ T_A = 85°C)

primary windings	primary current RMS	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 [mΩ]	
1	6	±20	2.5±0.625	1:2000	0.33	
2	3	±10	2.5±0.625	2:2000	1.5	
3	2	±6.7	2.5±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

| Hrsg.: **KB-E**
editor | Bearb: DJ
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Electrical Data

		min.	typ.	max.	Unit
V_{Ctot}	Maximum supply voltage (without function)			7	V
I_C	Supply Current with primary current		$15mA + I_P*K_N + V_{out}/R_L$		mA
$I_{out,SC}$	Short circuit output current		±20		mA
R_P	Resistance / primary winding @ T_A=25°C		1		mΩ
R_S	Secondary coil resistance @ T_A=85°C			67	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			kΩ
C_L	External recommended capacitance of V_{out}			500	pF
$\Delta X_{Ti} / \Delta T$	Temperature drift of X @ T_A = -40 ... +85 °C			40	ppm/K
$\Delta V_0 = \Delta(V_{out} - V_{Ref})$	Sum of any offset drift including:		5	15	mV
V_{0t}	Longtermdrift of V_0		3		mV
V_{0T}	Temperature drift von V_0 @ T_A = -40 ...+85°C		3		mV
V_{0H}	Hysteresis of V_{out} @ I_P=0 (after an overload of 10 x I_{PN})			7.5	mV
$\Delta V_0/\Delta V_C$	Supply voltage rejection ratio			1	mV/V
v_{oss}	Offsetripple (with 1 MHz- filter first order)			55	mV
v_{oss}	Offsetripple (with 100 kHz- filter firdt order)		9	15	mV
v_{oss}	Offsetripple (with 20 kHz- filter first order)		2.5	4	mV
C_k	Maximum possible coupling capacity (primary – secondary)		5	10	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), SC = significant characteristic

				max.	Unit
V_{out} (SC)	(V) M3011/6:	Output voltage vs. external reference (I_P=6A, 40-80Hz)		625±0.7%	mV
$V_{out} - V_{Ref}$ (I_P=0)	(V) M3226:	Offset voltage		± 5.3	mV
V_d	(V) M3014:	Test voltage, rms, 1 s pin 1 – 6 vs. pin 7 – 10		1.5	kV
V_e	(AQL 1/S4)	Partial discharge voltage acc.M3024 (RMS)		1400	V
		with V_{vor} (RMS)		1750	V

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

Designed according standard EN 50178 with insulation material group 1

			max.	Unit
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)		3	kV
V_e	Partial discharge voltage acc.M3024 (RMS)		1400	V
	with V_{vor} (RMS)		1750	V

Applicable documents

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

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

Datum	Name	Index	Ämendment
11.08.14	KRe	83	Electrical data: Vctot changed. Inspection M3011/6 defined as SC-measure. Vout changed. CN-14-076
21.12.12	Le	83	Applicable documents added. CN-572

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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/µs.

U_{PD} Rated discharge voltage (recurring peak voltage separated by the insulation) proved with a sinusoidal voltage V_e

$$U_{PD} = \sqrt{2} * V_e / 1,5$$

V_{vor} Defined voltage is the RMS valve of a sinusoidal voltage with peak value of $1,875 * U_{PD}$ required for partial discharge test in IEC 61800-5-1

$$V_{vor} = 1,875 * U_{PD} / \sqrt{2}$$

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 $V_{ref} = 2,5V$.
$$V_o = V_{out}(0) - 2,5V$$

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}

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

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

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

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