

Ultra-stable, high precision (ppm class) fluxgate technology DR Series current transducer for non-intrusive, isolated DC and AC current measurement up to 11000A



**Features**

- Linearity error maximum 1 ppm
- 4mm banana jack for secondary current
- Transducer core optimized for high level of immunity against external magnetic fields
- Operating temperature
  - Transducer head 0-70°C
  - Electronics 0-45°C
- Turns ratio 1:2500
- 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

Specification highlights	Symbol	Unit	Min	Typ	Max
Nominal primary AC current	$I_{PN AC}$	Arms			7000
Nominal primary DC current	$I_{PN DC}$	A	-10000		10000
Measuring range	$\hat{I}_{PM}$	A	-11000		11000
Primary / secondary ratio	$n1 : n2$		1:2500		1:2500
Linearity error	$\epsilon_L$	ppm	-1		1
Offset current (including earth field)	$I_{OE}$	ppm	-5		5
DC-10Hz Overall accuracy @25°C (= $\epsilon_L + I_{OE}$ )	acc $\epsilon$	ppm	-6		6
AC Maximum gain error 10Hz to 1kHz	$\epsilon_G$	%			±0.05
Operating temperature range	$T_a$	°C	0		70

All ppm (or %) values refer to nominal current

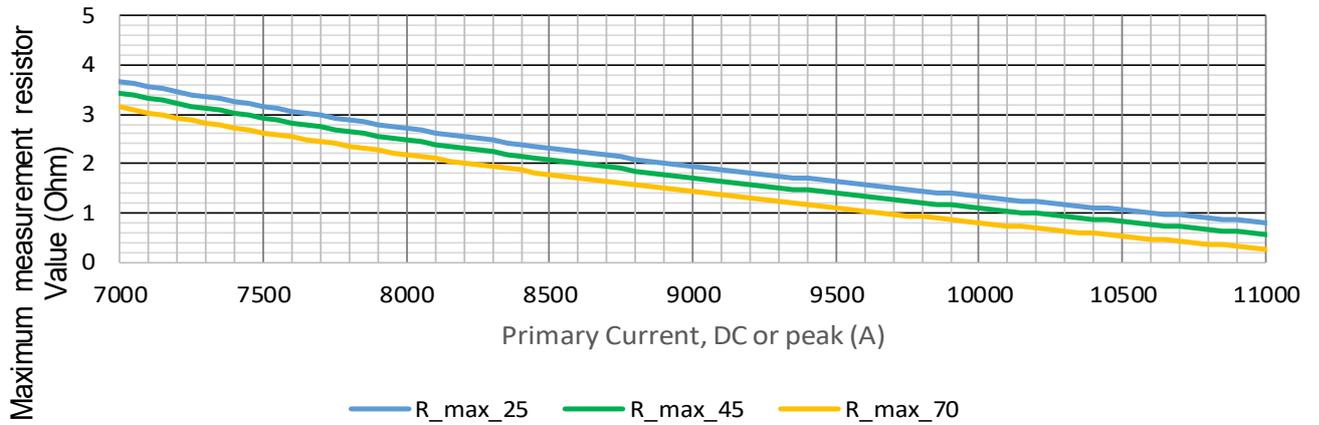
## Electrical specifications at Ta=23°C

Parameter	Symbol	Unit	Min	Typ.	Max	Comment
Nominal primary AC current	$I_{PN AC}$	Arms			7000	Refer to fig. 1 & 2 for derating
Nominal primary DC current	$I_{PN DC}$	A	-10000		10000	Refer to fig. 1 for derating
Measuring range	$I_{PM}$	A	-11000		11000	Refer to fig. 1 & 2 for derating
Overload capacity	$\dot{I}_{OL}$	kA			20	Non-measured, 100ms
Nominal secondary current	$I_{SN}$	mA	-4000		4000	At nominal primary DC current
Primary / secondary ratio			1:2500		1:2500	
Measuring resistance	$R_M$	$\Omega$	0		1	Refer to fig. 1 for details
Linearity error	$\epsilon_L$	ppm $\mu A$	-1 -4		1 4	ppm refers to nominal current $\mu A$ refers to secondary current
Offset current (including earth field)	$I_{OE}$	ppm $\mu A$	-5 -20		5 20	ppm refers to nominal current $\mu A$ refers to secondary current
Offset temperature coefficient	$TC_{IOE}$	ppm/K $\mu A/K$	-0.1 -0.4		0.1 0.4	ppm refers to nominal current $\mu A$ refers to secondary current
Bandwidth	$f(-3dB)$	kHz	100			Small signal, graphs figure 3
Amplitude error	$\epsilon_G$	%			10Hz - 1kHz	0.05%
1kHz - 5kHz					1.50%	
5kHz - 30kHz					15.00%	
Phase shift	$\theta$	°			10Hz - 1kHz	0.05°
1kHz - 5kHz					0.5°	
5kHz - 30kHz					3°	
Response time to a step current IPN	$t_r @ 90\%$	$\mu s$		1		di/dt = 100A/ $\mu s$
Noise	noise	ppm rms			0 - 100Hz	0.05
0 - 1kHz					0.40	
0 - 10kHz					3.00	
0 - 100kHz					4.00	
Fluxgate excitation frequency	$f_{exc}$	kHz		7.82		
Induced rms voltage on primary conductor		$\mu V rms$			10	
Mains input voltage AC		$V_{AC}$	90		295	50/60 Hz
Mains input voltage DC		$V_{DC}$	127		417	
Control Unit ambient temperature		°C	0		45	
Transducer head temperature		°C	0		70	Refer to fig. 1 for derating
<b>Stability</b>						
Offset stability over time		ppm / month	-0.1 -0.40		0.1 0.40	ppm refers to nominal current $\mu A$ refers to secondary current
Offset change with vertical external magnetic field		$\mu A / mT$			8	(perpendicular to bus bar) $\mu A$ refers to secondary current
Offset change with horizontal external magnetic field		$\mu A / mT$			8	(parallel to bus bar) $\mu A$ refers to secondary current

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

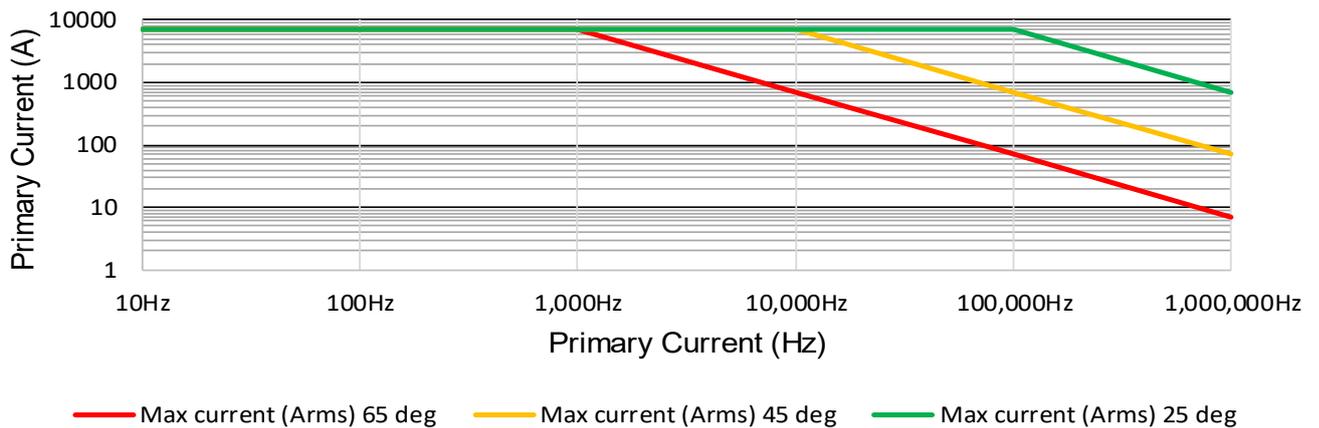
Cable length 5m

Maximum measurement resistor vs. ambient temperatures



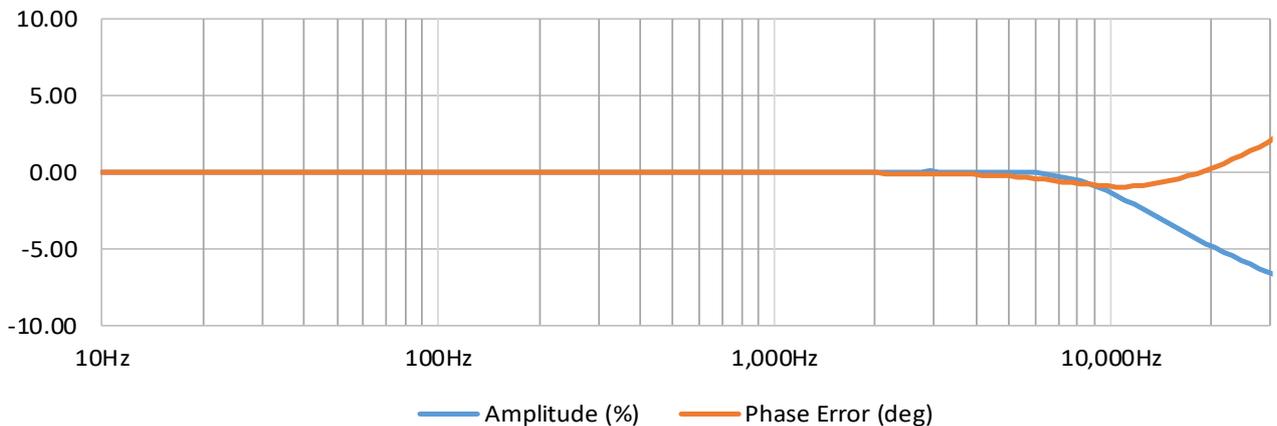
**Frequency and ambient temperature derating (Fig. 2)**

Maximum primary current  $A_{rms}$



**Frequency characteristics (Fig. 3)**

Amplitude / Phase



## Isolation specifications

Parameter	Unit	Value
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	20	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		70	Transducer head
Storage temperature range	°C	-40		85	
Relative humidity	%	20		80	Non-condensing
Mass	kg		19 6		Transducer Head Control Unit
Connections	4mm banana Jacks				
Standards	EN 61326-1 EMC EN 61010-1:2010 Safety				

**Advanced Sensor Protection Circuits “ASPC”**

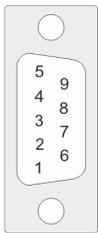
Developed to protect the current transducer from typical fault conditions:

- 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)

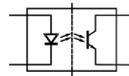
**DSUB-9 Status Output**



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

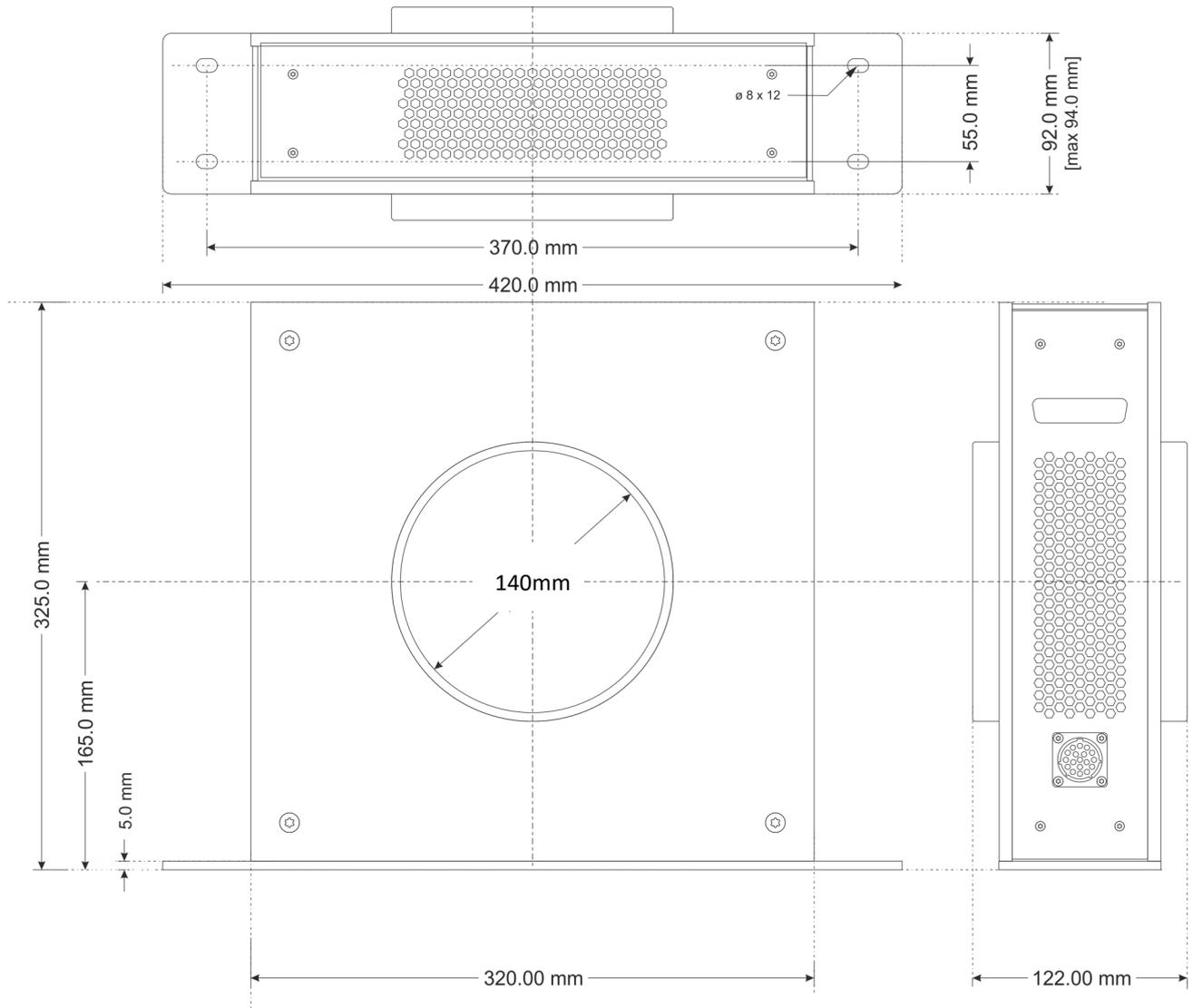
Status pin properties.

- 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 Transducer Head Dimensions**



## **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