

Ultra-stable, high precision (ppm class) fluxgate technology DS Series current transducer for non-intrusive, isolated DC and AC current measurement up to 3000A



Features

- 1 ppm linearity
- 6 ppm offset
- Current output
- 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 $\phi 68\text{mm}$ 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			2000
Nominal primary DC current	$I_{PN DC}$	A	-3000		3000
Measuring range	\hat{I}_{PM}	A	-3000		3000
Primary / secondary ratio	$n1 : n2$		1:1500		1:1500
Linearity error	ϵ_L	ppm	-1		1
Offset current (including earth field)	I_{OE}	ppm	-6		6
DC-10Hz Overall accuracy @25°C (= $\epsilon_L + I_{OE}$)	acc ϵ	ppm	-7		7
AC Maximum gain error 10Hz to 2kHz	ϵ_G	%			± 0.01
Operating temperature range	T_a	°C	-40		65
Power supply voltages	U_c	V	± 14.25		± 15.75

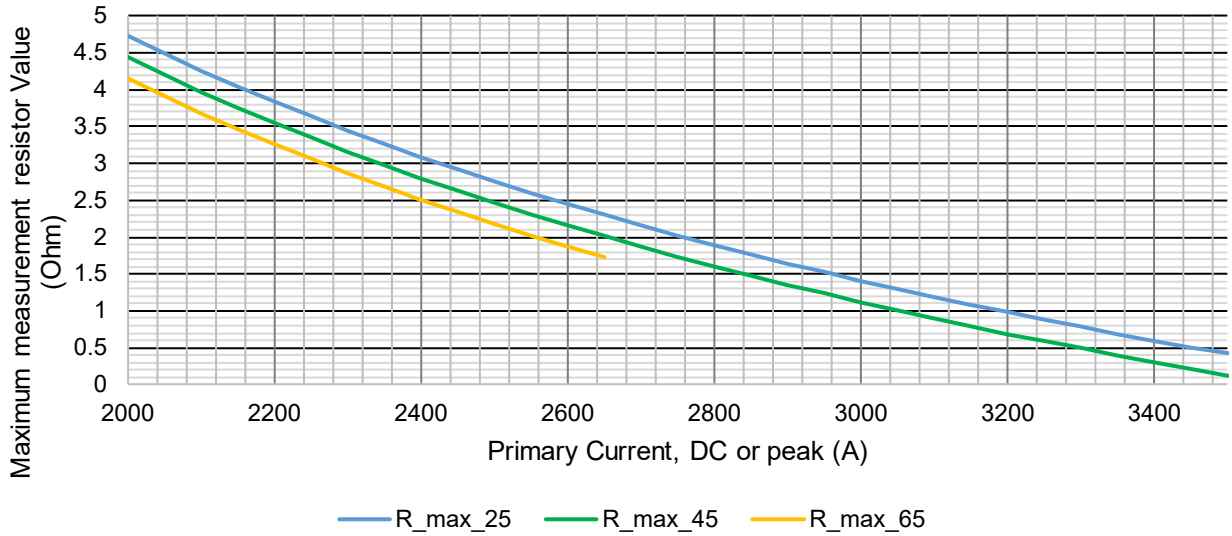
All ppm (or %) values refer to nominal current

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

Parameter	Symbol	Unit	Min	Typ.	Max	Comment	
Nominal primary AC current	$I_{PN AC}$	Arms			2000	Refer to fig. 1 & 2 for derating	
Nominal primary DC current	$I_{PN DC}$	A	-3000		3000	Refer to fig. 1 for derating	
Measuring range	I_{PM}	A	-3000		3000	Refer to fig. 1 & 2 for derating	
Overload capacity	\hat{I}_{OL}	kA			10	Non-measured, 100ms	
Nominal secondary current	I_{SN}	mA	-2000		2000	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	-1		1	ppm refers to nominal current	
		μA	-2		2	μA refers to secondary current	
Offset current	I_{OE}	ppm	-6		6	ppm refers to nominal current	
		μA	-12		12	μA refers to secondary current	
DC-10Hz Overall accuracy @25°C (= $\epsilon_L + I_{OE}$)	acc_E	ppm	-7		7	ppm refers to nominal DC current	
Offset temperature coefficient	TC_{IOE}	ppm/K	-0.1		0.1	ppm refers to nominal current	
		$\mu A/K$	-0.2		0.2	μA refers to secondary current	
Bandwidth	$f(-3dB)$	kHz	300			Small signal, graphs figure 3	
Amplitude error	ϵ_G	10Hz - 2kHz			0.01%	% refers to nominal current	
		2kHz - 10kHz			1.50%		
		10kHz - 100kHz			3.00%		
Phase shift	θ	10Hz - 2kHz			0.04°		
		2kHz - 10kHz			0.5°		
		10kHz - 100kHz			3°		
Response time to a step current I_{PN}	$tr @ 90\%$	μs		1		$di/dt = 100A/\mu s$	
Noise	noise	ppm rms			0 - 100Hz	0.02	Measured on secondary current
					0 - 1kHz	0.10	
					0 - 10kHz	1.20	
					0 - 100kHz	3.50	
Fluxgate excitation frequency	f_{Exc}	kHz		15.63			
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	160	170	185	Add I_s (if I_s is positive)	
Negative current consumption	I_{ns}	mA	150	160	170	Add I_s (if I_s is negative)	
Operating temperature range	T_a	°C	-40		65		
Stability							
Offset stability over time		ppm/month $\mu A/month$	-0.1		0.1	ppm refers to nominal current	
			-0.2		0.2	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	

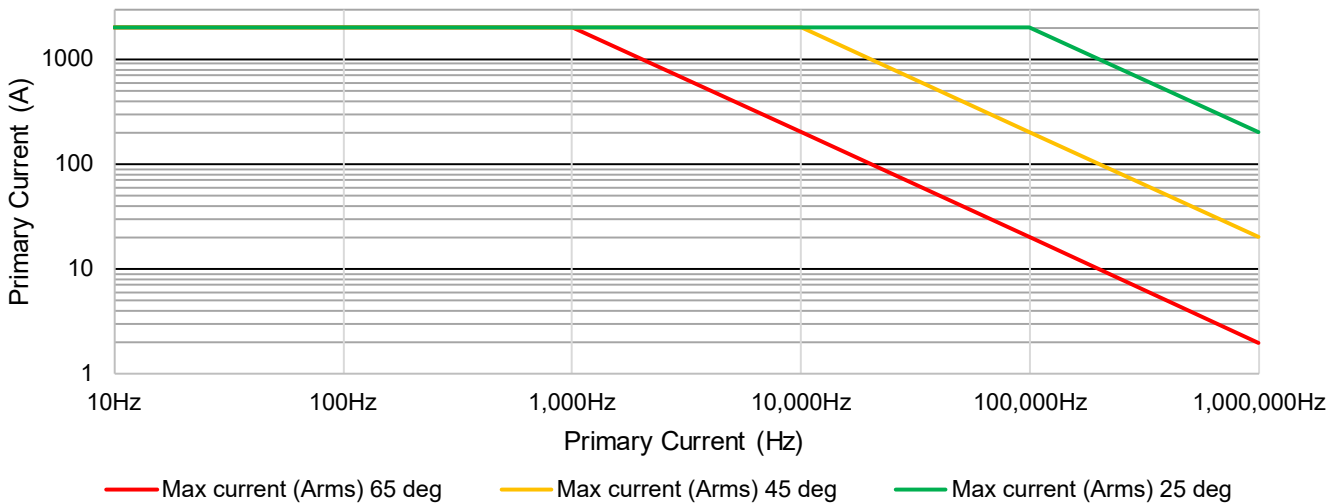
Measurement resistor R_M and ambient temperature derating (Fig. 1)

Maximum measurement resistor vs. ambient temperatures



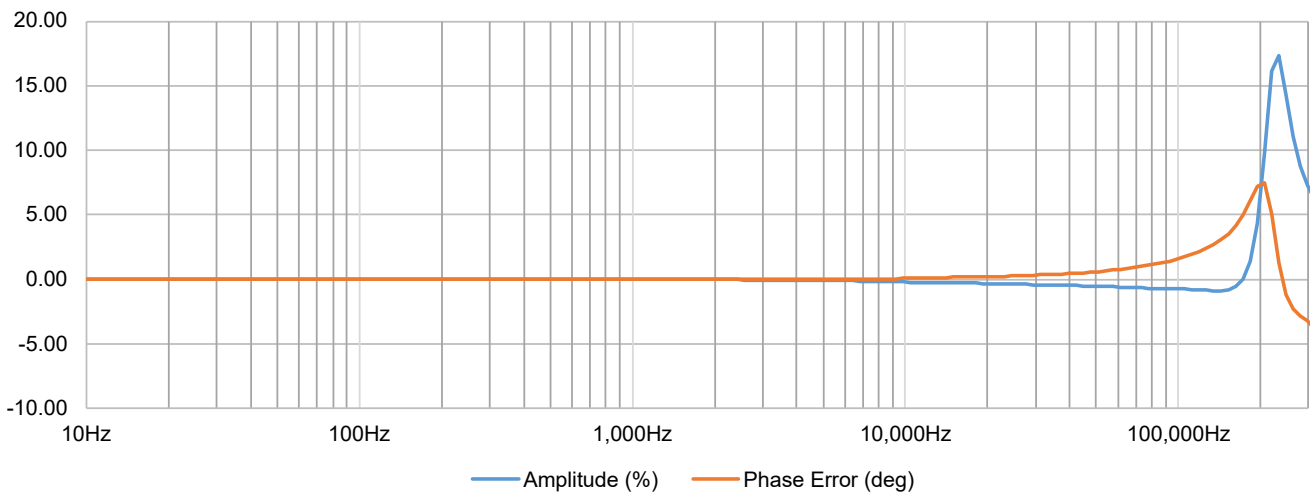
Frequency and ambient temperature derating (Fig. 2)

Maximum primary current A_{rms}



Frequency characteristics (Fig. 3)

Amplitude / Phase



Isolation specifications

Parameter	Unit	Value
Clearance	mm	22
Creepage distance	mm	22
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	14.4 0.2
Impulse withstand voltage (1.2/50µs)	kV	26.3
Rated rms isolation voltage reinforced isolation, overvoltage category III, Pollution degree 2 according to - IEC 61010-1 - EN50780	V	1500 1500

Absolute maximum ratings

Parameter	Unit	Max	Comment
Primary	kA	10	Maximum 100ms
Power supply	V	±16.5	

Environmental and mechanical characteristics

Parameter	Unit	Min	Typ	Max	Comment
Ambient operating temperature range	°C	-40		65	
Storage temperature range	°C	-40		65	
Relative humidity	%	20		80	Non-condensing
Mass	kg		6.5		
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

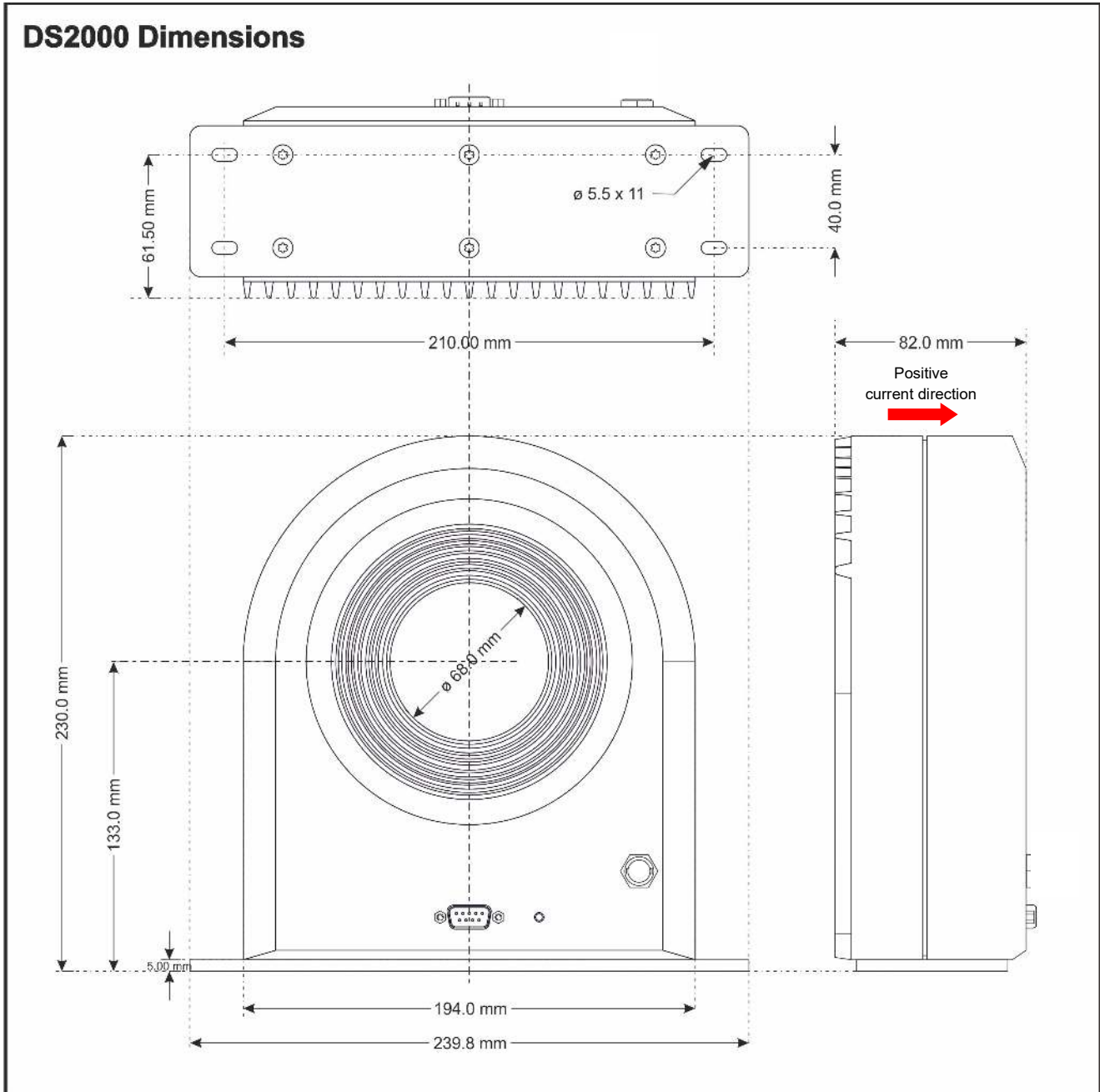
When transducer is operating in normal condition, the status pins (3 and 8) are shorted.

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

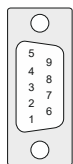
Accessories

- 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

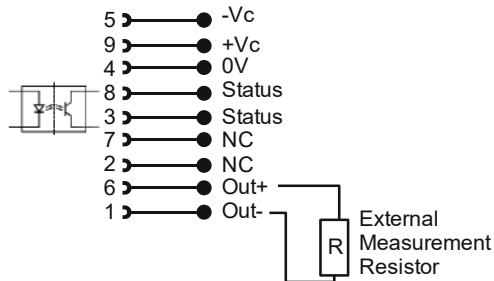


Standard DSUB-9 current output



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

- Base plate mounting 4 holes Ø5.5 x 11
4 x M5 steel screws / 6N.m
- Bottom direct mounting 6 holes Ø4.2 x 7
(after unscrewing the base plate) 6 x M4 steel screw / 4N.m

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