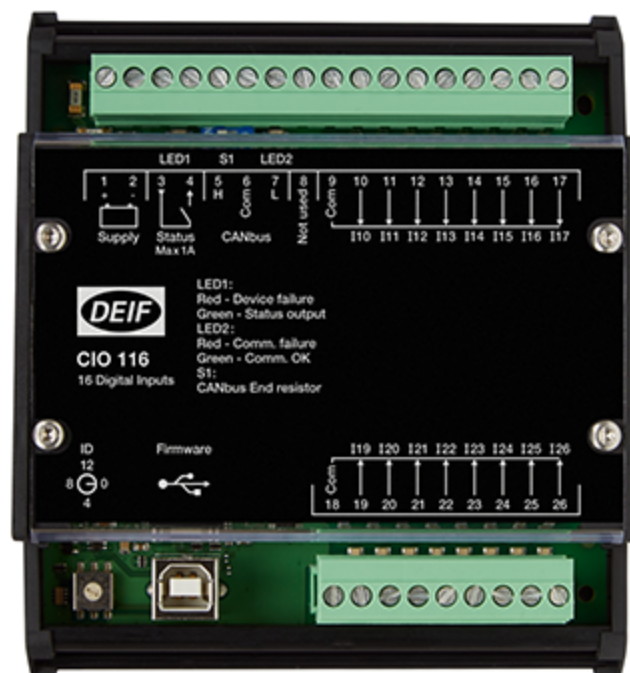




## INSTALLATION AND COMMISSIONING GUIDE

# CAN bus-based I/O module, CIO 116

### 16 digital inputs



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# 1. Introduction

## 1.1 Warnings, legal information and safety

### 1.1.1 Warnings and notes

Throughout this document, a number of warnings and notes with helpful user information will be presented. To ensure that these are noticed, they will be highlighted as follows in order to separate them from the general text.

#### Warnings



##### **DANGER!**

This highlights dangerous situations. If the guidelines are not followed, these situations could result in death, serious personal injury, and equipment damage or destruction.



##### **CAUTION**

This highlights potentially dangerous situations. If the guidelines are not followed, these situations could result in personal injury or damaged equipment.

#### Notes



##### **INFO**

Notes provide general information, which will be helpful for the reader to bear in mind.

### 1.1.2 Legal information and disclaimer

DEIF takes no responsibility for installation or operation of the generator set. If there is any doubt about how to install or operate the engine/generator etc. controlled by the specific extension, the company responsible for the installation or the operation of the extension must be contacted.



##### **DANGER!**

The CIO module is not to be opened by unauthorised personnel. If opened anyway, the warranty will be lost.

#### Disclaimer

DEIF A/S reserves the right to change any of the contents of this document without prior notice.

The English version of this document always contains the most recent and up-to-date information about the product. DEIF does not take responsibility for the accuracy of translations, and translations might not be updated at the same time as the English document. If there is a discrepancy, the English version prevails.

### 1.1.3 Safety issues

Installing and operating the CIO module may imply work with dangerous currents and voltages. Therefore, the installation should only be carried out by authorised personnel who understand the risks involved in working with live electrical equipment.



##### **DANGER!**

Be aware of the hazardous live currents and voltages. Do not touch any live inputs as this could lead to injury or death.

# 1.2 About the installation and commissioning guide

## 1.2.1 General purpose

This installation and commissioning guide mainly includes general product and hardware information, mounting instructions, terminal strip descriptions, I/O lists and limits, wiring descriptions and how to produce translations for the CIO module through the USW.

The general purpose of this document is to give the user important information to be used in the installation of the unit.



**DANGER!**

Please make sure to read this document before starting to work with the CIO module and the controller. Failure to do this could result in human injury or damage to the equipment.

## 1.2.2 Intended users

This installation and commissioning guide is mainly intended for the person responsible for the design and installation. In most cases, this would be a panel builder designer. Naturally, other users might also find useful information in the document.

## 1.2.3 Software version

CIO 116	SW version 1.10 or later
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## 2. Installation, mounting and wiring

### 2.1 Installation

The CIO module is delivered in a sturdy carton to prevent shipping damage. When you receive a system, check the part number against that of the requisition and packaging list for agreement. Inspect for damage, and if there is evidence of such, immediately file a claim with the carrier and notify the regional DEIF sales office, your sales representative or a sales representative at DEIF's head office in Skive, Denmark.

If the unit is not installed immediately, store it in the original shipping package in a moisture and dust free environment.

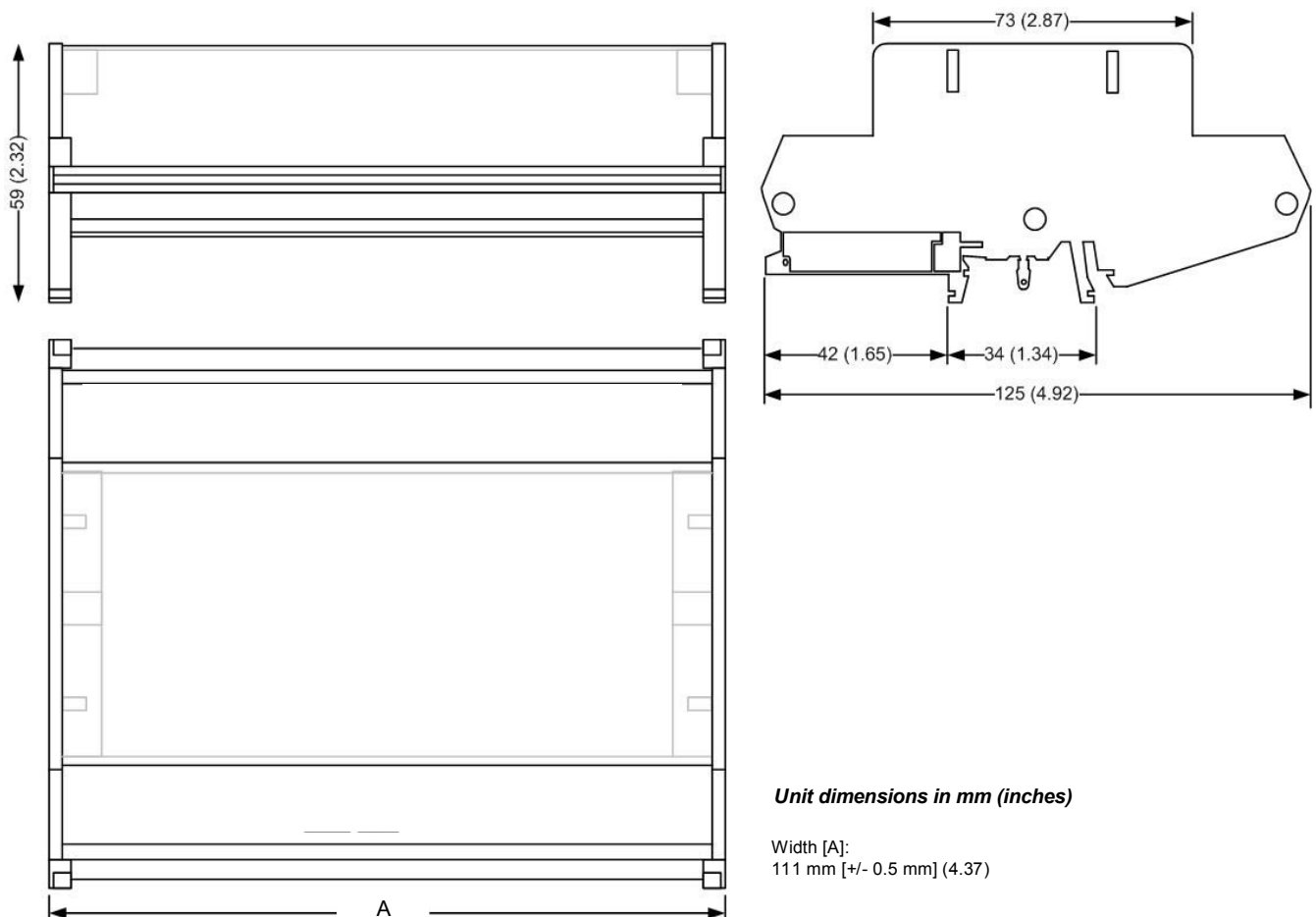
### 2.2 Mounting

#### 2.2.1 Mounting the CIO modules

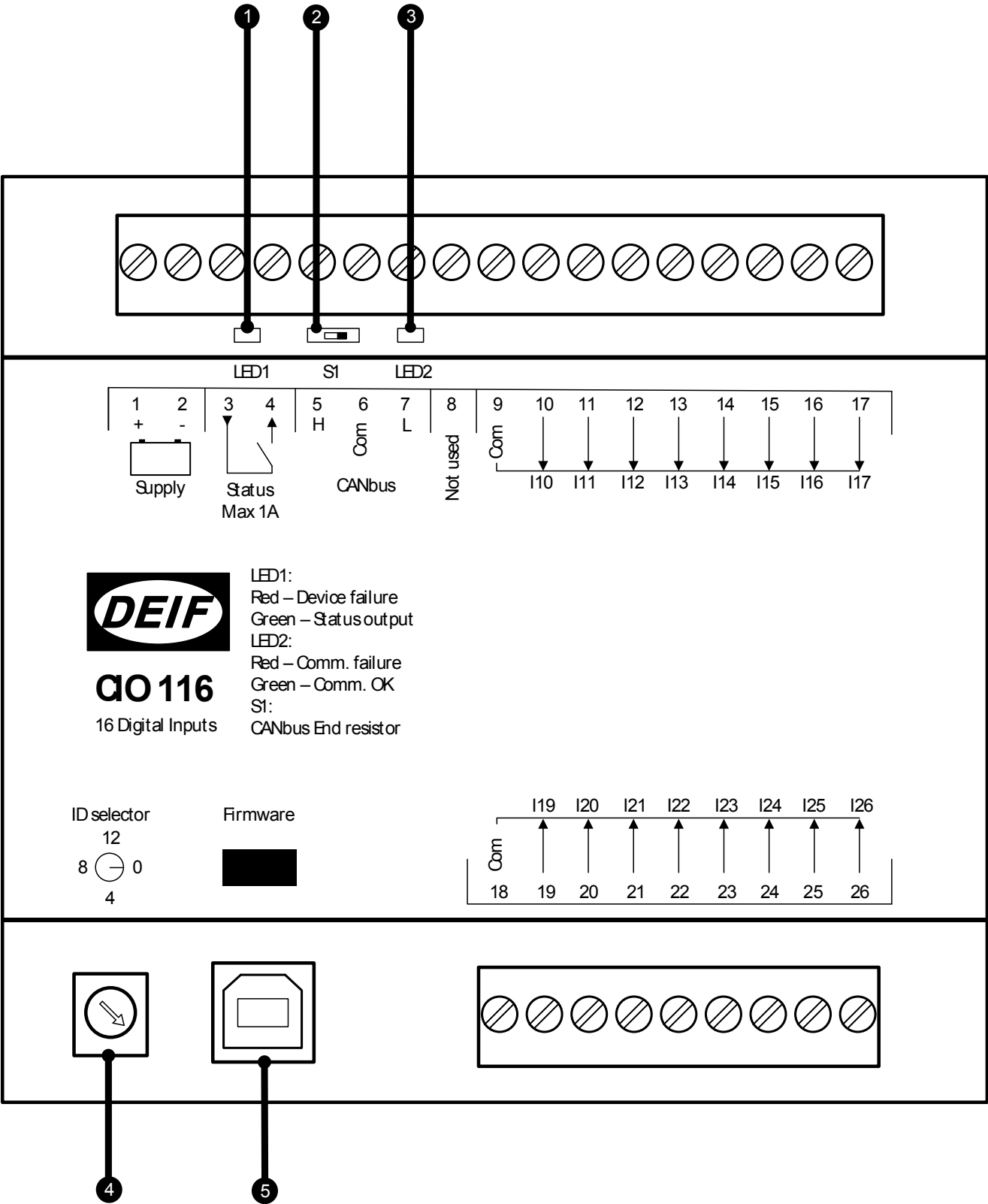
The CIO module is designed for mounting in a closed cabinet on a DIN rail. The module can be mounted on either a TS35 or G-type rail. The unit must be mounted where the ambient temperature does not exceed the range -40 to +70 °C.

#### 2.2.2 Dimensions

The CIO 116 and CIO 208 modules have the following dimensions:



2.3 Common functions



1. LED1 (Status LED)

LED1 indicates the operation status of the module, and the status output of this LED is located at terminal 3-4.

Set up as either status or configurable relay:

## Set up as status relay

LED colour	Description
Green	Status is OK, the relay is closed.
Red constant	The CIO module is not working correctly, the relay is open.
Red flashing	ID 0 is selected, relay is open.

## Set up as configurable relay

LED colour	Description
Green	Status is OK, the relay is closed.
Turned off/no light	Status is OK, the relay is open.
Red constant	The CIO module is not working correctly, the relay is open.
Red flashing	ID 0 is selected, relay is open.
Yellow	The relay is closed, status is not OK.

## 2. Terminal resistor

The CIO module has a built-in 120 ohm end-termination for the CAN bus line which can be activated via the switch (S1) located at terminal 5. See the section "CAN bus" in "Wiring and terminals" for more information and to see when to activate the switch.

## 3. LED2 (CAN bus LED)

LED2 indicates the status of the CAN bus communication to the host controller. This LED is located at terminal 7.

LED colour	Description
Green constant	Communication to the controller is working correctly.
Red constant	No CAN bus communication detected.
Red 2 flashes	CAN bus communication detected, but no CIO-specific communication
Red flashing	CIO communication detected, but not to this module.

## 4. ID selector

The ID selector is used to give CIO modules of the same type different IDs.

CIO 116 can use IDs from 1 to 15

CIO 208 can use IDs from 1 to 15

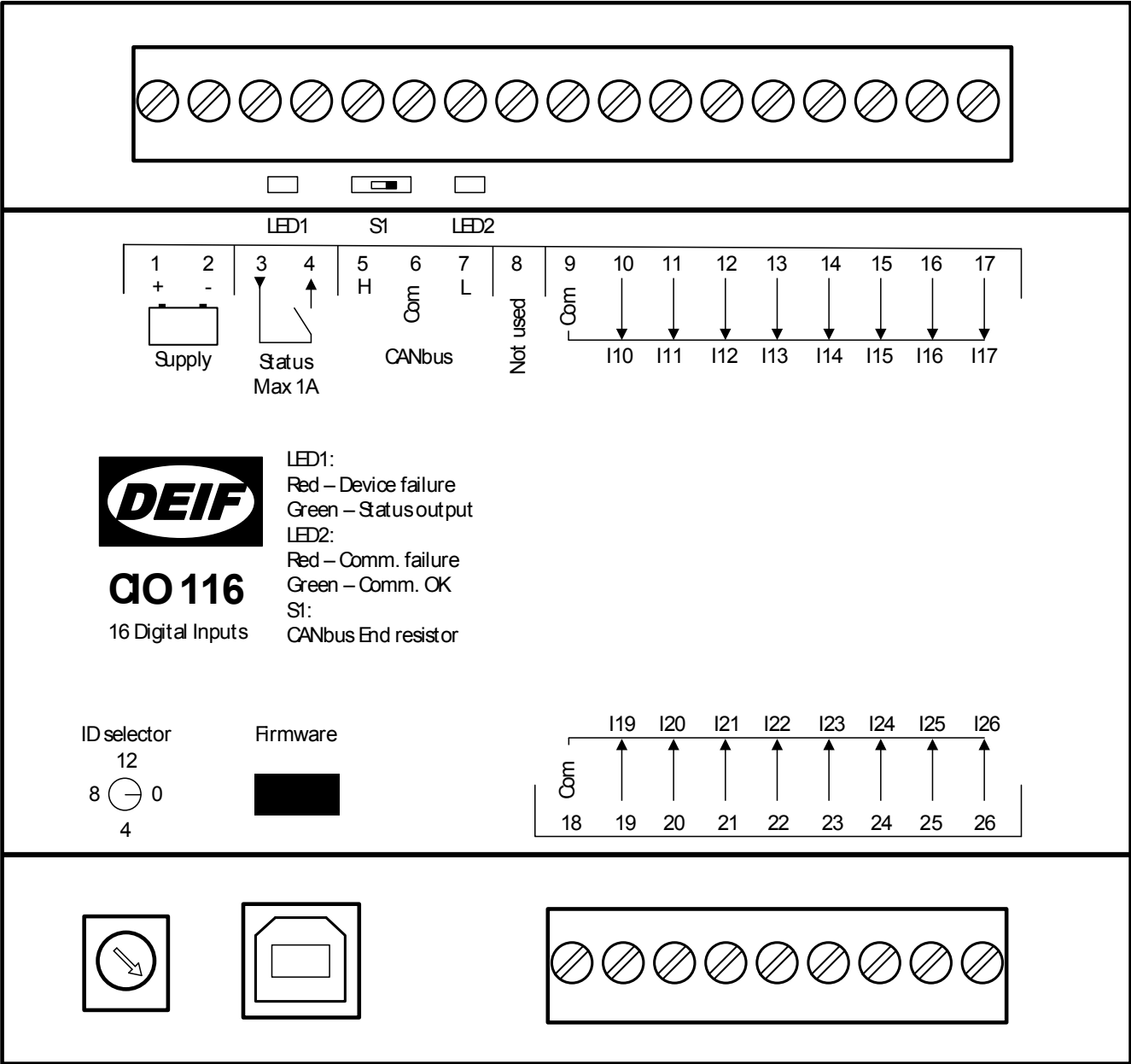
CIO 308 can use IDs from 1 to 15

## 5. USB for firmware update

The firmware of the CIO modules can be updated via the USB port.

2.4    **Wiring and terminals**

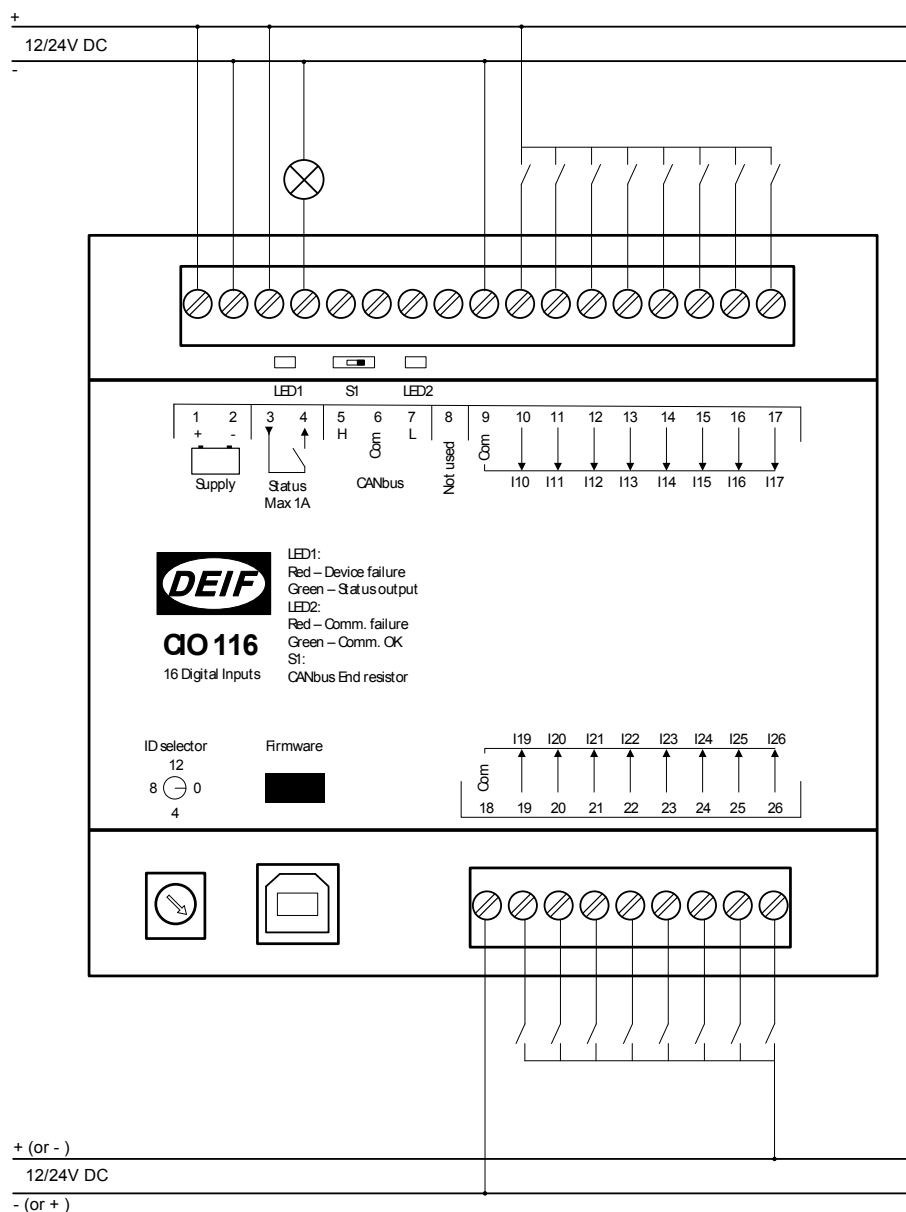
2.4.1    **Terminal overview - CIO 116**



Terminal	Name	Description	Comment
1	+	+12/24 V DC	Power supply
2	-	0 V DC	
3	Status	Common	Status relay (configurable)
4		Normally open	
5	H	CAN H	CAN bus interface
6	Com	CAN Com	
7	L	CAN L	
8	Not used		

Terminal	Name	Description	Comment
9	Com	Common	Common for terminals 10-17
10	I10	Input 10	Digital input group 1
11	I11	Input 11	
12	I12	Input 12	
13	I13	Input 13	
14	I14	Input 14	
15	I15	Input 15	
16	I16	Input 16	
17	I17	Input 17	
18	Com	Common	Common for terminals 19-26
19	I19	Input 19	Digital input group 2
20	I20	Input 20	
21	I21	Input 21	
22	I22	Input 22	
23	I23	Input 23	
24	I24	Input 24	
25	I25	Input 25	
26	I26	Input 26	

## 2.4.2 Wiring



### INFO

The two digital input groups can have different sources.

### INFO

The potential of the common terminal can be both positive and negative.

## 2.4.3 CAN bus

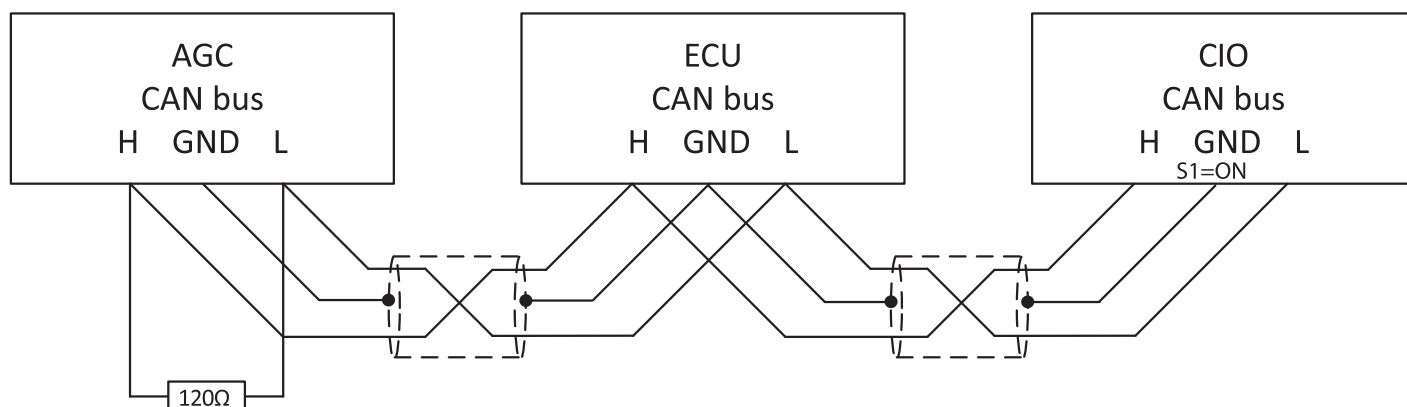
The CIO module(s) can be configured as the only device on the CAN bus or together with an engine controller (ECU) on the same CAN bus as shown in the below example. CIO module(s) can be placed together with all the different engine protocols which are available in the AGC (both J1939 and CANopen), because the CIO module will adapt to the baud rate on the CANline.

It is possible to connect up to three CIO modules of each type to one AGC.

**INFO**

A controller cannot have both CIO modules and Beckhoff modules connected

Below is an example that shows how the CAN bus can be connected:

**AGC 200**

On the AGC 200, only CAN port C is available.

Terminal	Function	Description
13	CAN H	CAN port C
14	Com	
15	CAN L	

**AGC-4/AGC Plant Management**

On the AGC-4 and AGC Plant Management, it is possible to use the CAN ports C, D, E or F, and you need to have at least one of the following options: H5, H8 or H12.

**INFO**

Option H7 is not available for use with CIO modules.

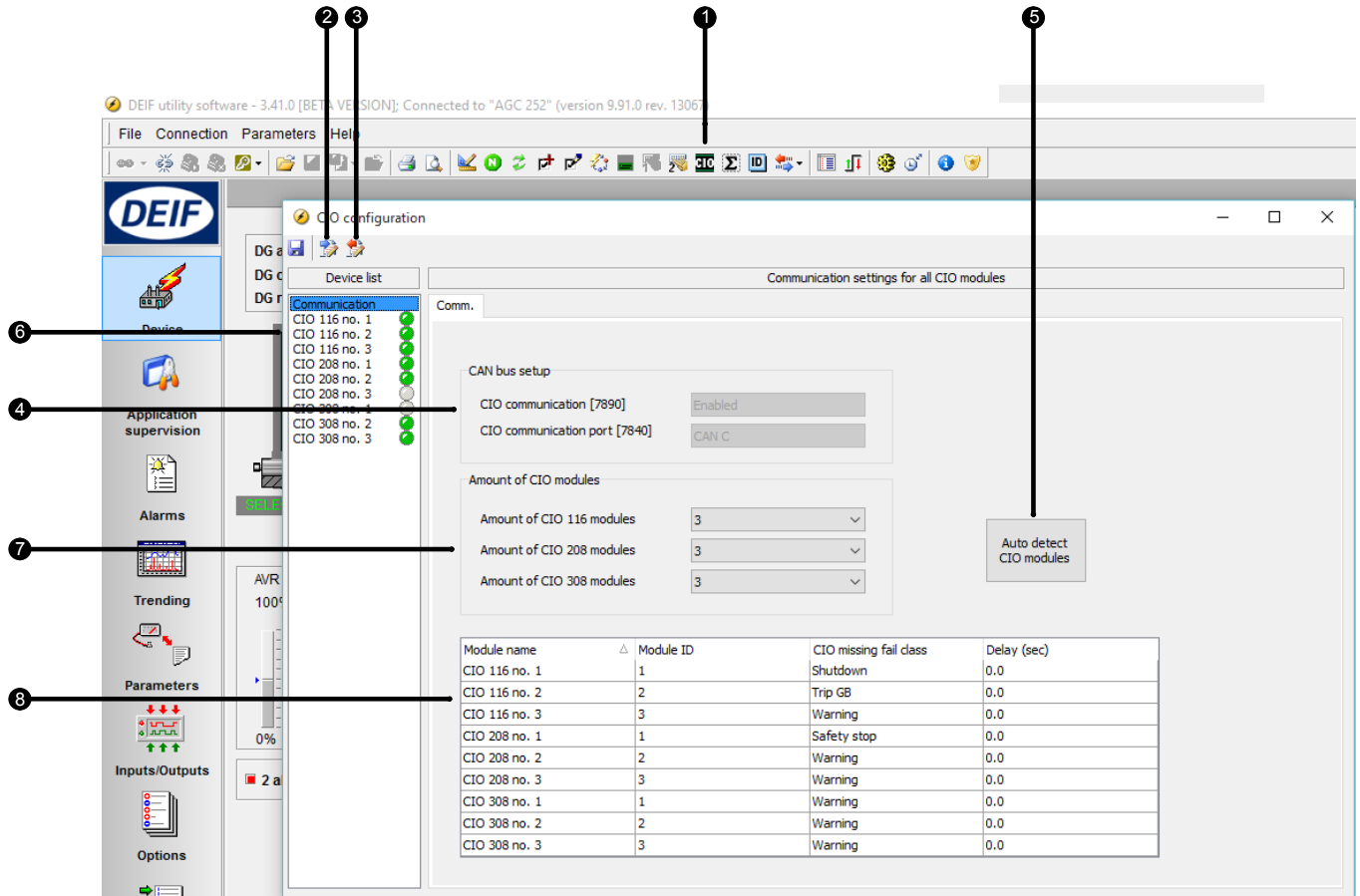
Terminal	Function	Description
29	CAN H	CAN port C
30	Com	
31	CAN L	
32	CAN H	CAN port D
33	Com	
34	CAN L	
131	CAN L	CAN port E
132	Com	
133	CAN H	

Terminal	Function	Description
128	CAN L	CAN port F
129	Com	
130	CAN H	

## 3. Communication

### 3.1 Communication setup

A few parameters revolving around communication to the CIO can be accessed through the display. Through the CIO tab in the USW, full access to all the CIO parameters is available. The CIO configuration menu is accessed from the top menu bar of the USW.



#### 1. CIO configuration menu

When you open the CIO configuration menu, the first page is Communication setup.

#### 2. Read configuration from the controller

#### 3. Write configuration to the controller

#### 4. CAN bus setup

The CAN port for the CIO modules is illustrated as well as the communication port, which are both configured in the USW parameter list.

#### 5. Auto detect

If the CIO modules are already connected and have the correct ID, the USW can automatically detect the number and composition of CIO modules by using the auto detect function.

#### 6. Device navigation list

Click a module from the list to access setup of the module. The green/grey light indicates if connection to the module is established.

## 7. Manually select how many devices are connected

## 8. List of modules

The module ID must correspond with the ID selected on the module and can be changed manually in the list. The fail class and delay set here are triggered if the specific module is missing.



### INFO

The first time you open the menu, the buttons will be inactive and it is necessary to read the configuration from the controller.



### INFO


If the communication to a CIO 116 or CIO 308 module is lost, the AGC will continue with the last received input value.

### 3.1.1 Step-by-step guide to setting up communication the first time

Follow these steps to establish communication to the CIO modules. Setup of the I/Os is described in a later chapter.

- Adjust the ID from 1-15 on the switch by rotating the screw in the lower left corner
- Select which CAN port to use for CIO (parameter 7840).

**Select "Ext. modules DEIF" if the CAN port is only used to CIO modules, but If an engine (ECU) also is connected to the CAN line then "H5 EIC" or similar should be selected.**

- Enable CIO communication (parameter 7890).
- Open the CIO menu by pressing the CIO icon 
- Read the configuration from the controller.
- Auto-detect the number of modules and their ID.

**This only works if the CIO modules are connected, but it is also possible to manually add and configure modules by changing value in "Amount of CIO xxx modules"**

- Determine fail class for module missing for all modules.
- Write the configuration to the controller.





### CAUTION

When the configuration is written to the controller all I/Os are temporarily disabled. For example, all relays are de-energised.

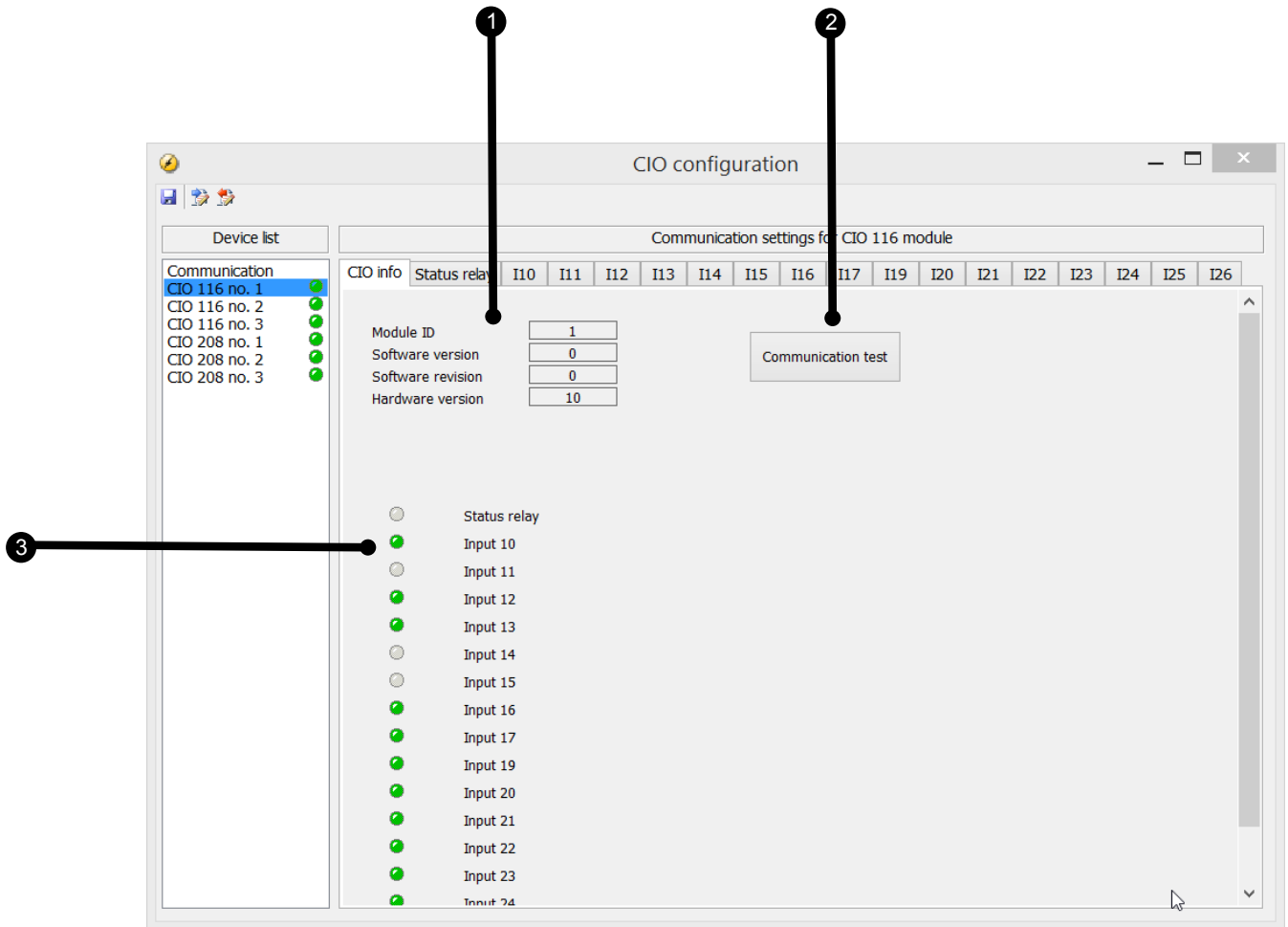
### 3.1.2 Step-by-step guide to update firmware to CIO module

Follow these steps to update the firmware for a CIO module.

- Apply power to the module
- Set ID to 0.
- Connect a USB cable between the CIO module and a PC
- Open the utility software and connect to the CIO module via USB.
- Login as "Customer" with the password 2000.
- Write a new firmware to the device by pressing this icon 
- When the firmware is completed, the connection can be stopped , the USB cable can be removed, and the ID should be returned to the desired ID.

## 4. I/O setup

### 4.1 CIO info tab



#### 1. Module info

This section gives an overview of the specific module's ID and the software and hardware version of the module. This information is important if support is needed for the product.

#### 2. Communication test

When you click the Communication test button, the CAN bus LED (LED2) of the corresponding module will flash green.

#### 3. I/O status

In this section, the state of the input of the specific module is shown.

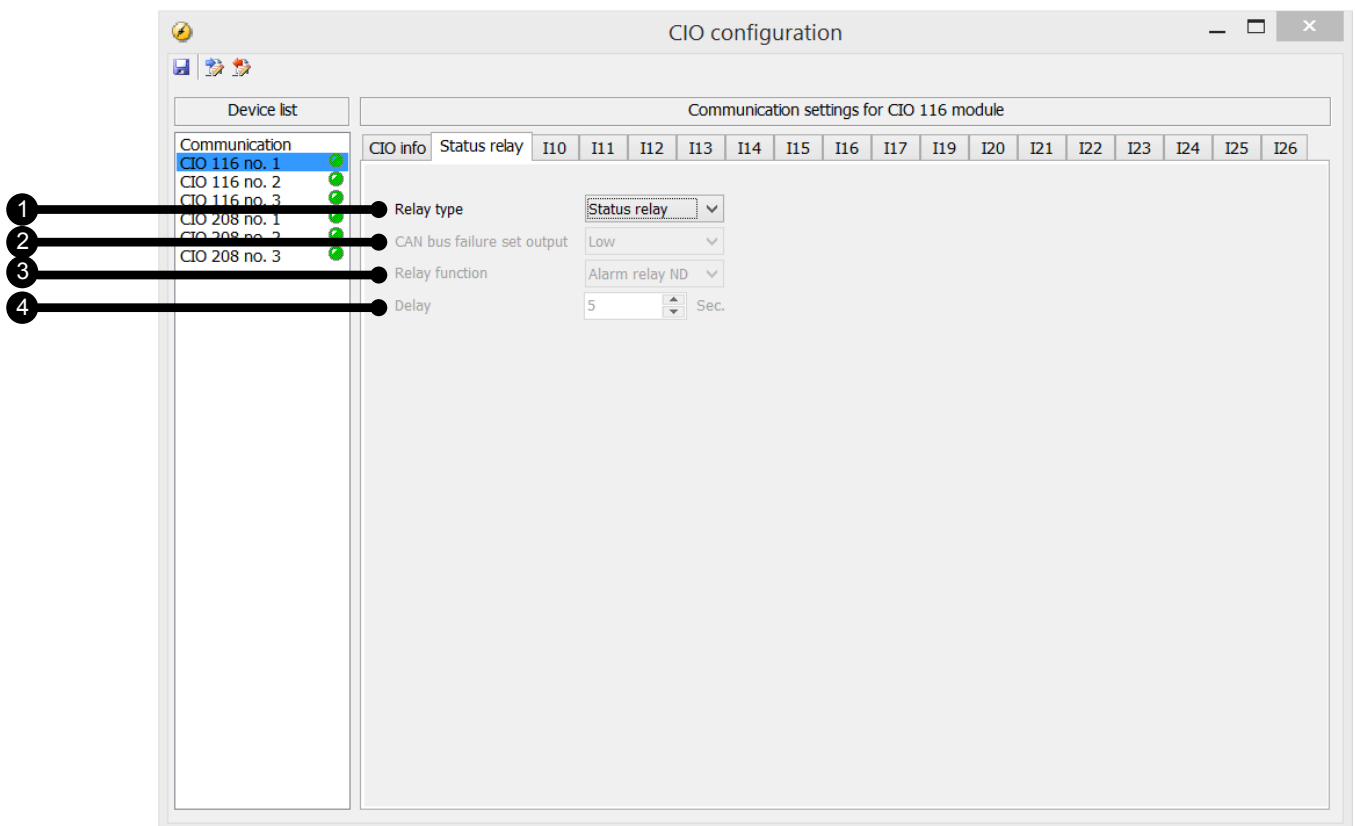
### 4.2 Status relay

The module has a status relay, which can be used as a status relay or as a configurable relay.



## INFO

Power cycling the CIO module while there is no communication to the AGC will reset the settings results, and the relay will be set as a status relay until communication is established. The CIO configuration is stored in the AGC, and this means that the CIO module will be configured when the communication to the AGC is available.



### 1. Relay type

This setting has two states: Status relay and Configurable.

If it is used as a status relay, the relay will stay closed as long as the state of the module is OK, which corresponds with a constant green status LED (see Status LED). If the relay is used as a status relay, the settings below are disregarded.

### 2. CAN bus failure set output

This setting has three levels: Low, High and Stay. In case of a CAN bus failure, the related relay will change its state based on this setting. If it is set to Stay, the relay will keep its current state until communication is working again.

### 3. Relay function

The relay function can be set to five different settings:

#### Alarm relay ND

The related relay is used as an alarm relay of the type "ND" (Normally De-energised).

The relay is activated until the alarm that caused the activation is acknowledged and gone.

#### Limit relay

The relay will activate at a certain predefined limit set point. When the condition that activated the relay has returned to normal, and when the delay has expired, the relay will deactivate. The delay is adjustable.

An output relay should be configured as a limit relay, otherwise an alarm will be raised when the output is activated.



#### **INFO**

To use the relay in M-Logic, it must be configured as a limit relay.

### **Horn relay**

All configurable relays can be selected to be a horn output (horn relay).

This means that, for example, the relay can be connected to an alarm annunciator, like a horn. When "Horn relay" is selected, an external horn is activated every time a new alarm occurs. If the alarm horn timer in parameter 6130 is adjusted to 0 seconds, the horn remains activated until the alarm is acknowledged. If the alarm horn parameter (6130) is not 0 seconds, the horn relay output is active until the timer expires and then the relay deactivates, even though the alarm is still present.

### **Siren relay**

When "Siren relay" is selected, an external siren is activated on all alarms, like the selection "Horn relay". When the siren relay is activated and another alarm is active, a short-time reset will be activated. If the alarm horn timer in parameter 6130 is adjusted to 0 seconds, the siren relay remains activated until all alarms are acknowledged.

### **Alarm relay NE**

The related relay is used as an alarm relay of the type "NE" (Normally Energised).

The relay is normally closed, and if the related alarm occurs, the relay will open until the alarm is acknowledged and gone.

## **4. Delay**

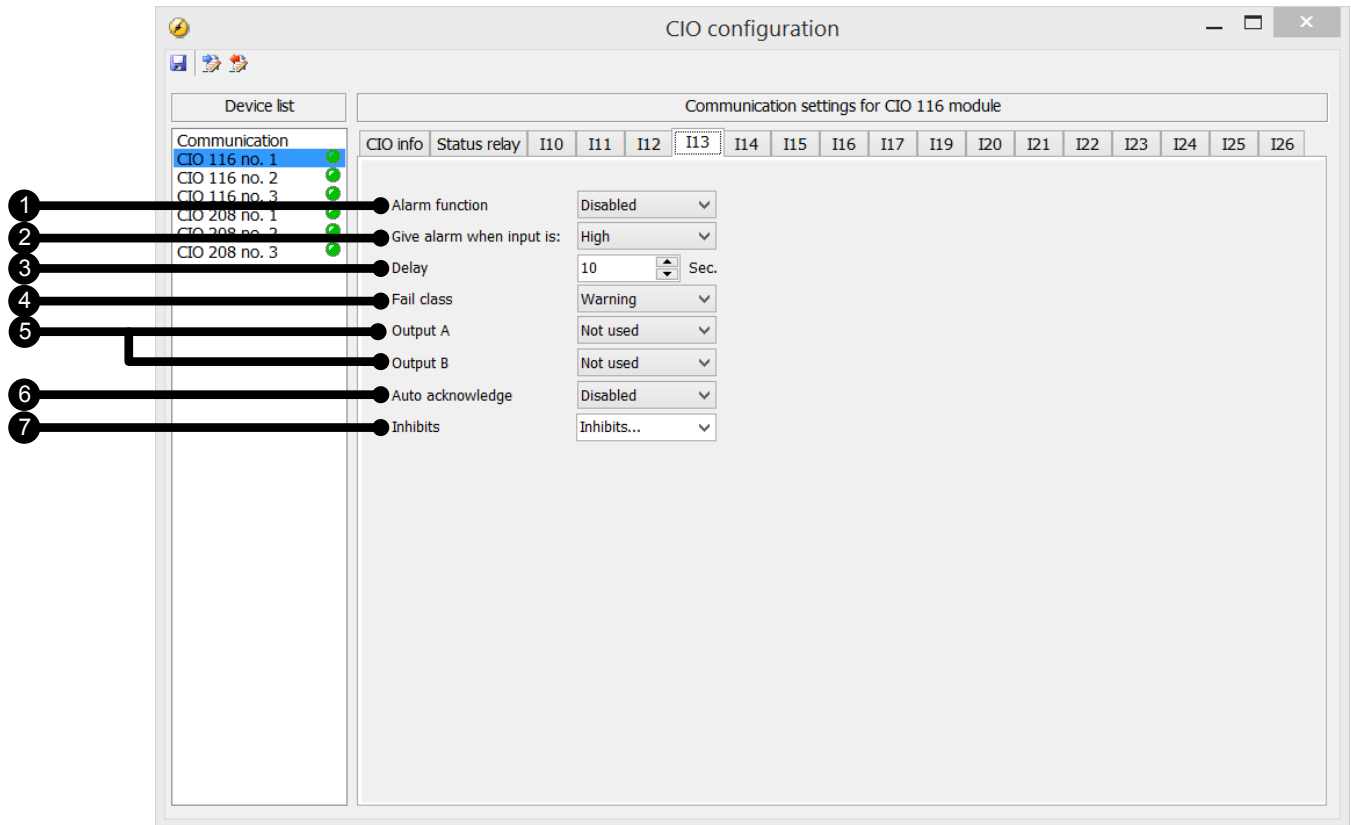
Used when the relay function is "Limit".

The delay setting indicates how many seconds the relay stays energised after the input has become inactive. This functionality is also called off-delay.

## **4.3 CIO 116**

### **4.3.1 Input settings**

In the following, the alarms related to the digital inputs of the CIO 116 are described.



### 1. Alarm function

Activates/deactivates the alarm function.

### 2. Give alarm when input is

Defines if the alarm is triggered when the signal is high or low.

### 3. Delay

The timer setting is the time that must expire from the alarm level is reached until the alarm occurs.

### 4. Fail class

When the alarm occurs, the unit will react depending on the selected fail class. Select the required fail class from the drop-down list. The list contains the fail classes Block, Warning, Trip GB, Shutdown and Safety stop.

### 5. Output A/Output B

Select which terminal to activate in case of an alarm. A terminal number can be selected, but "Limit" is also available in the drop-down list. Limit makes the alarm useable as an input event in M-Logic.

No alarm will appear when both outputs (OA and OB) of the alarm are adjusted to a limit relay.

### 6. Auto acknowledge

If this option is set, the alarm is automatically acknowledged if the signal related to the alarm disappears.

### 7. Inhibits

Is used to express exceptions to when an alarm must be triggered. In order to select when the alarms are to be active, a configurable inhibit setting has been made for every alarm. The inhibit functionality is only available via the PC utility software. For every alarm, there is a drop-down list from which you can select the signals that must be present in order to inhibit the alarm.

Function	Description
Inhibit 1	M-Logic outputs: Conditions are programmed in M-Logic
Inhibit 2	
Inhibit 3	
GB On (TB On)	The generator breaker (GB) is closed (TB = tie breaker)
GB Off (TB Off)	The generator breaker is opened
Run status	Running is detected and the timer in menu 6160 has expired
Not run status	Running is not detected and the timer in menu 6160 has not expired
Generator voltage > 30%	Generator voltage is above 30 % of nominal
Generator voltage < 30%	Generator voltage is below 30 % of nominal
MB On	The mains breaker is closed
MB Off	The mains breaker is opened
Parallel	Both GB (TB) and MB are closed
Not parallel	Either GB (TB) or MB is closed, but not both
Redundant controller	Allows a redundant controller to operate in hot standby with the master controller, and to assume control even in engine running conditions if a problem occurs on the master (hot standby). Only the "Breaker externally tripped" alarm is inhibited as default when a unit has redundant status. See the Option T1 manual for more information.

Example:

The image shows two side-by-side screenshots of a software interface for selecting inhibit functions. The left window shows a list of functions with checkboxes: Inhibit 1, Inhibit 2, Inhibit 3, GB On, GB Off, Run status, Not run status, Generator voltage > 30%, Generator voltage < 30%, MB On, MB Off, Parallel, Not parallel, and Redundant controller. The right window shows the same list, but with 'GB On' and 'Not run status' checked. 'Not run status' is highlighted with a blue background. Both windows have 'All', 'None', 'OK', and 'Cancel' buttons at the bottom.

Inhibit of the alarm is active, as long as one of the selected inhibit functions is active.

In the example above, inhibit is set to **GB On** and **Not run status**. Here, the alarm will be active when the generator has started. When the generator has been synchronised to the busbar, the alarm will be disabled again.

- Function inputs such as running feedback, remote start or access lock are never inhibited. Only alarm inputs can be inhibited.
- If an alarm is configured to activate a limit relay, the relay will activate even though the inhibit input is ON.