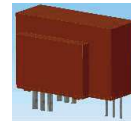


K-No.: 24618

### 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

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#### 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 @ $V_C = \pm 15V, R_M \geq 0\Omega$ @ $V_C = \pm 12V, R_M \geq 0\Omega$ or $V_C = \pm 15V, R_M \geq 16\Omega$	50 100	A A
$R_M$	Measuring resistance $V_C = \pm 12V$ $V_C = \pm 15V$	0 ... 200 16 ... 400	$\Omega$ $\Omega$
$I_{SN}$	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 @ $V_C = \pm 12V, R_M = 10\Omega$ ( $t_{max} = 10sec$ ) @ $V_C = \pm 15V, R_M = 16\Omega$ ( $t_{max} = 10sec$ )	$\pm 145$ $\pm 175$			A A
X	Accuracy @ $I_{PN}, T_A = 25^\circ C$		0.1	0.5	%
$\square_L$	Linearity			0.1	%
$I_o$	Offset current @ $I_P = 0, T_A = 25^\circ C$		0.02	0.08	mA
$t_r$	Response time		500		ns
$\Delta t (I_{P,max})$	Delay time at $di/dt = 100 A/\mu s$		200		ns
f	Frequency bandwidth	DC...200			kHz

#### General data

		min.	typ.	max.	Unit
$T_A$	Ambient operating temperature	-40		+85	$^\circ C$
$T_S$	Ambient storage temperature (acc. M3101)	-40		+90	$^\circ C$
m	Mass		13.5		g
$V_C$	Supply voltage	$\pm 11.4$	$\pm 12$ or $\pm 15$	$\pm 15.75$	V
$I_C$	Current consumption		18.5		mA
	Constructed and manufactured 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	$V_{AC}$

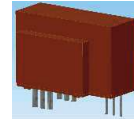
Date	Name	Issue	Amendment
20.01.2022	NSch.	81	Applicable documents on sheet 4 changed. „The color of the plastic material... added. Minor change
21.01.19	DJ	81	Page 2: Marking changed from 4646X412 to 4646-X412. Page 3, Type test M3064 accurately defined. CN-19-018.

Hrsg.: R&D-PD NPI D editor	Bearb.: DJ designer	MC-PM: NSch. check	freig.: SB released
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**K-No.: 24618**

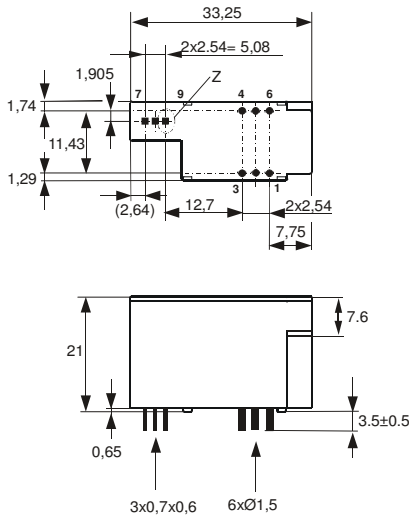
## 50/100A Current Sensor

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.:**
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### Mechanical outline (mm):

General tolerances DIN ISO 2768-c


 Tolerances grid distance  
±0,2mm

 DC = Date Code  
F = Factory

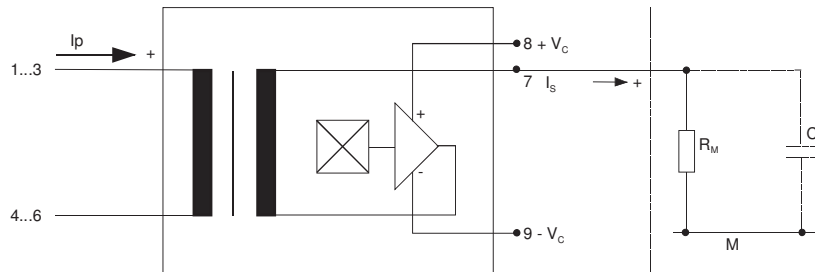
**Connections:**

 1...6: Ø 1.5mm  
7...9: 0.6x0.7mm

**Marking:**

 UL-sign  
4646-X412  
F DC

### Schematic diagram



### Possibilities of wiring for V<sub>C</sub> = ±15V (@ T<sub>A</sub> = 85°C, R<sub>M</sub> = 25 Ω)

primary windings N <sub>P</sub>	primary current RMS I <sub>P</sub> [A]	primary current maximal I <sub>P,max</sub> [A]	output current RMS I <sub>S</sub> (I <sub>P</sub> ) [mA]	turns ratio K <sub>N</sub>	primary resistance R <sub>P</sub> [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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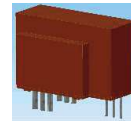
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**Electrical Data (investigate by a type checking)**

		min.	typ.	max.	Unit
$V_{Ctot}$	Maximum supply voltage (without function) $\pm 15.75$ to $\pm 18$ V: for 1s per hour			$\pm 18$	V
$R_S$	Secondary coil resistance @ $T_A=85^\circ\text{C}$			145	$\Omega$
$R_p$	Primary coil resistance per turn @ $T_A=25^\circ\text{C}$			0.36	m $\Omega$
$X_{Ti}$	Temperature drift of X @ $T_A = -40 \dots +85^\circ\text{C}$			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 $I_0$ @ $T_A = -40 \dots +85^\circ\text{C}$		0.03		mA
$I_{0H}$	Hysteresis current @ $I_P=0$ (caused by primary current $3 \times I_{PN}$ )		0.02	0.05	mA
$\Delta I_0/\Delta V_C$	Supply voltage rejection ratio			0.01	mA/V
$i_{0ss}$	Offsetripple (with 1MHz- filter first order)			0.15	mA
$\dot{i}_{0ss}$	Offsetripple (with 100kHz- filter first order)		0.017	0.025	mA
$\ddot{i}_{0ss}$	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 ( $I_P=3 \times 10A, 40-80$ Hz)	$1 \dots 3 : 2000 \pm 0.5$ %
$I_0$	(V)	M3226	Offset current	$< 0.05$ mA
$V_d$	(V)	M3014	Test voltage, 1s	2.5 kV <sub>RMS</sub>
$V_e$	(AQL 1/S4)		Partial discharge voltage acc. M3024 with $V_{vor}$	1500 V <sub>RMS</sub> 1875 V <sub>RMS</sub>

**Type Testing** (Precondition acc. to M3236)

$V_w$			HV transient test according to M3064 (1,2 $\mu\text{s}$ / 50 $\mu\text{s}$ -wave form) 5 pulse $\rightarrow$ polarity +, 5 pulse $\rightarrow$ polarity -	8 kV
$V_d$			Testing voltage acc. M3014	(5s) 5 kV <sub>RMS</sub>
$V_e$			Partial discharge voltage acc. M3024 with $V_{vor}$	1500 V <sub>RMS</sub> 1875 V <sub>RMS</sub>

Hrsg.: R&D-PD NPI D  
editor

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designer

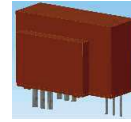
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freig.: SB  
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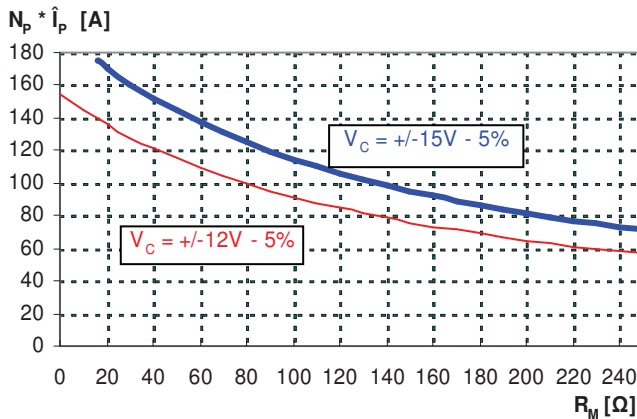
Customer: Standard type

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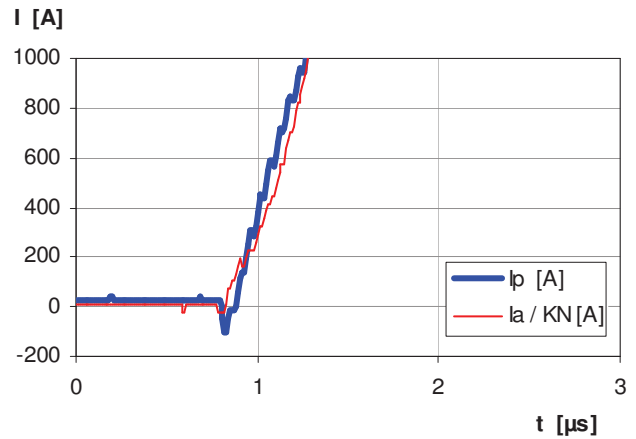
**Limit curve of measurable current  $\hat{I}_P(R_M)$**

@ ambient temperature  $T_A = 85\text{ }^\circ\text{C}$



**Maximum measuring range (μs-range)**

Output current behaviour of a 3kA current pulse  
@  $V_C = \pm 15\text{V}$  und  $R_M = 25\Omega$



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:

$$t'_r \leq t_r + 2,5R_M C_a$$

**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 manufactured 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

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