



■ Transportation Solutions

LÜTZE Rail Technology

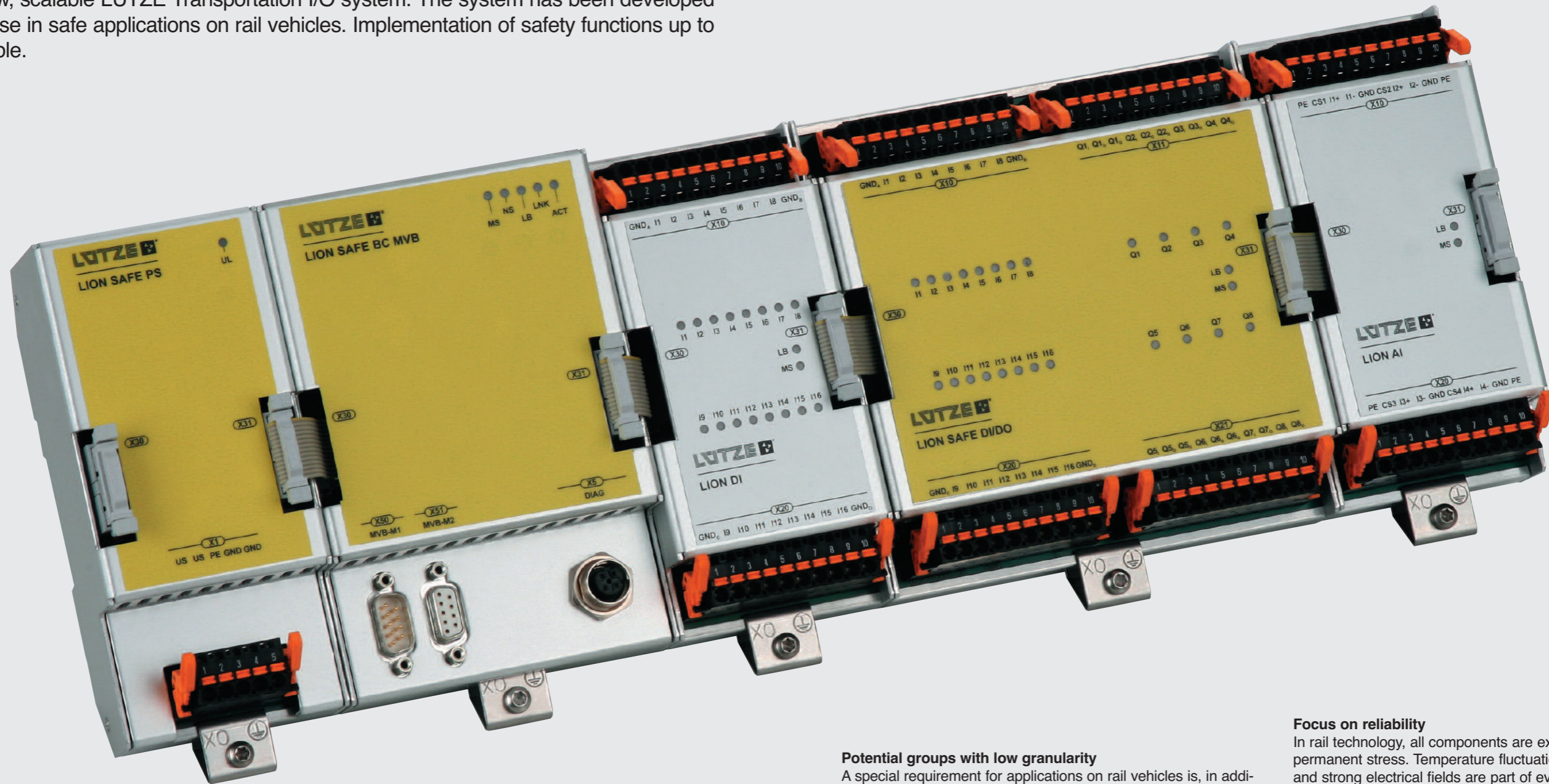
LION - Safety-related remote I/O system

IRIS 
Certification

LÜTZE 
TRANSPORTATION

LION - Safety-related remote I/O system

LION is the new, scalable LÜTZE Transportation I/O system. The system has been developed especially for use in safe applications on rail vehicles. Implementation of safety functions up to SIL2 are possible.



Safety can be expanded in a modular way

With LION it is possible to combine safe and non-safe I/O modules on the same I/O station. Now safety functions can be implemented where required - in decentralised positions.

Safe fieldbuses

LION provides flexibility by using different fieldbus interfaces in one application. Bus couplers with MVB or Ethernet interface are available. The safe data transmission is provided by a SDT protocol.

New, safe backplane bus - L-BUS²

The new L-BUS² has numerous diagnostics functions. In this way, users always have an overview of the current status of the TCMS and the connected peripherals.

Potential groups with low granularity

A special requirement for applications on rail vehicles is, in addition to the different nominal voltage ranges, the high demand on galvanic isolated I/O potential groups. LION offers solutions for all nominal voltage ranges, combined with fine granularity and a high packing density.

Process reliability thanks to new connectors

With the pluggable connection level, it is possible to connect sensors and actuators with pre-assembled cables. The plug-in terminals are lockable and can be encoded. This ensures that installation errors and confusions during service are prevented. The innovative push-in technology allows the direct and toolless wire connection.

Focus on reliability

In rail technology, all components are exposed to very high and permanent stress. Temperature fluctuations, vibrations, impacts and strong electrical fields are part of everyday operation. The engineers of LÜTZE Transportation are focussing on components with high quality and robust capability.

Standards and approvals

As an IRIS-certified company, the hardware and software development of the LÜTZE Transportation is based on strict quality regulations.

The LION system has been developed according to national and international approval criteria such as EN 50155, EN 50121-3-2, EN 61373, EN 50124-1, EN 50126, EN 50128 and EN 50129.

LION - Safety-related remote I/O system

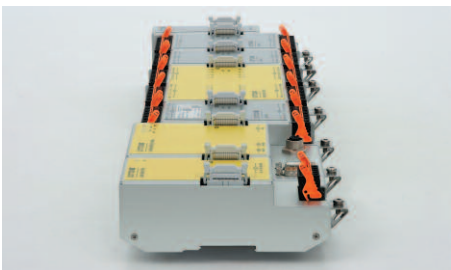
Safety



LÜTZE Transportation consistently pursues their aim of making safety affordable and allows through the modularity of the LION system the scaling of the safety functions from SIL0 to SIL2.

With LION, safe(SIL2) and non-safe (SIL0) modules can be operated together on the same bus. A separate network installation for processing safety-relevant signals is no longer required.

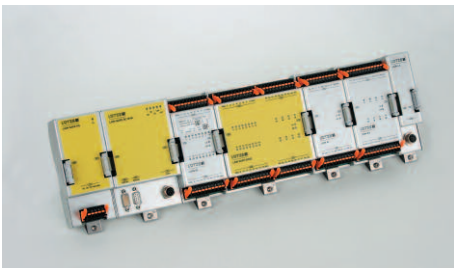
Modularity



The modular structure of the systems allows the user to create individually-configured I/O stations, depending on the installation location and the assigned task.

Compact I/O nodes are not flexible and clearly at a disadvantage in comparison to LION.

Flexibility



With LION it is extremely easy and flexible to configure additional I/O units at one system. For example during an advanced project phase if additional requirements occur and thus additional I/O channels are necessary.

On the LION, two different bus couplers can be operated with MVB or Ethernet interfaces. By replacing the bus coupler, users can easily switch between different fieldbus systems.

Reliability



In the LION, only materials are used, which are consistently of good quality over the entire product lifecycle. In order to achieve this goal, the high requirements of European operators - such as Deutsche Bahn and SNCF - are incorporated into the product. Gold-plated contacts and stainless steel connections are an inherent part of LION.

Furthermore, innovative production technologies are used, such as an automated coating process or complete tracing of components.

Safe backplane bus

L-BUS²

The backbone of LION is the internal, safe L-BUS² (LÜTZE bus), via all data is exchanged with 4.5 Mbit/s between the I/O modules (slaves) and the bus coupler (master). The L-BUS² is internally operating via a RS485 physical interface and controls communication, addressing and power supply of all I/O modules.

In case of a malfunction of one or several I/O modules, the master can unambiguously record this malfunction and continue to address the intact modules. The functionality and availability of the overall system is retained in spite of the malfunction.

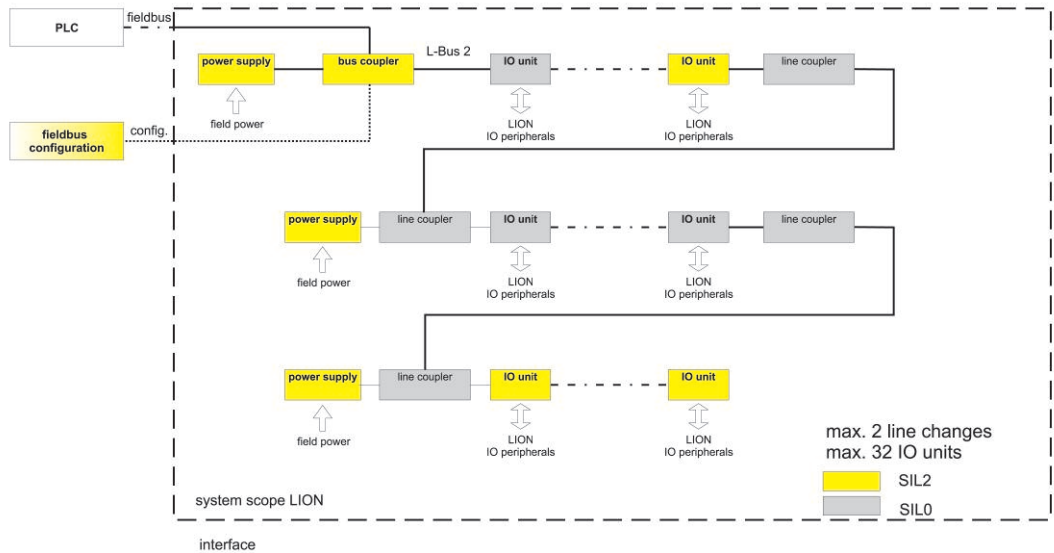
Product Overview - LION

Type	SIL	Part. No.	Description
Infrastructure Components	2	800101	Power supply unit 72 W with wide range input DC 24 V ... 110 V and redundant input connector
	2	800103	Power supply unit 36 W with wide range input DC 24 V ... 110 V
	0	800102	Line Coupler L-Bus M12
Bus Coupler	2	803001	Bus Coupler MVB
	2	803002	Bus Coupler Ethernet
Digital Inputs	0	803101	Digital Input module, 16 channels, DC 24 V ... 36 V
	0	803102	Digital Input module, 16 channels, DC 72 V ... 110 V
Digital Outputs	0	803202	Digital Output module, 16 channels, DC 24 V
	0	803203	Digital Output module, 8 channels, DC 24 V ... 110 V
	0	803201	Relay Output module, 8 channels, DC 24 V ... 150 V
Analog Inputs	0	803301	Analog Input module, 4 channels, 0...10 V
	0	803302	Analog Input module, 4 channels, 0...20 mA
	0	803303	Analog Input module, 4 channels, PT100
	0	803304	Analog Input module, 4 channels, PT1000
Analog Outputs	0	803401	Analog Output module, 4 channels, 0...10 V
	0	803402	Analog Output module, 4 channels, 0...20 mA
Safe Input and Outputs	2	803501	Safe Digital Input / Output Module SIL2 16 safe input channels, DC 24...36 V 8 safe output channels, DC 24 V ... 110 V
	2	803502	Safe Digital Input / Output Module SIL2 16 safe input channels, DC 72...110 V 8 safe output channels, DC 24 V ... 110 V

LION - Safety-related remote I/O system

System architecture

An I/O station always consists of a power supply (PS), a bus coupler (BC) and at least one I/O expansion module. The I/O station can be operated with up to 32 I/O modules in any combination.

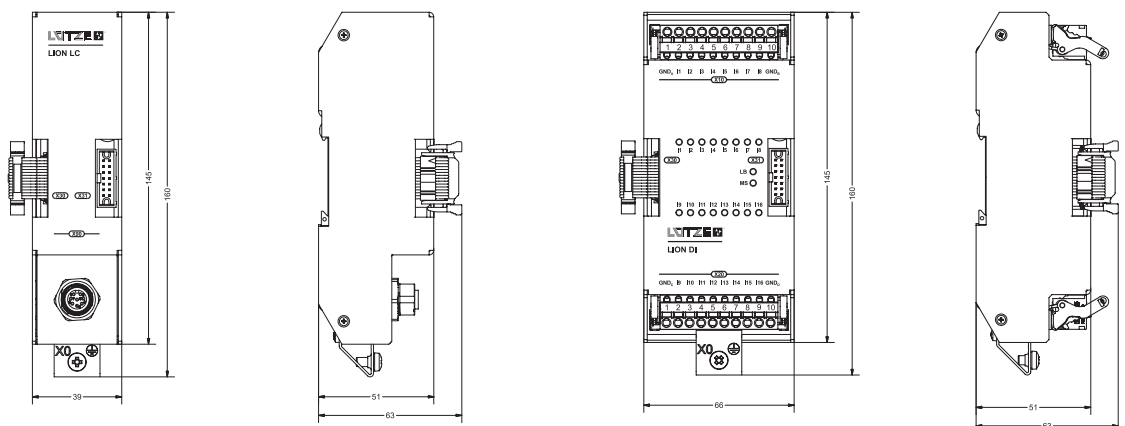


The I/O modules can be installed on different "lines". The connection between the individual lines is done via a line coupler (LC).
By using line couplers, I/O modules of one line can be connected at a distance of up to 10 metres to the previous line of the I/O station.

In total 2 line changes are possible.

Design

The system is installed without the need of tools onto DIN rail profiles.



Due to the flat design of the modules and any installation position on the DIN rail profile, the system is perfect for areas with limited space, such as the driver's cab of a locomotive.

Advantages in safe architectures

Redundancies are very cost intensive

LION generates high saving potentials through its use of 1-channel architectures.

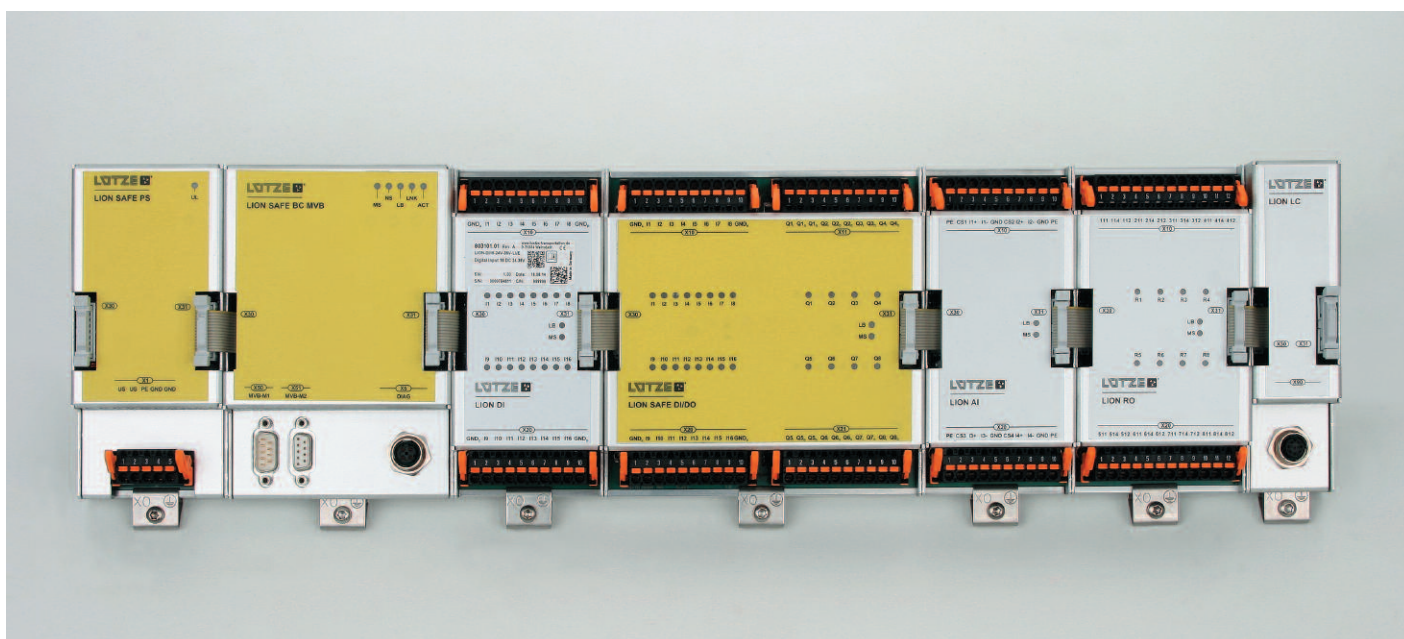
LION can work without additional fieldbus networks for safety circuits

With LION, the available network installation can still be used. It is sufficient to use a suitable, applicable safety software attachment in terms of protocolling. Safety and non-safety I/O stations can thus be operated on the same network. These features have a positive effect on the cost and vehicle weight.

LION provides clear advantages in comparison to compact safety nodes.

LION allows the scaling of safe I/O channels. The modular architecture allows the direct coupling of safe modules to non-safe modules. It is no longer necessary to install special safe I/O nodes. Safety functions in the train can now be implemented where they are really required. This is possible because LION supports the operation of safe and non-safe I/O modules on the same I/O node.

LION I/O stations can be connected via a standard fieldbus such as the MVB (IEC 61375-3-1/3-2) or the TRDP (IEC 61375-3-4) to the vehicle control. Here the data transmission must be sufficiently protected. This is achieved using an error detection mechanism. In LION, the standardised protocol SDT (IEC 61375-2-3) is used.



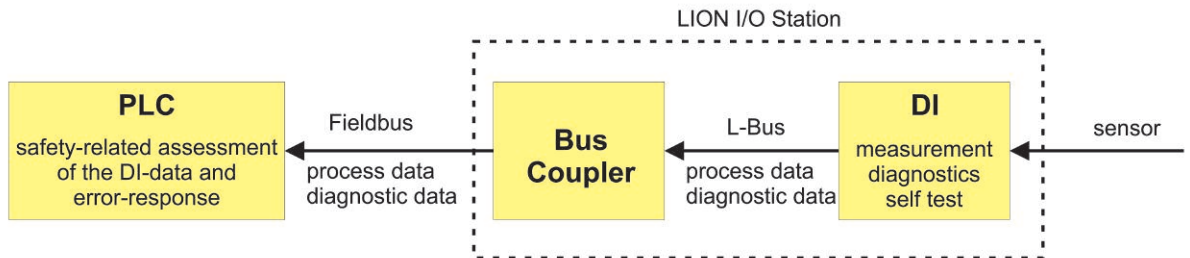
Because of the safe L-BUS², safe and non-safe I/O modules can be operated in any combination on the same I/O station.

LION - Safety-related remote I/O system

LION safety concept

The L-BUS² ensures the safe transport of process and diagnostics data between the bus coupler and all connected modules. The software of the non-safe modules were developed according to the normed and standardised development process of the EN 50128.

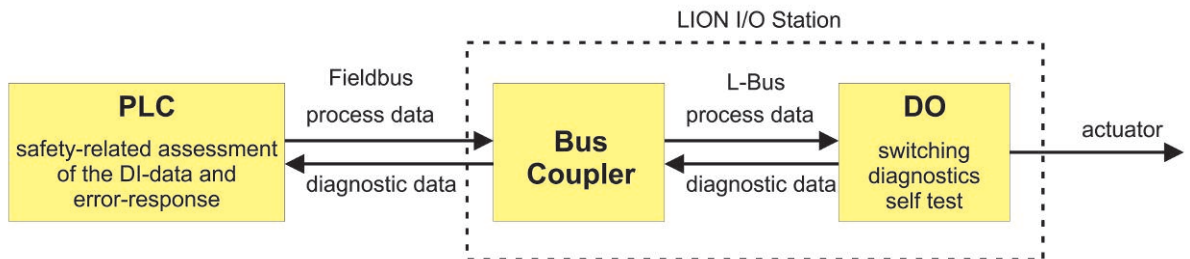
The SIL0 modules communicate in absent of reaction on the L-BUS². The field level of the modules is galvanically isolated.



Safe inputs

The I/O module transfers the process input and diagnostics data via the bus coupler to the control unit using a safe fieldbus protocol. The control unit assesses the data based on the diagnostics information, decides on its validity and processes a safe reaction in case of malfunction.

Errors can be detected through diagnostics and self-test functions within the digital inputs as well as in the bus coupler. This leads to zero setting of the inputs in the process data and to the marking of invalid values in the diagnostics data. Non-controllable errors in the I/O module lead to a failsafe condition.

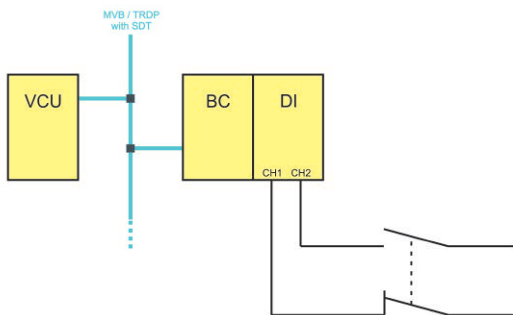


Safe outputs

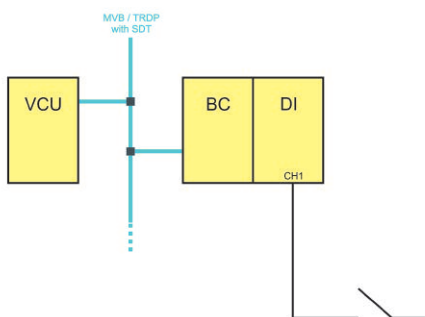
The I/O module switches the outputs and determines the diagnostic data. The diagnostic data are sent by the bus coupler via a safe protocol to the control unit. The control unit processes the relevant safety function based on the diagnostic information.

Errors can be detected by diagnostics and self-test functions within the digital outputs and the bus coupler. This leads to switch-off of the outputs and to an error message by the diagnostic data. Non-controllable errors in the I/O module lead to the failsafe mode and the switching off of the outputs.

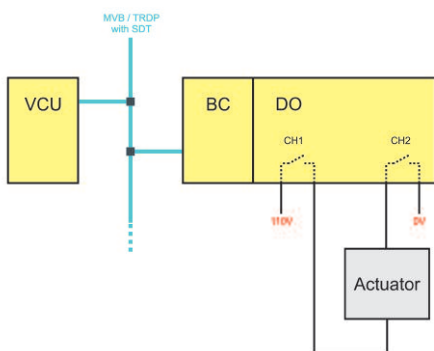
Safety architectures with LION



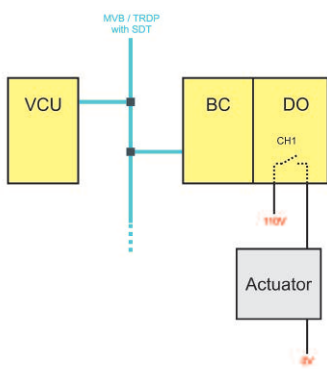
With this architecture pattern, the safety level SIL2* can be achieved. Here the input signal is read in a redundant/antivalent way. The user must ensure that a plausibility inspection of the read in signals is done in the control unit. Two input channels are required for the antivalence. Here all possibilities are open to the user which inputs are used. Two neighbouring input channels or, for example, two inputs from different modules or I/O stations can be combined.



For SIL1* applications, any safety-relevant input channel can be used. Here the input signal of the sensor is read via one channel. All inputs are monitored cyclic with test pulses to reveal the error status "Stuck-at-High". A total of 16 input channels are available per safety I/O module.



In order to achieve safety level SIL2*, an architecture pattern can be used in which the actuator is controlled via plus/minus-switching. Here two output channels are used. The user is free to choose which outputs are used for the purpose. Two neighbouring output channels or, for example, two outputs from different modules or I/O stations can be combined.



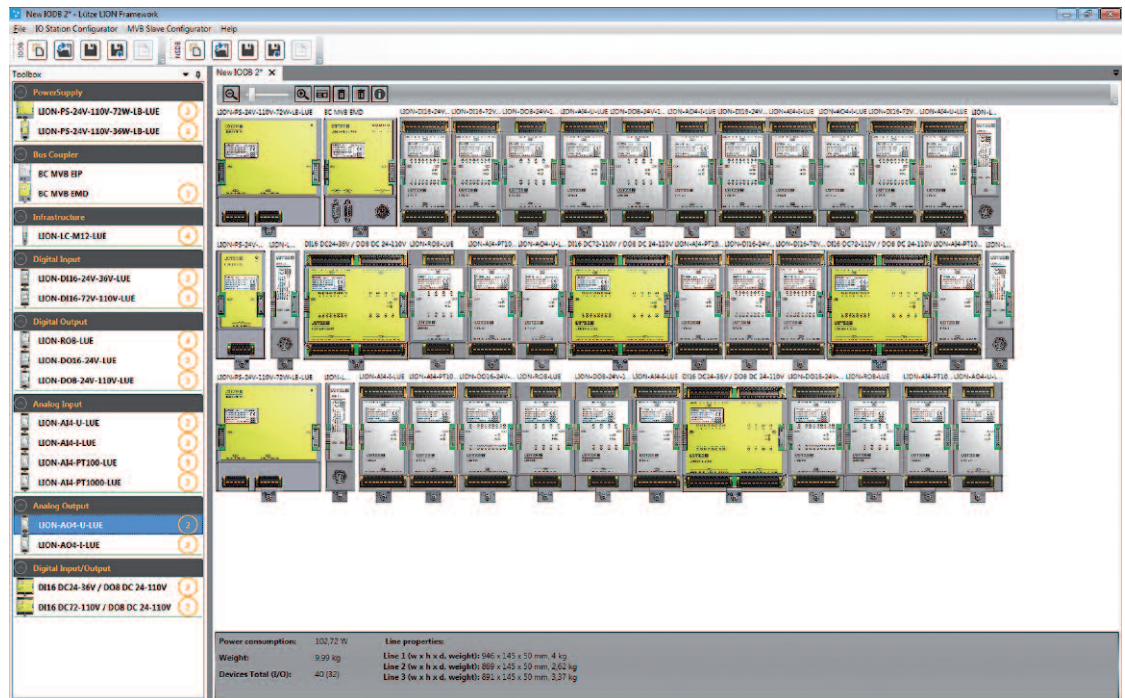
In order to achieve safety level SIL1* it is sufficient to switch the output signal via one channel. Here the outputs are monitored in channel granular manner. The user can read back the current switching condition of the transistor to the internal module monitoring (detection of Stuck-On errors) in order to diagnose other error statuses such as short-circuits or overload. A total of 8 output channels are available per safety-relevant I/O module.

*The achievable SIL level depends on the THR of the overall system. (EN50129)

LION - Safety-related remote I/O system

LION Configuration Framework

The LION Configuration Framework is an innovative software platform of the LION system. It supports the user during all project phases, starting with the planning of the I/O stations via the field bus configuration right up to the supporting documentation for the safety verification.

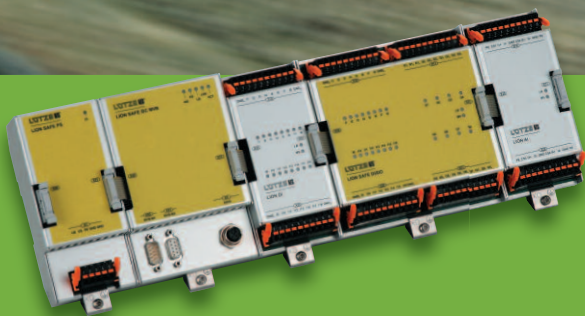


The main components of the continuously maintained software tool LION Configuration Framework are the LION I/O Station Configurator and the LION MVB Slave Configurator.

The LION Configuration Framework can be downloaded free of charge under www.luetze-transportation.com.

We are on Track!

Electronic control for rail vehicles



Control Technology



Interface



Indication



www.luetze-transportation.com

LUTZE 
TRANSPORTATION

Germany

Lütze Transportation GmbH
Postfach 12 24 (PLZ 71366)
Bruckwiesenstraße 17-19
D-71384 Weinstadt
Tel.: +49 71 51 6053-545
Fax: +49 71 51 6053-6545
sales.transportation@luetze.de

Austria

Lütze ETE Ges.m.b.H.
Tel.: +43 1 2575252-0
Fax: +43 1 2575252-20

Switzerland

Lütze AG
Tel.: +41 55 45023-23
Fax: +41 55 45023-13

USA

Lutze Inc.
Tel.: +1 704 504-0222
Fax: +1 704 504-0223

United Kingdom

Lutze Ltd.
Tel.: +44 1827 31333-0
Fax: +44 1827 31333-2

France

Lutze SAS
Tel.: +33 1 341877-00
Fax: +33 1 341818-44

Spain

Lutze S.L.
Tel.: +34 93 2857480
Fax: +34 93 2857481

China

Luetze Trading (Shanghai) Co. Ltd.
Tel.: +86 21 32580670
Fax: +86 21 32580671

www.luetze-transportation.com

