



 Transportation Solutions

# **LION Configuration Framework** (LCF Tool)

Application manual  
Configuration tool

**Version 06**

Lütze Transportation GmbH  
Bruckwiesenstraße 17-19  
D-71384 Weinstadt  
Tel.: +49 (0) 7151 6053-545  
Fax: +49 (0) 7151 6053-6454  
Sales.Transportation@luetze.de  
[www.luetze-transportation.com](http://www.luetze-transportation.com)



# Table of Contents

<b>1</b>	<b>Introduction.....</b>	<b>6</b>
1.1	A brief introduction to the LION System and the LCF tool.....	6
1.1.1	Initial situation .....	6
1.1.2	Application example.....	7
<b>2</b>	<b>General information.....</b>	<b>8</b>
2.1	Symbol description .....	8
2.1.1	Safety messages .....	8
2.1.2	Handling notes.....	8
2.2	Special notes .....	8
2.3	Copyright .....	9
2.4	Disclaim of liability .....	9
2.5	Standards .....	9
2.6	Labeling .....	10
2.6.1	QR code – product information.....	11
<b>3</b>	<b>Terms and abbreviations .....</b>	<b>12</b>
3.1	Terminology .....	12
3.2	Abbreviations .....	12
<b>4</b>	<b>System planning.....</b>	<b>15</b>
<b>5</b>	<b>Download and installation .....</b>	<b>16</b>
5.1	Download options .....	16
5.2	Installation.....	17
<b>6</b>	<b>Overview.....</b>	<b>18</b>
6.1	I/O Station Configurator .....	18
6.2	MVB Slave Configurator .....	20
6.3	TRDP Slave Configurator .....	20
<b>7</b>	<b>General settings.....</b>	<b>21</b>
7.1	Menu settings .....	21
7.1.1	File > New.....	21
7.1.2	File > Open .....	21
7.1.3	File > Save.....	22
7.1.4	File > Close.....	23
7.1.5	File > Exit.....	24
7.2	Toolbar buttons.....	24
<b>8</b>	<b>I/O Station Configurator .....</b>	<b>25</b>
8.1	Creating a new IODB file .....	25
8.1.1	New IODB file via the menu bar or toolbar .....	25
8.1.2	I/O Properties.....	27
8.1.3	The 10 predefined rules for configuration .....	29
8.1.4	Arranging the modules.....	32
8.1.5	Warnings and error handlings.....	44
8.1.6	Delete modules.....	47
8.1.7	Zoom in/out of the display size .....	49
8.1.8	Device Wizard.....	50
8.2	Generating an IODB Report .....	54
8.3	IODB sample configuration .....	54
<b>9</b>	<b>MVB Slave Configurator.....</b>	<b>55</b>
9.1	Creating a new NSDB configuration file .....	56
9.2	Import of the IODB.....	57
9.3	How to proceed with an NSDB configuration.....	59

9.3.1	Create additional NSDB sections .....	59
9.3.2	General NSDB-Information .....	60
9.3.3	L-Bus <sup>2</sup> Subdevices .....	63
9.3.4	Configuration data and filter settings .....	65
9.4	General port configuration .....	67
9.4.1	Create new ports .....	67
9.4.2	Port settings .....	67
9.4.3	Port sizes .....	69
9.5	Create a new source port .....	70
9.5.1	Update button functionality .....	71
9.5.2	The Clear button functionality .....	72
9.5.3	Create a NEW PORT using the Clear button .....	72
9.6	Create a new sink port .....	76
9.7	Mapping .....	79
9.7.1	General .....	79
9.7.2	PVName properties .....	80
9.7.3	Data types .....	81
9.7.4	The check variable (CV) .....	84
9.8	Options for mapping the ports .....	85
9.8.1	Option 1: Mapping via input .....	85
9.8.2	Option 2: Mapping via mouse clicks .....	88
9.9	Display short info of the process data .....	89
9.10	Diagnostic port .....	91
9.10.1	Quick guide .....	91
9.10.2	More detailed description .....	92
9.10.3	Deleting the diagnostic port .....	95
9.11	Overview of the modules and port characteristics .....	96
9.12	Create an NSDB Report .....	97
9.13	Create NSDB/Report with Safety checksum .....	99
9.14	Remarks .....	101
<b>10</b>	<b>Troubleshooting .....</b>	<b>102</b>
<b>11</b>	<b>Further information .....</b>	<b>103</b>
11.1	Current version of the LCF .....	103
11.2	Software versions .....	103
11.3	EULA LION Configuration Framework .....	105
11.4	This application manual .....	106
<b>12</b>	<b>Attachments .....</b>	<b>107</b>
12.1	Modules in sorted overviews .....	107
12.1.1	Modules sorted by IDs .....	107
12.1.2	Modules sorted by IDs .....	108
12.2	Examples .....	109
12.2.1	Mapping of the analog output modules .....	109
12.2.2	Mapping of the analog input modules .....	112
12.2.3	Mapping of the digital output modules .....	112
12.2.4	Mapping of the digital input modules .....	113
12.2.5	Mapping of the digital input/output modules .....	114
12.3	Overview DEVICES - Input data / Output data .....	115
12.3.1	Digital inputs .....	115
12.3.2	Digital outputs .....	116
12.3.3	Analog inputs .....	117
12.3.4	Analog outputs .....	118
12.3.5	Digital input/ digital output .....	119
12.4	Overview DEVICES - Short information of the process datas .....	120
12.4.1	Digital inputs .....	120
12.4.2	Digital outputs .....	121
12.4.3	Analog inputs .....	123



12.4.4	Analog outputs .....	126
12.4.5	Digital input/ digital output.....	128
12.5	Color legend in the report .....	129
<b>13</b>	<b>Maintenance and service .....</b>	<b>130</b>
13.1	Module exchange .....	130
13.2	Service Life .....	131
13.3	Extending the LION system .....	131
<b>14</b>	<b>Shutdown and disposal .....</b>	<b>132</b>
<b>15</b>	<b>Revision of the document.....</b>	<b>133</b>
<b>16</b>	<b>Appendix A.....</b>	<b>135</b>
16.1	Structure note .....	135
16.1.1	Overview.....	135
<b>17</b>	<b>Appendix B.....</b>	<b>136</b>
17.1	Structure note .....	136
17.1.1	Overview.....	136
17.1.2	Documents with the old designation of the LION-ID:.....	140

## 1

## Introduction

This document is part of the LION System.

The LION Configuration Framework (LCF) is a tool for planning and configuring a LION System.

The LCF tool 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, through the fieldbus configuration to the supporting documentation for the proof of safety.



**Before reading this manual, you should have read and understood the LION System Description document, which provides an introduction to the LION system and the terminology you will need.**

The LION Configuration Framework is a tool for planning and configuring a LION system, so it is important that you first understand the basics.



**Risk of injury and damage to equipment caused by failure to read and observe the operating instructions.**

The instructions contain important information on safety, commissioning, operation, maintenance and disposal of the corresponding device.

Before installation or use, carefully read these instructions in order to rule out possible dangers and damage and to guarantee correct use.

## NOTICE

**Always keep the document ready at hand.**

This applies until the product is disposed of. In case of sale, rental or in case of disposal, pass the instructions on to the authorized person.



This instructions and further information is available on the website of the Lütze Transportation GmbH:

**[www.luetze-transportation.com](http://www.luetze-transportation.com)**

## 1.1

## A brief introduction to the LION System and the LCF tool

## 1.1.1

## Initial situation

You have any bus system on a train, e.g., MVB bus system (or TRDP bus), and want to control analog/digital inputs and outputs via this bus system.

The HEAD (e.g., LION MVB bus coupler) receives the message from the field bus and must cause the modules connected to it to control the correct output. Or to read out a corresponding input and to make this information available to other devices connected to the fieldbus.

The LCF tool is used to create the mapping of the I/O hardware to the bus topology in a comfortable, simple, and clear way. Mapping here means that the signals of the DEVICES are connected to variables on the fieldbus (e.g., PV name in a MVB port).

The mapping between the fieldbus signals and the actual inputs and outputs of the DEVICES is set up using the LION framework.

The LION framework is required to create a file specific to each HEAD. This contains the data structure and must be transferred to the HEAD.

### 1.1.2

#### **Application example**

The door release is detected via a digital signal at a digital DEVICE and forwarded to a higher-level control unit via the fieldbus.

As soon as this signal is present at the corresponding DEVICE, it is forwarded by the HEAD (e.g., LION MVB bus coupler) to the higher-level controller and processed there. If the conditions are correct, the higher-level control unit can send a signal to the HEAD via the fieldbus to set the output of a DEVICE to unlock the doors.

## 2 General information

### 2.1 Symbol description

#### 2.1.1 Safety messages

This document contains safety information, which is characterized by a signal word in combination with a specific colour to indicate the warning level. The information highlights possible dangers and gives instructions on how to avoid them.



Indicates a dangerous situation that leads to death or serious injuries if not observed.



Indicates a dangerous situation that can lead to death or serious injuries if not observed.



Indicates a dangerous situation that can lead to slight or moderate injuries if not observed.



Indicates a situation that could damage the product or the environment. This notice does not apply to personal injuries.

#### 2.1.2 Handling notes

You will also find icons that indicate important information and action steps:



Indicates technically important information to operate the device safely.



Indicates the use of tools.

### 2.2 Special notes



LION-XXX **Important information on correct use in a safety-relevant environment.**  
These notes are marked with an ID, for example LION-001.



SRAC XX **Safety-related application condition.**  
Reference to a safety-relevant application condition from the assessment report. These references are marked with an ID, for example SRAC 01.

**2.3****Copyright**

This document is intended for the operator and his staff. It is prohibited to give the content to a third party, to duplicate, exploit or impart it. The Lütze Transportation GmbH has to allow it explicit in writing.

General data, text, images, and drawings are copyrighted and subject to industrial property rights. Contravention will be prosecuted. The named brands and product names in this document are trademarks or registered trademarks owned by the respective titleholder.

**2.4****Disclaim of liability**

This document was written in consideration of the applied standards, regulations and the current state of technology.

The content's accuracy has been verified. Discrepancies are not excluded. For these discrepancies, we disclaim liability. Applicable changes and additional information will be in the next version of this document.

The following causes are not covered by the Lütze Transportation GmbH's liability policy:

- Nonobservance of this document
- Untrained and unqualified employees
- Non-conventional use
- Non-approved reconstructions and functional modifications of the product
- Using non-original or non-admitted parts or equipment

**2.5****Standards**

LION-005 The safety-related automation system LION (Lütze Input Output Network) has been independently appraised by TÜV Süd Rail GmbH (Assesment Report FW8257G) in accordance with the standards EN 50128, EN 50129, EN 50155, EN 50159, EN 50121-3-2, and EN 50124-1 regularly certified.

The system integrator can refer to this report and the certificate for the approval of this component.

**Reports and certificates can be requested by Lütze Transportation GmbH.**

**NOTICE**

**See also the standards in the respective data sheets.**

## 2.6

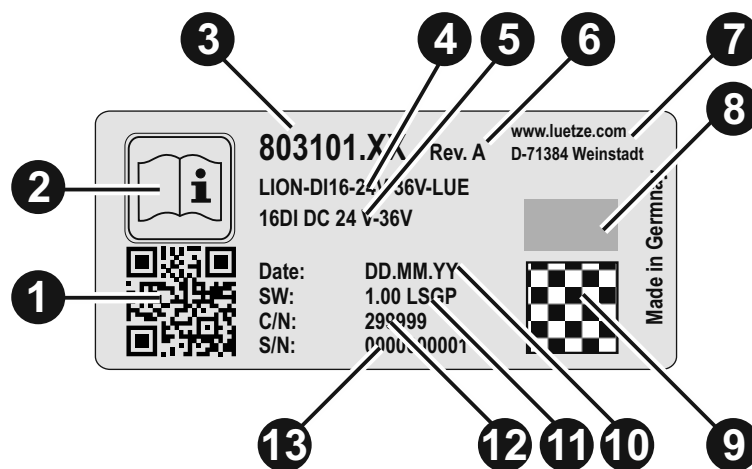
## Labeling

LION-029 **Identification of the modules.**

The product label contains important information for identification and verification with the system configuration.

**Observe the adhesive labels.**

- Keep them readable.
- In case of a malfunction, the part number and the serial number might be needed.



The label contains the following information:

1. The QR code refers to the product information on the homepage
2. Symbol for: first read the operating instructions
3. **Part number\***
4. Type (assembly designation/module designation)
5. Module description
6. **Hardware revision\***
7. Company name/address
8. Approvals
9. Data matrix code contains: serial number, part number, and a date
10. Manufacturing date (Date)
11. **Software version (SW)\***
12. Batch identification (C/N)
13. **Serial number (S/N)\***

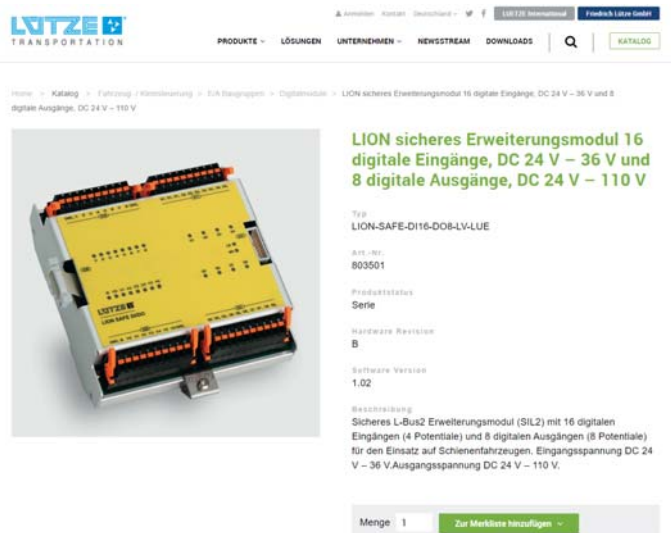
\* These are the four crucial pieces of information LION-029 needs for identification and system configuration verification.

## 2.6.1

## QR code – product information

The code links to further product information in the online catalog on the LÜTZE Transportation website. To reach the page, proceed as follows:

1. Scan the QR code with a smart phone or another device that can read such codes.
2. A standard browser will open with the linked page.



3. Choose a language.
4. Under *Downloads*, it is possible to download further technical documentation.

## 3

## Terms and abbreviations

### 3.1

### Terminology

In this document, we use the following terms that are defined exactly below:

<b>Actor</b>	Synonym for actuator
<b>Fieldbus</b>	A fieldbus is used for data communication within a rail vehicle (e.g., MVB, TRDP)
<b>LOGIC</b>	The LOGIC is the data processing component of the train. (Equivalent terms are VCU or PLC.)
<b>HEAD</b>	HEAD is the designation for the LION bus coupler (BC) or the LION CCU in the LION system. The designation HEAD refers to the LION subsystem and the internal communication bus L-Bus <sup>2</sup> , respectively. The HEAD is the system master of the I/O station and controls the communication with the I/O modules.
<b>DEVICE</b>	A DEVICE is a communication device on the L-Bus <sup>2</sup> . It is an I/O module that is addressed by the HEAD within the I/O station.

### 3.2

### Abbreviations

In this document we use the following abbreviations:

<b>AC</b>	Alternating current
<b>AI</b>	Analog input
<b>AERR</b>	Application error
<b>AO</b>	Analog output
<b>BC</b>	Bus coupler - the LION Bus coupler. It is also called HEAD in the LION system.
<b>CCU</b>	Compact Control Unit
<b>CH</b>	Channel
<b>CPU</b>	Central Processing Unit
<b>CRC</b>	A cyclic redundancy check is an error detection code commonly used in digital networks and storage devices to detect accidental changes to raw data. It generates a safety checksum.
<b>CON</b>	Configuration error
<b>DC</b>	Direct current
<b>DI</b>	Digital input
<b>DIAG</b>	Diagnostic information
<b>DO</b>	Digital output
<b>EMC</b>	Electromagnetic compatibility
<b>EN</b>	European Standard



<b>ERR</b>	Error (test pulse error)
<b>ESD</b>	Electrostatic discharge
<b>EXTV</b>	External voltage
<b>FR</b>	Failure Rate (formerly HR – Hazard Rate)
<b>GND</b>	Ground
<b>I/O</b>	Input/Output
<b>IEEE</b>	Institute of Electrical and Electronics Engineers
<b>IODB</b>	Input/Output Data Base
<b>IP address</b>	An Internet Protocol address is a numerical label assigned to each device connected to a computer network that uses the Internet Protocol for communication. An IP address serves two main functions: host or network interface identification and location addressing.
<b>IP code</b>	ingress protection code (e.g., IP20)
<b>L-Bus<sup>2</sup></b>	L-Bus <sup>2</sup> is the short form of " <b>Lütze Bus 2</b> ". Lütze's own communication bus is used by LION, which is based on RS485.
<b>LCF</b>	LION Configuration Framework
<b>LION</b>	Lütze Input/Output Network
<b>MTBF</b>	Mean time between failures
<b>MTTR</b>	Mean time to repair
<b>MVB</b>	Multifunction Vehicle Bus
<b>NSDB file</b>	The NSDB file is a configuration file for an I/O station with an MVB bus coupler. The input, output, and diagnostic data of the MVB ports of the I/O station are assigned there. The NSDB file can be used to configure individual modules of the I/O station during commissioning. The NSDB file is created exclusively with the LCF configuration tool and assigned to the bus coupler.
<b>PE</b>	Protective Earth
<b>PLC</b>	A programmable controller is a device that is used to control or regulate a machine or system and is programmed on a digital basis. (See also LOGIC)
<b>PS</b>	Power supply or supply voltage
<b>PST</b>	Process Safety Time
<b>RAMS</b>	Reliability, Availability, Maintainability, and Safety
<b>RO</b>	Relay output
<b>SCC</b>	Switching cycle counter
<b>SDTv2</b>	The Safe Data Transmission Protocol is defined in the standard IEC 61375-2. NOTE: The Safe Data Transmission Protocol (STDv2) is basically explained in the LION System Description chapter "Safety layer SDTv2".
<b>SIL</b>	Safety integrity level
<b>SO</b>	Switching output

<b>TDB file</b>	The TDB file is a configuration file for an I/O station with a TRDP bus coupler; the input, output, and diagnostic data for the TRDP ports of the I/O station are assigned there. The TDB file can be used to configure individual modules of the I/O station during commissioning. The TDB file is created exclusively with the LCF configuration tool and assigned to the bus coupler.
<b>THR</b>	Tolerable Hazard Rate
<b>TR</b>	Transistor
<b>TRDP</b>	Train Realtime Data Protocol
<b>TH35</b>	The top hat rail (TH35 according to IEC 60715, formerly known as TS 35 according to EN 5002) is a mounting rail with a top hat profile. A mounting rail, also known as a DIN rail, is a universal carrier made of a sheet metal profile in electrical engineering for fastening electrical equipment in distribution boxes, switch cabinets, terminal boxes, etc.
<b>VCU</b>	Vehicle Unit Control (See also LOGIC)
<b>VDP</b>	Vital Data Package (See also SDTv2)

## 4

## System planning

**NOTICE**

The chapter „System planning“ can be found in the corresponding document „LION System description“, see there chapter „System planning“.



> This link opens the product webpage of article no. 800101 on the LÜTZE Transportation website, below in the download area you will find the:

**„System description, LION-Lütze Input/Output Network“**

## 5

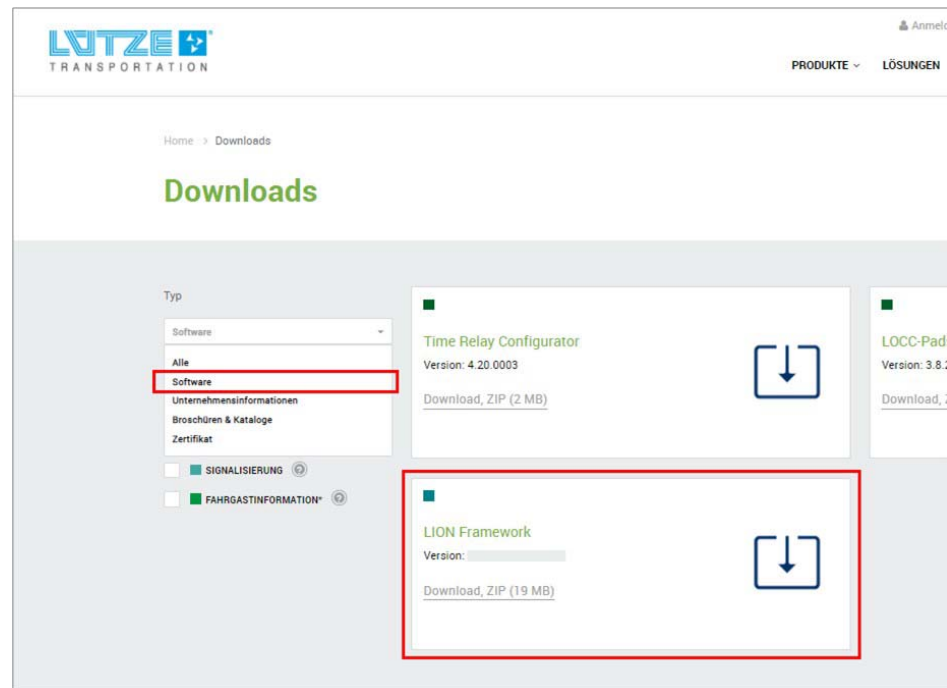
## Download and installation

## 5.1

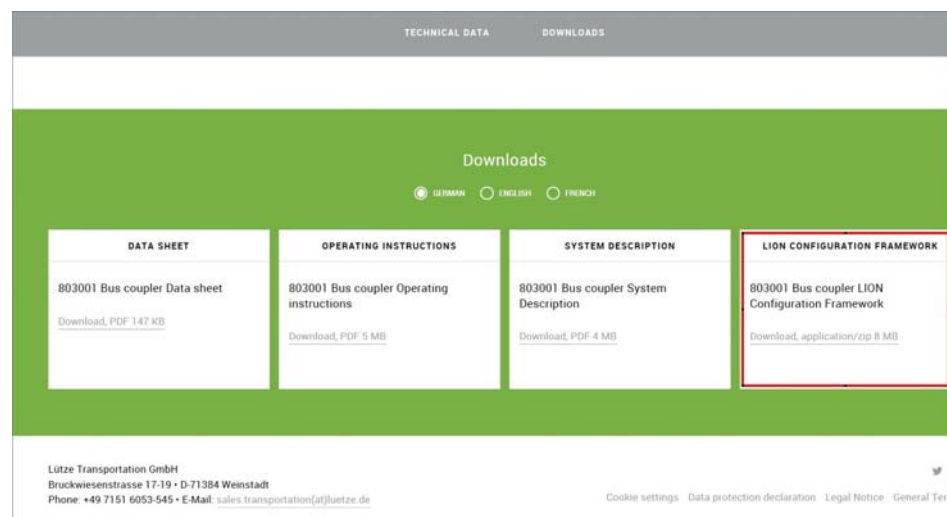
## Download options

The software tool LION Configuration Framework (LCF) can be downloaded as a zipped folder at these locations:

1. In the **general download area** of the Lütze Transportation website:



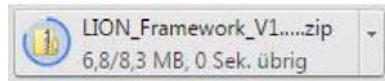
2. In the **download area of the LION bus coupler (HEAD)** product page:



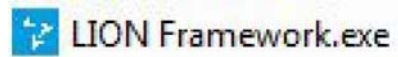
## 5.2

### Installation

1. Choose a directory
2. Unpack the downloaded **zip-file**.



3. Double click on the **LION Framework.exe** file.



4. The LION Framework starts.



**There is no further installation necessary.**

## 6

## Overview

The LION Framework is a tool for generating configuration files for the HEAD and for configuring a LION system.

The LION Configuration Framework (LCF) 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, through the fieldbus configuration, to the supporting documentation for the proof of safety.

The LCF contains three configuration components:

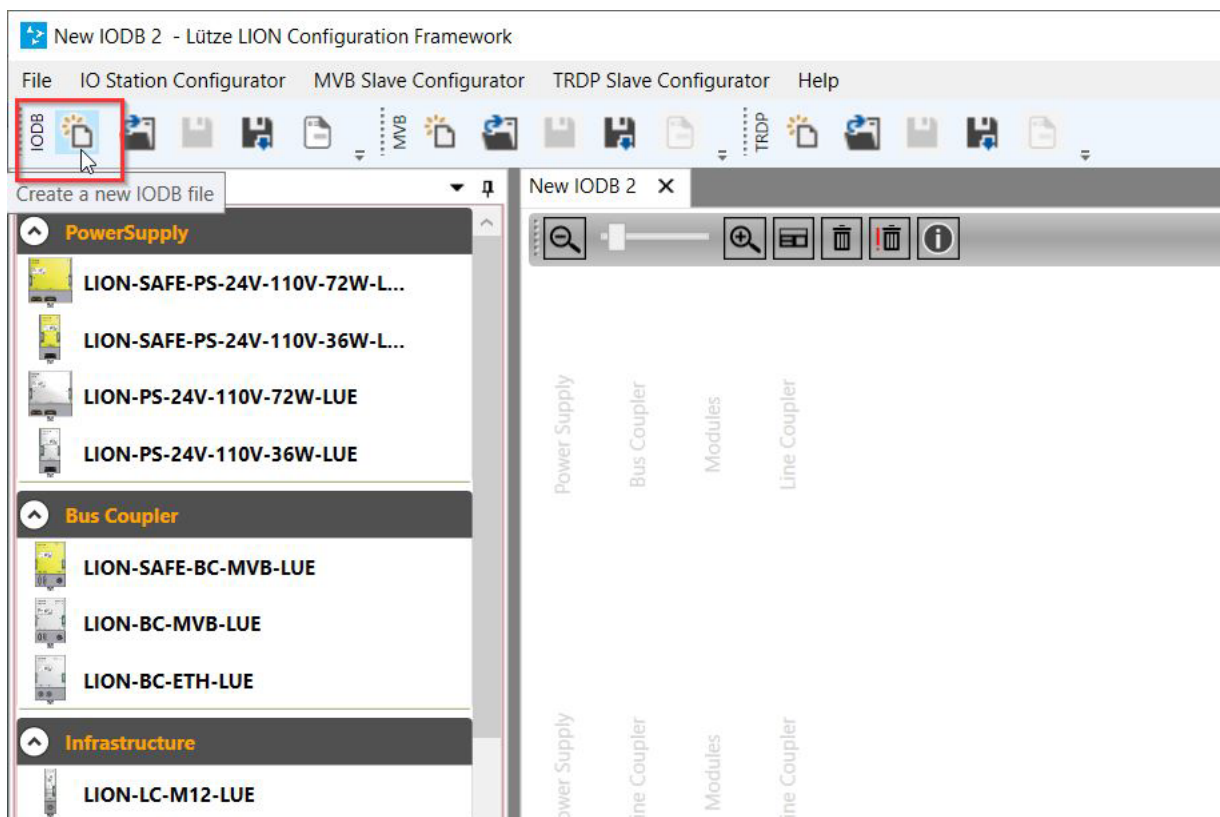
The **I/O Station Configurator**, **MVB Slave Configurator** and the **TRDP Slave Configurator**.



## 6.1

## I/O Station Configurator

The composition of the LION I/O station is configured in the *IO station configurator*. This includes all components of the LION system. The configured station must match the composition of the physical station to be configured.



**Drag and drop** the modules from the left **toolbox window** to arrange them in the right IODB window. The modules are arranged according to predefined rules: you will get direct feedback, whether the combination is possible or not. Alternatively, you can use the **Device Wizard**. It arranges the modules according to a selection list defined by the user.

Both procedures are described in detail in the respective chapters.

The *I/O Station Configurator* helps you to calculate the current consumption and displays the length and weight of the I/O Station.

**Power consumption:** 30,12 W  
**Weight:** 5,72 kg  
**Devices Total (I/O):** 16 (8)

**Line properties:**  
**Line 1 (w x h x d, weight):** 619 x 160 x 63 mm, 3,05 kg  
**Line 2 (w x h x d, weight):** 276 x 160 x 63 mm, 1,44 kg  
**Line 3 (w x h x d, weight):** 245 x 160 x 63 mm, 1,23 kg

<b>Power consumption:</b>	30,12 W	<b>Line properties:</b>
<b>Weight:</b>	5,72 kg	<b>Line 1 (w x h x d, weight):</b> 619 x 160 x 63 mm, 3,05 kg
<b>Devices Total (I/O):</b>	16 (8)	<b>Line 2 (w x h x d, weight):</b> 276 x 160 x 63 mm, 1,44 kg
		<b>Line 3 (w x h x d, weight):</b> 245 x 160 x 63 mm, 1,23 kg

### NOTICE

The power consumption values given here are based on the maximum possible values.

Please refer to the corresponding data sheet for the nominal power consumption values.

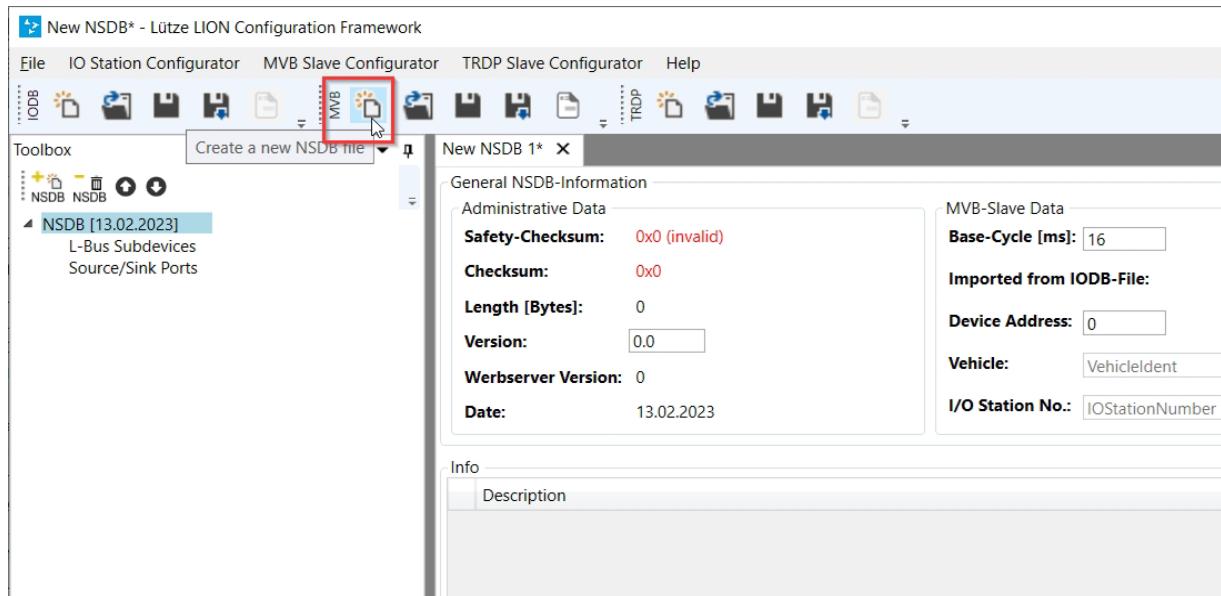
### NOTICE

The configured I/O Station is the basis for the fieldbus configuration.

The configured I/O station is saved in a file (.IODB). This file is mandatory for configuring the MVB Bus coupler. This file can be created either as an MVB slave configuration or as a TRDP slave configuration. The file is transferred to the MVB Bus coupler using the LCF.

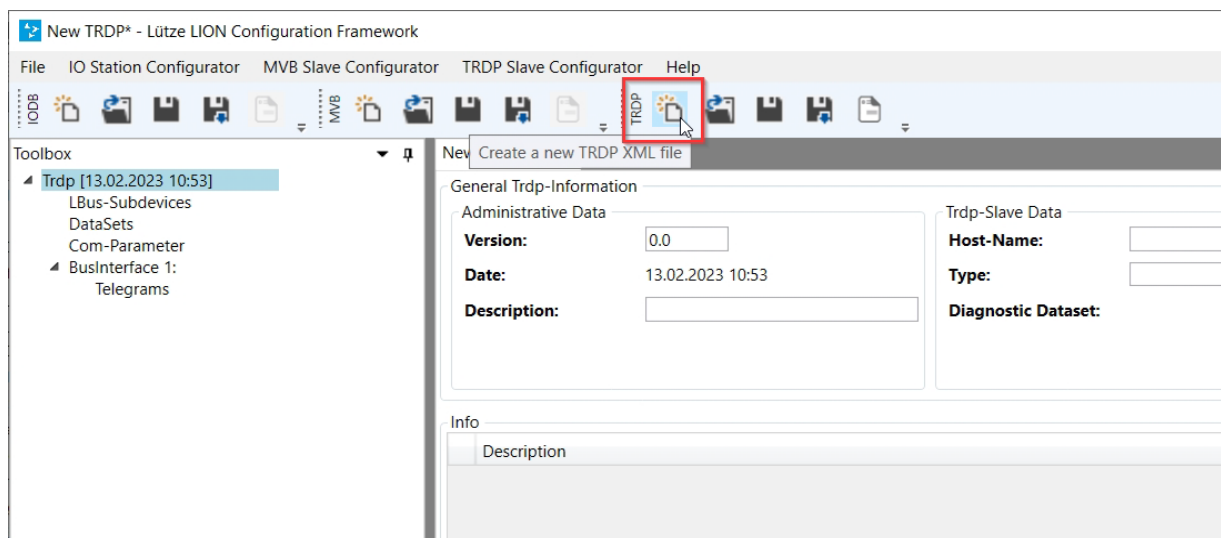
## 6.2 MVB Slave Configurator

With the *MVB Slave Configurator* a NSDB file can be generated to setup the MVB communication parameters of the LION MVB Bus coupler as well as the configuration and data mapping of the DEVICES.



## 6.3 TRDP Slave Configurator

With the *TRDP Slave Configurator* a TRDP XML (TDP) file can be generated to setup the TRDP communication parameters of the LION TRDP Bus coupler as well as the configuration and data mapping of the DEVICES.





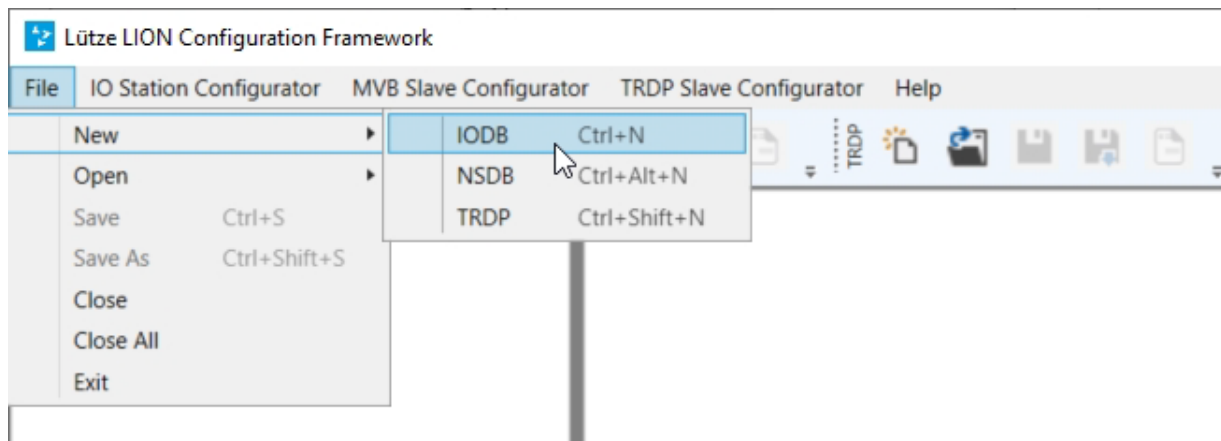
## 7 General settings

### 7.1 Menu settings

#### 7.1.1 File > New

To generate a new IODB, TRDP or NSDB configuration file, proceed as follows:

1. In the menu bar click **File**
2. Select **New**
3. Select **IODB**, **TRDP** or **NSDB** to create a new file.



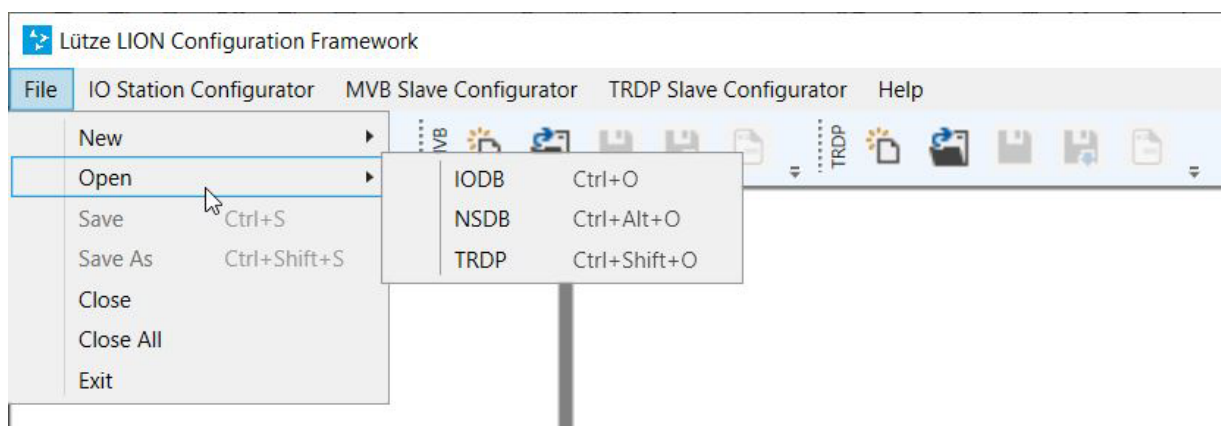
#### NOTICE

You first need an *IODB file*, as the basis for an *NSDB file* or *TRDP file*.

#### 7.1.2 File > Open

To open an existing IODB, TRDP or NSDB configuration file, proceed as follows:

1. In the menu bar click **File**
2. Select **Open**

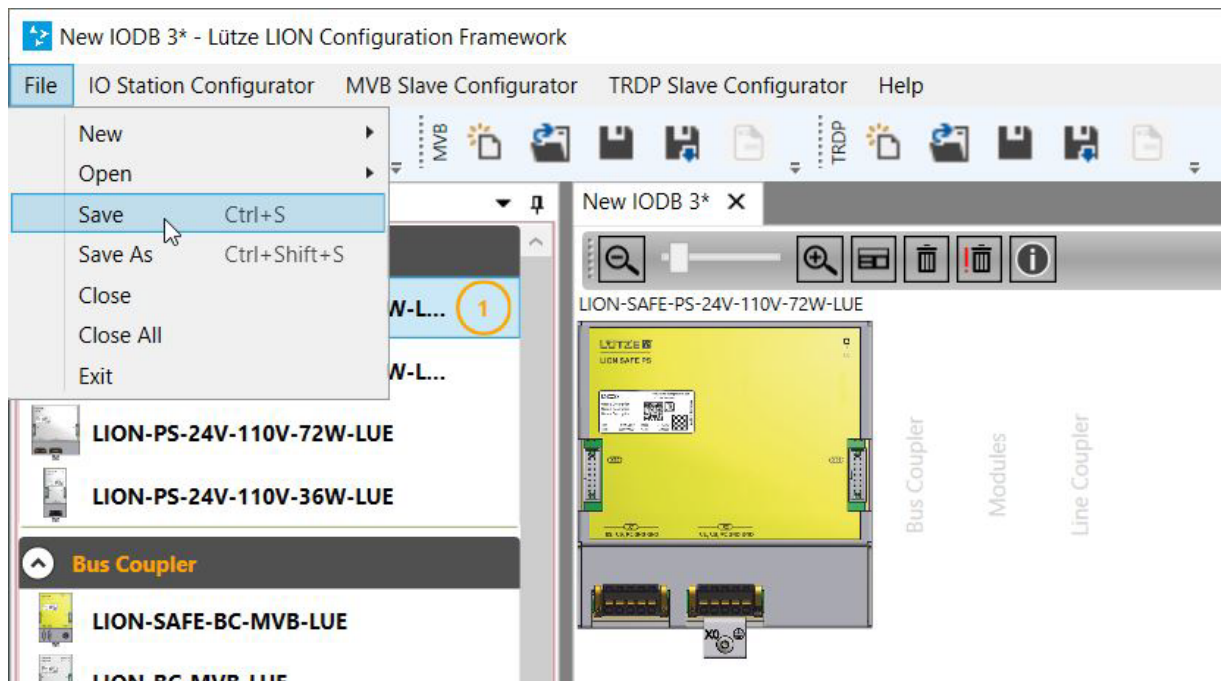


3. Select a file format you want to open.
4. (A file window opens.) Select the path of the file you wish to open.
5. Click **Open**

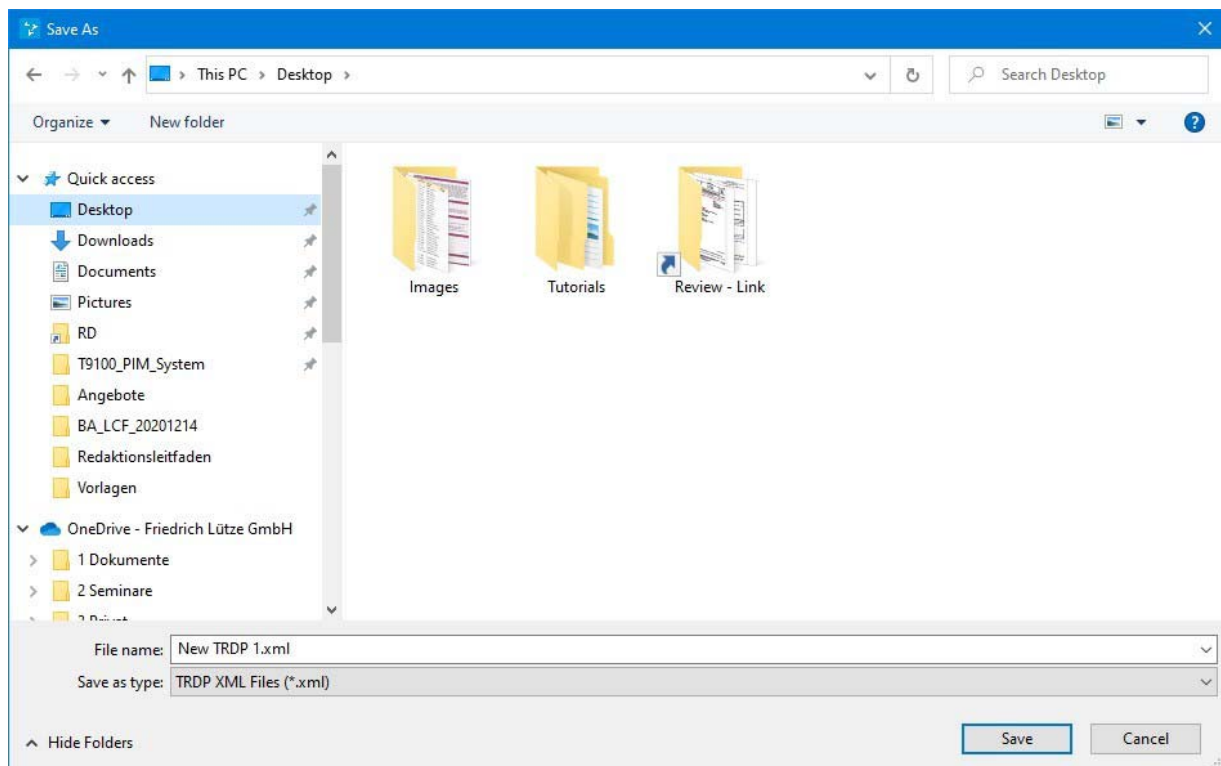
### 7.1.3 File > Save

To save a configuration file, proceed as follows:

1. In the menu bar click **File**
2. Select **Save** or **Save as**



3. Type in the file name.
4. Select the desired file extension.

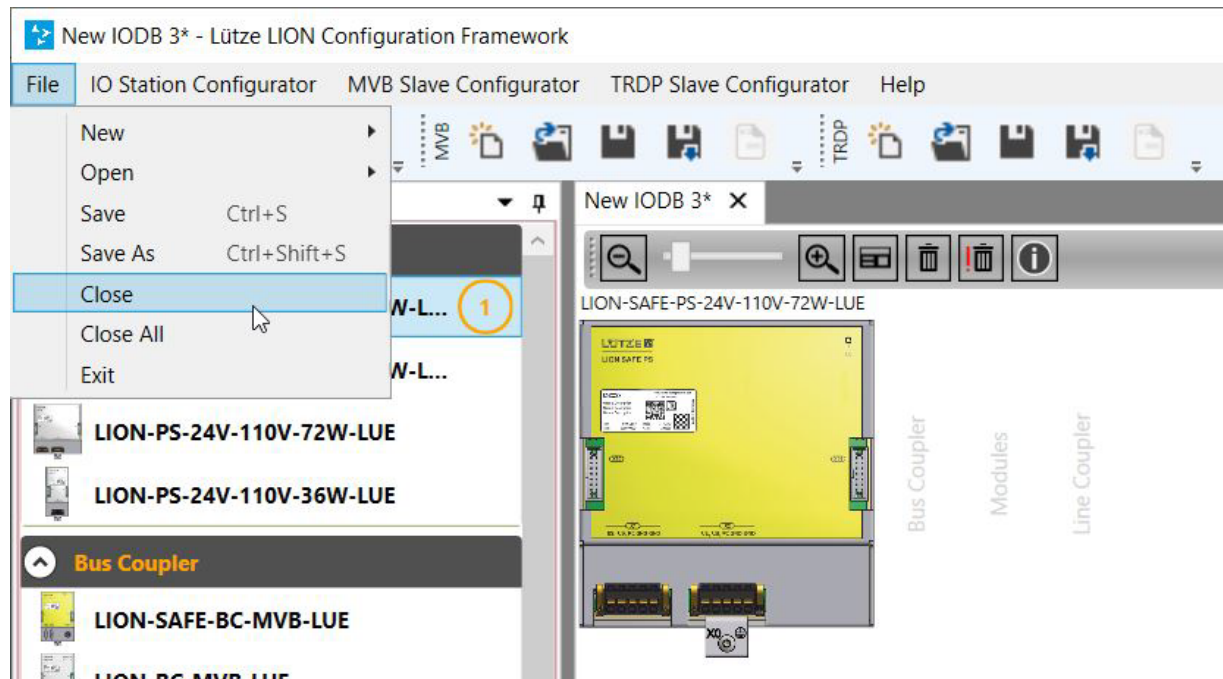


5. Click **Save**

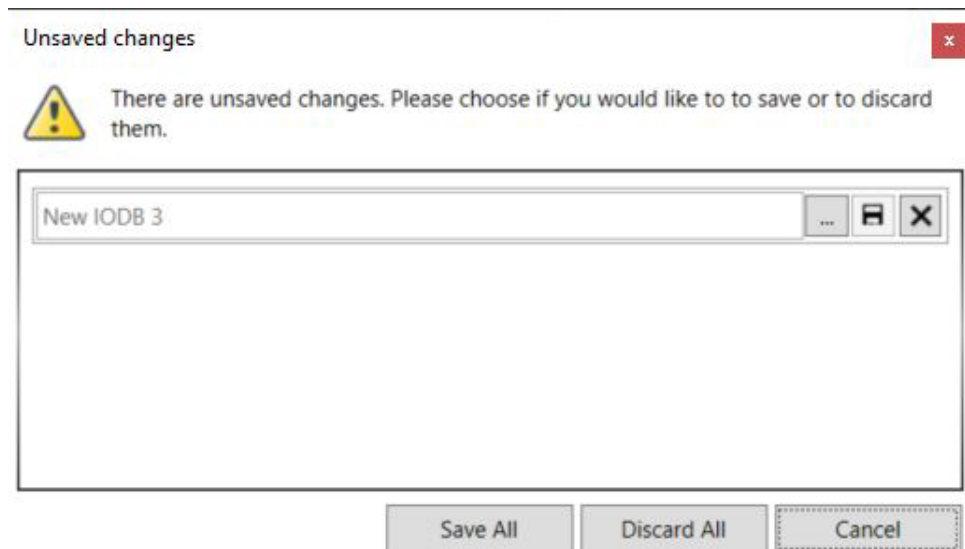
### 7.1.4 File > Close

It is possible to open different configurations at the same time. To close one or all configurations, proceed as follows:

1. In the menu bar click **File**
2. Select **Close** or **Close all**



A warning message appears.



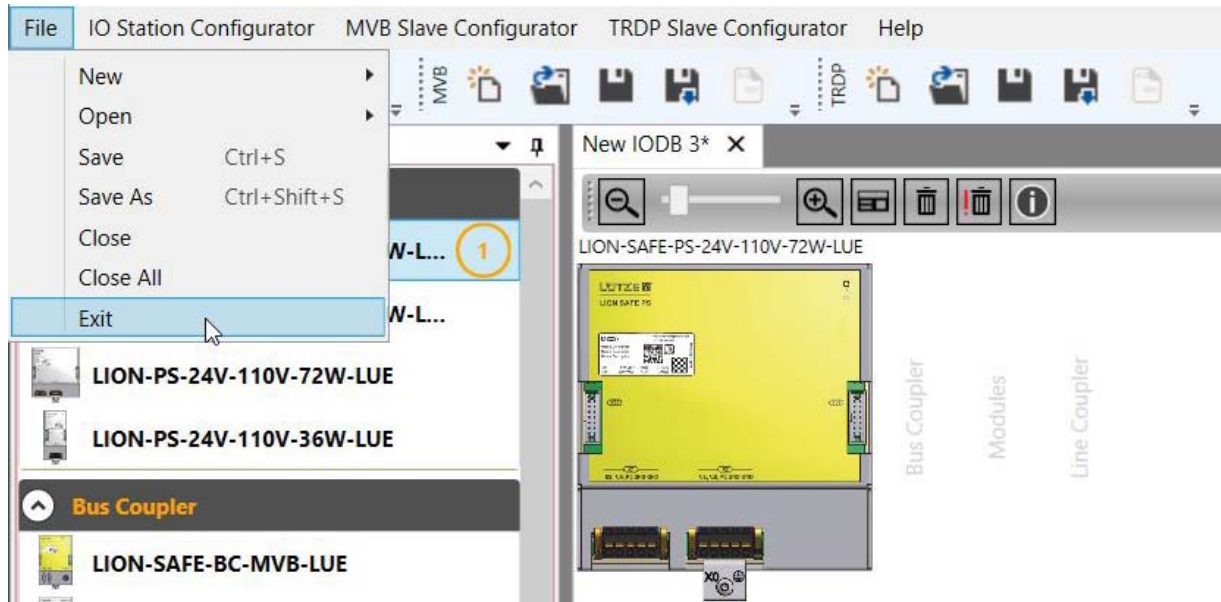
It is possible to select between *saving* the configuration or *discarding* it.

## 7.1.5

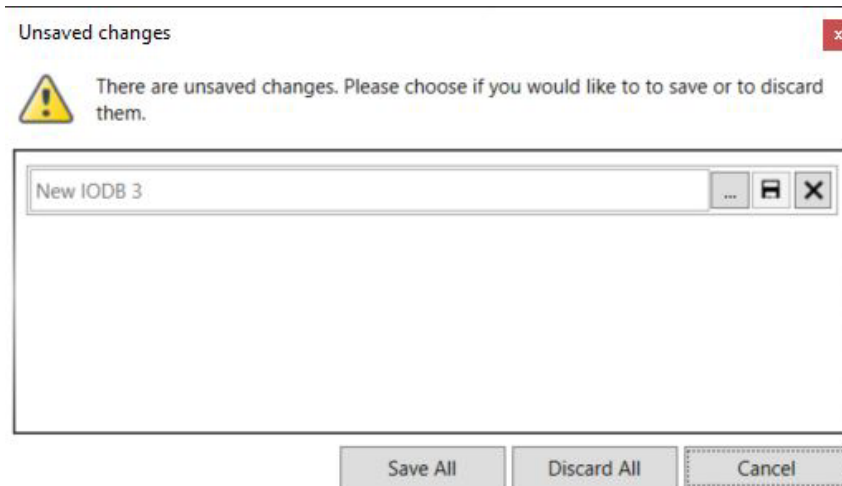
## File &gt; Exit

To shut down the LION Configuration Framework tool, proceed as follows:

1. In the menu bar click **File**
2. Select **Exit**



A warning message appears.



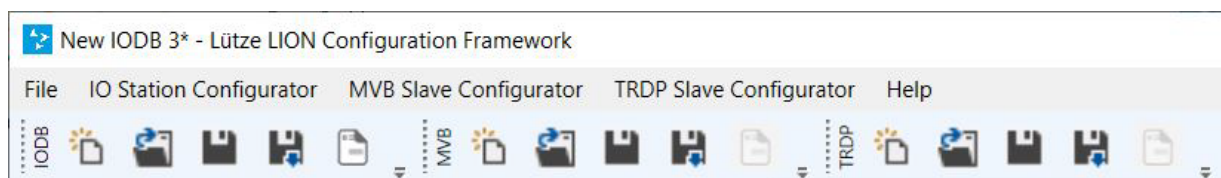
It is possible to select between *saving* the configuration or *discarding* it.

## 7.2

## Toolbar buttons

**NOTICE**

All operations are also possible using the toolbar buttons as an alternative to the drop-down menus.



## 8 I/O Station Configurator

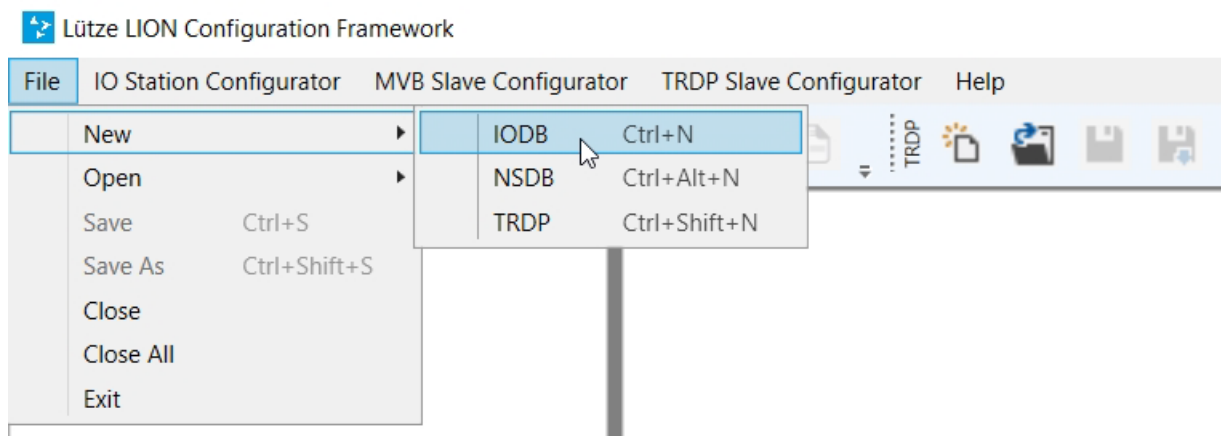
### 8.1 Creating a new IODB file

The IODB file shows the structure of the LION system. To create a new IODB file, go to the menu bar or click on the button in the toolbar.

#### 8.1.1 New IODB file via the menu bar or toolbar

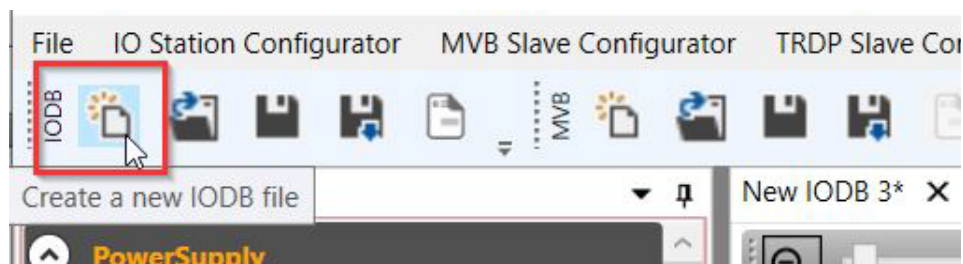
To generate a new IODB proceed as follows:

1. In the menu bar click **File**.
2. Select **New**.
3. Select **IODB** to create a new file.

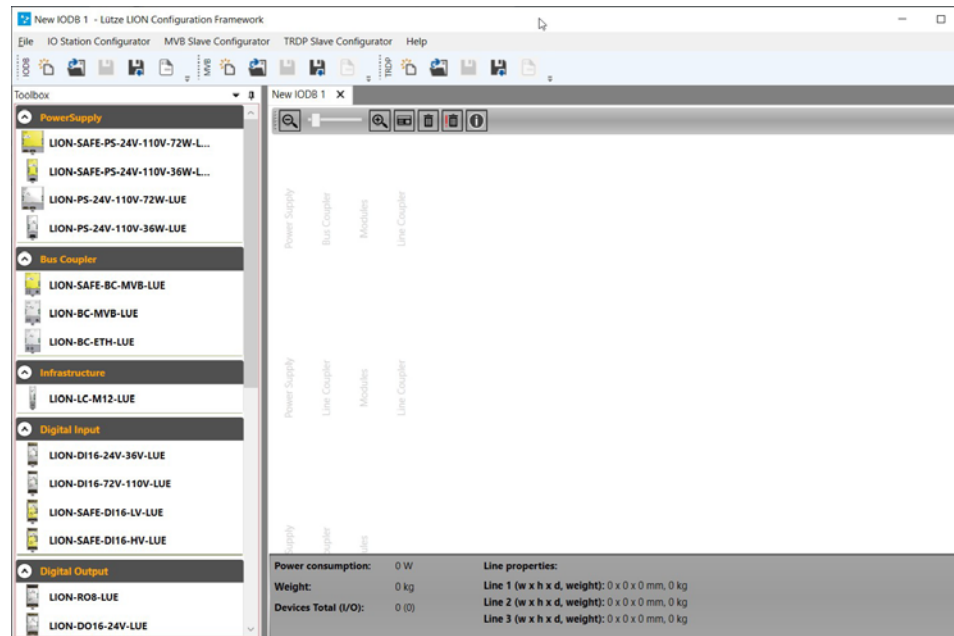


or:

Click on the **Create a new IODB file** icon in the toolbar:



4. This window will appear:



**HINT:** You can now either arrange the modules manually or use the Device Wizard (see also **chapter 8.1.8 „Device Wizard” on page 50**). But first read and understand chapter 8 completely.

5. The toolbox on the left side displays all components which can be used in a LION I/O station. The LION I/O station is built from these modules. **Drag and drop** the modules from the toolbox window to arrange them in IODB window on the right side. The modules are arranged according to predefined rules, you will get direct feedback, whether the combination is possible or not.

## NOTICE

You must first have read and understood the rules in **chapter 8.1.3 „The 10 predefined rules for configuration”** before you can arrange the modules yourself.





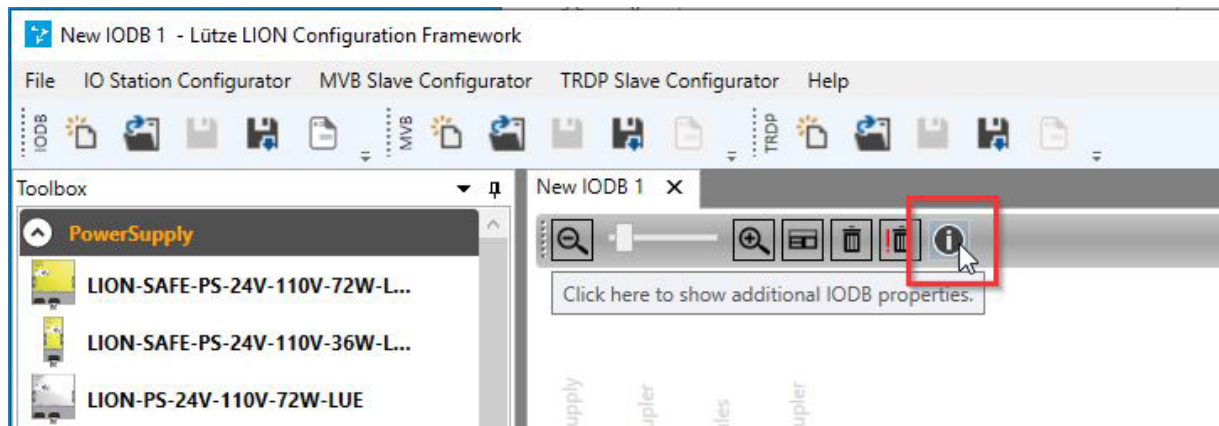
## 8.1.2 I/O Properties

Before starting to select the modules for the configuration, some general properties must be defined.

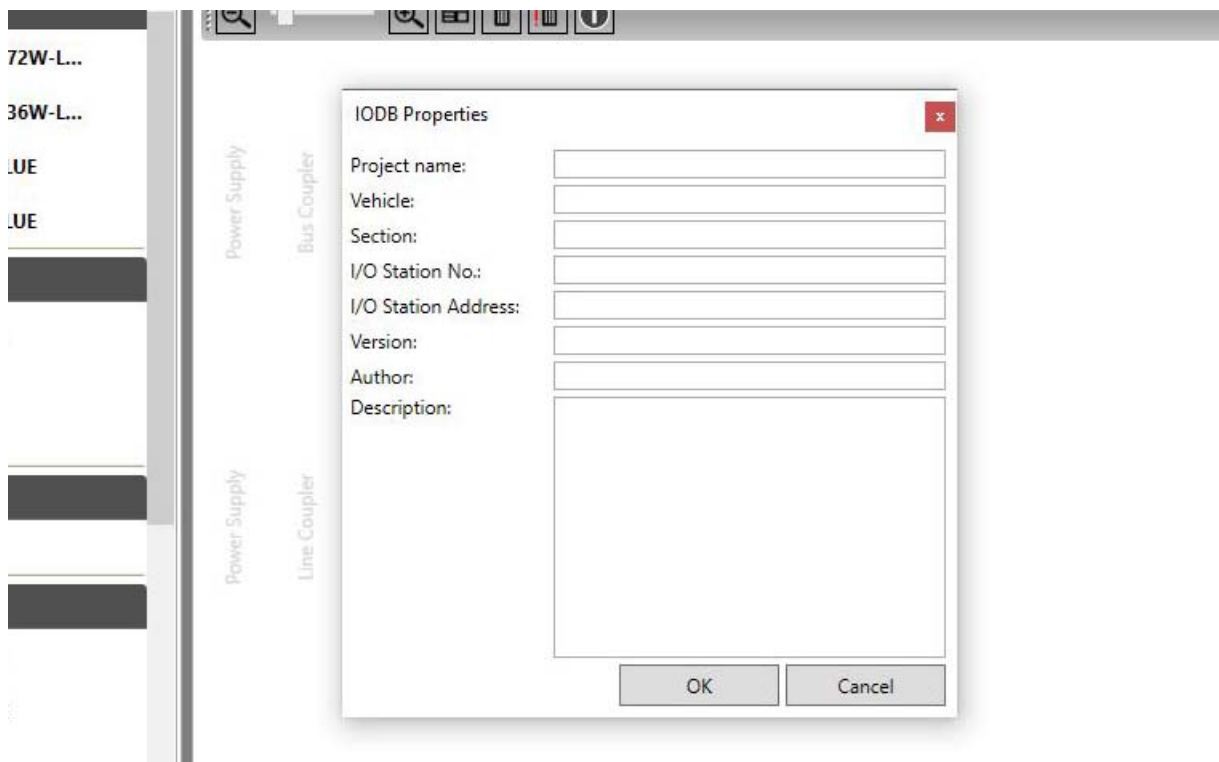
### NOTICE

**The properties entered here are also included in the IODB report.** Some of them are also used by the fieldbus configuration. (The I/O Station Address is used by the MVB configuration.)

1. Click the **i-Button** in the toolbar of the I/O Station configurator.



The following window appears:



2. Type in the corresponding information:

**NOTICE**

**The I/O Station Address must be a plain number with max. 4 digits.**

If the value does not match this requirement an "Integer out of range" error will be displayed when importing the IODB file into the MVB Slave Configurator.

## IODB Properties

Project name:	Train 1
Vehicle:	Test 1
Section:	A
I/O Station No.:	A1
<b>I/O Station Address:</b>	<b>1234</b>
Version:	00
Author:	Mr. Smith
Description:	This is a test text.

3. Click OK to save the set properties.

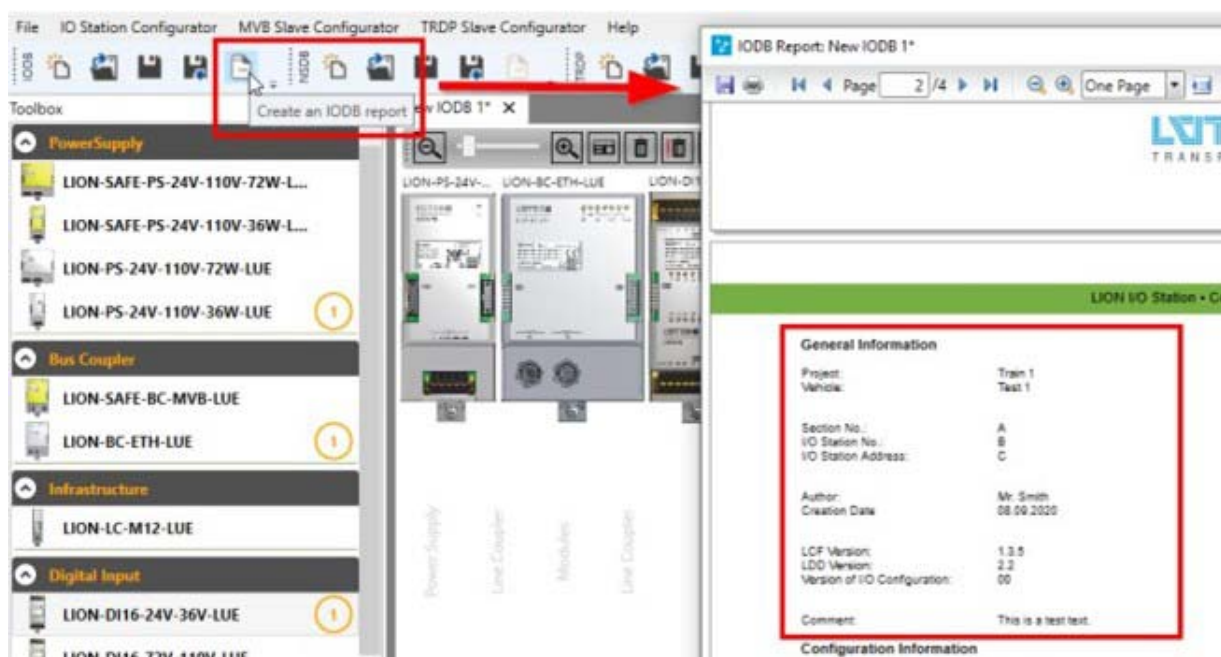
**NOTICE**

**At least the field I/O station address should be filled in which is used by the MVB Slave Configurator as MVB-address.**

The other information is optional but should be included for a meaningful documentation.

**NOTICE**

**This general information is also printed in the IODB Configuration Report.**





### 8.1.3 The 10 predefined rules for configuration

The following 10 predefined rules are essential to properly configure the LION system. The error messages in the LCF are programmed according to these rules:

**1. The first component of every line must be a LION Power Supply.**

Other LION Power supplies can follow in the line. Power supplies can be placed either on the text "Power Supply" or between any DEVICE.

#### NOTICE

Use the Device Wizard to plan the IODB, if you do not know which type of power supply is the correct one for your LION system.



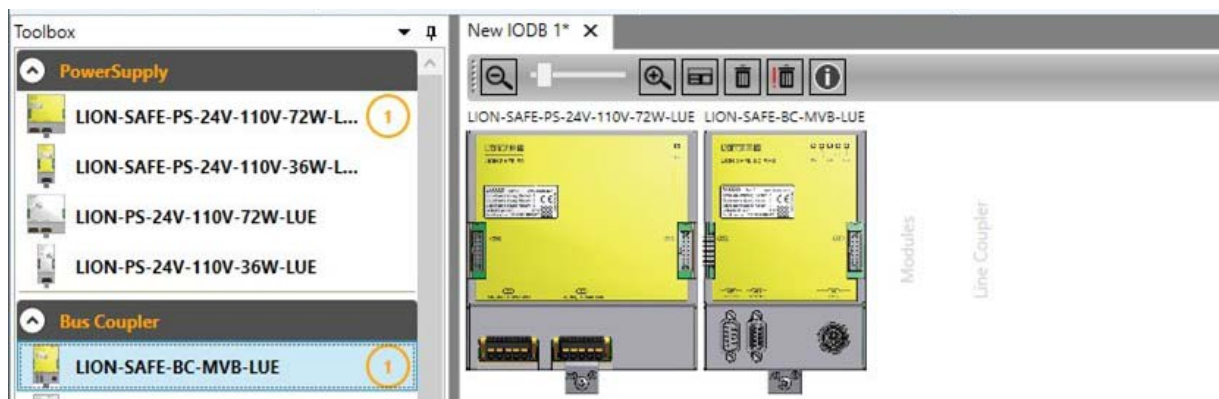
**2. The second component of the first line must be a HEAD (e.g., LION Bus Coupler).**

#### NOTICE

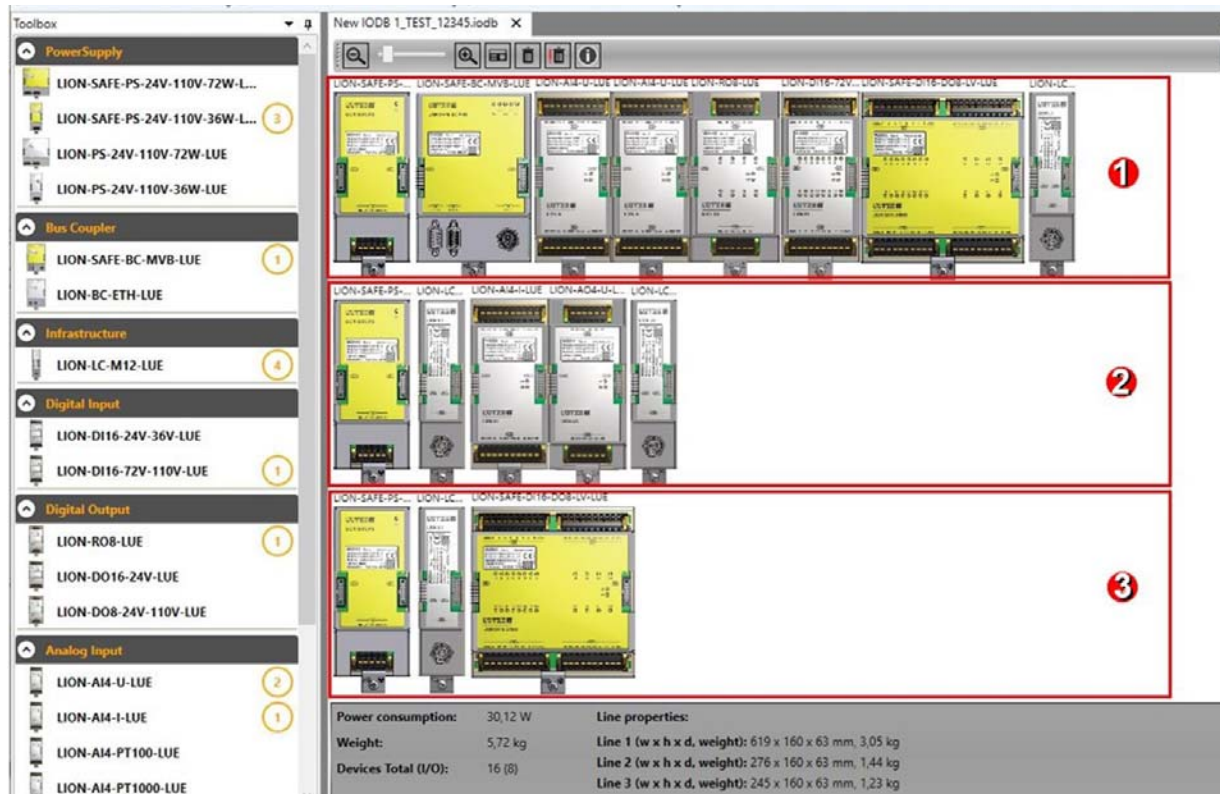
This also defines the fieldbus protocol of the system (e.g., MVB, TRDP, etc.)

#### NOTICE

Per LION I/O station only one HEAD is allowed and must be placed as second component in the first line.



3. Max. 3 lines are possible:



4. It is not allowed to create a line longer than 2000 mm.

If the line is longer than 2000 mm, the LCF will warn you:



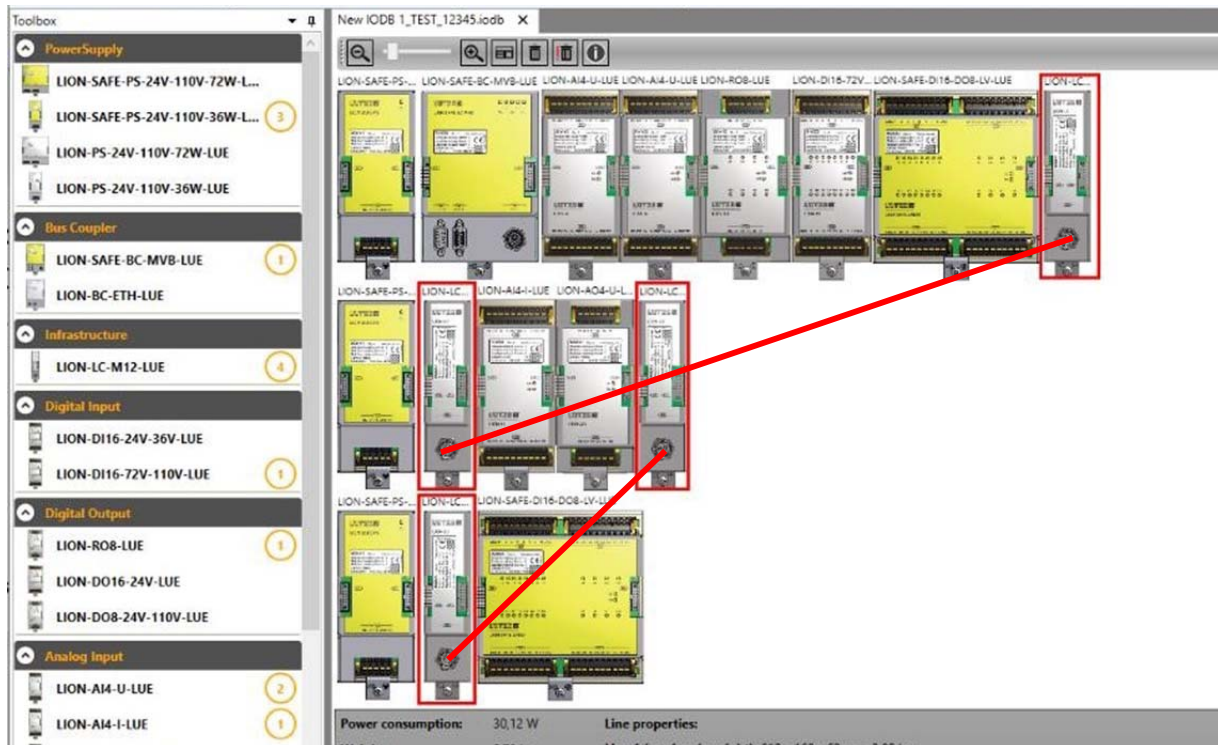
5. a) If the system consists of two lines, the last component of the first line and second component of the second line must be a LION Line Coupler.

Example with a 2-line architecture:

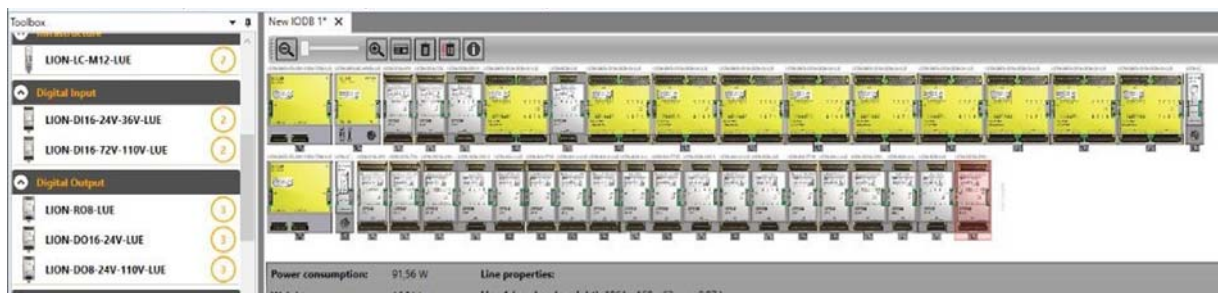


5. b) If the system consists of three lines, the last component of the first and second lines and the second component of the second and third lines must be a *LION Line Coupler*.

Example with a 3-line architecture:



6. The maximum cable length *between two LION Line Couplers* is **not allowed to be more than 10 m**.
7. The LION MVB bus coupler is the **HEAD**, the LION DEVICES are the **DEVICES** of the LION system.
8. A **module** is the smallest exchangeable unit in the system.
9. It is possible to **connect max. 32 LION DEVICES** to the LION HEAD.  
In one line or in several, where one line must not be longer than 2000 mm.



10. Safe and non-safe modules can be combined in the system.



If a safe function is to be realized with the I/O station, the specifications of the system description and the corresponding operating manuals must be observed. This means that not all combinations are possible anymore!

## NOTICE

Many different LION system architectures are possible.  
(See also the LION System Description, chapter "System architecture" for more information. Find the link in chapter 4 „System planning" on page 15.)



## 8.1.4 Arranging the modules

### 1. Drag and drop of the modules

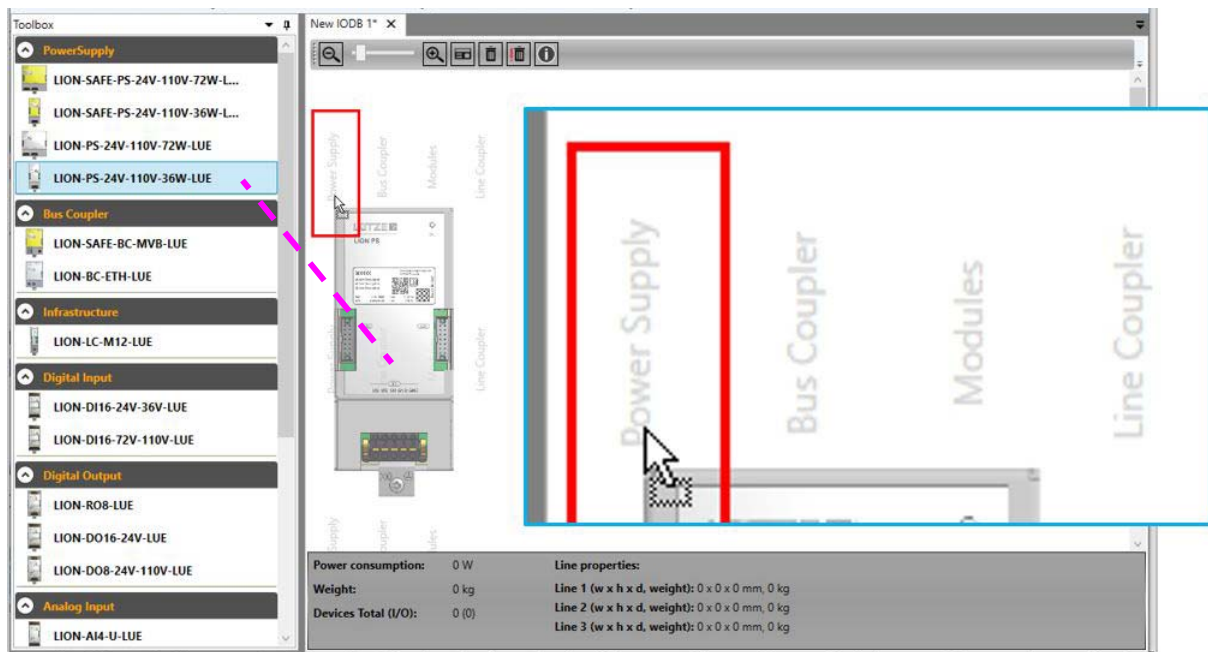
Always start with the power supply in the first position:

#### NOTICE

Always start with the LION Power Supply in the first position.



Use the default grey words in the IODB window.  
These indicate the general order of the different module types.



**Only LION SAFE Power Supplies may be used for a SIL > 0 I/O station.**

1. Click on a power supply in the left toolbox window.
2. Now drag the module with the mouse button pressed down to the first word "Power Supply" in the first line and drop it, as shown in the screenshot above.

#### NOTICE

Only correct module types can be dropped onto a word.

If an incorrect module type is dropped onto a field the LCF will refuse to place it at this position.

## 2. Orange circled number of used modules



### NOTICE

The used modules get an orange circled number in the left toolbox window. This indicates the number of modules of this type that are used within the LION I/O station.

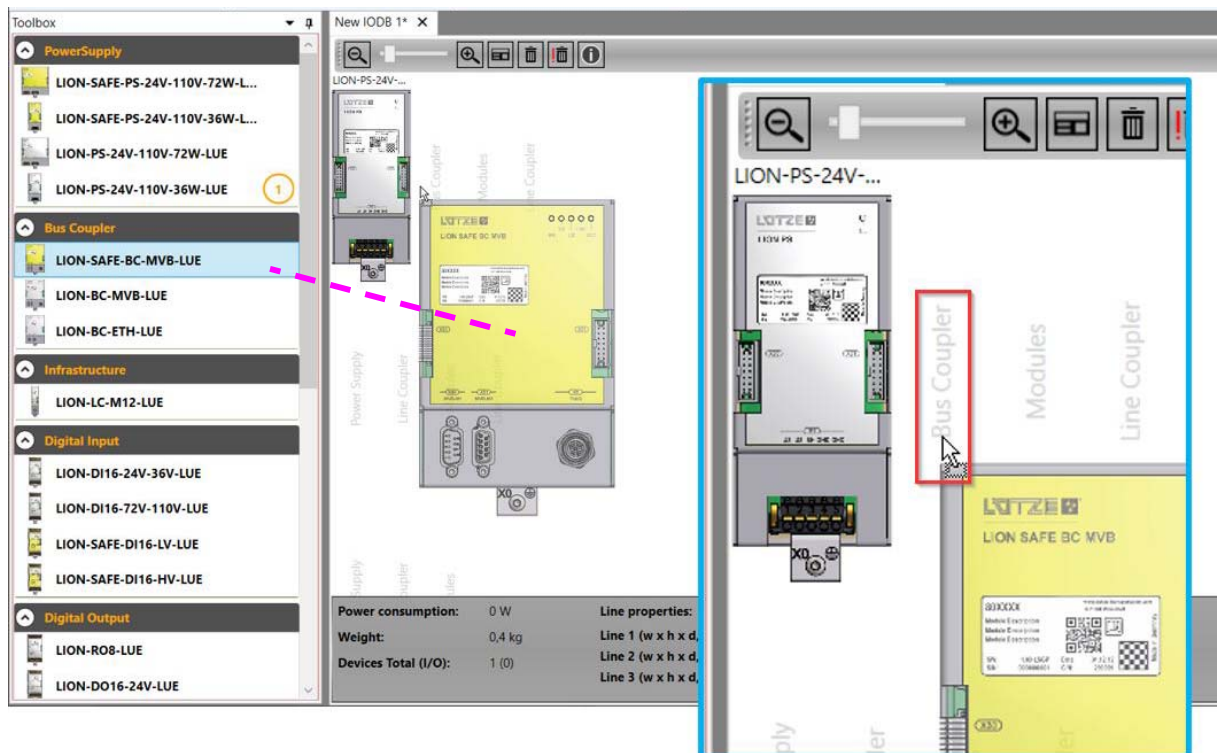
## 3. Placing the HEAD in second position

The HEAD (e.g., the LION MVB Bus Coupler) always follows in the second position.

### NOTICE

The chosen HEAD defines the fieldbus used by the LION I/O station.

1. Click on a HEAD in the left toolbox window.
2. Now drag the module with the mouse button pressed down to the word "Bus Coupler" in the first line and drop it, as shown in the screenshot below.



#### 4. Placing of the first DEVICE of a line

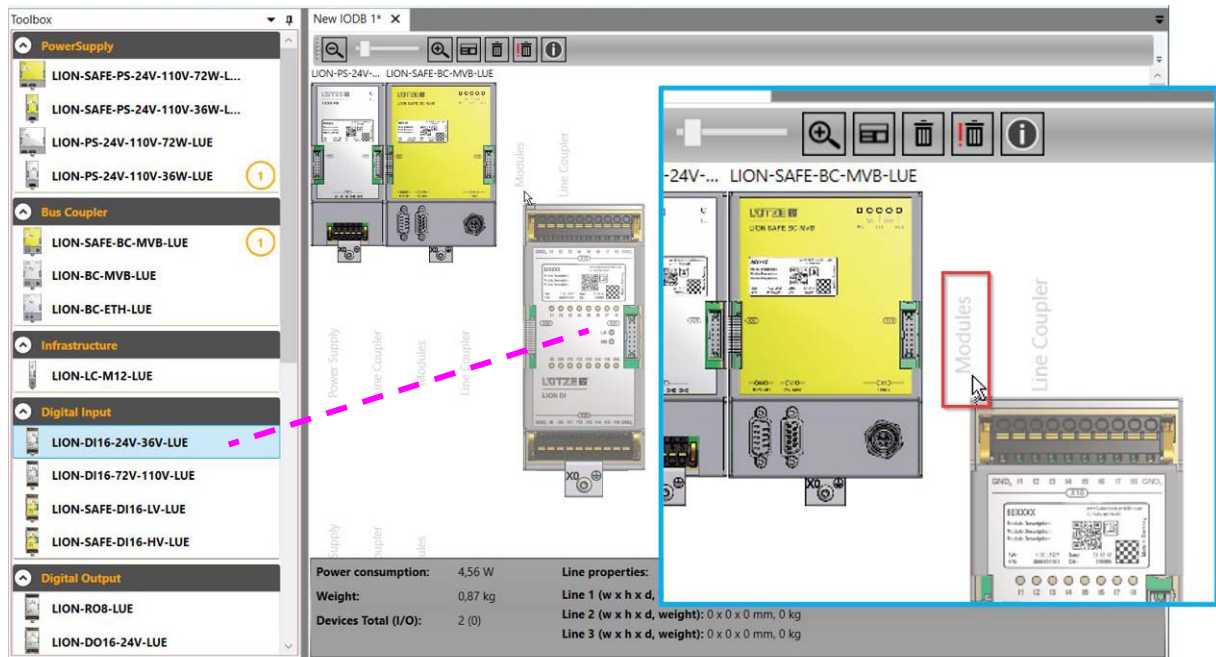


4.1 A DEVICE can be placed on the field labeled "Modules".

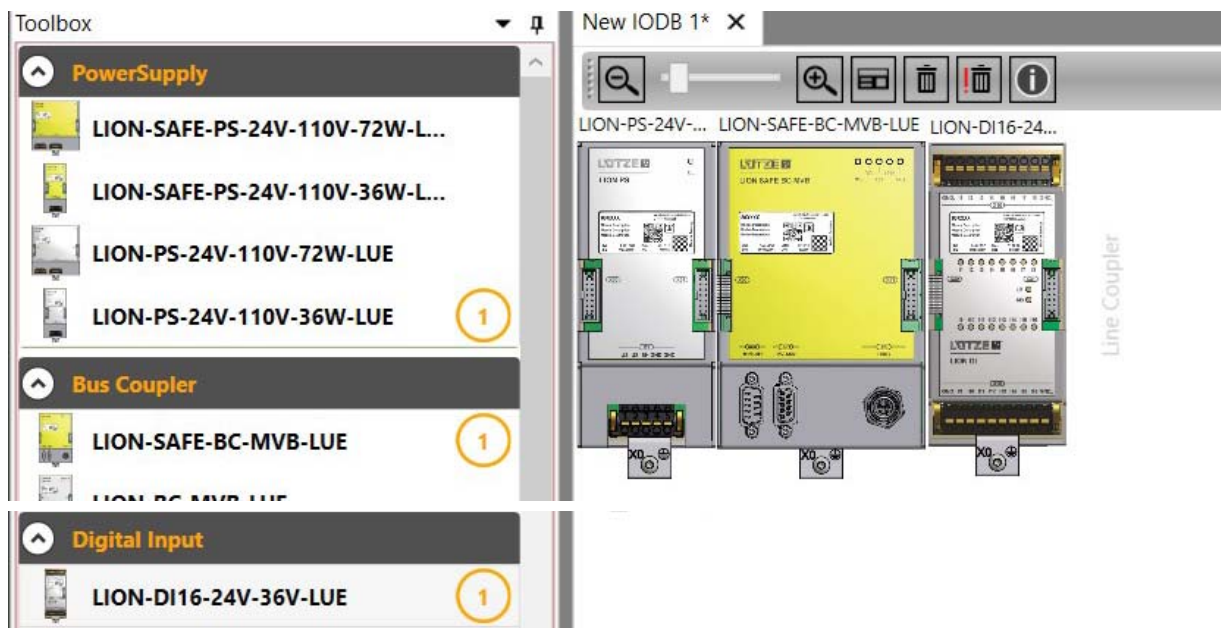
4.2 In the first row, the first DEVICE is placed after the HEAD.

4.3 In the second and third row, the first DEVICE can be placed after a line coupler or an inline power supply.

##### 4.1. A DEVICE can be placed on the field labeled "Modules":

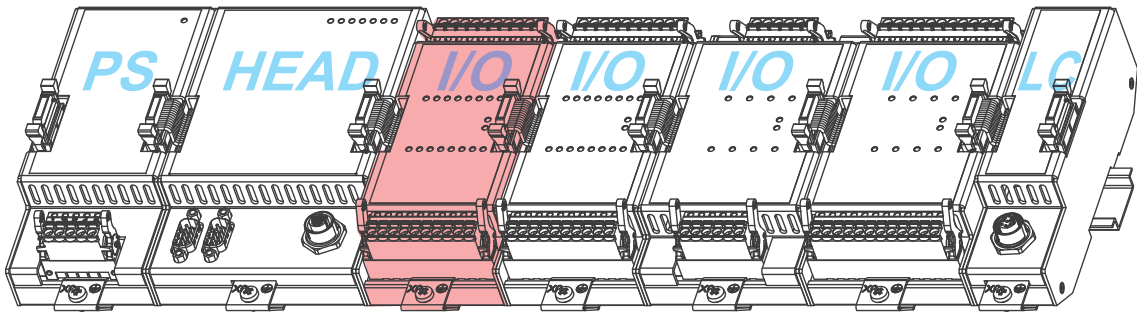


1. Click on an analog/digital input/output module in the left toolbox window.
2. Now drag the module with the mouse button pressed down to the word "Modules" in the first line and drop it, as shown in the screenshot above.
3. If done it correctly, you will get this result:

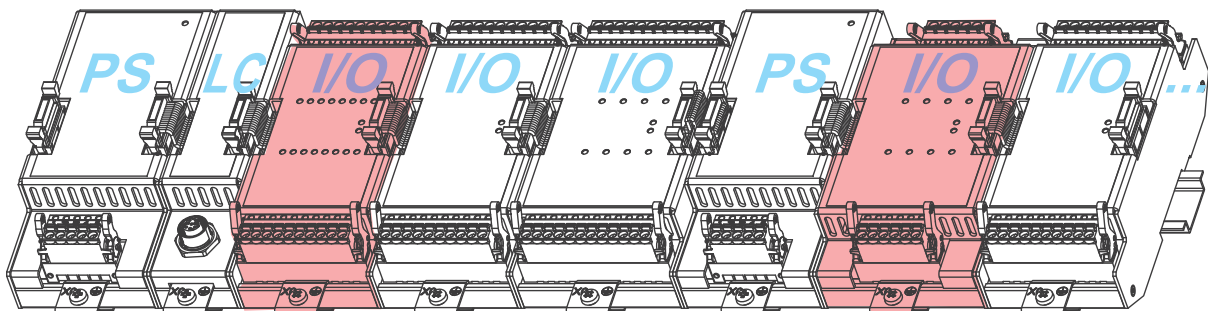




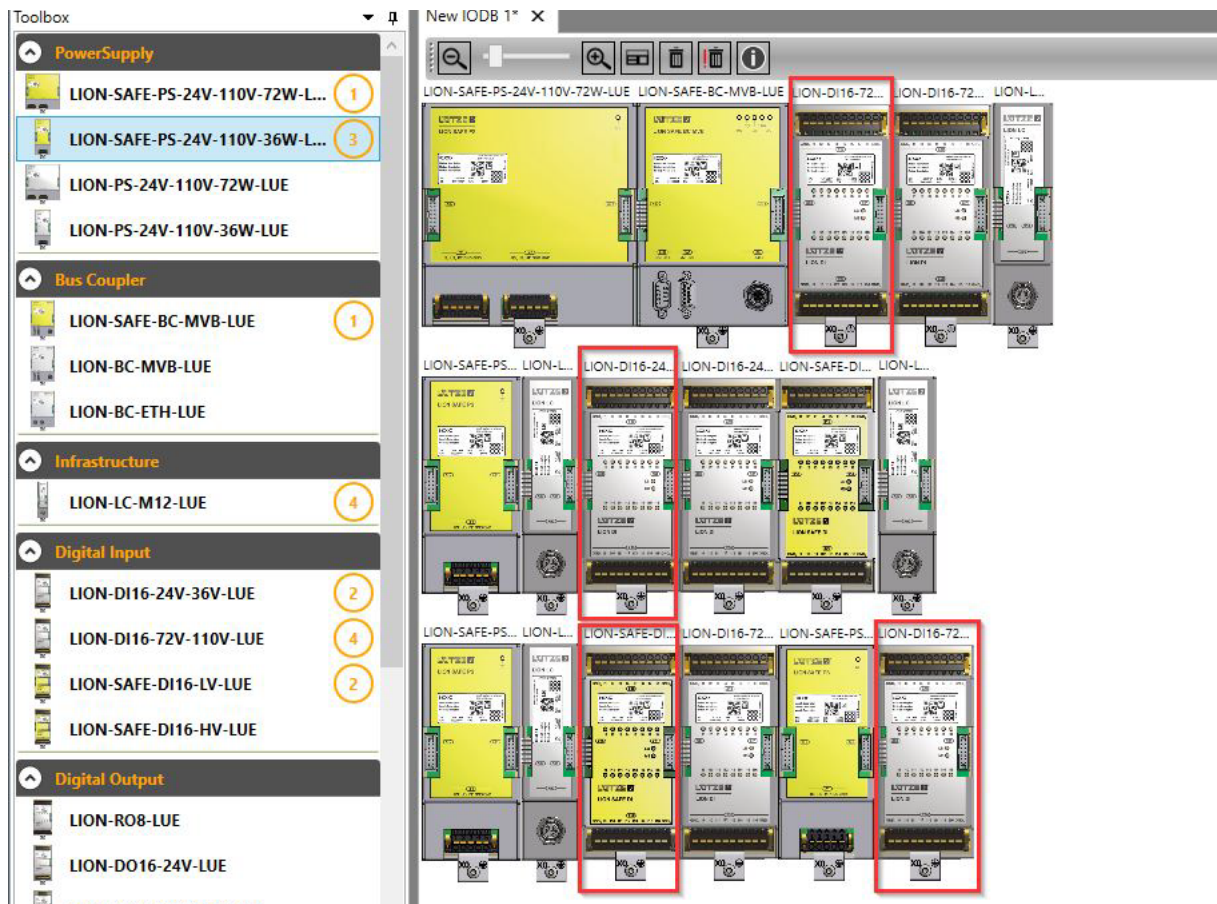
#### 4.2. In the first line, the first DEVICE is placed after the HEAD:



#### 4.3. In the second and third line, the first DEVICE can be placed after the first line coupler in the line or an inline power supply.



#### Examples for the placing of the first DEVICE in the LCF tool:



## 5. To add more DEVICES



5.1 A DEVICE can be placed before or after another DEVICE.

5.2 A DEVICE can be placed between two other DEVICES, **but never between Power supply and HEAD**.

5.3 A DEVICE can be placed before or after an inline power supply.

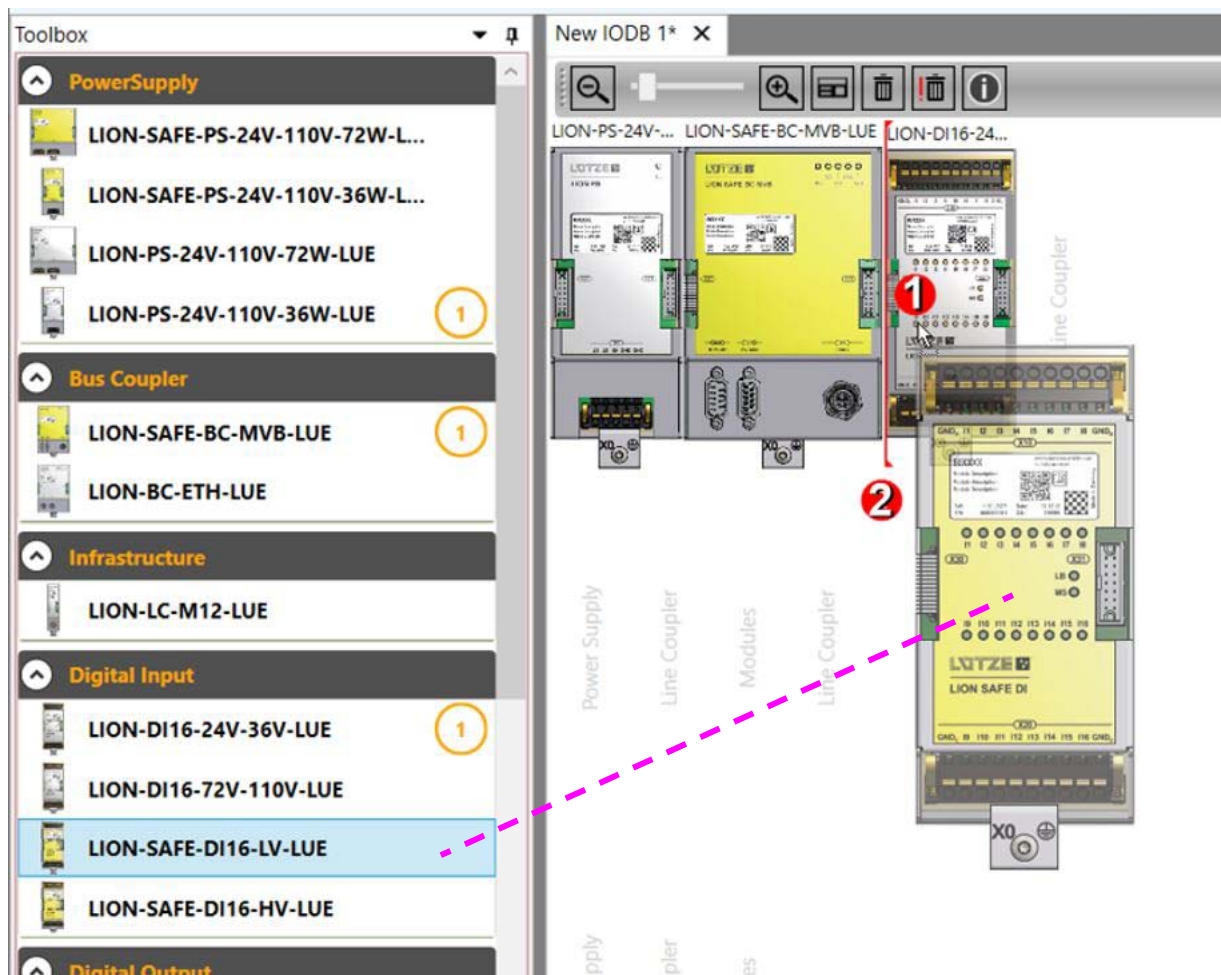
To add more DEVICES, proceed as follows:

### 5.1. A DEVICE can be placed before or after another DEVICE.

1. Drag the DEVICE over an existing DEVICE.

2. A red marking line appears (to the left or right of the module, depending on how you move the mouse). Drop the module in the desired position.

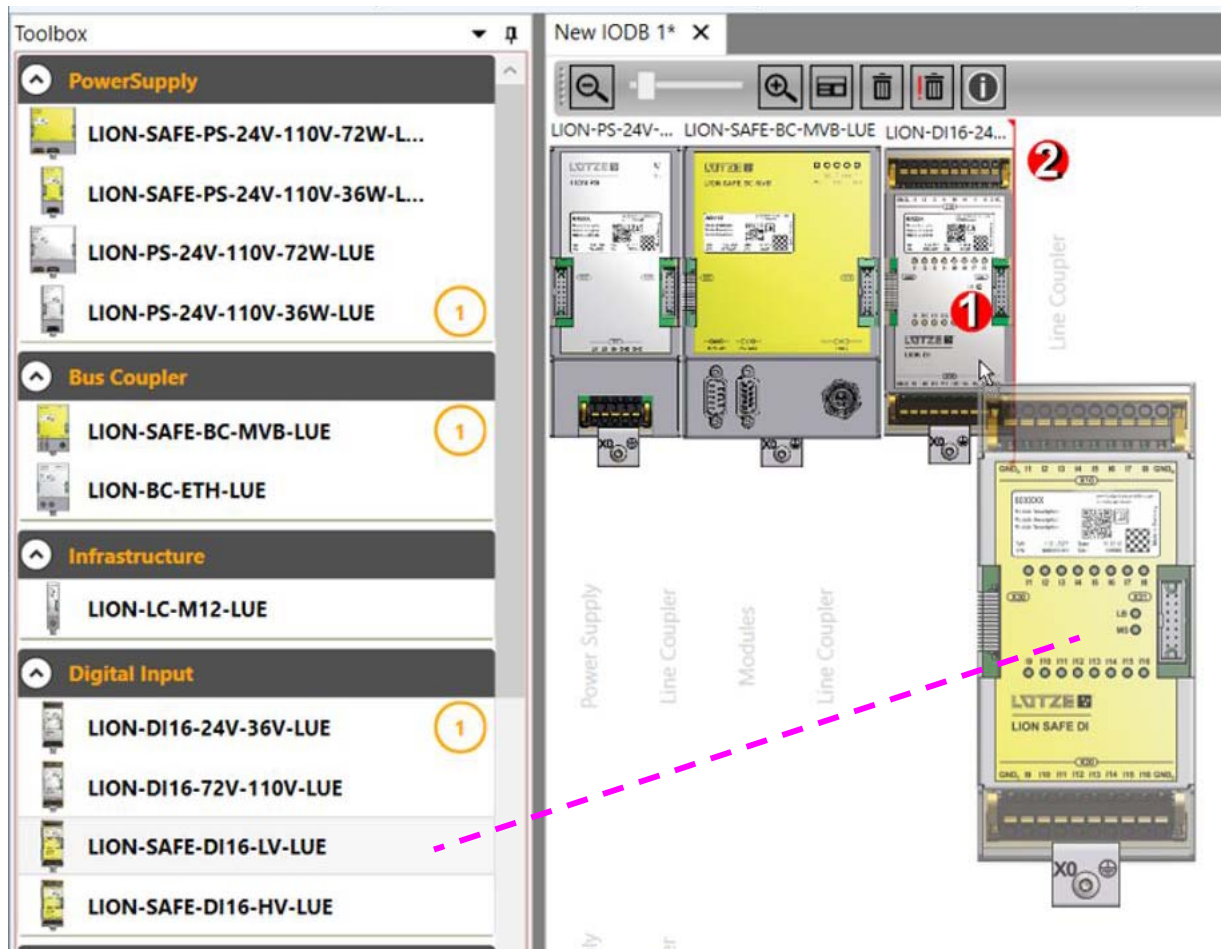
*a) in front of a placed DEVICE:*



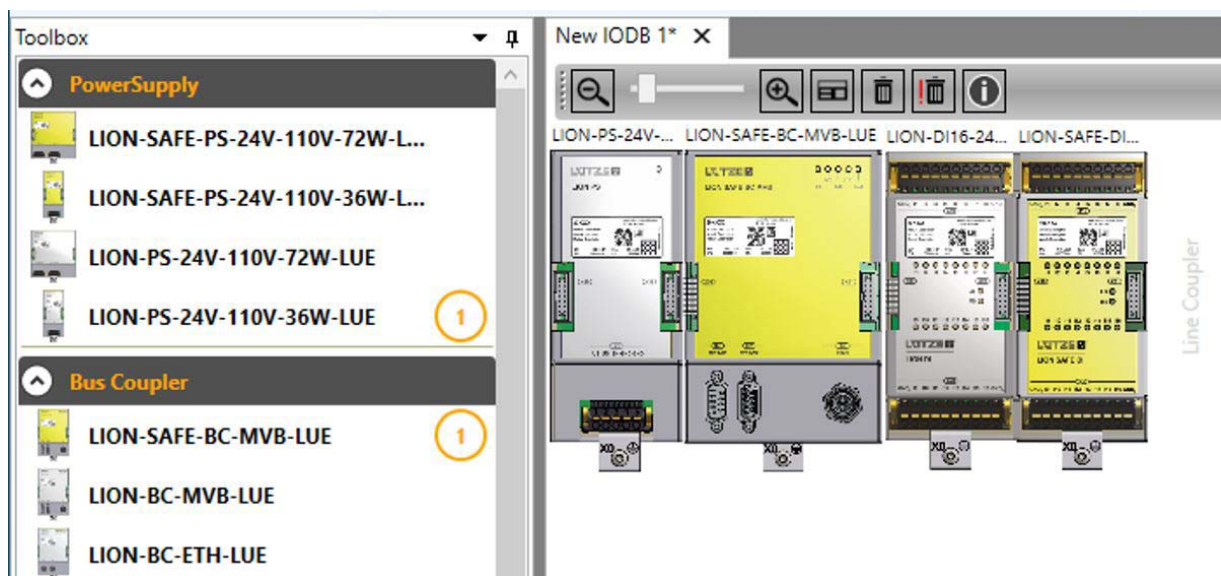


or:

*b) behind a placed module:*



If you did it right, you will get this result:



### 5.2. A DEVICE can be placed between two other DEVICES, but never between Power supply and HEAD

#### NOTICE

In the same way, further DEVICES can now be placed in front of and behind the placed DEVICES.

The placed DEVICES can be subsequently changed again at any time, see also chapter 8.1.4 „Arranging the modules” on page 32.

Power consumption:	7,8 W	Line properties:
Weight:	1,48 kg	Line 1 (w x h x d, weight): 297 x 160 x 63 mm, 1,48 kg
Devices Total (I/O):	4 (2)	Line 2 (w x h x d, weight): 0 x 0 x 0 mm, 0 kg
		Line 3 (w x h x d, weight): 0 x 0 x 0 mm, 0 kg

### 5.3. A DEVICE can be placed before or after an inline power supply.

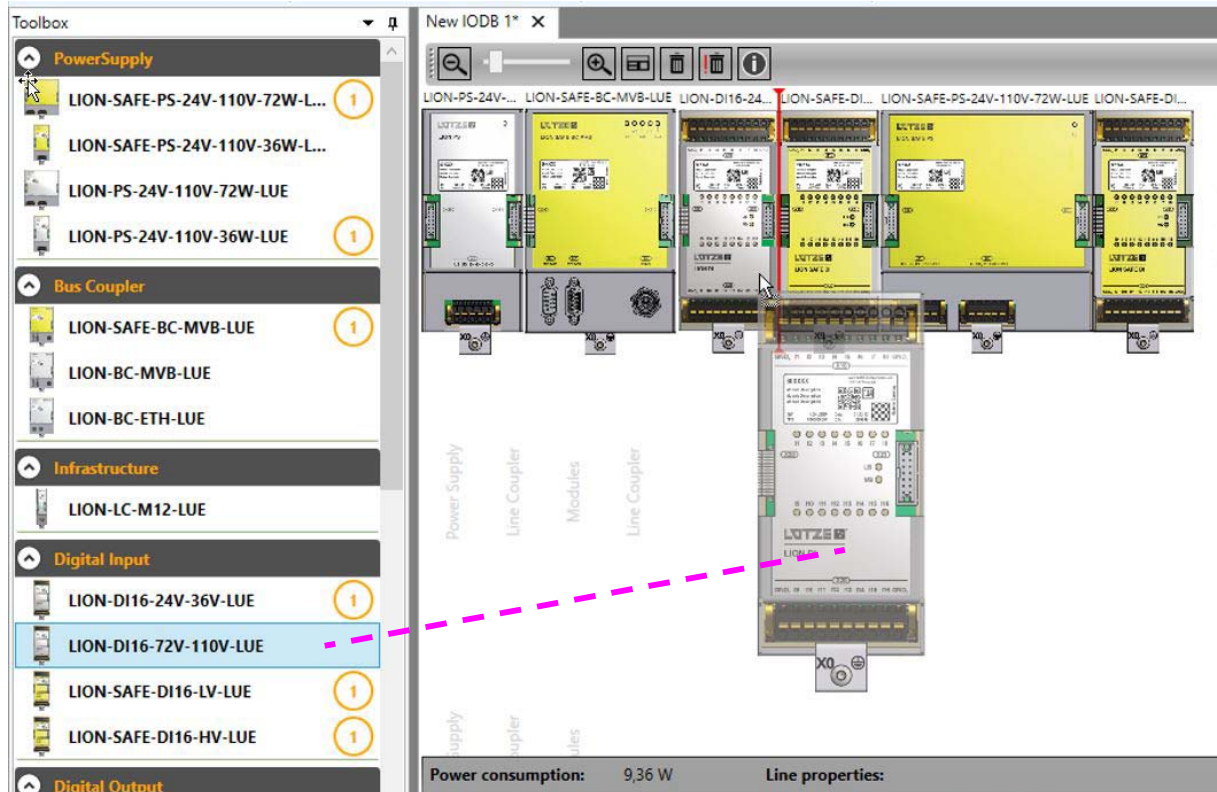
a) You can place further (inline) power supply units in a line.

#### NOTICE

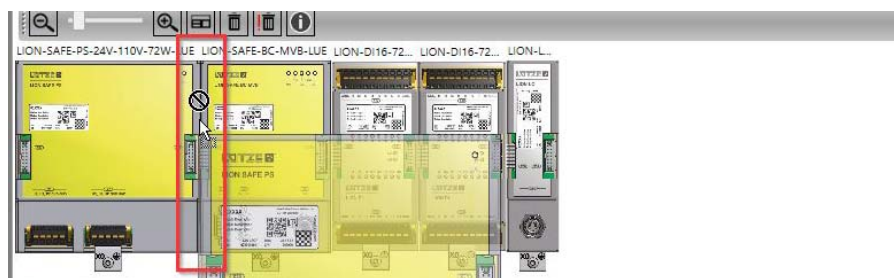
If necessary, further power supply units can be connected to the line.  
(See also chapter 8.1.5.3. Display of insufficient current” on page 46.)

b) Placing of a **DEVICE** between **HEAD** and inline power supply**NOTICE**

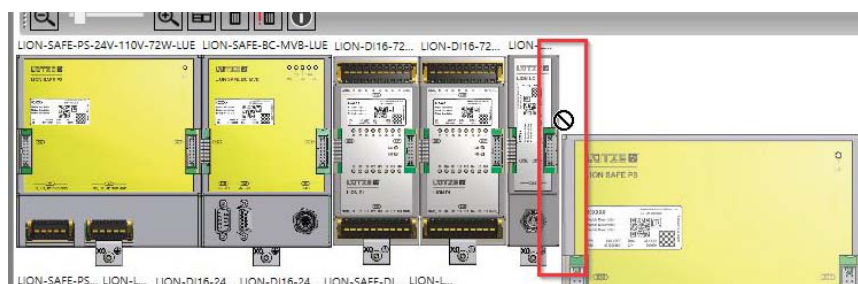
A module can be placed anywhere where the red line appears. (See also the following screenshot.)

**NOTICE**

No placement is possible between the voltage supply at the first position and the **HEAD**.

**NOTICE**

Placement after a line coupler is also not possible.



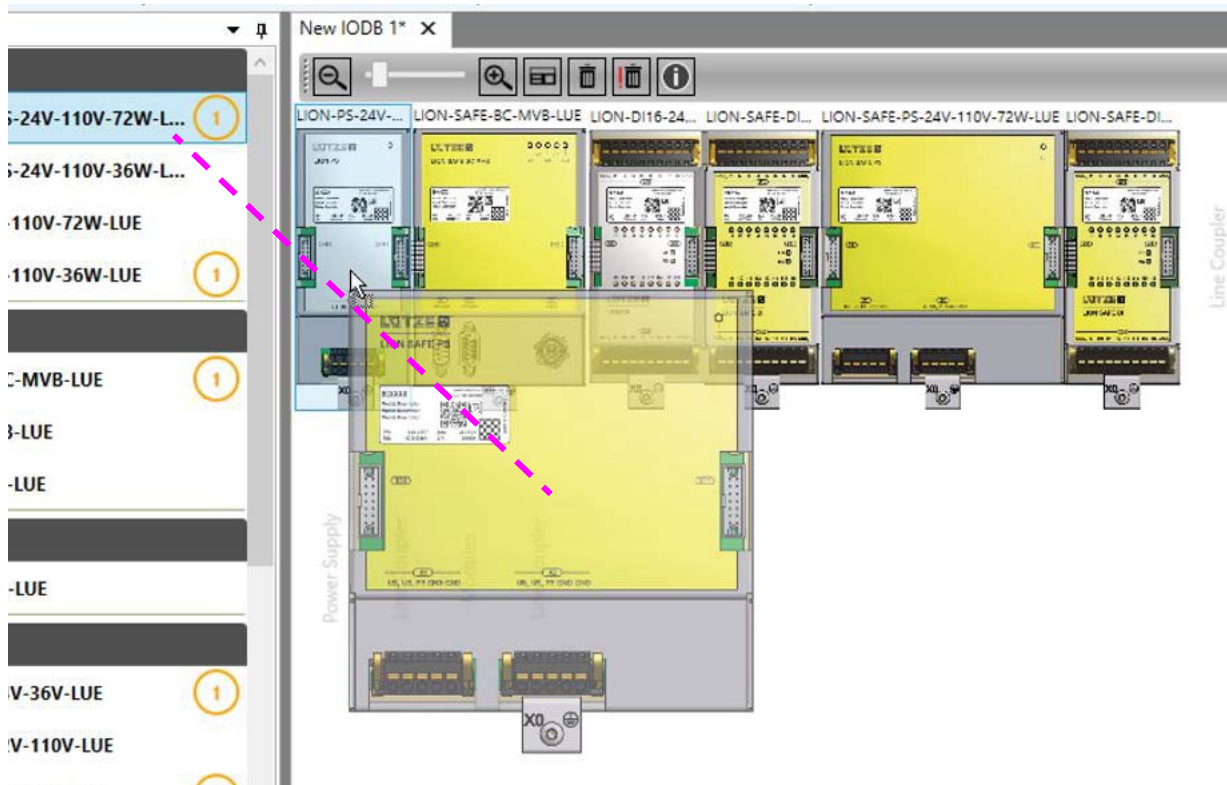


## c) Replacing the power supply unit or HEAD directly

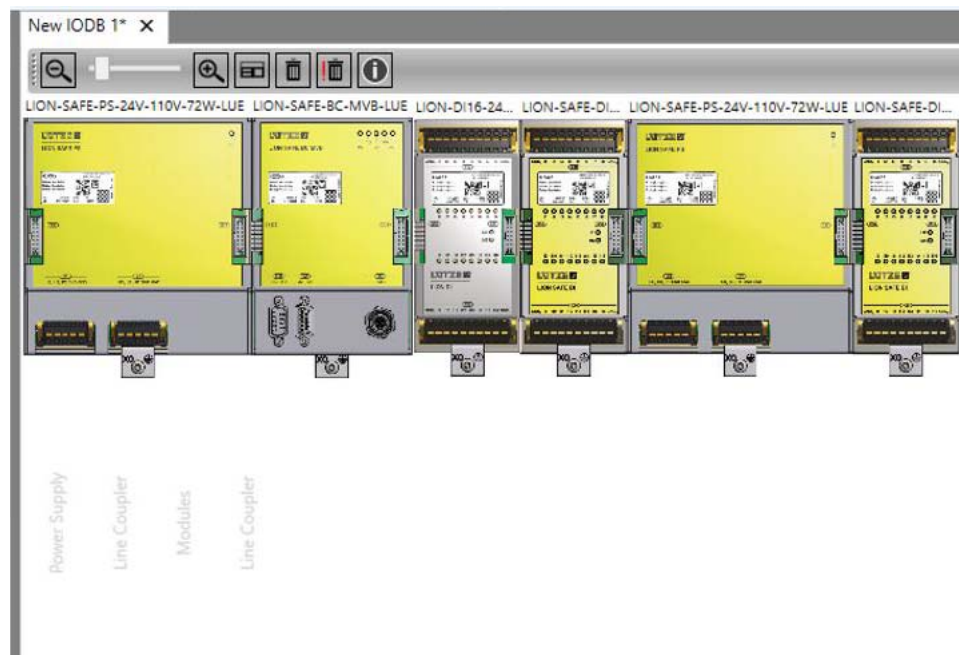
**NOTICE**

These replacements work only at position 1 and position 2 of a line.

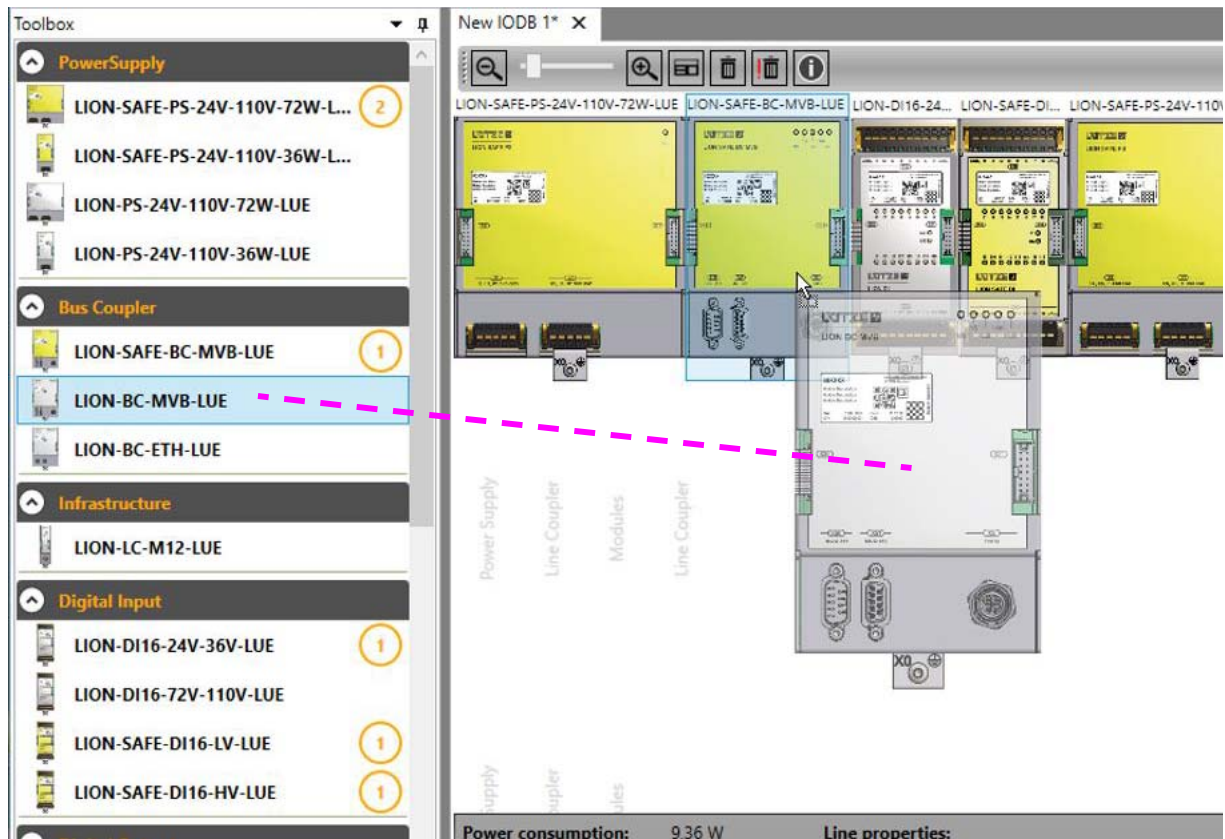
Replace the **power supply** directly by **drag & drop** on the icon:



If done it correctly, you will get this result:

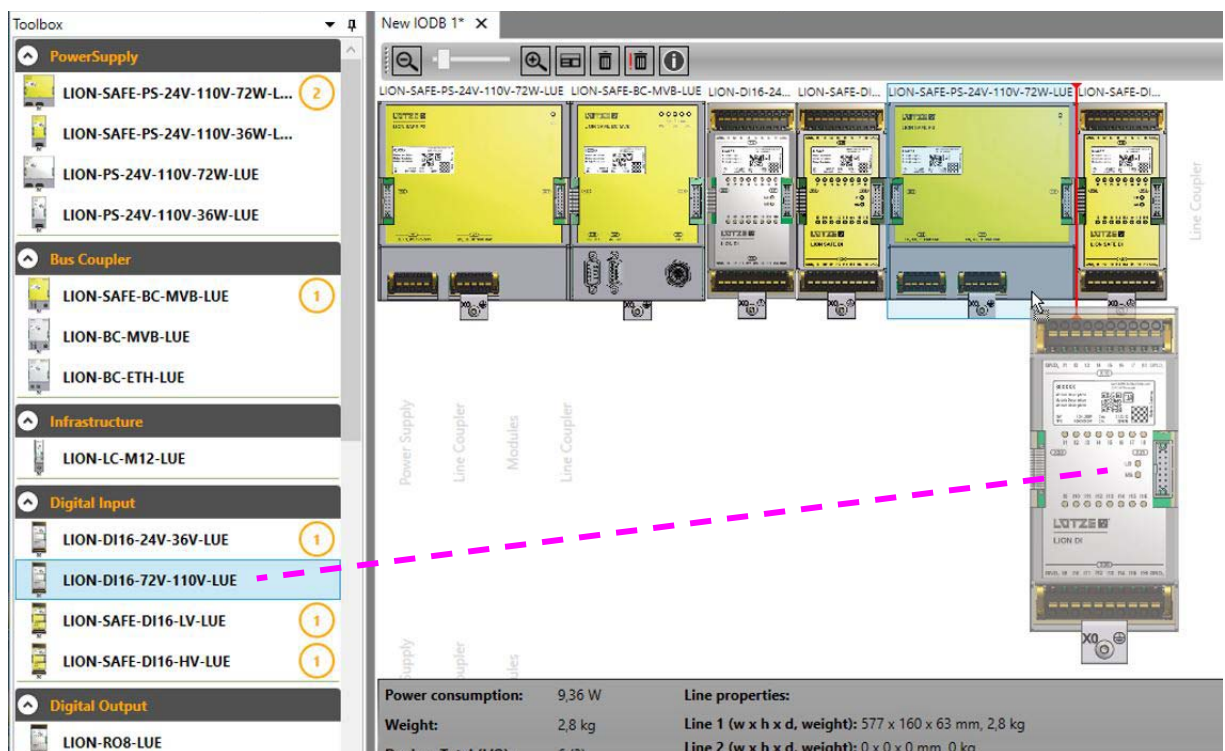


Replace the **HEAD** directly by **drag & drop** on the icon:



**Exception: Power supplies in the middle of the line.**

These behave here exactly like the DEVICES, i.e., they are not replaced, and a red line appears to the right or left of them for placing modules



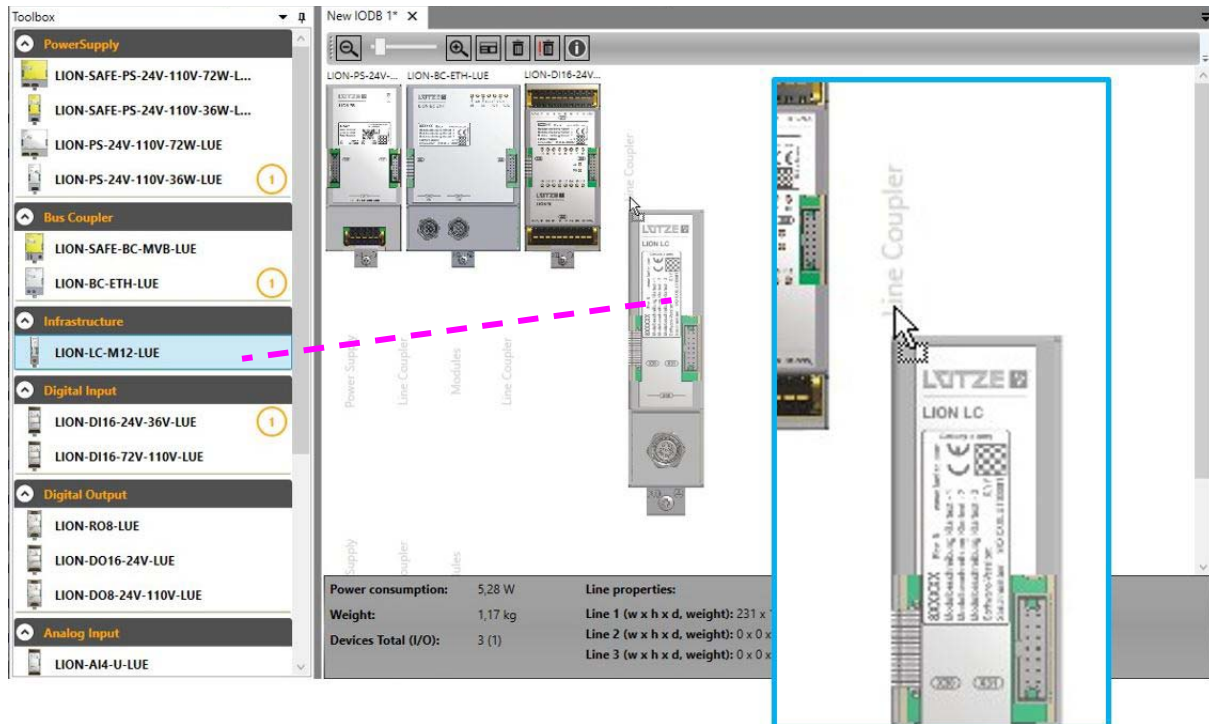
## 6. LION line couplers or the last place in the first and second line

Line couplers can only be placed on the "Line coupler" text area.

### NOTICE

However, a line coupler is not necessarily required.

This is only the case if you want to extend the station over several lines.



### NOTICE

You intuitively want to add more DEVICES here, but this is not possible.

The last module in the first and second line is "Line Coupler". It is only possible to drag a **LION Line Coupler** here.



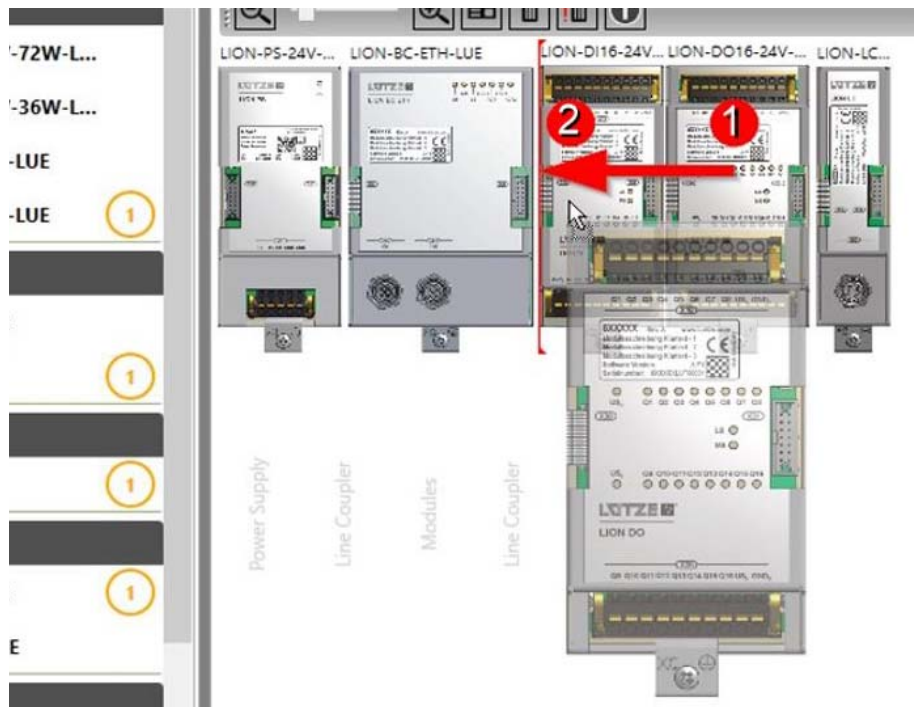


## 7. Changing the order of DEVICES

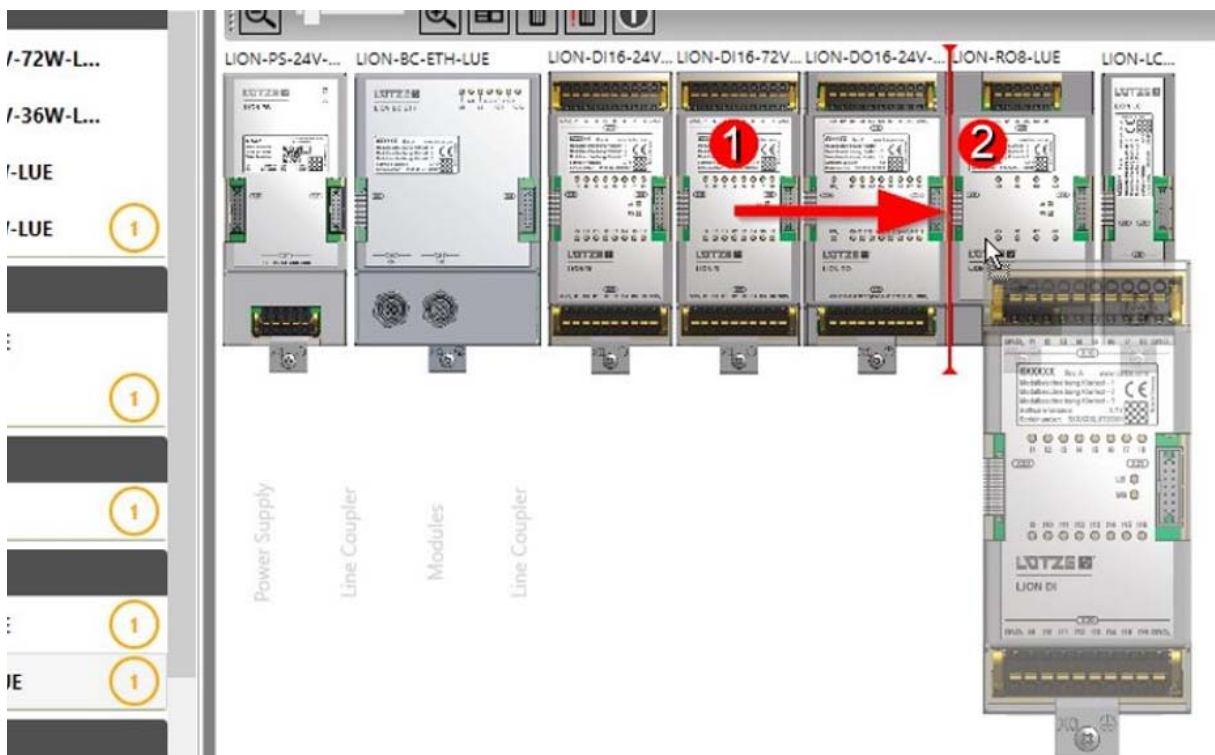
You can change the order of the modules at any time by following the previously mentioned rules.

1. Drag the DEVICE over an existing DEVICE.
2. A red marking line appears (to the left or right of the module, depending on how you move the mouse). Drop the module in the desired position.

### Example1:



### Example2:



## 8.1.5

## Warnings and error handlings

The LCF reacts with warnings if it detects errors in the configuration. For example, if the possible length of one of the three lines is exceeded, or the order of the modules is not correct. It is also displayed if the configured power supplies are sufficient to power the configured DEVICES.

All this is constantly recalculated and displayed.

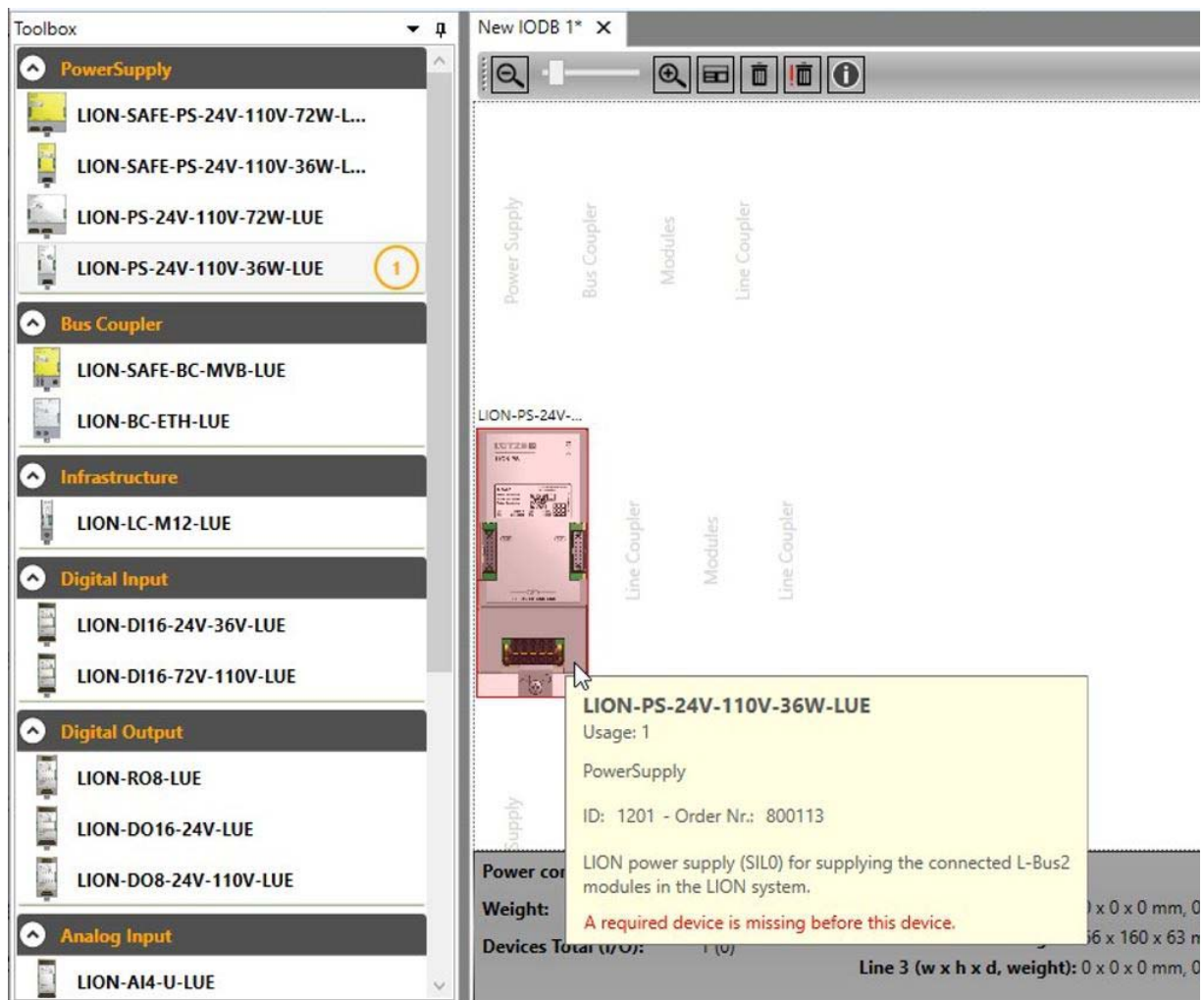
These warnings and their troubleshooting are presented below.

## 1. Display of incorrectly placed modules

If the placing of a module is not possible, or a module is missing, this is indicated with red areas above the modules. Such a configuration is not valid.

In this example the module is in the wrong line. **The first line must not be empty.**

**Troubleshooting:** The configuration always starts at the top of the first line and then continues from left to right without gaps. If a line is longer than 2 m, a new line must be started.



## NOTICE

Refer to the tooltips to get additional information about a detected configuration error. These are displayed as red text.



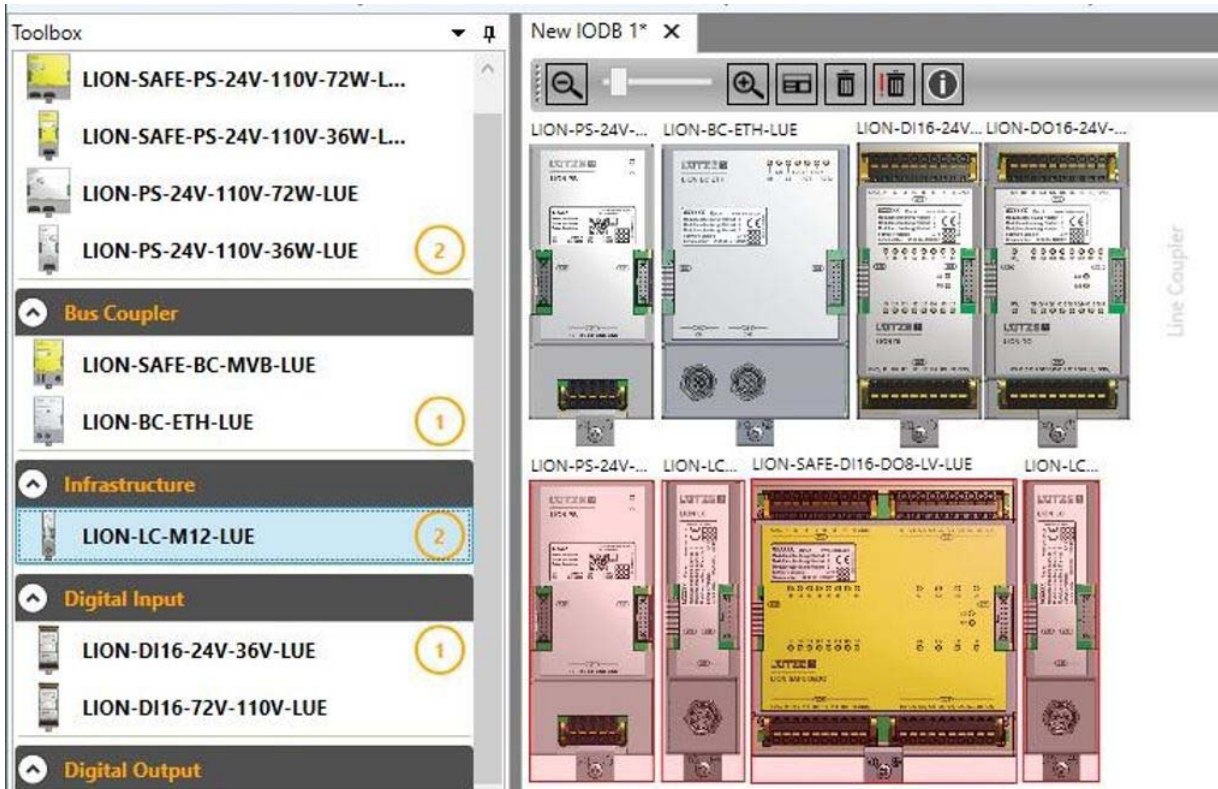


**NOTICE**

**If you release the mouse button after placing and the module is not displayed, either one of the rules was not observed or the marking was not hit exactly.** The module must then be placed again.

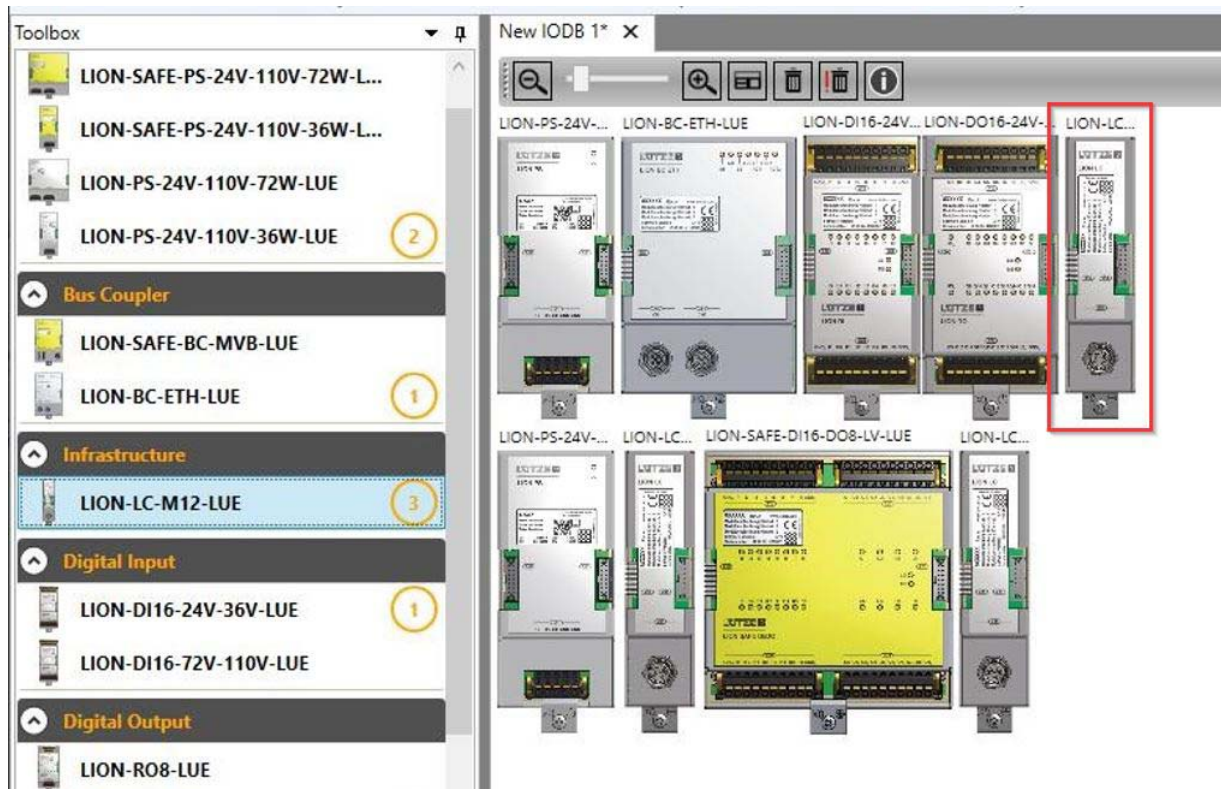
## 2. Display of incorrect configurations

If the sequence is invalid, all affected modules are highlighted with red areas. In the example below the **LION Line Coupler** at the end of the first line is missing.



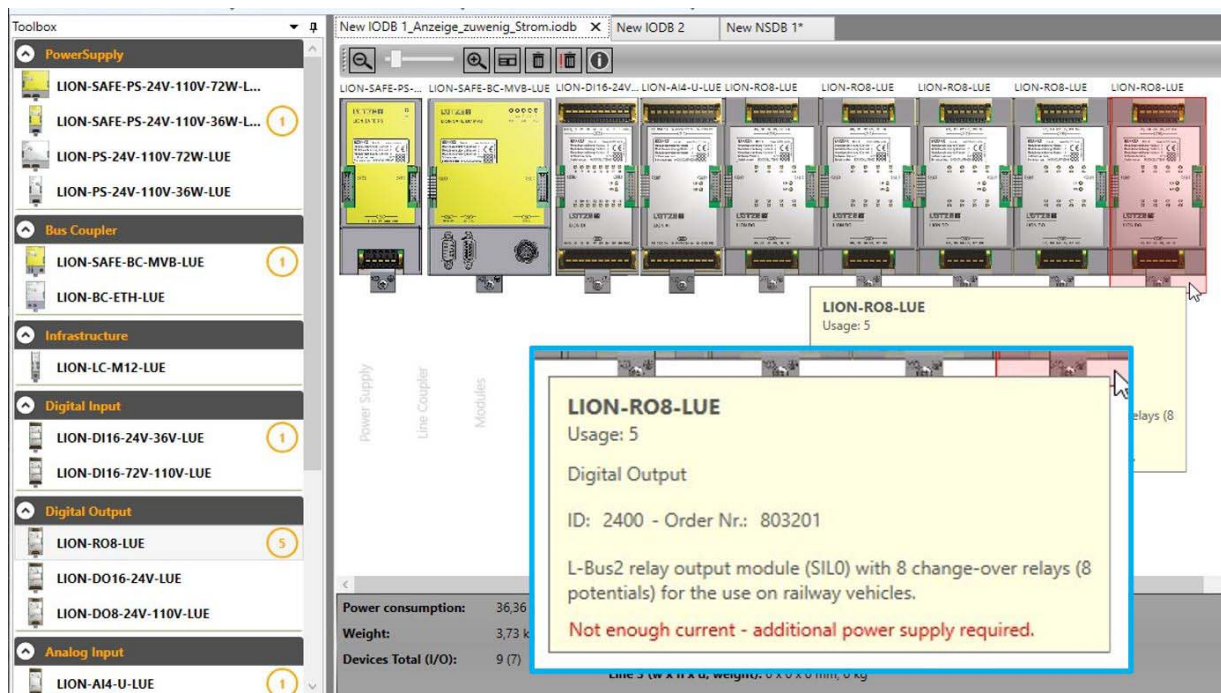
This causes all following modules to be displayed in red, because an important module of the chain is missing.

**Troubleshooting:** To fix the error a **LION Line Coupler** must be added at the end of the first line.



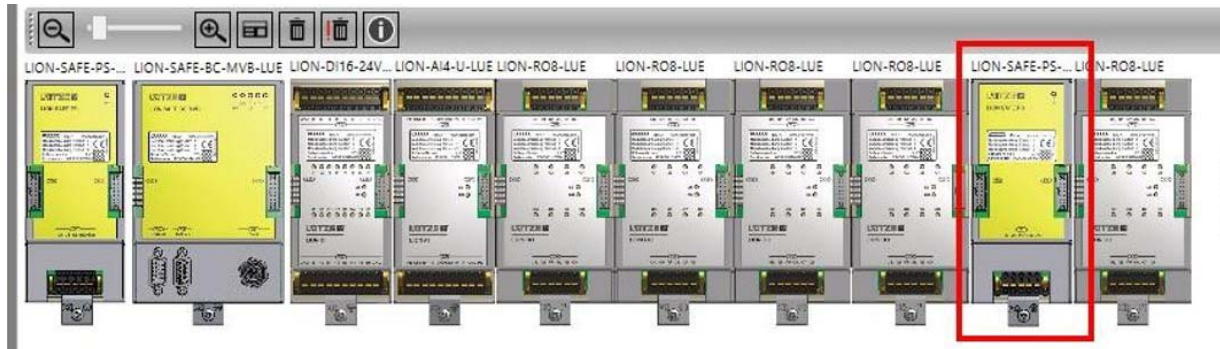
### 3. Display of insufficient current

The LCF calculates if the power consumption of the configured modules exceeds the capabilities of the configured power supplies. A red area appears above the modules and the tooltip says, "Not enough current - additional power supply required".





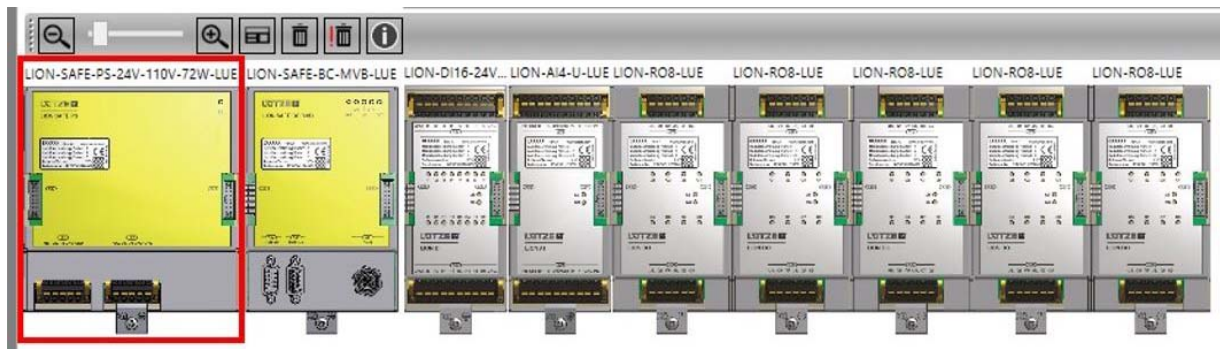
**Troubleshooting 1:** Insert an additional power supply before the first displayed module.



It is not necessary to place the additional power supply directly in front of the module shown in the picture above.

The power supply can be moved further to the left if it can supply all DEVICES on the right.

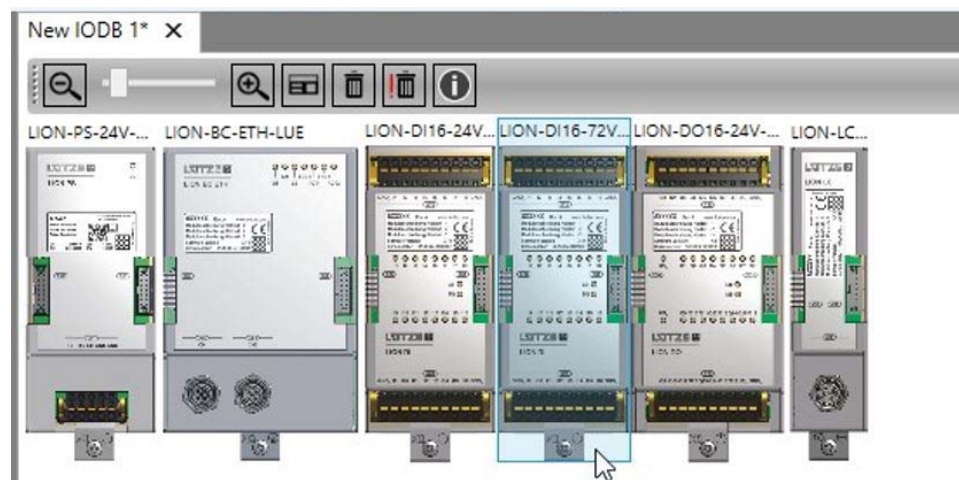
**Troubleshooting 2:** Insert a stronger power supply in the first place of the line.



## 8.1.6

### Delete modules

1. Click on the module you want to delete in the right IODB window.



A light blue area appears above the module.

2. Now the marked module can be deleted either with the **"Del"** key on the keyboard.

or:

with the (left) **trash can button**:



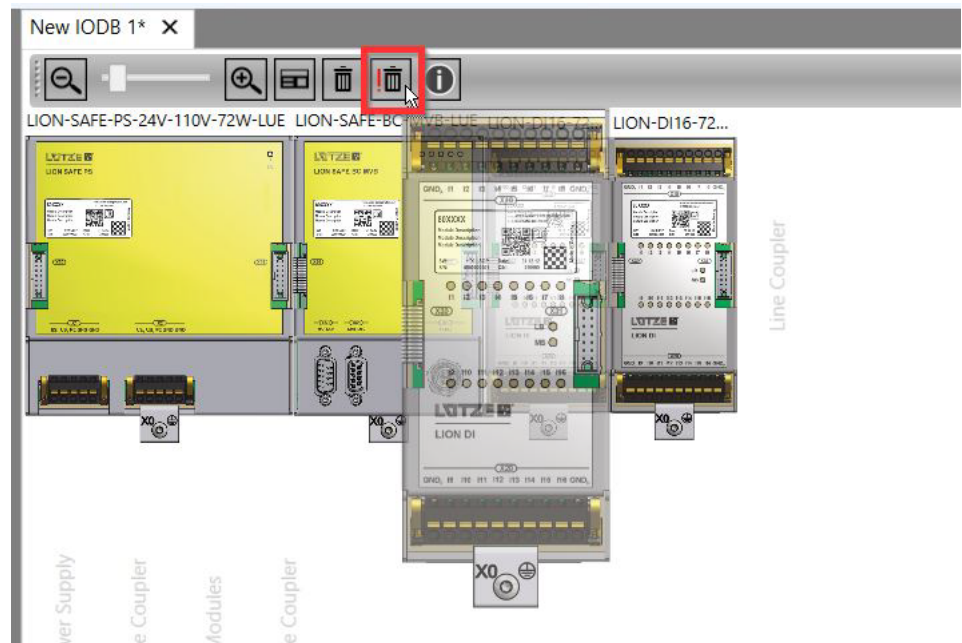
#### Alternative solutions:

3. Another possibility is to simply drag the module to be deleted onto another module (or grey words e.g., from other lines). But it must not be of the same type, otherwise the module will only change its location.

4. You can also **delete all modules at once** by pressing the **right trash can button**:



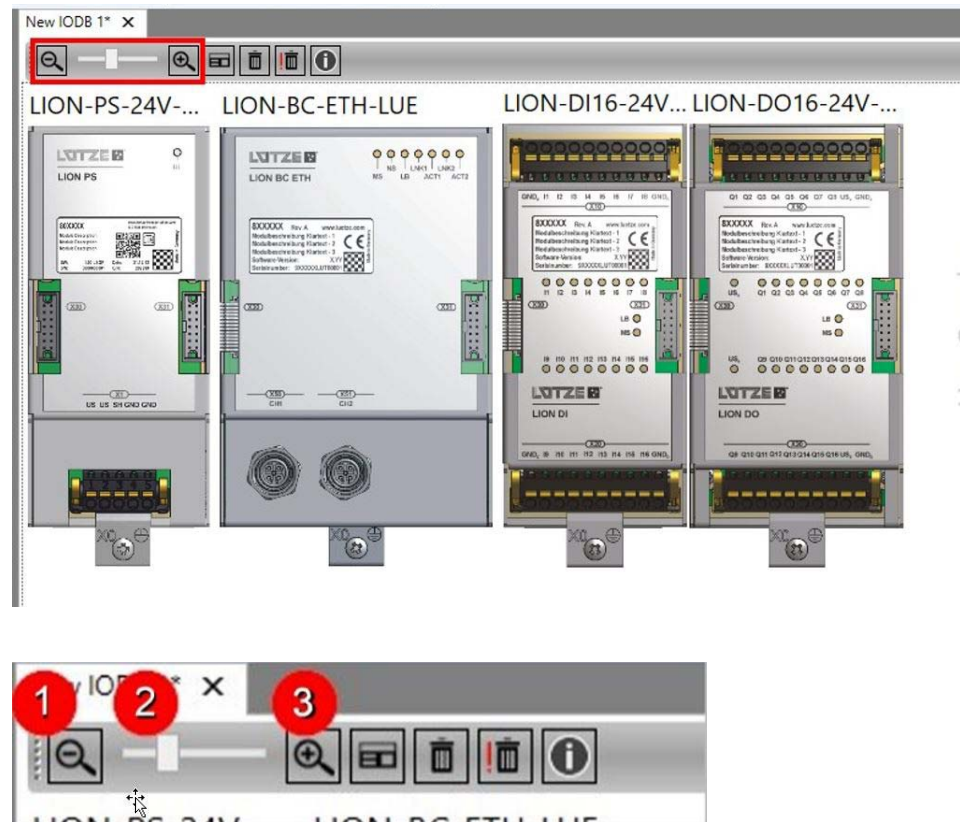
**A special hint:** If you drag a single module onto the **right trash can button**, it will be also deleted. (This do not work on the **left trash can button**!)



## 8.1.7

## Zoom in/out of the display size

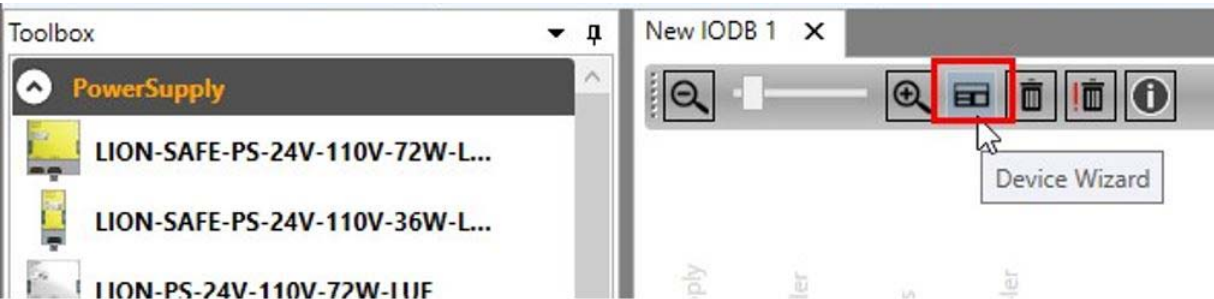
At the top of the IODB window is a toolbar, where you can set the zoom level of your configuration.



1. With the **zoom out button (1)** you can reduce the zoom level step by step.
2. The **zoom slider (2)** allows you to increase or decrease the zoom level continuously.
3. With the **zoom in button (3)** you can enlarge the zoom level step by step.
4. Use the **control key + mouse wheel** to increase or decrease the zoom level.

### 8.1.8 Device Wizard

The **Device Wizard** supports you in selecting the suitable modules. You specify the desired properties, such as the number of digital outputs or inputs and voltage ranges, and the **Device Wizard** automatically selects the required modules and the desired number.

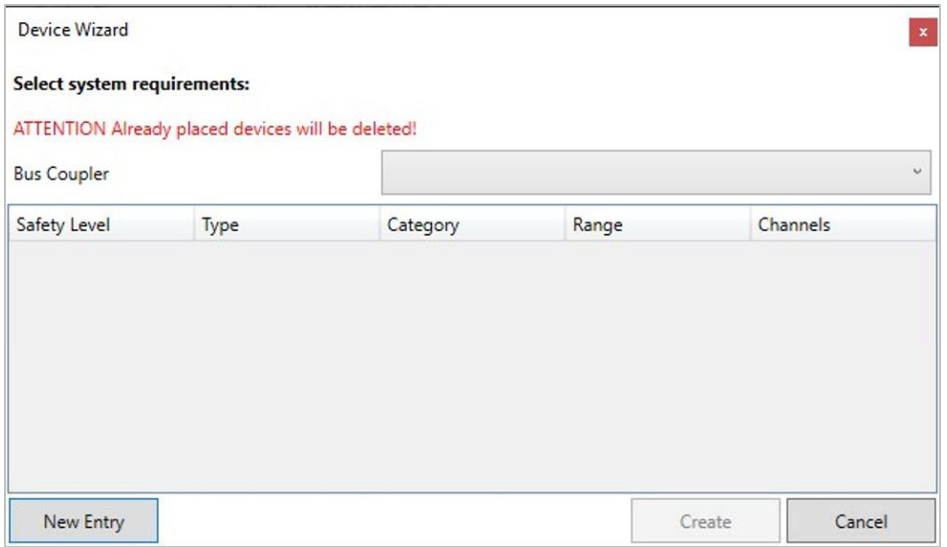


Click on the **Device Wizard button**.

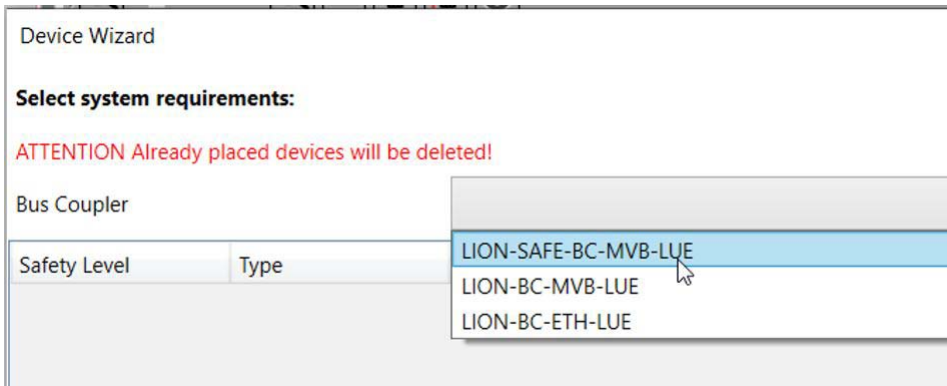
**NOTICE**

Already placed devices will be deleted!

The following window appears:



1. First select a **HEAD** from the drop-down list.





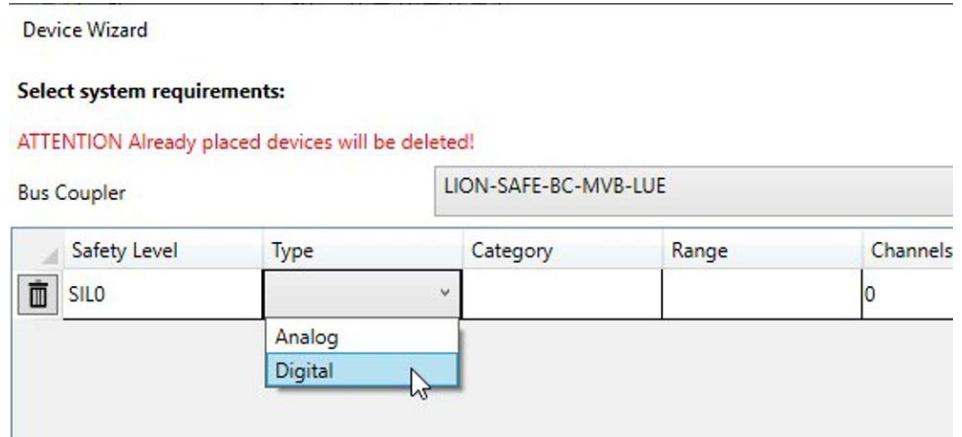
**NOTICE**

The chosen HEAD (e.g., bus coupler) defines the fieldbus used by the LION I/O station.

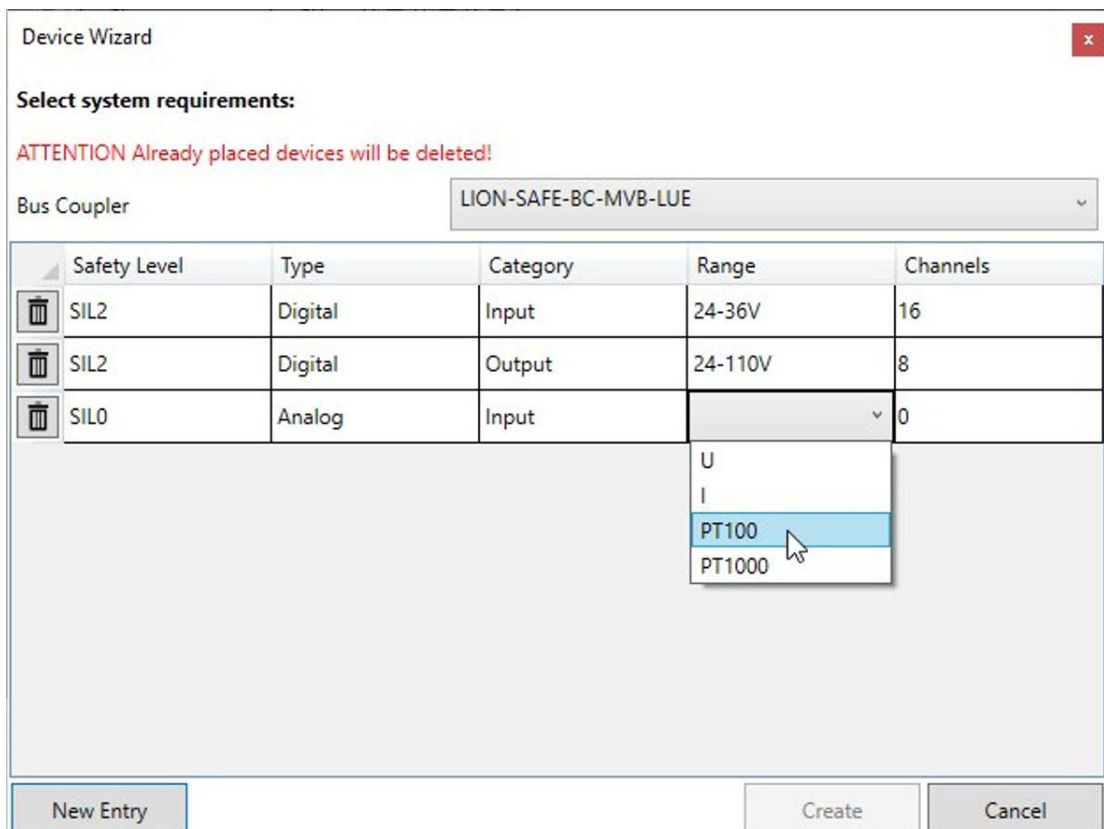


Click **New Entry** to define attributes for the first required I/O type.

2. The attributes can be chosen from drop down lists.



3. Repeat this sequence for each I/O type required.



4. The **Device Wizard** will create a LION I/O station with all required components to provide the configured I/O types in the requested number.  
This includes power supplies, the **HEAD**, all **DEVICES** as well as line couplers.
5. Click **Create**.

Device Wizard

Select system requirements:

ATTENTION Already placed devices will be deleted!

Bus Coupler: LION-SAFE-BC-MVB-LUE

	Safety Level	Type	Category	Range	Channels
	SIL2	Digital	Input	24-36V	16
	SIL2	Digital	Output	24-110V	8
	SIL0	Analog	Input	PT100	2
	SIL0	Digital	Output	Relay	2

New Entry Create Cancel

6. The **Device Wizard** will create a LION I/O station with all necessary **DEVICES**:

Toolbox

- PowerSupply**
  - LION-SAFE-PS-24V-110V-72W-L...
  - LION-SAFE-PS-24V-110V-36W-L... 1
  - LION-PS-24V-110V-72W-LUE
  - LION-PS-24V-110V-36W-LUE
- Bus Coupler**
  - LION-SAFE-BC-MVB-LUE 1
  - LION-BC-MVB-LUE
  - LION-BC-ETH-LUE
- Infrastructure**
  - LION-LC-M12-LUE
- Digital Input**
  - LION-DI16-24V-36V-LUE
  - LION-DI16-72V-110V-LUE
  - LION-SAFE-DI16-LV-LUE
  - LION-SAFE-DI16-HV-LUE
- Digital Output**
  - LION-RO8-LUE 1
  - LION-DO16-24V-LUE

New IOB 1\* X

Power consumption: 14,64 W      Line properties:

Weight: 2,24 kg      Line 1 (w x h x d, weight): 448 x 160 x 63 mm, 2,24 kg

Devices Total (I/O): 5 (3)      Line 2 (w x h x d, weight): 0 x 0 x 0 mm, 0 kg

Line 3 (w x h x d, weight): 0 x 0 x 0 mm, 0 kg



7. Click **File/Save (Ctrl+S)** to store the configuration.



The generated LION I/O station can be edited the same way as a manually created one. It is possible to rearrange the modules as well as adding or removing modules.

**Toolbox**

- Digital Input**
  - LION-DI16-24V-36V-LUE
  - LION-DI16-72V-110V-LUE
- Digital Output**
  - LION-RO8-LUE
  - LION-DO16-24V-LUE
  - LION-DO8-24V-110V-LUE
- Analog Input**
  - LION-AI4-U-LUE
  - LION-AI4-I-LUE
  - LION-AI4-PT100-LUE
  - LION-AI4-PT1000-LUE
- Analog Output**
  - LION-AO4-U-LUE
  - LION-AO4-I-LUE
- Digital Input/Output**
  - LION-SAFE-DI16-DO8-LV-LUE
  - LION-SAFE-DI16-DO8-HV-LUE

**New IO DB 1\* X**

LION-SAFE-PS-... LION-SAFE-BC-MVB-LUE LION-AI4-PT10... LION-SAFE-DI16-DO8-LV-LUE

Power Supply Line Coupler Modules Line Coupler

Power consumption: 8,88 W  
 Weight: 1,79 kg  
 Devices Total (I/O): 4 (2)

**Line properties:**  
 Line 1 (w x h x d, weight): 371 x 160 x 63 mm, 1,79 kg  
 Line 2 (w x h x d, weight): 0 x 0 x 0 mm, 0 kg  
 Line 3 (w x h x d, weight): 0 x 0 x 0 mm, 0 kg

## NOTICE

Rerunning the Device Wizard will overwrite the current LION I/O station and delete all manual changes.

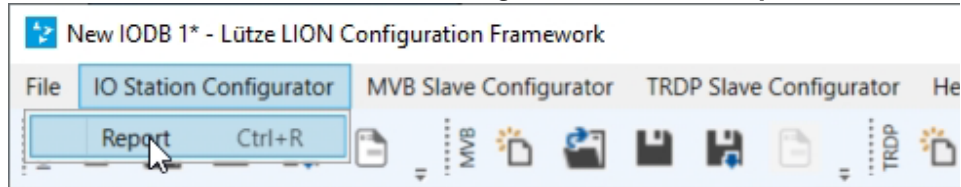
## 8.2 Generating an IODB Report

After the configuration of the I/O station a report can be generated. The report contains all properties and modules which were configured.

### NOTICE

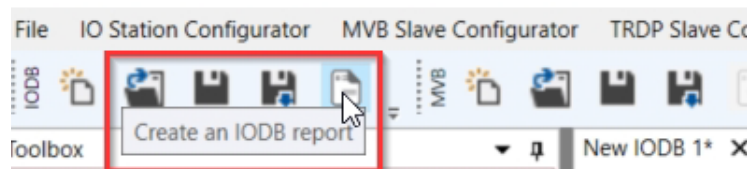
The report can be used as a guideline for mounting and installing the I/O station.

1. In the menu bar click **IO Station Configurator** and select **Report**.

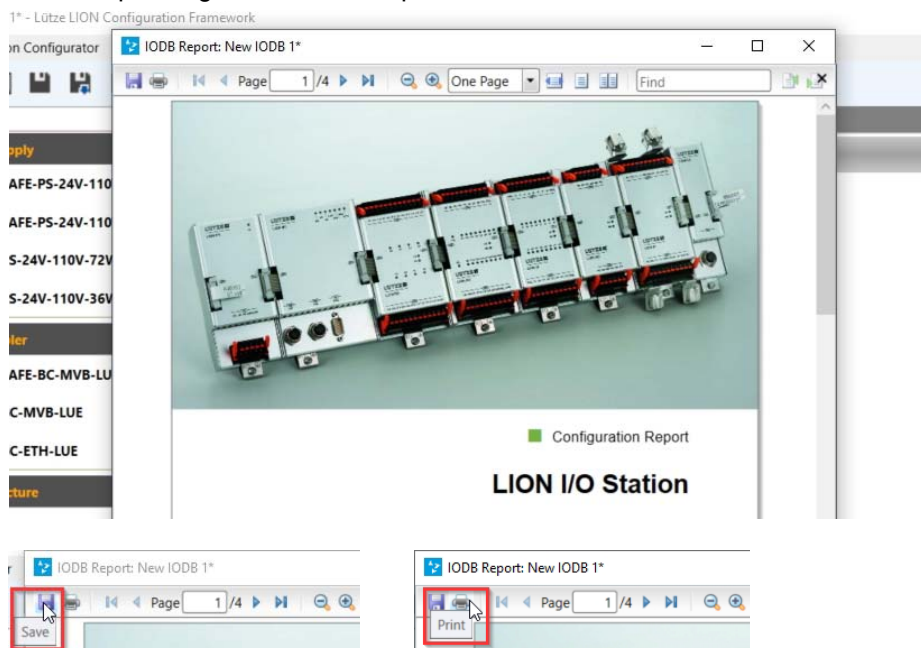


or:

Click on the **report icon** in the toolbar.



2. The report is generated as a \*.pdf file.



### NOTICE

It is possible to save the report or print it.

## 8.3 IODB sample configuration

### NOTICE

If you need the IODB sample configuration as a download, please contact the service of Lütze Transportation GmbH (see also *Maintenance and service* on page 130).

## 9

## MVB Slave Configurator

**NOTICE**

LION MVB bus couplers are available in non-safe and safe variants.  
SDTv2 is only relevant for **SIL>0** and thus for LION SAFE MVB HEADs.



The definition of a HEAD and the DEVICES can be found in the chapter 3 „Terms and abbreviations” on page 12.



The HEAD can be easily identified by its label.

Non-safe modules have a gray label. Safe modules have a yellow label:

1. Non-safe:



2. Safe:

**CAUTION**

The project planner is responsible for the configuration.

Especially for the correct mapping of the process and diagnosis data between HEAD and DEVICES.

1. The MVB bus coupler is the HEAD of the L-Bus<sup>2</sup>. The HEAD sends data to the DEVICES or receives data from the DEVICES.
2. The HEAD communicates with the DEVICES via L-Bus<sup>2</sup>.
3. To enable any data communication, a mapping between the I/O data and the MVB Fieldbus must be created.
4. To do this, the process image of the DEVICES must be mapped to the **PV Names** of the **source ports** or **sink ports** of the HEAD.

**NOTICE**

The mapping and configuration of the individual data must be performed in the LION Configuration Framework.



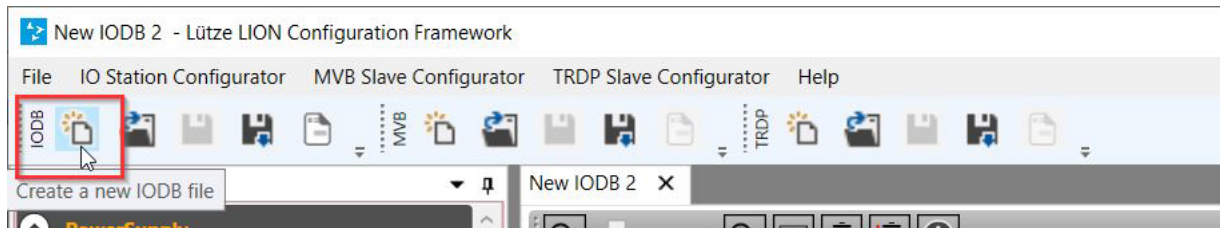
See also in the HEAD manuals, chapter "Configuration" for more information.

## 9.1

## Creating a new NSDB configuration file

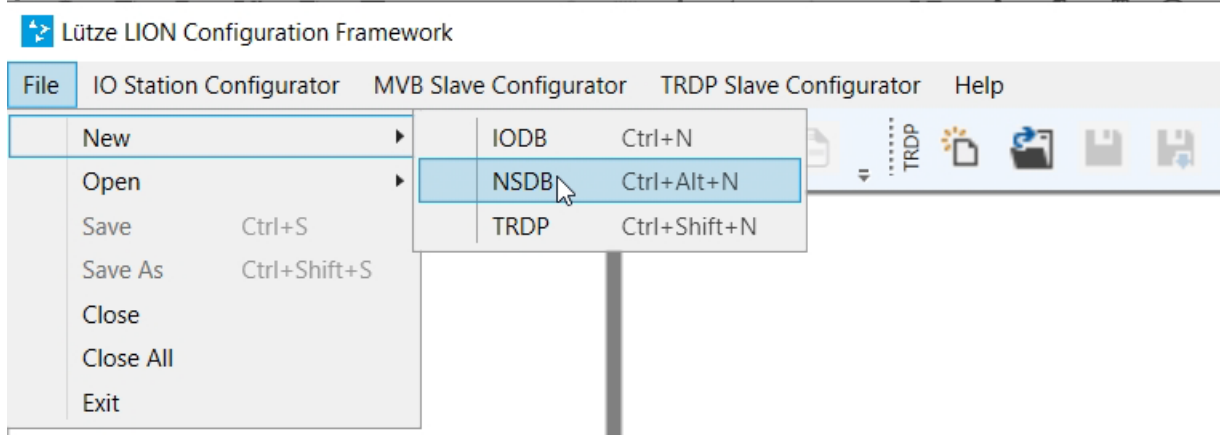


**You need to create an IODB first before creating the configuration file.**  
See also chapter 6.1 „I/O Station Configurator” on page 18.



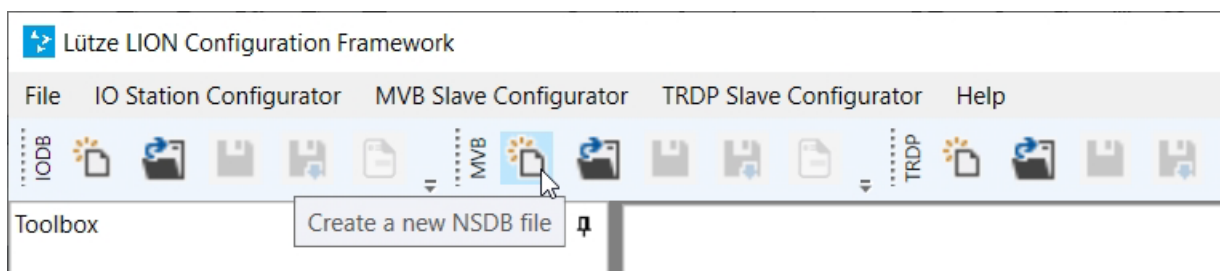
For a new **NSDB configuration file**, proceed as followed:

1. In the menu bar click **File**
2. Select **New**
3. Click **NSDB**



or:

Click on the **new NSDB file - icon** in the toolbar:

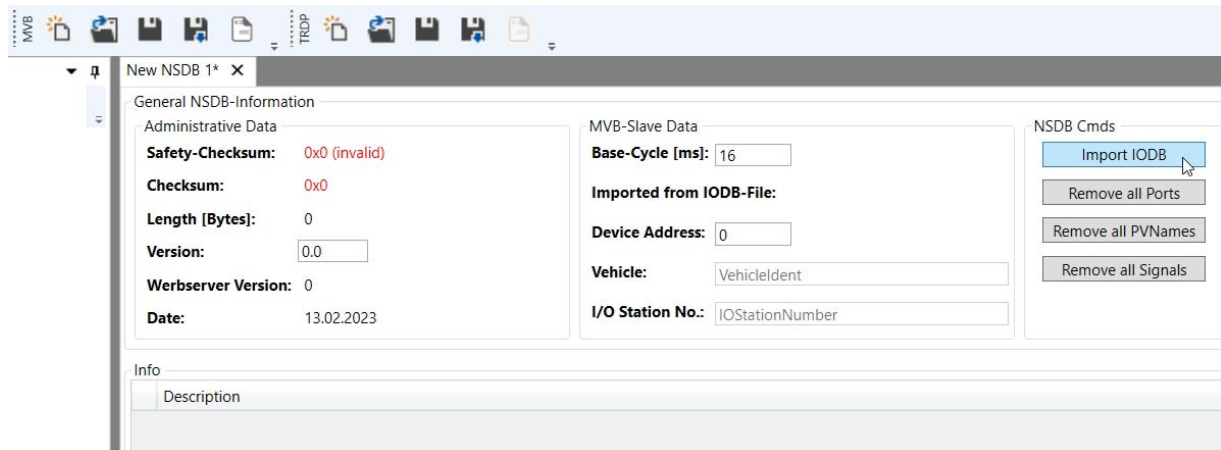


## 9.2

### Import of the IODB

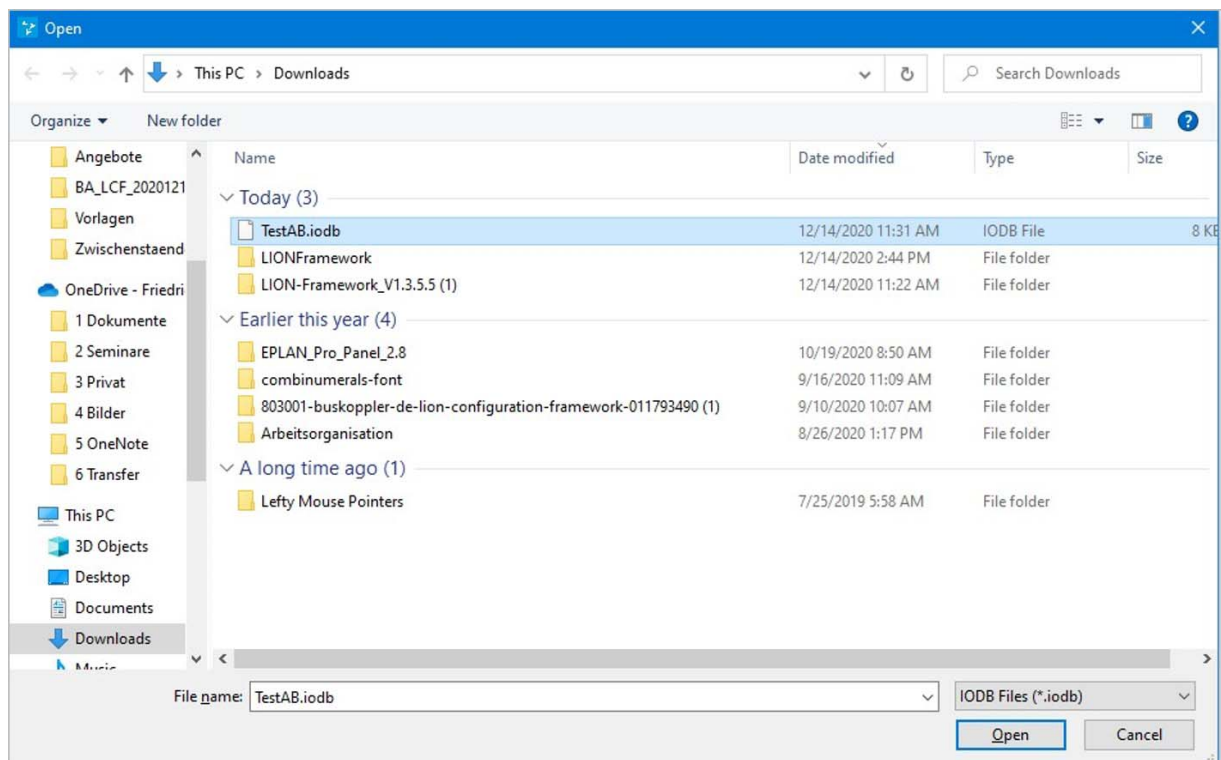
Start the NSDB configuration by importing the previously created IODB configuration file, see chapter 8 „I/O Station Configurator“ on page 25. The LION I/O station containing all modules and their process data structure is imported automatically.

#### 1. Click **Import IODB**



#### 2. Select the IODB file you would like to import.

#### 3. Click **Open**



#### 4. Several warning windows and notes may appear.



Read them and confirm them with OK or cancel the import with NO if necessary.

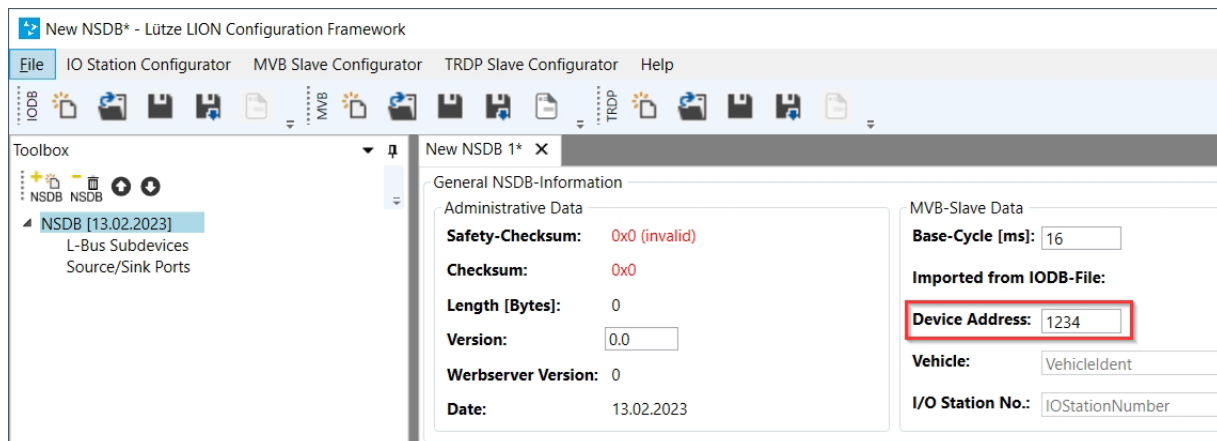
Example:



## NOTICE

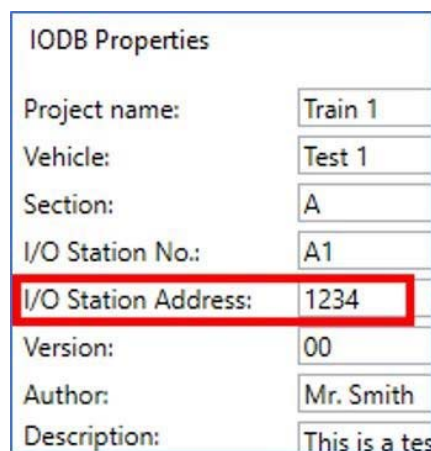
If you need any further assistance, please contact our service.

The following window appears:

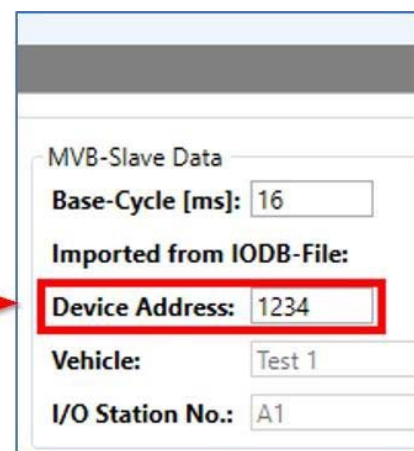


As you can see below the *MVB Device Address* is automatically imported from the *IODB file*.

**Image A**



**Image B**



## NOTICE

The window shown in "Image A" is taken from the entries in *chapter 8.1.2 „I/O Properties”* on page 27.



## 9.3

## How to proceed with an NSDB configuration

After importing the IODB configuration you must follow several configuration steps to setup the fieldbus configuration as well as the data mapping.

Just follow the entries in the toolbox from top to bottom. A configured NSDB file and a report can be created after all steps have been performed.

Afterwards a safe NSDB report can be created.

## 9.3.1

## Create additional NSDB sections



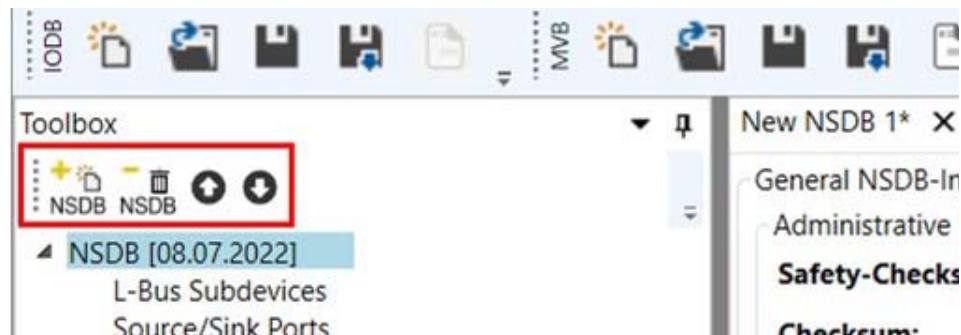
The MVB Slave Configurator can create **Sum NSDB files** which contain multiple configurations in one file.

## NOTICE

The LION HEAD does only support single NSDB files.

To create more NSDB sections, an additional toolbar is displayed at the top of the toolbox.

Here you can create (**+NSDB**) or delete (**-NSDB**) additional NSDB sections. Use the **up arrow** / **down arrow** to arrange the NSDB sections.

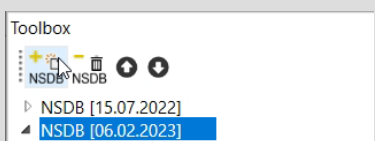


## Description

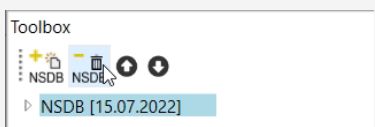
## Example:



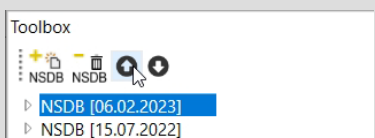
**Click the + NSDB button** to create additional NSDB sections.



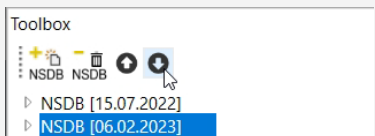
**Click the - NSDB button** to remove the selected NSDB sections.



**Click the up arrow** to move the selected NSDB section up one level.



**Click the down arrow** to move the selected NSDB section down one level.



## 9.3.2

## General NSDB-Information

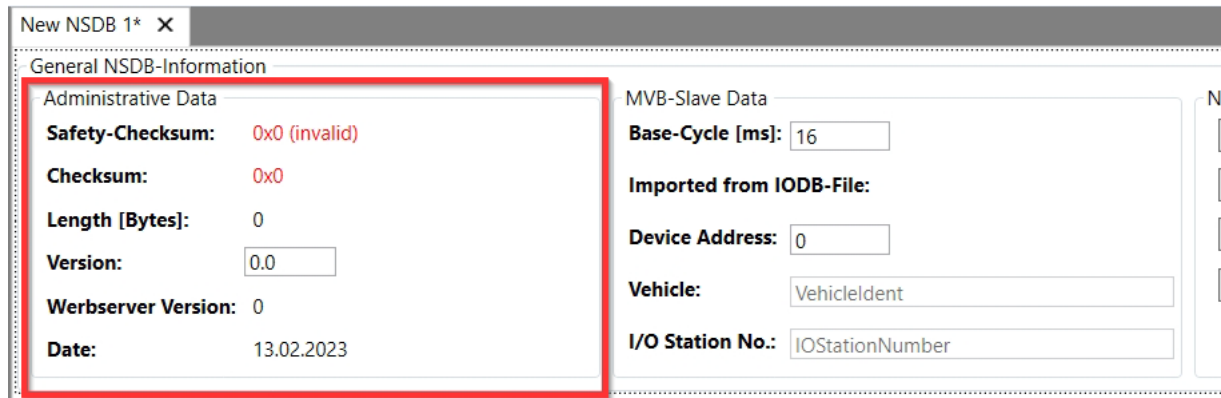
The imported data will appear under **General NSDB-Information**. A part of the data is taken from the IODB file.



**Suggestion: You should give sufficient thought to a clear structure and system in advance.** This should be documented in detail and be comprehensible for all project participants.

**A style guide or guideline should be created.**

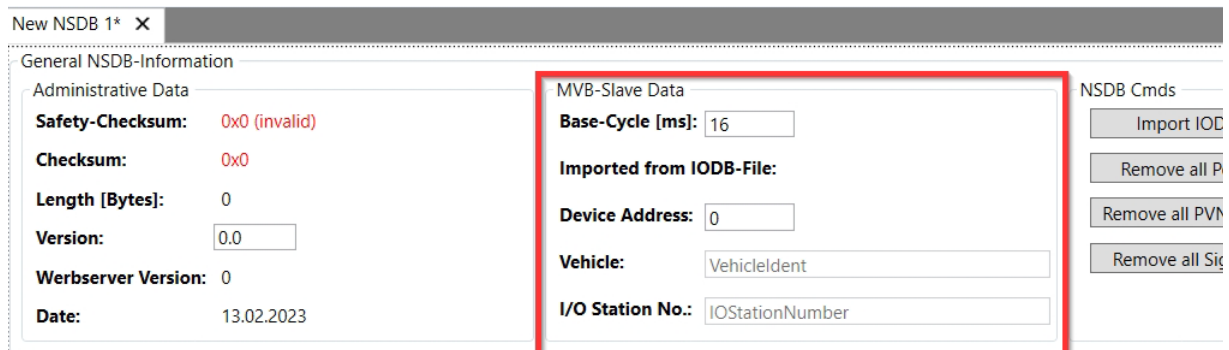
## 1. Administrative Data (on the left)


**Safety-Checksum**

The Safety-Checksum is generated when you create the report and then press save. ***This is the safety process to get a valid NSDB file with the corresponding report.***

<b>Checksum</b>	The checksum is generated when saving.
<b>Length [Bytes]</b>	<b>Length of the NSDB file</b>
<b>Version</b>	Version of the NSDB file/configuration.
<b>Webserver Version</b>	Displays the entered version in the representation of the web server
<b>Date</b>	<b>Creation date</b>

## 2. MVB-Slave Data (on the right)


**Base-Cycle [ms]**

Base Cycle of the MVB communication.  
**16ms - 65535ms.** Must be a multiple of 16.  
 The actual MVB time is set by the MVB master. This time is used for the calculation of the STS timeout.

<b>Imported from IODB-File:</b>	
<b>Device Address</b>	MVB Device Address
<b>Vehicle</b>	The name of the vehicle can be entered in the IODB configuration file. <b><i>NOTE: Can only be edited there.</i></b>
<b>I/O Station No.</b>	The number for each I/O system can be entered in the IODB configuration file. <b><i>NOTE: Can only be edited there.</i></b>

### 2.1 Remarks on the Safety-Checksum

- The **Safety-Checksum** is relevant for the application engineer (the developer of the train control system) to identify the NSDB used in a LION I/O station.
- The **Safety-Checksum** is displayed on the one hand in the web server. After uploading a NSDB file to a MVB bus coupler the displayed Safety-Checksum must match the Safety-Checksum in the report.
- The **Safety-Checksum** is transmitted via the fieldbus (diagnostic port) and can be checked by the train control system to check if the connected LION I/O station uses the expected NSDB configuration. If the value of the Safety-Checksum differs from the expected value, the station is incorrectly configured.

### 2.2 Remarks on the Checksum

#### NOTICE

The checksum is generated as soon as the NSDB file is saved.

- In contrast to the Safety-Checksum the Checksum is used for additional monitoring for file corruption.

## 9.3.3

L-Bus<sup>2</sup> Subdevices

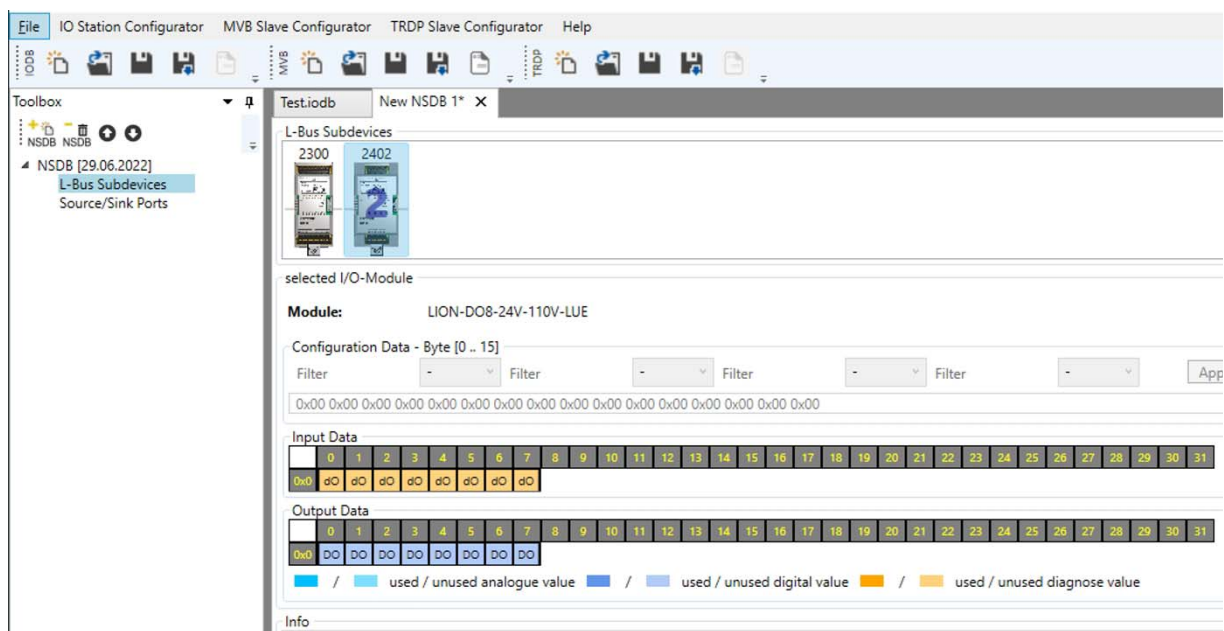
The L-Bus<sup>2</sup> Subdevices section shows all DEVICES imported from the IODB file. This section can be used to display the process data structure of each DEVICE as well as setup custom configuration data for each DEVICE.

The configuration data is used by some DEVICES to configure their behavior (e.g., configure filter parameters on safe input modules).



**For further information also see the operating instructions of the respective DEVICE.**

The displayed process data structure consists of input, output, and diagnostic data. There are modules that provide input data only, modules that provide output data only, and modules that have both. Module 2402 (*part no. 803203*) provides both, which is shown below.



## 1. Explanation of the markings

1.1 The colors represent whether a data field is already **used in a port**. E.g.:

Blue / Light Blue used / unused    Orange / Light Orange used / unused    Yellow / Light Yellow used / unused

1.2 **Output data** can be analog or digital values (depending on the device type).

These can be **mapped to sink ports**. E.g.:

Yellow / Light Yellow used / unused analogue value

Blue / Light Blue used / unused digital value

1.3 **Input data** can be digital, analog or diagnostic data.

These can be **mapped to source ports**. E.g.:

Orange / Light Orange used / unused diagnose value

## 2. Process data structure

In this program window, the representation of the **process data structure** is rather an additional aspect.

### NOTICE

See also **chapter 12.1 „Modules in sorted overviews” on page 107**, there you will find the module ID and the assignments to the respective part numbers.

E.g., module 2402 (part no. 803203) is a digital output module with 8 outputs. The outputs can be controlled via the 8 output bits (blue). In addition, the module returns one bit of diagnostic information (orange) for each output.

**Input Data**  
Input data will be transferred from the I/O module to the PLC.

Input Data	
Processdata, per channel	–
Diagnosis data, per channel	Error message[1 Bit per channel]
Total	1 Byte

**Diagnosis Data per channel – Error**

Channel Status	Binary Value
Error (Short circuit, overload or overtemperature)	1
No Error	0

**Datastructure**

Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
Error	Error	Error	Error	Error	Error	Error	Error
Channel 8	Channel 7	Channel 6	Channel 5	Channel 4	Channel 3	Channel 2	Channel 1

Fig. 53: Diagnosis Data Structure – Input Data DO 8

Bit	Channel	Content
0	1	0 or 1
1	2	0 or 1
2	3	0 or 1
3	4	0 or 1
4	5	0 or 1
5	6	0 or 1
6	7	0 or 1
7	8	0 or 1

(Image similar)



L-Bus Subdevices

2300 2402

selected I/O-Module

Module: LION-DO8-24V-110V

Configuration Data - Byte [0 .. 15]

Filter - Filter

0x00 0x00 0x00 0x00 0x00 0x00 0x00 0x00

**Input Data**

0	1	2	3	4	5	6	7	8
0x0	dO	dO	dO	dO	dO	dO	dO	dO

**Output Data**

0	1	2	3	4	5	6	7	8
0x0	DO	DO	DO	DO	DO	DO	DO	DO

used / unused analogue va

**Output Data**  
Output data will be transferred from the PLC to the module.

Output Data	
Processdata per channel	Port status [1 Bit per channel]
Diagnosis data	–
Total	1 Byte

**Port Status**

Channel Status	Binary Value
activated	1
deactivated	0

**Datastructure**

Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
Channel 8	Channel 7	Channel 6	Channel 5	Channel 4	Channel 3	Channel 2	Channel 1

Fig. 54: Process Data Structure – Output Data DO8

Bit	Channel	Content
0	1	0 or 1
1	2	0 or 1
2	3	0 or 1
3	4	0 or 1
4	5	0 or 1
5	6	0 or 1
6	7	0 or 1
7	8	0 or 1

(Image similar)



L-Bus Subdevices

2300 2402

selected I/O-Module

Module: LION-DO8-24V-110V

Configuration Data - Byte [0 .. 15]

Filter - Filter

0x00 0x00 0x00 0x00 0x00 0x00 0x00 0x00

**Input Data**

0	1	2	3	4	5	6	7	8
0x0	dO	dO	dO	dO	dO	dO	dO	dO

**Output Data**

0	1	2	3	4	5	6	7	8
0x0	DO	DO	DO	DO	DO	DO	DO	DO

used / unused analogue va

### NOTICE

The information about the data of the individual modules can be found in the respective documentation of the modules.



## 9.3.4

## Configuration data and filter settings

**NOTICE**

The actual purpose of this program window is the setting of the configuration data. The configuration data influences the behavior of the LION module depending on the module type.

Currently these are mainly filter settings to influence the noise resistance of inputs. This is described in the documentation of the respective DEVICES.

**NOTICE**

These configurations are described in the corresponding operating instructions (e.g., setting the input filters for analog and digital modules).

With the configuration data, you can set module-specific properties when starting up the EA station according to the requirements of the application.

In this way, an adaptation to the environment can be made with identical modules, depending on the application.

**1. Example with filter modules**

Some modules offer the possibility to set a filter for the inputs. This filter setting is adjusted under **L-Bus<sup>2</sup>-Subdevices**. For this the respective module must be selected and the filter can then be adjusted via **Configuration data**.

**NOTICE**

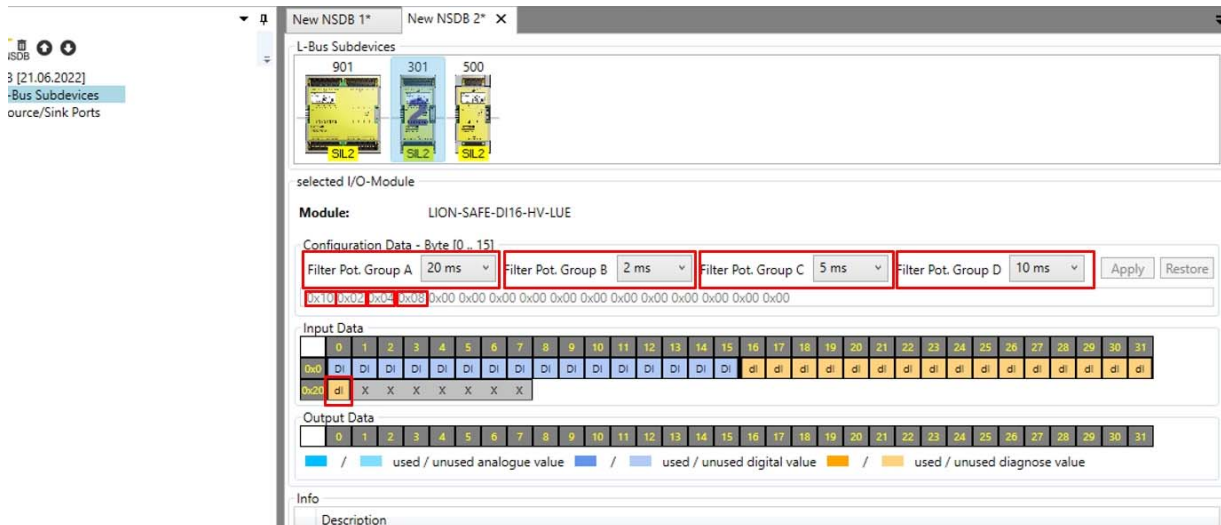
Which modules offer a filter configuration can be found in the table in chapter 9.11 „Overview of the modules and port characteristics“ on page 96.

The modules that offer this are listed there in the Config data column.

The modules, which have such a filter setting, return depending on the module one or more config bits in the input data, which indicates whether the filter setting is correct.

At the module in the following example **803104** (ID 301, Type LION-SAFE-DI16-HV-LUE) it is the 33. bit of the input data.

## Data structure

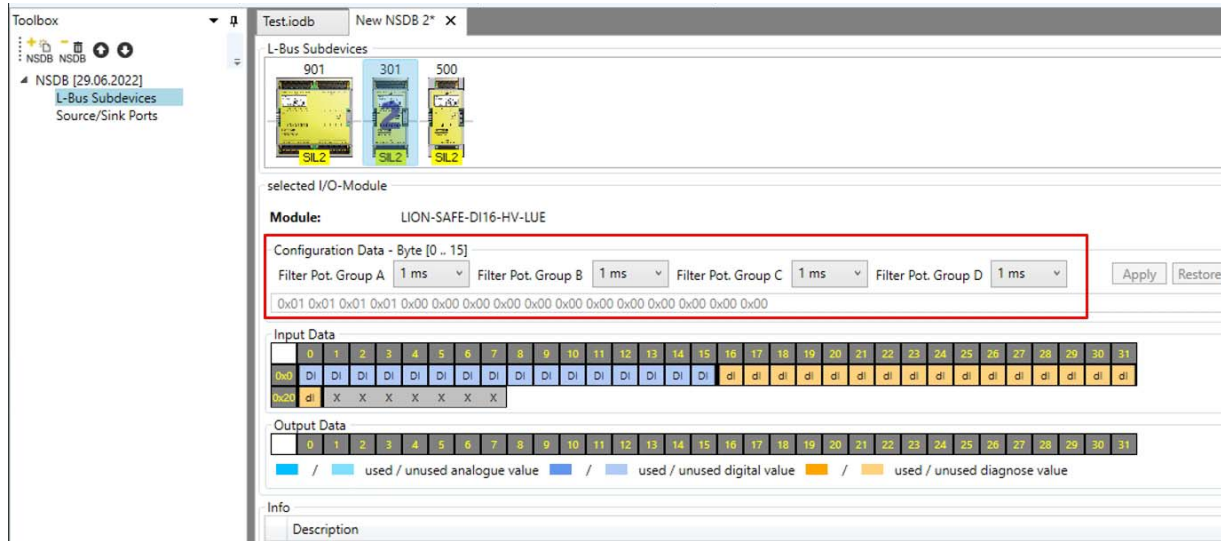


In the upper figure, all four potential groups were configured with different values.

To configure a module, the respective module must be selected in the chain. Then either each input or per potential group the filter value can be set. Whether it is individual inputs or potential groups depends on the module type.

## NOTICE

**If no filter value is set, the default value is used, and this corresponds to 1ms or "No filter". This is displayed as an error in the configuration bit.**



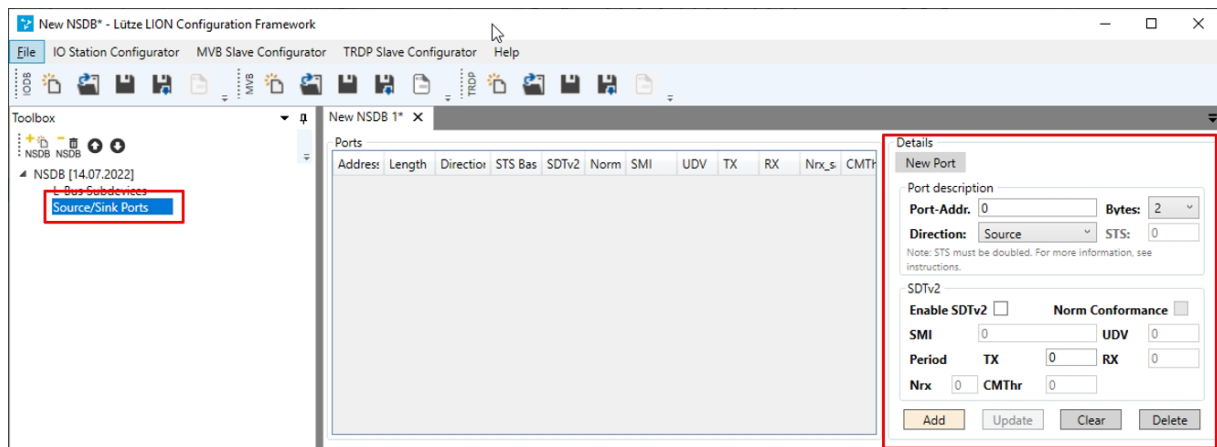
With the drop-down menus it is possible to define the filter settings for each input or per potential group.

This is only valid for SIL2 modules with config options:

- The unit of measurement for this SIL2 modules are [ms]:  
ID 300 (803103) / ID 301 (803104) / ID 900 (803501) / ID 901 (803502)
- The unit of measurement for this SIL2 module is [Hz]:  
ID 500 (803305)

## 9.4 General port configuration

Under **Source/Sink Ports** corresponding ports can be created and edited.



### 9.4.1 Create new ports

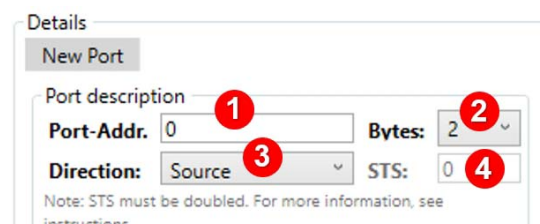
For an MVB configuration we must create appropriate ports. Source ports transmit data from the LION I/O station to the fieldbus, sink port are received by the LION I/O station and can be used to control outputs of DEVICES. Diagnostic data of the HEAD can be mapped into a source port, this is called diagnostic port in the further course. Create your required number of source ports, sink ports and one diagnostic port. On the right side of the input mask, you can enter the port address, port size and port type under **Details**.

This will be shown in the following sections.

### 9.4.2 Port settings

The **Details** section of each port can be used to setup all communication parameters needed for the MVB fieldbus. Each port can be saved with the SDTv2 security protocol.

This is enabled in the lower area of the **Details** section. If SDTv2 is enabled additional parameters are needed to configure the SDTv2 protocol.



- |                       |   |
|-----------------------|---|
| (1) <b>Port-Addr.</b> | Port address according MVB specification.   |
| (2) <b>Bytes</b>      | The size of the port in bytes. The maximum size is 32 bytes.  |
| (3) <b>Direction</b>  | <b>Source</b> port (default) or <b>Sink</b> port  |
| (4) <b>STS</b>        | The sink time supervision is a monitoring mechanism for sink ports. Also see chapter "Sink Time Supervision" in the operating manual LION Bus couplers. |

#### NOTICE

**The STS calculation deviates from the standard.** Within the MVB HEAD, half the STS value is used for calculation  $(STS / 2) * \text{MVB base cycle time}$ .

(5) **Enable SDTv2** Enable if the port receives or transmits data via the Safety Layer SDTv2.

(6) **Norm Conformance** The "Norm Conformance" checkbox switches between the normative and an alternative implementation of the SDTv2 protocol.

(7) **SMI** **1-999 is reserved and should not be used**  
Safety message identifier. Identifies the source of the SDTv2 channel.

(8) **UDV** **Value range: 1 ... 15 (0: invalid)**  
User data version, user defined version of the data structure transmitted over the SDTV2 channel.

(9) **Period TX** Cycle time in [ms] used to generate safe data packets on source ports.  
(On sink ports this value must match the cycle time the port is generated at the source).

(10) **Period RX** **typical:  $0 < \text{Trxperiod} \leq \text{Ttxperiod}$**   
Cycle time in [ms] used to process the safe data from the network.  
This can be higher or lower than the **Period TX** (over sampling / under sampling).

#### NOTICE

The transmitter needs only the transmit cycle time, the receiver needs both cycle times (because both over- and undersampling is possible).

#### NOTICE

It is strongly recommended to configure the cycle times as integer multiples of the internal processing cycle (8ms) of the bus coupler, otherwise they will be rounded down.

(11) **Nrx** **Value range: 1 ... 128 (typical: 3)**  
Number of RX cycles without new data during which the last received data is still considered safe. Trxsafe without having received a valid VDP, the safe state is assumed.

(12) **CMThr** **Value range:  $\geq 10000 / \text{Trxperiod}$  (Trxperiod in unit [ms]), Default: 10000**  
Number of accepted faulty telegrams. Exceeding this number leads to a failsafe.

#### NOTICE

No or faulty data are marked with a red frame. In this case no Safety CRC can be generated.

### 9.4.3 Port sizes

The size of each port can be configured using the dropdown **Bytes**. The available sizes are limited as seen in the following image.

#### 2 Bytes

Port-Area

	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31
0x0	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15																

■ PVName 
 ■ Signal value 
 ■ Check value

#### 4 Bytes

Port-Area

	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31
0x0	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31

■ PVName 
 ■ Signal value 
 ■ Check value

#### 8 Bytes

Port-Area

	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31
0x0	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31
0x20	32	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48	49	50	51	52	53	54	55	56	57	58	59	60	61	62	63

■ PVName 
 ■ Signal value 
 ■ Check value

#### 16 Bytes

Port-Area

	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31
0x0	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31
0x20	32	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48	49	50	51	52	53	54	55	56	57	58	59	60	61	62	63
0x40	64	65	66	67	68	69	70	71	72	73	74	75	76	77	78	79	80	81	82	83	84	85	86	87	88	89	90	91	92	93	94	95
0x60	96	97	98	99	100	101	102	103	104	105	106	107	108	109	110	111	112	113	114	115	116	117	118	119	120	121	122	123	124	125	126	127

■ PVName 
 ■ Signal value 
 ■ Check value

#### 32 Bytes

Port-Area

	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31
0x0	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31
0x20	32	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48	49	50	51	52	53	54	55	56	57	58	59	60	61	62	63
0x40	64	65	66	67	68	69	70	71	72	73	74	75	76	77	78	79	80	81	82	83	84	85	86	87	88	89	90	91	92	93	94	95
0x60	96	97	98	99	100	101	102	103	104	105	106	107	108	109	110	111	112	113	114	115	116	117	118	119	120	121	122	123	124	125	126	127
0x80	128	129	130	131	132	133	134	135	136	137	138	139	140	141	142	143	144	145	146	147	148	149	150	151	152	153	154	155	156	157	158	159
0xa0	160	161	162	163	164	165	166	167	168	169	170	171	172	173	174	175	176	177	178	179	180	181	182	183	184	185	186	187	188	189	190	191
0xc0	192	193	194	195	196	197	198	199	200	201	202	203	204	205	206	207	208	209	210	211	212	213	214	215	216	217	218	219	220	221	222	223
0xe0	224	225	226	227	228	229	230	231	232	233	234	235	236	237	238	239	240	241	242	243	244	245	246	247	248	249	250	251	252	253	254	255

■ PVName 
 ■ Signal value 
 ■ Check value

**NOTICE**

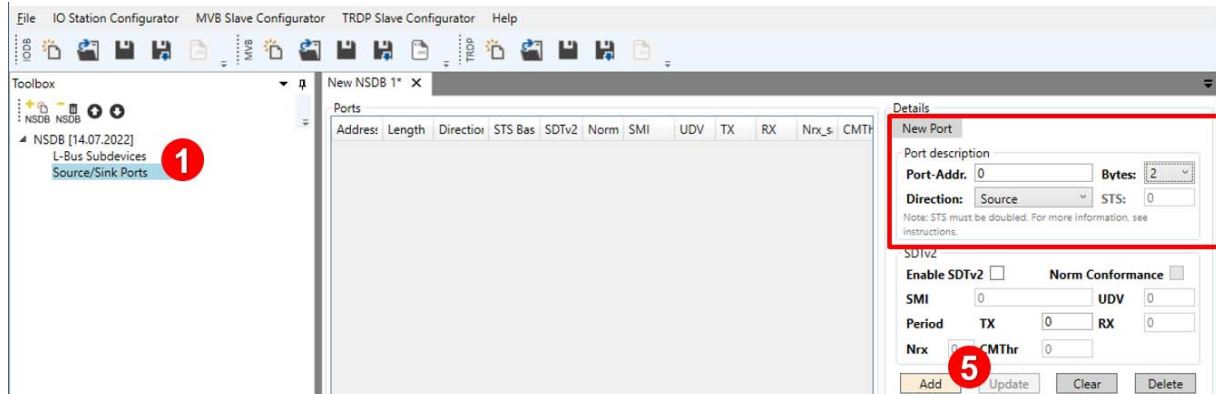
**SDTv2 ports require a minimum size of 8 bytes (due to the overhead of the safety protocol).**



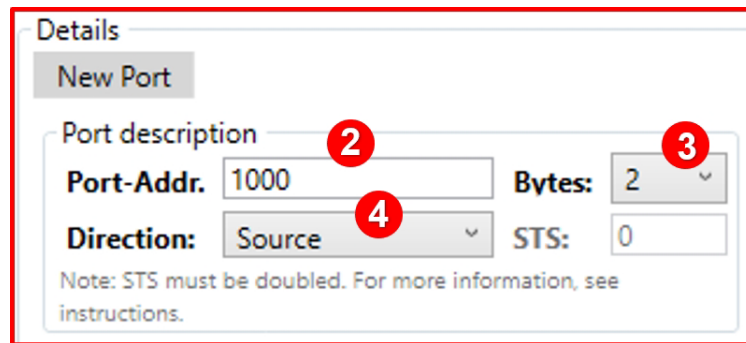
## 9.5 Create a new source port

### NOTICE

The Source ports are sent by the HEAD to transmit data on the MVB, such as digital inputs, diagnostic data etc.).



1. Select **Source/Sink Ports** (1) in the toolbox window.



2. Enter a **Port-Address** (2), e.g. "1000" (This depends on your numbering concept.)

Port-Addr. 1000

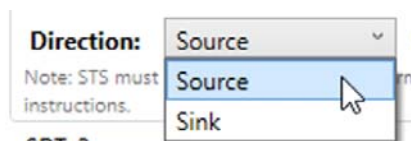
### NOTICE

MVB-port addresses: 0 to 4095

3. Create a **source port** with 2 bytes (3):



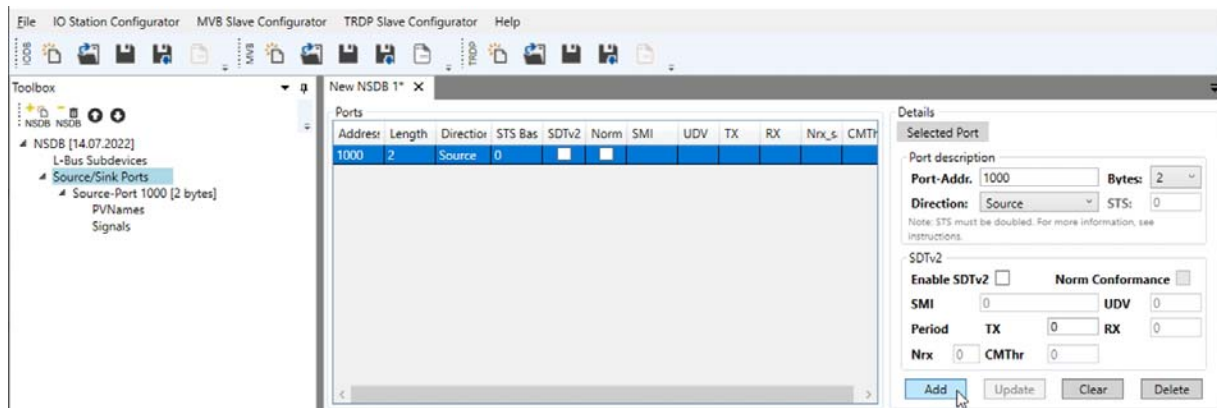
4. Select the direction: **Source** (default) (4):



5. Use **Add** (5) to add the new source port.



6. Now the newly created port is added to the list of ports.



### 9.5.1 Update button functionality

#### NOTICE

You can change the properties at any time and save them with the **Update button**.

Type in any change in a **SELECTED PORT**, this activates the **Update button**: (Its color turns to orange.)



Click the **Update button** to save the changes.



7. Now let's create a *second source port* for this example.  
Simply enter the new port address in the field:

Port-Addr.

#### NOTICE

Since the port-address did not exist yet, the port-address could be also "updated" into another number by mistake. - **Without any warning !**

#### NOTICE

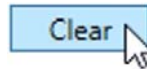
Do not change the **Port-Address** in a **SELECTED PORT**.  
Use the **Clear button** to create a **NEW PORT** !

### 9.5.2 The Clear button functionality

This is where the **Clear button** is located:



The **Clear button** has two functions.

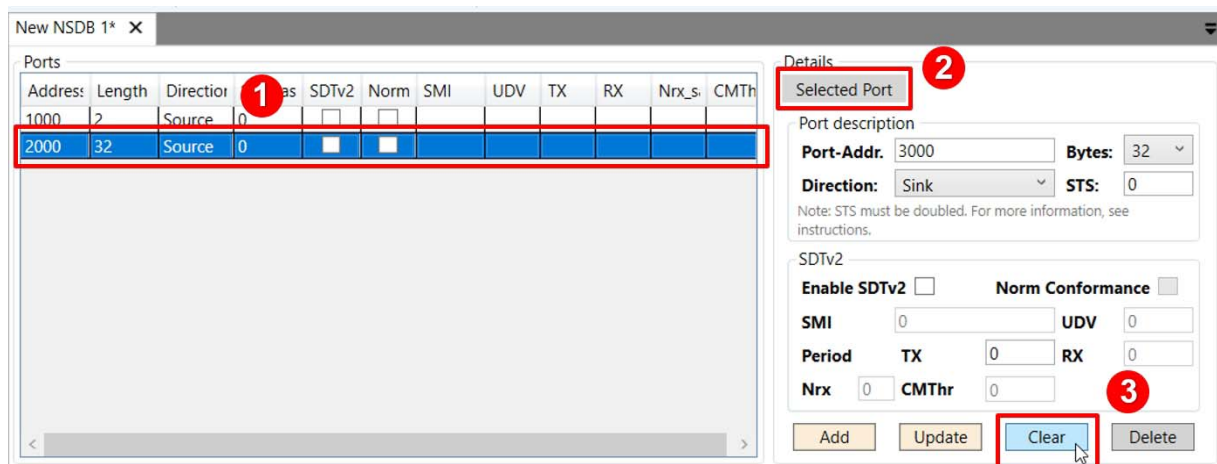


- The first function is to discard the unsaved entries of a **SELECTED PORT (2)**: All ports will be disabled
- The second function is to disable a **selected port (1)** and get a **NEW PORT (4)**. The entered values are reset to the default values. The port address has been set to the value zero.

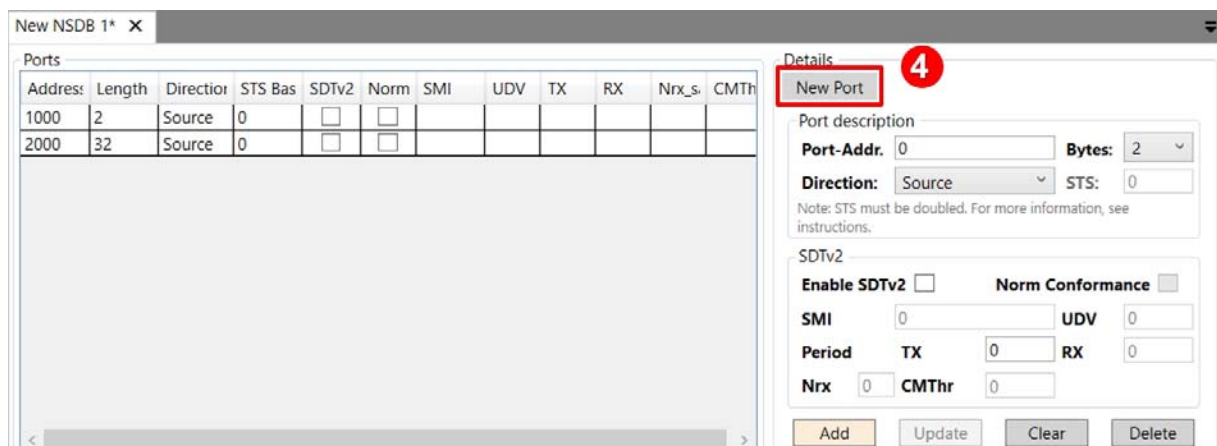
### 9.5.3 Create a NEW PORT using the Clear button

If you want to create new ports, you should proceed as follows.

- If a **port is already selected, e.g., after editing (1)** and you want to create a **NEW PORT (2)**, first **click the Clear button (3)**.



2. In this way you will get a **NEW PORT window (4)** that you can add to the list without overwriting an existing port.

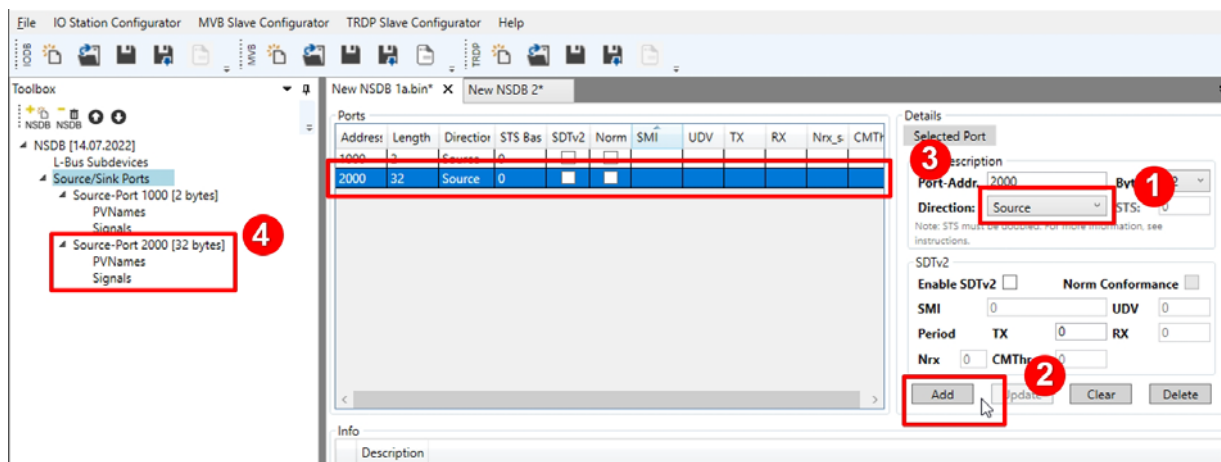


8. We select a new port address.

### NOTICE

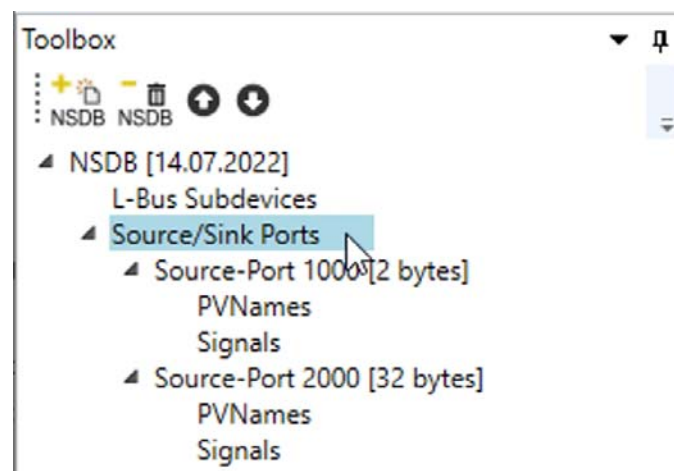
**Enter only integer values here. A red frame automatically marks an invalid input.** This red frame appears in case of missing or incorrect input.

9. Use **Add** to create the new source (or sink) port (1).

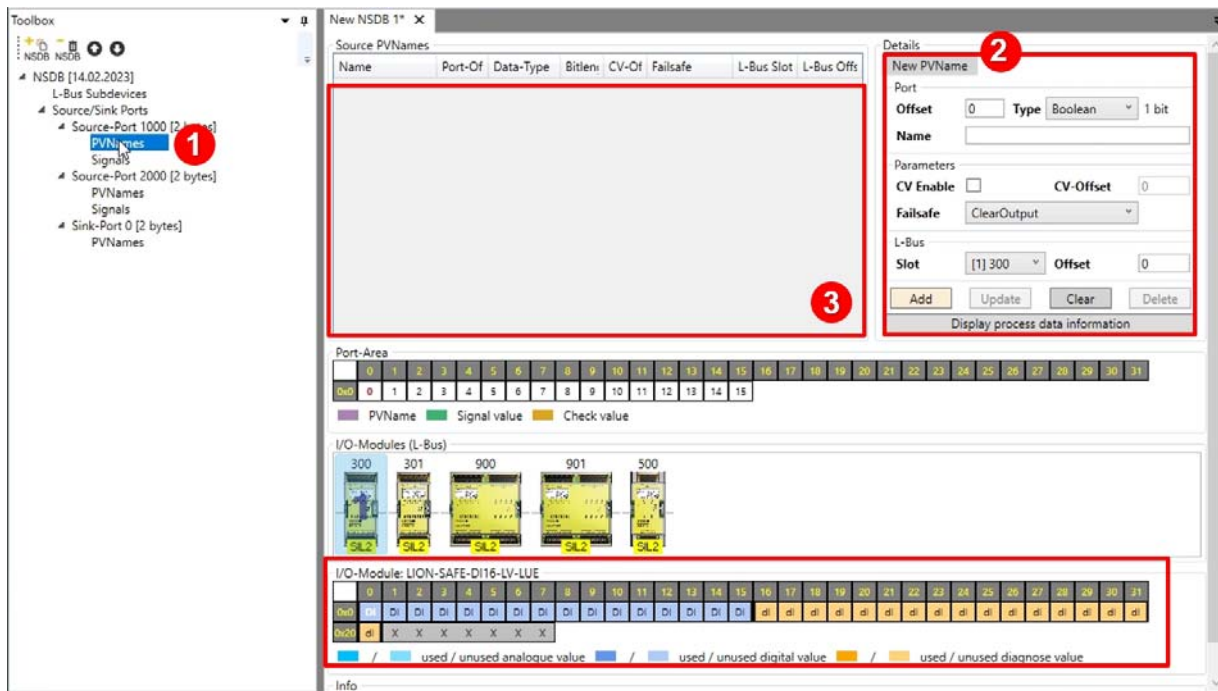


The created ports are also displayed on the left side in the **Toolbox**.

By using the **Toolbox**, you can navigate through all configuration elements.



10. Select the corresponding **source port (1)** in the left toolbox window, then you will get this view on the right side. **New PV-Names (2)** can be created and added here:



The *PV-Names* appear in the **Source PVNames** list (3).

11. Select one of the **DEVICES** you want to configure (In this example it is the module at the 1st position).

### NOTICE

**Make sure that the module has input data.**  
**Source ports can only be mapped to input data of DEVICES.**

When editing a Source Port only input data of the **DEVICES** is displayed.



## Application example

e.g., the module 300 (part no. 803103) digital input module



The module 300 (part no. 803103) is a digital input module which can only process input data.  
Therefore, mappable data is displayed when you select the source port.

The screenshot shows the 'New NSDB 1\*' window with the 'Source PVNames' tab selected. The 'Source-Port 1000 [2 bytes]' is highlighted in the left sidebar. The 'Details' panel on the right shows the configuration for the selected port: Port 1000, Type Boolean, 1 bit, Name, CV Enable, CV-Offset 0, Failsafe ClearOutput, L-Bus Slot [1] 300, Offset 0. The 'Port-Area' table shows the mapping of PVNames to Signal values. The 'I/O-Modules (L-Bus)' section shows the module 300 (part no. 803103) selected. The 'I/O-Module: LION-SAFE-DI16-LV-LUE' table shows the mapping of PVNames to Signal values.

Port	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31
di0	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31
di1	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31

The screenshot shows the 'New NSDB 1\*' window with the 'Sink PVNames' tab selected. The 'Sink-Port 0 [2 bytes]' is highlighted in the left sidebar. The 'Details' panel on the right shows the configuration for the selected port: Port 0, Type Boolean, 1 bit, Name, CV Enable, CV-Offset 0, Failsafe ClearOutput, L-Bus Slot [1] 300, Offset 0. The 'Port-Area' table shows the mapping of PVNames to Signal values. The 'I/O-Modules (L-Bus)' section shows the module 300 (part no. 803103) selected. The 'I/O-Module: LION-SAFE-DI16-LV-LUE' table shows the mapping of PVNames to Signal values.

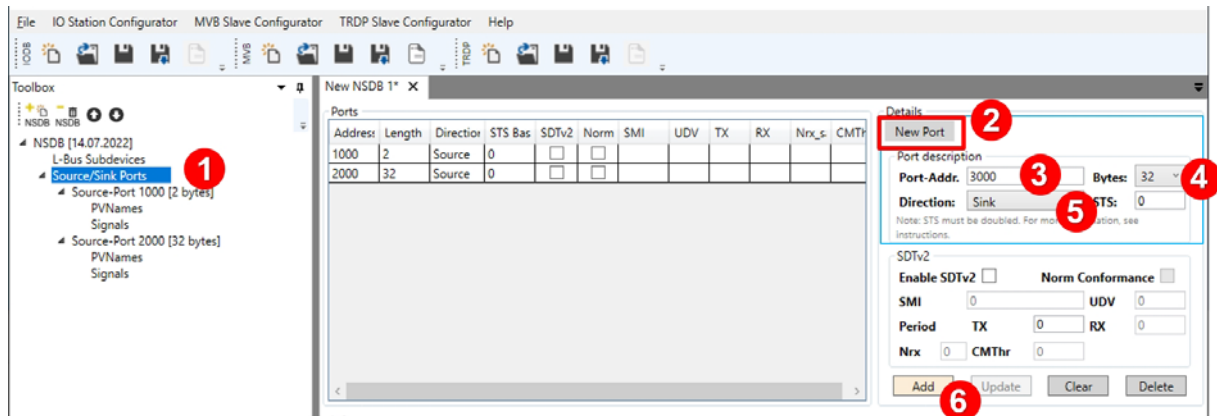
Port	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31
di0	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31
di1	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31

## 9.6 Create a new sink port

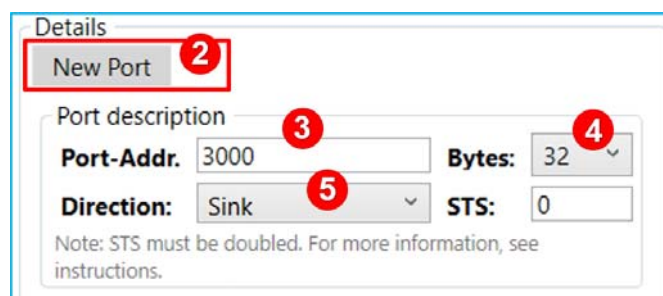
### NOTICE

Sink ports are received by the HEAD from the MVB and can be used to control outputs of the DEVICES such as digital or analog outputs.

A sink port is created in the same way as a source port.



1. Select **Source/Sink Ports** (1) in the **toolbox** window.
2. If a port is selected, click on the **Clear button**, to get a **NEW PORT** (2).

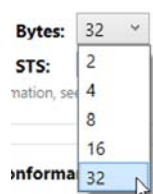


3. Enter a **Port-Address** (3), e.g. "3000" (This depends on your numbering concept.)

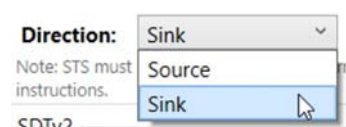
### NOTICE

MVB-port addresses: 0 to 4095

4. Select the number of **bytes** (4), e.g. 32 bytes:



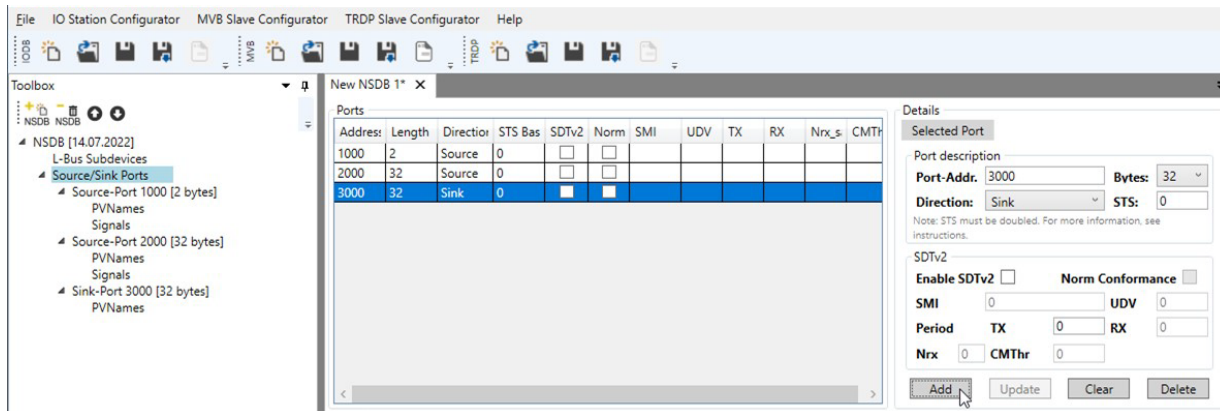
5. Select the direction: **Sink** (5) to create a *sink port*.



6. Use **Add** (6) to add the new source port.



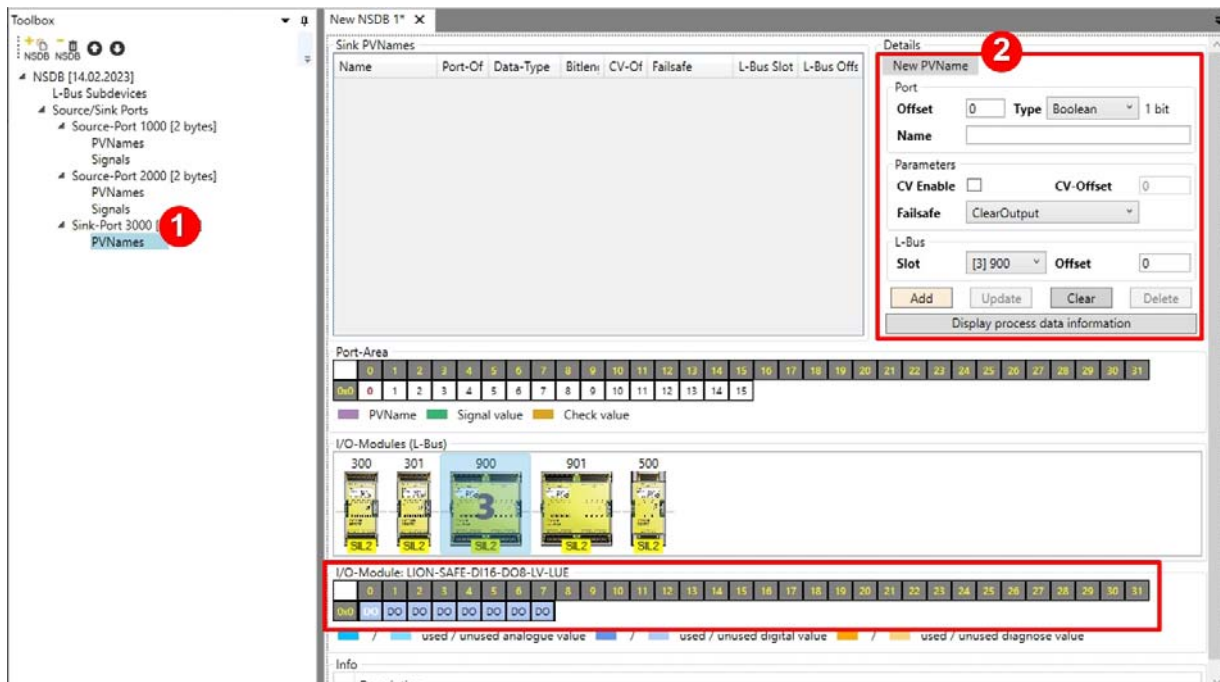
You will get this result:



## NOTICE

You can change the properties at any time and save them with the Update button. Also see *chapter 9.5.1 „Update button functionality”* on page 71.

7. Select the corresponding **sink port (1)** in the left **toolbox** window, then you will get this view on the right side. **New PV-Names (2)** can be created here:



8. Select one of the DEVICES you want to configure (*In this example it is the module at the 1st position*).

## NOTICE

**Make sure that the module has output data.**  
Sink ports can only be mapped to output data of DEVICES.

When editing a *sink port* only output data of the DEVICES is displayed

### Application example

e.g., the module 2300 (part no. 803101) digital input module



The module 2300 (part no. 803101) is a digital input module which cannot process any output data.

**Therefore, no mappable data is displayed when you select the sink port.**

**Sink PVNames**

Name	Port-Of	Data-Type	Bitleng	CV-Of	Failsafe	L-Bus Slot	L-Bus Offs
------	---------	-----------	---------	-------	----------	------------	------------

**Port-Area**

0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31
0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15																

**I/O-Modules (L-Bus)**

2300

**I/O-Module: LION-DI16-24V-36V-LUE**

0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31
0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15																

**Details**

New PVName

Port

Offset 0 Type Boolean 1 bit

Name

Parameters

CV Enable ☐ CV-Offset 0

Failsafe ClearOutput

L-Bus

Slot [1] 2300 Offset 0

Add Update Clear Delete

Display process data information

**Source PVNames**

Name	Port-Of	Data-Type	Bitleng	CV-Of	Failsafe	L-Bus Slot	L-Bus Offs
------	---------	-----------	---------	-------	----------	------------	------------

**Port-Area**

0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31
0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15																

**I/O-Modules (L-Bus)**

2300

**I/O-Module: LION-DI16-24V-36V-LUE**

0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31
0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15																

**Details**

New PVName

Port

Offset 0 Type Boolean 1 bit

Name

Parameters

CV Enable ☐ CV-Offset 0

Failsafe ClearOutput

L-Bus

Slot [1] 2300 Offset 0

Add Update Clear Delete

Display process data information

## 9.7

## Mapping

## 9.7.1

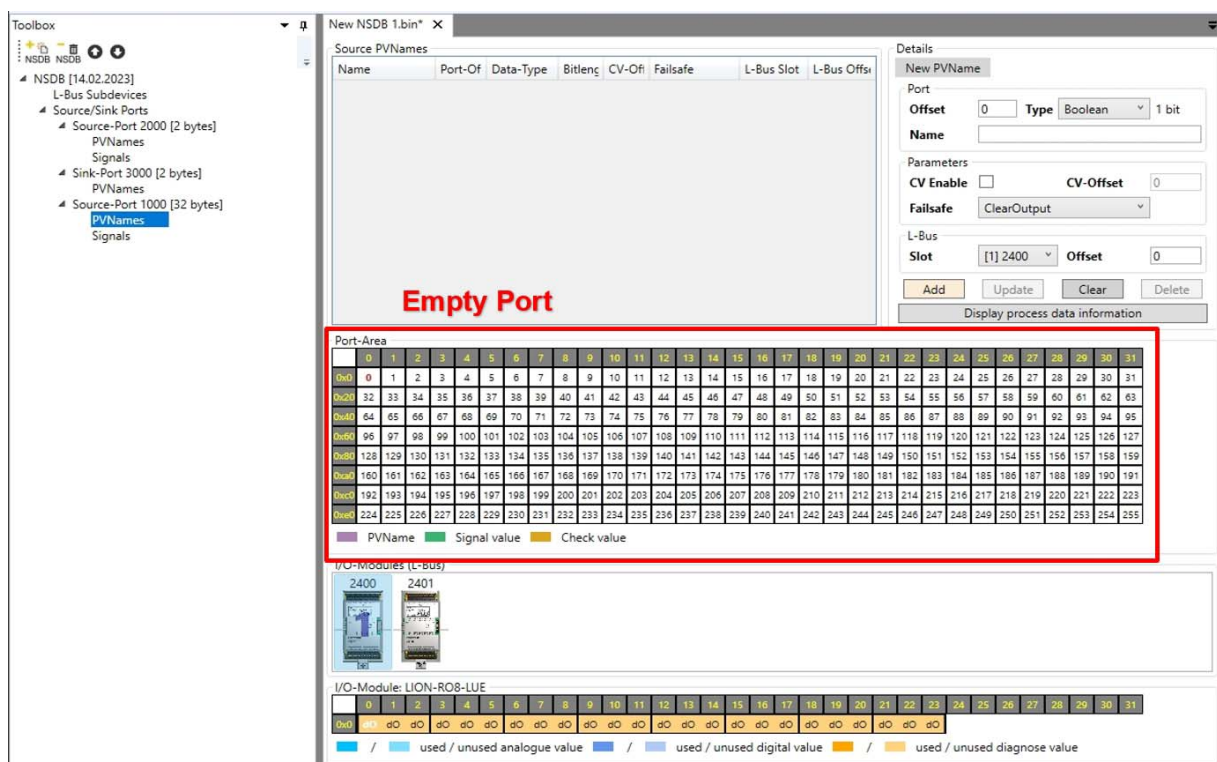
## General



To check the validity of process data, it is necessary to read in and monitor the diagnostic data within the process data of a **DEVICE** (see also *operating instructions of the DEVICES*).

For the function of the I/O station and to check the correct configuration, the diagnostic port of the HEAD must also be read in and monitored.

1. Select the port to which you want to map data on the left side in the toolbox.
2. The port opens with the port area. The port area shows a bit-wise representation of the data.



3. Below the Port-Area the **DEVICES** are shown. When editing a source port only the input data of the **DEVICES** is shown and can be mapped to the Port-Area.
4. To add a mapping first select the **DEVICE** to map input data from.

## NOTICE

**The mapping is not restricted to a certain combination of **DEVICES** and **ports**.** A port can be used to transmit data from several **DEVICES** regardless of the type of data (input/diagnostic).

5. Select the start of the data to be mapped by double clicking the bit in the Port-Area as well as in the **"I/O-Module"** section. The selection will be highlighted.
6. Select the data type in the Details section.

## NOTICE

**The data type must match the I/O data to be mapped.**  
(See also the chapter 9.7.3 „Data types“ on page 81.)

7. For the correct data type please refer to the operating manual of the **DEVICES**.



## 9.7.2 PVName properties

- |                          |  |
|--------------------------|--|
| (1) <b>Offset (Port)</b> | Start bit in the port. Specifies the starting point of the selection of the data type for the data to be mapped ( <i>will be setup automatically when selecting the bit by double clicking</i> ) |
| (2) <b>Type</b>          | Selected data type ( <i>see also the following table "Data types" on page 81</i> )   |
| (3) <b>Name</b>          | Name of the process variable. Variable Name ( <i>for documentation purpose only</i> )  |
| (4) <b>CV Enable</b>     | Activates the generation of MVB check variables  |
| (5) <b>CV-Offset</b>     | Specifies the start address of the check variable  |
| (6) <b>Failsafe</b>      | In the event of a sink time supervision error, the output can be reset ( <b>ClearOutput</b> ) or the last value retained ( <b>HoldLastValue</b> ).   |

### NOTICE

This setting is ignored by the LION System and defaults to "ClearOutput".

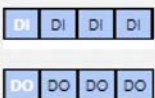
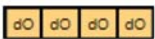
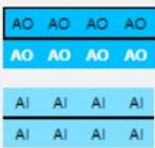
- |  |   |
|--|---|
| (7) <b>Slot</b>                              | L-Bus <sup>2</sup> module from which the data is to be mapped into the port.<br>Slot number of the DEVICE where process data are mapped on the configured <b>PVNames</b> .                                      |
| (8) <b>Offset (L-Bus<sup>2</sup>)</b>        | Start address in the L-Bus <sup>2</sup> module ( <i>will be setup automatically when selecting the bit by double clicking</i> ).<br>Allocation of the MVB process variables to the L-Bus <sup>2</sup> I/O data. |
| (9) <b>Add</b>                               | Create a new <b>PVName</b> / save the settings by clicking <b>Add</b> .   |
| (10) <b>Update</b>                           | Update the edited <b>PVName</b> by clicking <b>Update</b> .   |
| (11) <b>Clear</b>                            | Opens an input mask with default settings for creating a new <b>PVName</b> .<br>Deactivates marked existing <b>PVNames</b> in the list so that they cannot be overwritten accidentally.                         |
| (12) <b>Delete</b>                           | Delete the selected <b>PVName</b> by clicking <b>Delete</b> .   |
| (13) <b>Display process data information</b> | see " <b>Display short info of the process data</b> " on page 89  |

### 9.7.3 Data types

1. <b>Boolean</b>	1 bit	1 bit (e.g., digital output on/off)
2. <b>Antivalent</b>	2 bits	antivalent value
3. <b>BCD/Enum</b>	4 bits	binary coded decimal
4. <b>BITSET 8</b>	8 bits	8 bits (e.g., control 8 digital outputs)
5. <b>BITSET 16</b>	16 bits	16 bits (e.g., control 16 digital outputs)
6. <b>BITSET 32</b>	32 bits	32 bits (e.g., control 32 digital outputs)
7. <b>Unsigned 8</b>	1 byte	unsigned numerical representation 0 ... 255
8. <b>Unsigned 16</b>	2 bytes	unsigned numerical representation 0 ... 65,535
9. <b>Unsigned 32</b>	4 bytes	unsigned numerical representation 0 ... 4,294,967,295
10. <b>Integer 8</b>	1 byte	signed numerical representation -128 ... 127
11. <b>Integer 16</b>	2 bytes	signed numerical representation -32,768 ... 32,767
12. <b>Integer 32</b>	4 bytes	signed numerical representation -2,147,483,648 ... 2,147,483,647

#### Overview

Here an overview which data type fits to which data, i.e. which data can be mapped with which data type.

	Boolean	Antivalent	BCD/Enum	Bitset	Unsigned	Integer
<b>1. Digital outputs/inputs</b> 	✓	✓	✓	✓	✗	✗
<b>2. Diagnostic inputs</b> 	✓	✓	✓	✓	✗	✗
<b>3. Analog outputs/inputs</b> 	✗	✗	✗	✗	✓	✓

1. In the following figure the 8 diagnostic data bits of the outputs are mapped into port 1000. The 8 bits are represented as **BITSET8** and placed at bit position 32 in the source port.

The screenshot shows the MVB Slave Configurator interface. On the left, a tree view shows the project structure. The main window is divided into several sections:

- Source PVNames:** A table with columns: Name, Port-Of, Data-Type, Bitleng, CV-Off, Failsafe, L-Bus Slot, L-Bus Offs.
- Details:** A panel for configuring a new PVName. It includes fields for Port (32), Offset (0), Type (BITSET 8), and 8 bits. There are also checkboxes for CV Enable, CV-Offset, and Failsafe (ClearOutput).
- Port-Area:** A large table showing the mapping of 8 bits (bits 32-39) to the source port. The bits are highlighted in red.
- I/O-Modules (L-Bus):** A section showing the LION-DOB-24V-110V-LUE module.
- I/O-Module:** A section showing the LION-DOB-24V-110V-LUE module.

2. Put in a **Name**, e.g., „Modul2402\_DiagnoseData“ and click **Add**.

The screenshot shows the MVB Slave Configurator interface after adding a new PVName. The 'Source PVNames' table now includes the entry 'Modul2402\_Diagn'. The 'Details' panel shows the configuration for this entry. The 'Port-Area' table shows the mapping of 8 bits (bits 32-39) to the source port. The 'I/O-Modules (L-Bus)' section shows the LION-DOB-24V-110V-LUE module. The 'Info' section at the bottom provides a description of the new PVName.

**Source PVNames:**

Name	Port-Of	Data-Type	Bitleng	CV-Off	Failsafe	L-Bus Slot	L-Bus Offs
Modul2402_Diagn	32	BITSET 8	8	unused	ClearOutput	2	0

**Details:**

Selected PVName: Modul2402\_DiagnoseData

Port: 32, Offset: 0, Type: BITSET 8, 8 bits

Parameters: CV Enable, CV-Offset, Failsafe (ClearOutput)

L-Bus Slot: [2] 2402, Offset: 0

**Port-Area:**

Port	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31
bits	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31
bits	32	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48	49	50	51	52	53	54	55	56	57	58	59	60	61	62	63

**I/O-Modules (L-Bus):**

2400, 2402

**I/O-Module:**

LION-DOB-24V-110V-LUE

**Info:**

Description: New PVName 'BITSET 8' [32...39] at offset 32 overlaps existing Source-Port 1000 [32 bytes]-PVName 'BITSET 8' [32...39] at offset 32 with 8 bits

3. Mapped areas of the port are displayed as purple in the Port-Area. Mapped areas of each DEVICE are highlighted according to the legend below the data structure of the DEVICES.

**NOTICE**

Input data of DEVICES can be mapped several times even across different ports.

- To create another mapping, define a new offset in the Port-Area. In this example the 8 bits are represented as **BITSET8** and placed at bit position 110 in the source port.
- Put in a new **Name**, e.g., „Modul2402\_DiagnoseData2“
- Click **Add**.

The screenshot displays the MVB Slave Configurator interface. On the left, a tree view shows the project structure. The main window is divided into several sections:

- Source PVNames:** A table listing source PVNames. The entry 'Modul2402\_Diagn' is highlighted, showing its configuration: Port-Of 110, Data-Type BITSET 8, Bitlen 8, CV-Of unused, Failsafe ClearOutput, L-Bus Slot 2, and L-Bus Offs 0.
- Port-Area:** A grid showing the mapping of input data. A red arrow points to bit 110 in the 'Port' column.
- Details:** A panel showing the details of the selected PVName 'Modul2402\_DiagnoseData2'. It includes fields for Offset (110), Type (BITSET 8), and CV-Offset (0).
- I/O-Modules (L-Bus):** A section showing the modules 2400 and 2402.
- I/O-Module: LION-DO8-24V-110V-LUE:** A section showing the bit map for the module. A red arrow points to bit 110 in the 'Port' column.

**NOTICE**

A warning is issued, which can be ignored if this is the desired behavior.

The screenshot displays the MVB Slave Configurator interface. The 'I/O-Module: LION-DO8-24V-110V-LUE' section shows a bit map with a red arrow pointing to bit 110. The 'Info' section displays a warning message:

LION-DO8-24V-110V-LUE offset 0 is referenced 2 times:

- Source-Port 1000 [32 bytes]:PVName 'BITSET 8' [32...39]
- Source-Port 1000 [32 bytes]:PVName 'BITSET 8' [110...117]

LION-DO8-24V-110V-LUE offset 1 is referenced 2 times:

- Source-Port 1000 [32 bytes]:PVName 'BITSET 8' [32...39]
- Source-Port 1000 [32 bytes]:PVName 'BITSET 8' [110...117]

LION-DO8-24V-110V-LUE offset 2 is referenced 2 times:

- Source-Port 1000 [32 bytes]:PVName 'BITSET 8' [32...39]
- Source-Port 1000 [32 bytes]:PVName 'BITSET 8' [110...117]

LION-DO8-24V-110V-LUE offset 3 is referenced 2 times:

- Source-Port 1000 [32 bytes]:PVName 'BITSET 8' [32...39]
- Source-Port 1000 [32 bytes]:PVName 'BITSET 8' [110...117]

LION-DO8-24V-110V-LUE offset 4 is referenced 2 times:

- Source-Port 1000 [32 bytes]:PVName 'BITSET 8' [32...39]
- Source-Port 1000 [32 bytes]:PVName 'BITSET 8' [110...117]

## 9.7.4

## The check variable (CV)

The check variable (CV) can be mapped into the port in addition to the actual data. This check variable can be mapped to any free position in the port, as the following example shows.

The screenshot shows the LION LCF Tool MVB Slave Configurator interface. On the left, a tree view shows the project structure, including 'Sink-Port 3000 [2 bytes]' and 'Sink-Port 1000 [32 bytes]'. The main window displays the 'Sink PVNames' table and the 'Details' panel for the selected 'DigitalOutputModule2'.

Name	Port-Of	Data-Type	Bitleng	CV-Of	Failsafe	L-Bus Slot	L-Bus Offs
DigitalOutputMod	0	BITSET 8	8	10	ClearOutput	2	0

The 'Details' panel shows the configuration for 'DigitalOutputModule2':

- Port: Offset 0, Type BITSET 8, 8 bits
- Name: DigitalOutputModule2
- Parameters: CV Enable ☒, CV-Offset 10
- Failsafe: ClearOutput
- L-Bus Slot: [2] 2402, Offset 0

A red arrow points from the 'CV-Offset' value of 10 in the 'Details' panel to the 'Port-Area' table, specifically to the cell at index 10. The 'Port-Area' table shows the mapping of PVName, Signal value, and Check value across the port area.

Port-Area	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
0x0	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15

Legend: PVName (purple), Signal value (green), Check value (yellow). The cell at index 10 is highlighted as a Check value.

The 'I/O-Modules (L-Bus)' section shows the modules 2400 and 2402. The 'I/O-Module: LION-DO8-24V-110V-LUE' section shows the module configuration with a legend for used/unused analogue, digital, and diagnose values.

The close-up of the 'Port-Area' table shows the mapping of PVName, Signal value, and Check value across the port area. The cell at index 10 is highlighted as a Check value.

Port-Area	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
0x0	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15

Legend: PVName (purple), Signal value (green), Check value (yellow). The cell at index 10 is highlighted as a Check value.

**NOTICE**

Further details on configuration can be found in the respective operating manuals of the LION Bus couplers and DEVICES / I/O modules.

If you have any further questions, contact the service department.  
(For more information, refer to chapter 13 on page 130.)



## 9.8 Options for mapping the ports

### 9.8.1 Option 1: Mapping via input

#### 1. Basic principle:

Select a **Sink-Port** (1), then select the **module** (2), select the **data Type** (3) with which you want to map the **output data** of the module (4) to the **Sink-Port** (5).

The screenshot shows the MVB Slave Configurator interface. On the left, a tree view shows the project structure with 'Sink-Port 3000 [2 bytes]' selected (1). The main area shows a table of Sink PVNames. Below this, the 'Port-Area' is shown with a grid of bits (0-31). A red box highlights bits 0-7 (5). The 'I/O-Modules (L-Bus)' section shows a module 'LION-DO8-24V-110V-LUE' (2). Below this, another grid of bits (0-31) is shown, with a red box highlighting bits 0-7 (4). The 'Details' panel on the right shows the 'New PVName' dialog with 'Type' set to 'BITSET 8' (3). Red arrows connect the Sink-Port (1) to the module (2), the module's output data (4) to the Sink-Port's output data (5), and the data Type (3) to the Sink-Port's output data (5).

### NOTICE

You can map as much output data to a sink port as there are available bits.

#### 2. Create/edit a new PVName

##### 2.1. Standard setting **Port**

The 'Details' panel shows the 'New PVName' dialog. The 'Port' section has 'Offset' set to 0 and 'Type' set to 'Boolean'. The 'Name' field is empty.

In the **Port-Area** (5) the value in **Port > Offset** indicates the start bit.

The 'Details' panel shows the 'New PVName' dialog. The 'Port' section has 'Offset' set to 4 and 'Type' set to 'Boolean'. The 'Port-Area' grid shows bit 4 highlighted.

2.2 By selecting the (data-) **Type** (3), the corresponding bits are set, e.g. 4 bits:

The 'Details' panel shows the 'New PVName' dialog. The 'Port' section has 'Offset' set to 4 and 'Type' set to 'BCD/Enum'. The 'Port-Area' grid shows bits 4-7 highlighted.

e.g. Offset: 3, Type: 8 BITSET:

[illegible]

2.3 Enter a **Name** for the mapping, e.g., “*DigitalOutput\_1*”:

Details

New PVName

Port

**Offset** 4 **Type** BCD/Enum 4 bits

**Name** DigitalOutput\_1

## 2.4 Parameters

Parameters default settings:

Parameters

CV Enable ☐ CV-Offset

Failsafe

**CVEnable** activates the generation of MVB check variables. **CVOffset** specifies the start address of the check variable.



**See also chapter 9.7.4 „The check variable (CV)” on page 84.**

**Failsafe:** This setting is ignored by the LION system and defaults to **ClearOutput**.

### 2.5. *L-Bus* area

Default settings for the ***L-Bus area***:

L-Bus

Slot	[2] 2402	Offset	0
------	----------	--------	---

In the ***L-Bus area***, the modules can also be selected via the ***Slot*** drop-down menu.

L-Bus

Slot	Offset
[2] 2402	0
[1] 2400	
[2] 2402	

Buttons: Add, Clear, Delete

Display process data information

The text box **L-Bus > Offset** indicates the start bit.

L-Bus

Slot: [2] 2402 Offset: 2

I/O-Module: LION-DO-3x1-110V-LITE

0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27
DO	DO	DO	DO	DO	DO	DO	DO																				

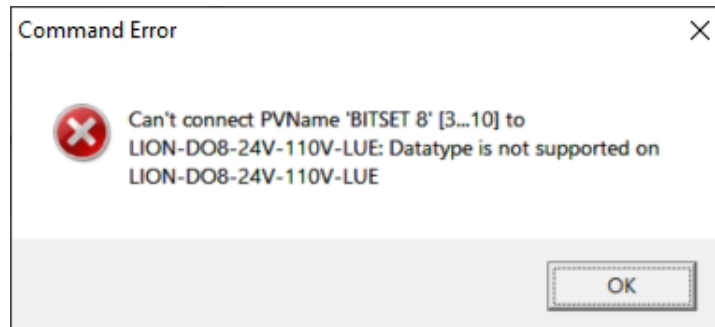
Legend:

- Blue: used / unused analogue value
- Light Blue: used / unused digital value
- Orange: used / unused diagnose value

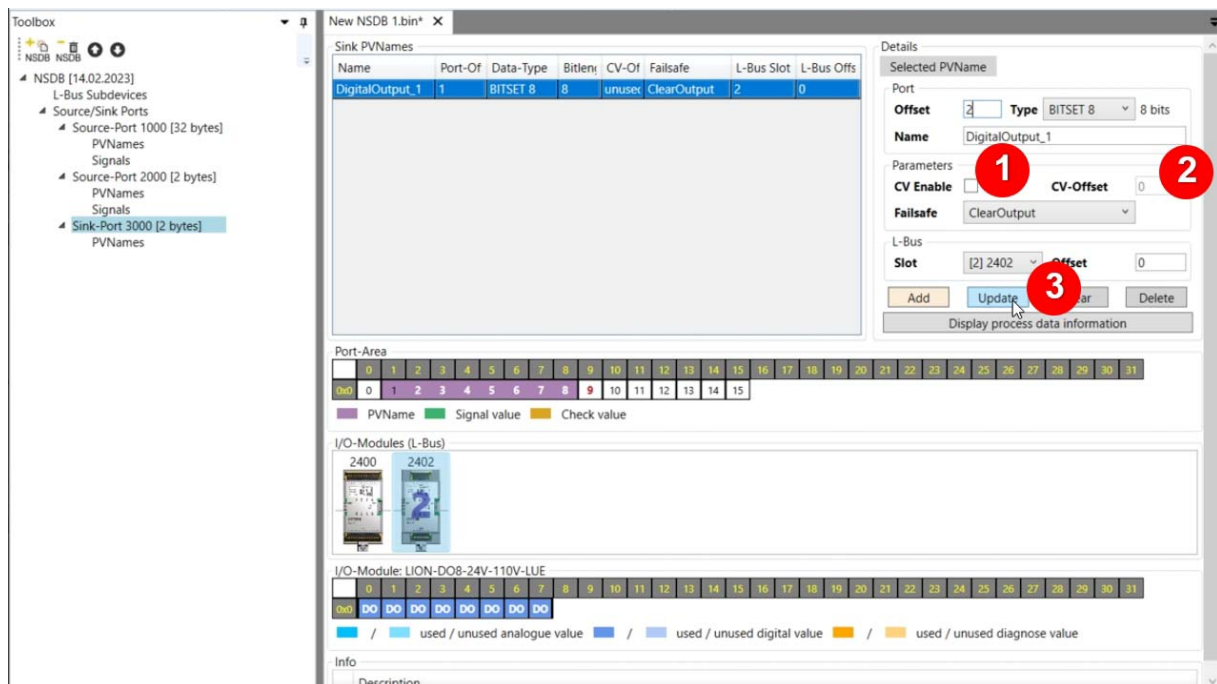
2.6. Save the settings with **Add**.**NOTICE**

If a configuration is not possible this is indicated by corresponding **warnings**. In this case the instructions must be followed, and a valid configuration must be established.

e.g.:



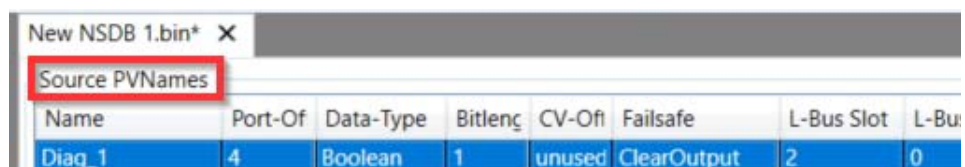
If everything is correct, the new **PVName** will be displayed in the **Sink PVNames** list:

**NOTICE**

The **Parameters** (1+2) can be changed at any time and saved with **Update** (3).

The new parameters are displayed in the **Sink PVNames** list.

There is also a **Source PVNames** list in a **source ports**:



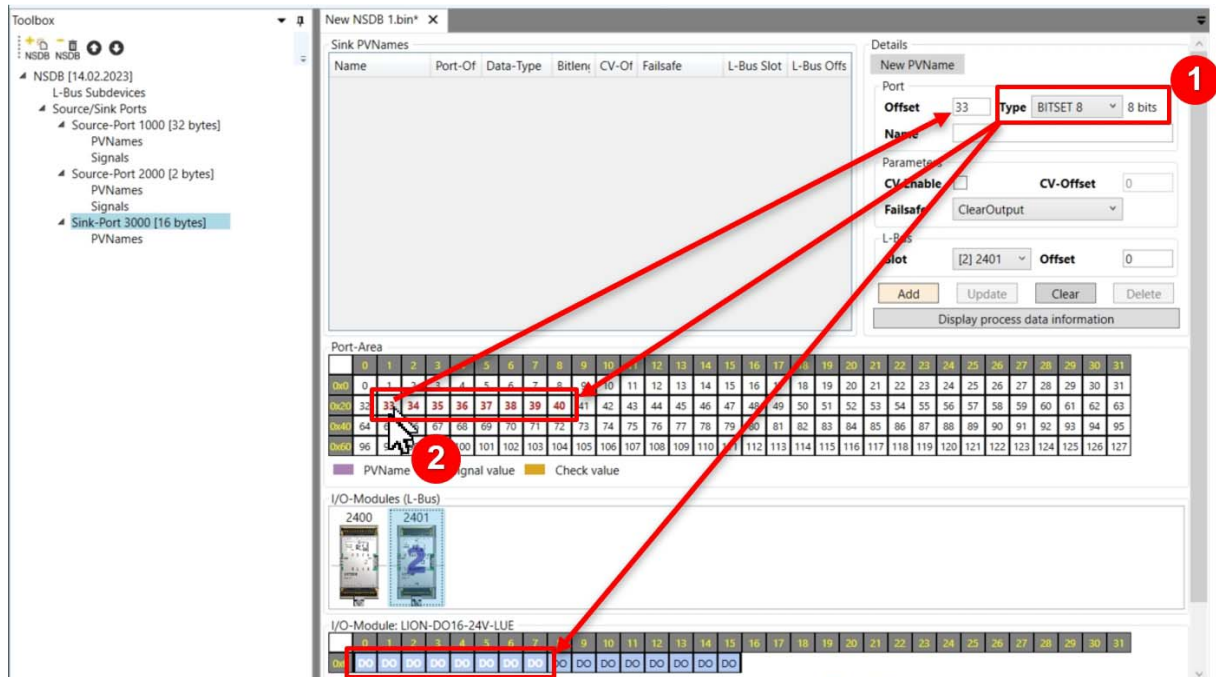
## 9.8.2

## Option 2: Mapping via mouse clicks

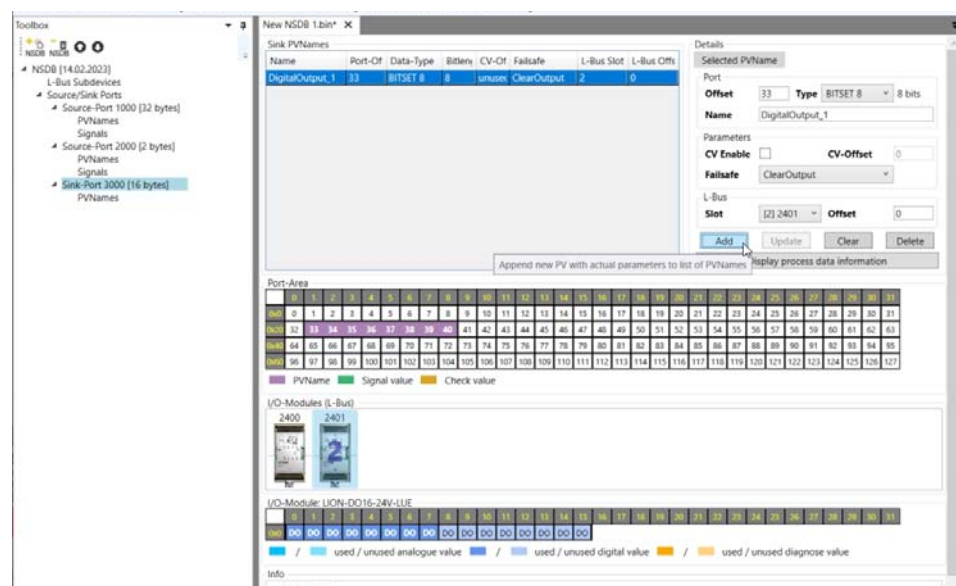
**NOTICE**

As an alternative to input via text fields and drop-down menus, you can also set the offsets (Port- and L-Bus area) by mouse double click.

In this example a BITSET8 is chosen (1), so you have 8 bits (BITSET 8) for distribution in the **Port-Area** (2). With a mouse double click you can set the **Offset** of this 8-bit row (in this e.g., 33)

**NOTICE**

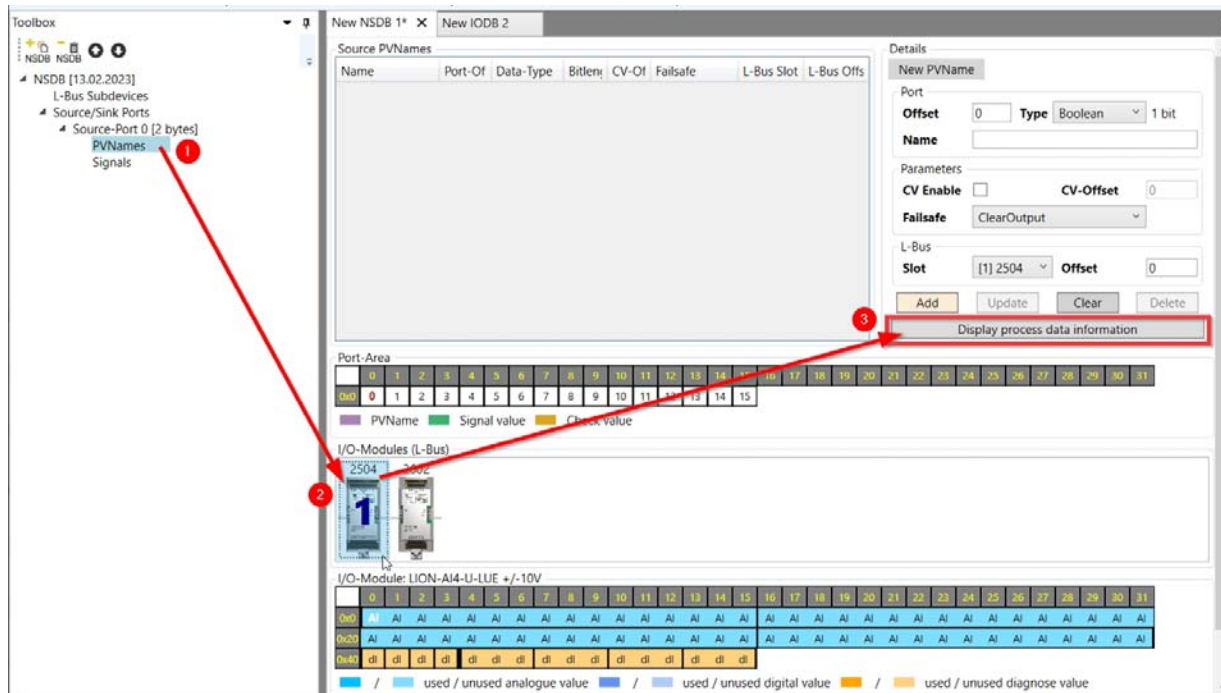
How to assign single ports with a mouse click was already described in the source ports. This is what the configuration saved with **Add** looks like:

**NOTICE**

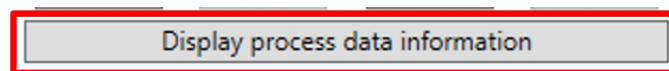
You can map as much output data to a sink port as there are available bits.

## 9.9

## Display short info of the process data

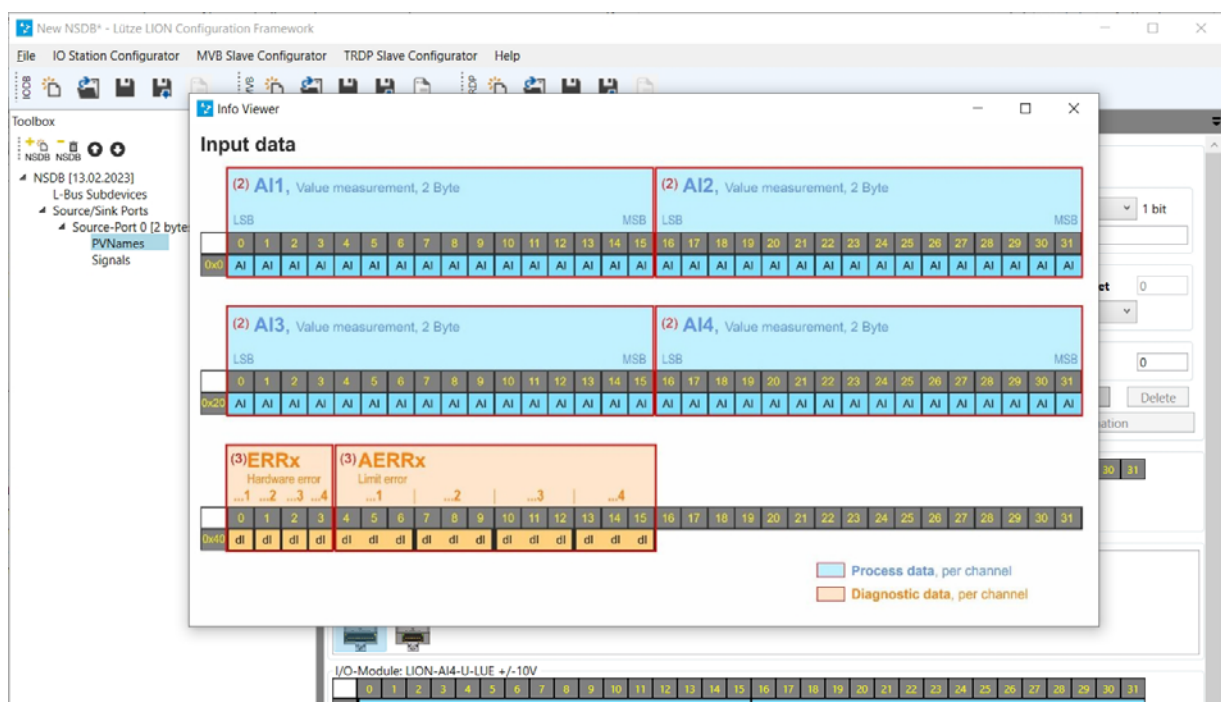


Click on the **button *Display process data information*** (3) to get short info about the **process data** (1) of the module for the respectively selected **module** (2).



The following example shows the short information of the process data of module 803306 (ID 2504).

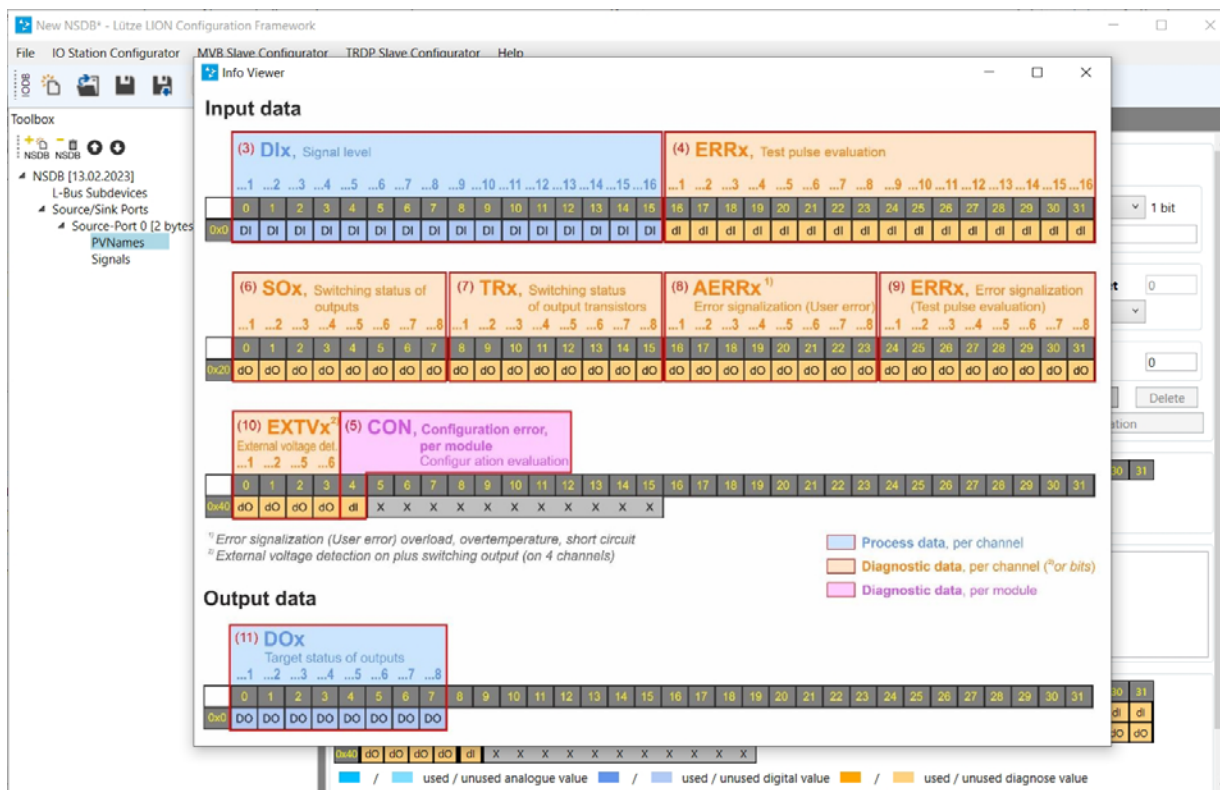
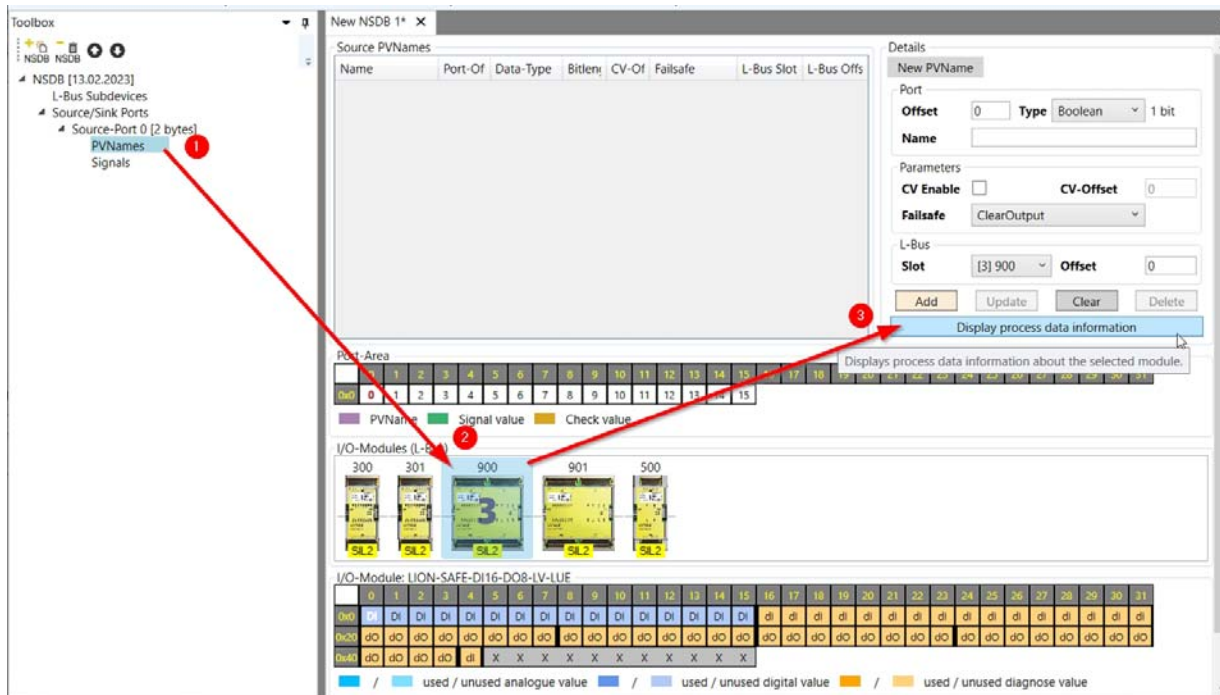
All process data (input and output data) of the module are displayed in an extra window, regardless of whether you are in a source or sink port.





By selecting another module, its data is displayed.

The following example shows the short information of the process data of module 803501 (ID 900) - or the identical modul 803502 (ID 901).



An overview of all short information of the process data of the modules can be found in the attachments in *chapter 12.4 „Overview DEVICES - Short information of the process datas“* on page 120.

## 9.10

## Diagnostic port

The HEAD has a lot of diagnostic information which can be transferred via the MVB. This is general diagnostic information of the LION I/O station. This does not include the diagnostic data of each DEVICE such as short circuit detection, but general diagnostic information about the LION I/O station and the status of the fieldbus communication.

The general diagnostic data is transferred in a separate MVB port which is just called **diagnostic port**.



**Diagnostic data is only displayed on the web server if the diagnostic report has also been created.**

The variables of the diagnostic port are described in the respective LION Bus coupler operating manual.

## 9.10.1

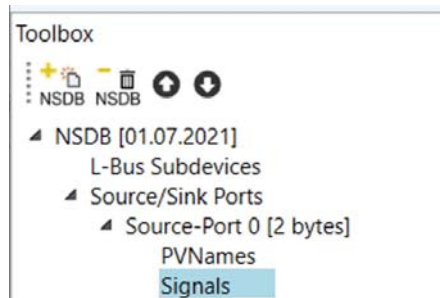
## Quick guide

Here you will find a brief overview of the topic diagnostic port. To create one, proceed as follows.

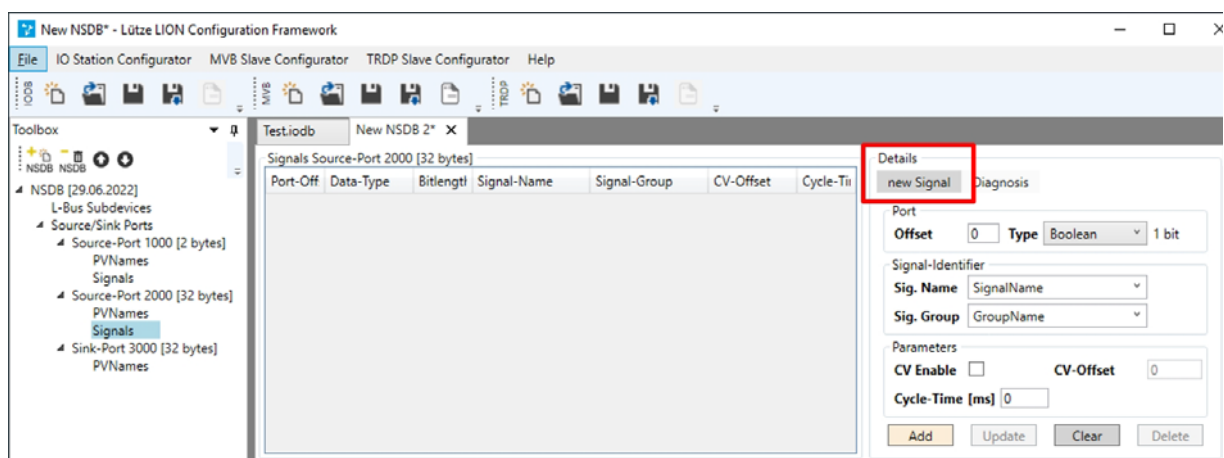
## NOTICE

The diagnostic port can be created in any source port, but only once in one NSDB file.

1. Click on the submenu **Signals** (under a **Source-Port**).

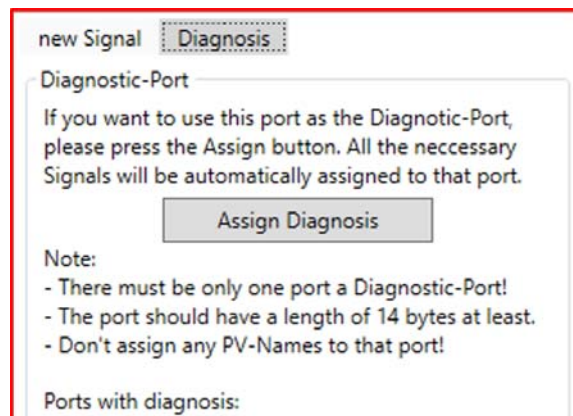
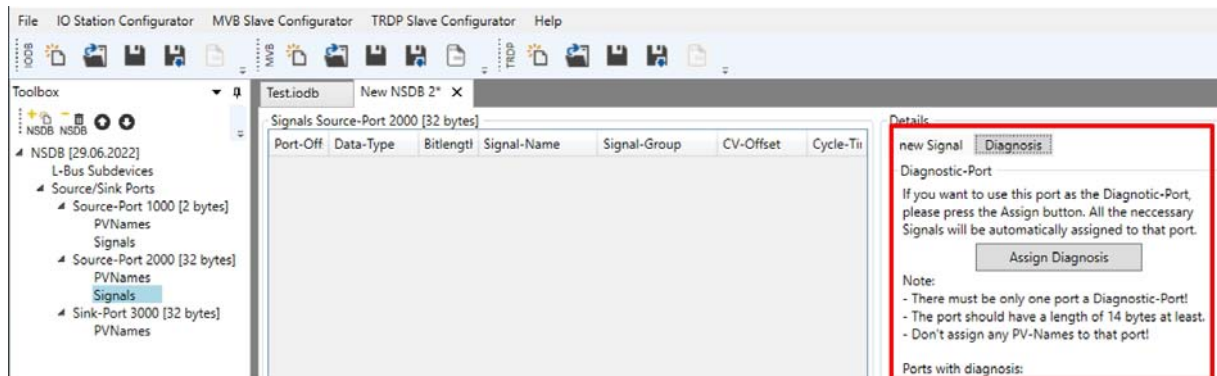


2. On the right side you will find the two tabs **new Signal** and **Diagnosis** under Details.



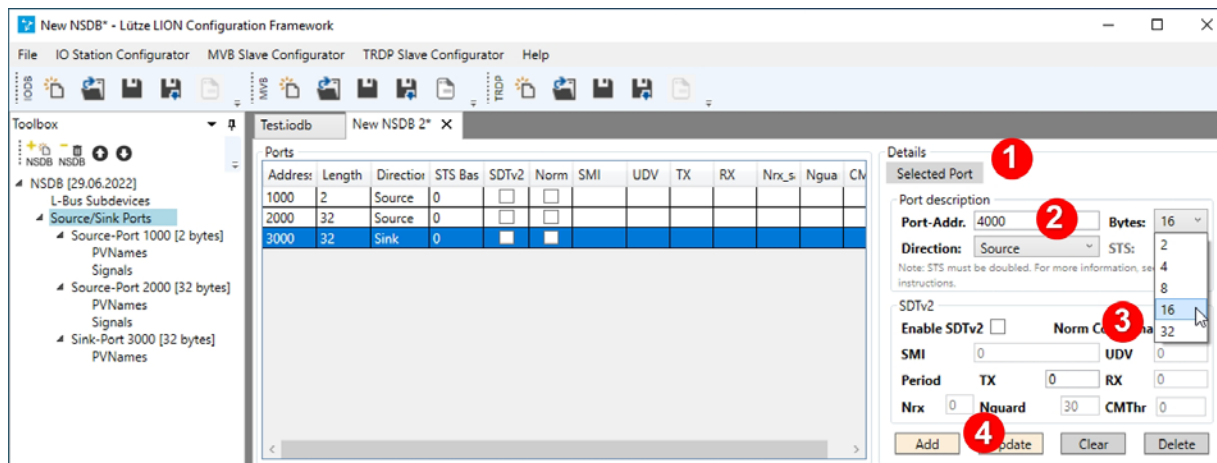
The diagnostic port is automatically created by the LION Configuration Framework under **New Signals > Diagnosis**.

It is recommended to create the diagnostic port automatically.



## 9.10.2 More detailed description

To create a diagnostic port, proceed as follows:



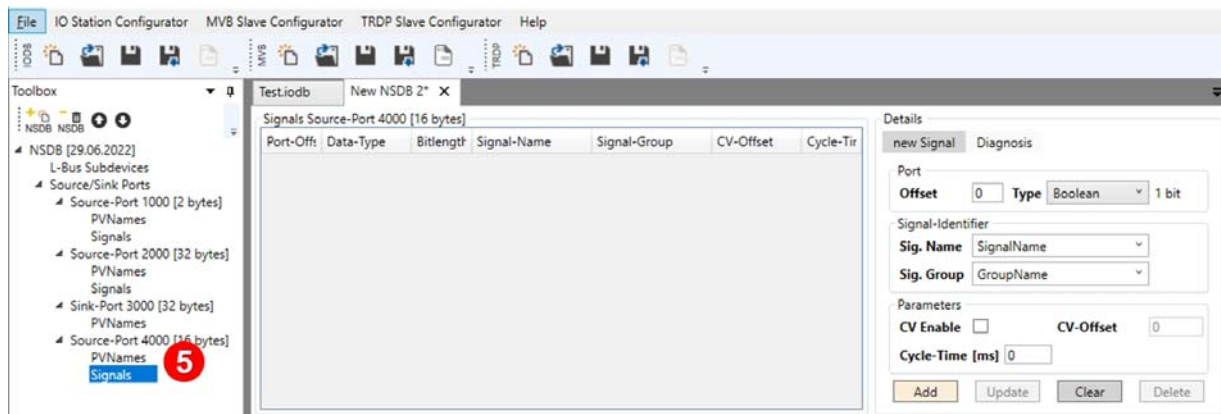
**Note:** In this example two source ports are already created.

1. Create a **new source port** (1)
2. Type in a **Port-Address** (2)
3. Select **Bytes** (3)

### NOTICE

The diagnosis port requires a source port with at least 16 bytes.

4. Click **Add** (4)

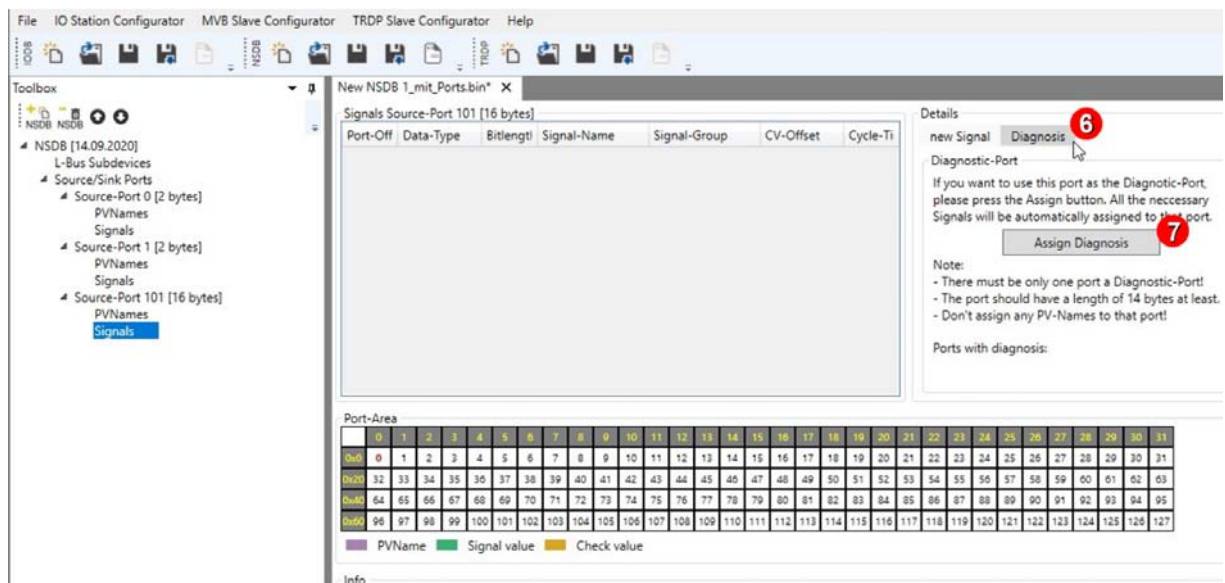


5. Click **Signals** (5) under the new source port on the left side in the **toolbox**.
6. Click on the **Diagnosis** tab (6).

### NOTICE

There must be only one port a diagnostic port.  
The port should have a length of 16 bytes at least.  
Do not assign any PV-names to that port.

7. If you want to use this port as a diagnostic port, click the **Assign Diagnosis** button (7).

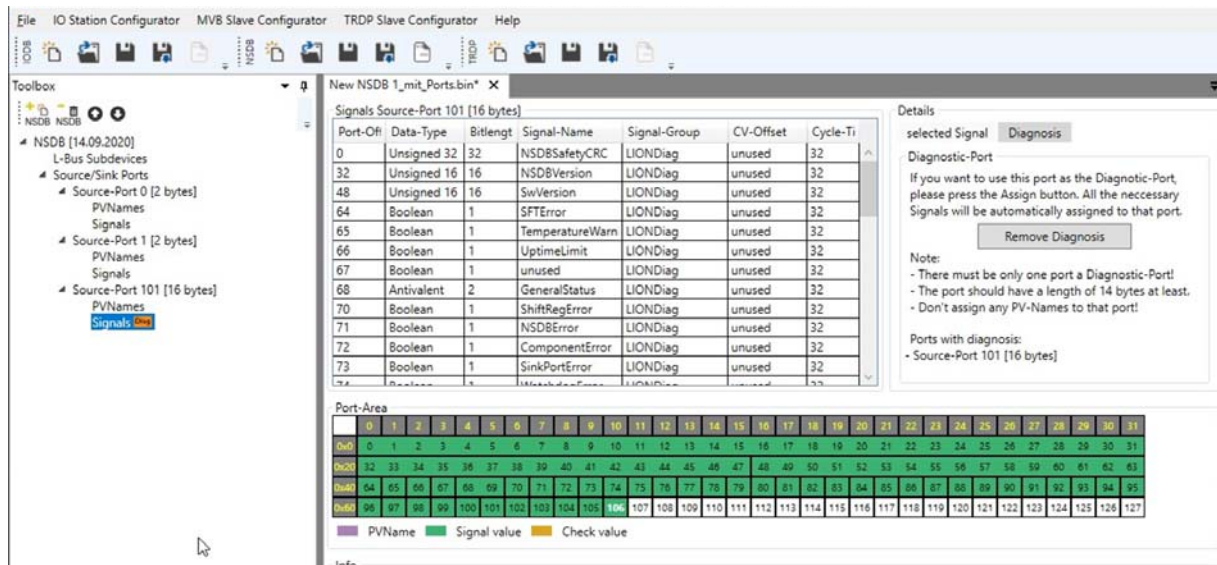


### NOTICE

Please wait a moment. The now following loading process is not displayed.



It takes a moment, then all necessary signals are automatically assigned to the diagnostic port:

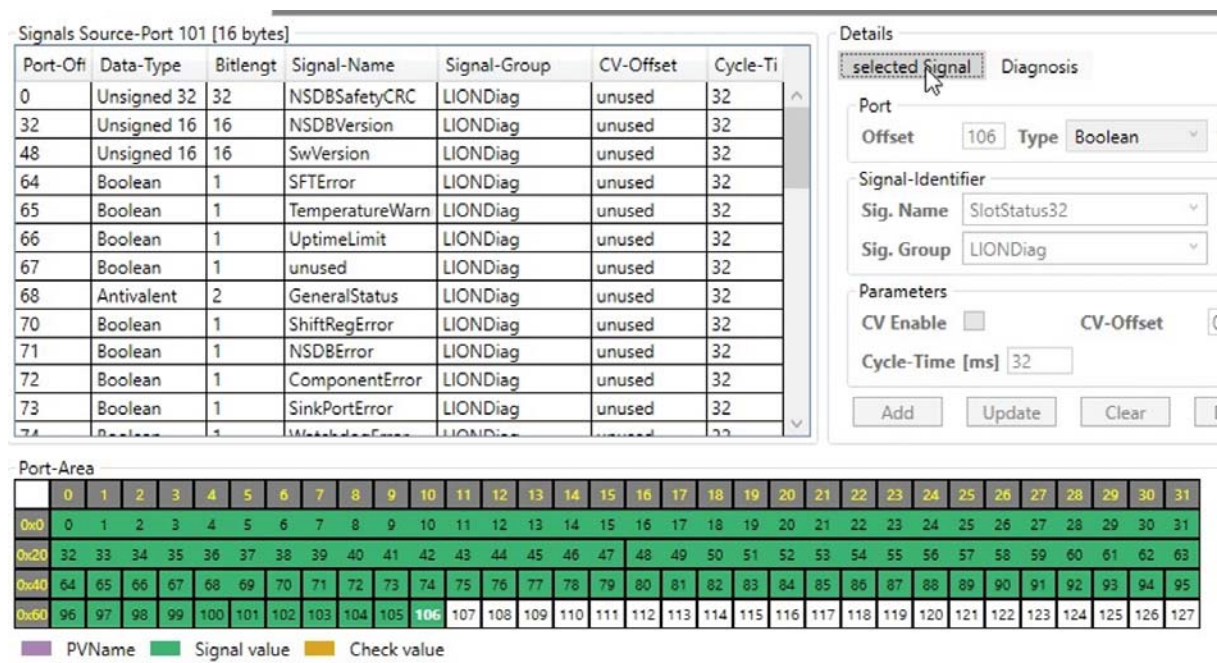


## NOTICE

The diagnostic port can only be created once. Only one port must be a diagnostic port.

## NOTICE

Don't assign any PV-Names to the diagnostic port.



## NOTICE

If the diagnostic port is not created, the diagnostic data will not be displayed in the web server of the HEAD.



### 9.10.3 Deleting the diagnostic port

1. To delete the **Diagnosis Port**, go to the **Diagnosis** tab (1).
2. Click **Remove diagnosis** (2) to remove the automatically created signals. Afterwards the port can be reused to transmit I/O data.

Signals Source-Port 101 [16 bytes]

Port-Offset	Data-Type	Bitlength	Signal-Name	Signal-Group	CV-Offset	Cycle-Time
0	Unsigned 32	32	NSDBSafetyCRC	LIONDiag	unused	32
32	Unsigned 16	16	NSDBVersion	LIONDiag	unused	32
48	Unsigned 16	16	SwVersion	LIONDiag	unused	32
64	Boolean	1	SFTError	LIONDiag	unused	32
65	Boolean	1	TemperatureWarning	LIONDiag	unused	32
66	Boolean	1	UptimeLimit	LIONDiag	unused	32
67	Boolean	1	unused	LIONDiag	unused	32
68	Antivalent	2	GeneralStatus	LIONDiag	unused	32
70	Boolean	1	ShiftRegError	LIONDiag	unused	32
71	Boolean	1	NSDBError	LIONDiag	unused	32
72	Boolean	1	ComponentError	LIONDiag	unused	32
73	Boolean	1	SinkPortError	LIONDiag	unused	32

Port-Area

0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	
0x0	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31
0x20	32	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48	49	50	51	52	53	54	55	56	57	58	59	60	61	62	63
0x40	64	65	66	67	68	69	70	71	72	73	74	75	76	77	78	79	80	81	82	83	84	85	86	87	88	89	90	91	92	93	94	95
0x60	96	97	98	99	100	101	102	103	104	105	106	107	108	109	110	111	112	113	114	115	116	117	118	119	120	121	122	123	124	125	126	127

Legend: PVName (purple), Signal value (green), Check value (yellow)

Info: Description

Details

selected Signal **Diagnosis** (1)

Diagnostic-Port

If you want to use this port as the Diagnostic-Port, please press the Assign button. All the necessary Signal (2) be automatically assigned to that port.

**Remove Diagnosis** (2)

Note:

- There must be only one port a Diagnostic-Port!
- The port should have a length of 14 bytes at least.
- Don't assign any PV-Names to that port!

Ports with diagnosis:

- Source-Port 101 [16 bytes]

#### NOTICE

More detailed information can be found in chapter "8.2.5 MVB diagnostic port" in the LION MVB Bus coupler manual.

## 9.11

## Overview of the modules and port characteristics

The table shows all available LION components, together with some input and output parameters of the DEVICES. Depending on the type, the DEVICES have input data, output data or both.

(\* Filter setting of this module is possible.) See also *chapter 9.3.4 „Configuration data and filter settings” on page 65.*

Kind of module	ID	Type	Part number	Input data	Output data	Config data
Power Supply	200	LION-SAFE-PS-24V-110V-72W-LUE	800101	-	-	-
	201	LION-SAFE-PS-24V-110V-36W-LUE	800103	-	-	-
	1200	LION-PS-24V-110V-72W-LUE	800111	-	-	-
	1201	LION-PS-24V-110V-36W-LUE	800113	-	-	-
Bus Coupler	102	LION-SAFE-BC-MVB-LUE	803001	-	-	-
	1102	LION-BC-MVB-LUE	803011	-	-	-
	1103	LION-BC-ETH-LUE	803012	-	-	-
Line Coupler	2700	LION-LC-M12-LUE	800102	-	-	-
Digital Input	2300	LION-DI16-24V-36V-LUE	803101	2 Bytes	-	-
	2301	LION-DI16-72V-110V-LUE	803102	2 Bytes	-	-
	300*	LION-SAFE-DI16-LV-LUE	803103	5 Bytes (33 Bits)	-	4 Byte
	301*	LION-SAFE-DI16-HV-LUE	803104	5 Bytes (33 Bits)	-	4 Byte
Digital Output	2400	LION-RO8-LUE	803201	3 Bytes	1 Byte	-
	2401	LION-DO16-24V-LUE	803202	3 Bytes (18 Bits)	2 Bytes	-
	2402	LION-DO8-24V-110V-UE	803203	1 Byte	1 Byte	-
	2403	LION-DO16-24V-4X4-LUE	803204	3 Bytes (20 Bits)	2 Bytes	-
Analog Input	2501	LION-AI4-U-LUE	803301	10 Bytes	-	-
	2502	LION-AI4-I-LUE	803302	10 Bytes	-	-
	2500	LION-AI4-PT100-LUE	803303	10 Bytes	-	-
	2503	LION-AI4-PT1000-LUE	803304	10 Bytes	-	-
	500*	LION-SAFE-AI4-I-LUE	803305	10 Bytes	-	4 Byte
	2504	LION-AI4-U-LUE +/-10V	803306	10 Bytes	-	-
Analog Output	2600	LION-AO4-U-LUE	803401	2 Bytes	8 Bytes	-
	2601	LION-AO4-I-LUE	803402	2 Bytes	8 Bytes	-
	2602	LION-AO4-U-LUE +/-10V	803403	2 Bytes	8 Bytes	-
Digital Input/ Digital Output	900*	LION-SAFE-DI16-DO8-LV-LUE	803501	9 Bytes (69 Bits)	1 Byte	4 Byte
	901*	LION-SAFE-DI16-DO8-HV-LUE	803502	9 Bytes (69 Bits)	1 Byte	4 Byte

Example: The analog output module 803401 supplies 2 bytes of input data to the LION Bus coupler and 8 bytes can be set by the LION Bus coupler. Both the input data and the output data can be mapped to MVB ports to be used there.

**NOTICE**

**For a detailed description of the input/output data please see the documentation of the corresponding DEVICE.**

## 9.12 Create an NSDB Report

The NSDB report summarizes the settings and configurations of the MVB HEAD setting and is used by the validator to check the settings made. The safety CRC is generated in the NSDB report and must therefore always be created.

This is the last step before the configuration file can be loaded onto the MVB HEAD.

### NOTICE

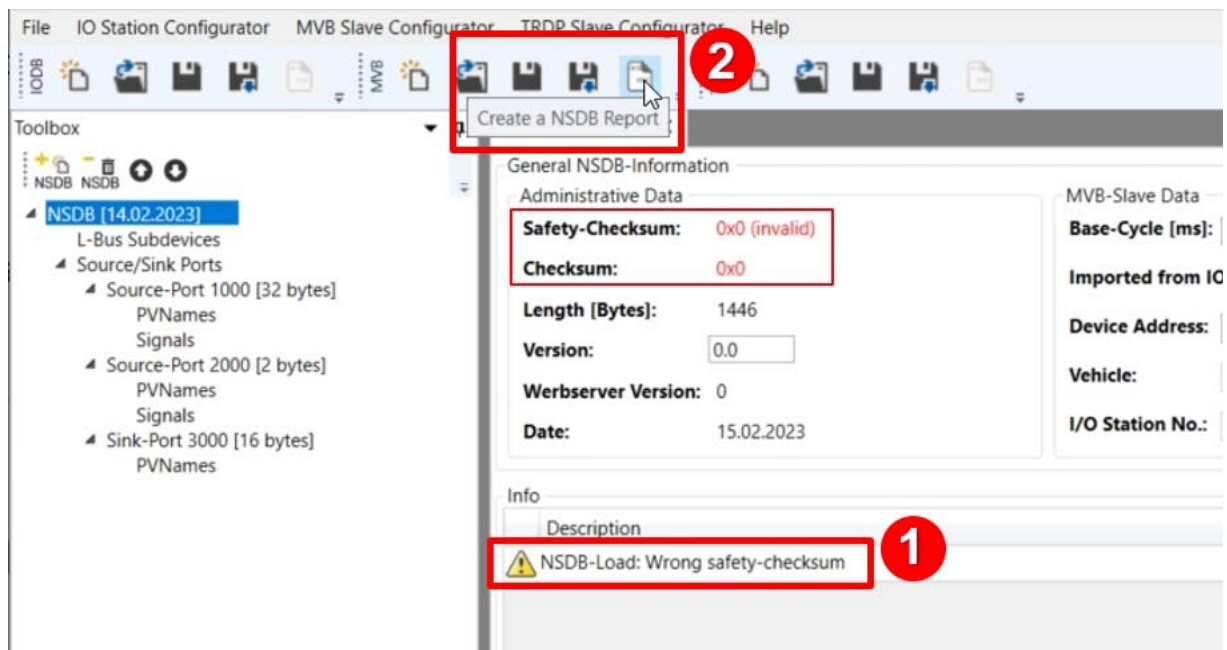
The checksum is created as soon as the NSDB configuration has been saved.

### NOTICE

Without safety-checksum the MVB HEAD does not accept the NSDB file. It does not matter whether safe modules are used or not. The safety-checksum must always be created.

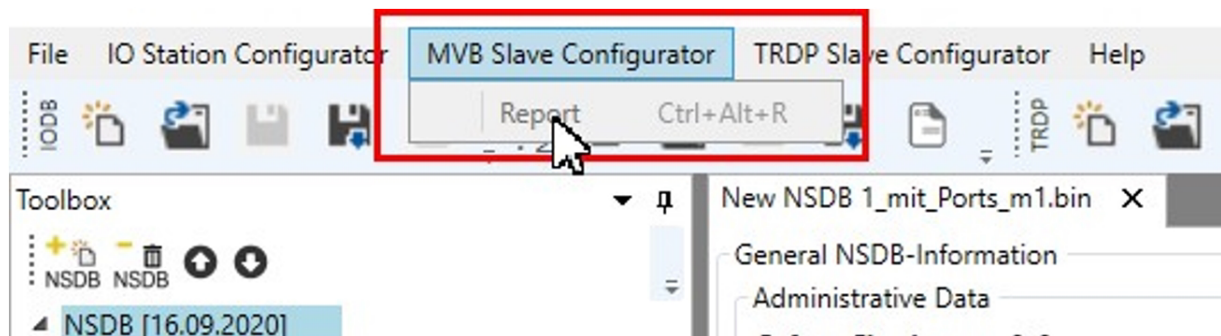
6. Until the report is created the **safety checksum will be invalid** (1)

7. To create the report and create the safety checksum **click on** (2) **Create a NSDB report-icon**.

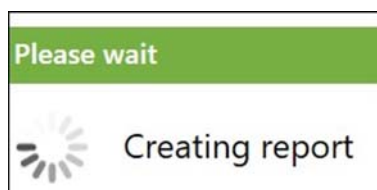


or:

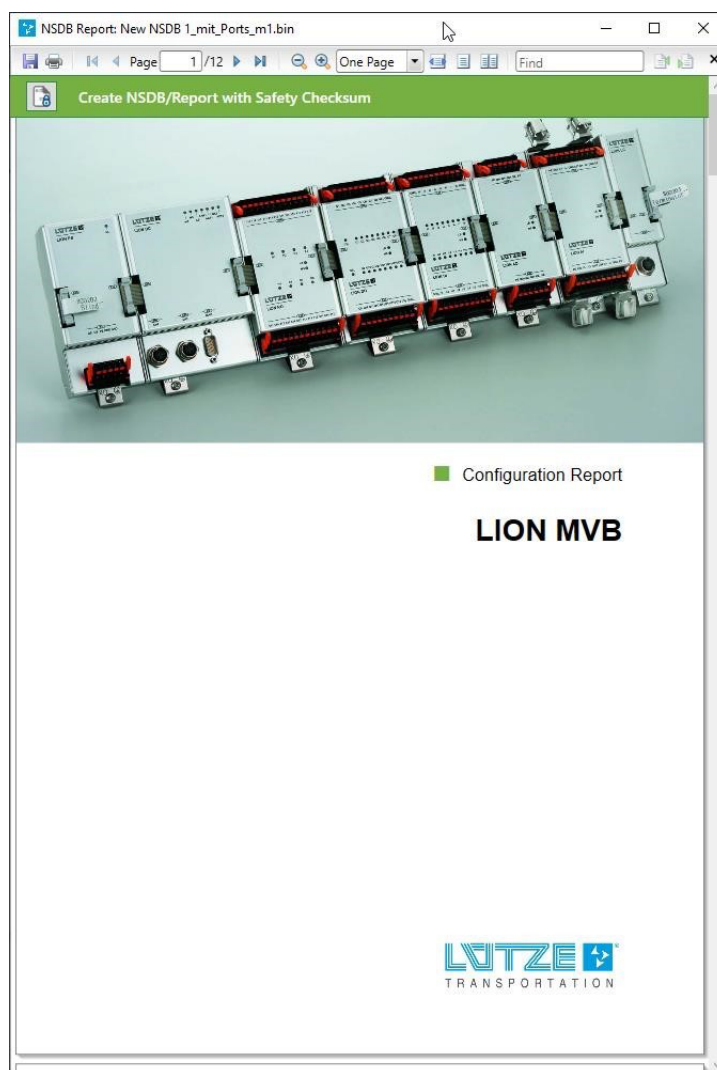
Select **MVB Save Configurator / Report**



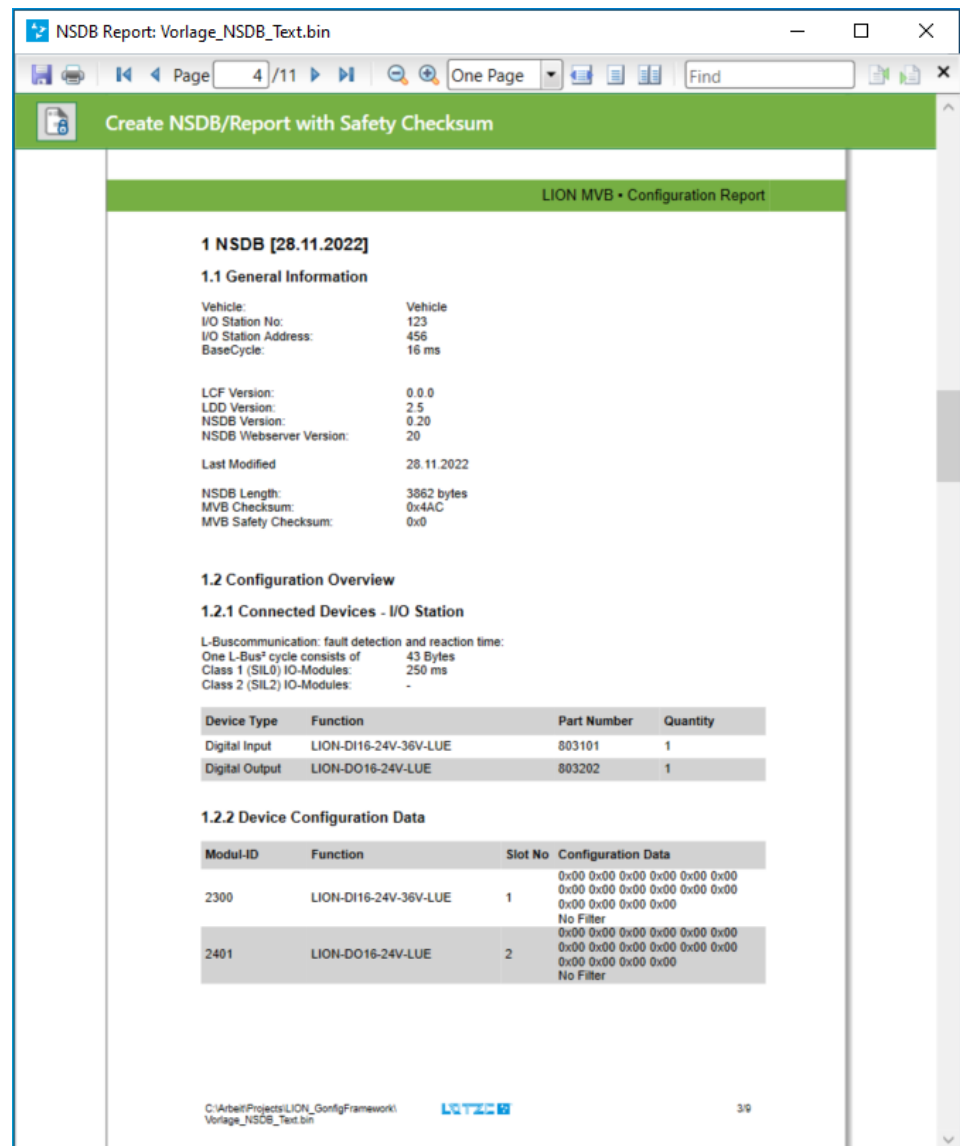
This window appears:



A new NSDB (Configuration) report was created:

**NOTICE**

Read the report carefully and check the created configuration against your requirements.

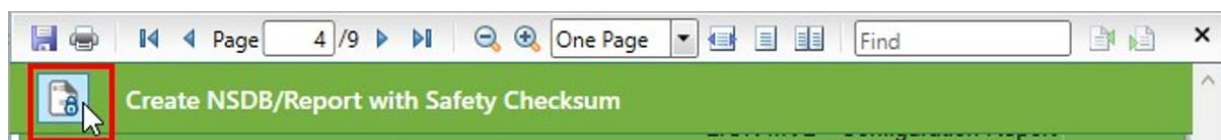


## 9.13

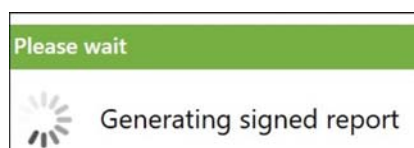
**Create NSDB/Report with Safety checksum**

If there are no errors in the report and the configuration is as required, the safety checksum can be generated.

1. Click on **Create NSDB/Report with Safety Checksum** on the top of the NSDB Report window.

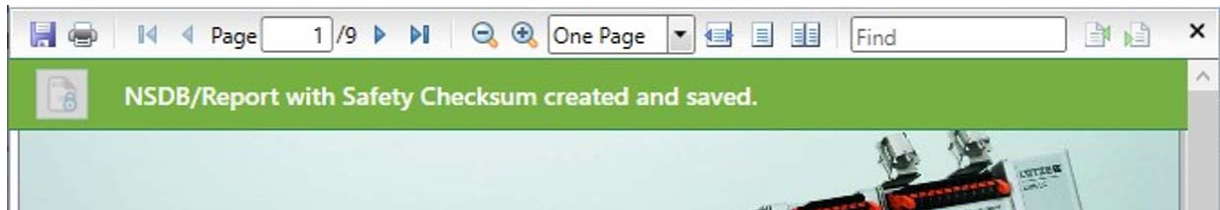


This window appears:



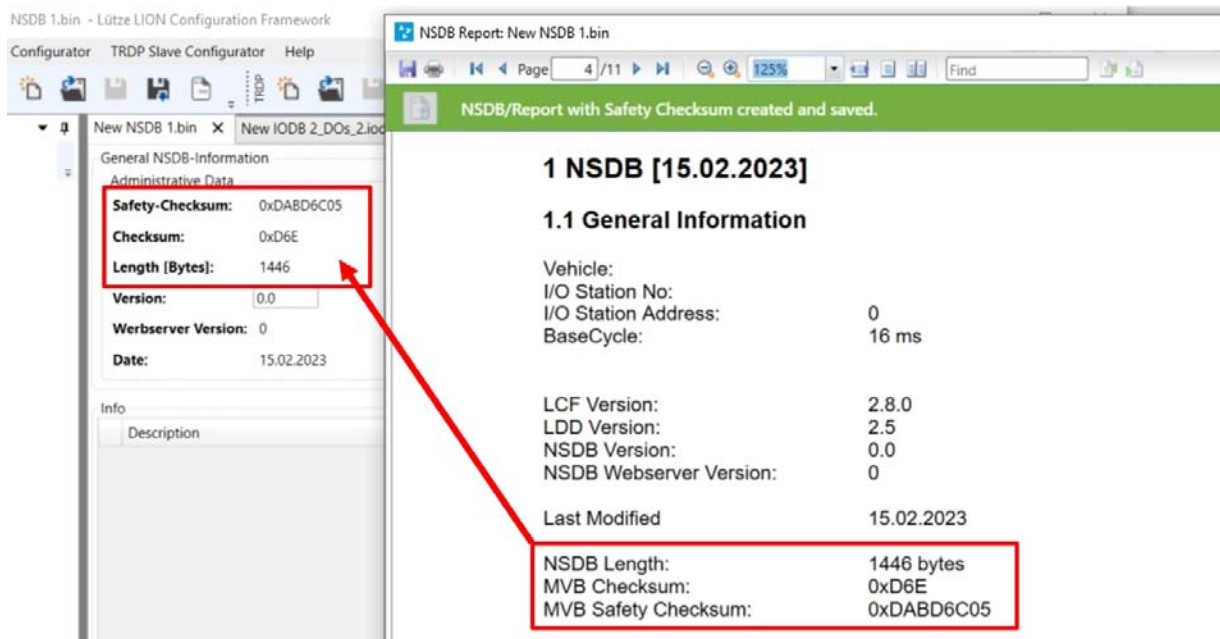


A **signed report** will be generated:



### NOTICE

The MVB safety checksum is automatically stored to the NSDB file and displayed in the MVB Slave Configurator.



The generated NSDB (\*.bin file) can be transferred to the HEAD (e.g. MVB bus coupler).

Name	Typ
New NSDB 1.bin	Adobe Acrobat Document
New NSDB 1	Textdokument
New NSDB 1.bin	BIN-Datei



**Additionally a text file with the same name is generated.** This file contains the complete configuration and can be read in e.g. for further processing.

Name	Typ
New NSDB 1.bin	Adobe Acrobat Document
New NSDB 1	Textdokument
New NSDB 1.bin	BIN-Datei

Example content of the text file:

```

New NSDB 1 - Editor
Datei Bearbeiten Format Ansicht Hilfe
=====
New NSDB 1.txt
=====
NSDB-HEADER
=====
SafetyChecksum : 0x9AADF754
Checksum       : 0x828
Length [Bytes] : 1426
Version        : 0.0
Web Server Version: 0
Date           : 16.02.2023

Base-Cycle      : 16
Device Address  : 0
Vehicle         :
I/O Station No. :

=====
L-Bus Subdevices - Configuration data
=====
LBus-Slot | LBus-Module-ID | LBus module name | Configuration data
-----
1 | 2600 | LION-A04-U-LUE | 0x00 0x00 0x00 0x00 0x00 0x00 0x00 0x00 0x00 0x00 0x00 0x00 0x00 0x00 0x00 0x00

=====
Source/Sink Ports
=====
Address | Length | Direction | STS Base | SDTV2 | Norm Conform | SMI | UDV | TX | RX | NrX_Safe | Nguard | CMThr
-----
1000 | 32 | Source | 0 | no | no | | | | | | | |
2000 | 2 | Source | 0 | no | no | | | | | | | |
3000 | 32 | Sink | 0 | no | no | | | | | | | |

=====
Resolver: Signals (Diagnoseport)
=====
No | Port | Port-Offset | Data-Type | Bitlength | Signal-Name | Signal-Group | CV-Offset | Cycle-Time
-----

=====
Resolver: PVNames
=====
No | Port | Name | Port-Offset | Data-Type | Bitlength | CV-Offset | Failsafe | L-Bus Slot | L-Bus Offset
-----

=====
All LBus2-IO-Modules
=====
Module-ID | Item Nr. | LBus module name | Output byte | Data-Type | Name | Offset | Input byte | Data-Type | Name | Offset
-----
2400 | 803201 | LION-RO8-LUE | 1 Byte | Output (ROX) | Switch outputs 0 - 7 | 3 Byte | Input (SCC) | Switching Counter 0 - 23
2401 | 803202 | LION-DO16-24V-LUE | 2 Byte | Output (DOX) | Switch outputs 0 - 15 | 2 Byte | Input (AERR) | Output Error 0 - 15
| | | | | | | | 2 Bit | Input (PS) | Voltage error 16 - 17
2402 | 803203 | LION-DO8-24V-110V-LUE | 1 Byte | Output (DOX) | Switch outputs 0 - 7 | 1 Byte | Input (AERR) | Output Error 0 - 7
2403 | 803204 | LION-DO16-24V-4X4-LUE | 2 Byte | Output (DOX) | Switch outputs 0 - 15 | 2 Byte | Input (AERR) | Output Error 0 - 15
| | | | | | | | 4 Bit | Input (PS) | Voltage error 16 - 19
2300 | 803101 | LION-DI16-24V-36V-LUE | | | | | 2 Byte | Input (DIX) | Switching state 0 - 15
2301 | 803102 | LION-DI16-72V-110V-LUE | | | | | 2 Byte | Input (DIX) | Switching state 0 - 15
300 | 803103 | LION-SAFE-DI16-LV-LUE | | | | | 2 Byte | Input (DIX) | Switching state 0 - 15
| | | | | | | | 2 Byte | Input (ERR) | Test pulse evaluation 16 - 31
| | | | | | | | 1 Bit | Input (CONX) | Configuration Error 32

=====
Zeile 1, Spalte 1 70% Windows (CRLF) UTF-8

```

## 9.14

## Remarks

### NOTICE

**These were ideal examples.** In real situations the topologies are more complex and must meet lots of requirements regarding the MVB structure. ***If you need any assistance, please contact the service department.*** (For more information, refer to chapter 13 on page 130.)

## 10 Troubleshooting

Here you can find an overview of possible errors and their solutions.

Error	Reason	Procedere
1 <b>HEAD does not start</b>	validation/safety checksum not generated	<b>Create validation/safety checksum</b> <i>See chapter 9.13 „Create NSDB/Report with Safety checksum” on page 99</i>
2 Mapping of data fails with error message (Datatype is not supported ...)	Wrong data type selected...	<b>Choose the correct data type.</b> <i>NOTE: Please refer to the user documentation of the corresponding DEVICE.</i>
3 <b>Desired data is not displayed during mapping</b>	Source/sink mixed up	<b>Verify your entries</b>
4 Mapping name file not found	Besides the *.bin also a *.xml with the mapping names is stored.  The file was not found or the *.bin was created by an old LCF version.	<b>Either select the file manually or ignore the error.</b> <i>The file will be created automatically (but without content).</i>

### NOTICE

If you need any assistance, please contact the service department.  
(For more information, refer to chapter 13 on page 130.)

## 11 Further information

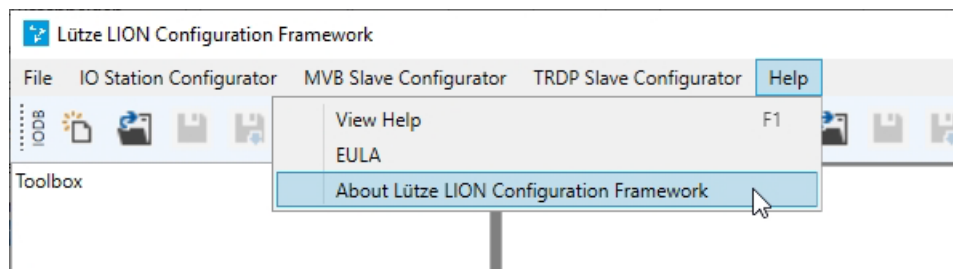
### 11.1 Current version of the LCF

1. LION Configuration Framework (LCF): **Version 2.10.0001**
2. LION LDD (LION Device Description): **Version 2.5**

*Example screenshot:*



*Find this information here in the LCF Tool:*



### 11.2 Software versions

#### [V2.10.0001 - 2023-06]

1. Numbering of the pages in this application manual was corrected.

**LDD (devices.ldd) v2.5 - unchanged**

#### [V2.10.0000 - 2023-02]

1. integrate an output text NSDB file when generating the NSDB report.
2. adjustments of the validation of the SDTv2 configurations in the GUI and gray out SDTv2 in the NSDB report.
3. display of process data for selected modules in PopUp (area MVB)

4. integration of the outage revelation time incl. the number of bytes transferred in one L-Bus<sup>2</sup> cycle in the reports (IODB, NSDB, TRDP)
5. integration of an additional field for the WebServer version on the "General NSDB information" (NSDB) incl. display in the NSDB report
6. design change in the Safety CRC area (it was implemented that the Safety CRC on the GUI remains red and invalid until the CRC is generated)
7. bugfixing at saving the files

**LDD (devices.ldd) v2.5** - unchanged

#### [V2.08.0000 - 2022-06]

- On the "Source/Sink Ports -> Details" view a hint for the "STS" field has been integrated.
- Corrected the order of the menus.
- New filter settings in program window: L-Bus<sup>2</sup> Subdevices > Configuration data

**LDD (devices.ldd) v2.5** with new possibility to specify filter settings via drop-down menus for SIL2 modules.

The filters represent the name of the inputs. The name can be max. 19 characters long.

- The unit of measurement for SIL2 modules ID 300 / 301 / 900 / 901 are **[ms]**
- The unit of measurement for SIL2 module ID 500 is **[Hz]**

#### [V2.06.0000 - 2022-04]

New MVB Bus coupler 803011, LION MVB SIL0 added

**LDD (devices.ldd) v2.4**

#### [V2.04.0000 - 2022-01]

Instruction manual adapted to the changes of V2.02.0000

**LDD (devices.ldd) v2.3**

#### [V2.02.0000 - 2021-11-10]

Bugfix for the MVB Slave Configurator, corrected calculation of the Safety CRC; Devices.

**LDD (devices.ldd) v2.3 with new modules DI16 SIL2, AI4 SIL2, AI4 +/-10V SIL0, AO4 +/-10V SIL0**

#### [v1.3.5.3 - 2019-03-22]

New Features - Stable version of the TRDP Slave Configurator

**LDD (devices.ldd) v2.2 with new SIL0 Power Supplies - naming support in the NSDB Configurator - drag and drop file opening support**

#### [v1.3.4.2 - 2018-11-14]

New Features - Initial Release of TRDP Slave Configurator

**LDD (devices.ldd) v2.0 with new BC ETH TRDP**

#### [v1.3.3.1 - 2018-10-24]

New Features - SDTV2 norm conformance + SDTV2 safety trailer visualization +



error correction pvName limit of 254 in each direction + mapping of data with endianness only 8-bit aligned

**LDD (devices.ldd) v1.5**

**[v1.2.1.1 - 2018-06-14]**

failure correction, changed

**LDD (devices.ldd) to v1.5**

**[v1.2.1.0 - 2016-09-14]**

Initial Revision for website

**LDD (devices.ldd) to v1.0**

## 11.3

### EULA LION Configuration Framework

#### SOFTWARE LICENSE AGREEMENT FOR LÜTZE SOFTWARE

##### 1. License:

The software is distributed as Freeware. You may use this software on any number of computers for as long as you like. The software is NOT Public Domain software. We allow the free distribution of the software. However, we retain ownership and copyright of the software and its source code in its entirety. You may use and/or distribute the software only subject to the following conditions:

- You may not modify the program or documentation files in any way
- You must include all the files that were in the original distribution
- You may not decompile or otherwise reduce the software to a human perceivable form
- You may not sell the software or charge a distribution fee, except to recover the media costs
- You understand and agree with this license and with the disclaimer of warranty and the limitation of liability printed below

The software may be bundled and distributed together with other software products, but the same conditions apply. You do not need to seek our permission first. But a note telling us about your software and your comment about our software would be nice.

##### 2. Disclaimer of warranty:

The software and related documentation are provided "as is", without warranty of any kind. The *Lütze Transportation GmbH* disclaims all warranties, express or implied, including, but not limited to, the implied warranties of design, merchantability, fitness for a particular purpose. The *Lütze Transportation GmbH* does not warrant that the functions contained in the software or documentation will meet your requirements, or that the operation of the software will be uninterrupted, error-free or complete, or that defects in the software or documentation will be corrected.

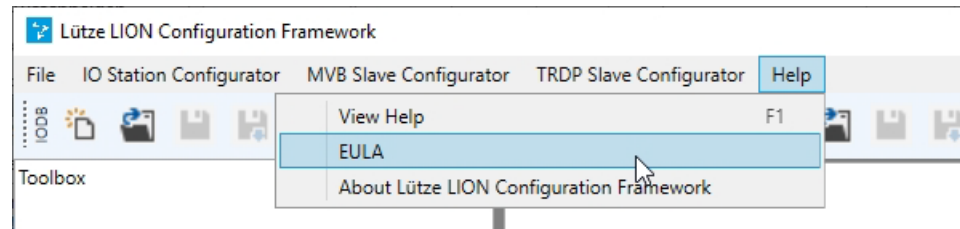
##### 3. Limitation of liability:

Under no circumstances, including negligence, shall *Lütze Transportation GmbH* be liable for any lost revenue or profits or any incidental, indirect, special, or consequential damages that result from the use or inability to use the or related products or documentation, even if *Lütze Transportation GmbH* has been advised of the possibility of such damages. Some states do not allow the limitation or exclusion of liability for incidental or consequential damages so the above

limitation or exclusion may not apply to you. In no event shall *Lütze Transportation GmbH* total liability to you for all damages, losses, and causes of action, whether in contract, tort (including negligence) or otherwise, exceed the amount paid by you for the software.

*State: November 2011*

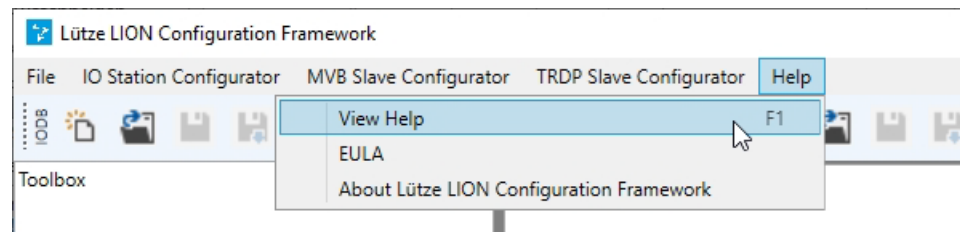
*Find this information here in the LCF Tool:*



## 11.4

### This application manual

*Find this application manual also here in the LCF Tool:*



## 12 Attachments

### 12.1 Modules in sorted overviews

Here you will find an overview of the module IDs and the assignments to the respective part numbers.

#### NOTICE

**The module ID is a unique identifier for each module type in the LION System.** The module ID is independent of the part number which may vary in certain situations (e.g., customer specific module variant). Therefore, LION works internally with a Module ID. The Module ID identifies the type of the module. This has a fixed number of data (process input data / process output data / diagnostic input data / diagnostic output data as well as configuration data).

#### 12.1.1 Modules sorted by IDs

Kind of module	Part number	ID	Type	Input data	Output data	Config data
Power Supply	800101	200	LION-SAFE-PS-24V-110V-72W-LUE	-	-	-
	800103	201	LION-SAFE-PS-24V-110V-36W-LUE	-	-	-
	800111	1200	LION-PS-24V-110V-72W-LUE	-	-	-
	800113	1201	LION-PS-24V-110V-36W-LUE	-	-	-
Bus Coupler	803001	102	LION-SAFE-BC-MVB-LUE	-	-	-
	803011	1102	LION-BC-MVB-LUE	-	-	-
	803012	1103	LION-BC-ETH-LUE	-	-	-
Line Coupler	800102	2700	LION-LC-M12-LUE	-	-	-
Digital Input	803101	2300	LION-DI16-24V-36V-LUE	2 Bytes	-	-
	803102	2301	LION-DI16-72V-110V-LUE	2 Bytes	-	-
	803103	300	LION-SAFE-DI16-LV-LUE	5 Bytes (33 Bits)	-	4 Byte
	803104	301	LION-SAFE-DI16-HV-LUE	5 Bytes (33 Bits)	-	4 Byte
Digital Output	803201	2400	LION-RO8-LUE	3 Bytes	1 Byte	-
	803202	2401	LION-DO16-24V-LUE	3 Bytes (18 Bits)	2 Bytes	-
	803203	2402	LION-DO8-24V-110V-LUE	1 Byte	1 Byte	-
	803204	2403	LION-DO16-24V-4X4-LUE	3 Bytes (20 Bits)	2 Bytes	-
Analog Input	803301	2501	LION-AI4-U-LUE	10 Bytes	-	-
	803302	2502	LION-AI4-I-LUE	10 Bytes	-	-
	803303	2500	LION-AI4-PT100-LUE	10 Bytes	-	-
	803304	2503	LION-AI4-PT1000-LUE	10 Bytes	-	-
	803305	500	LION-SAFE-AI4-I-LUE	10 Bytes	-	4 Byte
	803306	2504	LION-AI4-U-LUE +/-10V	10 Bytes	-	-
Analog Output	803401	2600	LION-AO4-U-LUE	2 Bytes	8 Bytes	-
	803402	2601	LION-AO4-I-LUE	2 Bytes	8 Bytes	-
	803403	2602	LION-AO4-U-LUE +/-10V	2 Bytes	8 Bytes	-
Digital Input/Digital Output	803501	900	LION-SAFE-DI16-DO8-LV-LUE	9 Bytes (69 Bits)	1 Byte	4 Byte
	803502	901	LION-SAFE-DI16-DO8-HV-LUE	9 Bytes (69 Bits)	1 Byte	4 Byte

### 12.1.2 Modules sorted by IDs

Kind of module	ID	Part number	Type	Input data	Output data	Config data
Bus Coupler	102	803001	LION-SAFE-BC-MVB-LUE	-	-	-
Power Supply	200	800101	LION-SAFE-PS-24V-110V-72W-LUE	-	-	-
	201	800103	LION-SAFE-PS-24V-110V-36W-LUE	-	-	-
Digital Input	300	803103	LION-SAFE-DI16-LV-LUE	5 Bytes (33 Bits)	-	4 Byte
	301	803104	LION-SAFE-DI16-HV-LUE	5 Bytes (33 Bits)	-	4 Byte
Analog Input	500	803305	LION-SAFE-AI4-I-LUE	10 Bytes	-	4 Byte
Digital Input/Digital Output	900	803501	LION-SAFE-DI16-DO8-LV-LUE	9 Bytes (69 Bits)	1 Byte	4 Byte
	901	803502	LION-SAFE-DI16-DO8-HV-LUE	9 Bytes (69 Bits)	1 Byte	4 Byte
Bus Coupler	1102	803011	LION-BC-MVB-LUE	-	-	-
	1103	803012	LION-BC-ETH-LUE	-	-	-
Power Supply	1200	800111	LION-PS-24V-110V-72W-LUE	-	-	-
	1201	800113	LION-PS-24V-110V-36W-LUE	-	-	-
Digital Input	2300	803101	LION-DI16-24V-36V-LUE	2 Bytes	-	-
	2301	803102	LION-DI16-72V-110V-LUE	2 Bytes	-	-
Digital Output	2400	803201	LION-RO8-LUE	3 Bytes	1 Byte	-
	2401	803202	LION-DO16-24V-LUE	3 Bytes (18 Bits)	2 Bytes	-
	2402	803203	LION-DO8-24V-110V-LUE	1 Byte	1 Byte	-
	2403	803204	LION-DO16-24V-4X4-LUE	3 Bytes (20 Bits)	2 Bytes	-
Analog Input	2500	803303	LION-AI4-PT100-LUE	10 Bytes	-	-
	2501	803301	LION-AI4-U-LUE	10 Bytes	-	-
	2502	803302	LION-AI4-I-LUE	10 Bytes	-	-
	2503	803304	LION-AI4-PT1000-LUE	10 Bytes	-	-
	2504	803306	LION-AI4-U-LUE +/-10V	10 Bytes	-	-
Analog Output	2600	803401	LION-AO4-U-LUE	2 Bytes	8 Bytes	-
	2601	803402	LION-AO4-I-LUE	2 Bytes	8 Bytes	-
	2602	803403	LION-AO4-U-LUE +/-10V	2 Bytes	8 Bytes	-
Line Coupler	2700	800102	LION-LC-M12-LUE	-	-	-

## 12.2

## Examples

## 12.2.1

## Mapping of the analog output modules

How the input data and output data appear in the LION framework will now be explained in more detail. For this purpose, the **analog output module part no. 803401 (ID 2600)** is used as an example.

The module 803401 (ID 2600) is an analog output module.

The module can output a voltage from 0 to 10 V. The four outputs are controlled via the 8-byte output data.

So, each output has 2 bytes, with which the voltage can be regulated.

Via the 2-byte input data, which the module returns, it indicates errors of the outputs. These errors can be for example overtemperature, overload or overtemperature.

1. The following figure shows the analog module 803401 (ID 2600) in a **sink port**. Since it is a sink port, **only the output data is displayed**.

The screenshot displays the IO Station Configurator interface. On the left, the 'Source/Sink Ports' tree shows 'Sink-Port 3000 [32 bytes]' selected. The central 'Sink PVNames' table is empty. The 'Details' panel on the right shows the 'Offset' field set to 64 and 'Type' as 'Unsigned 16-bit 2 bytes'. Below this, the 'Port-Area' table shows a grid of 32 ports (0-31) with their respective data types. The 'I/O-Module' section shows the module '2600' and its 'LION-404-U-LUE' configuration. The 'Port-Area' table is as follows:

Port	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31
0x0	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31
0x20	32	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48	49	50	51	52	53	54	55	56	57	58	59	60	61	62	63
0x40	64	65	66	67	68	69	70	71	72	73	74	75	76	77	78	79	80	81	82	83	84	85	86	87	88	89	90	91	92	93	94	95
0x60	96	97	98	99	100	101	102	103	104	105	106	107	108	109	110	111	112	113	114	115	116	117	118	119	120	121	122	123	124	125	126	127
0x80	128	129	130	131	132	133	134	135	136	137	138	139	140	141	142	143	144	145	146	147	148	149	150	151	152	153	154	155	156	157	158	159
0xA0	160	161	162	163	164	165	166	167	168	169	170	171	172	173	174	175	176	177	178	179	180	181	182	183	184	185	186	187	188	189	190	191
0xC0	192	193	194	195	196	197	198	199	200	201	202	203	204	205	206	207	208	209	210	211	212	213	214	215	216	217	218	219	220	221	222	223
0xE0	224	225	226	227	228	229	230	231	232	233	234	235	236	237	238	239	240	241	242	243	244	245	246	247	248	249	250	251	252	253	254	255

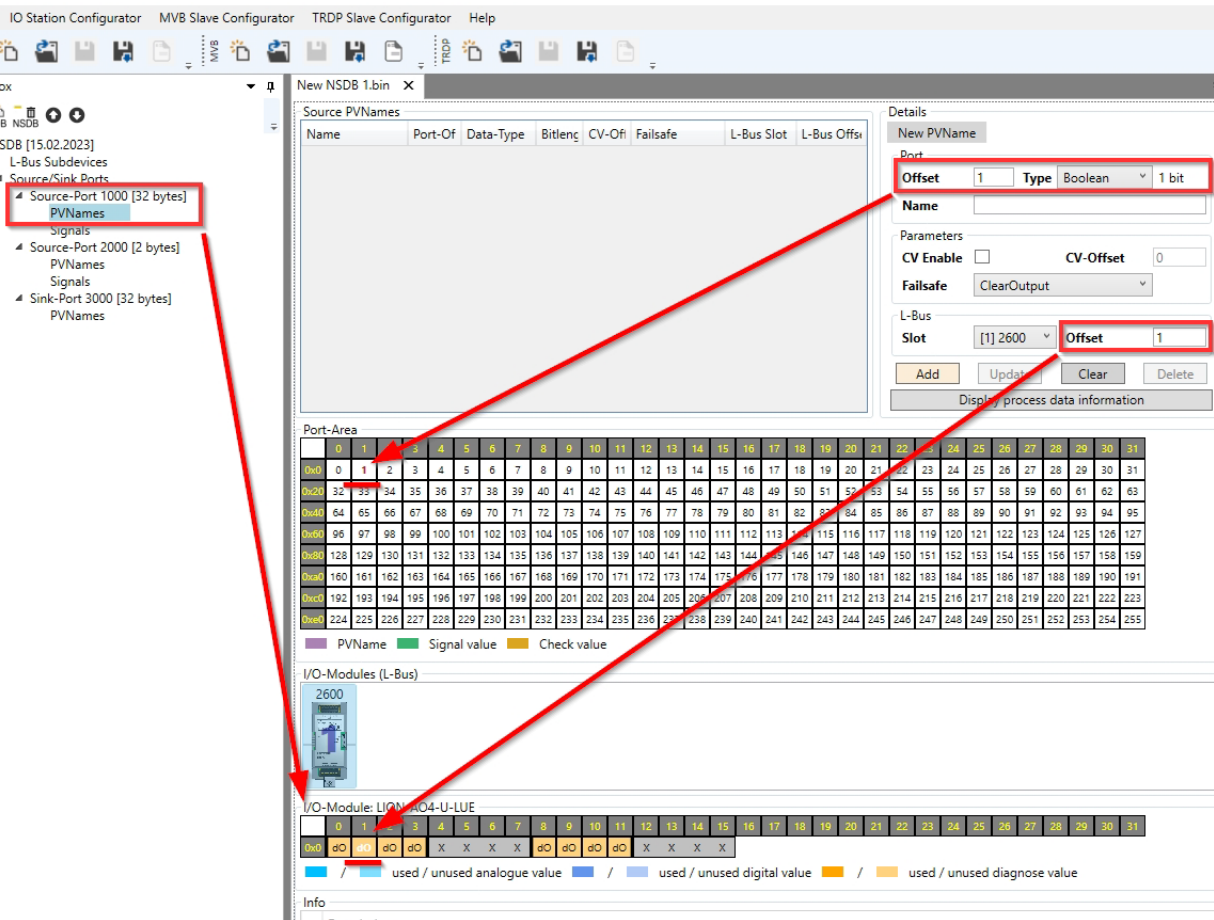
The 'I/O-Module' section shows the module '2600' and its 'LION-404-U-LUE' configuration. The 'Port-Area' table is as follows:

Port	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31
0x0	AO	AO	AO	AO	AO	AO	AO	AO	AO	AO	AO	AO	AO	AO	AO	AO	AO	AO	AO	AO	AO	AO	AO	AO	AO	AO	AO	AO	AO	AO	AO	AO
0x20	AO	AO	AO	AO	AO	AO	AO	AO	AO	AO	AO	AO	AO	AO	AO	AO	AO	AO	AO	AO	AO	AO	AO	AO	AO	AO	AO	AO	AO	AO	AO	AO



2. If the module 803401 is called in a **source port**, **only the input data** of the module are displayed.

IO Station Configurator   MVB Slave Configurator   TRDP Slave Configurator   Help



**NOTICE**

**Input data appears only in source ports.**

**Output data appears only in sink ports.**

3. When the output or input data has been mapped to a port, the color display changes. This allows you to see which data is already mapped and which is not yet.

### 3.1 Analog output signals of 803401 mapped to the sink port:

**Sink PVNames**

Name	Port-Of	Data-Type	Bitlength	CV-Off	Failsafe	L-Bus Slot	L-Bus Offset
AnalogOutput1	64	Unsigned 16	16	unused	ClearOutput	1	32

**Details**

Selected PVName

Port  
Offset: 64 Type: Unsigned 16 2 bytes  
Name: AnalogOutput1

Parameters  
CV Enable: ☐ CV-Offset: 0  
Failsafe: ClearOutput

L-Bus  
Slot: [1] 2600 Offset: 32

Buttons: Add, Update, Clear, Delete

Append new PV with actual parameters to list of PVNames Display process data information

**Port-Area**

Port	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31
0x0	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31
0x1	32	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48	49	50	51	52	53	54	55	56	57	58	59	60	61	62	63
0x2	64	65	66	67	68	69	70	71	72	73	74	75	76	77	78	79	80	81	82	83	84	85	86	87	88	89	90	91	92	93	94	95
0x3	96	97	98	99	100	101	102	103	104	105	106	107	108	109	110	111	112	113	114	115	116	117	118	119	120	121	122	123	124	125	126	127

Legend: PVName (purple), Signal value (green), Check value (yellow)

**I/O-Modules (L-Bus)**

2600

**I/O-Module: LION-AO4-U-LUE**

Port	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31
0x0	AO	AO	AO	AO	AO	AO	AO	AO	AO	AO	AO	AO	AO	AO	AO	AO	AO	AO	AO	AO	AO	AO	AO	AO	AO	AO	AO	AO	AO	AO	AO	
0x1	AO	AO	AO	AO	AO	AO	AO	AO	AO	AO	AO	AO	AO	AO	AO	AO	AO	AO	AO	AO	AO	AO	AO	AO	AO	AO	AO	AO	AO	AO	AO	

Legend: / (blue), used / unused analogue value (light blue), / (dark blue), used / unused digital value (orange), / (yellow), used / unused diagnose value (light orange)

Info

### 3.2 Input data (= diagnostic data) of 803401 are mapped to the source port:

**Source PVNames**

Name	Port-Of	Data-Type	Bitlength	CV-Off	Failsafe	L-Bus Slot	L-Bus Offset
DiagnosticData_1	1	Boolean	1	unused	ClearOutput	1	1

**Details**

Selected PVName

Port  
Offset: 1 Type: Boolean 1 bit  
Name: DiagnosticData\_1

Parameters  
CV Enable: ☐ CV-Offset: 0  
Failsafe: ClearOutput

L-Bus  
Slot: [1] 2600 Offset: 1

Buttons: Add, Update, Clear, Delete

Append new PV with actual parameters to list of PVNames Display process data information

**Port-Area**

Port	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31
0x0	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31
0x1	32	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48	49	50	51	52	53	54	55	56	57	58	59	60	61	62	63
0x2	64	65	66	67	68	69	70	71	72	73	74	75	76	77	78	79	80	81	82	83	84	85	86	87	88	89	90	91	92	93	94	95
0x3	96	97	98	99	100	101	102	103	104	105	106	107	108	109	110	111	112	113	114	115	116	117	118	119	120	121	122	123	124	125	126	127

Legend: PVName (purple), Signal value (green), Check value (yellow)

**I/O-Modules (L-Bus)**

2600

**I/O-Module: LION-AO4-U-LUE**

Port	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31
0x0	dO	dO	dO	dO	dO	dO	dO	dO	dO	dO	dO	dO	dO	dO	dO	dO	dO	dO	dO	dO	dO	dO	dO	dO	dO	dO	dO	dO	dO	dO	dO	
0x1	dO	dO	dO	dO	dO	dO	dO	dO	dO	dO	dO	dO	dO	dO	dO	dO	dO	dO	dO	dO	dO	dO	dO	dO	dO	dO	dO	dO	dO	dO	dO	

Legend: / (blue), used / unused analogue value (light blue), / (dark blue), used / unused digital value (orange), / (yellow), used / unused diagnose value (light orange)

Info

Description

## 12.2.2

## Mapping of the analog input modules

Here is an example with the analog input module 803301 / ID 2501.

Analog input modules can only mapped to the source port:

The screenshot displays the LION LCF Tool interface for configuring an analog input module. On the left, a tree view shows the project structure with 'Source/Sink Ports' expanded, highlighting 'Source-Port 2000 [2 bytes]' and 'PVNames'. The main window is divided into several sections:

- Source PVNames:** A table listing available source ports. The entry 'AI\_1' is highlighted in blue, indicating it is selected. The table columns are Name, Port-Of, Data-Type, Bitleng, CV-Of, Failsafe, L-Bus Slot, and L-Bus Offset.
- Details:** A panel on the right showing the configuration for the selected 'AI\_1' port. It includes fields for Port (AI\_1), Offset (0), Type (Unsigned 16), and 2 bytes. Parameters like CV Enable, CV-Offset (0), Failsafe (ClearOutput), and L-Bus Slot ([1] 2501) are also visible.
- Port-Area:** A grid showing the mapping of ports to physical addresses. The 'AI\_1' port is mapped to address 0.
- I/O-Modules (L-Bus):** A list of modules connected to the L-Bus. The module '2501' is highlighted, corresponding to the selected source port.
- I/O-Module: LION-AI4-U-LUE:** A detailed view of the module's internal structure, showing a grid of ports and their corresponding physical addresses. The 'AI\_1' port is mapped to address 0.

A red box highlights the 'AI\_1' port in the Source PVNames table and the 'AI\_1' port in the I/O-Module: LION-AI4-U-LUE grid. A red arrow points from the 'AI\_1' port in the Source PVNames table to the 'AI\_1' port in the I/O-Module: LION-AI4-U-LUE grid.

## 12.2.3

## Mapping of the digital output modules

1. Digital output of 803201 / ID 2400 are mapped to the sink port:

The screenshot displays the LION LCF Tool interface for configuring a digital output module. On the left, a tree view shows the project structure with 'Source/Sink Ports' expanded, highlighting 'Sink-Port 3000 [16 bytes]' and 'PVNames'. The main window is divided into several sections:

- Sink PVNames:** A table listing available sink ports. The entry 'DO\_1' is highlighted in blue, indicating it is selected. The table columns are Name, Port-Of, Data-Type, Bitleng, CV-Of, Failsafe, L-Bus Slot, and L-Bus Offset.
- Details:** A panel on the right showing the configuration for the selected 'DO\_1' port. It includes fields for Port (DO\_1), Offset (0), Type (Boolean), and 1 bit. Parameters like CV Enable, CV-Offset (0), Failsafe (ClearOutput), and L-Bus Slot ([1] 2400) are also visible.
- Port-Area:** A grid showing the mapping of ports to physical addresses. The 'DO\_1' port is mapped to address 0.
- I/O-Modules (L-Bus):** A list of modules connected to the L-Bus. The module '2400' is highlighted, corresponding to the selected sink port.
- I/O-Module: LION-RO8-LUE:** A detailed view of the module's internal structure, showing a grid of ports and their corresponding physical addresses. The 'DO\_1' port is mapped to address 0.

A red box highlights the 'DO\_1' port in the Sink PVNames table and the 'DO\_1' port in the I/O-Module: LION-RO8-LUE grid. A red arrow points from the 'DO\_1' port in the Sink PVNames table to the 'DO\_1' port in the I/O-Module: LION-RO8-LUE grid.

## 2. Digital input (= Diag) of 803201 / ID 2400 are mapped to the source port:

Source PVNames

Name	Port-Of	Data-Type	Bitleng	CV-Of	Failsafe	L-Bus Slot	L-Bus Offs
DO_2	0	Boolean	1	unused	ClearOutput	1	0
DO_3a	1	BCD/Enum	4	unused	ClearOutput	1	1

Details

Selected PVName

Port

Offset: 1 Type: BCD/Enum 4 bits

Name: DO\_3a

Parameters

CV Enable: ☐ CV-Offset: 0

Failsafe: ClearOutput

L-Bus

Slot: [1] 2400 Offset: 1

Add Update Clear Delete

Append new PV with actual parameters to list of PVNames

Port-Area

Port	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31
DO_2	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31
DO_3a	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31

I/O-Modules (L-Bus)

2400

I/O-Module: LION-RO8-LUE

Port	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31
DO_2	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31
DO_3a	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31

Info

Description

## 12.2.4

## Mapping of the digital input modules

Here is another example with the digital input module (e.g., 803101 / ID 2300)

Digital input modules can only mapped to the source port:

Source PVNames

Name	Port-Of	Data-Type	Bitleng	CV-Of	Failsafe	L-Bus Slot	L-Bus Offs
DigitalInput_1	0	BITSET 8	8	unused	ClearOutput	1	0

Details

Selected PVName

Port

Offset: 0 Type: BITSET 8 8 bits

Name: DigitalInput\_1

Parameters

CV Enable: ☐ CV-Offset: 0

Failsafe: ClearOutput

L-Bus

Slot: [1] 2300 Offset: 0

Add Update Clear Delete

Display process data information

Port-Area

Port	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
DigitalInput_1	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15

I/O-Modules (L-Bus)

2300

I/O-Module: LION-DI 5-24V-36V-LUE

Port	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31
DigitalInput_1	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31

Info

Description

## 12.2.5

## Mapping of the digital input/output modules

1. Digital input / Digital output of 803501 / ID 900 are mapped to the sink port:

**Sink PVNames**

Name	Port-Of	Data-Type	Bitlength	CV-Off	Failsafe	L-Bus Slot	L-Bus Offset
DIDO_DO_1	4	Boolean	1	unused	ClearOutput	1	4

**Port-Area**

Port	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31
DO0	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31
DO1	32	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48	49	50	51	52	53	54	55	56	57	58	59	60	61	62	63
DO2	64	65	66	67	68	69	70	71	72	73	74	75	76	77	78	79	80	81	82	83	84	85	86	87	88	89	90	91	92	93	94	95
DO3	96	97	98	99	100	101	102	103	104	105	106	107	108	109	110	111	112	113	114	115	116	117	118	119	120	121	122	123	124	125	126	127

**I/O-Modules (L-Bus)**

900 901

**I/O-Module: LION-SAFE-DI16-DO8-LV-LUE**

Port	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31
DO	DO	DO	DO	DO	DO	DO	DO	DO	DO	DO	DO	DO	DO	DO	DO	DO	DO	DO	DO	DO	DO	DO	DO	DO	DO	DO	DO	DO	DO	DO	DO	

**Info**

Description

2. Digital input / Diagnostic data of 803501 / ID 900 are mapped to the source port:

**Source PVNames**

Name	Port-Of	Data-Type	Bitlength	CV-Off	Failsafe	L-Bus Slot	L-Bus Offset
DIDO_1	0	BITSET 8	8	unused	ClearOutput	1	0

**Port-Area**

Port	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31
DO0	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31
DO1	32	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48	49	50	51	52	53	54	55	56	57	58	59	60	61	62	63
DO2	64	65	66	67	68	69	70	71	72	73	74	75	76	77	78	79	80	81	82	83	84	85	86	87	88	89	90	91	92	93	94	95
DO3	96	97	98	99	100	101	102	103	104	105	106	107	108	109	110	111	112	113	114	115	116	117	118	119	120	121	122	123	124	125	126	127

**I/O-Modules (L-Bus)**

900 901

**I/O-Module: LION-SAFE-DI16-DO8-LV-LUE**

Port	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31
DI	DI	DI	DI	DI	DI	DI	DI	DI	DI	DI	DI	DI	DI	DI	DI	DI	DI	DI	DI	DI	DI	DI	DI	DI	DI	DI	DI	DI	DI	DI	DI	
DO	DO	DO	DO	DO	DO	DO	DO	DO	DO	DO	DO	DO	DO	DO	DO	DO	DO	DO	DO	DO	DO	DO	DO	DO	DO	DO	DO	DO	DO	DO	DO	

**Info**

Description



## 12.3 Overview DEVICES - Input data / Output data

### 12.3.1 Digital inputs

ID	Type	Part number	Input data	Output data																																																																	
2300	LION-DI16-24V-36V-LUE	803101	2 Bytes	-																																																																	
Input Data																																																																					
<table><tr><td></td><td>0</td><td>1</td><td>2</td><td>3</td><td>4</td><td>5</td><td>6</td><td>7</td><td>8</td><td>9</td><td>10</td><td>11</td><td>12</td><td>13</td><td>14</td><td>15</td><td>16</td><td>17</td><td>18</td><td>19</td><td>20</td><td>21</td><td>22</td><td>23</td><td>24</td><td>25</td><td>26</td><td>27</td><td>28</td><td>29</td><td>30</td><td>31</td></tr><tr><td>0x0</td><td>DI</td><td>DI</td><td>DI</td><td>DI</td><td>DI</td><td>DI</td><td>DI</td><td>DI</td><td>DI</td><td>DI</td><td>DI</td><td>DI</td><td>DI</td><td>DI</td><td>DI</td><td>DI</td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td></tr></table>						0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	0x0	DI	DI	DI	DI	DI	DI	DI	DI	DI	DI	DI	DI	DI	DI	DI	DI															
	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31																																					
0x0	DI	DI	DI	DI	DI	DI	DI	DI	DI	DI	DI	DI	DI	DI	DI	DI																																																					
Output Data																																																																					
<table><tr><td></td><td>0</td><td>1</td><td>2</td><td>3</td><td>4</td><td>5</td><td>6</td><td>7</td><td>8</td><td>9</td><td>10</td><td>11</td><td>12</td><td>13</td><td>14</td><td>15</td><td>16</td><td>17</td><td>18</td><td>19</td><td>20</td><td>21</td><td>22</td><td>23</td><td>24</td><td>25</td><td>26</td><td>27</td><td>28</td><td>29</td><td>30</td><td>31</td></tr><tr><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td></tr></table>						0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31																																
	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31																																					
<div><div></div> / <div></div> used / unused analogue value</div> <div><div></div> / <div></div> used / unused digital value</div> <div><div></div> / <div></div> used / unused diagnose value</div>																																																																					

ID	Type	Part number	Input data	Output data																												
2301	LION-DI16-72V-110V-LUE	803102	2 Bytes	-																												
Input Data																																
	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31
0x0	DI	DI	DI	DI	DI	DI	DI	DI	DI	DI	DI	DI	DI	DI	DI	DI																
Output Data																																
	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31
	/ used / unused analogue value / used / unused digital value / used / unused diagnose value																															

ID	Type	Part number	Input data	Output data																												
300	LION-SAFE-DI16-LV-LUE	803103	5 Bytes (33 Bits)	-																												
Input Data																																
	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31
0x0	DI	DI	DI	DI	DI	DI	DI	DI	DI	DI	DI	DI	DI	DI	DI	DI	di	di	di	di	di	di	di	di	di	di	di	di	di	di	di	di
0x20	di	X	X	X	X	X	X	X																								
Output Data																																
	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31
	/    used / unused analogue value    /    used / unused digital value    /    used / unused diagnose value																															

ID	Type	Part number	Input data	Output data																												
301	LION-SAFE-DI16-HV-LUE	803104	5 Bytes (33 Bits)	-																												
Input Data																																
	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31
0x0	DI	DI	DI	DI	DI	DI	DI	DI	DI	DI	DI	DI	DI	DI	DI	DI	di	di	di	di	di	di	di	di	di	di	di	di	di	di	di	di
0x20	di	X	X	X	X	X	X	X																								
Output Data																																
	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31

### 12.3.2 Digital outputs

ID	Type	Part number	Input data	Output data
2400	LION-RO8-LUE	803201	3 Bytes	1 Byte

Configuration Data - Byte [0 .. 15]

Filter  Filter  Filter  Filter

0x00 0x00 0x00 0x00 0x00 0x00 0x00 0x00 0x00 0x00 0x00 0x00 0x00 0x00 0x00 0x00

Input Data

	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31
0x0	dO	dO	dO	dO	dO	dO	dO	dO	dO	dO	dO	dO	dO	dO	dO	dO	dO	dO	dO	dO	dO	dO	dO	dO	dO	dO	dO	dO	dO	dO	dO	

Output Data

	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31
0x0	DO	DO	DO	DO	DO	DO	DO	DO																								

■ / ■ used / unused analogue value 
 ■ / ■ used / unused digital value 
 ■ / ■ used / unused diagnose value

ID	Type	Part number	Input data	Output data
2401	LION-DO16-24V-LUE	803202	3 Bytes (18 Bits)	2 Bytes

Configuration Data - Byte [0 .. 15]

Filter  Filter  Filter  Filter

0x00 0x00 0x00 0x00 0x00 0x00 0x00 0x00 0x00 0x00 0x00 0x00 0x00 0x00 0x00 0x00

Input Data

	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31
0x0	dO	dO	dO	dO	dO	dO	dO	dO	dO	dO	dO	dO	dO	dO	dO	dO	dO	dO	X	X	X	X	X	X								

Output Data

	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31
0x0	DO	DO	DO	DO	DO	DO	DO	DO	DO	DO	DO	DO	DO	DO	DO	DO																

■ / ■ used / unused analogue value 
 ■ / ■ used / unused digital value 
 ■ / ■ used / unused diagnose value

ID	Type	Part number	Input data	Output data
2402	LION-DO8-24V-110V-LUE	803203	1 Byte	1 Byte

Configuration Data - Byte [0 .. 15]

Filter  Filter  Filter  Filter

0x00 0x00 0x00 0x00 0x00 0x00 0x00 0x00 0x00 0x00 0x00 0x00 0x00 0x00 0x00 0x00

Input Data

	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31
0x0	dO	dO	dO	dO	dO	dO	dO	dO																								

Output Data

	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31
0x0	DO	DO	DO	DO	DO	DO	DO	DO																								

■ / ■ used / unused analogue value 
 ■ / ■ used / unused digital value 
 ■ / ■ used / unused diagnose value

ID	Type	Part number	Input data	Output data
2403	LION-DO16-24V-4X4-LUE	803204	3 Bytes (20 Bits)	2 Bytes

Configuration Data - Byte [0 .. 15]

Filter  Filter  Filter  Filter

0x00 0x00 0x00 0x00 0x00 0x00 0x00 0x00 0x00 0x00 0x00 0x00 0x00 0x00 0x00 0x00

Input Data

	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31
0x0	dO	dO	dO	dO	dO	dO	dO	dO	dO	dO	dO	dO	dO	dO	dO	dO	dO	dO	dO	X	X	X	X									

Output Data

	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31
0x0	DO	DO	DO	DO	DO	DO	DO	DO	DO	DO	DO	DO	DO	DO	DO	DO																

■ / ■ used / unused analogue value 
 ■ / ■ used / unused digital value 
 ■ / ■ used / unused diagnose value

### 12.3.3 Analog inputs

ID	Type	Part number	Input data	Output data																												
2501	LION-AI4-U-LUE	803301	10 Bytes	-																												
Input Data																																
	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31
0x0	AI	AI	AI	AI	AI	AI	AI	AI	AI	AI	AI	AI	AI	AI	AI	AI	AI	AI	AI	AI	AI	AI	AI	AI	AI	AI	AI	AI	AI	AI	AI	AI
0x20	AI	AI	AI	AI	AI	AI	AI	AI	AI	AI	AI	AI	AI	AI	AI	AI	AI	AI	AI	AI	AI	AI	AI	AI	AI	AI	AI	AI	AI	AI	AI	AI
0x40	di	di	di	di	di	X	X	X	X	di	di	di	di	X	X	X	X															
Output Data																																
	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31
/    /    used / unused analogue value    /    /    used / unused digital value    /    /    used / unused diagnose value																																

ID	Type	Part number	Input data	Output data																												
2502	LION-AI4-I-LUE	803302	10 Bytes	-																												
Input Data																																
	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31
0x0	AI	AI	AI	AI	AI	AI	AI	AI	AI	AI	AI	AI	AI	AI	AI	AI	AI	AI	AI	AI	AI	AI	AI	AI	AI	AI	AI	AI	AI	AI	AI	AI
0x20	AI	AI	AI	AI	AI	AI	AI	AI	AI	AI	AI	AI	AI	AI	AI	AI	AI	AI	AI	AI	AI	AI	AI	AI	AI	AI	AI	AI	AI	AI	AI	AI
0x40	di	di	di	di	di	X	X	X	X	di	di	di	di	di	di	di	di															
Output Data																																
	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31
/    /    used / unused analogue value    /    /    used / unused digital value    /    /    used / unused diagnose value																																

ID	Type	Part number	Input data	Output data																												
2500	LION-AI4-PT100-LUE	803303	10 Bytes	-																												
Input Data																																
	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31
0x0	AI	AI	AI	AI	AI	AI	AI	AI	AI	AI	AI	AI	AI	AI	AI	AI	AI	AI	AI	AI	AI	AI	AI	AI	AI	AI	AI	AI	AI	AI	AI	AI
0x20	AI	AI	AI	AI	AI	AI	AI	AI	AI	AI	AI	AI	AI	AI	AI	AI	AI	AI	AI	AI	AI	AI	AI	AI	AI	AI	AI	AI	AI	AI	AI	AI
0x40	di	di	di	di	di	X	X	X	X	di	di	di	di	X	X	X	X															
Output Data																																
	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31
/    /    used / unused analogue value    /    /    used / unused digital value    /    /    used / unused diagnose value																																

ID	Type	Part number	Input data	Output data																												
2503	LION-AI4-PT1000-LUE	803304	10 Bytes	-																												
Input Data																																
	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31
0x0	AI	AI	AI	AI	AI	AI	AI	AI	AI	AI	AI	AI	AI	AI	AI	AI	AI	AI	AI	AI	AI	AI	AI	AI	AI	AI	AI	AI	AI	AI	AI	AI
0x20	AI	AI	AI	AI	AI	AI	AI	AI	AI	AI	AI	AI	AI	AI	AI	AI	AI	AI	AI	AI	AI	AI	AI	AI	AI	AI	AI	AI	AI	AI	AI	AI
0x40	di	di	di	di	di	X	X	X	X	di	di	di	di	X	X	X	X															
Output Data																																
	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31
/    /    used / unused analogue value    /    /    used / unused digital value    /    /    used / unused diagnose value																																

ID	Type	Part number	Input data	Output data																												
500	LION-SAFE-AI4-I-LUE	803305	10 Bytes	-																												
Input Data																																
	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31
0x0	AI	AI	AI	AI	AI	AI	AI	AI	AI	AI	AI	AI	AI	AI	AI	AI	AI	AI	AI	AI	AI	AI	AI	AI	AI	AI	AI	AI	AI	AI	AI	AI
0x20	AI	AI	AI	AI	AI	AI	AI	AI	AI	AI	AI	AI	AI	AI	AI	AI	AI	AI	AI	AI	AI	AI	AI	AI	AI	AI	AI	AI	AI	AI	AI	AI
0x40	di	di	di	di	di	di	di	di	di	di	di	di	di	di	di	di	di															
Output Data																																
	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31
/    /    used / unused analogue value    /    /    used / unused digital value    /    /    used / unused diagnose value																																



ID	Type	Part number	Input data	Output data
<b>2504</b>	<b>LION-AI4-U-LUE+/-10V</b>	<b>803306</b>	<b>10 Bytes</b>	<b>-</b>

Input Data

	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31
0x0	AI	AI	AI	AI	AI	AI	AI	AI	AI	AI	AI	AI	AI	AI	AI	AI	AI	AI	AI	AI	AI	AI	AI	AI	AI	AI	AI	AI	AI	AI	AI	AI
0x20	AI	AI	AI	AI	AI	AI	AI	AI	AI	AI	AI	AI	AI	AI	AI	AI	AI	AI	AI	AI	AI	AI	AI	AI	AI	AI	AI	AI	AI	AI	AI	AI
0x40	di	di	di	di	di	di	di	di	di	di	di	di	di	di	di	di	di	di	di	di	di	di	di	di	di	di	di	di	di	di	di	di

Output Data

	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31
--	---	---	---	---	---	---	---	---	---	---	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----

■ / ■ used / unused analogue value  
 ■ / ■ used / unused digital value  
 ■ / ■ used / unused diagnose value

### 12.3.4 Analog outputs

ID	Type	Part number	Input data	Output data
2600	LION-AO4-U-LUE	803401	2 Bytes	8 Bytes

Configuration Data - Byte [0 .. 15]

Filter

-

Filter

-

Filter

-

Filter

-

Filter

Apply

0x00 0x00 0x00 0x00 0x00 0x00 0x00 0x00 0x00 0x00 0x00 0x00 0x00 0x00 0x00 0x00

Input Data

	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31
0x0	dO	dO	dO	dO	X	X	X	X	dO	dO	dO	dO	X	X	X	X																

Output Data

	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31
0x0	AO	AO	AO	AO	AO	AO	AO	AO	AO	AO	AO	AO	AO	AO	AO	AO	AO	AO	AO	AO	AO	AO	AO	AO	AO	AO	AO	AO	AO	AO	AO	AO
0x20	AO	AO	AO	AO	AO	AO	AO	AO	AO	AO	AO	AO	AO	AO	AO	AO	AO	AO	AO	AO	AO	AO	AO	AO	AO	AO	AO	AO	AO	AO	AO	AO

/

used / unused analogue value

/

used / unused digital value

/

used / unused diagnose value

ID	Type	Part number	Input data	Output data
<b>2601</b>	<b>LION-AO4-I-LUE</b>	<b>803402</b>	<b>2 Bytes</b>	<b>8 Bytes</b>

Configuration Data - Byte [0 .. 15]

Filter  Filter  Filter  Filter

0x00 0x00 0x00 0x00 0x00 0x00 0x00 0x00 0x00 0x00 0x00 0x00 0x00 0x00 0x00 0x00

Input Data

	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31
0x0	dO	dO	dO	dO	X	X	X	X	dO	dO	dO	dO	X	X	X	X																

Output Data

	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31
0x0	AO	AO	AO	AO	AO	AO	AO	AO	AO	AO	AO	AO	AO	AO	AO	AO	AO	AO	AO	AO	AO	AO	AO	AO	AO	AO	AO	AO	AO	AO	AO	AO
0x20	AO	AO	AO	AO	AO	AO	AO	AO	AO	AO	AO	AO	AO	AO	AO	AO	AO	AO	AO	AO	AO	AO	AO	AO	AO	AO	AO	AO	AO	AO	AO	AO

■ / ■ used / unused analogue value  
 ■ / ■ used / unused digital value  
 ■ / ■ used / unused diagnose value

ID	Type	Part number	Input data	Output data
<b>2602</b>	<b>LION-AO4-U-LUE +/-10V</b>	<b>803403</b>	<b>2 Bytes</b>	<b>8 Bytes</b>

Configuration Data - Byte [0 .. 15]

Filter  Filter  Filter  Filter

0x00 0x00 0x00 0x00 0x00 0x00 0x00 0x00 0x00 0x00 0x00 0x00 0x00 0x00 0x00 0x00

Input Data

	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31
0x0	dO	dO	dO	dO	X	X	X	X	dO	dO	dO	dO	dO	dO	dO	dO																

Output Data

	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31
0x0	AO	AO	AO	AO	AO	AO	AO	AO	AO	AO	AO	AO	AO	AO	AO	AO	AO	AO	AO	AO	AO	AO	AO	AO	AO	AO	AO	AO	AO	AO	AO	AO
0x20	AO	AO	AO	AO	AO	AO	AO	AO	AO	AO	AO	AO	AO	AO	AO	AO	AO	AO	AO	AO	AO	AO	AO	AO	AO	AO	AO	AO	AO	AO	AO	AO

■ / ■ used / unused analogue value  
 ■ / ■ used / unused digital value  
 ■ / ■ used / unused diagnose value

### 12.3.5 Digital input/ digital output

ID	Type	Part number	Input data	Output data
900	LION-SAFE-DI16-DO8-LV-LUE	803501	9 Bytes (69 Bits)	1 Byte

Configuration Data - Byte [0 .. 15]

Filter Pot. Group A  Filter Pot. Group B  Filter Pot. Group C  Filter Pot. Group D

0x01 0x01 0x01 0x01 0x00 0x00 0x00 0x00 0x00 0x00 0x00 0x00 0x00 0x00 0x00 0x00

Input Data

	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31
0x0	DI	DI	DI	DI	DI	DI	DI	DI	DI	DI	DI	DI	DI	DI	DI	DI	di	di	di	di	di	di	di	di	di	di	di	di	di	di	di	di
0x20	do	do	do	do	do	do	do	do	do	do	do	do	do	do	do	do	do	do	do	do	do	do	do	do	do	do	do	do	do	do	do	do
0x40	do	do	do	do	di	X	X	X	X	X	X	X	X	X	X	X																

Output Data

	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31
0x0	DO	DO	DO	DO	DO	DO	DO	DO																								

■ / ■ used / unused analogue value  
 ■ / ■ used / unused digital value  
 ■ / ■ used / unused diagnose value

ID	Type	Part number	Input data	Output data
901	LION-SAFE-DI16-DO8-HV-LUE	803502	9 Bytes (69 Bits)	1 Byte

Configuration Data - Byte [0 .. 15]

Filter Pot. Group A  Filter Pot. Group B  Filter Pot. Group C  Filter Pot. Group D

0x01 0x01 0x01 0x01 0x00 0x00 0x00 0x00 0x00 0x00 0x00 0x00 0x00 0x00 0x00 0x00

Input Data

	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31
0x0	DI	DI	DI	DI	DI	DI	DI	DI	DI	DI	DI	DI	DI	DI	DI	DI	di	di	di	di	di	di	di	di	di	di	di	di	di	di	di	di
0x20	do	do	do	do	do	do	do	do	do	do	do	do	do	do	do	do	do	do	do	do	do	do	do	do	do	do	do	do	do	do	do	do
0x40	do	do	do	do	di	X	X	X	X	X	X	X	X	X	X	X																

Output Data

	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31
0x0	DO	DO	DO	DO	DO	DO	DO	DO																								

■ / ■ used / unused analogue value  
 ■ / ■ used / unused digital value  
 ■ / ■ used / unused diagnose value



## 12.4 Overview DEVICES - Short information of the process datas

### 12.4.1 Digital inputs

ID	Type	Part number	Input data	Output data
2300	LION-DI16-24V-36V-LUE	803101	2 Bytes	-
2301	LION-DI16-72V-110V-LUE	803102	2 Bytes	-

**Input data**

(3) **Dlx**, Signal level

...1 ...2 ...3 ...4 ...5 ...6 ...7 ...8 ...9 ...10 ...11 ...12 ...13 ...14 ...15 ...16

0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31
0x0	DI	DI	DI	DI	DI	DI	DI	DI	DI	DI	DI	DI	DI	DI	DI	DI															

Process data, per channel

**Input Data**

0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31
0x0	DI	DI	DI	DI	DI	DI	DI	DI	DI	DI	DI	DI	DI	DI	DI	DI															

**Output Data**

0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31
---	---	---	---	---	---	---	---	---	---	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----

■ / ■ used / unused analogue value 
 ■ / ■ used / unused digital value 
 ■ / ■ used / unused diagnose value

ID	Type	Part number	Input data	Output data
300	LION-SAFE-DI16-LV-LUE	803103	5 Bytes (33 Bits)	-
301	LION-SAFE-DI16-HV-LUE	803104	5 Bytes (33 Bits)	-

**Input data**

(3) **Dlx**, Signal level

...1 ...2 ...3 ...4 ...5 ...6 ...7 ...8 ...9 ...10 ...11 ...12 ...13 ...14 ...15 ...16

(4) **ERRx**, Test pulse evaluation

...1 ...2 ...3 ...4 ...5 ...6 ...7 ...8 ...9 ...10 ...11 ...12 ...13 ...14 ...15 ...16

0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31
0x0	DI	DI	DI	DI	DI	DI	DI	DI	DI	DI	DI	DI	DI	DI	DI	DI	dl	dl	dl	dl	dl	dl	dl	dl	dl	dl	dl	dl	dl	dl	dl

(5) **CON**, Configuration error, per module  
Configur ation evaluation

0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31
0x20	dl	X	X	X	X	X	X	X																							

■ Process data, per channel  
■ Diagnostic data, per channel  
■ Diagnostic data, per module

**Input Data**

0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31
0x0	DI	DI	DI	DI	DI	DI	DI	DI	DI	DI	DI	DI	DI	DI	DI	DI	dl	dl	dl	dl	dl	dl	dl	dl	dl	dl	dl	dl	dl	dl	dl
0x20	dl	X	X	X	X	X	X	X																							

**Output Data**

0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31
---	---	---	---	---	---	---	---	---	---	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----

■ / ■ used / unused analogue value 
 ■ / ■ used / unused digital value 
 ■ / ■ used / unused diagnose value

## 12.4.2 Digital outputs

ID	Type	Part number	Input data	Output data
2400	LION-RO8-LUE	803201	3 Bytes	1 Byte

**Input data**

(2) **SCCx**, Switching cycle counter

...	1	2	3	4	5	6	7	8																							
LSB	MSB	LSB	MSB	LSB	MSB	LSB	MSB	LSB	MSB	LSB	MSB	LSB	MSB	LSB	MSB																
0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31
0x0	dO	dO	dO	dO	dO	dO	dO	dO	dO	dO	dO	dO	dO	dO	dO	dO	dO	dO	dO	dO	dO	dO	dO	dO	dO	dO	dO	dO	dO	dO	

**Output data**

(3) **ROx**, Signal level

...	1	2	3	4	5	6	7	8																							
0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31
0x0	DO	DO	DO	DO	DO	DO	DO	DO	DO	DO	DO	DO	DO	DO	DO	DO	DO	DO	DO	DO	DO	DO	DO	DO	DO	DO	DO	DO	DO	DO	

Diagnostic data, per relay  
Process data, per relay

Configuration Data - Byte [0 .. 15]

Filter - Filter - Filter - Filter - Apply

0x00 0x00 0x00 0x00 0x00 0x00 0x00 0x00 0x00 0x00 0x00 0x00 0x00 0x00 0x00 0x00

**Input Data**

0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31
0x0	dO	dO	dO	dO	dO	dO	dO	dO	dO	dO	dO	dO	dO	dO	dO	dO	dO	dO	dO	dO	dO	dO	dO	dO	dO	dO	dO	dO	dO	dO	

**Output Data**

0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31
0x0	DO	DO	DO	DO	DO	DO	DO	DO	DO	DO	DO	DO	DO	DO	DO	DO	DO	DO	DO	DO	DO	DO	DO	DO	DO	DO	DO	DO	DO	DO	

used / unused analogue value used / unused digital value used / unused diagnose value

ID	Type	Part number	Input data	Output data
2401	LION-DO16-24V-LUE	803202	3 Bytes (18 Bits)	2 Bytes

**Input data**

(2) **AERRx**, Error signalization (User error)

**PSx**, Supply voltage [per potential group]

...	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	A	B													
0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31
0x0	dO	dO	dO	dO	dO	dO	dO	dO	dO	dO	dO	dO	dO	dO	dO	dO	dO	X	X	X	X	X	X	X	X	X	X	X	X	X	

**Output data**

(3) **DOx**, Signal level

...	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16															
0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31
0x0	DO	DO	DO	DO	DO	DO	DO	DO	DO	DO	DO	DO	DO	DO	DO	DO	DO	DO	DO	DO	DO	DO	DO	DO	DO	DO	DO	DO	DO	DO	

Diagnostic data, per channel or group  
Process data, per channel

Configuration Data - Byte [0 .. 15]

Filter - Filter - Filter - Filter - Apply

0x00 0x00 0x00 0x00 0x00 0x00 0x00 0x00 0x00 0x00 0x00 0x00 0x00 0x00 0x00 0x00

**Input Data**

0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31
0x0	dO	dO	dO	dO	dO	dO	dO	dO	dO	dO	dO	dO	dO	dO	dO	dO	dO	X	X	X	X	X	X	X	X	X	X	X	X	X	

**Output Data**

0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31
0x0	DO	DO	DO	DO	DO	DO	DO	DO	DO	DO	DO	DO	DO	DO	DO	DO	DO	DO	DO	DO	DO	DO	DO	DO	DO	DO	DO	DO	DO	DO	

used / unused analogue value used / unused digital value used / unused diagnose value

ID	Type	Part number	Input data	Output data
2402	LION-DO8-24V-110V-LUE	803203	1 Byte	1 Byte

**Input data**

(2) **AERR<sub>x</sub>**, Error signalization (User error)  
 ...1 ...2 ...3 ...4 ...5 ...6 ...7 ...8

0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31
0x0	dO	dO	dO	dO	dO	dO	dO																								

**Output data**

(3) **DO<sub>x</sub>**, Signal level  
 ...1 ...2 ...3 ...4 ...5 ...6 ...7 ...8

0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31
0x0	DO	DO	DO	DO	DO	DO	DO																								

Diagnostic data, per channel  
Process data, per channel

Configuration Data - Byte [0 .. 15]

Filter  Filter  Filter  Filter

0x00 0x00 0x00 0x00 0x00 0x00 0x00 0x00 0x00 0x00 0x00 0x00 0x00 0x00 0x00 0x00

**Input Data**

0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31
0x0	dO	dO	dO	dO	dO	dO	dO																								

**Output Data**

0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31
0x0	DO	DO	DO	DO	DO	DO	DO																								

■ / ■ used / unused analogue value  
 ■ / ■ used / unused digital value  
 ■ / ■ used / unused diagnose value

ID	Type	Part number	Input data	Output data
2403	LION-DO16-24V-4X4-LUE	803204	3 Bytes (20 Bits)	2 Bytes

**Input data**

(2) **AERR<sub>x</sub>**, Error signalization (User error)      **PS<sub>x</sub>**, Supply voltage [per potential group]  
 ...1 ...2 ...3 ...4 ...5 ...6 ...7 ...8 ...9 ...10 ...11 ...12 ...13 ...14 ...15 ...16 ...A ...B ...C ...D

0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31
0x0	dO	dO	dO	dO	dO	dO	dO	dO	dO	dO	dO	dO	dO	dO	dO	dO	dO	dO	dO	X	X	X	X								

**Output data**

(3) **DO<sub>x</sub>**, Signal level

0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31
0x0	DO	DO	DO	DO	DO	DO	DO	DO	DO	DO	DO	DO	DO	DO	DO																

Diagnostic data, per channel or group  
Process data, per channel

Configuration Data - Byte [0 .. 15]

Filter  Filter  Filter  Filter

0x00 0x00 0x00 0x00 0x00 0x00 0x00 0x00 0x00 0x00 0x00 0x00 0x00 0x00 0x00 0x00

**Input Data**

0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31
0x0	dO	dO	dO	dO	dO	dO	dO	dO	dO	dO	dO	dO	dO	dO	dO	dO	dO	dO	dO	X	X	X	X								

**Output Data**

0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31
0x0	DO	DO	DO	DO	DO	DO	DO	DO	DO	DO	DO	DO	DO	DO	DO																

■ / ■ used / unused analogue value  
 ■ / ■ used / unused digital value  
 ■ / ■ used / unused diagnose value



### 12.4.3 Analog inputs

ID	Type	Part number	Input data	Output data
2501	LION-AI4-U-LUE	803301	10 Bytes	-

Input data

(2) AI1, Value measurement, 12 Bit												(2) AI2, Value measurement, 12 Bit																											
LSB												MSB				X	X	X	X	LSB												MSB				X	X	X	X
0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31								
0x0	AI	AI	AI	AI	AI	AI	AI	AI	AI	AI	AI	AI	AI	AI	AI	AI	AI	AI	AI	AI	AI	AI	AI	AI	AI	AI	AI	AI	AI	AI	AI								

(2) AI3, Value measurement, 12 Bit												(2) AI4, Value measurement, 12 Bit																											
LSB												MSB				X	X	X	X	LSB												MSB				X	X	X	X
0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31								
0x20	AI	AI	AI	AI	AI	AI	AI	AI	AI	AI	AI	AI	AI	AI	AI	AI	AI	AI	AI	AI	AI	AI	AI	AI	AI	AI	AI	AI	AI	AI	AI								

(3) ERRx Hardware error ...1 ...2 ...3 ...4								(3) AERRx Limit error ...1 ...2 ...3 ...4																							
0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31
0x40	dl	dl	dl	dl	X	X	X	X	dl	dl	dl	dl	X	X	X	X															

Process data, per channel

Diagnostic data, per channel

Input Data

0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31
0x0	AI	AI	AI	AI	AI	AI	AI	AI	AI	AI	AI	AI	AI	AI	AI	AI	AI	AI	AI	AI	AI	AI	AI	AI	AI	AI	AI	AI	AI	AI	AI
0x20	AI	AI	AI	AI	AI	AI	AI	AI	AI	AI	AI	AI	AI	AI	AI	AI	AI	AI	AI	AI	AI	AI	AI	AI	AI	AI	AI	AI	AI	AI	AI
0x40	dl	dl	dl	dl	X	X	X	X	dl	dl	dl	dl	X	X	X	X															

ID	Type	Part number	Input data	Output data
2502	LION-AI4-I-LUE	803302	10 Bytes	-

Input data

(2) AI1, Value measurement, 12 Bit

LSB

MSB

X

X

X

X

(2) AI2, Value measurement, 12 Bit

LSB

MSB

X

X

X

X

	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31
0x0	AI	AI	AI	AI	AI	AI	AI	AI	AI	AI	AI	AI	AI	AI	AI	AI	AI	AI	AI	AI	AI	AI	AI	AI	AI	AI	AI	AI	AI	AI	AI	AI

(2) AI3, Value measurement, 12 Bit

LSB

MSB

X

X

X

X

(2) AI4, Value measurement, 12 Bit

LSB

MSB

X

X

X

X

	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31
0x20	AI	AI	AI	AI	AI	AI	AI	AI	AI	AI	AI	AI	AI	AI	AI	AI	AI	AI	AI	AI	AI	AI	AI	AI	AI	AI	AI	AI	AI	AI	AI	AI

(3) ERRx

Hardware error

...1

...2

...3

...4

(3) AERRx

Limit error

...1

...2

...3

...4

	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31
0x40	dl	dl	dl	dl	X	X	X	X	dl	dl	dl	dl	dl	dl	dl	dl																

Process data, per channel

Diagnostic data, per channel

Input Data

	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31
0x0	AI	AI	AI	AI	AI	AI	AI	AI	AI	AI	AI	AI	AI	AI	AI	AI	AI	AI	AI	AI	AI	AI	AI	AI	AI	AI	AI	AI	AI	AI	AI	AI
0x20	AI	AI	AI	AI	AI	AI	AI	AI	AI	AI	AI	AI	AI	AI	AI	AI	AI	AI	AI	AI	AI	AI	AI	AI	AI	AI	AI	AI	AI	AI	AI	AI
0x40	dl	dl	dl	dl	X	X	X	X	dl	dl	dl	dl	dl	dl	dl	dl																

ID	Type	Part number	Input data	Output data
2500	LION-AI4-PT100-LUE	803303	10 Bytes	-
2503	LION-AI4-PT1000-LUE	803304	10 Bytes	-

**Input data**

(2) AI1, Value measurement, 2 Byte

LSB MSB

0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
AI	AI	AI	AI	AI	AI	AI	AI	AI	AI	AI	AI	AI	AI	AI	AI

0x0

(2) AI2, Value measurement, 2 Byte

LSB MSB

16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31
AI	AI	AI	AI	AI	AI	AI	AI	AI	AI	AI	AI	AI	AI	AI	AI

(2) AI3, Value measurement, 2 Byte

LSB MSB

0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
AI	AI	AI	AI	AI	AI	AI	AI	AI	AI	AI	AI	AI	AI	AI	AI

0x20

(2) AI4, Value measurement, 2 Byte

LSB MSB

16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31
AI	AI	AI	AI	AI	AI	AI	AI	AI	AI	AI	AI	AI	AI	AI	AI

(3) ERRx, Hardware error

...1 ...2 ...3 ...4

0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
dl	dl	dl	dl	X	X	X	X	dl	dl	dl	dl	X	X	X	X

0x40

(3) AERRx, Limit error

...1 ...2 ...3 ...4

0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
dl	dl	dl	dl	X	X	X	X	dl	dl	dl	dl	X	X	X	X

Process data, per channel
Diagnostic data, per channel

**Input Data**

0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31
AI	AI	AI	AI	AI	AI	AI	AI	AI	AI	AI	AI	AI	AI	AI	AI	AI	AI	AI	AI	AI	AI	AI	AI	AI	AI	AI	AI	AI	AI	AI	AI
AI	AI	AI	AI	AI	AI	AI	AI	AI	AI	AI	AI	AI	AI	AI	AI	AI	AI	AI	AI	AI	AI	AI	AI	AI	AI	AI	AI	AI	AI	AI	AI
dl	dl	dl	dl	X	X	X	X	dl	dl	dl	dl	X	X	X	X																

ID	Type	Part number	Input data	Output data
500	LION-SAFE-AI4-I-LUE	803305	10 Bytes	-

**Input data**

(2) AI1, Value measurement, 2 Byte

LSB MSB

0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
AI	AI	AI	AI	AI	AI	AI	AI	AI	AI	AI	AI	AI	AI	AI	AI

0x0

(2) AI2, Value measurement, 2 Byte

LSB MSB

16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31
AI	AI	AI	AI	AI	AI	AI	AI	AI	AI	AI	AI	AI	AI	AI	AI

(2) AI3, Value measurement, 2 Byte

LSB MSB

0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
AI	AI	AI	AI	AI	AI	AI	AI	AI	AI	AI	AI	AI	AI	AI	AI

0x20

(2) AI4, Value measurement, 2 Byte

LSB MSB

16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31
AI	AI	AI	AI	AI	AI	AI	AI	AI	AI	AI	AI	AI	AI	AI	AI

(4) DIAGx, Diagnostic data

...1 ...2 ...3 ...4

0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
dl	dl	dl	dl	dl	dl	dl	dl	dl	dl	dl	dl	dl	dl	dl	dl

0x40

(5) CONx, Configuration error, per channel

Configuration evaluation

...1 ...2 ...3 ...4

0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
dl	dl	dl	dl	dl	dl	dl	dl	dl	dl	dl	dl	dl	dl	dl	dl

Process data, per channel
Diagnostic data, per channel
Diagnostic data, per channel

**Input Data**

0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31
AI	AI	AI	AI	AI	AI	AI	AI	AI	AI	AI	AI	AI	AI	AI	AI	AI	AI	AI	AI	AI	AI	AI	AI	AI	AI	AI	AI	AI	AI	AI	AI
AI	AI	AI	AI	AI	AI	AI	AI	AI	AI	AI	AI	AI	AI	AI	AI	AI	AI	AI	AI	AI	AI	AI	AI	AI	AI	AI	AI	AI	AI	AI	AI
dl	dl	dl	dl	dl	dl	dl	dl	dl	dl	dl	dl	dl	dl	dl	dl																



ID	Type	Part number	Input data	Output data																															
2504	LION-AI4-U-LUE+/-10V	803306	10 Bytes	-																															
Input data																																			
(2) AI1, Value measurement, 2 Byte																(2) AI2, Value measurement, 2 Byte																			
LSB																MSB																			
0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15																16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31																			
0x0 AI AI AI AI AI AI AI AI AI AI AI AI AI AI AI AI																AI AI AI AI AI AI AI AI AI AI AI AI AI AI AI AI																			
(2) AI3, Value measurement, 2 Byte																(2) AI4, Value measurement, 2 Byte																			
LSB																MSB																			
0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15																16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31																			
0x20 AI AI AI AI AI AI AI AI AI AI AI AI AI AI AI AI																AI AI AI AI AI AI AI AI AI AI AI AI AI AI AI AI																			
(3) ERRx				(3) AERRx																															
Hardware error				Limit error																															
...1 ...2 ...3 ...4				...1 ...2 ...3 ...4																															
0 1 2 3				4 5 6 7				8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31																											
0x40 dl dl dl dl				dl dl dl dl				dl dl																											
																																Process data, per channel		Diagnostic data, per channel	
Input Data																																			
0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31																																			
0x0 AI																																			
0x20 AI																																			
0x40 dl																																			
Output Data																																			
0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31																																			
used / unused analogue value used / unused digital value used / unused diagnose value																																			

## 12.4.4 Analog outputs

ID	Type	Part number	Input data	Output data
2600	LION-AO4-U-LUE	803401	2 Bytes	8 Bytes
2601	LION-AO4-I-LUE	803402	2 Bytes	8 Bytes

**Input data**

(2) **ERRx**  
Hardware error

...1 ...2 ...3 ...4

(2) **AERRx**  
Limit error

...1 ...2 ...3 ...4

	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31
0x0	dO	dO	dO	dO	X	X	X	X	dO	dO	dO	dO	X	X	X	X																

**Output data**

(3) **AO1**, Desired condition of the outputs, 12 Bit

LSB MSB

(3) **AO2**, Desired condition of the outputs, 12 Bit

LSB MSB

	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31
0x0	AO	AO	AO	AO	AO	AO	AO	AO	AO	AO	AO	AO	AO	AO	AO	AO	AO	AO	AO	AO	AO	AO	AO	AO	AO	AO	AO	AO	AO	AO	AO	

(3) **AO3**, Desired condition of the outputs, 12 Bit

LSB MSB

(3) **AO4**, Desired condition of the outputs, 12 Bit

LSB MSB

	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31
0x20	AO	AO	AO	AO	AO	AO	AO	AO	AO	AO	AO	AO	AO	AO	AO	AO	AO	AO	AO	AO	AO	AO	AO	AO	AO	AO	AO	AO	AO	AO	AO	

Diagnostic data, per channel
  Process data, per channel

Configuration Data - Byte [0 .. 15]

Filter - Filter - Filter - Filter - Apply

0x00 0x00 0x00 0x00 0x00 0x00 0x00 0x00 0x00 0x00 0x00 0x00 0x00 0x00 0x00 0x00

**Input Data**

	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31
0x0	dO	dO	dO	dO	X	X	X	X	dO	dO	dO	dO	X	X	X	X																

**Output Data**

	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31
0x0	AO	AO	AO	AO	AO	AO	AO	AO	AO	AO	AO	AO	AO	AO	AO	AO	AO	AO	AO	AO	AO	AO	AO	AO	AO	AO	AO	AO	AO	AO	AO	
0x20	AO	AO	AO	AO	AO	AO	AO	AO	AO	AO	AO	AO	AO	AO	AO	AO	AO	AO	AO	AO	AO	AO	AO	AO	AO	AO	AO	AO	AO	AO	AO	

/  used / unused analogue value
  /  used / unused digital value
  /  used / unused diagnose value

ID	Type	Part number	Input data	Output data
2602	LION-AO4-U-LUE +/-10V	803403	2 Bytes	8 Bytes

**Input data**

(2) **ERRx**  
Hardware error

...1 ...2 ...3 ...4

(2) **AERRx**  
Limit error

...1 ...2 ...3 ...4

(2) **LIMx**  
Limit error

...1 ...2 ...3 ...4

	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31
0x0	dO	dO	dO	dO	X	X	X	X	dO	dO	dO	dO	dO	dO	dO	dO																

**Output data**

(3) **AO1**, Desired condition of the outputs, 2 Byte

LSB MSB

	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
0x0	AO	AO	AO	AO	AO	AO	AO	AO	AO	AO	AO	AO	AO	AO	AO	AO

(3) **AO2**, Desired condition of the outputs, 2 Byte

LSB MSB

	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31
	AO	AO	AO	AO	AO	AO	AO	AO	AO	AO	AO	AO	AO	AO	AO	AO

(3) **AO3**, Desired condition of the outputs, 2 Byte

LSB MSB

	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
0x20	AO	AO	AO	AO	AO	AO	AO	AO	AO	AO	AO	AO	AO	AO	AO	AO

(3) **AO4**, Desired condition of the outputs, 2 Byte

LSB MSB

	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31
	AO	AO	AO	AO	AO	AO	AO	AO	AO	AO	AO	AO	AO	AO	AO	AO

Diagnostic data, per channel  
 Process data, per channel

Configuration Data - Byte [0 .. 15]

Filter - Filter - Filter - Filter - - Apply

0x00 0x00 0x00 0x00 0x00 0x00 0x00 0x00 0x00 0x00 0x00 0x00 0x00 0x00 0x00 0x00

**Input Data**

	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31
0x0	dO	dO	dO	dO	X	X	X	X	dO	dO	dO	dO	dO	dO	dO	dO																

**Output Data**

	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31
0x0	AO	AO	AO	AO	AO	AO	AO	AO	AO	AO	AO	AO	AO	AO	AO	AO	AO	AO	AO	AO	AO	AO	AO	AO	AO	AO	AO	AO	AO	AO	AO	AO
0x20	AO	AO	AO	AO	AO	AO	AO	AO	AO	AO	AO	AO	AO	AO	AO	AO	AO	AO	AO	AO	AO	AO	AO	AO	AO	AO	AO	AO	AO	AO	AO	AO

/  used / unused analogue value
 /  used / unused digital value
 /  used / unused diagnose value

## 12.4.5 Digital input/ digital output

ID	Type	Part number	Input data	Output data
900	LION-SAFE-DI16-DO8-LV-LUE	803501	9 Bytes (69 Bits)	1 Byte
901	LION-SAFE-DI16-DO8-HV-LUE	803502	9 Bytes (69 Bits)	1 Byte

**Input data**

(3) **DIx**, Signal level

...	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
0x0	DI	DI	DI	DI	DI	DI	DI	DI	DI	DI	DI	DI	DI	DI	DI	DI

(4) **ERRx**, Test pulse evaluation

...	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
	dl	dl	dl	dl	dl	dl	dl	dl	dl	dl	dl	dl	dl	dl	dl	dl

(6) **SOx**, Switching status of outputs

...	1	2	3	4	5	6	7	8
0x20	dO	dO	dO	dO	dO	dO	dO	dO

(7) **TRx**, Switching status of output transistors

...	1	2	3	4	5	6	7	8
	dO	dO	dO	dO	dO	dO	dO	dO

(8) **AERRx**<sup>1)</sup>, Error signalization (User error)

...	1	2	3	4	5	6	7	8
	dO	dO	dO	dO	dO	dO	dO	dO

(9) **ERRx**, Error signalization (Test pulse evaluation)

...	1	2	3	4	5	6	7	8
	dO	dO	dO	dO	dO	dO	dO	dO

(10) **EXTVx**<sup>2)</sup>, External voltage det.

...	1	2	3	4	5	6
0x40	dO	dO	dO	dO	dO	dO

(5) **CON**, Configuration error, per module

...	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31
	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X

<sup>1)</sup> Error signalization (User error) overload, overtemperature, short circuit  
<sup>2)</sup> External voltage detection on plus switching output (on 4 channels)

Process data, per channel

Diagnostic data, per channel (<sup>2</sup> or bits)

Diagnostic data, per module

**Output data**

(11) **DOx**, Target status of outputs

...	1	2	3	4	5	6	7	8
0x0	dO	dO	dO	dO	dO	dO	dO	dO

Configuration Data - Byte [0 .. 15]

Filter Pot. Group A: 1 ms    Filter Pot. Group B: 1 ms    Filter Pot. Group C: 1 ms    Filter Pot. Group D: 1 ms    Apply

0x01 0x01 0x01 0x01 0x00 0x00 0x00 0x00 0x00 0x00 0x00 0x00 0x00 0x00 0x00 0x00

**Input Data**

...	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31
0x0	DI	DI	DI	DI	DI	DI	DI	DI	DI	DI	DI	DI	DI	DI	DI	dl	dl	dl	dl	dl	dl	dl	dl	dl	dl	dl	dl	dl	dl	dl	dl
0x20	dO	dO	dO	dO	dO	dO	dO	dO	dO	dO	dO	dO	dO	dO	dO	dO	dO	dO	dO	dO	dO	dO	dO	dO	dO	dO	dO	dO	dO	dO	dO
0x40	dO	dO	dO	dO	dl	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X

**Output Data**

...	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31
0x0	dO	dO	dO	dO	dO	dO	dO																								

  /   used / unused analogue value   
   /   used / unused digital value   
   /   used / unused diagnose value

12.5

Color legend in the report

Here you can see all the color codes used in the LCF displays.

Legend

Port items

PVNames

Signals

Check values

I/O Module items

used digital values

unused digital values

used analogue values

unused analogue values

used diagnose values

unused diagnose values

General

concurrently used items



## 13

## Maintenance and service

The system and the single modules do not require preventive maintenance.

If you have any further questions regarding the product or our repair service, please contact us at:

**Lütze Transportation GmbH**

Bruckwiesenstraße 17-19

71384 Weinstadt

Germany

Phone: +49 (0) 7151 6053-545

Fax: +49 (0) 7171 6053-6545

E-Mail: Sales.Transportation@luetze.de

## 13.1

## Module exchange



SRAC 02 The higher-level system (i.e. the concrete application) must ensure that in the event of a fault, the LION system is replaced at the latest after 7 days or is de-energized and remains in this state.



LION-034 **If a module has to be exchanged, the time limit of 10 minutes for the exchange must be timed accurately.**

For the exchange, proceed as follows:

Identify the defect module or the module which has to be exchanged, with the help of the diagnostic messages.

1. Switch off the power of the system.
2. Disconnect the interfaces.
3. Demount the module.
4. Mount the new module.
5. Connect the new module.
6. Switch on the power.
7. Test the module regarding any errors. After changing a module a new system test has to be completed.

## 13.2

## Service Life



LION-057 **The modules of Safety Class 2 are intended for a maximum service life of 20 years.**

**After this time, the modules must be taken out of service and replaced by new ones.** Due to the design, a proof test interval is not possible or is only possible if the module is damaged. In this case, further operation is no longer permitted.

## 13.3

## Extending the LION system



**Risk of injury by deploying insufficiently qualified operating personnel**

Inappropriate deployment of not qualified or insufficiently qualified personnel can cause property damage and personal injuries.

- The extending of the LION system applies special procedures and must be done by trained and qualified personnel or experts, especially electricians.

If the LION system has to be extended by any modules, follow these instructions:

1. Switch off the power.
2. Mount and install the module.
3. Configure the extended system with the LION Framework (IODB and NSDB/TDB).
4. Update the planning data.
5. Observe the new reaction time.
6. Upload the new NSDB/TDB on the system, see the "**Operating instructions of the buscoupler**".
7. A new system test has to be completed.
8. If no error occurs, the system can be executed.

## Shutdown and disposal

Observe the valid environmental regulations of your country for the final shutdown and disposal.

Disassemble the device and completely dismantle it before disposal.

Dispose of electric parts in line with the regulation for Waste of Electrical and Electronic Equipment (WEEE) . You assume the obligation to properly dispose of the delivered goods after termination of use at your own expense in accordance with the statutory provisions and release Friedrich Lütze GmbH from the obligations under § 19 section 3 ElektroG (obligation of manufacturers of electrical and electronic equipment to take back electrical and electronic equipment) and related claims of third parties.

If you have handled the device to a commercial third party without any contractual acceptance of the disposal, you have to take back the device after the final shutdown on your own cost and the legal liability.

The claim of Friedrich Lütze GmbH for takeover / indemnification by the customer shall not become time-barred before the expiration of two years after the final termination of the use of the equipment. The two-year period of suspension of expiry shall commence at the earliest upon receipt by Friedrich Lütze GmbH of a written notification on its part of the termination of use.

## 15 Revision of the document

Version	Revision	Date
00	Release (Online help only.) - J. Horn	07/01/2014
00.1	Draft completely revised - A. Berk, D. Briem	08/26/2020
00.1	<p>Corrections and review by Daniel Herbst were carried out. German screenshots were substituted by English ones.</p> <p>6.1.8. Text substituted, 7. Text corrected, 7.3.2 Text and Screenshots deleted resp. exchanged. 7.3.3.1 Coloring of I/O modules deleted, 7.3.3.2 Color coding of port area deleted, 7.4 General port configuration Text added 7.4.2 Create new ports Text extended and corrected, 7.4.3 Create new source port Text extended and corrected,</p> <p>7.4.4 Chapter new name to Port sizes. Chapter 7.4.5. Chapter new name Mapping of Input data to source port and extended with Text and Screenshots Chapter 7.4.6 About Process Data - PVNames/Signals was deleted. Chapter 7.4.6.1 Create New PVName was deleted. Chapter 7.4.6.2.7 was renamed to Mapping diagnostic data in a source port and extended with Text, Screenshots deleted. Chapter 7.4.7 Create a diagnostic port: Text parts and Screenshots were deleted. Structure was manually changed. Since we have the structure automatically generated, we must disregard these</p> <p>changes Chapter 7.4.7. Create a new sink port: Text parts were deleted and substituted with new text. Chapter 7.4.9.2 Error descriptions was deleted, 7.4.10.1</p> <p>Create new ports was deleted. Chapter 7.4.10.2 Append new PVnames to the port was deleted. Chapter 7.4.12 Port configuration of LION Safe modules was deleted. Chapter 7.4.13 Setting of check variables was deleted. Chapter 7.4.1.14 Further port settings was deleted. Chapter 7.5 Types of I/O modules was extended with a display of all modules in the port.</p> <p>Create an NSDB Report was extended with new text Chapter 7.7 Create an</p> <p>NSDB/Report with checksum was deleted.</p> <p>Chapter Remarks was inserted. Chapter 7.9. Example NSDB was deleted. Revision history was generated.</p> <p>-A. Berk, D. Herbst</p>	12/15/2020
00.2	The TRDP part was deleted for the publication of a customized manual. - A. Berk	01/14/2021
00.3	Layout adapted and noted for TRDP information deleted. There will be 2 documents instead: one for MVB bus coupler, one for TRDP (will follow). - A. Berk / D. Herbst / D. Briem	01/26/2021/ 04/30/2021
00.4	Content and structure completely revised together with the development department. There is an external revision document for further details. - D. Briem / S. Strobel	06/25/2021
00.5	Chapter 9 "MVB Slave Configurator": revised; supplemented by the new modules; 11.1 new software version (V2.04.0000) - D. Briem / S. Strobel / V. Nefzer	08/03/2021/ 01/05/2022

01	<i>New bus coupler 803011, LION MVB SIL0 added; New: chapter 9.3.4 Configuration data; New edition: 12.1 Modules ID assignments; New pictures: 12.3.5 Digital input/ digital output - F. Geckeler, D. Herbst, D. Briem</i>	04/22/2022
02	<i>The term MASTER was replaced by HEAD.  New screenshot: 6.1, 7.2; 8.1.4.5.1 - last one, 8.1.4.5.2, 8.1.4.5.3, 8.1.4.5.4, 8.1.4.5.5, 9.3.3, 9.3.4, 9.4, 9.4.2, 9.4.3, 9.5, 9.6, 9.8.1-2, 9.8.2, 9.3.3 L-Bus<sup>2</sup> Sub devices, Chapters 8, 9, 9.81, revised, New: Screenshot; NEW: Chapter Headline: 9.3.3.2 Process data structure; 9.3.4 Configuration data: renamed in "9.3.4 Configuration data and filter settings", texts revised; 9.4.2 Port Settings: New: NOTICE; 9.5:- 9.6 Revised; 9.9 Overview of the modules and port characteristics, New: Marking the modules for which the filter can be set with "*"; 11.1 Current version of the LCF: New: Software version; 11.2 Software versions: New: Software version description; New: 12.4; - D. Herbst, D. Briem</i>	08/01/2022
03	<i>The term I/O module was replaced by DEVICE.  New software designs: 1. integrate the output text NSDB file; 2. validation of SDTv2 configurations and gray out SDTv2 in report; 3. display of process data in PopUp (MVB): 4. integrating the outage disclosure time in the reports (IODB, NSDB, TRDP); 5. integration of additional field for WebServer version (NSDB) incl. report; 6. design change in safety CRC (it was implemented that the safety CRC on the GUI remains red and invalid until the CRC is generated); 7. bugfixing at saving the files  New chapter 9.7.7 Display short info of the process data;  Document completely revised and rebuild in Adobe FrameMaker - D. Herbst, D. Briem</i>	01/31/2023 02/13/2023 02/20/2023
04	<i>New information at: 9.3.2, 2. Base cycle [ms]</i>	04/12/2023
05	<i>Adjustments to chapter headings, chapter order and table of contents</i>	05/24/2023
06	<i>Numbering of the pages was corrected</i>	06/27/2023

*In this publication the legally protected term "QR Code" is used. "QR Code" is a registered trademark of DENSO WAVE INCORPORATED.*



## 16

## Appendix A

Contains safety related application conditions

## 16.1

## Structure note



**SRAC XX Safety-related application condition.**  
Reference to a safety-relevant application condition from the assessment report.  
These references are marked with an ID, for example SRAC 01.

## 16.1.1

## Overview

ID	Safety related application conditions
<b>SRAC 01</b>	The higher-level system - the concrete application - must consider in the definition of the safe state of the application that the generic LION system reports a logical "0" in the event of a failure and in the event of an error.
<b>SRAC 02</b>	The higher-level system - the concrete application - must ensure that in the event of a fault, the LION system is replaced at the latest after 7 days or is de-energized and remains in this state.
<b>SRAC 03</b>	The higher-level system - the concrete application - must consider in the system design that a telegram loss within the timeout is possible and thus data or events that are shorter than the timeout can get lost unnoticed.
<b>SRAC 04</b>	The user must carry out life-sign monitoring (for example, via MVB sink time supervision) of the bus coupler to be able to detect failures of the LION system, to react safely and to maintain the safe state.
<b>SRAC 05</b>	omitted
<b>SRAC 06</b>	The user must ensure that the LION system is protected against unauthorized access.
<b>SRAC 07</b>	The safety qualification tests of the LION system must be carried out as part of the safety qualification tests of the specific higher-level application.
<b>SRAC 08</b>	A validation of the configuration data for commissioning must be carried out.
<b>SRAC 09</b>	Pollution degree for operation at an altitude of > 2000 m up to 4000 m above sea level.  The user must ensure that the degree of pollution PD1 according to EN50124-1 is not exceeded (for example, through a control cabinet with at least IP51).
<b>SRAC 10</b>	Operating voltage for operation at an altitude of > 2000 m up to 4000 m above sea level.  The user must ensure that the maximum permissible operating voltage according to EN50155 is at maximum of 72 V (supply voltage/input voltage/output voltage/ ...).
<b>SRAC 11</b>	Test voltage for operation at an altitude of > 2000 m up to 4000 m above sea level.  The user must ensure that the maximum permissible test voltage between all potentials in the vehicle does not exceed AC 1000 V at an altitude of 4000 m.
<b>SRAC 12</b>	The user must ensure that the area around 0 mA (+/-0,5mA) is not used since the safe AI4 module cannot distinguish between a line break or defective sensor or a measured 0 mA.

## 17

## Appendix B

Contains important information for correct use in SIL-relevant environments

## 17.1

## Structure note



**LION-XXX Important information on correct use in a safety-relevant environment.**  
These notes are marked with an ID, for example LION-001.

## 17.1.1

## Overview

ID	Important information	Old designation (in the versions of the documents see below table)
<b>LION-001</b>	<i>omitted</i>	<i>LION-001 (only Checkpoint)</i>
<b>LION-002</b>	Safety qualification tests of the LION systems	LION-002 + SRAC 07
<b>LION-003</b>	Error reaction of the BC	LION-003 + LION-073 + SRAC 04
<b>LION-004</b>	Ensuring the validity of the configuration.BA	LION-004 + SRAC 08
<b>LION-005</b>	Certification of the system	LION-005 + LION-030 + LION-070
<b>LION-006</b>	Validity of certification	LION-006 + part from LION-008
<b>LION-007</b>	Galvanic isolation of the safety-relevant area from the non-safety-relevant areas	LION-007 + LION-042 + LION-047 + LION-048 (+ LION-052)
<b>LION-008</b>	Possible components of a certified system	LION-008 + LION-023
<b>LION-009</b>	Safety-related conditions of the assessment report	-
<b>LION-010</b>	Requirement for a safe function of the EA station	LION-010 + LION-011
<b>LION-011</b>	<i>omitted</i>	<i>replaced with LION-010</i>
<b>LION-012</b>	<i>omitted</i>	<i>replaced with LION-050</i>
<b>LION-013</b>	<i>omitted</i>	<i>omitted</i>
<b>LION-014</b>	Safety-related failure reaction of the buscoppler	LION-014
<b>LION-015</b>	Safety-related failure reaction of the input/output modules	LION-015

ID	Important information	Old designation (in the versions of the documents see below table)
LION-016	Safety-related failure reaction of the power supply	LION-016 + LION-043 + LION-044
LION-017	MVB safety layer	LION-017 + part from LION-018
LION-018	Structure of the Safety Datasets	LION-018 + part from LION-017
LION-019	MVB diagnosis port	LION-019
LION-020	Error response to detected inconsistencies in the safety data set	LION-020
LION-021	NSDB format	LION-021
LION-022	L-Bus <sup>2</sup> master	-
LION-023	<i>omitted</i>	<i>omitted</i>
LION-024	Mechanism for checking the configuration by each restart is implemented.	
LION-025	Fail-safe Master-Module	LION-025
LION-026	Fail-safe Slave-Module	LION-026
LION-027	Configuration data, process image and error states of a safe digital output module.	LION-027
LION-028	Fail-safe Power Supply	LION-016 + LION-043
LION-029	Identification of the modules	
LION-030	<i>omitted</i>	<i>replaced with LION-005</i>
LION-031	Fault detection and reaction time	LION-031 + LION-074
LION-032	Configuration check during startup	LION-032
LION-033	<i>omitted</i>	-
LION-034	Module exchange	LION-034
LION-035	<i>omitted</i>	<i>replaced with LION-050</i>
LION-036	Configuration data, process image and error states of a safe digital input module.	
LION-037	Safe state at a digital input	LION-037

ID	Important information	Old designation (in the versions of the documents see below table)
<b>LION-038</b>	Error detection digital input	LION-038
<b>LION-039</b>	Safe state at a digital output	LION-039
<b>LION-040</b>	Error detection digital output	LION-040 + LION-027
<b>LION-041</b>	Testpulse at digital output	Part of LION-041
<b>LION-042</b>	<i>omitted</i>	<i>replaced with LION-007</i>
<b>LION-043</b>	<i>omitted</i>	<i>replaced with LION-016 + LION-028</i>
<b>LION-044</b>	<i>omitted</i>	<i>replaced with LION-016 + LION-028</i>
<b>LION-045</b>	Requirement for the cable between the lines	LION-045
<b>LION-046</b>	Supply SAFE BC with SAFE PS at X30	LION-046
<b>LION-047</b>	<i>omitted</i>	<i>replaced with LION-007</i>
<b>LION-048</b>	<i>omitted</i>	<i>replaced with LION-007</i>
<b>LION-049</b>	<i>omitted</i>	-
<b>LION-050</b>	Calculating the FR for a safe function	LION-050 + LION-035 + LION-012
<b>LION-051</b>	<i>omitted</i>	-
<b>LION-052</b>	<i>omitted</i>	-
<b>LION-053</b>	Diagnosis and configuration via the web server	LION-053 + SAC 06
<b>LION-054</b>	Conditions and errors during the start-up and run-down phase	LION-054 + LION-055 + LION-056
<b>LION-055</b>	<i>omitted</i>	<i>replaced with LION-054</i>
<b>LION-056</b>	<i>omitted</i>	<i>replaced with LION-054</i>
<b>LION-057</b>	The modules of Safety Class 2 are intended for a maximum service life of 20 years	LION-057
<b>LION-058</b>	DI One-channel SIL architecture	LION-058
<b>LION-059</b>	DI Two-channel SIL architecture	LION-059
<b>LION-060</b>	DO Single switching output SIL architecture	LION-060

ID	Important information	Old designation (in the versions of the documents see below table)
<b>LION-061</b>	DO Double switching output SIL architecture	LION-061
<b>LION-062</b>	DO Plus/minus switching output SIL architecture	LION-062
<b>LION-063</b>	<i>omitted</i>	-
<b>LION-064</b>	Testpulse at digital input	Teil von LION-041
<b>LION-065</b>	<i>omitted</i>	-
<b>LION-066</b>	Leak current in case of error	-
<b>LION-067</b>	Start synchronization by the bus master	-
<b>LION-068</b>	Evaluation of the feedback from the digital output module	-
<b>LION-069</b>	Limited Run Slave-Module	LION-069
<b>LION-070</b>	<i>omitted</i>	<i>replaced with LION-005</i>
<b>LION-071</b>	Sink time supervisiond	LION-071
<b>LION-072</b>	<i>omitted</i>	<i>see SRAC 03</i>
<b>LION-073</b>	MVB Monitoring concept	LION-003 + LION-073 + SAC 04
<b>LION-074</b>	<i>omitted</i>	<i>replaced with LION-031</i>
<b>LION-075</b>	Risk about of two different implementations of the SDTv2 protocol	LION-075
<b>LION-076</b>	SDTv2 Implementation	LION-076
<b>LION-077</b>	Safe state at an analog output	-
<b>LION-078</b>	Error detection at an analog input	-
<b>LION-079</b>	AI One-channel SIL architecture	-
<b>LION-080</b>	AI Two-channel SIL architecture	-
<b>LION-081</b>	Configuration data, process image and error states of a safe analog input module.	-



## 17.1.2

**Documents with the old designation of the LION-ID:****LION System description (SD)**

Version	Document title	Release date
03	SB_LION_System_Description_V03_en	06/16/2020
02	SB_LION_System_Description_V02_en	11/30/2018
01	SB_LION_System_Description_V01_EN	07/26/2018
00	LION_System_Description_V00_EN	03/08/2017

**LION Infrastructure Components (MA)**

Version	Document title	Release date
00	BA_Infrastructure_Components_LION_V00_EN	03/10/2017

**LION BC MVB SIL2 (MA)**

Version	Document title	Release date
05	BA_LION_Buscoupler_V05_EN	not released
04	BA_LION_Buscoupler_V04_EN	01/15/2019
03	BA_LION_Buscoupler_V03_EN	12/20/2018
02	BA_LION_Buscoupler_V02_EN	11/30/2018
01	BA_LION_Buscoupler_V01_EN	02/23/2018
00	BA_LION_Buscoupler_V00_EN	03/08/2017

**LION BC ETH TRDP SIL0 (MA)**

Version	Document title	Release date
02	LION_SIL0_Buscoupler_ETH_MA_EN_V02	04/11/2022
01	BA_LION_Bus_coupler_ETH_803012_V01_en	03/19/2019
00	BA_LION_Bus_coupler_ETH_803012_V00_en	12/13/2018

**LION SIL0 I/O modules (MA)**

Version	Document title	Release date
00	BA_IO_Modules_LION_V00_EN	03/10/2017

**LION SIL2 I/O modules (MA)**

Version	Document title	Release date
01	BA_SIL2_IO_Modules_LION_EN_v01	07/18/2019
00	BA_SIL2_IO_Modules_LION_EN_V00	07/20/2016

