

K-no.: 24619
50 A Current Sensor for 5V- Supply Voltage

For electronic current measurement:
DC, AC, pulsed, mixed ..., with a galvanic
isolation between primary circuit
(short power) and secondary circuit
(electronic circuit)

Date: 15.05.2014
Customer: Standard type
Customers Part no.:
Page 1 of 2
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 nominal r.m.s. current	50	A
V_{out}	Output voltage @ I_P	$V_{Ref} \pm (0.625 \cdot I_P / I_{PN})$	V
V_{out}	Output voltage @ $I_P=0$, $T_A=25^\circ\text{C}$	$V_{Ref} \pm 0.0025$	V
V_{Ref}	External Reference voltage range	0...4	V
	Internal Reference voltage	2.5 ± 0.005	V
K_N	Turns ratio	1...3 : 1400	

Accuracy – Dynamic performance data

		min.	typ.	max.	Unit
$I_{P,max}$	Max. measuring range	± 150			
X	Accuracy @ I_{PN} , $T_A=25^\circ\text{C}$			0.7	%
ϵ_L	Linearity			0.1	%
$V_{out} - V_{Ref}$	Offset voltage @ $I_P=0$, $T_A=25^\circ\text{C}$			± 2.5	mV
$\Delta V_o / V_{Ref} / \Delta V$	Temperature drift of V_{out} @ $I_P=0$, $T_A=-40...85^\circ\text{C}$		3	10	ppm/ $^\circ\text{C}$
t_r	Response time @ 90% von I_{PN}		500		ns
$\Delta t (I_{P,max})$	Delay time at $di/dt = 100 \text{ A}/\mu\text{s}$		500		ns
f	Frequency bandwidth	DC...100			kHz

General data

		min.	typ.	max.	Unit
T_A	Ambient operating temperature	-40		+85	$^\circ\text{C}$
T_S	Ambient storage temperature	-40		+85	$^\circ\text{C}$
m	Mass		15		g
V_C	Supply voltage	4.75	5	5.25	V
I_C	Current consumption		16		mA
	Constructed and manufactured and tested in accordance with EN 61800-5-1 (Pin 1 - 6 to Pin 7 – 10)				
	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	RMS	600	V
V_{work}	Working voltage	(table 7 acc. to EN61800-5-1)	overvoltage category 2	RMS	1020
U_{PD}	Rated discharge voltage	peak value		1400	V
	Max. potential difference acc. to UL 508	RMS		600	V_{AC}

Date **Name** **Issue** **Amendment**

15.05.14 DJ 83 Marking changed from 4646X460 → 4646-X460. CN-14-009

Hrsg.: KB-E
editor

Bearb.: DJ
designer

KB-PM: KRe.
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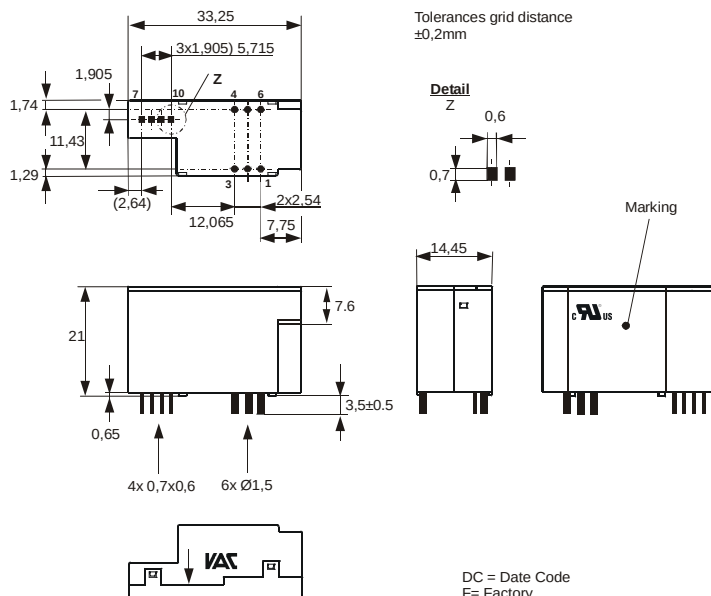
Customer: Standard type

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Mechanical outline (mm):

General tolerances DIN ISO 2768-c



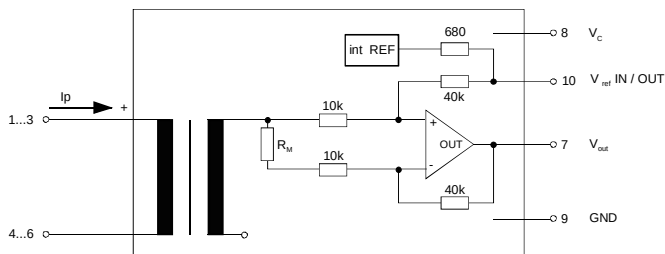
Connections:

1...6: Ø 1.5 mm
7..10: 0.7*0.6 mm

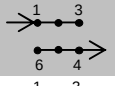
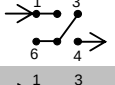
Marking:

UL-sign
4646-X460
F DC

Schematic diagram



Possibilities of wiring (@ $T_A = 85^\circ\text{C}$)

primary windings	primary current RMS	primary current maximal	output voltage RMS	turns ratio	primary resistance	wiring
N_P	I_P [A]	$\hat{I}_{P,max}$ [A]	$V_{out}(I_P)$ [V]	K_N	R_P [mΩ]	
1	50	±150	2.5±0.625	1:1400	0.1	
2	25	±75	2.5±0.625	2:1400	0.45	
3	16,7	±50	2.5±0.625	3:1400	1	

Temperature of the primary conductor should not exceed 100°C

Additional information is obtainable on request.

This specification is no declaration of warranty acc. BGB §443 dar.

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50 A Current Sensor for 5V- Supply Voltage

For the electronic measurement of currents:
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Electrical Data

		min.	typ.	max.	Unit
V_{Ctot}	Maximum supply voltage (without function)			6	V
I_C	Supply Current with primary current		16mA + $I_p \cdot K_N + V_{out}/R_L$		mA
$I_{out,SC}$	Short circuit output current		±20		mA
R_P	Resistance / primary winding @ $T_A=25^\circ C$			0.3	mΩ
R_S	Secondary coil resistance @ $T_A=85^\circ C$			30	Ω
$R_{i,Ref}$	Internal resistance of Reference input		670		Ω
$R_{i,(V_{out})}$	Output resistance of V_{out}			1	Ω
R_L	External recommended resistance of V_{out}	1			kΩ
C_L	External recommended capacitance of V_{out}			500	pF
$\Delta X_{Ti} / \Delta V$	Temperature drift of X @ $T_A = -40 \dots +85^\circ C$			40	ppm/K
$\Delta V_0 = \Delta(V_{out} - V_{Ref})$	Sum of any offset drift including:		2	6	mV
V_{0t}	Longterm drift of V_0		1		mV
V_{0T}	Temperature drift von V_0 @ $T_A = -40 \dots +85^\circ C$		1		mV
V_{0H}	Hystereses of V_{out} @ $I_p=0$ (after an overload of $10 \times I_{PN}$)			1	mV
$\Delta V_0 / \Delta V_C$	Supply voltage rejection ratio			1	mV/V
V_{oss}	Offsetripple (with 1 MHz- filter first order)			22	mV
V_{oss}	Offsetripple (with 100 kHz- filter first order)		3	8	mV
V_{oss}	Offsetripple (with 20 kHz- filter first order)		0.6	1.5	mV
C_k	Maximum possible coupling capacity (primary – secondary)		5		pF
	Mechanical stress according to M3209/3			30g	
	Settings: 10 – 2000 Hz, 1 min/Octave, 2 hours				

Inspection (Measurement after temperature balance of the samples at room temperature)

$V_{out} (I_p=I_{PN})$	(V)	M3011/6:	Output voltage vs. reference ($I_p=3 \times 10As$, 40-80Hz)	625±0,7%	mV
$V_{out}-V_{Ref} (I_p=0)$	(V)	M3226:	Offset voltage	± 0.0025	V
V_d	(V)	M3014:	Test voltage, rms, 1 s pin 1 – 6 vs. pin 7 – 10	2.5	kV
V_e	(AQL 1/S4)		Partial discharge voltage acc.M3024 (RMS) with V_{vor} (RMS)	1500 1875	V V

Type Testing (Pin 1 - 6 to Pin 7 – 10)

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)	5	kV
V _e	Partial discharge voltage acc.M3024 (RMS)	1500	V
	with V _{vor} (RMS)	1875	V

Applicable documents

Current direction: A positive output current appears at point V_{out} , by primary current in direction of the arrow.

Further standards UL 508 ; file E317483, category NMTR2 / NMTR8

Enclosures according to IEC529: IP50.

Datum	Name	Index	Ämendment		
15.05.14	DJ	83	Inspection: M3011/6, Ip=50A, 40-80Hz ➔ Ip=3x10As, 40-80Hz. Typo changed, lapidary.		
23.04.13	KRe.	83	Applicable documents: further standards added. ÄA-665		
Hrsg.: KB-E editor		Bearb: DJ designer	KB-PM: KRe. check		freig.: HS released

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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 $I_P = 0,9 \cdot I_{PN}$ between a rectangular current and the output voltage $V_{out}(I_P)$

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

U_{PD} Rated discharge voltage (recurring peak voltage separated by the insulation) proved with a sinusoidal voltage V_e
 $U_{PD} = \sqrt{2} \cdot V_e / 1,5$

V_{vor} Defined voltage is the RMS valve of a sinusoidal voltage with peak value of $1,875 \cdot U_{PD}$ required for partial discharge test in IEC 61800-5-1
 $V_{vor} = 1,875 \cdot U_{PD} / \sqrt{2}$

V_{sys} System voltage RMS value of rated voltage according to IEC 61800-5-1

V_{work} Working voltage voltage according to IEC 61800-5-1 which occurs by design in a circuit or across insulation

V_0 : Offset voltage between V_{out} and the rated reference voltage of $V_{ref} = 2,5V$.
 $V_0 = V_{out}(0) - 2,5V$

V_{0H} : Zero variation of V_0 after overloading with a DC of tenfold the rated value

V_{0t} : Long term drift of V_0 after 100 temperature cycles in the range -40 bis 85 °C.

X : Permissible measurement error in the final inspection at RT, defined by

$$X = 100 \cdot \left| \frac{V_{out}(I_{PN}) - V_{out}(0)}{0,625V} - 1 \right| \%$$

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

$$X_{ges} = 100 \cdot \left| \frac{V_{out}(I_{PN}) - 2,5V}{0,625V} - 1 \right| \% \quad \text{or} \quad X_{ges} = 100 \cdot \left| \frac{V_{out}(I_{PN}) - V_{ref}}{0,625V} - 1 \right| \%$$

ϵ_L : Linearity fault defined by $\epsilon_L = 100 \cdot \left| \frac{I_P}{I_{PN}} - \frac{V_{out}(I_P) - V_{out}(0)}{V_{out}(I_{PN}) - V_{out}(0)} \right| \%$

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