VAC VACUUMSCHMELZE	**SPECIFICATION**	**Item no.:**	**T60404-N4646-X960**

K-no.: 25454	**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: 04.02.2022
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
- 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 rated current, r.m.s	50	A
$I_{\Delta N}$	Differential rated current, r.m.s	0.3	A
V_{out}	Output voltage @ $I_{\Delta P}$	$V_{Ref} \pm (0.74*I_{\Delta P}/I_{\Delta N})$	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}	Internal Reference voltage	2,5 ± 0.005	V
	External Reference voltage range	2.5 ± 0.100	V
V_{Ref}(test current)**)	Reference voltage (external)	0…1	V
V_{out}(Teststrom)**)	Ausgangsspannung @ V_{Ref} = 0…1V	$V_{out}(0)$ + 0.250± 0.060	V
K_N	Turns ratio	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.

Accuracy – Dynamic performance data

		min.	typ.	max.	Unit
$I_{P,max}$	Max. measuring range (differencial current)	±0.85			
X	Accuracy @ $I_{\Delta N}$, 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
$\Delta V_o / \Delta T$	Temperature drift of V_{out} @ I_P=0, T_A= -40…85°C		0.1		mV/°C
t_r	Response time @ 90% von $I_{\Delta N}$		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 (acc to M3101)	-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)				
	Reinforced 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
04.02.2022	NSch.	81	Applicable documents on sheet 2 changed. „The color of the plastic material… added. Minor change
02.02.17	DJ	81	Page A1, M-sheet M3101 added (storage temperature). Page A3, SC-size defined (Vout). Minor change

Hrsg.: MC-PD editor	Bearb: DJ designer		MC-PM: KRe. check			freig.: SB released

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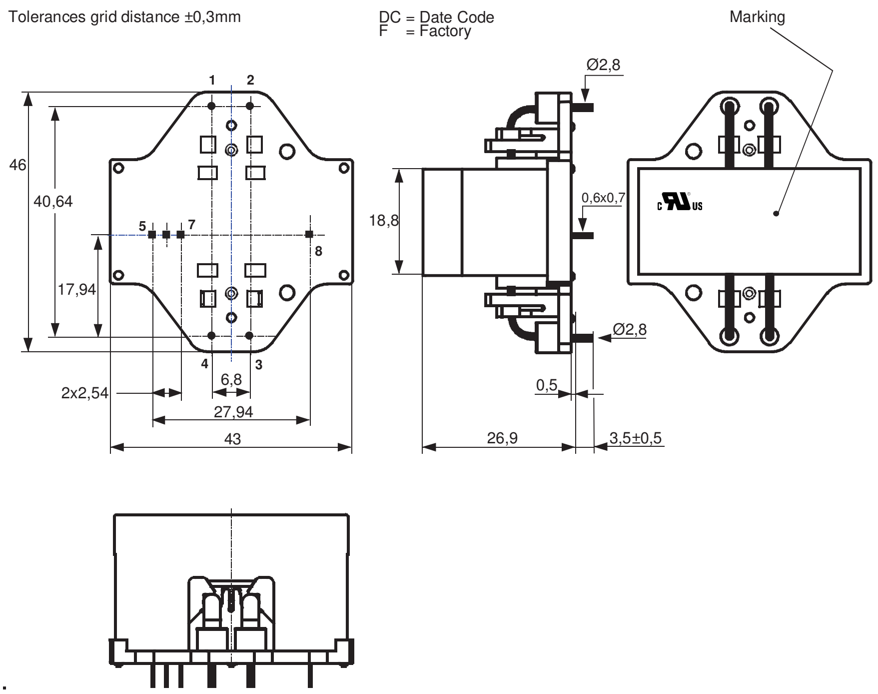
Mechanical outline (mm): General tolerances DIN ISO 2768-c



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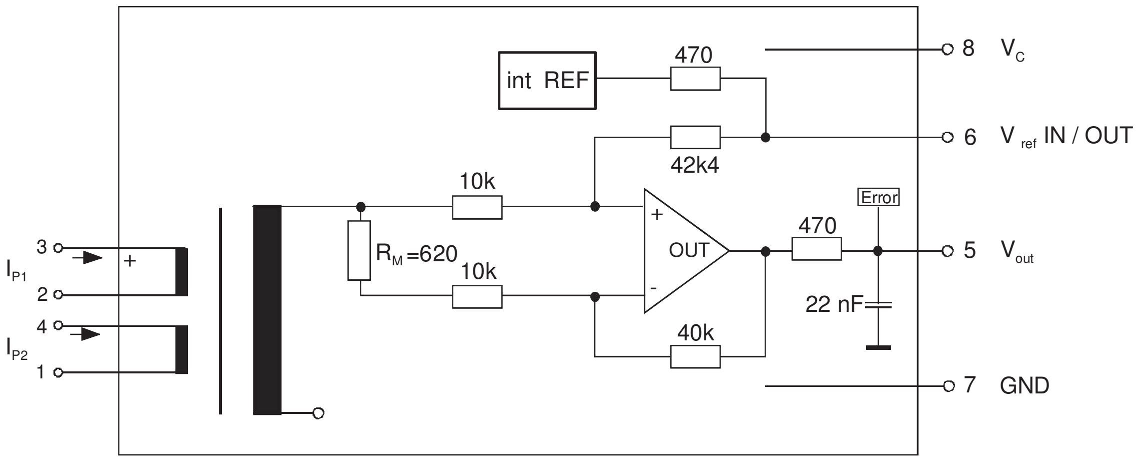
Connections:

1...4: 2,8 mm
5...8: 0,6*0,7 mm

Marking:

VAC UL-sign
4646-X960
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.
Enclosures according to IEC529: IP50.

Further standards UL 508, file E317483, category NMTR2 / NMTR8
Short clearance and creepage distances due to metallic shielding.
Temperature of the primary conductor should not exceed 100°C.
The color of the plastic material is not specified and the current sensor can be supplied in different colors
(e.g. brown, black, white, natural). This has no effect on the specifications or UL approval

Hrsg.: MC-PD editor	Bearb: DJ designer		MC-PM: KRe. check			freig.: SB released

Electrical Data

		min.	typ.	max.	Unit
V_{Ctot}	Maximum supply voltage (without function)			7	V
I_C	Supply Current with primary current		$16mA + I_{\Delta p} * K_N + V_{out}/R_L$		mA
$I_{out,SC}$	Short circuit output current		±20		mA
R_P	Primary resistance @ T_A=25°C		0.17		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 $I_{\Delta N}$)		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/Oktave, 2 hours			3g	

Inspection (Measurement after temperature balance of the samples at room temperature, SC = significant characteristic)

V_{out} (SC)	(V)	M3011/6:	Output voltage vs. reference ($I_{\Delta P}$=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 - 8	3.5	kV
V_e	(AQL 1/S4)		Partial discharge voltage acc.M3024 (RMS) with V_{vor} (RMS)	1500 3500	V V

Type Testing (Pin 1 - 4 vs. 5 - 8)

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)	3.5	kV
V_e	Partial discharge voltage acc.M3024 (RMS) with V_{vor} (RMS)		1500 3500	V V

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 $I_{\Delta P} = 0{,}9 \cdot I_{\Delta N}$ between a rectangular current and the output voltage V_{OUt} ($I_{\Delta P}$)

Δt (I_{Pmax}): Delay time (describe the dynamic performance for the rapid current pulse rate e.g short circuit current) measured between $I_{\Delta Pmax}$ and the output voltage $V_{out}(I_{\Delta Pmax})$ with a primary current rise of $di_{\Delta P}/dt \geq 100$ A/µs.

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

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

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

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

ε_L: Linearity fault defined by

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