DS50ID

Ultra-stable, high precision (ppm class) fluxgate technology DS Series current transducer for non-intrusive, isolated DC and AC current measurement up to 150A



Features

- Linearity error maximum 8 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 ϕ27.6mm 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

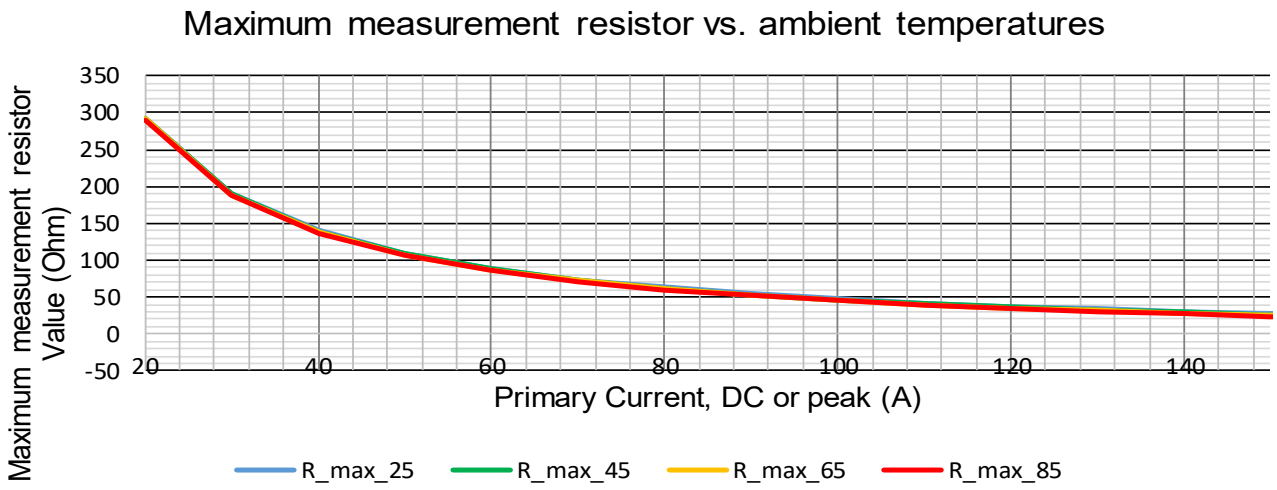
Specification highlights	Symbol	Unit	Min	Typ	Max
Nominal primary AC current	I_{PN} AC	Arms			50
Nominal primary DC current	I_{PN} DC	A	-75		75
Measuring range	$\hat{I}_{PM}$	A	-150		150
Primary / secondary ratio	n1 : n2		1:500		1:500
Linearity error	ε_L	ppm	-8		8
Offset current (including earth field)	I_{OE}	ppm	-80		80
DC-10Hz Overall accuracy @25°C (= $\varepsilon_L + I_{OE}$)	accε	ppm	-88		88
AC Maximum gain error 10Hz to 5kHz	ε_G	%			±0.01
Operating temperature range	Ta	°C	-40		85
Power supply voltages	Uc	V	±14.25		±15.75

All ppm (or %) values refer to nominal current

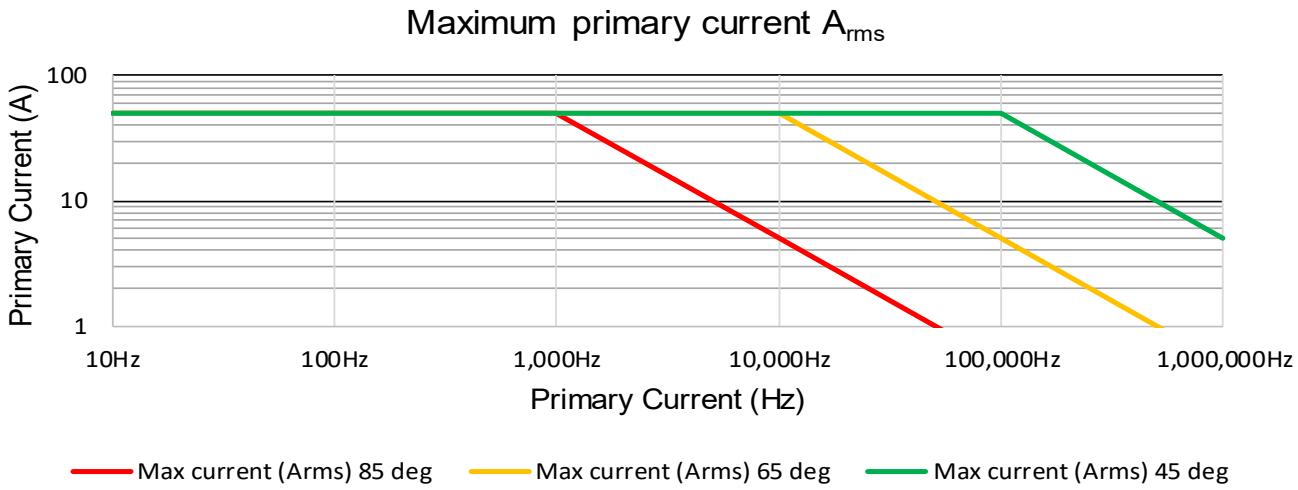
Electrical specifications at Ta=23°C, supply voltage = ± 15V unless otherwise stated

Parameter	Symbol	Unit	Min	Typ.	Max	Comment
Nominal primary AC current	I_{PN} AC	Arms			50	Refer to fig. 1 & 2 for derating
Nominal primary DC current	I_{PN} DC	A	-75		75	Refer to fig. 1 for derating
Measuring range	I_{PM}	A	-150		150	Refer to fig. 1 & 2 for derating
Overload capacity	$\hat{I}_{OL}$	A			1500	Non-measured, 100ms
Nominal secondary current	I_{SN}	mA	-150		150	At nominal primary DC current
Primary / secondary ratio			1:500		1:500	
Measuring resistance	R_M	Ω	0		12	Refer to fig. 1 for details
Linearity error	ε_L	ppm µA	-8 -1.2		8 1.2	ppm refers to nominal current µA refers to secondary current
Offset current (including earth field)	I_{OE}	ppm µA	-80 -12		80 12	ppm refers to nominal current µA refers to secondary current
DC-10Hz Overall accuracy @25°C (= ε_L + I_{OE})	acc_ε	ppm	-88		88	ppm refers to nominal DC current
Offset temperature coefficient	TC_{IOE}	ppm/K µA/K	-0.4 -0.06		0.4 0.06	ppm refers to nominal current µA refers to secondary current
Bandwidth	f(-3dB)	kHz	1000			Small signal, graphs figure 3
Amplitude error 10Hz –5kHz 5kHz -100kHz 100kHz - 1000kHz	ε_G	%			0.01% 1.00% 20.00%	% refers to nominal current
Phase shift 10Hz –5kHz 5kHz -100kHz 100kHz - 1000kHz	θ	°			0.1° 0.5° 5.0°	
Response time to a step current I_{PN}	tr @ 90%	µs		1		di/dt = 100A/µs
Noise 0 - 100Hz 0 - 1kHz 0 - 10kHz 0 - 100kHz	noise	ppm rms			0.08 0.16 1.60 6.00	Measured on secondary current
Fluxgate excitation frequency	f_{Exc}	kHz		32.5		
Induced rms voltage on primary conductor		µV rms			5	
Power supply voltages	Uc	V	±14.25		±15.75	
Positive current consumption	Ips	mA	93	97	104	Add Is (if Is is positive)
Negative current consumption	Ins	mA	85	91	96	Add Is (if Is is negative)
Operating temperature range	Ta	°C	-40		85	
Stability						
Offset stability over time		ppm / month µA / month	-0.8 -0.12		0.8 0.12	ppm refers to nominal current µA refers to secondary current
Offset change with vertical external magnetic field		µA /mT		2.4	9.6	(perpendicular to bus bar) µA refers to secondary current
Offset change with horizontal external magnetic field		µA /mT		9.6	24	(parallel to bus bar) µA refers to secondary current
Offset change with power supply voltage changes		µA /V		0.048	0.48	µA refers to secondary current
Offset change with absolute power supply voltages tracking		µA /V		0.144	0.48	µA refers to secondary current

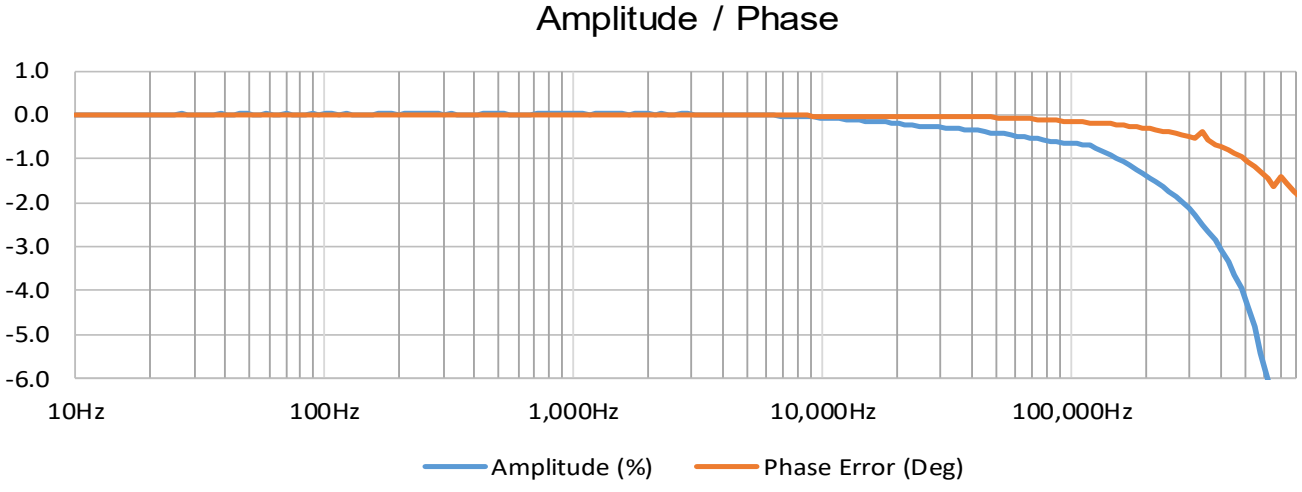
Measurement resistor RM and ambient temperature derating (Fig. 1)



Frequency and ambient temperature derating (Fig. 2)



Frequency characteristics (Fig. 3)



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	1.5	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 off-set 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

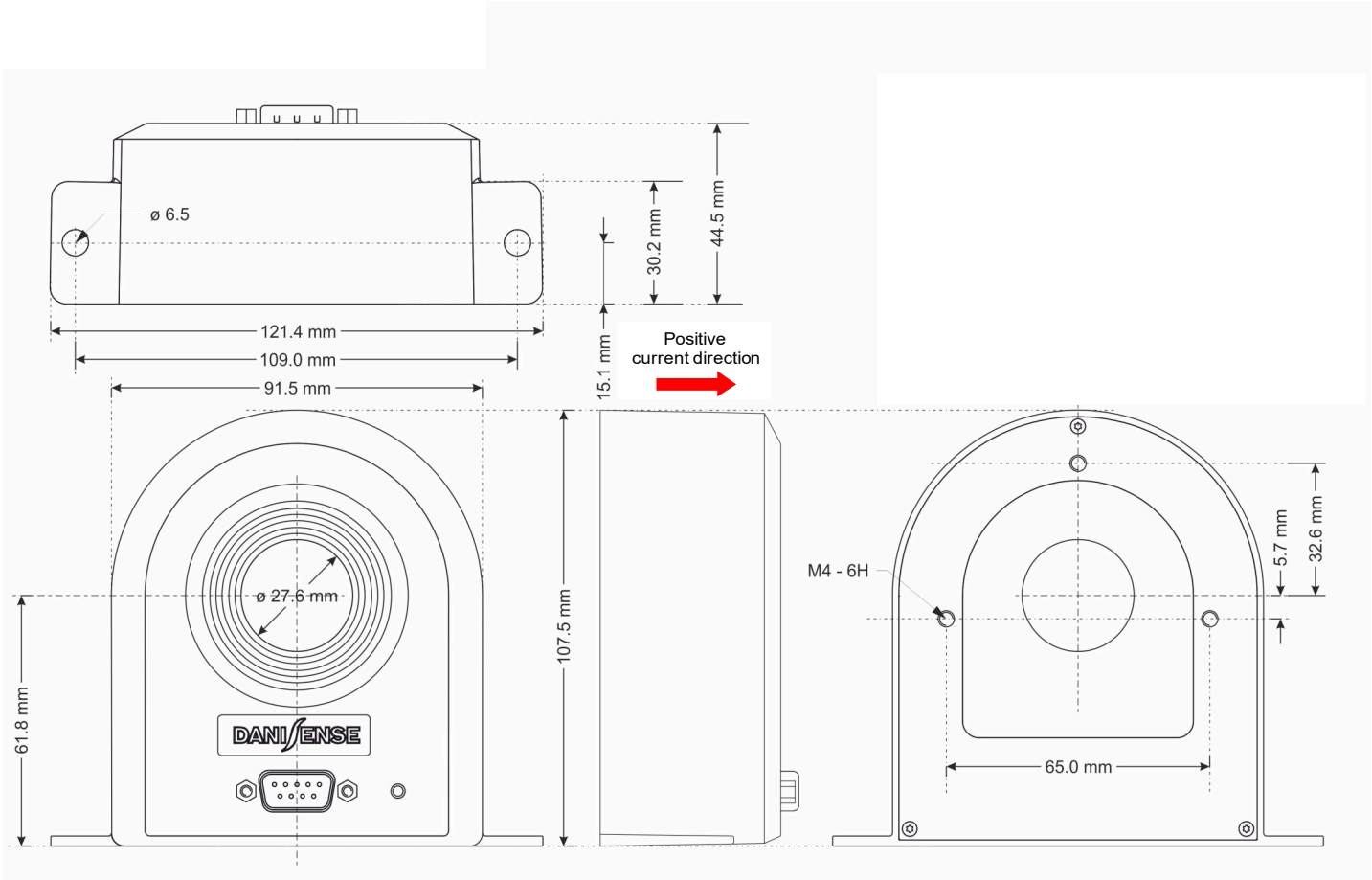
- maximum forward voltage 60V, maximum reverse voltage 5V

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)

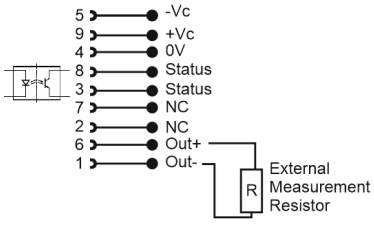
DSUB pin layout

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

• Base plate mounting	2 holes Ø6.5
	2 x M5 steel screws / 6N.m
• Back side panel mounting	3 holes Ø4.0 x 6H
	3 x M4 steel screw / 4N.m

Declaration of Conformity

Danisense A/S

Malervej 10

DK-2630 Taastrup

Denmark

Declares that under our sole responsibility the products listed in Appendix A are 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

EN 61010-2-030:2010

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

Appendix A describes the products covered by this Declaration of Conformity.



Place		Date
Taastrup, Denmark	Henrik Elbæk	2022-03-15