CSN Series MR Current Sensor

Technical information

Supply voltage is +5 V and temperature is 25 °C unless otherwise stated

Electrical

Nominal current (In)		25 A.t rms	
Measuring range		0 to ± 56 A.t [1]	
Measuring resistance [2]		Rm min.	Rm max.
with +5 V	@ ± 25 A.t rms	0 Ohm	80 Ohm
	@ ± 40 A.t rms	0 Ohm	31 Ohm
Nominal analogue output current		12.5 mA rms	
Turns ratio		1-2-3/2000	
Accuracy [3] @ 25 °C		max. ± 0.24 % @ In	
@ -40 °C to 85 °C		max. ± 0.32 % @ In	
Supply voltage		+5 Vdc (± 5 %)	
Internal reference voltage		+2.5 Vdc (± 10 mV)	
Galvanic isolation		5.0 kV rms/50 Hz/1 minute	

Accuracy - dynamic performance

Zero offset current at 25 °C	< ± 30 uA *(= 0.24 % of 25 A)*
Thermal drift of offset current 10 °C to 50 °C	< ± 5 uA *(= 0.04 % of 25 A)*
Thermal drift of offset current -40 °C to 85 °C	< ± 10 uA *(= 0.08 % of 25 A)*
Linearity	< ± 0.1 %
Response time @ 90 % of pulse amplitude	< 200 ns
di/dt accurately followed	> 100 A/us
Bandwidth (-1 dB)	dc to 200 kHz

General data

Operating temperature	-40 °C to 85 °C
Storage temperature	-40 °C to 90 °C
Current consumption	12 mA (+5 V) plus output current
Secondary internal resistance (@ 70 °C)	50 Ohm
Positive primary current	In direction of arrow
Sensor housing	Glass-filled Polyamide (UL94-V0)
Approvals	EN 50082-2, EN 50081-2, UL, CE
Rated insulation voltage (RIV)/Insulation classification	400 V reinforced
Dimensions [L x W x H] (mm)	34 x 12,6 x 25,5
Construction	Fully encapsulated
Environment	Pollution degree 2, Category III
Fastening	PCB mounted sensor
Weight	20 g
Connection to primary	Via 6 x 0,8 mm square pins
Connection to secondary	Via 5 x 0,64 mm square pins

Notes

[1] ac peak. Maximum dc or ac rms range is 40 A.t.

[2] Higher resistance (Rm) values can be used with reduced measuring range. Specified values conditional on 70 °C ambient and no power supply tolerance.

[3] Excludes the effects of tolerances of reference voltage and external load resistance.

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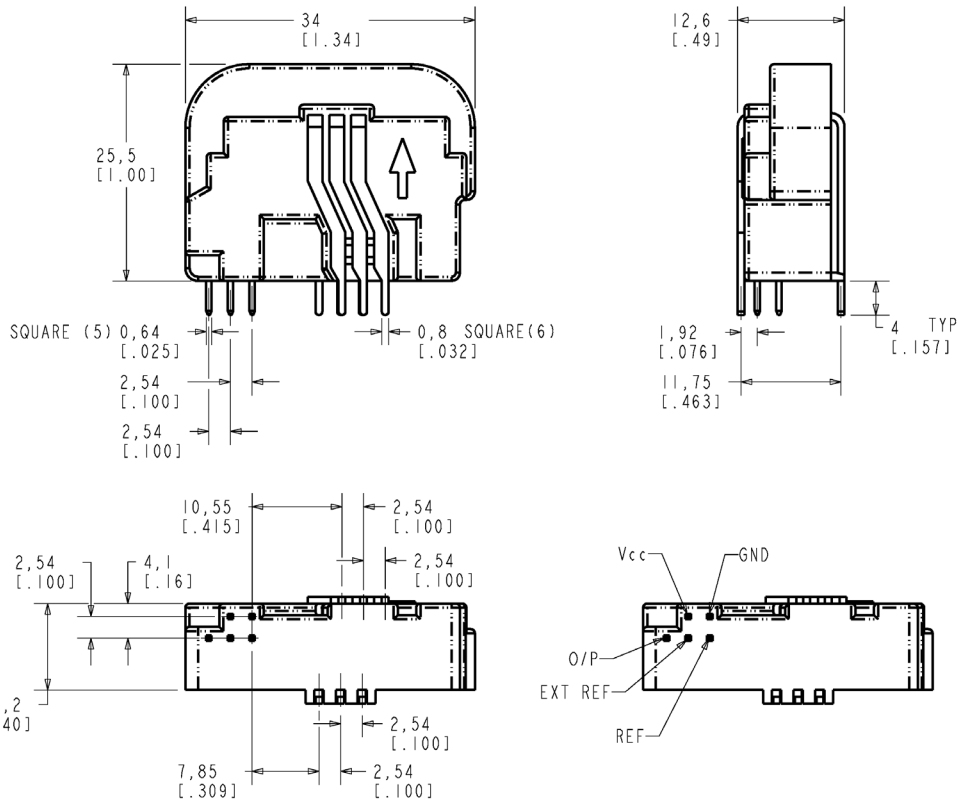
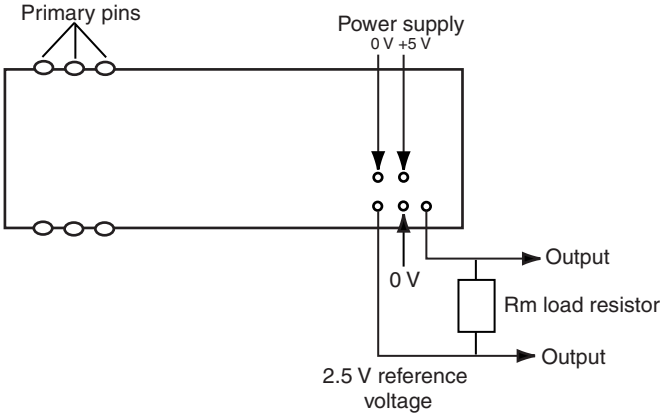
Mounting drawing in mm and [inches]

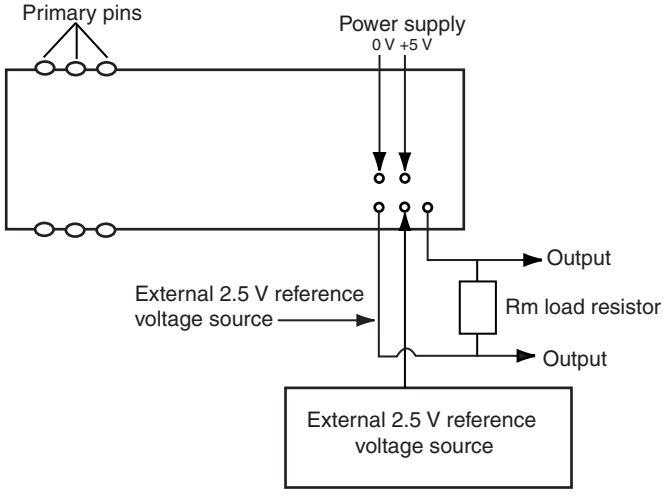


Electrical wiring diagram

Internal voltage reference mode



External voltage reference mode



Order guide

Description	Listing
25 A MR current sensor	CSNX25

Performance Parameter Definition

Nominal Current

The maximum virtual value current can be measured in full temperature range. It was defined as A*Ts (ampere*turns) due to primary ampere effective was multiplied by primary turns and output current is proportional to ampere*turns measured.

The current sensor is sensitive to the primary current linkage With Np: the number of primary turns (1 to 3 depending upon the connection of the primary jumpers).

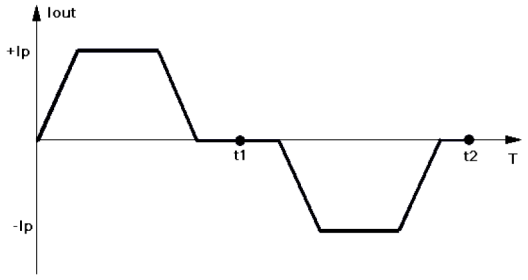
Measuring Range

The maximum peak current can be measured in full temperature range, but not continually.

Offset Current

The offset current can either be measured when the magnetic core of the transducer are:

- Completely demagnetized, and measure offset directly
- In known Magnetization state caused by a cycle current as below:



Using the current cycle as shown above, the offset was calculated as:

$I_{offset} = (I_1 + I_2) / 2$
I_1 = Output current at t1
I_2 = Output current at t2

Residual current

Due to hysteresis of magnetic material used, the residual current I_M is the consequence of a current on the primary side and appears as an additional error of offset current. Using the current cycle same as above offset definition, the residual current can be calculated as:

$I_{OM} = (I_1 - I_2) / 2$
I_1 = Output current at t1
I_2 = Output current at t2

NOTE: I_{OM} depends on the current value I_P.

Thermal Drift

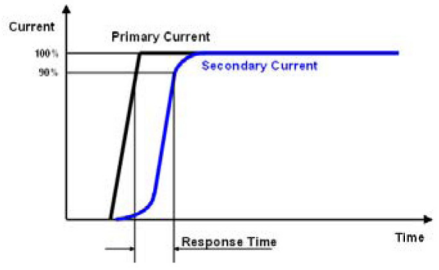
The thermal drift of the offset current is the variation of the offset from 25 °C to the considered temperature:

$I_{OT} = I_T - I_0$
I_T = Output current at temperature T without primary current
I_0 = Output current at temperature 25 °C without primary current

NOTE: all data are exclude residual current, the current sensor has to be demagnetized prior to the application of the current cycle (for example with a demagnetization tunnel).

Response Time

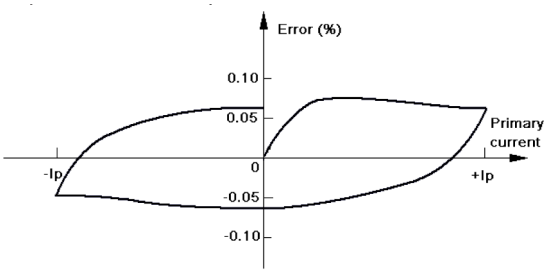
The response time t_r is shown in the figure below. Response time is related with both product performance and primary current di/dt. So, they are measured at nominal ampere-turns and maximum di/dt.



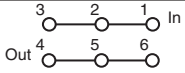
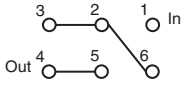
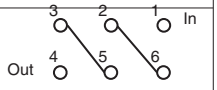
Linearity

Increasing the primary current (DC) from 0 to Ip, then decreasing to 0; and then increasing to -Ip and back to 0, the step of increasing/decreasing is 10 % of Ip.

The linerity error ε_L was defined as the maximum difference between whether positive or negative measured points and the linear regression line, and expressed in % of Ip.



Primary pin connections (3 turns)

Primary turns	Primary Current		Nominal output (mA)	Primary pin connection
	Nom Ipn (A)	Max Ip (A)		
1	25	56	12.5	
2	12	27	12	
3	8	18	12	

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