Current Sensors

DEWESoft®

TECHNICAL REFERENCE MANUAL

CURRENT SENSORS V24-1

Table of contents

1. About this document

This is the users manual for current sensors.

1.1. Legend

The following symbols and formats will be used throughout the document.

Important
It gives you important information about the subject.
Please read carefully!

Hint
It gives you a hint or provides additional information about a subject.

Example
Gives you an example of a specific subject.

1.2. Online versions

1.2.1. Device Technical Reference Manual

The most recent version of this manual can be downloaded from our homepage:
https://dewesoft.com/download/manuals
In the *Hardware Manuals* section click the download link for the *Device® technical reference manual*.

1.2.2. DEWESoft® User Manual

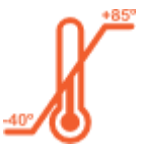
The DEWESoft® User Manual document provides basics and additional information and examples for working with DEWESoft® and certain parts of the program.
The latest version of the DEWESoft® tutorials can be found here:
https://dewesoft.com/download/manuals

2. Current sensors

High-accuracy sensors for AC/DC current measurement and power analysis. From current clamps to high-precision zero flux current transducers and Rogowski coils.

Current

TEDS compatible



-40°C to +85°C

2.1. Main Features

- **AC/DC CURRENT MEASUREMENT**: Dewesoft offers high-accuracy zero-flux current transducers, Rogowski coils, current clamps and shunts for AC and/or DC current measurement.
- **HIGH ACCURACY**: Highly precise zero flux current transducers or fluxgate compensated clamps are a perfect fit for most demanding power measurements for E-mobility, inverter and motor testing applications.
- **UP TO 30 000 AMPS**: DEWESoft offers a very wide range of current measurement ranges up to 30 000 (30 thousand) amps.
- **-40°C to +85°C**: DEWESoft offers current transducers with a wide temperature range. Ideal for winter testing (-40 °C, -40 °F) and summer testing (+85 °C, 185 °F).
- **INTEGRATED SENSOR POWER SUPPLY**: Current clamps such as Iron-core, Rogowski coils, and Hall Compensated clamps can be directly supplied by the LV Amplifier. Fluxgate and zero flux transducers need an external power supply unit (PWR-MCTS2).
- **FLEXIBLE**: There are more than 1000 different current sensors available on the market. If you want to connect your own or other sensors we are very happy to help you here. Dewesoft instruments allow connecting most types of current transducers.

2.2. Zero-Flux Transducers

Zero-flux current transducers are not simple transformers, they have sophisticated constructions and integrated electronics. They have two windings which are operated in saturation to measure the DC current, a primary winding for the AC current and a secondary winding for compensation. This kind of current measurement is very precise because of the zero-flux compensation.

This is a very important point because when the magnetic core of the transformer stays magnetized with the residual magnetic flux, it destroys the accuracy of the measurement. In these transducers, the parasitic magnetic flux is perfectly compensated. Therefore, zero-flux current transducers are used for measuring currents with high precision, but they are not suitable for simple and fast measurements such as iron-core clamps or Rogowski coils. Zero-flux transducers are used to measure currents with the highest accuracy for both AC and DC and have high bandwidth capabilities (up to 2 MHz). They are very linear and have low phase and offset errors.

These types of transducers measure current flows with galvanic isolation. They reduce the high currents to a much lower value. The conductor with the measured current must be guided through the loop of the sensor (meaning the circuit must be broken to install the transducer) because current transducers function on the principle of a transformer, where a high current is transformed to a low current which can then be measured with the DAQ.

Working principle:

In the transducer a magnetic flux is produced by the flow of the primary current, this current is counteracted by the secondary current that produces a secondary magnetic flux that counteracts the primary magnetic flux from a secondary winding. The secondary current flows over a burden resistor which induces a voltage over the terminals. This voltage is then measured as it is proportional to the current that is flowing in the conductor.

This Current transducer needs to be powered by a SIRIUSi PWR-MCTS2.

2.2.1. Zero-Flux Transducers: DC-CT

Please refer to the DC-CT product line manual on the https://dewesoft.com/download/manuals webpage.

2.2.2. Zero-Flux Transducers: General specifications

2.2.2.1. Zero-Flux Transducers: Specifications

Specifications in the table are provided by the transducer manufacturer and are their absolute maximum ratings / limits.

	CT 100		CT 200		CT 400	
Type	Zero-Flux		Zero-Flux		Zero-Flux	
Primary Current Range DC RMS Sinus	100 A		200 A		400 A	
Conversion ratio	1:500		1:1000		1:1500	
Overload Ability Short Time (100 ms)	20 kApk		20 kApk		20 kApk	
Max. measurement resistor (100 % of Ip)	25 Ω		20 Ω		10 Ω	
Step response (0 ... 90%)	0.2 µs		0.2 µs		1 µs	
Temperature influence	0.2 ppm/K		0.2 ppm/K		0.1 ppm/K	
Nominal secondary current	200 mA at 100 A		200 mA at 200 A		266 mA at 400 A	
Bandwidth (-3 dB)	DC ... 2 MHz		DC ... 1.1 MHz		DC ... 800 kHz	
Linearity	1.5 ppm		1.2 ppm		0.8 ppm	
Offset	< 0.0015 %		< 0.0010 %		< 0.0008 %	
Accuracy						
Frequency	Amplitude	Phase Error	Amplitude	Phase Error	Amplitude	Phase Error
DC	0.002 %	-	0.001 %	-	0.0008 %	-
to 100 Hz	0.015 %	± 0.01 °	0.015 %	± 0.01 °	0.015 %	± 0.01 °
100 - 1 kHz	0.025 %	± 0.05 °	0.02 %	± 0.02 °	0.02 %	± 0.01 °
1 kHz - 10 kHz	0.2 %	± 0.1 °	0.15 %	± 0.05 °	0.15 %	± 0.1 °
10 kHz - 20 kHz	0.5 %	± 0.25 °	0.5 %	± 0.25 °	0.5 %	± 0.5 °
20 kHz - 50 kHz	0.5 %	± 0.25 °	0.5 %	± 0.25 °	0.5 %	± 0.5 °
50 kHz - 100 kHz	1 %	± 0.5 °	1 %	± 0.5 °	1 %	± 1 °
General Specifications						
Rated isolation voltage RMS, single isolation CAT III, pollution deg. 2, IEC 61010-1 standards, EN 50178 standards	1000 V		1000 V		1000 V	
Test voltage 50 / 60 Hz, 1 min	4.95 kV		4.95 kV		4.95 kV	
Inner diameter	28 mm		28 mm		28 mm	
Dimensions	93 x 78.8 x 49.5		94 x 78.8 x 49.5		95 x 78.8 x 49.5	
Supply voltage (±5 %)	±15 V		±15 V		±15 V	

Operating humidity	20 % to 80 % (not condensing)	20 % to 80 % (not condensing)	20 % to 80 % (not condensing)
Operating temperature	- 40 °C to + 85 °C	- 40 °C to + 85 °C	- 40 °C to + 85 °C
DEWESoft® Shunt	5 Ω	5 Ω	5 Ω
PWR-MCTS2 needed	Yes	Yes	Yes
Compatible amplifiers (see 1)	SIRIUS LV / HS-LV / XHS-LV SIRIUS STG / HS-STG SIRIUS STGM, SIRIUS UNI DEWE 43 IOLITE STG, KRYPTON STG IOLITE LVe	SIRIUS LV / HS-LV / XHS-LV SIRIUS STG / HS-STG SIRIUS STGM, SIRIUS UNI DEWE 43 IOLITE STG, KRYPTON STG IOLITE LVe	SIRIUS LV / HS-LV / XHS-LV SIRIUS STG / HS-STG SIRIUS STGM, SIRIUS UNI DEWE 43 IOLITE STG, KRYPTON STG IOLITE LVe
Cable length	5 m - MCTS to Transducer 0.3 m - Amplifier to MCTS	5 m - MCTS to Transducer 0.3 m - Amplifier to MCTS	5 m - MCTS to Transducer 0.3 m - Amplifier to MCTS
1) The ranges of the IOLITE and KRYPTON amplifiers might affect the resolution of the measured values.			

	CT 500		CT 1000		CT 2000	
Type	Zero-Flux		Zero-Flux		Zero-Flux	
Primary Current Range DC RMS Sinus	500 A		1000 A		2000 A	
Conversion ratio	1:750		1:1500		1:2000	
Overload Ability Short Time (100 ms)	5000 Apk		5000 Apk		10000 Apk	
Max. measurement resistor (100 % of Ip)	5 Ω		4 Ω		3.5 Ω	
Step response (0 ... 90%)	1 µs		1 µs		1 µs	
Temperature influence	1 ppm/K		0.3 ppm/K		< 0.1 ppm/k	
Nominal secondary current	666 mA at 500 A		666 mA at 1000 A		1 A at 2000 A	
Bandwidth (-3 dB)	DC ... 520 kHz		DC ... 440 kHz		DC ... 140 kHz	
Linearity	3 ppm		3 ppm		3 ppm	
Offset	< 0.00115 %		< 0.0012 %		< 0.0012 %	
Accuracy						
Accuracy	Amplitude	Phase Error	Amplitude	Phase Error	Amplitude [1]	Phase Error [1]
DC	0.00115 %	-	0.0012 %	-	0.0012 %	-
to 100 Hz	0.015 %	± 0.01 °	0.015 %	± 0.01 °	0.015 %	± 0.01 °
100 - 1 kHz	0.02 %	± 0.01 °	0.02 %	± 0.01 °	0.05 %	± 0.05 °
1 kHz - 10 kHz	0.1 %	± 0.05 °	0.15 %	± 0.1 °	0.25 %	± 0.1 °
10 kHz - 20 kHz	0.2 %	± 0.5 °	1.5 %	± 1 °	1 %	± 1 °
20 kHz - 50 kHz	0.2 %	± 0.5 °	1.5 %	± 1 °	-	-
50 kHz - 100 kHz	0.5 %	± 1 °	4 %	± 2 °	-	-
General Specifications						
Rated isolation voltage RMS, single isolation CAT III, pollution deg. 2, IEC 61010-1 standards, EN 50178 standards	1000 V		1000 V		1000 V	
Test voltage 50 / 60 Hz, 1 min	4.2 kV		4.2 kV		6 kV	
Inner diameter	38 mm		38 mm		70 mm	
Dimensions	128 x 106 x 54		128 x 106 x 54		231 x 220 x 76	

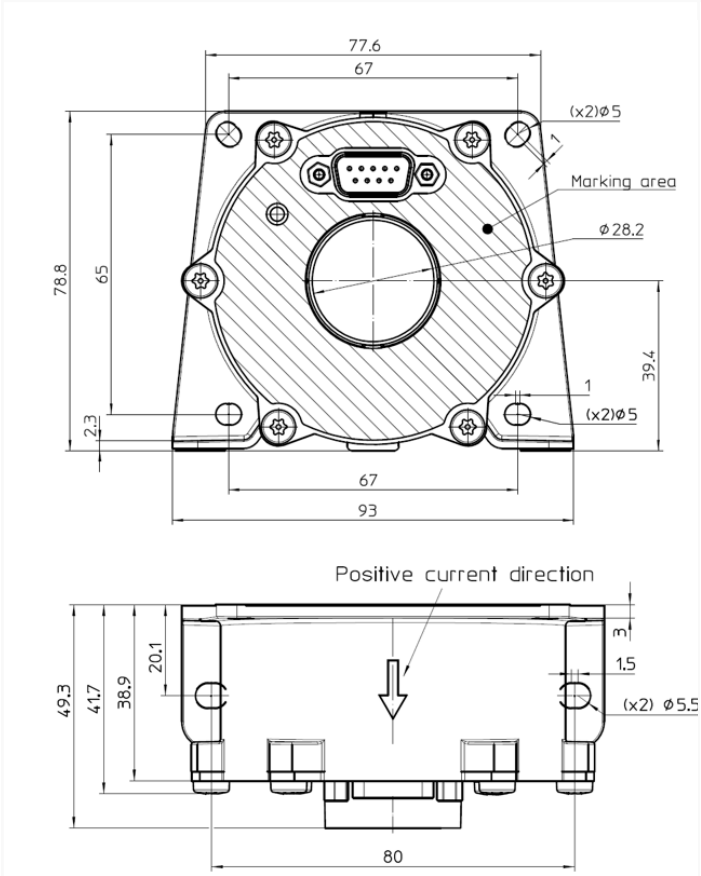
Supply voltage (±5 %)	±15 V	±15 V	±15 V
Operating humidity	20 % to 80 % (not condensing)	20 % to 80 % (not condensing)	20 % to 80 % (not condensing)
Operating temperature	- 40 °C to + 85 °C	- 40 °C to + 85 °C	- 40 °C to + 85 °C
DEWESoft® Shunt	1 Ω	1 Ω	1 Ω
PWR-MCTS2 needed	Yes	Yes	Yes
Compatible amplifiers	SIRIUS LV / HS-LV / XHS-LV SIRIUS STG / HS-STG SIRIUS STGM, SIRIUS UNI DEWE 43 IOLITE STG, KRYPTON STG IOLITE LVe	SIRIUS LV / HS-LV / XHS-LV SIRIUS STG / HS-STG SIRIUS STGM, SIRIUS UNI DEWE 43 IOLITE STG, KRYPTON STG IOLITE LVe	SIRIUS LV / HS-LV / XHS-LV SIRIUS STG / HS-STG SIRIUS STGM, SIRIUS UNI DEWE 43 IOLITE STG, KRYPTON STG IOLITE LVe
Cable length	5 m - MCTS to Transducer 0.3 m - Amplifier to MCTS	5 m - MCTS to Transducer 0.3 m - Amplifier to MCTS	5 m - MCTS to Transducer 0.3 m - Amplifier to MCTS
1) The ranges of the IOLITE and KRYPTON amplifiers might affect the resolution of the measured values.			

Transducer Specifications

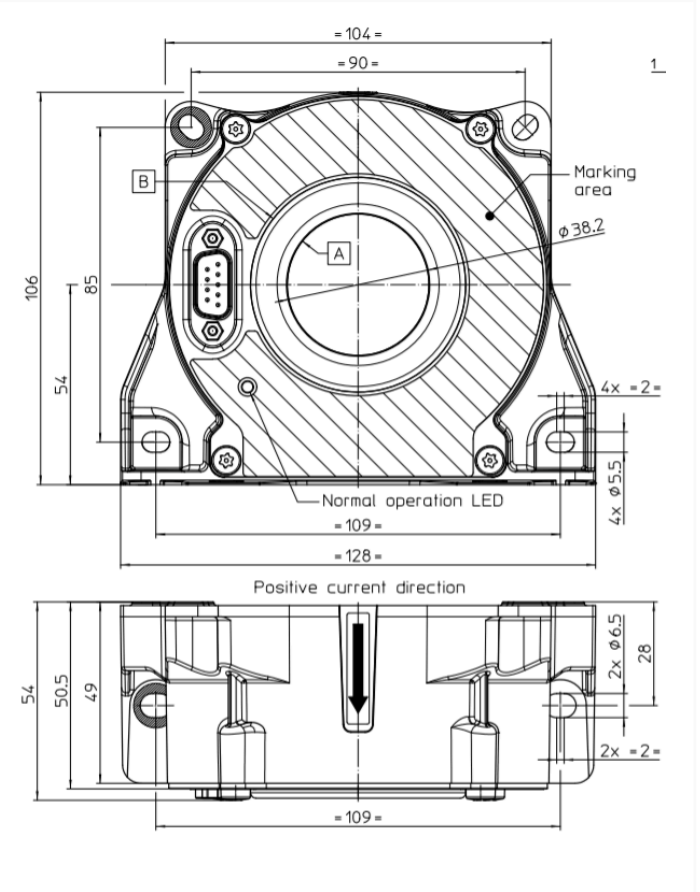
Warning

Never operate the zero-flux-transducers (CT 100, CT 200, CT 400, CT 500, CT 1000, CT 2000) without power supply (SIRIUSi-PWR-MCTS2, SIRIUSir-PWR-MCTS2). The zero-flux transducer can be damaged!

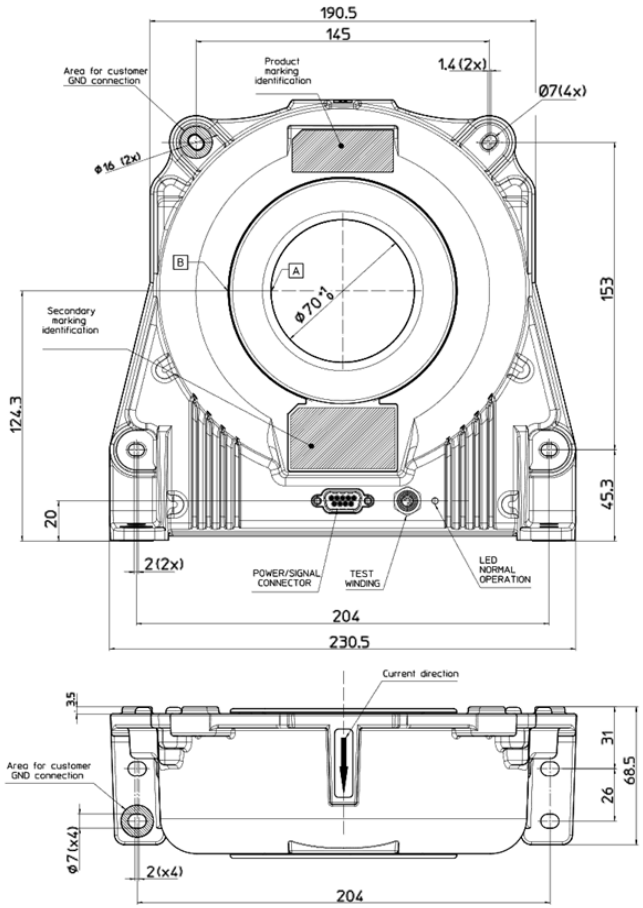
2.2.2.2. Zero-Flux Transducers: Dimensions



Dimensions CT 100, CT 200 and CT 400



Dimensions CT 500 and CT 1000



Dimensions CT 2000

2.2.2.3. Zero-Flux Transducers: Overcurrent protection

As soon as electrical saturation appears, the transducer switches from normal operation to over current mode. This electrical saturation appears in any case beyond 1.1 times the current range. Under these conditions:

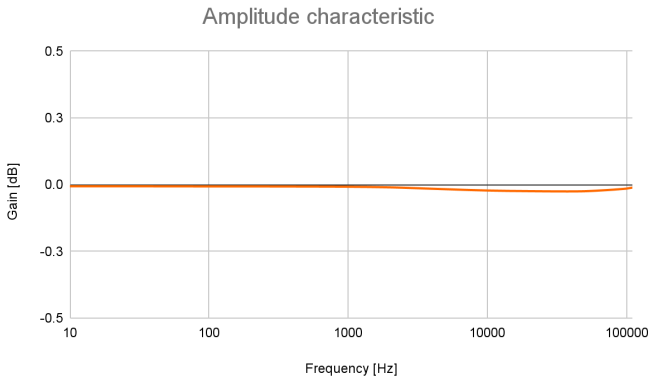
- the contact (operation status) between pin 8 to 3 (of D-SUB-9 connector) switches off, this contact becomes open
- the green LED (located on the cover plate of the transducer and related to operation status) switches off

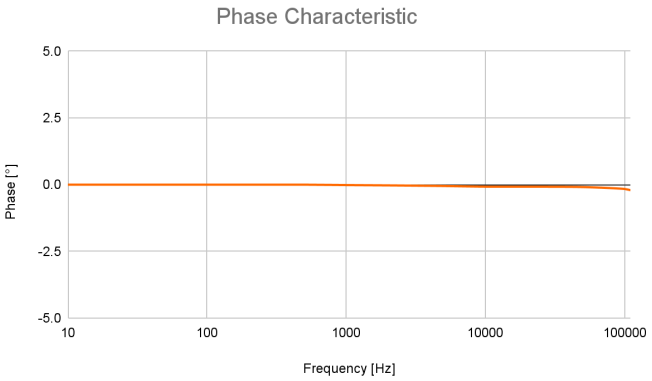
The over current mode remains until the primary current decreases to a value lower than a recovery current. In DEWESoft the overcurrent can be seen as digital input.

2.2.2.4. Zero-Flux Transducers: Magnitude and phase response

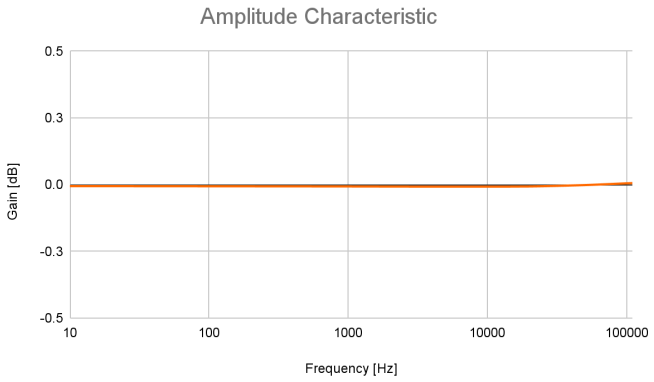
These characteristics were measured in the actual system (SIRIUS + MCTS + Transducer). There is some difference between the measurements of the typical response and manufacturer's maximum ratings.

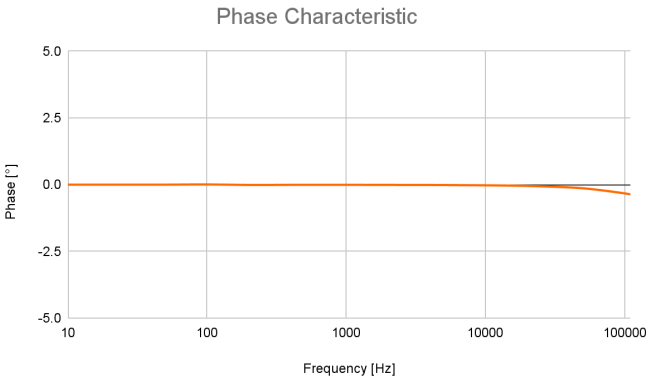
CT100



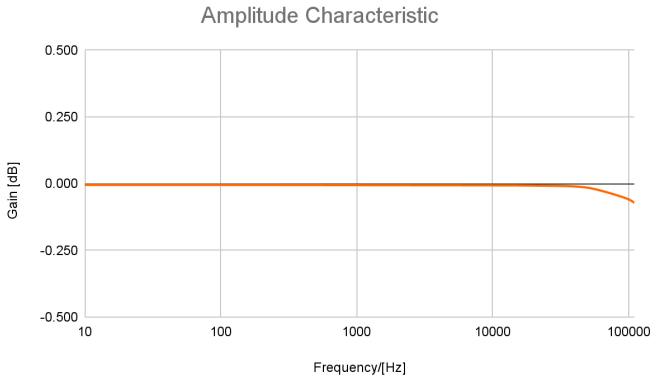


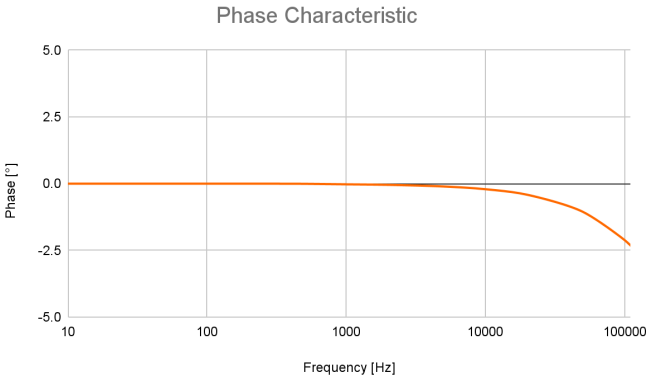
CT200



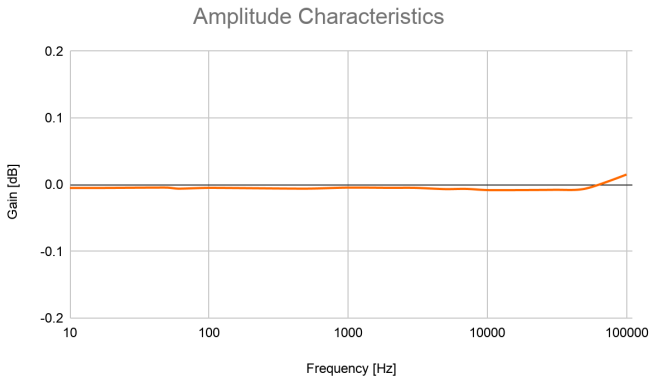


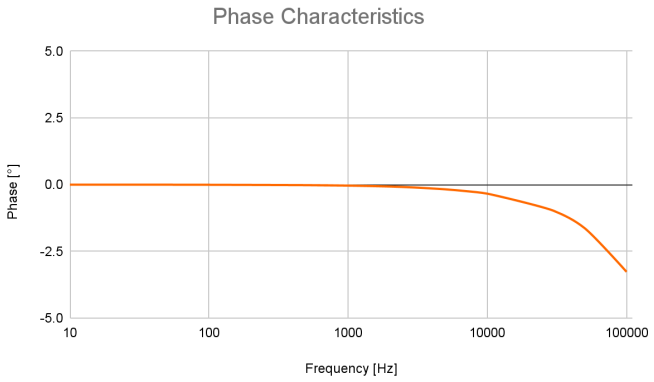
CT400



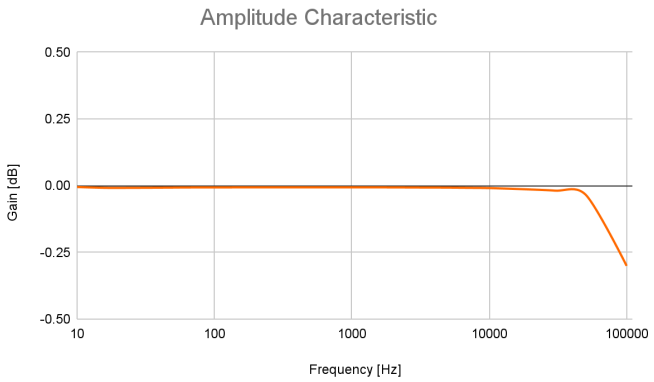


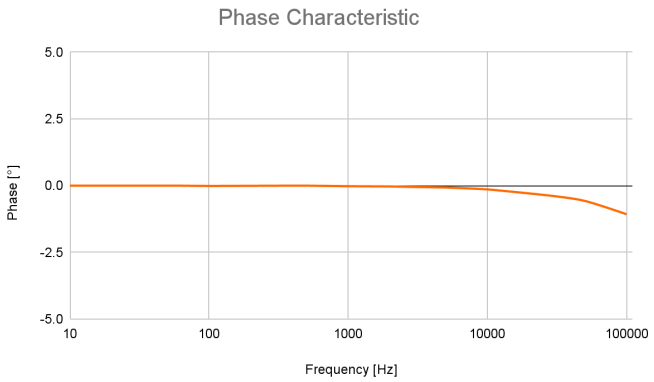
CT500



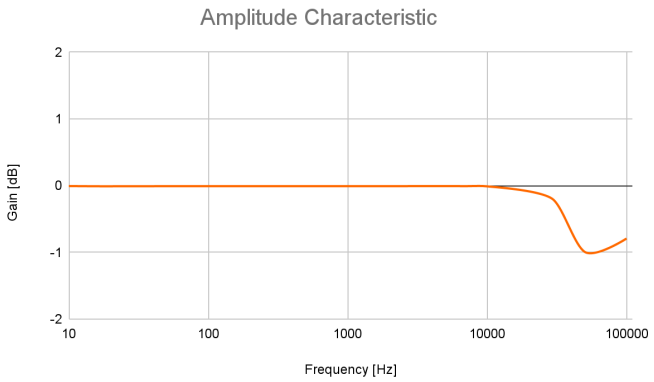


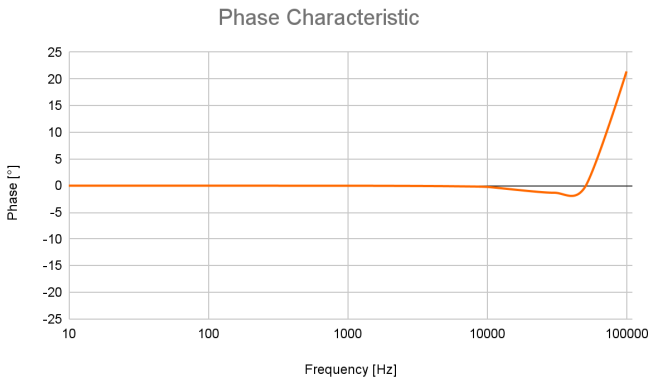
CT1000





CT2000



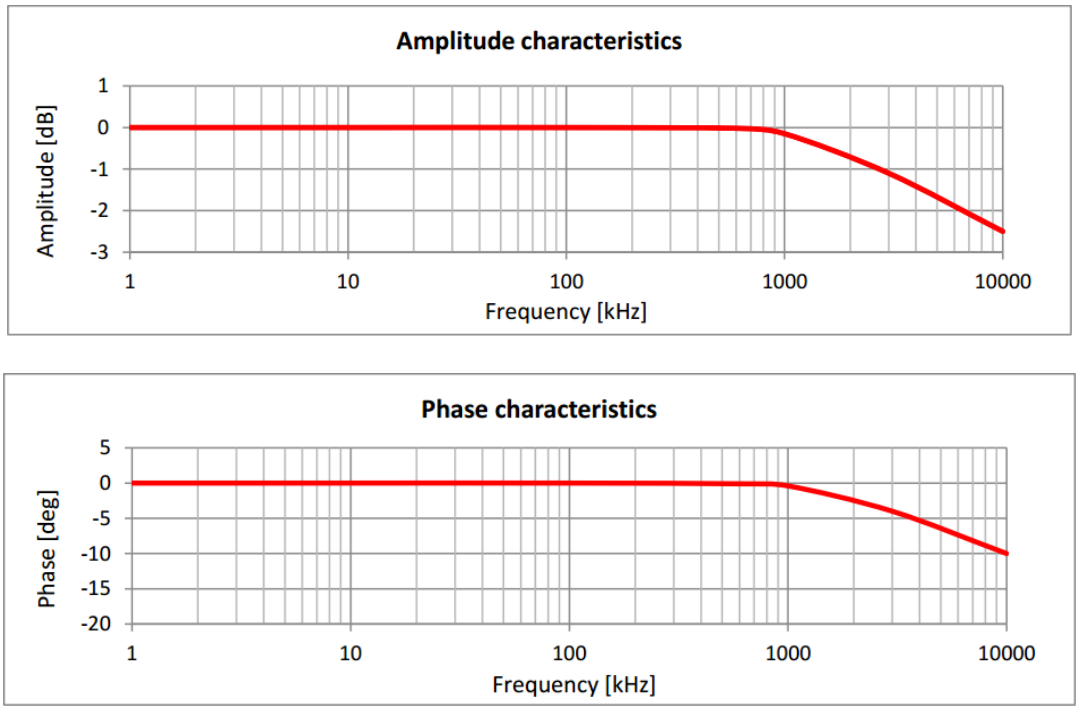


2.2.3. Shunt DSI-MCTS-X00N: Specifications

Note: The DSI-MCTS-x-03M cable only can be used for the corresponding zero-flux transducer. The cables have a built-in shunt, which must match the corresponding transducer. The following table shows which shunt cables belong to the corresponding zero-flux transducer:

Resistor		
Cable	**R / P**	**Fits to**
DSI-MCTS-100N-03M	5 Ω / 1 Watt	CT 100
DSI-MCTS-200N-03M	5 Ω / 1 Watt	CT 200
DSI-MCTS-400N-03M	5 Ω / 1 Watt	CT 400
DSI-MCTS-500N-03M	1 Ω / 1 Watt	CT 500
DSI-MCTS-1000N-03M	1 Ω / 1 Watt	CT 1000
DSI-MCTS-2000N-03M	1 Ω / 2 Watt	CT 2000
General Specifications		
Pulse Power (5 sec)	200 %	
Technology	Metal Foil	
Accuracy		
Amplitude Accuracy	±0.01 %	
Temperature Coefficient	Typ: ±2 ppm/°C (max. ± 5 ppm/°C)	
Load Life Stability	±0.005 % @ 25 °C, 2000 h at rated power	
Frequency Characteristics		
Angular Accuracy	< 1° @ 500 kHz	
Frequency Range	< 0.5 dB @ 1000 kHz	
Rise Time	1 ns	
Inductance (L)	max. 0.1 µH (typical 0.03 µH)	
Capacitance (C)	max. 1 pF (typical 0.5 pF)	

2.2.3.1. Shunt DSI-MCTS-X00N: Amplitude and Phase Chart



SHUNT DSI-MCTS-X00-03M Characteristics

2.3. Clamps

2.3.1. DC CLAMPS FluxGate Technology

Fluxgate current sensors make use of a high permeability magnetic core in order to ascertain the magnetic field that is produced as the current flows through a conductor. Fluxgate technology depends on a negative feedback circuit, including a magnetic circuit. This is done by reverting a current back through the feedback coil so that the magnetic flux can be canceled out. The magnetic flux is caused in the coil by the current that is being measured. This decreases the effect of the material's magnetic nonlinearity, as it is compensated and can be kept low.

Fluxgate technology can detect current using the DC current detection method. This brings the inherent advantage with it that there is no need to use semiconductors. This enables the current clamps to have a long-term stability as well as a wide temperature stability range and a very low offset voltage.

Most clamp-type transducers have a lower accuracy than their unibody counterparts, this is mainly due to the split in the magnetic core that is needed to open the clamp. Fluxgate current clamps are the industry leading clamps when it comes to linearity, bandwidth and temperature drift, second only to the high quality unibody zero-flux transducers.

This Current transducer needs to be powered by a SIRIUSi PWR-MCTS2.

2.3.1.1. DC CLAMPS FluxGate Technology: Specifications

Specifications in the table are provided by the sensor manufacturer.

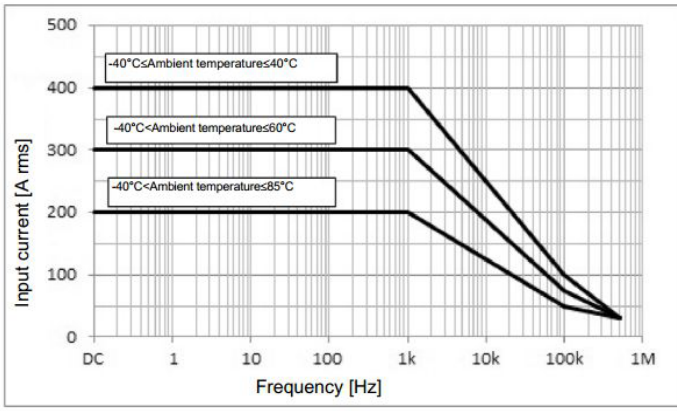
	DS-CLAMP-200DC		DS-CLAMP-500DCS		DS-CLAMP-500DC		DS-CLAMP-1000DC	
Type	Flux gate		Flux gate		Flux gate		Flux gate	
Current Range	200 A DC or AC RMS		500 A DC or AC RMS		500 A DC or AC RMS		1000 A DC or AC RMS	
Sensitivity	10 mV/A		4 mV/A		4 mV/A		2 mV/A	
Bandwidth	DC to 500 kHz		DC to 200 kHz		DC to 100 kHz		DC to 20 kHz	
Bandwidth (upgraded after 2022)	DC to 700 kHz		DC to 500 kHz		DC to 200 kHz		not yet available	
TEDS	Fully supported		Fully supported		Fully supported		Fully supported	
Conductor Position Sensitivity	max. ± 0.1 % of reading		max. ± 0.1 % of reading		max. ± 0.2 % of reading		max. ± 0.2 % of reading	
Zero Offset (+25°C)	max. ± 10 mA		max. ± 250 mA		max. ± 250 mA		max. ± 50 mA	
Error due Earth Magnetic Field	max. ± 50 mA		max. ± 100 mA		max. ± 150 mA		max. ± 150 mA	
Temp. Coefficient	± 0.01 %/°C		± 0.01 %/°C		± 0.01 %/°C		± 0.01 %/°C	
Accuracy								
Frequency	**Amplitude**	**Phase Error**	**Amplitude**	**Phase Error**	**Amplitude**	**Phase Error**	**Amplitude**	**Phase Error**
DC	± 0.2 % rdg. ± 40 mA	-	± 0.3 % rdg. ± 100 mA	-	± 0.2 % rdg. ± 100 mA	-	± 0.2 % rdg. ± 200 mA	-
to 100 Hz	± 0.2 % rdg. ± 20 mA	± 0.1 °	± 0.3 % rdg. ± 50 mA	± 0.1 °	± 0.2 % rdg. ± 50 mA	± 0.1 °	± 0.2 % rdg. ± 100 mA	± 0.1 °
100 - 500 Hz	± 0.3 % rdg. ± 40 mA	± 0.2 °	± 0.3 % rdg. ± 100 mA	± 0.2 °	± 0.3 % rdg. ± 100 mA	± 0.2 °	± 0.5 % rdg. ± 200 mA	± 0.2 °
500 Hz - 1 kHz		± 0.5 °	± 0.5 % rdg. ± 100 mA	± 0.5 °	± 0.5 % rdg. ± 100 mA	± 0.5 °	± 1.0 % rdg. ± 200 mA	± 0.5 °
1 kHz - 5 kHz	± 1.0 % rdg. ± 40 mA	± 1.0 °	± 1.0 % rdg. ± 100 mA	± 1.0 °	± 1.0 % rdg. ± 100 mA	± (0.5 f [kHz]) °	± 2.0 % rdg. ± 200 mA	± (0.7 f [kHz]) °
5 kHz - 10 kHz	± 1.5 % rdg. ± 40 mA	± 1.5 °	± 1.5 % rdg. ± 100 mA	± 1.5 °	± 1.5 % rdg. ± 100 mA	± (0.5 f [kHz]) °	± 5.0 % rdg. ± 200 mA	± (0.7 f [kHz]) °
10 kHz - 20 kHz	± 5 % rdg. ± 40 mA	± (0.5 + 0.1 f [kHz]) °	± 5 % rdg. ± 100 mA	± (0.5 + 0.1 f [kHz]) °	± 5 % rdg. ± 100 mA	± (0.5 f [kHz]) °	± 30 % rdg. ± 200 mA	± (0.7 f [kHz]) °
20 kHz - 50 kHz	± 5 % rdg. ± 40 mA	± (0.5 + 0.1 f [kHz]) °	± 5 % rdg. ± 100 mA	± (0.5 + 0.1 f [kHz]) °	± 10 % rdg. ± 250 mA	± (0.5 f [kHz]) °	± 30 % rdg. ± 200 mA	± (0.7 f [kHz]) °
50 kHz - 100 kHz	± 10 % rdg. ± 100 mA	± (0.5 + 0.1 f [kHz]) °	± 15 % rdg. ± 250 mA	± (0.5 + 0.1 f [kHz]) °	± 30 % rdg. ± 250 mA	± (0.5 f [kHz]) °	/	/
100 kHz - 200 kHz	± 15 % rdg. ± 40 mA	± (0.5 + 0.1 f [kHz]) °	± 30 % rdg. ± 250 mA	± (0.5 + 0.1 f [kHz]) °	/	/	/	/
200 kHz - 300 kHz	± 15 % rdg. ± 40 mA	± (0.5 + 0.1 f [kHz]) °	/	/	/	/	/	/
300 kHz - 500 kHz	± 30 % rdg. ± 100 mA	± (0.5 + 0.1 f [kHz]) °	/	/	/	/	/	/

General Specifications				
Dimensions [mm]	153 x 67 x 25	153 x 67 x 25	238 x 114 x 35	238 x 114 x 35
Max. Conductor Size	20 mm	20 mm	50 mm	50 mm
Power Supply	± 11 V to ± 15 V	± 11 V to ± 15 V	± 11 V to ± 15 V	± 11 V to ± 15 V
Current Consumption	max. 6 VA	max. 7 VA	max. 7 VA	max. 7 VA
Operating Environment	Indoors, Pollution Degree II, altitude up to 2000m	Indoors, Pollution Degree II, altitude up to 2000m	Indoors, Pollution Degree II, altitude up to 2000m	Indoors, Pollution Degree II, altitude up to 2000m
Operating Temp.	- 40 °C to + 85 °C	- 40 °C to + 85 °C	- 40 °C to + 85 °C	- 40 °C to + 85 °C
Operating Humidity	up to 80 % (not condensing)	up to 80 % (not condensing)	up to 80 % (not condensing)	up to 80 % (not condensing)
Safety Standards	EN61010-2-032:2012	EN61010-2-032:2012	EN61010-2-032:2012	EN61010-2-032:2012
EMC Standards	EN61326-1:2013	EN61326-1:2013	EN61326-1:2013	EN61326-1:2013
Rohs	EN50581:2012	EN50581:2012	EN50581:2012	/
PWR-MCTS2 needed	Yes	Yes	Yes	Yes
Compatible amplifiers (see 1)	SIRIUS LV / HS-LV / XHS-LV SIRIUS STG / HS-STG SIRIUS STGM, SIRIUS UNI DEWE 43 IOLITE STG, KRYPTON STG IOLITE LVe	SIRIUS LV / HS-LV / XHS-LV SIRIUS STG / HS-STG SIRIUS STGM, SIRIUS UNI DEWE 43 IOLITE STG, KRYPTON STG IOLITE LVe	SIRIUS LV / HS-LV / XHS-LV SIRIUS STG / HS-STG SIRIUS STGM, SIRIUS UNI DEWE 43 IOLITE STG, KRYPTON STG IOLITE LVe	SIRIUS LV / HS-LV / XHS-LV SIRIUS STG / HS-STG SIRIUS STGM, SIRIUS UNI DEWE 43 IOLITE STG, KRYPTON STG IOLITE LVe
Cable length	3 m - MCTS to Clamp 0.3 m - Amplifier to MCTS	3 m - MCTS to Clamp 0.3 m - Amplifier to MCTS	3 m - MCTS to Clamp 0.3 m - Amplifier to MCTS	3 m - MCTS to Clamp 0.3 m - Amplifier to MCTS
1) The ranges of the IOLITE and KRYPTON amplifiers might affect the resolution of the measured values.				

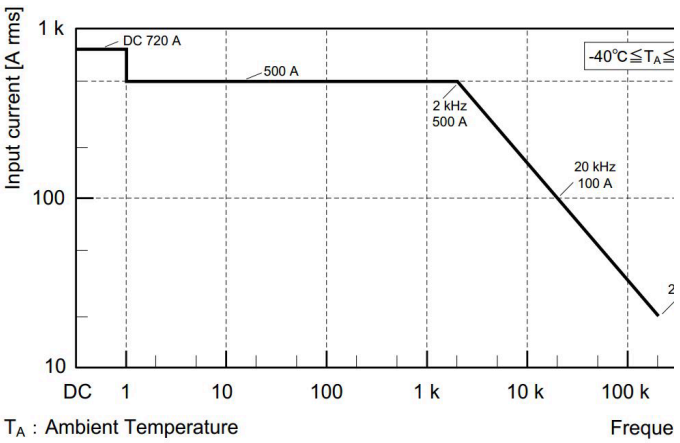
Warning

Never operate the DC CLAMPS Fluxgate (DS-CLAMP-200DC, DS-CLAMP-500DCS, DS-CLAMP-500DC, DS-CLAMP-1000DC) without power supply (SIRIUSi-PWR-MCTS2, SIRIUSir-PWR-MCTS2). The clamps can be damaged!

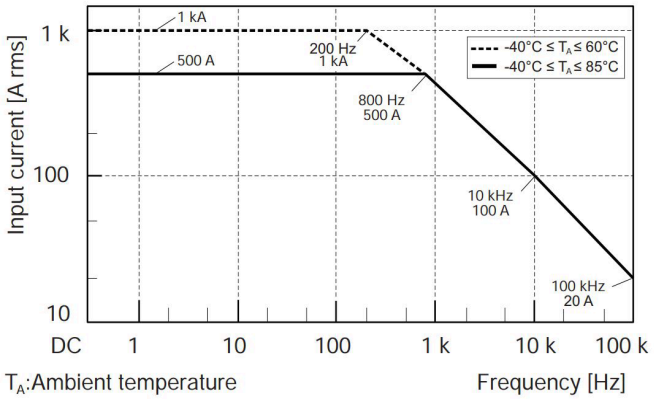
2.3.1.2. Frequency derating curves



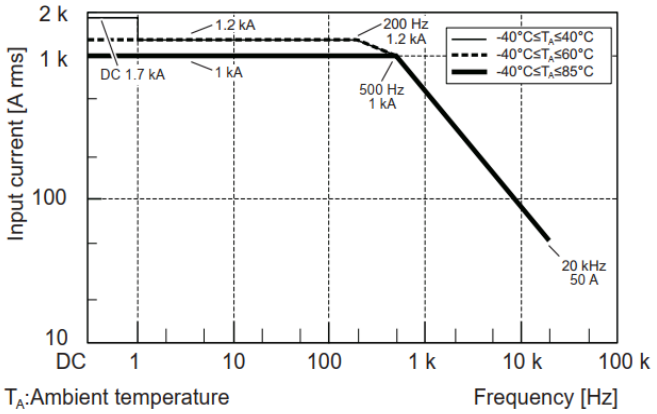
Frequency derating curve DS-CLAMP-200DC



Frequency derating curve DS-CLAMP-500DCS



Frequency derating curve DS-CLAMP-500DC



Frequency derating curve DS-CLAMP-1000DC

2.3.1.3. Measurement procedure (Typ: FluxGate Technology)

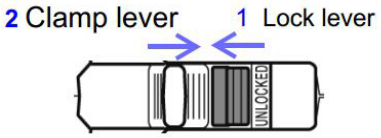
At the start of measurement

1. Connect the device to the product with which you wish to use it. (while that product's power is off)

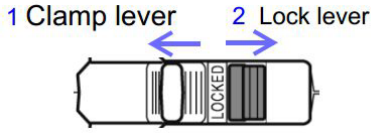
2. Turn of the product with which you wish to use the device

3. Perform zero-adjustment (0 ADJ) or demagnetization (DEMAG) as necessary. (See “Demagnetization (DEMAG) and zero-adjustment (0 ADJ).”)

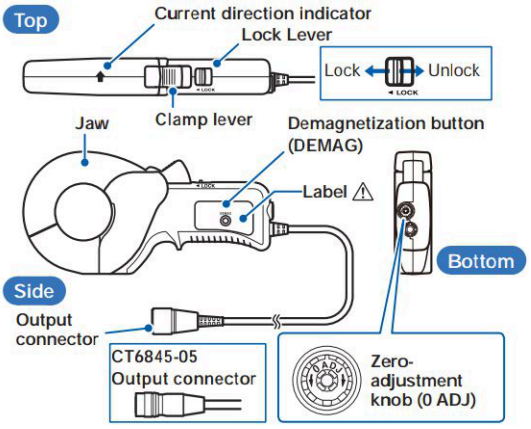
4. Slide the lock lever until the UNLOCKED label is visible and the mechanism in place. Then slide the clamp lever to open the clamp mechanism. Apply the clamp mechanism to roughly the center of the conductor being measured.



5. Slide the clamp lever to close the clamp mechanism, verify that the tips of the clamp mechanism have met each other properly, and slide the lock lever until the LOCKED label is visible to lock the mechanism in place.

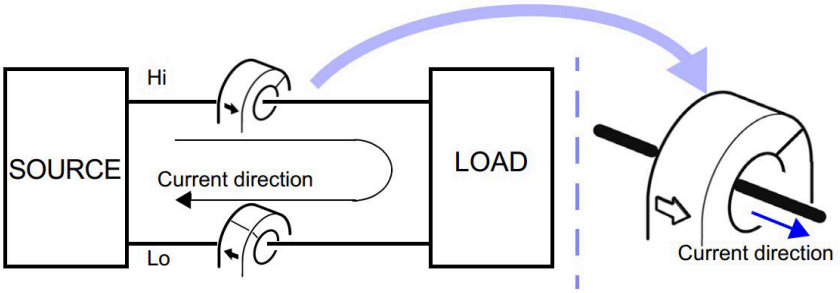


6. Start measurement



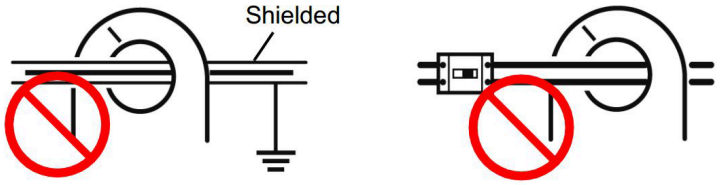
Use of the lock lever for DS-CLAMP-500DC

Wiring



Example Wiring

- Make sure the direction of the arrow on the case matches the direction of the current flow. If they are oriented incorrectly, the output signal from the sensor will be reversed.
- When the device is used with a wattmeter, follow the wiring instructions provided with the wattmeter.
- High-frequency large current at a frequency of 1 kHz or higher can increase measurement error or distort the measured waveform due to the position of the conductor to be measured. Locate the conductor as close as possible to the center of the clamp. Unclamped conductors carrying a high-frequency large current can also increase measurement error or distort the measured waveform. Keep unclamped conductors away from the clamp of the device.



Demagnetization (DEMAG) and zero-adjustment (0 ADJ)

An offset will be output immediately after the power is turned on and when an overcurrent in excess of the rated current is input to the device. Since this offset will cause an error during DC current measurement, perform zero-adjustment as follows:

1. Slide the clamp lever to open the clamp mechanism and press the "DEMAG" button on the panel.
2. Open and close the clamp mechanism two or three times, confirm that the offset output is stabilized, and then slide the lock lever until the LOCKED label is visible to lock the mechanism in place.
3. Monitor the offset output and perform zero-adjustment with the zero-adjustment knob on the bottom of the device.

Warning

- Zero-adjustment cannot be performed while the device is receiving current input.
- Because offset output varies with the surrounding environment and the ambient temperature (terrestrial magnetism and devices that generate magnetic fields), zero adjustment should be performed at the same location at which measurements will be made.
- If the device is connected to an instrument with a zero correction function, align the notch of the zero-adjustment knob with the center.
- Mechanical shock, for example from dropping the instrument, may cause the offset to shift.
- If unable to fully correct values, perform demagnification (DEMAG) several times with the clamp in the closed position.

When measurement is complete

1. Slide the lock lever until the UNLOCKED label is visible. Then slide the clamp lever to open the clamp mechanism and remove the device from the conductor.
2. Turn off the product with which the device is being used.
3. Disconnect the device from the product's connector.

2.3.1.4. DS-CLAMP-200DC

DS-CLAMP-200DC

DS-CLAMP-200DC: Connection

The DS-CLAMP-200DC needs the SIRIUSi-PWR-MCTS2 power supply. The DS-CLAMP-200DC is connected to the SIRIUSi-PWR-MCTS2. An adapter cable D9m-D9f-03M-CLAMP brings the low voltage signal to the Sirius® HS-LV or Sirius® LV input amplifier:

DS-CLAMP-200DC: Connection

2.3.1.5. DS-CLAMP-500DC

DS-CLAMP-500DC

DS-CLAMP-500DC: Connection

The DS-CLAMP-500DC needs the SIRIUSi-PWR-MCTS2 or SIRIUSir-PWR-MCTS2 power supply. The DS-CLAMP-500DC is connected to the SIRIUSi-PWR-MCTS2 or SIRIUSi-PWR-MCTS2. An adapter cable D9m-D9f-03M-CLAMP brings the low voltage signal to the Sirius® HS-LV or Sirius® LV input amplifier:

DS-CLAMP-500DC: Connection

2.3.1.6. DS-CLAMP-500DCS

DS-CLAMP-500DC

DS-CLAMP-500DCS: Connection

The DS-CLAMP-500DCS needs the SIRIUSi-PWR-MCTS2 or SIRIUSir-PWR-MCTS2 power supply. The DS-CLAMP-500DC is connected to the SIRIUSi-PWR-MCTS2 or SIRIUSi-PWR-MCTS2. An adapter cable D9m-D9f-03M-CLAMP brings the low voltage signal to the Sirius® HS-LV or Sirius® LV input amplifier:

DS-CLAMP-500DC: Connection

2.3.1.7. DS-CLAMP-1000DC

DS-CLAMP-1000DC

DS-CLAMP-1000DC: Connection

The DS-CLAMP-1000DC needs the SIRIUSi-PWR-MCTS2 or SIRIUSir-PWR-MCTS2 power supply. The DS-CLAMP-1000DC is connected to the SIRIUSi-PWR-MCTS2 or SIRIUSi-PWR-MCTS2. An adapter cable D9m-D9f-03M-CLAMP brings the low voltage signal to the Sirius® HS-LV or Sirius® LV input amplifier:

DS-CLAMP-1000DC: Connection

2.3.2. DC CLAMPS Hall Effect Technology

The Hall Effect is conveniently used to measure both the AC and DC current with a wide amplitude and frequency range (up to 100 kHz) with high sensitivity. For this reason, it is recommended to use hall effect-based clamps to measure DC currents.

The working principle of the current transducer is as follows:
These types of current transducers measure the magnitude of the magnetic field that is created by the flow of current. A voltage is generated by the transducer that is known as a Hall voltage that is induced by the magnetic field, the transducer then measures the magnetic flux density of the field.

Therefore the working principle of this type of transducer is based on the Hall voltage principle. In essence this principle states that if a conductor (or semiconductor) that has a current flowing through it in one direction, is brought in contact with a magnetic field, a voltage can be measured.

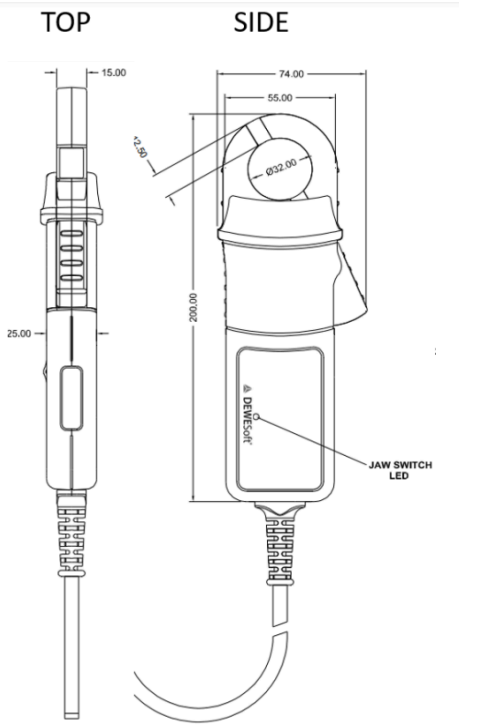
2.3.2.1. DC CLAMPS Hall Effect Technology: Specifications

Specifications in the table are provided by the sensor manufacturer.

	DS-CLAMP-150DC	DS-CLAMP-150DCS	DS-CLAMP-1800DC
Type	Hall Effect	Hall Effect	Hall Effect
Current Range	200 A DC or 150 A AC RMS	250 A DC or 150 A AC RMS	1800 A DC or AC RMS
Sensitivity	20 mV/A	20 mV/A	1 mV/A
Accuracy (+25°C)	1 % + 2 mA	1 % + 2 mA	0 - 1000 A: ± 2.5 % of reading ± 0.5 A 1000 - 1500 A: ± 3.5 % of reading 1500 - 1800 A: ± 5 % of reading
Bandwidth	DC to 100 kHz	DC to 100 kHz	DC to 20 kHz
Resolution	± 1 mA	± 1 mA	± 1 mA
TEDS	Fully supported	Fully supported	Fully supported
Conductor Position Sensitivity	± 0.5 %	± 0.5 %	± 1.5 %
Zero Offset (+25°C)	± 10 mV max. + 1 mV/°C	± 10 mV max. + 1 mV/°C	-
Error due Earth Magnetic Field	± 0.5 mV	±0.5 mV	max. 150 mA
Temp. Coefficient	± 0.02 % of reading / °C	± 0.02 % of reading / °C	± 0.15 % of reading / °C
Zero	Auto zero @ power supply of sensor	Auto zero @ power supply of sensor	Auto zero via push-button
General Specifications			
Dimensions [mm]	205 x 60 x 15	106 x 100 x 25	205 x 60 x 15
Max. Conductor Size	32 mm	25 mm	32 mm
Power Supply	± 10 V	± 10 V	+ 9 V
Current Consumption	30 mA + 1mA/A measured	30 mA + 1mA/A measured	max. 25mA
Jaws Open Indication	Yes	No	No
Operating Temp.	0 to + 60 °C	0 to + 60 °C	0 to + 50 °C
Operating Humidity	15 % to 85 % (not condensing)	15 % to 85 % (not condensing)	15 % to 85 % (not condensing)
Safety Standards	EN 61010-1:2010 EN 61010-2-032:2012 EN 61010-2-031:2012	EN 61010-1:2010 EN 61010-2-032:2012 EN 61010-2-031:2012	EN 61010-1:2010 EN 61010-2-032:2012 EN 61010-2-031:2012
Safety	300 Vrms CAT III	300 Vrms CAT III	300 Vrms CAT III
EMC Standards	EN 61326-2-2:2013	EN 61326-2-2:2013	EN 61326-2-2:2013
PWR-MCTS2 needed	No	No	No
Compatible Amplifiers	SIRIUS LV / HS-LV / XHS-LV (see 1)	SIRIUS LV / HS-LV / XHS-LV (see 1)	SIRIUS LV / HS-LV / XHS-LV SIRIUS STG / HS-STG SIRIUS STGM, SIRIUS UNI IOLITE STG, KRYPTON STG IOLITE LVe DEWE-43
Cable length	3 m	3 m	3 m
1) *in-rush current is too high, so the clamps are not compatible with other amplifiers			

2.3.2.2. DS-CLAMP-150DC

DS-CLAMP-150DC



DS-CLAMP-150DC Dimensions

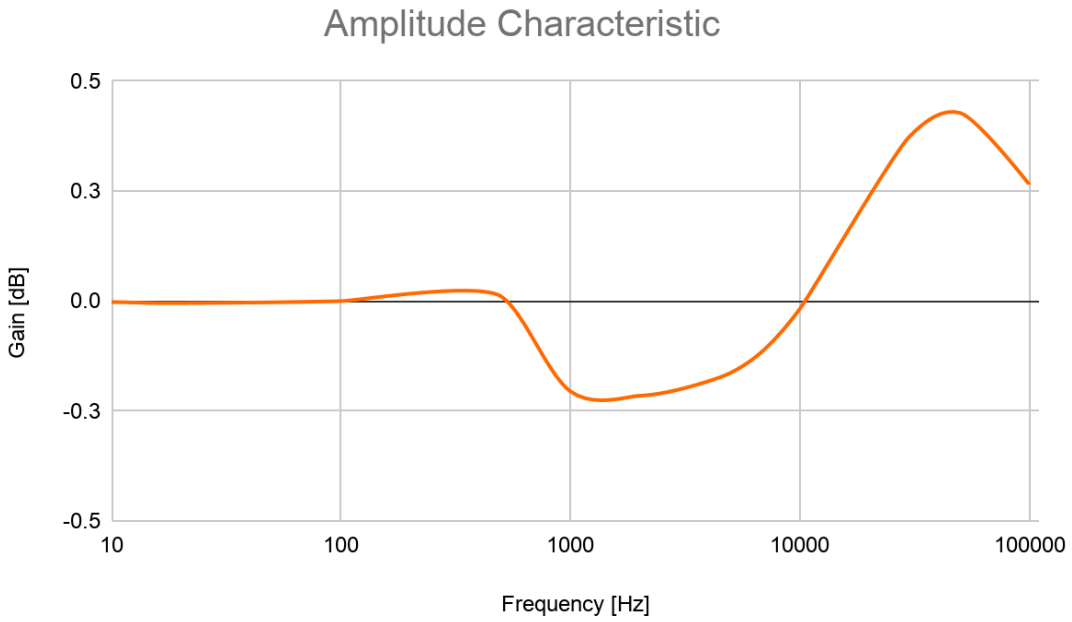
DS-CLAMP-150DC: Connection

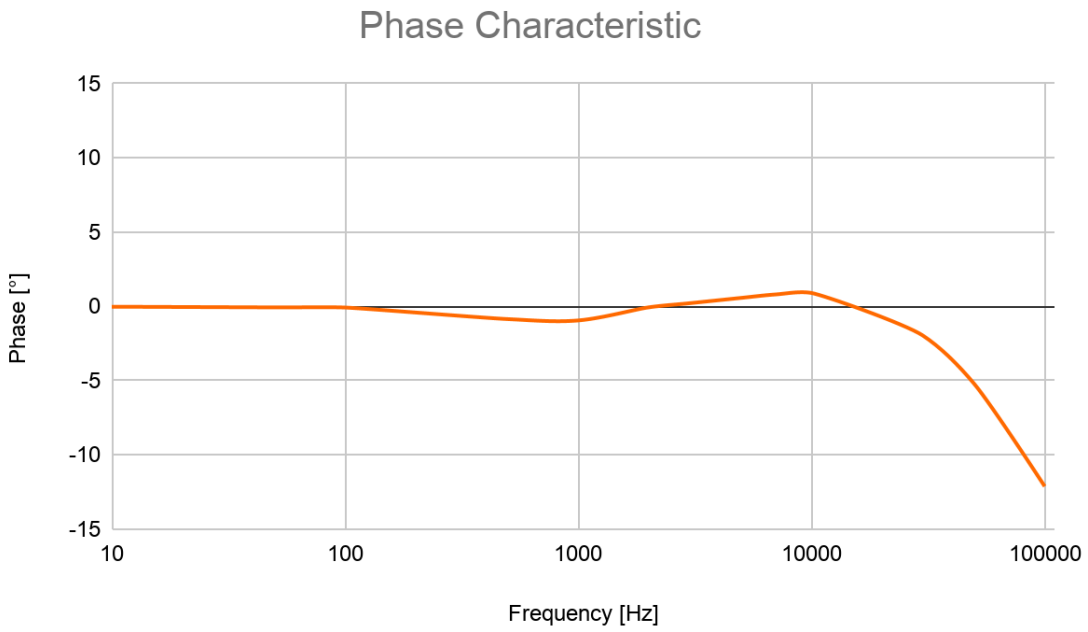
The DS-CLAMP-150DC can be connected directly to a Sirius® LV or Sirius® HS-LV amplifier with DSUB-9 connector

DS-CLAMP-150DC: Connection

2.3.2.3. DS-CLAMP-150DC: Amplitude and Phase Characteristics

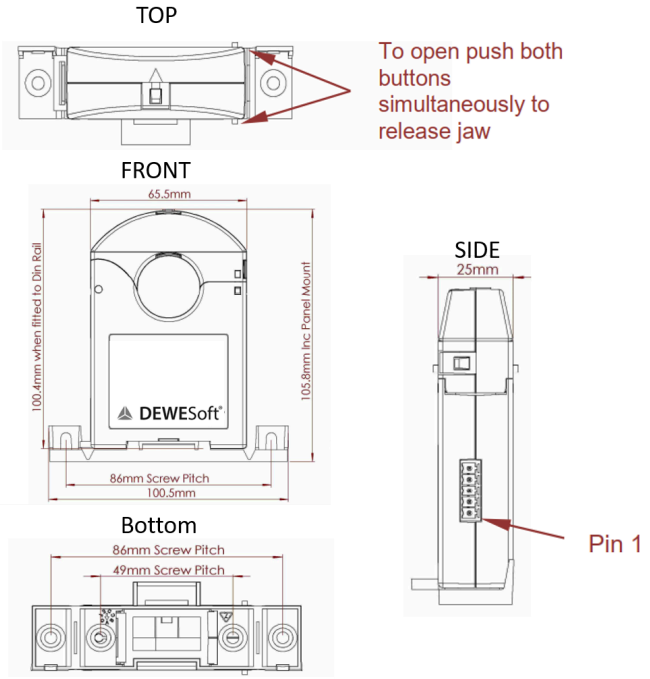
These characteristics were measured in the actual system (SIRIUS + MCTS + Transducer). There is some difference between the measurements of the typical response and manufacturer's maximum ratings.





2.3.2.4. DS-CLAMP-150DCS

DS-CLAMP-150DCS



DS-CLAMP-150DCS Dimentions

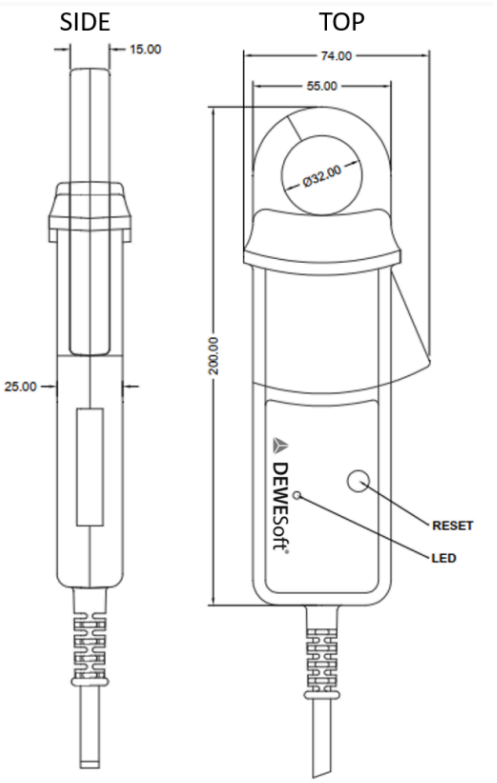
DS-CLAMP-150DCS: Connection

The DS-CLAMP-150DCS can be connected directly to a Sirius® LV or Sirius® HS-LV amplifier with DSUB-9 connector.

DS-CLAMP-150DCS: Connection

2.3.2.5. DS-CLAMP-1800DC

DS-CLAMP-1800DC



DS-CLAMP-1800DC: Dimensions

DS-CLAMP-1800DC: Connection

The DS-CLAMP-1800DC can be connected directly to all DewesoftX® amplifiers with DSUB-9 connector (e.g. Sirius® LV).

DS-CLAMP-1800DC: Connection

2.3.3. AC CLAMPS Iron Core Technology

These clamps are based on AC transformer technology and can therefore only be used for measuring alternating currents. These types of current transducers do not need excitation and can therefore be used on any Dewesoft amplifier that has a DSUB9 connector. These types of current transducers are usually more affordable due to the fact that they have a simpler working principle.

The working principle of the current transducer is as follows:
The alternating current (AC) that is flowing induces a magnetic flux in the core of the current transducer. There is a secondary magnetic flux that is induced in the secondary coil of the current transducer. The second magnetic flux is a reaction to the primary magnetic flux as it tries to cancel it out, this also has the effect that there is a secondary current induced that is proportional to the secondary magnetic flux. As the secondary current flows over the secondary coil which has a shunt resistor incorporated, there is then a voltage drop over the resistor which is proportional to the current that is flowing.

2.3.3.1. AC CLAMPS Iron Core Technology: Specifications

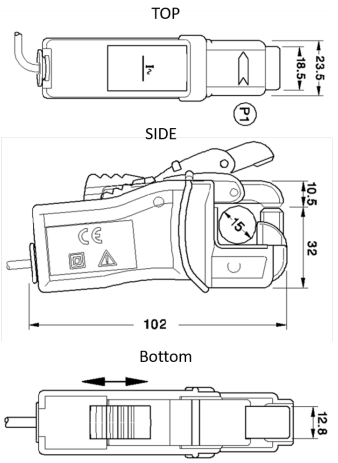
Specifications in the table are provided by the sensor manufacturer.

	DS-CLAMP-5AC	DS-CLAMP-15AC	DS-CLAMP-200AC	DS-CLAMP-1000AC
Type	Iron-Core	Iron-Core	Iron-Core	Iron-Core
Range	5 A AC RMS	15 A AC RMS	200 A AC RMS	1000 A AC RMS
Sensitivity	100 mV/A	100 mV/A	10 mV/A	1 mV/A
Accuracy (+25 °C)	5 mA - 0.5 A ± 2 % of reading 0.5 A - 1 A ± 1 % of reading 1 A - 12 A ±0 .5 % of reading	< 1 A ± 2.5 % of reading 1 A - 15 A ± 1 % of reading	0.5 A - 10 A ± 3.5 % of reading 10 A - 100 A ± 2.5 % of reading 100 A - 240 A ± 1 % of reading	< 1 A ± 2 % of reading 10 A - 100 A ± 0.5 % of reading 100 A - 1200 A ± 0.3 % of reading
Phase Error	5 mA - 0.5 A ± 2 ° 0.5 A - 1 A ± 1° 1 A - 12 A ± 1 °	< 1 A ± 5 ° 1 A - 15 A ± 3 °	0.5 A - 10 A not specified 10 A - 100 A ≤ 5 ° 100 A - 240 A ≤ 2.5 °	< 1 A not specified 10 A - 100 A ≤ 1 ° 100 A - 1200 A ≤ 0.7 °
Bandwidth	2 Hz to 5 kHz	2 Hz to 10 kHz	2 Hz to 10 kHz	2 Hz to 10 kHz
Resolution	0.01 A	0.01 A	0.5 A	0.001 A
TEDS	Fully supported	Fully supported	Fully supported	Fully supported
Overload Capability	1.5 x I nominal	1.3 x I nominal	1.3 x I nominal	1.3 x I nominal
Conductor Position Sensitivity	≤ 0.5 % of reading	≤ 0.5 % of reading	≤ 0.5 % of reading	≤ 0.1 % of reading
Influence of Crest Factor	≤ 1 %	≤ 3 %	≤ 3 %	≤ 1 %
Error due Earth Magnetic Field	/	≤ 15 mV/A @ 50 Hz	≤ 15 mV/A @ 50 Hz	≤ 15 µV/A @ 50 Hz
Temperature Coefficient	±0.015 % / °C	≤ 0.2 % / 10 °C	≤ 0.2 % / 10 °C	≤ 0.1 % / 10 °C
Influence of Frequency	/	< 5 % of output signal from 20 Hz ... 1 kHz < 10 % of output signal from 1 kHz ... 10 kHz	< 3 % of output signal from 20 Hz ... 1 kHz < 12 % of output signal from 1 kHz ... 10 kHz	< 1 % of output signal from 30 Hz ... 48 Hz < 0.5 % of output signal from 35 Hz ... 1 kHz < 1 % of output signal from 1 kHz ... 5 kHz
General Specifications				
Dimensions [mm]	102 x 34 x 24	135 x 51 x 30	135 x 51 x 30	216 x 111 x 45
Conductor Diameter	15 mm	20 mm	20 mm	52 mm
Operating Temperature	-10 °C to +55 °C	-40 °C to +70 °C	-40 °C to +70 °C	-40 °C to +70 °C
Operating Humidity	up to 85 % (not condensing)	up to 85 % (not condensing)	up to 85 % (not condensing)	up to 85 % (not condensing)
Safety Standards	EN61010-2 EN61010-2-032:2012	EN61010-2 EN61010-2-032:2012	EN61010-2 EN61010-2-032:2012	EN61010-2 EN61010-2-032:2012

Safety	CAT III 600V CAT IV 300V	CAT III 600V CAT IV 300V	CAT III 600V CAT IV 300V	CAT III 600V CAT IV 300V
EMC Standards	EN61326-1:2013	EN61326-1:2013	EN61326-1:2013	EN61326-1:2013
PWR-MCTS2 needed	No	No	No	No
Compatible Amplifiers	SIRIUS LV / HS-LV / XHS-LV SIRIUS STG / HS-STG SIRIUS STGM, SIRIUS UNI DEWE 43 IOLITE STG, KRYPTON STG IOLITE LVe	SIRIUS LV / HS-LV / XHS-LV SIRIUS STG / HS-STG SIRIUS STGM, SIRIUS UNI DEWE 43 IOLITE STG, KRYPTON STG IOLITE LVe	SIRIUS LV / HS-LV / XHS-LV SIRIUS STG / HS-STG SIRIUS STGM, SIRIUS UNI DEWE 43 IOLITE STG, KRYPTON STG IOLITE LVe	SIRIUS LV / HS-LV / XHS-LV SIRIUS STG / HS-STG SIRIUS STGM, SIRIUS UNI DEWE 43 IOLITE STG, KRYPTON STG IOLITE LVe
Cable length	2 m	1.4 m	1.4 m	1.4 m

2.3.3.2. DS-CLAMP-5AC

DS-CLAMP-5AC



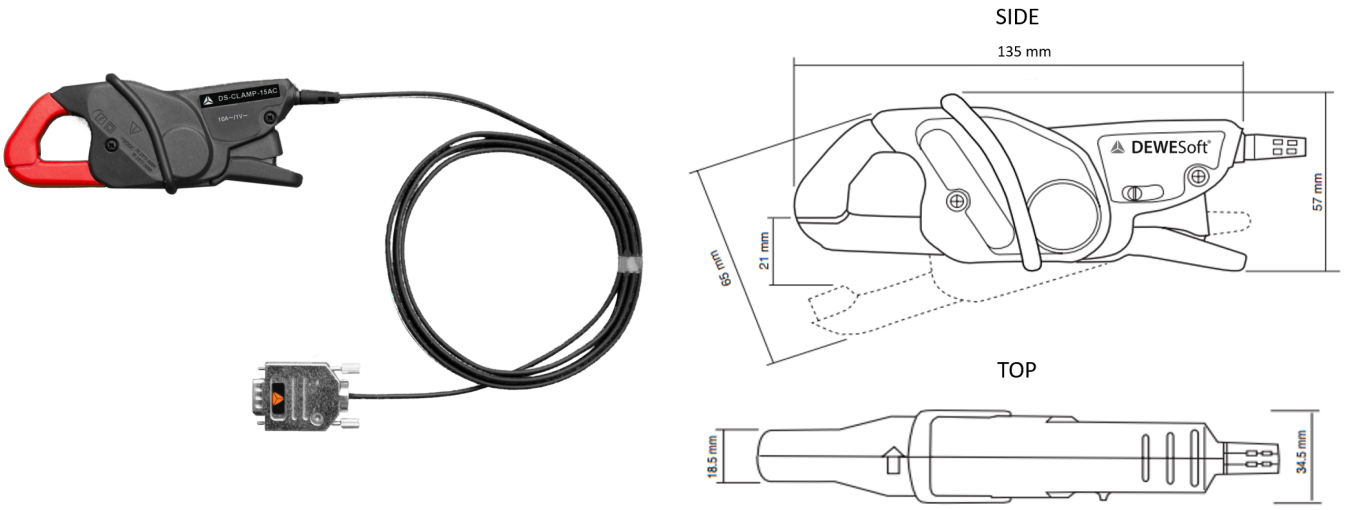
DS-CLAMP-5AC: Dimensions

DS-CLAMP-5AC: Connection

The DS-CLAMP-5AC can be connected directly to all DewesoftX® amplifiers with DSUB-9 connectors (e.g. Siriusi-LV).

DS-CLAMP-5AC: Connection

2.3.3.3. DS-CLAMP-15AC



DS-CLAMP-15AC

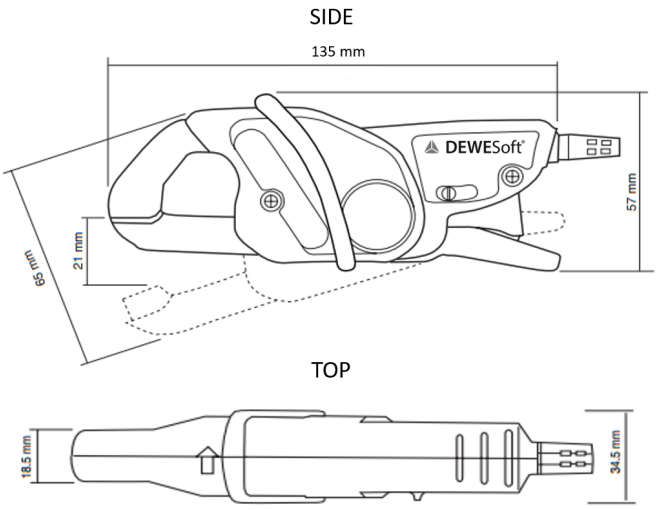
DS-CLAMP-15AC: Connection

The DS-CLAMP-15AC can be connected directly to all DewesoftX® amplifiers with DSUB-9 connectors (e.g. Siriusi-LV).

DS-CLAMP-15AC: Connection

2.3.3.4. DS-CLAMP-200AC

DS-CLAMP-200A



DS-CLAMP-200A Dimentions

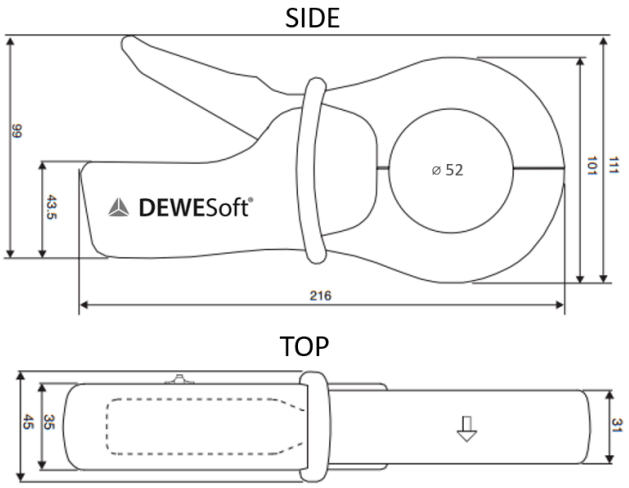
DS-CLAMP-200AC: Connection

The DS-CLAMP-200AC can be connected directly to all DewesoftX® amplifiers with DSUB-9 connectors (e.g. Siriusi-LV).

DS-CLAMP-200AC: Connection

2.3.3.5. DS-CLAMP-1000AC

DS-CLAMP-1000AC



DS-CLAMP-1000AC Dimensions

DS-CLAMP-1000AC: Connection

The DS-CLAMP-1000AC can be connected directly to all DewesoftX® amplifiers with DSUB-9 connectors (e.g. Siriusi-LV).

DS-CLAMP-1000AC: Connection

2.4. Other current sensors

2.4.1. Rogowsky coils

A Rogowski coil is a simple measurement device which allows an AC current measurement without splitting the conductor. It consists of a helical coil of wire with the lead from one end returning through the center of the coil to the other end so that both terminals are at the same end of the coil. This coil must be wrapped around the conductor where the current measurement will take place. This allows for a measurement to be done without cutting, disconnecting or stripping the wire. The alternating current in the conductor will cause a voltage induction in the coil.

There are also some disadvantages. Because the principle of measurement with the Rogowski coil is the measurement of the induced voltage caused by the current flowing inside of the coil, which is proportional to the derivation of the current, an integrator circuit must be used on the output side to make the output voltage proportional to the current flowing through the conductor. Therefore, an external power supply is necessary. It's not possible to measure DC currents (exception: special types of Rogowski coils are able to measure DC currents). The biggest disadvantage of the Rogowski coil is the phase shift. The phase shift also depends heavily on the positioning of the coil (vertical and horizontal). This positioning error of the coil cannot be compensated using the Dewesoft sensor editor. But the phase and amplitude error due to frequency behavior can be compensated using the sensor editor.

Measurement with the Rogowski coil has several advantages. Rogowski coils are available for measuring very small currents (≈ 100 mA) up to very high currents (> 100 kA). The coil itself is flexible, thin, light and robust. Since there are no magnetic materials, the Rogowski coils cannot saturate and, therefore, have a high overload withstand capability. They are very linear and immune to DC currents which allow for measuring small AC currents with the presence of a large DC component. The bandwidth of the Rogowski coils depends on the type and price and can go up to several MHz.

2.4.1.1. Rogowsky coils: Specifications

Specifications in the table are provided by the sensor manufacturer.

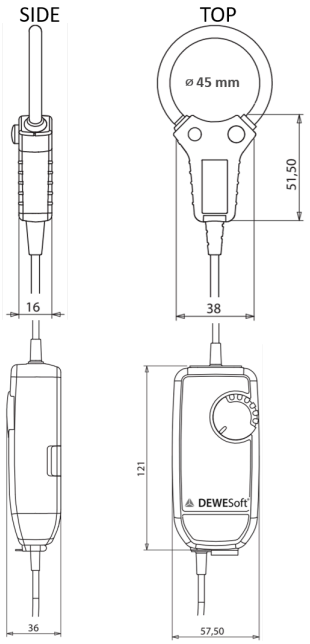
	DS-FLEX-3000-17	DS-FLEX-3000-35	DS-FLEX-3000-35HS	DS-FLEX-3000-80	DS-FLEX-30000-120
Type	Rogowski coil	Rogowski coil	Rogowski coil	Rogowski coil	Rogowski coil
Current Range	3 A, 30 A, 300 A, 3000 A AC RMS	3 A, 30 A, 300 A, 3000 A AC RMS	3000 A AC RMS	3 A, 30 A, 300 A, 3000 A AC RMS	30 A, 300 A, 3000 A, 30000 A AC RMS
Sensitivity	1000 mV/A, 100 mV/A, 10 mV/A, 1 mV/A	1000 mV/A, 100 mV/A, 10 mV/A, 1 mV/A	10 mV/A	1000 mV/A, 100 mV/A, 10 mV/A, 1 mV/A	100 mV/A, 10 mV/A, 1 mV/A, 0.1 mV/A
Accuracy (+25 °C)	≤ 1.5 %	≤ 1.5 %	≤ 1.0 %	≤ 1.5 %	≤ 1.5 %
Phase Error @ 50 Hz	≤ 1.0 deg	≤ 1.0 deg	≤ 1.0 deg	≤ 1.0 deg	≤ 1.0 deg
Bandwidth	3 A: 10 Hz to 10 kHz Others: 10 Hz to 20 kHz	3 A: 10 Hz to 10 kHz Others: 10 Hz to 20 kHz	5 Hz - 1MHz	3 A: 10 Hz to 10 kHz Others: 10 Hz to 20 kHz	30 A: 10 Hz to 5 kHz Others: 10 Hz to 20 kHz
TEDS	Not supported	Not supported	Fully supported	Not supported	Not supported
Noise	≤ 0.04 Arms	≤ 0.04 Arms	≤ 0.04 Arms	≤ 0.04 Arms	≤ 0.04 Arms
Temperature Coefficient	≤ 0.5 % / 10 °C	≤ 0.5 % / 10 °C	≤ 0.5 % / 10 °C	≤ 0.5 % / 10 °C	≤ 0.5 % / 10 °C
General Specifications					
Casing Dimensions [mm]	120 x 58 x 36	120 x 58 x 36	140 x 64 x 28	120 x 58 x 36	120 x 58 x 36
Coil Length	170 mm	350 mm	350 mm	800 mm	1200 mm
Coil Diameter	45 mm	100 mm	100 mm	250 mm	380 mm
Power Supply	+5 V	+5 V	+9 V	+5 V	+5 V
Operating Temperature	- 10 °C to + 55 °C	- 10 °C to + 55 °C	- 10 °C to + 55 °C	- 10 °C to + 55 °C	- 10 °C to + 55 °C
Operating Humidity	up to 90 % (not condensing)	up to 90 % (not condensing)	up to 90 % (not condensing)	up to 90 % (not condensing)	up to 90 % (not condensing)
Safety Standards	EN60529 EN61010-2 EN61010-2-032:2012	EN60529 EN61010-2 EN61010-2-032:2012	EN60529 EN61010-2 EN61010-2-032:2012	EN60529 EN61010-2 EN61010-2-032:2012	EN60529 EN61010-2 EN61010-2-032:2012
Safety	CAT IV 600V	CAT IV 600V	CAT III 1000V	CAT IV 1000V	CAT IV 1000V
EMC Standards	EN61326-1:2013	EN61326-1:2013	EN61326-1:2013	EN61326-1:2013	EN61326-1:2013
PWR-MCTS2 needed	No	No	No	No	No
Compatible amplifiers	SIRIUS LV / HS-LV / XHS-LV SIRIUS STG / HS-STG SIRIUS STGM DEWE 43 IOLITE LVe	SIRIUS LV / HS-LV / XHS-LV SIRIUS STG / HS-STG SIRIUS STGM DEWE 43 IOLITE LVe	SIRIUS LV / HS-LV / XHS-LV SIRIUS STG / HS-STG IOLITE STG, KRYPTON STG IOLITE LVe	SIRIUS LV / HS-LV / XHS-LV SIRIUS STG / HS-STG SIRIUS STGM DEWE 43 *not tested yet with IOLITE and KRYPTON modules	SIRIUS LV / HS-LV / XHS-LV SIRIUS STG / HS-STG SIRIUS STGM DEWE 43 *not tested yet with IOLITE and KRYPTON modules
Cable length	2.5 m (Extendable to 10 m upon request)	2.5 m (Extendable to 10 m upon request)	2.5 m (Extendable to 10 m upon request)	2.5 m (Extendable to 10 m upon request)	2.5 m (Extendable to 10 m upon request)

Specifications in the table are provided by the sensor manufacturer.

	DS-FLEX-CWTUM6-1200A
Type	Rogowski coil
Peak current	1200 A
Sensitivity	5 mV/A
Accuracy	max. ± 2 % of reading
Linearity	0.05 % of reading
DC offset	max. ± 3 mV (@ 25°C)
Bandwidth	3.2 Hz (-3 dB) ... 30 MHz (-3 dB)
Noise	max. 10 mVpp
TEDS	Supported
di/dt	70 kA/us (peak) 1.2 kA/us (rms)
Temperature Coefficient	≤ 0.5 % / 10 °C
General Specifications	
Coil Length	80 mm
Coil Cross Section	1.7 mm
Operating Temperature	- 40 °C to + 125 °C
Overvoltage protection	1.2 kVpeak (rating established @ 3 kVrms, 50 Hz, 60 s flash test)
PWR-MCTS2 needed	No
Compatible amplifiers	SIRIUS LV / HS-LV / XHS-LV SIRIUS STG / HS-STG SIRIUS STGM DEWE 43
Cable length	1 m

2.4.1.2. DS-FLEX-3000-17

DS-FLEX-3000-17



DS-FLEX-3000-17 Dimensions

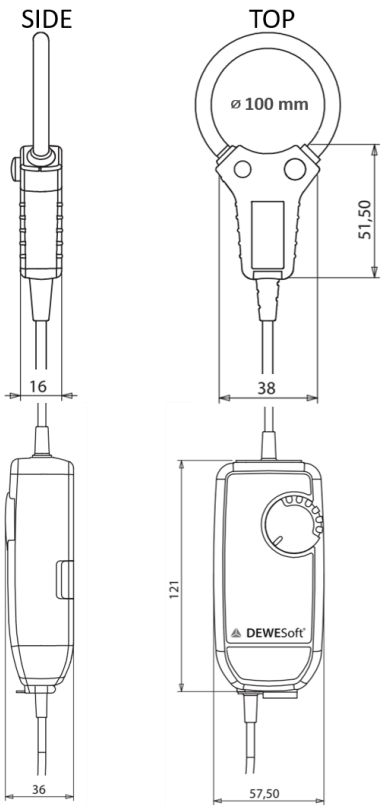
DS-FLEX-3000-17: Connection

The DS-FLEX-3000-17 can be connected directly to a Sirius® amplifier with DSUB-9 connector.

DS-FLEX-3000-17: Connection

2.4.1.3. DS-FLEX-3000-35

DS-FLEX-3000-35



DS-FLEX-3000-35 Dimensions

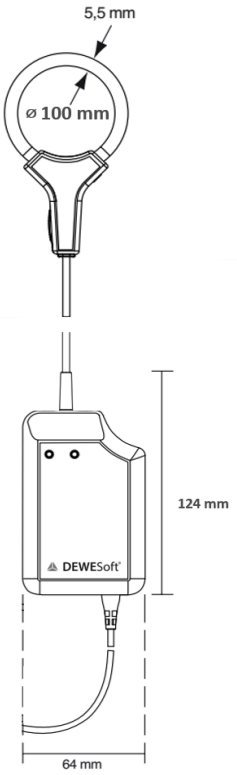
DS-FLEX-3000-35: Connection

The DS-FLEX-3000-35 can be connected directly to a Sirius® amplifier with DSUB-9 connector.

DS-FLEX-3000-35: Connection

2.4.1.4. DS-FLEX-3000-35-HS

DS-FLEX-3000-35-HS



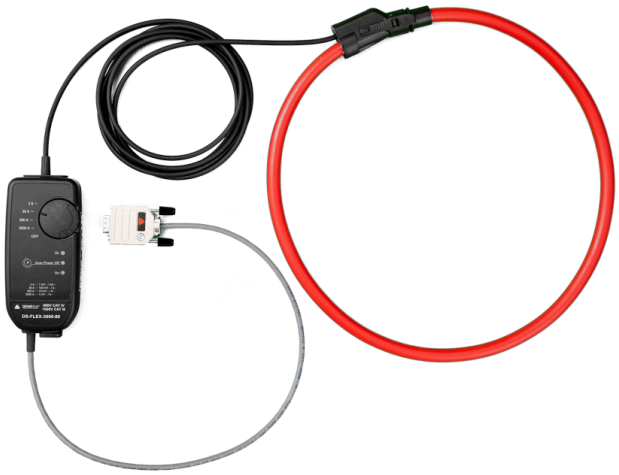
DS-FLEX-3000-35-HS Dimensions

DS-FLEX-3000-35-HS: Connection

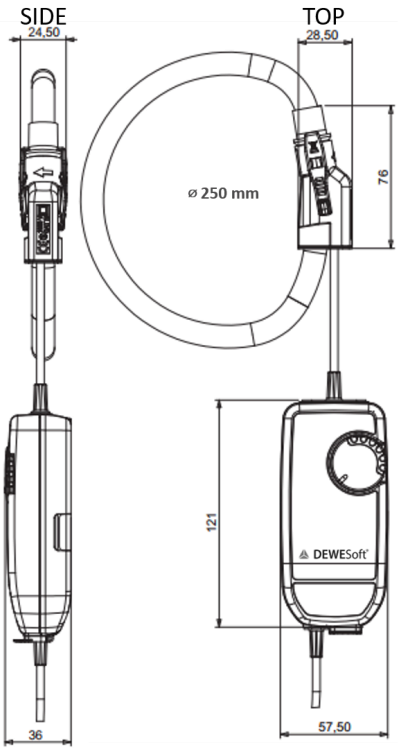
The DS-FLEX-3000-35-HS can be connected directly to a Sirius® amplifier with DSUB-9 connector.

DS-FLEX-3000-35-HS: Connection

2.4.1.5. DS-FLEX-3000-80



DS-FLEX-3000-80



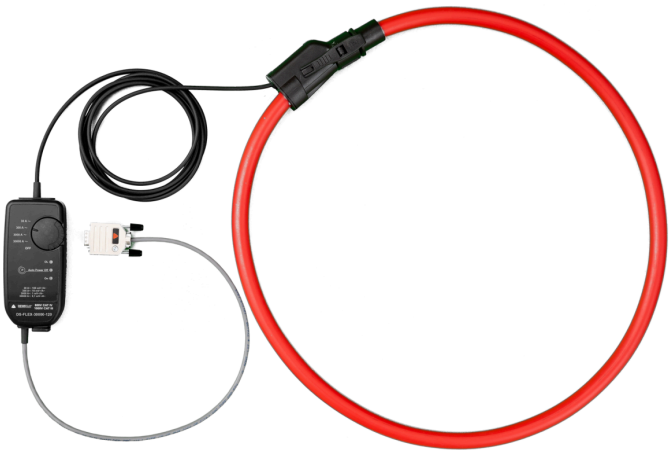
DS-FLEX-3000-80 Dimensions

DS-FLEX-3000-80: Connection

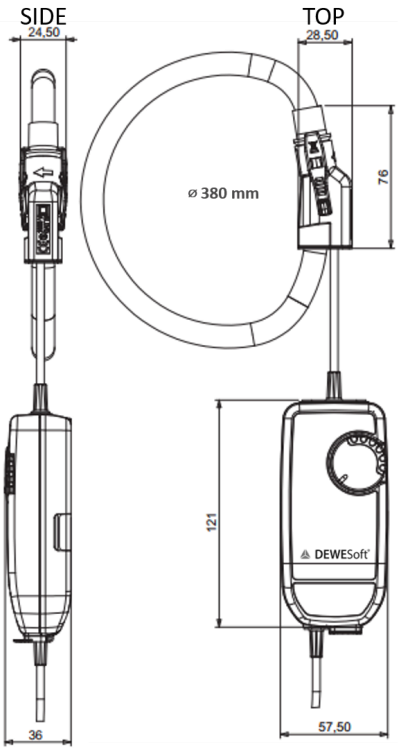
The DS-FLEX-3000-80 can be connected directly to a Sirius® amplifier with DSUB-9 connector.

DS-FLEX-3000-80: Connection

2.4.1.6. DS-FLEX-30000-120



DS-FLEX-30000-120



DS-FLEX-30000-120 Dimensions

DS-FLEX-30000-120: Connection

The DS-FLEX-30000-120 can be connected directly to a Sirius® amplifier with DSUB-9 connector.

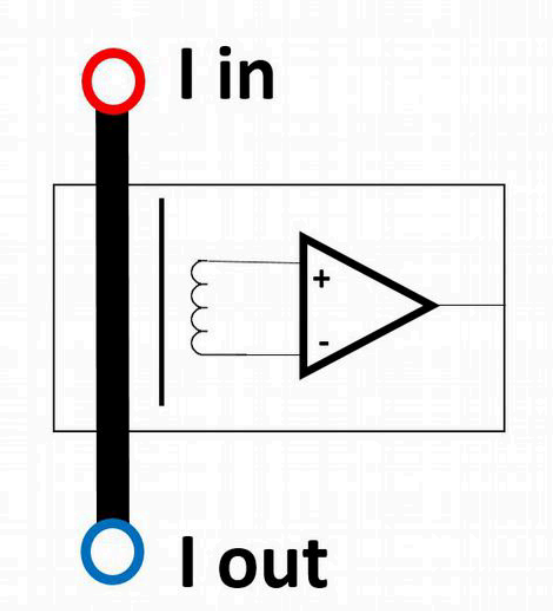
DS-FLEX-30000-120: Connection

2.4.1.7. DS-FLEX-CWTUM6-1200A

The DS-FLEX-CWTUM6-1200A can be connected directly to a Sirius® amplifier with DSUB-9 connector.

2.4.2. Isolated Current Transducers

The DSI shunt adapter is an adapter for current measurement on any DSUB9 connector except for the DEW43 amplifier. The technology is based on the hall effect.



Isolated Transducer

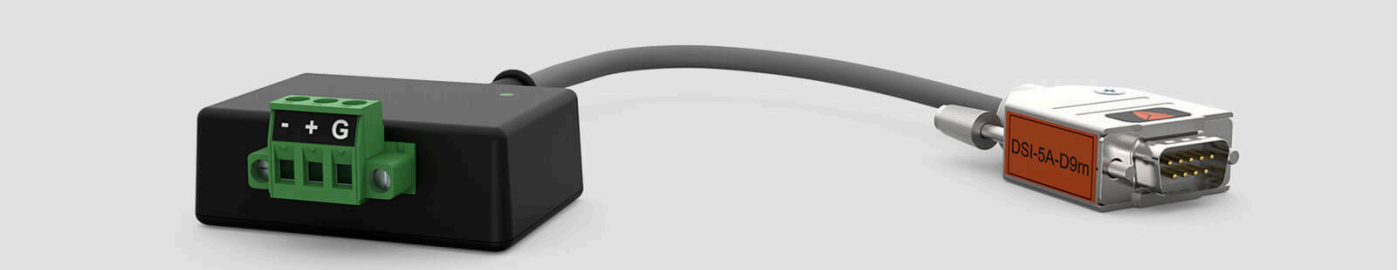
Working principle:

These types of current transducers measure the magnitude of the magnetic field that is created by the flow of current. A voltage is generated by the transducer that is known as a Hall voltage that is induced by the magnetic field, the transducer then measures the magnetic flux density of the field.

Therefore the working principle of this type of transducer is based on the Hall voltage principle. In essence this principle states that if a conductor (or semiconductor) that has a current flowing through it in one direction, is brought in contact with a magnetic field, a voltage can be measured.

2.4.2.1. DSI-5A

The DSI-5A allows current measurement of up to 5A.



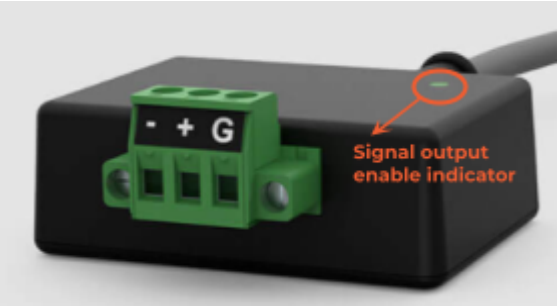
DSI-5A-D9m

2.4.2.1.1. DSI-5A v2 specifications

Inputs specifications	**DSI-5A v2**
Input connector type	MSTB 2,5/ 3-STF-5,08 Phoenix Contact, mates with MSTB 2,5/ 3-GF-5,08
Connector info	2.5 mm² Nominal cross section
Nominal current	5 A (DC or AC RMS continuous)
Pulse load	1 s @ 15 A, 5 s @ 0 A
Shunt Resistor	10 mΩ
Input accuracy	Calibrated to ±0.1 %, calibration in TEDS
Temperature Coefficient	±15 ppm/°C max (-55 °C to +125 °C)
Voltage rating	300 V DC or AC RMS
TEDS	1024-bit, 1-Wire EEPROM
Physical	
Dimensions	57 x 39 x 20 mm
Cable	200 mm
Weight	100 g

Important
Isolated voltage input amplifiers are recommended for connecting shunt resistor adapters.

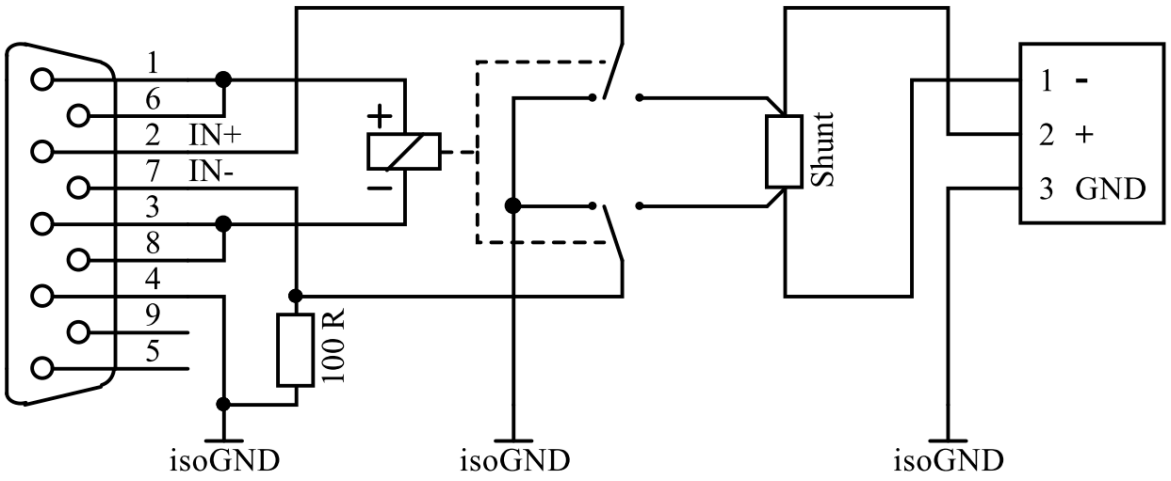
2.4.2.1.2. DSI-5A input connection



DSI-5A input connector

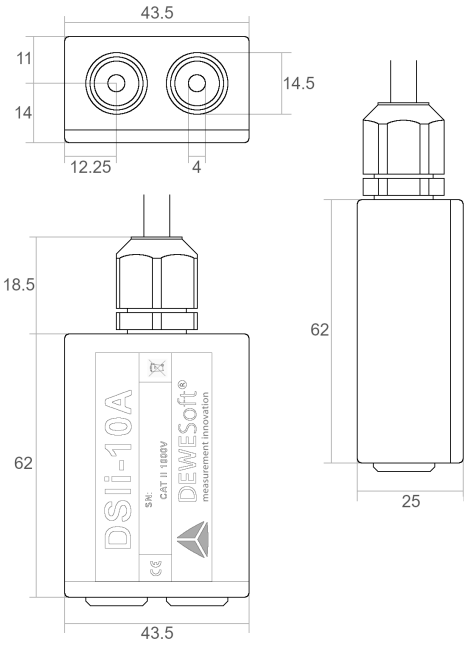
Pin	Name	Description
1	-	Current Input -
2	+	Current Input +
3	G	Analog Ground

2.4.2.1.3. DSI-5A output connector



2.4.2.2. DSIi-10A

DSIi 10A isolated current transducer



DSIi 10A isolated current transducer Dimensions

DSIi 10A isolated current transducer connected

2.4.2.2.1. DSIi-10A Specifications

Inputs specifications	
Input connector type	4mm Banana
Current Range	10 A DC or ACpeak
Accuracy	0.5 % of reading
Phase Error	< 0.1° (50 Hz)
Bandwidth	1 kHz (0.05 dB, 0.1°) 10 kHz (0.1 dB, 1.5°) 100 kHz (0.2 dB, 6°)
TEDS	Fully Supported
Overload Capability	100 A nominal current for < 1 sec
Zero Offset	20 mA
Temperature Coefficient	40 ppm/K
Environmental specifications	
Dimensions	65 x 44 x 24 mm
Power Supply	5 V
Current Consumption	max. 30 mA
Operating Temperature	-40 °C to +55 °C
Isolation	4 kVp
Safety	600 V CAT III

2.4.2.3. DSIi-20A

DSIi 20A isolated current transducer connected

2.4.2.3.1. DSIi-20A Specifications

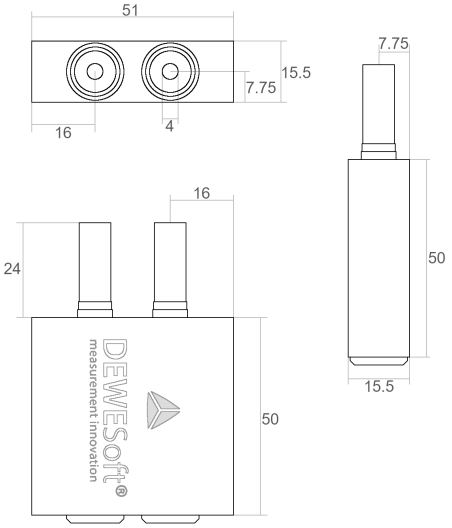
Inputs specifications	
Input connector type	4mm Banana
Current Range	20 A DC or ACpeak
Accuracy	0.5 % of reading
Phase Error	< 0.1° (50 Hz)
Bandwidth	1 kHz (0.05 dB, 0.1°) 10 kHz (0.1 dB, 1.5°) 100 kHz (0.2 dB, 6°)
TEDS	Fully Supported
Overload Capability	100 A nominal current for < 1 sec
Zero Offset	20 mA
Temperature Coefficient	40 ppm/K
Environmental specifications	
Dimensions	65 x 44 x 24 mm
Power Supply	5 V
Current Consumption	max. 30 mA
Operating Temperature	-40 °C to +55 °C
Isolation	4 kVp
Safety	600 V CAT III

2.4.3. Shunts

Working principle:
A shunt is a conductor with some sort of resistance, typically in the milli Ohm range. Measuring current with a shunt is actually an indirect current measurement, as in reality the voltage drop over the resistor is measured.

2.4.3.1. DS-SHUNT-05

DS-SHUNT-05



DS-SHUNT-05 Dimensions

2.4.3.1.1. DS-SHUNT-05 Specifications

Inputs specifications	
Current Range	5A AC
Resistance	50mΩ
Sensitivity	50 mV/A
Accuracy	0.1% of reading
Overload Capability	5x for < 1sec 2.5x for < 10sec
Temperature Coefficient	20 ppm/K
Dimensions	5.0 x 5.0 x 1.5 cm
Safety	600V CAT II

2.4.3.2. BNC-SHUNT-50ohm

The BNC-SHUNT-50ohm allows current measurement of up to 20mA.

2.4.3.2.1. BNC-SHUNT-50ohm Specifications

Inputs specifications	
Input current	4 mA – 20 mA (typ.)
Shunt resistor	50.000 Ω
Resistance Tolerance	±0.01%
Temperature Coefficient	±0.05ppm/°C typical (0°C to +60°C) ±0.2ppm/°C typical (-55°C to +125°C MIL Range)
Power Rating	20 mW (1)

Caution

(1) Do not exceed the absolute maximum rating!

2.5. SIRIUSi-PWR-MCTS: Power supply for current transducers

2.5.1. Power Supply for Transducers

SIRIUSi-PWR-MCTS2 is a power supply unit for powering current transducers directly from Dewesoft instruments without any external power supply. SIRIUSi-PWR-MCTS2 can be built into SIRIUS compatible chassis or directly into R1, R2, R3, R4 or R8 data acquisition systems.

There are 2 versions of the power supply available. The 4 channel and the 8 channel HD models. The 4 channel version is able to deliver 20 W per channel, whereas the 8 channel can deliver 15 W per channel.

The power supply comes in the SIRIUSi modular and rack version chassis, making it one of the most compact power supplies on the market.

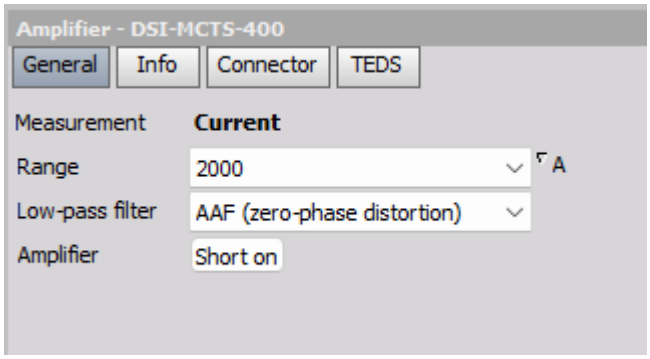
SIRIUSi-PWR-MCTS2 4 Channel

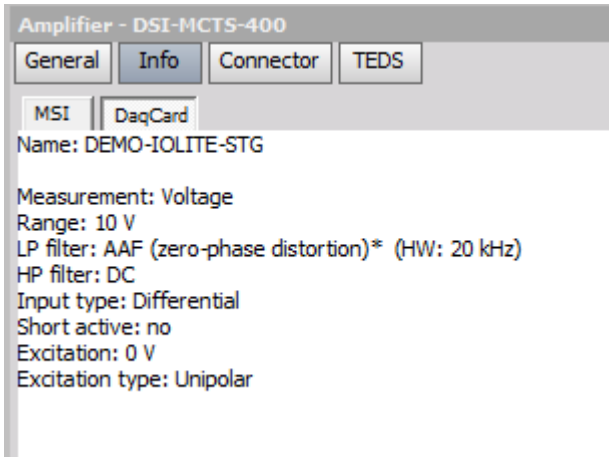
SIRIUSi-HD-PWR-MCTS2 8 Channel

SIRIUSir-PWR-MCTS2 4 Channel and SIRIUSir-HD-PWR-MCTS2 8 Channel

	SIRIUSi-PWR-MCTS2 / SIRIUSir-PWR-MCTS	SIRIUSi-HD-PWR-MCTS2 / SIRIUSir-HD-PWR-MCTS
Power supply	9 - 36 V DC	9 - 36 V DC
Max power consumption	85 W	85 W
Physical dimensions	265 x 140 x 65 mm	265 x 140 x 65 mm
Operating temperature	-20 °C to 50 °C	-20 °C to 50 °C
Storage temperature	-40 °C to 85 °C	-40 °C to 85 °C
Humidity (@ 60 °C)	95 % RH non-condensing	95 % RH non-condensing
Output	4 x Isolated Power supply (1500 V DC, 60 sec)	8 x Isolated Power supply (1500 V DC, 60 sec)
Output voltage	±15 V DC	±15 V DC
Maximum output per channel	20 W	20 W
Short circuit protection	indefinite (automatic recovery)	indefinite (automatic recovery)
Overload protection	150 % of Iout max. typ	150 % of Iout max. typ

SIRIUS PWR-MCTS2 power supply can be used with various Dewesoft devices. However, be sure to set the input channel to Differential input type in the software, if supported.





2.5.2. Connecting transducers to SIRIUS®

Zero-flux transducers and DC CLAMPS Fluxgate technology need SIRIUSi-PWR-MCTS power supply for operation.

Current transducer to MCTS
First connect the transducer (e.g. CT 1000) with the D9m-D9f-5M-MCTS cable to the SIRIUSi-PWR-MCTS slice to the Sensor 1 input:

Zero-Flux to MCTS connection

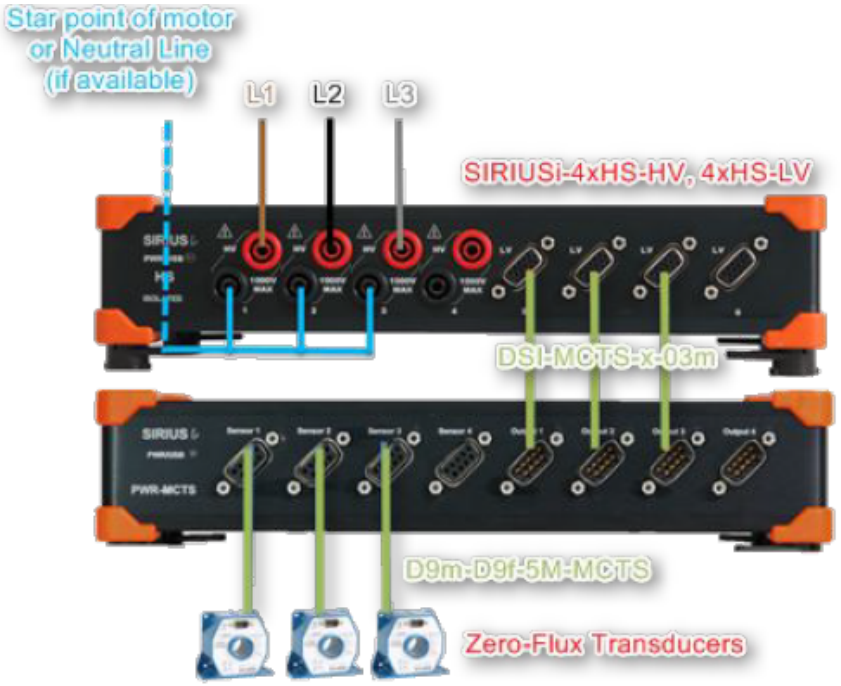
The D9m-D9f-5M-MCTS cable is a simple extension cable and can be used for all zero-flux transducers (100 A up to 2000 A).

MCTS to SIRIUS
Then take the corresponding DSI-MCTS-x-03M cable (where x must match the transducer: e.g. for the CT 500, you need the DSI-MCTS-500N-03M cable) and use Output 1 of the SIRIUSi-PWR-MCTS and connect it to the first LV input of the SIRIUSi-4xHS-HV,4xHS-LV slice:

MCTS to Sirius® connection

Multiple Transducers

When you have multiple Transducers you simply repeat the previous steps for each transducer. For example, when you use a three-phase system, in star connection, it will look like this:



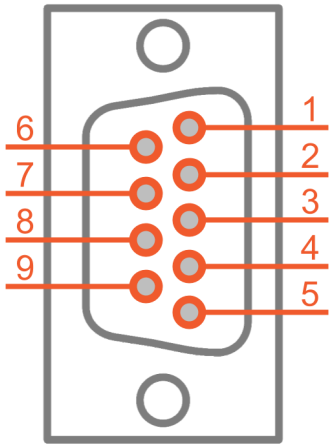
Three-phase system in star connection

Hint

You will find how to connect voltage and current transducers to the system for different wiring configurations (DC, 1-phase, 2-phase, 3-phase delta-star-aron-V, etc.) in the DewesoftX® PRO training course “POWER ANALYSIS”
https://training.dewesoft.com/online/course/power-analysis

2.5.2.1. Connecting Transducer to SIRIUS®: Pinouts

Transducer connector pinout

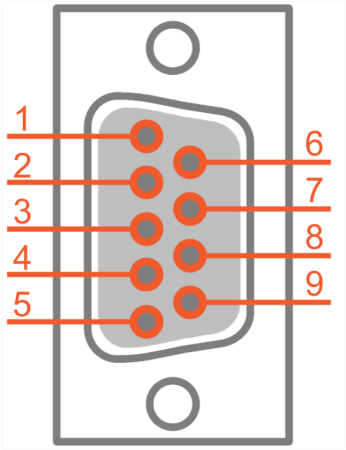


Output connector: pinout (DSUB-9 male)

Pin	Name	Description
1	RETURN	Return
2	NC	Not connected
3	Normal op. st.	Normal op. st.
4	GND	Ground
5	-Uc	-Supply
6	OUT	Output
7	NC	Not connected
8	Normal op. st.	Normal op. st.
9	+Uc	+Supply

SIRIUS-PWR-MCTS2 connectors pinout

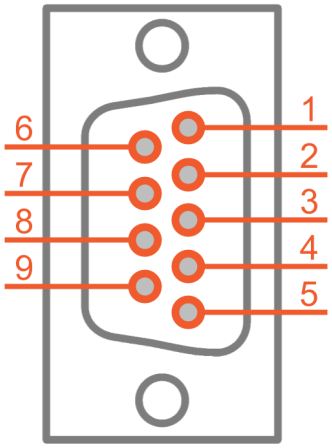
Sensor connector



Sensor connector: pinout (DSUB-9 female)

Pin	Name	Description
1	RETURN	Return
2	TEDS	TEDS
3	Normal op. st.	Normal op. st.
4	GND	Ground
5	-15 V	-15 V supply
6	OUT	Output
7	NC	Not connected
8	Normal op. st.	Normal op. st.
9	+15 V	+15 V supply

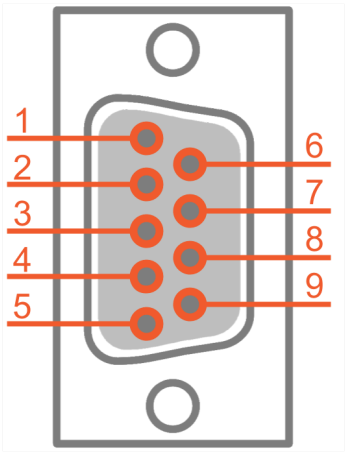
Output connector



Output connector: pinout (DSUB-9 male)

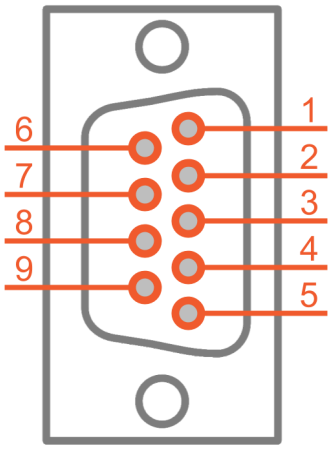
Pin	Name	Description
1	RETURN	Return
2	TEDS	TEDS
3	Normal op. st.	Normal op. st.
4	GND	Ground
5	NC	Not connected
6	OUT	Output
7	NC	Not connected
8	Normal op. st.	Normal op. st.
9	NC	Not connected

DSI-MCTS-x-03M cable pin-out



DSI-MCTS-x-03M connector: pinout (DSUB-9 female)

Pin	Name	Description
1	RETURN	Return
2	NC	Not connected
3	GND	Ground
4	GND	Ground
5	NC	Not connected
6	OUT	Output
7	NC	Not connected
8	Normal op. st.	Normal op. st.
9	NC	Not connected



DSI-MCTS-x-03M connector: pinout (DSUB-9 male)

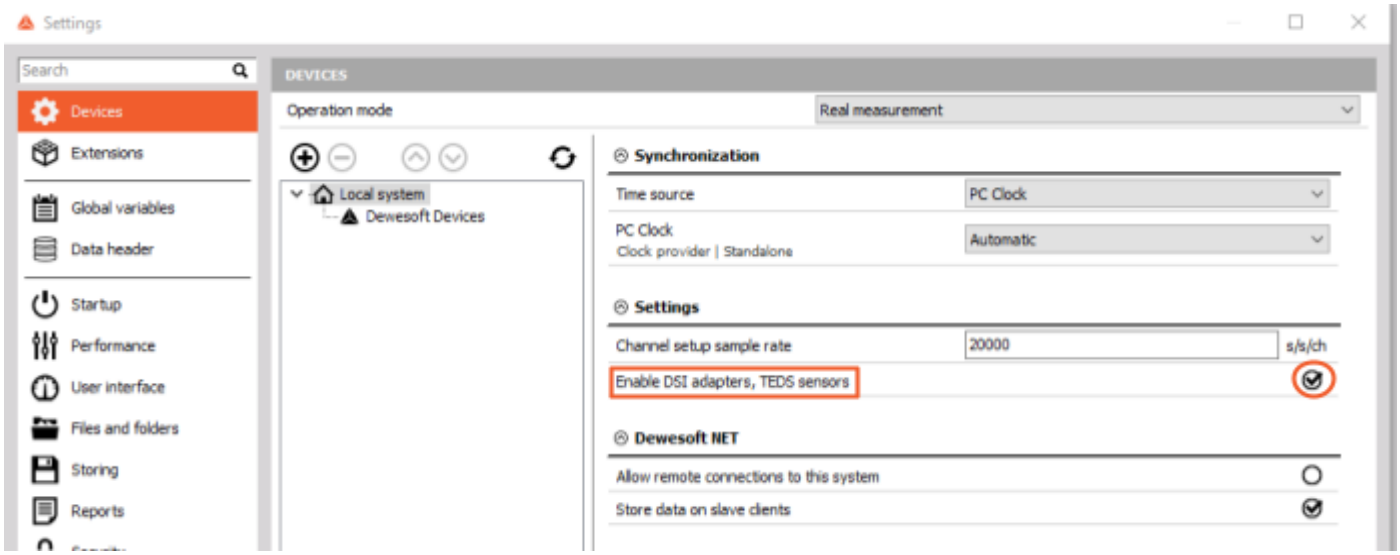
Pin	Name	Description
1	NC	Not connected
2	In+	In+
3	NC	Not connected
4	GND	Ground
5	Digital IO	Digital IO
6	NC	Not connected
7	In-	In-
8	NC	Not connected
9	TEDS	TEDS

2.5.2.2. DewesoftX® setup

The DSI-MCTS-x-03M cable has an integrated TEDS chip, which stores data about scaling, calibration etc. of the zero-flux transducer. If you connect this Shunt cable to the LV input of the Sirius® slice, the configuration data is read and applied to the DewesoftX® channel setup automatically.

Settings: TEDS feature

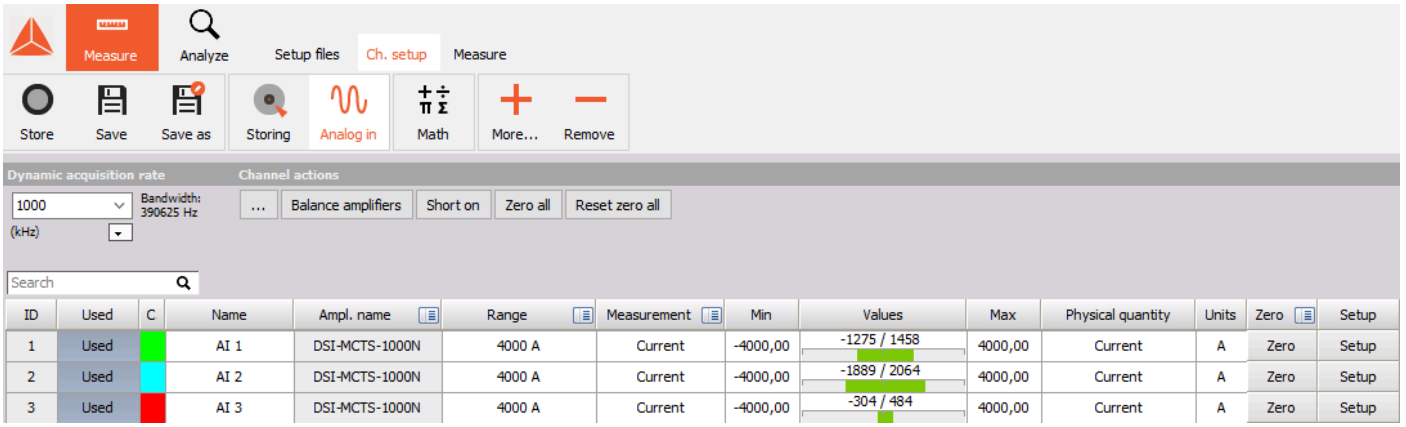
For the automatic setup to work, you must first activate this feature in the DewesoftX® settings. Please check that the “Enable DSI adapters, TEDS sensors” check-box is activated:



DewesoftX® TEDS setting

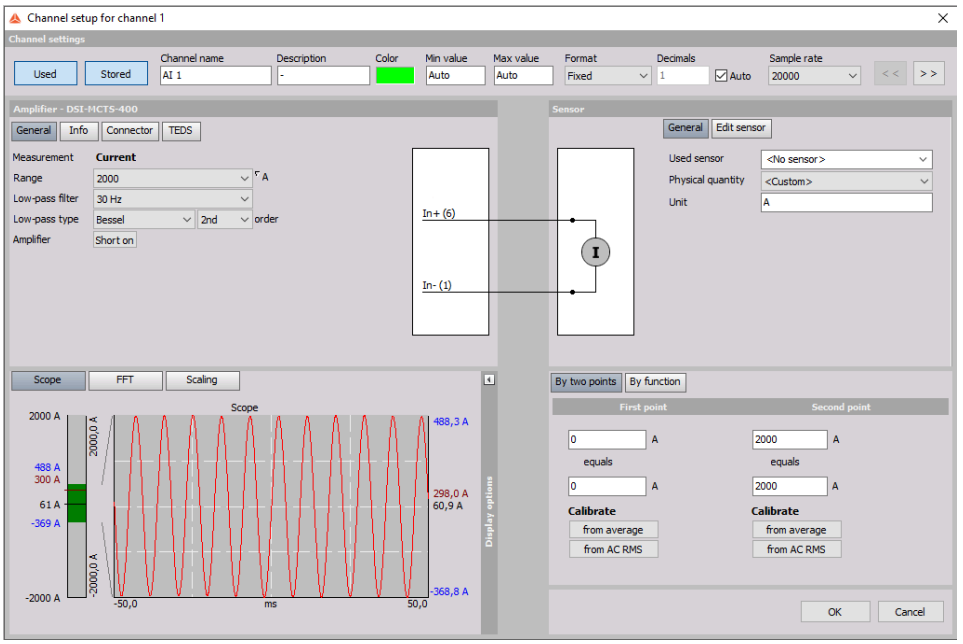
Channel Setup

When the TEDS feature is activated, then the channel setup will immediately detect the sensor when you connect it (e.g. IN 1000-S) you will see the corresponding transducer in the Ampl.name column (e.g. DSI-MCTS-1000N). Also notice, that the type of measurement will be changed to Current:



Ch. Setup: Analog in

Finally, open the Setup of the individual channels, and fine-tune the remaining setting: e.g. change the channel name, set a suitable measurement range, set a low-pass filter, ...



Channel setup

3. Warranty information

Notice
The information contained in this document is subject to change without notice.

Note:
Dewesoft d.o.o. shall not be liable for any errors contained in this document. Dewesoft MAKES NO WARRANTIES OF ANY KIND WITH REGARD TO THIS DOCUMENT, WHETHER EXPRESS OR IMPLIED. DEWESOFT SPECIFICALLY DISCLAIMS THE IMPLIED WARRANTIES OF MERCHANTABILITY AND FITNESS FOR A PARTICULAR PURPOSE. Dewesoft shall not be liable for any direct, indirect, special, incidental, or consequential damages, whether based on contract, tort, or any other legal theory, in connection with the furnishing of this document or the use of the information in this document.

The copy of the specific warranty terms applicable to your Dewesoft product and replacement parts can be obtained from your local sales and service office. To find a local dealer for your country, please visit https://dewesoft.com/support/distributors.

3.1. Calibration

Every instrument needs to be calibrated at regular intervals. The standard norm across nearly every industry is annual calibration. Before your Dewesoft data acquisition system is delivered, it is calibrated. Detailed calibration reports for your Dewesoft system can be requested. We retain them for at least one year, after system delivery.

3.2. Support

Dewesoft has a team of people ready to assist you if you have any questions or any technical difficulties regarding the system. For any support please contact your local distributor first or Dewesoft directly.

Dewesoft d.o.o.
Gabrsko 11a
1420 Trbovlje Slovenia

Europe Tel.: +386 356 25 300
Web: http://www.dewesoft.com
Email: Support@dewesoft.com
The telephone hotline is available Monday to Friday from 07:00 to 16:00 CET (GMT +1:00)

3.3. Service/repair

The team of Dewesoft also performs any kinds of repairs to your system to assure a safe and proper operation in the future. For information regarding service and repairs please contact your local distributor first or Dewesoft directly on https://dewesoft.com/support/rma-service.

3.4. Restricted Rights

Use Slovenian law for duplication or disclosure. Dewesoft d.o.o. Gabrsko 11a, 1420 Trbovlje, Slovenia / Europe.

3.5. Printing History

Version 2.0.0, Revision 217 Released 2015 Last changed: 23. July 2018 at 16:54.

3.6. Copyright

3.7. Trademarks

We take pride in our products and we take care that all key products and technologies are registered as trademarks all over the world. The Dewesoft name is a registered trademark. Product families (KRYPTON, SIRIUS, DSI, DS-NET) and technologies (DualCoreADC, SuperCounter, GrandView) are registered trademarks as well. When used as the logo or as part of any graphic material, the registered trademark sign is used as a part of the logo. When used in text representing the company, product or technology name, the ® sign is not used. The Dewesoft triangle logo is a registered trademark but the ® sign is not used in the visual representation of the triangle logo.

4. Safety instructions

Your safety is our primary concern! Please be safe!

4.1. Safety symbols in the manual

Warning

Calls attention to a procedure, practice, or condition that could cause the body injury or death

Caution

Calls attention to a procedure, practice, or condition that could possibly cause damage to equipment or permanent loss of data.

4.2. General Safety Instructions

Warning

The following general safety precautions must be observed during all phases of operation, service, and repair of this product. Failure to comply with these precautions or with specific warnings elsewhere in this manual violates safety standards of design, manufacture, and intended use of the product. Dewesoft d.o.o. assumes no liability for the customer's failure to comply with these requirements.

All accessories shown in this document are available as an option and will not be shipped as standard parts.

4.2.1. Environmental Considerations

Information about the environmental impact of the product.

4.2.2. Product End-of-Life Handling

Observe the following guidelines when recycling a Dewesoft system:

4.2.3. System and Components Recycling

Production of these components required the extraction and use of natural resources. The substances contained in the system could be harmful to your health and to the environment if the system is improperly handled at its end of life! Please recycle this product in an appropriate way to avoid unnecessary pollution of the environment and to keep natural resources.

This symbol indicates that this system complies with the European Union's requirements according to Directive 2002/96/EC on waste electrical and electronic equipment (WEEE). Please find further information about recycling on the Dewesoft web site www.dewesoft.com

Restriction of Hazardous Substances
This product has been classified as Monitoring and Control equipment and is outside the scope of the 2002/95/EC RoHS Directive. However, we take care of our environment and the product is lead-free.

4.2.4. General safety and hazard warnings for all Dewesoft systems

Safety of the operator and the unit depend on following these rules.

- Use this system under the terms of the specifications only to avoid any possible danger.
- Read your manual before operating the system.
- Observe local laws when using the instrument.
- DO NOT touch internal wiring!
- DO NOT use higher supply voltage than specified!
- Use only original plugs and cables for harnessing.
- You may not connect higher voltages than rated to any connectors.
- The power cable and connector serve as Power-Breaker. The cable must not exceed 3 meters, the disconnect function must be possible without tools.
- Maintenance must be executed by qualified staff only.
- During the use of the system, it might be possible to access other parts of a more comprehensive system. Please read and follow the safety instructions provided in the manuals of all other components regarding warning and security advice for using the system.
- With this product, only use the power cable delivered or defined for the host country.
- DO NOT connect or disconnect sensors, probes or test leads, as these parts are connected to a voltage supply unit.
- Ground the equipment: For Safety Class 1 equipment (equipment having a protective earth terminal), a non-interruptible safety earth ground must be provided from the mains power source to the product input wiring terminals.
- Please note the characteristics and indicators on the system to avoid fire or electric shocks. Before connecting the system, please read the corresponding specifications in the product manual carefully.

- The inputs must not, unless otherwise noted (CATx identification), be connected to the main circuit of category II, III and IV.
- The power cord separates the system from the power supply. Do not block the power cord, since it has to be accessible for the users.
- DO NOT use the system if equipment covers or shields are removed.
- If you assume the system is damaged, get it examined by authorized personnel only.
- Adverse environmental conditions are Moisture or high humidity Dust, flammable gases, fumes or dissolver Thunderstorm or thunderstorm conditions (except assembly PNA) Electrostatic fields, etc.
- The measurement category can be adjusted depending on module configuration.
- Any other use than described above may damage your system and is accompanied with dangers like short-circuiting, fire or electric shocks.
- The whole system must not be changed, rebuilt or opened.
- DO NOT operate damaged equipment: Whenever it is possible that the safety protection features built into this product have been impaired, either through physical damage, excessive moisture, or any other reason, REMOVE POWER and do not use the product until the safe operation can be verified by service-trained personnel. If necessary, return the product to Dewesoft sales and service office for service and repair to ensure that safety features are maintained.
- If you assume a more riskless use is not provided anymore, the system has to be rendered inoperative and should be protected against inadvertent operation. It is assumed that a more riskless operation is not possible anymore if the system is damaged obviously or causes strange noises. The system does not work anymore. The system has been exposed to long storage in adverse environments. The system has been exposed to heavy shipment strain.
- Warranty void if damages caused by disregarding this manual. For consequential damages, NO liability will be assumed!
- Warranty void if damage to property or persons caused by improper use or disregarding the safety instructions.
- Unauthorized changing or rebuilding the system is prohibited due to safety and permission reasons (CE).
- Be careful with voltages >25 VAC or >35 VDC! These voltages are already high enough in order to get a perilous electric shock by touching the wiring.
- The product heats during operation. Make sure there is adequate ventilation. Ventilation slots must not be covered!
- Only fuses of the specified type and nominal current may be used. The use of patched fuses is prohibited.
- Prevent using metal bare wires! Risk of short circuit and fire hazard!
- DO NOT use the system before, during or shortly after a thunderstorm (risk of lightning and high energy over-voltage). An advanced range of application under certain conditions is allowed with therefore designed products only. For details please refer to the specifications.
- Make sure that your hands, shoes, clothes, the floor, the system or measuring leads, integrated circuits and so on, are dry.
- DO NOT use the system in rooms with flammable gases, fumes or dust or in adverse environmental conditions.
- Avoid operation in the immediate vicinity of high magnetic or electromagnetic fields, transmitting antennas or high-frequency generators, for exact values please refer to enclosed specifications.
- Use measurement leads or measurement accessories aligned with the specification of the system only. Fire hazard in case of overload!

- Lithium ion batteries are classified as not hazardous when used according to the recommendations of the manufacturer described in Battery Safety Data Sheet, which is available for download from this link.
- Do not switch on the system after transporting it from a cold into a warm room and vice versa. The thereby created condensation may damage your system. Acclimatize the system unpowered to room temperature.
- Do not disassemble the system! There is a high risk of getting a perilous electric shock. Capacitors still might be charged, even if the system has been removed from the power supply.
- The electrical installations and equipment in industrial facilities must be observed by the security regulations and insurance institutions.
- The use of the measuring system in schools and other training facilities must be observed by skilled personnel.
- The measuring systems are not designed for use in humans and animals.
- Please contact a professional if you have doubts about the method of operation, safety or the connection of the system.
- Please be careful with the product. Shocks, hits and dropping it from already- lower level may damage your system.
- Please also consider the detailed technical reference manual as well as the security advice of the connected systems.
- This product has left the factory in safety-related flawlessness and in proper condition. In order to maintain this condition and guarantee safety use, the user has to consider the security advice and warnings in this manual.

EN 61326-3-1:2008
IEC 61326-1 applies to this part of IEC 61326 but is limited to systems and equipment for industrial applications intended to perform safety functions as defined in IEC 61508 with SIL 1-3.
The electromagnetic environments encompassed by this product family standard are industrial, both indoor and outdoor, as described for industrial locations in IEC 61000-6-2 or defined in 3.7 of IEC 61326-1.
Equipment and systems intended for use in other electromagnetic environments, for example, in the process industry or in environments with potentially explosive atmospheres, are excluded from the scope of this product family standard, IEC 61326-3-1.
Devices and systems according to IEC 61508 or IEC 61511 which are considered as “operationally well-tried”, are excluded from the scope of IEC 61326-3-1.
Fire-alarm and safety-alarm systems, intended for the protection of buildings, are excluded from the scope of IEC 61326-3-1.

4.3. Documentation version history

Version	Date	Notes
V23-1	28.8.2023	- First version: gather all data about current sensors in one manual. Datasheets and others are now obsolete.
V23-2	2.10.2023	- DS-CLAMP-500DCS, DSI-5A added
V23-3	30.10.2023	- Added a mention o DC-CT product line

V24-1	7.3.2024	- Added DS-FLEX-CWTUM6-1200A
		- Update of specifications sheets:
		  - Phase error on Rogowsky coils
		  - Added midrange amplifiers that can be used