CIP Safety communication

Reference guide

v2 - EN

Original instructions

Document updates

Publication date	Code	Updates
FEB 2025	Inxpect 100S_200S CIP RG_7_00326_en_v2	Updated eds files list Minor changes
SEP 2024	Inxpect 100S_200S CIP RG_7_00326_en_v1	First issue

1. Purpose and Scope

This document is an addendum of the safety manual of Inxpect SRE 100 Series and Inxpect SRE 200 Series and it defines the data exchanged through CIP™ (Common Industrial Interface) based on Ethernet/IP™ and CIP Safety™ fieldbus interface.

In particular, this document describes and specifies the fieldbus interface provided by C201B-C control unit as part of both Inxpect SRE 100 Series and Inxpect SRE 200 Series.

The following topics will be covered:

- Overview of the Fieldbus interface;
- Definition of the exchanged data;
- Fieldbus parameters settings.

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2. Applicability

This release of this document is applicable to the Inxpect SRE 100 Series and Inxpect SRE 200 Series in accordance with

INXPECT_C201B_20240903.eds	Standard ODVA configuration file
INXPECT_C201B_20250220.eds	With EDS-AOP feature that enables detailed parameter information from the EDS file to be displayed for that device in Studio 5000 (named tags)
068B_0004_C201B_58510359_2byteSafeIn_4byteSafeOut.eds	Compliant with OMRON safety controllers and importable with Sysmac Studio (Assembly objects: 2-byte in and 4-byte out)
068B_0004_C201B_E8ADEE77_16byteSafeIn_4byteSafeOut.eds	Compliant with OMRON safety controllers and importable with Sysmac Studio (Assembly objects: 16-byte in and 4-byte out)

and control unit C201B-C firmware version 2.1.0.

- Vendor ID: 1675 (0x068B)
- Device type: 150 (0x0096)
- Product code: 4
- Major revision: 1
- Minor revision: 1

2.1 NOTICE

The following considerations shall be taken into account:

- Inxpect SRE 200 Series supports four detection fields and it is a multi-target system, able to detect up to four targets for each sensor.
- Inxpect SRE 100 Series supports two detection fields and it is a mono-target system, able to detect only the nearest target to each sensor.

For this reason, some data are available only in Inxpect SRE 200 Series. In the document, a note is present where a difference between Inxpect SRE 200 Series and Inxpect SRE 100 Series is present.

3. System Overview

C201B-C control unit (Refer to Figure 1), part of both Inxpect SRE 100 Series and Inxpect SRE 200 Series, communicates with the machine control unit via CIP Safety and Ethernet/IP by means of one of the two RJ45 connectors [**X1**] and [**X2**] at the bottom (Refer to Figure 3).

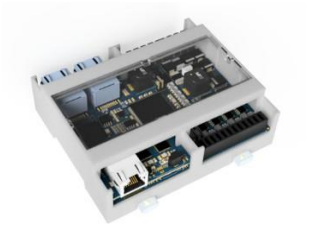


Figure 1 *C201B-C device*

The control unit is suitable for the following network topologies:

1. Linear;
2. Star;
3. Ring (DLR).

So in case 1 and 2 the two RJ45 connectors are interchangeable with the same scope while in the third case the two ports are used to create the ring topology.

The two ports are identified by the Ethernet Link CIP object in the following way:

- [X1] as “port1”
- [X2] as “port2”

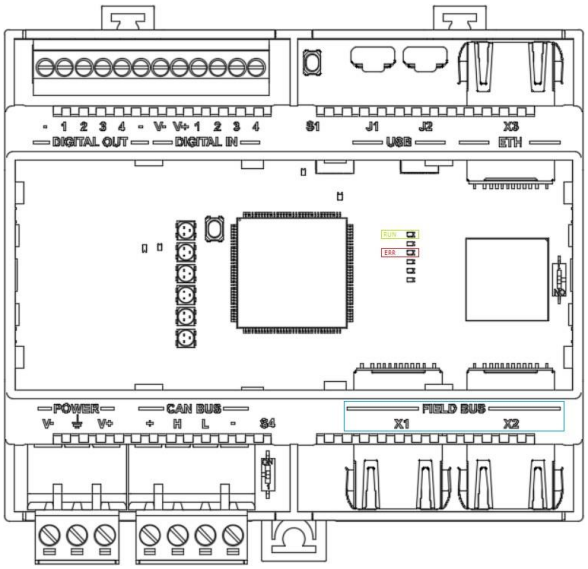


Figure 2 *C201B-C layout*

In case of Ring network topology the control unit supports the Device Level Ring (DLR) networking technology but just as a beacon-based ring node.

4. Integration into the network

To integrate the control unit into the fieldbus network the following steps shall be taken:

- Danger due to unintended use of SIL 2 data of the control units in SIL 3 applications. Ensure that the safety-related data of the control unit is only used in applications which do not exceed safety integrity level SIL 2 (IEC 61508);

- Before integrating an already-configured device into a safety-related network, reset the fieldbus parameters (Refer to "8.6 Factory reset of the fieldbus parameters" on page 26);
- The control unit needs a unique IP address, the sub-network mask and, possibly, the IP address of the gateway to be able to exchange data with other devices in the network.

  Options for assigning the data to the control unit:
  - Using the Inxpect Safety application in the **Admin**/ **Fieldbus Parameters** page;
  - With a BOOTP- or DHCP server (if BOOTP or DHCP are enabled)
  - Via CIP with the TCP/IP object (0xF5)
    ***Note**: Upon delivery, the control unit requests an IP address via BOOTP and DHCP. Once the control unit has received a valid IP address, the BOOTP and DHCP are disabled and the IP address is set as a static. Therefore, it can only be changed via Inxpect Safety application or via CIP with the TCP/IP object (0xF5).*

  The factory reset of the fieldbus parameter described in "8.6 Factory reset of the fieldbus parameters" on page 26 restores the DHCP.
- The control unit requires a safety network number (SSN) in a safety-relevant EtherNet/IP network. The safety network number should be identical for all devices in a safety-related EtherNet/IP network. The safety network is identified using the safety network number. The safety network number is a 48-bit identifier.

  You can assign the safety network number to the control unit using the Inxpect Safety application in the **Admin**/ **Fieldbus Parameters** page.

  ***Note**: A function of automatic setting of the safety network number is not supported.*
- If the control unit has already been connected to a control and should be connected to another control, the link to the old control must be explicitly removed.

  You can remove the link to a control using the Reset ownership command of the Inxpect Safety application in the **Admin**/ **Fieldbus Parameters** page.

5. Exchanged data

The following data are available:

- Explicit messages, refer to "6. Exchanged data - CIP standard objects" below.
- Implicit messages used for the cyclical data transmission, refer to "7. Exchanged data - Assembly objects" on page 15.

6. Exchanged data - CIP standard objects

In addition to the cyclical data, the control unit provides acyclical data via explicit messaging, e.g., for diagnostic purposes or configuration information. The data are organized in CIP objects. The CIP standard objects provided by the control units are the following:

- Identity object (0x01);
- Message Router object (0x02);
- Assembly objects (0x04);
- Connection Manager object (0x06);
- Safety Supervisor object (0x39);
- Safety Validator objects (0x3a);
- Device Level Ring (DLR) object (0x47);
- Quality of Service (QoS) object (0x48);
- TCP/IP Interface object (0xf5);
- Ethernet Link objects (0xf6);
- LLDP Management object (0x109).

6.1 Identity object (0x01)

6.1.1 Class attributes

Attribute ID		Access rules	Name	Data type
Decimal	Hex			
1	0x01	get	Revision	UINT
2	0x02	get	Max. instance	UINT
3	0x03	get	Number of instances	UINT
6	0x06	get	Max. ID number class attributes	UINT
7	0x07	get	Max. ID number instance attributes	UINT

6.1.2 Class services

Service ID		Name	Description
Decimal	Hex		
1	0x01	Get attribute all	Retrieve all attribute values
14	0x0e	Get attribute single	Retrieve attribute value

6.1.3 Available instances

Instance ID	
Decimal	Hex
1	0x01

6.1.4 Instance attributes

Attribute ID		Access rules	Name	Data type
Decimal	Hex			
1	0x01	get	Vendor ID	UINT
2	0x02	get	Device type	UINT
3	0x03	get	Product code	UINT
4	0x04	get	Revision	STRUCT
5	0x05	get	Status	WORD
6	0x06	get	Serial number	UDINT
7	0x07	get	Product name	SHORT STRING
8	0x08	get	State	USINT

6.1.5 Instance services

Service ID		Name	Description
Decimal	Hex		
1	0x01	Get attribute all	Retrieve all attribute values
14	0x0e	Get attribute single	Retrieve attribute value

6.2 Message Router object (0x02)

6.2.1 Class attributes

Attribute ID		Access rules	Name	Data type
Decimal	Hex			
1	0x01	get	Revision	UINT
2	0x02	get	Max. instance	UINT
3	0x03	get	Number of instances	UINT
6	0x06	get	Max. ID number class attributes	UINT
7	0x07	get	Max. ID number instance attributes	UINT

6.2.2 Class services

Service ID		Name	Description
Decimal	Hex		
14	0x0e	Get attribute single	Retrieve attribute value

6.2.3 Available instances

The control unit implements the Message Router object exclusively at class level. It does not provide any instances.

6.3 Assembly object (0x04)

6.3.1 Class attributes

Attribute ID		Access rules	Name	Data type
Decimal	Hex			
1	0x01	get	Revision	UINT
2	0x02	get	Max. instance	UINT
3	0x03	get	Number of instances	UINT
6	0x06	get	Max. ID number class attributes	UINT
7	0x07	get	Max. ID number instance attributes	UINT

6.3.2 Class services

Service ID		Name	Description
Decimal	Hex		
14	0x0e	Get attribute single	Retrieve attribute value

6.3.3 Available instances

Instance ID		Notes
Decimal	Hex	
200	0xc8	4 bytes safe input data of the target (safe output data of the originator)
101	0x65	2 bytes safe output data of the target (safe input data of the originator)
103	0x67	4 bytes safe output data of the target (safe input data of the originator)
105	0x69	16 bytes safe output data of the target (safe input data of the originator)
107	0x6b	120 bytes non-safe output data of the target (non-safe input data of the originator)

6.3.4 Instance attributes

Attribute ID		Access rules	Name	Data type
Decimal	Hex			
1	0x01	get	Number of members in list	UINT
2	0x02	get	Member list	STRUCT
3	0x03	get / set *	Data	ARRAY of BYTE
4	0x04	get	Size	UINT

Note *: just for safe input data of the target (safe output data of the originator).*

6.3.5 Instance services

Service ID		Name	Description
Decimal	Hex		
14	0x0e	Get attribute single	Retrieve attribute value
16	0x10	Set attribute single	Modify attribute value
24	0x18	Get member	Get a member of instance attribute 2

6.4 Connection Manager object (0x06)

6.4.1 Class attributes

Attribute ID		Access rules	Name	Data type
Decimal	Hex			
1	0x01	get	Revision	UINT
2	0x02	get	Max. instance	UINT
3	0x03	get	Number of instances	UINT
6	0x06	get	Max. ID number class attributes	UINT
7	0x07	get	Max. ID number instance attributes	UINT

6.4.2 Class services

Service ID		Name	Description
Decimal	Hex		
14	0x0e	Get attribute single	Retrieve attribute value

6.4.3 Available instances

The control unit does not provide any instance attributes for the Connection Manager object.

Instance ID	
Decimal	Hex
1	0x01

6.4.4 Instance services

Service ID		Name	Description
Decimal	Hex		
14	0x0e	Get attribute single	Retrieve attribute value
78	0x4e	Forward Close	Close connection
84	0x54	Forward Open	Open new connection

6.5 Safety Supervisor object (0x39)

6.5.1 Class attributes

Attribute ID		Access rules	Name	Data type
Decimal	Hex			
1	0x01	get	Revision	UINT

6.5.2 Class services

Service ID		Name	Description
Decimal	Hex		
14	0x0e	Get attribute single	Retrieve attribute value

6.5.3 Available instances

Instance ID	
Decimal	Hex
1	0x01

6.5.4 Instance attributes

Attribute ID		Access rules	Name	Data type
Decimal	Hex			
11	0x0B	get	Device Status	USINT
12	0x0C	get	Exception Status	BYTE
15	0x0F	get / set	Alarm Enable	BOOL
16	0x10	get / set	Warning Enable	BOOL
25	0x19	get	Configuration UNID	10 octets
26	0x1A	get	Safety Configuration Identifier	10 octets
27	0x1B	get	Target UNID	10 octets
28	0x1C	get	OCPOUNID	STRUCT

6.5.5 Instance services

Service ID		Name	Description
Decimal	Hex		
14	0x0e	Get attribute single	Retrieve attribute value
16	0x10	Set attribute single	Modify attribute value
84	0x54	Safety Reset	Type 0: completely restart device

6.6 Safety Validator object (0x3a)

6.6.1 Class attributes

Attribute ID		Access rules	Name	Data type
Decimal	Hex			
1	0x01	get	Revision	UINT
8	0x08	get	Safety connection fault count	UINT

6.6.2 Class services

Service ID		Name	Description
Decimal	Hex		
14	0x0e	Get attribute single	Retrieve attribute value
75	0x4b	Reset all error counters	Reset all error counters

6.6.3 Available instances

Instance ID	
Decimal	Hex
1	0x01
2	0x02
3	0x03
4	0x04

6.6.4 Instance attributes

Attribute ID		Access rules	Name	Data type
Decimal	Hex			
1	0x01	get	Safety Validator state	USINT
2	0x02	get	Safety Validator type	USINT
3	0x03	get	Ping interval EPI multiplier	UINT
4	0x04	get	Time coord msg min multiplier	STRUCT
5	0x05	get	Network time expectation multiplier	STRUCT
6	0x06	get	Timeout multiplier	STRUCT
7	0x07	get	Max consumer number	USINT
12	0x0c	get	Max data age	UINT
13	0x0d	get	Application data path	EPATH
14	0x0e	get	Error code	UINT
15	0x0f	get	Producer / consumer fault counters	STRUCT

6.6.5 Instance services

Service ID		Name	Description
Decimal	Hex		
14	0x0e	Get attribute single	Retrieve attribute value
16	0x10	Set attribute single	Modify attribute value

6.7 Device Level Ring object (0x47)

6.7.1 Class attributes

Attribute ID		Access rules	Name	Data type
Decimal	Hex			
1	0x01	get	Revision	UINT
2	0x02	get	Max. instance	UINT
3	0x03	get	Number of instances	UINT
6	0x06	get	Max. ID number class attributes	UINT
7	0x07	get	Max. ID number instance attributes	UINT

6.7.2 Class services

Service ID		Name	Description
Decimal	Hex		
14	0x0e	Get attribute single	Retrieve attribute value

6.7.3 Available instances

Instance ID	
Decimal	Hex
1	0x01

6.7.4 Instance attributes

Attribute ID		Access rules	Name	Data type
Decimal	Hex			
1	0x01	get	Network topology	USINT
2	0x02	get	Network status	USINT
10	0x0a	get	Active supervisor address	STRUCT
12	0x0c	get	Capability flags	DWORD

6.7.5 Instance services

Service ID		Name	Description
Decimal	Hex		
1	0x01	Get attribute all	Retrieve all attribute values
14	0x0e	Get attribute single	Retrieve attribute value

6.8 Quality of Service object (0x48)

6.8.1 Class attributes

Attribute ID		Access rules	Name	Data type
Decimal	Hex			
1	0x01	get	Revision	UINT
2	0x02	get	Max. instance	UINT
3	0x03	get	Number of instances	UINT
6	0x06	get	Max. ID number class attributes	UINT
7	0x07	get	Max. ID number instance attributes	UINT

6.8.2 Class services

Service ID		Name	Description
Decimal	Hex		
14	0x0e	Get attribute single	Retrieve attribute value

6.8.3 Available instances

Instance ID	
Decimal	Hex
1	0x01

6.8.4 Instance attributes

Attribute ID		Access rules	Name	Data type
Decimal	Hex			
4	0x04	get / set	DSCP Urgent	USINT
5	0x05	get / set	DSCP Scheduled	USINT
6	0x06	get / set	DSCP High	USINT
7	0x07	get / set	DSCP Low	USINT
8	0x08	get / set	DSCP Explicit	USINT

6.8.5 Instance services

Service ID		Name	Description
Decimal	Hex		
14	0x0e	Get attribute single	Retrieve attribute value
16	0x10	Set attribute single	Modify attribute value

6.9 TCP/IP Interface object (0xf5)

6.9.1 Class attributes

Attribute ID		Access rules	Name	Data type
Decimal	Hex			
1	0x01	get	Revision	UINT
2	0x02	get	Max. instance	UINT
3	0x03	get	Number of instances	UINT
6	0x06	get	Max. ID number class attributes	UINT
7	0x07	get	Max. ID number instance attributes	UINT

6.9.2 Class services

Service ID		Name	Description
Decimal	Hex		
14	0x0e	Get attribute single	Retrieve attribute value

6.9.3 Available instances

Instance ID	
Decimal	Hex
1	0x01

6.9.4 Instance attributes

Attribute ID		Access rules	Name	Data type
Decimal	Hex			
1	0x01	get	Status	DWORD
2	0x02	get	Configuration capability	DWORD
3	0x03	get / set	Configuration control	DWORD
4	0x04	get	Physical link object	STRUCT
5	0x05	get / set	Interface configuration	STRUCT
6	0x06	get / set	Host name	STRING
7	0x07	get	Safety Network Number	6 octets

Attribute ID		Access rules	Name	Data type
Decimal	Hex			
10	0x0a	get / set	Select ACD	BOOL
11	0x0b	get / set	Last Conflict Detected	STRUCT
13	0x0d	get / set	Encapsulation inactivity timeout	UINT

6.9.5 Instance services

Service ID		Name	Description
Decimal	Hex		
1	0x01	Get attribute all	Retrieve all attribute values
14	0x0e	Get attribute single	Retrieve attribute value
16	0x10	Set attribute single	Modify attribute value

6.10 Ethernet Link object (0xf6)

6.10.1 Class attributes

Attribute ID		Access rules	Name	Data type
Decimal	Hex			
1	0x01	get	Revision	UINT
2	0x02	get	Max. instance	UINT
3	0x03	get	Number of instances	UINT
6	0x06	get	Max. ID number class attributes	UINT
7	0x07	get	Max. ID number instance attributes	UINT

6.10.2 Class services

Service ID		Name	Description
Decimal	Hex		
14	0x0e	Get attribute single	Retrieve attribute value

6.10.3 Available instances

Instance ID	
Decimal	Hex
1	0x01
2	0x02

6.10.4 Instance attributes

Attribute ID		Access rules	Name	Data type
Decimal	Hex			
1	0x01	get	Interface speed	UDINT
2	0x02	get	Interface flags	DWORD
3	0x03	get	Physical address	ARRAY
4	0x04	get	Interface counters	STRUCT
5	0x05	get	Media counters	STRUCT
6	0x06	get / set	Interface control	STRUCT
7	0x07	get	Interface type	USINT
8	0x08	get	Interface state	USINT

Attribute ID		Access rules	Name	Data type
Decimal	Hex			
10	0x0a	get	Interface label	SHORT STRING
11	0x0b	get	Interface capability	STRUCT

6.10.5 Instance services

Service ID		Name	Description
Decimal	Hex		
1	0x01	Get attribute all	Retrieve all attribute values
14	0x0e	Get attribute single	Retrieve attribute value
16	0x10	Set attribute single	Modify attribute value
76	0x4c	Get and clear	Retrieve attribute value and clear it

6.11 LLDP Management object (0x109)

6.11.1 Class attributes

Attribute ID		Access rules	Name	Data type
Decimal	Hex			
1	0x01	get	Revision	UINT
2	0x02	get	Max. instance	UINT
3	0x03	get	Number of instances	UINT
6	0x06	get	Max. ID number class attributes	UINT
7	0x07	get	Max. ID number instance attributes	UINT

6.11.2 Class services

Service ID		Name	Description
Decimal	Hex		
14	0x0e	Get attribute single	Retrieve attribute value

6.11.3 Available instances

Instance ID	
Decimal	Hex
1	0x01

6.11.4 Instance attributes

Attribute ID		Access rules	Name	Data type
Decimal	Hex			
1	0x01	get / set	LLDP enable	STRUCT
2	0x02	get / set	Message tx interval	UINT
3	0x03	get / set	Message tx hold	USINT
4	0x04	get	LLDP datastore	WORD
5	0x05	get	Last Change	UDINT

6.11.5 Instance services

Service ID		Name	Description
Decimal	Hex		
1	0x01	Get attribute all	Retrieve all attribute values
14	0x0e	Get attribute single	Retrieve attribute value
16	0x10	Set attribute single	Modify attribute value

7. Exchanged data - Assembly objects

The cyclical data transmission between the CIP Safety Originator (e.g. the Safety PLC) and the control unit, acting as a CIP Safety target, occurs via Assembly Objects with Safety characteristics. The control unit provides one slot where various Assembly Objects can be exclusively (or all together) plugged in for transmitting the safety-related process data. The following Assembly Objects are available:

- O2T Safety 4 bytes (Assembly object 200) - 4 bytes safe input data of the target (safe output data of the originator);
- T2O Safety 2 bytes (Assembly object 101) - 2 bytes safe output data of the target (safe input data of the originator);
- T2O Safety 4 bytes (Assembly object 103) - 4 bytes safe output data of the target (safe input data of the originator);
- T2O Safety 16 bytes (Assembly object 105) - 16 bytes safe output data of the target (safe input data of the originator);

Also non-safety-related process data is available by another Assembly Object without Safety characteristics.

- T2O Non-Safe 120 bytes (Assembly object 107) - 120 bytes output non-safe data of the target (non-safe input data of the originator).

The Null instance for the Connection Application Paths is (hex): 0x8f.

7.1 Safe input data of the target (safe output data of the originator)

The following data are available as input of the control unit (output of the originator):

- Selection of the dynamic configuration to be used
- Restart signal
- System recondition signal
- Sensor muting signal
- OSSD values setting

The following table reports in detail the exchanged input data of the control unit.

Name	Data type	Values	Definition
Set configuration ID (bit 0 - 4)	BOOL	0 - 31	Set dynamically the configuration to be used. ***Note**: this value has effect only if digital inputs are not set as "Dynamic configuration switch".*
Restart signal Detection Field 1	BOOL	TRUE FALSE	To perform the restart of a specific detection field, the control has to do a transition of this signal from FALSE to TRUE and from TRUE to FALSE with a minimum duration of 2 seconds and within 5 seconds.
Restart signal Detection Field 2	BOOL	TRUE FALSE	
Restart signal Detection Field 3	BOOL	TRUE FALSE	
Restart signal Detection Field 4	BOOL	TRUE FALSE	

Name	Data type	Values	Definition
System recondition signal	BOOL	TRUE FALSE	To perform a recondition of the system, the control has to set value TRUE.
Mute Sensor 1	BOOL	TRUE FALSE	To mute a specific sensor, the control has to set the value to TRUE. To unmute a specific sensor, the control has to set the value to FALSE. ***Note**: this value has effect only if digital inputs are not set as "Muting group 1" and/or "Muting group 2".*
Mute Sensor 2	BOOL	TRUE FALSE	
Mute Sensor 3	BOOL	TRUE FALSE	
Mute Sensor 4	BOOL	TRUE FALSE	
Mute Sensor 5	BOOL	TRUE FALSE	
Mute Sensor 6	BOOL	TRUE FALSE	
Set OSSD 1	BOOL	TRUE FALSE	To set as ON-state a specific OSSD, the control has to set the value to TRUE. To set as OFF-state a specific OSSD, the control has to set the value to FALSE. ***Note**: this value has effect only if digital outputs are set as "Fieldbus controlled".*
Set OSSD 2	BOOL	TRUE FALSE	
Set OSSD 3	BOOL	TRUE FALSE	
Set OSSD 4	BOOL	TRUE FALSE	
Mute Group 1	BOOL	TRUE FALSE	To mute a specific sensor, the control has to set the value to TRUE. To unmute a specific sensor, the control has to set the value to FALSE. ***Note**: this value has effect only if digital inputs are not set as "Muting group 1" and/or "Muting group 2".*
Mute Group 2	BOOL	TRUE FALSE	

7.2 Safe output data of the target (safe input data of the originator)

Depending on the selected module, the following data are available as output of the control unit (input of the originator):

- Detection field status
- Muting status
- Stop signal feedback
- Diagnostic signal feedback
- Configuration signal feedback
- Restart signal feedback
- Static object detection field status
- Current configuration ID
- OSSD values
- Input values
- Single channel input values

- Sensor presence field
- Sensor working mode

The following table reports in detail the exchanged output data of the control unit at the system level.

Name	Data type	Values	Definition
Detection Field 1	BOOL	TRUE FALSE	Value is FALSE if the specific detection field is in detection or the restart timeout is not expired. In addition, any fault condition results in reaching the safe state of the system, forcing the value to FALSE. TRUE otherwise.
Detection Field 2	BOOL	TRUE FALSE	
Detection Field 3	BOOL	TRUE FALSE	
Detection Field 4	BOOL	TRUE FALSE	
Muting status	BOOL	TRUE FALSE	Value is FALSE if at least a field of a sensor is muted. TRUE otherwise.
Stop feedback signal	BOOL	TRUE FALSE	Value is FALSE if a stop signal is present on the digital input set as “Stop signal”. TRUE otherwise.
Diagnostic feedback signal	BOOL	TRUE FALSE	Value is FALSE if a diagnostic condition is present. TRUE otherwise.
Configuration feedback	BOOL	TRUE FALSE	Value is FALSE if the system is in “Configuration” state. TRUE otherwise.
Restart feedback signal	BOOL	TRUE FALSE	Value is FALSE if at least a field of a sensor is ready to restart by a “Restart signal”. TRUE otherwise.
Configuration ID bit 0	BOOL	0 - 31	Value indicates the dynamic configuration ID currently in use.
Configuration ID bit 1	BOOL		
Configuration ID bit 2	BOOL		
Configuration ID bit 3	BOOL		
Configuration ID bit 4	BOOL		
Restart Signal feedback Detection Field 1	BOOL	TRUE FALSE	Value is FALSE if the specific field of at least a sensor is ready to restart by a “Restart signal”. TRUE otherwise.
Restart Signal feedback Detection Field 2	BOOL	TRUE FALSE	
Restart Signal feedback Detection Field 3	BOOL	TRUE FALSE	
Restart Signal feedback Detection Field 4	BOOL	TRUE FALSE	
Static Object Detection status Detection Field 1	BOOL	TRUE FALSE	Value is TRUE if in the specific detection field of at least a sensor is performed a static detection. FALSE otherwise.
Static Object Detection status Detection Field 2	BOOL	TRUE FALSE	
Static Object Detection status Detection Field 3	BOOL	TRUE FALSE	
Static Object Detection status Detection Field 4	BOOL	TRUE FALSE	

Name	Data type	Values	Definition
OSSD 1	BOOL	TRUE FALSE	Value is TRUE if the specific OSSD is set ON. FALSE otherwise.
OSSD 2	BOOL	TRUE FALSE	
OSSD 3	BOOL	TRUE FALSE	
OSSD 4	BOOL	TRUE FALSE	
Input 1	BOOL	TRUE FALSE	Value is TRUE if the specific double channel input is set ON. FALSE otherwise.
Input 2	BOOL	TRUE FALSE	
Channel 1 Input 1	BOOL	TRUE FALSE	Value is TRUE if the specific single channel input is set ON. FALSE otherwise.
Channel 2 Input 1	BOOL	TRUE FALSE	
Channel 1 Input 2	BOOL	TRUE FALSE	
Channel 2 Input 2	BOOL	TRUE FALSE	

The following table reports in detail the exchanged output data of the control unit for each connected sensor (where n is the sensor number and the range is from 1 to 6).

Name	Data type	Values	Definition
Sensor n Detection Field 1	BOOL	TRUE FALSE	Value is FALSE if the specific detection field of the sensor is in detection or the restart timeout is not expired. In addition, any fault condition results in reaching the safe state of the system, forcing the value to FALSE. TRUE otherwise.
Sensor n Detection Field 2	BOOL	TRUE FALSE	
Sensor n Detection Field 3	BOOL	TRUE FALSE	
Sensor n Detection Field 4	BOOL	TRUE FALSE	
Sensor n Diagnostic feedback	BOOL	TRUE FALSE	Value is FALSE if a diagnostic condition is present. TRUE otherwise.
Sensor n Muting feedback	BOOL	TRUE FALSE	Value is FALSE if at least a field is muted. TRUE otherwise.
Sensor n Reserved	BOOL	TRUE FALSE	
Sensor n Installation status	BOOL	TRUE FALSE	Value is TRUE if the sensor is used. FALSE otherwise.
Sensor n Presence Detection Field 1	BOOL	TRUE FALSE	Value is FALSE if a target is present in the specific field. TRUE otherwise.
Sensor n Presence Detection Field 2	BOOL	TRUE FALSE	
Sensor n Presence Detection Field 3	BOOL	TRUE FALSE	
Sensor n Presence Detection Field 4	BOOL	TRUE FALSE	

Name	Data type	Values	Definition
Sensor n Working Mode 1	BOOL	TRUE FALSE	It represents the current working mode of the sensor: FALSE, it is working in “Restart prevention”. TRUE, it is working in “Access mode”.
Sensor n Working Mode 2	BOOL	TRUE FALSE	
Sensor n Working Mode 3	BOOL	TRUE FALSE	
Sensor n Working Mode 4	BOOL	TRUE FALSE	

7.3 Non-safe output data of the target (non-safe input data of the originator)

The same information of safe output is also available as non-safe output data for monitoring purposes. They must not be used for safety-related tasks.

7.3.1 Detection field distance

Detection field x distance represents the minimum distance of the target detected in the field x. The distance is reported in mm. Value 0 is used in case of no detection.
By default, the value is given in big endian format. It is possible during the configuration of the system to select a little endian format.

7.3.2 Detection field angle

Detection field x angle represents the azimuth angle of the minimum distance of the target detected in the field x. The angle is reported in degrees(°) in the range (0°, +180°) and centered in 90°.

***Note**: in order to obtain an angle in the range [-90°, +90°] centered in 0°, just subtract 90 to the read value.*

7.4 O2T Safety 4 bytes (Assembly object 200)

Connection Application Paths (hex): 20 04 24 8F 2C C8 2C 8F

Byte 0							
Bit 7	**Bit 6**	**Bit 5**	**Bit 4**	**Bit 3**	**Bit 2**	**Bit 1**	**Bit 0**
Restart signal Detection Field 3 *	Restart signal Detection Field 2	Restart signal Detection Field 1	ID of configuration to be set bit4	ID of configuration to be set bit3	ID of configuration to be set bit2	ID of configuration to be set bit1	ID of configuration to be set bit0
Byte 1							
Bit 7	**Bit 6**	**Bit 5**	**Bit 4**	**Bit 3**	**Bit 2**	**Bit 1**	**Bit 0**
Muting command Sensor 6	Muting command Sensor 5	Muting command Sensor 4	Muting command Sensor 3	Muting command Sensor 2	Muting command Sensor 1	System recondition signal	Restart signal Detection Field 4 *
Byte 2							
Bit 7	**Bit 6**	**Bit 5**	**Bit 4**	**Bit 3**	**Bit 2**	**Bit 1**	**Bit 0**
Reserved	Reserved	Muting command Group 2	Muting command Group 1	Set OSSD 4	Set OSSD 3	Set OSSD 2	Set OSSD 1
Byte 3							
Bit 7	**Bit 6**	**Bit 5**	**Bit 4**	**Bit 3**	**Bit 2**	**Bit 1**	**Bit 0**
Reserved	Reserved	Reserved	Reserved	Reserved	Reserved	Reserved	Reserved

Note: available only for Inxpect SRE 200 Series.*

7.5 T2O Safety 2 bytes (Assembly object 101)

Connection Application Paths (hex): 20 04 24 8F 2C 8F 2C

Byte 0							
Bit 7	**Bit 6**	**Bit 5**	**Bit 4**	**Bit 3**	**Bit 2**	**Bit 1**	**Bit 0**
Configuration feedback	System diagnostic signal	Stop feedback signal	Muting status	Detection Field 4*	Detection Field 3*	Detection Field 2	Detection Field 1
Byte 1							
Bit 7	**Bit 6**	**Bit 5**	**Bit 4**	**Bit 3**	**Bit 2**	**Bit 1**	**Bit 0**
Reserved	Reserved	Configuration ID bit 4	Configuration ID bit 3	Configuration ID bit 2	Configuration ID bit 1	Configuration ID bit 0	Restart feedback signal

Note*: available only for Inxpect SRE 200 Series.*

7.6 T2O Safety 4 bytes (Assembly object 103)

Connection Application Paths (hex): 20 04 24 8F 2C 8F 2C 67

Byte 0							
Bit 7	**Bit 6**	**Bit 5**	**Bit 4**	**Bit 3**	**Bit 2**	**Bit 1**	**Bit 0**
Configuration feedback	System diagnostic signal	Stop feedback signal	Muting status	Detection Field 4 *	Detection Field 3 *	Detection Field 2	Detection Field 1
Byte 1							
Bit 7	**Bit 6**	**Bit 5**	**Bit 4**	**Bit 3**	**Bit 2**	**Bit 1**	**Bit 0**
Static Object Detection Field 4 *	Static Object Detection Field 3 *	Static Object Detection Field 2 *	Static Object Detection Field 1 *	Restart feedback signal Detection Field 4 *	Restart feedback signal Detection Field 3 *	Restart feedback signal Detection Field 2	Restart feedback signal Detection Field 1
Byte 2							
Bit 7	**Bit 6**	**Bit 5**	**Bit 4**	**Bit 3**	**Bit 2**	**Bit 1**	**Bit 0**
OSSD 3	OSSD 2	OSSD 1	Configuration ID bit 4	Configuration ID bit 3	Configuration ID bit 2	Configuration ID bit 1	Configuration ID bit 0
Byte 3							
Bit 7	**Bit 6**	**Bit 5**	**Bit 4**	**Bit 3**	**Bit 2**	**Bit 1**	**Bit 0**
Reserved	Channel 2 Input 2	Channel 1 Input 2	Channel 2 Input 1	Channel 1 Input 1	Input 2	Input 1	OSSD 4

Note*: available only for Inxpect SRE 200 Series.*

7.7 T2O Safety 16 bytes (Assembly object 105)

Connection Application Paths (hex): 20 04 24 8F 2C 8F 2C 69

Byte 0							
Bit 7	**Bit 6**	**Bit 5**	**Bit 4**	**Bit 3**	**Bit 2**	**Bit 1**	**Bit 0**
Configuration feedback	System diagnostic signal	Stop feedback signal	Muting status	Detection Field 4 *	Detection Field 3 *	Detection Field 2	Detection Field 1
Byte 1							
Bit 7	**Bit 6**	**Bit 5**	**Bit 4**	**Bit 3**	**Bit 2**	**Bit 1**	**Bit 0**

Static Object Detection Field 4 *	Static Object Detection Field 3 *	Static Object Detection Field 2 *	Static Object Detection Field 1 *	Restart feedback signal Detection Field 4 *	Restart feedback signal Detection Field 3 *	Restart feedback signal Detection Field 2	Restart feedback signal Detection Field 1
Byte 2							
Bit 7	**Bit 6**	**Bit 5**	**Bit 4**	**Bit 3**	**Bit 2**	**Bit 1**	**Bit 0**
OSSD 3	OSSD 2	OSSD 1	Configuration ID bit 4	Configuration ID bit 3	Configuration ID bit 2	Configuration ID bit 1	Configuration ID bit 0
Byte 3							
Bit 7	**Bit 6**	**Bit 5**	**Bit 4**	**Bit 3**	**Bit 2**	**Bit 1**	**Bit 0**
Reserved	Channel 2 Input 2	Channel 1 Input 2	Channel 2 Input 1	Channel 1 Input 1	Input 2	Input 1	OSSD 4
Byte 4							
Bit 7	**Bit 6**	**Bit 5**	**Bit 4**	**Bit 3**	**Bit 2**	**Bit 1**	**Bit 0**
Sensor 1 Installation status	Sensor 1 Reserved	Sensor 1 Muting feedback	Sensor 1 Diagnostic feedback	Sensor 1 Detection Field 4 *	Sensor 1 Detection Field 3 *	Sensor 1 Detection Field 2	Sensor 1 Detection Field 1
Byte 5							
Bit 7	**Bit 6**	**Bit 5**	**Bit 4**	**Bit 3**	**Bit 2**	**Bit 1**	**Bit 0**
Sensor 1 Working Mode 4 *	Sensor 1 Working Mode 3 *	Sensor 1 Working Mode 2	Sensor 1 Working Mode 1	Sensor 1 Presence Field 4 *	Sensor 1 Presence Field 3 *	Sensor 1 Presence Field 2	Sensor 1 Presence Field 1
Byte 6							
Bit 7	**Bit 6**	**Bit 5**	**Bit 4**	**Bit 3**	**Bit 2**	**Bit 1**	**Bit 0**
Sensor 2 Installation status	Sensor 2 Reserved	Sensor 2 Muting feedback	Sensor 2 Diagnostic feedback	Sensor 2 Detection Field 4 *	Sensor 2 Detection Field 3 *	Sensor 2 Detection Field 2	Sensor 2 Detection Field 1
Byte 7							
Bit 7	**Bit 6**	**Bit 5**	**Bit 4**	**Bit 3**	**Bit 2**	**Bit 1**	**Bit 0**
Sensor 2 Working Mode 4	Sensor 2 Working Mode 3	Sensor 2 Working Mode 2	Sensor 2 Working Mode 1	Sensor 2 Presence Field 4 *	Sensor 2 Presence Field 3 *	Sensor 2 Presence Field 2	Sensor 2 Presence Field 1
Byte 8							
Bit 7	**Bit 6**	**Bit 5**	**Bit 4**	**Bit 3**	**Bit 2**	**Bit 1**	**Bit 0**
Sensor 3 Installation status	Sensor 3 Reserved	Sensor 3 Muting feedback	Sensor 3 Diagnostic feedback	Sensor 3 Detection Field 4 *	Sensor 3 Detection Field 3 *	Sensor 3 Detection Field 2	Sensor 3 Detection Field 1
Byte 9							
Bit 7	**Bit 6**	**Bit 5**	**Bit 4**	**Bit 3**	**Bit 2**	**Bit 1**	**Bit 0**
Sensor 3 Working Mode 4 *	Sensor 3 Working Mode 3 *	Sensor 3 Working Mode 2	Sensor 3 Working Mode 1	Sensor 3 Presence Field 4 *	Sensor 3 Presence Field 3 *	Sensor 3 Presence Field 2	Sensor 3 Presence Field 1
Byte 10							
Bit 7	**Bit 6**	**Bit 5**	**Bit 4**	**Bit 3**	**Bit 2**	**Bit 1**	**Bit 0**
Sensor 4 Installation status	Sensor 4 Reserved	Sensor 4 Muting feedback	Sensor 4 Diagnostic feedback	Sensor 4 Detection Field 4 *	Sensor 4 Detection Field 3 *	Sensor 4 Detection Field 2	Sensor 4 Detection Field 1
Byte 11							
Bit 7	**Bit 6**	**Bit 5**	**Bit 4**	**Bit 3**	**Bit 2**	**Bit 1**	**Bit 0**
Sensor 4 Working Mode 4 *	Sensor 4 Working Mode 3 *	Sensor 4 Working Mode 2	Sensor 4 Working Mode 1	Sensor 4 Presence Field 4 *	Sensor 4 Presence Field 3 *	Sensor 4 Presence Field 2	Sensor 4 Presence Field 1
Byte 12							
Bit 7	**Bit 6**	**Bit 5**	**Bit 4**	**Bit 3**	**Bit 2**	**Bit 1**	**Bit 0**

Sensor 5 Installation status	Sensor 5 Reserved	Sensor 5 Muting feedback	Sensor 5 Diagnostic feedback	Sensor 5 Detection Field 4 *	Sensor 5 Detection Field 3 *	Sensor 5 Detection Field 2	Sensor 5 Detection Field 1
Byte 13							
Bit 7	**Bit 6**	**Bit 5**	**Bit 4**	**Bit 3**	**Bit 2**	**Bit 1**	**Bit 0**
Sensor 5 Working Mode 4 *	Sensor 5 Working Mode 3 *	Sensor 5 Working Mode 2	Sensor 5 Working Mode 1	Sensor 5 Presence Field 4 *	Sensor 5 Presence Field 3 *	Sensor 5 Presence Field 2	Sensor 5 Presence Field 1
Byte 14							
Bit 7	**Bit 6**	**Bit 5**	**Bit 4**	**Bit 3**	**Bit 2**	**Bit 1**	**Bit 0**
Sensor 6 Installation status	Sensor 6 Reserved	Sensor 6 Muting feedback	Sensor 6 Diagnostic feedback	Sensor 6 Detection Field 4 *	Sensor 6 Detection Field 3 *	Sensor 6 Detection Field 2	Sensor 6 Detection Field 1
Byte 15							
Bit 7	**Bit 6**	**Bit 5**	**Bit 4**	**Bit 3**	**Bit 2**	**Bit 1**	**Bit 0**
Sensor 6 Working Mode 4 *	Sensor 6 Working Mode 3 *	Sensor 6 Working Mode 2	Sensor 6 Working Mode 1	Sensor 6 Presence Field 4 *	Sensor 6 Presence Field 3 *	Sensor 6 Presence Field 2	Sensor 6 Presence Field 1

Note*: available only for Inxpect SRE 200 Series.*

7.8 T2O Non-Safe 120 bytes (Assembly object 107)

Connection Application Paths (hex): 20 04 2C C1 2C 6B

It provides 120-byte output data (inputs of the control host) divided in:

- **Control unit and sensor diagnostics** as reported in Table 1 .

Byte	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
0	Control unit - Error status							
1 - 2	Control unit - Detailed error status (16 bit)							
3	Sensor 1 - Error status							
4 - 5	Sensor 1- Detailed error status (16 bit)							
6	Sensor 2 - Error status							
7 - 8	Sensor 2 - Detailed error status (16 bit)							
9	Sensor 3 - Error status							
10 -11	Sensor 3 - Detailed error status (16 bit)							
12	Sensor 4 - Error status							
13 - 14	Sensor 4 - Detailed error status (16 bit)							
15	Sensor 5 - Error status							
16 - 17	Sensor 5 - Detailed error status (16 bit)							
18	Sensor 6 - Error status							
19 - 20	Sensor 6 - Detailed error status (16 bit)							

Table 1 *Extended Info module - Error status*

- **Target distance and azimuth angle** of each sensor (as reported in Table 2 , Table 3 , Table 4 , Table 5 , Table 6 and Table 7). It is the current distance and azimuth angle of a target detected by each sensor. For details refer to par. "7.3.1 Detection field distance" on page 19 and par. "7.3.2 Detection field angle" on page 19.

Byte	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
21 - 22	Sensor 1 - Detection field 1 distance (16 bit)							
23	Sensor 1 - Detection field 1 angle (8 bit)							
24 - 25	Sensor 1 - Detection field 2 distance (16 bit)							
26	Sensor 1 - Detection field 2 angle (8 bit)							
27 - 28	Sensor 1 - Detection field 3 distance (16 bit)							
29	Sensor 1 - Detection field 3 angle (8 bit)							
30 - 31	Sensor 1 - Detection field 4 distance (16 bit)							
32	Sensor 1 - Detection field 4 angle (8 bit)							

Table 2 *Extended Info module - Target distances and azimuth angles for Sensor 1*

Byte	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
33 - 34	Sensor 2 - Detection field 1 distance (16 bit)							
35	Sensor 2 - Detection field 1 angle (8 bit)							
36 - 37	Sensor 2 - Detection field 2 distance (16 bit)							
38	Sensor 2 - Detection field 2 angle (8 bit)							
39 - 40	Sensor 2 - Detection field 3 distance (16 bit)							
41	Sensor 2 - Detection field 3 angle (8 bit)							
42 - 43	Sensor 2 - Detection field 4 distance (16 bit)							
44	Sensor 2 - Detection field 4 angle (8 bit)							

Table 3 *Extended Info module - Target distances and azimuth angles for Sensor 2*

Byte	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
45 - 46	Sensor 3 - Detection field 1 distance (16 bit)							
47	Sensor 3 - Detection field 1 angle (8 bit)							
48 - 49	Sensor 3 - Detection field 2 distance (16 bit)							
50	Sensor 3 - Detection field 2 angle (8 bit)							
51 - 52	Sensor 3 - Detection field 3 distance (16 bit)							
53	Sensor 3 - Detection field 3 angle (8 bit)							
54 - 55	Sensor 3 - Detection field 4 distance (16 bit)							
56	Sensor 3 - Detection field 4 angle (8 bit)							

Table 4 *Extended Info module - Target distances and azimuth angles for Sensor 3*

Byte	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
57 - 58	Sensor 4 - Detection field 1 distance (16 bit)							
59	Sensor 4 - Detection field 1 angle (8 bit)							
60 -61	Sensor 4 - Detection field 2 distance (16 bit)							
62	Sensor 4 - Detection field 2 angle (8 bit)							
63 - 64	Sensor 4 - Detection field 3 distance (16 bit)							
65	Sensor 4 - Detection field 3 angle (8 bit)							
66 - 67	Sensor 4 - Detection field 4 distance (16 bit)							
68	Sensor 4 - Detection field 4 angle (8 bit)							

Table 5 *Extended Info module - Target distances and azimuth angles for Sensor 4*

Byte	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
69 - 70	Sensor 5 - Detection field 1 distance (16 bit)							
71	Sensor 5 - Detection field 1 distance (8 bit)							
72 -73	Sensor 5 - Detection field 2 distance (16 bit)							
74	Sensor 5 - Detection field 2 distance (8 bit)							
75 - 76	Sensor 5 - Detection field 3 distance (16 bit)							
77	Sensor 5 - Detection field 3 distance (8 bit)							
78 - 79	Sensor 5 - Detection field 4 distance (16 bit)							
80	Sensor 5 - Detection field 4 distance (8 bit)							

Table 6 *Extended Info module - Target distances and azimuth angles for Sensor 5*

Byte	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
81 - 82	Sensor 6 - Detection field 1 distance (16 bit)							
83	Sensor 6 - Detection field 1 distance (8 bit)							
84 -85	Sensor 6 - Detection field 2 distance (16 bit)							
86	Sensor 6 - Detection field 2 distance (8 bit)							
87 - 88	Sensor 6 - Detection field 3 distance (16 bit)							
89	Sensor 6 Detection field 3 distance (8 bit)							
90 - 91	Sensor 6 - Detection field 4 distance (16 bit)							
92	Sensor 6 - Detection field 4 distance (8 bit)							

Table 7 *Extended Info module - Target distances and azimuth angles for Sensor 6*

Note*: only one target data (distance) is available for Inxpect SRE 100 Series.*

- **Control unit and sensors status** as reported in Table 8 .

Byte	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
93	Control unit status							
94	Sensor 1 status (1/2)							
95	Sensor 1 status (2/2)							
96	Sensor 2 status (1/2)							
97	Sensor 2 status (2/2)							
98	Sensor 3 status (1/2)							
99	Sensor 3 status (2/2)							
100	Sensor 4 status (1/2)							
101	Sensor 4 status (2/2)							
102	Sensor 5 status (1/2)							
103	Sensor 5 status (2/2)							
104	Sensor 6 status (1/2)							
105	Sensor 6 status (2/2)							

Table 8 *Extended Info module - Status*

- Reserved extra info for future implementation (as reported in Table 9).

Byte	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
106 - 119	Reserved							

Table 9 *Extended Info module - Extra info*

8. Fieldbus settings

By the Inxpect Safety application the user can manage the following fieldbus parameters (relative to the CIP and CIP Safety based on the Ethernet/IP):

- Network parameters;
- Safety Network Number (SNN);
- Safety Configuration Signature (SCID);
- Endianness of the exchanged data;
- Reset ownership command;
- Factory reset of the fieldbus parameters.

8.1 Network parameters

This section contains the following parameters to set:

- DHCP
- Unique IP address (used also as Node ID of the CIP Safety Unique ID);
- Netmask;
- Gateway;
- Host name.

8.2 Safety Network Number (SNN)

This section allows to set the SNN in the following ways:

- Manual;
- Time-based (date and time in CIP format).

The configuration with a safety network configuration tool (SNCT) is not possible and the SNN is settable only by the Inxpect Safety application.

8.3 Safety Configuration Signature (SCID)

This section allows to copy and get the Safety Configuration Identifier composed by:

- Safety Configuration CRC32 calculated as the CRC32 of all System configurations;
- date and time (in CIP format) relative when a new System configuration is performed.

8.4 Endianness of the exchanged data

The control unit manages the data in Big endian format but the user can choose to exchange data in Little endian format.
The parameter affects only on the uint16 data of not-safe Assembly object 107.

8.5 Reset ownership command

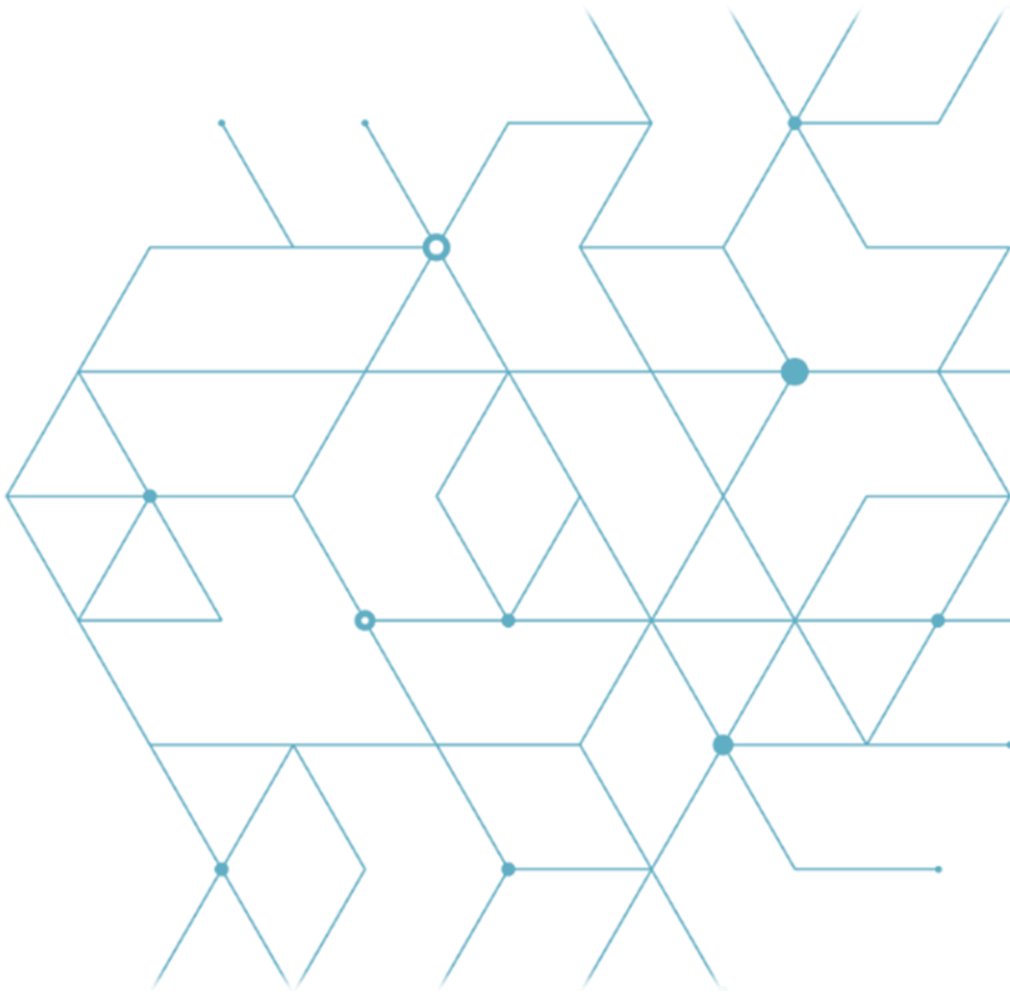
The Inxpect Safety application allows resetting the control unit association with a CIP Safety PLC if the user wants to connect it to another one.

8.6 Factory reset of the fieldbus parameters

The Inxpect Safety application allows setting the factory values to the fieldbus parameters.

The default values are the following:

- DHCP: active;
- IP address: 0.0.0.0;
- Netmask: 0.0.0.0;
- Gateway: 0.0.0.0;
- Host name: NULL;
- SNN (hex): ffff_ffff_ffff;
- SCID:
  - CRC32: relative to the System configuration;
  - Date and time (CIP format): relative to the factory reset command;
- Endianness: Big endian.



CIP Safety communication
Reference guide v1
SEP 2024
Inxpect 100S_200S CIP RG_7_00326_en_v1

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