VACUUMSCHMELZE	**SPECIFICATION**	**Item no.:**	**T60404-N4646-X975**

K-no.: 25792	**300 mA Differential 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: 21.10.2015
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8Description
- 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

Applications
Mainly used for stationary operation in industrial applications:
- Solar converters

Electrical data – Ratings

I_{PN}	Primary rated current, r.m.s	50	A
$I_{\Delta N}$	Differential rated current, r.m.s	0.3	A
V_{out}	Output voltage @ I_P	$V_{Ref} \pm (0.74*I_{\Delta P}/I_{\Delta N})$	V
$V_{out}(0)$*)	Output voltage @ I_P=0, T_A=25°C	$V_{Ref} \pm 0.025$	V
V_{out} (Error)	in case of error (current sensor) V_{out} < 0,5V is set	<0.5	V
V_{Ref}	External Reference voltage range	2.5 ± 0.005	V
	Internal Reference voltage	2,5 ± 0,100	V
V_{Ref}(test current)**)	Reference voltage (external)	0…1	V
V_{out}(test current)**)	Output voltage @ V_{Ref} = 0…1V	$V_{out}(0)$ + 0.250± 0.060	V
K_N	Turns ratio	1:1:1 : 1000	

*) With switching on and after "test current" the current sensor is degaussed by an internal AC-current for about 110ms. Meantime the output is set to V_{out} < 0.5V.

**) Due to external V_{Ref} = 0…1V an internal test current is generated.

Accuracy – Dynamic performance data

		min.	typ.	max.	Unit
$I_{P,max}$	Max. measuring range (differencial current)	±0.85			
X	Accuracy @ I_{PN}, T_A= 25°C			1.5	%
ε_L	Linearity			1	%
V_{out} - V_{Ref}	Offset voltage @ I_P=0, T_A= 25°C			±25	mV
Δ V_o/ ΔT	Temperature drift of V_{out} @ I_P=0, T_A= -40…85°C		0.1		mV/°C
t_r	Response time @ 90% von I_{PN}		35		µs
f	Frequency bandwidth	DC…10			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		42		g
V_C	Supply voltage	4.75	5	5.25	V
I_C	Current consumption		16		mA
	Constructed and manufactored and tested in accordance with EN50178 (primary vs. secondary) Basic insulation, Insulation material group 1, Pollution degree 2				
S_{clear}	Clearance (component without solder pad)	8			mm
S_{creep}	Creepage (component without solder pad)	8			mm
V_{sys}	System voltage overvoltage category 3	RMS		600	V
V_{work}	Working voltage over voltage category 2	RMS		1000	V
U_{PD}	Rated discharge voltage	peak value		1414	V

Date	Name	Issue	Amendment
21.10.15	DJ	81	Typo on page 4: X and Xges. Values adapted on output voltage on Page 1 (0.625 ➔ 0.74).
			Applicable documents changed. Lapidary change

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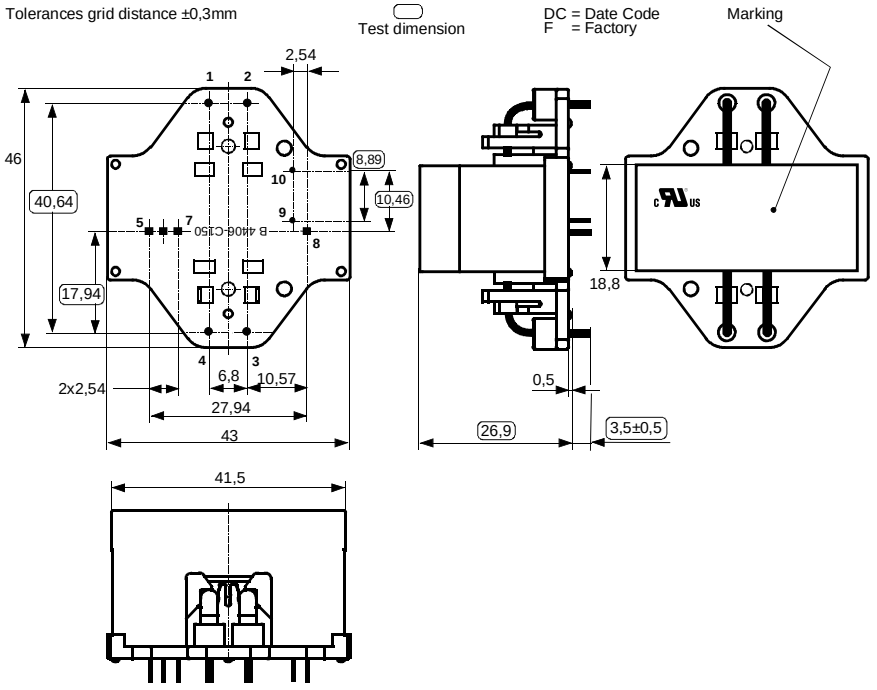
Mechanical outline (mm): General tolerances DIN ISO 2768-c



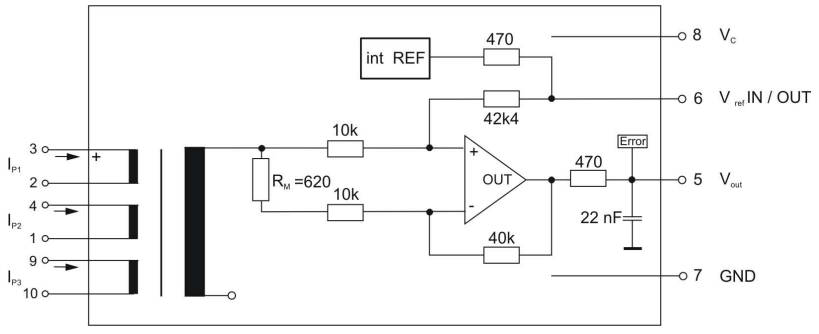
Connections:

1...4:	2.8 mm
5...8:	0.6*0.7 mm
9…10:	0.8 mm

Marking:

UL-sign
4646-X975
F DC

Schematic diagram



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.

Temperature of the primary conductor should not exceed 100°C.
Short clearance and creepage distances due to metallic shielding.
Further standards UL 508, file E317483, category NMTR2 / NMTR8

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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		16mA +I_p*K_N+V_{out}/R_L		mA
$I_{out,SC}$	Short circuit output current		±20		mA
$R_{P1,P2}$	Primary resistance @ T_A=25°C		0.17		mΩ
R_{P3}	Primary resistance @ T_A=25°C		1.14		mΩ
R_S	Secondary coil resistance @ T_A=85°C			80	Ω
$R_{i,Ref}$	Internal resistance of Reference input		470		Ω
R_i,(V_{out})	Output resistance of V_{out}		470		Ω
R_L	External recommended resistance of V_{out}		100		kΩ
C_L	External recommended capacitance of V_{out}		no limit		pF
$\Delta X_{Ti} / \Delta T$	Temperature drift of X @ T_A = -40 ... +85 °C			400	ppm/K
$\Delta V_{Ref} / \Delta T$	Temperature drift of V_{Ref} @ T_A = -40 ... +85 °C		5	50	ppm/K
$\Delta V_0 = \Delta(V_{out} - V_{Ref})$	Sum of any offset drift including:		16	25	mV
V_{0t}	Longtermdrift of V_0		12		mV
V_{0T}	Temperature drift von V_0 @ T_A = -40 ...+85°C		10		mV
$\Delta V_0/\Delta V_C$	Supply voltage rejection ratio		7.5	1	mV/V
V_{0H}	Hystereses of V_{out} @ I_P=0 (after an overload of 1000 x I_{PN})		75	175	mV
$V_{0H, Demag}$	Hystereses after Degaussing			12	mV
v_{oss}	Offsetripple (without external filter)			120	mV
v_{oss}	Offsetripple (with 20 kHz- filter firdt order)		35	50	mV
v_{oss}	Offsetripple (with 1.6 kHz- filter first order)		10	15	mV
	Mechanical stress according to M3209/3 Settings: 10 – 2000 Hz, 1 min/Decade, 2 hours			3g	

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=0.4A, 40-80Hz)		0.972 … 1.002	V
V_{out}–V_{Ref} (I_P=0) (V)	M3226:	Offset voltage		± 0.025	V
V_{out}(test current) (V)		Output voltage @ V_{Ref} = 0V		0.250± 0.060	V
V_d (V)	M3014:	Test voltage, RMS, 1 s pin 1 – 4 vs. 5 – 10		3.6	kV
V_e (AQL 1/S4)		Partial discharge voltage acc.M3024 (RMS) with V_{vor} (RMS)		1500 3600	V V

Type Testing (Pin 1 – 4 vs. 5 -10)

V_W	HV transient test according to M3064 (1,2 µs / 50 µs-wave form)			6	kV
V_d	Testing voltage to M3014		(1min)	3.6	kV
V_e	Partial discharge voltage acc.M3024 (RMS) with V_{vor} (RMS)			1500 3600	V V

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Explanation of sever al 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)

Δt (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

$$X = 100 \cdot \left| \frac{V_{out}(I_{PN}) - V_{out}(0)}{0.74V} - 1 \right| \%$$

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

$$X_{ges} = 100 \cdot \left| \frac{V_{out}(I_{PN}) - 2{,}5V}{0.74V} - 1 \right| \% \quad \text{or} \quad X_{ges} = 100 \cdot \left| \frac{V_{out}(I_{PN}) - V_{ref}}{0.74V} - 1 \right| \%$$

ε_L: Linearity fault defined by

$$\varepsilon_L = 100 \cdot \left| \frac{I_P}{I_{PN}} - \frac{V_{out}(I_P) - V_{out}(0)}{V_{out}(I_{PN}) - V_{out}(0)} \right| \%$$

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