CAN Current Sensor (Shunt Type)

Battery Management Systems

battery made simple

Remote Monitoring ready

Reviewed by *D.B.* on *2025-January-21*

Product Code: CS030A

Introduction

EMUS CAN Current Sensor is high accurate device used to measure currents with high precision. It replaces an interconnecting bus bar, and due to the galvanic isolation between the sensor and the conducting part, it can be installed anywhere in the battery pack between two adjacent series-connected cells. The current sensor measures the current passing through it and communicates by CAN messages with the Control Unit. It also includes 1 or 3 voltage ports depending on your needs.

NOTE: *CS030A-1K-x-x / CS030A-2K-x-x and Contactor Control are under development*

NOTE: *Parameters noted with "-" are pending on testing*

Applications

- Electric vehicles, AGV
- Ideal for energy storage systems
- Photovoltaic battery systems

Features

- Voltage measurement channel up to 1500V and voltage isolation up to 850V
- Designed current from 300A up to 2000A depending on versions
- Resistive measurement technique, high EMI protection
- Adjustable CAN speed communication to 250kbps or 500kbps

Product Identifier

Current Range (A)	Voltage Channel	CAN Terminator	Contactor Control	Product Code
300	N1	0	0	CS030A-300-N1-0-0
			1	CS030A-300-N1-0-1
		1	0	CS030A-300-N1-1-0
			1	CS030A-300-N1-1-1
	P1	0	0	CS030A-300-P1-0-0
			1	CS030A-300-P1-0-1
		1	0	CS030A-300-P1-1-0
			1	CS030A-300-P1-1-1
	U3	0	0	CS030A-300-U3-0-0
			1	CS030A-300-U3-0-1
		1	0	CS030A-300-U3-1-0
			1	CS030A-300-U3-1-1

CS030A - 300 - N1 - 0 - 0

Product Code	*Current Range (A)*	*Voltage Channel*	*CAN Terminator*	*Contactor Control*
CAN Current Sensor	300 = 300A 1k = 1000A 2k = 2000A	N1 = 1 Channel on Negative Terminal P1 = 1 Channel on Positive Terminal U3 = 3 Channels	0 = No 1 = Yes	0 = No 1 = Yes

Current Range (A)	Voltage Channel	CAN Terminator	Contactor Control	Product Code
1K	N1	0	0	CS030A-1K-N1-0-0
			1	CS030A-1K-N1-0-1
		1	0	CS030A-1K-N1-1-0
			1	CS030A-1K-N1-1-1
	P1	0	0	CS030A-1K-P1-0-0
			1	CS030A-1K-P1-0-1
		1	0	CS030A-1K-P1-1-0
			1	CS030A-1K-P1-1-1
	U3	0	0	CS030A-1K-U3-0-0
			1	CS030A-1K-U3-0-1
		1	0	CS030A-1K-U3-1-0
			1	CS030A-1K-U3-1-1

Current Range (A)	Voltage Channel	CAN Terminator	Contactor Control	Product Code
2K	N1	0	0	CS030A-2K-N1-0-0
			1	CS030A-2K-N1-0-1
		1	0	CS030A-2K-N1-1-0
			1	CS030A-2K-N1-1-1
	P1	0	0	CS030A-2K-P1-0-0
			1	CS030A-2K-P1-0-1
		1	0	CS030A-2K-P1-1-0
			1	CS030A-2K-P1-1-1
	U3	0	0	CS030A-2K-U3-0-0
			1	CS030A-2K-U3-0-1
		1	0	CS030A-2K-U3-1-0
			1	CS030A-2K-U3-1-1

**Only available 300A-N1 with or without CAN termination, Contactor Controls is not available for current CS030A version. For further information on other versions contact Support. Other versions can be adquire under request, in such case contact Sales*

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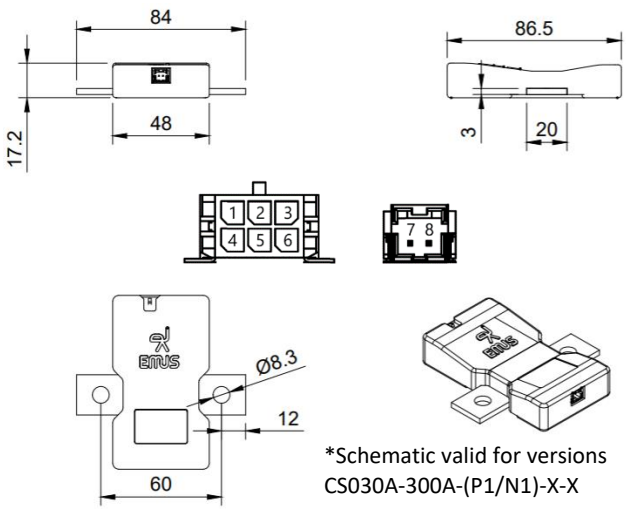
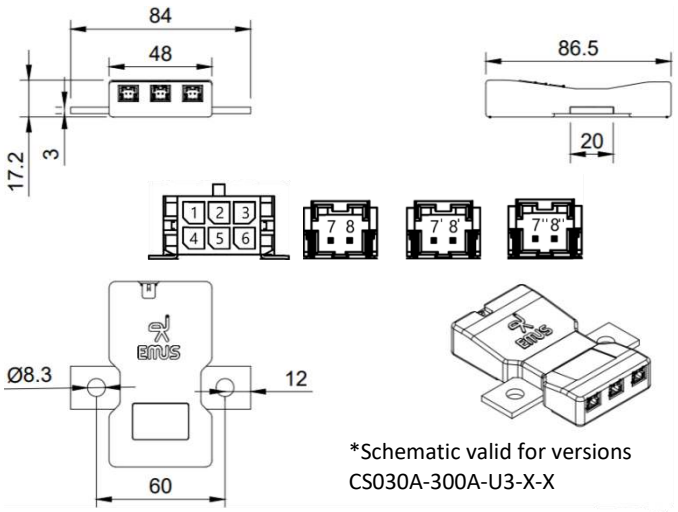
Product Code: CS030A

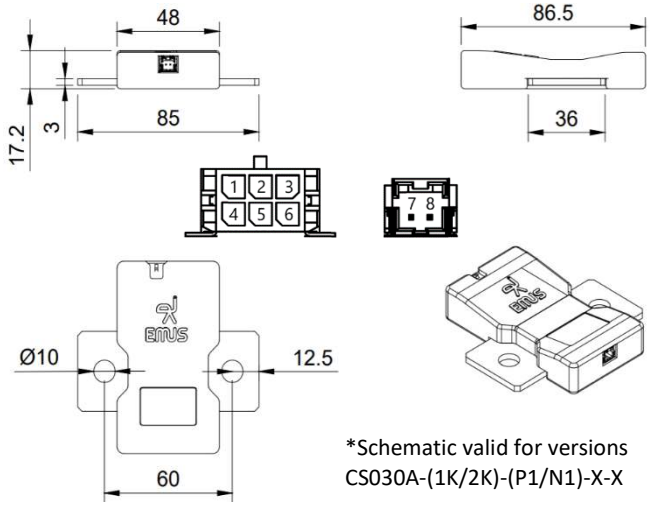
Mechanical Information



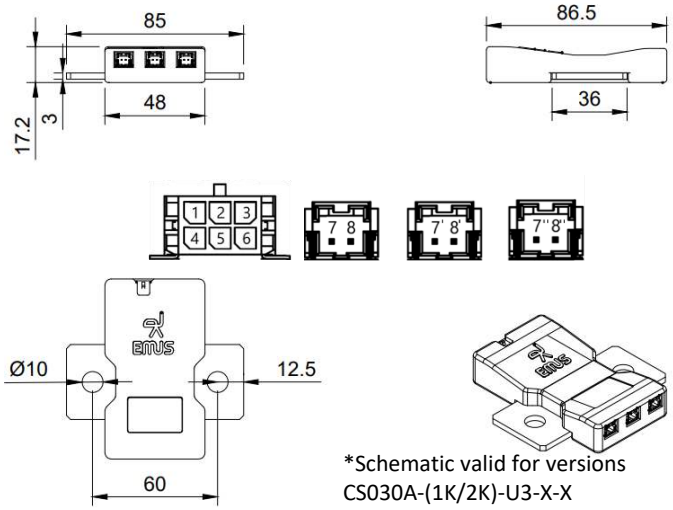
*Schematic valid for versions CS030A-300A-(P1/N1)-X-X



*Schematic valid for versions CS030A-300A-U3-X-X



*Schematic valid for versions CS030A-(1K/2K)-(P1/N1)-X-X



*Schematic valid for versions CS030A-(1K/2K)-U3-X-X

Table 1. CS030A pin assignment

Pin No.	Assignment	Mating Housing	Terminal
1	PWR	8 Pin Molex Micro-fit Header 43025-0800	43030-0003 (recommended crimp tool Molex Hand Crimp Tool P/N: 638190000)
2 *	Contactor Control		
3	CAN_H		
4	GND		
5	Wake Up		
6	CAN_L		
7 = 8 **	Voltage Measurement 1	502351-0201 2pin Molex Dura-click header	50212-8100 Molex crimps
7' = 8' **	Voltage Measurement 2	502351-0201 2pin Molex Dura-click header	50212-8100 Molex crimps
7" = 8" **	Voltage Measurement 3	502351-0201 2pin Molex Dura-click header	50212-8100 Molex crimps

*Available in CS030A with Contactor Control integrated only

** Pin pair 7-8 is internally shorted. Pin pair 7'-8' is internally shorted. Pin pair 7''-8'' is internally shorted

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CAN Current Sensor (Shunt Type)

Product Code: CS030A

Electrical Characteristics

Table 2. Operational parameters (all versions)

Parameter	Value
Supply voltage	6 – 70VDC
Current consumption	14mA@12VDC / 7.35mA@24VDC
Current consumption sleep mode	68µA@12VDC / 44µA@24VDC
Wake up GPI voltage input	6 - 70VDC
Recommended ambient temperature usage range*	-30 to +55°C
Operational temperature (shunt)	-30 to +170°C
Internal isolation clearance distance	8 mm
Isolation voltage**	850VDC
Transient voltage (t = 1s)	2500V
IP rating	IP42
Weight	74.25g

*Under constant nominal current. Maximum temperature might differ on bus bar heat transfer properties and resistance
**Recommended maximum battery voltage

Measurement Specifications

Table 3. Current measurement

Parameter	Version		
	300A	1K	2K
Nominal current range	±300A	±1000A	±2000A
Maximum current measurement range	±1600A	-	-
Maximum peak current (1min)	±400A	-	-
Maximum peak current (15sec)	±650A	-	-
Maximum peak current (1sec)	±1000A	-	-
Resolution	1mA	-	-
Maximum offset	15mA	-	-
Typical current measurement error	±0.35%	-	-
Maximum current measurement error	±0.4% or 25mA	-	-
Outrange current measurement error	±0.5%	-	-
Conductor resistance	100µΩ ± 3%	-	-
Typical power loss at maximum rated current	9W	-	-

Table 4. Voltage measurement

Parameter	Version	
	1 Channel	3 Channel
Maximum safe input voltage	±1500V	±1500V
Maximum measurable voltage	±1800V	-
Resolution	1mV	-

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CAN Current Sensor (Shunt Type)

Product Code: CS030A

Parameter	Version	
	1 Channel	3 Channel
Typical voltage measurement error*	±0.1% + 2 digits	-
Maximum voltage measurement error	±0.45% + 2 digits	-
Typical offset	<25mV	-
Maximum offset	300mV	-
Input resistance	4.2MΩ	-

*Voltage measurements below 15V may have lower accuracy

Table 5. Communication specifications (all versions)

Parameter	Value
CAN terminator	120Ω*
CAN speed	250kbit/s or 500kbit/s
Default communication period	100ms

*If CAN termination version is used

Installation

Depending on the type of Voltage Measurement Channel, the current sensor must be connected to the battery in distinct locations. Please note that incorrect installation of the current sensor might damage it. The 3CH type can be installed in any position on the battery.

- N1 type must be connected to the Negative terminal of the battery
- P1 type must be connected to the Positive terminal of the battery
- U3 type can be placed on any terminal or replacing a bus bar

Current flowing in this direction is considered Positive by default!
EMUS G1 system considers always Charging Current as Positive Current!

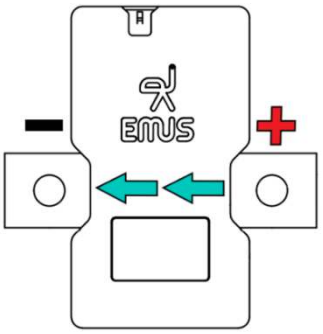

Figure 1. CS030A positive current direction

Figure 2. CS030A type N1 and P1 installation respectively

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CAN Protocol

**For further information about implemented CAN protocol contact Support*

Current Measurement

Current Measurement message:

CAN Identifier	Ext. ID	RTR	DLC	Data0	Data1	Data2	Data3	Data4	Data5
0x521h	0	0	6	Reserved	Message Tracker	Current (LSB)	Current (3rd Byte)	Current (2nd Byte)	Current (MSB)

Description of values:

Data	Value	Description
0	Reserved	Reserved
1	Message Tracker	This byte can be used to distinguish from other Current Measurement messages. Every time this message is sent Byte1 increases +1 from 00 to 0F cyclically.
2	Current (LSB)	Current measured, encoded 0.001A. For example: • Byte2 = E3 • Byte3 = 23 • Byte4 = 10 • Byte5 = 00 001023E3 (HEX) = 1057.763A (DEC)
3	Current (3rd Byte)	
4	Current (2nd Byte)	
5	Current (MSB)	

Voltage Measurement

Voltage Measurement message:

CAN Identifier	Ext. ID	RTR	DLC	Data0	Data1	Data2	Data3	Data4	Data5
0x522h	0	0	6	Reserved	Message Tracker	Voltage (LSB)	Voltage (3rd Byte)	Voltage (2nd Byte)	Voltage (MSB)

Description of values:

Data	Value	Description
0	Reserved	Reserved
1	Message Tracker	This byte can be used to distinguish from other Voltage Measurement messages. Every time this message is sent Byte1 increases +1 from 00 to 0F cyclically.
2	Voltage (LSB)	Current measured, encoded 0.001V. For example: • Byte2 = E4 • Byte3 = 23 • Byte4 = 10 • Byte5 = 00 001023E4 (HEX) = 1057.764V (DEC)
3	Voltage (3rd Byte)	
4	Voltage (2nd Byte)	
5	Voltage (MSB)	

Temperature Measurement

Temperature Measurement message:

CAN Identifier	Ext. ID	RTR	DLC	Data0	Data1	Data2	Data3	Data4	Data5
0x525h	0	0	6	Reserved	Message Tracker	Temper. (LSB)	Temper. (3rd Byte)	Temper. (2nd Byte)	Temper. (MSB)

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Description of values:

Data	Value	Description
0	Reserved	Reserved
1	Message Tracker	This byte can be used to distinguish from other Temper. Measurement messages. Every time this message is sent Byte1 increases +1 from 00 to 0F cyclically.
2	Temper. (LSB)	Current measured, encoded 0.001°C. For example: • Byte2 = 55 • Byte3 = 61 • Byte4 = 00 • Byte5 = 00 00001BE6 (HEX) = 24.917°C (DEC)
3	Temper. (3rd Byte)	
4	Temper. (2nd Byte)	
5	Temper. (MSB)	

Change CS030A CAN Speed

To change the CAN speed it is only required to send the corresponding CAN message. The current sensor will automatically start working at the new CAN speed.

Set CAN Speed to 250kbps message:

CAN Identifier	Ext. ID	RTR	DLC	Data0	Data1	Data2	Data3	Data4	Data5	Data 6	Data 7
0x411h	0	0	8	3A	08	00	00	00	00	00	00

Set CAN Speed to 500kbps message:

CAN Identifier	Ext. ID	RTR	DLC	Data0	Data1	Data2	Data3	Data4	Data5	Data 6	Data 7
0x411h	0	0	8	3A	04	00	00	00	00	00	00

Change CS030A CAN Identifier

To change the CAN Identifier of the measurement message it is only required to send the corresponding CAN message. The current sensor will automatically start sending the measurement message with a new CAN Identifier.

Set a new CAN Identifier:

CAN Identifier	Ext. ID	RTR	DLC	Data0	Data1	Data2
0x411h	0	0	3	Message type	New CAN Identifier (MSB)	New CAN Identifier (LSB)

Description of values:

Data	Value	Description
0	Message type	• 10 for the Current Measurement message • 11 for the Voltage Measurement message • 14 for the Temperature Measurement message
1	New CAN Identifier (MSB)	The new CAN Identifier of the measurement message can be set to any HEX value between 0x000h and 0x7FFh
2	New CAN Identifier (LSB)	