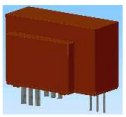
VACUUMSCHMELZE	SPECIFICATION	Item no.: T60404-N4646-X412

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: 21.01.2019

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
21.01.19	DJ	81	Page 2: Marking changed from 4646X412 to 4646-X412. Page 3, Type test M3064 accurately defined. CN-19-018.
18.04.13	KRe	81	Mechanical outline: marking with UL-sign and max. potential difference added. CN-661

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

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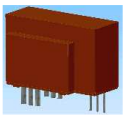
K-No.: 24618	**50/100A Current Sensor** For the electronic measurement of currents: DC, AC, pulsed, mixed ..., with a galvanic Isolation between the primary circuit (high power) and the secondary circuit (electronic circuit)		Date: 21.01.2019
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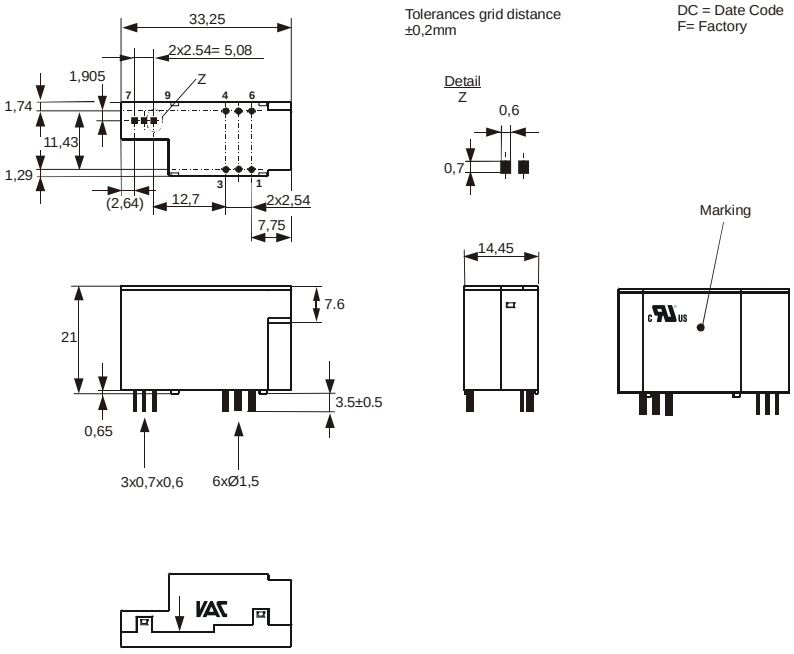
Mechanical outline (mm): General tolerances DIN ISO 2768-c

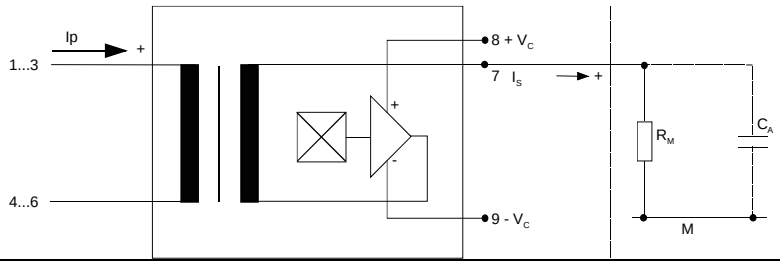


Connections:
1...6: ∅ 1.5mm
7...9: 0.6x0.7mm

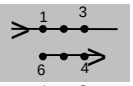
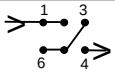
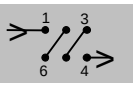
Marking:

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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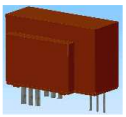
K-No.: 24618	**50/100A Current Sensor** For the electronic measurement of currents: DC, AC, pulsed, mixed ..., with a galvanic Isolation between the primary circuit (high power) and the secondary circuit (electronic circuit)		Date: 21.01.2019

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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 with V_{vor}	1500 1875	V_{RMS} 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 with V_{vor}		1500 1875	V_{RMS} V_{RMS}

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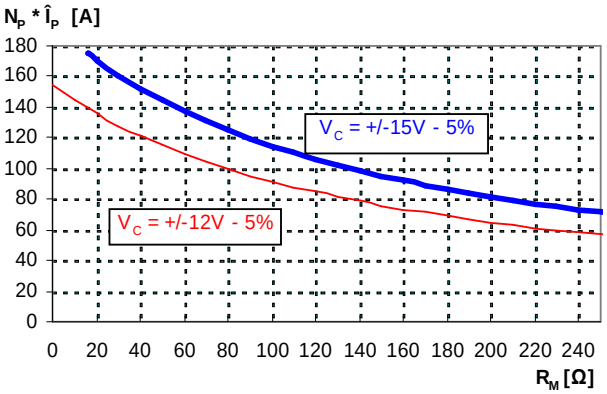
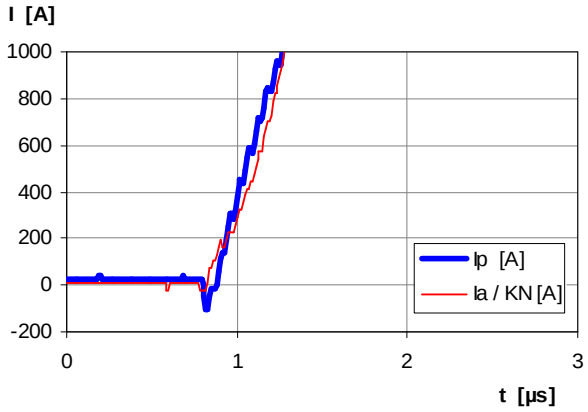
Limit curve of measurable current $\hat{I}_P(R_M)$

@ 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