

Ultra-stable, high precision (ppm class) fluxgate technology DR Series current transducer for non-intrusive, isolated DC and AC current measurement up to 11kA



Features

Linearity error maximum +/- 7ppm

3 pin XLR mini connector for voltage output

Transducer core optimized for high level of immunity against external magnetic fields

Operating temperature

Transducer head 0-50°C

Electronics 0-45°C

Aperture diameter 140 mm

2U 19" Control unit with universal (100-240V AC 50/60Hz)

AC input voltage or 120-370V DC input voltage

Danisense advanced sensor protection circuit "ASPC"

Applications:

MPS for particles accelerators

Stable power supplies

Precision drives

Batteries testing and evaluation systems

Power measurement and power analysis

Current calibration purposes

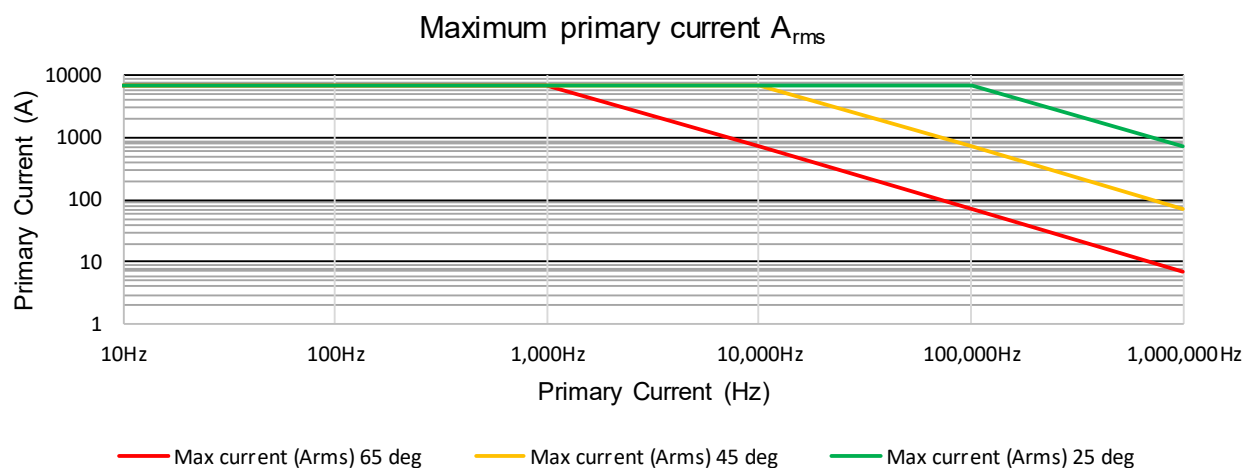
Specifications highlights (@23°C)	Symbol	Unit	Min	Typ	Max
Measuring range (DC or AC peak)	I_{PM}	kA	-11		11
Nominal primary AC current	$I_{PN AC}$	kArms			7
Nominal primary DC current	$I_{PN DC}$	kA	-10		10
Nominal output voltage @ 10kA	V_{SN}	V	-10.000		10.000
Primary / secondary ratio	Ratio	V/kA		1.000	
Linearity error	ϵ_L	ppm	-7		7
Offset current (including earth field)	V_{OE}	ppm	-11		11
Ratio error	V_{RE}	ppm	-5		5
DC-10Hz Overall accuracy @23°C (= $\epsilon_L + V_{RE} + V_{OE}$)	ϵ_{DC}	ppm	-23		23
AC Max. gain error (10Hz to 1kHz)	ϵ_{AC}	%	-0.05		0.05
AC Max. phase shift error (10Hz to 1kHz)	θ	°			0.05
Bandwidth	f(-3dB)	kHz	100		
Operating temperature transducer head	T_a	°C	0		50

All ppm (or %) values refer to nominal current 7500A or 10V

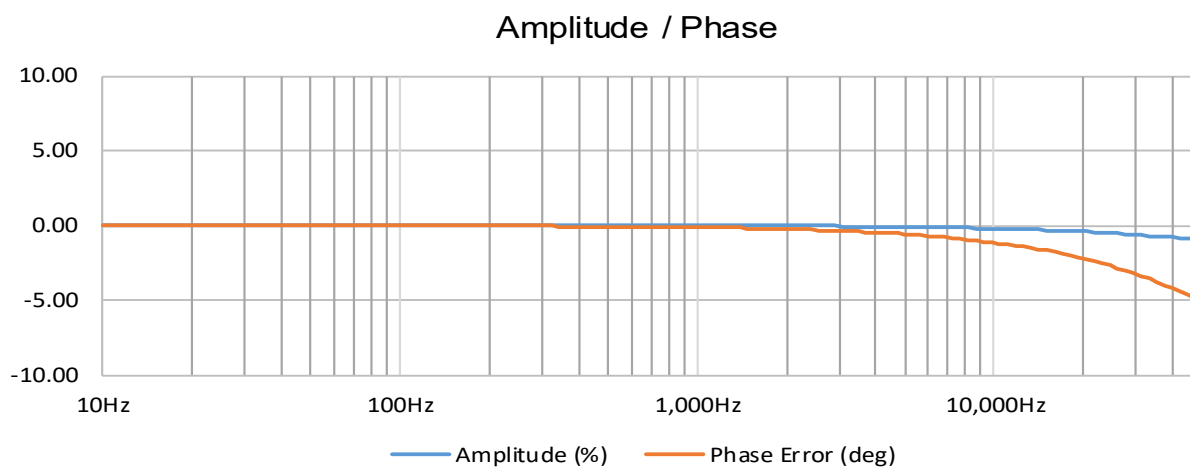
Electrical specifications at Ta=23°C

Parameter	Symbol	Unit	Min	Typ.	Max	Comment
Nominal primary AC current	$I_{PN\ AC}$	Arms			7,000	Refer to fig. 2 for derating
Nominal primary DC current	$I_{PN\ DC}$	A	-10,000		10,000	
Measuring range	I_{PM}	A	-11,000		11,000	DC or peak value
Overload capacity	$\hat{I}_{OL}$	A			35,000	Non-measured, 100ms
Nominal output voltage	V_{out}	V	-10.000		10.000	At nominal DC current
Primary / secondary ratio	Ratio	V/kA	-1.000		1.000	
Linearity error	ε_L	ppm μV	-7.0 -70		7.0 70	ppm refers to nominal current μV refers to output voltage
Bandwidth	$f(-3dB)$	kHz	100			Small signal, graphs figure 3
Amplitude error	ε_G	%			0.05 1.50 15.00	% refers to nominal current
10Hz – 1kHz						
1kHz - 5kHz						
Phase shift	θ	°			0.05° 0.50° 3.00°	
10Hz – 1kHz						
1kHz - 5kHz						
5kHz - 30kHz						
Response time to a step current I_{PN}	$t_r @ 90\%$	μs		1		$di/dt = 100A/\mu s$
Noise	noise	ppm rms			0.10 0.70 5.00 7.00	Measured on secondary current
0 - 100Hz						
0 - 1kHz						
0 - 10kHz						
0 - 100kHz						
Fluxgate excitation frequency	f_{Exc}	kHz		7.82		
Induced rms voltage on primary conductor		μV rms			10	
Mains input voltage AC	V_{AC}	V rms	90		295	50 / 60Hz
Mains input voltage DC	V_{DC}	V	127		417	
Operating temperature range / Control unit	T_a	°C	0		45	
Operating temperature range / Head	T_a	°C	0		50	
Offset error						
Initial (including earth field)	V_{OE}	ppm μV	-11.0 -110		11.0 110	ppm refers to nominal current μV refers to output voltage
Versus temperature	TC_{VOE}	ppm/K $\mu V/K$	-0.3 -3		0.3 3	ppm refers to nominal current μV refers to output voltage
Versus time	TS_{VOE}	ppm/mont h $\mu V/month$	-0.1 -1		0.1 1	ppm refers to nominal current μV refers to output voltage
Ratio error						
Initial	V_{RE}	ppm μV	-5.0 -50		5.0 50	ppm refers to nominal current μV refers to output voltage
Versus temperature	TC_{VRE}	ppm/K $\mu V/K$	-1.5 -15		1.5 15	ppm refers to nominal current μV refers to output voltage
Versus time	TS_{VRE}	ppm/mont h $\mu V/month$	-20.0 -200		20.0 200	ppm refers to nominal current μV refers to output voltage

Frequency and ambient temperature derating (Fig. 2)



Frequency characteristics (Fig. 3)



Isolation specifications

Parameter	Unit	Value
Rated isolation voltage rms, reinforced isolation IEC 61010-1 standard and with following conditions - Overvoltage category III -Pollution degree 2	kV	3
Rms voltage for AC isolation test, 50/60 Hz, 1 min - Between primary and (secondary and shield) - Between secondary and shield	kV	23.7 0.2
Impulse withstand voltage	kV	43.5
Creepage distance / Clearance	mm	60 / 60
Comparative Tracking Index	CTI	600

Absolute maximum ratings

Parameter	Unit	Max	Comment
Primary current	kA	35	Maximum 100ms
Primary current	kA	11	Continuous

Environmental and mechanical characteristics

Parameter	Unit	Min	Typ	Max	Comment
Ambient operating temperature range	°C	0		45	Control unit
Ambient operating temperature range	°C	0		60	Transducer head
Storage temperature range	°C	-40		85	
Relative humidity	%	20		80	Non-condensing
Mass	kg		17 6		Transducer Head Control Unit
Connections	3 pin XLR mini				
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

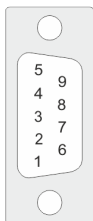
Both DC and AC primary current up to 100% of nominal value can be applied to the current transducers in the above situations without damage to the electronics.

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)

Package content

- Transducer head
- Electronics box 19" 2U
- AC power cable - Region specific
- 5m cable between transducer head and electronics box (Custom sizes can be delivered at extra charge)
- 2m XLR mini cable to connect the voltage output to 4mm banana plugs (+, - and cable shield)

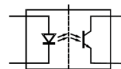
DSUB-9 Status Output



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

Status pin properties.

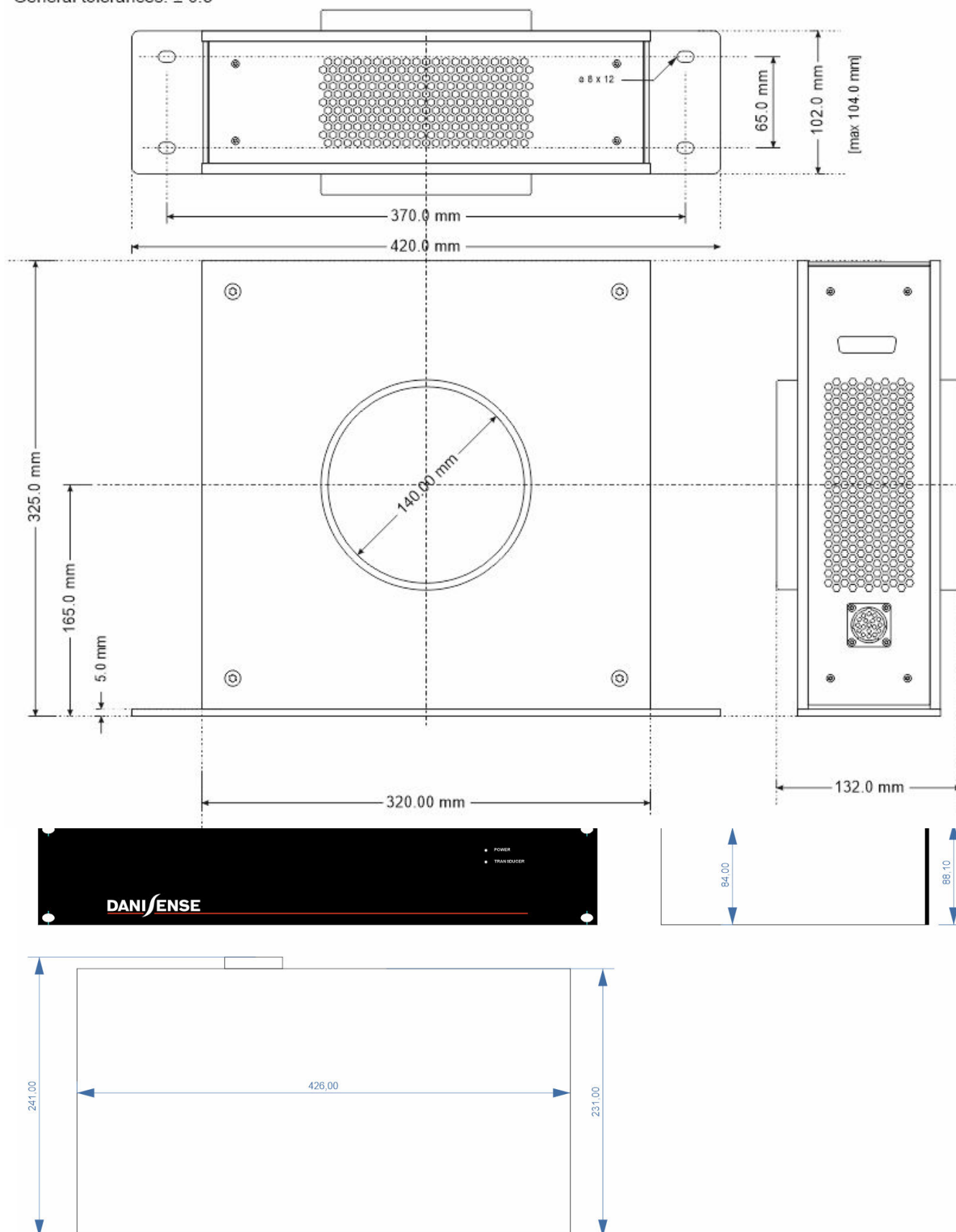
- Forward direction pin 8 to pin 3
- Maximum forward current 10mA
- Maximum forward voltage 60V
- Maximum reverse voltage 5V



5	NC
9	NC
4	NC
8	Status
3	Status
7	NC
2	NC
6	NC
1	NC

DS10000 Dimensions

General tolerances: ± 0.3



User Guide

Intended use:

The DS10000UX-10V is intended to measure the current flowing through the aperture of the transducer head. The measured current is available as a voltage output on the XLR mini connector (2m cable is included with 4mm safety banana plugs). The voltage output is 10V/10kA.

Instruction for use:

1. Do not apply primary current through the transducerhead before everything is connected and powered.
 1. Cable from transducer head to electronics control box must be connected
 2. The electronics control box needs to be mains powered. (Universal input)
2. If the electronics control unit is intended for desk use, mount the rubber feet which are part of the package. If the electronics control unit is intended for Rack mounting, use the screw kit for mounting and do not mount the rubber feet.
3. Connect a precision voltage analyzer to the XLR cable for analysis purposes.
4. Ensure that the BLACK and RED current output connections are shorted



Indications:

When mains is applied a green light diode on the front under the power symbol will light green, indicating the transducer is working and is tracking the input signal.

Safety Instructions:

DO NOT TRY TO DISASSEMBLE THE UNIT.

Make sure that the unit is properly connected to earth ground.

Do not block the ventilation openings on the side panels.

If the fan does not operate properly contact Danisense for repair.

If the "POWER" green diode is not operating when mains is applied, disconnect power and contact Danisense for further instruction.

CE Statement:

This product has been tested and found to comply with the following standards.

Electrical safety: EN 61010-1 2010

Electromagnetic Compatibility: EN 61326-1 2013

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