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 rated current, r.m.s	50	A
$I_{\Delta N}$	Differential rated current, r.m.s	0.3	A
V_{out}	Output voltage @ $I_{\Delta N}$	V_{Ref} ± (0,74*$I_{\Delta P}/I_{\Delta N}$)	V
$V_{out}(0)$*)	Output voltage @ I_P=0, T_A=25°C	V_{Ref} ± 0.025	V
V_{out} (Error)	in case of error (current sensor) V_{out} < 0,5V is set	<0.5	V
V_{Ref}	Internal Reference voltage	2.5 ± 0.005	V
	External Reference voltage range	1.4 … 3.5	V
V_{Ref}(test current)**)	Reference voltage (external)	0…0.1	V
V_{out}(Teststrom)**)	Ausgangsspannung @ V_{Ref} = 0…0.1V	$V_{out}(0)$ + 0.250± 0.060	V
K_N	Turns ratio	(1) : 1: 1000	

*) With switching on and after “test current“ the current sensor is degaussed by an internal AC-current for about 110ms. Meantime the output is set to V_{out} < 0.5V.

**) Due to external V_{Ref} = 0…0.1V an internal test current is generated.

Accuracy – Dynamic performance data

		min.	typ.	max.	Unit
$I_{\Delta P,max}$	Max. measuring range (differencial current)	±0.85			
X	Accuracy @ $I_{\Delta N}$, T_A= 25°C			1.5	%
ε_L	Linearity			1	%
V_{out} - V_{Ref}	Offset voltage @ I_P=0, T_A= 25°C			±25	mV
$\Delta V_o / \Delta T$	Temperature drift of V_{out} @ I_P=0, T_A= -40…85°C		0.1		mV/°C
t_r	Response time @ 90% von $I_{\Delta N}$		35		µs
f	Frequency bandwidth	DC…10			kHz

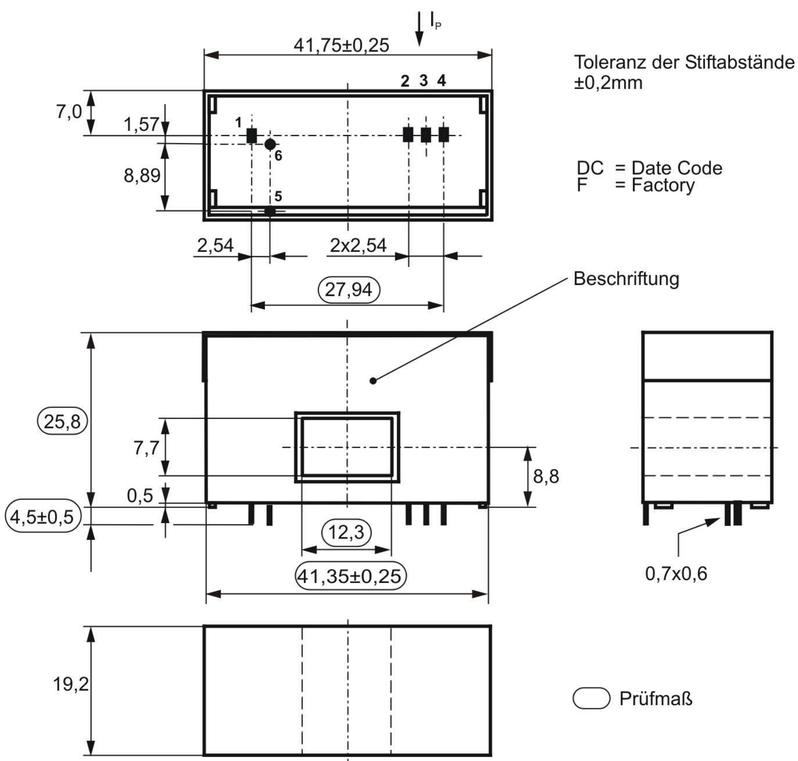
General data

		min.	typ.	max.	Unit
T_A	Ambient operating temperature	-40		+85	°C
T_S	Ambient storage temperature	-40		+85	°C
m	Mass		42		g
V_C	Supply voltage	4.75	5	5.25	V
I_C	Current consumption		16		mA

Mechanical outline (mm): General tolerances DIN ISO 2768-c

Connections:

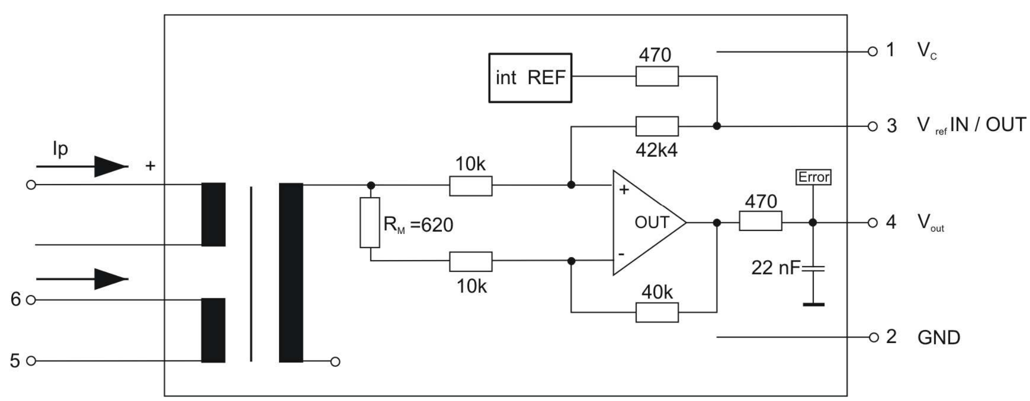
1...4: 0,6*0,7 mm
5…6: 0,8 mm



Marking:

4646-X956
F DC

Schematic diagram



Applicable documents:

Current direction: A positive output current appears at point V_{out}, by primary current in direction of the arrow.
Housing and bobbin material UL-listed: Flammability class 94V-0.
Enclosures according to IEC529: IP50.
Short clearance and creepage distances due to metallic shielding.
Temperature of the primary conductor should not exceed 100°C.
To avoid shortcuts between Pin 6 and shielding make sure a minimum distance of 1mm between current sensor and pc-board

Electrical Data

		min.	typ.	max.	Unit
V_{Ctot}	Maximum supply voltage (without function)			6	V
I_C	Supply Current with primary current		$16mA + I_p * K_N + V_{out}/R_L$		mA
$I_{out,SC}$	Short circuit output current		±20		mA
$R_{P1,P2}$	Primary resistance @ T_A=25°C		0.17		mΩ
R_{P3}	Primary resistance @ T_A=25°C		1.14		mΩ
R_S	Secondary coil resistance @ T_A=85°C			80	Ω
$R_{i,Ref}$	Internal resistance of Reference input		470		Ω
$R_i,(V_{out})$	Output resistance of V_{out}		470		Ω
R_L	External recommended resistance of V_{out}		100		kΩ
C_L	External recommended capacitance of V_{out}		no limit		pF
$\Delta X_{Ti} / \Delta T$	Temperature drift of X @ T_A = -40 ... +85 °C			400	ppm/K
$\Delta V_{Ref} / \Delta T$	Temperature drift of V_{Ref} @ T_A = -40 ... +85 °C		5	50	ppm/K
$\Delta V_0 = \Delta(V_{out} - V_{Ref})$	Sum of any offset drift including:		16	25	mV
V_{0t}	Longtermdrift of V_0		12		mV
V_{0T}	Temperature drift von V_0 @ T_A = -40 ...+85°C		10		mV
$\Delta V_0/\Delta V_C$	Supply voltage rejection ratio		7.5	1	mV/V
V_{0H}	Hystereses of V_{out} @ I_P=0 (after an overload of 1000 x I_{PN})		75	175	mV
$V_{0H, Demag}$	Hystereses after Degaussing			12	mV
v_{oss}	Offsetripple (without external filter)			120	mV
v_{oss}	Offsetripple (with 20 kHz- filter firdt order)		35	50	mV
v_{oss}	Offsetripple (with 1.6 kHz- filter first order)		10	15	mV
	Mechanical stress according to M3209/3 Settings: 10 – 2000 Hz, 1 min/Octave, 2 hours			3g	

Inspection (Measurement after temperature balance of the samples at room temperature, SC = significant characteristic, V = 100% test, AQL 1/S4 = accepted quality level)

$V_{out} - V_{Ref}$ ($I_{\Delta P}$) (V)	M3011/6:	Output voltage vs. reference ($I_{\Delta P}$=0.4A, 40-80Hz)	0.972 … 1.002	V (SC)
$V_{out} - V_{Ref}$ (I_P=0) (V)	M3226:	Offset voltage	± 0.025	V
V_{out}(test current) (V)		Output voltage @ V_{Ref} = 0V	0.250± 0.060	V

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 $I_{\Delta P} = 0{,}9 \cdot I_{\Delta N}$ between a rectangular current and the output voltage V_{OUt} ($I_{\Delta p}$)

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

U_{PD} Rated discharge voltage (recurring peak voltage separated by the insulation) proved with a sinusoidal voltage V_e

$U_{PD} = \sqrt{2} * V_e / 1{,}5$

V_{vor} Defined voltage is the RMS valve of a sinusoidal voltage with peak value of 1,875 * U_{PD} required for partial discharge test in IEC 61800-5-1

$V_{vor} = 1{,}875 * U_{PD} / \sqrt{2}$

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.
$V_o = V_{out}(0) - 2{,}5V$

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

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

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

$$X = 100 \cdot \left| \frac{V_{out}(I_{\Delta N}) - V_{out}(0)}{0{,}74V} - 1 \right| \%$$

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

$$X_{ges} = 100 \cdot \left| \frac{V_{out}(I_{\Delta N}) - 2{,}5V}{0{,}74V} - 1 \right| \% \quad \text{or} \quad X_{ges} = 100 \cdot \left| \frac{V_{out}(I_{\Delta N}) - V_{ref}}{0{,}74V} - 1 \right| \%$$

ε_L: Linearity fault defined by $\varepsilon_L = 100 \cdot \left| \frac{I_{\Delta P}}{I_{\Delta N}} - \frac{V_{out}(I_{\Delta P}) - V_{out}(0)}{V_{out}(I_{\Delta N}) - V_{out}(0)} \right| \%$

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