

Technical data sheet

LION SAFE CCU



Identification

Type LION-SAFE-PLC-SProg-CAN-MVB-ETH-LLNK-LUE
Part No. [802109](#)

Product version

Hardware revision 1.2 (Safe A / non-Safe B)
Software version 03.16 (Safe D / non-Safe D)
Datasheet version 04

Use/Application/Properties

Description Compact high-performance PLC with safety integrity level SIL2 for use in rail vehicles. Free programmable in a safe and certified development environment. High-performance field busses MVB (SDTv2), CAN and Ethernet, TRDP (SDTv2) with DualHoming. Safe and non-safe I/O modules can be connected via the L-Bus².

Safety integrity

Standards SIL 2 according to EN 50129, EN 50716 (EN 50657, EN 50128) and EN 50126

General (Software)

Controller CPU Sitara AM4379 Cortex A9 1GHz
Program memory: 1 MB
Working memory: 4 MB
Diagnostics memory: 8 kB
Real Time Clock (RTC) without battery

Software (Safe) Operating system: FreeRTOS™ Runtime system: SAFEOS Programming languages FBS, ST Programming SAFEPROG

Software (non Safe) Real time operating system rcXSoft-SPS Phoenix Software ProConOS® Programming acc. to IEC 61131-3:AWL, KOP, FBS, ST, AS Programming: MULTIPROG Field bus configuration flexible per configurator or per FB Visualization per OPC (Ethernet)

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Software	Real time operating system rcX Soft-SPS Phoenix Software ProConOS® Programming acc. to IEC 61131-3: AWL, KOP, FBS, ST, AS Programming: MULTIPROG Field bus configuration flexible per configurator or per FB Visualization per OPC (Ethernet)

General

Dimensions (w × h × d)	195.0 mm × 160.0 mm × 54.0 mm
Weight/unit	0.984 kg
Mounting	DIN rail mounting
Installation position	Horizontal, vertical, horizontal upright, horizontal suspended Installation space: Top: 5 mm (for assembly) Bottom: 5 mm (for assembly) Side: 0 mm

Bus interface

	Fieldbus
Bus system	MVB EMD, Class 1.3 (Safety Layer SDTv2)
Module type	Slave
Configuration	The field bus is configured by software.
Connection	X2: SUB-D male connector, 9-pole, M3 thread X3: SUB-D socket connector, 9-pole, M3 thread
	Fieldbus
Bus system	CANopen
Module type	Master
Connection	X4: SUB-D socket connector, 9-pin, M3 thread X5: SUB-D plug connector, 9-pin, M3 thread
Configuration	The field bus is configured by software.
	Fieldbus
Bus system	Ethernet 802.3, 100 Base TX
Module type	Ethernet TCP/IP client or server Ethernet TCP/IP UDP/IP Client or Server DualHoming TRDP with SDTv2 (TCNOpen V1.4.1.0) This interface is also the programming interface for safety PLC and standard PLC at the same time Visualization of the standard PLC via OPC
Connection	X6: M12 jack 4-pin D coded X7: M12 socket 4-pin d-coded
Configuration	The field bus is configured by software.

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	Local bus
Bus system	L-Bus ² for connecting LION/ I/O modules
Module type	HEAD (Master)
Connection type, incoming bus	X30: Female connector IDE, 14-pin
Connection type, continuing bus	X31: Plug connector IDE, 14-pin
Configuration	The local bus is configured by software.
	Local bus
Bus system	LLK for connecting safe gateways (proprietary)
Module type	Master
Connection	X8: M12 female connector 5-pin b-coded
Configuration	The local bus is configured per software.
Bus system	USB to connect USB memory for software updates
Module type	Master
Connection	X12: USB female connector Type-A No function at this time

Relay

Number	2
Connection type	X11: Spring terminal, Push-in
Contact type	Forcibly guided in accordance with EN 50205 application type A
Contact material	AgCuNi + 0.2 µm HV
Switch-on delay	approx. 18.5 ms
Switch-off delay	Approx. 21 ms
Mechanical service life	approx. 10 × 10 ⁶ operations
Switching voltage	AC/DC 5...250V
Switching current	AC/DC 0.005...6 A

Supply module electronic

Rated voltage U _N	DC 24V is only allowed via LION PS
Current consumption via L-Bus ²	Max. 3.4 A, consisting of:- 0.6 A own consumption- 1.0 A over L-Bus ² - 1.8 A over LLK
Connection	X30: male connector 14-pin (via L-Bus ² 1:1 connector to LION PS)

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Diagnostics

Diagnosis indications	Status standard control unit (PLC) LED yellow Logic supply(U _L) LED green MVB status (MVB _{ST}) LED green MVB error (MVB _{ERR}) LED red CAN status (CAN _{ST}) LED green CAN error (CAN _{ERR}) LED red LLK status (LLK _{ACT}) LED green LLK error (LLK _{ERR}) LED red Ethernet Activity channel 1 (ACT1) LED yellow Ethernet Link channel 1 (LNK1) LED green Ethernet Activity channel 2 (ACT2) LED yellow Ethernet Link channel 2 (LNK2) LED green Safety control unit operation (SPLC _{RUN}) LED green Safety control unit stop (SPLC _{STP}) LED yellow Safety control unit error (SPLC _{ERROR}) LED red Safety control unit LED1 freely programmable (SPLCUSR1) LED green Safety control unit LED2 freely programmable (SPLCUSR2) LED green L-Bus ² status (LB _{ST}) LED green L-Bus ² error (LB _{ERR}) LED red
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Electrical isolation

Potential groups	See diagram "Potential groups"
Isolating voltage	AC 500 V Ethernet and electronics AC 500 V MVB and electronics AC 500 V CAN and electronics AC 500 V LLK and electronics AC 500 V relay and electronics

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Storage temperature range	-40 °C ... +85 °C
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PE connection

Connection tab	X0: screw M4
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Environmental service conditions

Altitude	2000 m
Operating temperature class	OT4: -40 °C ... +70 °C
Switch-on extended Operating temperature class	ST1: OTx + 15 °C
Temperature variation class	H1: no requirements
Shock/Vibration	Category 1, class B
Class of supply voltage interruption	This value is defined by the LION supply voltage.
Supply change-over class	This value is defined by the LION supply voltage.
Degree of pollution	PD2
Over voltage category	OV2
Socket and edge connector	K2: Sockets for ICs and/or edge connectors are not used
Protective coating class	PC2: lacquered on both sides

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Degree of protection IP20

Failure Rate Prediction (MTBF)

Standards Electronic components – Reliability – Reference conditions for failure rates and stress models for conversion: EN/IEC 61709
Failure Rates of Components – Expected values: SN 29500

Failure rate at +45 °C 5541 fit
Failure rate at +45 °C 180486 h
1 fit equals one failure per 10⁹ component hours
The indicated temperature is the mean component ambient temperature.

Comments The results are valid under following conditions:
Automotive environment or industrial areas without extreme dust levels and harmful substances.
Continuous operation 8760 h per year.

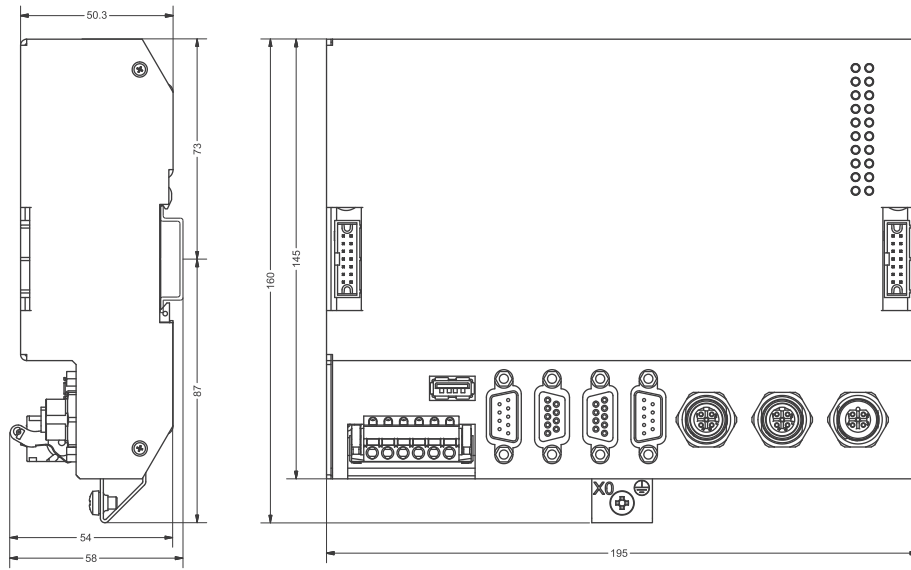
Standards/Certifications

Standards **EN 50155:2021**: Railway applications – Rolling stock – Electronic equipment
EN 50121-3-2:2016+A1:2019: Railway applications – Electromagnetic compatibility – Part 3-2: Rolling stock – Apparatus
EN 50124-1:2017: Railway applications – Insulation coordination – Part 1: Basic requirements – Clearances and creepage distances for all electrical and electronic equipment
EN 50126-1:2017: Railway Applications – The Specification and Demonstration of Reliability, Availability, Maintainability and Safety (RAMS) - Part 1: Generic RAMS Process
EN 50128:2011+A1:2020+A2:2020: Railway applications - Communication, signalling and processing systems - Software for railway control and protection systems
EN 50129:2018+AC:2019: Railway applications – Communication, signalling and processing systems – Safety related electronic systems for signalling
EN 50716:2023: Railway Applications – Requirements for software development
EN 61373:2010: Railway applications – Rolling stock equipment – Shock and vibration tests
EN 61373:1999: Railway applications – Rolling stock equipment – Shock and vibration tests
Regulation No. EMC 06: Technical Rules on Electromagnetic Compatibility - Verification of radio compatibility of rail vehicles with railroad radio services
EN 45545-2:2020+A1:2023 Railway applications - Fire protection on railway vehicles - Part 2: Requirements for fire behaviour of materials and components

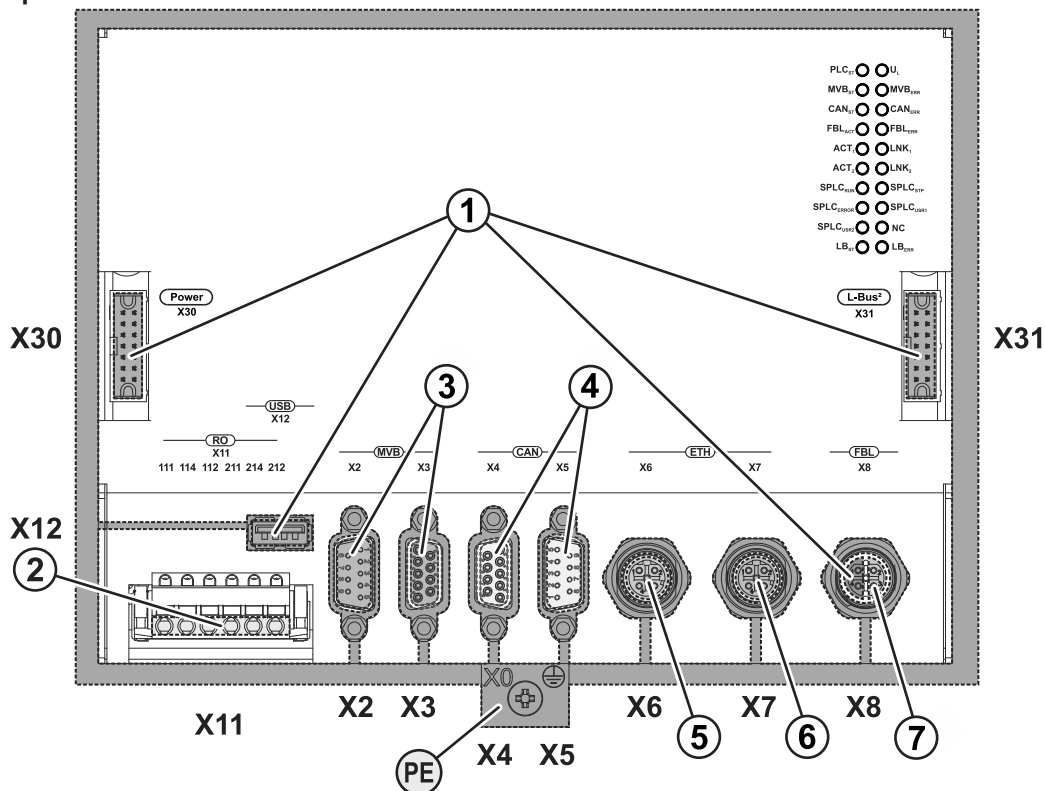
Equipment/Spare parts

Accessories Included accessories
L-Bus bus termination connector, part number 800201
6-pin plug-in terminal, part number 835234
Optional accessories
L-Bus protective connector (dummy connector), part number 800202
L-Bus 1:1 connection cable, part number 800203
EMC-Shield clip set, part number 800204

Dimensions



Potential groups



1.
DE Potentialgruppen
EN Potential groups
FR Groupes de potentiel

- (PE): PE (X0), HOUSING,
 Potential PE
- (1): POWER, L-Bus² (X30, X31),
 ELECTRONIC,
 USB connector, CPU (X12),
 F-Bus-Link, (X8: Pin 1+4),
 Potential A
- (2): RELAY OUTPUTS (X11),
 Potential B
- (3): MVB (X2, X3) (optional),
 Potential C
- (4): CAN (X4, X5) (optional),
 Potential D
- (5): Ethernet 1 (X6),
 Potential E
- (6): Ethernet 2 (X7),
 Potential F
- (7): F-Bus-Link, (X8: Pin 2+3),
 Potential G

2.
DE Kapazitive Kopplung
EN Capacitive coupling
FR Couplage capacitif

- ca. 4.7 nF: (PE) ↔ (1)
 ca. 10 nF: (PE) ↔ (2)
 ca. 1.5 nF: (PE) ↔ (5)
 ca. 1.5 nF: (PE) ↔ (6)

3.
DE Trennspannung/
EN Isolating voltage/
FR Tension d'isolement

- 3.1**
 Basisisolierung/
 Basic insulation/
 Isolation de base
- AC 1500 V:**
 (PE) ↔ (1)+(2)+(3)+(4)+(5)+(6)+(7)
 (1) ↔ (2)+(3)+(4)+(5)+(6)+(7)

3.2
 Verstärkte Isolierung/
 Reinforced insulation/
 Isolation renforcée