VACUUMSCHMELZE

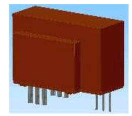
SPECIFICATION

Item no.: **T60404-N4646-X400**

K-No.: 24578

25 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: 17.08.2015

Customer: Standard type

Customers Part no.:

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

I_{PN}	Primary nominal r.m.s. current	25	A
R_M	Measuring resistance V_C=± 12V	10 ... 200	Ω
	V_C=± 15V	22 … 400	Ω
I_{SN}	Secondary nominal r.m.s. current	25	mA
K_N	Turns ratio	1…3 : 1000	

Accuracy – Dynamic performance data

		min.	typ.	max.	Unit
$I_{P,max}$	Max. measuring range				
	@ V_C = ±12V, R_M = 10 Ω (t_{max} = 10sec)	±120			A
	@ V_C = ±15V, R_M = 22 Ω (t_{max} = 10sec)	±130			A
X	Accuracy @ I_{PN}, θ_A = 25°C		0.1	0.5	%
ε_L	Linearity			0.1	%
I_0	Offset current @ I_P=0A, θ_A = 25°C		0.02	0.1	mA
t_r	Response time		500		ns
t_{ra}	Reaction time at di/dt = 100 A/µs		200		ns
f_{BW}	Frequency bandwidth	DC...200			kHz

General data

		min.	typ.	max.	Unit
ϑ_A	Ambient operating temperature	-40		+85	°C
ϑ_S	Ambient storage temperature	-40		+90	°C
m	Mass		12		g
V_C	Supply voltage	±11.4	±12 or ±15	±15.75	V
I_C	Current consumption		18,5		mA
*S_{clear}	clearance (component without solder pad)	10.2			mm
*S_{creep}	creepage (component without solder pad)	10.2			mm
*U_{sys}	System voltage			600	V_{RMS}
*U_{AC}	Working voltage			1020	V_{RMS}
*U_{PD}	Rated discharge voltage			1400	V_S
	Max. potential difference acc. to UL 508			600	V_{AC}

*Constructed and manufactored and tested in accordance with EN 61800-5-1:2007 (Pin 1 - 6 to Pin 7 – 9)
Reinforced insulation, Insulation material group 1, Pollution degree 2, overvoltage category 3

Date	Name	Issue	Amendment
17.08.15	DJ	82	Marking of item-no, value of primary resistance in page 2 (possibilities of wiring).changed. CN-15-420
17.04.13	KRe.	82	Mechanical outline: marking with UL-sign. and max. potential difference added. CN-658

Hrg KB-E (editor)	Bearb: DJ (designer)	KB-PM: Sn. (check)	freig.: Berton (released)

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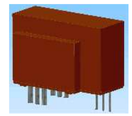
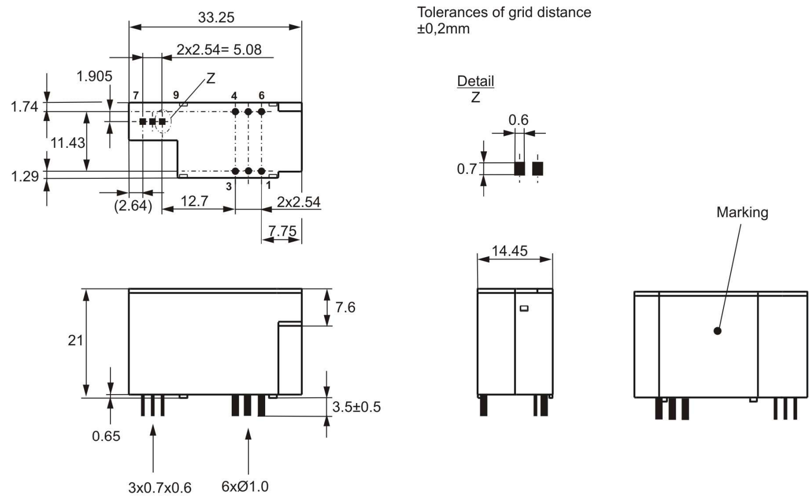


Customer: Standard type	Customers Part no.:	

Mechanical outline (mm): General tolerances DIN ISO 2768-c



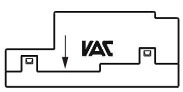
Connections:
1...6: ∅ 1.0 mm
7...9: 0.6x0.7 mm

Marking:

c UL us
4646-X400
F DC

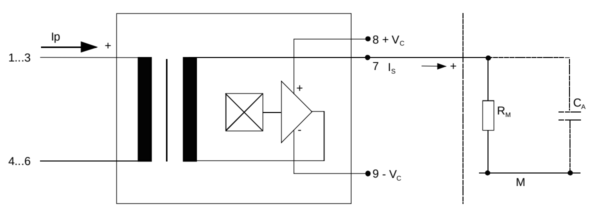
Explanation:

DC = Date Code
F = Factory

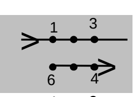
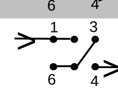
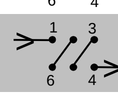


Current direction: A positive output current appears at point I_S, by primary current in direction of the arrow.

Schematic diagram



Possibilities of wiring for V_C = ±15V (@ θ_A = 85°C, R_M = 22 Ω)

primary windings N_P	primary current RMS I_P [A]	maximal $\hat{I}_{P,max}$ [A]	output current RMS I_S (I_P) [mA]	turns ratio K_N	primary resistance R_P [mΩ]	wiring
1	25	130	25	1:1000	0.3	
2	10	65	20	2:1000	1.35	
3	8	43	24	3:1000	2.4	

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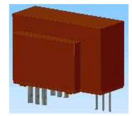

Electrical Data (investigate by a type checking)

		min.	typ.	max.	Unit
V_{Ctot}	Maximum supply voltage (without function) ±15.75 … ±18 V: for 1s per hour			±18	V
R_S	Secondary coil resistance @ θ_A=85°C			88	Ω
R_p	Primary coil resistance per turn @ T_A=25°C			1	mΩ
X_{Ti}	Temperature drift of X @ ϑ_A = -40 ... +85 °C			0.1	%
I_{0ges}	Offset current (including I_0, I_{0t}, I_{0T})			0.15	mA
I_{0t}	Long term drift Offset current I_0		0.05		mA
I_{0T}	Offset current temperature drift I_0 @ ϑ_A = -40 ...+85°C		0.05		mA
I_{0H}	Hyteresis current @ I_P=0 (caused by primary current 3 x I_{PN})		0.04	0.1	mA
$\Delta I_0/\Delta V_C$	Supply voltage rejection ratio			0.01	mA/V
i_{oss}	Offset ripple (with1 MHz- filter first order)			0,15	mA
i_{oss}	Offset ripple (with 100 kHz- filter first order)		0.03	0.05	mA
i_{oss}	Offset ripple (with 20 kHz- filter first order)		0.007	0.015	mA
C_k	Maximum possible coupling capacity (primary – secondary)		4		pF
	Mechanical Stress according to M3209/3 Settings: 10 – 2000 Hz, 1 min/Oktave, 2 hours			10g	

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

$K_N(N_1/N_2)$	(V)	M3011/6	Transformation ratio (I_P=3*10A, 40-80 Hz)	1…3 : 1000 ± 0.5	%
I_0	(V)	M3226	Offset current	< 0.1	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)	1300 1625	V V

Type Testing (Pin 1 - 6 to Pin 7 – 9)

Designed according standard EN 61800-5-1:2007 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 acc. M3014 (RMS)	(5 s)	5	kV
V_e	Partial discharge voltage acc. M3024 (RMS) with V_{vor} (RMS)		1500 1875	V V

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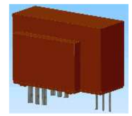
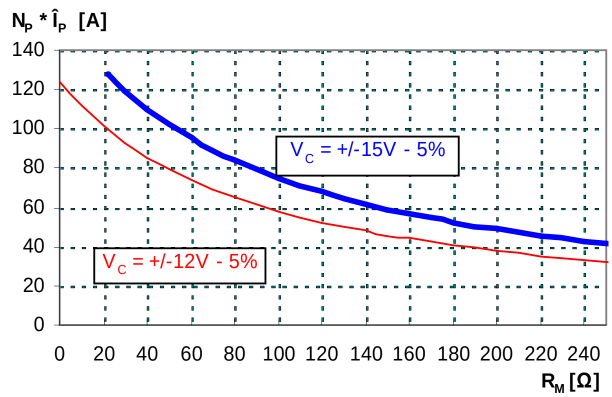


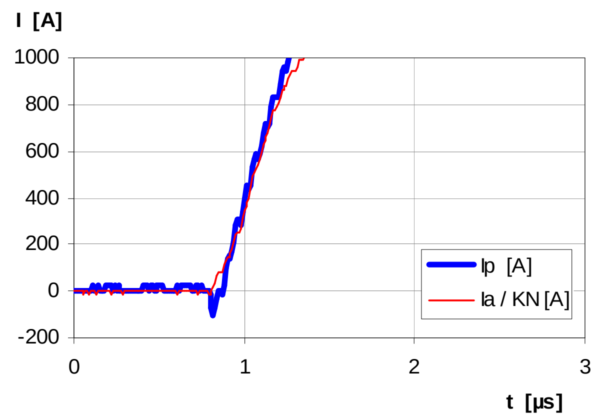
Limit curve of measurable current $\hat{I}_P(R_M)$

@ ambient temperature $T_A \leq 85$ °C



Maximum measuring range (µs-range)

Output current behaviour of a 3kA current pulse
@ V_C = ±15V und R_M= 25Ω



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

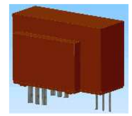
$$f_g = \frac{1}{2\pi \cdot R_M \cdot C_a}$$

In this case is the response time enlarged.
It is calculated from:

$$t'_r \leq t_r + 2.5 R_M \cdot C_a$$

Applicable documents

Constructed and manufactored and tested in accordance with EN 61800.
Temperature of the primary conductor should not exceed 100°C.
Further standards UL 508 ; file E317483, category NMTR2 / NMTR8



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 $I_P = 0.9 \cdot I_{Pmax}$ 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/µs.

$X_{ges}(I_{PN})$: The sum of all possible errors over the temperature range by measuring a current I_{PN}:

$$X_{ges} = 100 \cdot \left| \frac{I_S(I_{PN})}{K_N \cdot I_{SN}} - 1 \right| \%$$

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_i) in a specified temperature range, obtained by:

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

(I_{SB}: Secondary current θ_{A1} or θ_{A2})

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

Where I_P is any input DC and I_{Sx} the corresponding output term.