

K-no.: 25156
15 A Current Sensor for 5V- Supply Voltage

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

Date: 22.02.2013
Customer: Standard type
Customers Part no.:
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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
- 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	15	A
V_{out}	Output voltage @ I_P	$V_{Ref} \pm (0.625 \cdot I_P / I_{PN})$	V
V_{out}	Output voltage @ $I_P=0$, $T_A=25^\circ\text{C}$	$V_{Ref} \pm 8$	mV
V_{Ref}	External Reference voltage range	0...4	V
	Internal Reference voltage	2.5 ± 0.005	V
K_N	Turns ratio	1...3 : 2000	

Accuracy – Dynamic performance data

		min.	typ.	max.	Unit
$I_{P,max}$	Max. measuring range	± 51			
X	Accuracy @ I_{PN} , $T_A = 25^\circ\text{C}$			0.7	%
ϵ_L	Linearity			0.1	%
$V_{out} - V_{Ref}$	Offset voltage @ $I_P=0$, $T_A = 25^\circ\text{C}$			± 2.21	mV
$\Delta V_o / V_{Ref} / \Delta T$	Temperature drift of V_{out} @ $I_P=0$, $V_{Ref}=2.5\text{V}$, $T_A = -40...85^\circ\text{C}$	2.3		20	ppm/ $^\circ\text{C}$
t_r	Response time @ 90% von I_{PN}		300		ns
$\Delta t (I_{P,max})$	Delay time at $di/dt = 100 \text{ A}/\mu\text{s}$		200		ns
f	Frequency bandwidth	DC...200			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		12		g
V_C	Supply voltage	4.75	5	5.25	V
I_C	Current consumption		15		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 3 b, Pollution degree 2

S_{clear}	Clearance (component without solder pad)	7.4			mm
S_{creep}	Creepage (component without solder pad)	8.0			mm
V_{sys}	System voltage	overvoltage category 3	RMS	300	V
V_{work}	Working voltage	(tabel 7 acc. to EN61800-5-1)			
		overvoltage category 2	RMS	350	V
U_{PD}	Rated discharge voltage	peak value		1037	V

Date	Name	Issue	Amendment
22.02.13	Le	82	Values for clearance and creepage changed from 7 → 7.4 and 7 → 8.0. Temperatur drift from 6 to 2.3. Offset-voltage $\pm 8 \rightarrow \pm 2.21$. Frequency bandwidth from 100 to 200 kHz. Marking with issue(increased). CN-572

Hrsg.: KB-E editor	Bearb.: Le. designer	KB-PM: KRe. check	freig.: HS released
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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		15mA + $I_p \cdot K_N + V_{out}/R_L$		mA
$I_{out,SC}$	Short circuit output current		±20		mA
R_P	Resistance / primary winding @ $T_A=25^\circ\text{C}$		1		mΩ
R_S	Secondary coil resistance @ $T_A=85^\circ\text{C}$			67	Ω
$R_{i,Ref}$	Internal resistance of Reference input		670		Ω
$R_{is}(V_{out})$	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
$\Delta X_{Ti} / \Delta T$	Temperature drift of X @ $T_A = -40 \dots +85^\circ\text{C}$			40	ppm/K
$\Delta V_0 = \Delta(V_{out} - V_{Ref})$	Sum of any offset drift including:		3.5	10	mV
V_{0t}	Longterm drift of V_0		2		mV
V_{0T}	Temperature drift von V_0 @ $T_A = -40 \dots +85^\circ\text{C}$		2		mV
V_{0H}	Hysteresis of V_{out} @ $I_p=0$ (after an overload of $10 \times I_{PN}$)		3	mV	
$\Delta V_0 / \Delta V_C$	Supply voltage rejection ratio			1	mV/V
V_{OSS}	Offsetripple (with 1 MHz- filter first order)			30	mV
V_{OSS}	Offsetripple (with 100 kHz- filter first order)		4	8	mV
V_{OSS}	Offsetripple (with 20 kHz- filter first order)		1.2	2	mV
C_k	Maximum possible coupling capacity (primary – secondary)		5	10	pF
	Mechanical stress according to M3209/3			30g	
	Settings: 10 – 2000 Hz, 1 min/Oktave, 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. external reference ($I_p=15A$, 40-80Hz)	625±0.7%	mV
$V_{out}-V_{Ref}(I_p=0)$	(V)	M3226:	Offset voltage	± 2.21	mV
V_d	(V)	M3014:	Test voltage, rms, 1 s pin 1 – 6 vs. pin 7 – 10	1.5	kV
V_e	(AQL 1/S4)		Partial discharge voltage acc.M3024 (RMS) with V_{vor} (RMS)	1100 1375	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)	6	kV
V_d		Testing voltage to M3014 (5 s)	3	kV
V_e		Partial discharge voltage acc.M3024 (RMS) with V_{vor} (RMS)	1100 1375	V V

Applicable documents

Current direction: A positive output current appears at point I_S , by primary current in direction of the arrow.
Housing and bobbin material UL-listed: Flammability class 94V-0.
Enclosures according to IEC529: IP50.

Datum	Name	Index	Amendment
22.02.13	Le	82	Date updated.
08.04.08	Le	81	"preliminary" and EN 60721 5K3 delete. AA-427

Hrsg.: KB-E editor	Bearb: Le designer	KB-PM: KRe. check	freig.: HS released
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Explanation of several 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 $di_P/dt \geq 100 \text{ A}/\mu\text{s}$.

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

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 value 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_{OH} : Zero variation of V_0 after overloading with a DC of tenfold the rated value

V_{ot} : 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 $\epsilon_L = 100 \cdot \left| \frac{I_P}{I_{PN}} - \frac{V_{out}(I_P) - V_{out}(0)}{V_{out}(I_{PN}) - V_{out}(0)} \right| \%$

This "Additional information" is no declaration of warranty according BGB §443.

Hrsg.: KB-E
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Bearb.: Le
designer

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check

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