



 Transportation Solutions

LION Configuration Framework (LCF Tool)

Application manual

Part I of II: Configurator HEAD

Version 10

Contact

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The company Lütze Transportation GmbH reserves the right to make changes to its products in the interest of technical development. These changes are not necessarily documented in each individual case.

This application manual is part of the product family and contains important information on safety and operation. Read this document before use to avoid possible dangers and to ensure proper use.

This application manual and the information contained herein have been compiled with due care. However, the company Lütze Transportation GmbH accepts no liability for printing or other errors or any resulting damage.

The brands and product names mentioned in this system description are trademarks or registered trademarks of their respective titleholders.

For the sole purpose of better readability, gender-specific spelling and multiple designations are not used. All personal designations should nevertheless be regarded as gender-neutral.

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1

Introduction

This document is an integral part of the LION product family.

The document is divided into two main sections:

- **Part 1: LION LCF Tool Configuration HEAD**
Application manual for LION HEAD (Bus coupler)
- **Part 2: LION LCF Tool Configuration LOGIC**
Application manual for LION LOGIC (DIOLINE PLC and LION Safe CCU)

This document contains important information about the application and security of the LION LÜTZE Configuration Framework (LCF) software.

The LION LCF is a tool for the planning and configuration of a LION system. The tool supports the user in all project phases. Starting with the planning of the I/O stations, via the fieldbus configuration right up to the supporting documentation for the safety verification.



To avoid hazardous situations, these instructions must be read and understood before installing, operating, maintaining or dismantling the device.

NOTICE This applies to every person who is getting in touch with the product. Trained personnel and experts, especially qualified persons who have worked with similar products before, have to read and understand this document as well.

⚠ CAUTION: 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 ensure correct use.



NOTE: Always keep the document available.

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



✓ **Tip:** These instructions and further information are available on the website of the Friedrich Lütze GmbH:

<https://www.luetze-transportation.com/>

Search for the article number, or the product name.

1.1

Navigation

Short summary

An “Advance Organizer” at the beginning of each chapter provides a brief summary of what the chapter is about.

This makes it easier to decide whether the content is relevant. The presentation can vary depending on the topic. For example, it can be a concept map, a diagram, or a short enumeration.

Color coding guides the user through this document along the product life cycle. This can contain different color information depending on the product and document type.

Short route to the destination:

There are three landing pages with hotspots. If you click on them, you will jump automatically to the required chapter.

Small icons at the bottom of the page for quick navigation

◀ Jumps one page backwards

▶ Jumps one page forward

🌐 Jumps to TOC (starting page)

2

General information

Short summary

Here you can find out what the symbols and safety notes mean.

In addition, you receive information on standards and regulations, copyright, label and QR code.

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 color to indicate the warning level. The information highlights possible dangers and gives instructions on how to avoid them.

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


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

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


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

2.1.2

Handling notes

 Important technical information: Indicates technically important information to operate the device safely.

 Tool: Indicates the use of tools.

 Tip: Indicates further information, such as the Lütze Transportation download page.

 Service: Indicates the contact address for getting support or more information.

 Chapter: Points to other chapters to enhance understanding.

2.2**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.

2.3**Disclaim of liability**

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

The correctness of the content 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 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

2.4**Other applicable documents**

When operating the software, also observe all operating instructions supplied with other components of your system.

For clarity's sake, we also want to make it clear that these operating instructions do not cover every potential issue that could arise from using this device. If you require further information or if specific problems arise that are not covered in sufficient detail in these operating instructions, you can request the necessary information from our service department at any time.

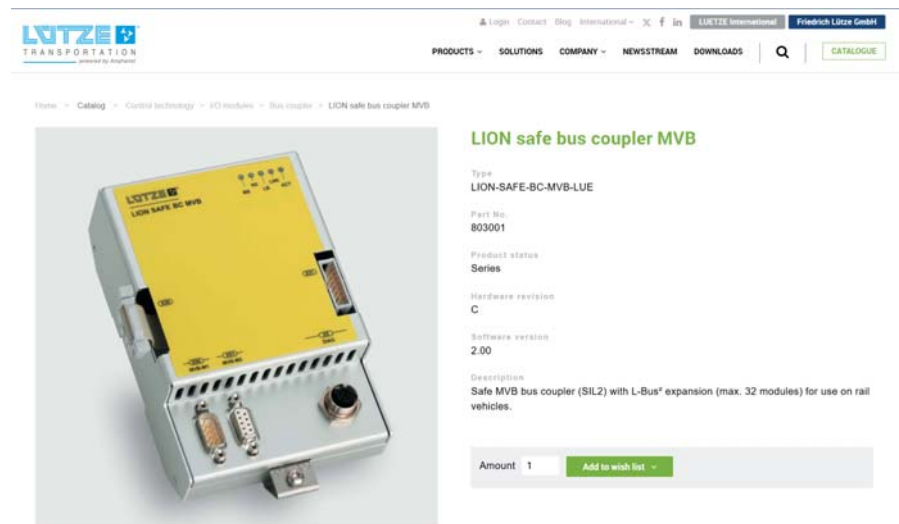
2.5

QR code – Product information

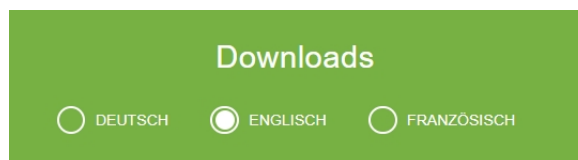
The QR code will lead you to additional product information from the online catalogue on the Lütze Transportation website.

To obtain this information, follow these instructions:

1. Scan the QR code with a smartphone or other device that can read QR codes.
2. The default browser opens with the corresponding page.



3. Choose a language.
4. Seek Downloads to download additional technical documentation.



803001
LION-SAFE-BC-MVB-LUE



803002
LION-SAFE-BC-ETH-LUE

3

Terms and abbreviations

3.1

Terminology

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

Term	Definition
Actor	Synonym for actuator
Bus coupler or Gateway	<p>see HEAD</p> <p>Interface between the vehicle's master computer and the L-Bus² for controlling the I/O modules. The synonym HEAD is used in the customer documents.</p> <p>Bus coupler - requires a configuration file for data mapping between L-Bus² and fieldbus.</p> <p>Gateway - can be configured by the user directly on the device.</p>
DEVICE	A DEVICE is a communication device on the L-Bus ² . It is an I/O module that is addressed by the HEAD within the I/O station at startup and receives or sends data during operation, on request from the HEAD.
Fieldbus	fieldbus is a synonym for any bus system to connect one or more modules that have to exchange data with each other. A fieldbus is used for data communication within a rail vehicle (e.g., MVB, TRDP).
HEAD	<p>HEAD is synonymous with bus coupler or PLC.</p> <p>The term HEAD refers to the LION subsystem and the internal communication bus L-Bus², respectively.</p> <p>The HEAD is the system master of the I/O station and controls the communication with the I/O modules.</p>
I/O Module	<p>Modules for reading in or outputting digital or analog signals in different variants or for special tasks.</p> <p>Each I/O module has an L-Bus² interface in the slave version for communication with an L-Bus² master (HEAD).</p>
I/O Station	<p>A complete unit with a HEAD and one or more DEVICES is called an I/O station.</p> <p>The I/O station is put together in the LCF after which (all fieldbus data or device configuration settings are configured or assigned to it).</p>
L-Bus²	L-Bus ² is the short form of " Lütze Bus 2 ". Lütze's own communication bus is used by LION, which is based on RS485.
LOGIC	LOGIC is, on the one hand, the data processing component of the train or, equivalently, a LION CCU system. (Equivalent terms are VCU or PLC.)
Train consist	Central control of the vehicle, which communicates with the bus coupler via an interface (fieldbus).

3.2

Abbreviations

In this document we use the following abbreviations:

Abbreviation	Definition
AC	Alternating current
AI	Analog input
AERR	Application error
AO	Analog output
BC	Bus coupler - the LION Bus coupler. It is also called HEAD in the LION system.
CCU	Compact Control Unit
CH	Channel
CPU	Central Processing Unit
CRC	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.
CON	Configuration error
DC	Direct current
DI	Digital input
DIAG	Diagnostic information
DO	Digital output
EMC	Electromagnetic compatibility
EN	European Standard
ERR	Error (test pulse error)
ESD	Electrostatic discharge
EXTV	External voltage
FR	Failure Rate (formerly HR – Hazard Rate)
GPIO	General Input/Output pin on the controller
GND	Ground
I/O	Input/Output
IEEE	Institute of Electrical and Electronics Engineers

Abbreviation	Definition
IODB	Input/Output Data Base
IP address	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.
IP code	ingress protection code (e.g., IP20)
LCF	LION Configuration Framework
LION	Lütze Input/Output Network
LION LCF	LION (Lütze) Configuration Framework, especially for the configuration of the LION system
MTBF	Mean time between failures
MTTR	Mean time to repair
MVB	Multifunction Vehicle Bus
NSDB file	The NSDB file is a configuration file for an I/O station with a SIL2 Bus coupler MVB. 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.
PE	Protective Earth
PLC	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)
PS	Power supply or supply voltage
PST	Process Safety Time
RAMS	Reliability, Availability, Maintainability, and Safety
RO	Relay output
SCC	Switching cycle counter
SDTv2	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".
SIL	Safety integrity level
OP	Operating system

Abbreviation	Definition
OS	The Linux Foundation's open-source project Yocto provides tools and processes for embedded and IoT software, regardless of the underlying structure of the hardware architecture, to create a Linux distribution.
SO	Switching output
TCMS	Train Control and Management System
TDB file	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.
THR	Tolerable Hazard Rate
TR	Transistor
TRDP	Train Realtime Data Protocol
TH35	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.
VCU	Vehicle Unit Control (See also LOGIC)
VDP	Vital Data Package (See also SDTv2)

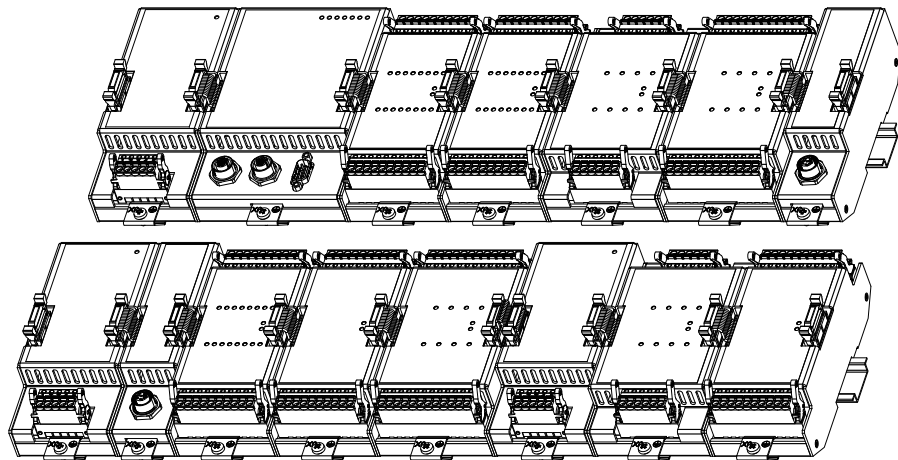
4 System planning

4.1 General information

NOTICE

The texts on the images and screenshots in this document, especially on the buttons, may partially appear in the local language due to the browser and system language settings. All texts that we can influence are written in English.

Chapter: The chapter „System planning“ can be found in the corresponding document „LION System description“.



✓ Tip: You can find the LION system description on the Lütze Transportation website: www.luetze-transportation.com.

For example, enter the article number 803002 in the search field or use the QR code on page 177. (You can also find a description of the LION system on every LION product webpage.)

Select the product from the displayed search results.

At the bottom of the respective product page, you will find the documents related to the product.

5

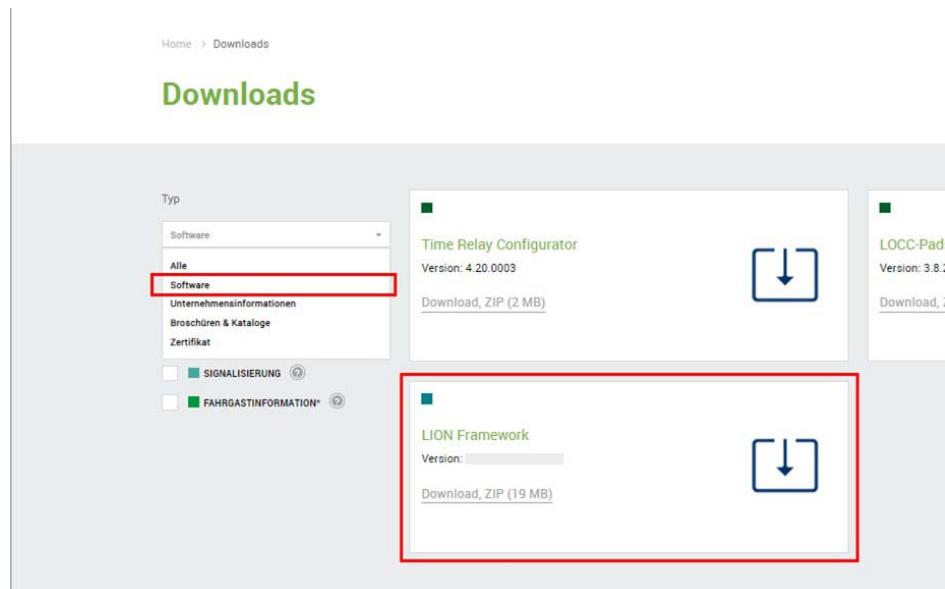
Download and Installation

5.1

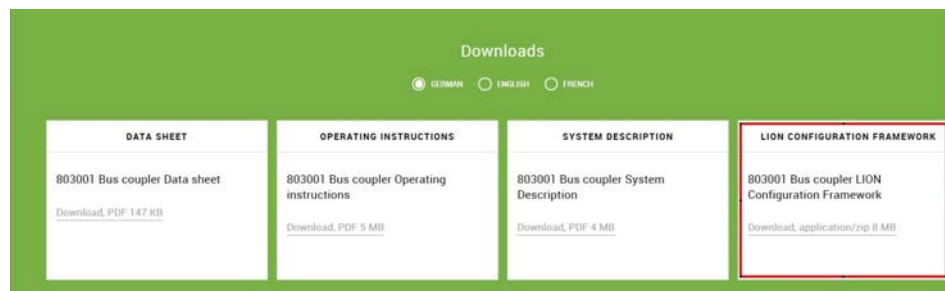
Options for downloading

The software tool LION Configuration Framework (LCF) can be downloaded free of charge from the LÜTZE Transportation website at the following locations:

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



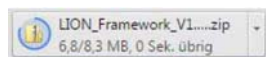
2. In the download area of the product page of a LION bus coupler (HEAD):



5.2

Installation

1. Select a directory on your PC.
2. Unzip the downloaded file.



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



4. The LION LCF Tool starts.

! Important technical information: No further installation required.

Part II: Configurator LOGIC

Definition

A HEAD is the control unit of a LION system.

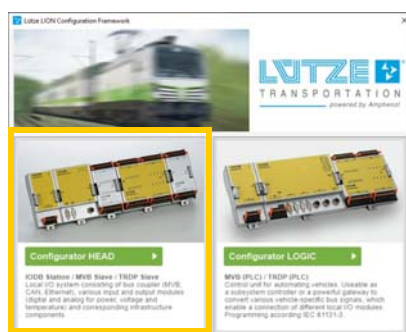
The HEAD performs all monitoring and control tasks that are necessary for the operation of the connected DEVICES. The type of HEAD determines the type of fieldbus used in the LION system.

The HEAD receives the messages from the higher-level system of the train, the LOGIC, via the fieldbus and must ensure that the modules connected to it, e.g., read a corresponding input or control the correct output. This information is also made available to the other devices connected to the fieldbus.

This part is elaborated in more details in the following chapters.

5.2.1

Brief description of the LCF Configurator HEAD



The *configuration of the HEAD* refers to

I/O Station Configurator (HEAD)	chapter 8 on page 26
Configurator HEAD (MVB Slave)	chapter 9 on page 63
Configurator HEAD (TRDP Slave)	chapter 10 on page 113

6

Introduction to the LCF Tool

6.1

Brief description of the LION LCF Tool

The LION Configuration Framework (LION LCF) tool is a tool for creating configurations for a LION bus coupler (HEAD), i.e., for configuring a LION I/O station. Or to create a configuration for the LOGIC of a system with LION PLCs or DIOLINE PLCs.

It supports the user in all project phases. Starting with the planning of an I/O station, through the fieldbus configuration, to the supporting documentation for the safety proof.

After starting the program, you will see this start page. Select whether you want to configure a LION Station (HEAD) or a LION PLC Station (LOGIC) or DIOLINE PLC Station (LOGIC).

**Configurator HEAD****IODB Station / MVB Slave / TRDP Slave**

Local I/O system consisting of bus coupler (MVB, TRDP, CAN, Ethernet), various input and output modules (digital and analog for power, voltage and temperature) and corresponding infrastructure components.

The LCF Configurator HEAD is used to configure the LION bus coupler with the connected I/O modules.

Configurator LOGIC**MVB (PLC) / TRDP (PLC)**

Control unit for automating vehicles. Useable as a subsystem controller or a powerful gateway to convert various vehicle-specific bus signals, which enable the connection of different local I/O modules. Programming according to IEC 61131-3.

The LCF Configurator LOGIC is used to configure the MVB and TRDP protocol of the LOGIC and as a remote station for the LION bus couplers.

NOTE:

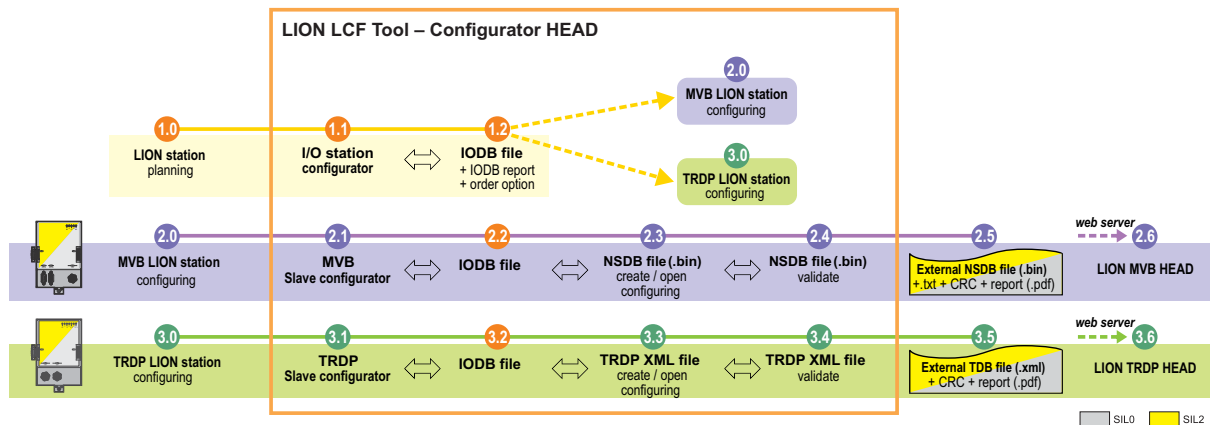
An NSDB file for DIOLINE MVB can only be created for DIOLINE FW 2.09 or higher with the Configurator LOGIC.

6.2

Brief description of the Configurator HEAD



The configuration of the HEAD is the data mapping of a LION I/O station, an MVB slave or a TRDP slave referred to the LOGIC of a train.

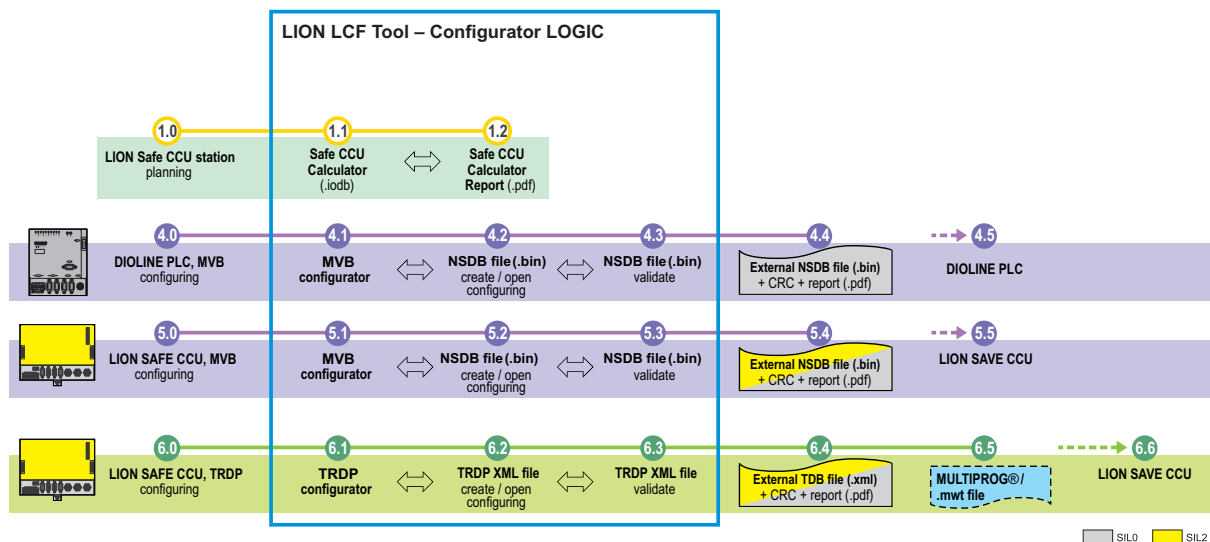


6.3

Brief description of the Configurator LOGIC



The configuration of the LOGIC refers to the structure of an MVB PLC (e.g. LION SAVE CCU, DIOLINE PLC) or a TRDP PLC (e.g. LION SAVE CCU).



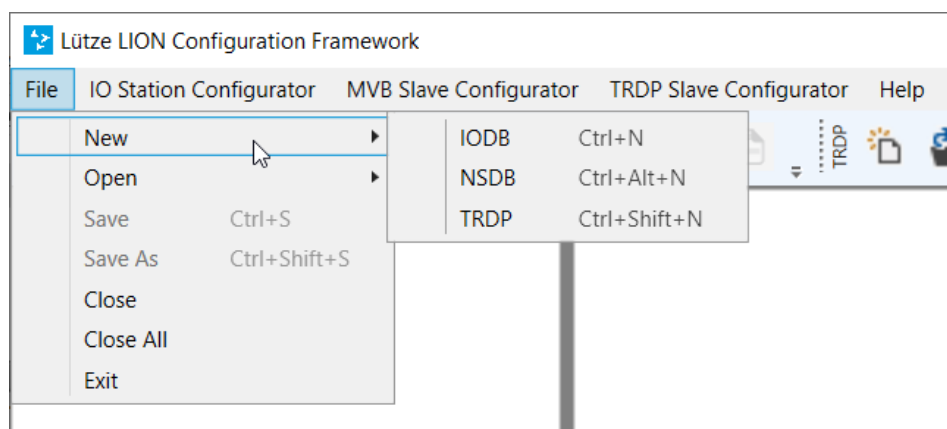
7 General Settings – Configurator HEAD

7.1 Menu settings

7.1.1 Creating a file: File > New

To generate a new file proceed as follows:

1. Click in the menu on *File*.
2. Select *New*.
3. Select *IODB*, *TRDP*, or *NSDB* to create a new file.

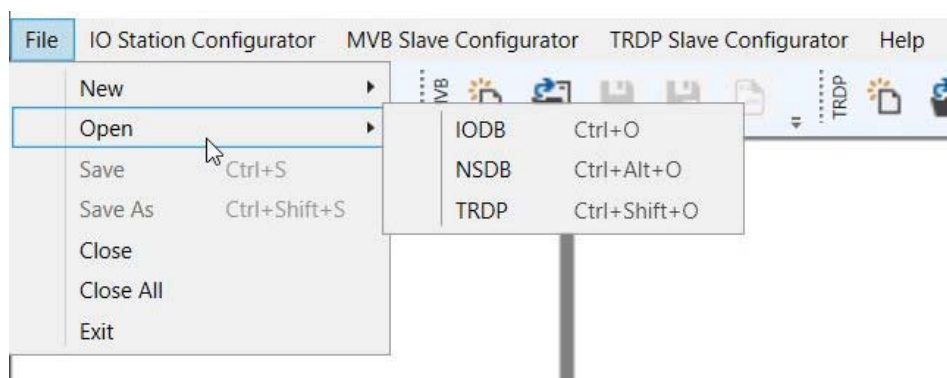


NOTE: For the configurator of a HEAD, the following applies:
First, an IODB file is needed as a basis for an NSDB file or a TRDP file.

7.1.2 Open a file: File > Open

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

1. Click on **File** in the menu bar.
2. Select **Open**.

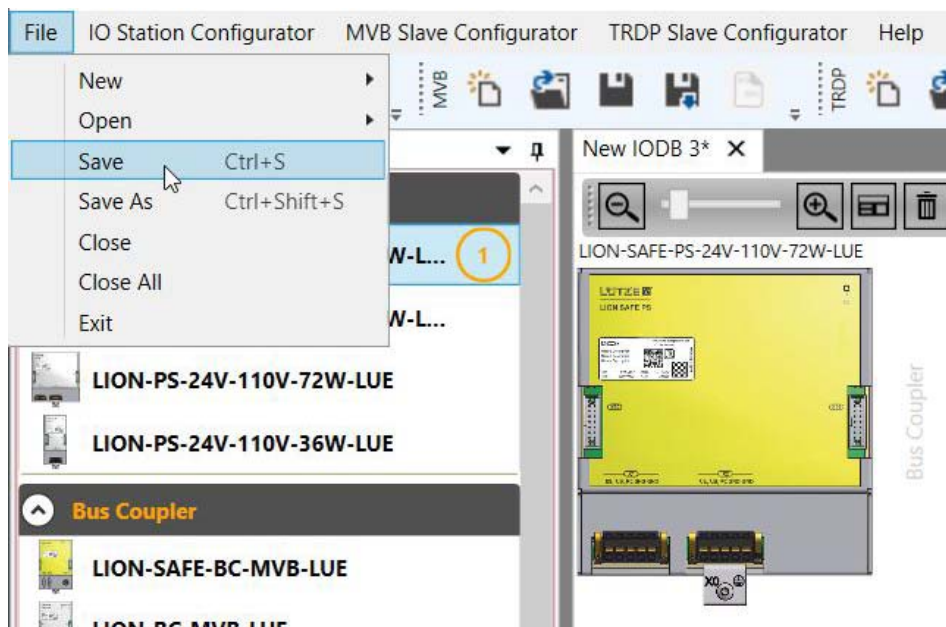


3. Select a file format that you want to open.
4. (A file window of your operating system opens.)
Select the path of the file you wish to open.
5. Click **Open**.

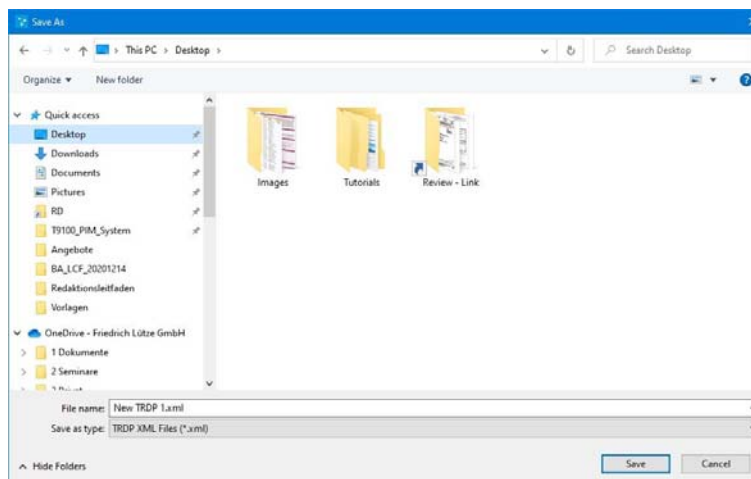
7.1.3 Save a file: File > Save

To save a configuration file, proceed as follows:

1. Click on **File** in the menu bar.
2. Select **Save** or **Save as**.



3. Enter the file name.
4. Select the desired file extension.



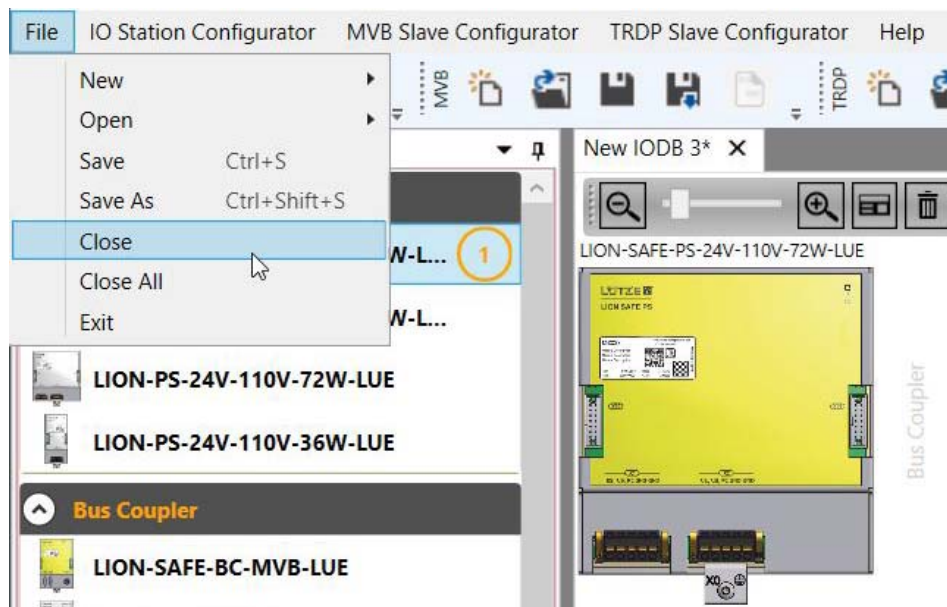
5. Click **Save**.

7.1.4

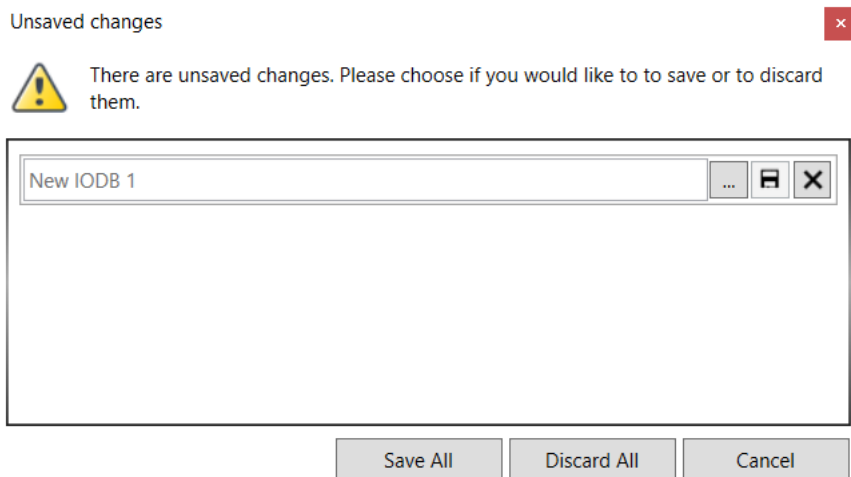
Close a file: File > Close / Close all

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

1. Click on **File** in the menu bar.
2. Select **Close** if you want to close the current file, or select **Close All** if you want to close all open files.

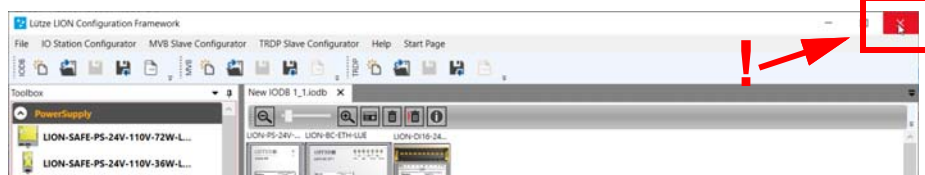


The following warning message appears:



Select whether the configuration should be saved or discarded.

⚠ CAUTION: Do NOT exit via the close button at the top right. This closes the LCF immediately without saving.

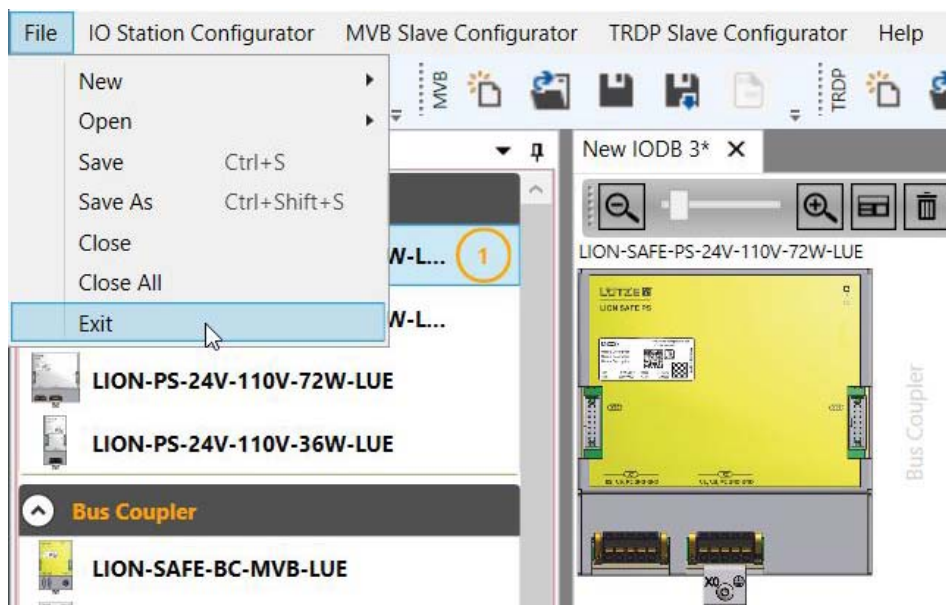


7.1.5

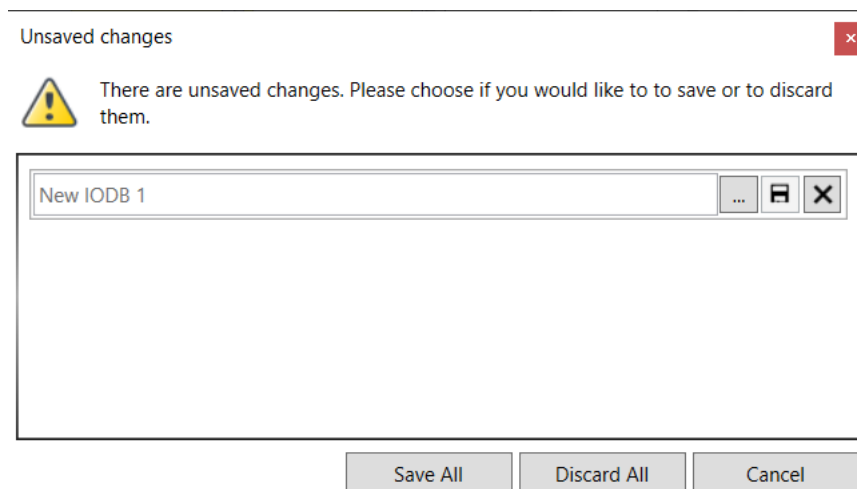
Exit the file: File > Exit

Proceed as follows to exit the LION Configuration Framework tool:

1. Click on **File** in the menu bar.
2. Select **Exit**.

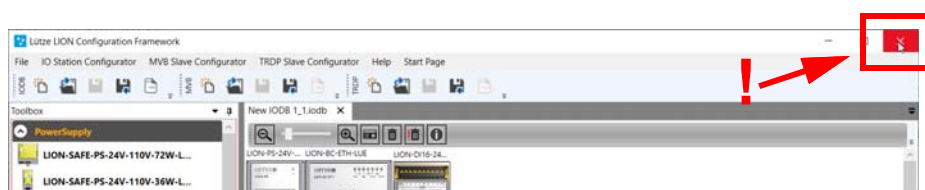


The following warning message appears:



Select whether the configuration should be saved or discarded.

⚠ CAUTION: Do NOT exit via the close button at the top right. This closes the LCF immediately without saving.



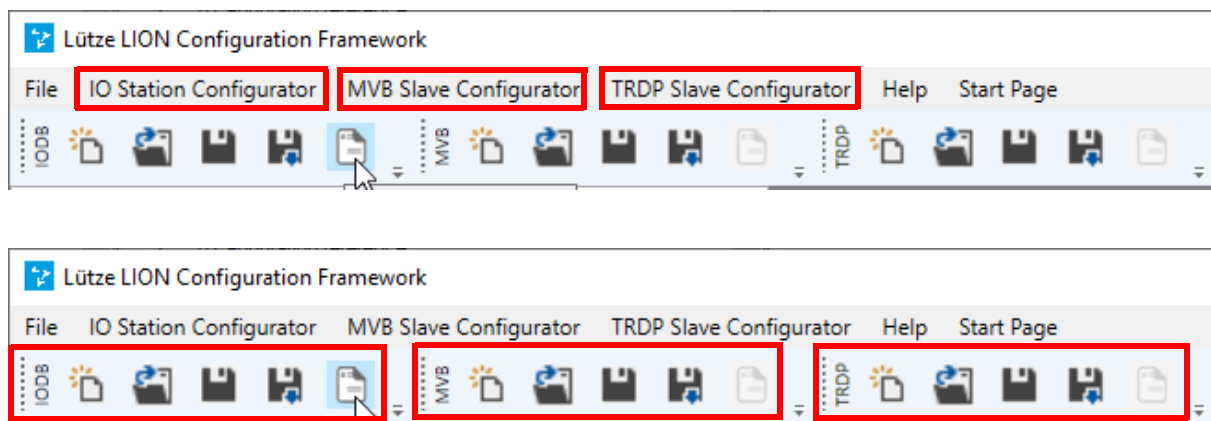
7.2 Toolbar buttons

NOTE: The buttons on the toolbar can also be used for all operations instead of the drop-down menus.

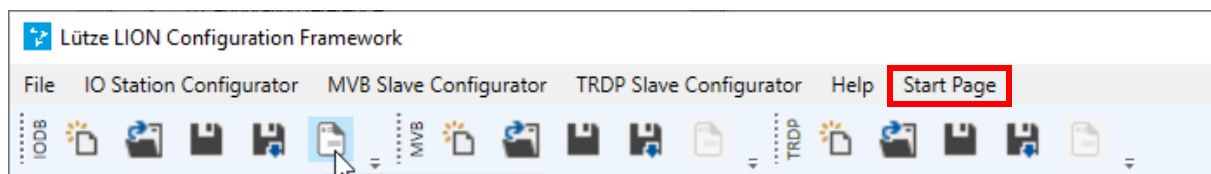
In the two configurators, these are different.

7.2.1 Configurator HEAD

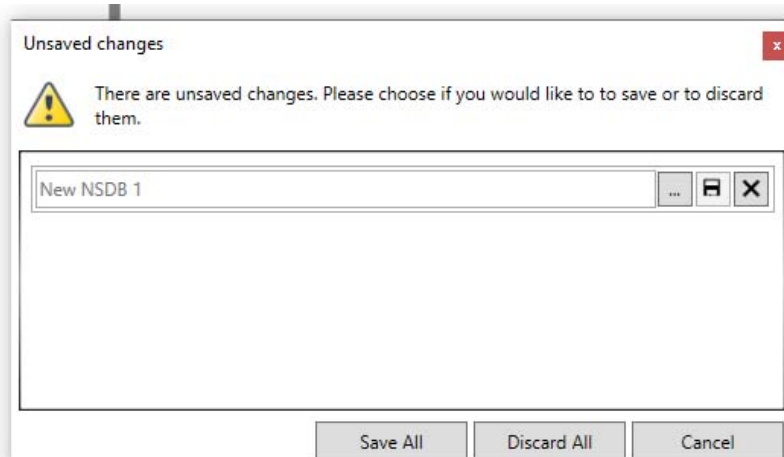
The LION LCF Configurator HEAD has three sets of buttons with icons for the respective main application.



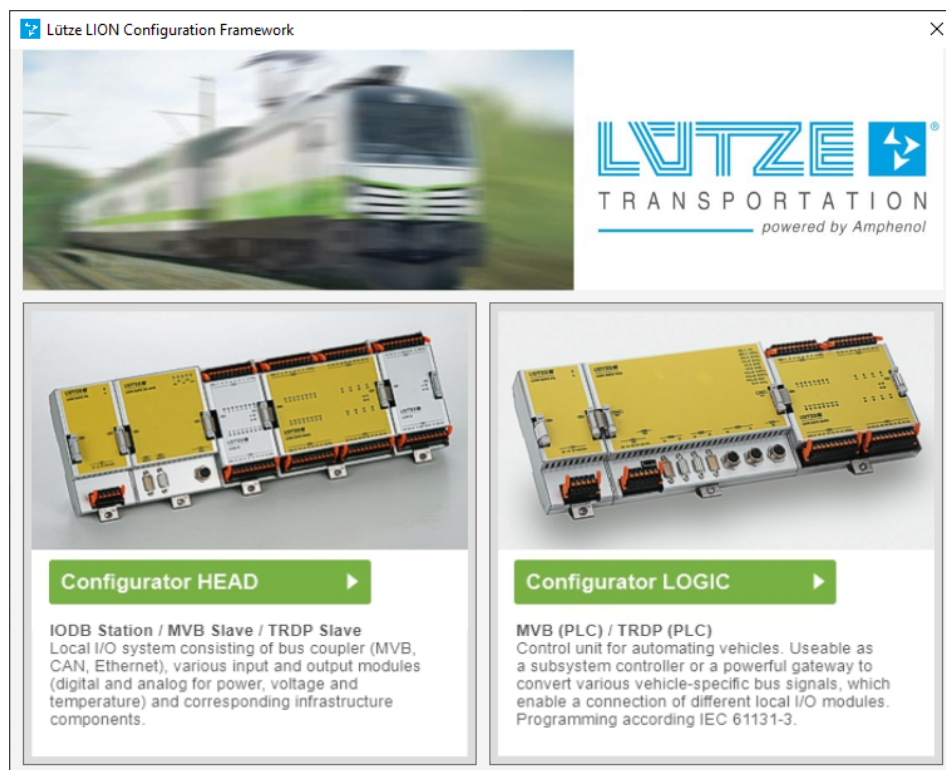
7.3 Menu item Home (start page)



You can exit the current application at any time by clicking on the *Start Page* menu item:



A second click on the *Start Page* menu item takes you back to the start page:



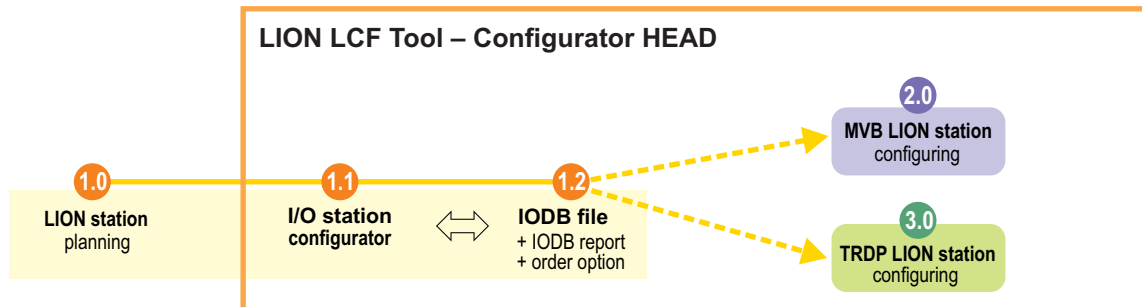
8

I/O Station Configurator

Short summary

To plan a LION station, you must start the “I/O Station Configurator HEAD” (1.1). Using the Configurator, you then create an IODB file and a report (1.2).

An IODB file is required as the basis for the configuration of an MVB or TRDP I/O station. The IODB file contains the structural design of the hardware of a LION I/O system.



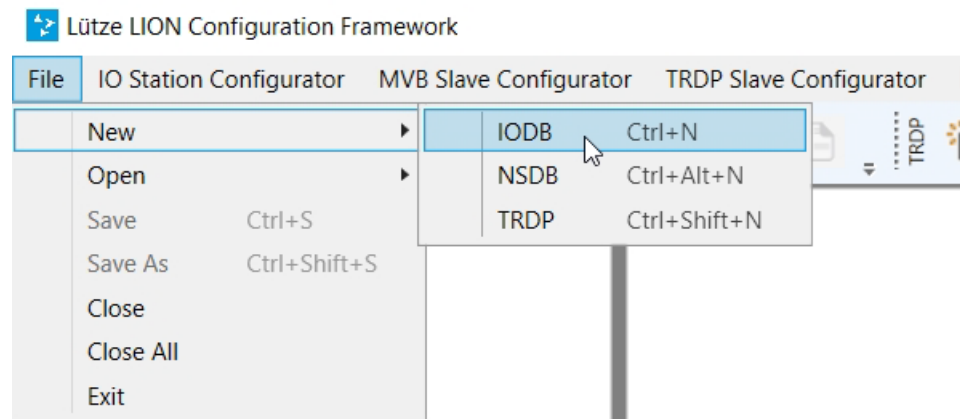
8.1 Creating a new IODB file

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*.

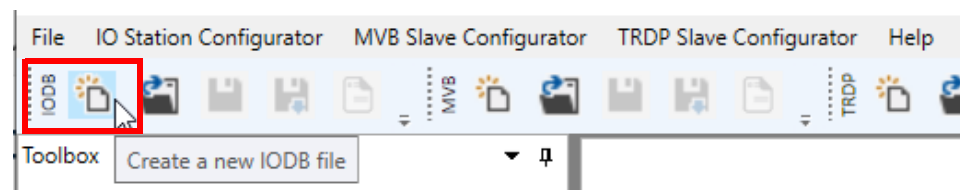
8.1.1 New IODB file via the menu bar or toolbar

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.

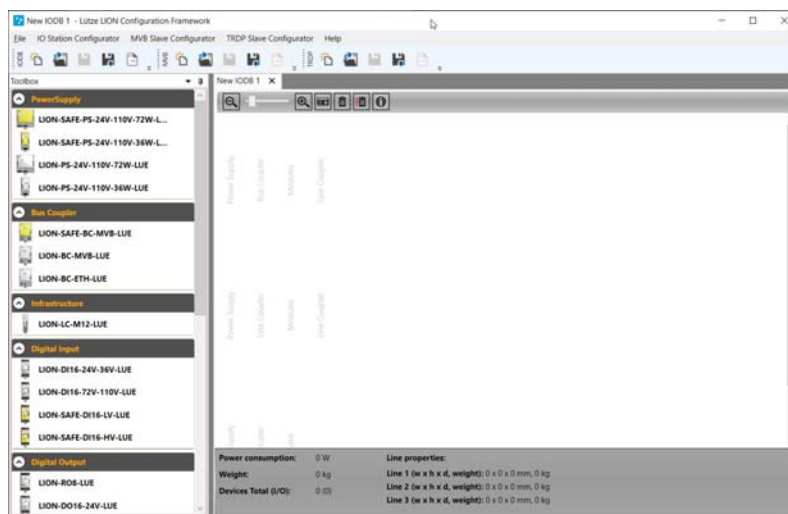


or: Click on the **Create a new IODB file** icon in the toolbar:



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4. This window will appear:



✓ Tip: You can now either arrange the modules manually or use the Device Wizard.

Chapter: See also chapter 8.1.9 on page 52). 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.

NOTE: You must first have read and understood the rules in chapter 8.1.3 on page 30 before you can arrange the modules yourself.



8.1.2

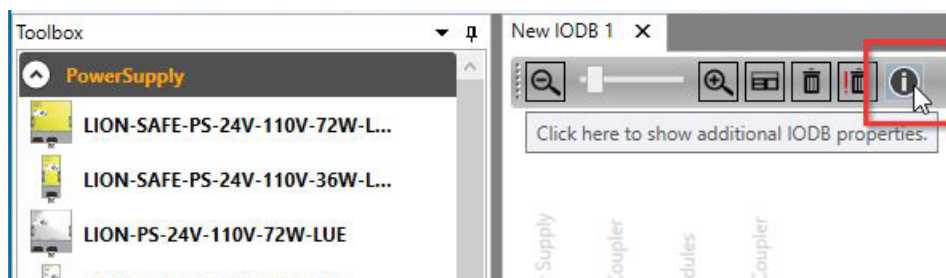
IODB Properties

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

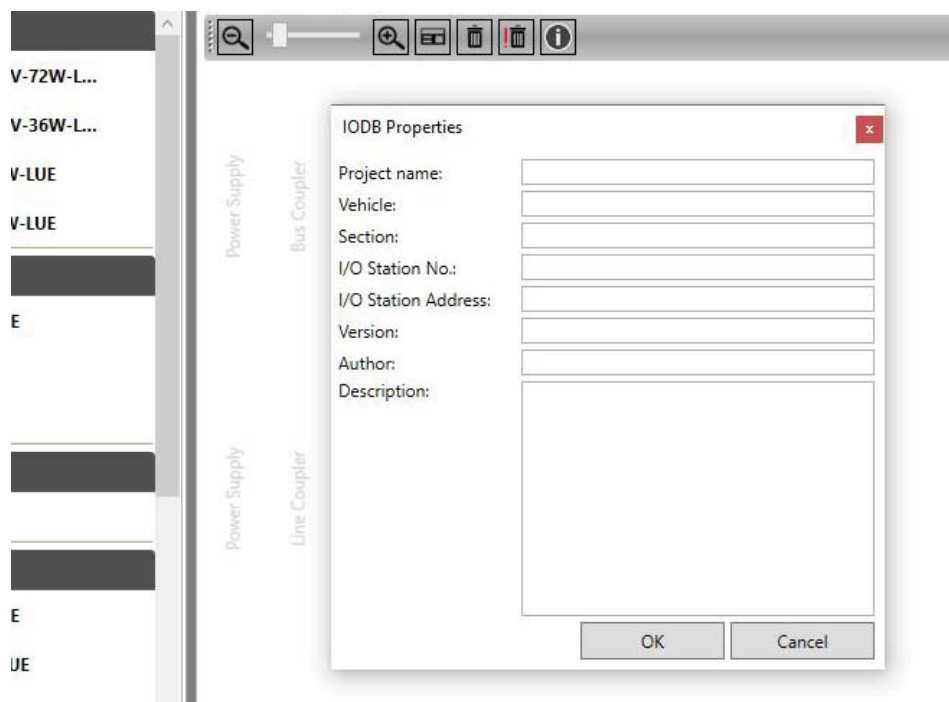
NOTE: The IODB properties entered here are also included in the IODB report.

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:



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2. Type in the corresponding information:

NOTE: 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
I/O Station Address:	1234
Version:	00
Author:	Mr. John Smith
Description:	This is a test text.

3. Click OK to save the set properties.

NOTE: 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.

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

The screenshot shows the 'IODB Report: New IODB 1*' window. On the left, a 'Toolbox' lists components under categories: PowerSupply, Bus Coupler, Infrastructure, and Digital Input. A red box highlights the 'Create a IODB Report' button. The main window displays the following information:

General Information

Project:	Train 1
Vehicle:	Test 1
Section No.:	A
I/O Station No.:	A1
I/O Station Address:	1234
Author:	Mr. John Smith
Creation Date:	09.12.2025
LCF Version:	3.0.0
LDD Version:	2.9
Version of I/O Configuration:	00
Comment:	This is a test text.

Configuration Information

Total Power Consumption:	5.28 W
I/O Station Weight:	1.17 kg

L-Bus[®] communication: fault detection and reaction time:
 One L-Bus[®] cycle consists of 20 Bytes
 Class 1 (SIL0) IO-Modules: 250 ms
 Class 2 (SIL2) IO-Modules: -

Device Type	Function	Part Number	Quantity	Process Timing*
PowerSupply	LION-PS-24V-110V-36W-LUE	800113	1	-
Bus Coupler	LION-BC-ETH-LUE	803012	1	-
Digital Input	LION-DI16-24V-36V-LUE	803101	1	In: 12.25 ms

* Process timing calculations are based on default filter constants

8.1.3

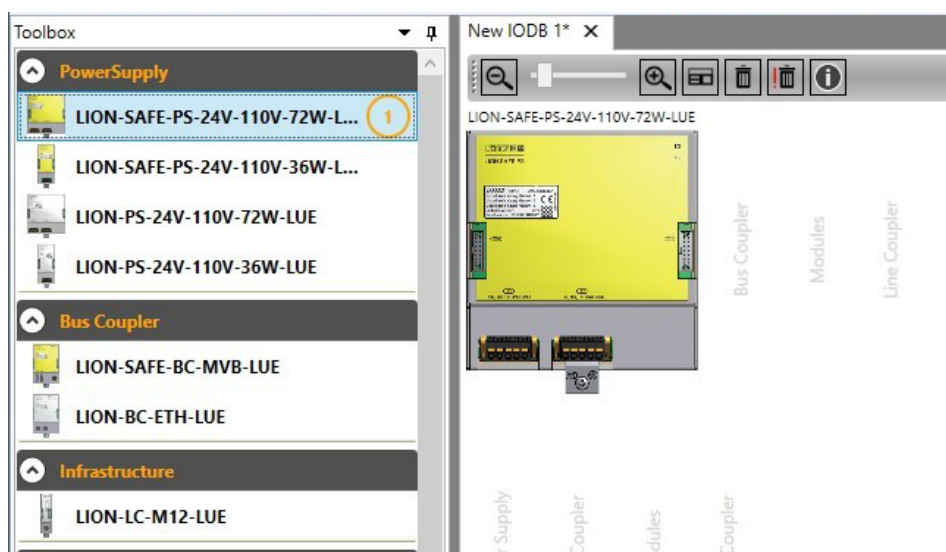
The predefined rules for configuration

The following 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 (PS).**

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

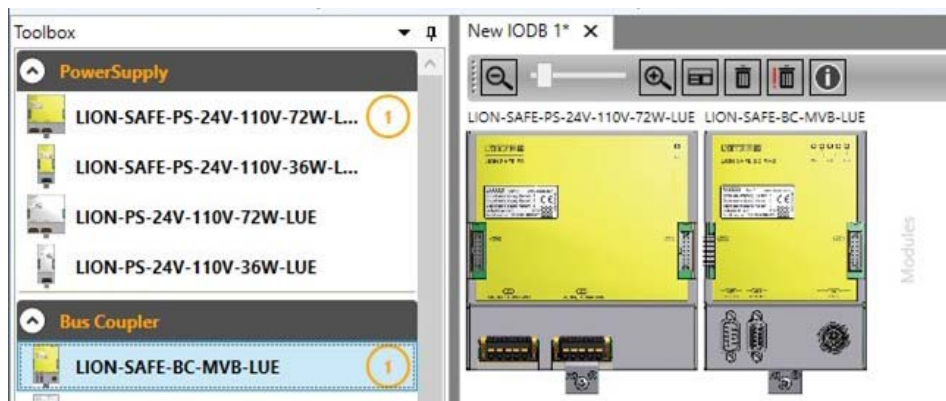
NOTE: Use the Device Wizard to plan the IODB, if you do not know which type of power supply is the correct one for your LION system.



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

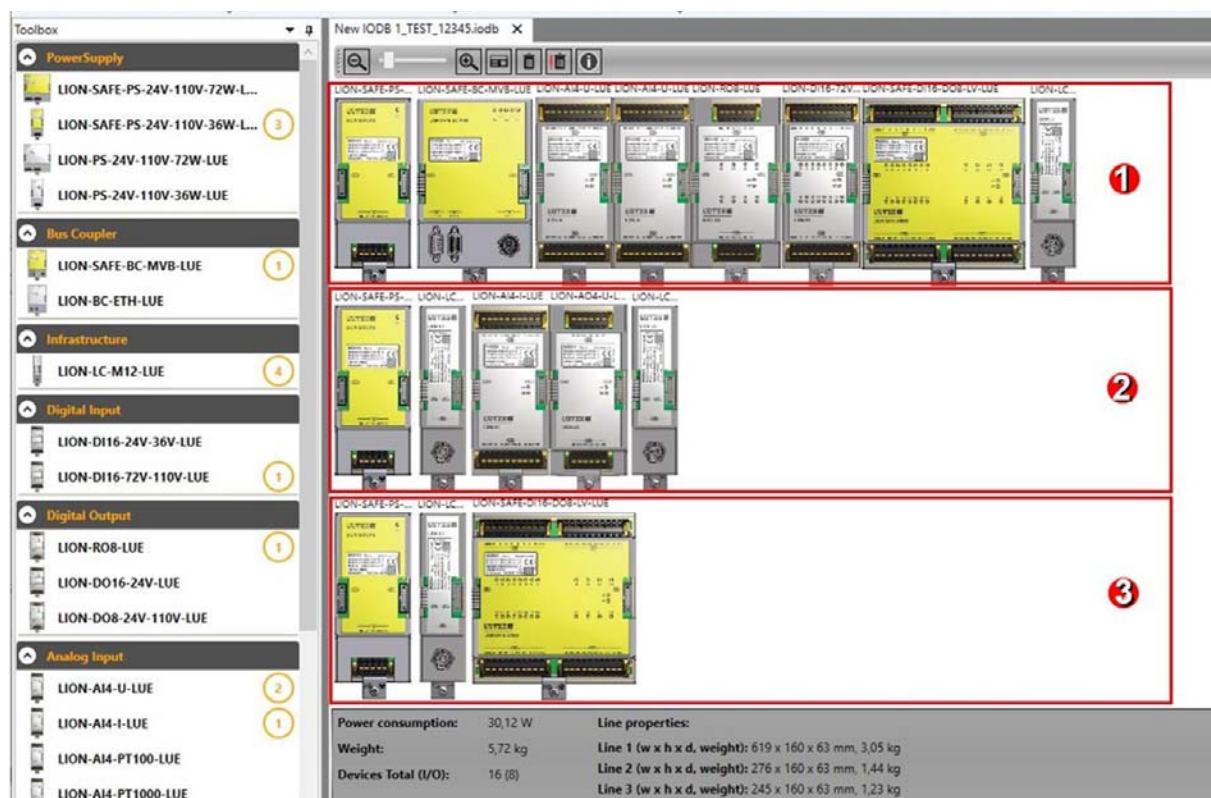
NOTE: This also defines the fieldbus protocol of the system (e.g., MVB, TRDP, etc.)

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



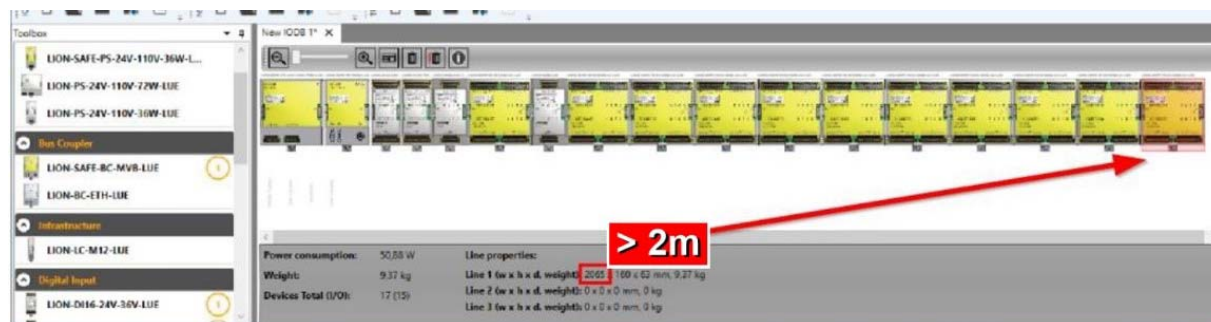
LION LCF Application Manual ▪ I/O Station Configurator

3. Max. 3 lines are possible:



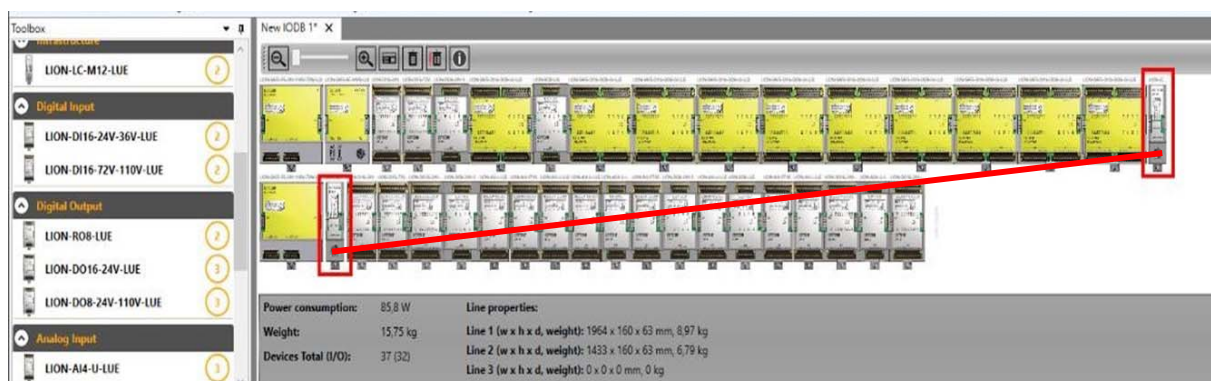
4. It is **not allowed** to create a line longer than 2000 mm.

In one line or in several, where one line must not be longer than 2000 mm, the LCF will warn you:



5a. 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*.

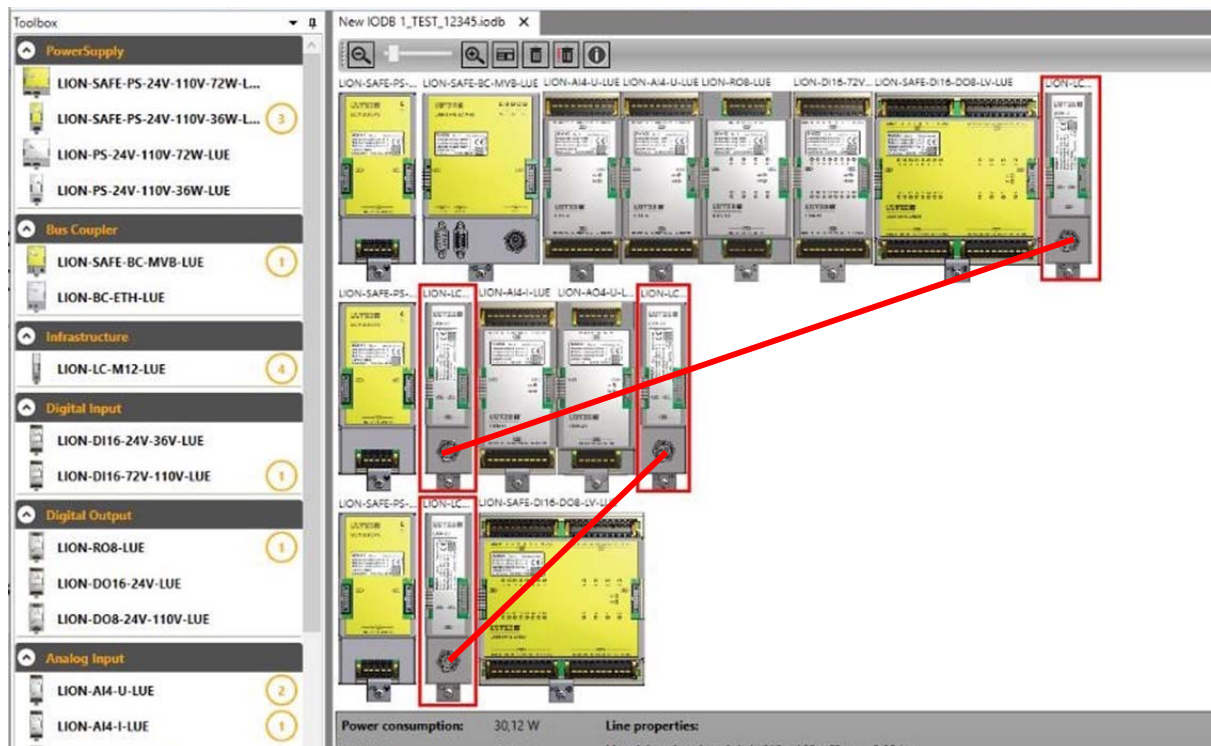
Example with a 2-line architecture:



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5b. 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 DEVICES** to the LION HEAD.
The LCF will warn you if there are more than 32 DEVICES:



10. **Safe and non-safe modules can be combined** in the system. If the power supply and bus coupler are SIL0, the entire system cannot achieve SIL2.
11. A power supply unit is always located at the beginning of a line. If the maximum energy requirement of the modules exceeds the nominal value of the LION power supply unit, the sections must be supplied by an additional LION power supply unit. This is calculated and displayed in the LCF tool.

Chapter: See also the LION System Description, chapter "5.6 System architecture" for more information. Find the QR Code in chapter 15 on page 177.

8.1.4 Calculating the power consumption

The I/O station configurator helps to calculate the power consumption and displays the length and weight of the I/O station.

Power consumption:	33,36 W	Line properties:
Weight:	5,72 kg	Line 1 (w x h x d, weight): 619 x 160 x 63 mm, 3,05 kg
Devices Total (I/O):	16 (8)	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

Power consumption:	33,36 W	Line properties:
Weight:	5,72 kg	Line 1 (w x h x d, weight): 619 x 160 x 63 mm, 3,05 kg
Devices Total (I/O):	16 (8)	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

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

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

8.1.5

Arranging the modules

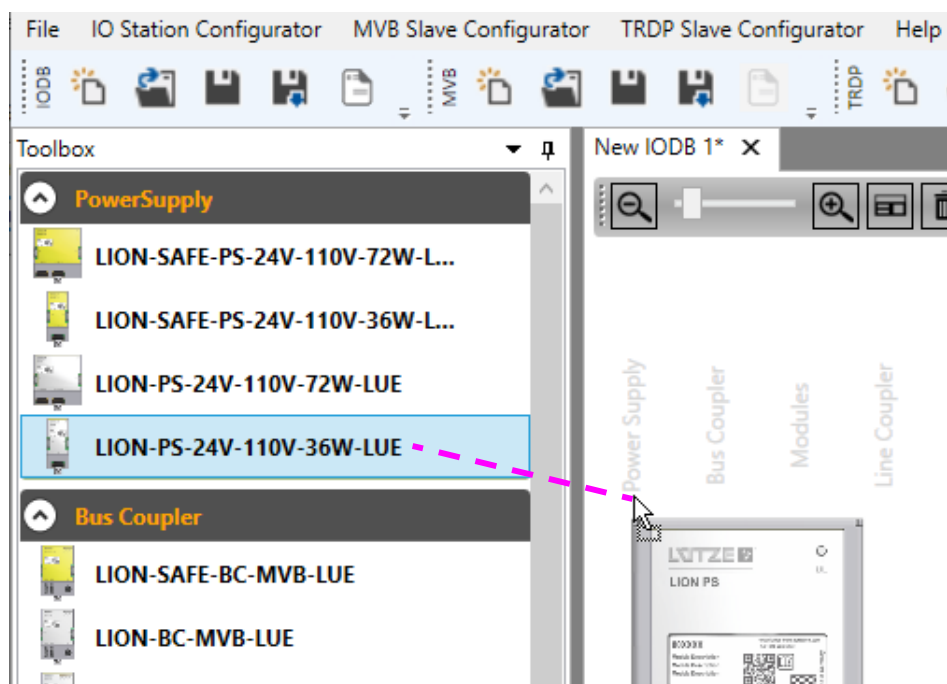
The following section describes the steps to arrange the modules on the LCF.

Step 1: Drag and drop of the modules

Always start with the power supply in the first position:

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

! Important technical information: Use the default grey words in the IO DB window. These indicate the general order of the different module types.



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

Positioning of the power supply

1. Click on a power supply in the left toolbox window.
2. Drag the module now 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.

NOTE: 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.

Orange circled number of used modules

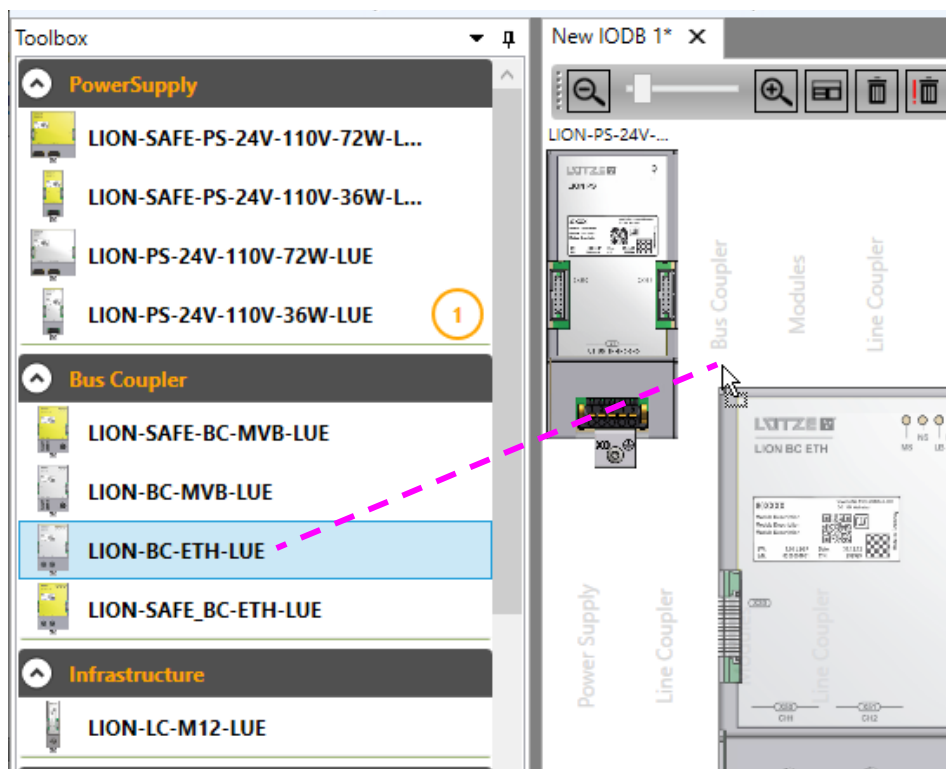
NOTE: The used modules get an orange circled number in the left toolbox window. This indicates the number of modules of this type that are used within the LION I/O station.

Step 2: Placing the HEAD in second position

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

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

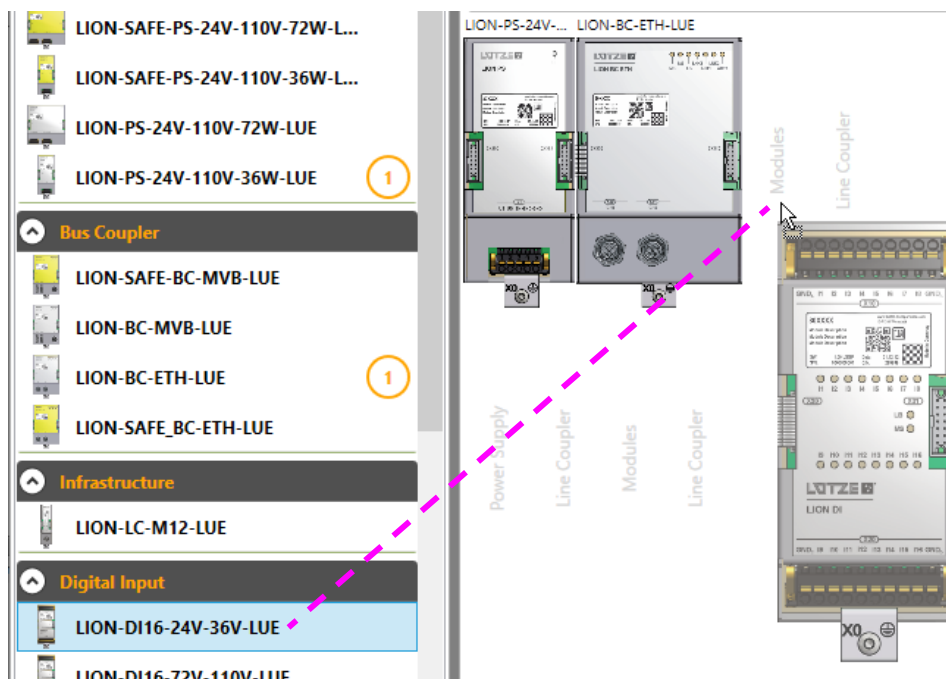
1. Click on a HEAD in the left toolbox window.
2. Drag the module now with the mouse button pressed down to the word "Bus Coupler" in the first line and drop it, as shown in the screenshot below.



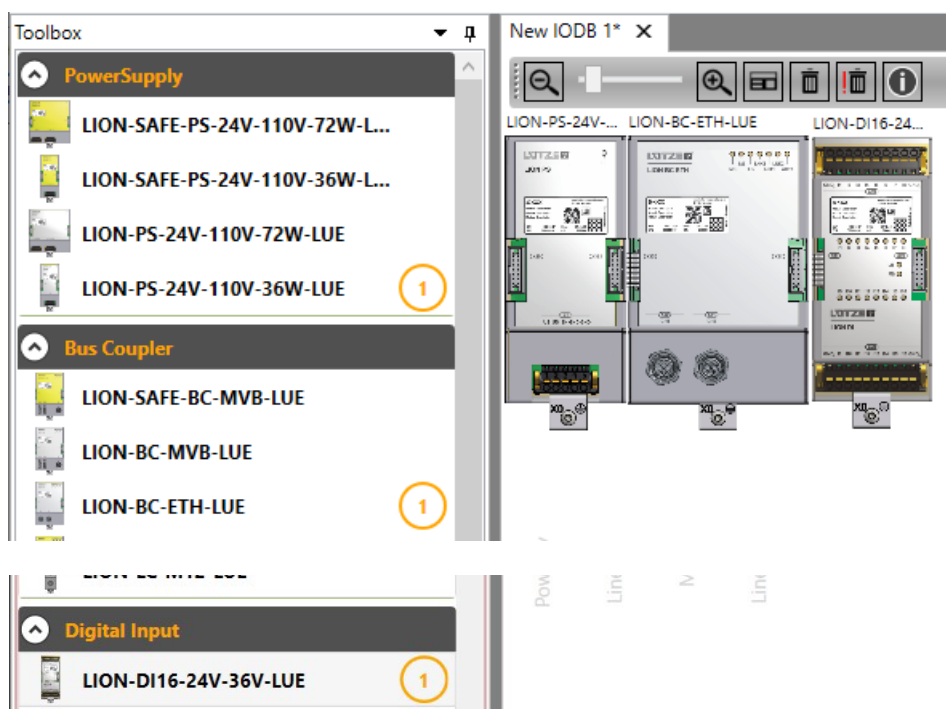
LION LCF Application Manual ▪ I/O Station Configurator

Step 3: Placing of the first DEVICE of a line

A DEVICE can be placed on the field **Modules**.

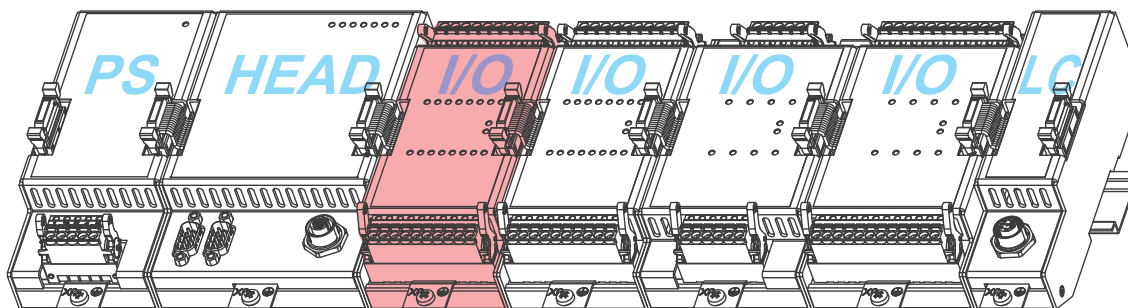


- Click on an analog/digital input/output module in the left toolbox window.
- Drag the module now with the mouse button pressed down to the word "Modules" in the first line and drop it, as shown in the screenshot above.
- If done it correctly, you will get this result:

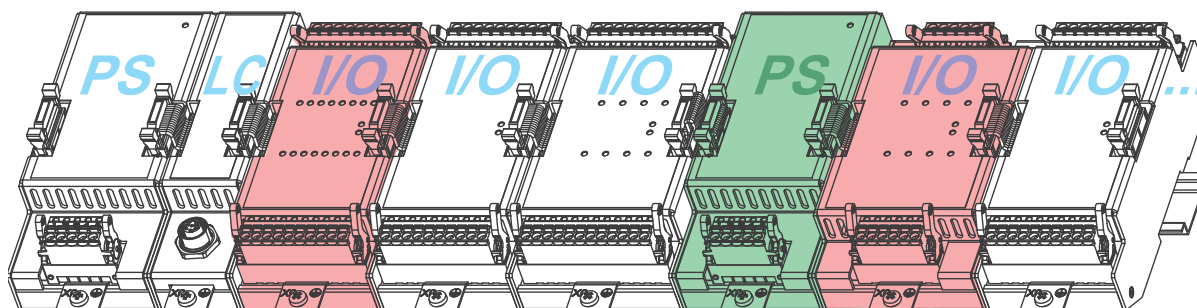


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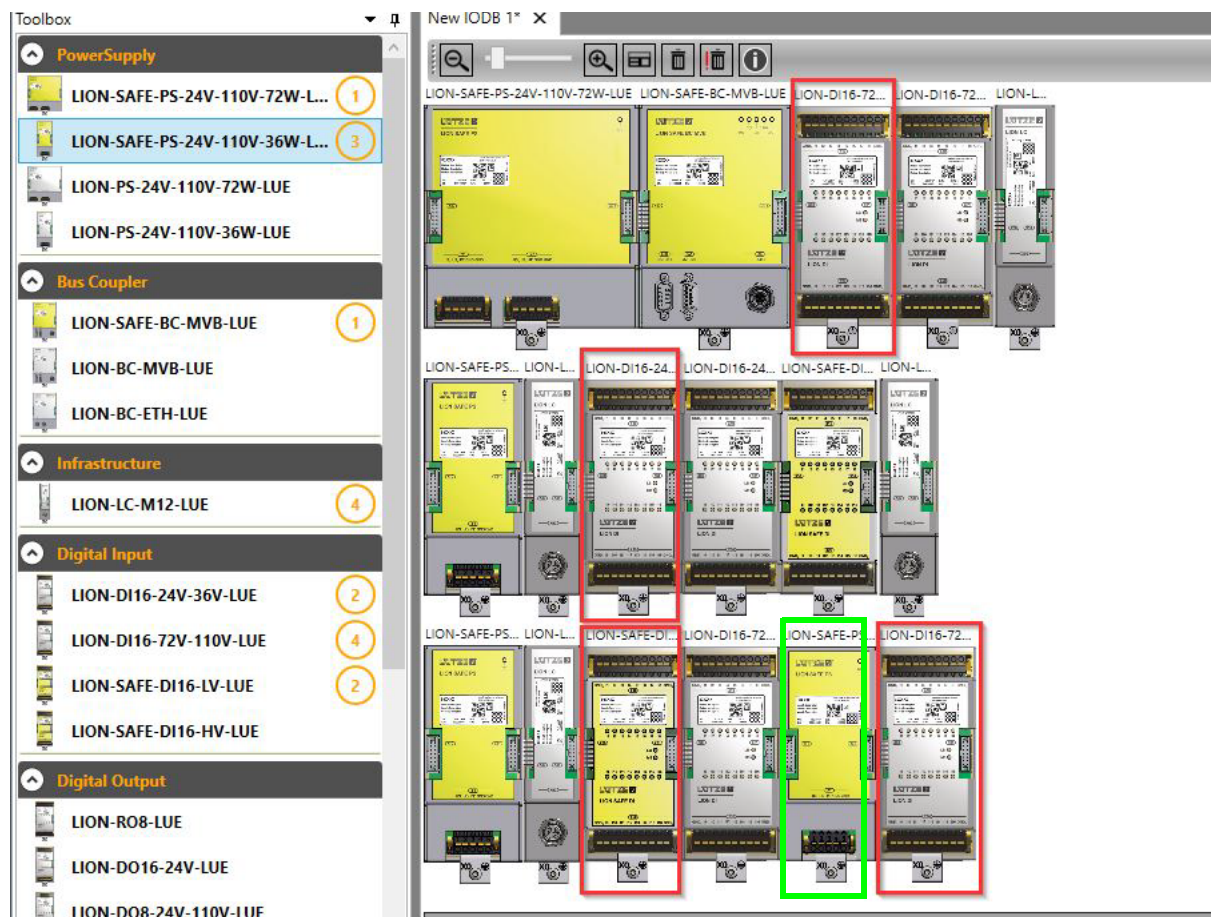
! Important technical information: In the first line, the first DEVICE is placed after the HEAD:



! Important technical information: 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 (green).



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

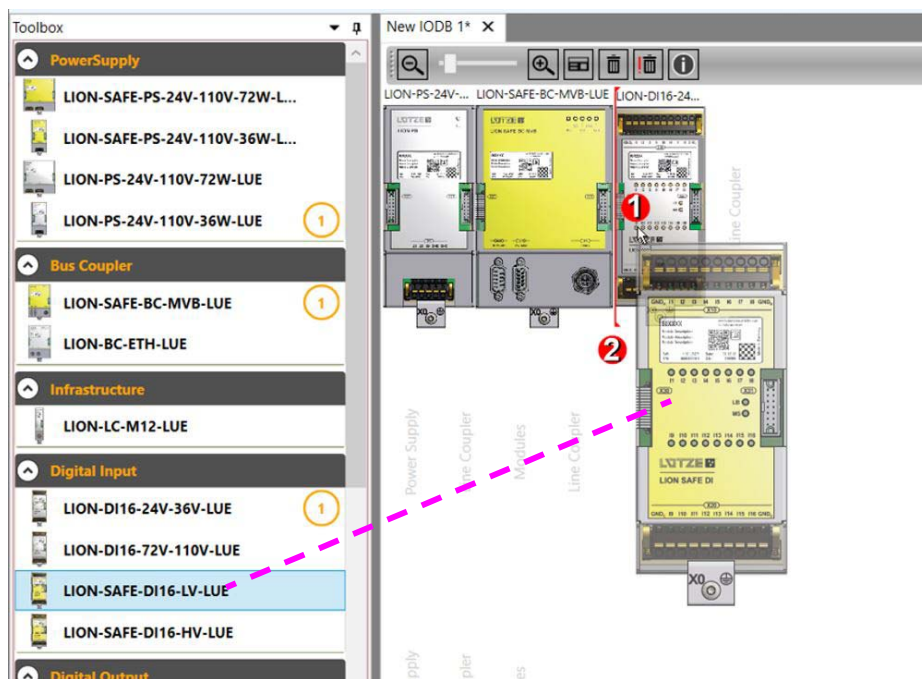


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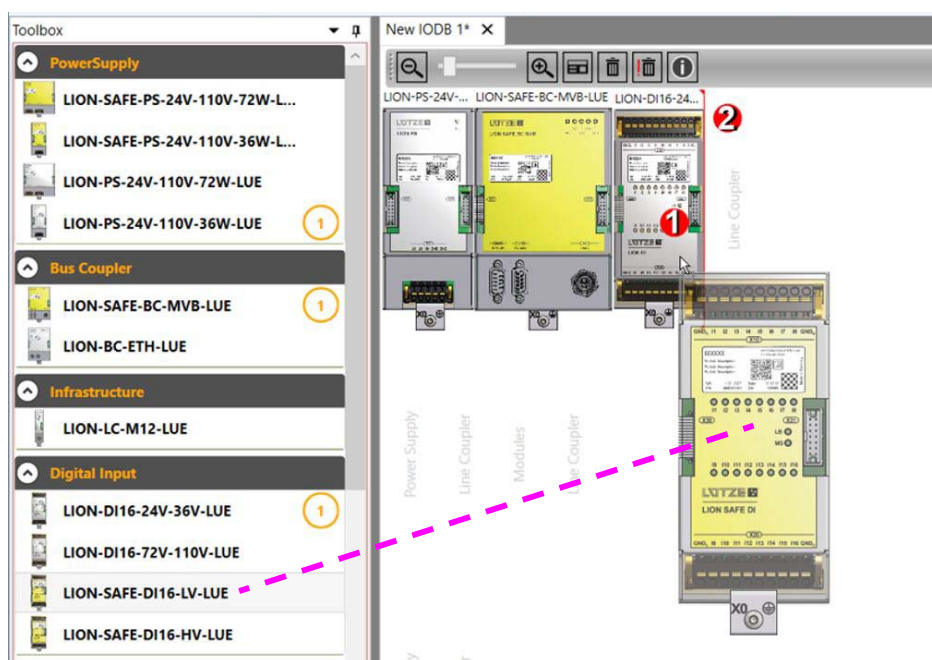
Step 4: Adding more Devices

! Important technical information: **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) either in front of a placed DEVICE:

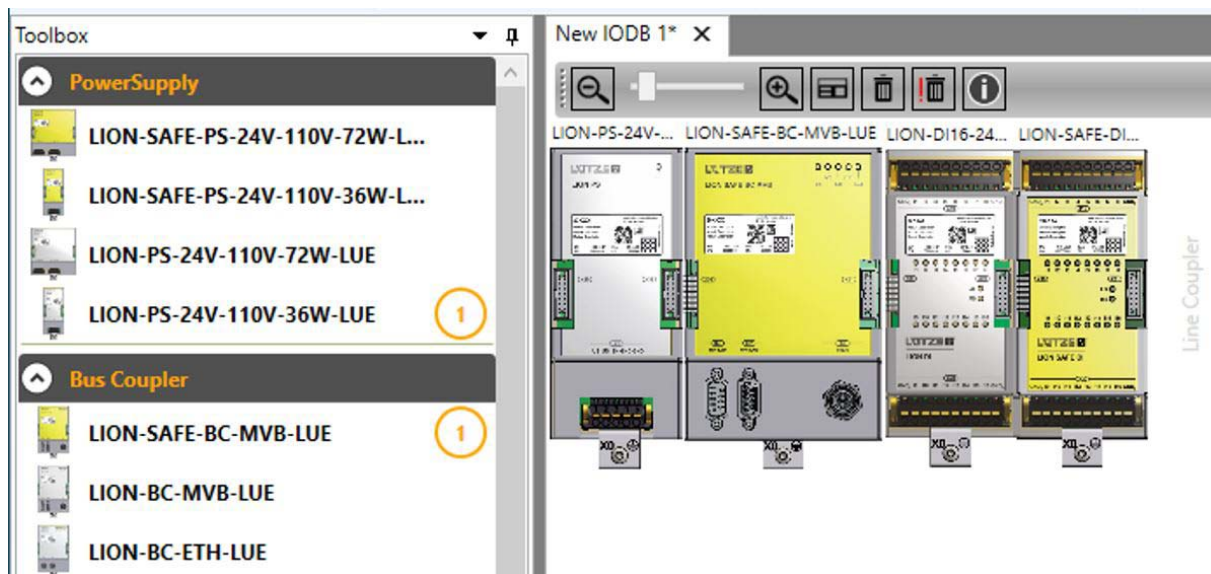


b) or behind a placed module:



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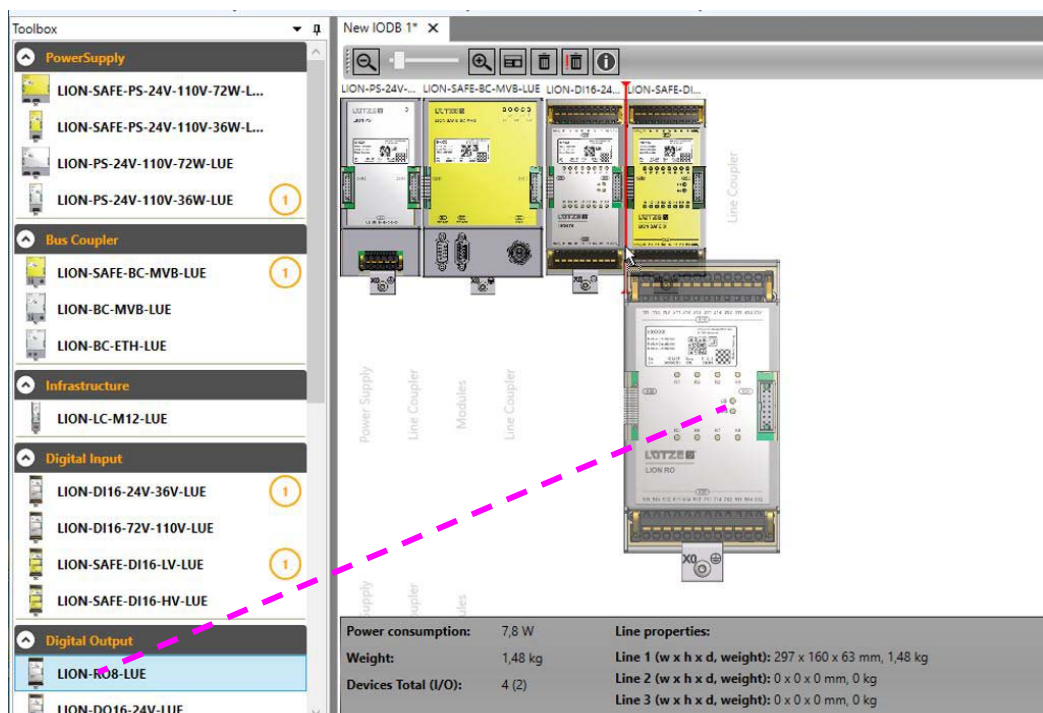
If done correctly, you will get this result:



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

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

Chapter: The placed DEVICES can be subsequently changed again at any time, see also chapter 8.1.5 on page 34



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Inline power supply

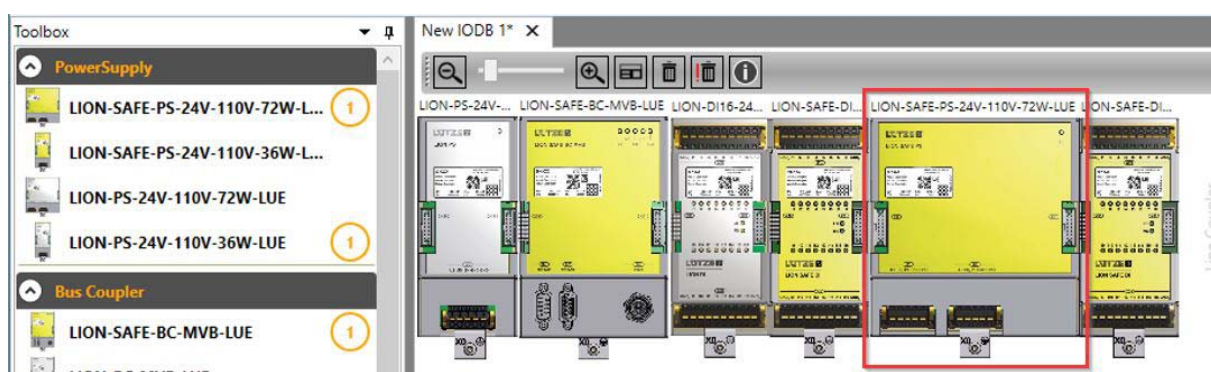
! Important technical information: **A DEVICE can be placed before or after an inline power supply.**

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

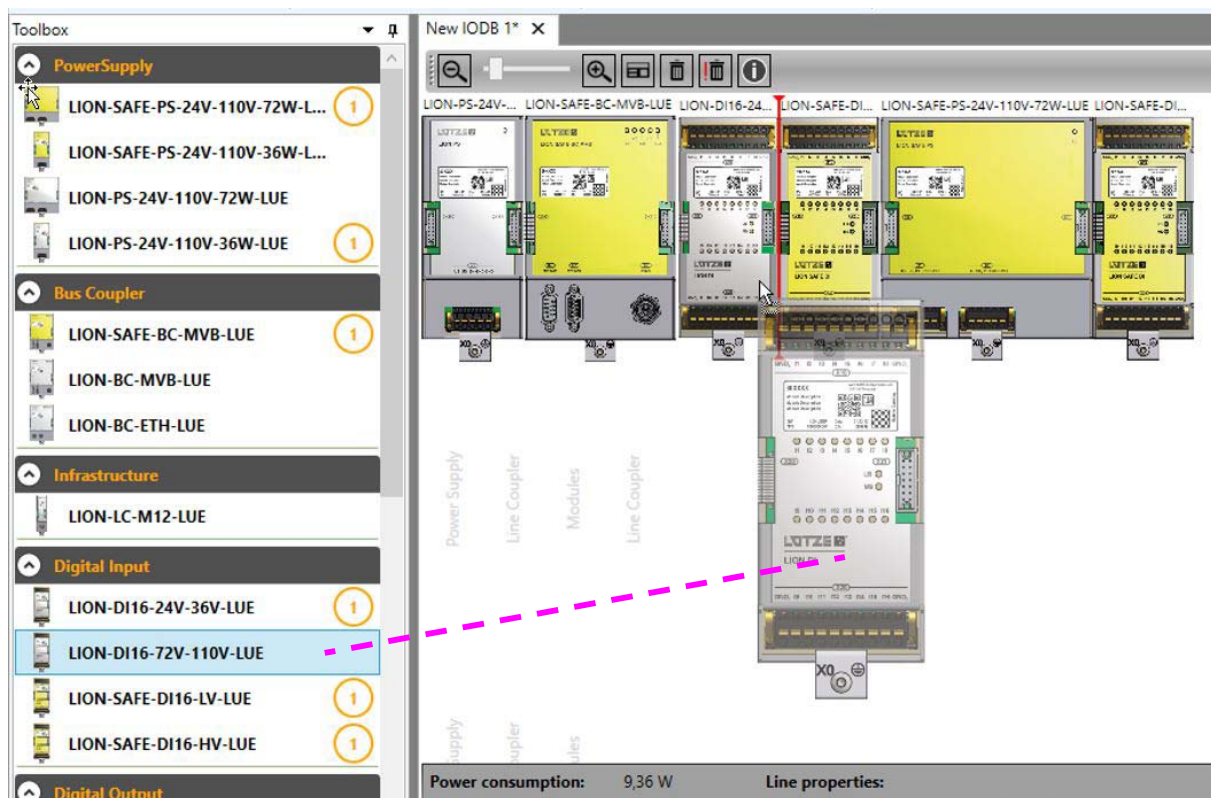
NOTE: If necessary, further power supply units can be connected to the line.

Chapter: **See also "3. Display of insufficient current" on page 48.**

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

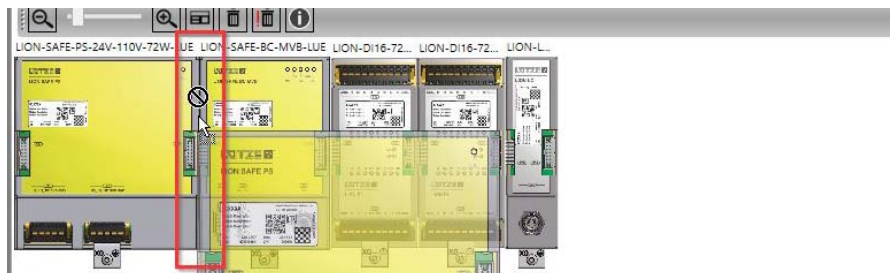


NOTE: A module can be placed anywhere where the red line appears. (See also the following screenshot.)

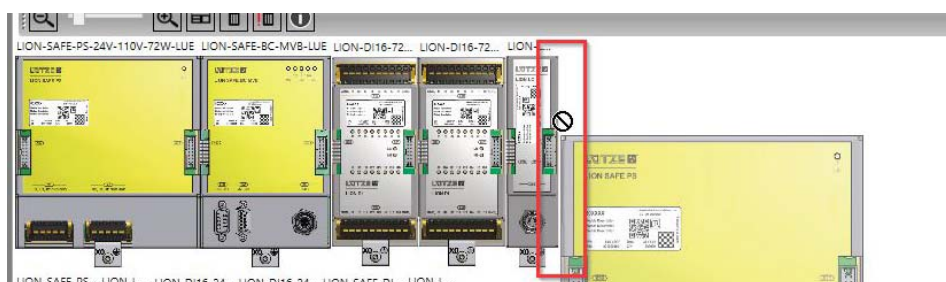


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NOTE: No placement is possible between the voltage supply at the first position and the HEAD.



NOTE: Placement after a line coupler is not possible.



c) Replacing the power supply unit or HEAD directly

NOTE: This type of replacement only works with PS and HEAD.

1. Replace the **power supply** directly by **dragging & dropping** on the icon:

Toolbox

- PowerSupply**
 - LION-SAFE-PS-24V-110V-72W-LUE
 - LION-SAFE-PS-24V-110V-36W-LUE
 - LION-PS-24V-110V-72W-LUE
 - LION-PS-24V-110V-36W-LUE
- Bus Coupler**
 - LION-SAFE-BC-MVB-LUE
 - 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
 - LION-DO16-24V-LUE

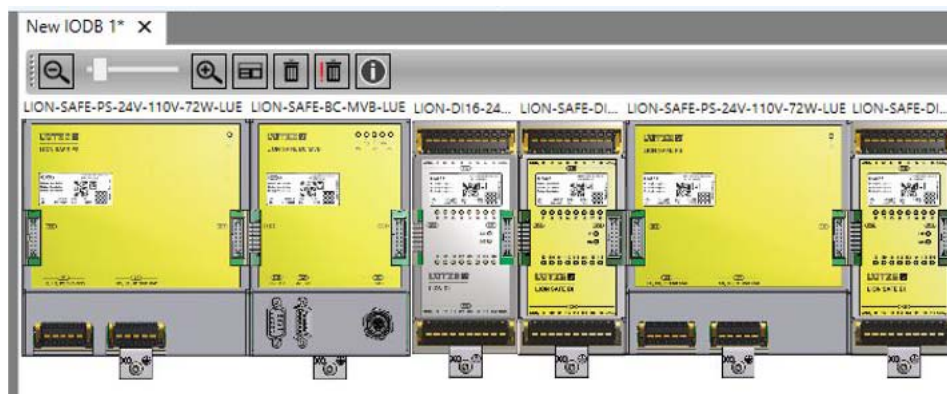
New IODB 1* X

Power consumption: 9,36 W
Weight: 2,5 kg
Devices Total (I/O): 6 (3)

Line properties:
Line 1 (w x h x d, weight): 503 x 160 x 63 mm, 2,5 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

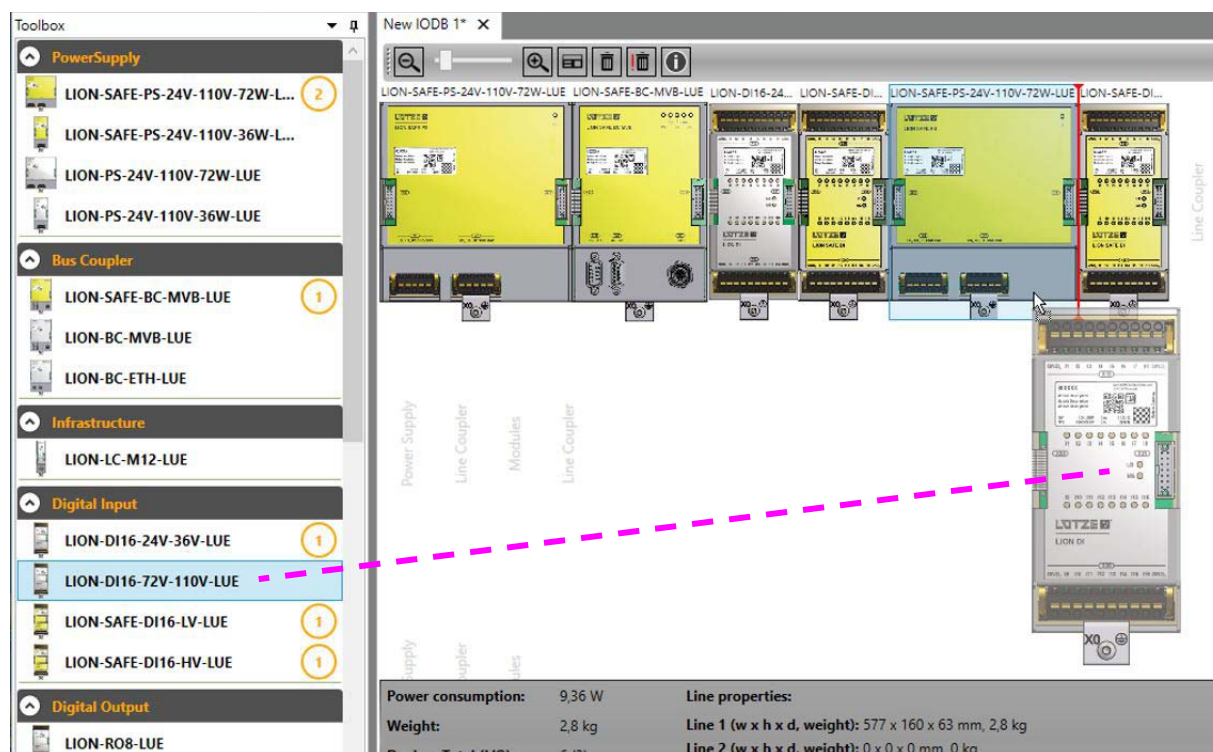
LION LCF Application Manual ▪ I/O Station Configurator

If done it correctly, you will get this result:



Exception: Replacement behavior of inline power supplies:

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.



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2. The HEAD can be replaced directly using drag & drop:



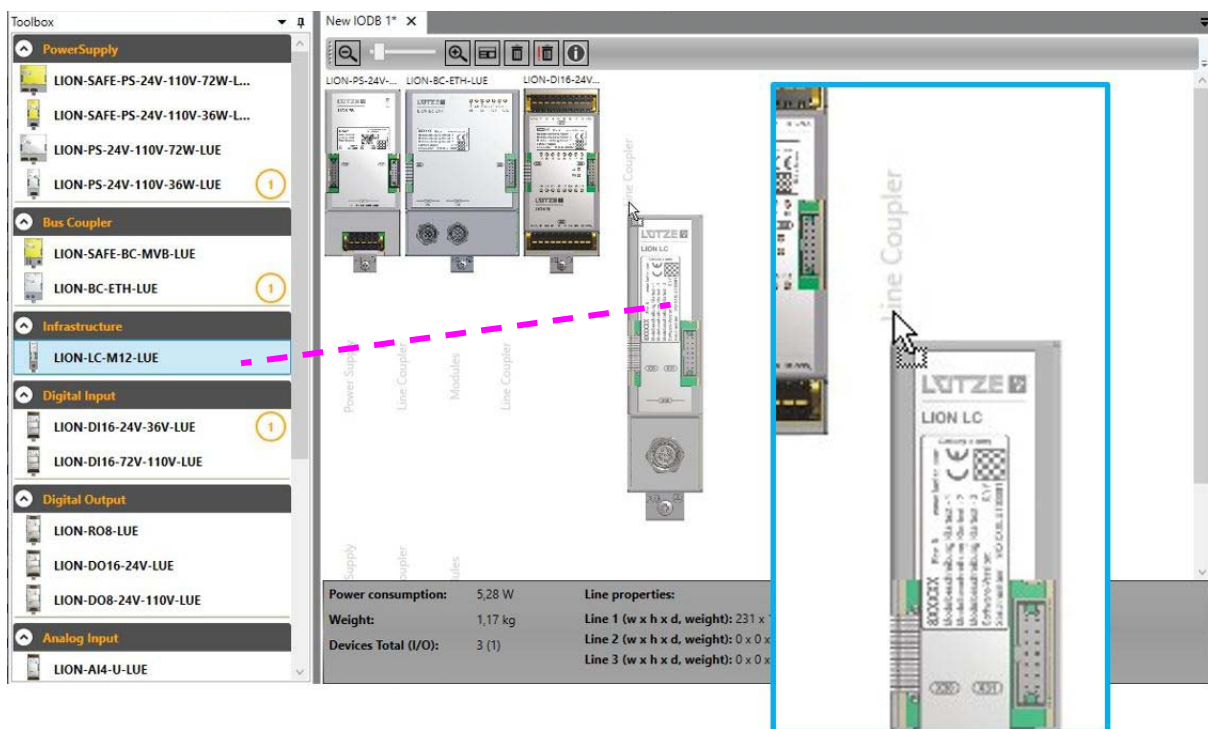
Step 5: LION line couplers or the last place in the first and second line

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

NOTE:

However, a line coupler is not necessarily required.

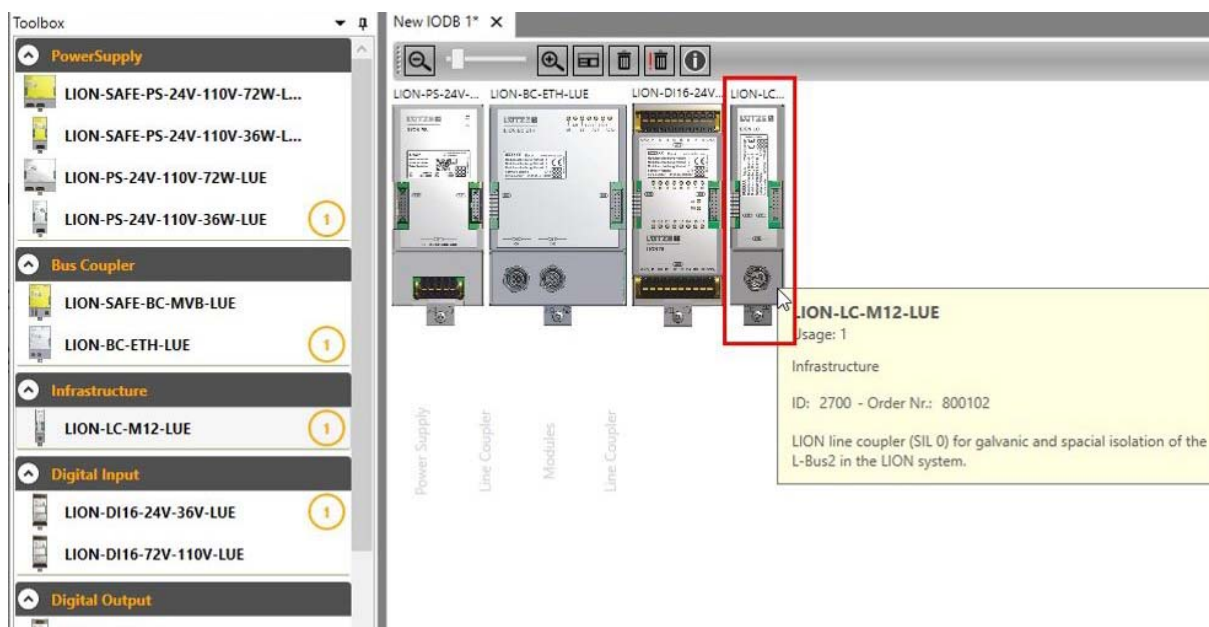
This is only the case if you want to extend the station over several lines.



To the text area "Line Coupler"

NOTE: It is not possible to place additional DEVICES here.

The last module in the first and second line is a "Line Coupler". It is only possible to drag a LION Line Coupler here. If the system runs across three lines, then the last module in the first and the second line is a „Line Coupler“.

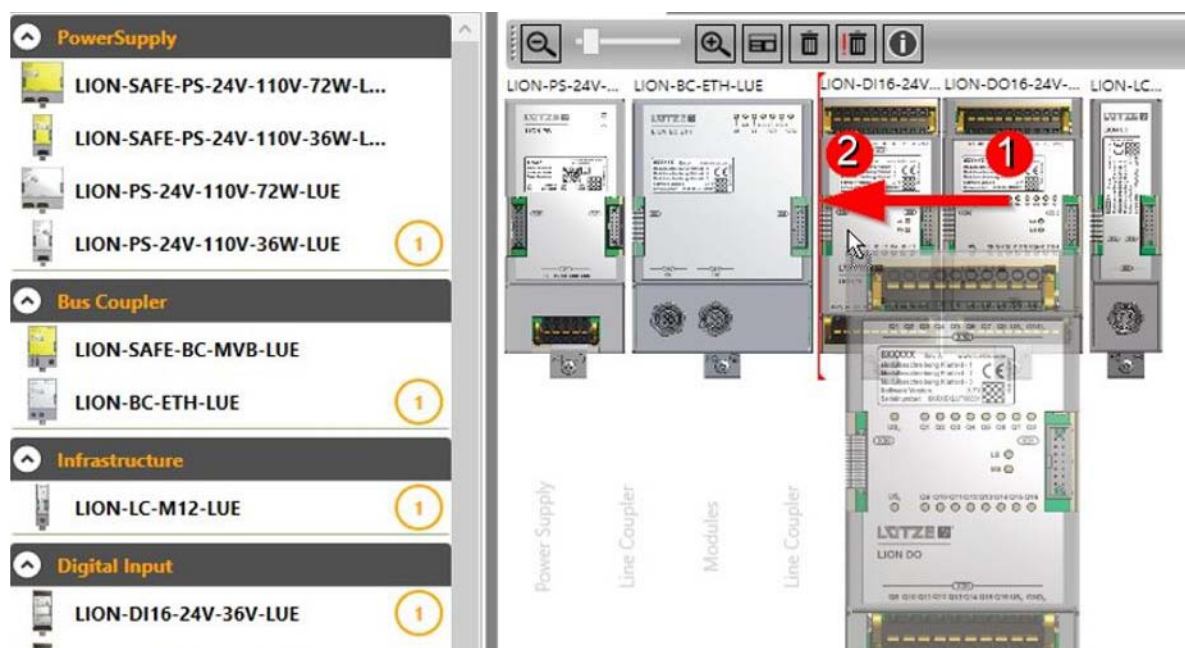


Step 6: Changing the order of DEVICES

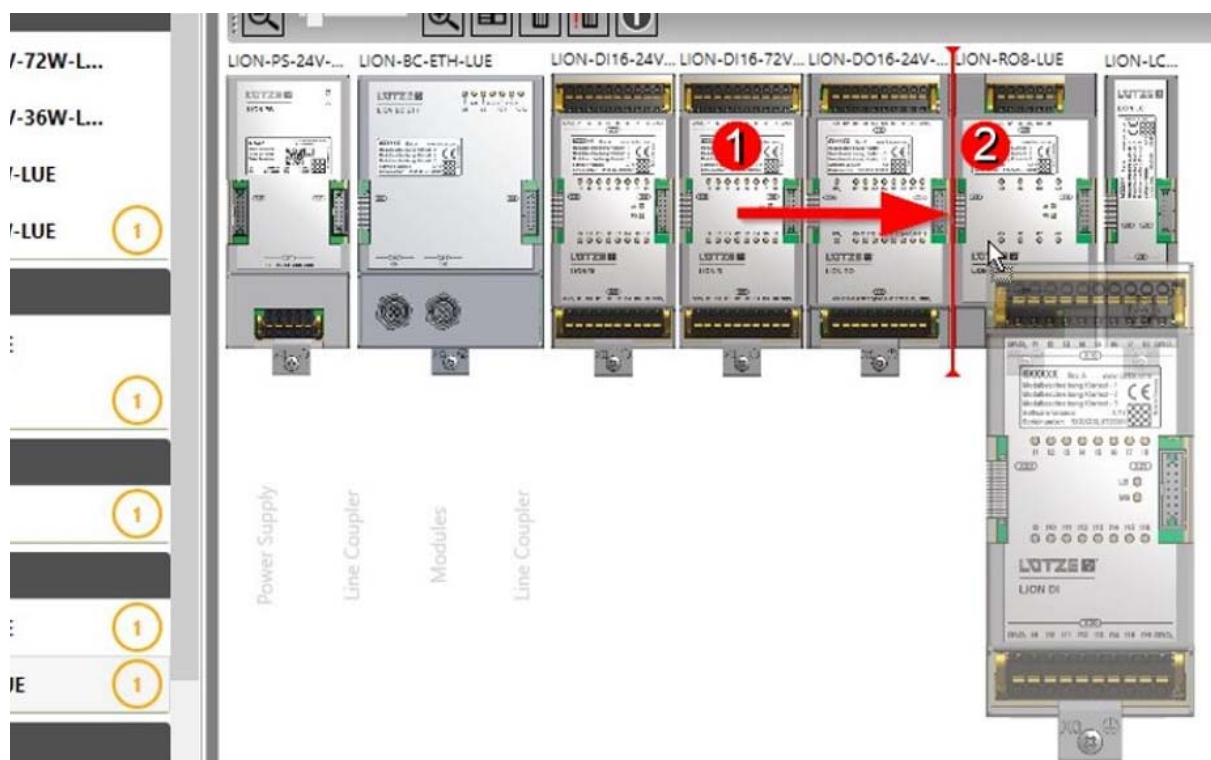
You can change the order of the modules at any time by following the previously mentioned rules.

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:



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Example2:

8.1.6

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.

NOTE: 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.

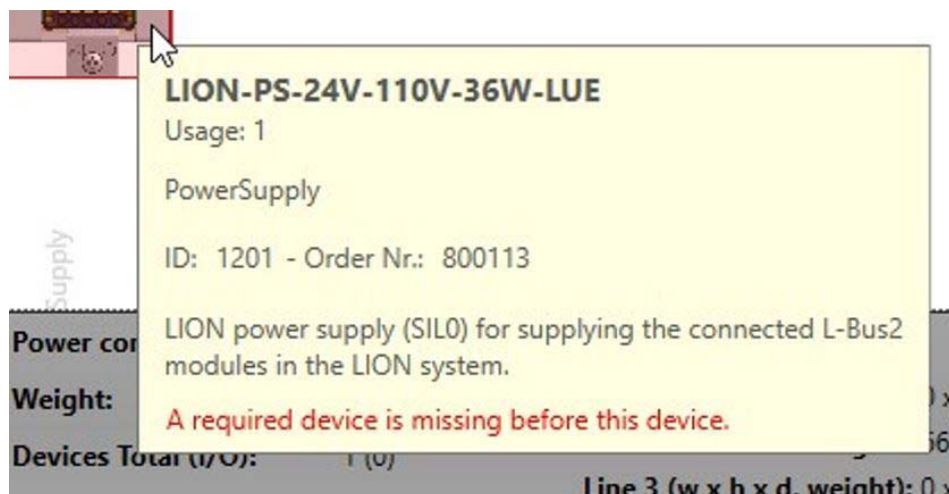
NOTE: The first line must not be empty.

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.



NOTE: Refer to the tooltips to get additional information about a detected configuration error.

These are displayed as red text.

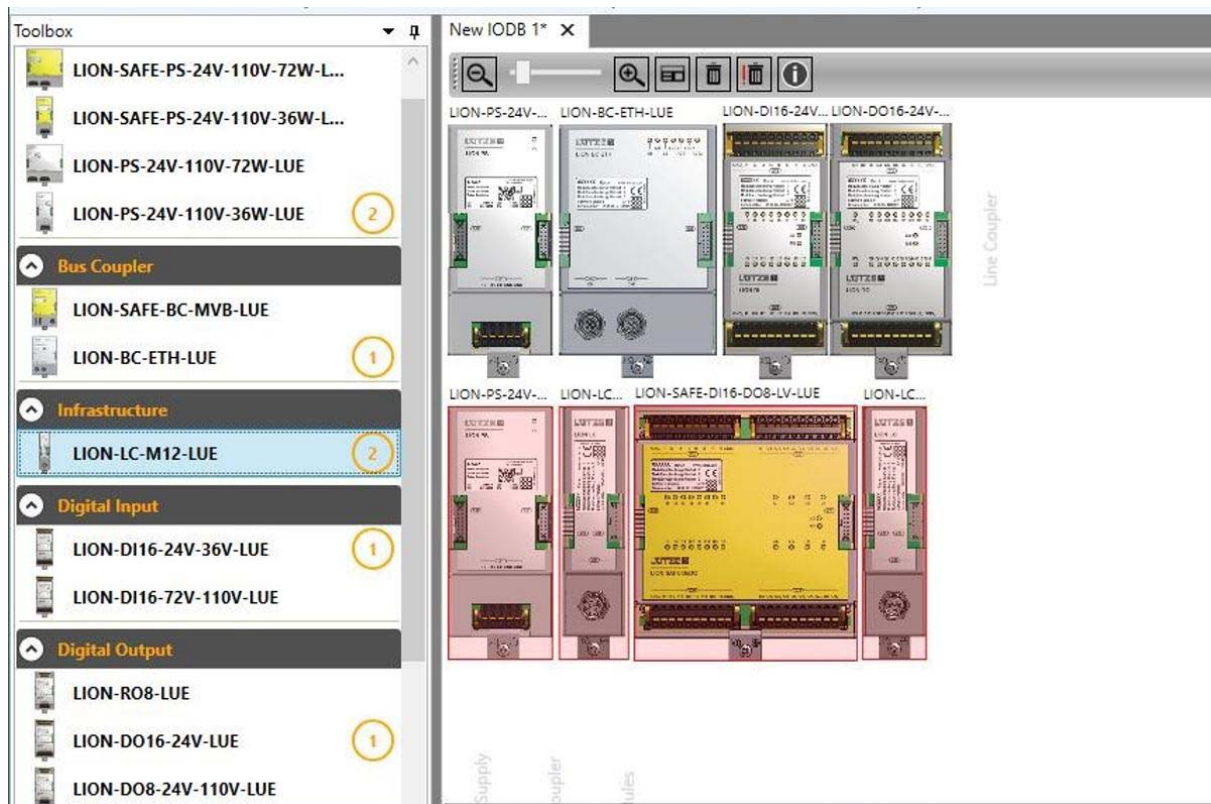


NOTE: If you release the mouse button after placing and the module is not displayed, either one of the rules was not observed or the marking was not hit exactly.

The module must then be placed again.

2. Display of incorrect configurations

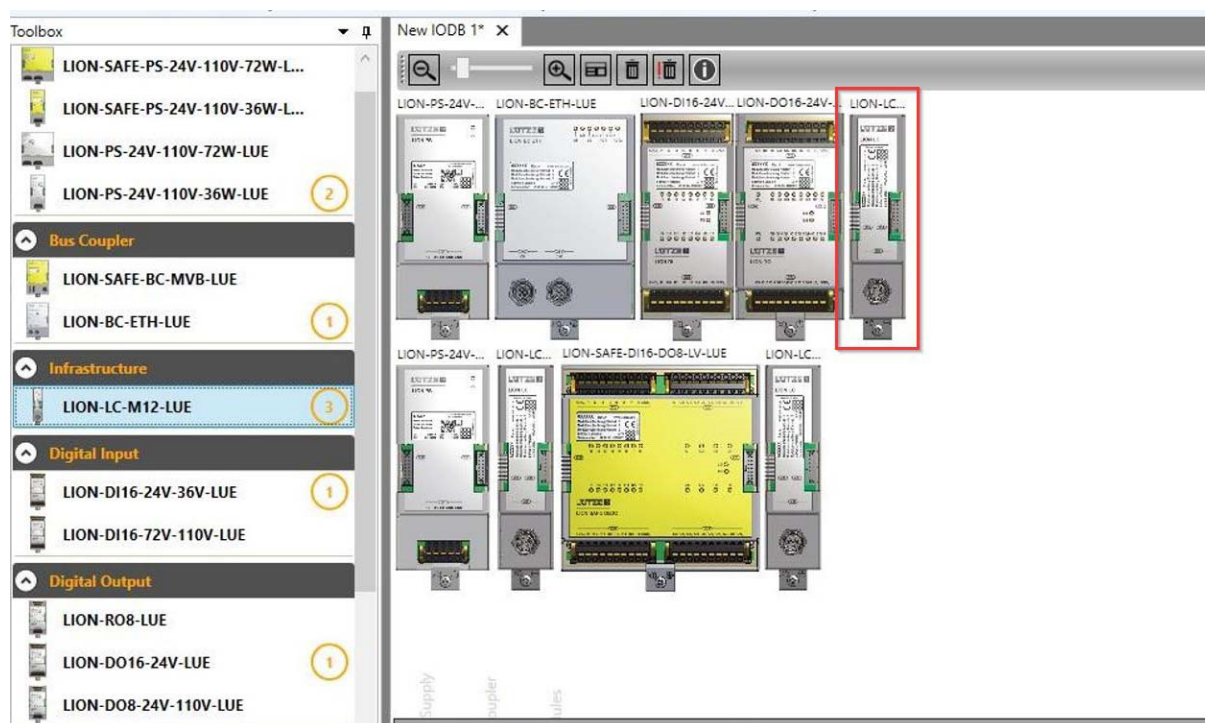
If the sequence is invalid, all affected modules are highlighted with red areas. In the example below the **LION Line Coupler** at the end of the first line is missing.



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

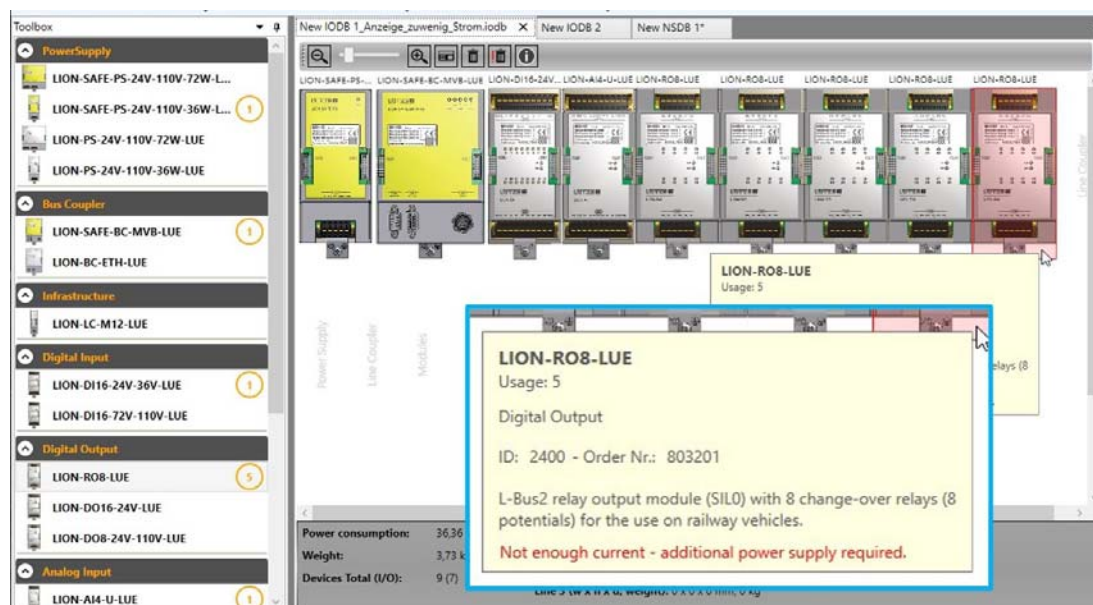
Troubleshooting: To fix the error a **LION Line Coupler** must be added at the end of the first line.

LION LCF Application Manual ▪ I/O Station Configurator



3. Display of insufficient current

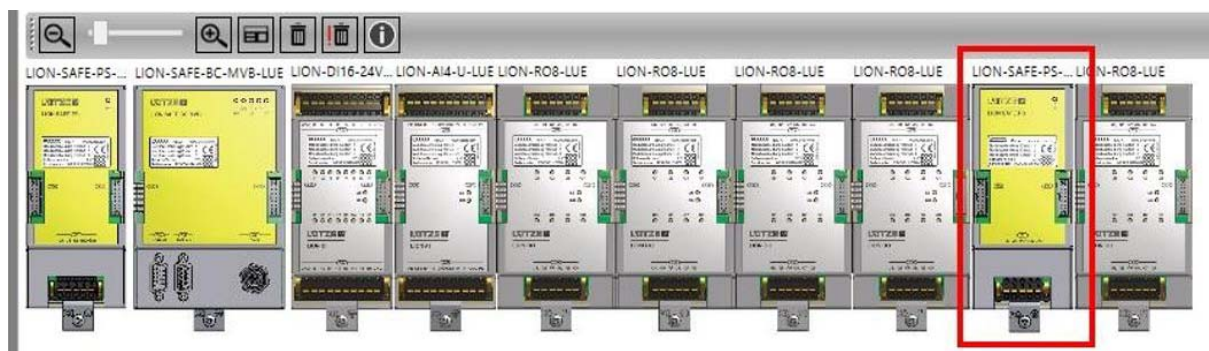
The LCF calculates if the power consumption of the configured modules exceeds the capabilities of the configured power supplies. A red area appears above the modules and the tooltip says, "Not enough current - additional power supply required".



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

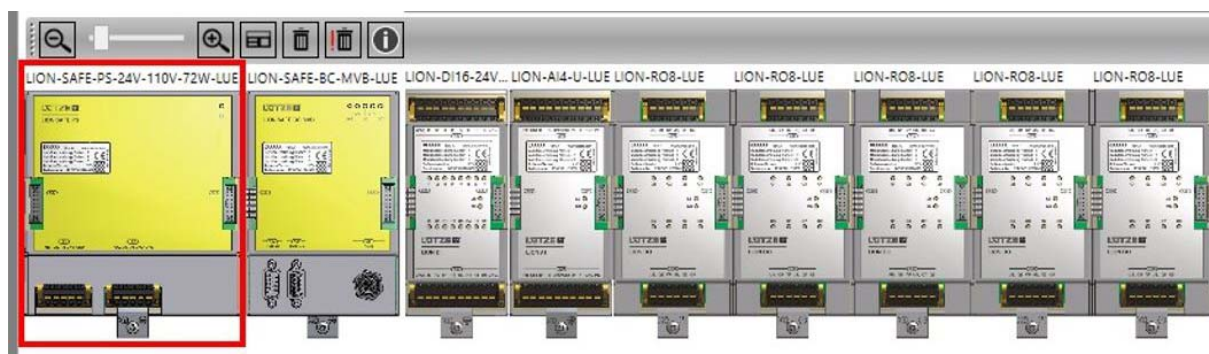
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module.



! Important technical information: 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.

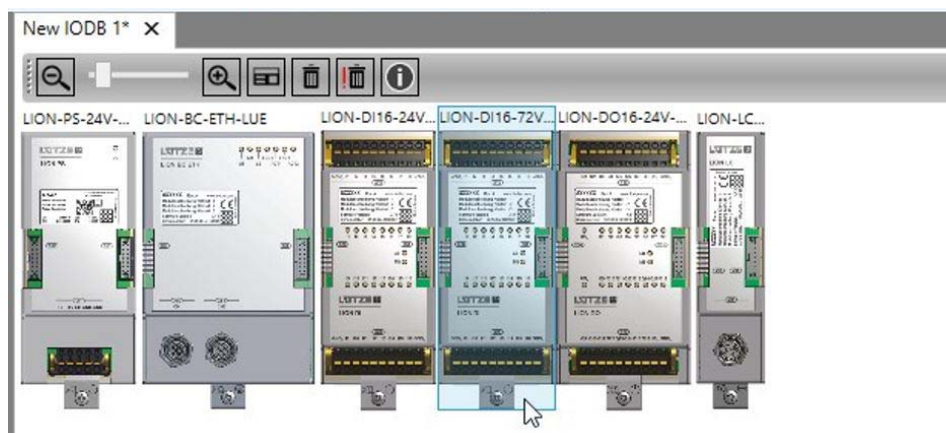
Troubleshooting 2: Insert a stronger power supply in the first place of the line.



8.1.7

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.

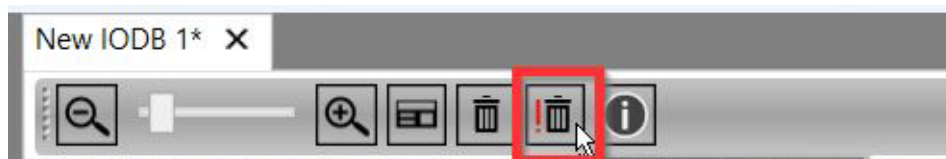
or:

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

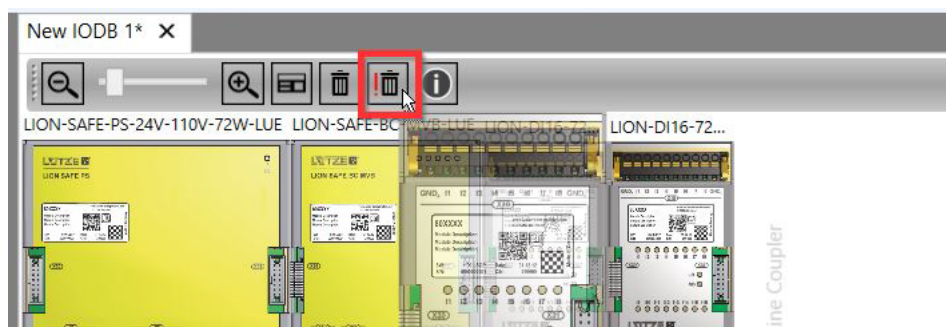


Alternative solutions:

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**:

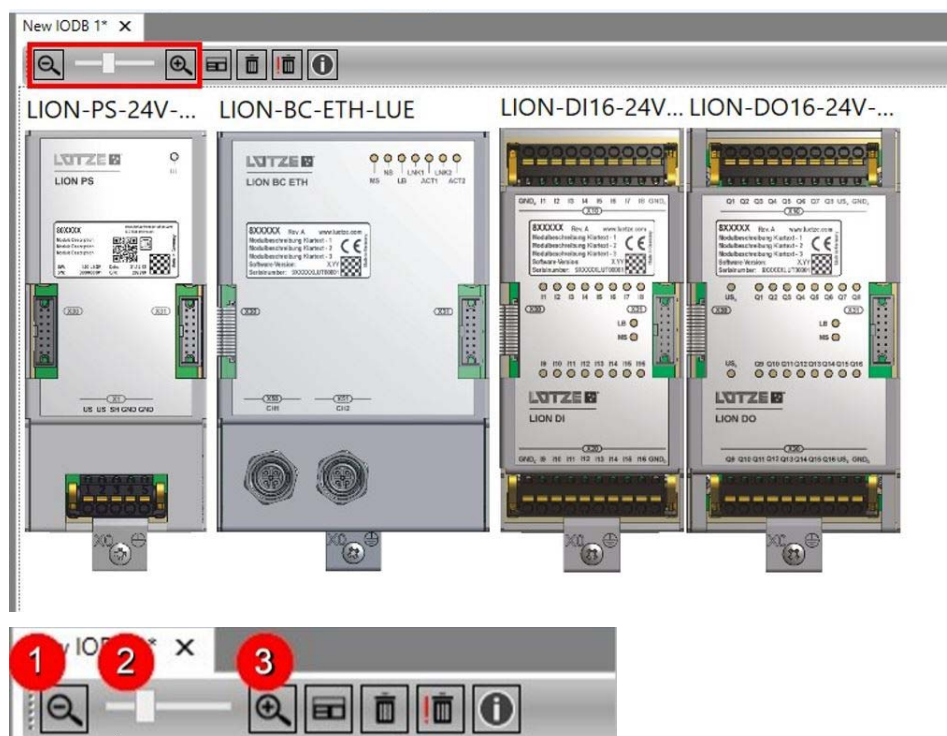


A special hint: If you drag a single module onto the **right trash can button**, it will be also deleted. (This do not work on the **left trash can button**!)



8.1.8 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.

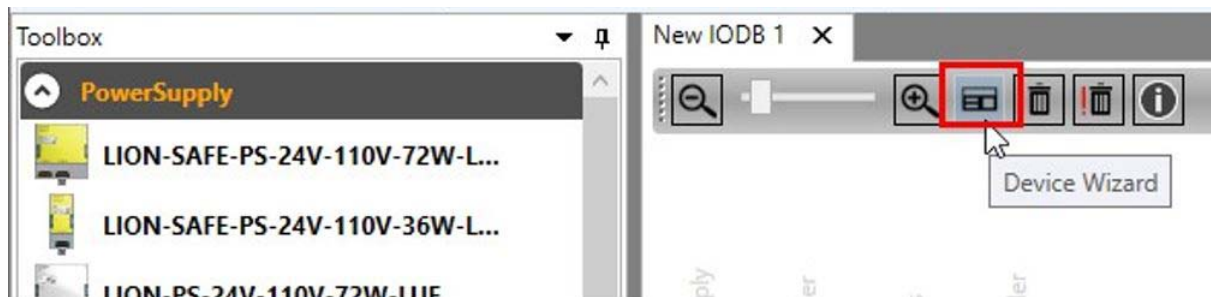


1. With the **zoom out button (1)** you can reduce the zoom level step by step.
2. The **zoom slider (2)** allows you to increase or decrease the zoom level continuously.
3. With the **zoom in button (3)** you can enlarge the zoom level step by step.
4. Use the **control key + mouse wheel** to increase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

8.1.9

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.



1. Click on the **Device Wizard button**.

! Important technical information: **Already placed devices will be deleted!**

The following window appears:

Safety Level	Type	Category	Range	Channels
--------------	------	----------	-------	----------

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

NOTE:

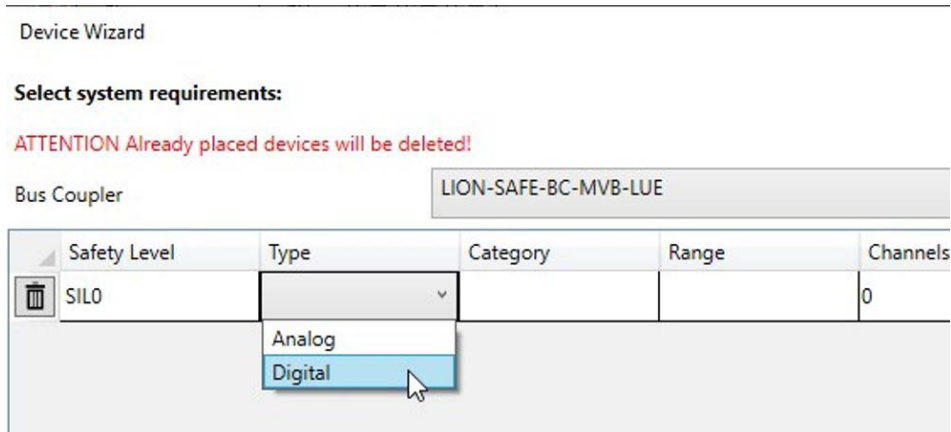
The chosen HEAD (e.g., bus coupler) defines the fieldbus used by the LION I/O station.

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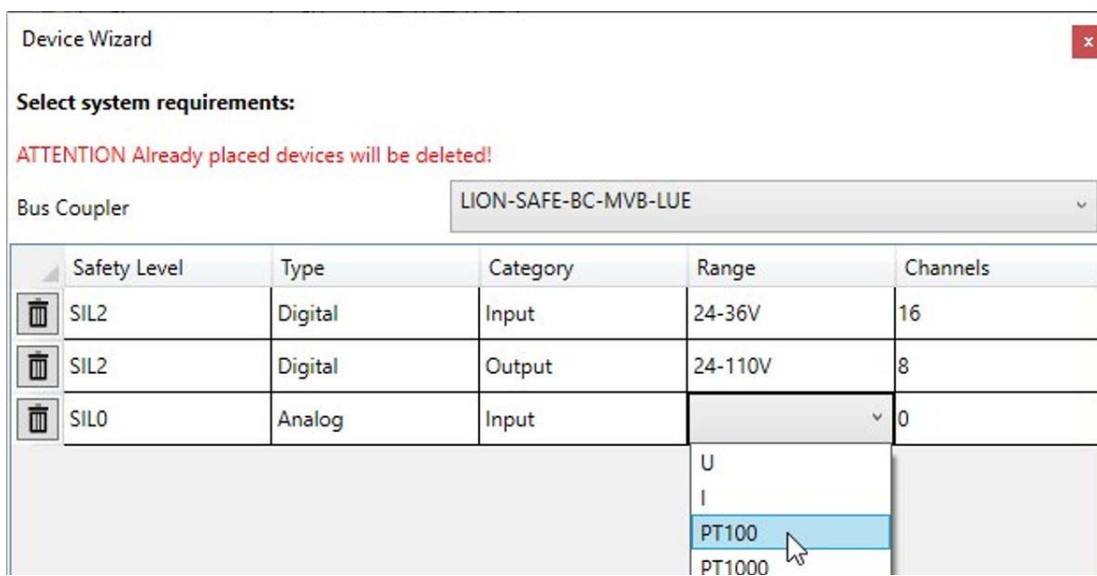
3. Click **New Entry** to define attributes for the first required I/O type.



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



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



NOTE: 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.

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6. 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

7. 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 IODB 1* X

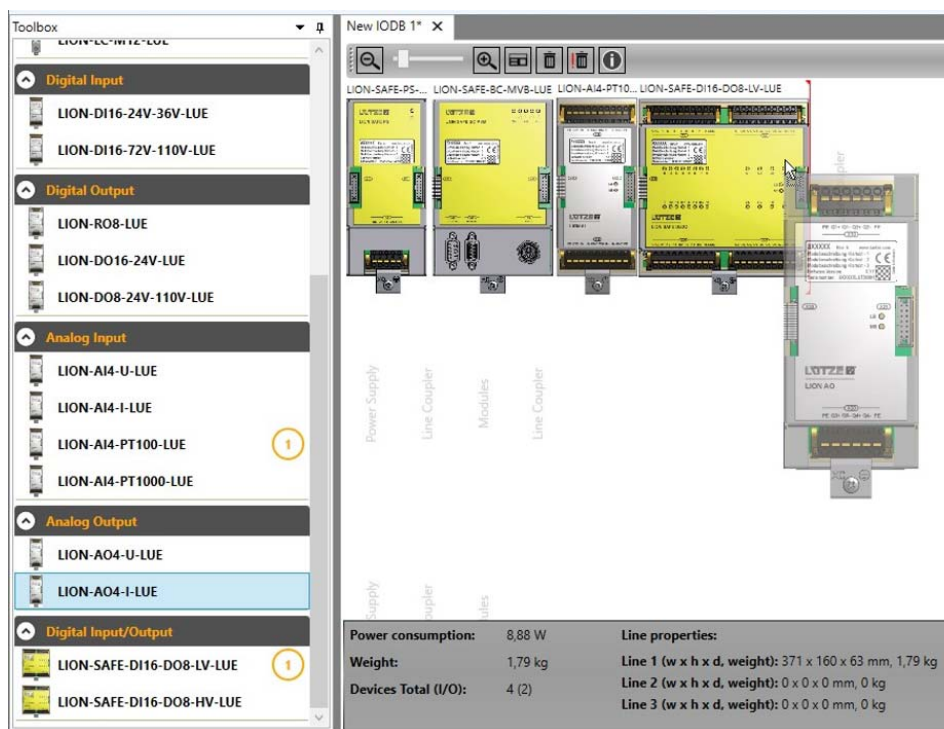
Power consumption: 14,64 W
Weight: 2,24 kg
Devices Total (I/O): 5 (3)

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

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

! Important technical information: 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



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

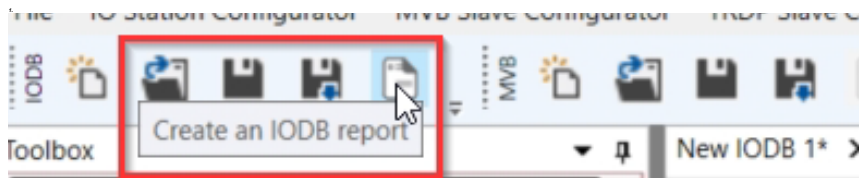
8.2

How to create 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.

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

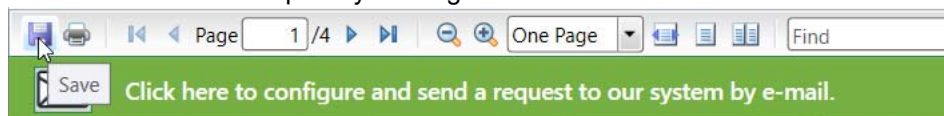
1. Click on the **report icon** in the toolbar.



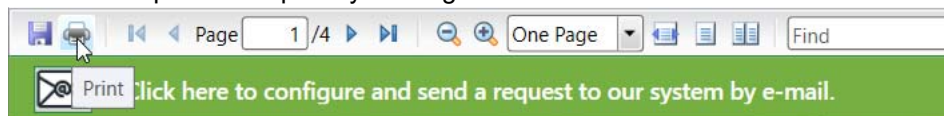
2. The report is generated as a *.pdf file.



3. You can save the report by clicking this button.




4. You can print the report by clicking this button.



NOTE: It is possible to save the report or print it.

8.3

IODB sample configuration

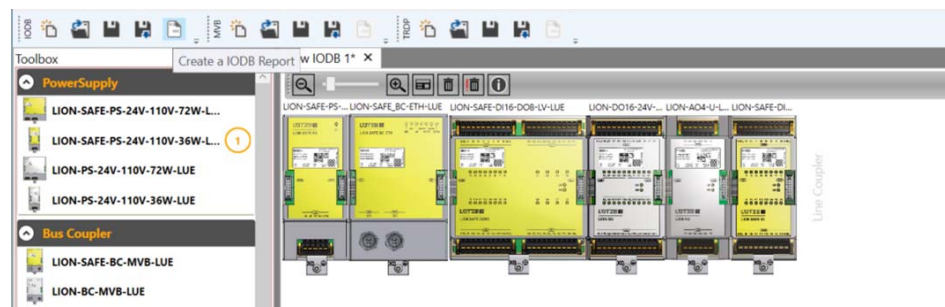
 **Service:** If you need the IODB sample configuration as a download, please contact the service of Lütze Transportation GmbH (see also **chapter 15** on **page 177**).

8.4 Create a quote request for the LION system

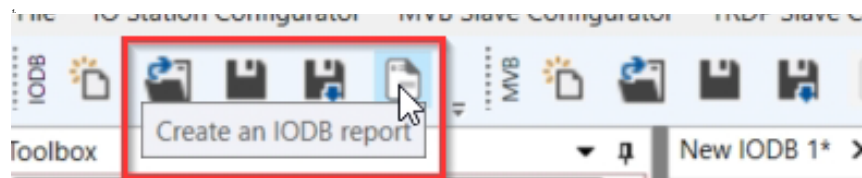
This function allows you to create a quote request for the LION system you have put together and send it to the LÜTZE Transportation sales department.

8.4.1 IODB report

Step 1: Open the LION system to be calculated.



Step 2: Click on the report icon in the toolbar.



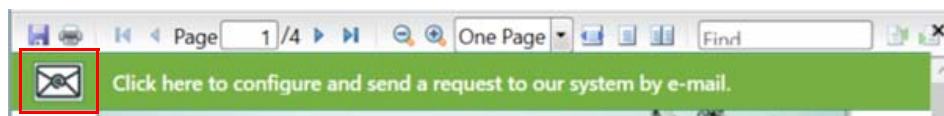
Step 3: The report is generated as a *.pdf file.



Step 4: Check all data carefully.

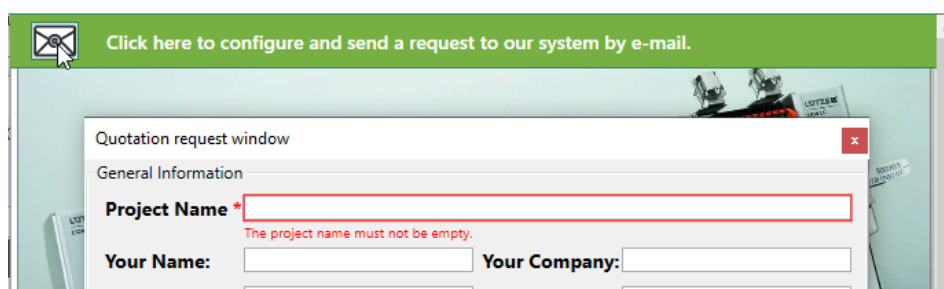
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Step 5: In the upper part of the IODB report, there was an option to send an inquiry regarding the configured LION system to the sales department.



NOTE: Microsoft Outlook program must be installed on the computer.

Step 6: Clicking on the button opens the quotation request window.



8.4.2

Send an E-Mail

Step 7: Once the “Project Name” field (1) has been filled in, the “Apply” button (2) for sending the email will be activated.

Quotation request window

General Information

Project Name * 1

The project name must not be empty.

Your Name: **Your Company:**

Your Position: **Address:**

System-Information

Specify the number of stations * Calculating the order quantity

ID	Position Nr.	Part Nr.	Quantity	Order quantity	Unit
1	Pos. 10	800103	1	5	pcs.
2	Pos. 20	803002	1	5	pcs.
3	Pos. 30	803501	1	5	pcs.
4	Pos. 40	803204	1	5	pcs.
5	Pos. 50	803403	1	5	pcs.
6	Pos. 60	803104	1	5	pcs.

Accessories

Part Nr. / Description	Quantity
800207 - LION Connection cable for Line Coupler (LC) Length = 2 m	5
800202 - LION L-Bus ² Blind Connector	10
Please select here	

Apply 2
Cancel

Step 8: After confirming the “Apply” button, an email will be generated.

Senden An sales.transportation@luetze.de 1

Cc

Betreff LION Request for proposal: Txxx 2

IODB Report: New IODB 1.iodb 1 MB 3

Dear Sir/Madam,

We are interested in your product/service and would like to receive a detailed offer.

Could you please provide us with the following information: 4

- Pos. 10 / Part no. - 800103 / 5 units 5
- Pos. 20 / Part no. - 803002 / 5 units
- Pos. 30 / Part no. - 803501 / 5 units
- Pos. 40 / Part no. - 803204 / 5 units
- Pos. 50 / Part no. - 803403 / 5 units
- Pos. 60 / Part no. - 803104 / 5 units

Accessories: 6

- Pos. 70 / Part no. - 800207 / 5 units
- Pos. 80 / Part no. - 800202 / 10 units

Please send us a detailed offer with price, delivery time and all relevant information.

We look forward to hearing from you soon.

Kind regards, 7

Step 9: The email structure

(1) Recipient: Filled in automatically.

(2) Subject line: The entry from “Project Name” is transferred after the standard text.

(3) Email attachment: The automatically generated IODB report from the LCF tool as a PDF document.

(4) Cover letter: Filled in automatically.

(5) List of system components: All necessary data for the LION IODB system is transferred to the text of the email. First, the system components themselves are presented (e.g., lines 10 to 60).

(6) Spare parts/accessories: The spare parts (if selected) are then listed below.

(7) The signature: This is taken from your Outlook signature or, as described below, automatically copied from the draft in the quote request window. This requires that the fields “Your name,” “Your company,” “Your position,” and “Your address” are filled in.

NOTE: The text can be supplemented and changed at any time.

Step 10: Once you have finished editing, you can send the email as usual.

8.4.3

Details

(1) General Information

Quotation request window

General Information 1

Project Name *

The project name must not be empty.

Your Name: **Your Company:**

Your Position: **Address:**

System-Information

Customer-specific entries (e.g., project number, etc.)

NOTICE The **Project Name** field is a mandatory field. It will be included in the subject line of the email.

All other input fields are optional. When filled in, the entries will be included in the email signature.

(2) System-Information

System-Information 2

Specify the number of stations *

ID	Position Nr.	Part Nr.	Quantity	Order quantity	Unit
1	Pos. 10	800103	1	1	pcs.
2	Pos. 20	803002	1	1	pcs.
3	Pos. 30	803501	1	1	pcs.
4	Pos. 40	803204	1	1	pcs.
5	Pos. 50	803403	1	1	pcs.
6	Pos. 60	803104	1	1	pcs.

Accessories

An overview of all components of the preconfigured LION I/O Station is displayed here.

If the same preset configuration is planned for multiple stations, you can have the entire configuration recalculated (In this example, 5 times).

System-Information

Specify the number of stations *

ID	Position Nr.	Part Nr.	Quantity	Order quantity	Unit
1	Pos. 10	800103	1	1	pcs.
2	Pos. 20	803002	1	1	pcs.
3	Pos. 30	803501	1	1	pcs.
4	Pos. 40	803204	1	1	pcs.
5	Pos. 50	803403	1	1	pcs.
6	Pos. 60	803104	1	1	pcs.

(1) Enter the corresponding number of stations in the “Specify the number of...” field

(2) Confirm with the “Calculating the order quantity” button.

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Newly calculated data is written to the “Order quantity” column of the table.

System-Information

Specify the number of stations * Calculating the order quantity

ID	Position Nr.	Part Nr.	Quantity	Order quantity	Unit
1	Pos. 10	800103	1	5	pcs.
2	Pos. 20	803002	1	5	pcs.
3	Pos. 30	803501	1	5	pcs.
4	Pos. 40	803204	1	5	pcs.
5	Pos. 50	803403	1	5	pcs.
6	Pos. 60	803104	1	5	pcs.

Accessories

(3) Accessoires

Accessories **3**

Part Nr. / Description	Quantity
Please select here	0
Please select here	

Apply Cancel

Here you can enter additional accessories, specifying the quantity.

By clicking on the first line, “Please select here,” you can open the pull-down menu for selecting accessories by double-clicking or using the arrow key on the right-hand side.

Accessories

Part Nr. / Description	Quantity
Please select here	0

2x click!

- 800201 - LION L-Bus² Termination Connector
- 800202 - LION L-Bus² Blind Connector
- 800203 - LION L-Bus² 1:1 Cable
- 800204 - LION Shield Clip Set
- 800205 - LION Connection cable for Line Coupler (LC) Length = 10 m
- 800206 - LION Connection cable for Line Coupler (LC) Length = 5 m
- 800207 - LION Connection cable for Line Coupler (LC) Length = 2 m
- 800208 - LION Set I/O Connector 5-pin plus coding elements
- 800212.90 - LION Connection cable for Line Coupler (LC) Length = 1m M12 90 Degree

Cancel

Then enter the desired amount.

Accessories

Part Nr. / Description	Quantity
800207 - LION Connection cable for Line Coupler (LC) Length = 2 m	5
Please select here	

Apply Cancel

NOTICE Entries can be modified at any time.

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To get a another selection line, simply click on “Please select here” below.

Accessories

Part Nr. / Description	Quantity
800207 - LION Connection cable for Line Coupler (LC) Length = 2 m	5
Please select here	

Apply Cancel

Accessories

Part Nr. / Description	Quantity
800207 - LION Connection cable for Line Coupler (LC) Length = 2 m	5
800202 - LION L-Bus ² Blind Connector	0
800201 - LION L-Bus ² Termination Connector	
800202 - LION L-Bus ² Blind Connector	
800203 - LION L-Bus ² 1:1 Cable	
800204 - LION Shield Clip Set	
800205 - LION Connection cable for Line Coupler (LC) Length = 10 m	
800206 - LION Connection cable for Line Coupler (LC) Length = 5 m	
800207 - LION Connection cable for Line Coupler (LC) Length = 2 m	
800208 - LION Set I/O Connector 5-pin plus coding elements	
800212.90 - LION Connection cable for Line Coupler (LC) Length = 1m M12 90 Degree	

Cancel

Accessories

Part Nr. / Description	Quantity
800207 - LION Connection cable for Line Coupler (LC) Length = 2 m	5
800202 - LION L-Bus ² Blind Connector	10

Apply Cancel

Accessories

Part Nr. / Description	Quantity
800207 - LION Connection cable for Line Coupler (LC) Length = 2 m	5
800202 - LION L-Bus ² Blind Connector	10
Please select here	

Apply Cancel

NOTICE This allows you to create as many selection lines as you like.

9

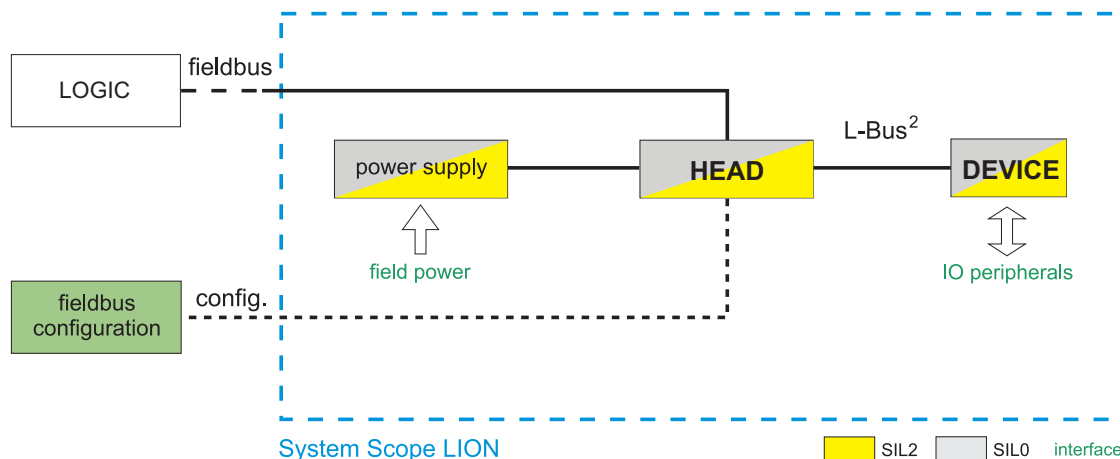
Configurator HEAD – MVB Slave Configurator

Short summary

You need an IODB file in order to create an NSDB configuration file. This is described in steps below.

The type of HEAD determines the type of fieldbus used in the LION system. If an MVB HEAD is used, it is the master of an MVB LION station (blue frame).

The HEAD, and therefore the entire LION station, is also an MVB slave in relation to the higher-level system, the LOGIC.



A LION system is a local I/O system consisting of a bus coupler (MVB, Ethernet, etc.), the HEAD, and various input and output modules (digital and analog for power, voltage and temperature), the DEVICES and corresponding infrastructure components. The following applies:

1. The MVB bus coupler is the HEAD of the L-Bus². The HEAD sends data to the DEVICES or receives data from the DEVICES.
2. The HEAD communicates with the DEVICES via L-Bus².
3. The I/O data and the MVB fieldbus need to be mapped in order to allow data transfer.
4. To do this, the process image of the DEVICES must be mapped to the **PVNames** of the **source ports** or **sink ports** of the HEAD.

NOTE: The mapping and configuration of the individual data must be carried out in the LION LCF tool.

! Important technical information: Further information can also be found in the "Configuration" chapter in the respective operating manuals of the HEADs.

NOTE: LION HEADs are available in non-safe and safe versions. SDTv2 is only relevant for SIL>0 and therefore for LION SAFE MVB HEADs.

The HEAD can be easily recognized by its name and appearance. *Non-safe* modules have a gray label. Safe modules (SIL2) have a yellow label.

1. Non-safe:



2. Safe (SIL2):

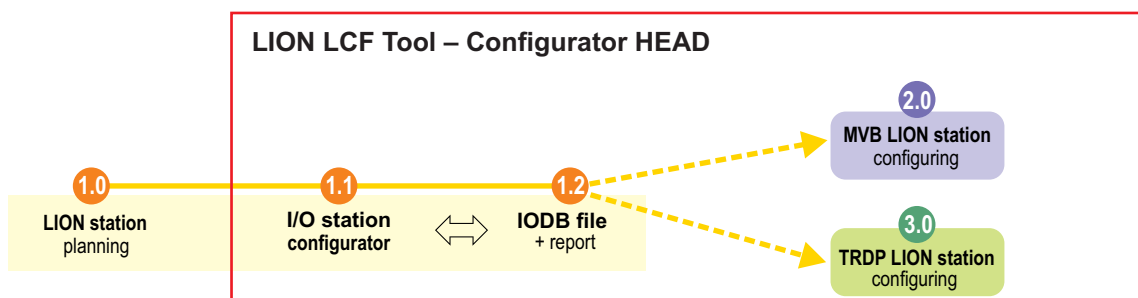


⚠ CAUTION: The project planner is responsible for the configuration.

Especially for the accurate mapping of diagnostic and process data between the head and devices.

9.1 Creating a new NSDB configuration file

9.1.1 Basis IODB file



! Important technical information: You need an IODB file in order to create an NSDB configuration file. This is described in steps 1.0 to 2.0 in the diagram above.

Chapter: Refer to chapter „I/O station configurator“.

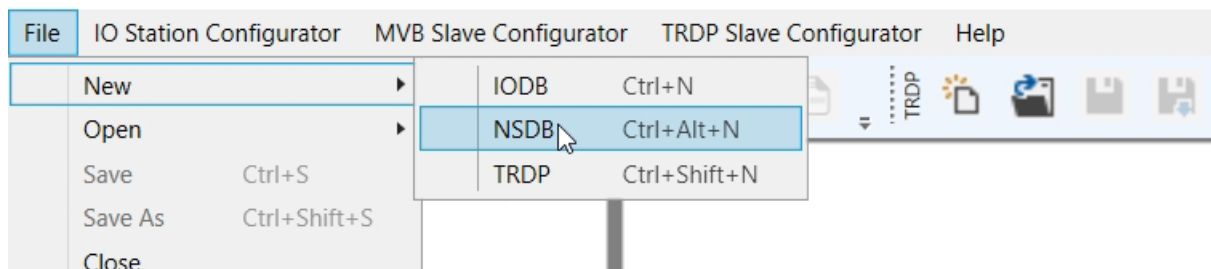


As soon as an IODB file is available, the NSDB config file can be created:

9.1.2 Creating a new NSDB configuration file

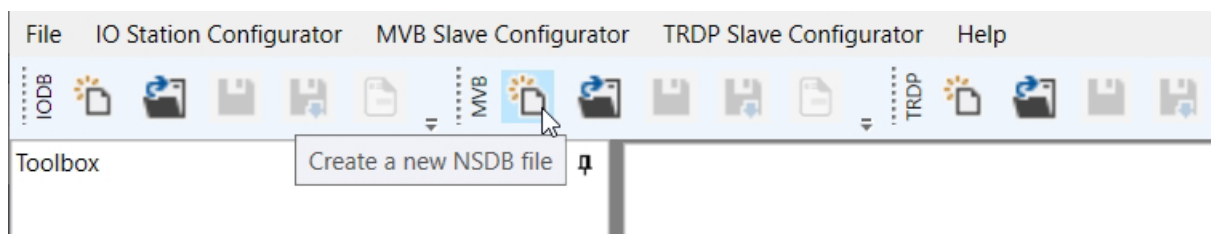
To create a new NSDB configuration file, proceed as follows:

1. Click on **File** in the menu bar.
2. Select **New**.
3. Click on **NSDB**.

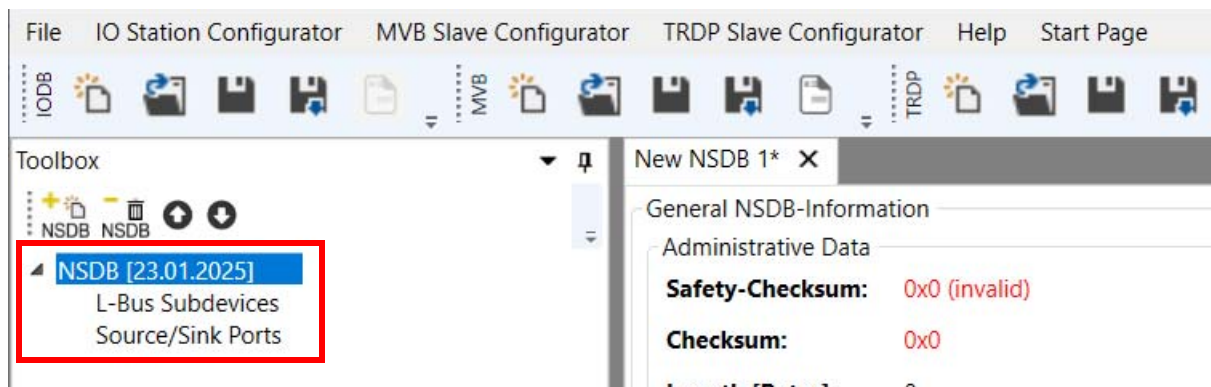


or

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

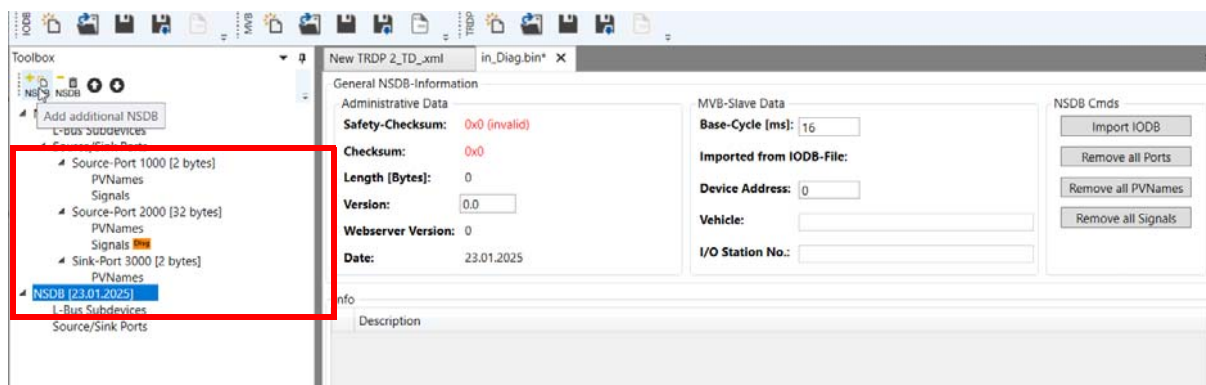


The **new NSDB file** appears in the *toolbox*.

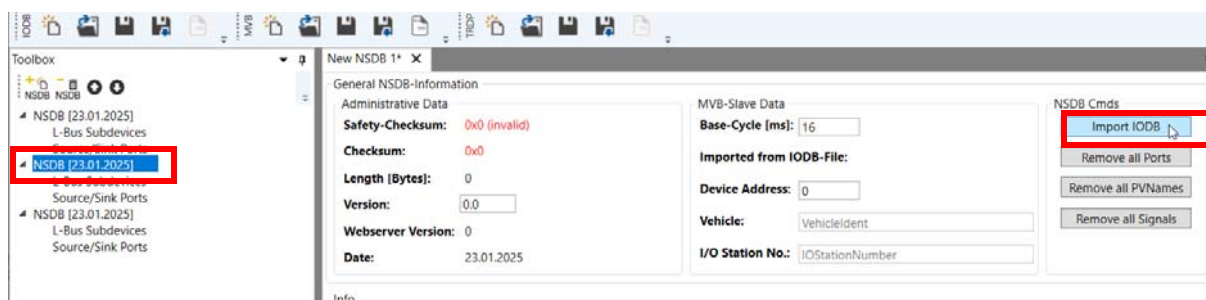


9.1.3 Creating additional NSDB files

Additional NSDB files can be created and managed using the “+NSDB” button in the *toolbox window*.

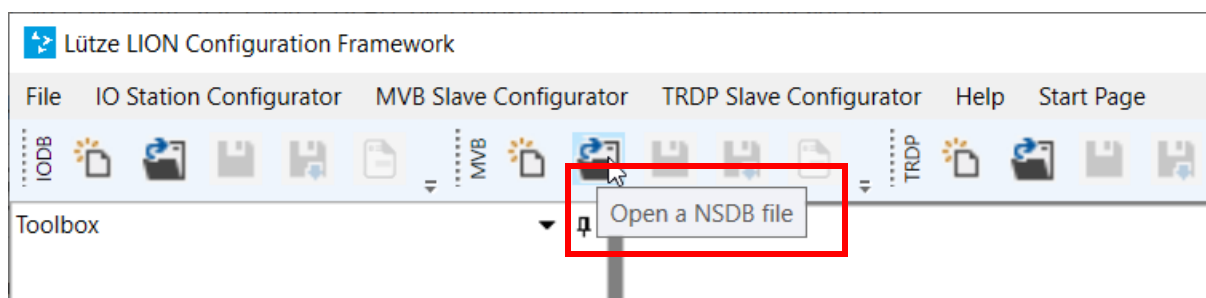


For each NSDB file, a different IODB file can be loaded.



9.1.4 Importing NSDB files

Click on **Open an NSDB file** in the symbol bar.



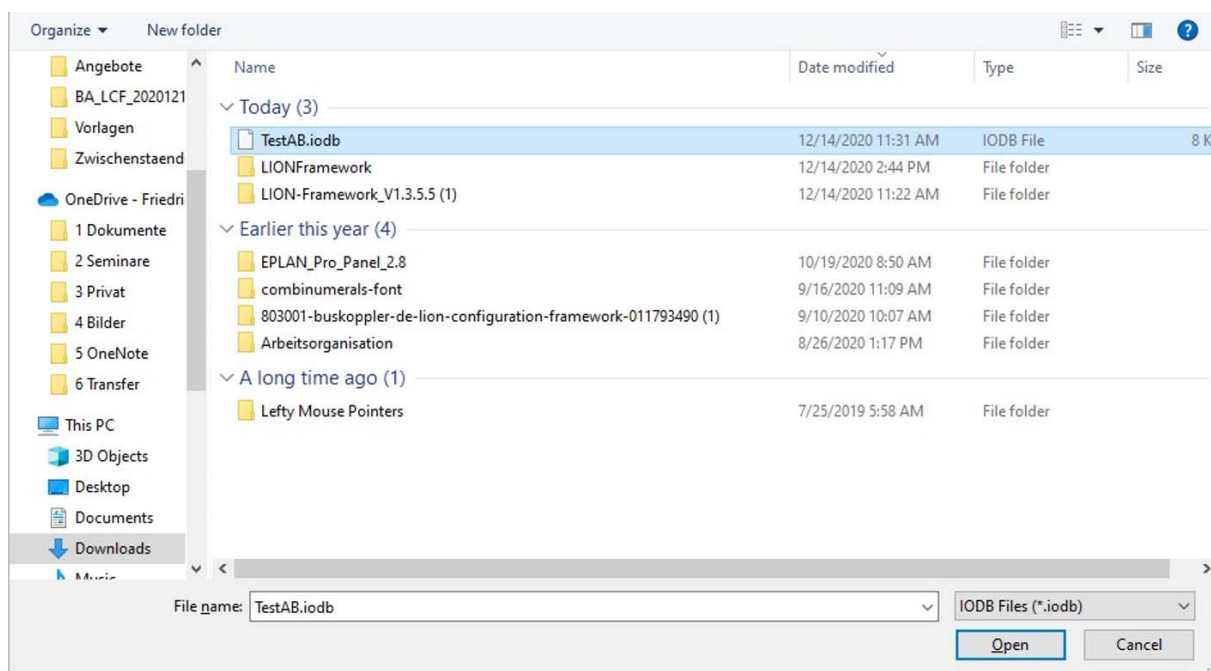
This is how you can import and further edit existing NSDB files.

9.2 Import of the IODB files

Start the NSDB configuration by importing the previously created IODB file. The LION I/O station with all modules and their process data structure is imported automatically.

1. Click on the **Import IODB** button.

2. Select the **IODB file** you want to import.
3. Click **Open**.

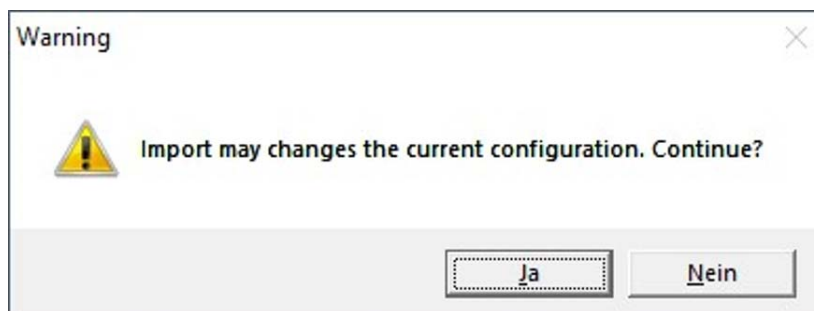


4. Several warning windows and messages may appear.

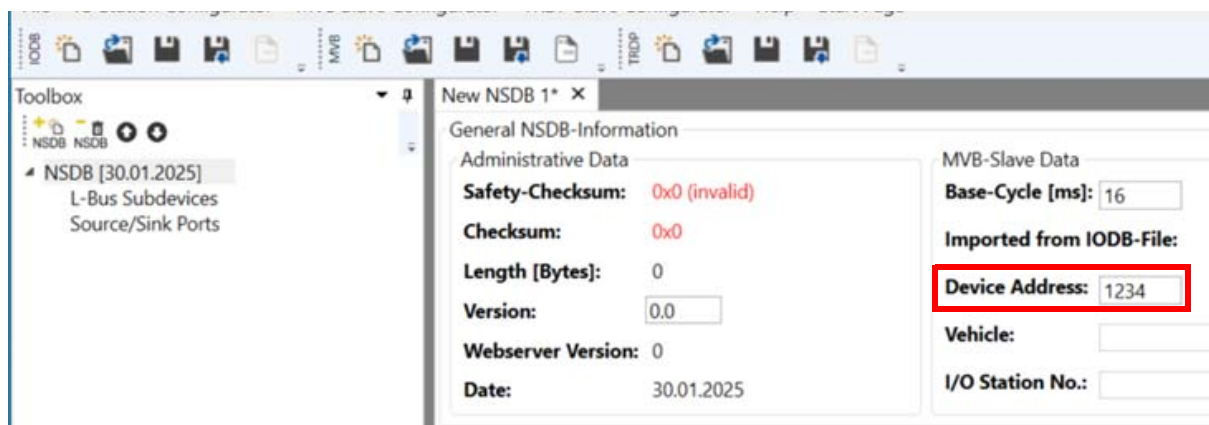
! Important technical information: Read the warning message and confirm it or ignore it if necessary. Cancel the import if you have any concerns.

Service: If you get stuck or need any other help, please contact the service department. The contact information is in chapter 15 on page 177

Example :



The following window appears:



The MVB device address is automatically imported from the IODB file:

Image A

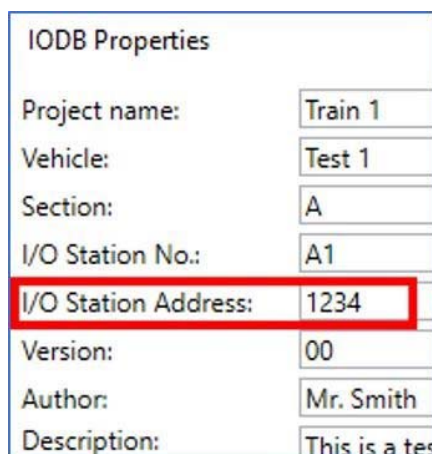
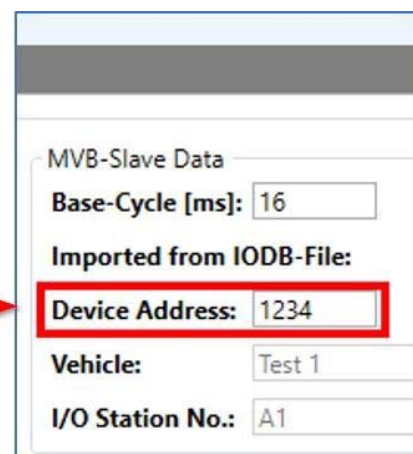


Image B

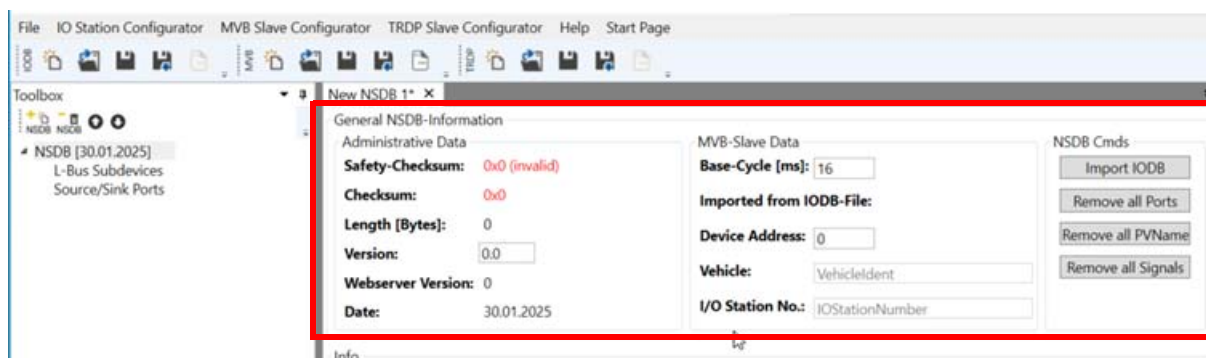


NOTE:

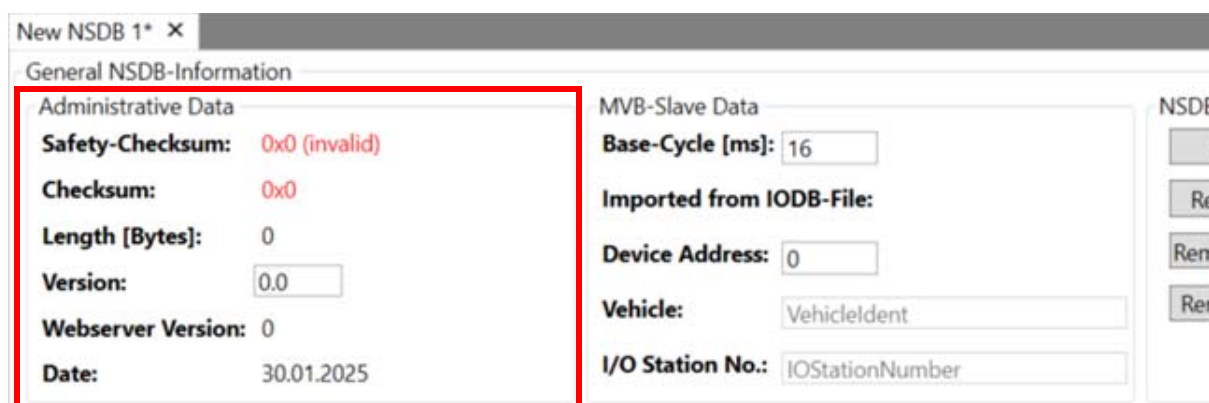
The section shown in “Fig. A” can also be seen in the entries in chapter .chapter 8.1.2 on page 28

9.2.1 General NSDB Information

The imported data is displayed under the **General NSDB information** area. Part of the data is taken from the IODB file.



1. Administrative Data (on the left side).



Safety Chesum

This safety. checksum is generated when you create the report and then click on Save. **This is the security process for obtaining a valid NSDB file with the corresponding report.**

Checksum	This checksum is generated when saving.
Length [Bytes]	Length of the NSDB file [in bytes]
Version	Version of the NSDB file/configuration.
Webserver Version	Displays the entered version in the web server display.
Date	Date of creation

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2. MVB slave data (on the right-hand side).

Base-Cycle [ms]

Basic cycle of MVB communication. **16ms - 65535ms** - must be a multiple of 16.
The actual MVB time is set by the MVB master. This time is used to calculate the STS timeout.

Imported from the IODB file:

Device Address MVB device address

Vehicle The name of the vehicle can be entered in the IODB configuration file. NOTE: Can only be edited there.

I/O Station No. The number for each I/O system can be entered in the IODB configuration file. NOTE: Can only be edited there.

2a. Notes on the safety checksum.

- The *safety checksum* is relevant for the application engineer (the developer of the train protection system) to identify the *NSDB file* used in a LION I/O station.
- The *safety checksum* is displayed in the web server. After uploading an NSDB file to an MVB HEAD, the displayed safety checksum must match the safety checksum in the report.
- The safety checksum is transmitted via the fieldbus (diagnostic interface) and can be checked by the train protection system to determine whether the connected LION I/O station is using the expected NSDB configuration. If the value of the safety checksum deviates from the expected value, the station is incorrectly configured.

2b. Notes on the checksum

NOTE: The checksum is created as soon as the NSDB file is saved.

In contrast to the safety checksum, the checksum is used for additional monitoring for file errors.

9.2.2

NSDB file - L-Bus² subdevices

The DEVICES that are created in the IODB file are listed under **L-Bus² subdevices**. When you select a module, the LCF tool displays the output and input data provided by the module.

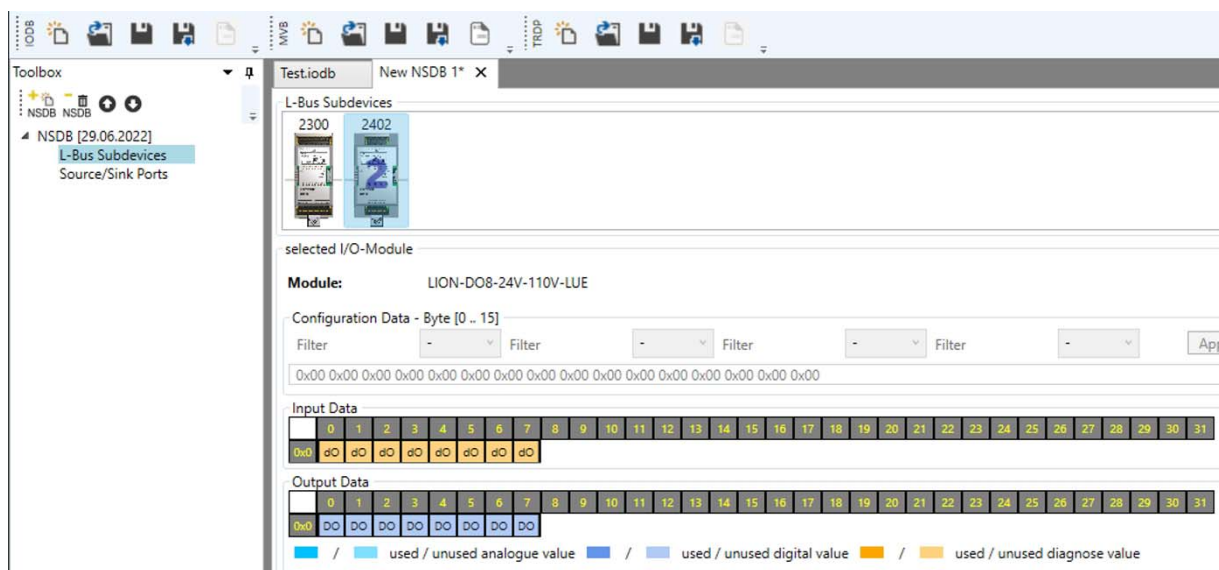


This area can be used to display the process data structure or to set up user-defined configuration data for each DEVICE.

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

! Important technical information: For further information, please also refer to the operating instructions for the respective DEVICE.

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



1. Explanation of the markings

1.1 If a data field is previously used in a connection, it is shown by the colors, for example:

blue / light blue used / unused orange / light orange used / unused cyan / light cyan used / unused

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

These can be mapped to sink ports, for example:

cyan / light cyan used / unused analogue value dark 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, for example:

orange / light orange used / unused diagnose value

2. Process data structure

In this program window, the display of the process data structure is more of an additional aspect.

 Chapter: **See also chapter 18.1 on page 180, where you will find the module ID and the assignments to the respective part numbers.**

The module with ID 2402 (item no. 803203), for example, is a digital output module with eight outputs. The outputs can be controlled via the eight output bits (blue). In addition, the module provides 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 Channel 8	Error Channel 7	Error Channel 6	Error Channel 5	Error Channel 4	Error Channel 3	Error Channel 2	Error 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)

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 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	dO

Output Data

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

 /  used / unused analogue va

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	dO

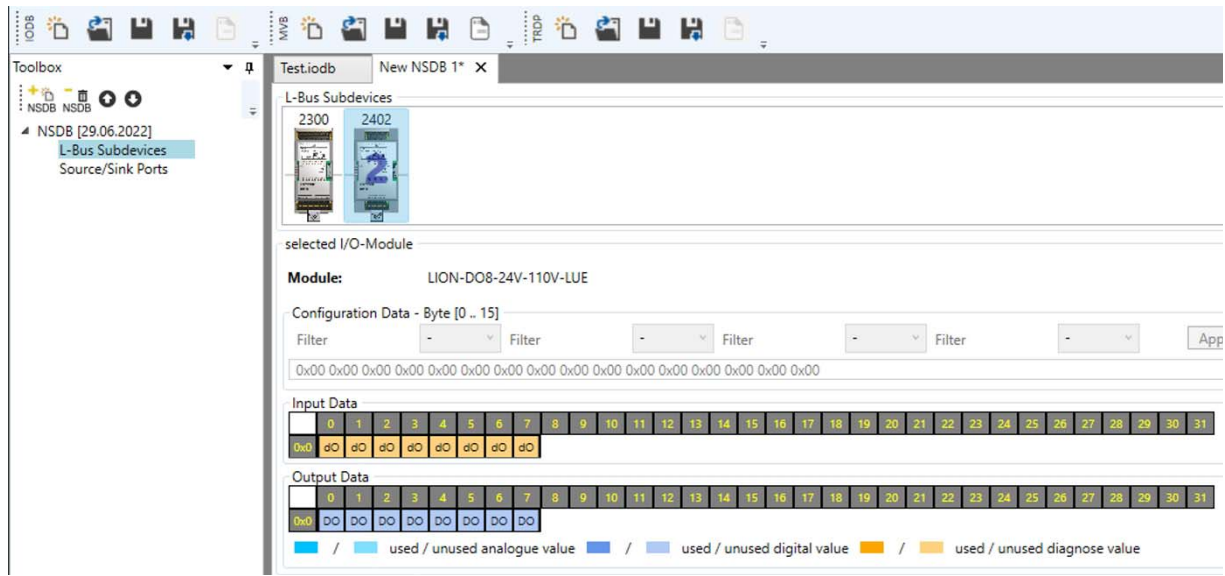
Output Data

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

 /  used / unused analogue va

✓ **Tip: The individual operation instructions for each module contain information about the data of each module.**

9.2.3 Configuration data and filter settings



NOTE: The actual purpose of this program window is to set the configuration data. The configuration data influences the behavior of the LION module depending on the module type.

Currently, these are mainly filter settings for influencing the noise resistance of inputs.

NOTE: These configurations are described in the corresponding operating instructions for the respective DEVICE (e.g., setting the input filters for analog and digital modules). You can use the configuration data to set module-specific properties according to the requirements of the application when starting up the I/O station.

In this way, it is possible to adapt to the environment with identical modules depending on the application.

9.2.4 Modules with filter settings

Some modules offer the option of setting a filter for the inputs. These filter settings are set under **L-Bus² sub devices**.

After choosing the appropriate module, *configuration data* can be used to set the filter.

NOTE: Chapter xx has a table that shows which modules provide a filter setting. chapter 9.10 on page 107

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

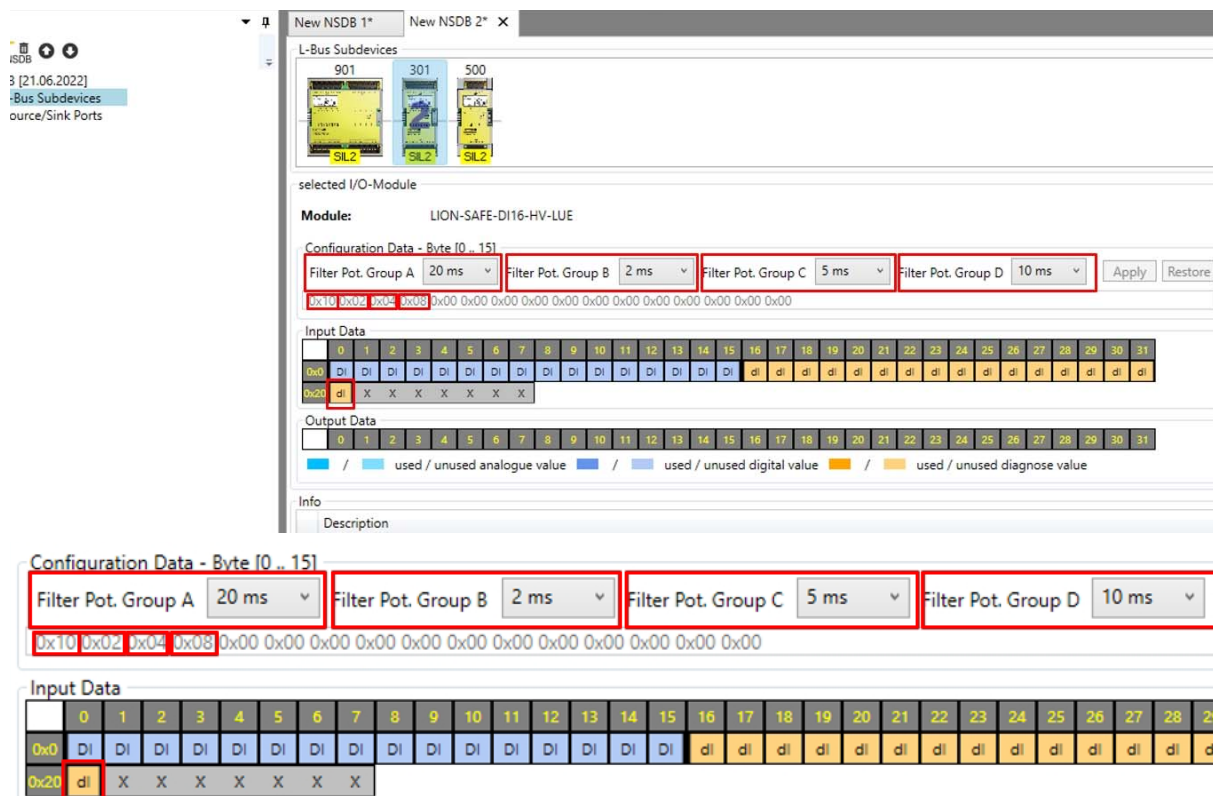
The modules that have such a filter setting return one or more config bits in the input data, depending on the module, which indicate whether the filter setting is correct.

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For the module in the following example, item no. 803104 (ID 301, type LION-SAFE-DI16-HV-LUE), it is the 33rd module. Bit of the input data

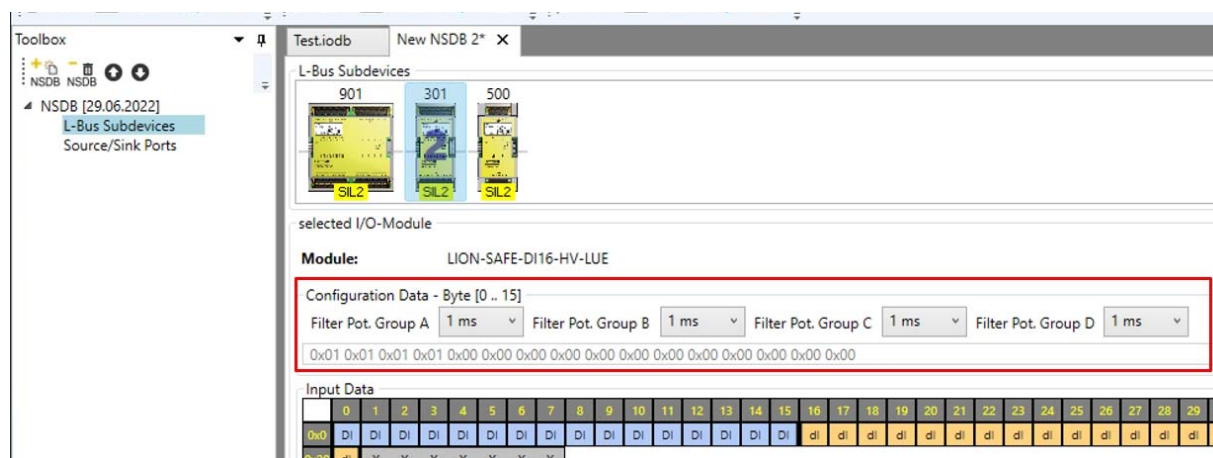
Data structure

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



To configure a module, the corresponding module must be selected in the chain. The filter value can then be set either per input or per potential group. Whether these are individual inputs or potential groups depends on the module type.

NOTE: If no filter value is set, the default value is used, which corresponds to 1ms or “No filter”. This is displayed as an error in the configuration bit:



You can use the drop-down menus to define the filter settings for each input or for each potential group.

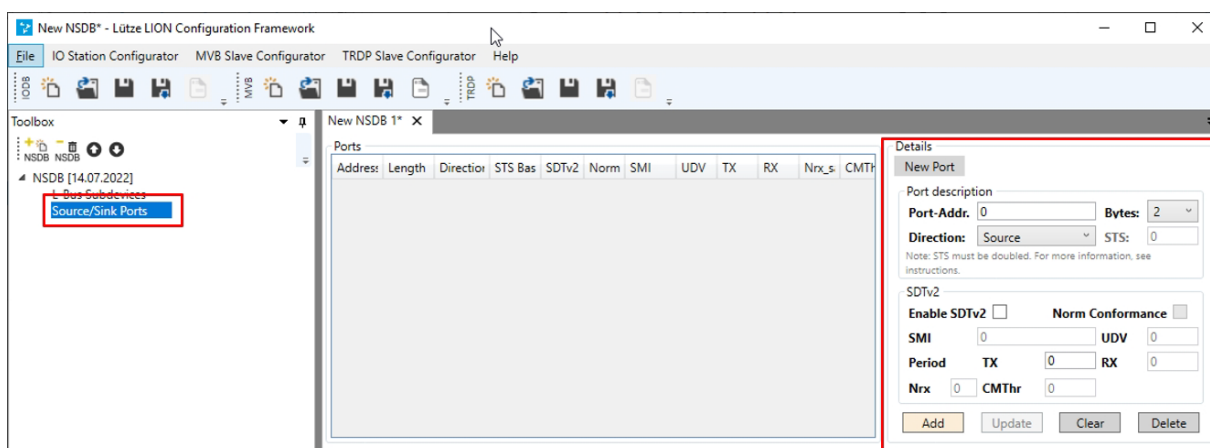
NOTE: This only applies to SIL2 modules with configuration options.

- The unit of measurement for these SIL2 modules is [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)

9.3

General configuration of the ports

Corresponding ports can be created and edited under Source/Sink Ports.



9.3.1

Creating new reports

For an MVB configuration, we need to create corresponding *ports*. *Source ports* transmit data from the LION I/O station to the fieldbus, *Sink ports* are received by the LION I/O station and can be used to control the outputs of DEVICES.

Diagnostic data from the HEAD can be mapped to a source port, which is referred to below as the diagnostic port.

Create the desired number of *source ports*, *sink ports* and a *diagnostic port*. On the right-hand side of the input screen, you can enter the port address, port size and port type under *Details*:

9.3.2 Port settings

All communication parameters required for the MVB fieldbus can be set in the *Details* area of each port.

- | | |
|-------------------------|--|
| (1) Port address | Port address according to MVB specification. |
| (2) Bytes | The port size in bytes. The maximum size is 32 bytes. |
| (3) Direction | Source-port (default) or Sink-port |
| (4) STS | Sink time monitoring is a monitoring mechanism for sink ports. See also the “ <i>Sink Time Supervision</i> ” chapters in the respective operating instructions for the LION HEADs. |

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

Each port can be saved with the SDTv2 safety protocol.

SDTv2 is activated, additional parameters are required to configure the SDTv2 protocol. See the following input window.

- | | |
|--------------------------------------|--|
| (5) Enable SDTv2 | Activate the “ <i>Enable SDTv2</i> ” checkbox so that the port can receive or send data via the SDTv2 security layer. |
| (6) Conformity with standards | The checkmark next to “ <i>Standard conformity</i> ” switches between the normative and an alternative implementation of the SDTv2 protocol. |
| (7) SMI | |

NOTE: 1-999 is reserved and should not be used. Identification of the security message. Identifies the source of the SDTv2 channel.

(8) UDV

NOTE: Value range 15 (0: invalid)
User data version, user-defined version of the data structure that is transmitted via the SDTV2 channel.

(9) Period TX

Cycle time in [ms], which is used to generate secure data packets at source ports. *(At sink ports, this value must match the cycle time with which the port is generated at the source).*

(10) Period RX

The usual value is $0 < \text{Trx_period} \leq \text{Ttx_period}$. Cycle time in [ms] is used to process network-based secure data. This can be higher or lower than the **TX period** (over or under sampling).

NOTE: The transmitter only requires the transmission cycle time, the receiver requires both cycle times (as both *oversampling and undersampling* are possible).

NOTE: It is strongly recommended to configure the cycle times as integer multiples of the internal processing cycle (8ms) of the HEAD, as otherwise they will be rounded off.

(11) nRX

Value range 128 (typically: 3)
Number of RX cycles without new data in which the last received data is still considered safe. Trx_safe without having received a valid VDP, the safe state is assumed.

(12) CMThr

Threshold value for channel monitoring (**Channel monitoring threshold**):

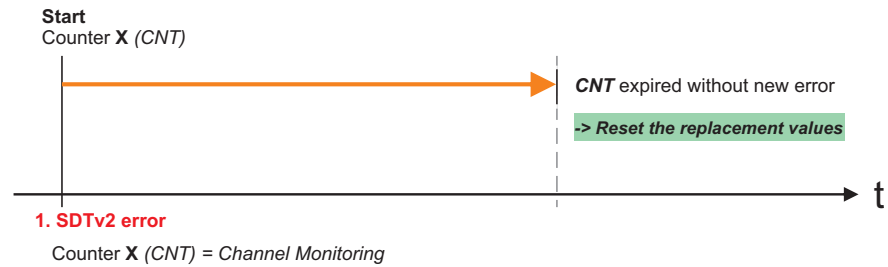
Value range: $\geq 100,000 / \text{Ttx_period}$ (Ttx_period in unit [ms]),
Standard/default: 10,000 (e.g. if the Ttx_period is assumed to be 10 ms, therefore $\text{CMThr} = 100,000/10 = 10,000$):

SDTv2 channel monitoring aims to detect a sudden increase in the transmission error rate within the SDTv2 channel, which could be due to a hardware or software error in one of the components belonging to the SDTv2 channel. These failures can be permanent, in which case a repair is required, or temporary, in which case the system can recover itself. *(A special case here is the inauguration of a train in accordance with IEC 61375).*

NOTE: However, it is possible to recover from this state, but this also means that there is no jump to *fail-safe mode*.

As long as the communication is considered unsafe, all data is invalidated and defined substitute values ("0") are sent. The replacement values are only set after a second error and only if the counter has not yet expired.

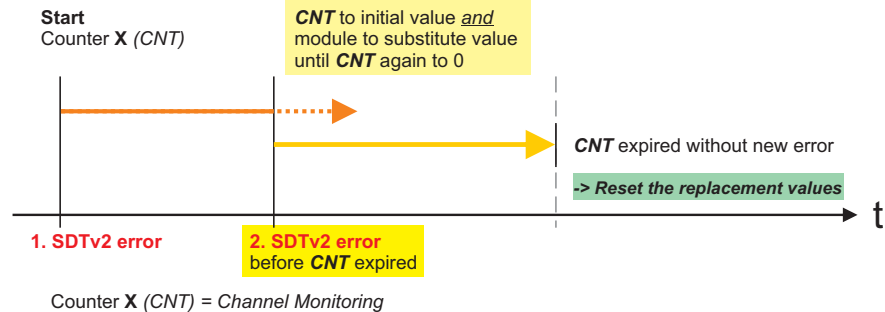
Case 1:



The counter X (corresponds to the value set in CMThr) counts down with each error-free value after a first SDTv2 error is detected. However, the values are not yet set to the safe state. When the counter value of error-free packets has reached "0", the counter is reset to CHThr again.

Once secure communication has been restored, updated data with new values is provided again.

Case 2:



If another SDTv2 error is detected before the counter has expired after the first detected SDTv2 error, the values will be transferred to a safe state. Additionally, the counter is reset to the value set in CMThr. Every SDTv2 error that occurs again causes the counter value to be set to CMThr (this is not visible in the illustration).

After the counter value has expired without an SDTv2 error, the counter is reset to CMThr and the values are transferred to a valid state (i.e., they return from the safe state to normal operation).

Once secure communication has been restored, updated data with new values is provided again.

NOTE: The IEC 61375-2-3 standard uses a different interpretation. It specifies that the default value of CMThr should be ≤ 43 . VDPs (Vital Data Packets) with a false SC-32 checksum (32-bit security code) per hour. This means that up to 43 VDPs per hour may have an incorrect SC-32 checksum before the communication is no longer considered secure. *Further information can be found in IEC 61375-2-3, chapter "Channel monitoring".*

NOTE: No data or incorrect data is marked with a red frame. In this case, a safety CRC cannot be generated.

SDTv2

Enable SDTV2	<input checked="" type="checkbox"/>	Norm Conformance	<input type="checkbox"/>	
SMI	<input type="text" value="0"/>	UDV	<input type="text" value="0"/>	
Period	TX	<input type="text" value="0"/>	RX	<input type="text" value="0"/>
Nrx	<input type="text" value="0"/>	CMThr	<input type="text" value="0"/>	

Add Update Clear Delete

9.3.3 Port size

The size of the individual ports can be configured via the Bytes drop-down menu. The available sizes are limited, as can be seen in the following illustration.

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

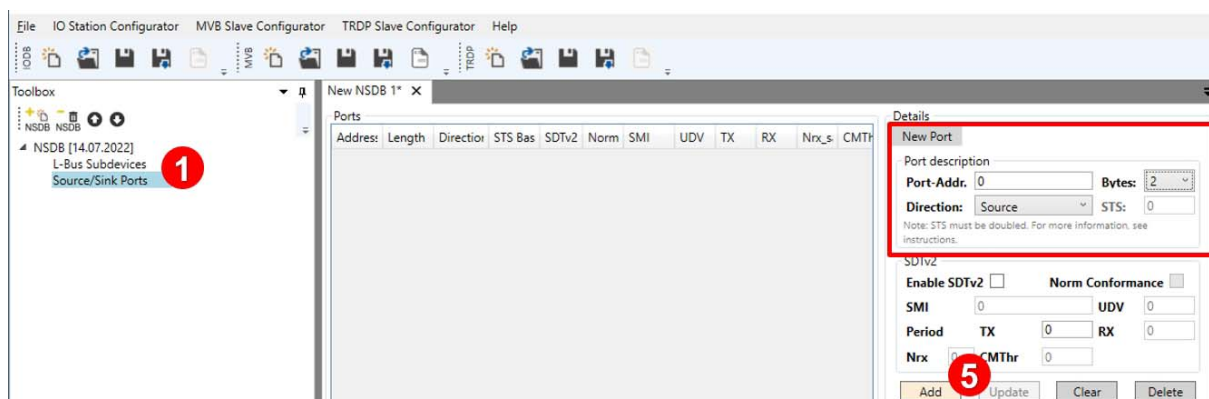
Port-Area	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31
0x0	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31
0x20	32	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48	49	50	51	52	53	54	55	56	57	58	59	60	61	62	63
0x40	64	65	66	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

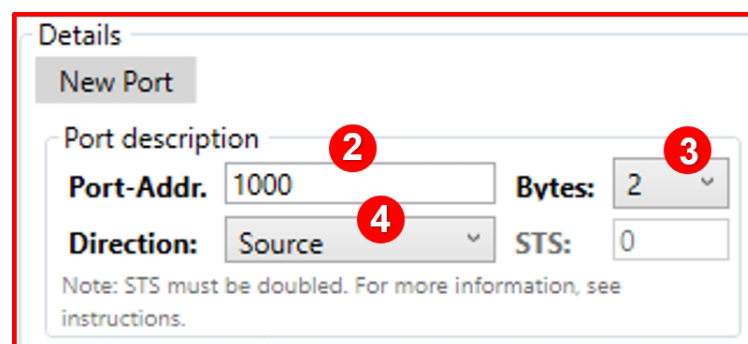
NOTE: SDTv2 ports require a minimum size of 8 bytes (due to the overhead of the safety protocol).

9.4 Creating a new source port

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).

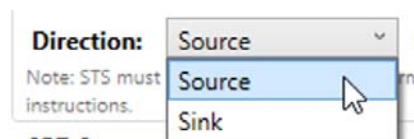
Port-Addr. 1000

NOTE: MVB port addresses are only possible from 0 to 4095.

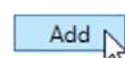
3. Create a **source port** with 2 bytes (3):



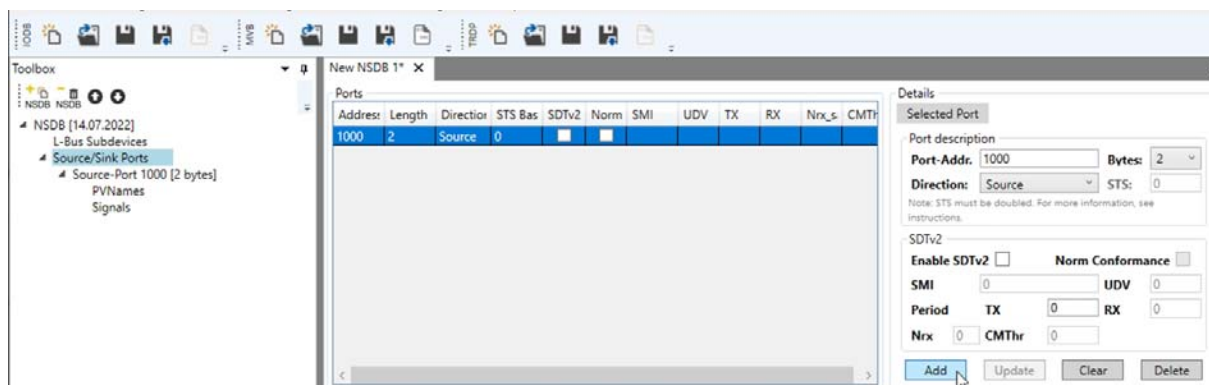
4. Select the direction: **Source** (default setting) (4):



5. Click **Add** (5) to create the new port.



6. The newly created **source port** is now added to the list of *ports*.



9.4.1 Functionality of the update button

NOTE: You can change the properties at any time and save them using the update button.

If you enter a change to a **SELECTED PORT**, the update button is activated: (The color turns orange.)



Click on the Update button to save the changes.



A second source port is created for this example: Simply enter another port address in the field:

Port-Addr.

NOTE: As the port address did not yet exist, the currently selected port address could also be inadvertently updated to a “different number”. This is carried out without a warning message.

Therefore, do not change the port address in a selected *port*. Use the **Clear button** to create a new port instead.

9.4.2 The functionality of the Clear button

The button can be found here:



The *Clear button* has two functions:

- The first function is to discard the unsaved entries of a **selected port (2)**. Clicking on *Clear* deactivates all ports.
- The second function consists of deactivating a **selected port (1)** and obtaining a **New Port (4)**. The values entered are reset to the default values. The port address was set to the value zero.

9.4.3 Create a new port with *Clear*

To create new ports, proceed as follows:

1. If a port is already selected, e.g. after editing (1), the heading **Selected Port** (2) appears in the *Details* area because you can see the settings for the selected port. First click on the **Clear button** (3) to create a **new port** (4).

The screenshot shows the 'New NSDB 1*' window. On the left, the 'Ports' table has columns: Address, Length, Direction, STS Bas, SDTv2, Norm, SMI, UDV, TX, RX, Nrx_s, CMTh. The row with Address 2000, Length 32, and Direction Source is highlighted with a red box and labeled with a red circle '1'. On the right, the 'Details' panel shows 'Selected Port' (labeled with a red circle '2') and various configuration fields. The 'Clear' button at the bottom of the Details panel is highlighted with a red box and labeled with a red circle '3'.

2. This will give you the heading **New Port** (4) in the Details area. You can now create a new port without inadvertently overwriting an existing port.

The screenshot shows the same interface after clicking 'Clear'. The 'Details' panel now has a 'New Port' heading (labeled with a red circle '4'). The 'Port-Addr' field is set to 0 and 'Bytes' is set to 2. The 'Ports' table on the left now shows two rows: one with Address 1000 and one with Address 2000.

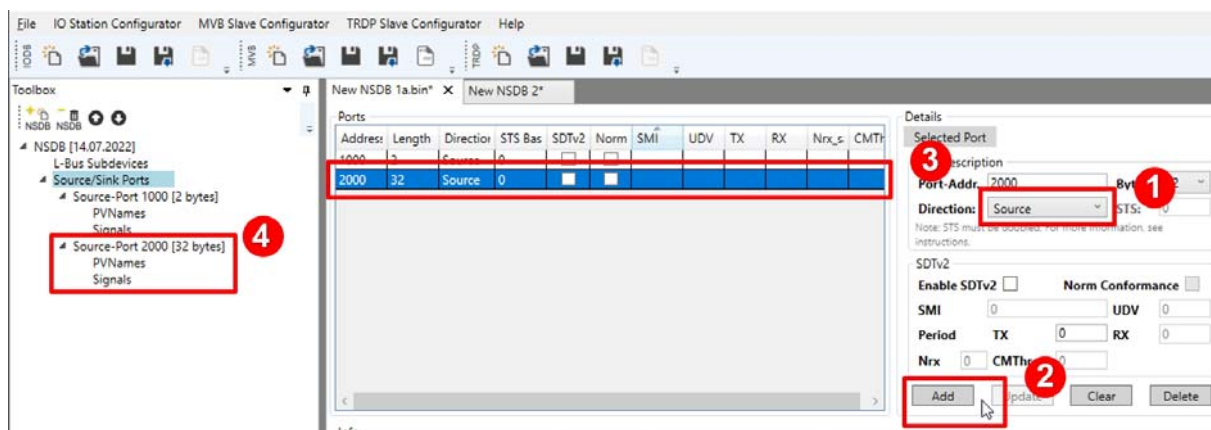
3. Select a port address.

NOTE: Only enter integer values here. A red frame automatically indicates an invalid or missing entry.

This red frame appears if an entry is missing or incorrect:

The two screenshots show the 'Details' panel for a 'Selected Port'. The left panel shows a valid 'Port-Addr' of 2000. The right panel shows an invalid 'Port-Addr' of 2000a, which is highlighted with a red border to indicate it is not a valid integer value.

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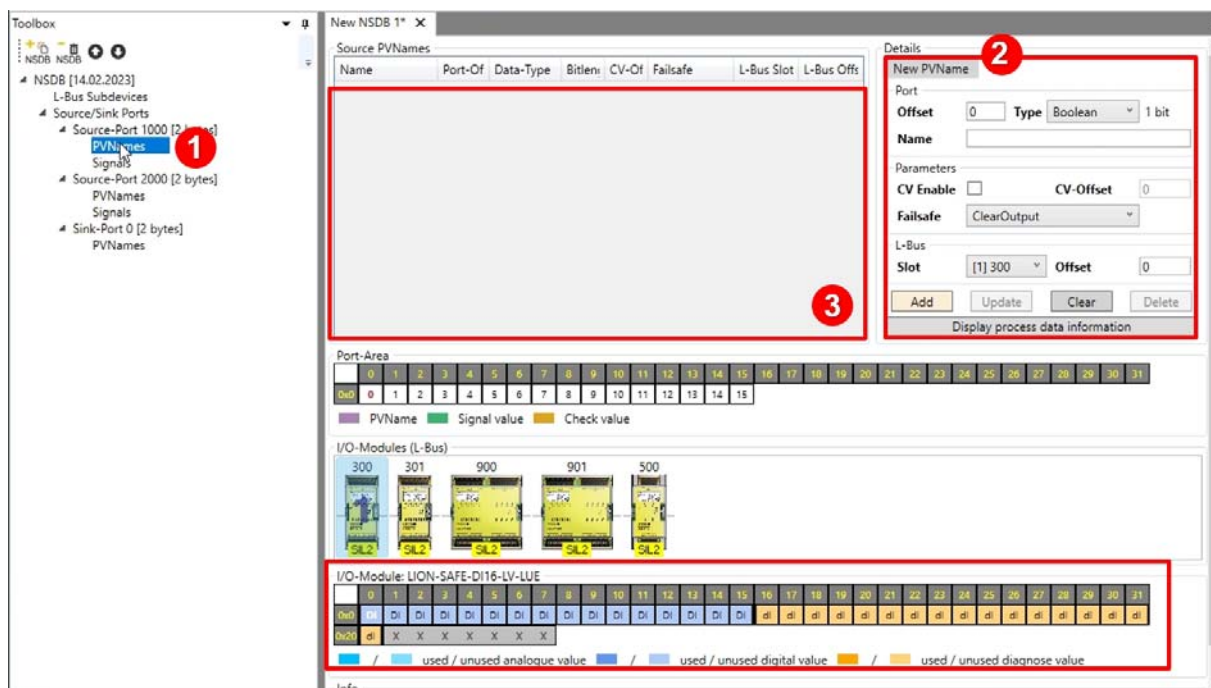
4. Use **Add** to create the new **source** or **sink port** (1).

The ports created are also displayed on the left-hand side of the *toolbox*.

You can use the *toolbox* to navigate through all configuration elements.

5. Select a **source port** (1) in the left-hand toolbox window, then you will see this view on the right-hand side. In the Details area under **New PV name** (2), you can create and add PVNames here:

The PVNames appear in the Source PVNames list (3).



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6. Select one of the DEVICES that you want to configure (in this example, it is the module in the first position).

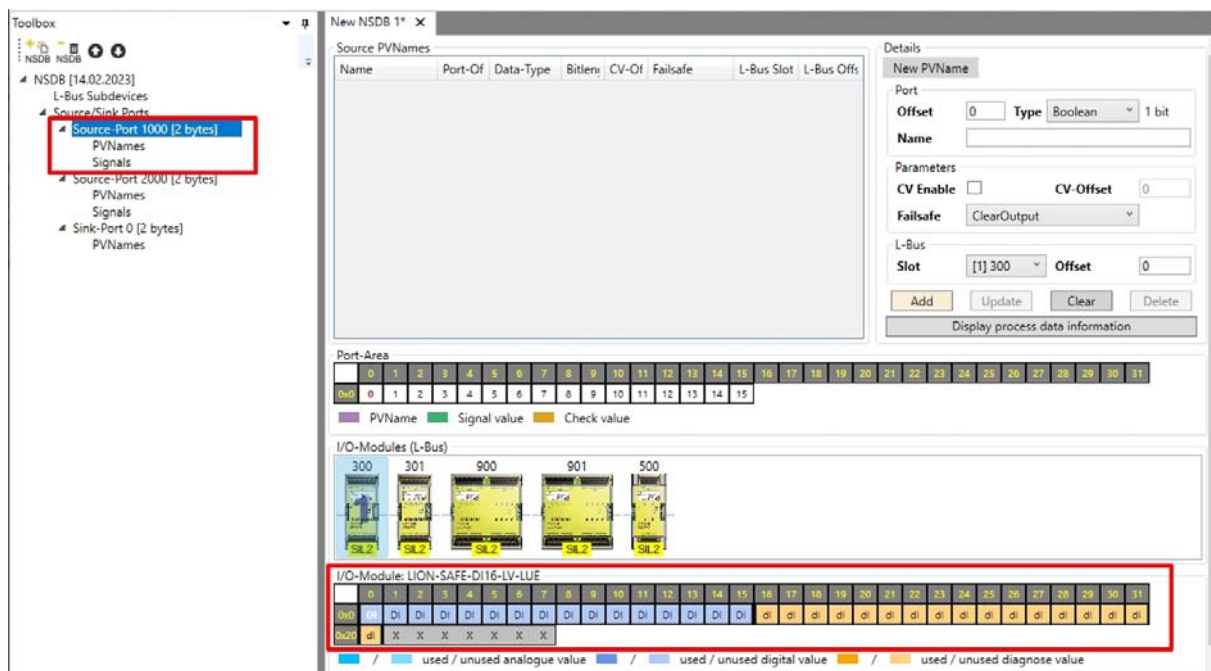
NOTE: Make sure that the DEVICE has input data. Source ports can only be mapped to input data from DEVICES. This means that when editing a source port, only the input data of the DEVICE is displayed.

Application example

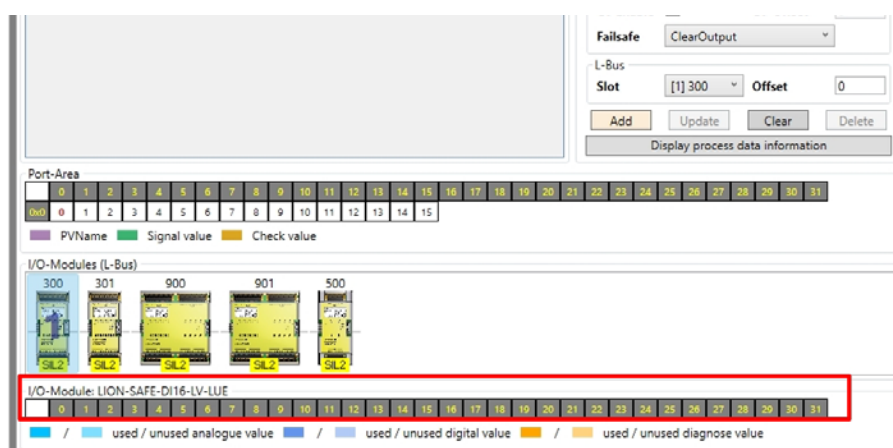
The Digital input module with ID 300 (item no. 803103).

✓ Tip: This module can only process input data.

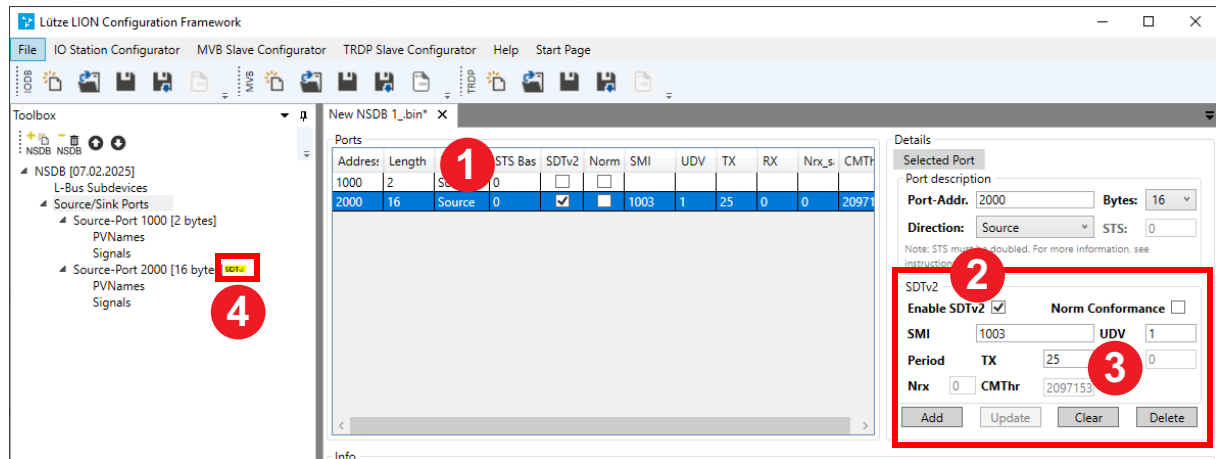
Therefore, if you select the *source port*, the assignable data will be displayed (red box on the right).



However, if you select a sink port, you will not receive any assignable data for an input module.



9.4.4 Activate SDTv2 for the Source Port



Procedure:

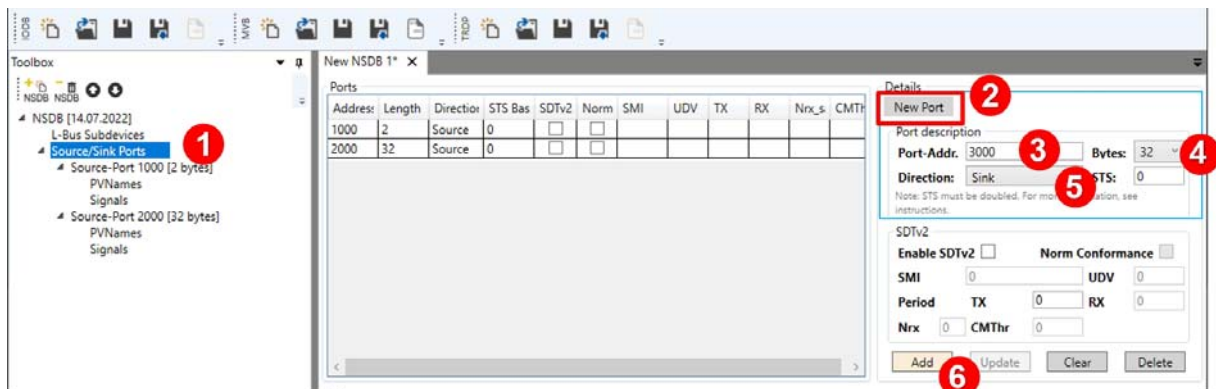
1. Select a port from the ports list (1).
2. Click on the checkbox Enable SDTv2 (2), this activates the SDTv2 area.
3. Enter the corresponding values (3). SDTv2 values can be configured here.
4. After clicking on the Add or Update button, a yellow SDTv2 symbol (4) for the port becomes visible in the ToolBox window.

The SDTv2 symbol indicates that this port supports the SDTv2 security protocol.

9.5 Creating a new Sink Port

NOTE: 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.

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2. When a port is selected, click on *Clear* to obtain a **new port (2)**.

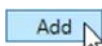
3. Enter a *port address (3)*, e.g., “3000” (This depends on your *numbering concept*).

NOTE: MVB port addresses are only possible from 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. Click on **Add (6)** to create the new port.



Now the newly created *sink port* is added to the list of *ports*:

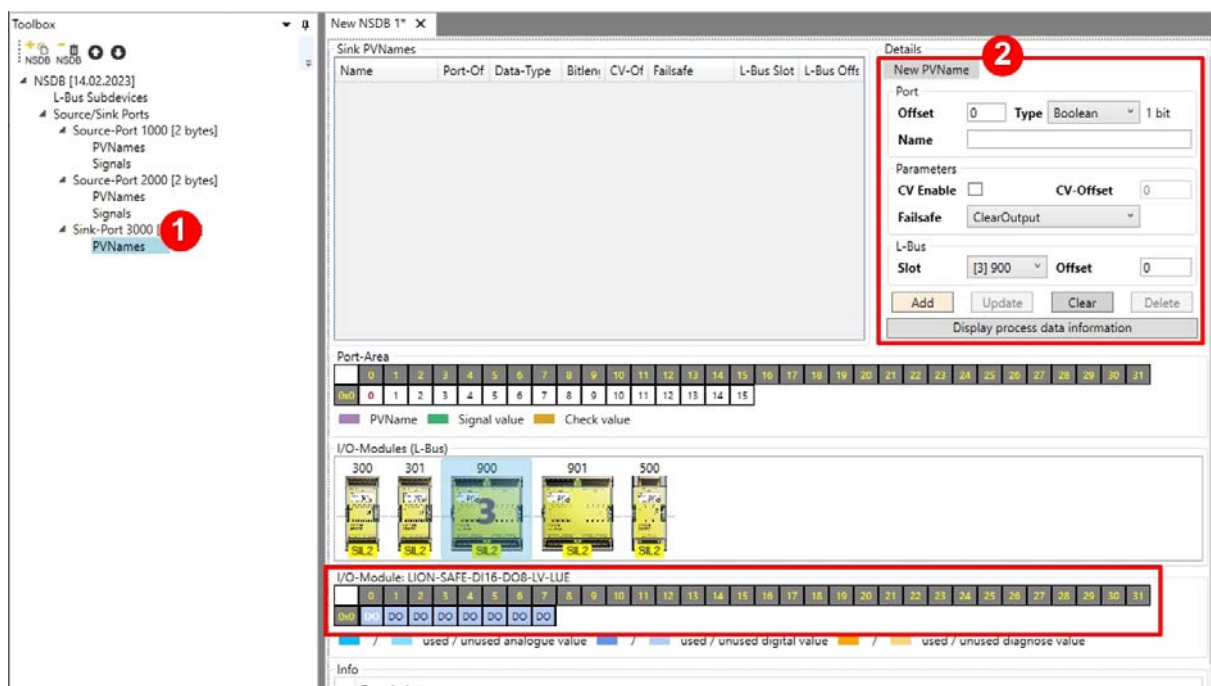
Address	Length	Direction	STS Bas	SDTV2	Norm	SMI	UDV	TX	RX	Nrx_s	CMTh
1000	2	Source	0	<input type="checkbox"/>	<input type="checkbox"/>						
2000	32	Source	0	<input type="checkbox"/>	<input type="checkbox"/>						
3000	32	Sink	0	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>						

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

✓ Tip: See also chapter 9.4.1 on page 82.

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7. Select the corresponding *sink port* (1) in the left-hand *toolbox* window and you will see this view on the right-hand side. *New PVNames* (2) can be created in the *Details* area:

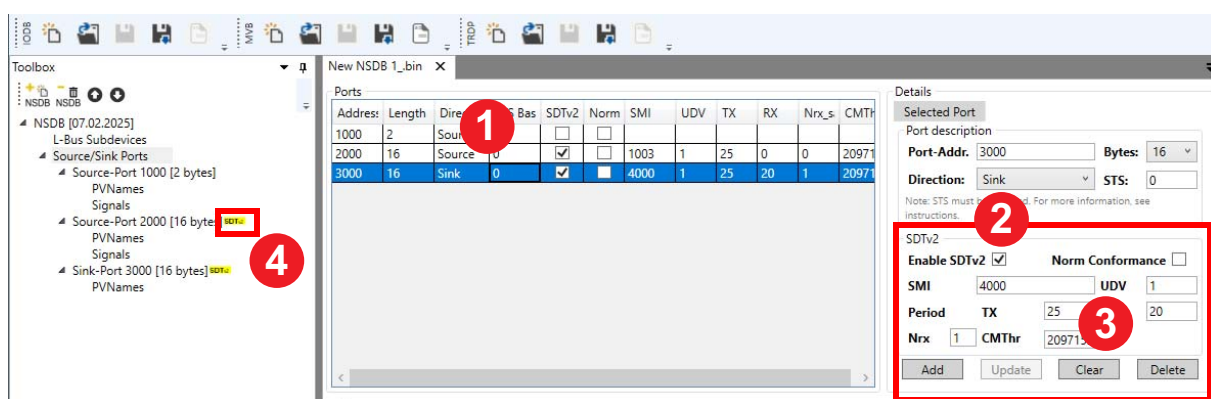


8. Select a *DEVICE* that you want to configure (in this example, it is the module in the third position).

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

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

9.5.1 Enable SDTv2 for the sink port



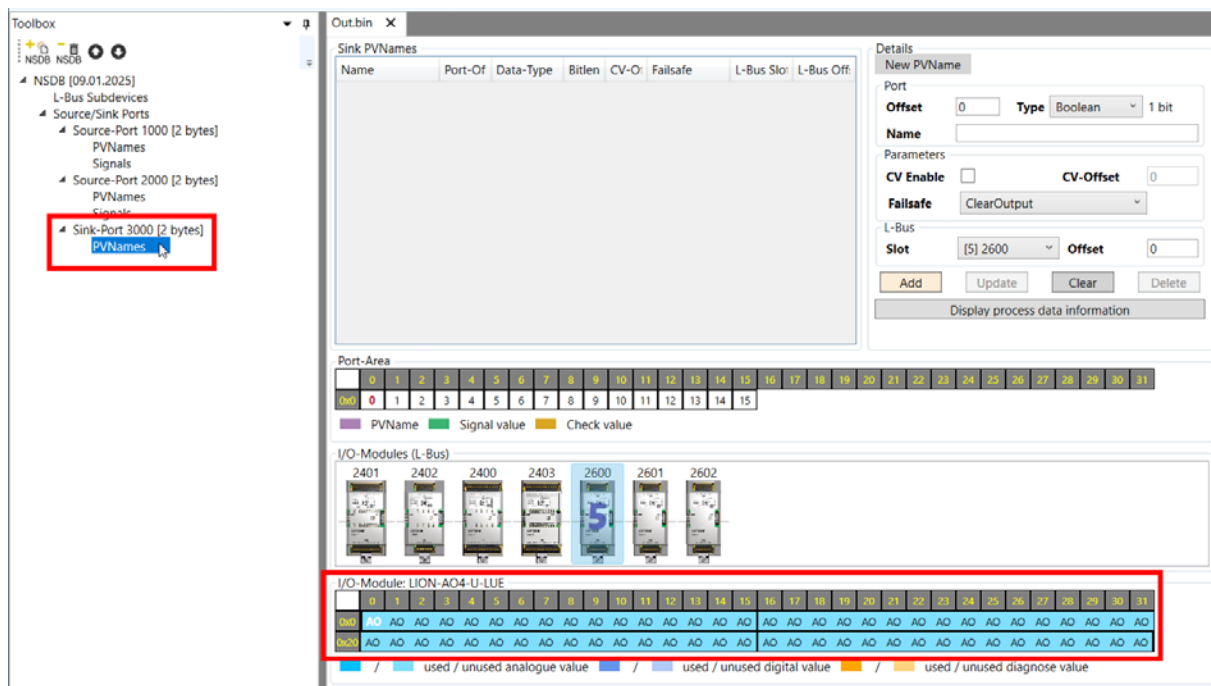
Procedure:

1. Select a port from the ports list (1).
2. Click on the checkbox *Enable SDTv2* (2), this activates the *SDTv2* area.
3. Enter the corresponding values (3). *SDTv2* values can be configured here.
4. After clicking on the *Add* or *Update* button, a yellow *SDTv2* symbol (4) for the port becomes visible in the *ToolBox* window.

Application example

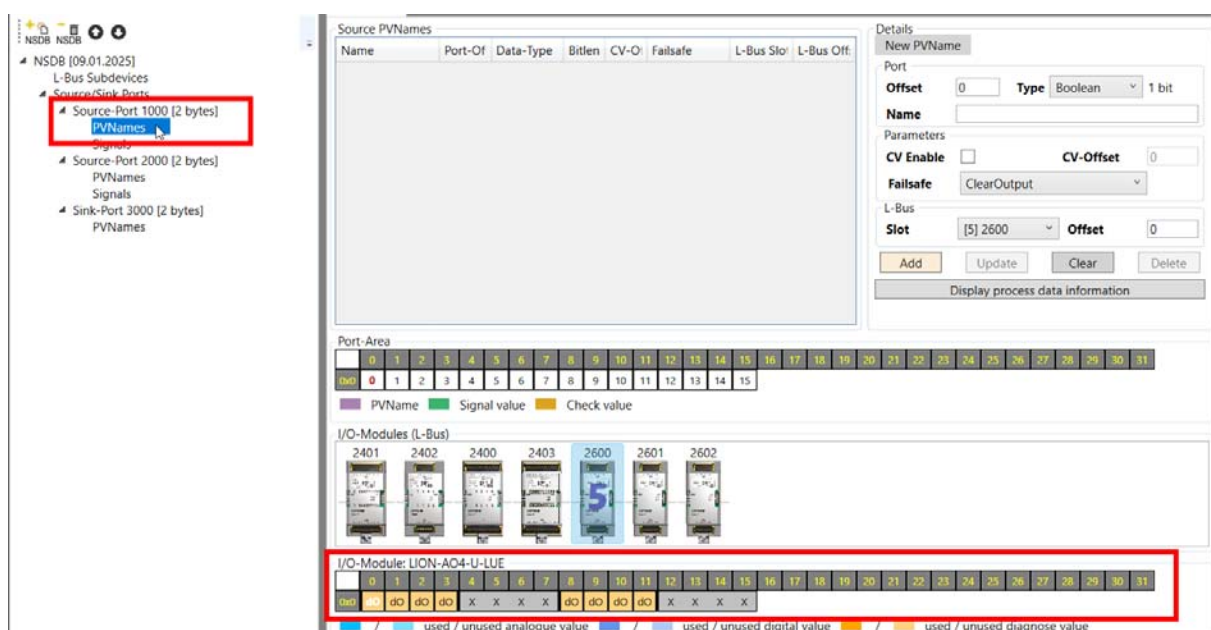
NOTE: The Digital output module with ID 2600 (item no. 803101). This module can only process output data.

Therefore, if you select the sink port, the assignable data will be displayed (red box on the right).



However, if you select a sink port, you will not receive any assignable data for an input module.

NOTE: The diagnostic data (in orange) is offered as input data for all output modules:



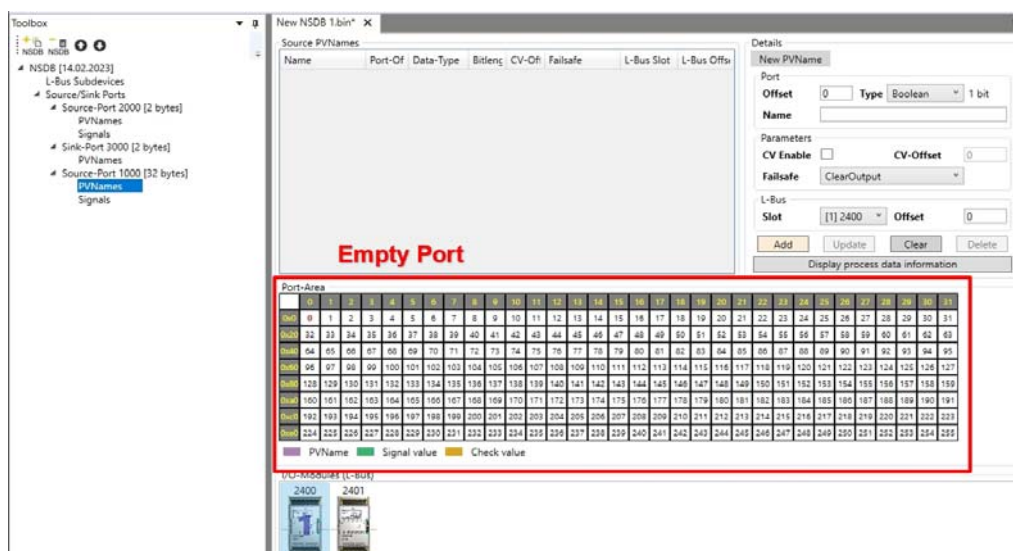
9.6 Mapping / Assignment of data

9.6.1 General

⚠ WARNING 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 the operating instructions for the **DEVICES**).

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

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



3. The **DEVICES** are displayed below the *port area*. When editing a *source port*, for example, only the input data of the **DEVICE** is displayed and can be assigned in the *port area*.
4. The first step in adding an assignment is to choose the **DEVICE** to which the data should be assigned.

NOTE: The assignment is not limited to a specific combination of **DEVICES** and ports.

A port can be used to transfer data from several **DEVICES**, regardless of the type of data (input/diagnosis).

5. Select the start of the data to be mapped by double-clicking on the *bit* in the *port area* and in the “I/O modules” section.
6. Select the data type in the *Details* section.

NOTE: The data type must match the I/O data to be assigned.

Chapter: See also chapter 9.6.2 on page 92

7. Refer to the operating instructions for the relevant DEVICE. Apply PV name properties for the correct data type.

(1) **Offset (Port)** Start bit in the port. Sets the starting point for selecting the data type for the data to be assigned. *(It is set up automatically when the bit is selected by double-clicking).*

(2) **Type** Selected data type (see also the table in **chapter 9.6.2 on page 92**)

(3) **Name** Name of the process variable. *Variable name (for documentation purposes only).*

(4) **CV Enable** Activates the generation of MVB Check variables.

(5) **CV Offset** Specifies the start address of the check variable.

(6) **Failsafe** In the event of an error when monitoring the sink time, the output can be reset (*ClearOutput*) or the last value can be retained (*HoldLastValue*).

NOTE: This setting is ignored by the LION system and is set to "ClearOutput" by default.

(7) **Slot** L-Bus² module from which the data is to be mapped to the *port*. Slot number of the DEVICE on which the process data is mapped to the configured PVNames.

(8) **Offset (L-Bus²)** Start address in the L-Bus² module *(is set automatically when the bit is selected by double-clicking).*

Assignment of the MVB process variables to the L-Bus² I/O data.

(9) **Add** Create a new *PV name* / Saves the current settings.

(10) **Update** Click to update the edited *PV name*.

(11) **Clear** Opens an empty input mask with default settings for creating a new *PV name*. Deactivates marked existing *PVNames* in the list so that they cannot be accidentally overwritten.

(12) **Delete** Deletes the selected *PV name* by clicking on it.

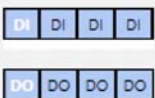
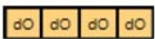
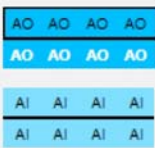
(13) **Display process data information**, see chapter 9.8 on page 100.

9.6.2 Data Typen

1. Boolean	1 bit	1 bit (e.g., <i>digital output on/off</i>)
2. Antivalent	2 bits	antivalent value
3. BCD/Enum	4 bits	binary coded decimal
4. BITSET 8	8 bits	8 bits (e.g., control 8 digital outputs)
5. BITSET 16	16 bits	16 bits (e.g., control 16 digital outputs)
6. BITSET 32	32 bits	32 bits (e.g., control 32 digital outputs)
7. Unsigned 8	1 byte	unsigned numerical representation 0 255
8. Unsigned 16	2 bytes	unsigned numerical representation 0 65.535
9. Unsigned 32	4 bytes	unsigned numerical representation 0 4,294,967,295
10. Integer 8	1 byte	signed numerical representation -128 ... 127
11. Integer 16	2 bytes	signed numerical representation -32.768 ... 32.767
12. Integer 32	4 bytes	signed numerical representation -2,147,483,648 ... 2,147,483,647

Overview Data types MVB

Here is an overview of which data type corresponds to which data, i.e., which data can be represented (*mapped*) with which data type.

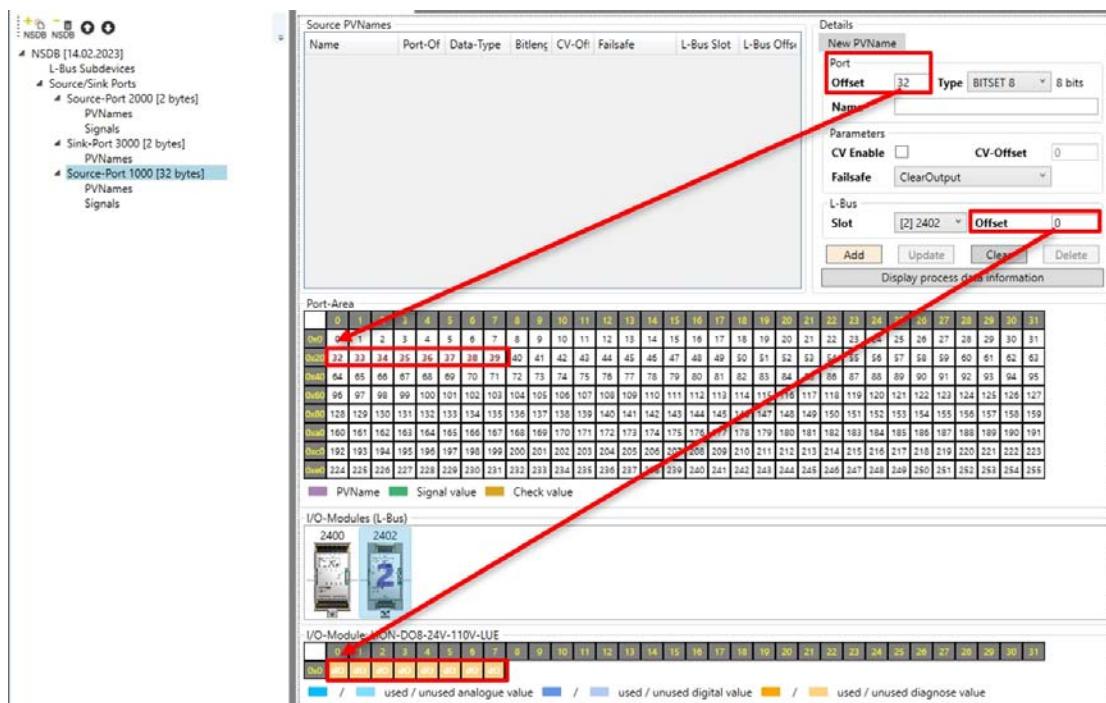
	Boolean	Antivalent	BCD/Enum	Bitset	Unsigned	Integer
1. Digital outputs/inputs 	✓	✓	✓	✓	✗	✗
2. Diagnostic inputs 	✓	✓	✓	✓	✗	✗
3. Analog outputs/inputs 	✗	✗	✗	✗	✓	✓

On the following pages you will find an application example on the topic of mapping data.

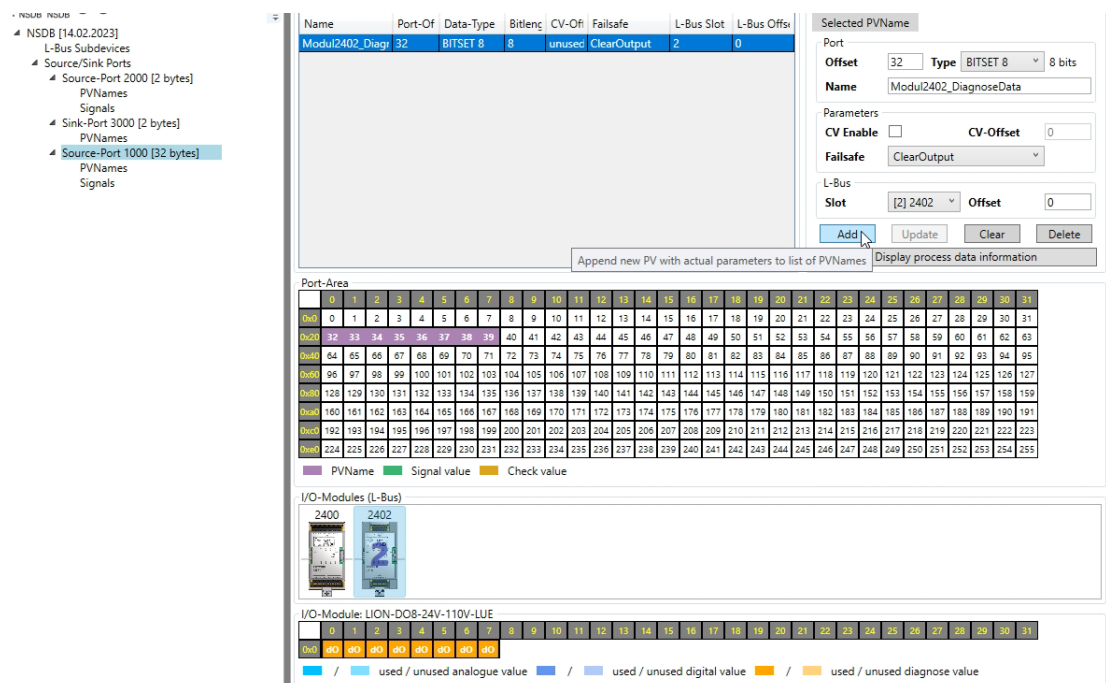
9.6.3

Mapping of data with I/O Offset

- The following figure shows the 8 diagnostic data bits of the outputs on *port 1000*. The 8 bits are represented as BITSET8 and placed at bit position 32 in the *source port*.



- Enter a name, e.g., “*Module2402_DiagnoseData*,” and click on **Add**.



- In the *port area field* the mapped areas are displayed in purple. (According to the color key under the *port area field*, purple means PV name). The mapped areas of the individual DEVICES are marked dark orange under the data structure of the DEVICES. (According to the color key under the *I/O module field*, dark orange means used *diagnostic data*).

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NOTE: Input data from DEVICES can be mapped multiple times, even across different ports.

4. To create a different 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.*
5. Enter a new name, e.g., B. "Module2402_DiagnoseData2".
6. Click on **Add**.

The screenshot displays the MVB Slave Configurator interface. On the left, a tree view shows the project structure with 'Source-Port 1000 [32 bytes]' selected. The main window is divided into several sections:

- Source PVNames:** A table listing PVNames and their properties. The entry 'Module2402_Diagn' is highlighted, showing 'Port-Of: 110', 'Data-Type: BITSET 8', 'Bitlen: 8', 'CV-Of: unused', 'Failsafe: ClearOutput', 'L-Bus Slot: 2', and 'L-Bus Offs: 0'.
- Details:** A panel on the right showing the configuration for the selected PVName. It includes fields for 'Port', 'Offset' (set to 110), 'Type' (BITSET 8), 'Name' (Module2402_DiagnoseData2), 'CV Enable', 'CV-Offset', 'Failsafe', 'L-Bus Slot' (set to 2), and 'Offset' (set to 0). Buttons for 'Add', 'Update', 'Clear', and 'Delete' are at the bottom.
- Port-Area:** A large grid showing bit positions (0 to 31) for various ports. A red arrow points from the 'Offset' field in the Details panel to the bit position 110 in the Port-Area grid.
- I/O-Modules (L-Bus):** A section showing the mapping of I/O modules to the L-Bus. It includes a diagram of the modules and a table of bit positions.
- I/O-Module: LION-DO8-24V-110V-LUE:** A section showing the mapping of the LION-DO8-24V-110V-LUE module to the L-Bus. It includes a diagram of the module and a table of bit positions.

NOTE: A warning is issued, but this can be ignored if this is the desired behavior.

The screenshot displays the I/O-Module: LION-DO8-24V-110V-LUE configuration. It shows a diagram of the module and a table of bit positions (0 to 31). The table indicates the status of each bit position, with some bits marked as 'used / unused analogue value', 'used / unused digital value', or 'used / unused diagnose value'. Below the table, a section titled 'Info' provides a description of the module and its configuration, including warnings about bit positions 0, 1, 2, 3, and 4 being referenced multiple times.

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

- Sink PVNames:** A table with columns: Name, Port-Of, Data-Type, Bitleng, CV-Off, Failsafe, L-Bus Slot, L-Bus Offs. The entry 'DigitalOutputMod' has CV-Off set to 10.
- Details:** A panel for the selected PVName 'DigitalOutputModule2'. It shows 'CV Enable' checked and 'CV-Offset' set to 10. A red box highlights these two fields, with a red arrow pointing from the 'CV-Offset' value to the 'Port-Area' grid.
- Port-Area:** A grid of 16 positions (0-15). Position 10 is highlighted in yellow, indicating it is the Check Variable (CV) position.
- I/O-Modules (L-Bus):** A section showing the module 'LION-DO8-24V-110V-LUE' with a grid of 16 positions. Position 10 is also highlighted in yellow.

NOTE: Further details on configuration can be found in the respective operating instructions for the LION bus couplers and DEVICES. If you have any further questions, please contact the service department.

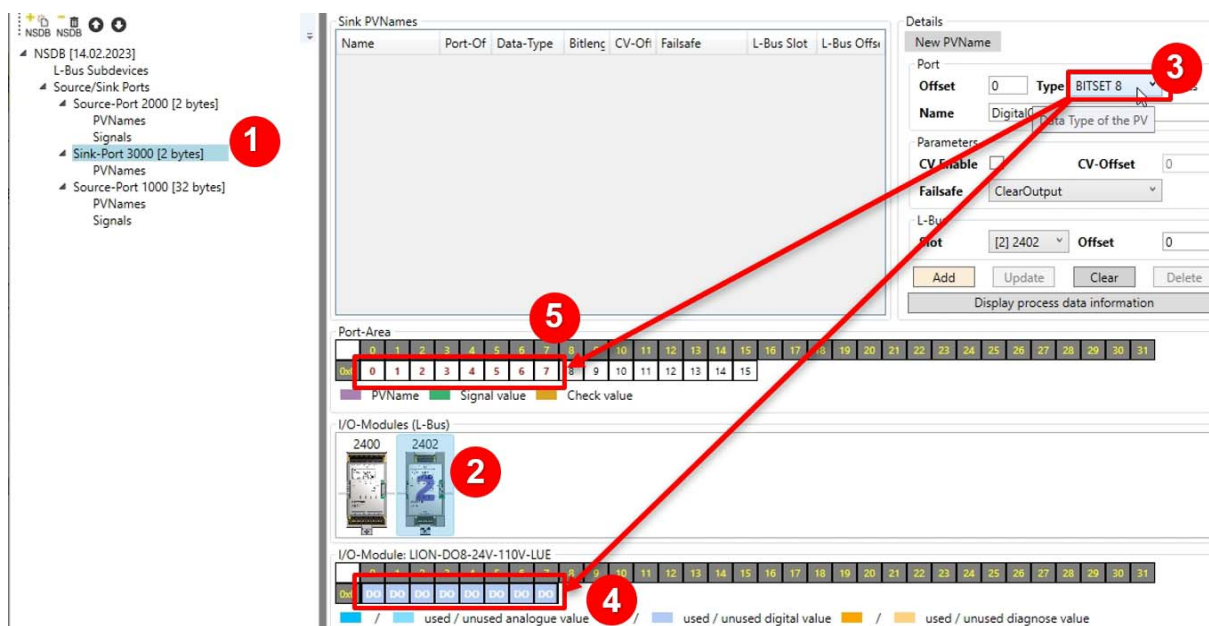
Chapter: Further information is available from chapter 15 on page 177

9.7 Options for the assignment of ports

9.7.1 Option 1: Assignment via input

Basic principle

1. Select a *sink port* (1).
2. Select the *DEVICE* (2).
3. Select the *data type* (3) with which you want to map the output data of the module (4) to the *sink port* (5).

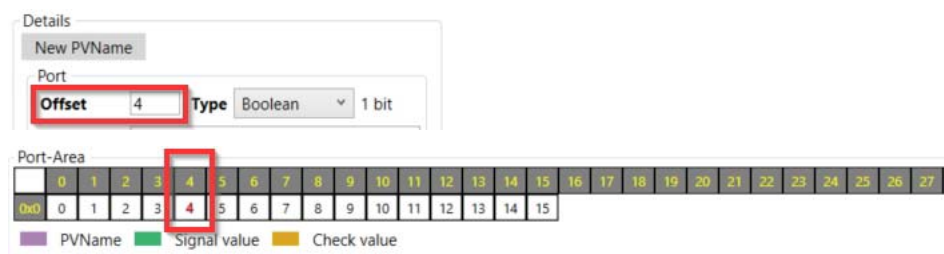


NOTE: You can assign as much output data to a sink port as there are bits available.

4. Create/edit a New PV name

4a. Default setting **Port**

In the **port area** (5), the value in *Port/Offset* specifies the start bit:



4b. The corresponding number of bits, in this case **4 bits**, is specified after choosing the (**data**) **type** (3).



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

4c. Enter a name for the mapping, e.g., “DigitalOutput_1”:

4d. Parameter

Default settings of the parameters

- CV Enable activates the generation of MVB check variables.
- CV-Offset specifies the start address of the check variable.

Chapter: See also chapter 9.6.4 on page 95

NOTE: In failsafe mode: This setting is ignored by the LION system and is set to ClearOutput by default.

4e. L-Bus area

Default settings for the L-Bus area

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

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The Offset text field shows the start bit:

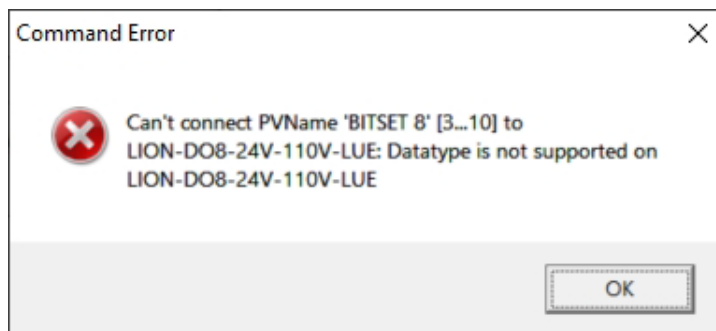


2.6. Save the settings with **Add**.

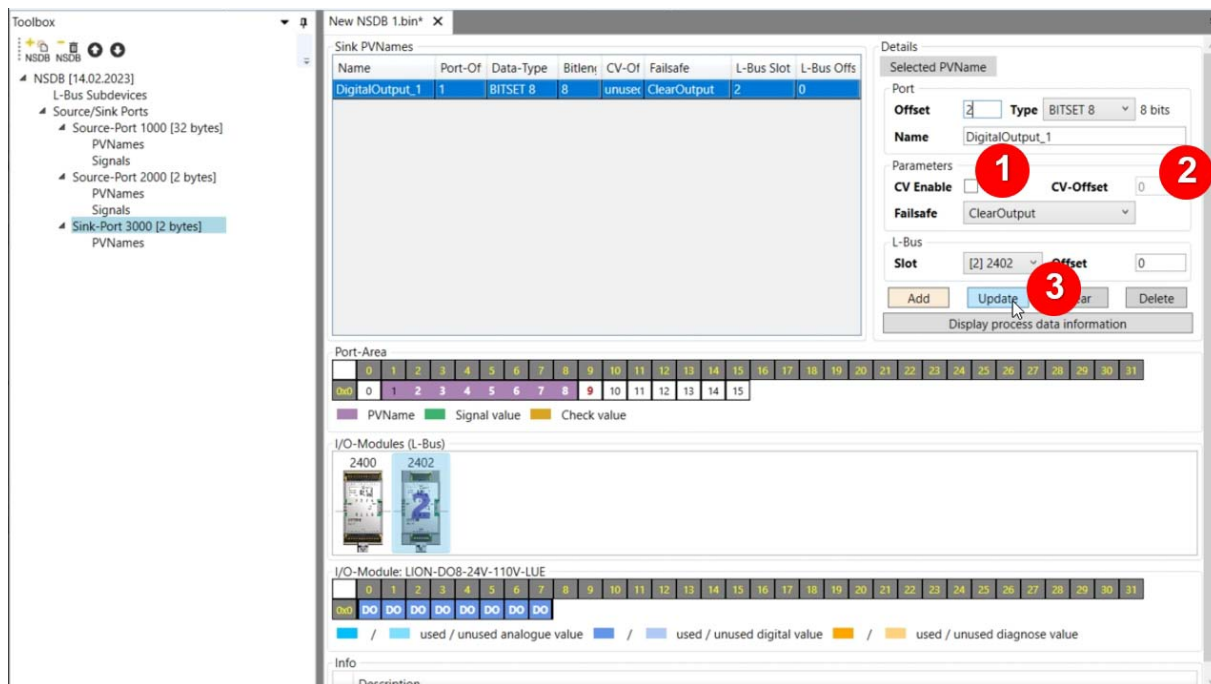
NOTE: If a configuration is not possible, it will be indicated by corresponding warnings.

In this case, the instructions must be followed, and a valid configuration must be created.

For example



If everything is correct, the new PV name is displayed in the *Sink PVNames* list:



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

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There is a corresponding source *PVNames* list in a source port:

New NSDB 1.bin* X							
Source PVNames							
Name	Port-Of	Data-Type	Bitleng	CV-Off	Failsafe	L-Bus Slot	L-Bus Offs
Diag_1	4	Boolean	1	unused	ClearOutput	2	0

9.7.2

Option 2: Mapping at the click of a mouse

NOTE: As an alternative to using text fields and drop-down menus, you can also set the offsets (in the *port* and *L-Bus²* area) by double-clicking with the mouse.

In this example, a *BITSET8* was selected as the type (1), so that you have 8 bits for distribution in the port area (2). You can set the offset of this 8-bit series with a double-click of the mouse (*here*, for example, 33).

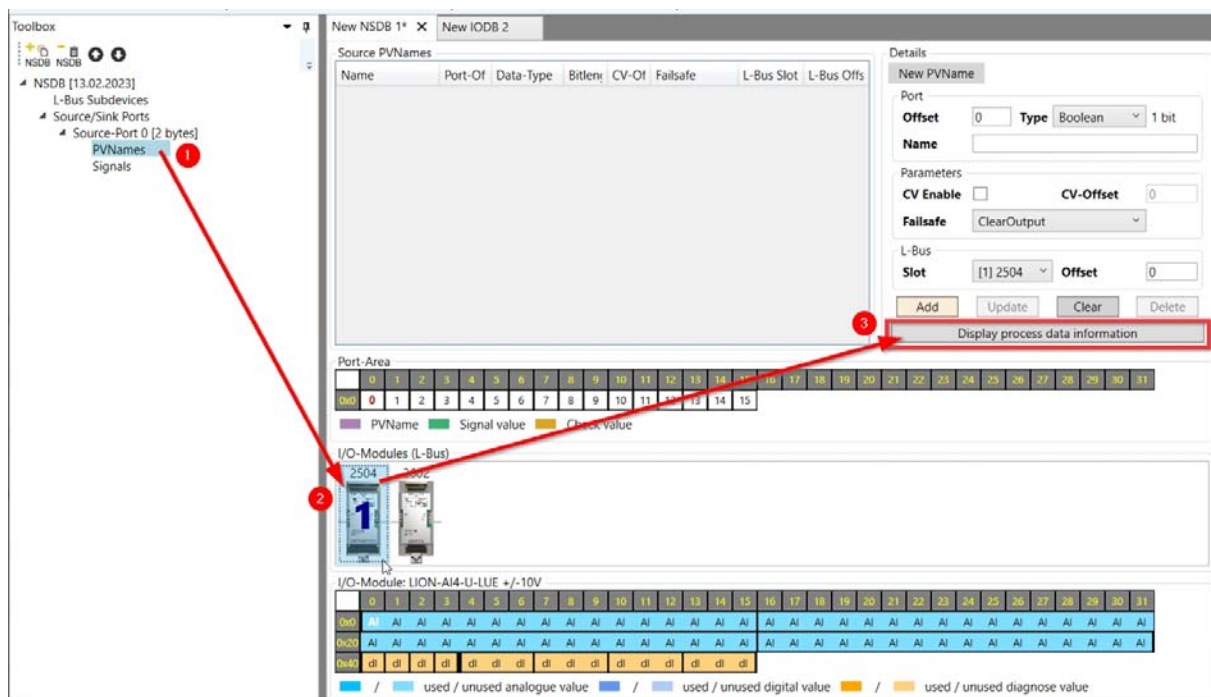
The screenshot shows the 'Sink PVNames' configuration window. On the left, a tree view shows the hierarchy: NSDB [14.02.2023] > L-Bus Subdevices > Source/Sink Ports > Sink-Port 3000 [16 bytes] > PVNames. The 'Details' panel on the right shows the configuration for a new PVName. A red circle with the number 1 points to the 'Type' dropdown menu, which is set to 'BITSET 8' with '8 bits' indicated. A red circle with the number 2 points to the 'Port-Offset' field, which is set to 33. Below the details panel, the 'Port-Area' is shown as a grid of 32 bits (0-31). A red box highlights the first 8 bits (33-40), which are currently set to 'DO'. Below the port area, the 'I/O-Modules (L-Bus)' section shows two modules: '2400' and '2401'. The '2401' module is selected, and its 'I/O-Module: LION-DO16-24V-LUE' is shown. A red box highlights the first 8 bits (0-7) of this module, which are currently set to 'DO'.

How to assign individual ports with a mouse click has already been described for the source ports. This is what the configuration saved with *Add* looks like:

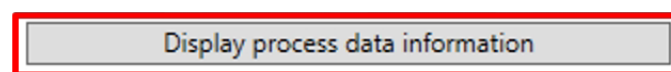
The screenshot shows the 'Sink PVNames' configuration window after clicking the 'Add' button. The 'Port-Area' grid is now populated with 32 bits (0-31). A red box highlights the first 8 bits (33-40), which are now set to 'DO'. Below the port area, the 'I/O-Modules (L-Bus)' section shows two modules: '2400' and '2401'. The '2401' module is selected, and its 'I/O-Module: LION-DO16-24V-LUE' is shown. A red box highlights the first 8 bits (0-7) of this module, which are now set to 'DO'. The legend at the bottom indicates: 'DO' (used / unused digital value), 'AO' (used / unused analogue value), and 'DI' (used / unused diagnose value).

NOTE: You can assign as much output data to a sink port as there are bits available.

9.8 Show brief information on the process data

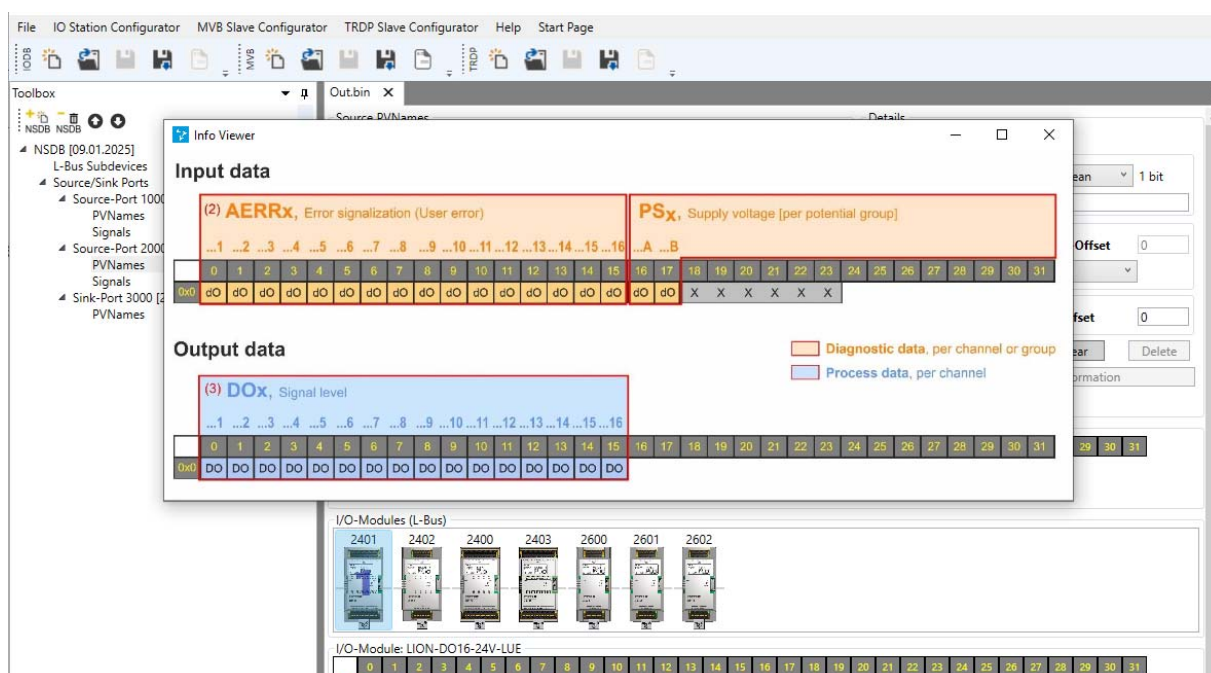


Click on the **Display process data information button (3)** to obtain brief information about the **process data (1)** of the module for the **selected module (2)**.



The following example shows the brief information of the process data of output module 803202 (ID 2401).

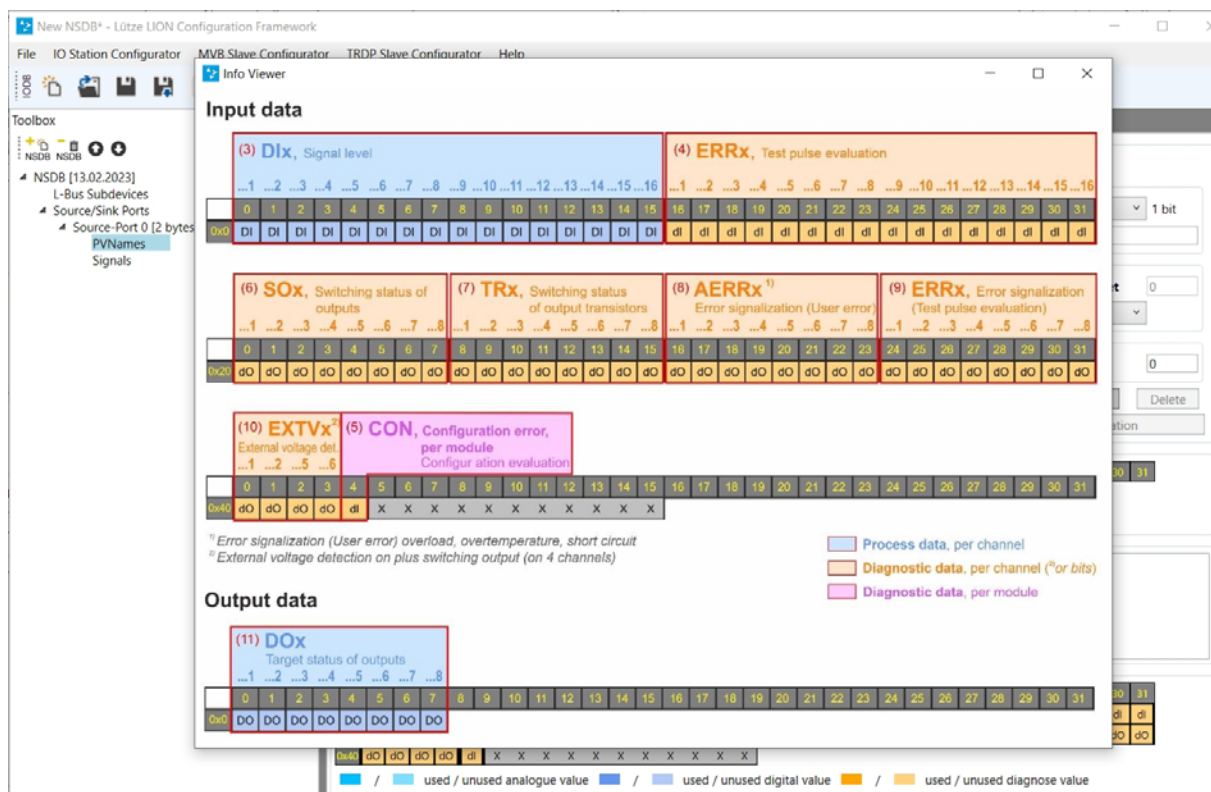
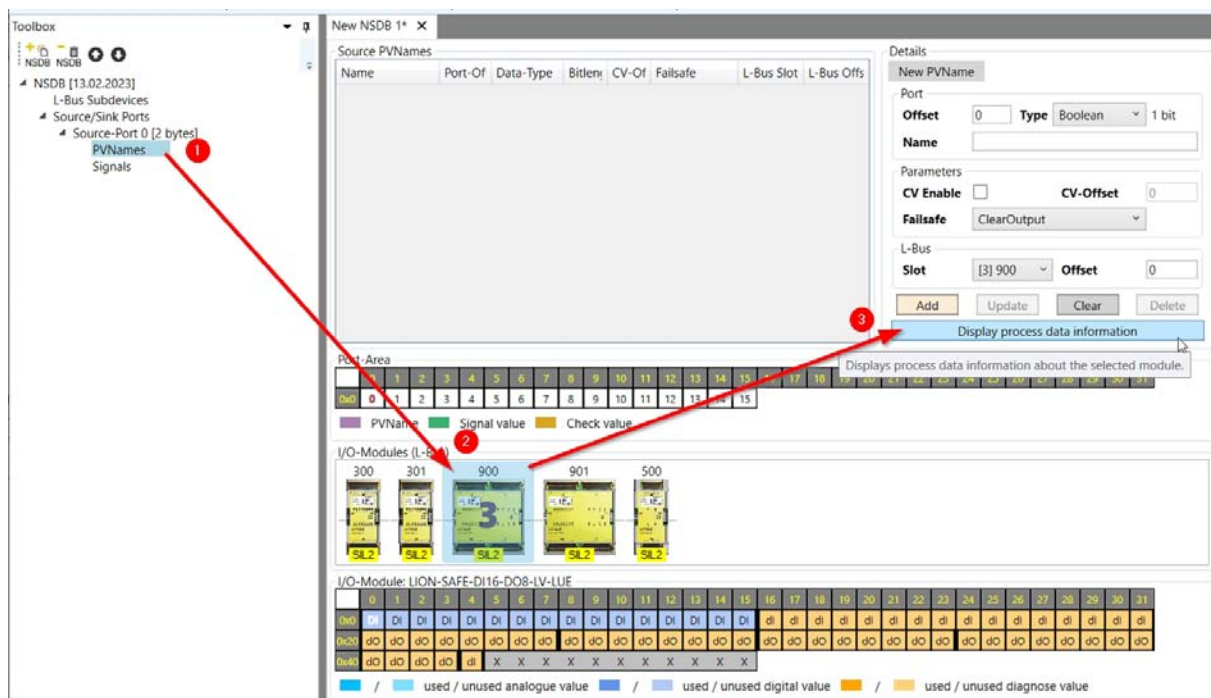
All process data (*input and output data*) of a module is displayed in an additional window, regardless of whether you are in a *source or sink port*.



If you select another module, its data is displayed.

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



✓ Tip: An overview of all brief information on the process data of the modules can be found in the annexes in [chapter 18.4](#) on page 195.

9.9

Diagnostics Port

The HEAD has a variety of diagnosis information that can be transmitted via the MVB. These are general diagnosis information of the I/A LION station. This does not include the diagnosis data of the individual devices, such as short circuit detection, but rather general diagnosis information about the LION I/O station and the status of the fieldbus communication.

The general diagnosis data is transmitted through a separate MVB port, which is referred to as the *diagnostic port*.

! Important technical information: 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 operating manual of the HEAD.

9.9.1

Brief instructions

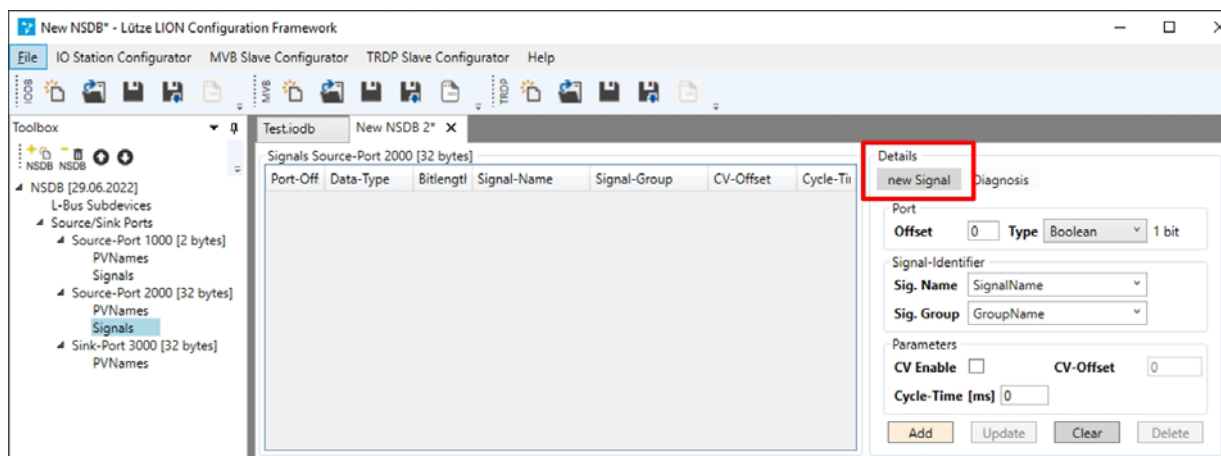
This is a brief overview of the topic of diagnostic ports. To create a diagnostic port, proceed as follows.

NOTE: The diagnostic connection can be created in any source port, but only once in an NSDB file.

1. Click on the submenu *Signals* (under the menu item *Source-Port*):



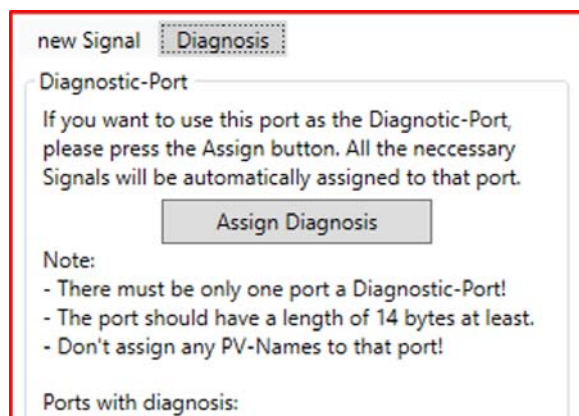
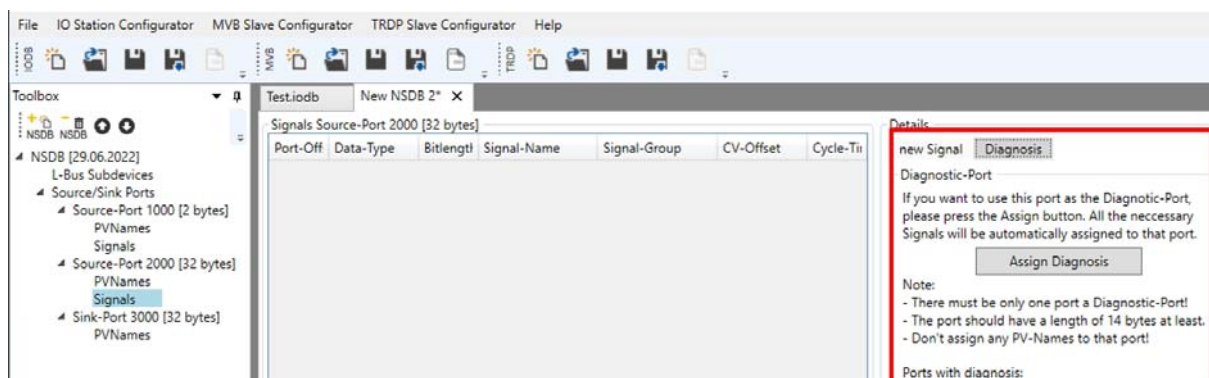
2. On the right side, in the Details section, you will find the two tabs *New Signal* and *Diagnosis*.



The diagnosis port is automatically created by the LION LCF under *New Signals* > *Diagnosis*.

! Important technical information: It is recommended to create the diagnostic port automatically.

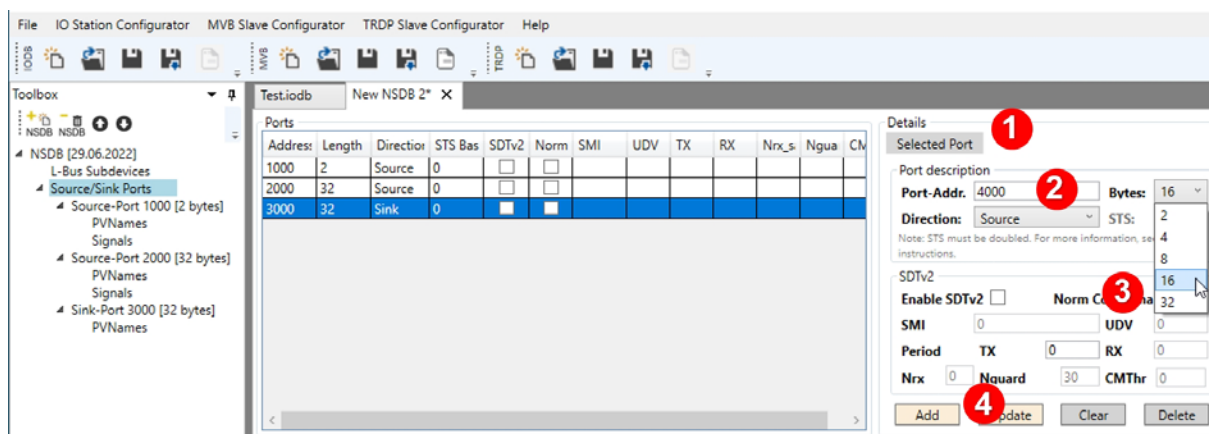
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9.9.2 More detailed description of the diagnostic port

To create a diagnostic port, proceed as follows:

NOTE: In this example, two *source ports* have already been created.

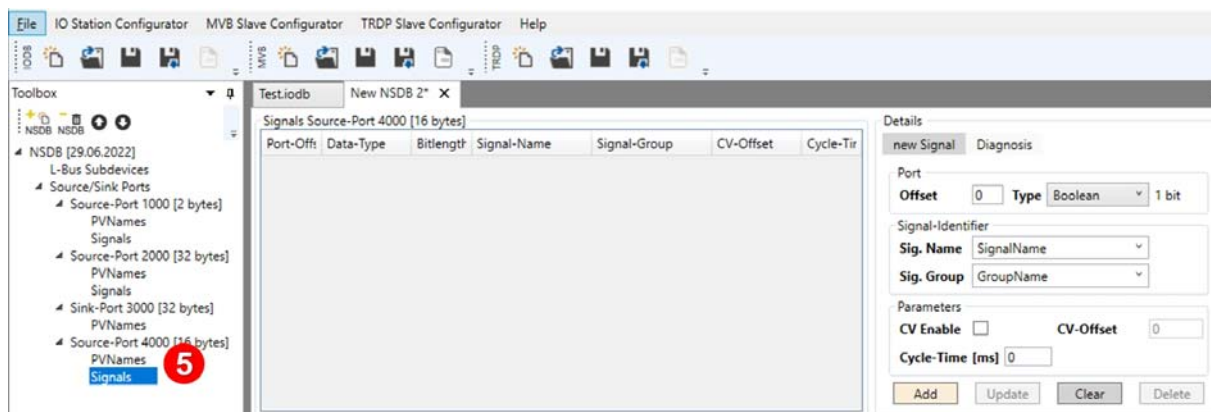


1. Create a new **source port** (1).
2. Enter a **port address** (2).
3. For **Bytes** (3), use a minimum of 16 bytes.

! Important technical information: The diagnostic port requires a source port with at least 16 bytes.

4. Click on **Add** (4).

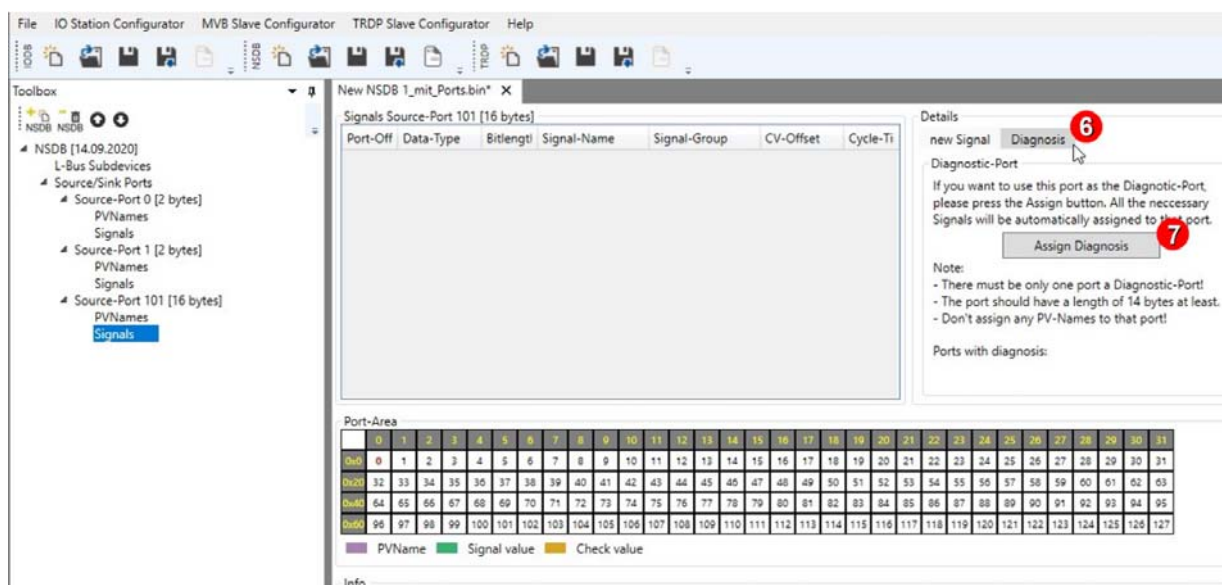
LION LCF Application Manual Configurator HEAD – MVB Slave Configurator



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

NOTE: There may only be one port designated as the *diagnostic port*. The *port* should have a length of at least 16 bytes. No *PVNames* may be assigned to this port.

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



NOTE: Please wait a moment until the new *diagnostic port* is displayed.

LION LCF Application Manual Configurator HEAD – MVB Slave Configurator

All required signals are automatically assigned to the diagnostic port:

Signals Source-Port 101 [16 bytes]

Port-Off	Data-Type	Bitlength	Signal-Name	Signal-Group	CV-Offset	Cycle-Ti
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	TemperatureWarn	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
74	Boolean	1	MatchError	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)

Details: selected Signal Diagnosis

Diagnostic-Port

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

Remove Diagnosis

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]

NOTE: The *diagnostic port* can only be created once. Only one (source) port may be a *diagnostic port*.

NOTE: No *PVNames* may be assigned to the diagnostic port:

Signals Source-Port 101 [16 bytes]

Port-Off	Data-Type	Bitlength	Signal-Name	Signal-Group	CV-Offset	Cycle-Ti
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	TemperatureWarn	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
74	Boolean	1	MatchError	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)

Details: selected Signal Diagnosis

Port

Offset 106 Type Boolean

Signal-Identifier

Sig. Name SlotStatus32

Sig. Group LIONDiag

Parameters

CV Enable ☐ CV-Offset 0

Cycle-Time [ms] 32

Add Update Clear

NOTE: The HEAD's web server will not display the *diagnostic data* if the diagnostic port is not created.

9.9.3 Deleting the diagnostic port

1. To delete the *diagnostic port*, go to the Diagnosis tab (1).
2. Click the *Remove diagnosis* (2) button to remove the automatically created signals. After that, the *port* can be used again for the transmission of 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
74	Boolean	1	MasterError	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**

Diagnostic-Port

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

Remove Diagnosis

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]

NOTE: For more information, please refer to the operating manual of the LION MVB bus coupler, in chapter "8.2.5 MVB Diagnostic Port."

9.10

Overview of the DEVICES and port properties

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

 Chapter: (* Filter settings for this module are possible.) See also chapter 9.2.3 on page 73

Type of module	ID	Type	Part-No.	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-SAFE-PS-24V-110V-72W-LUE	800111	-	-	-
	1201	LION-SAFE-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 bytes
	301 *	LION-SAFE-DI16-HV-LUE	803104	5 bytes (33 bits)	-	4 bytes
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	ALION-AI4-U-LUE	803301	10 bytes	-	-
	2502	LION-AI4-U-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 bytes
	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 bytes
	901 *	LION-SAFE-DI16-DO8-HV-LUE	803502	9 bytes (69 bits)	1 byte	4 bytes

Example: The analog output module 803401 provides 2 bytes of input data (*diagnostic 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 for use there.

NOTE: A detailed description of the input/output data can be found in the operating manual of the corresponding DEVICE.

9.11

Creating a new NSDB Report

The NSDB report summarizes the settings and configurations of the MVB HEAD and is used by the validator for verification.

NOTE: When creating the NSDB report, a (first) *checksum* is generated.

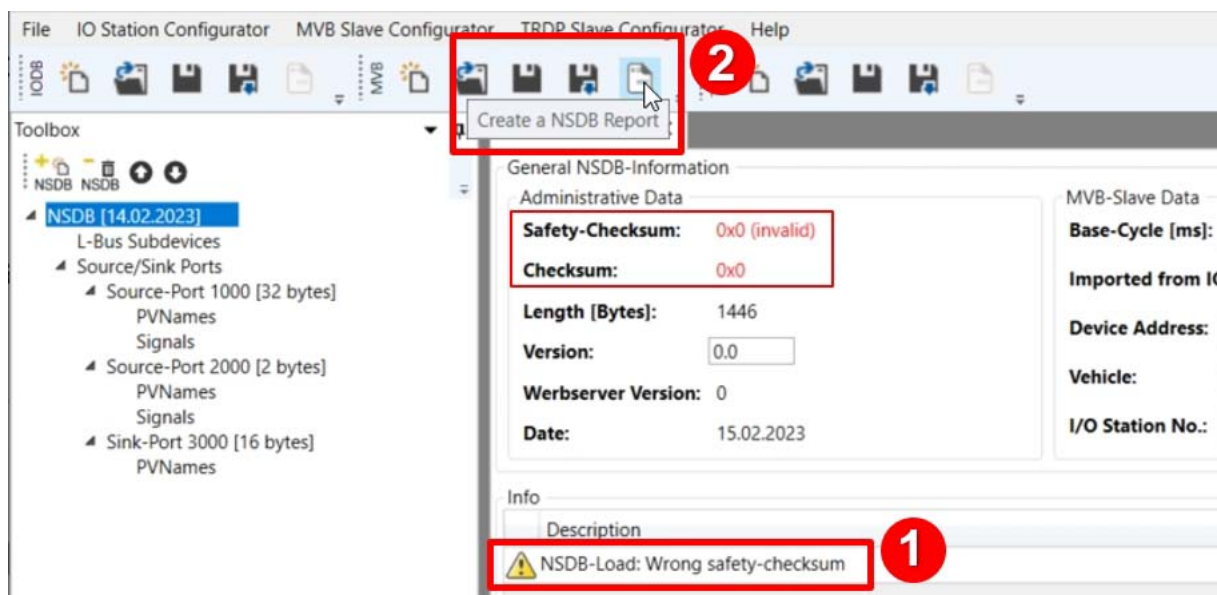
NOTE: The actual security checksum is only generated with the created and verified NSDB report.

Hence, the NSDB report must always be created first as the basis.

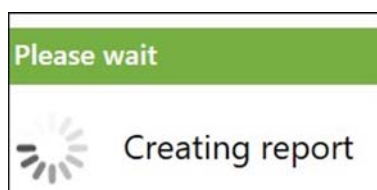
NOTE: Without a safety checksum, the MVB HEAD does not accept the NSDB file.

In this context, it doesn't matter whether safe modules are used in the LION system or not. The safety checksum must always be created. This is the last step before the configuration file can be loaded onto the MVB HEAD.

1. To create the report and *checksums*, click on the icon *create NSDB-Report* (2).
2. As long as the *NSDB report* has not been created, the *safety checksum* (1) is invalid.



3. This window appears:



NOTE: The larger the configuration, the longer it can take for the report to be created.

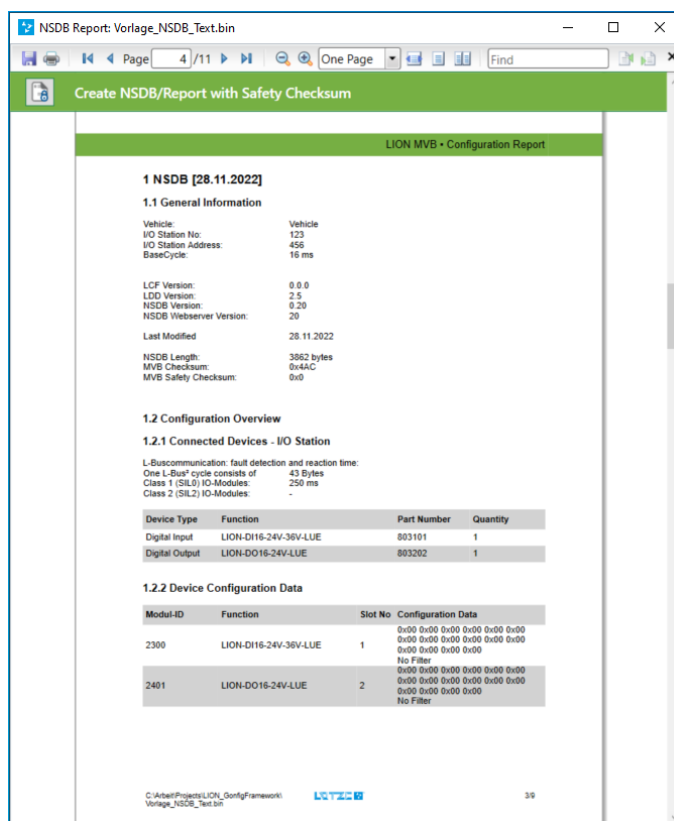
4. A new *NSDB (Configuration) report* has been created:



4. The report is used for the review and validation of the settings. A report PDF is created, and additionally, the actual configuration file, the NSDB file. This file contains the current configuration settings for the MVB HEAD.

NOTE: Read the report carefully and review the created configuration according to your requirements.



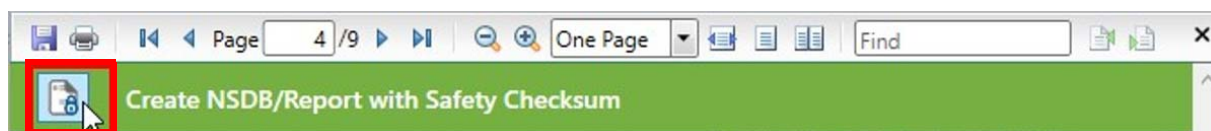


9.12

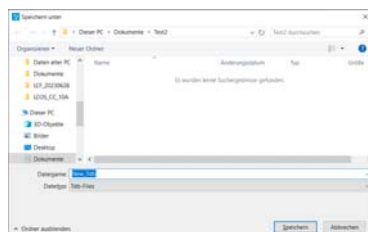
Create NSDB report with checksum.

If the report contains no errors and the configuration meets the requirements, the *safety checksum* can be generated.

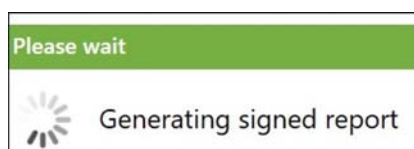
1. At the top of the NSDB report, select the option labeled "**Create NSDB/Report with Safety Checksum.**"



After that, there is an option to specify the (local) storage location.

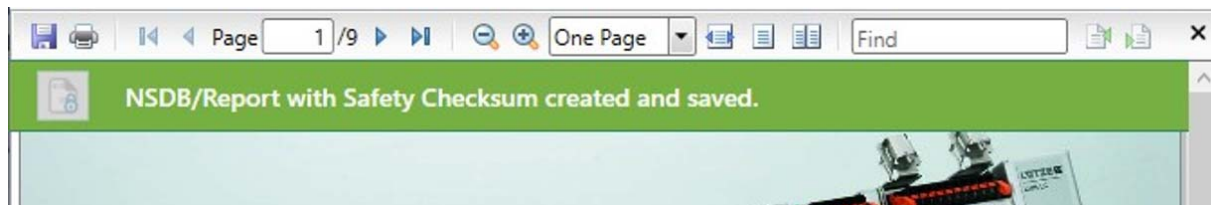


This window appears:

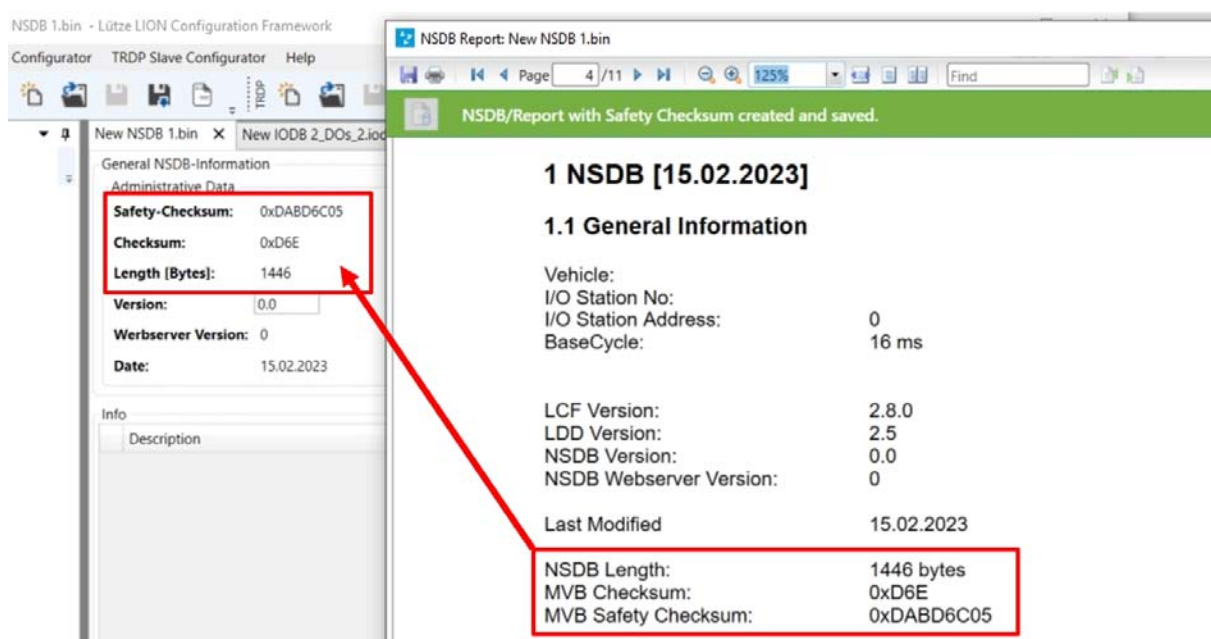


NOTE: The larger the configuration, the longer it can take for the report to be created.

A *signed report* is being created






NOTE: The *MVB safety checksum* is automatically stored in the NSDB file and displayed in the *MVB Slave Configurator*:



! Important technical information: The generated *NSDB file (*.bin)* can be transferred to the *HEAD* (e.g., *MVB coupler*).

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

! Important technical information: **Additionally, a text file with the same name is created. This file contains the complete configuration and can, for example, be read in for further processing.**

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

Example of the content of the text file:

```


Datei Bearbeiten Format Ansicht Hilfe
|
| New NSDB 1.txt
|
|=====
| NSDB-HEADER
|=====
|-----
SafetyChecksum : 0x9AAFD754
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-Modul-ID |LBus module name |Configuration data
|-----
| 1         |2600         |LION-AQ4-U-LUE  | 0x00 0x00 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|Fail-safe |L-Bus Slot|L-Bus Offset
|-----
|-----
|=====
| All LBus2-IO-Modules
|=====
|Modul-Id|Item Nr.|LBus module name |Output byte |Input byte
|-----

```

9.13

Notes

NOTE: These were idealized examples. In real situations, the tasks are more complex and must meet a variety of requirements for the MVB structure.

 **Service:** If you get stuck or need any other help, please contact the service department. The contact information is in chapter 15 on page 177

10

Configurator HEAD – TRDP Slave Configurator

The type of HEAD determines the type of fieldbus used in the LION system. If a TRDP HEAD is used, it is the master of a TRDP LION station (blue frame). The HEAD, and therefore the entire LION station, is also a TRDP slave in relation to the higher-level system, the LOGIC.

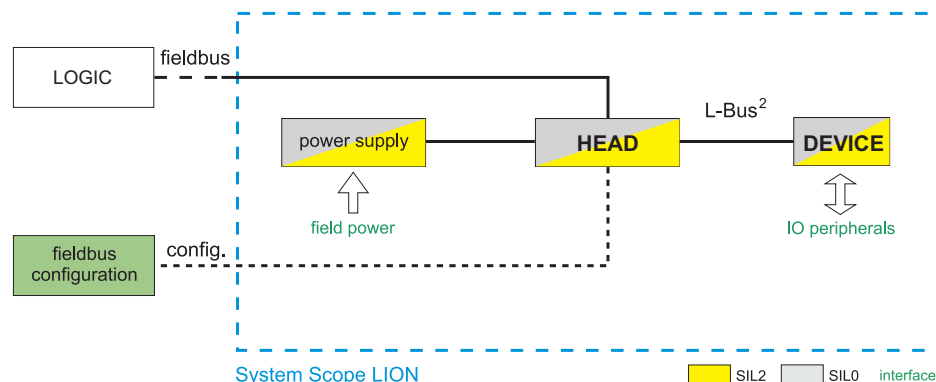


Fig.. 1: This smallest possible LION I/O system illustrates the principle.

A LION system is a local I/O system consisting of a bus coupler (MVB, Ethernet, etc.), the HEAD, and various input and output modules (digital and analog for power, voltage and temperature), the DEVICES and corresponding infrastructure components.

The following applies:

1. The TRDP bus coupler is the HEAD of the L-Bus². The HEAD sends data to the DEVICES or receives data from the DEVICES.
2. The HEAD communicates with the DEVICES via L-Bus².
3. To enable data communication, a mapping must be created between the I/O data and the TRDP fieldbus.

NOTE:

The mapping and configuration of the individual data must be carried out in the LION LCF tool.

! Important technical information: Further information can also be found in the "Configuration" chapter in the respective operating manuals of the HEADs.

NOTE: LION HEADs are available in non-safe and safe versions. SDTv2 is only relevant for SIL>0 and therefore for LION SAFE HEADs.

The HEAD can be easily recognized by its name and appearance. Non-safe modules have a gray label. Safe modules (SIL2) have a yellow label.

1. Non-safe:



2. Safe (SIL2):



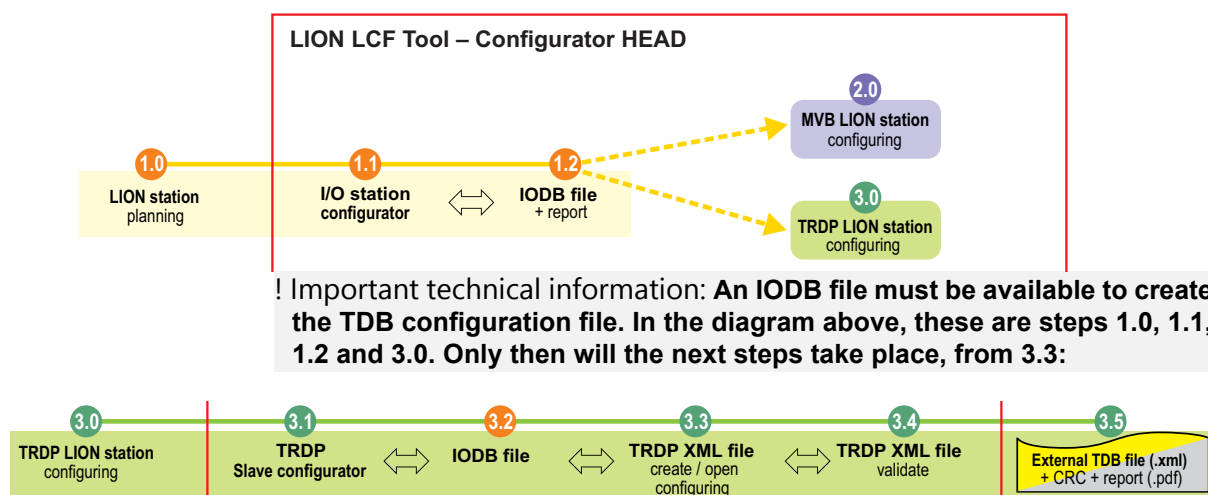
⚠ CAUTION: The project planner is responsible for the configuration. Especially for the accurate mapping of diagnostic and process data between the head and devices.

10.1

Creating a new TDB configuration file

10.1.1

Creating a new IODB file



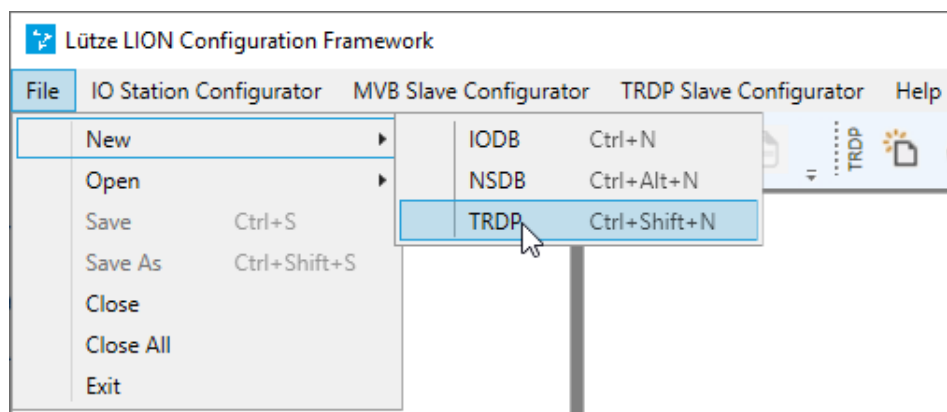
NOTE: Only TRDP-capable bus couplers may be placed in the I/O Station Configurator. These are item no. 803012 (SIL0) or item no. 803002 (SIL2).

As soon as the IODB file is available, the next step follows:

10.1.2 Creating a new TRDP/XML configuration file.

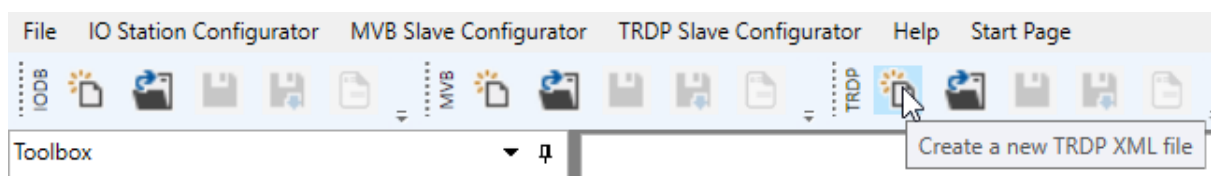
To create a new TRDP/XML configuration file, proceed as follows:

1. Click on **File** in the menu bar.
2. Select **New**.
- 3a. Click on **TRDP**.



or

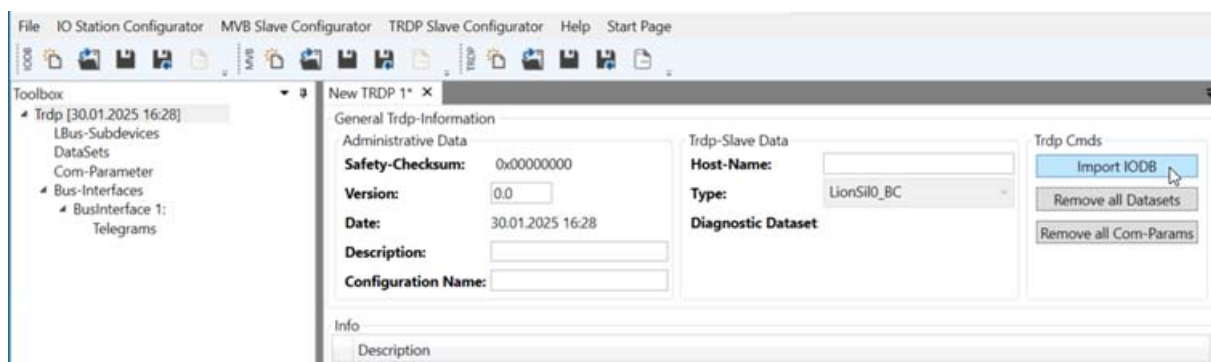
- 3b. Click on the “**New TRDP file**” icon in the toolbar.



10.2 Import of the IODB file

Start the TRDP configuration by importing the previously created IODB file. The LION I/O station with all modules and their process data structure is imported automatically. The LION I/O station with all modules and their process data structure is imported automatically.

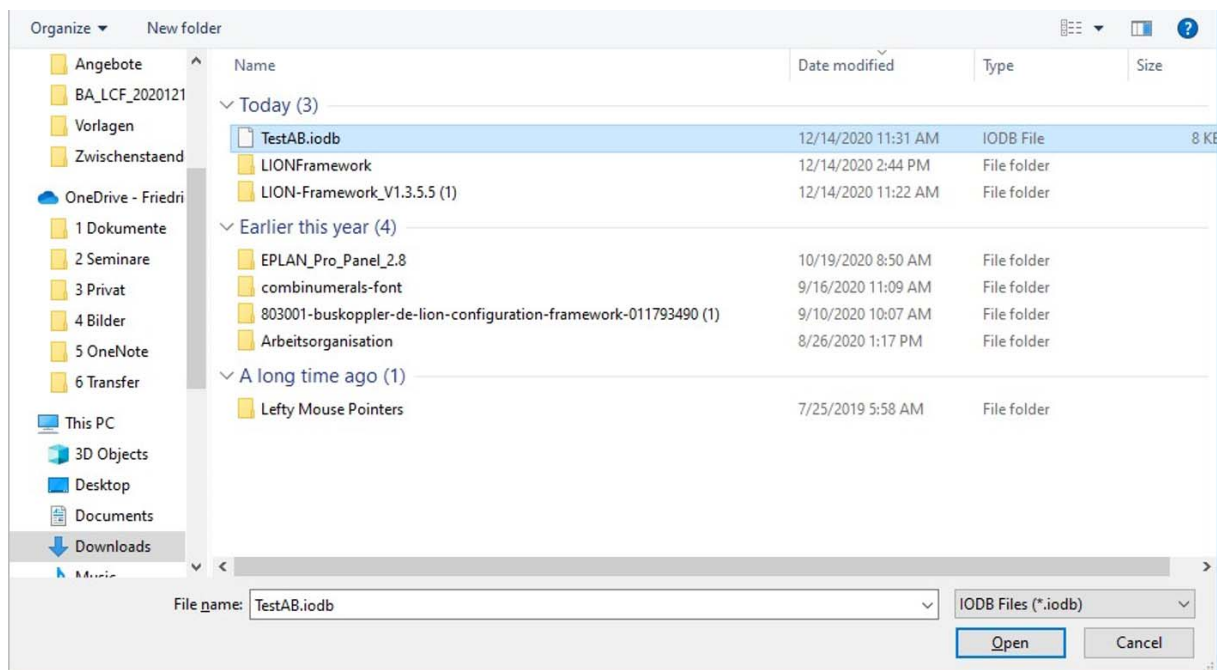
1. Click on the **Import IODB** button.



2. Select the IODB file you want to import.

LION LCF Tool Application manual ▪ Configurator HEAD – TRDP Slave Configurator

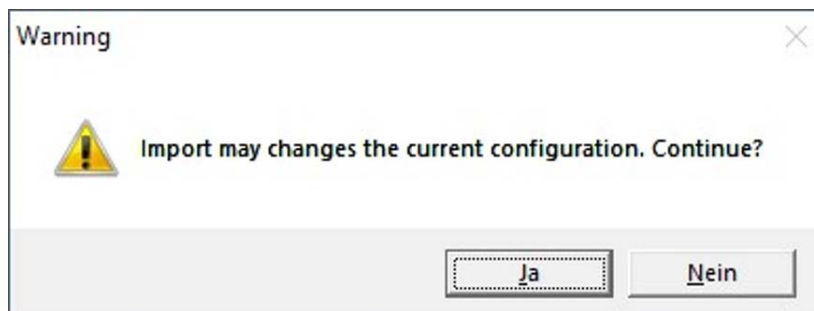
3. Click **Open**.



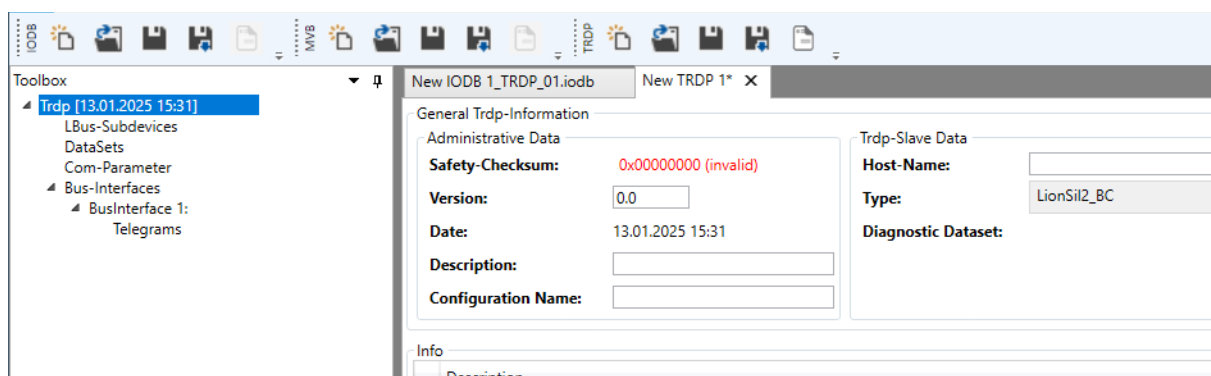
4. Several warning windows and messages may appear.

! Important technical information: Read the warning message and confirm it or ignore it if necessary. Cancel the import if you have any concerns. If you get stuck or need any other help, please contact the service department.

Example :



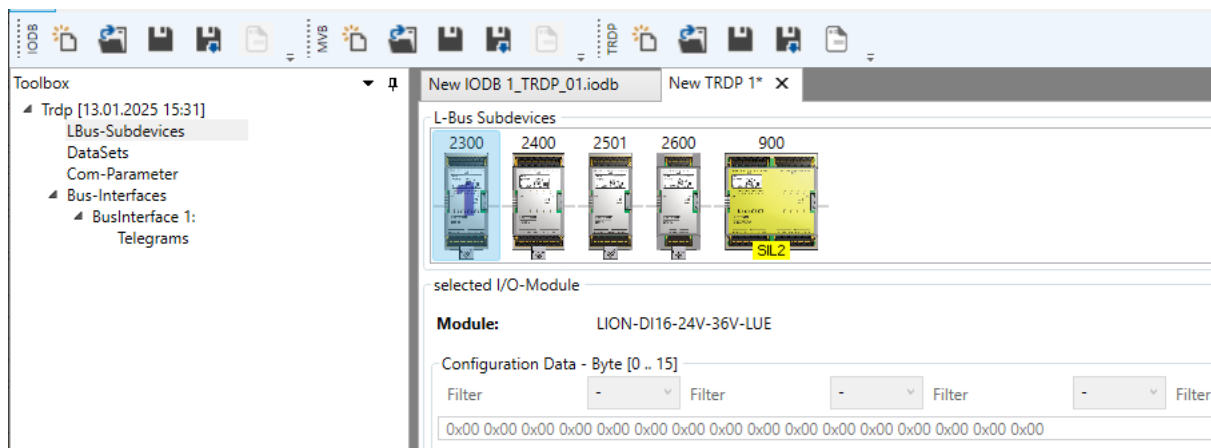
The following window appears:



NOTE: In contrast to the MVB configuration, the TRDP device address is not automatically imported from the IODB file.

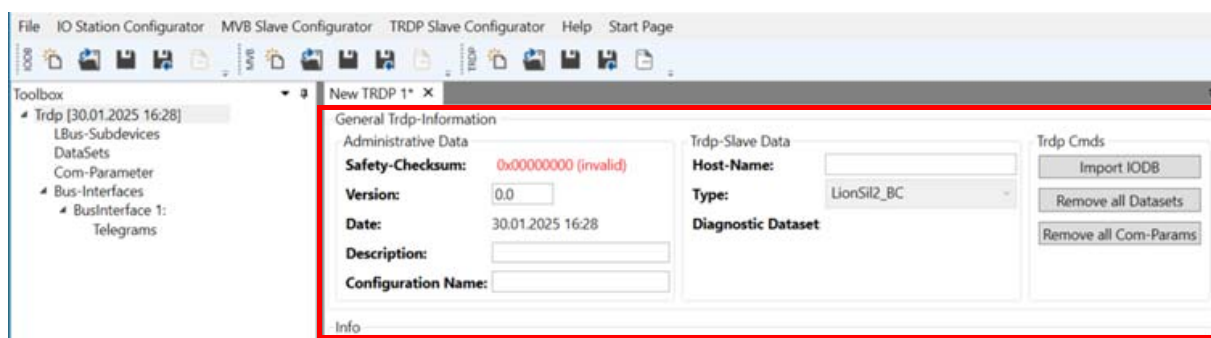
LION LCF Tool Application manual ▪ Configurator HEAD – TRDP Slave Configurator

Only the L-Bus² subdevices selected in the *I/O Station Configurator* are displayed:



10.2.1 General TRDP-Information

The imported data is displayed under the **General TRDP information** area. Part of the data is taken from the IODB file.



LION LCF Tool Application manual ▪ Configurator HEAD – TRDP Slave Configurator

1. Administrative Data (on the left side).

Safety Chesium

This *safety checksum* is generated when you create the report and then click on Save. This is the security process to obtain a valid TDB file with the corresponding report.

Version	Version of the TRDP file/configuration
Date	Date of creation
Description	Field for a brief description
Configuration Name	Field for the name of the configuration

2. TRDP slave data (on the right-hand side).

Fill in the general TRDP information fields as required.

Host-Name

The host name should describe the device for which the configuration is intended, in this example "TRDP_Example".

Type

The selection of the I/O station type is displayed here. The "Type" field is not selectable or editable.

During IODB data import, the TRDP HEAD (SIL0 or SIL2) for which the TDB configuration is to be carried out is automatically recognized.

In this example for a TRDP HEAD SIL2.

Diagnostic Dataset:

The valid diagnostic data record is displayed here.

a) Notes on the safety checksum.

- The *safety checksum* is relevant for the application engineer (the developer of the train protection system) to identify the *NSDB file* used in a LION I/O station.
- The *safety checksum* is displayed in the web server. After uploading a *TDB file* to a TRDP HEAD, the displayed safety checksum must match the safety checksum in the report.
- The safety checksum is transmitted via the fieldbus (diagnostic interface) and

can be checked by the train protection system to determine whether the connected LION I/O station is using the expected TRDP configuration. If the value of the safety checksum deviates from the expected value, the station is incorrectly configured.

NOTE: The checksum is created as soon as the TRDP file is saved.

In contrast to the safety checksum, the checksum is used for additional monitoring for file errors.

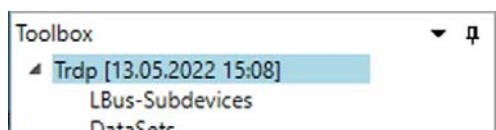
10.3

How to create a TRDP/XML configuration

Once the IODB file has been imported and the general TRDP information has been entered, the actual mapping of the DEVICES must be carried out in the corresponding *telegrams*.

On the left-hand side, you can see the *Toolbox*, which shows the individual areas and sequence of the configuration.

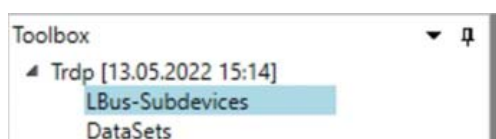
NOTE: In contrast to the NSDB configuration, there can only be one configuration per LION station.



10.3.1

L-Bus² Subdevices

The DEVICES that are created in the IODB are listed under *LBus subdevices*. When you select a module, the LCF tool displays the output and input data provided by the module.



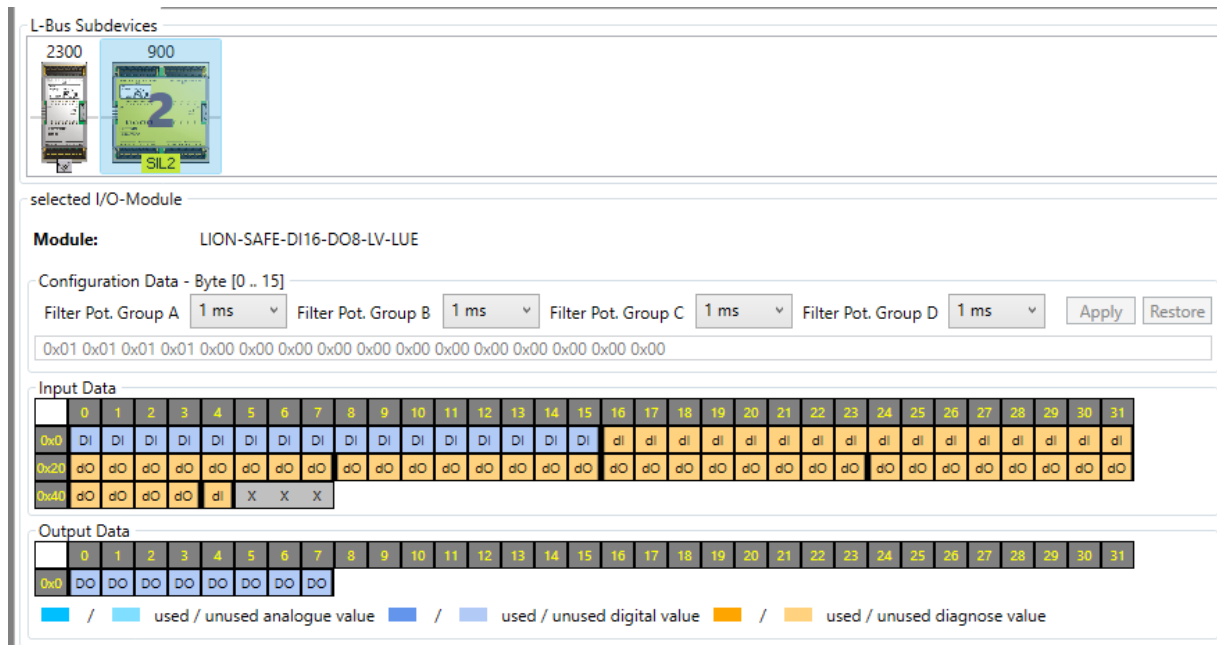
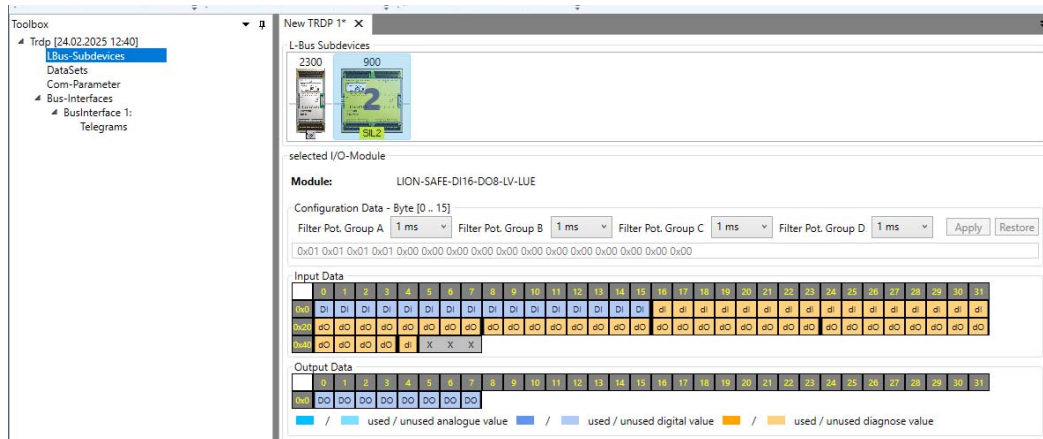
This area can be used to display the process data structure or to set up user-defined configuration data for each DEVICE.

The configuration data is used by some DEVICES (*such as ID 900*) to configure their behavior (e.g., configuration of filter parameters on safe input modules).

NOTE: For further information, please also refer to the operating instructions for the respective DEVICE.

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The displayed process data structure consists of input, output and diagnostic data. There are modules that only provide input data, modules that only provide output data, and modules that have both. Module 900 (part no. 803501) offers both, as shown below.



1. Explanation of the markings

1a. If a data field is previously used in a connection, it is shown by the colors, for example:

Blue / Light Blue used / unused Orange / Light Orange used / unused Cyan / Light Cyan used / unused

1b. *Output data* can have analog or digital values (depending on the device type).

These can be mapped to sink ports, for example:

Cyan / Light Cyan used / unused analogue value Blue / Light Blue used / unused digital value

1c. *Input data* can be digital, analog or diagnostic data.

These can be mapped to source ports, for example:

Orange / Light Orange used / unused diagnose value

2. Process data structure interrelationships

Chapter: **See also chapter 9.10 on page 107, where you will find the module ID and the assignments to the respective part numbers.**

The module with ID 2402 (*item no. 803203*), for example, is a digital output module with eight outputs. The outputs can be controlled via the eight output bits (blue). In addition, the module provides 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 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)

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	dO

Output Data

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

used / unused analogue va

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	dO

Output Data

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

used / unused analogue va

NOTE: The individual operation instructions for each module contain information about the data of each module.

10.3.2

Configuration data and filter settings

NOTE: The actual purpose of this program window is to set the configuration data.

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

You can use the configuration data to set module-specific properties according to the requirements of the application when starting up the I/O station.

In this way, it is possible to adapt to the environment with identical modules depending on the application.

1. Example with Filter Modules

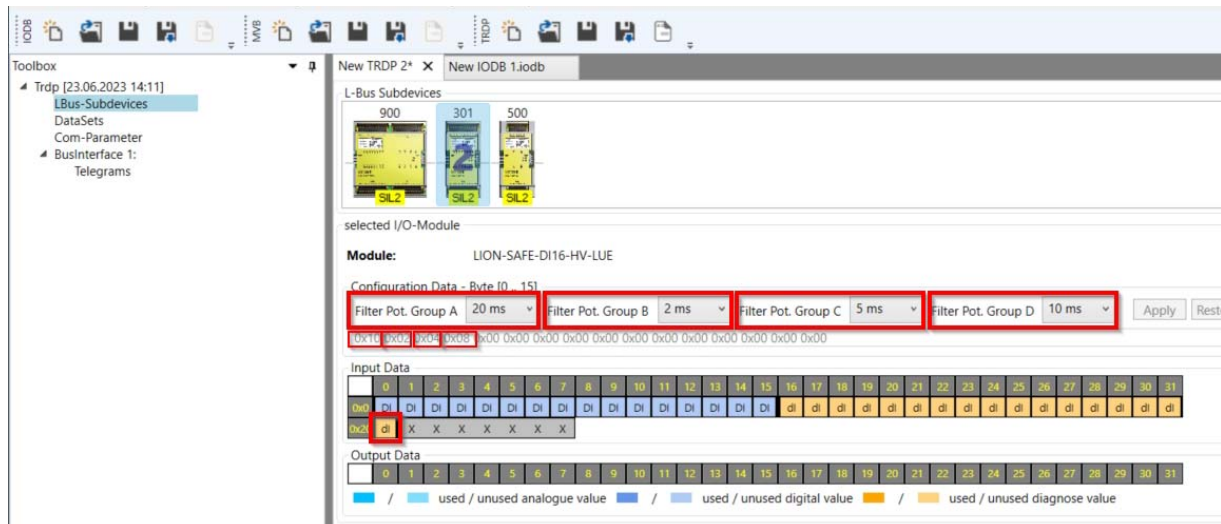
These filter settings are set under L-Bus² sub devices. After choosing the appropriate module, *configuration data* can be used to set the filter.

Chapter: The table in shows which modules offer a filter configuration.chapter 9.10 on page 107

The modules that have such a filter setting return one or more *config bits* in the input data, depending on the module, which indicate whether the filter setting is correct. These *config bits* belong to the diagnostic data.

Data structure

For the module in the following example, item no. 803104 (ID 301, type LION-SAFE-DI16-HV-LUE), it is the 33rd module. Bit of the input data.

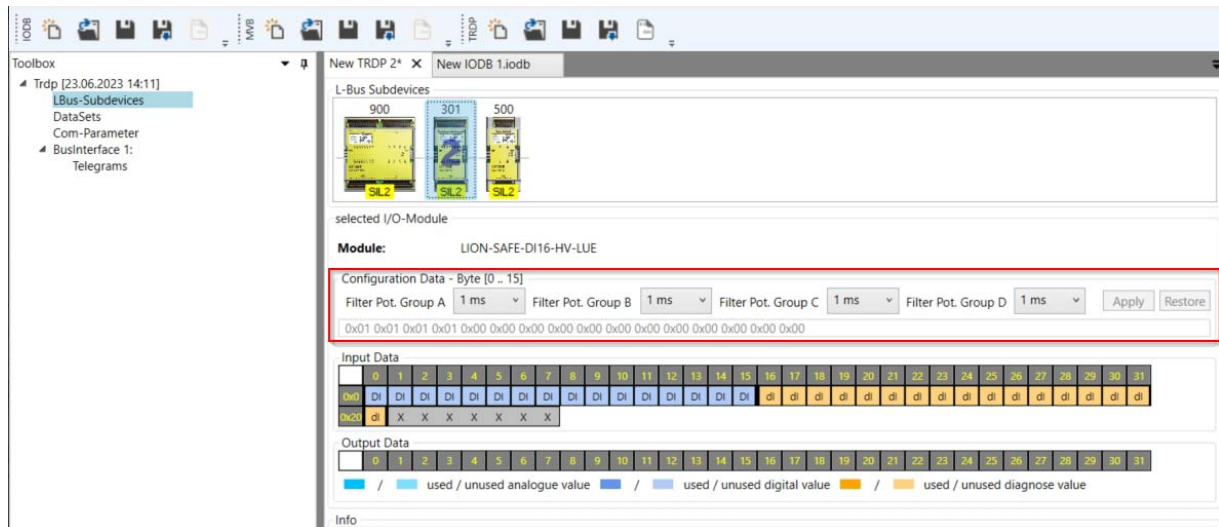


In the figure, all four potential groups were configured with different values.

To configure a module, the corresponding module must be selected in the chain. The filter value can then be set either per input or per potential group. Whether these are individual inputs or potential groups depends on the module type.

NOTE: If no filter value is set, the default value is used, which corresponds to 1ms or “No filter”. This is displayed as an error in the configuration bit:

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You can use the drop-down menus to define the filter settings for each input or for each potential group.

NOTE: This only applies to SIL2 modules with configuration options.

- The unit of measurement for these SIL2 modules is [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)

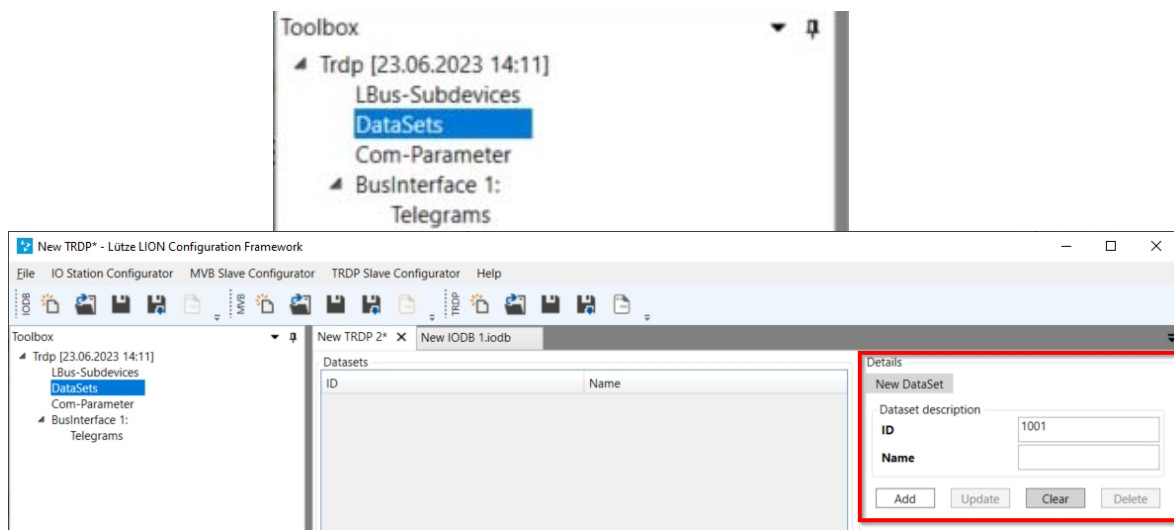
10.4

DataSets

10.4.1

Adding a new DataSet

The data structures that are used with TRDP are created in the Toolbox window under DataSets.



(1) The DataSet ID must be unique. The *DataSet ID* must be greater than 1000. (for example 1001)

(2) In addition to the DataSet ID, a name can be assigned to the data structure.

(3) The *Add* button can be used to add new *DataSet IDs* to the *datasets list*.

(4) Existing *datasets* can be changed with *Update*. To do this, they must be selected in the *datasets list* and then changed under *Details*.

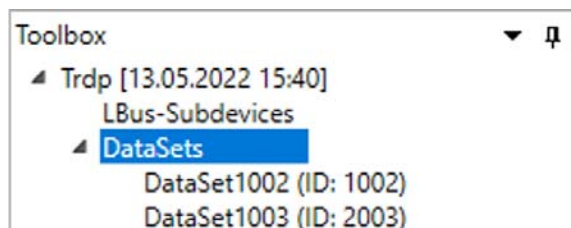
(5) A new *DataSet* can be created with *Clear*.

(6) *Delete* deletes the currently selected *DataSet*.

⚠ CAUTION: Make sure that you do not swap the *Add* and *Update* buttons. This swap overwrites an existing entry. If a new data record is to be created, always proceed as follows:

1. Create a new ID
2. Click on *Add*
3. Change name now

The *DataSet IDs* created are then also displayed in the *Toolbox window* under *DataSet* with the *name* and *ID*:



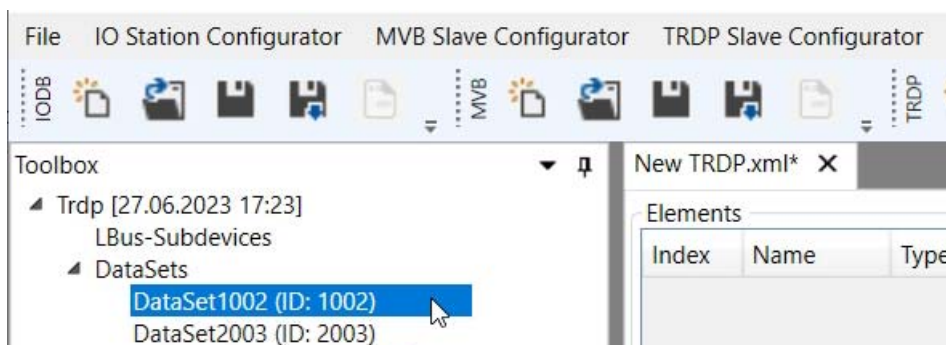
The module data of the *DEVICES* can then be mapped to the *DataSets* or data structures in the further course of the configuration.

10.5 The Elements of the DataSets

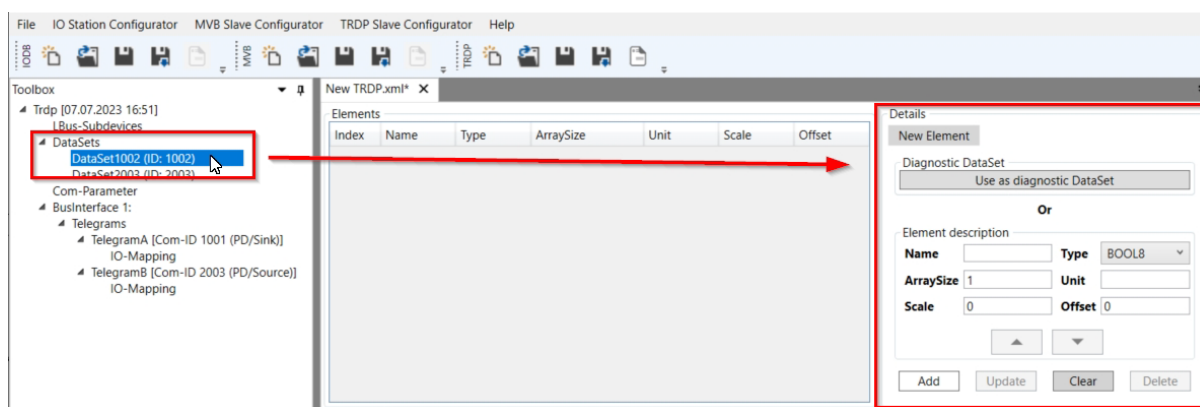
10.5.1 Creating Elements

To configure digital/analog inputs/outputs, these can be described as one *element*.

To do this, a *DataSet* must be selected in the *Toolbox* window:



If no element has yet been created in the selected *DataSet*, this detail window is displayed:



You can now choose to create either a *new element* or a new diagnostic *DataSet*.

10.5.2 Create a Diagnostic DataSet in the selected DataSet

This means that you can turn any *DataSet* into a *diagnostic DataSet*:

NOTE: However, a *diagnostic DataSet* can only be added once per LION station and only in a single *DataSet*.

Chapter: See also chapter 10.6 on page 138.

10.5.3 2. Create a new element in the selected DataSet:

NOTE: It is not possible to modify the elements inside the diagnostic dataset.

Description of the Elements

You create a *new element* when you create the *element description*.

(1) The *name* must be unique. We recommend using the data type or the ArraySize as part of the name, for example. (e.g., „Bool8Array2“)

(2) *ArraySize* specifies the number of *data elements* in the corresponding TRDP element. *This example shows the number of BOOL8 elements.*

(3) Optional: *Scale** specifies the scaling factor for the display. (*The size and level of detail of the advertisement depend on the customer's product specifications.*)

(4) *Type* specifies the data type of the element. *In this example BOOL8.*

(5) Optional: *Unit** specifies the physical unit of the element. (e.g., „V“, for Volt)

(6) Optional: *Offset** specifies the *starting bit* (offset) for displaying an element in the dataset.

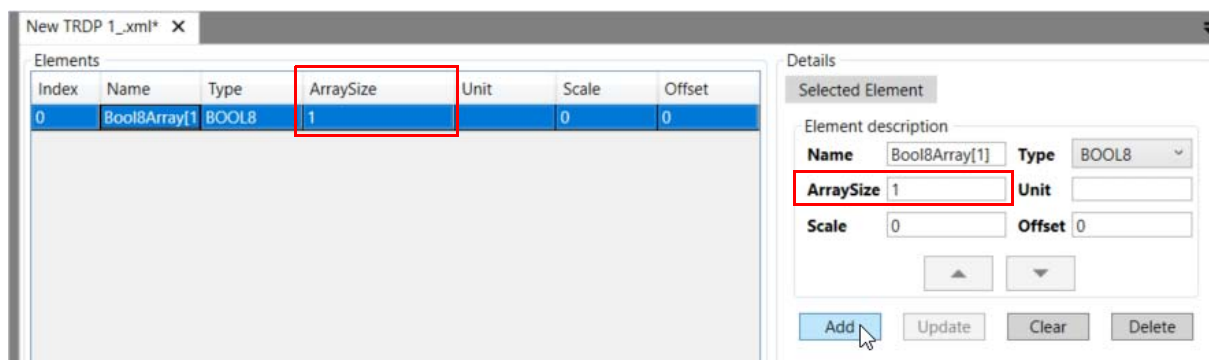
Display options, custom settings : (Update(8), Clear(9), Delete(10)) have the same functionality

Create a new item in the list.

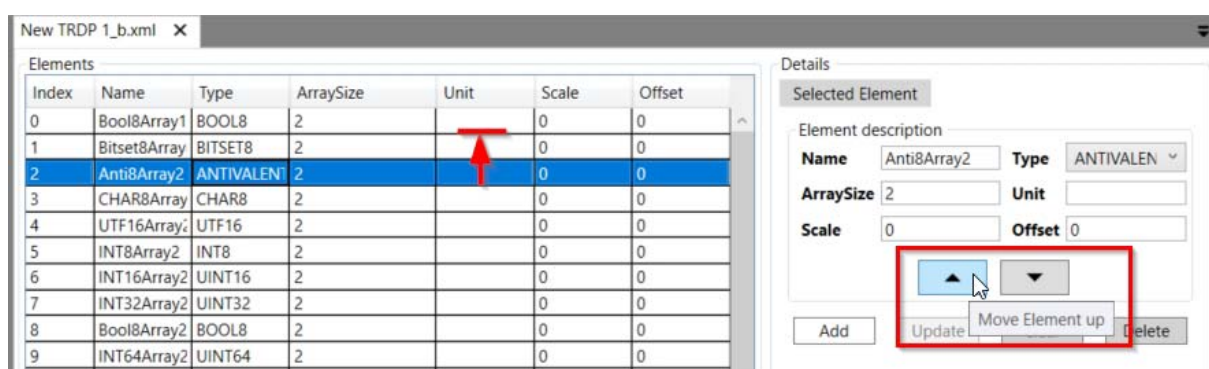
1. Enter the *name* (1) (e.g., "Bool8Array1").
2. Select the (*data*) type (2) (e.g., BOOL8), see also **chapter 10.5.4 on page 129**.
3. Enter the *array size* (3) (e.g., 1 = default), see also **chapter 10.5.6 on page 131**.
4. *Optional (custom)*: Input: Unit (4), Scale (5), Offset (6).
5. When you are done, select *Add* (7).

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6. You will then receive this result:



The order of the elements can be changed with the up/down keys.



NOTE: This is only possible as long as no IO mapping of the telegrams has been done yet.

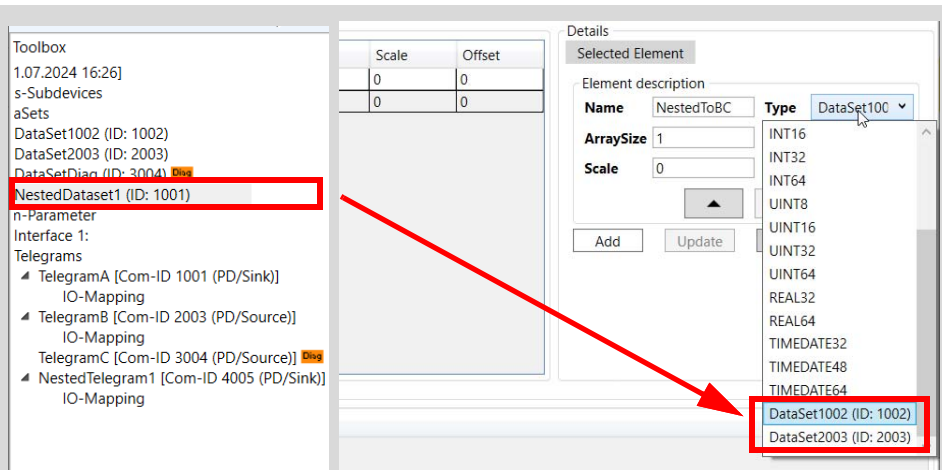
Chapter: See also chapter 10.5.5 on page 130.

10.5.4 Data type / Data type (*element property*)

	Data type	Data in the LCF	TRDP Data for communication	Description
1.	BOOL8	1 bit	1 bytes	1 bit relevant (TRUE/FALSE)
2.	BITSET 8	8 bits	1 bytes	control 8 digital outputs
3.	ANTIVALENT8	2 bits	1 bytes	antivalent value
4.	CHAR8	8 Bits	1 bytes	0 ... 255
5.	UTF16	2 bytes	2 bytes	is a variable length encoding for Unicode characters
6.	INT8	1 byte	1 bytes	signed numerical representation -128 ... 127
7.	INT16	2 bytes	2 bytes	signed numerical representation -32.768 ... 32.767
8.	INT32	4 bytes	4 bytes	signed numerical representation -2,147,483,648 ... 2,147,483,647
9.	INT64	8 bytes	8 bytes	signed numerical representation -9,223,372,036,854,775,808 ... 9,223,372,36,854,775,807
10.	UINT8	1 bytes	1 bytes	unsigned numerical representation 0 255
11.	UINT16	2 bytes	2 bytes	unsigned numerical representation 0 65.535
12.	UINT32	4 bytes	4 bytes	unsigned numerical representation 0 4,294,967,295
13.	UINT64	8 bytes	8 bytes	unsigned numerical representation 0 bis 18.446.744.073.709.551.615
14.	REAL32	4 bytes	4 bytes	-3.402823e+38 ... 3.402823e+38 Smallest number by amount: 1.0e-44
15.	REAL64	8 bytes	8 bytes	-1.7976931348623158e+308 ... 1.7976931348623158e+308 Smallest number by amount: 4.94065645841247e-324
16.	TIMEDATE32	4 bytes	4 bytes	32 bit UNIX time
17.	TIMEDATE48	6 bytes	6 bytes	48 bit TCN time
18.	TIMEDATE64	8 bytes	8 bytes	32 bit seconds and 32 bit microseconds

19. DataSet_xyz (ID:XXXX)

All DataSets* created and available in the project will be displayed in the dropdown menu. These are needed for nested records, for example:

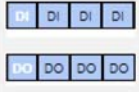
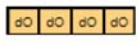



NOTE:

*The own *DataSet* and the *diagnostic DataSet* are not displayed in the pull-down menu. That means this selection looks different for each dataset.

Overview of TRDP Data Types

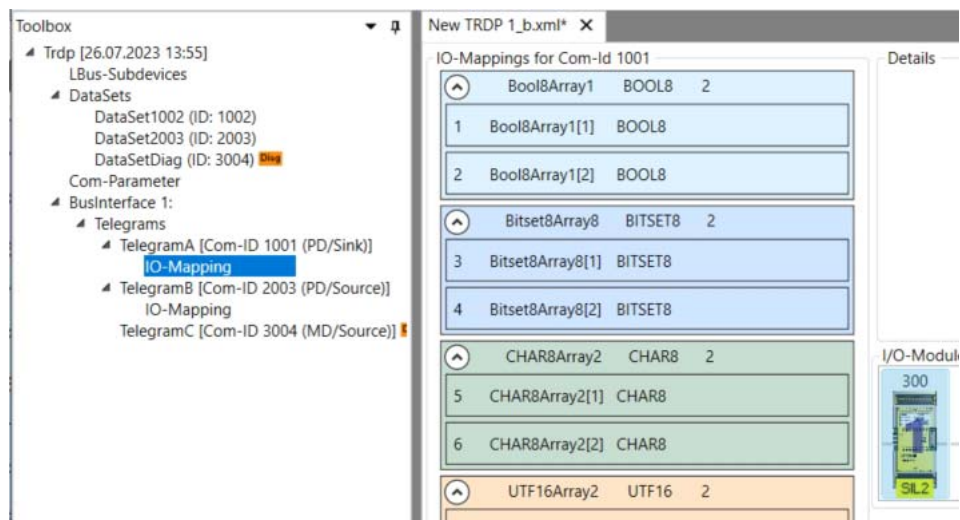
Here is an overview of which data type corresponds to which data, i.e., which data can be represented (*mapped*) with which data type.

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

10.5.5

Rearranging the elements

NOTE: When the corresponding *I/O mapping area* is opened, all **array groups** are always displayed open. The LCF therefore does not remember the last states of the display in the *I/O mapping area*.



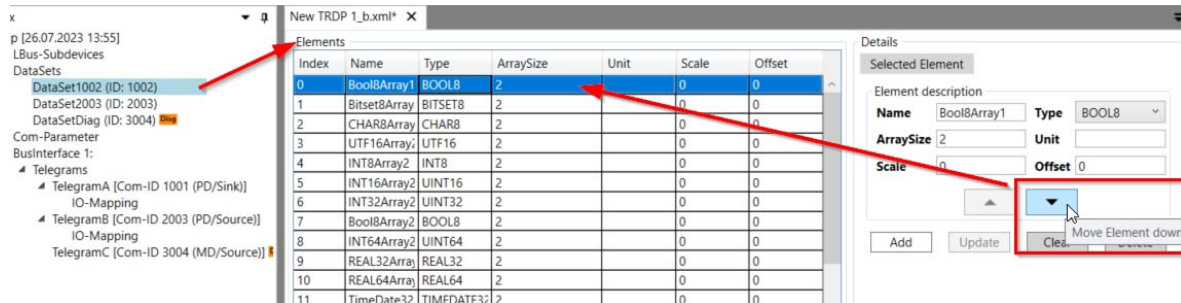
NOTE: The **elements** and their sequence are created and managed in the **element list** of the associated DataSet. (see chapter 10.5.1 on page 125).

This sequence can be seen in the *I/O mapping area* of the linked *telegram*. This can be seen as an example in the image shown here.

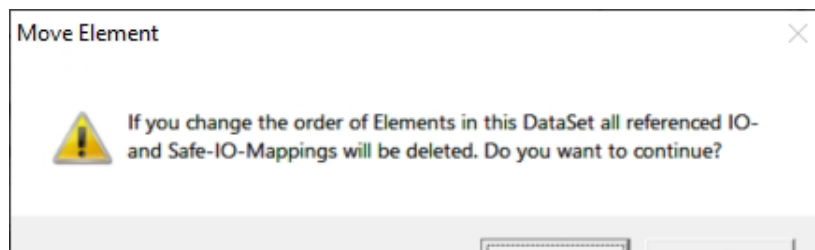
NOTE: This order of the **array groups** can be easily changed in the associated **DataSet** in this state if nothing has been mapped yet. As soon as only one element is mapped, a subsequent change is no longer easily possible.

⚠ CAUTION As soon as only one element is mapped, see **chapter 10.9.7 on page 155**, moving *elements* is no longer straightforwardly possible. In this case, all I/O mappings of this telegram will be deleted.

This is an example for it:



The following warning message appears:

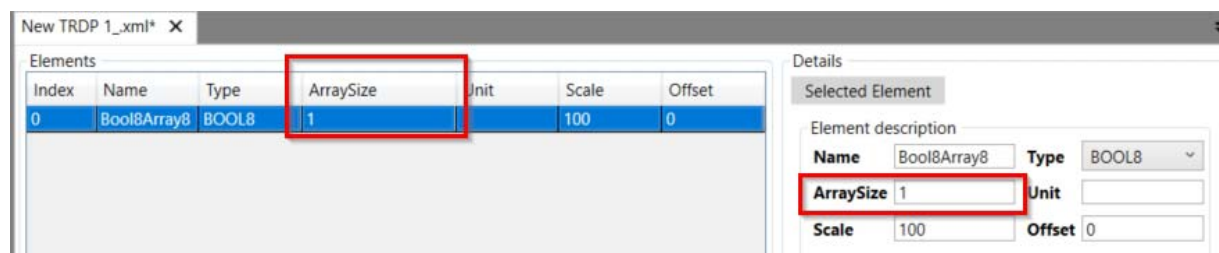


NOTE: If you choose to proceed now, all I/O mappings of this *telegram* will be deleted.

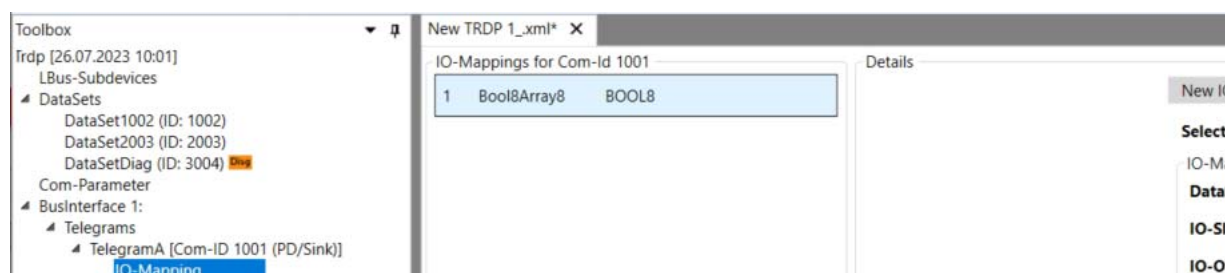
10.5.6

ArraySize / Array size (*element property*)

The *ArraySize* indicates the number of data elements, e.g., the *number of BOOL8 elements*.



In the *I/O mapping* area, this looks as follows:

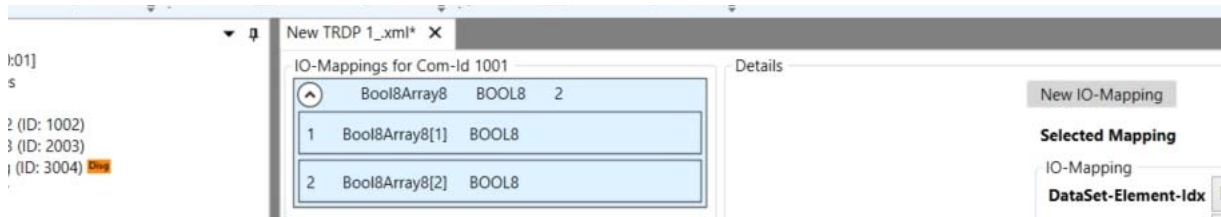


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Starting from *ArraySize* = 2, there is a frame around the *group of elements*.



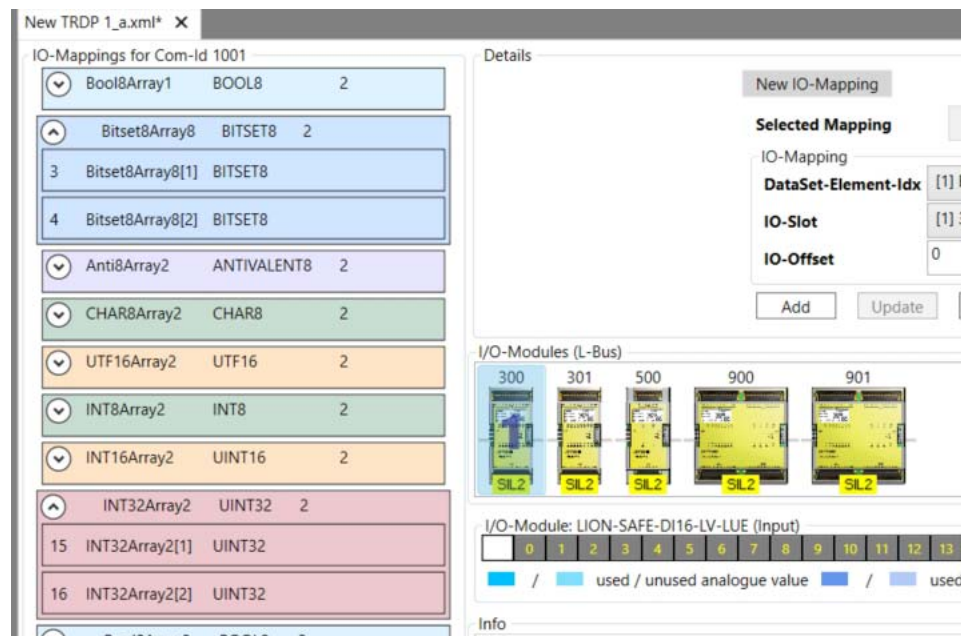
In the *I/O mapping* area, this looks as follows:



This frame can then be minimized using the button in the upper left corner:



This is useful when there are many groups with many elements in the IO mapping area that need to be managed.



10.5.7

Special representation of nested data

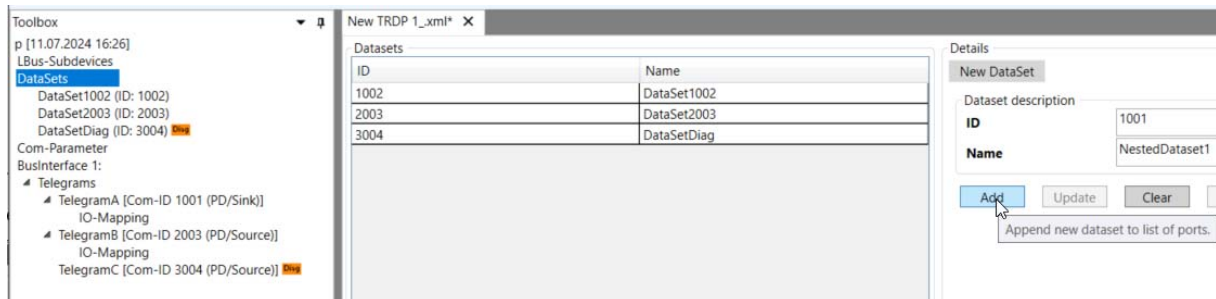
NOTE: The LION HEAD supports the nesting of DataSets up to a depth of 5 levels.

As soon as a dataset exists, it is possible to use it as an *element* in another dataset. This makes it possible to reduce redundant information when the same data structure is needed multiple times.

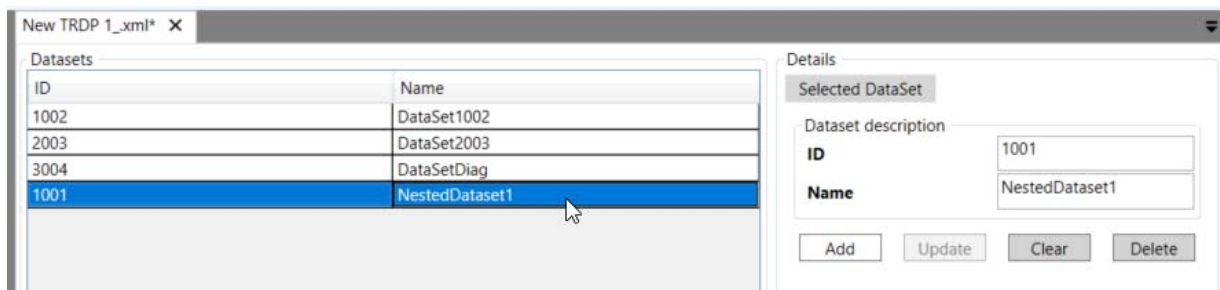
NOTE: Make sure not to add any circular dependencies. These lead to errors in the configuration.

Here you see an example of how you can create nested datasets:

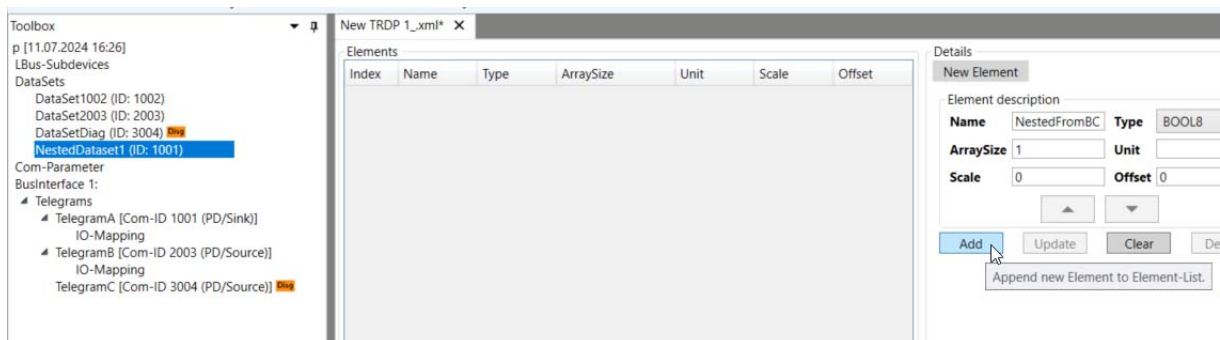
1. First, create a new dataset, in this example "*NestedDataSet1*," and add it to the list of *datasets* using *Add*.



2. This creates a new dataset:



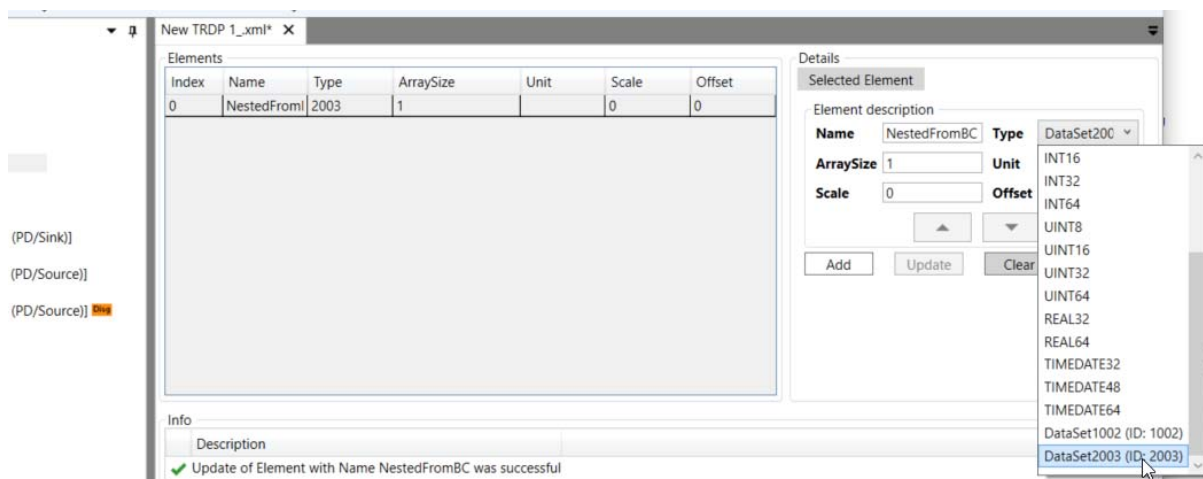
3. This creates a new dataset:



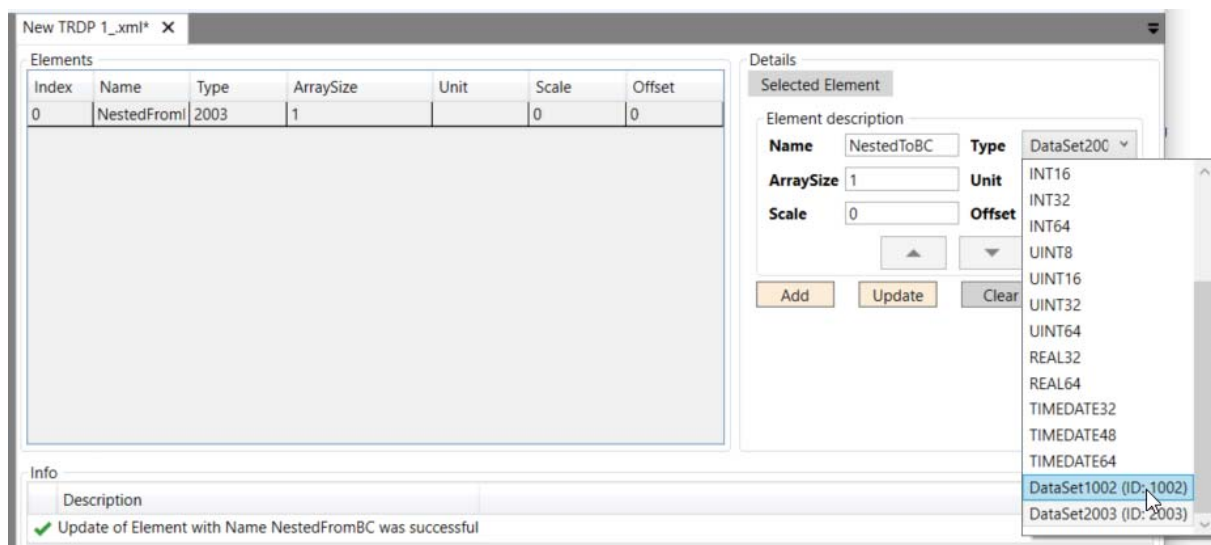
4. First, create an element "NestedFrom BC", an element of type "Source": To do

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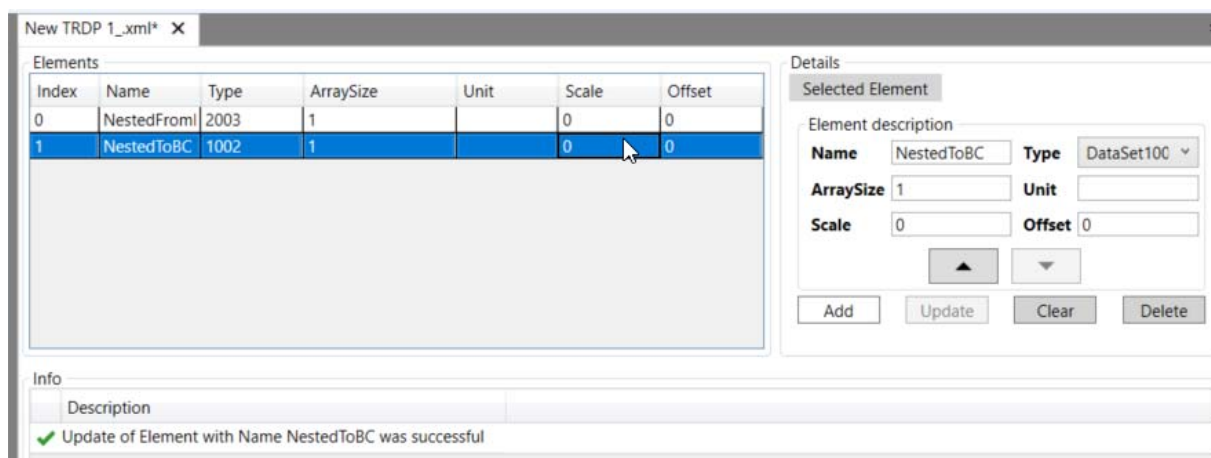
this, we select the DataSet 2003 and confirm this with Update:



5. Then we create a second element "*NestedToBC*". For this, we select the DataSet 1002 and confirm it with Update:

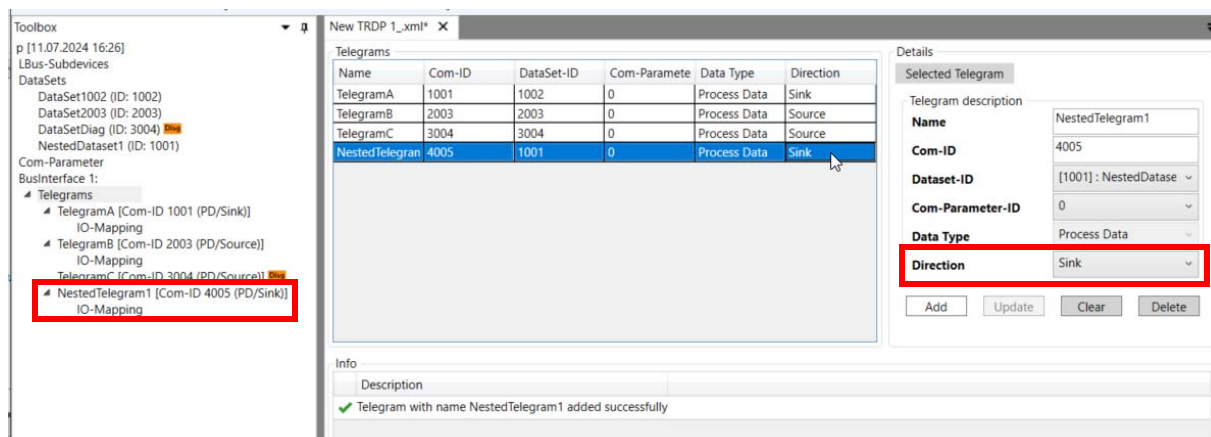


6. Now the dataset "*NestedDataSet1*" has two nested *elements* in its list:



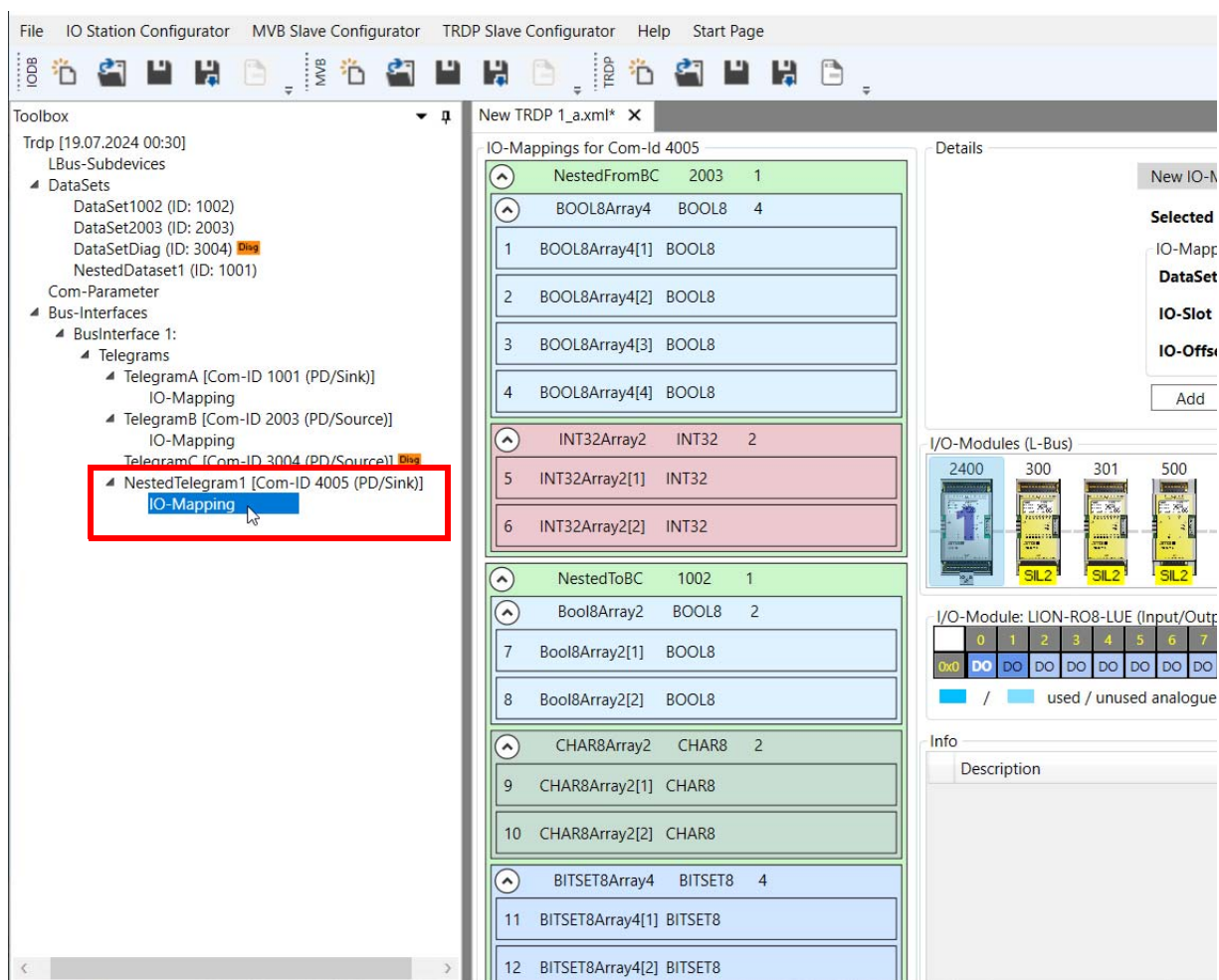
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7. A nested telegram, for example "*NestedTelegram1*", can now be created under the list of *telegrams* in the menu item *BusInterface/BusInterface 1*:



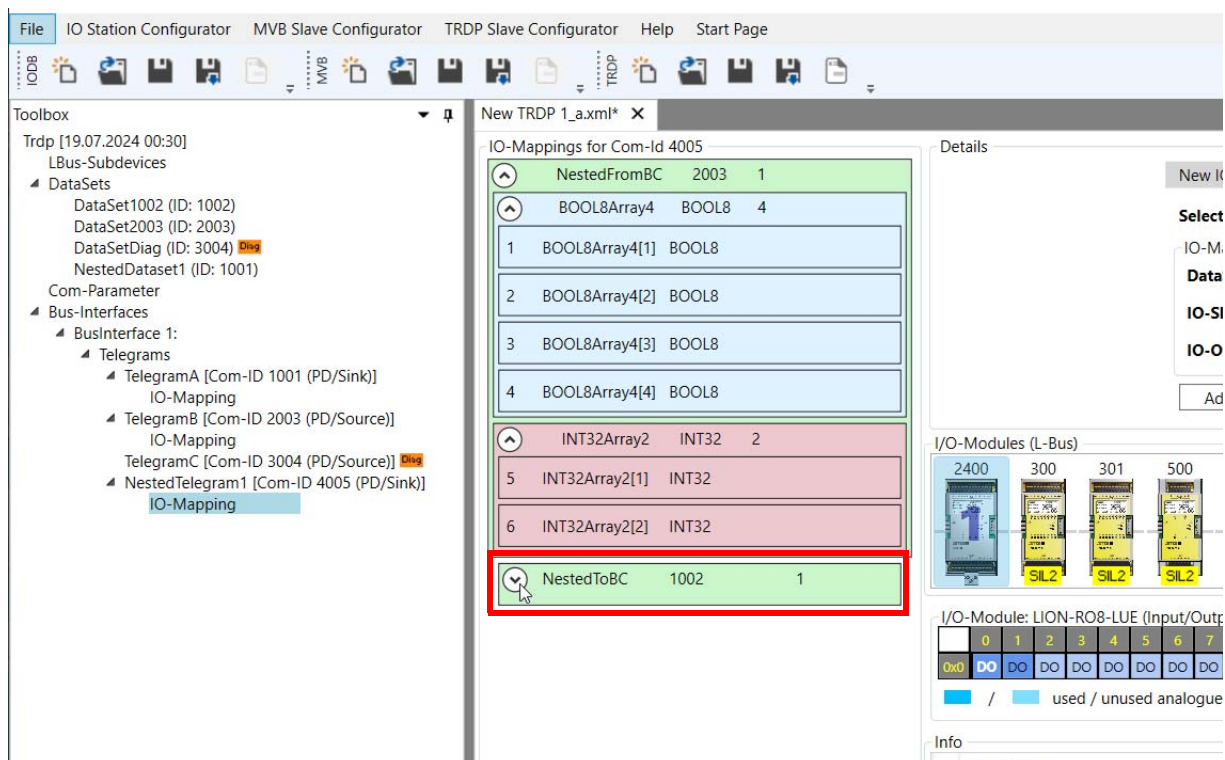
In Direction, it is now set whether the entire NestedTelegram is a Sink or Source Telegram.

8. The nested data is displayed in the *I/O mapping area* of "*NestedTelegram1*" and can be assigned/mapped to the I/O modules. The nesting of the data is visualized by the colored frames:



9. The nested data can be minimized as needed using the round button in the upper left corner:

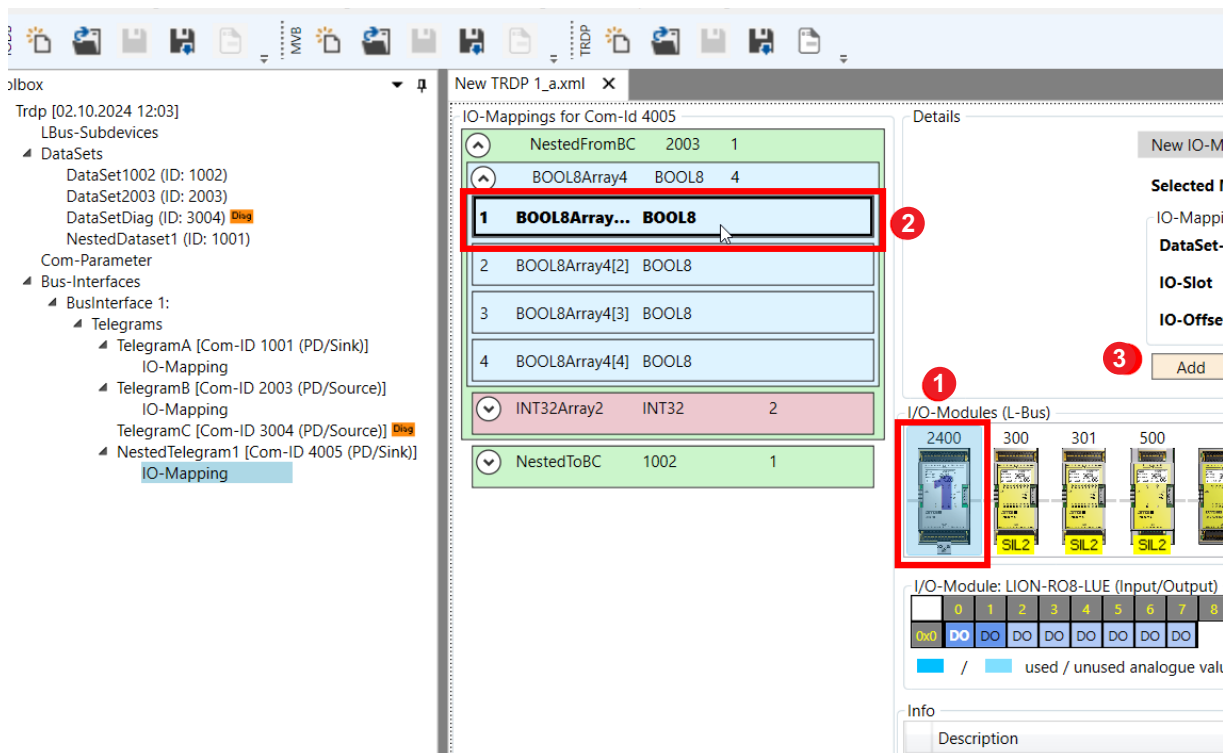
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This facilitates the assignment.

10. This is an example of the I/O data mapping:

First, select a DEVICE (1) and then select the corresponding data (2). With **Add** (3), the marked data is connected/mapped.



This is then represented by a color change (darker color, bold text) and a "Mapped" symbol on the right side:

1 BOOL8Array... BOOL8



This is what it looks like, and additionally, a confirmation appears at the bottom in the *info box*.

The screenshot displays the LION LCF Tool Configurator HEAD interface. On the left, the 'Toolbox' shows a tree structure with 'Trdp [02.10.2024 12:03]' expanded, showing 'LBus-Subdevices', 'DataSets', 'Com-Parameter', and 'Bus-Interfaces'. The 'DataSets' section is expanded, showing 'DataSet1002 (ID: 1002)', 'DataSet2003 (ID: 2003)', 'DataSetDiag (ID: 3004)', and 'NestedDataSet1 (ID: 1001)'. The 'Com-Parameter' section is expanded, showing 'BusInterface 1' and 'Telegrams'. The 'BusInterface 1' section is expanded, showing 'TelegramA [Com-ID 1001 (PD/Sink)]', 'TelegramB [Com-ID 2003 (PD/Source)]', 'TelegramC [Com-ID 3004 (PD/Source)]', and 'NestedTelegram1 [Com-ID 4005 (PD/Sink)]'. The 'NestedTelegram1' section is expanded, showing 'IO-Mapping'. The 'IO-Mappings for Com-Id 4005' list shows '1 BOOL8Array... BOOL8' selected. The 'Details' panel shows 'Selected IO-Mapping' and 'Selected Mapping' fields. The 'I/O-Modules (L-Bus)' section shows a diagram of modules 2400, 300, 301, 500, and 900. The 'Info' section at the bottom shows a confirmation message: 'IO-Mapping for DataSet-Element 1 added successfully'.

Chapter: See also chapter 10.9.10 on page 156.

10.6

Creating a Diagnostic Dataset

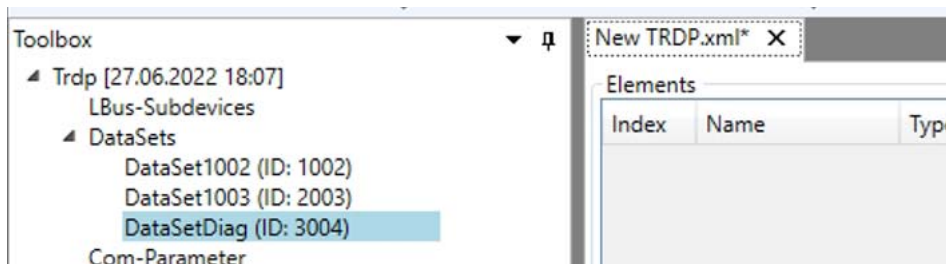
The *diagnostic dataset* is a specific set of defined elements. The elements display various information about the LION system, such as versions or errors.

NOTE: It is recommended to check the diagnostic data cyclically and simultaneously with the process data.

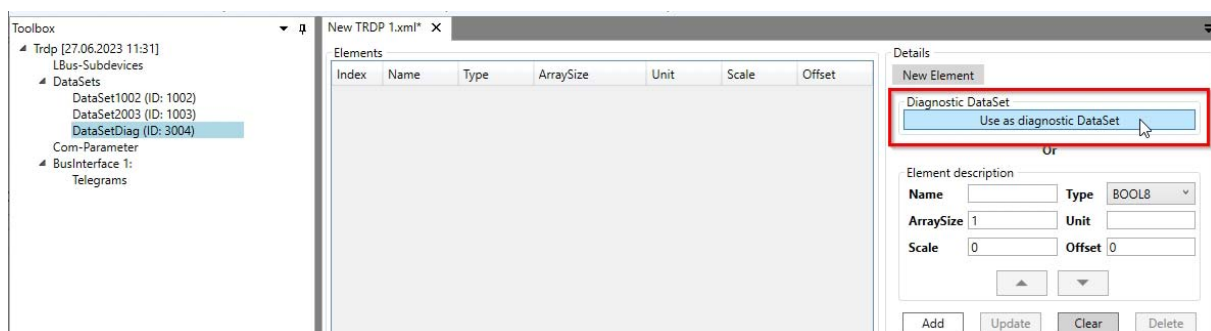
Procedure:

1. First, a new *DataSet* must be created with *ADD*. Give the *DataSet* a meaningful name, such as *DataSetDiag*.

2. The *DataSet* must be selected in the *Toolbox*.



3. As long as no *DataSet* has been defined as a *diagnostic data set*, the following selection appears:

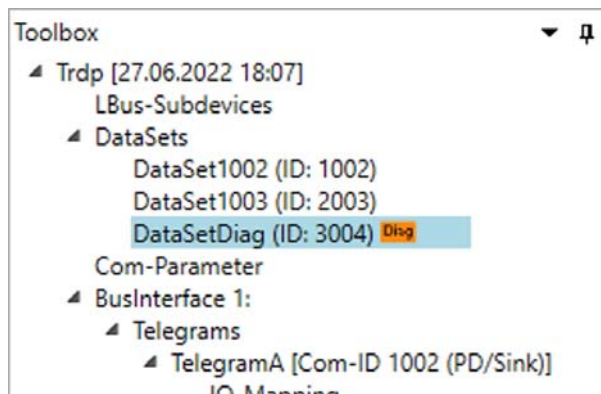


4. The *Diagnostic DataSet* can be created automatically on the right-hand side under *New element*. To do this, click on the “*Use as Diagnostic DataSet*” button. Once this action has been performed, this option is no longer displayed.
5. The data structure is created automatically and the names are assigned to the variables. When creating diagnostic data, the TRDP HEAD type (SIL0 or SIL2) is automatically checked. The display of the data structure of the diagnostic dataset depends on this.

! Important technical information: For TRDP HEAD type SIL0, the data structure consists of 14 elements. For TRDP HEAD type SIL2, there are 21 elements.

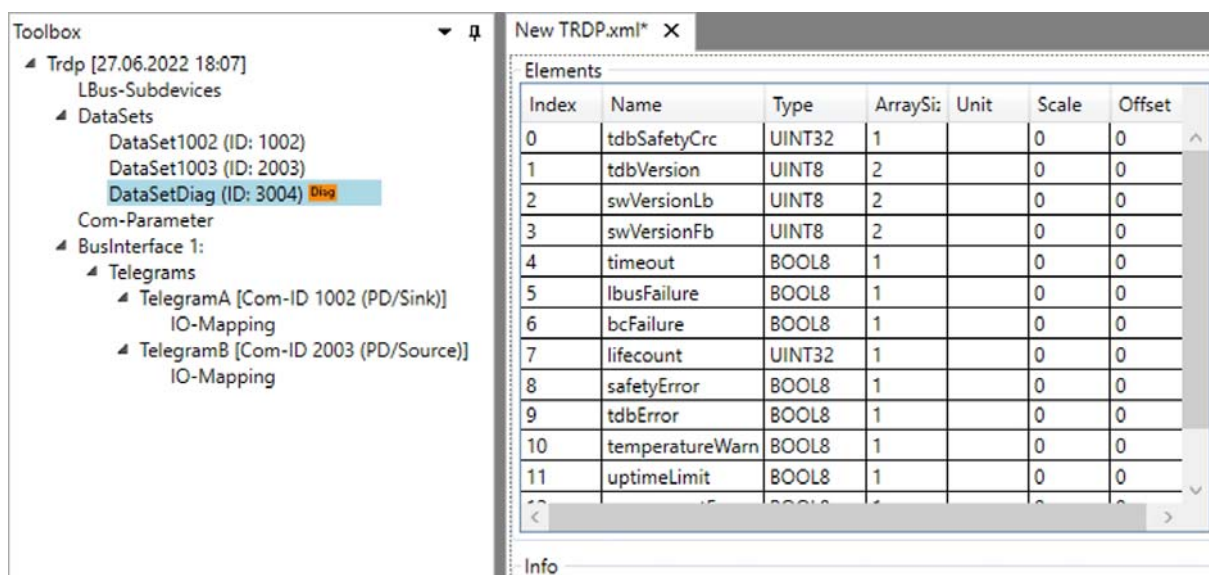
NOTE: A diagnostic DataSet can only be added once and only in a single DataSet.

The DataSet with the diagnostic data is now marked with an orange “Diag”:



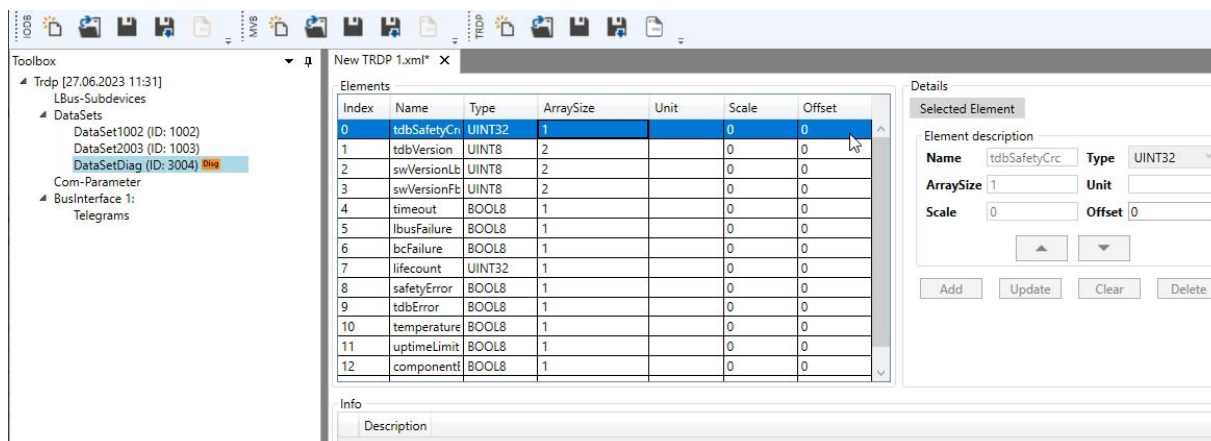
The automatically generated *elements* of the Diagnostic DataSet are displayed in the *list of elements*.

Here you see the SIL0 diagnostic dataset:



NOTE: Although the individual elements can be selected, they cannot be edited further.

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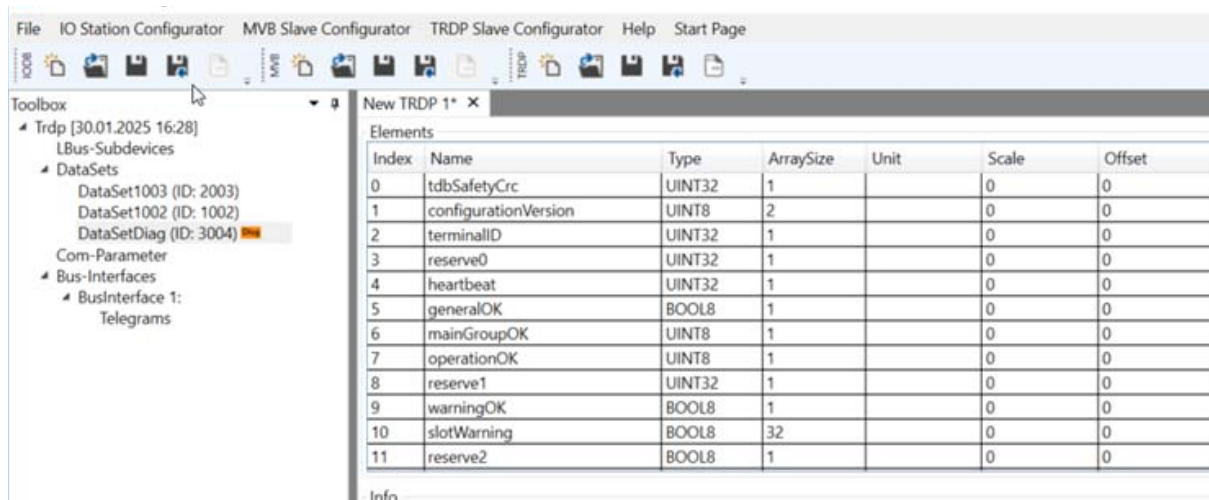
NOTE: The diagnostic data sets of TRDP HEAD SIL0 and TRDP HEAD SIL2 differ.

The following table lists the *elements of the diagnostic data set* together with their description:

No.	index	Element name	Description
1.	0	tdbSafetyCrc	Safety CRC of the TDB file
2.	1	tdbVersion	Version der TDB-Datei
3.	2	swVersionLb	Cortex Firmware Version
4.	3	swVersionFb	netX firmware version
5.	4	timeout	Telegram timeout (corresponds to STS for MVB)
6.	5	lbusFailure	L-Bus ² communication disrupted
7.	6	bcFailure	netX or Cortex in failsafe mode
8.	7	lifecount	Lifesign counter of the Cortex MasterApp Task
9.	8	safetyError	At least one safety data record is incorrect
10.	9	tdbError	Incorrect TDB file
11.	10	temperatureWarning	At least one slave reports excess temperature (<i>warning threshold</i> < <i>temperature</i> < <i>switch-off threshold</i>).
12.	11	uptimeLimit	The HEAD has been in operation for 48 hours
13.	12	componentError	Is set if 1. the number of L-Bus ² slaves does not match the TDB. 2. the wrong ID is recognized at the slot. Device does not start completely - no communication possible, therefore no bit can be received.
14.	13	slotStatus	Is set per DEVICE in the event of a communication error. Limited Run Input data of the affected DEVICES is set to 0.

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The following table lists the *elements of the diagnostic data set* together with their description:



Index	Name	Type	ArraySize	Unit	Scale	Offset
0	tdbSafetyCrc	UINT32	1		0	0
1	configurationVersion	UINT8	2		0	0
2	terminalID	UINT32	1		0	0
3	reserve0	UINT32	1		0	0
4	heartbeat	UINT32	1		0	0
5	generalOK	BOOL8	1		0	0
6	mainGroupOK	UINT8	1		0	0
7	operationOK	UINT8	1		0	0
8	reserve1	UINT32	1		0	0
9	warningOK	BOOL8	1		0	0
10	slotWarning	BOOL8	32		0	0
11	reserve2	BOOL8	1		0	0

No.	index	Element name	Description
1.	0	tdbSafetyCrc	Safety CRC of the TDB file
2.	1	Configuration version	Version of the configuration file (with two decimal places in the configuration tool; values: 0.0 - 255.255)
3.	2	terminalID	Unique identifier for the bus coupler with a checksum (CRC32 with IEEE polynomial) from: <ul style="list-style-type: none"> - Serial number (UNSIGNED32) - Hardware revision in the form of a character (UNSIGNED8) - Software versions R5F and STM application
4.	3	reserve0	Backup for possible general extensions
5.	4	heartbeat	L-Bus ² Heartbeat, may have gaps Is increased by 1 with every L-Bus ² cycle (10ms).The value can skip meter readings.
6.	5	generalOK	General error message of the I/O station.
7.	6	mainGroupOK	Affected main group in the event of an error message from the I/O station.
8.	7	operationOK	An operating error has occurred during cyclical operation of the I/O station.
9.	8	reserve1	Backup for possible error messages
10.	9	warningOK	There is a warning in the I/O station.
11.	10	slotWarning X	Warnings from slot X
12.	11	reserve2	No backup for warnings
13.	12	reserve3	Backup for possible warnings
14.	13	slotStatus X	Process data from slot X
15.	14	trdpInfo	If timeout errors occur due to longer transmission cycles than the monitoring time allows, the error is toggled. If timeout errors occur because the transmission cycles are longer than the permitted monitoring time, the error is switched over.
16.	15	sdtv2Info	If errors occur due to longer transmission cycles than the monitoring time allows, the error can toggle.

17.	16	<i>trdpErrorCounter</i>	Possible errors from reception are added up cyclically. If no receive data is received within the receive cycle, the error counter is incremented for each COM ID. If these are permanently absent, it is continuously increased.
18.	17	<i>sdtv2ErrorCounter</i>	Possible SDTv2 errors from the COM IDs are added up cyclically. If no COM-ID has been configured for SDTv2, the counter remains at 0. Each error (whether a single error or permanent failure of a COM ID) causes the error counter to increase cyclically. If many COM-IDs are affected, the increase is correspondingly faster than in the case of sporadic errors.
19.	18	<i>sdtv2WarningCounter</i>	Possible SDTv2 warnings from the COM IDs are added up cyclically. (See <i>SDTv2Errorcounter</i>)
20.	19	<i>reserve4</i>	Backup for possible error messages
21.	20	<i>errorCode</i>	List with the last 10 error messages

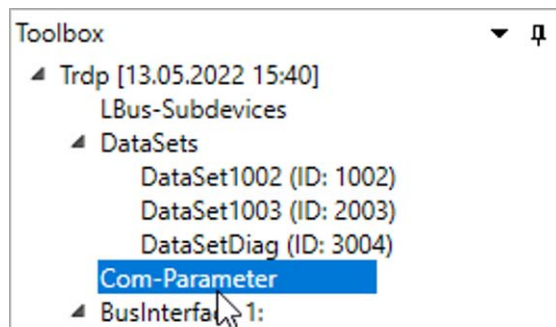
In the next step, the *diagnostic data record* must be assigned to a *telegram*. To do this, the *data record* can be assigned to a *telegram* under the Telegrams menu item in the *Toolbox*.

 Chapter: See chapter 10.9 on page 146.

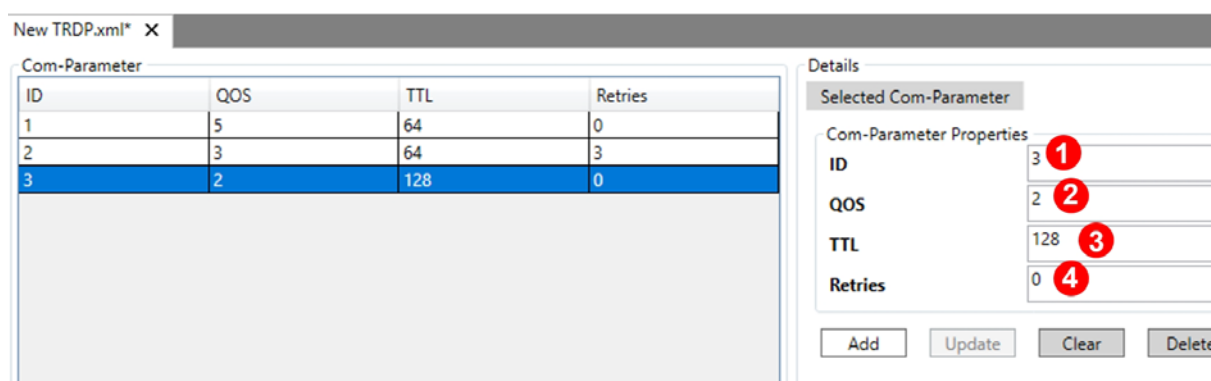
NOTE: The diagnostic data set can only be defined as a source telegram.

10.7 Com-Parameter

The *COM parameters* describe the properties of a *telegram/slot*.



Three properties can be selected and changed for this purpose.

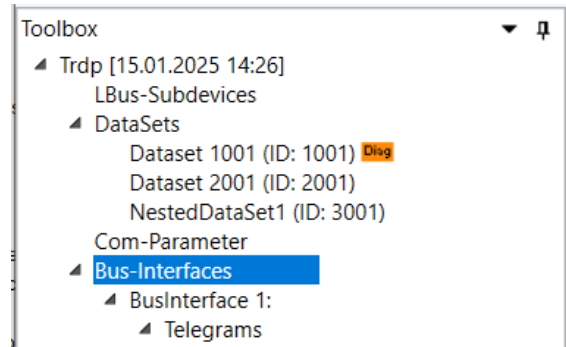


Name	Description
1. ID	ID des Com-Parameters. Used for later assignment
2. QOS	<i>Quality of Service</i> - Method by which <i>telegrams</i> in a network can be influenced, e.g. higher priority and therefore lower <i>jitter</i> and preference for this <i>telegram</i> in the event of high utilization. Possible range 0 to 7
3. TTL	<i>Time-to-Live</i> - Specifies how many hops a package may cover. Possible range 0 to 255. The default value is 64.
4. Retries	NOTICE: Only for measurement data (MD). Possible retries of a package: 0 to 5

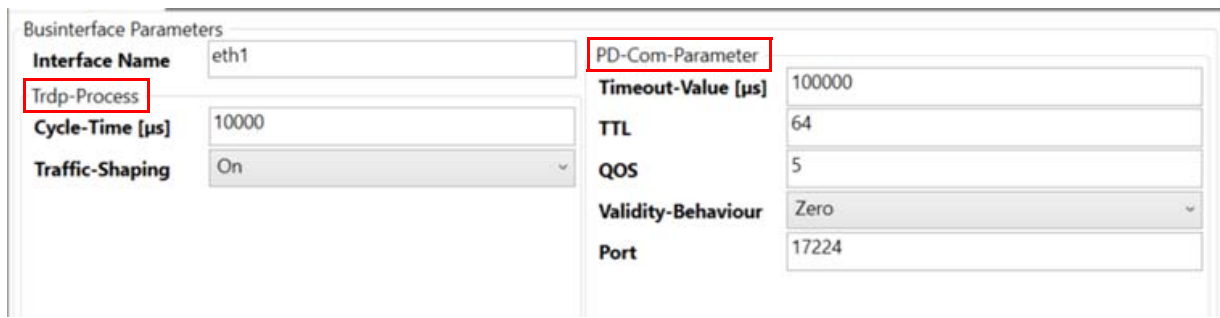
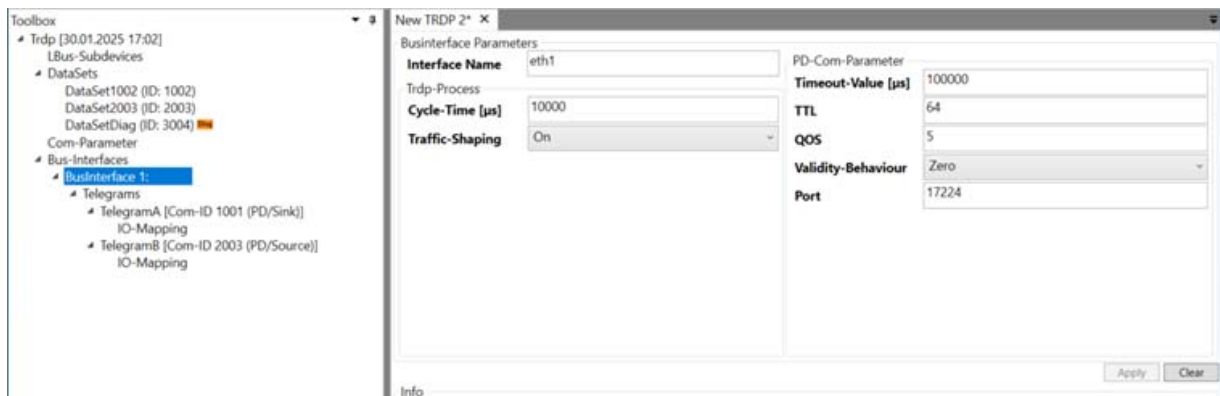
10.8

Bus Interfaces

The *Bus Interfaces* are grouped in *BusInterfaces*.



BusInterface allows for general configurations in three areas: the *TRDP process* and *PD-COM parameters*. (Not used here: *MD-COM parameters*.)



NOTE: Some settings are duplicated in the bus interface parameters and in the COM parameters, e.g., TTL & QOS.

If no COM parameter is assigned to a data structure, the default values from the bus interface parameters are used. The COM parameters are assigned to the data structure as shown in **chapter 10.9 on page 146**.

10.8.1 TRDP-Process

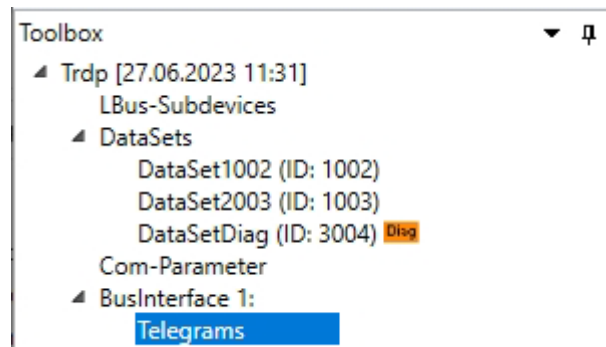
Name	Description	Comment
1. Cycle-Time [µs]	<i>Cycle time</i> - Cycle time of the process data, how often it should be sent. (The upper limit of the LCF is: UINT32_MAX - 1)	min. 10.000, which is the limit of the bus coupler (10 ms)
2. shaping	Traffic shaping is a technique for <i>bandwidth management</i> . It delays the data flow of certain types of network packets to ensure network performance for higher priority applications.	-

10.8.2 PD-Com-Parameter

Name	Description	Comment
1. TimeoutValue [µs]	Cycle time with which process data must arrive for it to be recognized as valid.	Standard Timeout value in [µs]
2. TTL	Default time to live for PD.	-
3. QOS	Standard quality of service for PD.	-
4. ValidityBehavoiour [Zero], [Keep].	Behavior of the outputs when no more packets are received. Zero = Set data to 0; Keep = Retain last received value	Only Zero (is preset) is supported. Keep is not supported.
5. Port	UDP port: Port is used for UDP-PD communication	<i>typical: 17224</i>

10.9 Telegrams

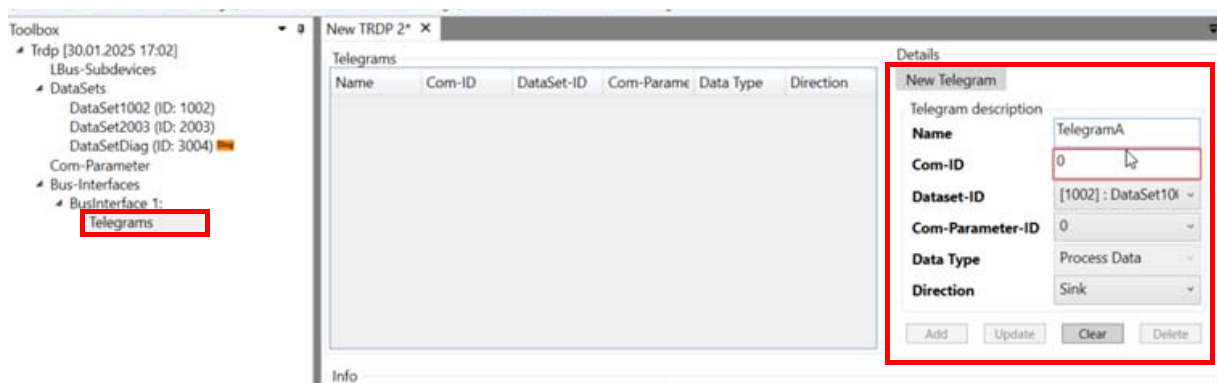
The individual telegrams can now be created under the Telegrams menu item.



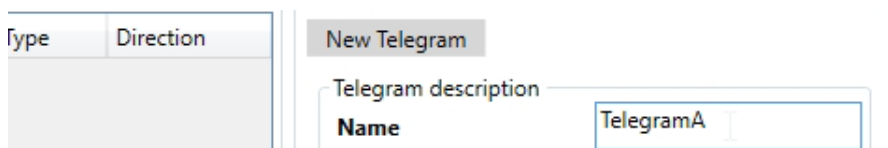
An identifier for the *telegram* can be created as a name.

10.9.1 Create a new telegram

1. In the Details section of the Telegram description, you can make your entries for *Telegram*:

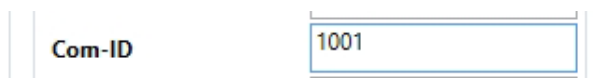


2. To create a telegram, a name must first be entered:



NOTE: The name must be uniquely assigned.

3. A COM ID must then be assigned to the *telegram*.



NOTE: Com-IDs 1-1000 are reserved for special purposes. The Com-ID must be greater than 1000 (e.g., 1001). This is indicated by a red (= value too small or greater than 4294967295 (UINT32_MAX)) or blue (= value correct) colored frame.

NOTE: The COM-ID must be unique and may only occur once. Next, the DataSet ID in which the data structure was defined must be selected, see also **chapter 10.4 on page 123**.

4. The data structures created as shown in **chapter 10.4 on page 123** can be selected under *Dataset ID*:

The screenshot shows a dropdown menu for 'Dataset-ID'. The menu is open, displaying several options. The first option is '[1002] : DataSet1002'. Below it, the same option is repeated. Then, there is '[1003] : DataSet2003' and '[3004] : DataSetDiag'. At the bottom of the menu is 'Sink'. A mouse cursor is pointing at the first '[1002] : DataSet1002' option.

NOTE: It is important that each DataSet contains at least one element.

Chapter: See chapter 10.5.1 on page 125.

5. Select the COM parameter ID.

The screenshot shows a dropdown menu for 'Com-Parameter-ID'. The menu is open, displaying several options. The first option is '0'. Below it, the same option is repeated. Then, there is '1', '2', and '3'. A mouse cursor is pointing at the first '0' option.

NOTE: If the *COM parameter ID = 0* is selected, the default setting created under *BusInterface* is used. Otherwise, the selected setting is used.

6. Data type

NOTE: The *TRDP HEAD* does not support message data. For this reason, the process data (PD telegram) data type cannot be selected by default.

The screenshot shows a dropdown menu for 'Data Type'. The menu is open, displaying two options: 'Process Data' and 'Sink'. A mouse cursor is pointing at the 'Sink' option.

7. Define the *direction*.

The *Direction* must then be set.

The screenshot shows a dropdown menu for 'Direction'. The menu is open, displaying three options: 'Sink', 'Sink', and 'Source'. A mouse cursor is pointing at the first 'Sink' option.

NOTE: **SINK** = Incoming data (generated by the **DEVICES**). The data is received and processed by the **HEAD**. **SOURCE** = Outgoing data (generated by the bus coupler). The data is sent from the **HEAD** to the **DEVICES**.

8. Then click on *Add* to create the new *telegram*.

Direction Sink

Add Update Clear Delete

Append new Telegram to Telegram-List.

The individual telegrams are created in this way.

The telegrams are clearly displayed in the *telegram list*.

Telegrams

Name	Com-ID	DataSet-ID	Com-Parameter	Data Type	Direction
TelegramA	1001	1002	0	Process Data	Sink
TelegramB	2003	2003	0	Process Data	Source

Details

Selected Telegram

Telegram description

Name TelegramB

Com-ID 2003

Dataset-ID [2003] : DataSet2003

Com-Parameter-ID 0

Data Type Process Data

Direction Source

Add Update Clear Delete

The *telegrams* created are also displayed in the Toolbox.

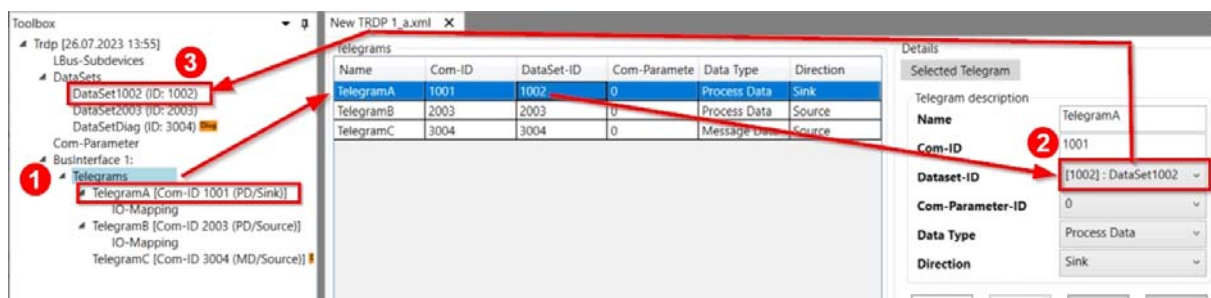
Toolbox

Trdp [27.06.2023 11:31]

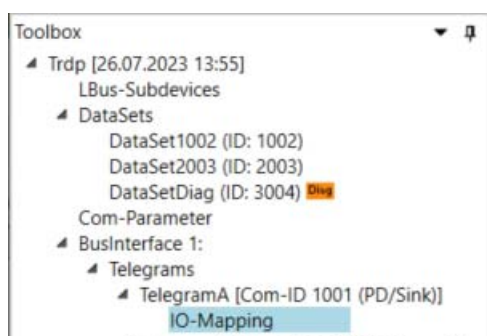
- ↳ LBus-Subdevices
 - ↳ DataSets
 - DataSet1002 (ID: 1002)
 - DataSet2003 (ID: 2003)
 - DataSetDiag (ID: 3004) Diag
 - Com-Parameter
 - ↳ BusInterface 1-
 - ↳ Telegrams
 - TelegramA [Com-ID 1001 (PD/Sink)]
 - IO-Mapping
 - TelegramB [Com-ID 2003 (PD/Source)]
 - IO-Mapping

10.9.2 Connection between DataSets, telegrams and elements

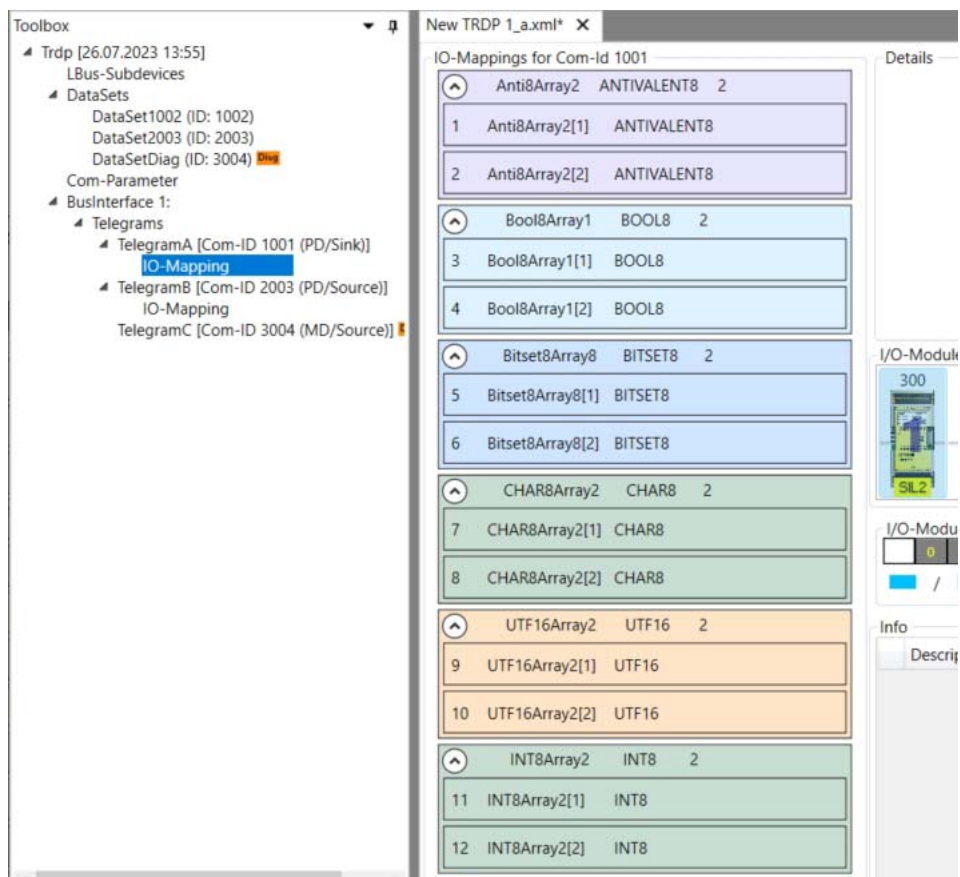
This image shows the connection *DataSet-ID* (2) between a *DataSet* (3) and a *telegram* (1):



and the I/O mapping of this *telegram*:



with the *elements* from the one linked *DataSet* with all types of existing data types. (Colors are assigned to the different file types).



10.9.3

Special case: Diagnostic "DataSet" as telegram

If a diagnostic *DataSet* has already been created, it can be assigned here.

Telegram description	
Name	TelegramC
Com-ID	3004
Dataset-ID	[3004] : DataSetDiz
Com-Parameter-ID	0
Data Type	Process Data
Direction	Source

NOTE: The *Diagnostic DataSet* can only be defined as a source telegram.

The *telegram* with the diagnostic data is marked with "Diag" in the *Toolbox* under *Telegrams*.

Item	ID	Tag
DataSet1002	1002	
DataSet2003	2003	
DataSetDiag	3004	Diag

Name	Com-ID	Direction	Tag
TelegramA	1001	10	
TelegramB	2003	20	
TelegramC	3004	30	Diag

The *telegrams* can be clicked on in the Toolbox. A dialog window opens.

The *telegram* can then be configured further.

PD-Parameter

Timeout [µs]: 100000

Cycle [µs]: 0

Redundant: 0

Validity-Behaviour: Zero

Destination

Name:

Uri:

Source

Name:

Uri1:

Uri2:

Apply Clear

Info

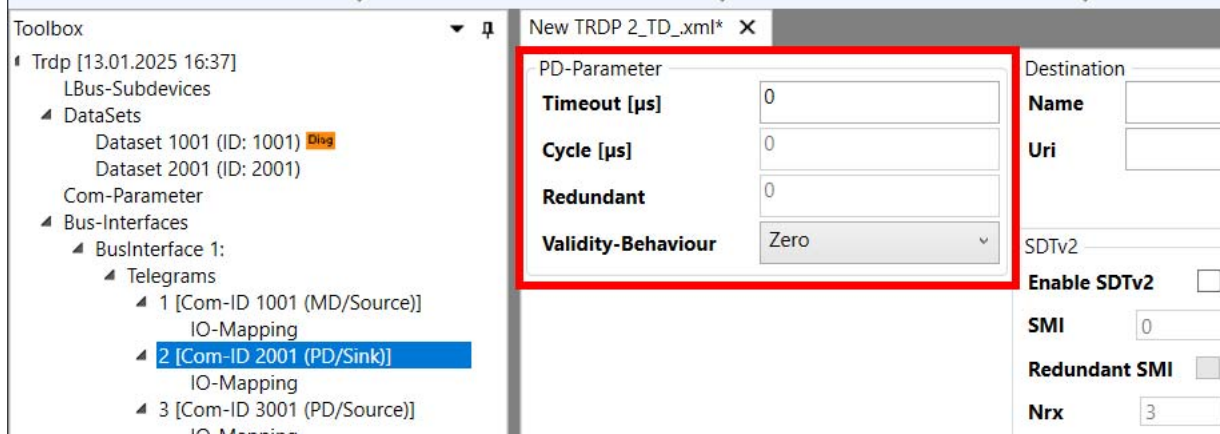
Description:

! Important technical information: *Diagnostic telegrams are not transferrable with SDTv2., therefore the entire SDTv2 area is not available.*

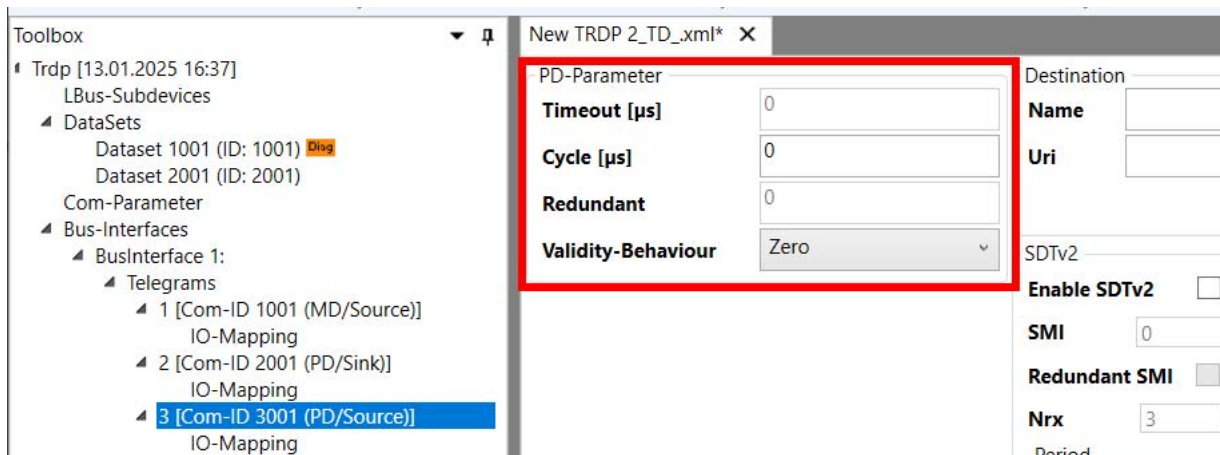
10.9.4 Process data-telegrams (PD-Parameters)

If no *timeout* or *cycle* is entered (=0), the values from the bus interface are used.

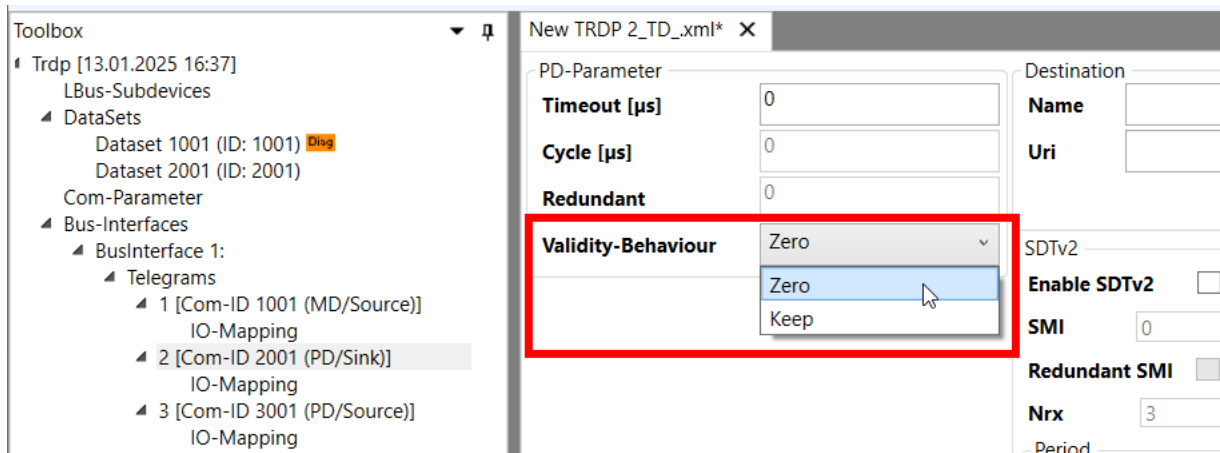
1. PD telegrams as Sink telegrams:



2. PD telegrams as Source telegrams:



The Validity-Behavior parameter



NOTE: Only Zero (*default*) is supported for the *Validity-Behavior* parameter. *Keep* is not supported.

10.9.5 Enable SDTv2 for a PD sink telegram

Sink telegram (Source / Destination) - The sources Uri1 and Uri2 can be specified as a range:

The screenshot shows the 'New TRDP_1.xml*' window. On the right, the 'Source' section has a table with the following data:

Name	SourceName
Uri1	10.0.1.80
Uri2	10.0.1.90

SDTv2 can be used for a PD sink telegram:

The screenshot shows the 'SDTv2' configuration panel. The 'Enable SDTv2' checkbox is checked and highlighted with a red box. Below it, the 'SMI' field is set to 0. Other fields include 'Redundant SMI', 'SMI 2', 'Nrx', 'Nguard', 'CMThr', 'Period', 'TX [ms]', and 'RX [ms]'. There are 'Apply' and 'Clear' buttons at the bottom right.

The following fields must be completed:

- SMI and UDV

The screenshot shows the 'SDTv2' configuration panel. The 'Enable SDTv2' checkbox is checked. The 'SMI' and 'UDV' fields are highlighted with red boxes. The 'SMI' field is set to 0 and the 'UDV' field is set to 0. Other fields include 'Redundant SMI', 'SMI 2', 'Nrx', 'Nguard', 'CMThr', 'Period', 'TX [ms]', and 'RX [ms]'. There are 'Apply' and 'Clear' buttons at the bottom right.

SMI

Safe Message Identifier:

- Greater or equal 1000
- Must match with the corresponding counterpart

UDV

User Data Version:

- Identify which version of the telegram configuration is used (must be version controlled)
- Greater or equal 1
 - Less or equal 255
 - Must match with counterpart

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Only for PD sink telegram:

- The checkbox *Redundant SMI* and the field *SMI 2*

SMI 2

Safe message identifier for the redundant connected counterpart. Can be switched seamlessly if conditions in norm are fulfilled.

- For sink ports, all fields in the SDTv2 area except *Nguard* and *SMI2* are active. The *Nguard* and *SMI2* fields are only activated if the *Redundant SMI* checkbox is activated.

Nrx

Number of telegrams received which could be missing until the safe channel is interpreted as unsafe
 $\rightarrow \text{Trx_safe} = (\text{Nrx} * \text{Trx_period}) \rightarrow$ Time a singular message is valid until it must be replaced by a new one

Nguard

Number of receive cycles used to detect if active and redundant source sending data.

$$\text{Tguard} = (\text{Trx_period} * \text{Nguard})$$

CMThr

Number of telegrams during which at most one telegram can include a transmission failure.

TX

$\text{Trx_period} \rightarrow$ time in ms in which period a new telegram is sent

RX

$\text{Trx_period} \rightarrow$ time in ms in which a received telegram is read

NOTE:

The data of the DEVICES can then be saved in the telegrams and the structure in the IO mapping.

10.9.6 Enable SDTv2 for a PD source telegram

Source-Telegram (Destination) - The name and Uri can be specified:

The screenshot shows the 'New TRDP_1_mit_Param.xml' window. On the left, the 'PD-Parameter' section has fields for 'Timeout [µs]', 'Cycle [µs]', 'Redundant', and 'Validity-Behaviour' (set to 'Zero'). The 'Destination' section is highlighted with a red box, containing 'Name' (DestName) and 'Uri' (10.0.1.70). The 'Source' section on the right has fields for 'Name', 'Uri1', and 'Uri2'.

SDTv2 can be used for a PD source telegram:

The screenshot shows the 'SDTv2' configuration dialog. The 'Enable SDTv2' checkbox is checked. The 'SMI' field is set to 0, and a tooltip 'Safe Data Transmission Support' is visible. Other fields include 'Redundant SMI', 'SMI 2', 'Nrxx', 'Nguard', 'CMThr', 'TX [ms]', and 'RX [ms]'. There are 'Apply' and 'Clear' buttons at the bottom right.

The following fields must be completed:

- SMI, UDV (and Period TX)

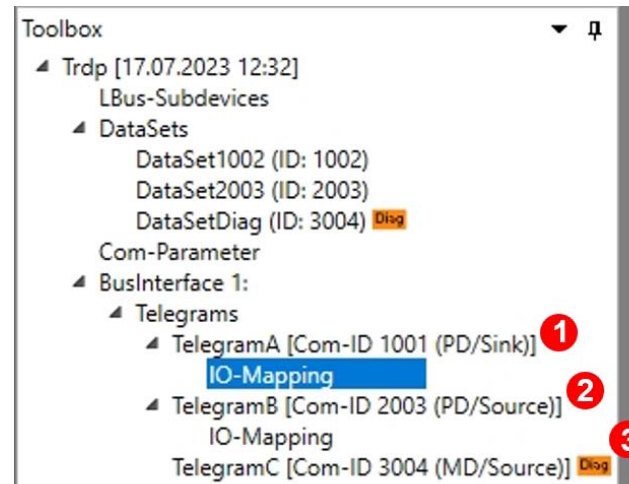
The screenshot shows the 'SDTv2' configuration dialog with 'Enable SDTv2' checked. The 'SMI' and 'UDV' fields are highlighted with red boxes, indicating they must be completed. Other fields are disabled.

- All other fields are disabled.

The data of the DEVICES can then be saved in the telegrams and the structure in the IO mapping.

10.9.7 The I/O mapping of the telegrams

To do this, the *telegram* in which the data is to be mapped must be selected in the *Toolbox*.

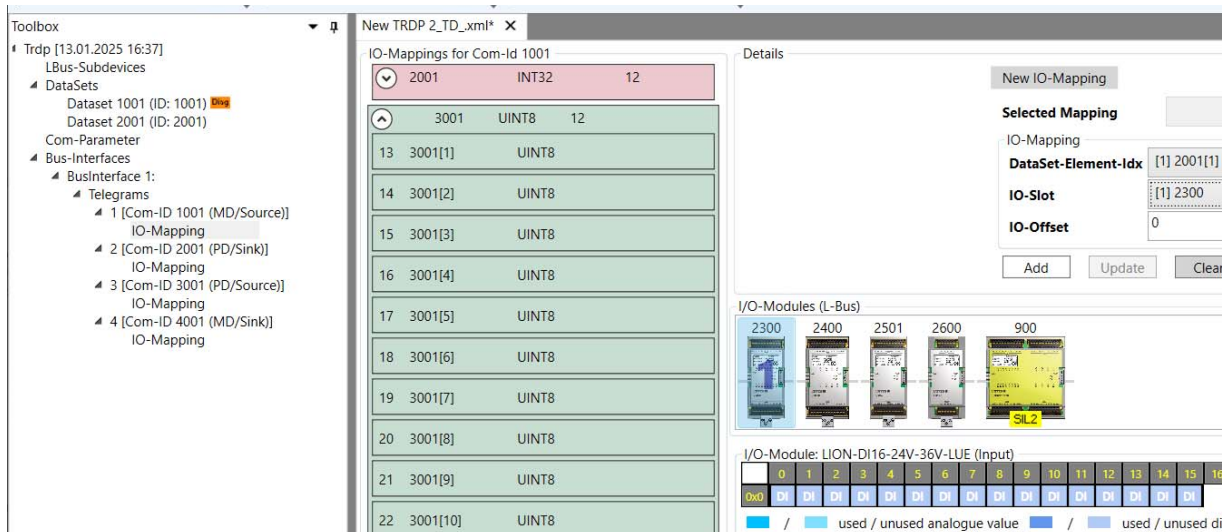


In the following examples, we first create a sink telegram (1), then a source telegram (2).

A *Diagnostic DataSet* as a *telegram* (3) does not offer the option of I/O mapping.

NOTE: A *Diagnostic DataSet* as a *telegram* can only be created as a source telegram.

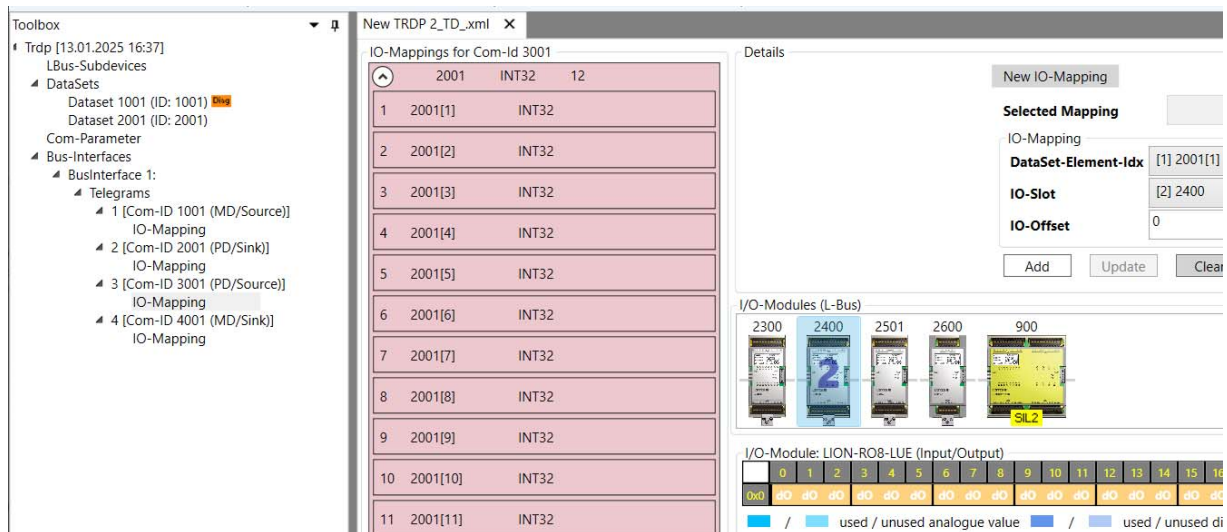
10.9.8 Sink Telegram



NOTE: Only data that is written from the HEAD to the DEVICE can be mapped in a *sink telegram*, e.g., the switching of the outputs on a digital output module. Data that cannot be mapped, e.g., input data, is not displayed.

For further information, please also refer to the operating instructions for the respective DEVICE.

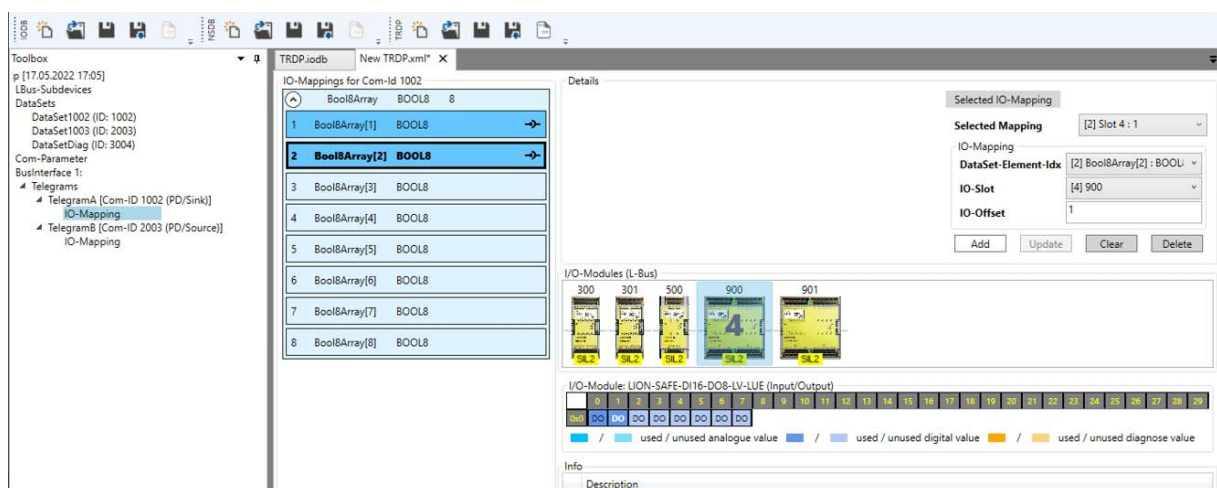
10.9.9 Source Telegram



NOTE: Only data that is written from the **DEVICE** to the **HEAD**, e.g., the status of a digital input or other status messages from a module, can be mapped in a *source telegram*. Data that cannot be mapped, e.g. output data, is not displayed. For further information, please also refer to the operating instructions for the respective **DEVICE**.

10.9.10 Assigned elements and unassigned elements

Depending on the module type, mapped and unmapped *elements* of the TRDP structure and the *I/O data* are displayed in different colors. This should help to better recognize already mapped (*assigned*) data.



In addition, the assigned data is marked with the following symbol:

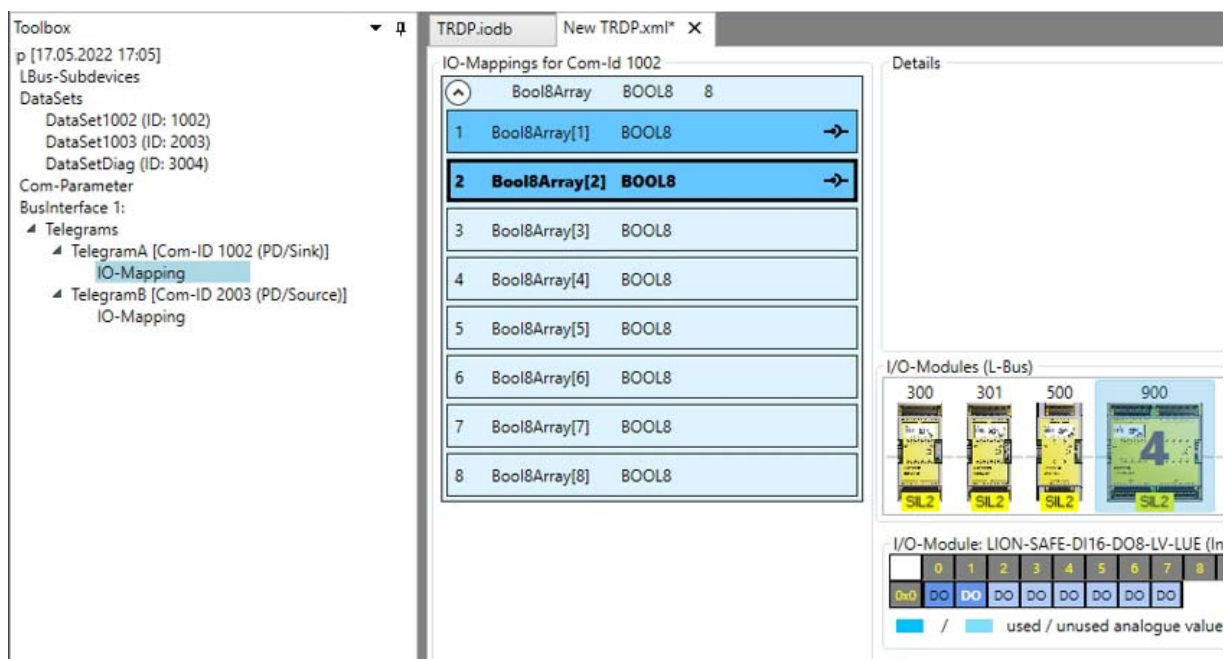


mapped element

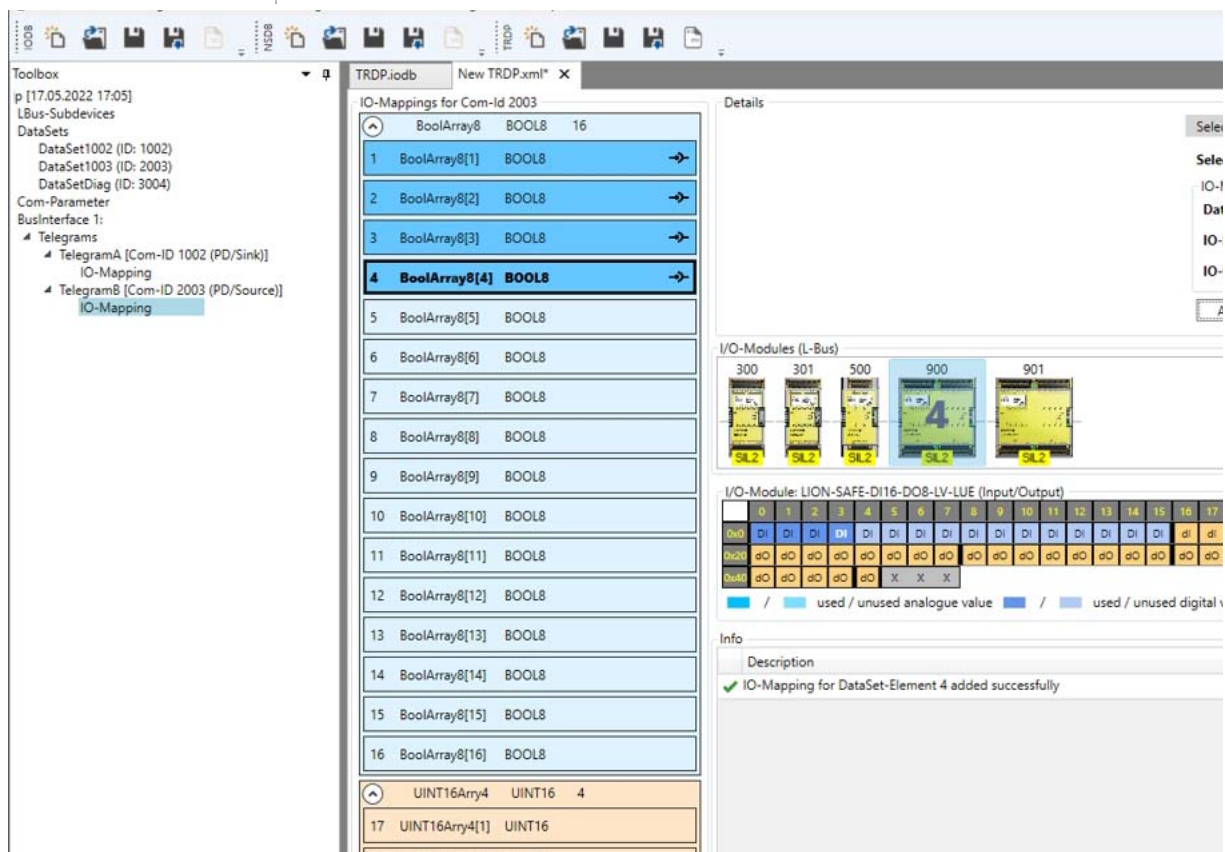
In addition, the data structures are highlighted in different colors depending on the *data type*.

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In our example, the digital outputs of the DI/DO DEVICE (ID 900) were mapped into a *sink process* data structure. Sink frame (telegram) means here that only the digital outputs are displayed.

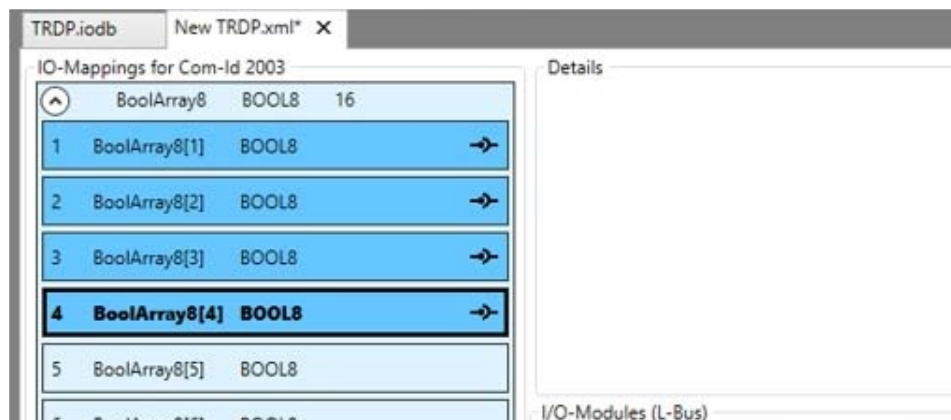


If you now select the *source frame (Telegram)* and then select the same DI/DO DEVICE (ID 900), you will see that the DO data is no longer displayed here, but only the input data (DI, in blue) and the diagnostic data (in orange) of the module:

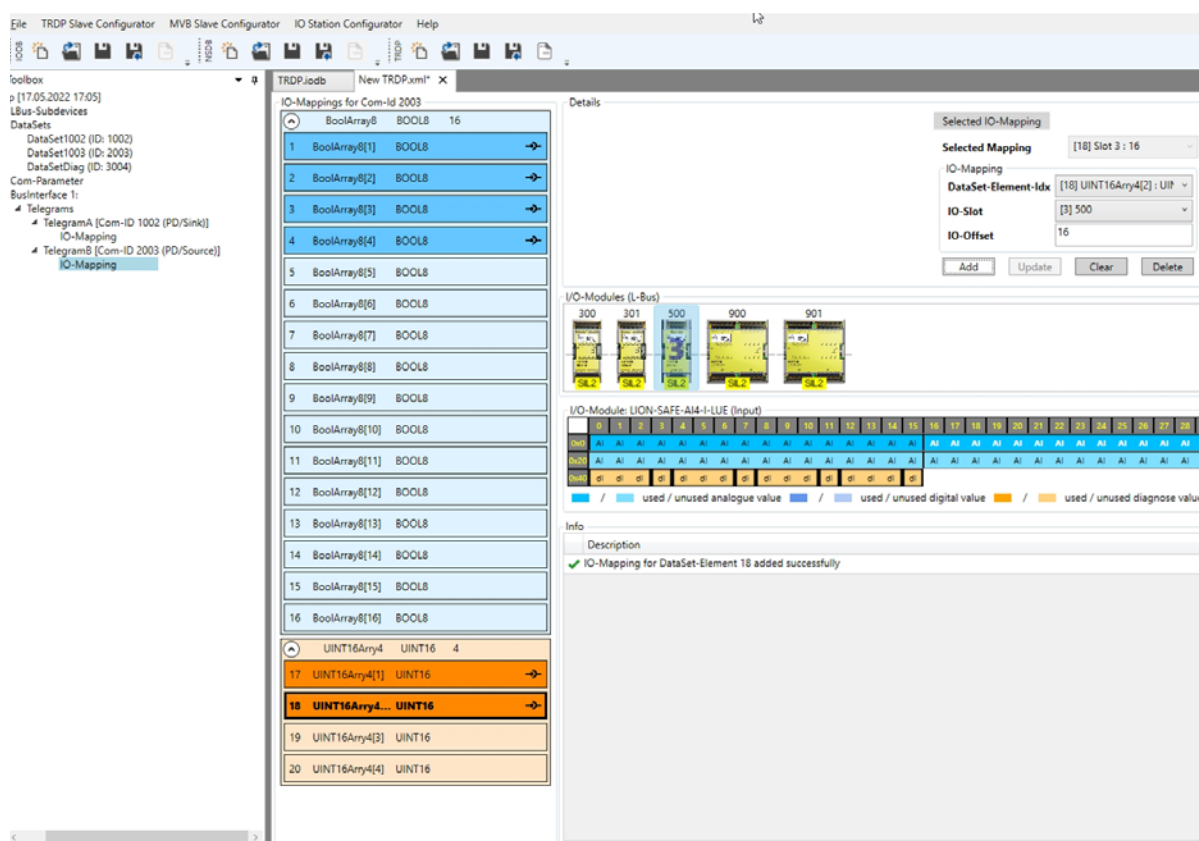


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The first four bits in the TRDP process data structure were mapped here.



In a further step, the measured values of module 500 are also mapped into the structure shown in the following figure.



This is then represented by a color change (darker color, bold text) and a "Mapped" symbol on the right side:



In addition, a confirmation appears at the bottom of the info box (Description).

10.10

Creating a new TRDP report

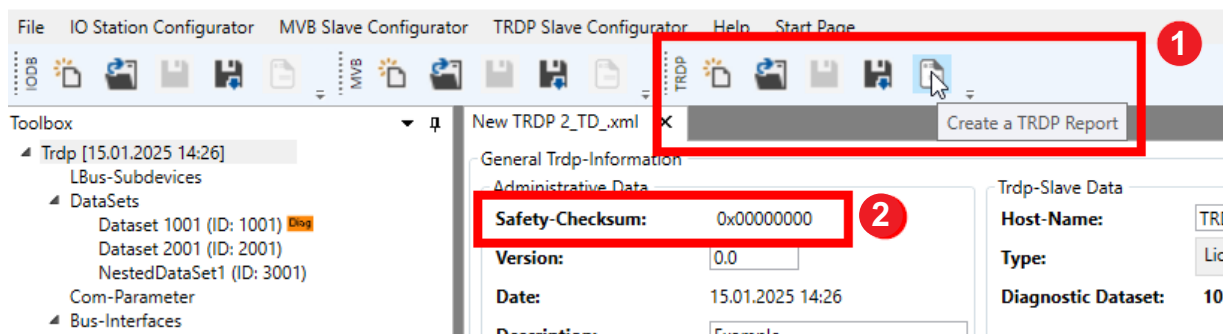
The TRDP report summarizes the settings and configurations of the TRDP HEAD and is used by the validator for checking.

NOTE: A (first) *TRDP checksum* is generated when the TRDP report is created.

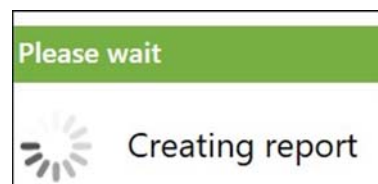
NOTE: The actual security checksum is only generated with the created and checked TRDP report.
The TRDP report must therefore always be created first as a basis.

NOTE: The TRDP HEAD will not accept the TDB file without a safety checksum. In this context, it doesn't matter whether safe modules are used in the LION system or not. The safety checksum must always be created. This is the last step before the configuration file can be loaded onto the TRDP HEAD.

1. To create the report and checksums, click on the TRDP Report-create icon (1).
2. As long as the TRDP report has not been created, the safety checksum (2) is invalid.

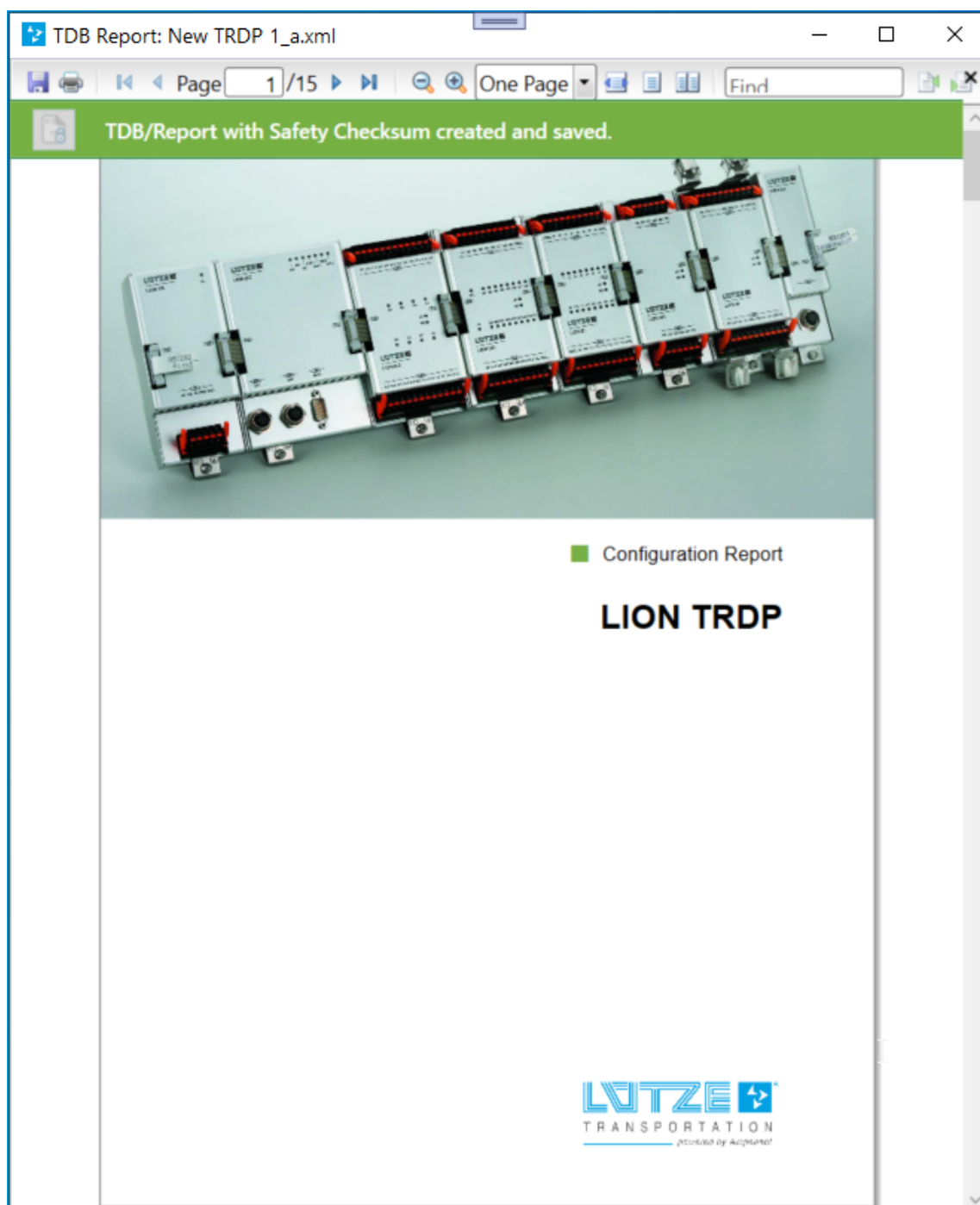


3. This window appears:



NOTE: The larger the configuration, the longer it may take to generate the report.

4. A new TDB (Configuration) report has been created:



5. The report is used for the review and validation of the settings. A report PDF and the actual configuration file, the TDB file, are created. This file contains the current configuration settings for the TRDP HEAD. The XML file is the template for the configuration file and is only used in the LION LCF. When configuring, the system first saves the data in the XML file and then uses it to create the TDB file.

NOTE: Read the report carefully and review the created configuration according to your requirements.

The report clearly summarizes all entries once again, here are some examples:

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Create TDB/Report with Safety Checksum

LION TRDP • Configuration Report

1 TRDP

1.1 General Information

LCF Version: 2.10.0
 LDD Version: 2.6
 TDB Version: 2.1
 TDB Configuration Name: Config Nr 01
 Last Modified: 31.1.2025
 SIL0 Checksum: 0x00000000
 TDB Safety Checksum: 0x00000000

1.2 Configuration Overview

1.2.1 Connected Devices - I/O Station

L-Bus² communication: fault detection and reaction time:
 One L-Bus² cycle consists of 174 Bytes
 Class 1 (SIL0) IO-Modules: 250 ms
 Class 2 (SIL2) IO-Modules: 30 ms

Device Type	Function	Part Number	Quantity
Digital Output	LION-RO8-LUE	803201	1
Digital Input	LION-SAFE-DI16-LV-LUE	803103	1
Digital Input	LION-SAFE-DI16-HV-LUE	803104	1
Analog Input	LION-SAFE-AI4-I-LUE	803305	1
Digital Input/Output	LION-SAFE-DI16-DO8-LV-LUE	803501	1

1.2.2 Device Configuration Data

Modul-ID	Function	Slot No	Configuration Data
2400	LION-RO8-LUE	1	0x00 0x00 0x00 0x00 0x00 0x00 0x00 0x00 0x00 0x00 0x00 0x00 0x00 0x00 0x00 0x00 No Filter
300	LION-SAFE-DI16-LV-LUE	2	0x01 0x01 0x01 0x01 0x00 0x00 0x00 0x00 0x00 0x00 0x00 0x00 0x00 0x00 0x00 0x00 Filter Pot. Group A: 1 ms; Filter Pot. Group B: 1 ms; Filter Pot. Group C: 1 ms; Filter Pot. Group D: 1 ms;

For example, you can see the listed *telegram assignments* that you have created.

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Create TDB Report with Safety Checksum

LION TRDP ▪ Configuration Report

1.3.1 Telegram TelegramA 1001

1.3.1.1 Process Variables

Telegram Element	Telegram Offset	Element Type	LBus-Ref Slot No (ID)	Offset	Safe Mapping
Bool8Array2 0		BOOL8[2] (1 bit)		not connected	
CHAR8Arra 0		CHAR8[2] (8 bits)	Slot 1 (2400)	0	no
BITSET8Arr 0		BITSET8[4] (8 bits)	Slot 1 (2400)	1	no

1.3.1.2 Telegram Map

Index	Name	Data Type	Array Size	Mapped	IO Slot	IO Offset
	DataSet1002	1002	1			
	Bool8Array2	BOOL8	2			
1	Bool8Array2[1]	BOOL8	1	→	1	0
2	Bool8Array2[2]	BOOL8	1	→	1	1
	CHAR8Array2	CHAR8	2			
3	CHAR8Array2[1]	CHAR8	1			
4	CHAR8Array2[2]	CHAR8	1			
	BITSET8Array4	BITSET8	4			
5	BITSET8Array4[1]	BITSET8	1			
6	BITSET8Array4[2]	BITSET8	1			
7	BITSET8Array4[3]	BITSET8	1			
8	BITSET8Array4[4]	BITSET8	1			

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LION LCF Tool Application manual ▪ Configurator HEAD – TRDP Slave Configurator

Or you can view the listed automatically generated *diagnostic telegrams*:

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Create TDB Report with Safety Checksum

LION TRDP ▪ Configuration Report

1.3.3 Telegram TelegramC 3004

1.3.3.1 Process Variables

Telegram Element	Telegram Offset	Element Type	LBus-Ref Slot No (ID)	Offset	Safe Mapping
tdbSafetyCr	0	UINT32 (32 bits)		not connected	
tdbVersion	0	UINT8[2] (8 bits)		not connected	
tdbTerminal	0	UINT32 (32 bits)		not connected	
reserve0	0	UINT32 (32 bits)		not connected	
heartbeat	0	UINT32 (32 bits)		not connected	
generalOK	0	BOOL8 (1 bit)		not connected	
mainGroupC	0	UINT8 (8 bits)		not connected	
operationOk	0	UINT8 (8 bits)		not connected	
reserve1	0	UINT32 (32 bits)		not connected	
warningOK	0	BOOL8 (1 bit)		not connected	
eaTemperat	0	BOOL8[32] (1 bit)		not connected	
reserve2	0	UINT32 (32 bits)		not connected	
slotStatus	0	UINT8[32] (8 bits)		not connected	
reserve3	0	UINT32[4] (32 bits)		not connected	
errorCode	0	UINT32[10] (32 bits)		not connected	

1.3.3.2 Telegram Map

	Index	Name	Data Type	Array Size	Mapped	IO Slot	IO Offset
		DataSetDiag	3004	1			
	1	tdbSafetyCrc	UINT32	1			
		tdbVersion	UINT8	2			
	2	tdbVersion[1]	UINT8	1			
	3	tdbVersion[2]	UINT8	1			
	4	tdbTerminalId	UINT32	1			
	5	reserve0	UINT32	1			
	6	heartbeat	UINT32	1			
	7	generalOK	BOOL8	1			
	8	mainGroupOK	UINT8	1			
	9	operationOK	UINT8	1			
	10	reserve1	UINT32	1			
	11	warningOK	BOOL8	1			
		eaTemperatureWarni	BOOL8	32			
	12	eaTemperatureWarni	BOOL8	1			
	13	eaTemperatureWarni	BOOL8	1			
	14	eaTemperatureWarni	BOOL8	1			
	15	eaTemperatureWarni	BOOL8	1			
	16	eaTemperatureWarni	BOOL8	1			
	17	eaTemperatureWarni	BOOL8	1			
	18	eaTemperatureWarni	BOOL8	1			

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Or you can see the listed *nested telegrams*:

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Create TDB Report with Safety Checksum

LION TRDP • Configuration Report

1.3.4 Telegram NestedTelegram1 4005

1.3.4.1 Process Variables

Telegram Element	Telegram Offset	Element Type	LBus-Ref Slot No (ID)	Offset	Safe Mapping
NestedFrom	0	2003 (0 bit)		not connected	
NestedToBC	0	1002 (0 bit)	Slot 1 (2400)	0	no

1.3.4.2 Telegram Map

Index	Name	Data Type	Array Size	Mapped	IO Slot	IO Offset
	NestedDataset1	1001	1			
	NestedFromBC	2003	1			
	BOOL8Array4	BOOL8	4			
1	BOOL8Array4[1]	BOOL8	1	→	1	0
2	BOOL8Array4[2]	BOOL8	1			
3	BOOL8Array4[3]	BOOL8	1			
4	BOOL8Array4[4]	BOOL8	1			
	INT32Array2	INT32	2			
5	INT32Array2[1]	INT32	1			
6	INT32Array2[2]	INT32	1			
	NestedToBC	1002	1			
	Bool8Array2	BOOL8	2			
7	Bool8Array2[1]	BOOL8	1			
8	Bool8Array2[2]	BOOL8	1			
	CHAR8Array2	CHAR8	2			
9	CHAR8Array2[1]	CHAR8	1			
10	CHAR8Array2[2]	CHAR8	1			
	BITSET8Array4	BITSET8	4			
11	BITSET8Array4[1]	BITSET8	1			
12	BITSET8Array4[2]	BITSET8	1			
13	BITSET8Array4[3]	BITSET8	1			
14	BITSET8Array4[4]	BITSET8	1			

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LION LCF Tool Application manual ▪ Configurator HEAD – TRDP Slave Configurator

You can also see all the lists and assignments displayed for the sub devices (modules) in the overview:

Create TDB/Report with Safety Checksum

LION TRDP ▪ Configuration Report

1.4 Mapping of Subdevices

Slot No	Modul No	Modul Description	In-Bytes	Out-Bytes
1	2300	LION-DI16-24V-36V-LUE	2	0
2	2400	LION-RO8-LUE	3	1
3	2501	LION-AI4-U-LUE	10	0
4	2600	LION-AO4-U-LUE	2	8
5	900	LION-SAFE-DI16-DO8-LV-LUE	9	1

1.4.1 Slot 1 - 2300 (2300)

1.4.1.1 Mapping of Inputs

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	

1.4.2 Slot 2 - 2400 (2400)

1.4.2.1 Mapping of Inputs

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	

1.4.2.2 Mapping of Outputs

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	

1.4.3 Slot 3 - 2501 (2501)

1.4.3.1 Mapping of Inputs

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	
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	

1.4.4 Slot 4 - 2600 (2600)

1.4.4.1 Mapping of Inputs

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	

1.4.4.2 Mapping of Outputs

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	

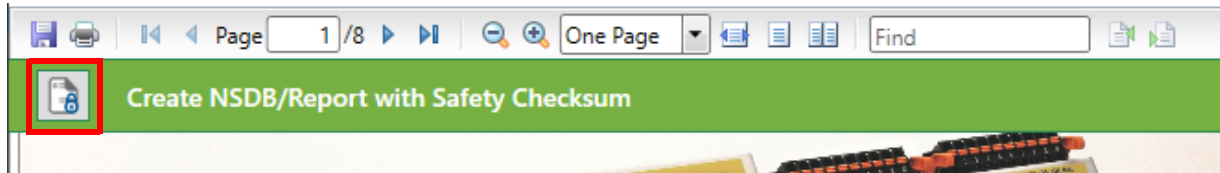
C:\Users\daniel.briem\Documents\Test1\New TRDP_1_a.xml

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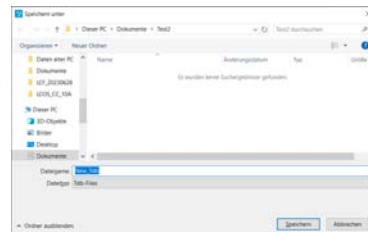
10.11 Create TRDP report with checksum.

If the report contains no errors and the configuration meets the requirements, the *safety checksum* can be generated.

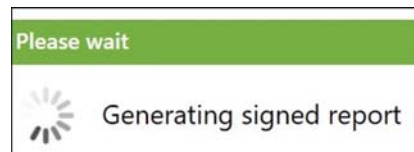
1. Click the **Create TRDP/Report with Safety Checksum** button at the top of the TDB report.



2. After that, there is an option to specify the (local) storage location.

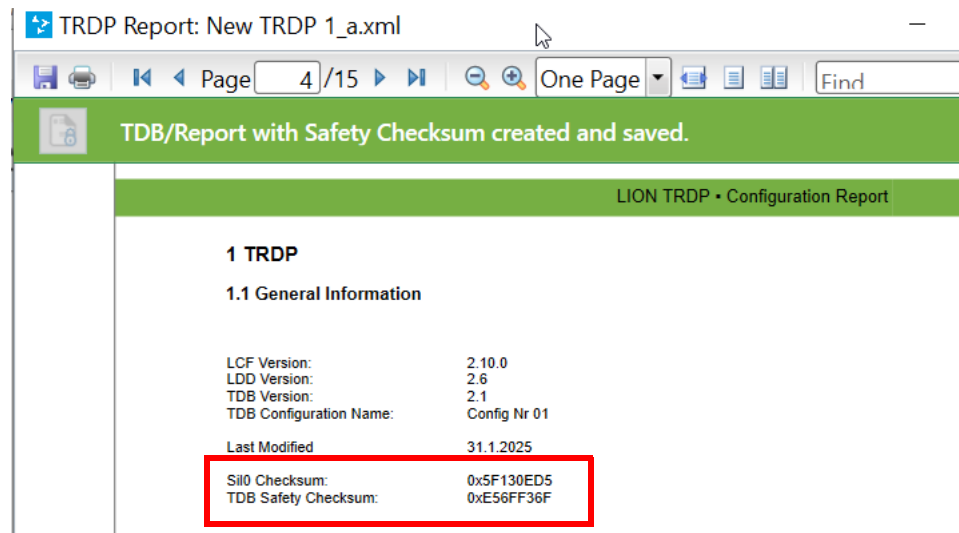


3. This window appears:



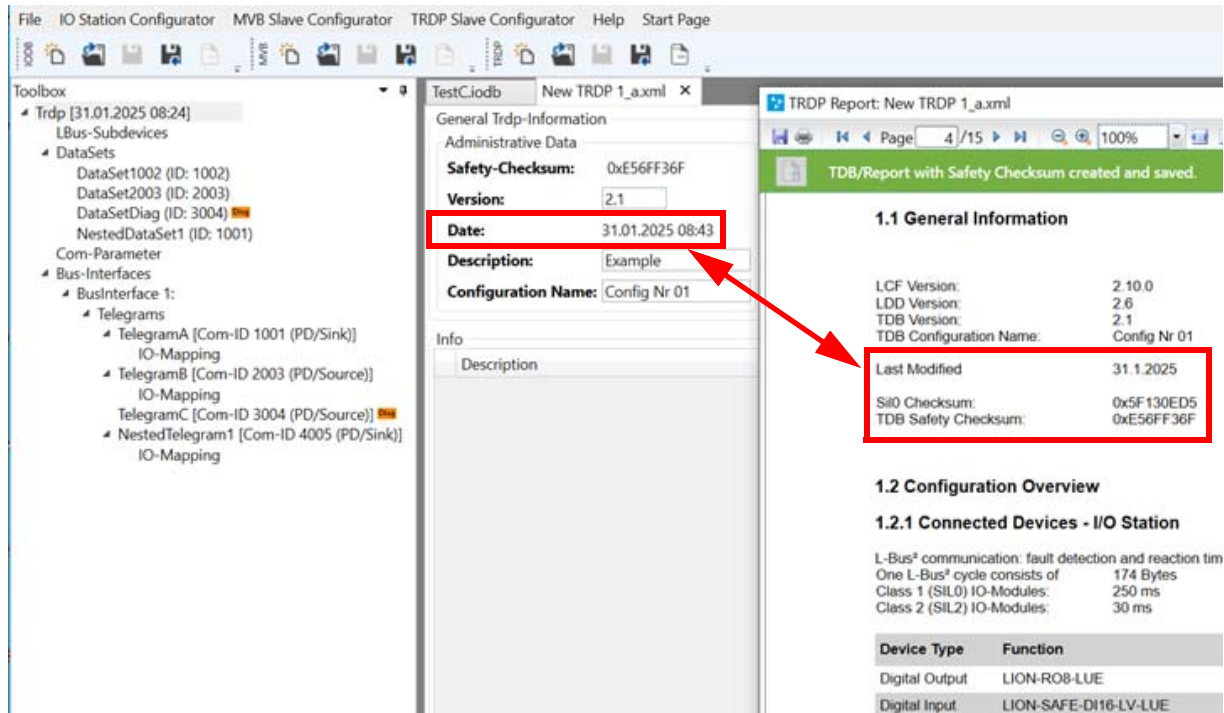
NOTE: The larger the configuration, the longer it may take to generate the report.

4. A *signed report* is created:



LION LCF Tool Application manual ▪ Configurator HEAD – TRDP Slave Configurator

NOTE: The *TDB safety checksum* is automatically displayed in the TRDP report and saved in the TRDP *Slave Configurator*.



1.

! Important technical information: The generated TBD file (*.tdb) can be transferred to the TRDP HEAD via web server.

Name	Typ	Änderung
New TRDP.xml	Adobe Acrobat Document	07.07.202:
New TRDP	XML-Dokument	07.07.202:
New_Tdb.tdb	TDB-Datei	07.07.202:

2.

! Important technical information:
When configuring, the system first saves the data in the XML file.
 The XML file is primarily used to create the TDB/Report with security checksum (Safety CRC) and to create the TDB file (configuration file).

✓ Tip: The XML file can be used as a source of information for further tasks.

Name	Typ	Änderung
New TRDP.xml	Adobe Acrobat Document	07.07.202:
New TRDP	XML-Dokument	07.07.202:
New_Tdb.tdb	TDB-Datei	07.07.202:

LION LCF Tool Application manual ▪ Configurator HEAD – TRDP Slave Configurator

Example of the content of the text file:

10.12

Notes

NOTE:

These were idealized examples. In real situations, the tasks are more complex and must meet a variety of requirements for the TRDP structure.




Service: If you get stuck or need any other help, please contact the service department. You can find the contact details in chapter 15 on page 177.

11 Troubleshooting Configurator HEAD

This is an overview of possible errors and their solutions.

Error	Possible cause	How to proceed
1 HEAD does not start.	Validation/safety checksum not generated.	<p>Create a signed report with validation/checksum.</p> <p>MVB: chapter 9.12 on page 110</p> <p>TRDP: chapter 10.11 on page 166</p>
2 Mapping of data aborts with error message (Data type not supported...)	Incorrect data type selected.	<p>Select the correct data type.</p> <p>NOTICE: Please refer to the operating instructions for the corresponding DEVICE.</p>
3 Required data are not displayed during mapping.	Source ports and sink ports have been mixed up.	Check the entries.
4 Mapping name file not found.	In addition to the *.bin file, an *.xml file with the mapping names is also saved.	Either select the file manually or ignore the error message.
	The file was not found or the *.bin file was created with an older LCF version.	An empty file is created automatically.

 **Service:** If you get stuck or need any other help, please contact the service department, contact information see [chapter 15 on page 177](#).

12

Configurator LOGIC – MVB Configurator

! Important technical information: The application manual for the **Configurator LOGIC - MVB Configurator**, can be found in the second part of the operating instructions “LION LCF Tool - 2nd Configurator LOGIC”.



This is about the creation of a configuration file of a DIOLINE PLC-/LION SAFE CCU and MVB report for a DIOLINE PLC LOGIC/LION SAFE CCU LOGIC.

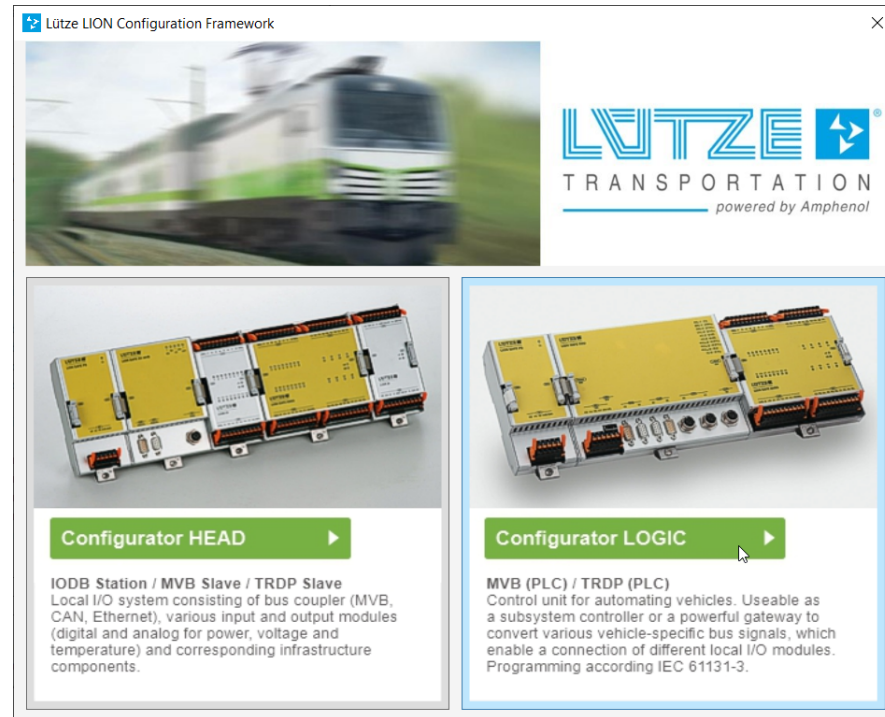


SERVICE: If you get stuck or need any other help, please contact the service department. The contact information is in [chapter 15 on page 177 §](#)

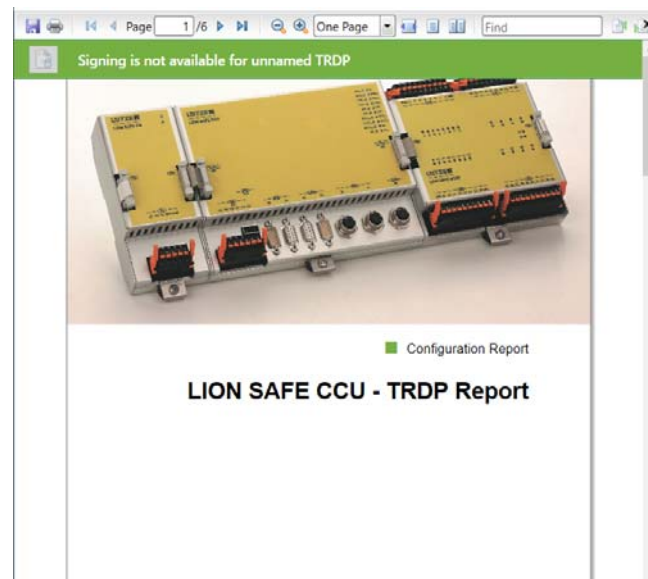
13


Configurator LOGIC – TRDP Configurator

! Important technical information: The application manual for the Configurator LOGIC - TRDP Configurator, can be found in the second part of the operating instructions “LION LCF Tool - 2nd Configurator LOGIC”.



This is about the creation of a configuration file and TRDP report for a LION SAFE CCU LOGIC.



 Service: If you get stuck or need any other help, please contact the service department. The contact information is in [chapter 15 on page 177](#)

14 Further Information

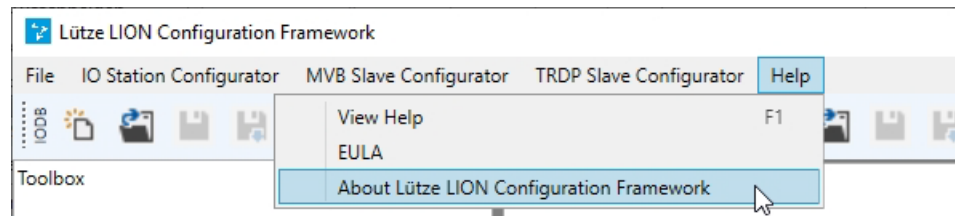
14.1 Current version of the LION LCF Tool

1. LION Configuration Framework (LCF): Version 3.01.0000
2. LION LDD (LION Device Description): Version 2.9

Example screenshot



You can find this information here in the LION LCF tool:



14.2 Software versions

[V3.01.0000 - 2025-11]

1. It is now possible to send an email with a query regarding LION I/O stations configured in LCF to the Transportation Sales Department via LCF itself.
2. Bug fixing of the device wizard
3. Correction of SDTV2 (UDV values) for TRDP BC, must be allowed up to 255.

LDD (devices.ldd) v2.9

[V3.00.0000 - 2025-02]

Due to the volume of content, the application manual had to be split into two parts:

1. **Part: LION LCF Tool - Configurator HEAD,**
Application manual for LION HEADs (Bus coupler)

1. The selection between HEAD (BC) and LOGIC (SAFE CCU) has been added.
2. The entire area for LOGIC (SAFE CCU) has been added.
3. A display of various application manuals has been introduced (HEAD/LOGIC).
4. Added: separate major and minor versions for TRDP BC SIL0 and TRD BC SIL2
5. Added: a different diagnostic data structure for BC SIL0 and BC SIL2
6. Display and storage of mapping data for DeviceID= 900 and DeviceID=901 corrected (For input data only 9 bytes must be given)
7. The structure of the TDB data itself corresponds to the data format specified in document T1754_T9129_TDB_V13.pdf
8. PDFsharp-MigraDoc libraries (V1.5) have been updated to improve reporting performance.
9. Bugfixing
 - a) GUI and TDB file: SDTv2 parameters
 - b) report (MVB Slave Configurator) => calculation STS (the correct (halved) STS value is displayed) corrected

LDD (devices.ldd) v2.6

2. Part: LION LCF Tool – Configurator LOGIC, Application manual for LION LOGIC (SAFE CCU)

1. The selection between HEAD (BC) and LOGIC (SAFE CCU) has been added
2. Complete area for LOGIC (SAFE CCU) has been added
3. BC 803002 with new diagnostic port
4. The structure of the TDB data itself corresponds to the data format specified in document T1754_T9129_TDB_V13.pdf

LDD (devices.ldd) v2.6

[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-Bus² 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]

1. On the "Source/Sink Ports -> Details" view a hint for the "STS" field has been integrated.
2. Corrected the order of the menus.
3. New filter settings in program window: L-Bus² 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 SILO, AO4 +/-10V SILO**

[v1.3.5.3 - 2019-03-22]

New Features - Stable version of the TRDP Slave Configurator
LDD (devices.ldd) v2.2 with new SILO 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

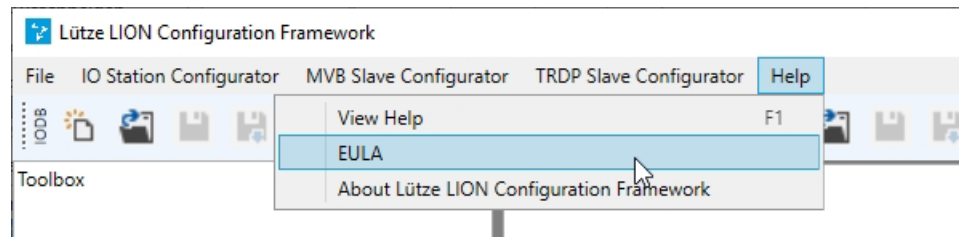
[v1.2.1.0 - 2016-09-14]

Initial Revision for website
LDD (devices.ldd) to v1.

14.3

EULA LION Configuration Framework

You can also find this information here in the LION LCF Tool.

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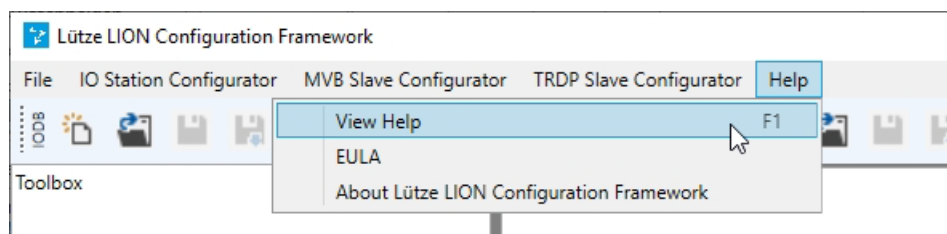
State: as of November 2011

14.4

Application manuals

Under the menu item Help / View Help you will find the LION LCF Tool application manuals.

Depending on whether you are in Configurator HEAD or Configurator LOGIC, you will receive the correct part of the application manual.



Due to the volume of content, the application manual had to be split into two parts:

1. LION LCF Tool - Configurator HEAD,
Application manual for LION HEADs (Bus coupler)
2. LION LCF Tool - Configurator LOGIC, Application manual for LION LOGIC
(LION SafeCCU)

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Service

For questions about the product or repair requests, please contact:

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✓ **Tip: You can obtain the technical documents via the search field on the website. Enter the article number 803002, for example, or simply use this QR code.:**



803001
LION-SAFE-BC-
MVB-LUE



803002
LION-SAFE-BC-
ETH-LUE

Select the product in the search result displayed.

At the bottom of the respective product page you will find the documents associated with the product.

16 Shutdown and disposal

16.1 Regulations

Observe the valid environmental regulations of your country for the final shutdown and disposal.

Disassemble the device and completely dismantle it before disposal.

Highly sensitive information

For highly sensitive information, mechanical destruction of the data carrier by shredding is recommended. This is done by companies that also destroy files.

Batteries

Over the next few years, further obligations will come into force with regard to the EU's new battery regulation. For example, further due diligence obligations for economic operators will apply from 18.08.2025 and further regulations will follow for the management of waste batteries.

Dispose of electric parts in line with the regulation for Waste of Electrical and Electronic Equipment (WEEE DE 65543672). 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 handed over the device to a commercial third party without any contractual agreement for the disposal, you must take it back at your own expense and at the risk of legal liability after its final shutdown.

The claim of Lütze Transportation GmbH for takeover or 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 Lütze Transportation mbH of a written notification on its part of the termination of use.

16.2 Data security

Protect your data from access by outsiders. The bus coupler contains passwords and configuration data.

NOTE: Reset the bus coupler to factory settings so that your configuration and passwords cannot be accessed during disposal.



17

Revision of the document

Version	Revision	Date
00-08	Only the English version, without TRDP and Configurator LOGIC	07/01/2014 - 01/24/2025
09	<p>Complete makeover of the existing English documents (LION_LCF_AM_EN_V08) and translation into German.</p> <p>Complete revision of the previous English-language document (LION_LCF_AM_EN_V08), and translation into a German version. This version forms the basis for the new English version.</p> <p>New intermediate overviews and flow charts were added for easier understanding.</p> <p>Three new chapters on LCF Configurator LOGIC were also added.</p>	11/26/2024 - 03/20/2025
10	New reviewed Version; new chapter 8.4 „Create a quote request for the LION system“;	11/28/2025 12/15/2025

The legally protected term “QR Code” is used in this publication. “QR Code” is a registered trademark of DENSO WAVE INCORPORATED.

18

Annexes

18.1

Modules in organized overviews

This is an overview of the module IDs and their corresponding part numbers.

NOTE: Each sort of module in the LION system is uniquely identified by its *module ID*. The part number, which may differ in some circumstances (such as a customized module variant), is unrelated to the *module ID*.

The LION system works internally with the *module ID*, which identifies the type of module and has a fixed amount of data.

18.1.1 Modules sorted by article

Type of modules	Item no.	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-SAFE-PS-24V-110V-72W-LUE	-	-	-
	800113	1201	LION-SAFE-PS-24V-110V-36W-LUE	-	-	-
Bus Coupler	803001	102	LION-SAFE-BC-MVB-LUE	-	-	-
	803002	103	LION-SAFE-BC-ETH-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 bytes
	803104	301	LION-SAFE-DI16-HV-LUE	5 bytes (33 bits)	-	4 bytes
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) ³ Bytes (20 Bits)	2 bytes	-
Analog Input	803301	2501	LION-AI4-U-LUE	10 bytes	-	-
	803302	2502	LION-AI4-U-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 bytes
	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 bytes
	803502	901	LION-SAFE-DI16-DO8-HV-LUE	9 bytes (69 bits)	1 byte	4 bytes

18.1.2 Modules sorted by IDs

Type of modules	ID	Item no.	Type	Input data	Output data	Config data
Bus Coupler	102	803001	LION-SAFE-BC-MVB-LUE	-	-	-
	103	803002	LION-SAFE-BC-ETH-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 bytes
	301	803104	LION-SAFE-DI16-HV-LUE	5 bytes (33 bits)	-	4 bytes
Analog Input	500	803305	LION-SAFE-AI4-I-LUE	10 bytes	-	4 bytes
Digital Input/Digital Output	900	803501	LION-SAFE-DI16-DO8-LV-LUE	9 bytes (69 bits)	1 byte	4 bytes
	901	803502	LION-SAFE-DI16-DO8-HV-LUE	9 bytes (69 bits)	1 byte	4 bytes
Bus Coupler	1102	803011	LION-BC-MVB-LUE	-	-	-
	1103	803012	LION-BC-ETH-LUE	-	-	-
Power Supply	1200	800111	LION-SAFE-PS-24V-110V-72W-LUE	-	-	-
	1201	800113	LION-SAFE-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)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-U-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	-	-	-

18.2

Application examples – Configurator MVB HEAD

The following section explains in detail how the input and output data appear in the LION LCF Tool.

18.2.1

Mapping of the output modules (AO) to a sink port

For this purpose, the (analog) output module with the article number 803401 (ID 2600) is used as an example.

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

Each output has 2 bytes that can be used to regulate the voltage.

Through the 2-byte input data that the module returns, it indicates errors of the outputs. These errors can be, for example, overload or overheating.

1. If the module 803401 is called in a *source port*, only the input data of the module will be displayed. Here are the unlinked diagnosis data in light orange.

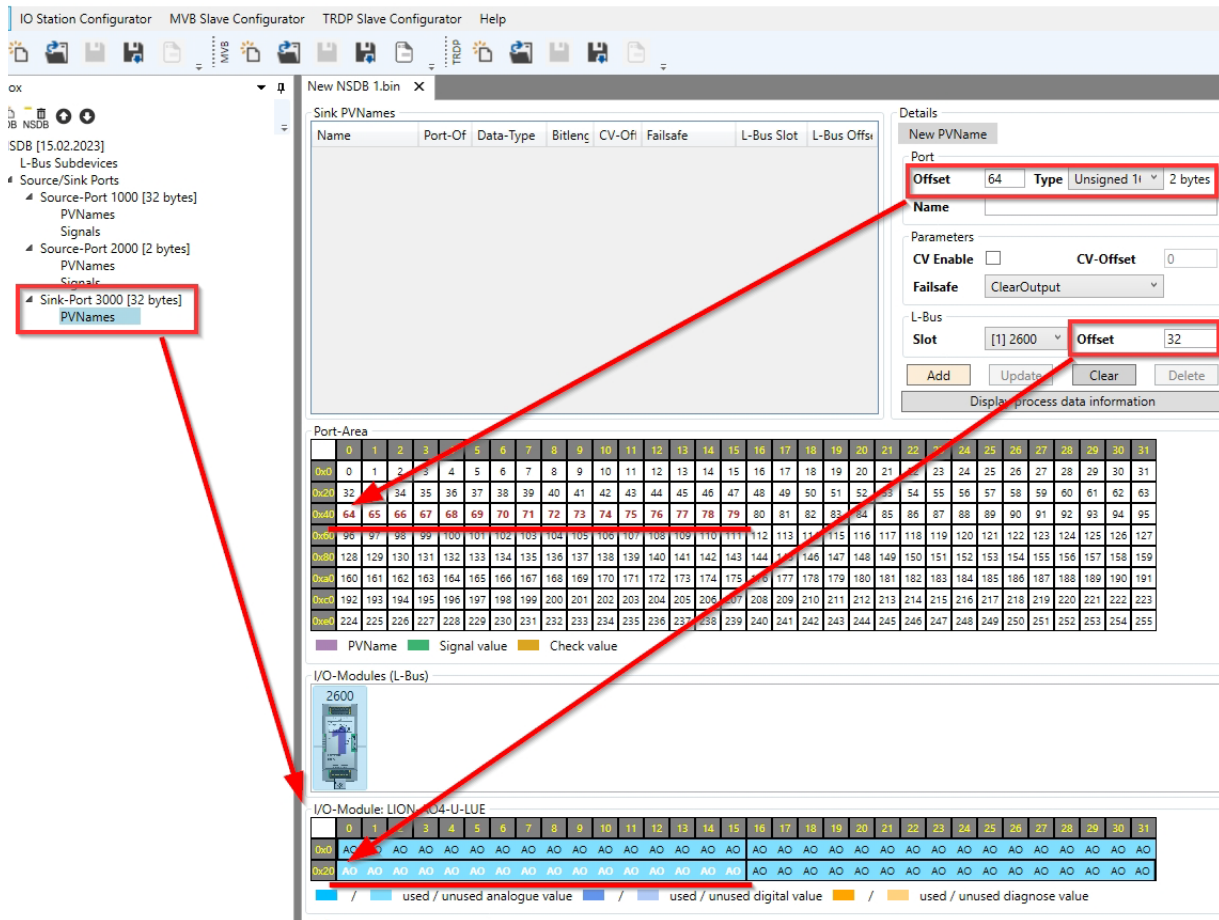
The screenshot shows the LION LCF Tool interface. On the left, a tree view displays the project structure: 'New NSDB 1.bin' > 'Source/Sink Ports' > 'Source-Port 1000 [32 bytes]' > 'PVNames'. A red box highlights the 'PVNames' entry. A red arrow points from this entry to the 'Port-Area' table. Another red arrow points from the 'Details' panel to the 'Port-Area' table. A third red arrow points from the 'Port-Area' table to the 'I/O-Modules (L-Bus)' section.

The 'Details' panel on the right shows the configuration for the selected module (2600). It includes fields for 'New PVName', 'Offset' (set to 1), 'Type' (set to Boolean), and 'L-Bus Slot' (set to [1] 2600). The 'Offset' field is highlighted with a red box. The 'L-Bus Slot' field is also highlighted with a red box.

The 'Port-Area' table displays a grid of data points. The columns are labeled 'Port' and 'Data-Type'. The rows are labeled '0x0' to '0x255'. The table shows the mapping of input and output data for the module. The 'Data-Type' column indicates the type of data (e.g., PVName, Signal value, Check value). The 'Port' column shows the address of the data point. The 'Data-Type' column is highlighted with a red box.

The 'I/O-Modules (L-Bus)' section shows the module 2600. It includes a table with columns 'Port' and 'Data-Type'. The rows are labeled '0x0' to '0x255'. The table shows the mapping of input and output data for the module. The 'Data-Type' column indicates the type of data (e.g., PVName, Signal value, Check value). The 'Port' column shows the address of the data point. The 'Data-Type' column is highlighted with a red box.

2. The following figure shows the output module 803401 (ID 2600), which is to be linked with a *sink port*. This is a sink port, hence only the module's unlinked analog output data (AO), seen above in light blue, can be connected to a *sink port*.



NOTE: The input and diagnostic data only appear on the *source ports*. The output data only appears at the *sink ports*.

With Offset, you set the starting value of the *bitsets*. As shown in this picture.

A preview of the linked bits that are now set is displayed by the red-highlighted text in the port area. A preview of the occupied bits in the module is displayed by the white highlighted text in the I/O module section.

3. Now click on *Add* to create the link (the mapping).

4. When the output or input data is assigned to a port, the color display changes. Look at the corresponding color key. This allows you to see which data has already been assigned and which has not.

c) The analog output signals of the 803401, which are 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
(b0)	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
(b20)	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
(b40)	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
(b60)	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
(b0)	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
(b20)	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

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

Info

d) The input data, in this case diagnostic data (dO, orange) from 803401, is 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
(b0)	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
(b20)	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
(b40)	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
(b60)	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
(b0)	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 (orange), / (blue), used / unused digital value (blue), / (orange), used / unused diagnose value (yellow)

Info

18.2.2

Mapping the input modules (AI) to a source port

This is an example with the (analog) input module (AI) 803301 / ID 2501.

Input modules can only be mapped to the source port, i.e. they have no output data:

The screenshot displays the LION LCF software interface. On the left, the 'Source/Sink Ports' tree shows 'Source-Port 2000 [2 bytes]' selected. The main window shows the 'Source PVNames' table with the following data:

Name	Port-Of	Data-Type	Bitleng	CV-Of	Failsafe	L-Bus Slot	L-Bus Offs
AI_1	0	Unsigned 16	16	unused	ClearOutput	1	0

The 'Details' panel on the right shows the configuration for 'AI_1':

- Port: Offset 0, Type Unsigned 16, 2 bytes
- Parameters: CV Enable ☐, CV-Offset 0, Failsafe ClearOutput
- L-Bus: Slot [1] 2501, Offset 0

The 'Port-Area' shows a grid of 32 ports (0-31). Port 0 is highlighted in red. The 'I/O-Modules (L-Bus)' section shows modules 2501, 2502, 2500, 2503, 504, and 500. Module 2501 is highlighted in red. The 'I/O-Module: LION-AI4-U-LUE' section shows a grid of 32 modules (0-31). Module 0 is highlighted in red. A red arrow points from the 'AI_1' row in the 'Source PVNames' table to the 'AI_1' module in the 'I/O-Modules (L-Bus)' section.

18.2.3

Mapping of the output modules (DO) to sink and source port.

1. First, the (digital) input data of the digital output module (DO), in this case the diagnostic data of the output (dO) of 803201 (ID 2400), is mapped to the source port:

The screenshot displays the LION LCF software interface. On the left, the 'Source/Sink Ports' tree shows 'Source-Port 1000 [16 bytes]' selected. The main window shows the 'Source PVNames' table with the following data:

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

The 'Details' panel on the right shows the configuration for 'DO_3a':

- Port: Offset 1, Type BCD/Enum, 4 bits
- Parameters: CV Enable ☐, CV-Offset 0, Failsafe ClearOutput
- L-Bus: Slot [1] 2400, Offset 1

The 'Port-Area' shows a grid of 32 ports (0-31). Port 1 is highlighted in red. The 'I/O-Modules (L-Bus)' section shows modules 2400 and 2401. Module 2400 is highlighted in red. The 'I/O-Module: LION-DO8-U-LUE' section shows a grid of 32 modules (0-31). Module 1 is highlighted in red. A red arrow points from the 'DO_3a' row in the 'Source PVNames' table to the 'DO_3a' module in the 'I/O-Modules (L-Bus)' section.

2. The (digital) output data (DO) is then mapped from 803201 (ID 2400) to the sink port.

Sink PVNames

Name	Port/Off	Data Type	Bitlength	CV-Off	Failsafe	L-Bus Slot	L-Bus Off
DO_1	0	Boolean	1	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
DO	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)

Module	2400	2402
DO	0	1

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	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

Details

Selected PVName: DO_1

Port: Offset 0, Type Boolean, 1 bit

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

L-Bus: Slot [1] 2400, Offset 0

Buttons: Add, Update, Clear, Delete

Display process data information

18.2.4

Mapping the digital input modules (DI)

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

Digital input modules (DI) can only be mapped to the source port:

Source PVNames

Name	Port/Off	Data Type	Bitlength	CV-Off	Failsafe	L-Bus Slot	L-Bus Off
DigitalInput_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
DI	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15

I/O-Modules (L-Bus)

Module	2300
DI	0

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
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

Details

Selected PVName: DigitalInput_1

Port: Offset 0, Type BITSET 8, 8 bits

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

L-Bus: Slot [1] 2300, Offset 0

Buttons: Add, Update, Clear, Delete

Display process data information

18.2.5

Mapping the digital input/output modules (DI/DO)

The DI/DO modules are a combination of input/output modules.

1. The digital output data from 803501 (ID 900) is mapped to the sink port.

Sink PVNames

Name	Port-Off	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

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
DO0	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. The digital input data from 803501 (ID 900) is mapped to the source port:

Source PVNames

Name	Port-Off	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
DI0	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	

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
DI0	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	

Info

Description

18.3 Overview of DEVICES - input data / output data

18.3.1 Digital inputs (DI)







ID	Type	Part number	Input data	Output data
2300	LION-DI16-24V-36V-LUE	803101	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
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	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	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

18.3.2 Digital Outputs (DO)

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

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

-

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	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

18.3.3 Analog inputs (AI)

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	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-U-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	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	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	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																
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

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

18.3.4 Analog outputs (AO)

ID

2600

Type

LION-AO4-U-LUE

Part number

803401

Input data

2 bytes

Output data

8 bytes

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	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

2601

Type

LION-AO4-I-LUE

Part number

803402

Input data

2 bytes

Output data

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	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

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

18.3.5 Digital inputs/digital outputs (DI/DO)

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	
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	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	
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	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																								

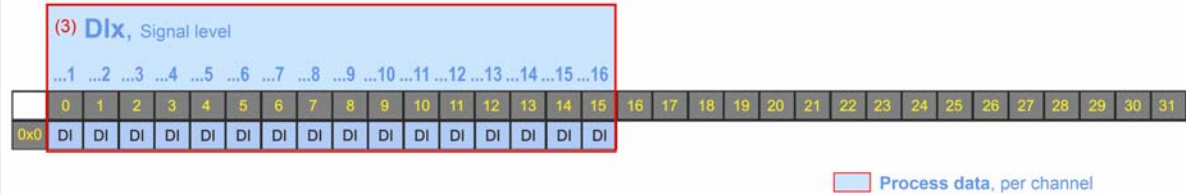
■ / ■ used / unused analogue value
 ■ / ■ used / unused digital value
 ■ / ■ used / unused diagnose value

18.4 Overview DEVICES - Brief information on the process data

18.4.1 Digital inputs (DI)

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



Input Data

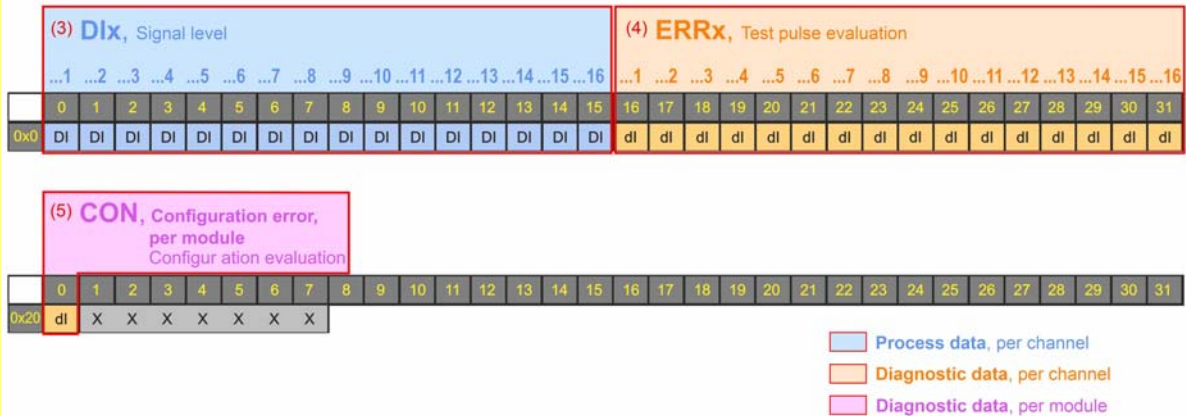


Output Data



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



Input Data



Output Data



18.4.2 Digital Outputs (DO)

ID	Type	Part number	Input data	Output data
2400	LION-RO8-LUE	803201	3 bytes	1 bytes
Input data				
<div>(2) SCCx, Switching cycle counter</div> <div><div>...1</div><div>...2</div><div>...3</div><div>...4</div><div>...5</div><div>...6</div><div>...7</div><div>...8</div></div> <div><div>LSB</div><div>MSB</div><div>LSB</div><div>MSB</div><div>LSB</div><div>MSB</div><div>LSB</div><div>MSB</div><div>LSB</div><div>MSB</div><div>LSB</div><div>MSB</div><div>LSB</div><div>MSB</div><div>LSB</div><div>MSB</div><div>LSB</div><div>MSB</div><div>LSB</div><div>MSB</div><div>LSB</div><div>MSB</div><div>LSB</div><div>MSB</div><div>LSB</div><div>MSB</div><div>LSB</div><div>MSB</div><div>LSB</div><div>MSB</div><div>LSB</div><div>MSB</div><div>LSB</div><div>MSB</div><div>LSB</div><div>MSB</div><div>LSB</div><div>MSB</div><div>LSB</div><div>MSB</div><div>LSB</div><div>MSB</div><div>LSB</div><div>MSB</div><div>LSB</div><div>MSB</div><div>LSB</div><div>MSB</div><div>LSB</div><div>MSB</div><div>LSB</div><div>MSB</div><div>LSB</div><div>MSB</div><div>LSB</div><div>MSB</div><div>LSB</div><div>MSB</div><div>LSB</div><div>MSB</div><div>LSB</div><div>MSB</div><div>LSB</div><div>MSB</div><div>LSB</div><div>MSB</div><div>LSB</div><div>MSB</div><div>LSB</div><div>MSB</div><div>LSB</div><div>MSB</div><div>LSB</div><div>MSB</div><div>LSB</div><div>MSB</div><div>LSB</div><div>MSB</div><div>LSB</div><div>MSB</div><div>LSB</div><div>MSB</div><div>LSB</div><div>MSB</div><div>LSB</div><div>MSB</div><div>LSB</div><div>MSB</div><div>LSB</div><div>MSB</div><div>LSB</div><div>MSB</div><div>LSB</div><div>MSB</div><div>LSB</div><div>MSB</div><div>LSB</div><div>MSB</div><div>LSB</div><div>MSB</div><div>LSB</div><div>MSB</div><div>LSB</div><div>MSB</div><div>LSB</div><div>MSB</div><div>LSB</div><div>MSB</div><div>LSB</div><div>MSB</div><div>LSB</div><div>MSB</div><div>LSB</div><div>MSB</div><div>LSB</div><div>MSB</div><div>LSB</div><div>MSB</div><div>LSB</div><div>MSB</div><div>LSB</div><div>MSB</div><div>LSB</div><div>MSB</div><div>LSB</div><div>MSB</div><div>LSB</div><div>MSB</div><div>LSB</div><div>MSB</div><div>LSB</div><div>MSB</div><div>LSB</div><div>MSB</div><div>LSB</div><div>MSB</div><div>LSB</div><div>MSB</div><div>LSB</div><div>MSB</div><div>LSB</div><div>MSB</div><div>LSB</div><div>MSB</div><div>LSB</div><div>MSB</div><div>LSB</div><div>MSB</div><div>LSB</div><div>MSB</div><div>LSB</div><div>MSB</div><div>LSB</div><div>MSB</div><div>LSB</div><div>MSB</div><div>LSB</div><div>MSB</div><div>LSB</div><div>MSB</div><div>LSB</div><div>MSB</div><div>LSB</div><div>MSB</div><div>LSB</div><div>MSB</div><div>LSB</div><div>MSB</div><div>LSB</div><div>MSB</div><div>LSB</div><div>MSB</div><div>LSB</div><div>MSB</div><div>LSB</div><div>MSB</div><div>LSB</div><div>MSB</div><div>LSB</div><div>MSB</div><div>LSB</div><div>MSB</div><div>LSB</div><div>MSB</div><div>LSB</div><div>MSB</div><div>LSB</div><div>MSB</div><div>LSB</div><div>MSB</div><div>LSB</div><div>MSB</div><div>LSB</div><div>MSB</div><div>LSB</div><div>MSB</div><div>LSB</div><div>MSB</div><div>LSB</div><div>MSB</div><div>LSB</div><div>MSB</div><div>LSB</div><div>MSB</div><div>LSB</div><div>MSB</div><div>LSB</div><div>MSB</div><div>LSB</div><div>MSB</div><div>LSB</div><div>MSB</div><div>LSB</div><div>MSB</div><div>LSB</div><div>MSB</div><div>LSB</div><div>MSB</div><div>LSB</div><div>MSB</div><div>LSB</div><div>MSB</div><div>LSB</div><div>MSB</div><div>LSB</div><div>MSB</div><div>LSB</div><div>MSB</div><div>LSB</div><div>MSB</div><div>LSB</div><div>MSB</div><div>LSB</div><div>MSB</div><div>LSB</div><div>MSB</div><div>LSB</div><div>MSB</div><div>LSB</div><div>MSB</div><div>LSB</div><div>MSB</div><div>LSB</div><div>MSB</div><div>LSB</div><div>MSB</div><div>LSB</div><div>MSB</div><div>LSB</div><div>MSB</div><div>LSB</div><div>MSB</div><div>LSB</div><div>MSB</div><div>LSB</div><div>MSB</div><div>LSB</div><div>MSB</div><div>LSB</div><div>MSB</div><div>LSB</div><div>MSB</div><div>LSB</div><div>MSB</div><div>LSB</div><div>MSB</div><div>LSB</div><div>MSB</div><div>LSB</div><div>MSB</div><div>LSB</div><div>MSB</div><div>LSB</div><div>MSB</div><div>LSB</div><div>MSB</div><div>LSB</div><div>MSB</div><div>LSB</div><div>MSB</div><div>LSB</div><div>MSB</div><div>LSB</div><div>MSB</div><div>LSB</div><div>MSB</div><div>LSB</div><div>MSB</div><div>LSB</div><div>MSB</div><div>LSB</div><div>MSB</div><div>LSB</div><div>MSB</div><div>LSB</div><div>MSB</div><div>LSB</div><div>MSB</div><div>LSB</div><div>MSB</div><div>LSB</div><div>MSB</div><div>LSB</div><div>MSB</div><div>LSB</div><div>MSB</div><div>LSB</div><div>MSB</div><div>LSB</div><div>MSB</div><div>LSB</div><div>MSB</div><div>LSB</div><div>MSB</div><div>LSB</div><div>MSB</div><div>LSB</div><div>MSB</div><div>LSB</div><div>MSB</div><div>LSB</div><div>MSB</div><div>LSB</div><div>MSB</div><div>LSB</div><div>MSB</div><div>LSB</div><div>MSB</div><div>LSB</div><div>MSB</div><div>LSB</div><div>MSB</div><div>LSB</div><div>MSB</div><div>LSB</div><div>MSB</div><div>LSB</div><div>MSB</div><div>LSB</div><div>MSB</div><div>LSB</div><div>MSB</div><div>LSB</div><div>MSB</div><div>LSB</div><div>MSB</div><div>LSB</div><div>MSB</div><div>LSB</div><div>MSB</div><div>LSB</div><div>MSB</div><div>LSB</div><div>MSB</div><div>LSB</div><div>MSB</div><div>LSB</d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Input data

[illegible]

Output data

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

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

Configuration Data - Byte [0 .. 15]

Filter Filter Filter Filter

```
0x00 0x00 0x00 0x00 0x00 0x00 0x00 0x00 0x00 0x00 0x00 0x00 0x00 0x00 0x00
```

Input Data

	0	1	2	3	4	5	6	/	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	d0	d0	d0	d0	d0	d0	d0	d0	d0	d0	d0	d0	d0	d0	d0	d0	d0	d0	X	X	X	X	X	X								

Output Data

[illegible]

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

v

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

Input data

(2) **AERRx**,
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) **DOx**, 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 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																								

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) 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 ...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	dO	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																

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	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

18.4.3 Analog inputs (AI)

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

Input data

(2) AI1, Value measurement, 12 Bit

LSBMSB

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

(2) AI2, Value measurement, 12 Bit

LSBMSB

X X X X

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

AI AI

(2) AI3, Value measurement, 12 Bit

LSBMSB

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

(2) AI4, Value measurement, 12 Bit

LSBMSB

X X X X

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

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 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

(3) AERRx
Limit error
...1 ...2 ...3 ...4

8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31

dl dl dl dl X X X X dl dl dl dl X X X X

Process data, per channel

Dagnostic 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-U-LUE	803302	10 bytes	-

Input data

(2) AI1, Value measurement, 12 Bit

LSBMSB

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

(2) AI2, Value measurement, 12 Bit

LSBMSB

X X X X

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

AI AI

(2) AI3, Value measurement, 12 Bit

LSBMSB

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

(2) AI4, Value measurement, 12 Bit

LSBMSB

X X X X

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

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 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

(3) AERRx
Limit error
...1 ...2 ...3 ...4

8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31

dl dl dl dl dl dl dl dl dl dl dl dl dl dl

Process data, per channel

Dagnostic 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	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

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	X	X	X	X	di	di	di	di	X	X	X	X																

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

Input data

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																

ID	Type	Part number	Input data	Output data
2504	LION-AI4-U-LUE+/-10V	803306	10 bytes	-

Input data



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	dl	dl	dl	dl	dl	dl	dl	dl	dl	dl	dl	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

Legend:

- used / unused analogue value (Blue box)
- used / unused digital value (Orange box)
- used / unused diagnose value (Yellow box)

18.4.4 Analog outputs (AO)

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

<div>(2) ERRx Hardware error ...1 ...2 ...3 ...4</div>				<div>(2) AERRx Limit error ...1 ...2 ...3 ...4</div>																																			
	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												(3) AO2, Desired condition of the outputs, 12 Bit																											
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	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							

(3) AO3, Desired condition of the outputs, 12 Bit												(3) AO4, Desired condition of the outputs, 12 Bit																																			
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															
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															

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	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

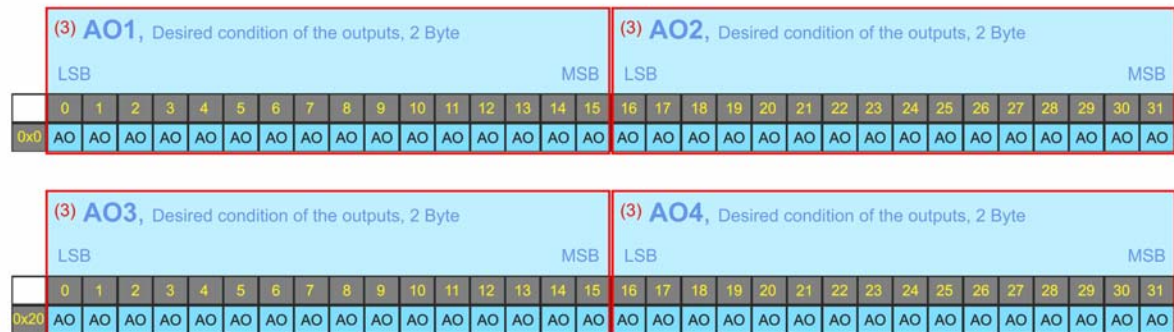
/ used / unused analogue value / used / unused digital value / used / unused diagnose value

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

Input data



Output data



- 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	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

Legend: / used / unused analogue value / used / unused digital value / used / unused diagnose value

18.4.5 Digital inputs / Digital outputs (DI/DO)

<i>ID</i>	<i>Type</i>	<i>Part number</i>	<i>Input data</i>	<i>Output data</i>
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

Figure 10-1 illustrates the register map of the 8051 microcontroller, showing the address range (0x00 to 0xFF) and the corresponding register names and functions. The registers are organized into several groups:

- (3) DIX, Signal level** (0x00 to 0x1F): This group contains 32 registers (0x00 to 0x1F) used for signal level detection.
- (4) ERRx, Test pulse evaluation** (0x20 to 0x3F): This group contains 32 registers (0x20 to 0x3F) used for test pulse evaluation.
- (6) SOx, Switching status of outputs** (0x40 to 0x5F): This group contains 32 registers (0x40 to 0x5F) used for switching status of outputs.
- (7) TRx, Switching status of output transistors** (0x60 to 0x7F): This group contains 32 registers (0x60 to 0x7F) used for switching status of output transistors.
- (8) AERRx¹, Error signalization (User error)** (0x80 to 0x9F): This group contains 32 registers (0x80 to 0x9F) used for error signalization (User error).
- (9) ERRx, Error signalization (Test pulse evaluation)** (0xA0 to 0xBF): This group contains 32 registers (0xA0 to 0xBF) used for error signalization (Test pulse evaluation).
- (10) EXTVx², External voltage det.** (0xC0 to 0xD7): This group contains 16 registers (0xC0 to 0xD7) used for external voltage detection.
- (5) CON, Configuration error, per module** (0xD8 to 0xFF): This group contains 16 registers (0xD8 to 0xFF) used for configuration error, per module.

- Process data, per channel
- Diagnostic data, per channel ⁽²⁾or bits)
- Diagnostic data, per module

Output data

[illegible]

Configuration Data - Byte [0 .. 15]

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

0x01 0x01 0x01 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	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																								

Legend: / used / unused analogue value / used / unused digital value / used / unused diagnose value

18.5

Color key in the LCF tool and report PDF

These are all the color codes used in the LION LCF.

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		

