

K-No.: 26575

500A 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: 11.03.2020

Customer: Standard type

Customers Part no:

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Description

- Closed loop (compensation)
Current Sensor with magnetic 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
- Uninterruptable Power Supplies (UPS)

Electrical data – Ratings

I_{PN}	Primary nominal RMS current	500	A
R_M	Measuring resistance	0 ... 200	Ω
I_{SN}	Secondary nominal RMS current	250	mA
K_N	Transformation ratio	(1) : 2000	

Accuracy – Dynamic performance data

		min.	typ.	max.	Unit
$I_{P,max}$	Max. measuring range @ $V_C = \pm 15V$, $R_M < 10\Omega$ ($t_{max} = 10sec$)	700			A
X	Accuracy @ I_{PN} , $\vartheta_A = 25^\circ C$			0.5	%
ϵ_L	Linearity			0.1	%
I_O	Offset current @ $I_P = 0A$, $\vartheta_A = 25^\circ C$			0.2	mA
t_r	Response time		<1		μs
t_{ra}	Reaction time		<1		μs
f	Frequency bandwidth	DC...50			kHz

General data

ϑ_A	Ambient operation temperature	-40		85	$^\circ C$
ϑ_S	Ambient storage temperature (acc. M3101)	-40		85	$^\circ C$
m	Mass		120		g
V_C	Supply voltage	± 14.25	± 15	± 15.75	V
I_C	Supply current at $I_P = 0A$ and RT		± 23		mA
Constructed and manufactured and tested in accordance with IEC 61800-5-1:2007 (Pin 1-4 to hole) Reinforced insulation, Insulation material group 1, Pollution degree 2					
S_{clear}	Clearance	8			mm
S_{creep}	Creepage	12			mm
$U_{sys,1}$	System voltage (overvoltage category III)			600	V_{RMS}
$U_{sys,2}$	System voltage (overvoltage category II)			1000	V_{RMS}
	max. Potential Difference acc. to UL 508			600	V_{RMS}

Date	Name	Issue	Amendment
		81	

Editor: R&D-PD NPI D

Designer: DJ

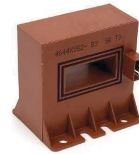
MC-PM: Sn.

Released: SB

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Mechanical outline (mm):

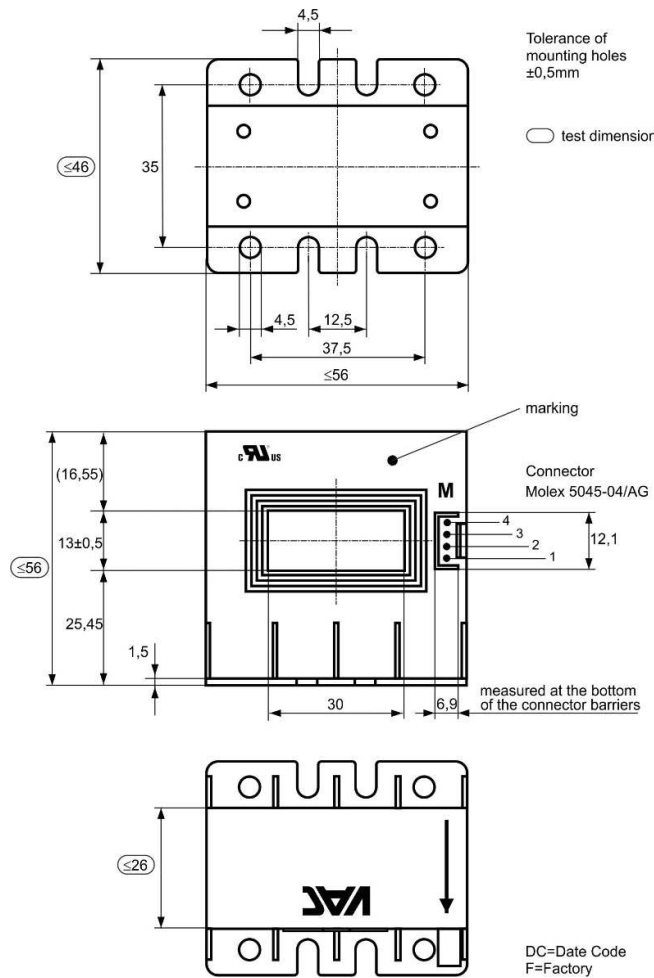
General tolerances DIN ISO 2768-c

Connections:

Pins 1-4: 0.64mm x 0.64mm

Marking:

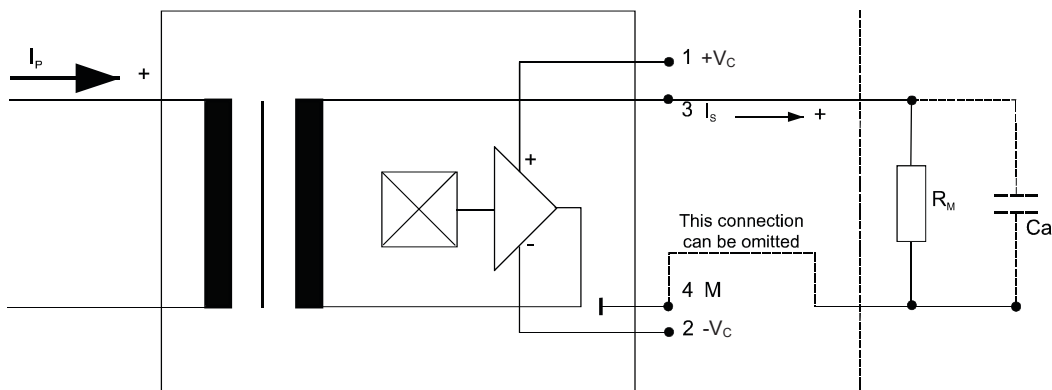
UL-sign 4648-X052 F DC



F: Factory
DC: Date Code

Date Code Format: [YWW]
Example: K04: 2018, Week 4

Schematic diagram:



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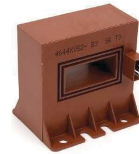
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Electrical data: (investigate by a type checking)

		min.	typ.	max.	Unit
$V_{C,tot}$	maximum supply voltage (without function) $\pm 15.75V$ to $\pm 18V$: for 1s per hour			± 18	V
R_S	Secondary coil resistance @ $\vartheta_A = 85^\circ C$			30	Ω
X_{TI}	Temperature drift of X @ $\vartheta_A = -40^\circ C \dots 85^\circ C$			0.1	%
I_{ot}	Long term drift of I_o		0.05		mA
I_{oT}	Offset current temperature drift I_o @ $\vartheta_A = -40^\circ C \dots 85^\circ C$		0.05		mA
I_{oH}	Hysteresis current @ $I_P = 0A$ (caused by $I_P = 3 \times I_{PN}$)		0.1		mA
$\Delta I_o / \Delta V_C$	Supply voltage rejection ratio			0.01	mA/V
i_{oss}	Offsetripple* (with 1 MHz-Filter, first order)		0.4	0.6	mA _{pp}
i_{oss}	Offsetripple* (with 100 kHz-Filter, first order)		0.06		mA _{pp}
i_{oss}	Offsetripple* (with 20 kHz-Filter, first order)		0.02		mA _{pp}
C_k	Maximum possible coupling capacity (primary - secondary)		15		pF
	Mechanical stress according to M3209/3 Settings: 10-2000Hz, 1min/oct, 2 hours		2		g

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

K_N (SC)	(100%) M3011/6:	Transformation ratio		1990 ... 2010	
I_o	(100%) M3226:	Offset current		0.2	mA
U_d	(100%) M3014:	Test voltage, 1s		1.8	kV _{RMS}
U_{PDE}	(AQL 1/S4) M3024:	Partial discharge voltage (extinction)		1.5	kV _{RMS}
$U_{PD} * 1.875$				1.875	

Type Tests: (Precondition acc. to M3236)

\hat{U}_W	HV transient test acc. to M3064 (1.2 μ s / 50 μ s) 5 pules -> polarity +, 5 pulses -> polarity -		8		kV
U_d	Test voltage acc. to M3014, 5s		3.6		kV _{RMS}
U_{PDE}	Partial discharge voltage (extinction) acc. to M3024		1.5		kV _{RMS}
$U_{PD} * 1.875$			1.875		

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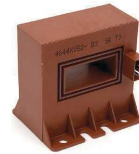
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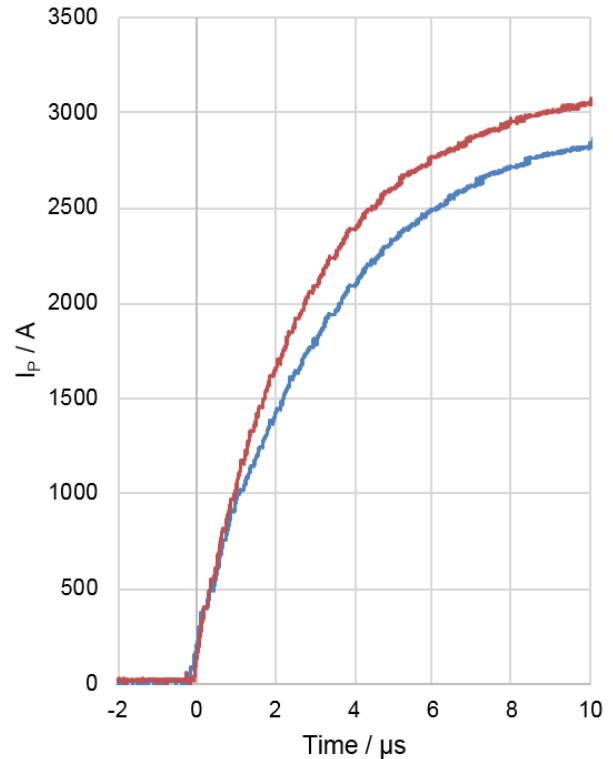
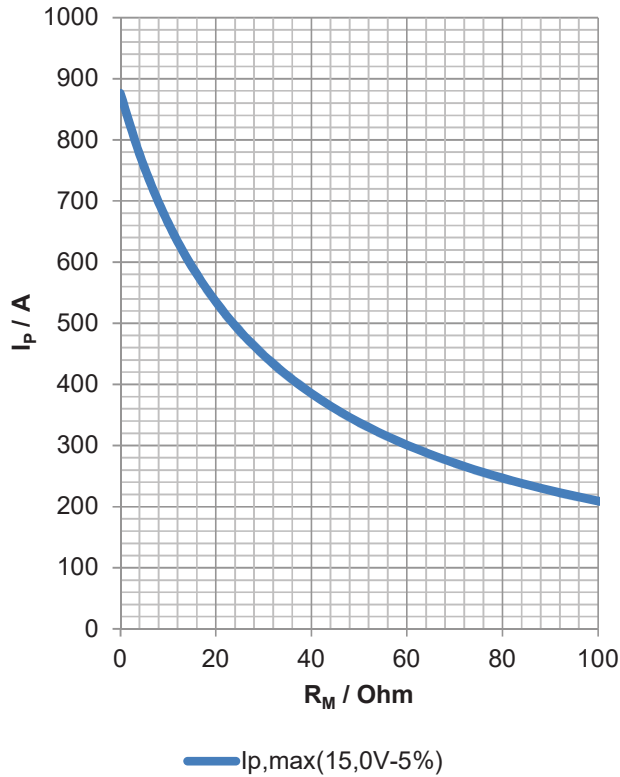
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Limit curve of measurable current of N4648-X052



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 and be limited by diodes only.

*Possible way to reduce the Offset ripple by a Low-Pass-Filter

The offset ripple can be reduced by an external low pass. Simplest solution is a passive low pass filter of 1st order with cutoff frequency:

$$f_g = \frac{1}{2 * \pi * R_M * C_a}$$

In this case the response time is enlarged:

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

Other instructions

- Current direction: A positive output current appears at point I_s , if primary current flows in direction of the arrow.
- Temperature of the primary conductor should not exceed 105°C.
- Housing and bobbin material UL-listed: Flammability class 94V-0.
- Further standards: UL508, UL-file: E317483, category NMTR2 / NMTR8

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