

## Technical data sheet

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### LION SAFE CCU



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#### Identification

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|          |  |
|----------|--|
| Type     | LION-SAFE-PLC-SProg-COM-MVB-ETH-LLNK-LUE |
| Part No. | <a href="#">802108</a>                   |

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#### Product version

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|                   |     |
|-------------------|-----|
| Hardware revision | A   |
| Software version  | A.A |
| Datasheet version | 00  |

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#### Use/Application/Properties

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|             |  |
|-------------|--|
| 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 (SDTv2), CANopen Master and Ethernet, TRDP (SDTv2) with DualHoming. Safe and non-safe I/O modules can be connected via the L-Bus <sup>2</sup> . |
|-------------|--|

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#### General (Software)

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|                     |   |
|---------------------|---|
| Controller          | CPU Sitara AM4379 Cortex A9 1GHz<br>Program memory: 1 MB<br>Working memory: 4 MB<br>Diagnostics memory: 8 kB<br>Real Time Clock (RTC) without battery   |
| Software (Safe)     | Operating system: FreeRTOS™<br>Runtime system: SAFEOS<br>Programming languages FBS, ST<br>Programming SAFEPROG  |
| Software (non Safe) | Real time operating system rcXSoft-SPS<br>Phoenix Software ProConOS®<br>Programming acc. to IEC 61131-3:AWL, KOP, FBS, ST,<br>ASProgramming: MULTIPROG<br>Field bus configuration flexible per configurator or per FBVisualization per OPC (Ethernet) |
| Software            | Operating system: FreeRTOS™<br>Runtime system: SAFEOS<br>Programming languages FBS, ST<br>Programming SAFEPROG  |

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Part No. [802108](#) • Datasheet version: 00

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|          |   |
|----------|---|
| Software | Real time operating system rcX<br>Soft-SPS Phoenix Software ProConOS®<br>Programming acc. to IEC 61131-3:<br>AWL, KOP, FBS, ST, AS<br>Programming: MULTIPROG<br>Field bus configuration flexible per configurator or per FB<br>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<br>Installation space:<br>Top: 5 mm (for assembly)<br>Bottom: 5 mm (for assembly)<br>Side: 0 mm |

### Bus interface

|                               |   |
|-------------------------------|---|
| <b>Fieldbus</b>               |   |
| Bus system                    | MVB EMD, Class 1.3<br>(Safety Layer SDTv2)  |
| Module type                   | Slave   |
| Configuration                 | The field bus is configured by software.  |
| Connection                    | X2: SUB-D male connector, 9-pole, M3 thread<br>X3: SUB-D socket connector, 9-pole, M3 thread  |
| <b>Fieldbus</b>               |   |
| Bus system                    | CANopen   |
| Module type                   | Master  |
| Connection                    | X4: SUB-D socket connector, 9-pin, M3 thread<br>X5: SUB-D plug connector, 9-pin, M3 thread  |
| Configuration                 | The field bus is configured by software.  |
| <b>Fieldbus</b>               |   |
| Bus system                    | Ethernet 802.3, 100 Base TX   |
| Module type                   | Ethernet TCP/IP client or server<br>Ethernet TCP/IP<br>UDP/IP Client or Server<br>DualHoming<br>TRDP with SDTv2<br>This interface is also the programming interface for safety PLC and standard PLC at the same time<br>Visualization of the standard PLC via OPC |
| Connection                    | X6: M12 jack 4-pin D coded<br>X7: M12 socket 4-pin d-coded  |
| Configuration                 | The field bus is configured by software.  |
| <b>Local bus</b>              |   |
| Bus system                    | L-Bus² for connecting LION/ I/O modules   |
| Module type                   | HEAD (Master)   |
| Connection type, incoming bus | X30: Female connector IDE, 14-pin   |

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|   |   |
|---|---|
| Connection type, continuing bus Configuration | X31: Plug connector IDE, 14-pin<br>The local bus is configured by software. |
| Bus system                                    | <b>Local bus</b><br>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<br>No function at this time                |

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### Relay

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|                         |  |
|-------------------------|--|
| 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. $10 \times 10^6$ operations                            |
| Switching voltage       | AC/DC 5...250V   |
| Switching current       | AC/DC 0.005...6 A  |

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### Supply module electronic

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

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### Diagnostics

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|                       |   |
|-----------------------|---|
| Diagnosis indications | Status standard control unit (PLC) LED yellow<br>Logic supply( $U_L$ ) LED green<br>MVB status ( $MVB_{ST}$ ) LED green<br>MVB error ( $MVB_{ERR}$ ) LED red<br>CAN status ( $CAN_{ST}$ ) LED green<br>CAN error ( $CAN_{ERR}$ ) LED red<br>LLK status ( $LLK_{ACT}$ ) LED green<br>LLK error ( $LLK_{ERR}$ ) LED red<br>Ethernet Activity channel 1 (ACT1) LED yellow<br>Ethernet Link channel 1 (LNK1) LED green<br>Ethernet Activity channel 2 (ACT2) LED yellow<br>Ethernet Link channel 2 (LNK2) LED green<br>Safety control unit operation ( $SPLC_{RUN}$ ) LED green<br>Safety control unit stop ( $SPLC_{STP}$ ) LED yellow<br>Safety control unit error ( $SPLC_{ERROR}$ ) LED red<br>Safety control unit LED1 freely programmable ( $SPLC_{USR1}$ ) LED green<br>Safety control unit LED2 freely programmable ( $SPLC_{USR2}$ ) LED green<br>L-Bus <sup>2</sup> status ( $LB_{ST}$ ) LED green<br>L-Bus <sup>2</sup> 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<br>AC 500 V MVB and electronics<br>AC 500 V CAN and electronics<br>AC 500 V LLK and electronics<br>AC 500 V relay and electronics |

### Technical data

|                           |                   |
|---------------------------|-------------------|
| Storage temperature range | -40 °C ... +85 °C |
|---------------------------|-------------------|

### PE connection

|                |              |
|----------------|--------------|
| Connection tab | X0: screw M4 |
|----------------|--------------|

### Environmental service conditions

|  |   |
|--|---|
| <b>Altitude</b>                                | 2000 m  |
| Operating temperature                          | -40 °C ... +70 °C (+85 °C for 10 min)                         |
| Operating temperature class                    | OT4: -40 °C ... +70 °C  |
| Switch-on extended Operating temperature class | ST1: OTx + 15 °C  |
| Shock/Vibration                                | Category 1, class B (acc. to DIN EN 61373)                    |
| 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.             |
| Useful life class                              | L4: 20 years<br>For restrictions, see operating instructions. |
| 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                                  |
| 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<br>Failure Rates of Components – Expected values: SN 29500  |
| Failure rate at +45 °C | 5541 fit  |
| Failure rate at +45 °C | 180486 h<br>1 fit equals one failure per 10 <sup>9</sup> component hours<br>The indicated temperature is the mean component ambient temperature.  |
| Comments               | The results are valid under following conditions:<br>Automotive environment or industrial areas without extreme dust levels and harmful substances.<br>Continuous operation 8760 h per year.<br>(Values of 0 fit, or 0 h mean that these values are still in the test, ask here if required.) |

## Technical data sheet

### Standards/Certifications

#### Standards

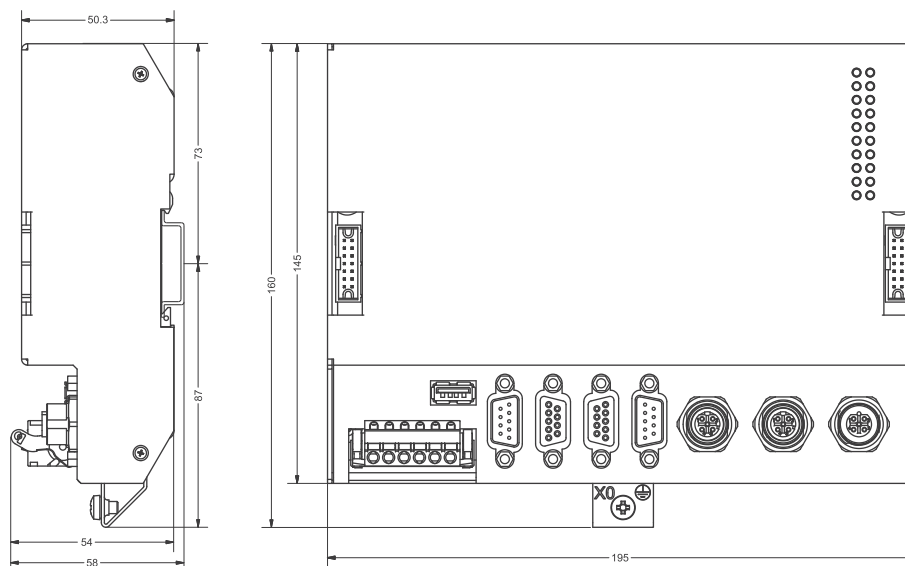
**EN 50155:2021:** Railway applications – Rolling stock – Electronic equipment  
**EN 50121-3-2:2016+A1:2019:** Railway applications – Electromagnetic compatibility – Part 3-2: Rolling stock – Apparatus  
**EN 50124-1:2017:** Railway applications – Insulation coordination – Part 1: Basic requirements – Clearances and creepage distances for all electrical and electronic equipment  
**EN 50657:2017:** Railways Applications – Rolling stock applications – Software on Board Rolling Stock  
**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:** Railway applications – Fire protection on railway vehicles – Part 2: Requirements for fire behaviour of materials and components

### Equipment/Spare parts

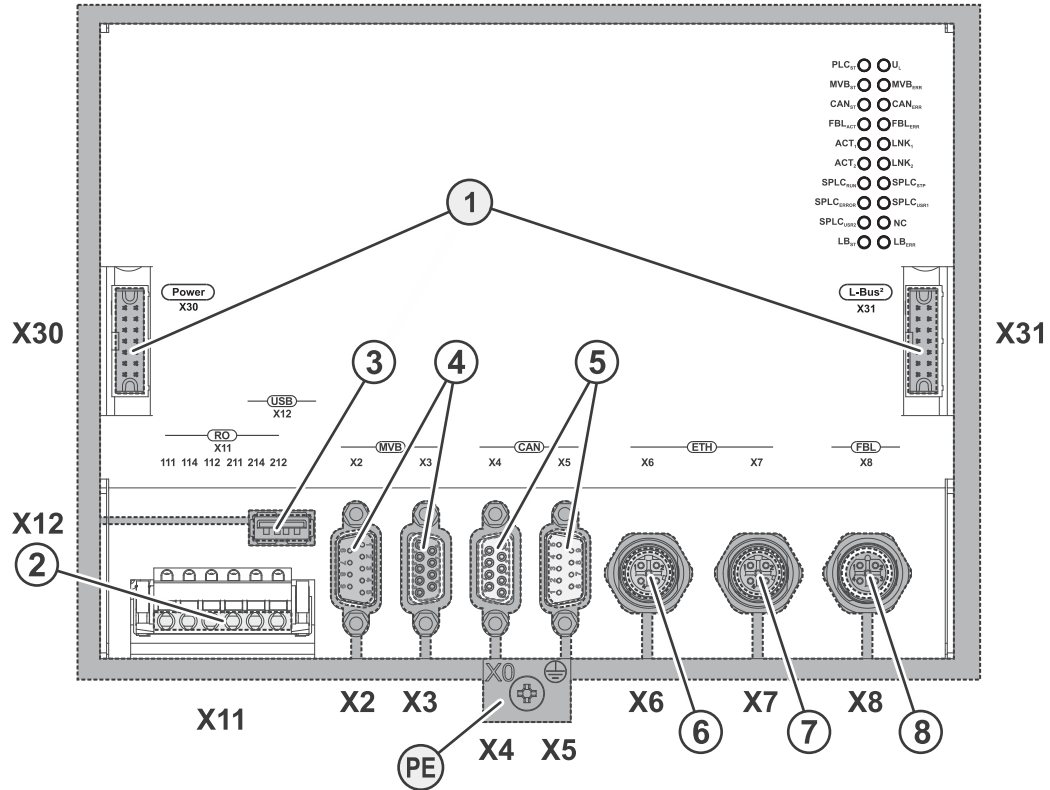
#### Accessories

L-Bus bus termination connector, part number 800201  
L-Bus protective connector (dummy connector), part number 800202  
L-Bus 1:1 connection cable, part number 800203  
Ethernet programming cable, part number 192013  
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-Bus<sup>2</sup> (X30, X31),  
ELECTRONIC, Potential A  
(2): RELAY OUTPUTS (X11),  
Potential B  
(3): USB connector, CPU (X12)  
Potential C  
(4): MVB (X2, X3)  
Potential D  
(5): CAN (X4, X5)  
Potential E  
(6): Ethernet 1 (X6)  
Potential F  
(7): Ethernet 2 (X7)  
Potential G  
(8): F-Bus-Link (X8)  
Potential H

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) ⇔ (6)  
ca. 1.5 nF: (PE) ⇔ (7)

3.  
DE Trennschaltung/  
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)+(8)  
(1) ⇔ (2)+(3)+(4)+(5)+(6)+(7)+(8)

3.2  
Verstärkte Isolierung/  
Reinforced insulation/  
Isolation renforcée