MCTS II
Multi Channel Current Transducer System

Specifications

Electronics-Rack

Modular system for up to six transducer power supply channels
Galvanic separation between channels
Standard transducer status readout interface
Supply voltage for active burden modules
19”-rack mountable device

MCTS II Front

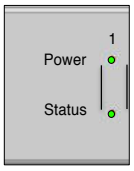
MCTS II Rear

General Data	
Operation Temperature:	-10 … 60 °C
Operation Humidity:	20 … 90 % RH, noncondensing
Warranty period:	36 Months

Electrical Data	
Supply voltage:	100-240 VAC, 50/60 Hz, fused with 6 A slow blow
Output voltages:	+ 15 V_{DC}, 3.4 A_{max} / -15 V_{DC}, 2.0 A_{max}
Max. Power Consumption:	The maximum power consumption depends on the number of channels installed, the number of transducers connected and the current consumption of each transducer. The maximum power consumption of a six channel MCTS with transducers IN 2000-S at 2000 A_{rms} primary current is around 175 W.

Power and Transducer Status Functions

Channel and transducer status are visible at the MCTS front panel and can be read out via the Status-Readout Interface



Power LED green: Channel installed
Power LED off: Channel not installed

Status LED green: Transducer ok
Status LED red: Transducer overload or open output

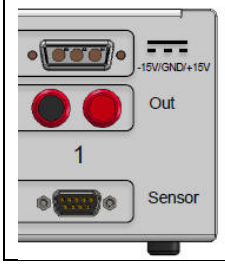
Status-Readout-Interface

This interface gives out the transducer status by means of potential free relay contacts.

Switching voltage: 200 V
Switching current: 2 A

A status readout cable is available as an option.

DC-voltage output for active burden modules



Normally the current transducers for higher primary current levels are not able to drive much more than 1 V at the output. If this is enough, our passive plug-on burden resistors are the right solution to get a mV/A-signal out of the sensor. If the connected measurement instrument demands a higher voltage signal level, our active plug-on voltage modules are the right solution. These deliver 7 V_{rms} (± 9.9 V_{pk}) at transducer nominal primary current.

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Current Transducers

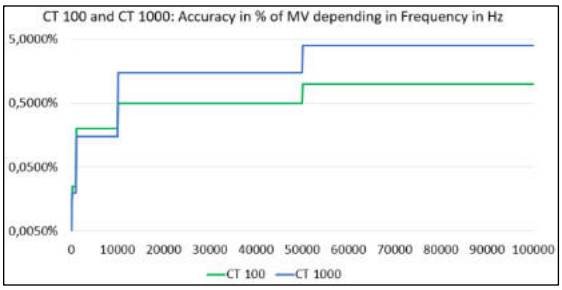
Type	CT 100	CT 200	CT 400	CT 500	CT 1000	CT 2000
						
Current Range DC / AC$_{rms}$ (Crestfactor 2)	100 A	200 A	400 A	500 A	1000 A	2000 A
100 ms Overload	20 kA$_{pk}$	20 kA$_{pk}$	20 kA$_{pk}$	3 kA$_{pk}$	5 kA$_{pk}$	10 kA$_{pk}$
Ratio	500 : 1	1000 : 1	1500 : 1	750 : 1	1500 :1	2000 : 1
Output Range	0 ... 200 mA$_{rms}$	0 ... 200 mA$_{rms}$	0 ... 266.667 mA$_{rms}$	0 ... 666.667 mA$_{rms}$	0 ... 666.667 mA$_{rm}$	0 ... 1 A$_{rms}$
Max. Measuring Resistance [1]	25 Ω	20 Ω	10 Ω	5 Ω	4 Ω	3.5 Ω
Bandwidth (-3 dB)	DC ... 2 MHz	DC ... 1.1 MHz	DC ... 800 kHz	DC ... 520 kHz	DC ... 440 kHz	DC ... 140 kHz
Step Response (0 ... 90 %)	0.2 µs	0.2 µs	1 µs	1 µs	1 µs	1 µs
DC Accuarcy (of MR) [2]	0.002 %	0.001 %	0.0008 %	0.00115 %	0.0012 %	0.0012 %
AC Accuarcy (of MV) [3]						
> 0 ... ≤ 100 Hz	0.015 %	0.015 %	0.015 %	0.015 %	0.015 %	0.015 %
> 100 ... ≤ 1000 Hz	0.025 %	0.02 %	0.02 %	0.02 %	0.02 %	0.05 %
> 1000 ... ≤ 10000 Hz	0.2 %	0.15 %	0.15 %	0.1 %	0.15 %	0.25 %
> 10000 ... ≤ 50000 Hz [4]	0.5 %	0.5 %	0.5 %	0.2 %	1.5 %	1 % [4]
> 50000 ... ≤ 100000 Hz	1 %	1 %	1 %	0.5 %	4 %	
Angular Accuracy						
> 0 ... ≤ 100 Hz	0.01 °	0.01 °	0.01 °	0.01 °	0.01 °	0.01 °
> 100 ... ≤ 1000 Hz	0.05 °	0.02 °	0.01 °	0.01 °	0.01 °	0.05 °
> 1000 ... ≤ 10000 Hz	0.1 °	0.05 °	0.1 °	0.05 °	0.1 °	0.1 °
> 10000 ... ≤ 50000 Hz [4]	0.25 °	0.25 °	0.5 °	0.5 °	1 °	1 ° [4]
> 50000 ... ≤ 100000 Hz	0.5 °	0.5 °	1 °	1 °	2 °	
Temp.-Coefficient (of MR)	0.2 ppm/K	0.2 ppm/K	0.1 ppm/K	1 ppm/K	0.3 ppm/K	0.1 ppm/K
Temperature Range	-40 ... 85 °C	-40 ... 85 °C	-40 ... 85 °C	-40 ... 85 °C	-40 ... 85 °C	-40 ... 85 °C
Test Voltage 50 Hz	4.95 kV	4.95 kV	4.95 kV	4.2 kV	4.2 kV	6 kV
Inner Diameter	28 mm	28 mm	28 mm	38 mm	38 mm	70 mm
Mass	0.275 kg	0.295 kg	0.305 kg	1.3 kg	1.3 kg	4.2 kg

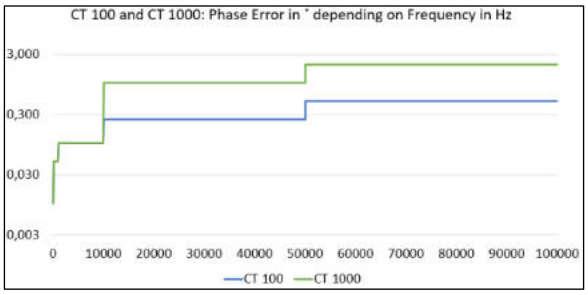
[1] At full scale and 25 °C. For other current values and temperatures see graphs below. Max measuring resistance = cable loop resistance + burden resistance (see page 5).

[2] Error of measuring range. At 25 °C.

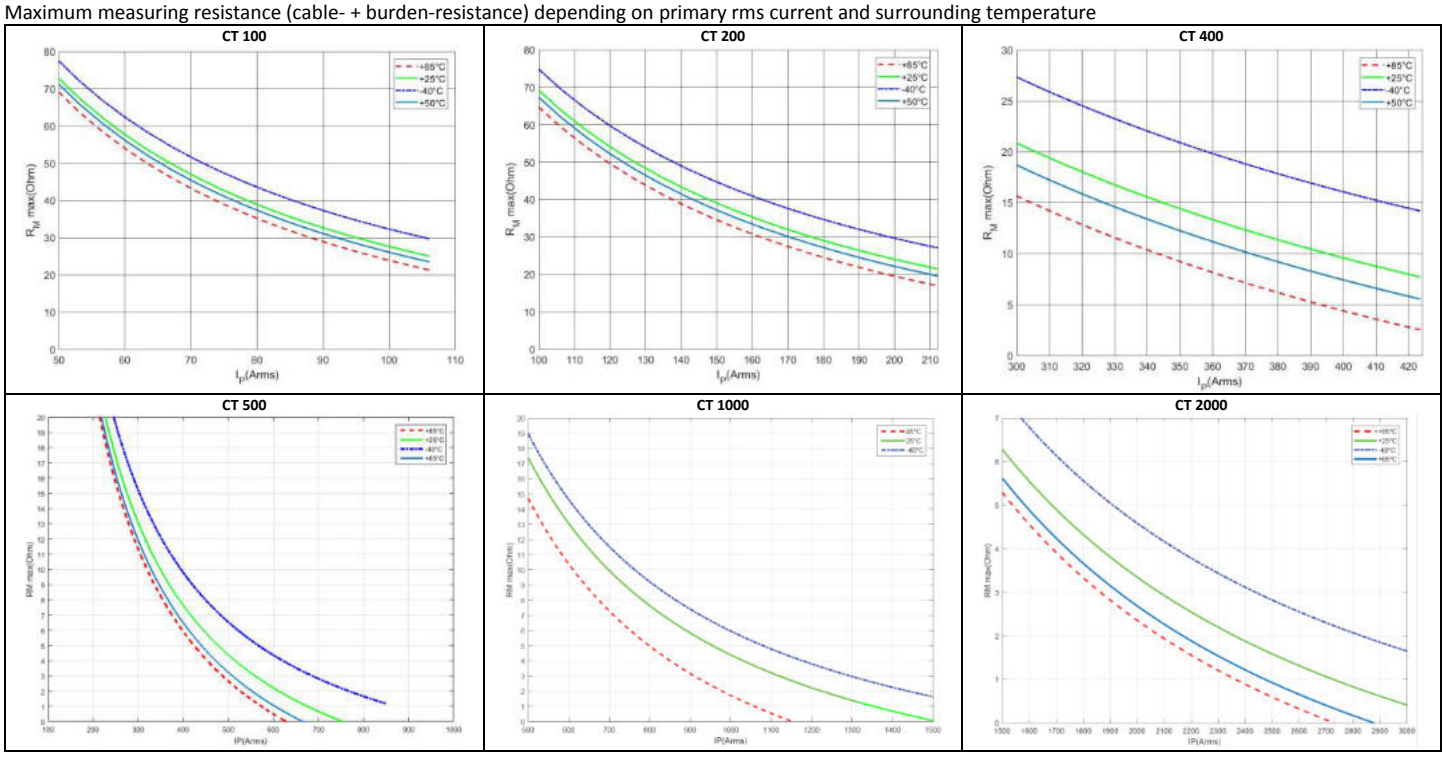
[3] Error of measured value. For range 3 % ... 100 %. Test current 0 ... 100 Arms, DC ... 100 kHz. At 25 °C.

[4] CT 2000: 10000 ... ≤ 20000 Hz. The precision frequency range of CT 2000 is limited to 20 kHz.





Maximum measuring resistance (cable- + burden-resistance) depending on primary rms current and surrounding temperature



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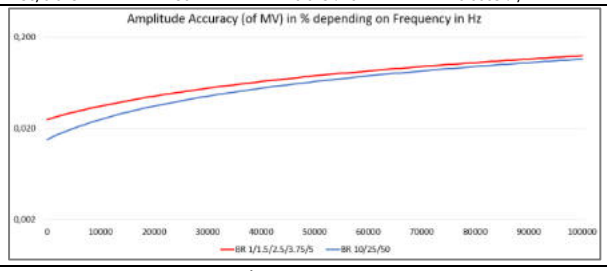
Burden Modules

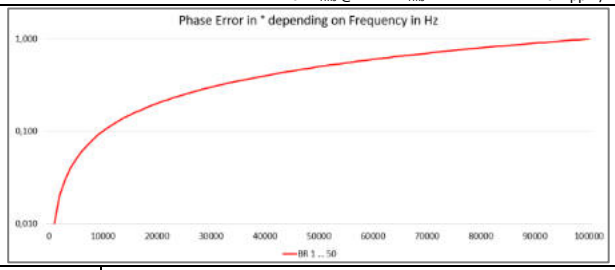
The transducer system delivers the transducer output current at the 4 mm output terminals on the back panel of the rack. For those instruments that don't have current input terminals, optional high precision passive and active plug-on burden modules with very low phase angle error are available. The active voltage output modules are supplied by the MCTS rack with a 3-pole D-SUB connector.

Passive plug-on burden resistors

Passive plug-on burden resistors are available from 1 Ω to 50 Ω. The burden resistor is limited by the transducer and the length of the connection cable. For higher output voltages active plug-on burden amplifiers are available.

Order Number	Resistance Value	Accuracy	Frequency Influence	Phase Error	Bandwidth	Max. Output Voltage	Load Influence
MCTS/BR1/0.025	1 Ω	0.025 % of MV	0.0005 %/kHz	< 1° @ 100 kHz	> 1 MHz	1.00 V_{rms} @ 1000 mA_{rms}	< 0.1 ppm/mW
MCTS/BR1.5/0.025	1.5 Ω	0.025 % of MV	0.0005 %/kHz	< 1° @ 100 kHz	> 1 MHz	1.00 V_{rms} @ 667 mA_{rms}	< 0.1 ppm/mW
MCTS/BR2.5/0.025	2.5 Ω	0.025 % of MV	0.0005 %/kHz	< 1° @ 100 kHz	> 1 MHz	1.58 V_{rms} @ 632 mA_{rms}	< 0.1 ppm/mW
MCTS/BR3.75/0.025	3.75 Ω	0.025 % of MV	0.0005 %/kHz	< 1° @ 100 kHz	> 1 MHz	1.94 V_{rms} @ 516 mA_{rms}	< 0.1 ppm/mW
MCTS/BR5/0.025	5 Ω	0.025 % of MV	0.0005 %/kHz	< 1° @ 100 kHz	> 1 MHz	2.24 V_{rms} @ 447 mA_{rms}	< 0.1 ppm/mW
MCTS/BR10/0.015	10 Ω	0.015 % of MV	0.0005 %/kHz	< 1° @ 100 kHz	> 1 MHz	3.16 V_{rms} @ 316 mA_{rms}	< 0.1 ppm/mW
MCTS/BR25/0.015	25 Ω	0.015 % of MV	0.0005 %/kHz	< 1° @ 100 kHz	> 1 MHz	5.00 V_{rms} @ 200 mA_{rms}	< 0.1 ppm/mW
MCTS/BR50/0.015	50 Ω	0.015 % of MV	0.0005 %/kHz	< 1° @ 100 kHz	> 1 MHz	7.07 V_{rms} @ 141 mA_{rms}	< 0.1 ppm/mW





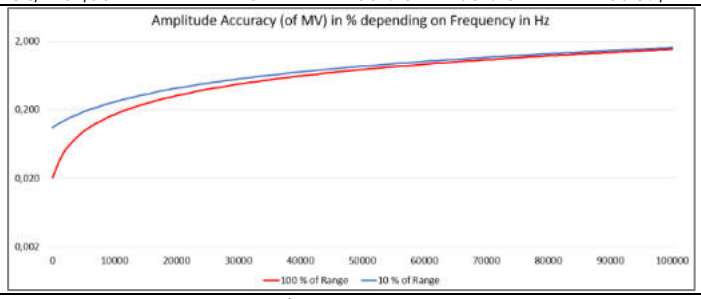
Resulting scaling with standard transducer / passive burden-combinations

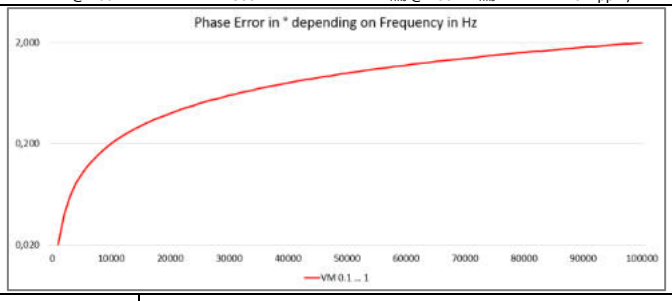
Transducer	Passive BR	Scaling	Output Voltage
CT 100	MCTS/BR10/0.015	20 mV/A	2 V_{rms} @ 100 A_{rms}
CT 200	MCTS/BR10/0.015	10 mV/A	2 V_{rms} @ 200 A_{rms}
CT 400	MCTS/BR3.75/0.025	2.5 mV/A	1 V_{rms} @ 400 A_{rms}
CT 500	MCTS/BR1.5/0.025	2 mV/A	1 V_{rms} @ 500 A_{rms}
CT 1000	MCTS/BR1.5/0.025	1 mV/A	1 V_{rms} @ 1000 A_{rms}
CT 2000	MCTS/BR1/0.025	0.5 mV/A	1 V_{rms} @ 2000 A_{rms}

Active plug-on voltage output modules

The output voltage level the transducer can drive is limited. The active plug-on burden modules combine a very precise burden resistor with a highly accurate voltage amplifier. The plug-on burden voltage modules deliver 7 V_{rms} (± 9.9 V_{pk}) at transducer nominal value.

Order Number	Input Resistance	Accuracy	Frequency Influence	Phase Error	Bandwidth	Max. Output Voltage	Load Influence
MCTS/VM1/0.02	1 Ω	0.01 % of MV + 0.01 % of MR	0.015 %/kHz	< 1° @ 100 kHz	> 300 kHz	7 V_{rms} @ 1000 mA_{rms}	< 0.1 ppm/mW
MCTS/VM0.66/0.02	1.5 Ω	0.01 % of MV + 0.01 % of MR	0.015 %/kHz	< 1° @ 100 kHz	> 300 kHz	7 V_{rms} @ 667 mA_{rms}	< 0.1 ppm/mW
MCTS/VM0.4/0.02	2.5 Ω	0.01 % of MV + 0.01 % of MR	0.015 %/kHz	< 1° @ 100 kHz	> 300 kHz	7 V_{rms} @ 400 mA_{rms}	< 0.1 ppm/mW
MCTS/VM0.26/0.02	3.75 Ω	0.01 % of MV + 0.01 % of MR	0.015 %/kHz	< 1° @ 100 kHz	> 300 kHz	7 V_{rms} @ 267 mA_{rms}	< 0.1 ppm/mW
MCTS/VM0.2/0.02	5 Ω	0.01 % of MV + 0.01 % of MR	0.015 %/kHz	< 1° @ 100 kHz	> 300 kHz	7 V_{rms} @ 200 mA_{rms}	< 0.1 ppm/mW
MCTS/VM0.1/0.02	10 Ω	0.01 % of MV + 0.01 % of MR	0.015 %/kHz	< 1° @ 100 kHz	> 300 kHz	7 V_{rms} @ 100 mA_{rms}	< 0.1 ppm/mW





Resulting scaling with standard transducer / active burden-combinations

Transducer	Active VM	Scaling	Output Voltage
CT 100	MCTS/VM0.2/0.02	70 mV/A	7 V_{rms} @ 100 A_{rms}
CT 200	MCTS/VM0.2/0.02	35 mV/A	7 V_{rms} @ 200 A_{rms}
CT 400	MCTS/VM0.26/0.02	17.5 mV/A	7 V_{rms} @ 400 A_{rms}
CT 500	MCTS/VM0.66/0.02	14 mV/A	7 V_{rms} @ 500 A_{rms}
CT 1000	MCTS/VM0.66/0.02	7 mV/A	7 V_{rms} @ 1000 A_{rms}
CT 2000	MCTS/VM1/0.02	3.5 mV/A	7 V_{rms} @ 2000 A_{rms}

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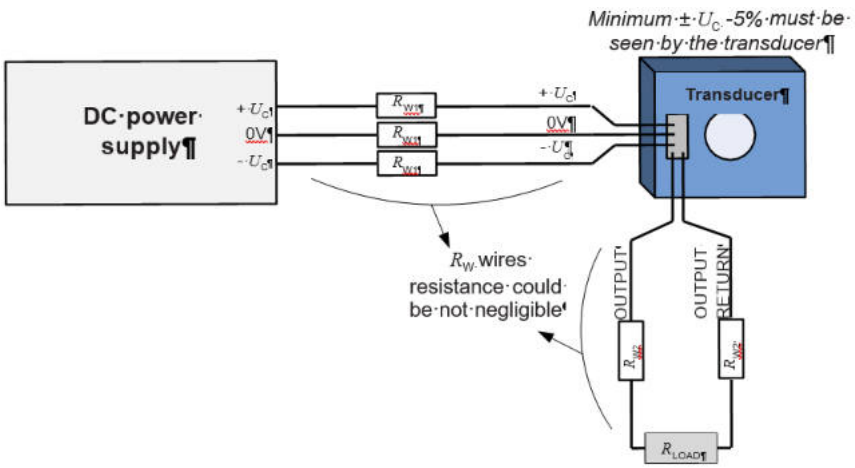
Connection Cables

Connection cables from the MCTS rack to the transducers are available in various cable lengths. Special cable lengths can be manufactured according demand. Be aware that the cable resistance is part of the maximum measuring resistance mentioned in the transducer data sheets. The cables are available with two different wire cross sections, 0.34 mm² and 0.75 mm².



Standard Connection Cables

Order Number	Cable Length	Wire Cross Section	Single Wire Resistance	Loop Resistance (4 x R_{WIRE})	Mass
MCTS/TPS/1	1 m	0.34 mm²	0.05 Ω	0.21 Ω	0.15 kg
MCTS/TPS/1.5	1.5 m	0.34 mm²	0.08 Ω	0.31 Ω	0.21 kg
MCTS/TPS/2.5	2.5 m	0.34 mm²	0.13 Ω	0.52 Ω	0.28 kg
MCTS/TPS/3	3 m	0.34 mm²	0.16 Ω	0.63 Ω	0.32 kg
MCTS/TPS/5	5 m	0.34 mm²	0.26 Ω	1.05 Ω	0.47 kg
MCTS/TPS/10	10 m	0.34 mm²	0.52 Ω	2.09 Ω	0.84 kg
MCTS/TPS/15	15 m	0.34 mm²	0.79 Ω	3.14 Ω	1.21 kg
MCTS/TPS/20	20 m	0.34 mm²	1.05 Ω	4.19 Ω	1.58 kg
MCTS/TPS/2.5/0.75	2.5 m	0.75 mm²	0.06 Ω	0.24 Ω	0.37 kg
MCTS/TPS/5/0.75	5 m	0.75 mm²	0.12 Ω	0.47 Ω	0.65 kg
MCTS/TPS/10/0.75	10 m	0.75 mm²	0.24 Ω	0.95 Ω	1.15 kg
MCTS/TPS/15/0.75	15 m	0.75 mm²	0.36 Ω	1.42 Ω	1.70 kg
MCTS/TPS/20/0.75	20 m	0.75 mm²	0.47 Ω	1.90 Ω	2.30 kg
MCTS/TPS/25/0.75	20 m	0.75 mm²	0.59 Ω	2.37 Ω	2.80 kg
MCTS/TPS/30/0.75	30 m	0.75 mm²	0.71 Ω	2.85 Ω	3.30 kg

Total Measuring Resistance at Full Scale. Other Resistance Values in Graphs on page 3.

Transducer	Measuring Resistance
CT 100	25 Ω
CT 200	20 Ω
CT 400	10 Ω
CT 500	5 Ω
CT 1000	4 Ω
CT 2000	3.5 Ω

Maximum Burden Resistor depending on Transducer and Connection Cable

The remaining burden resistance can be calculated by the subtraction of the connection cable loop resistance from the transducer total measuring resistance.

Example CT 1000 with 15 meters cable 0.34 mm² and 0.75 mm²:
CT 1000 total measuring resistance: 4 Ω at 1000 A_{rms}
MCTS/TPS/15 loop resistance: 3.14 Ω → Maximum allowed burden resistor = 4 Ω - 3.14 Ω = 0.86 Ω
MCTS/TPS/15/0.75 loop resistance: 1.42 Ω → Maximum allowed burden resistor = 4 Ω - 1.42 Ω = 2.58 Ω

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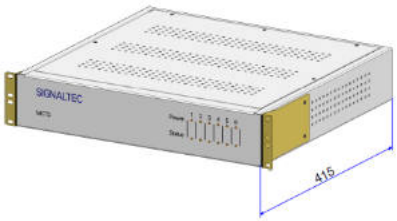
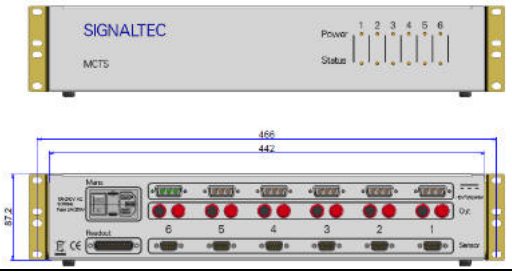
Dimensions

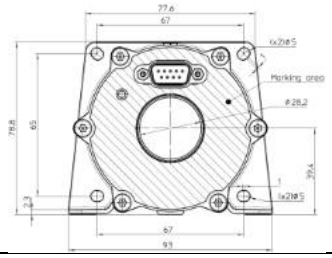
Rack

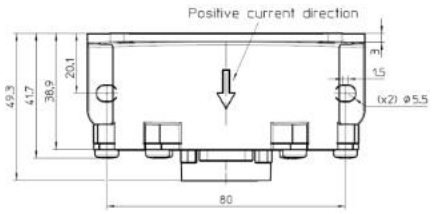




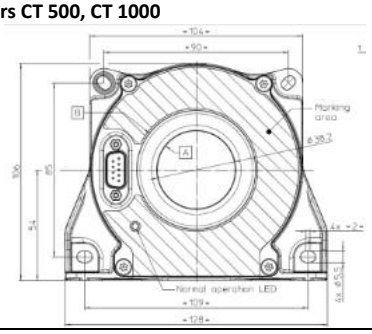
Cabinet Width:	442 mm (19" rack type)
Cabinet Height:	87,2 mm (2 HU)
Cabinet Depth:	415 mm
Mass Basic Unit:	6.8 kg
Mass Internal power supply:	0.5 kg
Mass 19" mounting brackets:	0.5 kg

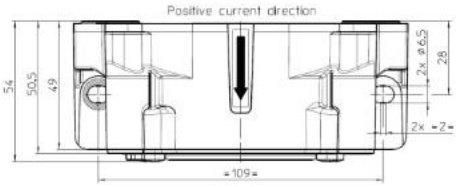
Transducers CT 100, CT 200, CT 400



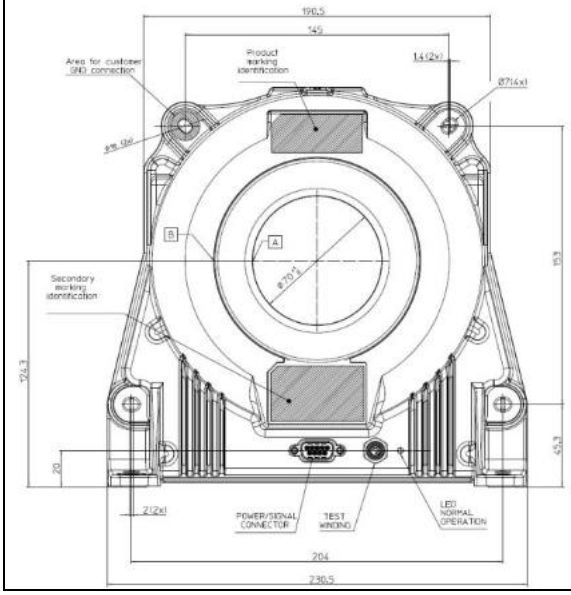


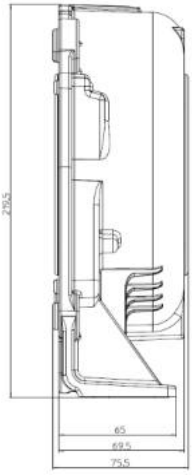
Transducers CT 500, CT 1000

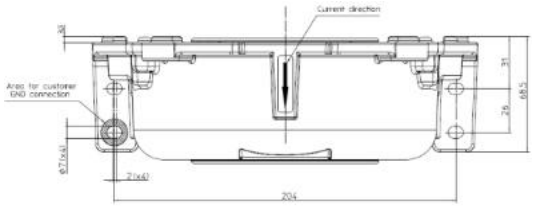




Transducer CT 2000







Passive plug-on burden resistors

Width:	51 mm
Height:	51 mm
Depth:	62 mm (Connectors included)
Mass:	85 g

Active plug-on voltage output modules

Width:	51 mm
Height:	51 mm
Depth:	62 mm (Connectors included)
Mass:	105 g

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Accessories

	**MCTS/CB** Carrying bag for rack, transducers, cables and burden modules
	**TSC** Transducer soft case for use with carrying bag **TSC1** for CT 100, CT 200, CT 400 **TSC2** for CT 500, CT 1000 **TSC4** for CT 2000
	**MCTS/ROC** 18-pole D-SUB-cable for status-readout-interface, length 3 m
	**BNC4A** BNC to 4 mm banana-plug adapter
	**BPL0.5** 4 mm banana-plug test lead set, length 0.5 m
	**BPL01** 4 mm banana-plug test lead set, length 1 m
	**BNCL1** BNC to BNC test lead, length 1 m
	**BNC4L1** BNC to 4 mm banana-plug test lead, length 1 m

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Order Numbers

MCTS Racks	
MCTS2/1CH	Basic unit with one internal power supply including 19" mounting brackets, power cord and manual
MCTS2/2CH	Basic unit with two internal power supplies including 19" mounting brackets, power cord and manual
MCTS2/3CH	Basic unit with three internal power supplies including 19" mounting brackets, power cord and manual
MCTS2/4CH	Basic unit with four internal power supplies including 19" mounting brackets, power cord and manual
MCTS2/5CH	Basic unit with five internal power supplies including 19" mounting brackets, power cord and manual
MCTS2/6CH	Basic unit with six internal power supplies including 19" mounting brackets, power cord and manual
MCTS2/BU	Basic unit without internal power supply including 19" mounting brackets, power cord and manual
MCTS/PS	Internal power Supply
Current Transducers	
CT 100	AC/DC current transducer 100 A_{rms}
CT 200	AC/DC current transducer 200 A_{rms}
CT 400	AC/DC current transducer 400 A_{rms}
CT 500	AC/DC current transducer 500 A_{rms}
CT 1000	AC/DC current transducer 1000 A_{rms}
CT 2000	AC/DC current transducer 2000 A_{rms}
Connection Cables	
MCTS/TPS/1	1.5 meters connection cable, 0.34 mm²
MCTS/TPS/1.5	1.5 meters connection cable, 0.34 mm²
MCTS/TPS/2.5	2.5 meters connection cable, 0.34 mm²
MCTS/TPS/3	3 meters connection cable, 0.34 mm²
MCTS/TPS/5	5 meters connection cable, 0.34 mm²
MCTS/TPS/10	10 meters connection cable, 0.34 mm²
MCTS/TPS/15	15 meters connection cable, 0.34 mm²
MCTS/TPS/20	20 meters connection cable, 0.34 mm²
MCTS/TPS/2.5/0.75	2.5 meters connection cable, 0.75 mm²
MCTS/TPS/5/0.75	5 meters connection cable, 0.75 mm²
MCTS/TPS/10/0.75	10 meters connection cable, 0.75 mm²
MCTS/TPS/15/0.75	15 meters connection cable, 0.75 mm²
MCTS/TPS/20/0.75	20 meters connection cable, 0.75 mm²
MCTS/TPS/25/0.75	25 meters connection cable, 0.75 mm²
MCTS/TPS/30/0.75	30 meters connection cable, 0.75 mm²
Passive Burden Resistors	
MCTS/BR1/0.025	1 Ω plug-on burden resistor for MCTS/TPS
MCTS/BR1.5/0.025	1.5 Ω plug-on burden resistor for MCTS/TPS
MCTS/BR2.5/0.025	2.5 Ω plug-on burden resistor for MCTS/TPS
MCTS/BR3.75/0.025	3.75 Ω plug-on burden resistor for MCTS/TPS
MCTS/BR5/0.025	5 Ω plug-on burden resistor for MCTS/TPS
MCTS/BR10/0.015	10 Ω plug-on burden resistor for MCTS/TPS
MCTS/BR25/0.015	25 Ω plug-on burden resistor for MCTS/TPS
MCTS/BR50/0.015	50 Ω plug-on burden resistor for MCTS/TPS
Active Voltage Output Modules	
MCTS/VM1/0.02	Plug-on output current amplifier 1A/7V
MCTS/VM0.66/0.02	Plug-on output current amplifier 667mA/7V
MCTS/VM0.4/0.02	Plug-on output current amplifier 400mA/7V
MCTS/VM0.26/0.02	Plug-on output current amplifier 267mA/7V
MCTS/VM0.2/0.02	Plug-on output current amplifier 200mA/7V
MCTS/VM0.1/0.02	Plug-on output current amplifier 100mA/7V
Accessories	
MCTS/CB	Carrying bag for MCTS rack, transducers and cables
TSC1	Transducer soft case for CT 100, CT 200, CT 400
TSC2	Transducer soft case for CT 500, CT 1000
TSC4	Transducer soft case for CT 2000
MCTS/ROC	Status readout interface cable, length 3 m
BPL0.5	4mm banana-plug test lead set for MCTS current output terminals, red and black, length 0.5 m
BPL1	4mm banana-plug test lead set for MCTS current output terminals, red and black, length 1 m
BNCL1	BNC to BNC test lead, length 1 m
BNC4L1	BNC to 4 mm banana-plug test lead, length 1 m
BNC4A	BNC to 4 mm banana-plug adapter

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