

Ultra-stable, high precision (ppm class) fluxgate technology DR Series current transducer for non-intrusive, isolated DC and AC current measurement up to 5500A



### 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 0-60°C
  - Electronics 0-45°C
- Aperture diameter 150 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:

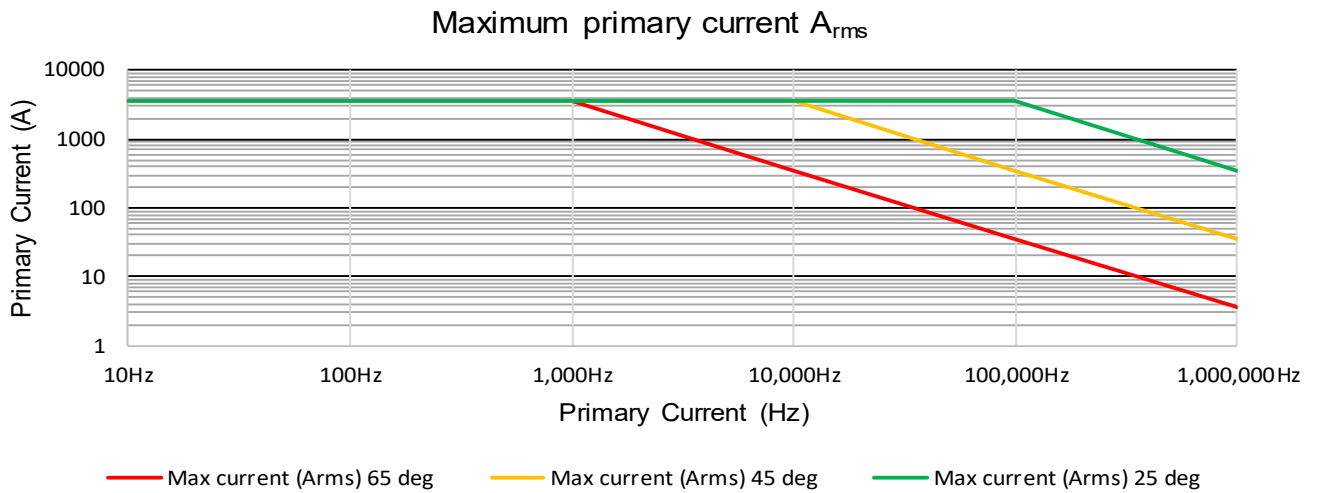
- MPS for particles accelerators
- Stable power supplies
- Precision drives
- Batteries testing and evaluation systems
- Power measurement and power analysis
- Current calibration purposes

Specifications highlights (@23°C)	Symbol	Unit	Min	Typ	Max
Measuring range (DC or AC peak)	$I_{PM}$	A	-5,500		5,500
Nominal primary AC current	$I_{PN AC}$	Arms			3,600
Nominal primary DC current	$I_{PN DC}$	A	-5,000		5,000
Nominal output voltage @ 5000A	$V_{SN}$	V	-10.000		10.000
Primary / secondary ratio	Ratio	V/kA		2.000	
Linearity error	$\epsilon_L$	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 (= $\epsilon_L + V_{RE} + V_{OE}$ )	$\epsilon_{DC}$	ppm	-23		23
AC Max. gain error (10Hz to 1kHz)	$\epsilon_{AC}$	%	-0.05		0.05
AC Max. phase shift error (10Hz to 1kHz)	$\theta$	°			0.05
Bandwidth	f(-3dB)	kHz	100		
Operating temperature transducer head	$T_a$	°C	0		60

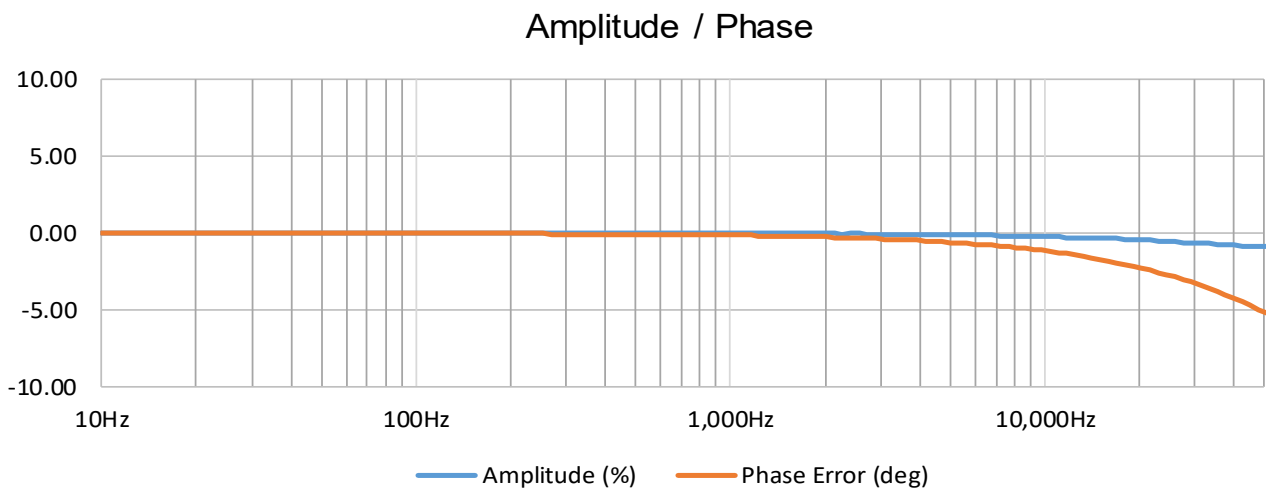
## Electrical specifications at Ta=23°C

Parameter	Symbol	Unit	Min	Typ.	Max	Comment
Nominal primary AC current	$I_{PN AC}$	Arms			3,600	Refer to fig. 2 for derating
Nominal primary DC current	$I_{PN DC}$	A	-5,000		5,000	
Measuring range	$I_{PM}$	A	-5,500		5,500	DC or peak value
Overload capacity	$\hat{I}_{OL}$	A			20,000	Non-measured, 100ms
Nominal output voltage	Vout	V	-10.000		10.000	At 5000A nominal DC current
Primary / secondary ratio	Ratio	V/kA	-2.000		2.000	
Linearity error	$\epsilon_L$	ppm $\mu V$	-7.0 -70		7.0 70	ppm refers to nominal current $\mu V$ refers to output voltage
Bandwidth	f(-3dB)	kHz	100			Small signal, graphs figure 3
Amplitude error	$\epsilon_G$	%			0.05	% refers to nominal current
10Hz - 1kHz					1.50	
1kHz - 5kHz					15.00	
Phase shift	$\theta$	°			0.05°	
10Hz - 1kHz					0.50°	
1kHz - 5kHz					3.00°	
5kHz - 30kHz						
Response time to a step current $I_{PN}$	$t_r$ @90%	$\mu s$		1		di/dt = 100A/ $\mu s$
Noise	noise	ppm rms			0.10	Measured on secondary current
0 - 100Hz					0.70	
0 - 1kHz					5.00	
0 - 10kHz					7.00	
0 - 100kHz						
Fluxgate excitation frequency	$f_{Exc}$	kHz		7.82		
Induced rms voltage on primary conductor		$\mu V$ 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	Ta	°C	0		45	
Operating temperature range / Head	Ta	°C	0		60	
<b>Offset error</b>						
Initial (including earth field)	$V_{OE}$	ppm $\mu V$	-11.0 -110		11.0 110	ppm refers to nominal current $\mu V$ refers to output voltage
Versus temperature	$TC_{VOE}$	ppm/K $\mu V/K$	-0.3 -3		0.3 3	ppm refers to nominal current $\mu V$ refers to output voltage
Versus time	$TS_{VOE}$	ppm/month $\mu V/month$	-0.1 -1		0.1 1	ppm refers to nominal current $\mu V$ refers to output voltage
<b>Ratio error</b>						
Initial	$V_{RE}$	ppm $\mu V$	-5.0 -50		5.0 50	ppm refers to nominal current $\mu V$ refers to output voltage
Versus temperature	$TC_{VRE}$	ppm/K $\mu V/K$	-1.5 -15		1.5 15	ppm refers to nominal current $\mu V$ refers to output voltage
Versus time	$TS_{VRE}$	ppm/month $\mu V/month$	-20.0 -200		20.0 200	ppm refers to nominal current $\mu V$ 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
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	8	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

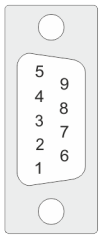
Both DC and AC primary current up to 100% of nominal value can be applied to the current transducers in the above situations without damage to the electronics.

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**

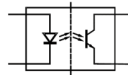
- Transducer head
- Electronics box 19” 2U
- AC power cable - Region specific
- 5m cable between transducer head and electronics box (Custom sizes can be delivered at extra charge)
- 2m XLR cable to connect the voltage output to 4mm banana plugs (+, - and cable shield)

**DSUB-9 Status Output**



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

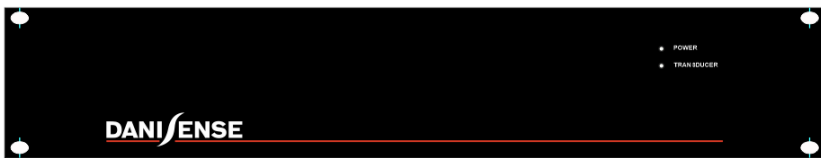
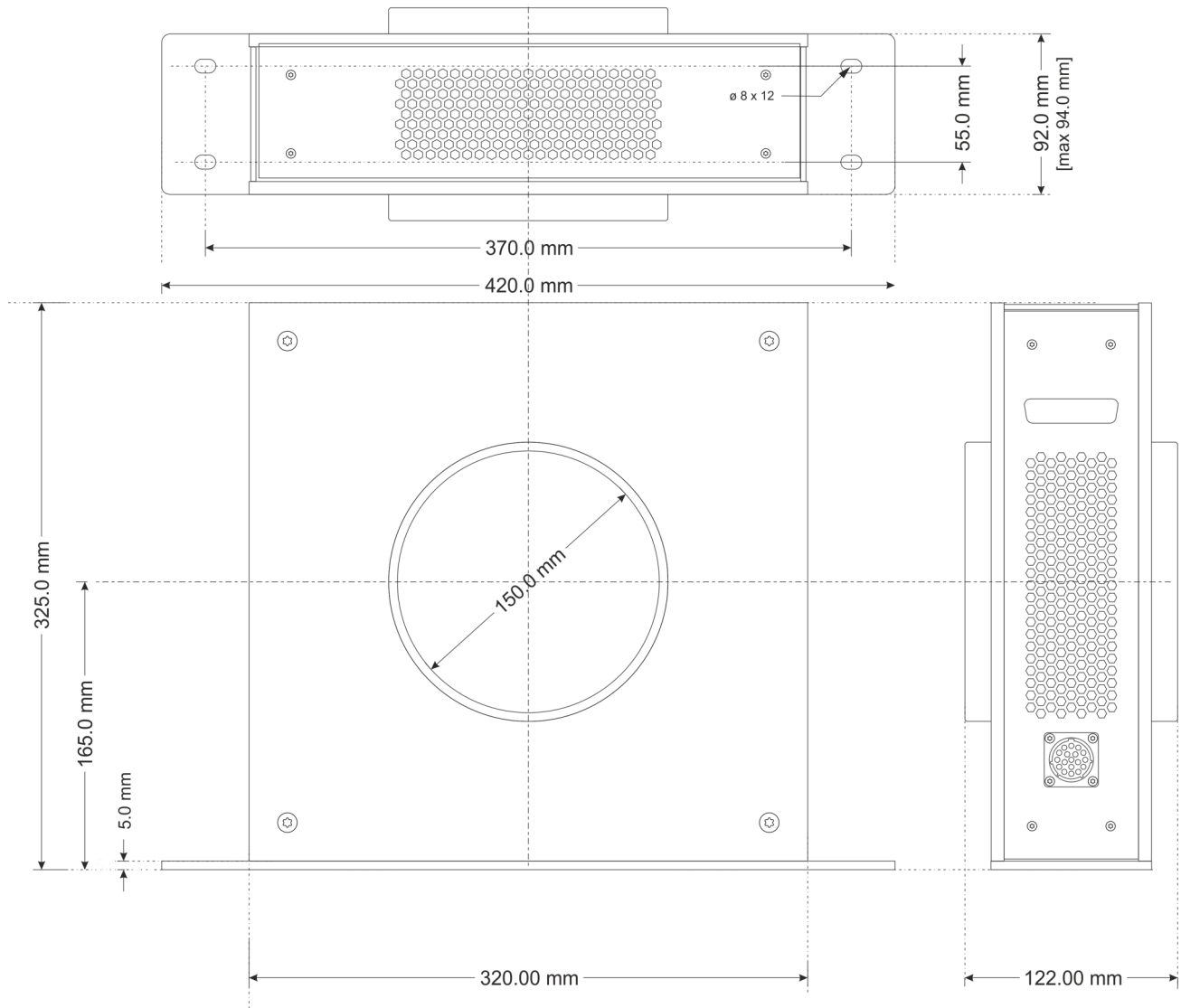
Status pin properties.  
 - Forward direction pin 8 to pin 3  
 - Maximum forward current 10mA  
 - Maximum forward voltage 60V  
 - Maximum reverse voltage 5V



- 5 —● NC
- 9 —● NC
- 4 —● NC
- 8 —● Status
- 3 —● Status
- 7 —● NC
- 2 —● NC
- 6 —● NC
- 1 —● NC

**DR5000 Transducer Head Dimension**

General tolerances  $\pm 0.3\text{mm}$



## User Guide

### Intended use:

The DR5000UX-10V/5000A 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/5kA.

### 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