

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	$I_{PN AC}$	A _{rms}			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 (= $\epsilon_L + I_{oE}$)	$acc\epsilon$	ppm	-11		11
AC Maximum gain error 10Hz to 2kHz	ϵ_G	%			± 0.07
Operating temperature range	T_a	°C	-40		85
Power supply voltages	U_c	V	± 14.25		± 15.75

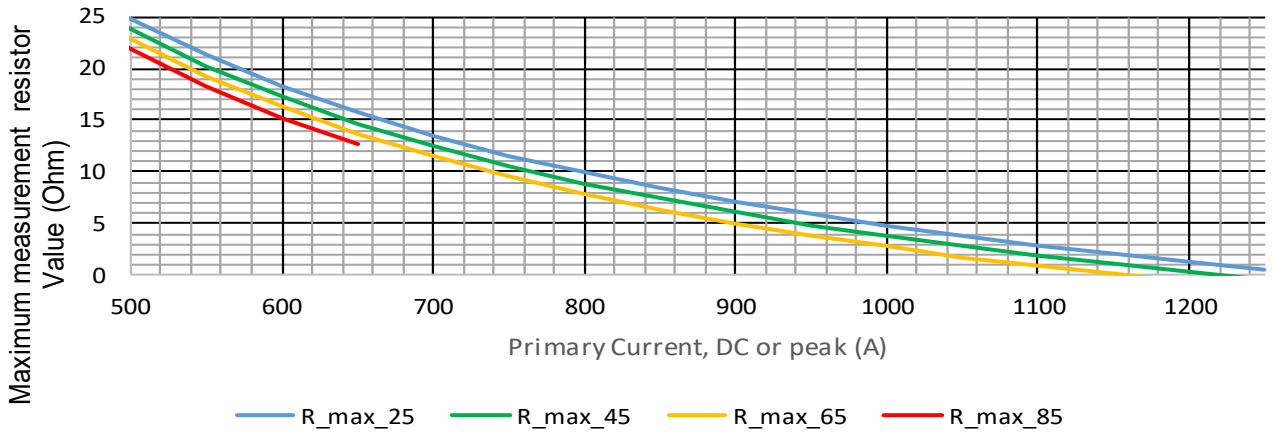
All ppm (or %) values refer to nominal current

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	-400		400	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 -0.4		1 0.4	ppm refers to nominal current μA refers to secondary current
Offset current (including earth field)	I_{OE}	ppm μA	-10 -4		10 4	ppm refers to nominal current μA refers to secondary current
DC-10Hz Overall accuracy @25°C (= ϵ_L + IOE)	acc ϵ	ppm	-11		11	ppm refers to nominal DC current
Offset temperature coefficient	TC _{IOE}	ppm/K $\mu A/K$	-0.1 -0.04		0.1 0.04	ppm refers to nominal current μA refers to secondary current
Bandwidth	f(-3dB)	kHz	500			Small signal, graphs figure 3
Amplitude error	10Hz - 2kHz 2kHz - 10kHz 10kHz - 100kHz	ϵ_G			0.01% 0.20% 2.50%	% refers to nominal current
Phase shift	10Hz - 2kHz 2kHz - 10kHz 10kHz - 100kHz	θ			0.03° 0.04° 1.00°	
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			0.01 0.02 0.2 0.7	Measured on secondary current
Fluxgate excitation frequency	f_{Exc}	kHz		32.5		
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	93	97	104	Add I _s (if I _s is positive)
Negative current consumption	I_{ns}	mA	85	91	96	Add I _s (if I _s is negative)
Operating temperature range	T _a	°C	-40		85	
Stability						
Offset stability over time		ppm / month μA	-0.1 -0.04		0.1 -0.04	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

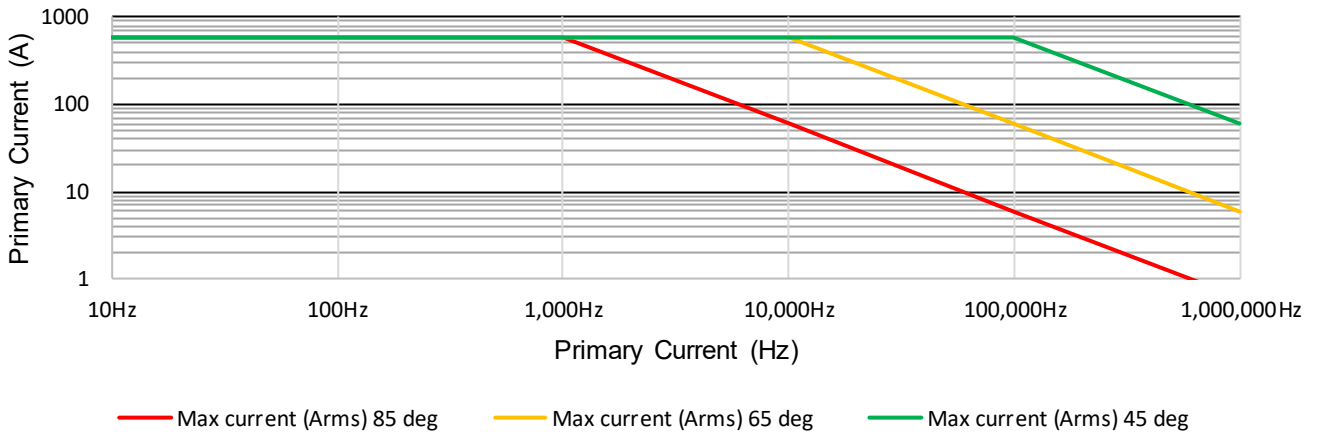
Measurement resistor R_M and ambient temperature derating (Fig. 1)

Maximum measurement resistor vs. ambient temperatures



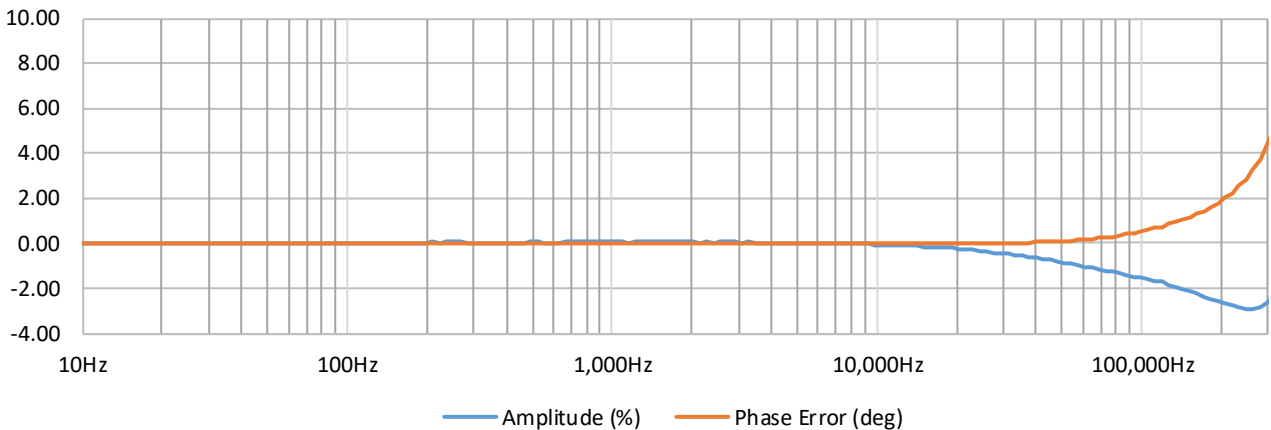
Frequency and ambient temperature derating (Fig. 2)

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

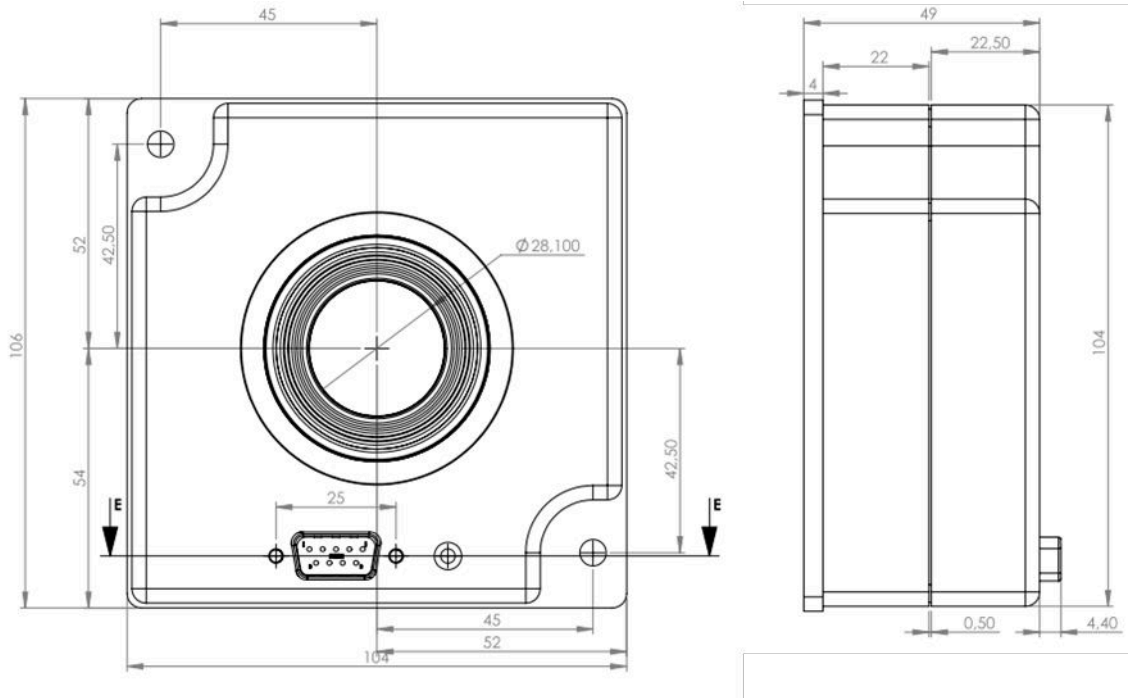
When transducer is operating in normal condition, the status pins (3 and 8) are shorted.

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 4xDL2000 : DSSIU-4
- 6-channel power supplies unit for connection up to 6xDL2000 : 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 ϕ 4 banana jacks)

Please visit Danisense homepage for relevant datasheets



(general tolerance 0.3mm unless otherwise stated)

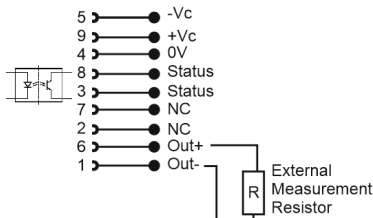
DSUB pin layout

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