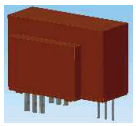
VACUUMSCHMELZE	SPECIFICATION	Item no.: T60404-N4646-X412

K-No.: 24618

50/100A 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: 20.01.2022

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
- 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 rms current		
	@ V_C = ±15V, R_M ≥ 0Ω	50	A
	@ V_C = ±12V, R_M ≥ 0Ω or V_C = ±15V, R_M ≥ 16Ω	100	A
R_M	Measuring resistance V_C=± 12V	0 ... 200	Ω
	V_C=± 15V	16 … 400	Ω
I_{SN}	Secondary nominal rms current	25/50	mA
K_N	Turns ratio	1…3 : 2000	

Accuracy – Dynamic performance data

		min.	typ.	max.	Unit
$I_{P,max}$	Max. measuring range				
	@ V_C = ±12V, R_M = 10Ω (t_{max} = 10sec)	±145			A
	@ V_C = ±15V, R_M = 16Ω (t_{max} = 10sec)	±175			A
X	Accuracy @ I_{PN}, T_A= 25°C		0.1	0.5	%
ε_L	Linearity			0.1	%
I_0	Offset current @ I_P=0, T_A= 25°C		0.02	0.08	mA
t_r	Response time		500		ns
Δt ($I_{P,max}$)	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 (acc. M3101)	-40		+90	°C
m	Mass		13.5		g
V_C	Supply voltage	±11.4	±12 or ±15	±15.75	V
I_C	Current consumption		18.5		mA
	Constructed and manufactored and tested in accordance with EN 61800-5-1 (Pin 1 - 6 to Pin 7 – 9) Reinforced insulation, Insulation material group 1, Pollution degree 2				
S_{clear}	clearance (component without solder pad)	10.2			mm
S_{creep}	creepage (component without solder pad)	10.2			mm
V_{sys}	System voltage overvoltage category 3			600	V_{RMS}
V_{work}	Working voltage (table 7 acc. to EN61800-5-1)			1020	V_{RMS}
U_{PD}	Rated discharge voltage			1400	V_{PEAK}

Max. potential difference acc. to UL 508	RMS	600	V_{AC}

Date	Name	Isuue	Amendment
20.01.2022	NSch.	81	Applicable documents on sheet 4 changed. „The color of the plastic material… added. Minor change
21.01.19	DJ	81	Page 2: Marking changed from 4646X412 to 4646-X412. Page 3, Type test M3064 accurately defined. CN-19-018.

Hrsg.: R&D-PD NPI D editor	Bearb: DJ designer		MC-PM: NSch. check			freig.: SB released

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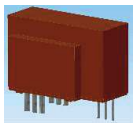

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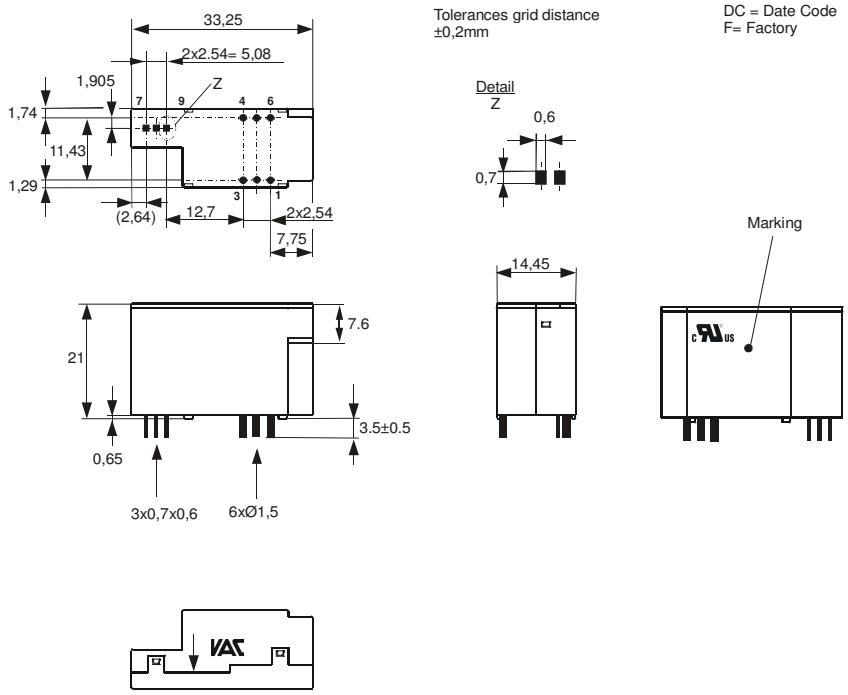
Customer: Standard type | Customers Part no.: | Page 2 of 4

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

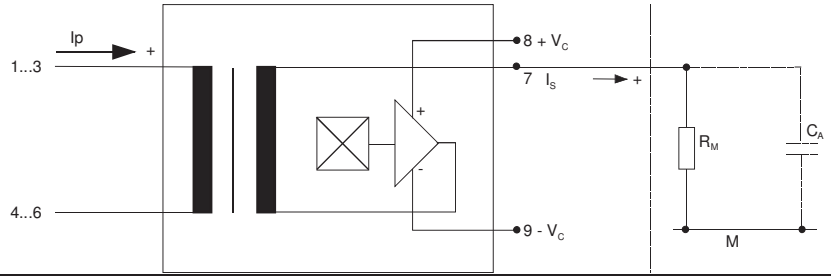


Connections:
1...6: ∅ 1.5mm
7...9: 0.6x0.7mm

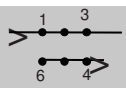
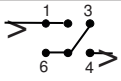
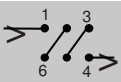
Marking:

UL-sign
4646-X412
F DC

Schematic diagram



Possibilities of wiring for V_C = ±15V (@ T_A = 85°C, R_M = 25 Ω)

primary windings N_P	primary current RMS I_P [A]	primary current 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	100	175	50	1:2000	0.12	
2	35	82	35	2:2000	0.54	
3	25	58	37.5	3:2000	1.1	

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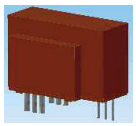
K-No.: 24618	**50/100A Current Sensor** For the electronic measurement of currents: DC, AC, pulsed, mixed ..., with a galvanic Isolation between the primary circuit (high power) and the secondary circuit (electronic circuit)		Date: 20.01.2022

Customer: Standard type	Customers Part no.:	Page 3 of 4

Electrical Data (investigate by a type checking)

		min.	typ.	max.	Unit
V_{Ctot}	Maximum supply voltage (without function) ±15.75 to ±18 V: for 1s per hour			±18	V
R_S	Secondary coil resistance @ T_A=85°C			145	Ω
R_p	Primary coil resistance per turn @ T_A=25°C			0.36	mΩ
X_{Ti}	Temperature drift of X @ T_A = -40 ... +85°C			0.1	%
I_{0ges}	Offset current (including I_0, I_{0t}, I_{0T})			0.1	mA
I_{0t}	Long term drift Offset current I_0		0.03		mA
I_{0T}	Offset current temperature drift I_0 @ T_A = -40 ...+85°C		0.03		mA
I_{0H}	Hyteresis current @ I_P=0 (caused by primary current 3 x I_{PN})		0.02	0.05	mA
$\Delta I_0/\Delta V_C$	Supply voltage rejection ratio			0.01	mA/V
i_{oss}	Offsetripple (with 1MHz- filter first order)			0.15	mA
i_{oss}	Offsetripple (with 100kHz- filter first order)		0.017	0.025	mA
i_{oss}	Offsetripple (with 20kHz- filter first order)		0.005	0.007	mA
C_k	Maximum possible coupling capacity (primary – secondary)		5		pF
	Mechanical Stress according to M3209/3 Settings: 10 – 2000 Hz, 1 min/Oktave, 2 hours An exceptionally high rate of on/off – switching of the supply voltage accelerates the aging process of the sensor.			10	g

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

K_N(SC)	(V)	M3011/6	Transformation ratio (I_P=3*10A, 40-80 Hz)	1…3 : 2000 ± 0.5	%
I_0	(V)	M3226	Offset current	< 0.05	mA
V_d	(V)	M3014	Test voltage, 1s	2.5	kV_{RMS}
V_e	(AQL 1/S4)		Partial discharge voltage acc. M3024	1500	V_{RMS}
			with V_{vor}	1875	V_{RMS}

Type Testing (Precondition acc. to M3236)

V_W	HV transient test according to M3064 (1,2 µs / 50 µs-wave form) 5 pulse ➔ polarity +, 5 pulse ➔ polarity -		8	kV
V_d	Testing voltage acc. M3014	(5s)	5	kV_{RMS}
V_e	Partial discharge voltage acc. M3024		1500	V_{RMS}
	with V_{vor}		1875	V_{RMS}

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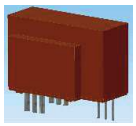
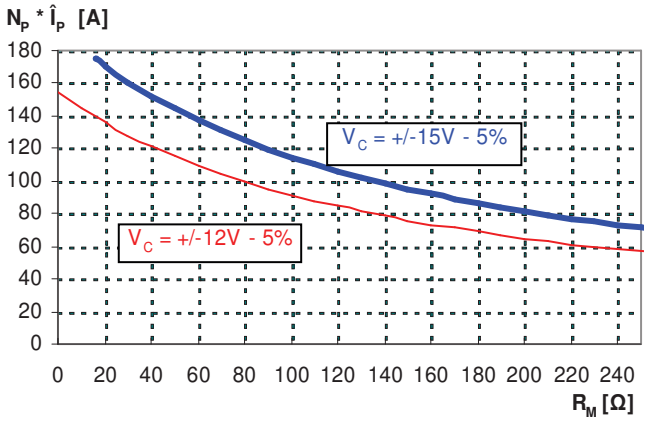


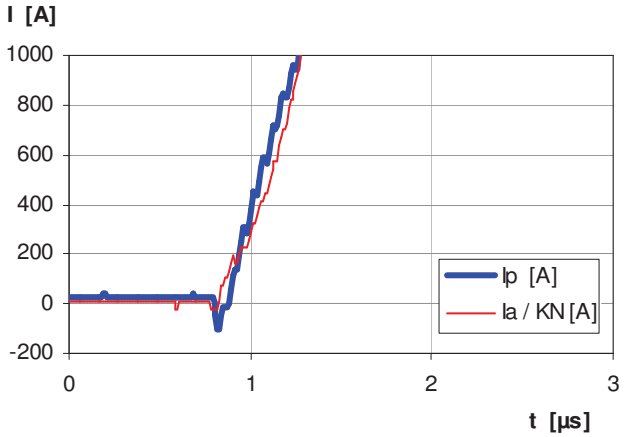
Limit curve of measurable current $\hat{I}_P(R_M)$

@ ambient temperature T_A = 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 the response time is enlarged.
It is calculated from:

$$t_r' \le t_r + 2{,}5 R_M C_a$$

Applicable documents

Temperature of the primary conductor should not exceed 105°C.
Current direction: A positive output current appears at point I_S, by primary current in direction of the arrow.
Constructed and manufactored and tested in accordance with EN 61800.
Further standards UL 508 ; file E317483, category NMTR2 / NMTR8
„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.: R&D-PD NPI D (editor)	Bearb: DJ (designer)		MC-PM: NSch. (check)			freig.: SB (released)