

Ultra-stable, high precision (ppm class) fluxgate technology DS Series current transducer for non-intrusive, isolated DC and AC current measurement up to 1000A



Features

- Linearity error maximum 1 ppm
- Fluxgate, closed loop compensated technology with fixed excitation frequency and second harmonic zero flux detection for best in class accuracy and stability
- Industry standard DSUB 9 pin connection
- Green diode for normal operation indication
- Full aluminum body for superior EMI shielding and extended operating temperature range
- Large aperture $\phi 28.1\text{mm}$ for cables and bus bars

Applications:

- MPS for particles accelerators
- Gradient amplifiers for MRI devices
- Stable power supplies
- Precision drives
- Batteries testing and evaluation systems
- Power measurement and power analysis
- Current calibration purposes

Specification highlights	Symbol	Unit	Min	Typ	Max
Nominal primary AC current	I_{PN} AC	Arms			600
Nominal primary DC current	I_{PN} DC	A	-900		900
Measuring range	\hat{I}_{PM}	A	-1000		1000
Primary / secondary ratio	$n1 : n2$		1:1500		1:1500
Linearity error	ϵ_L	ppm	-1		1
Offset current (including earth field)	I_{OE}	ppm	-10		10
DC-10Hz Overall accuracy @25°C (= $\epsilon_L + I_{OE}$)	acc ϵ	ppm	-11		11
AC Maximum gain error 10Hz to 5kHz	ϵ_G	%			± 0.01
Operating temperature range	T_a	°C	-40		85
Power supply voltages	U_c	V	± 14.25		± 15.75

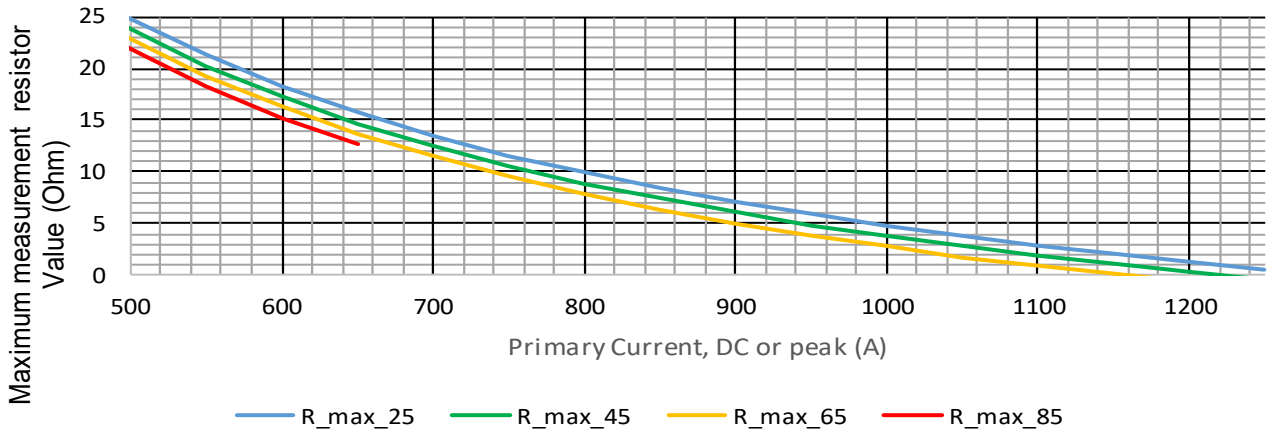
All ppm (or %) values refer to nominal current

Electrical specifications at Ta=23°C, supply voltage = ± 15V unless otherwise stated

Parameter	Symbol	Unit	Min	Typ.	Max	Comment
Nominal primary AC current	$I_{PN AC}$	A _{rms}			600	Refer to fig. 1 & 2 for derating
Nominal primary DC current	$I_{PN DC}$	A	-900		900	Refer to fig. 1 for derating
Measuring range	I_{PM}	A	-1000		1000	Refer to fig. 1 & 2 for derating
Overload capacity	\hat{I}_{OL}	A			4500	Non-measured, 100ms
Nominal secondary current	I_{SN}	mA	-600		600	At nominal primary DC current
Primary / secondary ratio			1:1500		1:1500	
Measuring resistance	R_M	Ω	0		3	Refer to fig. 1 for details
Linearity error	ϵ_L	ppm μA	-1 -0.6		1 0.6	ppm refers to nominal current μA refers to secondary current
Offset current (including earth field)	I_{OE}	ppm μA	-12 -7.2		12 7.2	ppm refers to nominal current μA refers to secondary current
DC-10Hz Overall accuracy @25°C (= $\epsilon_L + I_{OE}$)	acc ϵ	ppm	-13		13	ppm refers to nominal DC current
Offset temperature coefficient	$T_{C_{IOE}}$	ppm/K $\mu A/K$	-0.1 -0.06		0.1 0.06	ppm refers to nominal current μA refers to secondary current
Bandwidth	$f(-3dB)$	kHz	500			Small signal, graphs figure 3
Amplitude error	ϵ_G	%			10Hz - 2kHz	0.01%
					2kHz - 10kHz	0.20%
					10kHz - 100kHz	2.50%
Phase shift	θ	°			10Hz - 2kHz	0.03°
					2kHz - 10kHz	0.04°
					10kHz - 100kHz	1.0°
Response time to a step current I_{PN}	$t_r @ 90\%$	μs		1		$di/dt = 100A/\mu s$
Noise	noise	ppm rms			0 - 100Hz	0.01
					0 - 1kHz	0.02
					0 - 10kHz	0.20
					0 - 100kHz	0.70
Fluxgate excitation frequency	f_{Exc}	kHz		31.25		
Induced rms voltage on primary conductor		μV rms			5	
Power supply voltages	U_c	V	±14.25		±15.75	
Positive current consumption	I_{ps}	mA	94	100	105	Add I_s (if I_s is positive)
Negative current consumption	I_{ns}	mA	87	92	98	Add I_s (if I_s is negative)
Operating temperature range	T_a	°C	-40		85	
Stability						
Offset stability over time		ppm/month $\mu A/month$	-0.1 -0.06		0.1 0.06	ppm refers to nominal current μA refers to secondary current
Offset change with vertical external magnetic field		$\mu A / mT$		0.2	0.8	(perpendicular to bus bar) μA refers to secondary current
Offset change with horizontal external magnetic field		$\mu A / mT$		0.8	2	(parallel to bus bar) μA refers to secondary current
Offset change with power supply voltage changes		$\mu A / V$		0.004	0.04	μA refers to secondary current
Offset change with absolute power supply voltages tracking		$\mu A / V$		0.012	0.04	μA refers to secondary current

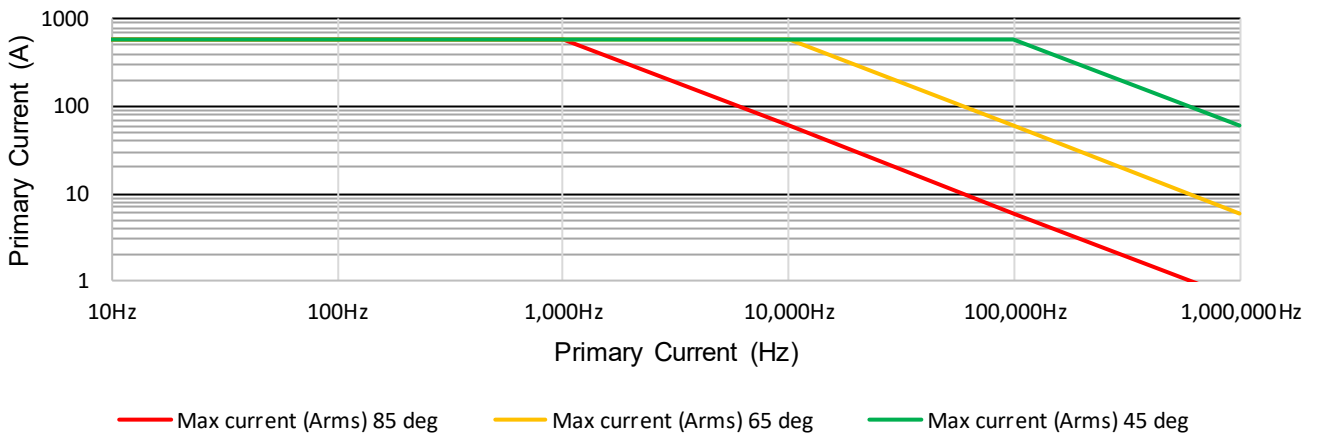
Measurement resistor R_M and ambient temperature derating (Fig. 1)

Maximum measurement resistor vs. ambient temperatures



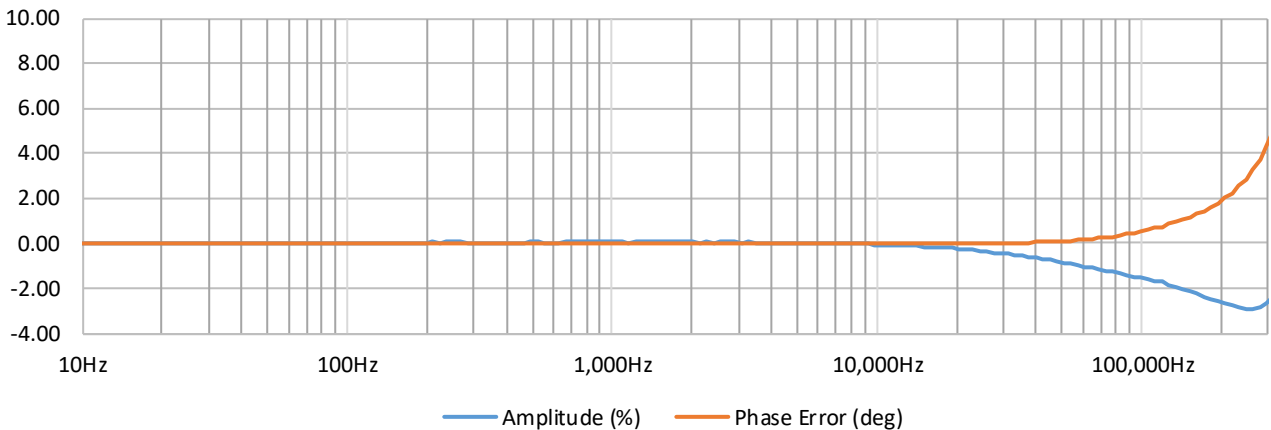
Frequency and ambient temperature derating (Fig. 2)

Maximum primary current A_{rms}



Frequency characteristics (Fig. 3)

Amplitude / Phase



Isolation specifications

Parameter	Unit	Value
Clearance	mm	9
Creepage distance	mm	10
Comparative tracking index (CTI)	V	> 600
Rms voltage for AC isolation test, 50/60 Hz, 1 min - Between primary and (secondary and shield) - Between secondary and shield	kV	5.7 0.2
Impulse withstand voltage (1.2/50µs)	kV	10.4
Rated rms isolation voltage reinforced isolation, overvoltage category III, Pollution degree 2 according to - IEC 61010-1 - EN50780	V	300 600

Absolute maximum ratings

Parameter	Unit	Max	Comment
Primary	kA	4.5	Maximum 100ms
Power supply	V	±16.5	

Environmental and mechanical characteristics

Parameter	Unit	Min	Typ	Max	Comment
Ambient operating temperature range	°C	-40		85	
Storage temperature range	°C	-40		85	
Relative humidity	%	20		80	Non-condensing
Mass	kg		0.6		
Connections	Power supplies: D-SUB 9 pins male				
Standards	EN 61326-1 EMC EN 61010-1:2010 Safety				

Advanced Sensor Protection Circuits “ASPC”

Developed to protect the current transducer from typical fault conditions:

- Unit is un-powered and secondary circuit is open or closed
- Unit is powered and secondary circuit is open or interrupted

Both DC and AC primary current up to 100% of nominal value can be applied to the current transducers in the above situations without damage to the electronics.

Please notice that the sensor core can be magnetized in all above cases, leading to a small change in output offset current (less than 10ppm)

Status pins

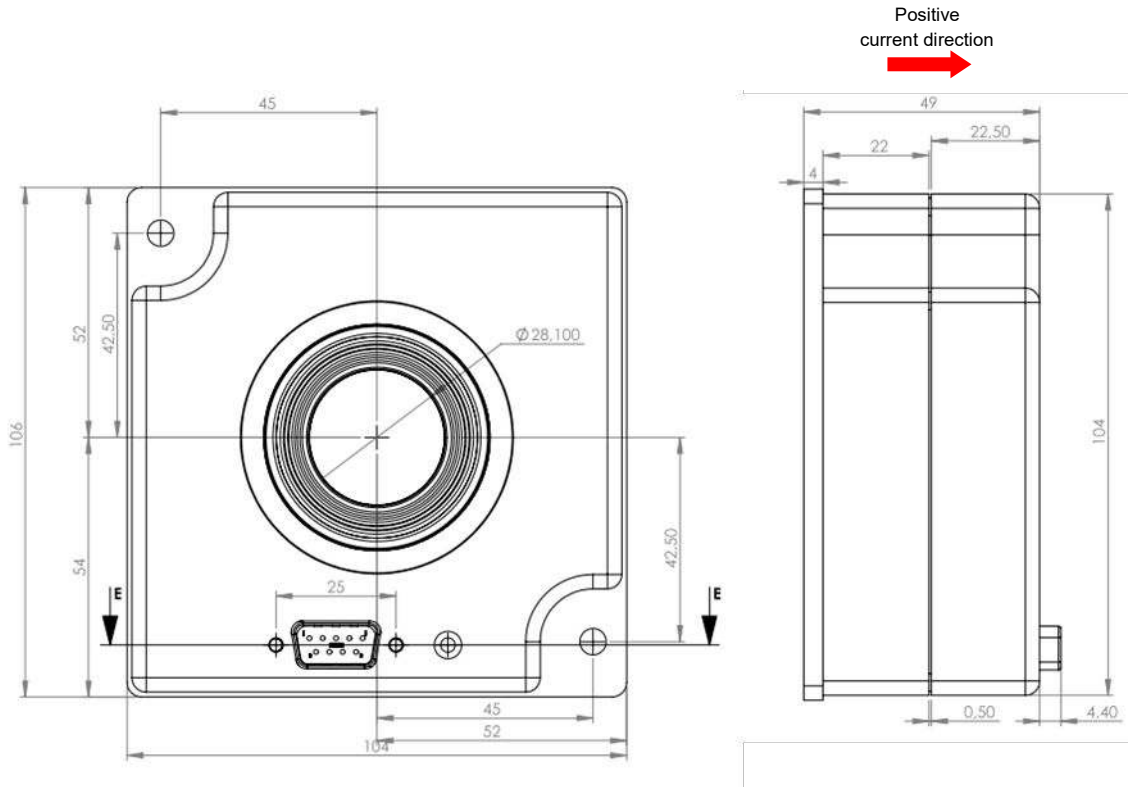
When transducer is operating in normal condition, the status pins (3 and 8) are shorted.

- Status pins properties:
- forward direction pin 8 to pin 3, maximum forward current 10mA
 - maximum forward voltage 60V, maximum reverse voltage 5V

Accessories

- 4-channel power supplies unit for connection up to 4xDCCT : DSSIU-4
- 6-channel power supplies unit for connection up to 6xDCCT : DSSIU-6
- Transducer cables in 5 lengths (2m - 5m - 10m - 15m - 20m): DSUB2 - DSUB5 - DSUB10 - DSUB15 - DSUB20
- Transducer cable 3m for connection to end-user's power supply:
Transducer cable for lab PS (with access to current output via Ø4 banana jacks)

Please visit Danisense homepage for relevant datasheets



(general tolerance 0.3mm unless otherwise stated)

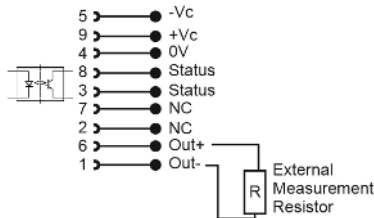
DSUB pin layout

Standard DSUB-9 current output



When sensor is operating in normal condition the status pins are shorted.

- Status pin properties.
- Forward direction pin 8 to pin 3
 - Maximum forward current 10mA
 - Maximum forward voltage 60V
 - Maximum reverse voltage 5V



Positive current direction

Is identified by an arrow on the transducer body

Mounting instructions

- Back side panel mounting

2 holes Ø5.5

2 x M5 steel screws / 6N.m

To check torque value

Declaration of Conformity

Danisense A/S
Malervej 10
DK-2630 Taastrup
Denmark

Declares that under our sole responsibility that this product is in conformity with the provisions of the following EC Directives, including all amendments, and with national legislation implementing these directives:

Directive 2014/30/EU

Directive 2014/35/EU

And that the following harmonized standards have been applied

EN 61010-1 (Third Edition):2010, EN 61010-1:2010/A1:2019

EN 61010-2-030:2021/A11:2021

EN 61326-1:2013

All DANISENSE products are manufactured in accordance with RoHS directive 2011/65/EU. Annex II of the RoHS directive was amended by directive 2015/863 in force since 2015, expanding the list of 6 restricted substances (Lead, Hexavalent Chromium, PBB, PBDE and Cadmium)

Danisense follows the provision in EN 63000:2018

Place

Taastrup, Denmark



Henrik Elbæk

Date

2022-03-15